

**FLOW CHARACTERIZATIONS FOR THE PLATTE RIVER BASIN
IN COLORADO, WYOMING, AND NEBRASKA**

Duane Stroup, Mark Rodney, and Don Anderson

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Platte River Recovery Program EIS Office
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FLOW CHARACTERIZATIONS FOR THE PLATTE RIVER BASIN IN COLORADO, WYOMING, AND NEBRASKA

1. Purpose and Method

The purpose of this report is to provide the most complete description possible of historic flows in the Platte River and in major tributaries to the Platte. This description is intended to increase understanding of river flow characteristics specific to the Platte and how these characteristics have changed between 1895 and 1998.

The characterizations presented in this report are based entirely upon river flow records from gaging stations. Particularly in the early years, records from some gages are incomplete, or gages may have been relocated or replaced. In order to provide the most complete and continuous picture of historic flows, records from adjacent gages often have been used to fill in gaps in the record. Thus, the characterizations provided in this report are for a reach of river instead of a single gage. Details of the methods used to fill in gage records are provided in Appendix A.

Mean daily flow and peak flow data were obtained from five sources. All peak flow data were obtained from the USGS (USGS 2004 [Peaks]). Mean daily flow data in Colorado are also from the USGS (USGS 2004 [Daily]). Mean daily flow data in Wyoming are from the USGS and from the Nebraska 1914 hydrographic report (Nebraska 1914). Mean daily flow data in Nebraska are from the USGS, Nebraska 1914, 1928, and 1930 hydrographic reports (Nebraska 1914, 1929, and 1931), and the Nebraska Department of Natural Resources website (Nebraska DNR, 2004).

The resulting product provides a picture of changes in river flows from 1895 to 1998 at seventeen locations along the Platte River and its major tributaries in Wyoming, Colorado, and Nebraska. This effort is an extension of similar flow characterizations such as Shaffer (1976), Williams (1978), Bentall (1982), and Kircher and Karlinger (1983).

2. Introduction

For this report, flows were analyzed to determine current and historic flow characteristics and how these characteristics have changed with time at 17 specific gage locations in the greater Platte River basin. These locations are shown in **Figure 1** and listed in **Figure 2**, along with the corresponding period of record.

This report considers annual flow volumes, mean daily, 3, 7, 15, and 30-day running average flow distributions, and seasonal flow peaks, among other descriptive flow indicators. For each location, the characterizations consider (1) the entire period of record, (2) the periods before and after 1940, and (3) specific time intervals, ranging from 12 to 19 years in length, coinciding with the completion of major reservoirs on the North Platte in Wyoming and Nebraska. These time intervals are presented in **Table 1**, along with the significant events corresponding to each. A partial list of the major reservoirs along the Platte River in

Platte River System Stream Gages

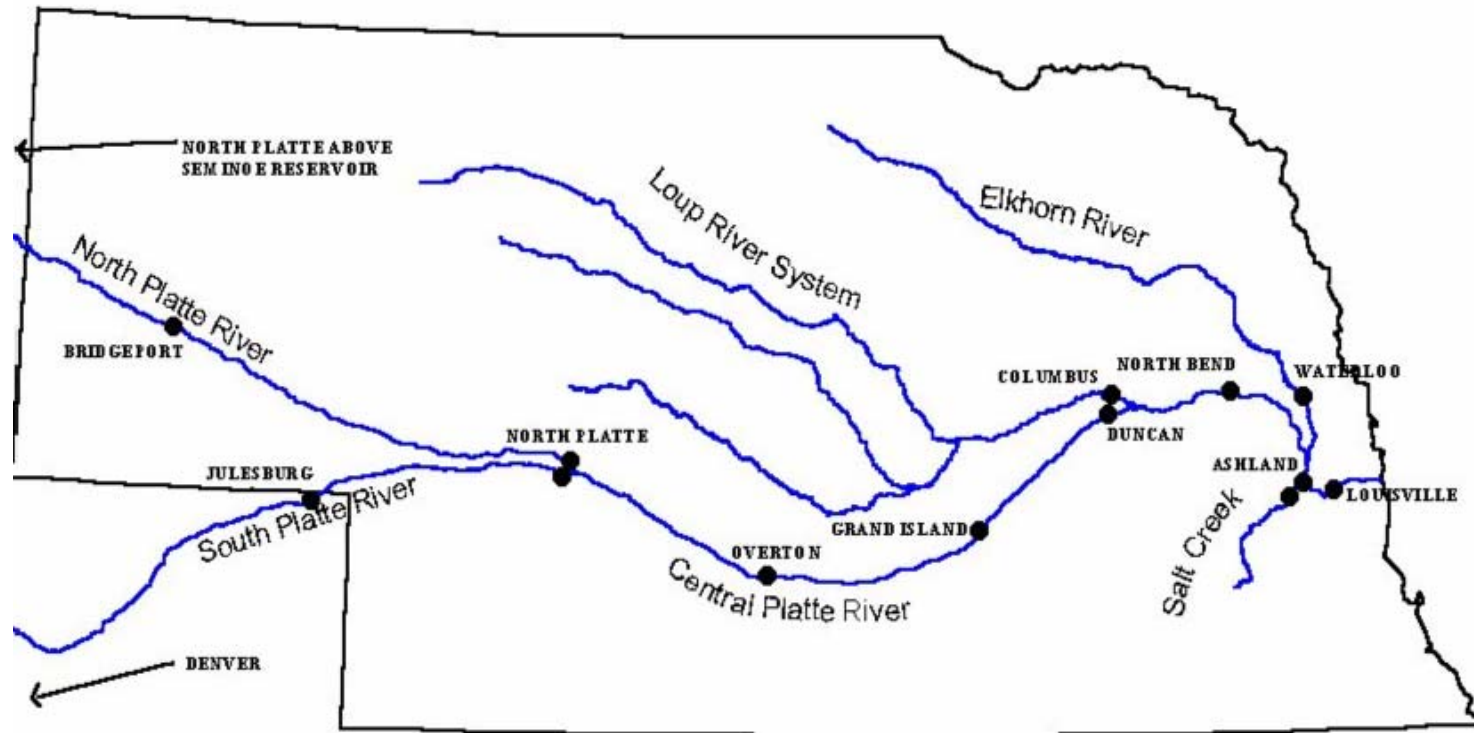
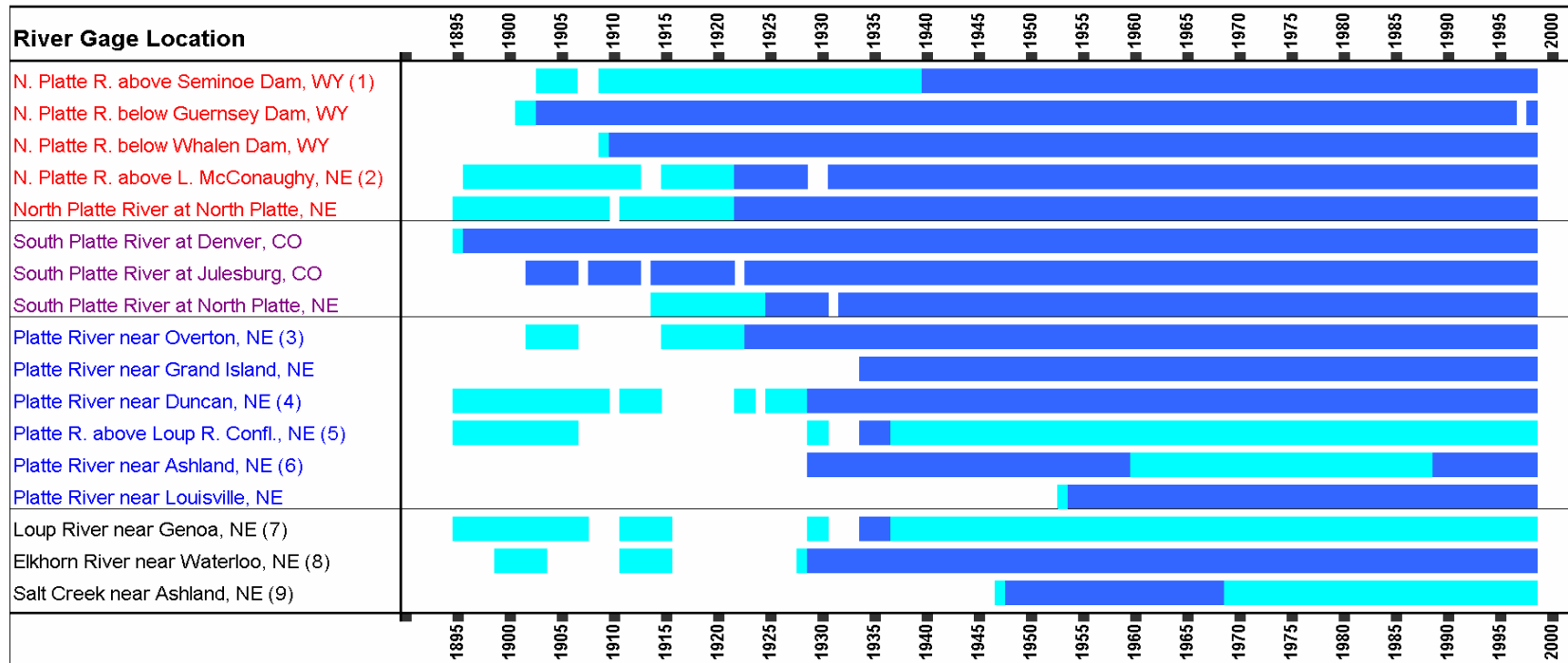


FIGURE 1

Figure 1. Platte River basin gage locations used in this analysis.

Figure 2. Platte River Flow Characterization Locations.



Notes:

- (1) Includes 2 sites: at Saratoga, WY; and upstream of Seminoe Dam.
- (2) Includes data from records for Camp Clarke (1896-1900), Mitchell (1901, 1907-11), Scottsbluff (1912), and Bridgeport (1902-1906, 1915-1928, and 1931-1998).
- (3) Includes data from historic record for Platte River near Lexington, NE, prior to 1/1/1925, and Platte River at Elm Creek (1915-1917).
- (4) Includes data from records for Platte River near Central City (1922-27) and Columbus (1895-1914, 6/15/1928-10/31/1928).
- (5) Sum of Platte River at Columbus, Loup River near Genoa, and Loup River Power Canal.
- (6) Consists partly (10/1/1960-7/2/1988) of record synthesized by combining Platte River at Louisville with Salt Creek near Ashland and Platte River at North Bend with Elkhorn River at Waterloo.
- (7) Includes data from record for Loup River at Columbus, NE, prior to 10/11/1978, with Loup River Power Canal diversion added beginning 1/1/1937.
- (8) Includes data from historic record for Elkhorn River at Arlington, NE.
- (9) Consists partly (9/30/1969-12/31/1998) of record synthesized by regression based on Salt Creek at Greenwood, NE.

Legend:

Missing record
Non-continuous and/or estimated
Continuous gage record

Figure 2. Data available for Platte River Basin Flow Characterization Locations.

Table 1. Time Intervals Utilized	
Interval	Significance
1941 and before	Before beginning of operation of Lake McConaughy. Lake McConaughy is the last of three major dams that were complete between 1938 and 1941. Alcova Reservoir and Seminoe Reservoir were completed in 1939 and 1938 respectively.
Post-1941	After beginning of operation of Lake McConaughy.
1895-1909	Between earliest available historic record and beginning of operation of Pathfinder Reservoir.
1910-1927	Between beginning of operation of Pathfinder Reservoir and beginning of operation of Guernsey Reservoir.
1928-1941	Between beginning of operation of Guernsey Reservoir and beginning of operation of Lake McConaughy. Alcova Reservoir and Seminoe Reservoir were completed in 1939 and 1938 respectively.
1942-1958	Between beginning of operation of Lake McConaughy and beginning of operation of Glendo Reservoir.
1959-1974	Between beginning of operation of Glendo Reservoir and beginning of most recent hydrologic period.
1975-1998	Between beginning of most recent hydrologic period and the end of the record evaluated.

Wyoming, Nebraska, and Colorado is given in **Table 2**. The characterization analysis is discussed in detail in **Section 6** and **Appendix A**.

3. Physical Setting

The South Platte and North Platte Rivers originate primarily as snowmelt streams in the Rocky Mountains of Colorado. They flow across the Great Plains to form the Platte River at their confluence near North Platte, Nebraska. The Platte River then flows eastward through Nebraska until it joins the Missouri River at the eastern edge of the state.

The Platte River basin drains approximately 90,000 square miles. The highest point in the basin (Mount Lincoln, Colorado) is more than 14,000 feet above mean sea level. The lowest point is just under 1,000 feet elevation at the Missouri River confluence. The Platte River extends approximately 312 miles from the North Platte/South Platte confluence to the mouth of the Platte River in eastern Nebraska. Above the confluence, the main stems of the North Platte

Table 2. Major Reservoirs in the Platte River Basin (partial list)

Reservoir	Capacity¹ (acre-feet)	Dam Location	Operation Began	Owner
NORTH PLATTE				
Seminole	1,107,000	On North Platte River approximately 77 miles ² SSW of Casper, WY	1939	Bureau of Reclamation
Pathfinder	1,016,000	On North Platte River approximately 46 miles SW of Casper, WY	1909	Bureau of Reclamation
Alcova	184,300	On North Platte River approximately 35 miles SW of Casper, WY	1938	Bureau of Reclamation
Glendo	789,400	On North Platte River approximately 93 miles ESE of Casper, WY	1957	Bureau of Reclamation
Guernsey	45,600	On North Platte River approximately 110 miles ESE of Casper, WY	1927	Bureau of Reclamation
Lake McConaughy	1,948,000	On North Platte River approximately 49 miles W of North Platte, NE	1941	Central NE Public Power & Irrigation
SOUTH PLATTE				
Antero	9,000 ³	On South Platte River approximately 59 miles W of Colorado Springs, CO	1907	Denver Water
Spinney Mtn.	54,500 ⁴	On South Platte River approximately 45 miles W of Colorado Springs, CO	1982	City of Aurora
Elevenmile Canyon	98,000 ³	On South Platte River approximately 35 miles W of Colorado Springs, CO	1932	Denver Water
Cheesman	79,000 ³	On South Platte River approximately 40 miles SSW of Denver, CO (State Capitol Building)	1890	Denver Water
Chatfield	235,100 ³	on South Platte River approximately 13 miles SSW of Denver, CO	1976	Corps of Engineers
Bear Creek	30,700 ³	on Bear Creek approximately 10 miles SW of Denver, CO	1979	Corps of Engineers
Cherry Creek	92,100 ³	on Cherry Creek approximately 9 miles SE of Denver, CO	1950	Corps of Engineers

1 – All capacities are total capacity as given in USGS Water Resources Data, except where noted.

2 – All distances are in linear miles from reference point.

3 – Capacity data from U.S. Army Corps of Engineers.

4 – Capacity data from City of Aurora.

Table 2 (continued). Major Reservoirs in the Platte River Basin (partial list)

Reservoir	Capacity¹ (acre-feet)	Dam Location	Operation Began	Owner
Milton	31,000	Off-line, approximately 13 miles ² S of Greeley, CO	1909	City of Greeley
Riverside	58,000	Off-line, adjacent to South Platte River Approximately 25 miles W of Fort Morgan, CO	1907	Riverside Irrigation District
Empire	38,000	Off-line, adjacent to South Platte River Approximately 19 miles W of Fort Morgan, CO	1905	Bijou Irrigation Company
Jackson Lake	36,000	Off-line, adjacent to South Platte River Approximately 16 miles WNW of Fort Morgan, CO	1901	Jackson Lake Reservoir Company
Prewitt	33,000	Off-line, adjacent to South Platte River Approximately 15 miles SW of Sterling, CO	1910	Logan Irrigation District
North Sterling	81,000	On Cedar Creek Approximately 10 miles NNW of Sterling, CO	1908	N. Sterling Irrigation District
LOUP RIVER Sherman	69,100	On Oak Creek near Loup City, NE, approximately 86 miles W of the confluence of the Platte and Loup Rivers (Platte-Loup confluence)	1964	Bureau of Reclamation
Calamus	107,400	On Calamus River near Burwell, NE, approximately 108 miles WNW of Platte-Loup confluence	1985	Bureau of Reclamation
Davis Creek	46,180 ⁵	Off-line, adjacent to North Loup River near North Loup, NE, approximately 80 miles W of Platte-Loup confluence	1992	Bureau of Reclamation

1 – All capacities are total capacity as given in USGS Water Resources Data, except where noted.

2 – All distances are in linear miles from reference point.

3 – Capacity data from U.S. Army Corps of Engineers.

5 – Maximum storage as given in Nebraska Dams Inventory, found at <http://nr.sun.nrc.state.ne.us/cgi-bin/dam>.

and South Platte rivers each extend several hundred additional miles into their Rocky Mountain headwater areas.

Numerous reports and studies relate to the Platte River basin, some dating back to pioneer days. A report by Simons and Associates (2000) presents a list of references on the many subjects concerning the basin. It also gives an overview of the physical history of the basin, including development.

4. Previous Studies

Significant recent studies of the Platte River basin which include flow characterizations include: Shaffer (1976), Williams (1978), Bentall (1982), and Kircher and Karlinger (1983). The characterizations presented in these reports are similar in many ways to those of this study and presented in Appendix A, but with different emphases, different analytical techniques, and more limited periods of record available at the time their work was being done (*i.e.*, ending in the 1970's or early 1980's).

Shaffer (1976) presented one of the earliest Platte River flow characterizations, focusing on the North and South Platte River in Nebraska and characterizing flows with respect to irrigation history in this part of the basin. Shaffer's report took two approaches: (1) a statistical approach presenting gage data in terms of flow duration, exceedance probability, and non-exceedance probability, and (2) a characterization in terms of monthly and annual maximum, mean, and minimum discharge for the selected gage locations over their period of record. At least equal emphasis was placed on canal, drain, and river gages. Shaffer's report makes no attempt to group the data, either by season or significant intervals of years. The period of record considered by Shaffer ends in 1973.

Williams (1978) presents flow characterization indicators similar to those presented in this report. The Williams report emphasizes the effects of changing flow patterns on channel characteristics along the North Platte and Platte rivers from Minatare to Grand Island. Both the Williams report and this report base their characterizations on time frames coincident with the beginning of operation of the North Platte reservoirs and both consider changes in mean annual flow. This report differs from Williams in that it considers mean flow in cubic feet per second (CFS) rather than total annual flow in acre-feet. Williams analyzes data by geometric mean (rather than arithmetic mean in this report); defines time intervals by the actual day that a project began operation (rather than by whole years); and does not consider seasonal patterns. In addition to some of the locations examined by Williams, Appendix A of this report includes three locations on the South Platte River (Denver and Julesburg, Colorado, and North Platte, Nebraska), locations on the Loup River, Elkhorn River, Salt Creek, and four locations on the lower Platte River (Duncan, below the confluence of the Loup and the Platte, Louisville, and Ashland). The period of record considered by Williams ends in 1970.

Bentall (1982) presents a graphical approach to flow characterization in terms of mean annual discharge in CFS. Appendix A of this report includes graphs of total annual flow in acre-feet similar to Bentall, and includes the number of days of data available for each year analyzed. Bentall does not group the data by season, nor does he group the data in significant intervals of years. Another aspect of the Bentall report is its presentation of cumulative mean annual discharges. This analysis was not repeated for this report because the additional data considered would not change Bentall's conclusions. The period of record considered by Bentall ends in 1980.

Kircher and Karlinger (1983) present two analyses of interest. The first is their analysis of data averaged over 3, 7, 15, and 30 days. The second analysis of interest is of flow-duration by

decade, which was not repeated or updated for this report because it would not contribute any new information nor change the conclusions reached. The period of record considered by Kircher and Karlinger ends in 1979.

5. Climate

5.1 Precipitation

Williams (1978) states that “Analysis of U.S. Weather Bureau precipitation data for North Platte, Kearney, and Grand Island reveals that there have been no significant long-term trends [in total annual precipitation] during the period 1900-1974. Therefore, any observed long term changes in streamflow probably are not attributable to changes in climate”.

Plots of total annual precipitation for North Platte, Gothenburg, and Grand Island presented by Kircher and Karlinger (1983) demonstrate the absence of significant precipitation trends in the central Platte River basin. However, these are not sufficient to demonstrate that there have been no changes in streamflow based on changes in climate in other areas of the basin because most of the flow through this part of the basin, even as far downstream as Grand Island, originates as snowmelt in the headwaters of the North and South Platte Rivers (Simons and Associates, 2000). Therefore, to accurately conclude that changes in climate have or have not affected streamflow basinwide, it is necessary to also analyze precipitation data from locations in or near the headwaters.

Unfortunately, no reliable, long-term precipitation data are available that can be considered representative of the high-elevation headwater areas of the Platte Basin. However, some precipitation data dating back to 1900 are available for the North Platte, South Platte, and Platte basins, as presented in **Figure 3**. Figure 3 plots average annual precipitation by time interval for 19 gaging stations in the Platte River basin. The stations are grouped by state (Wyoming, Colorado, and Nebraska) and sorted from upstream to downstream within each state. As Figure 3 shows, precipitation generally increases from west to east in the Platte River basin.

In order to make comparisons between gages, the average annual precipitation values were normalized such that the time interval with the highest average annual precipitation has a value of one. All other time intervals will have values between zero and one, which indicates how the average annual precipitation in each time interval compares to the time interval with the highest average annual precipitation. The normalized average annual precipitation is shown in **Figure 4**.

As is shown in Figure 4, the lowest average annual precipitation for some stations occur in the same time interval that other stations have their highest average annual precipitation. This is partially explained by the lack of data for some stations during some time intervals. The number of years of data for each station by time interval is shown in **Figure 5**.

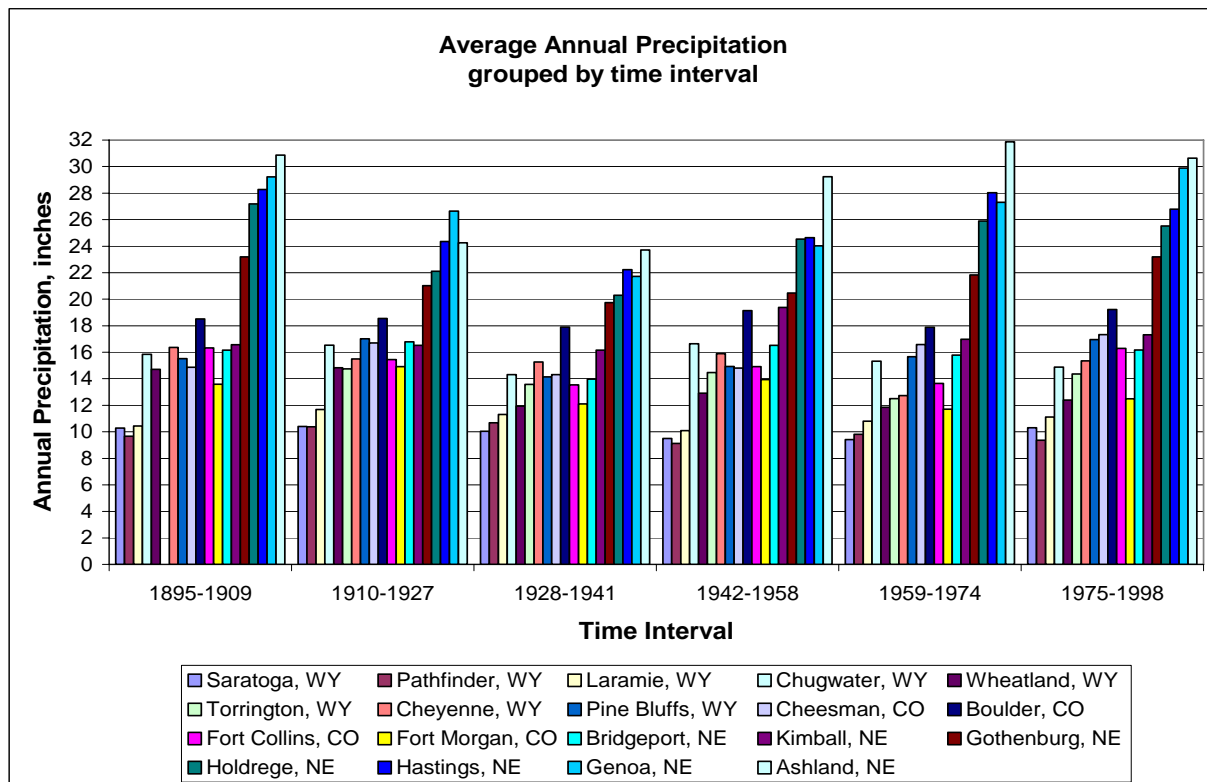


Figure 3. Average annual precipitation grouped by time interval.

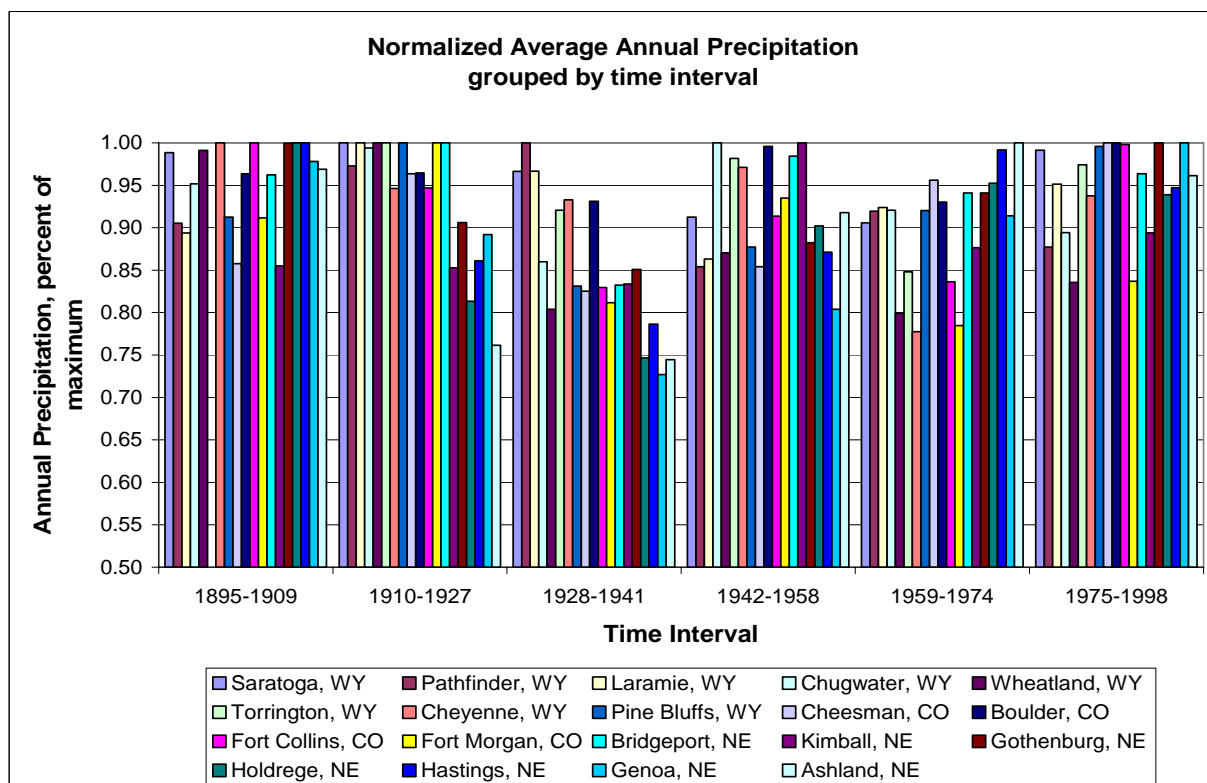


Figure 4. Normalized average annual precipitation grouped by time interval.

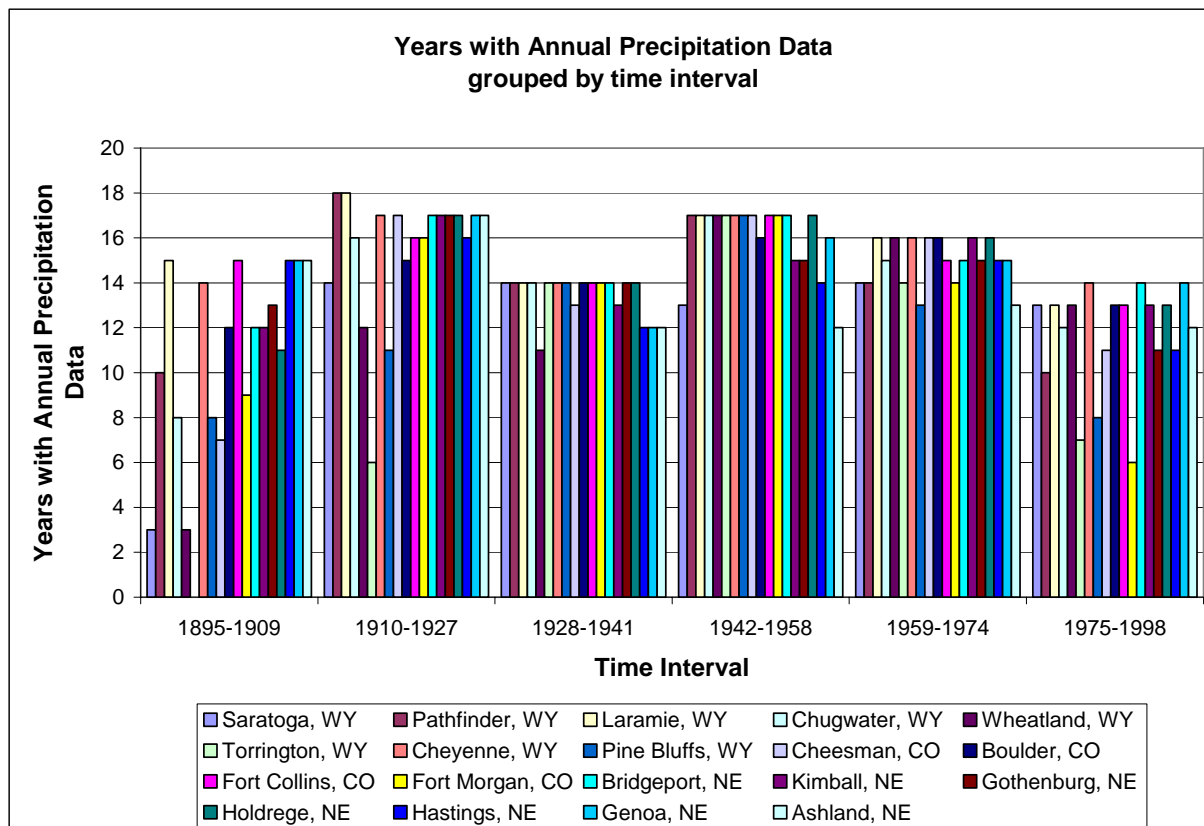


Figure 5. Years with annual precipitation data grouped by time interval.

5.2 Palmer Hydrologic Drought Index

Due to the scarcity of long-term precipitation data for the higher, snow-accumulation zones of the Platte River basin, regionalized estimates of the monthly Palmer Hydrologic Drought Index (PHDI) for these areas may provide a better picture of climatic conditions affecting snowmelt-driven hydrology. This index is a tool used to define periods of excess drought or excess precipitation, as well as indicate the severity of wet and dry periods. It is a modified version of the Palmer Drought Severity Index (PDSI), which is described by NOAA (1994) as follows:

“The PDSI has been the most commonly used drought index in the United States and was developed to measure intensity, duration, and spatial extent of drought. PDSI values are derived from measurements of precipitation, air temperature, and local soil moisture, along with prior values of these measures. Values range from -6.0 (extreme drought) to +6.0 (extreme wet conditions), and have been standardized to facilitate comparisons from region to region.”

Both the PDSI and PHDI have limitations as indicators of hydrologic conditions. The PDSI is primarily used to evaluate drought impacts on agriculture, and both indices treat all precipitation as contributing to wet or dry conditions in the same month that they occur (in

effect, treating all precipitation as rain). However, modifications were incorporated into the PHDI to more closely reflect conditions affecting soil moisture, stream flow, and lake levels.

The National Climatic Data Center (NCDC) provides monthly estimates of the PHDI for up to ten geographic divisions within each state for the period 1895 to present. For this report, mean values of these NCDC PHDI indices were compiled by time interval for seven regions of particular interest (**Figures 6 and Figure 7**):

- **Division 4** in Colorado, which corresponds to the South and North Platte River basins in Colorado, including most of their higher-elevation headwater areas, but which also includes substantial lower-elevation areas north and west of the South Platte River; and
- **Division 8** in Wyoming, which generally corresponds to the lower elevation areas of the North Platte River and South Platte River drainage basins in that state.
- **Division 10** in Wyoming, which generally corresponds to the higher elevation areas of the North Platte River drainage basin in that state.
- **Division 1, 5, 7, and 8** in Nebraska, which generally correspond to the areas of the North Platte River, South Platte River, and mainstem Platte River drainage basins in that state.

WYOMING

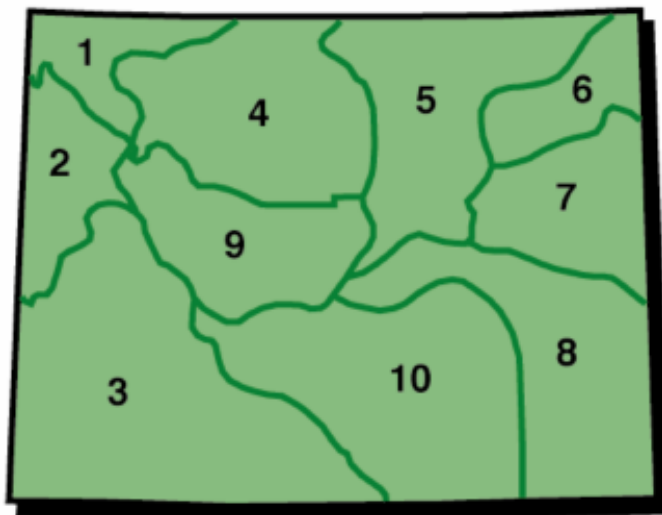
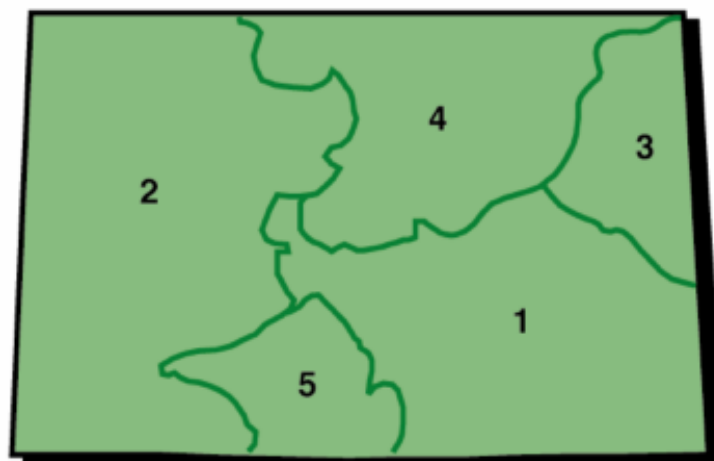


Figure 6. Palmer Hydrologic Drought Index Geographic “Divisions” in Wyoming as defined by the National Climatic Data Center.

COLORADO



NEBRASKA

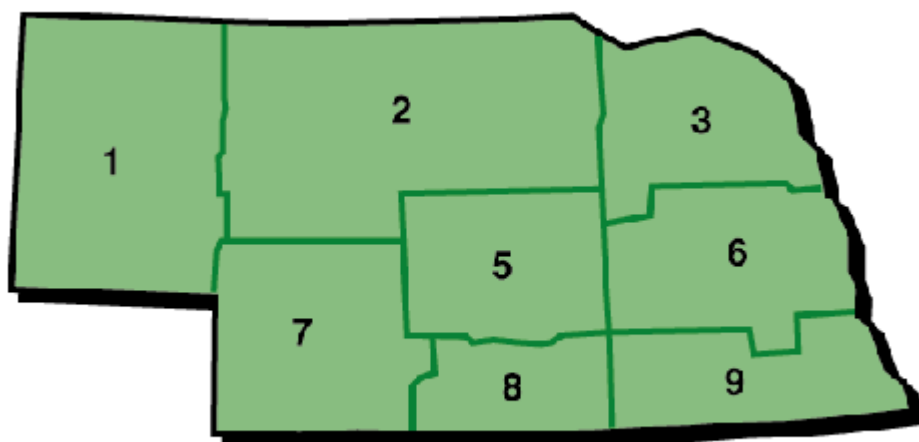


Figure 7. Palmer Hydrologic Drought Index Geographic “Divisions” in Colorado and Nebraska as defined by the National Climatic Data Center.

Mean PHDI values by time interval and by division are displayed in **Figure 8**. Based on PHDI values, the two wettest periods were 1895-1909 and 1910-1927 for most geographic divisions considered. Each of the subsequent periods were, by comparison, significantly drier.

Presumably, these climate differences are reflected to a greater or lesser extent in corresponding streamflows. To the extent that the PHDI values accurately reflect historic conditions in these areas, they suggest that soil moisture and climate-determined water yields from the headwaters of the Platte River would have been greater during the 1895-1927 period than during subsequent periods. It is of interest to note that none of the six time intervals qualifies, in either the upper or lower basin geographic areas, as “very dry” period, although the 1928-1941 period corresponded to “moderate PDHI drought” in parts of Nebraska.

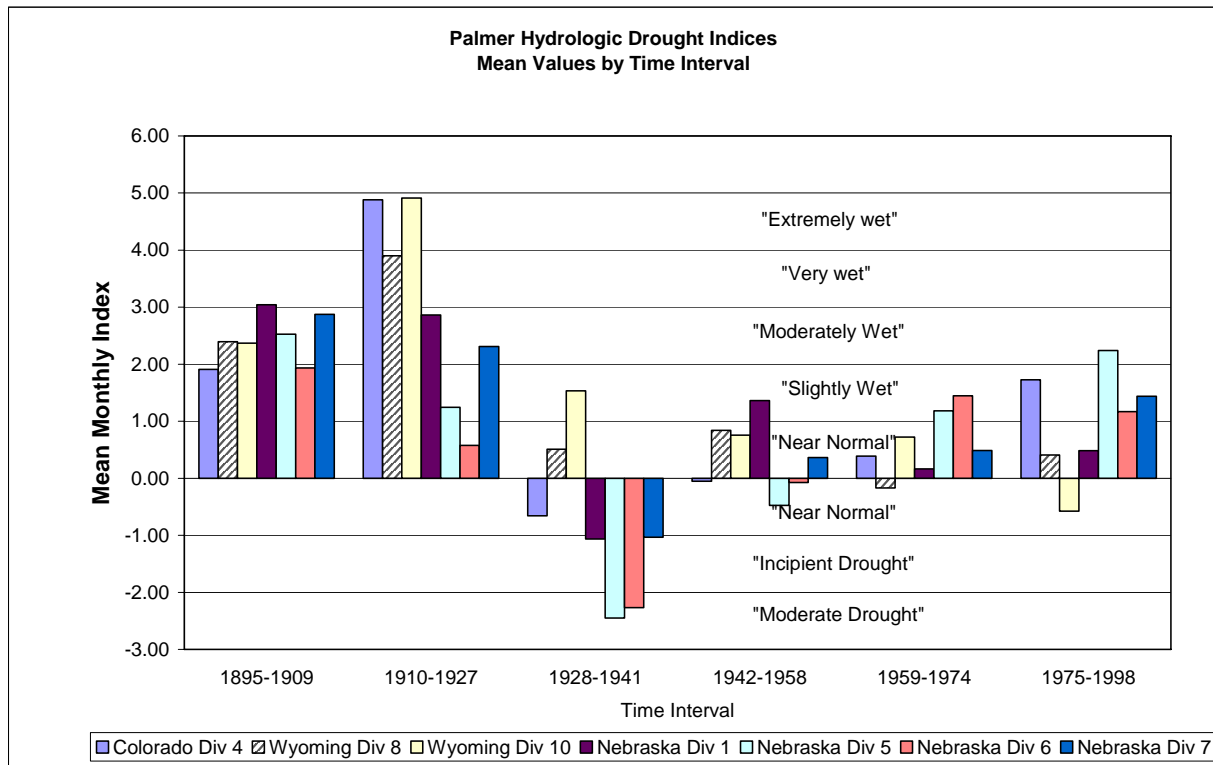


Figure 8. Palmer Hydrologic Drought Indices mean values by time interval.

Figure 3 though Figure 8 display information about climate and precipitation by time interval in order to determine to what extent differences in precipitation and climate could be responsible for changes in flows. This is not the same analyses that were done by Williams and Kircher and Karlinger. These earlier analyses were looking for long-term changes in climate, while Figures 3 through 8 quantify short term fluctuations in climate and precipitation that can have significant impacts on stream flows. The 1928-1941 time interval had the lowest average annual precipitation for most stations (Figure 4) and the driest PHDI for most regions (Figure 8). From this information, one could expect flows during the 1928-1941 time interval to be the lowest for most river reaches.

6.1 Overview

This report characterizes river flows at 14 gaging stations on the South Platte, North Platte, and Platte Rivers, along with flows in three lower-basin tributaries: the Loup River, the Elkhorn River, and Salt Creek. These locations are illustrated on **Figure 1** and listed in **Figure 2**. They describe current (1975-1998) flow characteristics as well as changes in flow characteristics with time. As already described, they extend similar analyses by others which date back to 1976.

This report differs in a number of ways from previous studies characterizing Platte River basin flows. In addition to differences already mentioned, this report:

- Addresses three locations along the South Platte River;
- Presents a consolidated set of data for a site in the upper North Platte basin (Seminole Reservoir);
- Presents a consolidated set of data representing a location downstream of the North Platte projects in Wyoming and upstream of Lake McConaughy;
- Combines records for hydrologically similar gages in order to provide the most comprehensive and continuous data set possible (see details in corresponding appendices);
- Groups summary statistics based on time intervals that are approximately bounded by the years that major North Platte reservoirs began operation (see **Table 1**);
- Considers medians as well as averages;
- Presents 3, 7, 15, and 30-year running averages along with mean daily flow quantities;
- Separates the data into hydrologically significant seasons (e.g., February 15 – March 16)¹;
- Extends the period of record through 1998; and
- Includes analysis of peak flow data from the USGS.

Detailed site-by-site characterizations of flows at specific gage locations in the greater Platte River basin are provided in **Appendix A** of this document. Individual sections of the appendix address each of the 17 locations. For each location, a variety of summary tables and figures are provided. These **tables** include:

- Average and median annual maximum mean daily flows;
- Average and median annual flow volumes;
- Average and median maximum mean daily flow by season;
- Average and median timing of maximum mean daily flow;
- Average and median annual minimum mean daily flows;
- These same five statistics for various running average periods (3, 7, 13, and 30 days);
- Flow frequencies for mean daily flows by range of discharge,
- Maximum exceedance flows for annual and seasonal values for 1, 3, 7, 15, and 30 average flows;
- Exceedance flows for annual and seasonal values for 1, 3, 7, 15, and 30 average flows;
- Average and Median annual peak flows;

¹ Four seasonal periods are characterized: February 15-March 16, April 16-July 15, June 1-August 15, and July 16-September 30. See the Introduction to the Appendix for a discussion of why these periods were selected.

- Average and median timing of peak flows; and
- Annual peak flow exceedance.

The tables present summary statistics *by time interval*, as well as for the entire period of record. The time intervals, as summarized in Table 1, are intended to begin and/or end at the approximate time that major North Platte River water management projects began operation in the basin, through 1998.

In addition to these tables, each site characterization in the Appendix includes the following **figures**:

- Annual maximum mean daily flows, annual maximum 30-day running average, and 10-year running average of annual maximum mean daily flow;
- Annual total flow volume, annual number of days with flow measurements, and 10-year running average of annual flow volume;
- Annual minimum mean daily flows, annual minimum 30-day running average, and 10-year running average of annual minimum mean daily flow;
- Magnitude and timing (day of year) of annual maximum mean daily flow by time interval;
- Flow frequency in years with flow in a range of discharge by time interval;
- Distribution of the median mean daily flow for each day of the year by time interval;
- Annual peak flow, annual maximum mean daily flow, and 10-year running average of annual peak flow; and
- Magnitude and timing (day of year) of annual peak flow by time interval.

These figures cover the entire period of record through 1998.

6.2 Summary: Maximum Mean Daily Flow, Peak Flows, and Annual Flow Volume

The peak mean daily flow and annual flow volume vary considerably from site to site as the result of differing drainage areas, hydroclimatological characteristics, watershed characteristics, diversions, use, and storage within the basin.

North Platte River

In the **upper North Platte River basin** (above Seminoe Reservoir), annual maximum mean daily flows were highest during the two time intervals prior to 1927 (1895-1909, 1910-1927). Somewhat lower and relatively stable annual maximum mean daily flows characterize subsequent time intervals. Average annual flow volumes exhibit a larger decline than peak flows relative to pre-1928 conditions. Irrigation development above Seminoe may help explain these changes, although climate variability is undoubtedly a major factor.

Downstream at **Below Guernsey Reservoir, Below Whalen Diversion Dam, and North Platte River above Lake McConaughy**, reductions in annual maximum mean daily flows over the first three time intervals (1895-1939) were more dramatic, with average annual maximum mean daily flows for the time intervals after 1927 never exceeding 39% of the 1895-

1909 average, nor 62% of the 1910-1927 average. These reductions correspond to the period following the establishment of Pathfinder and Guernsey Reservoirs upstream. Peak flows following 1939 have remained relatively stable. The average annual flow volume also declined substantially during the first three time intervals.

Immediately above the North Platte River confluence with the South Platte (**North Platte at North Platte**), reductions in annual peak daily flows during the 1895-1958 period are even more dramatic. For the three time intervals following 1939, average annual peak flows never exceed 18% of the 1895-1909 average, 29% of the 1910-1927 average, nor 44% of the 1928-1939 average. These reductions correspond to the period when the Pathfinder, Guernsey, Alcova and Seminole Reservoirs were established upstream. In addition, the Lake McConaughy Reservoir began operation above this site in 1941. Peak flows for periods following 1939 have remained relatively stable. The average annual flow volume declined substantially during the first four time intervals (through 1958), and to a proportionally greater extent than at the two upstream locations in the North Platte basin.

South Platte River

In the South Platte River basin, including the **Denver, Colorado, Julesburg, Colorado, and North Platte, Nebraska** locations, there are no obvious trends in either annual peak or annual total flows by time interval, in marked contrast to the North Platte River. An important difference between the North Platte and South Platte basins is that no significant reservoirs exist on the main stem South Platte River below Denver, and those that do exist above Denver have small capacities relative to their North Platte River counterparts. Thus, present-day flow in the South Platte is more strongly influenced by factors other than reservoir operations, including climate, land cover, urbanization, irrigation activities, farm conservation practices, and imports from the Colorado River, North Platte River, and Arkansas River drainage basins. Indeed, at the two lower locations in the basin (Julesburg and North Platte), the greatest average annual flow volumes on record occurred during the most recent time interval of 1975-1998. At Denver, average annual flows during this time interval ran a close second to the slightly higher flows of the 1910-1927 time interval.

Main Stem Platte River above the Loup River Confluence

Comparisons of flow records from the North Platte River at North Platte, Nebraska and the South Platte River at North Platte, Nebraska indicate that the bulk of the total flow where these two rivers merge has been consistently provided by the North Platte River for every time interval of record. However, the proportion of total flow provided by the North Platte has declined dramatically in more recent time intervals, relative to the periods before 1940. In the 1910-1927 time interval, the average annual flow volume in the North Platte River at the confluence was 4.9 times that of the South Platte River, and for the 1928-1939 time interval this proportion was 7.2. In contrast, for the 1940-1958, 1959-1974, and 1975-1998 time intervals, the ratios of average annual flow volumes contributed by the North Platte River versus the South Platte River were only 1.6, 2.1, and 1.3, respectively (note, however, that this change includes the effect of diverting water from the lower North Platte River to the lower South Platte River through the Sutherland Canal).

The pronounced trend of declining annual peak flows evident at the North Platte River at North Platte location for successive time intervals through 1958 is also evident at the **Platte River at Overton** location. In addition, average annual flow volumes at this location are substantially lower for the 1940-1998 period (1.16 million acre-feet) than for the 1895-1939 period (1.85 million acre-feet). Presumably, the marked reductions in annual flows contributed by the North Platte River contribute to the reduced annual flows at Overton. (No reservoirs exist on the main stem of the Platte River below the North Platte/South Platte confluence, and tributary inflows along this reach above Overton are minor).

Unfortunately, no streamflow records exist for the **Platte River near Grand Island** location prior to 1934. Evidence for a trend in annual peak flows at this location is difficult to detect. Annual peaks were significantly higher in the 1934-1939 time interval than in subsequent periods, but the differences are modest and the trend by period has been toward higher peaks since 1940. Moreover, annual flow volume was greatest in the most recent (1975-1998) time interval.

The **Platte River at Duncan** gage shows a profound reduction in average annual maximum mean daily flow and, to a lesser extent, in total annual flow volume immediately following the 1895-1909 time interval. For subsequent time intervals, no clear trend is evident in these values. The highest post-1909 annual peak flows occurred in the 1928-1939 time interval, while the highest annual flow volumes were recorded in 1975-1998. It should be noted that as one progresses farther downstream on the Platte River below Lake McConaughy, an increasing proportion of the drainage area contributing flow is not “controlled” by storage facilities, and thus climate conditions affecting the uncontrolled area are likely to have a larger and more immediate effect on stream flow.

Lower Platte River Tributaries

Below Columbus, Nebraska, various tributaries to the Platte River substantially impact flows in the Platte. This tends to diminish the relative influence of the North Platte and South Platte Rivers on flow characteristics as we progress downstream.

The Loup River is the largest of these tributaries. Both annual peak flows and annual flow volumes in the **Loup River at Columbus** have been higher in more recent time intervals (1959-1974 and 1975-1998) than in earlier time intervals. This is in spite of the establishment of several large reservoirs and substantial surface water diversions for irrigation in the Loup River basin in the 1960s and later years.

The record for the **Elkhorn River at Waterloo** shows characteristics similar to the Loup, in that both annual peak flows and annual flow volumes are highest for the two most recent time intervals (1959-1974 and 1975-1998), as compared to 1928-1958. Because flow in the Elkhorn is largely uncontrolled by reservoirs, the differences by time interval presumably reflect, to a large degree, variations in climate.

The period of record for **Salt Creek near Ashland** begins in 1947, rendering comparisons to “early development” conditions in the basin impossible. Over the relatively short period of

record, however, average annual peak daily flows and annual flow volumes have both tended to be higher in recent years (e.g., 1984-1998) than in previous years. Among the factors that may contribute to this trend are variations in climate and the effects of urbanization in the vicinity of Lincoln, Nebraska, including an increased reliance on water imported from outside of the basin.

Main Stem Platte River below the Loup River Confluence

Below the Loup River confluence, the tributaries described above have a substantial effect on Platte River flows. At the **Platte River/Loup River Confluence** near Columbus, no trend in average annual maximum daily flows is apparent for the time intervals beginning in 1928 and ending in 1998. However, reported average annual maximum daily flows were much higher in the 1895-1909 time interval than in any subsequent period for which records are available. Due to a scarcity of year-round flow records in early years, meaningful comparisons of average annual flow volumes can be made only for the period following 1929. At this location, the trend in average annual flow has been steadily upwards for the four most recent time intervals, from about 2.32 million acre-feet in 1928-1939 to about 3.61 million acre-feet in 1975-1998. The **Platte River near Ashland** shows a very similar trend of increases in average annual flow from the 1928-1939 time interval through 1975-1998. Comparable trends in average annual maximum daily flows are also apparent for these periods.

The farthest downstream location characterized in this report is the **Platte River at Louisville**. Unfortunately the flow record for this site, which begins in 1953, is the shortest of all locations. As a result, all North Platte reservoir projects except Glendo were operational before the beginning of the Louisville period of record. For the relatively short record available, the 1975-1998 time interval exhibits the highest average annual maximum daily flows (50,242 cfs) and the highest mean annual flow volume (5.97 million acre-feet).

6.3 Summary: Flow Averaging

Effects of upstream development, particularly reservoirs, appear to be reflected in maximum 30-day running average flows. For locations that are probably more strongly affected by hydroclimatologic factors than by upstream development, the maximum 30-day running average flows are significantly lower than the corresponding mean daily values, which indicates a propensity for shorter, sharper daily hydrograph peaks. Locations which fit this characterization are the **North Platte River above Seminoe Reservoir**, all **Platte River locations at and downstream of the Loup River confluence**, and the three **lower Platte River tributaries**.

For locations that are more substantially affected by upstream development, less difference is apparent between the maximum 30-day running average flow and the maximum mean daily flow. This reflects the tendency for upstream development, including storage, to “smooth out” short-term hydroclimatologic effects and attenuate sharp hydrograph peaks. This effect decreases with increasing downstream distance from upstream development and corresponding increase in intervening uncontrolled drainage area. The locations which fit this characterization include those along the reach of the **North Platte and Platte Rivers from**

Lake McConaughy to Duncan. The **South Platte River** flow record also shows similar characteristics. Although there may be relatively little impact on South Platte River flows due to upstream reservoir operation, there have been significant impacts from streamflow diversions, tributary and non-tributary groundwater pumping, and trans-basin diversions of water from neighboring watersheds.

6.4 Summary: Flow Frequency

The frequency of occurrence of mean daily flows by flow range shows relatively little change over time for locations that are not subject to the effects of large upstream storage facilities. Locations that display relatively little change in flow frequencies on either an annual or daily basis include the **North Platte River above Seminoe Reservoir** and all three **South Platte River** locations. In contrast, marked changes in flow frequencies are evident along the **lower North Platte River** and the **upper reaches of the main stem Platte**. For example, in the **North Platte River at North Platte, Nebraska**, daily mean flows greater than 3,000 cfs occurred in 100 percent of the 44 years prior to 1940 for which records are available, but in only 24 percent of the following 59 years. Conversely, low flows in the range of 201 to 500 cfs occurred on 7% of the days prior to 1940, versus 63% of days following this period. While such comparisons are often imperfect due to incomplete flow records, this general pattern is replicated at other sites that also are strongly affected by upstream storage facilities. Similar (though less profound) changes can be observed at the **North Platte River above Lake McConaughy**, the **Platte River at Overton**, and other downstream Platte River locations.

6.5 Summary: Median Daily Flow and Instantaneous Peak by Calendar Day

Upper Platte River Basin

For gage locations in the upper Platte River basin that are least affected by upstream reservoir storage, the highest values of median mean daily flow tend to occur consistently in the May to June time frame. This description applies to the **North Platte River above Seminoe Reservoir** and the **South Platte River at Denver** for all time intervals evaluated. This pattern weakens as flow moves downstream and is increasingly affected by storage facilities, diversions, and non-snowmelt runoff. In the **South Platte River at Julesburg**, for example, seasonal peak flows typically occur in the late May to June time frame, but these peaks may be rivaled or exceeded by peak flows occurring at other times of the year, particularly January through May. This was particularly true for time intervals following 1895-1909. Similarly, the **North Platte River above Lake McConaughy** and the **North Platte River at North Platte** consistently manifested annual peaks in the mid-May to June time frame prior to 1909. However, following 1909 (and following construction of Pathfinder Reservoir) both sites show considerably lower peaks in median mean daily flow in the late spring, and considerably more scatter in the dates upon which annual peak daily flow occurs.

Main Stem Platte River

The **Platte River near Overton** consistently manifested annual peak flows in late May and June for the 1895-1909 and 1910-1928 time intervals. From 1928 to the present, the peaks are

nearly as likely to occur at other times between mid-February and September, although the highest annual peak flows still tend to occur in May and June. A very similar pattern is evident in flows farther downstream, at **the Platte River near Duncan**. At an intermediate location (**Platte River near Grand Island**) annual peak flows since 1934 have been clustered around the months of March and June; the lack of records prior to 1934 makes it impossible to assess how this timing may differ from earlier periods.

Lower Platte Tributaries

Median mean daily flow in the **Loup River at Columbus** tends to be highest from March through June, with dates of annual peak flow tending to cluster in the months of March and June. This pattern is consistent with the dominant climatological patterns affecting the Loup Basin, whereby March is typically the dominant snowmelt month, and June is the month with the most precipitation. Similar seasonal peak flow patterns are evident in the **Elkhorn River at Waterloo** for all time intervals. In contrast, **Salt Creek near Ashland** shows little tendency to manifest peak annual flows in any particular month or months. Median mean flows tend to be somewhat higher during the March through July time frame, but annual peak flows (at least, for the available period of record beginning in 1947) can easily occur in any month between March and October. The relatively small size and substantial urbanization of the Salt Creek drainage basin, along with the presence of ten small reservoirs controlling about 11 percent of the drainage area in the upper basin, all influence the timing and magnitude of peak flows.

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APPENDIX A

FLOW CHARACTERIZATIONS AT SPECIFIC GAGE LOCATIONS

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FLOW CHARACTERIZATIONS AT SPECIFIC GAGE LOCATIONS

This appendix characterizes historic flows at 17 locations on the South Platte, North Platte, and Platte Rivers, including three downstream tributaries in the Platte River basin: the Loup River, the Elkhorn River, and Salt Creek. These locations are shown on **Figure 1** of the main report and listed in **Figure 2** of the main report. In many cases, the records for these characterizations were assembled by combining records for hydrologically similar gages from the same geographic region.

The characterizations consider groups of years coincident with the years that the North Platte reservoirs began operation (**Table 1** of the main report), and separate the data into hydrologically significant seasons. The flow quantities which have been evaluated are:

- Average and median Annual Maximum Mean Daily Flow and Annual Flow Volume by time interval and by year;
- Magnitude and occurrence of Annual Maximum Mean Daily Flow by calendar day;
- Average and median Seasonal Maximum Mean Daily Flow by time interval;
- Average and median Annual Minimum Mean Daily Flow by time interval and by year;
- 3-, 7-, 15-, and 30-Day Running Average Maximum and Minimum Flow by time interval;
- Annual and Seasonal Mean Daily Flow Frequency by time interval;
- Median Mean Daily Flow by calendar day; and
- Annual (“instantaneous”) Peak Flow (from USGS peak flow data).

The period of record considered was 1895 through 1998. Data for this are from five sources. All gage data in Colorado are from the United States Geological Survey NWIS Web site (USGS, 2004)¹. Most gage data in Wyoming and Colorado are from the United States Geological Survey Web site, with some data coming from the Nebraska 1914 hydrographic report. Data in Nebraska are from the USGS Web site, the State of Nebraska Department of Natural Resource’s Web site (Nebraska DNR, 2004) after 1994 for most sites, and three reports of stream flows published by Nebraska (Nebraska, 1914; Nebraska, 1929; and Nebraska, 1931).

For the Annual and Seasonal Mean Daily Flow Frequency by time interval; 3-, 7-, 15-, and 30-Day Running Average Maximum and Minimum Flow by time interval; and the Annual Peak Flow analyses, five time frames were considered. These were:

- Annual
- February 15 through March 16 (Feb 15-Mar 16) – This is the season in which most snowmelt occurs at lower Platte Basin elevations, and the period identified by USFWS as the second-highest priority for recommended peak and pulse flows in the central Platte River Valley to provide benefits for the target species (Bowman and Carlson, 1994);

¹ References cited in Appendix A are detailed in a reference list at the end of this appendix.

- April 16 through July 15 (Apr 16-Jul 15) – This is the season during which most snowmelt occurs at the highest basin elevations, and the period identified by USFWS as the highest priority for recommended peak and pulse flows in the central Platte River Valley;
- June 1 through August 15 (Jun 1-Aug 15) – This seasonal period was defined by the Federal Energy Regulatory Commission for the Central Nebraska Public Power and Irrigation District flow attenuation plan for the nesting season of least terns and piping plovers (CNPPID, 2000); this season encompasses peak irrigation, diversion, and storage demands at lower Platte Basin elevations;
- July 16 through September 13 (Jul 16-Sep 13) – This seasonal period roughly covers the later part of the irrigation season in the greater Platte River basin, and is usually the driest time of the summer growing season (NOAA, 2005 [Colorado], [Nebraska], and [Wyoming]). This period is characterized by minimal basin snowmelt, substantial deliveries of irrigation water from storage, and substantial return flow to the river system from Basin irrigation activities.

For these seasonal periods, all the mean daily flows that are used to calculate the 3-day, 7-day, 15-day, and 30-day average flows must have occurred during the seasonal period. For example, because there are 30 days in the Feb 15-Mar 16 seasonal period, the 30-day average contains only one flow value (the average from February 15 through March 16).

For the flow frequency characterizations, the following flow ranges were considered:

- 0 to 200 cfs
- 201 to 500
- 501 to 750
- 751 to 1,000
- 1,001 to 2,000
- 2,001 to 3,000
- 3,001 to 4,000
- 4,001 to 5,000
- 5,001 to 6,000
- 6,001 to 8,000
- 8,001 to 10,000
- 10,001 to 12,000
- 12,001 to 15,000
- Greater than 15,000

The ranges in flow observed across all the evaluated Platte River Basin locations suggested that the above would be useful categories for characterizing and distinguishing flow distributions at individual locations and during different time periods. The choices of these ranges is supported by the mean annual flow data for many locations in the greater Platte River basin that are summarized graphically by Bentall (1982).

The flow characterizations for the locations considered, including explanations of how the records were assembled for each location, are presented in the following pages.

A.1 NORTH PLATTE RIVER ABOVE SEMINOE RESERVOIR, WYOMING

A.1.1 Methodology.

This is the farthest upstream location in the North Platte River drainage basin that was evaluated for this report. For this location, a single continuous streamflow record was constructed using records from two gages, as follows:

Gage	Records Used	Data Source
North Platte River at Saratoga, WY	7/1/1903 - 10/31/1906; 4/1/1909 - 9/30/1914 (incomplete); 10/1/1915 - 6/30/1939	USGS website
North Platte River above Seminoe Reservoir	7/1/1939 - 9/30/1998	USGS website
Note: The record for the North Platte River above Seminoe gage has been published in the USGS "Water Resources data for Wyoming" under the following titles for the following dates:		
North Platte River near Parco, WY	7/1/1939-9/30/1943	

Where data do not exist for the North Platte River above Seminoe Reservoir, data from North Platte River at Saratoga, WY were substituted. The above Seminoe gage is approximately 30 miles downstream of the Saratoga gage. For the period 7/1/1939 through 9/30/1970, there are 2,879 days where the mean daily flow at the Saratoga gage is greater than the flow at the above Seminoe gage and 8,293 days that the above Seminoe gage has the greater flow. The average difference between the two gages when Saratoga has the greater flow is 75 cfs and the average difference when above Seminoe has the greater flow is 103 cfs. Therefore, the Saratoga gage used as an estimator of flows at the above Seminoe gage does not significantly increase the flow characteristics for this reach of the river.

Summary statistics characterizing this record are presented in **Table A.1-1** (mean daily values), **Table A.1-2** (annual 3-, 7-, 15- and 30-day running averages), **Table A.1-3** (seasonal 3-, 7-, 15- and 30-day running averages), and **Table A.1-4** (flow frequencies).

A.1.2 Maximum and Minimum Mean Daily Flows and Annual Flow Volume.

Table A.1-1 shows that the average and median Annual Maximum mean daily flows were similar in the 1895-1909 and 1910-1927 time intervals, decreased in the 1928-1941 time interval, and have remained relatively steady since then. It is interesting to note that the Annual Maximum mean daily flows are lower for the 1959-1974 and the 1975-1998 time intervals than for the 1942-1958 time interval. This is consistent with the climate data (precipitation and Palmer Hydrologic Drought Index (PHDI)) shown in **Figures 3, 4, 5, and 8** of the main report. **Figures 3 and 4** of the main report show the 1942-1958 and 1959-1974 time intervals having similar precipitation and the 1975-1998 has slightly higher precipitation. **Figure 8** of the main report shows that the PHDI in Wyoming

Table A.1-1 Summary of Mean Daily Flow Values.

North Platte River above Seminole Reservoir, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	7,687	8,175	7,371	8,070	9,428	6,699	7,698	7,044	7,356
Median Annual Maximum Mean Daily Flow (cfs)	7,520	8,060	7,150	8,870	8,460	6,340	7,360	7,210	7,050
Average Annual Flow Volume (kaf)	848	859	840	795	990	727	804	836	869
Median Annual Flow Volume (kaf)	845	884	810	953	1,030	668	804	789	941
Average Mean Daily Flow (cfs)	1,210	1,287	1,161	1,648	1,392	1,004	1,110	1,155	1,200
Median Mean Daily Flow (cfs)	437	400	437	510	450	339	400	451	435
Average Number of Mean Daily Flow Measurements	353	335	365	234	347	365	365	365	365
Number of Years of Data	94 of 104	37 of 47	57 of 57	6 of 15	17 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	535	484	565	579	513	430	421	559	670
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	7,837	8,600	7,368	9,536	9,971	6,699	7,698	7,036	7,356
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	7,469	8,208	7,015	9,188	9,583	6,288	7,477	6,784	6,843
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	1,522	1,441	1,572	1,860	1,673	1,027	1,277	1,423	1,881
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	468	430	490	501	425	420	422	515	622
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	7,540	8,110	7,150	9,140	9,830	6,340	7,360	7,210	7,050
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	7,080	7,510	6,800	8,960	9,085	5,960	7,360	6,155	6,595
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	1,235	1,250	1,170	1,250	1,415	1,006	1,050	1,375	1,355
Difference ("Apr-Jul Average" - "Jul-Sep Average")	6,314	7,159	5,796	7,676	8,298	5,672	6,422	5,613	5,475
Difference ("Apr-Jul Median" - "Jul-Sep Median")	6,305	6,860	5,980	7,890	8,415	5,335	6,310	5,835	5,695
Average Occurrence of Maximum Mean Daily Flow	6/3	6/3	6/3	6/8	6/5	5/30	6/9	6/3	5/30
Median Occurrence of Maximum Mean Daily Flow	6/8	6/5	6/8	6/8	6/9	6/3	6/8	6/10	6/5
Average Annual Minimum Mean Daily Flow (cfs)	171	171	171	213	186	145	134	171	198
Median Annual Minimum Mean Daily Flow (cfs)	163	173	162	227	178	134	125	168	177
Average occurrences per year of the Minimum	3	4	2	3	5	3	2	2	1
Occuring between	9/28	10/1	9/26	9/18	10/12	9/23	9/25	9/29	9/26
and	10/8	10/19	9/30	10/17	10/31	10/7	10/2	9/30	9/29
Median occurrences per year of the Minimum	1	2	1	3	3	2	2	1	1
Occuring between	9/15	9/19	9/12	9/19	9/25	9/22	9/15	9/10	9/11
and	9/20	9/25	9/17	11/13	10/6	9/24	9/20	9/11	9/12

Divisions 8 and 10 for time intervals 1959-1974 and 1975-1998 are less than those for time interval 1942-1958. The lower Annual Maximum mean daily flows for the 1959-1974 and the 1975-1998 time intervals are most likely the result of several years in the 1940's and the 1950's in which there were exceptionally high flow events in the basin (USGS, 2002 [Wyoming]) despite the presence of a severe climatic drought in the 1950's.

Average and median annual flow volumes show a similar decrease during the first three time intervals, with a gradual increase over the intervals following 1928-1941. It is interesting to note that the median annual flow volume is greater than the average annual flow volume during the 1895-1909, 1910-1927, and 1975-1998 time intervals. This would indicate mostly high flow years with a few very low flow years reducing the average annual flow volume.

Figure A.1-1 (maximum flows) and **Figure A.1-2** (annual flow volume) show that the above-described patterns can also be seen both on a year-by-year basis and on a 10-year running average basis. The decrease in Annual Maximum mean daily flows and annual flow volumes is possibly attributable to irrigation development in the upper North Platte River basin, which began in the 1890's, increased steadily until the 1920's, and has increased only slowly since then (Doherty, 1944). There have also been increases in forest density in the higher elevations of the basin that could have reduced run-off from forested lands (Troendle and Nankervis, 2000).

Figure A.1-3 shows the Annual Maximum mean daily flows plotted by flow magnitude and day of the year that the Annual Maximum mean daily flow occurred, grouped by time interval. **Figure A.1-3** shows the very narrow seasonal period within which the Annual Maximum mean daily flows occurred. The Annual Maximum mean daily flow occurs in May or June for almost all years, and between mid-May and mid-June for the significant majority of years. This is consistent with the dates occurrences of the Annual Maximum mean daily flow ("Dates of Maximum Flow") by season shown in **Table A.1-1**.

Both the average and median maximum mean daily flows are highest in the Apr 16-Jul 15 seasonal period for all time intervals (**Table A.1-1**). There is a significant decrease in both average and median maximum mean daily flows from the Apr 16-Jul 15 seasonal period to Jul 16-Sep 30 seasonal period for all time intervals. Both the average and median Dates of Maximum Flow are between May 29 and June 15 for all time intervals except 1895-1909, for which data are incomplete.

The lowest Annual Minimum mean daily flows occur during the 1928-1941 and 1942-1958 time intervals (**Table A.1-1**). Severe drought occurred during part of both of these time intervals (climate data [precipitation and Palmer Hydrologic Drought Index] are shown in **Figures 3, 4, 5, and 8** of the main report). **Figure A.1-4** (minimum flows) shows the same variations on an annual basis that **Table A.1-1** shows on a time interval basis. Both the average and median Dates of Minimum Flow are in September or October for all time intervals.

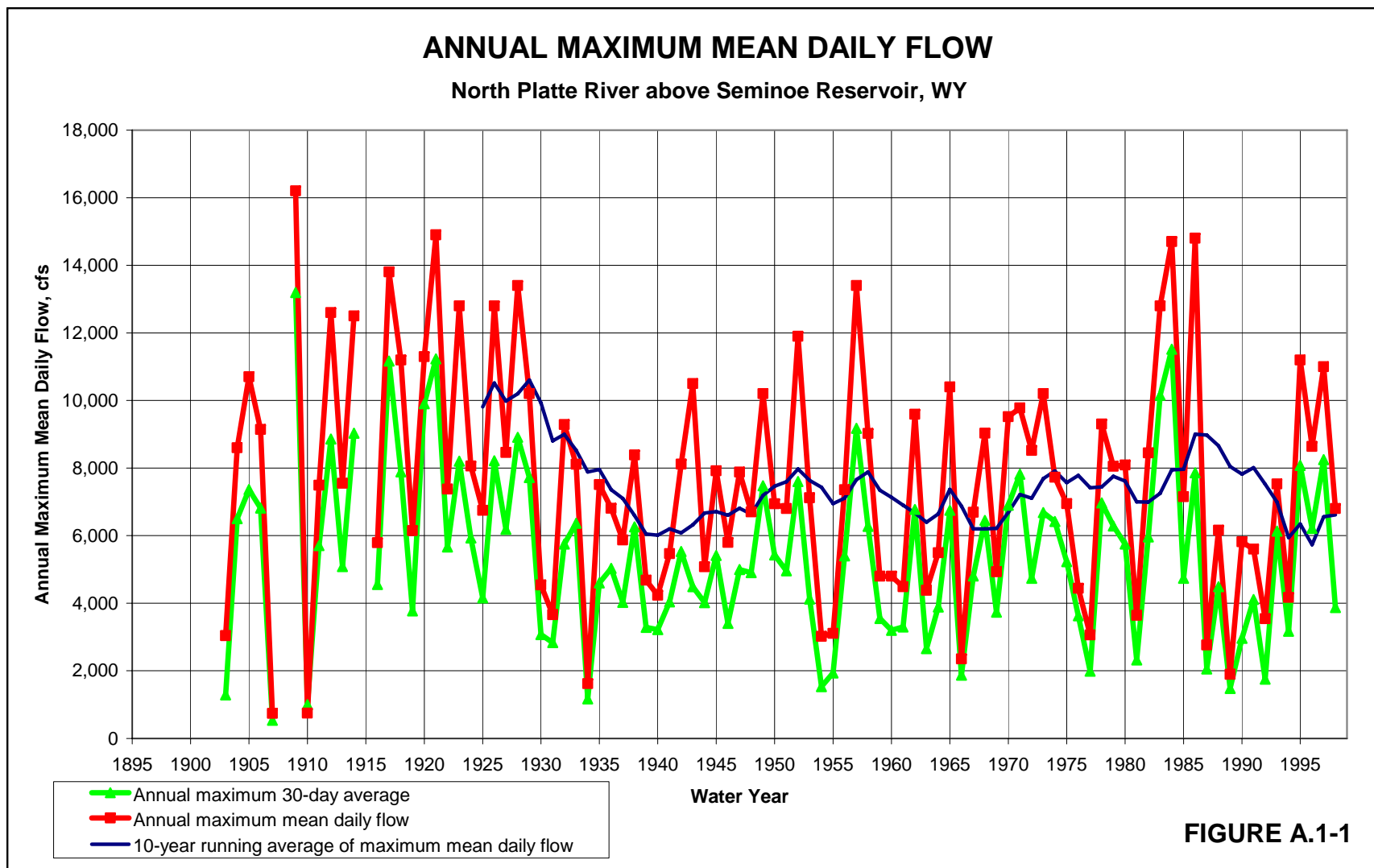


Figure A.1-1 Annual Maximum Mean Daily Flow.

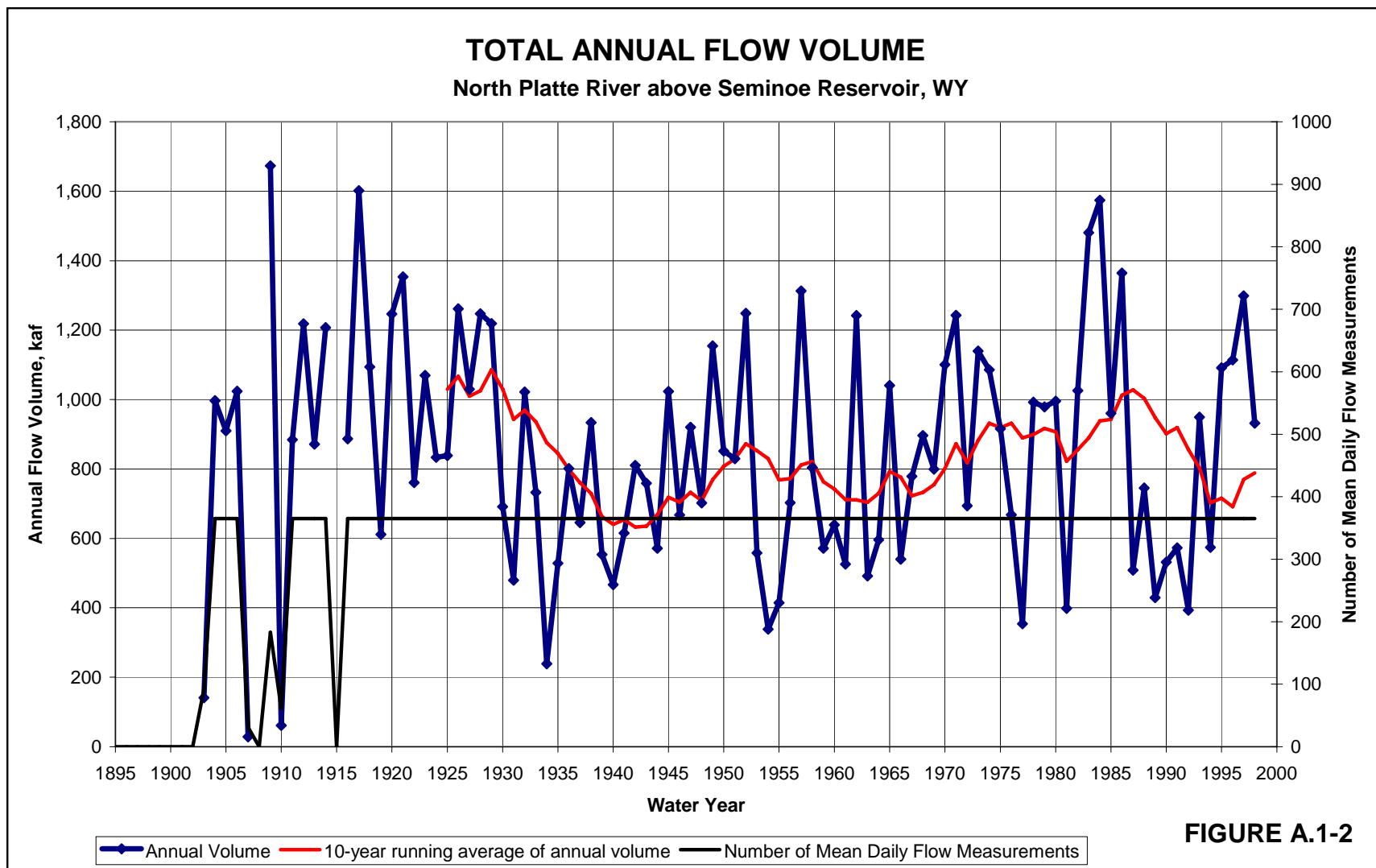
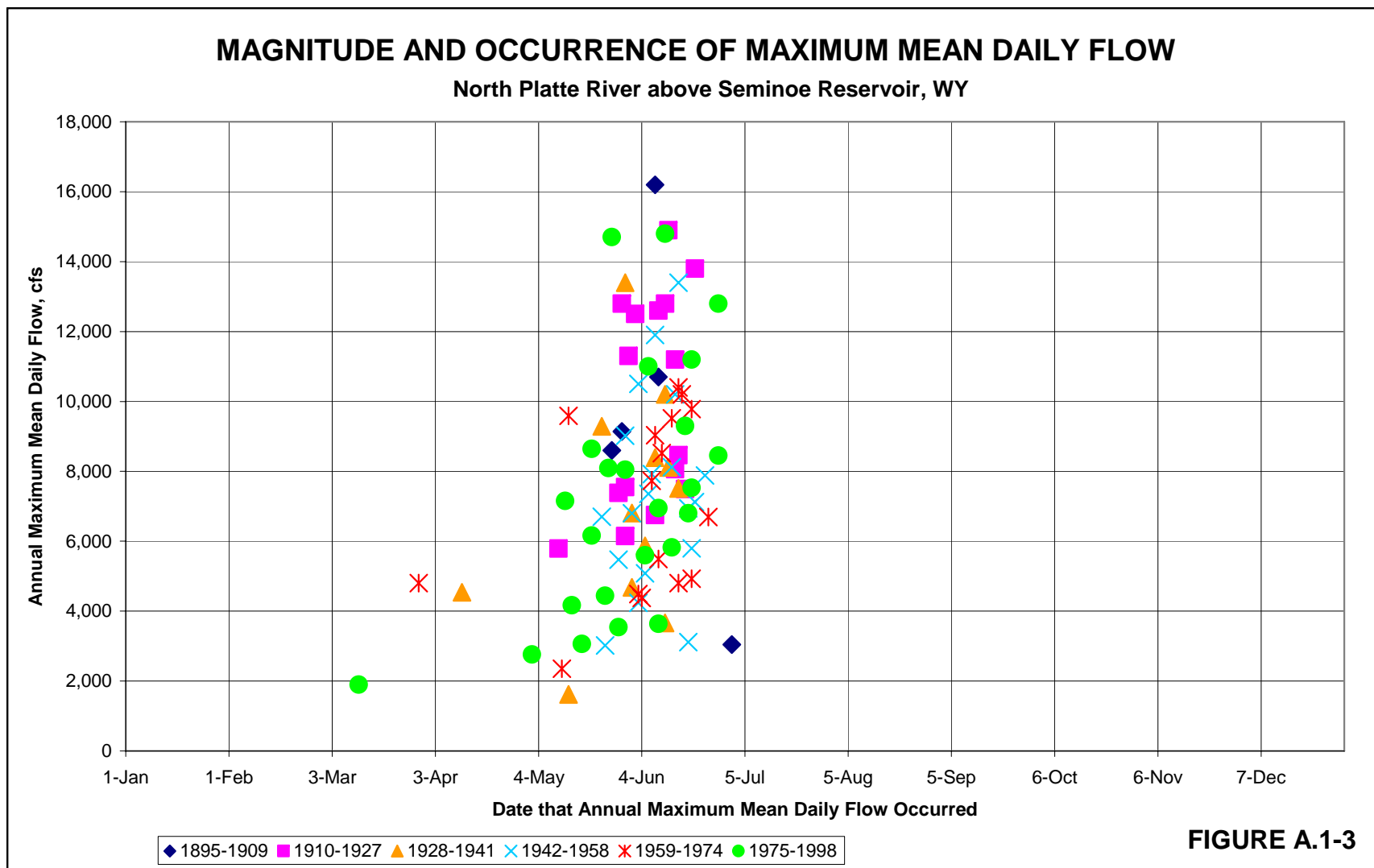


Figure A.1-2 Total Annual Flow Volume.

**FIGURE A.1-3****Figure A.1-3** Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

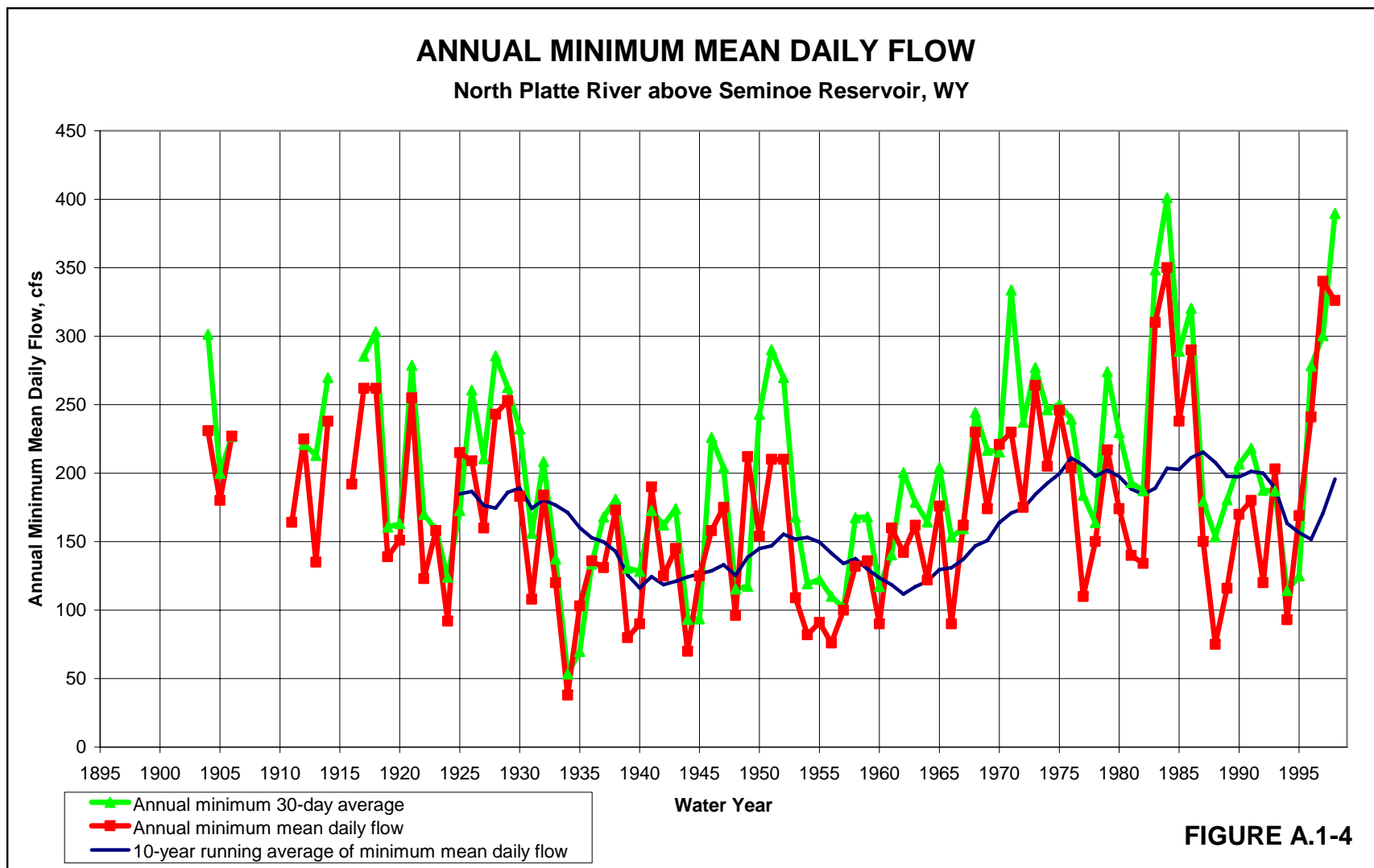


Figure A.1-4 Annual Minimum Mean Daily Flow.

These flow characterizations are consistent with the climatic and geographic characteristics of the basin. The Upper North Platte basin above Seminole Reservoir is an uncontrolled basin whose discharge is largely driven by high country snowmelt, which usually occurs in late spring.

A.1.3 3-, 7-, 15-, and 30-day Averages of Mean Daily Flows.

Table A.1-2 shows that there was some attenuation of all flow values due to the 3-, 7-, 15-, and 30-day flow averaging. That is, the maximum flows tend to decrease and the minimum flows tend to increase. This attenuation is not large, however. Otherwise, the characterizations are essentially the same as those for the Annual Maximum and Annual Minimum mean daily flows.

Table A.1-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.1-3** shows that, for all time intervals and all averaging times, the highest flow occurred in the Apr 16-Jul 15 and Jun 1-Aug 15 seasonal periods, with the Apr 16-Jun 15 seasonal period values being slightly higher. The seasonal period with the lowest flows in Feb 15-Mar 16. These characterizations are generally consistent with the largely uncontrolled, climate-driven nature of the basin. As noted in **Section A.1.2**, the average flows are almost always lower for the 1959-1974 and the 1975-1998 time intervals than for the 1942-1958 time interval. This is more noticeable for the 3-day, 7-day, and 15-day averaging periods and less noticeable for the 30-day averaging period; for the 30-day averaging period, there is little or no significant difference in the averages for these 3 time intervals with respect to each other.

A.1.4 Flow Frequency and Exceedance.

A.1.4.1 Flow Ranges.

Table A.1-4 and **Figure A.1-5** show that mean daily flows between 200 cfs and 4,000 cfs occur in 92 to 100 percent of the years in all time intervals except the 1895-1905 time interval, during which these flow ranges occurred in 83 to 100 percent of years. The higher the flow range (>4,000 cfs) the more likely it is that the 1895-1909 and 1910-1927 time intervals have the highest percentage of years with flow in a particular flow range. **Table A.1-4** also shows that, on a daily basis, flows in the 201-500-cfs range occur in by far the highest percentage of the days for all flow ranges considered, nearing or exceeding 50 percent and exceeding the next-highest percentage by a factor of 4 for all time intervals except 1895-1909 (which has limited flow data available). These frequency characterizations are consistent with the climatic and geographic characteristics of the basin discussed in **Section A.1.1**.

Table A.1-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

North Platte River above Seminoe Reservoir, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	7,687	8,175	7,371	8,070	9,428	6,699	7,698	7,044	7,356
Median Annual Maximum Mean Daily Flow (cfs)	7,520	8,060	7,150	8,870	8,460	6,340	7,360	7,210	7,050
Avg. Ann. Max. 3-day Avg. Flow (cfs)	7,355	7,857	7,029	7,745	9,061	6,443	7,319	6,761	7,002
Median Ann. Max. 3-day Avg. Flow (cfs)	7,140	7,817	6,863	8,510	8,060	5,920	7,073	6,955	6,773
Avg. Ann. Max. 7-day Avg. Flow (cfs)	6,861	7,425	6,495	7,219	8,594	6,093	6,700	6,295	6,484
Median Ann. Max. 7-day Avg. Flow (cfs)	6,715	7,580	6,366	7,908	7,627	5,623	6,366	6,422	6,208
Avg. Ann. Max. 15-day Avg. Flow (cfs)	6,203	6,777	5,830	6,530	7,911	5,507	6,039	5,606	5,832
Median Ann. Max. 15-day Avg. Flow (cfs)	6,049	6,581	5,591	7,026	6,789	5,106	5,591	5,657	5,530
Avg. Ann. Max. 30-day Avg. Flow (cfs)	5,423	5,907	5,109	5,950	6,856	4,735	5,098	4,972	5,208
Median Ann. Max. 30-day Avg. Flow (cfs)	5,314	5,750	4,959	6,660	6,189	4,318	4,994	4,774	4,985
Average Annual Minimum Mean Daily Flow (cfs)	171	171	171	213	186	145	134	171	198
Median Annual Minimum Mean Daily Flow (cfs)	163	173	162	227	178	134	125	168	177
Avg. Ann. Min. 3-day Avg. Flow (cfs)	175	175	175	222	191	149	131	177	204
Median Ann. Min. 3-day Avg. Flow (cfs)	169	175	161	234	191	140	127	174	183
Avg. Ann. Min. 7-day Avg. Flow (cfs)	180	178	182	219	195	153	135	183	214
Median Ann. Min. 7-day Avg. Flow (cfs)	172	184	168	222	200	144	127	180	194
Avg. Ann. Min. 15-day Avg. Flow (cfs)	188	184	190	221	205	156	145	190	222
Median Ann. Min. 15-day Avg. Flow (cfs)	176	192	172	204	208	146	129	182	199
Avg. Ann. Min. 30-day Avg. Flow (cfs)	201	195	204	243	214	166	163	204	233
Median Ann. Min. 30-day Avg. Flow (cfs)	187	181	188	227	212	162	162	202	212

Table A.1-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

North Platte River above Seminole Reservoir, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	7,355	7,857	7,029	7,745	9,061	6,443	7,319	6,761	7,002
Median Ann. Max. 3-day Avg. Flow (cfs)	7,140	7,817	6,863	8,510	8,060	5,920	7,073	6,955	6,773
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	503	446	536	518	473	399	406	527	634
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	7,499	8,264	7,029	9,149	9,581	6,443	7,319	6,761	7,002
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	7,181	7,953	6,707	8,890	9,306	6,072	7,116	6,504	6,552
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	1,408	1,317	1,465	1,742	1,514	939	1,188	1,330	1,750
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	448	409	467	414	425	403	417	493	596
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	7,227	7,877	6,863	8,790	9,497	5,920	7,073	6,955	6,773
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	6,868	7,353	6,683	8,790	8,943	5,763	7,053	5,838	6,310
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	1,118	1,130	1,100	1,190	1,307	948	1,017	1,262	1,295
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	6,861	7,425	6,495	7,219	8,594	6,093	6,700	6,295	6,484
Median Ann. Max. 7-day Avg. Flow (cfs)	6,715	7,580	6,366	7,908	7,627	5,623	6,366	6,422	6,208
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	470	419	500	497	447	371	382	488	592
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	6,996	7,811	6,495	8,538	9,087	6,093	6,700	6,295	6,484
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	6,626	7,372	6,169	8,355	8,724	5,475	6,405	6,042	6,085
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,266	1,177	1,321	1,547	1,385	808	1,082	1,207	1,565
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	414	400	441	400	425	383	371	465	541
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	6,794	7,610	6,366	8,206	9,061	5,623	6,366	6,422	6,208
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	6,355	6,944	6,039	8,206	8,169	5,112	6,360	5,258	5,676
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,018	1,040	1,000	1,052	1,146	825	899	1,095	1,192
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	6,203	6,777	5,830	6,530	7,911	5,507	6,039	5,606	5,832
Median Ann. Max. 15-day Avg. Flow (cfs)	6,049	6,581	5,591	7,026	6,789	5,106	5,591	5,657	5,530
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	427	387	451	454	410	346	358	442	522
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	6,323	7,127	5,830	7,715	8,360	5,507	6,039	5,606	5,832
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	5,906	6,609	5,475	7,540	7,939	4,756	5,658	5,392	5,400
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,085	1,008	1,132	1,349	1,204	663	946	1,056	1,313
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	396	368	422	400	398	360	345	439	483
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	6,129	6,789	5,591	7,077	8,038	5,106	5,591	5,657	5,530
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	5,562	6,238	5,249	7,077	7,612	4,103	5,505	4,804	5,075
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	874	902	867	877	1,016	697	708	922	1,099
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	5,423	5,907	5,109	5,950	6,856	4,735	5,098	4,972	5,208
Median Ann. Max. 30-day Avg. Flow (cfs)	5,314	5,750	4,959	6,660	6,189	4,318	4,994	4,774	4,985
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	381	335	407	365	354	306	334	396	465
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	5,570	6,345	5,109	8,469	7,222	4,735	5,098	4,972	5,208
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	4,838	5,314	4,546	6,513	6,275	3,789	4,536	4,559	4,544
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	851	795	886	1,048	928	552	763	827	1,012
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	352	323	391	330	342	296	336	396	435
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	5,413	6,059	4,959	7,089	7,038	4,318	4,994	4,774	4,985
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	4,675	5,367	4,465	5,674	5,682	3,361	4,465	4,439	4,265
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	723	741	714	741	832	565	556	773	880

Table A.1-4 Flow Frequency Distributions.

North Platte River above Seminole Reservoir, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	65	62	67	33	53	86	82	69	54
201 to 500	100	100	100	100	100	100	100	100	100
501 to 750	100	100	100	100	100	100	100	100	100
751 to 1,000	98	95	100	83	94	100	100	100	100
1,001 to 2,000	98	95	100	83	94	100	100	100	100
2,001 to 3,000	96	92	98	83	94	93	100	100	96
3,001 to 4,000	94	92	95	83	94	93	100	94	92
4,001 to 5,000	86	86	86	67	94	86	88	94	79
5,001 to 6,000	76	78	74	67	94	64	88	63	71
6,001 to 8,000	67	70	65	67	88	50	76	56	63
8,001 to 10,000	45	51	40	67	59	36	35	44	42
10,001 to 12,000	24	32	19	33	47	14	24	13	21
12,001 to 15,000	13	22	7	17	35	7	6	0	13
Greater than 15,000	1	3	0	17	0	0	0	0	0
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
North Platte River above Seminole Reservoir, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	6.7	8.6	5.6	3.1	3.5	16.0	8.1	6.0	3.6
201 to 500	49.8	49.4	50.0	41.4	52.2	48.3	54.4	49.0	47.7
501 to 750	11.4	10.9	11.7	17.6	10.9	9.0	8.0	11.2	14.6
751 to 1,000	5.6	4.5	6.3	5.0	4.3	4.6	3.9	6.4	8.0
1,001 to 2,000	9.5	8.5	10.0	10.0	8.8	7.7	9.6	10.8	9.8
2,001 to 3,000	5.1	4.9	5.3	6.4	5.5	3.9	4.9	5.6	5.3
3,001 to 4,000	3.5	3.6	3.5	2.6	3.3	4.1	3.4	3.8	3.3
4,001 to 5,000	2.6	2.8	2.5	2.3	3.3	2.4	2.6	2.8	2.3
5,001 to 6,000	1.9	2.2	1.8	3.4	2.6	1.5	1.9	1.3	1.9
6,001 to 8,000	2.3	2.5	2.2	4.1	2.7	1.9	2.1	2.3	2.1
8,001 to 10,000	0.8	1.0	0.7	1.6	1.3	0.5	0.6	0.7	0.7
10,001 to 12,000	0.4	0.6	0.3	0.9	1.0	0.1	0.3	0.1	0.4
12,001 to 15,000	0.2	0.5	0.1	1.5	0.6	0.1	0.0	0.0	0.2
Greater than 15,000	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
North Platte River above Seminole Reservoir, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	24	29	21	7	12	58	30	22	13
201 to 500	176	166	183	97	181	176	199	179	174
501 to 750	40	37	43	41	38	33	29	41	53
751 to 1,000	20	15	23	12	15	17	14	24	29
1,001 to 2,000	33	28	37	23	31	28	35	39	36
2,001 to 3,000	18	17	19	15	19	14	18	20	20
3,001 to 4,000	12	12	13	6	11	15	12	14	12
4,001 to 5,000	9	9	9	5	12	9	9	10	8
5,001 to 6,000	7	7	6	8	9	5	7	5	7
6,001 to 8,000	8	8	8	10	9	7	8	9	8
8,001 to 10,000	3	3	3	4	5	2	2	3	3
10,001 to 12,000	1	2	1	2	4	0	1	0	2
12,001 to 15,000	1	2	0	4	2	0	0	0	1
Greater than 15,000	0	0	0	1	0	0	0	0	0
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

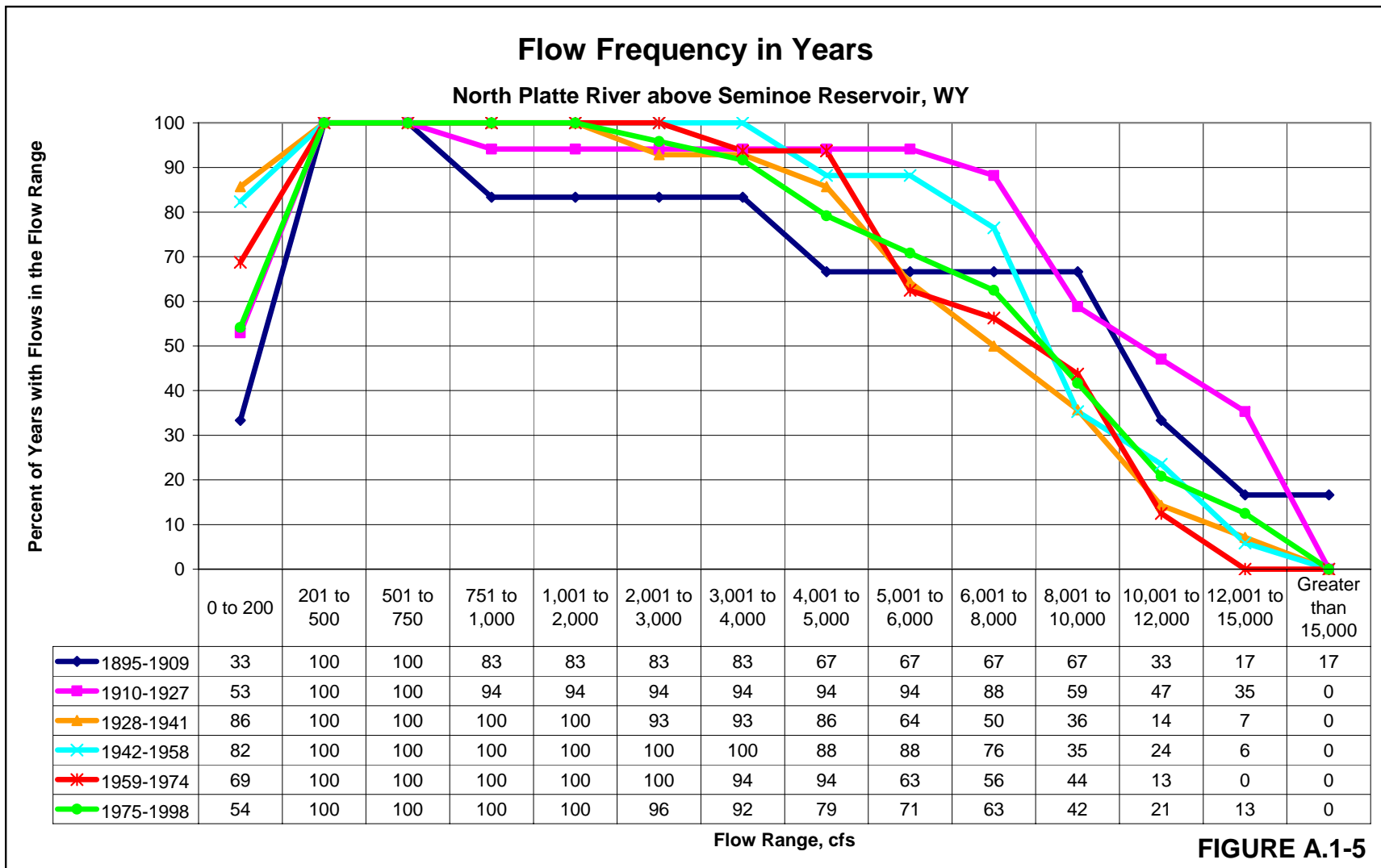


Figure A.1-5 Flow Frequency in Years.

A.1.4.2 Maximum Mean Flow Exceedance.

Table A.1-5 through **Table A.1-9** show the flow exceedance values and probabilities for, annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13) for maximum 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.1-5 shows the exceedance probabilities and values for annual maximum flow data. **Table A.1-5** shows that, for the higher exceedance probabilities, the same trends as those discussed in **Sections A.1.2** and **A.1.3** are noted for all averaging periods. In particular, it can be seen again that the average flows in the 1942-1958 time intervals are higher than those in the 1959-1974 time interval. This is most likely due to the reasons noted in **Section A.1.2**.

Table A.1-6 shows the exceedance probabilities and values for the maximum flow during the Mar 15-Apr 16 seasonal period. **Table A.1-5** shows that, for this late winter seasonal period, the maximum flow values are consistent with known climatological conditions.

Table A.1-7 shows the exceedance probabilities and values for the maximum flow for the Apr 16-Jul 15 seasonal period. **Table A.1-7** shows that, for this seasonal period, the flow values are similar to those for the annual maximum flow data exceedance values and probabilities (**Table A.1-5**). This seasonal period includes the main mountain snowmelt runoff and roughly the earliest third of the irrigation season.

Table A.1-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. It shows that, for this seasonal period, the flow characterizations are similar to those for the Apr 16- Jul 15 seasonal period (**Table A.1-7**), but are somewhat less well-defined. The occurrence of higher flow values for the 1942-1958 time interval than those for the 1959-1974 and 1975-1998 time intervals is again seen. The beginning of this seasonal period includes the later part of the mountain snowmelt runoff; the later part of this seasonal period includes the beginning of the irrigation season.

Table A.1-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. It shows that, for this seasonal period, the flow values are consistent with known climatological conditions. This seasonal period consists of the later part of the irrigation season, and generally tends to be quite dry. Also, the mountain snowmelt has ended by this time.

Table A.1-5 Maximum Flow Exceedance Values, Annual Data.

North Platte River above Seminole Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	740	740	1,900	740	750	1,620	3,020	2,350	1,900
Maximum exceeded in 90% of the years	3,239	3,412	3,368	1,890	6,006	3,834	4,292	4,435	3,204
Maximum exceeded in 80% of the years	4,624	4,838	4,552	3,040	6,876	4,420	5,980	4,800	3,958
Maximum exceeded in 70% of the years	5,799	6,094	5,578	5,820	7,468	4,666	6,780	4,865	5,484
Maximum exceeded in 60% of the years	6,802	7,424	6,740	8,600	7,754	5,550	7,012	5,490	6,288
Maximum exceeded in 50% of the years	7,520	8,060	7,150	8,870	8,460	6,340	7,360	7,210	7,050
Maximum exceeded in 40% of the years	8,118	8,544	7,998	9,140	11,260	7,370	7,904	8,520	7,946
Maximum exceeded in 30% of the years	9,155	10,300	8,716	9,920	12,520	8,138	8,300	9,275	8,469
Maximum exceeded in 20% of the years	10,440	12,260	9,742	10,700	12,760	8,750	9,964	9,590	9,980
Maximum exceeded in 10% of the years	12,740	13,040	11,080	13,450	13,200	9,927	11,060	9,990	12,320
Maximum	16,200	16,200	14,800	16,200	14,900	13,400	13,400	10,400	14,800
3-day Average Flows									
Maximum exceeded in 100% of the years	721	721	1,847	721	734	1,513	2,810	2,313	1,847
Maximum exceeded in 90% of the years	3,012	3,222	3,067	1,706	5,771	3,752	4,155	4,118	3,012
Maximum exceeded in 80% of the years	4,373	4,555	4,374	2,690	6,020	4,198	5,436	4,523	3,859
Maximum exceeded in 70% of the years	5,509	5,781	5,133	5,460	6,873	4,379	6,689	4,780	5,259
Maximum exceeded in 60% of the years	6,569	6,853	6,408	8,230	7,423	5,254	6,825	5,023	5,831
Maximum exceeded in 50% of the years	7,140	7,817	6,863	8,510	8,060	5,920	7,073	6,955	6,773
Maximum exceeded in 40% of the years	7,865	8,179	7,656	8,790	11,033	7,194	7,321	7,973	7,651
Maximum exceeded in 30% of the years	8,848	9,935	8,474	9,480	11,960	7,899	7,951	8,933	8,032
Maximum exceeded in 20% of the years	10,026	11,713	9,321	10,170	12,360	8,397	8,991	9,387	9,703
Maximum exceeded in 10% of the years	12,357	12,760	10,760	13,018	12,893	9,565	10,638	9,557	12,113
Maximum	15,867	15,867	14,067	15,867	14,600	13,200	12,633	10,267	14,067
7-day Average Flows									
Maximum exceeded in 100% of the years	627	627	1,751	627	702	1,454	2,423	2,137	1,751
Maximum exceeded in 90% of the years	2,664	3,031	2,727	1,455	5,269	3,610	3,742	3,786	2,632
Maximum exceeded in 80% of the years	4,107	4,128	4,177	2,283	5,693	3,912	5,081	4,237	3,623
Maximum exceeded in 70% of the years	4,931	5,440	4,562	4,946	6,448	3,994	6,234	4,411	4,451
Maximum exceeded in 60% of the years	6,029	6,435	5,793	7,610	7,121	4,782	6,339	4,577	5,275
Maximum exceeded in 50% of the years	6,715	7,580	6,366	7,908	7,627	5,623	6,366	6,422	6,208
Maximum exceeded in 40% of the years	7,380	7,713	6,861	8,206	10,601	6,754	6,729	7,423	6,928
Maximum exceeded in 30% of the years	8,006	9,636	7,533	8,991	10,738	7,634	6,814	8,111	7,525
Maximum exceeded in 20% of the years	9,678	10,706	8,740	9,776	11,618	7,819	8,375	8,386	9,280
Maximum exceeded in 10% of the years	11,310	12,337	10,347	12,295	12,629	9,089	10,081	9,177	10,944
Maximum	14,814	14,814	13,371	14,814	14,471	12,800	11,700	10,140	13,371
15-day Average Flows									
Maximum exceeded in 100% of the years	608	608	1,591	608	725	1,297	1,911	1,952	1,591
Maximum exceeded in 90% of the years	2,201	2,653	2,218	1,160	4,868	3,353	3,566	3,428	2,183
Maximum exceeded in 80% of the years	3,723	3,729	3,757	1,711	5,382	3,541	4,853	3,870	3,357
Maximum exceeded in 70% of the years	4,546	4,909	4,364	4,343	6,154	3,573	5,245	4,034	3,735
Maximum exceeded in 60% of the years	5,259	5,979	5,085	6,975	6,375	4,387	5,527	4,307	4,638
Maximum exceeded in 50% of the years	6,049	6,581	5,591	7,026	6,789	5,106	5,591	5,657	5,530
Maximum exceeded in 40% of the years	6,717	7,036	6,290	7,077	9,389	5,837	6,023	6,890	6,343
Maximum exceeded in 30% of the years	7,127	8,870	6,905	7,973	9,942	6,890	6,333	7,045	6,764
Maximum exceeded in 20% of the years	8,879	9,785	7,798	8,870	10,692	7,362	7,664	7,170	8,420
Maximum exceeded in 10% of the years	10,142	10,921	9,315	11,405	11,685	8,437	9,161	8,142	9,571
Maximum	13,940	13,940	12,973	13,940	13,553	10,971	10,752	8,896	12,973
30-day Average Flows									
Maximum exceeded in 100% of the years	534	534	1,481	534	998	1,170	1,536	1,870	1,481
Maximum exceeded in 90% of the years	2,008	2,219	2,028	912	4,005	2,909	2,817	2,929	2,008
Maximum exceeded in 80% of the years	3,258	3,380	3,222	1,291	4,662	3,163	4,038	3,300	2,707
Maximum exceeded in 70% of the years	4,003	4,136	3,848	3,897	5,550	3,276	4,416	3,643	3,580
Maximum exceeded in 60% of the years	4,627	5,053	4,489	6,504	5,794	4,031	4,928	3,885	4,189
Maximum exceeded in 50% of the years	5,314	5,750	4,959	6,660	6,189	4,318	4,994	4,774	4,985
Maximum exceeded in 40% of the years	5,959	6,324	5,492	6,817	8,079	4,946	5,407	6,419	5,923
Maximum exceeded in 30% of the years	6,455	7,433	6,273	7,089	8,343	5,801	5,450	6,566	6,223
Maximum exceeded in 20% of the years	7,525	8,213	6,771	7,361	8,995	6,303	6,123	6,748	7,322
Maximum exceeded in 10% of the years	8,676	9,378	7,834	10,277	10,405	7,314	7,525	6,840	8,198
Maximum	13,193	13,193	11,515	13,193	11,230	8,912	9,172	7,820	11,515

Table A.1-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

North Platte River above Seminole Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	232	257	232	400	257	288	290	232	305
Maximum exceeded in 90% of the years	309	297	320	420	285	317	312	315	355
Maximum exceeded in 80% of the years	350	327	382	440	303	327	382	337	410
Maximum exceeded in 70% of the years	392	366	405	461	366	348	390	398	461
Maximum exceeded in 60% of the years	421	400	441	481	393	402	402	435	555
Maximum exceeded in 50% of the years	468	430	490	501	425	420	422	515	622
Maximum exceeded in 40% of the years	500	473	524	568	500	434	456	555	671
Maximum exceeded in 30% of the years	571	519	609	635	559	472	474	650	773
Maximum exceeded in 20% of the years	678	571	752	701	652	519	490	760	832
Maximum exceeded in 10% of the years	851	682	863	768	860	571	500	874	896
Maximum	1,900	1,120	1,900	835	1,120	635	500	1,130	1,900
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	220	246	220	400	246	270	287	220	300
Maximum exceeded in 90% of the years	300	289	319	403	281	299	309	312	353
Maximum exceeded in 80% of the years	339	307	371	405	295	309	371	332	404
Maximum exceeded in 70% of the years	382	348	386	408	346	317	376	378	453
Maximum exceeded in 60% of the years	406	395	423	411	382	389	385	402	543
Maximum exceeded in 50% of the years	448	409	467	414	425	403	417	493	596
Maximum exceeded in 40% of the years	480	434	504	479	500	421	441	533	642
Maximum exceeded in 30% of the years	539	501	589	544	536	434	450	593	709
Maximum exceeded in 20% of the years	649	536	700	609	649	483	463	726	780
Maximum exceeded in 10% of the years	763	650	811	674	702	518	477	790	862
Maximum	1,573	918	1,573	739	918	545	490	1,087	1,573
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	207	240	207	377	240	240	286	207	294
Maximum exceeded in 90% of the years	292	278	309	382	276	284	299	301	351
Maximum exceeded in 80% of the years	330	295	349	386	295	291	341	328	394
Maximum exceeded in 70% of the years	366	327	371	391	325	297	353	351	440
Maximum exceeded in 60% of the years	392	376	398	395	377	363	369	396	518
Maximum exceeded in 50% of the years	414	400	441	400	425	383	371	465	541
Maximum exceeded in 40% of the years	457	413	474	463	459	404	391	476	603
Maximum exceeded in 30% of the years	508	459	535	525	530	412	423	549	655
Maximum exceeded in 20% of the years	605	502	634	588	602	433	440	618	723
Maximum exceeded in 10% of the years	711	629	741	651	639	463	452	725	808
Maximum	1,386	791	1,386	714	791	504	473	996	1,386
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	200	229	200	368	229	229	259	200	283
Maximum exceeded in 90% of the years	276	268	295	374	271	268	289	284	343
Maximum exceeded in 80% of the years	306	277	335	381	286	275	310	301	376
Maximum exceeded in 70% of the years	343	304	347	387	319	277	337	339	418
Maximum exceeded in 60% of the years	360	360	373	394	360	310	342	359	469
Maximum exceeded in 50% of the years	396	368	422	400	398	360	345	439	483
Maximum exceeded in 40% of the years	431	400	451	439	450	367	353	452	529
Maximum exceeded in 30% of the years	471	423	490	478	495	395	394	506	554
Maximum exceeded in 20% of the years	519	486	543	517	518	407	413	525	638
Maximum exceeded in 10% of the years	627	518	646	555	522	434	441	636	763
Maximum	998	700	998	594	700	480	453	831	998
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	187	214	187	311	218	214	237	187	272
Maximum exceeded in 90% of the years	261	246	280	315	259	241	262	273	329
Maximum exceeded in 80% of the years	290	267	311	319	279	249	292	294	351
Maximum exceeded in 70% of the years	317	277	330	322	299	270	307	311	378
Maximum exceeded in 60% of the years	330	309	349	326	327	274	327	349	422
Maximum exceeded in 50% of the years	352	323	391	330	342	296	336	396	435
Maximum exceeded in 40% of the years	393	333	416	355	380	318	344	433	445
Maximum exceeded in 30% of the years	423	369	443	380	407	325	351	472	516
Maximum exceeded in 20% of the years	448	409	488	404	420	349	384	491	562
Maximum exceeded in 10% of the years	531	444	562	429	447	395	403	516	591
Maximum	864	537	864	454	537	447	443	653	864

Table A.1-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

North Platte River above Seminole Reservoir, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,620	1,620	1,900	3,040	5,790	1,620	3,020	2,350	1,900
Maximum exceeded in 90% of the years	3,642	4,360	3,368	5,264	6,450	3,834	4,292	4,435	3,204
Maximum exceeded in 80% of the years	4,704	5,726	4,526	7,488	7,380	4,420	5,980	4,670	3,958
Maximum exceeded in 70% of the years	5,835	6,762	5,578	8,708	7,520	4,666	6,780	4,865	5,484
Maximum exceeded in 60% of the years	6,862	7,502	6,740	8,924	8,060	5,550	7,012	5,490	6,288
Maximum exceeded in 50% of the years	7,540	8,110	7,150	9,140	9,830	6,340	7,360	7,210	7,050
Maximum exceeded in 40% of the years	8,282	8,816	7,998	9,764	11,300	7,370	7,904	8,520	7,946
Maximum exceeded in 30% of the years	9,245	10,600	8,716	10,388	12,550	8,138	8,300	9,275	8,469
Maximum exceeded in 20% of the years	10,480	12,520	9,742	11,800	12,800	8,750	9,964	9,590	9,980
Maximum exceeded in 10% of the years	12,780	13,160	11,080	14,000	13,300	9,927	11,060	9,990	12,320
Maximum	16,200	16,200	14,800	16,200	14,900	13,400	13,400	10,400	14,800
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,513	1,513	1,847	2,690	5,743	1,513	2,810	2,313	1,847
Maximum exceeded in 90% of the years	3,520	4,185	3,067	4,906	5,803	3,752	4,155	4,118	3,012
Maximum exceeded in 80% of the years	4,567	5,456	4,374	7,122	6,833	4,198	5,436	4,523	3,859
Maximum exceeded in 70% of the years	5,596	5,917	5,133	8,342	7,022	4,379	6,689	4,780	5,259
Maximum exceeded in 60% of the years	6,701	7,049	6,408	8,566	7,817	5,254	6,825	5,023	5,831
Maximum exceeded in 50% of the years	7,227	7,877	6,863	8,790	9,497	5,920	7,073	6,955	6,773
Maximum exceeded in 40% of the years	7,935	8,454	7,656	9,342	11,100	7,194	7,321	7,973	7,651
Maximum exceeded in 30% of the years	8,918	10,111	8,474	9,894	12,100	7,899	7,951	8,933	8,032
Maximum exceeded in 20% of the years	10,122	11,960	9,321	11,309	12,367	8,397	8,991	9,387	9,703
Maximum exceeded in 10% of the years	12,363	12,907	10,760	13,588	13,000	9,565	10,638	9,557	12,113
Maximum	15,867	15,867	14,067	15,867	14,600	13,200	12,633	10,267	14,067
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,454	1,454	1,751	2,283	4,941	1,454	2,423	2,137	1,751
Maximum exceeded in 90% of the years	3,281	3,873	2,727	4,414	5,499	3,610	3,742	3,786	2,632
Maximum exceeded in 80% of the years	4,267	4,886	4,177	6,545	6,421	3,912	5,081	4,237	3,623
Maximum exceeded in 70% of the years	5,227	5,608	4,562	7,729	6,635	3,994	6,234	4,411	4,451
Maximum exceeded in 60% of the years	6,136	6,671	5,793	7,967	7,580	4,782	6,339	4,577	5,275
Maximum exceeded in 50% of the years	6,794	7,610	6,366	8,206	9,061	5,623	6,366	6,422	6,208
Maximum exceeded in 40% of the years	7,479	7,819	6,861	8,834	10,671	6,754	6,729	7,423	6,928
Maximum exceeded in 30% of the years	8,139	9,741	7,533	9,462	10,773	7,634	6,814	8,111	7,525
Maximum exceeded in 20% of the years	9,743	10,738	8,740	10,783	11,814	7,819	8,375	8,386	9,280
Maximum exceeded in 10% of the years	11,380	12,491	10,347	12,799	12,779	9,089	10,081	9,177	10,944
Maximum	14,814	14,814	13,371	14,814	14,471	12,800	11,700	10,140	13,371
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,297	1,297	1,591	1,711	4,744	1,297	1,911	1,952	1,591
Maximum exceeded in 90% of the years	2,969	3,533	2,218	3,816	5,073	3,353	3,566	3,428	2,183
Maximum exceeded in 80% of the years	3,840	4,514	3,757	5,922	6,124	3,541	4,853	3,870	3,357
Maximum exceeded in 70% of the years	4,649	5,288	4,364	6,996	6,200	3,573	5,245	4,034	3,735
Maximum exceeded in 60% of the years	5,390	6,147	5,085	7,036	6,581	4,387	5,527	4,307	4,638
Maximum exceeded in 50% of the years	6,129	6,789	5,591	7,077	8,038	5,106	5,591	5,657	5,530
Maximum exceeded in 40% of the years	6,730	7,174	6,290	7,794	9,457	5,837	6,023	6,890	6,343
Maximum exceeded in 30% of the years	7,156	8,870	6,905	8,511	10,054	6,890	6,333	7,045	6,764
Maximum exceeded in 20% of the years	8,887	9,942	7,798	9,884	10,805	7,362	7,664	7,170	8,420
Maximum exceeded in 10% of the years	10,209	10,938	9,315	11,912	11,884	8,437	9,161	8,142	9,571
Maximum	13,940	13,940	12,973	13,940	13,553	10,971	10,752	8,896	12,973
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,170	1,170	1,481	6,504	3,773	1,170	1,536	1,870	1,481
Maximum exceeded in 90% of the years	2,656	3,240	2,028	6,598	4,359	2,909	2,817	2,929	2,008
Maximum exceeded in 80% of the years	3,403	4,034	3,222	6,691	5,082	3,163	4,038	3,300	2,707
Maximum exceeded in 70% of the years	4,038	4,594	3,848	6,785	5,685	3,276	4,416	3,643	3,580
Maximum exceeded in 60% of the years	4,741	5,674	4,489	6,925	5,930	4,031	4,928	3,885	4,189
Maximum exceeded in 50% of the years	5,413	6,059	4,959	7,089	7,038	4,318	4,994	4,774	4,985
Maximum exceeded in 40% of the years	6,137	6,476	5,492	7,252	8,206	4,946	5,407	6,419	5,923
Maximum exceeded in 30% of the years	6,504	7,738	6,273	7,944	8,537	5,801	5,450	6,566	6,223
Maximum exceeded in 20% of the years	7,600	8,472	6,771	9,694	9,029	6,303	6,123	6,748	7,322
Maximum exceeded in 10% of the years	8,859	9,639	7,834	11,444	10,531	7,314	7,525	6,840	8,198
Maximum	13,193	13,193	11,515	13,193	11,230	8,912	9,172	7,820	11,515

Table A.1-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

North Platte River above Seminole Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	1,170	1,170	1,310	3,040	4,450	1,170	1,310	2,290	1,710
Maximum exceeded in 90% of the years	3,496	4,216	2,938	4,640	5,960	3,822	4,292	4,435	2,659
Maximum exceeded in 80% of the years	4,566	4,652	4,526	6,240	6,750	4,224	5,344	4,670	3,576
Maximum exceeded in 70% of the years	5,613	6,066	5,438	7,424	7,435	4,510	6,600	4,865	5,436
Maximum exceeded in 60% of the years	6,582	6,948	5,808	8,192	8,060	4,918	7,012	5,490	5,716
Maximum exceeded in 50% of the years	7,080	7,510	6,800	8,960	9,085	5,960	7,360	6,155	6,595
Maximum exceeded in 40% of the years	7,904	8,418	7,578	9,656	11,200	6,658	7,904	7,730	6,920
Maximum exceeded in 30% of the years	8,828	10,102	8,442	10,352	11,900	7,570	8,184	8,775	7,694
Maximum exceeded in 20% of the years	10,360	11,540	9,728	11,800	12,600	8,222	9,848	9,520	9,980
Maximum exceeded in 10% of the years	12,440	12,720	11,080	14,000	13,300	9,657	11,060	9,990	11,550
Maximum	16,200	16,200	14,800	16,200	14,900	12,600	13,400	10,400	14,800
3-day Average Flows									
Maximum exceeded in 100% of the years	1,111	1,111	1,280	2,690	4,623	1,111	1,280	2,260	1,687
Maximum exceeded in 90% of the years	3,282	4,020	2,815	4,387	5,767	3,682	4,155	4,118	2,595
Maximum exceeded in 80% of the years	4,422	4,578	4,374	6,085	6,227	4,067	5,161	4,523	3,411
Maximum exceeded in 70% of the years	5,363	5,833	5,133	7,305	6,967	4,217	6,414	4,780	5,229
Maximum exceeded in 60% of the years	6,225	6,657	5,542	8,047	7,353	4,622	6,825	5,023	5,539
Maximum exceeded in 50% of the years	6,868	7,353	6,683	8,790	8,943	5,763	7,053	5,838	6,310
Maximum exceeded in 40% of the years	7,463	8,077	7,224	9,342	10,933	6,254	7,321	7,590	6,655
Maximum exceeded in 30% of the years	8,695	9,867	7,977	9,894	11,717	7,460	7,855	8,405	7,546
Maximum exceeded in 20% of the years	9,919	11,347	9,054	11,309	12,367	7,967	8,857	9,030	9,703
Maximum exceeded in 10% of the years	12,270	12,487	10,760	13,588	13,000	9,345	10,638	9,543	11,273
Maximum	15,867	15,867	12,800	15,867	14,600	12,500	12,633	10,267	12,800
7-day Average Flows									
Maximum exceeded in 100% of the years	674	674	1,126	2,283	2,976	674	1,126	2,050	1,524
Maximum exceeded in 90% of the years	2,806	3,469	2,580	4,047	5,031	3,459	3,742	3,779	2,216
Maximum exceeded in 80% of the years	3,954	3,854	4,166	5,812	5,997	3,589	4,855	4,237	3,075
Maximum exceeded in 70% of the years	4,821	5,233	4,562	6,997	6,619	3,647	5,581	4,374	4,435
Maximum exceeded in 60% of the years	5,541	6,252	5,235	7,601	7,069	4,135	6,136	4,577	5,225
Maximum exceeded in 50% of the years	6,355	6,944	6,039	8,206	8,169	5,112	6,360	5,258	5,676
Maximum exceeded in 40% of the years	6,842	7,684	6,621	8,834	10,671	5,531	6,689	7,207	6,299
Maximum exceeded in 30% of the years	7,727	9,423	7,169	9,462	10,773	7,012	6,799	7,704	6,827
Maximum exceeded in 20% of the years	9,611	10,680	8,356	10,783	11,663	7,679	7,100	8,239	9,280
Maximum exceeded in 10% of the years	11,044	11,882	10,347	12,799	12,779	9,052	10,081	8,999	10,944
Maximum	14,814	14,814	12,171	14,814	14,471	10,053	11,700	10,140	12,171
15-day Average Flows									
Maximum exceeded in 100% of the years	447	447	960	1,711	2,592	447	960	1,799	1,182
Maximum exceeded in 90% of the years	2,276	2,834	2,067	3,467	4,666	2,807	3,408	3,239	1,837
Maximum exceeded in 80% of the years	3,708	3,354	3,741	5,224	5,531	3,167	4,512	3,833	2,587
Maximum exceeded in 70% of the years	4,267	4,439	4,283	6,297	6,113	3,333	4,912	4,006	3,735
Maximum exceeded in 60% of the years	4,965	5,742	4,619	6,687	6,581	3,478	5,234	4,307	4,481
Maximum exceeded in 50% of the years	5,562	6,238	5,249	7,077	7,612	4,103	5,505	4,804	5,075
Maximum exceeded in 40% of the years	6,195	7,059	5,748	7,794	9,113	5,243	5,567	6,327	5,753
Maximum exceeded in 30% of the years	7,038	8,251	6,348	8,511	9,577	5,999	5,903	6,804	6,493
Maximum exceeded in 20% of the years	8,828	9,147	7,338	9,884	10,035	7,199	6,216	7,122	8,317
Maximum exceeded in 10% of the years	9,595	10,496	9,048	11,912	11,841	7,488	9,161	8,142	9,400
Maximum	13,940	13,940	11,067	13,940	13,553	8,870	10,752	8,896	11,067
30-day Average Flows									
Maximum exceeded in 100% of the years	280	280	830	1,291	1,911	280	830	1,483	875
Maximum exceeded in 90% of the years	1,770	1,977	1,451	2,929	3,695	1,856	2,447	2,481	1,324
Maximum exceeded in 80% of the years	2,798	2,740	2,835	4,567	4,422	2,124	3,315	3,016	1,669
Maximum exceeded in 70% of the years	3,449	3,679	3,400	5,444	4,800	2,560	3,797	3,514	3,251
Maximum exceeded in 60% of the years	3,914	4,602	3,727	5,559	5,367	2,876	3,991	3,587	3,467
Maximum exceeded in 50% of the years	4,675	5,367	4,465	5,674	5,682	3,361	4,465	4,439	4,265
Maximum exceeded in 40% of the years	5,378	5,641	4,821	6,213	7,093	4,283	4,706	4,804	5,222
Maximum exceeded in 30% of the years	5,723	6,003	5,469	6,752	7,584	5,155	4,944	5,689	5,660
Maximum exceeded in 20% of the years	7,010	7,523	6,685	8,255	8,355	5,621	5,408	6,431	7,245
Maximum exceeded in 10% of the years	7,754	8,359	7,670	10,724	9,282	5,973	7,127	6,807	7,759
Maximum	13,193	13,193	10,157	13,193	11,162	7,710	9,172	7,758	10,157

Table A.1-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

North Platte River above Seminole Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	131	131	308	950	396	131	383	486	308
Maximum exceeded in 90% of the years	523	414	564	1,018	615	354	537	584	606
Maximum exceeded in 80% of the years	622	752	622	1,086	1,080	457	562	632	752
Maximum exceeded in 70% of the years	936	991	805	1,146	1,155	591	653	830	968
Maximum exceeded in 60% of the years	1,074	1,086	1,058	1,198	1,340	980	831	1,150	1,088
Maximum exceeded in 50% of the years	1,235	1,250	1,170	1,250	1,415	1,006	1,050	1,375	1,355
Maximum exceeded in 40% of the years	1,436	1,372	1,498	1,734	1,450	1,038	1,166	1,680	1,776
Maximum exceeded in 30% of the years	1,734	1,650	1,744	2,218	1,940	1,261	1,314	1,715	2,352
Maximum exceeded in 20% of the years	2,248	2,184	2,308	2,672	2,420	1,528	1,538	1,780	2,976
Maximum exceeded in 10% of the years	3,134	2,724	3,372	3,096	3,030	1,794	2,132	2,335	3,858
Maximum	5,420	3,770	5,420	3,520	3,770	2,200	4,550	3,360	5,420
3-day Average Flows									
Maximum exceeded in 100% of the years	119	119	301	911	383	119	339	460	301
Maximum exceeded in 90% of the years	462	388	510	989	568	298	438	532	535
Maximum exceeded in 80% of the years	561	703	561	1,067	1,047	398	526	623	657
Maximum exceeded in 70% of the years	865	937	687	1,123	1,072	537	631	753	874
Maximum exceeded in 60% of the years	1,027	1,057	989	1,157	1,130	877	785	1,100	1,045
Maximum exceeded in 50% of the years	1,118	1,130	1,100	1,190	1,307	948	1,017	1,262	1,295
Maximum exceeded in 40% of the years	1,339	1,287	1,388	1,607	1,387	978	1,078	1,360	1,693
Maximum exceeded in 30% of the years	1,604	1,432	1,669	2,025	1,620	1,245	1,219	1,592	2,319
Maximum exceeded in 20% of the years	2,163	1,817	2,287	2,441	2,300	1,371	1,451	1,720	2,760
Maximum exceeded in 10% of the years	2,769	2,556	3,161	2,855	2,750	1,693	1,927	2,268	3,615
Maximum	4,840	3,350	4,840	3,270	3,350	1,883	4,453	3,207	4,840
7-day Average Flows									
Maximum exceeded in 100% of the years	115	115	277	836	358	115	318	443	277
Maximum exceeded in 90% of the years	435	360	448	908	494	281	402	479	502
Maximum exceeded in 80% of the years	534	595	534	980	896	347	498	580	579
Maximum exceeded in 70% of the years	750	835	619	1,023	1,012	471	599	667	813
Maximum exceeded in 60% of the years	897	960	889	1,037	1,040	713	678	1,039	935
Maximum exceeded in 50% of the years	1,018	1,040	1,000	1,052	1,146	825	899	1,095	1,192
Maximum exceeded in 40% of the years	1,173	1,109	1,300	1,331	1,237	871	965	1,339	1,546
Maximum exceeded in 30% of the years	1,394	1,267	1,499	1,610	1,389	1,088	1,059	1,419	2,166
Maximum exceeded in 20% of the years	1,731	1,535	2,128	2,017	2,204	1,185	1,301	1,644	2,485
Maximum exceeded in 10% of the years	2,624	2,399	2,706	2,550	2,581	1,365	1,800	2,111	2,852
Maximum	4,379	3,173	4,379	3,083	3,173	1,656	4,109	2,729	4,379
15-day Average Flows									
Maximum exceeded in 100% of the years	104	104	255	769	300	104	297	383	255
Maximum exceeded in 90% of the years	381	279	396	810	387	246	371	447	410
Maximum exceeded in 80% of the years	461	441	467	851	776	258	466	501	493
Maximum exceeded in 70% of the years	624	713	573	873	920	406	515	605	703
Maximum exceeded in 60% of the years	759	808	720	875	942	580	591	825	827
Maximum exceeded in 50% of the years	874	902	867	877	1,016	697	708	922	1,099
Maximum exceeded in 40% of the years	1,017	969	1,193	1,057	1,039	725	821	1,207	1,312
Maximum exceeded in 30% of the years	1,216	1,047	1,311	1,237	1,177	838	929	1,289	1,820
Maximum exceeded in 20% of the years	1,510	1,217	1,781	1,641	2,019	975	1,208	1,532	1,968
Maximum exceeded in 10% of the years	2,169	2,113	2,169	2,270	2,219	1,101	1,577	1,824	2,380
Maximum	3,530	2,899	3,530	2,899	2,750	1,393	3,530	2,266	3,392
30-day Average Flows									
Maximum exceeded in 100% of the years	93	93	237	622	244	93	237	362	238
Maximum exceeded in 90% of the years	318	232	362	643	320	186	330	390	365
Maximum exceeded in 80% of the years	383	396	383	664	586	213	365	431	408
Maximum exceeded in 70% of the years	527	574	486	688	695	392	413	510	555
Maximum exceeded in 60% of the years	599	618	571	714	792	453	509	635	666
Maximum exceeded in 50% of the years	723	741	714	741	832	565	556	773	880
Maximum exceeded in 40% of the years	830	812	908	834	863	584	661	915	1,007
Maximum exceeded in 30% of the years	951	861	1,027	927	913	685	828	1,012	1,208
Maximum exceeded in 20% of the years	1,188	956	1,198	1,225	1,486	821	993	1,142	1,449
Maximum exceeded in 10% of the years	1,684	1,550	1,709	1,728	1,665	877	1,330	1,338	1,953
Maximum	2,691	2,232	2,691	2,232	2,035	1,263	2,505	1,695	2,691

A.1.4.3 Mean Flow Exceedance.

Table A.1-10 through **Table A.1-14** show probabilities and exceedance values considering all flows for, annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.1-10 shows the exceedance probabilities and values of flows for annual data. **Table A.1-10** shows that the characterizations are similar to those for the annual maximum flows (**Table A.1-5**). For all exceedance probabilities, the exceedance values by time interval for all averaging periods are consistent with known climatological conditions. NOTE: The maximum flows in **Tables A.n-10** through **A.n-14** are the same as those in **Tables A.n-5** through **A.n-9** throughout this Appendix.

Table A.1-11 shows the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.1-11** shows that the characterizations are essentially exactly the same as those for the maximum flows (**Table A.1-6**), with climatological conditions being the defining effect on the average flow values.

Table A.1-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.1-12** shows that, for this seasonal period, the distribution of flow values is not exactly the same as for maximum flows (**Table A.1-7**). In this case, inclusion of all available flow data has smoothed out the effects of the high flow events of the 1940's and 1950's, but not completely eliminated them. Otherwise, the flow values are consistent with known climatological conditions.

The average flow values increase with increasing averaging time because, except for the earliest part of this seasonal period, flows are generally decreasing throughout the period. Thus, for averages that end on the same day, there are generally a greater number of high individual flow values being averaged over a longer averaging time than over a shorter averaging time, which results in higher values for the longer averaging times than for the shorter averaging times. This effect becomes less pronounced with decreasing exceedance probability, and is lost altogether for the 10 percent exceedance probability.

Table A.1-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 time interval. **Table A.1-13** shows a pattern similar to that for the Apr 16-Jul 15 time interval. The flow values are generally consistent with known climatological conditions. Also, the average values again increase with increasing averaging time. The explanation given for the Apr 16-Jul 15 seasonal period also applies to this seasonal period.

Table A.1-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.1-14** shows that the characterizations are essentially exactly the same as those for the maximum flows (**Table A.1-9**). With mountain snowmelt

Table A.1-10 Exceedance Values Considering All Flows, Annual Data.

North Platte River above Seminole Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	124	124	162	250	175	124	190	162	235
Flow exceeded for 90% of the days	250	225	270	250	250	200	250	250	313
Flow exceeded for 80% of the days	275	253	300	250	275	229	270	285	335
Flow exceeded for 70% of the days	300	272	322	250	286	261	290	309	360
Flow exceeded for 60% of the days	320	288	350	300	300	270	310	340	385
Flow exceeded for 50% of the days	350	300	370	320	310	285	330	371	409
Flow exceeded for 40% of the days	380	329	400	385	340	311	346	407	435
Flow exceeded for 30% of the days	410	367	430	400	370	356	362	440	490
Flow exceeded for 20% of the days	453	400	480	418	448	380	400	480	560
Flow exceeded for 10% of the days	540	485	581	502	506	421	440	550	700
Maximum	1,900	1,120	1,900	835	1,120	635	500	1,130	1,900
3-day Average Flows									
Flow exceeded for 100% of the days	125	125	162	250	188	125	200	162	245
Flow exceeded for 90% of the days	250	223	270	250	250	210	249	249	315
Flow exceeded for 80% of the days	275	255	298	250	275	227	273	283	335
Flow exceeded for 70% of the days	300	272	324	289	288	261	290	310	361
Flow exceeded for 60% of the days	323	288	347	300	300	270	310	337	387
Flow exceeded for 50% of the days	350	302	373	333	310	284	330	377	406
Flow exceeded for 40% of the days	380	332	400	391	335	308	343	413	433
Flow exceeded for 30% of the days	409	370	432	400	372	354	361	443	487
Flow exceeded for 20% of the days	452	400	475	410	444	389	390	480	557
Flow exceeded for 10% of the days	530	475	581	540	504	416	437	541	693
Maximum	1,573	918	1,573	739	918	545	490	1,087	1,573
7-day Average Flows									
Flow exceeded for 100% of the days	135	135	170	250	207	135	209	170	259
Flow exceeded for 90% of the days	250	224	269	250	250	210	251	255	317
Flow exceeded for 80% of the days	277	259	300	250	275	232	276	280	342
Flow exceeded for 70% of the days	300	273	328	295	288	263	294	311	366
Flow exceeded for 60% of the days	327	289	347	300	300	271	309	343	389
Flow exceeded for 50% of the days	350	306	371	355	316	281	331	374	406
Flow exceeded for 40% of the days	378	331	400	369	334	313	341	421	434
Flow exceeded for 30% of the days	409	370	434	400	374	359	354	446	480
Flow exceeded for 20% of the days	450	401	470	400	435	385	393	473	537
Flow exceeded for 10% of the days	519	460	566	556	503	410	434	522	688
Maximum	1,386	791	1,386	714	791	504	473	996	1,386
15-day Average Flows									
Flow exceeded for 100% of the days	150	150	179	254	208	150	213	179	261
Flow exceeded for 90% of the days	257	227	267	270	258	213	252	256	324
Flow exceeded for 80% of the days	276	265	301	294	275	238	273	280	344
Flow exceeded for 70% of the days	306	275	329	313	295	266	298	313	374
Flow exceeded for 60% of the days	329	296	345	326	307	272	318	350	392
Flow exceeded for 50% of the days	350	318	378	340	324	284	328	384	412
Flow exceeded for 40% of the days	382	338	405	358	349	316	339	425	444
Flow exceeded for 30% of the days	411	362	436	370	382	348	348	448	476
Flow exceeded for 20% of the days	450	399	469	400	430	375	388	474	529
Flow exceeded for 10% of the days	510	457	543	509	494	405	431	522	635
Maximum	998	700	998	594	700	480	453	831	998
30-day Average Flows									
Flow exceeded for 100% of the days	187	214	187	311	218	214	237	187	272
Flow exceeded for 90% of the days	261	246	280	315	259	241	262	273	329
Flow exceeded for 80% of the days	290	267	311	319	279	249	292	294	351
Flow exceeded for 70% of the days	317	277	330	322	299	270	307	311	378
Flow exceeded for 60% of the days	330	309	349	326	327	274	327	349	422
Flow exceeded for 50% of the days	352	323	391	330	342	296	336	396	435
Flow exceeded for 40% of the days	393	333	416	355	380	318	344	433	445
Flow exceeded for 30% of the days	423	369	443	380	407	325	351	472	516
Flow exceeded for 20% of the days	448	409	488	404	420	349	384	491	562
Flow exceeded for 10% of the days	531	444	562	429	447	395	403	516	591
Maximum	864	537	864	454	537	447	443	653	864

Table A.1-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

North Platte River above Seminole Reservoir, WY		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		38	38	70	180	92	38	70	90	75
Flow exceeded for 90% of the days		224	210	233	250	244	171	215	232	249
Flow exceeded for 80% of the days		272	257	285	291	280	218	260	292	305
Flow exceeded for 70% of the days		318	298	332	367	318	260	300	345	354
Flow exceeded for 60% of the days		372	350	384	460	382	297	340	395	410
Flow exceeded for 50% of the days		440	420	450	560	450	356	400	458	490
Flow exceeded for 40% of the days		555	535	569	715	572	436	474	580	627
Flow exceeded for 30% of the days		828	810	838	1,200	930	625	730	900	852
Flow exceeded for 20% of the days		1,580	1,690	1,540	2,350	2,020	1,192	1,510	1,602	1,510
Flow exceeded for 10% of the days		3,480	3,869	3,250	5,390	4,460	3,122	3,276	3,230	3,260
Maximum		16,200	16,200	14,800	16,200	14,900	13,400	13,400	10,400	14,800
3-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		38	38	73	184	93	38	73	90	80
Flow exceeded for 90% of the days		225	212	236	250	244	173	216	234	249
Flow exceeded for 80% of the days		273	257	287	290	283	218	263	293	306
Flow exceeded for 70% of the days		319	298	333	365	318	260	298	346	354
Flow exceeded for 60% of the days		374	350	385	462	382	297	340	395	410
Flow exceeded for 50% of the days		441	423	451	551	450	358	400	458	493
Flow exceeded for 40% of the days		554	535	568	715	580	437	473	580	627
Flow exceeded for 30% of the days		830	813	836	1,168	958	630	727	900	854
Flow exceeded for 20% of the days		1,590	1,700	1,533	2,391	2,040	1,203	1,497	1,601	1,500
Flow exceeded for 10% of the days		3,477	3,889	3,259	5,435	4,477	3,150	3,289	3,197	3,264
Maximum		15,867	15,867	14,067	15,867	14,600	13,200	12,633	10,267	14,067
7-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		39	39	77	189	94	39	77	97	89
Flow exceeded for 90% of the days		228	213	239	250	246	176	219	237	252
Flow exceeded for 80% of the days		274	258	287	293	285	221	264	292	307
Flow exceeded for 70% of the days		321	299	334	363	321	261	299	347	356
Flow exceeded for 60% of the days		375	350	387	459	384	297	341	397	412
Flow exceeded for 50% of the days		443	423	451	550	450	361	404	463	498
Flow exceeded for 40% of the days		559	540	572	706	588	446	471	583	630
Flow exceeded for 30% of the days		841	822	847	1,245	981	644	737	926	866
Flow exceeded for 20% of the days		1,599	1,720	1,535	2,370	2,079	1,214	1,533	1,606	1,499
Flow exceeded for 10% of the days		3,484	3,868	3,277	5,671	4,409	3,150	3,330	3,249	3,287
Maximum		14,814	14,814	13,371	14,814	14,471	12,800	11,700	10,140	13,371
15-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		44	44	84	194	100	44	84	113	106
Flow exceeded for 90% of the days		232	215	243	250	250	180	223	242	256
Flow exceeded for 80% of the days		277	260	289	297	286	223	267	293	309
Flow exceeded for 70% of the days		322	300	336	365	323	262	300	349	356
Flow exceeded for 60% of the days		376	353	388	459	388	297	342	399	415
Flow exceeded for 50% of the days		449	428	458	557	460	364	408	472	506
Flow exceeded for 40% of the days		571	553	582	694	614	453	473	596	645
Flow exceeded for 30% of the days		867	869	867	1,289	1,021	673	750	938	882
Flow exceeded for 20% of the days		1,637	1,788	1,576	2,426	2,126	1,263	1,560	1,637	1,538
Flow exceeded for 10% of the days		3,542	3,854	3,337	5,953	4,381	3,086	3,444	3,284	3,323
Maximum		13,940	13,940	12,973	13,940	13,553	10,971	10,752	8,896	12,973
30-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		54	54	93	200	124	54	93	117	114
Flow exceeded for 90% of the days		238	222	249	250	252	187	228	249	266
Flow exceeded for 80% of the days		281	263	293	304	287	228	272	294	310
Flow exceeded for 70% of the days		326	303	340	358	333	265	307	354	356
Flow exceeded for 60% of the days		383	359	394	470	395	305	350	409	425
Flow exceeded for 50% of the days		460	442	467	562	472	372	409	482	516
Flow exceeded for 40% of the days		595	581	602	695	655	475	482	619	655
Flow exceeded for 30% of the days		923	933	917	1,398	1,092	716	818	980	931
Flow exceeded for 20% of the days		1,724	1,938	1,630	2,733	2,262	1,401	1,640	1,706	1,575
Flow exceeded for 10% of the days		3,553	3,917	3,366	5,574	4,411	2,969	3,450	3,294	3,328
Maximum		13,193	13,193	11,515	13,193	11,230	8,912	9,172	7,820	11,515

Table A.1-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

North Platte River above Seminole Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	40	40	125	750	207	40	155	337	125
Flow exceeded for 90% of the days	824	880	805	1,466	1,185	542	820	890	736
Flow exceeded for 80% of the days	1,220	1,390	1,160	1,910	1,720	934	1,280	1,200	1,040
Flow exceeded for 70% of the days	1,680	1,870	1,600	2,400	2,250	1,320	1,658	1,695	1,500
Flow exceeded for 60% of the days	2,180	2,460	2,024	2,942	2,890	1,762	2,040	2,110	1,960
Flow exceeded for 50% of the days	2,740	3,120	2,540	4,180	3,550	2,470	2,510	2,640	2,485
Flow exceeded for 40% of the days	3,410	3,798	3,190	5,256	4,490	3,108	3,250	3,180	3,158
Flow exceeded for 30% of the days	4,270	4,740	3,990	6,088	5,240	3,680	4,022	3,940	4,032
Flow exceeded for 20% of the days	5,330	5,790	5,000	7,210	6,360	4,548	5,030	4,680	5,170
Flow exceeded for 10% of the days	6,880	7,556	6,510	9,254	8,530	6,037	6,368	6,490	6,704
Maximum	16,200	16,200	14,800	16,200	14,900	13,400	13,400	10,400	14,800
3-day Average Flows									
Flow exceeded for 100% of the days	43	43	132	848	210	43	160	349	132
Flow exceeded for 90% of the days	857	926	833	1,560	1,257	560	857	914	757
Flow exceeded for 80% of the days	1,273	1,429	1,209	2,001	1,813	965	1,340	1,239	1,083
Flow exceeded for 70% of the days	1,737	1,949	1,647	2,448	2,320	1,352	1,699	1,737	1,553
Flow exceeded for 60% of the days	2,233	2,507	2,090	3,037	2,988	1,843	2,116	2,168	2,013
Flow exceeded for 50% of the days	2,810	3,187	2,590	4,317	3,665	2,515	2,583	2,672	2,543
Flow exceeded for 40% of the days	3,483	3,923	3,263	5,333	4,542	3,167	3,315	3,235	3,230
Flow exceeded for 30% of the days	4,342	4,762	4,051	6,137	5,323	3,733	4,095	3,990	4,087
Flow exceeded for 20% of the days	5,373	5,846	5,079	7,293	6,413	4,507	5,089	4,697	5,190
Flow exceeded for 10% of the days	6,866	7,604	6,519	9,572	8,715	5,987	6,320	6,518	6,690
Maximum	15,867	15,867	14,067	15,867	14,600	13,200	12,633	10,267	14,067
7-day Average Flows									
Flow exceeded for 100% of the days	47	47	148	905	236	47	169	383	148
Flow exceeded for 90% of the days	910	1,027	874	1,753	1,428	633	922	961	817
Flow exceeded for 80% of the days	1,388	1,546	1,291	2,125	2,017	1,045	1,448	1,398	1,154
Flow exceeded for 70% of the days	1,883	2,119	1,756	2,634	2,524	1,437	1,814	1,863	1,647
Flow exceeded for 60% of the days	2,356	2,686	2,213	3,339	3,153	2,017	2,249	2,289	2,119
Flow exceeded for 50% of the days	2,931	3,331	2,693	4,667	3,939	2,675	2,706	2,777	2,605
Flow exceeded for 40% of the days	3,638	4,013	3,403	5,659	4,612	3,236	3,479	3,376	3,371
Flow exceeded for 30% of the days	4,436	4,919	4,204	6,317	5,391	3,762	4,277	4,081	4,281
Flow exceeded for 20% of the days	5,480	5,945	5,116	7,400	6,496	4,587	5,159	4,895	5,225
Flow exceeded for 10% of the days	6,834	7,576	6,472	9,593	8,765	6,021	6,259	6,490	6,687
Maximum	14,814	14,814	13,371	14,814	14,471	12,800	11,700	10,140	13,371
15-day Average Flows									
Flow exceeded for 100% of the days	50	50	193	1,090	353	50	253	442	193
Flow exceeded for 90% of the days	1,067	1,270	1,002	2,073	1,804	796	1,070	1,128	870
Flow exceeded for 80% of the days	1,616	1,912	1,498	2,475	2,398	1,263	1,621	1,592	1,309
Flow exceeded for 70% of the days	2,132	2,497	1,953	3,155	2,968	1,723	2,035	2,078	1,847
Flow exceeded for 60% of the days	2,652	3,041	2,429	4,177	3,651	2,400	2,437	2,549	2,298
Flow exceeded for 50% of the days	3,257	3,618	3,003	5,339	4,218	2,925	3,059	3,058	2,874
Flow exceeded for 40% of the days	3,899	4,281	3,720	6,076	4,841	3,283	3,816	3,735	3,619
Flow exceeded for 30% of the days	4,646	5,169	4,387	6,530	5,682	3,868	4,517	4,169	4,406
Flow exceeded for 20% of the days	5,598	6,140	5,281	7,081	6,529	4,789	5,149	5,215	5,476
Flow exceeded for 10% of the days	6,817	7,747	6,476	10,282	9,027	6,161	6,080	6,555	6,671
Maximum	13,940	13,940	12,973	13,940	13,553	10,971	10,752	8,896	12,973
30-day Average Flows									
Flow exceeded for 100% of the days	81	81	386	1,488	791	81	477	828	386
Flow exceeded for 90% of the days	1,444	1,835	1,377	2,916	2,688	1,138	1,478	1,534	1,169
Flow exceeded for 80% of the days	2,041	2,570	1,798	3,813	3,333	1,816	2,030	1,907	1,583
Flow exceeded for 70% of the days	2,665	3,146	2,393	4,490	3,741	2,232	2,541	2,500	2,105
Flow exceeded for 60% of the days	3,230	3,704	2,956	5,008	4,180	2,725	3,178	3,004	2,788
Flow exceeded for 50% of the days	3,735	4,155	3,469	5,523	4,705	3,142	3,672	3,401	3,343
Flow exceeded for 40% of the days	4,273	4,768	4,008	5,957	5,328	3,717	4,081	3,846	4,012
Flow exceeded for 30% of the days	4,919	5,458	4,602	6,480	5,895	4,234	4,542	4,564	4,699
Flow exceeded for 20% of the days	5,703	6,257	5,398	7,159	7,316	5,010	5,038	5,483	5,634
Flow exceeded for 10% of the days	6,901	7,840	6,326	10,794	8,464	6,016	6,111	6,256	6,869
Maximum	13,193	13,193	11,515	13,193	11,230	8,912	9,172	7,820	11,515

Table A.1-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

North Platte River above Seminoe Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	38	38	110	360	154	38	135	150	110
Flow exceeded for 90% of the days	344	300	362	539	406	159	327	413	361
Flow exceeded for 80% of the days	526	498	536	702	670	337	472	568	573
Flow exceeded for 70% of the days	731	702	741	995	929	476	646	759	788
Flow exceeded for 60% of the days	1,010	986	1,030	1,450	1,300	644	890	1,080	1,072
Flow exceeded for 50% of the days	1,460	1,450	1,480	2,350	1,935	892	1,295	1,610	1,570
Flow exceeded for 40% of the days	2,236	2,250	2,220	3,128	2,600	1,350	1,970	2,290	2,320
Flow exceeded for 30% of the days	3,300	3,340	3,260	4,883	4,260	2,384	3,180	3,250	3,311
Flow exceeded for 20% of the days	4,650	5,044	4,440	6,500	5,910	3,480	4,450	4,250	4,694
Flow exceeded for 10% of the days	6,570	7,150	6,269	10,210	8,060	5,254	6,178	6,085	6,397
Maximum	16,200	16,200	14,800	16,200	14,900	12,600	13,400	10,400	14,800
3-day Average Flows									
Flow exceeded for 100% of the days	38	38	122	364	158	38	138	157	122
Flow exceeded for 90% of the days	348	303	366	559	418	167	330	419	374
Flow exceeded for 80% of the days	531	510	540	727	690	339	481	573	574
Flow exceeded for 70% of the days	739	727	753	1,033	953	485	652	766	790
Flow exceeded for 60% of the days	1,018	998	1,030	1,429	1,315	648	885	1,100	1,077
Flow exceeded for 50% of the days	1,463	1,443	1,477	2,385	1,960	907	1,302	1,618	1,577
Flow exceeded for 40% of the days	2,223	2,240	2,207	3,101	2,647	1,333	1,975	2,287	2,297
Flow exceeded for 30% of the days	3,283	3,311	3,270	4,960	4,270	2,343	3,179	3,258	3,330
Flow exceeded for 20% of the days	4,622	5,024	4,469	6,623	5,910	3,443	4,440	4,258	4,740
Flow exceeded for 10% of the days	6,548	7,101	6,243	10,107	8,060	5,218	6,068	6,093	6,407
Maximum	15,867	15,867	12,800	15,867	14,600	12,167	12,633	10,267	12,800
7-day Average Flows									
Flow exceeded for 100% of the days	39	39	130	394	166	39	144	190	130
Flow exceeded for 90% of the days	361	305	385	581	450	170	338	425	391
Flow exceeded for 80% of the days	549	538	559	731	720	348	504	588	593
Flow exceeded for 70% of the days	764	739	772	1,042	996	506	688	805	825
Flow exceeded for 60% of the days	1,038	1,027	1,045	1,470	1,339	669	899	1,112	1,113
Flow exceeded for 50% of the days	1,484	1,466	1,495	2,410	1,993	901	1,319	1,638	1,551
Flow exceeded for 40% of the days	2,223	2,238	2,218	3,046	2,610	1,299	1,966	2,259	2,303
Flow exceeded for 30% of the days	3,269	3,221	3,276	4,972	4,136	2,231	3,196	3,245	3,370
Flow exceeded for 20% of the days	4,591	4,962	4,436	6,508	5,875	3,367	4,365	4,199	4,795
Flow exceeded for 10% of the days	6,456	7,011	6,189	9,801	7,949	5,059	5,921	6,265	6,350
Maximum	14,814	14,814	12,171	14,814	14,471	10,053	11,700	10,140	12,171
15-day Average Flows									
Flow exceeded for 100% of the days	44	44	152	463	187	44	174	266	152
Flow exceeded for 90% of the days	393	328	409	642	533	178	356	453	402
Flow exceeded for 80% of the days	596	588	602	829	797	398	529	620	655
Flow exceeded for 70% of the days	801	800	803	1,114	1,033	534	717	871	873
Flow exceeded for 60% of the days	1,111	1,080	1,120	1,621	1,496	711	925	1,182	1,168
Flow exceeded for 50% of the days	1,538	1,533	1,539	2,449	1,995	930	1,366	1,679	1,589
Flow exceeded for 40% of the days	2,206	2,193	2,216	3,158	2,642	1,322	2,002	2,269	2,331
Flow exceeded for 30% of the days	3,156	3,097	3,209	4,808	3,815	2,084	3,031	3,125	3,377
Flow exceeded for 20% of the days	4,445	4,761	4,357	6,358	5,660	3,128	4,228	4,083	4,581
Flow exceeded for 10% of the days	6,136	6,581	5,834	8,918	7,761	4,935	5,293	6,180	6,053
Maximum	13,940	13,940	11,067	13,940	13,553	8,870	10,752	8,896	11,067
30-day Average Flows									
Flow exceeded for 100% of the days	54	54	224	607	239	54	224	316	233
Flow exceeded for 90% of the days	439	427	452	817	645	196	405	525	428
Flow exceeded for 80% of the days	677	709	665	1,091	949	443	602	767	682
Flow exceeded for 70% of the days	957	957	957	1,509	1,273	605	809	1,087	974
Flow exceeded for 60% of the days	1,273	1,282	1,262	2,160	1,676	805	1,108	1,391	1,282
Flow exceeded for 50% of the days	1,717	1,724	1,715	2,719	2,175	1,074	1,536	1,821	1,782
Flow exceeded for 40% of the days	2,295	2,268	2,328	3,662	2,821	1,448	2,084	2,318	2,497
Flow exceeded for 30% of the days	3,055	3,034	3,058	4,667	3,621	1,969	2,868	2,956	3,252
Flow exceeded for 20% of the days	4,003	4,178	3,894	5,473	4,603	2,658	3,659	3,699	4,298
Flow exceeded for 10% of the days	5,340	5,528	5,223	8,574	6,479	4,178	4,672	4,912	5,633
Maximum	13,193	13,193	10,157	13,193	11,162	7,710	9,172	7,758	10,157

Table A.1-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

North Platte River above Seminole Reservoir, WY		Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows										
Flow exceeded for 100% of the days	38	38	70	180	92	38	70	90	75	
Flow exceeded for 90% of the days	157	151	162	260	185	109	127	190	191	
Flow exceeded for 80% of the days	217	211	218	365	250	152	167	230	238	
Flow exceeded for 70% of the days	263	262	264	435	309	194	224	285	280	
Flow exceeded for 60% of the days	322	329	318	501	388	239	279	344	340	
Flow exceeded for 50% of the days	398	412	388	565	470	287	328	402	422	
Flow exceeded for 40% of the days	478	502	464	674	540	355	410	469	520	
Flow exceeded for 30% of the days	582	602	572	760	652	456	486	552	662	
Flow exceeded for 20% of the days	753	745	759	975	810	582	614	723	859	
Flow exceeded for 10% of the days	1,107	1,060	1,160	1,450	1,120	820	960	1,090	1,330	
Maximum	5,420	3,770	5,420	3,520	3,770	2,200	4,550	3,360	5,420	
3-day Average Flows		Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	38	38	73	184	93	38	73	90	80	
Flow exceeded for 90% of the days	159	152	164	259	185	110	128	189	192	
Flow exceeded for 80% of the days	218	214	219	370	247	151	168	230	237	
Flow exceeded for 70% of the days	265	265	265	432	312	192	228	285	278	
Flow exceeded for 60% of the days	323	326	320	500	382	238	280	341	341	
Flow exceeded for 50% of the days	397	410	387	560	462	286	331	405	417	
Flow exceeded for 40% of the days	475	498	464	666	547	354	415	460	519	
Flow exceeded for 30% of the days	581	599	567	751	652	452	481	547	652	
Flow exceeded for 20% of the days	750	745	753	977	810	580	615	715	857	
Flow exceeded for 10% of the days	1,093	1,033	1,130	1,441	1,081	801	943	1,074	1,310	
Maximum	4,840	3,350	4,840	3,270	3,350	1,883	4,453	3,207	4,840	
7-day Average Flows		Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	41	41	77	189	94	41	77	97	89	
Flow exceeded for 90% of the days	162	155	168	262	188	109	132	191	197	
Flow exceeded for 80% of the days	219	212	223	394	245	154	171	232	237	
Flow exceeded for 70% of the days	266	264	267	437	314	194	231	285	278	
Flow exceeded for 60% of the days	323	329	320	500	380	246	285	338	341	
Flow exceeded for 50% of the days	397	409	390	545	456	283	332	405	413	
Flow exceeded for 40% of the days	473	499	459	657	545	353	415	458	517	
Flow exceeded for 30% of the days	574	593	557	736	652	453	483	534	655	
Flow exceeded for 20% of the days	735	730	736	943	797	577	606	695	834	
Flow exceeded for 10% of the days	1,053	1,002	1,098	1,442	1,058	786	895	1,015	1,241	
Maximum	4,379	3,173	4,379	3,083	3,173	1,656	4,109	2,729	4,379	
15-day Average Flows		Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	52	52	84	194	100	52	84	113	106	
Flow exceeded for 90% of the days	168	160	173	265	193	121	136	193	208	
Flow exceeded for 80% of the days	224	214	226	411	251	160	179	239	242	
Flow exceeded for 70% of the days	268	265	270	443	308	196	236	285	280	
Flow exceeded for 60% of the days	324	333	322	486	380	246	297	341	336	
Flow exceeded for 50% of the days	394	410	385	533	471	286	333	395	415	
Flow exceeded for 40% of the days	470	497	459	603	548	360	411	461	510	
Flow exceeded for 30% of the days	562	587	546	695	651	434	479	513	641	
Flow exceeded for 20% of the days	708	702	713	907	741	577	579	657	804	
Flow exceeded for 10% of the days	972	934	1,012	1,324	950	761	829	899	1,176	
Maximum	3,530	2,899	3,530	2,899	2,750	1,393	3,530	2,266	3,392	
30-day Average Flows		Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	58	58	93	224	124	58	93	117	114	
Flow exceeded for 90% of the days	176	163	190	330	205	132	148	216	209	
Flow exceeded for 80% of the days	233	218	239	423	246	165	198	255	249	
Flow exceeded for 70% of the days	278	273	280	453	321	196	249	288	289	
Flow exceeded for 60% of the days	329	346	323	483	398	253	306	341	338	
Flow exceeded for 50% of the days	397	419	381	503	491	304	337	385	426	
Flow exceeded for 40% of the days	471	497	452	554	554	374	399	445	529	
Flow exceeded for 30% of the days	555	564	545	604	635	424	458	501	623	
Flow exceeded for 20% of the days	678	688	674	982	723	549	576	627	791	
Flow exceeded for 10% of the days	874	821	914	1,380	853	760	772	794	1,059	
Maximum	2,691	2,232	2,691	2,232	2,035	1,263	2,505	1,695	2,691	

having ended, the irrigation season winding down, and climatic conditions tending to be generally quite dry during this seasonal period, the flow values are mostly consistent with known climatological conditions.

A.1.5 Median Mean Daily Flow.

The plot of the Median mean daily flow by calendar day (that is, the mean daily flow that is exceeded as often as not exceeded on that particular calendar day) is shown on **Figure A.1-6**. **Figure A.1-6** shows that the highest values tend to occur at about the same time of the year, *i.e.* mid-May to mid-June, for all time intervals. The magnitudes of the values are consistent with the climatic conditions known to have been occurring during each interval (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). This, too, is consistent with the climatic and geographic characteristics of the basin discussed in **Section A.1.1**.

A.1.6 USGS Annual Peak Flow.

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.1-7** and **Figure A.1-8** and in **Table A.1-15** and **Table A.1-16**.

Figure A.1-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak flow, and the 10-year running average of the USGS Annual Peak flow. The most notable characterization that can be seen in **Figure A.1-7** is that the USGS Annual Peak Flow is greater than the Annual Maximum mean daily flow for all years for which data for both are available. This is the expected condition in an uncontrolled basin, since the averaging process for the mean daily flows can be expected to smooth out any instantaneous peaks. The small difference between these two quantities is most likely attributable to the relatively small size of the basin. Irrigation activities are another possible contributing factor.

Figure A.1-8 shows the date of occurrences of the USGS Annual Peak flow over the Period of Record. It shows that, except for 2 outliers which occurred during the 1959-1974 time interval, the USGS Annual Peak flow has occurred in about the same time frame as the Annual Maximum mean daily flow (**Figure A.1-3**), *i.e.* from early May to late June. This is consistent with the largely climate-driven nature of flow events in the upper North Platte basin.

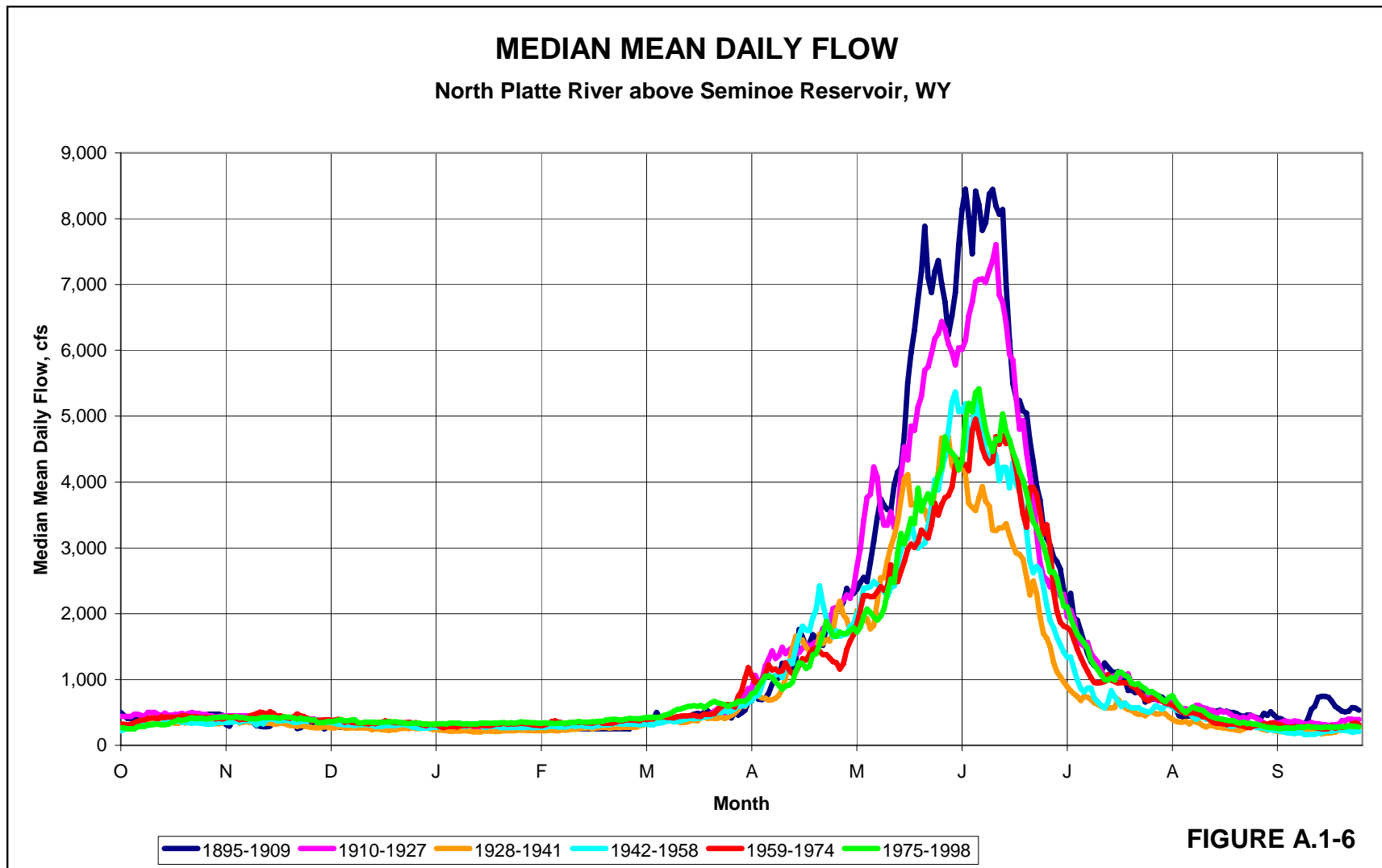
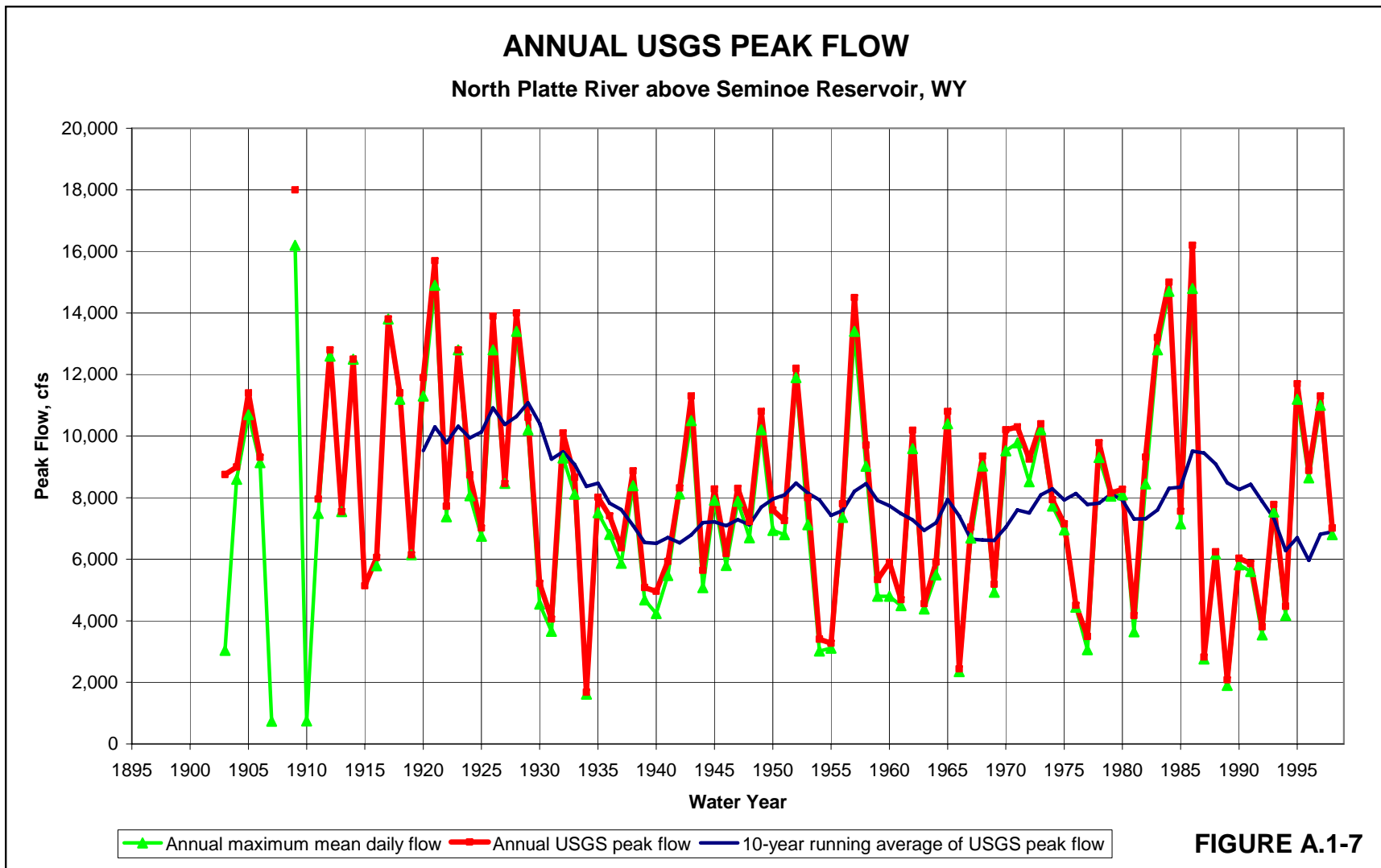


Figure A.1-6 Median Mean Daily Flow.

**FIGURE A.1-7****Figure A.1-7** Annual USGS Peak Flow.

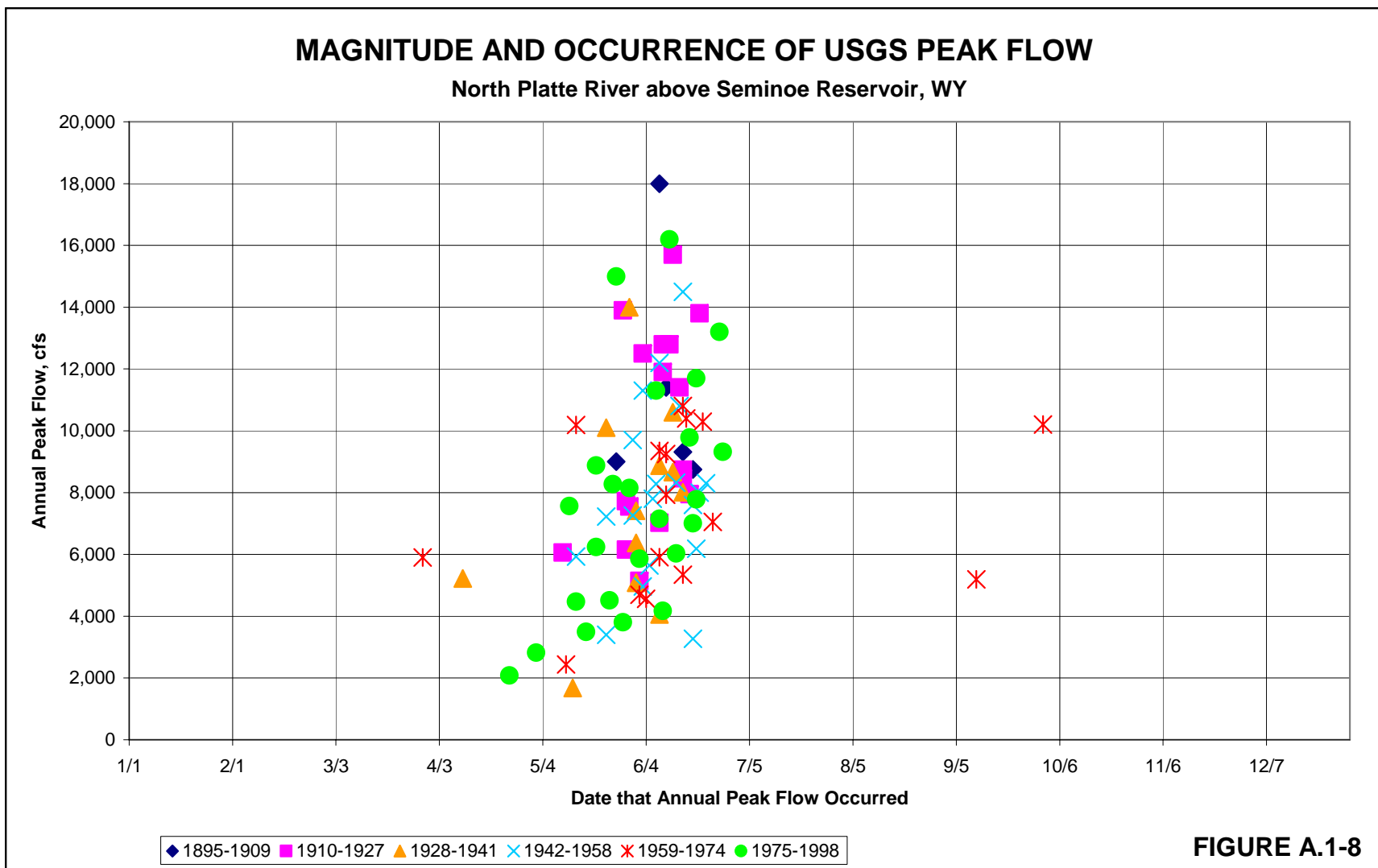


Figure A.1-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.1-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.1-15** shows that the average was somewhat higher than the median for the earliest three time intervals (1895-1909, 1910-1927, and 1928-1941) and that there was little or no difference between the two quantities for the latest three time intervals (1942-1958, 1959-1974, and 1975-1998). This is possibly the result of irrigation development and/or increased forest density in the basin in the latter half of the 20th century.

Table A.1-15 also shows that the occurrence of these average and median flow events always averages out to be within a week of each other and within a three-week period from late May through mid-June for all time intervals.

Table A.1-16 shows the exceedance probabilities for the USGS Annual Peak Flow. It is analogous to **Table A.1-5** for Annual Maximum mean daily flows, and shows a similar pattern. That is, peaks in the 1942-1958 time interval tend to be higher than those for the 1959-1974 time interval for all exceedance probabilities except 40 percent and 30 percent. The explanation is likely also the same as was discussed in **Section A.1.2**. Otherwise, the Peak flow values are consistent with known climatological conditions for all exceedance probabilities.

Table A.1-15 Summary of USGS Peak Flows.

North Platte River above Seminoe Reservoir, WY	Time Period								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	8,291	9,083	7,790	11,292	9,976	7,211	8,222	7,469	7,699
Median Annual Peak Flow (cfs)	8,000	8,700	7,780	9,310	8,740	6,890	8,000	7,490	7,355
Average Occurrence of Peak Flow	6/5	6/3	6/7	6/9	6/6	5/28	6/8	6/16	5/31
Median Occurrence of Peak Flow	6/8	6/8	6/8	6/10	6/9	6/1	6/8	6/10	6/2

Table A.1-16 USGS Peak Flow Exceedance Values.

North Platte River above Seminoe Reservoir, WY Annual Peak Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Peak exceeded in 100% of the years	1,680	1,680	2,080	8,750	5,140	1,680	3,270	2,440	2,080
Peak exceeded in 90% of the years	4,230	5,110	3,676	8,850	6,114	4,330	4,744	4,625	3,583
Peak exceeded in 80% of the years	5,268	6,060	4,790	8,950	7,126	5,032	6,388	5,190	4,350
Peak exceeded in 70% of the years	6,168	7,215	5,908	9,062	7,686	5,206	7,252	5,620	5,725
Peak exceeded in 60% of the years	7,380	7,950	7,090	9,186	8,154	6,018	7,680	5,910	6,394
Peak exceeded in 50% of the years	8,000	8,700	7,780	9,310	8,740	6,890	8,000	7,490	7,355
Peak exceeded in 40% of the years	8,742	9,000	8,276	10,146	11,700	7,890	8,292	9,250	8,076
Peak exceeded in 30% of the years	9,732	11,000	9,326	10,982	12,560	8,681	8,596	9,770	8,924
Peak exceeded in 20% of the years	11,100	12,500	10,280	12,720	12,800	9,362	10,580	10,200	10,388
Peak exceeded in 10% of the years	12,800	13,850	11,460	15,360	13,840	10,450	11,660	10,350	12,750
Peak Flow	18,000	18,000	16,200	18,000	15,700	14,000	14,500	10,800	16,200

A.2 NORTH PLATTE RIVER BELOW GUERNSEY RESERVOIR, WYOMING

A.2.1 Methodology.

For this location, a single gage record was used, as follows:

Gage	Records Used	Data Source
North Platte River below Guernsey Reservoir, WY	4/1-9/30/1901 4/1/1902-9/30/1998	USGS website
Guernsey Reservoir Outflow	10/1/1996-9/30/1997	Reclamation's Hydromet website
Note: This record has been published in the USGS "Water Resources Data for Wyoming" under the following titles for the following dates:		
North Platte River near Guernsey, Wyoming	4/1-9/30/1901; 10/1/1903-9/30/1904	
North Platte River at Guernsey, Wyoming	10/1/1902 – 9/30/1903; 10/1/1904 – 9/30/1908	
North Platte River at Whalen, Wyoming	10/1/1908 – 9/30/1909	
North Platte River and Interstate Canal at Whalen, WY	10/1/1909 – 9/30/1911; 10/1/1912 – 9/30/1916	
North Platte River above Whalen, Wyoming	10/1/1916 – 9/30/1927	

Where data do not exist for the North Platte River below Guernsey Reservoir, Guernsey Reservoir Outflow data was substituted. The two gages are essentially the same location only measured and reported by different federal agencies. For the period 10/1/1945 through 9/30/1998, there are 6,636 days where the mean daily outflow from Guernsey Reservoir is greater than the flow at the below Guernsey gage, 6,535 days that the below Guernsey gage has the greater flow, and 5,792 days where there is not difference between the two gages. The average difference between the two gages when Guernsey Reservoir Outflow has the greater flow is 22 cfs and the average difference when the below Guernsey gage has the greater flow is 28 cfs. Therefore, the Guernsey Reservoir Outflow used as an estimator of flows at the below Guernsey gage does not significantly increase the flow characteristics for this reach of the river.

Summary statistics characterizing this record are presented in **Table A.2-1** (mean daily values), **Table A.2-2** (annual 3-, 7-, 15- and 30-day running averages), **Table A.2-3** (seasonal 3-, 7-, 15- and 30-day running averages), and **Table A.2-4** (flow frequencies).

A.2.2 Maximum and Minimum Mean Daily Flows and Annual Flow Volume.

Table A.2-1 shows that there was a steady decrease in both average and median Annual Maximum mean daily flow and annual flow volume by time interval from the beginning of the period of record through 1942-1958. Since the 1942-1958 time interval, these quantities have remained generally constant, except for relatively small variations by time interval which correspond to climatic variations such as the 1950's drought period (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). The decreases are coincident with the times when the major North Platte reservoirs began operation (**Table 2** of the main report), except that there was no significant change coincident with

Table A.2-1 Summary of Mean Daily Flow Values.

North Platte River below Guernsey Reservoir, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	7,489	9,891	5,761	15,184	9,407	7,111	5,142	5,943	6,077
Median Annual Maximum Mean Daily Flow (cfs)	5,570	8,000	5,400	13,900	8,190	5,940	5,000	5,395	5,545
Average Annual Flow Volume (kaf)	1,318	1,530	1,165	1,691	1,658	1,262	1,058	1,202	1,216
Median Annual Flow Volume (kaf)	1,182	1,491	1,100	1,598	1,551	1,227	1,078	1,120	1,103
Average Mean Daily Flow (cfs)	1,852	2,191	1,609	2,688	2,290	1,744	1,461	1,660	1,679
Median Mean Daily Flow (cfs)	699	900	316	1,020	1,335	343	549	406	26
Average Number of Mean Daily Flow Measurements	361	356	365	325	365	365	365	365	365
Number of Years of Data	98 of 104	41 of 47	57 of 57	9 of 15	18 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	591	853	412	1,401	857	574	301	568	385
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	7,285	9,516	5,680	15,184	8,553	7,111	5,050	5,843	6,018
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	7,282	9,414	5,748	15,156	8,405	7,021	5,128	5,930	6,065
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	5,323	5,294	5,345	3,582	6,281	5,125	4,892	5,363	5,653
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	248	565	19	1,250	616	297	218	26	9
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	5,520	7,500	5,360	13,900	7,315	5,940	4,980	5,250	5,470
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	5,545	7,230	5,360	13,900	7,030	5,940	5,000	5,395	5,545
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	5,120	5,160	5,110	2,460	6,050	5,110	4,960	5,250	5,165
Difference ("Apr-Jul Average" - "Jul-Sep Average")	1,962	4,222	336	11,602	2,272	1,986	158	479	365
Difference ("Apr-Jul Median" - "Jul-Sep Median")	400	2,340	250	11,440	1,265	830	20	0	305
Average Occurrence of Maximum Mean Daily Flow	6/27	6/14	7/7	6/6	6/21	6/10	7/10	7/4	7/6
Median Occurrence of Maximum Mean Daily Flow	7/3	6/8	7/10	6/6	6/20	6/5	7/15	7/12	7/6
Average Annual Minimum Mean Daily Flow (cfs)	73	174	6	390	111	144	14	2	2
Median Annual Minimum Mean Daily Flow (cfs)	10	155	2	333	78	155	15	1	2
Average occurrences per year of the Minimum	8	6	9	20	4	1	18	9	3
Occuring between	12/4	11/21	12/15	9/22	12/20	11/28	11/17	11/22	1/11
and	1/2	12/26	1/8	11/6	2/2	12/22	1/5	12/13	1/24
Median occurrences per year of the Minimum	3	1	3	7	1	1	12	11	1
Occuring between	12/9	12/2	12/13	9/26	1/31	1/29	10/29	11/19	1/19
and	1/29	1/29	2/6	10/3	2/21	1/30	2/13	12/11	2/6

the beginning of operation of Glendo Reservoir in 1958. The decrease is particularly noticeable from the 1896-1909 time interval to the 1910-1927 interval, coincident with the beginning of operation of Pathfinder Reservoir in 1909.

Figure A.2-1 (maximum flows) and **Figure A.2-2** (annual flow volume) show changes in mean daily and annual flow characteristics that are coincident with the development of the upstream reservoirs. **Figure A.2-1** shows that, prior to 1909, the Annual Maximum mean daily flow was usually significantly higher than the annual maximum 30-day average flow. Between 1910 and 1941 there are an increasing number of years where this difference is not as great. After 1941, the difference is relatively small in most years. It is particularly noteworthy that for several significant individual high water events in the 1970's and 1980's there is almost no difference between the Annual Maximum mean daily flow and the maximum 30-day average flow. **Figure A.2-1** also shows a steadily decreasing 10-year running average of the Annual Maximum mean daily flow until about 1942, after which time it remains relatively steady until the 1970's, when it increases somewhat due to a wet climatic period.

Figure A.2-2 shows major fluctuations by year between very high and very low annual flow volume through 1909, less fluctuation and fewer extremes from 1910 through 1941, and relatively little change from year to year after 1941, except for the previously mentioned individual high water events in the 1970's and 1980's and the drought period of the 1950's. **Table A.2-1** shows average and median annual flow volumes, which decrease from over 1.6 million acre-feet to around 1.2 million acre-feet between the 1910-1941 and 1928-1941 time intervals.

Figure A.2-3 shows that the majority of Annual Maximum mean daily flows occurred in mid-May through mid-June for the 1895-1909 time interval, similar to the North Platte River above Seminoe Reservoir as shown on **Figure A.1-3**. However, considerably more scatter in the timing of Annual Maximum mean daily flows is evident at this location for all time intervals after 1909, as well as noticeably lower Annual Maximum mean daily flow values for all time intervals after 1927, coincident with the beginning of operation of Guernsey Dam (**Table 2** of the main report).

The average and median maximum mean daily flows are highest during the Apr 16-Jul 15 or Jun 1-Aug 15 seasonal periods for all time intervals (**Table A.2-1**). Differences between the maximum mean daily flows from the Apr 16-Jul 15 seasonal period to Jul 16-Sep 30 are quite large for 1895-1909 and significantly smaller for all subsequent time intervals. Both the average and median Dates of Maximum Flow occur in June for all time intervals prior to 1941 (1895-1909, 1910-1927, and 1928-1941). After 1941 (1942-1958, 1959-1974, and 1975-1998 time intervals), the average and median Dates of Maximum Flow occur in July.

In **Table A.2-1**, the average and median Annual Minimum mean daily flow do not show a definite pattern by time interval with respect to the timing of the minimum flows. However, **Table A.2-1** shows the Annual Minimum mean daily flow decreasing from

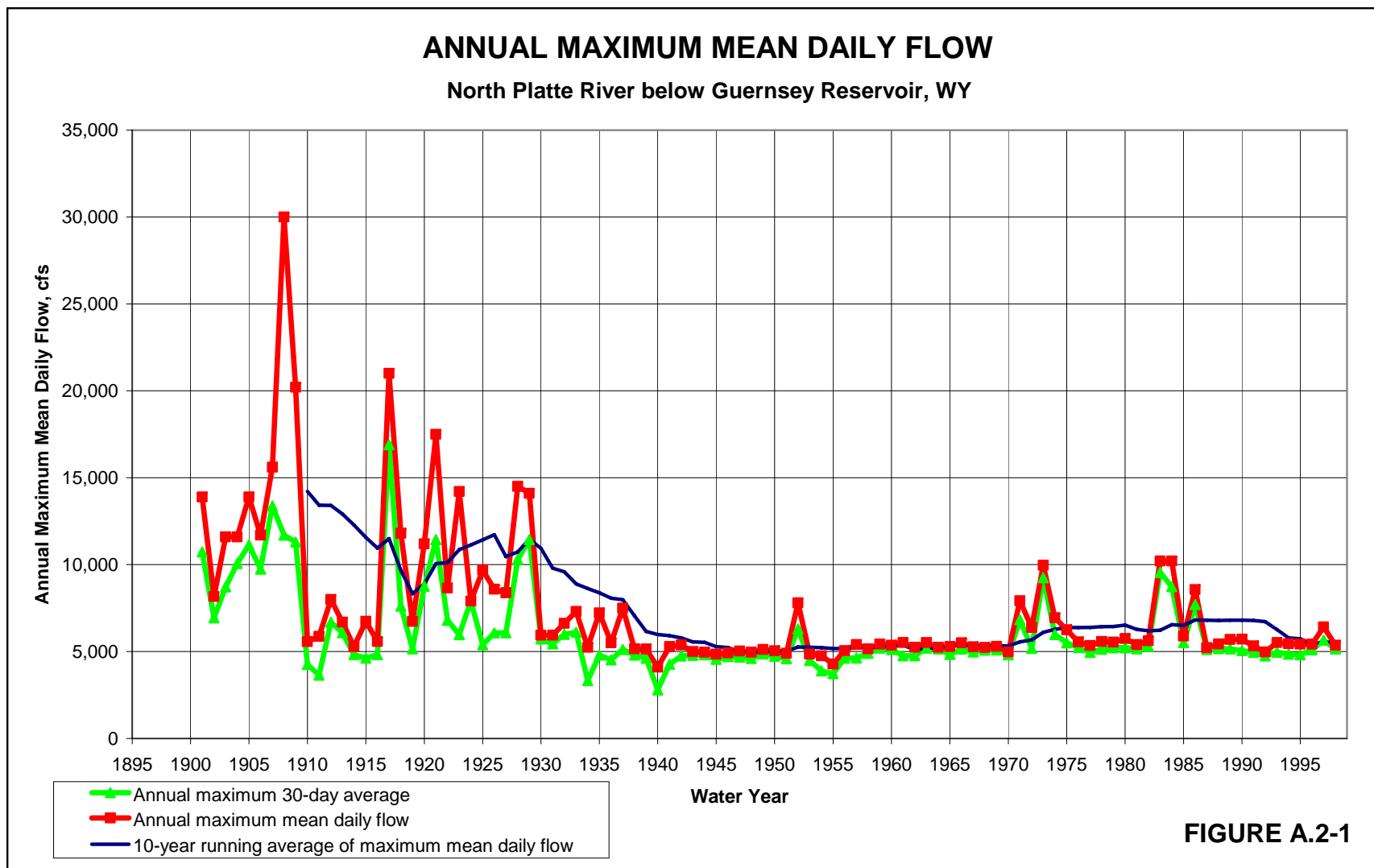


FIGURE A.2-1

Figure A.2-1 Annual Maximum Mean Daily Flow.

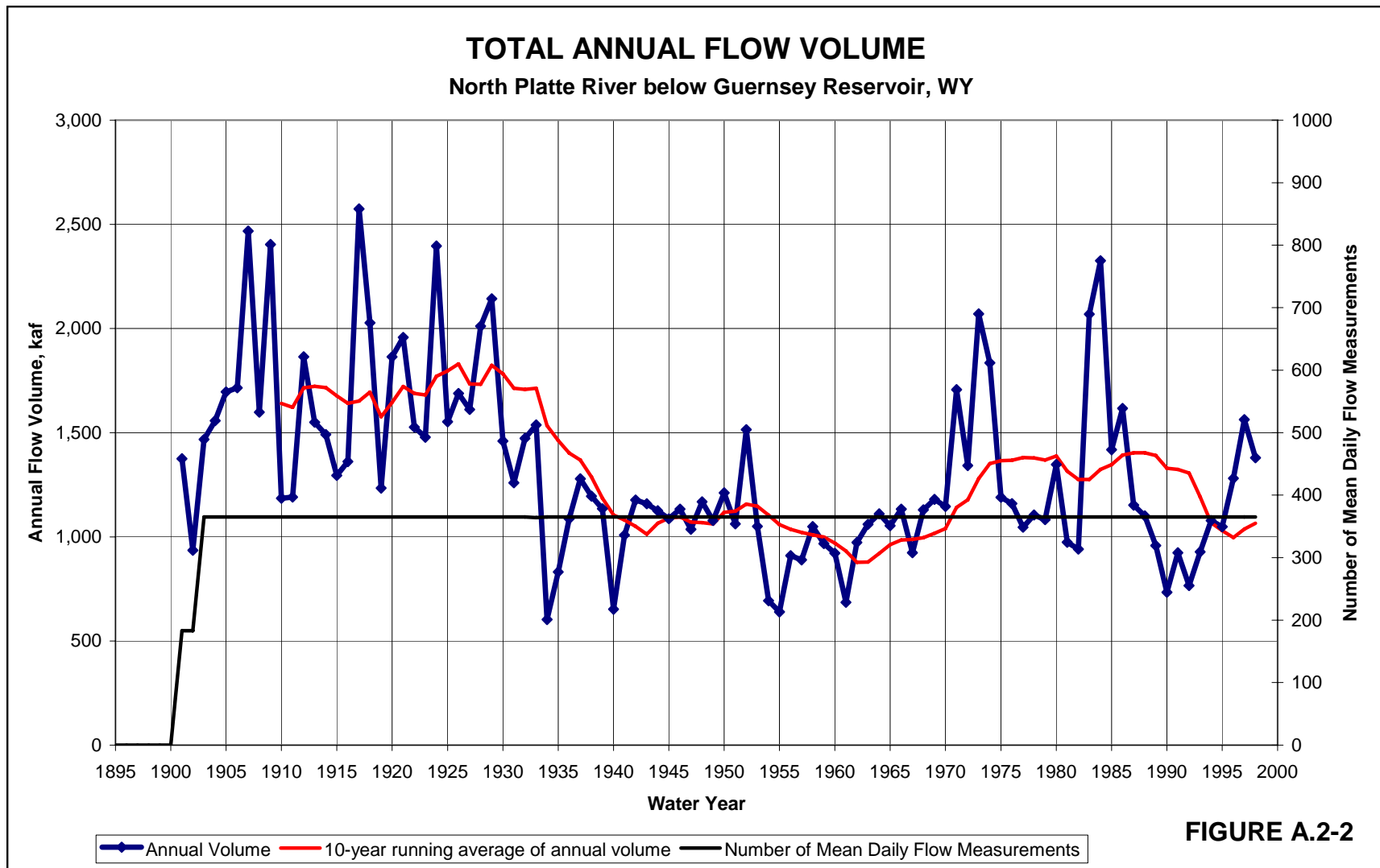


Figure A.2-2 Total Annual Flow Volume.

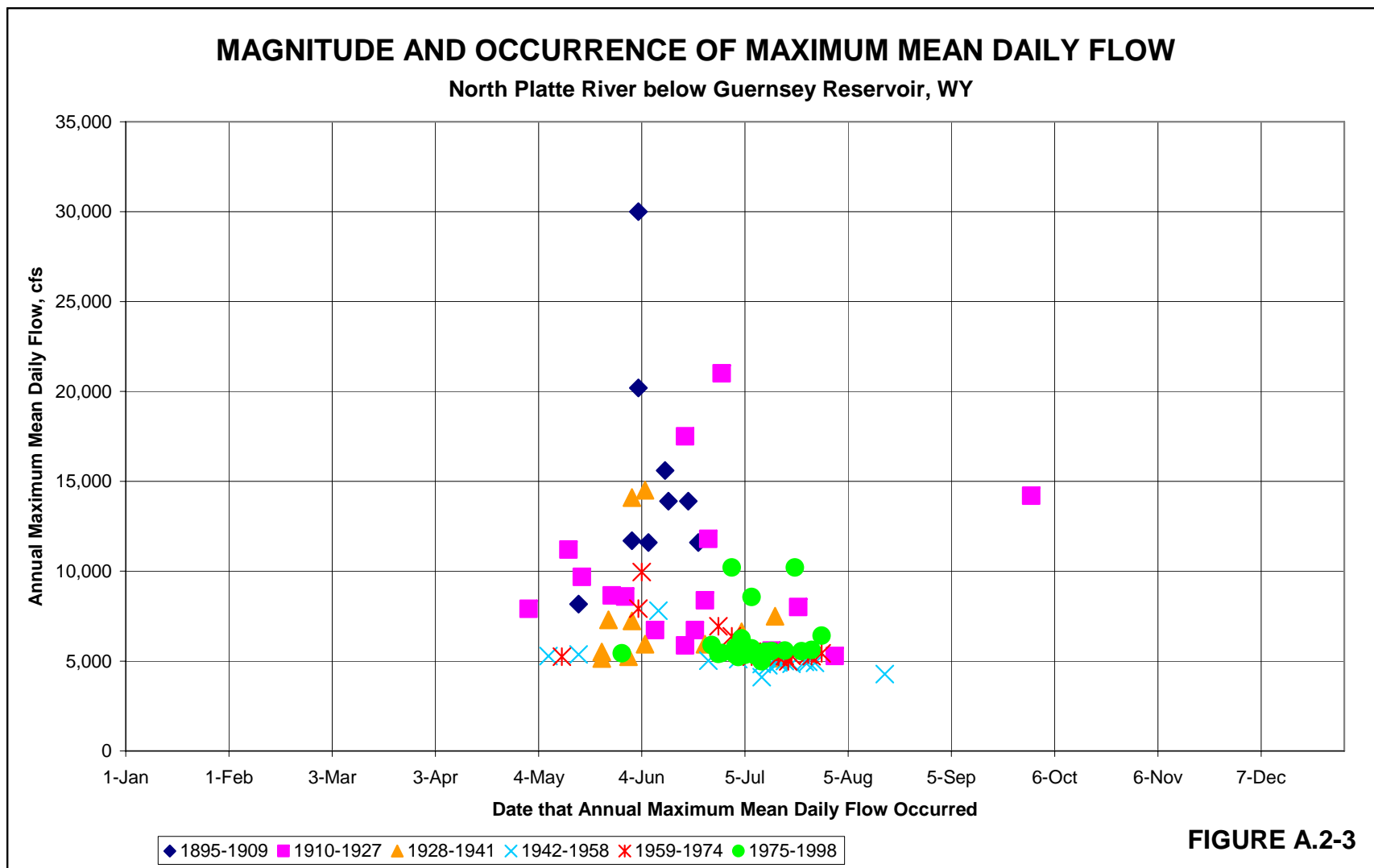


Figure A.2-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

greater than 100 cfs through 1941 to 15 cfs or less thereafter, and **Figure A.2-4** shows a pattern of high variability from one year to the next through 1941, and less variability thereafter. **Table A.2-1** does show a change in the Dates of Minimum Flow. Both the average and the median occurred in September-November for the 1895-1909 interval, and in November-February for all subsequent time intervals. Minimum flows were not calculated for years with incomplete flow records.

A.2.3 3-, 7-, 15-, and 30-day Averages of Mean Daily Flows.

Table A.2-2 shows that there was some attenuation of all flow values due to the 3-, 7-, 15-, and 30-day flow averaging, but not a large attenuation. For maximum flows, the attenuation due to averaging is greatest for 1895-1909 and grows smaller for subsequent time intervals. There was little attenuation after the 1928-1941 time interval, coincident with the beginning of operation of the Alcova and Seminole Reservoirs (**Table 2** of the main report). A similar pattern of decreasing minimum flows by time interval can also be seen in **Table A.2-2**. However, there was no clear pattern by time interval for the attenuation by averaging for the minimum flows.

Table A.2-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.2-3** shows that there is a significant decrease in all values with increasing averaging time (i.e. from daily to 30-day) for the 1895-1909 time interval. Also, the highest average and median flows occur in the Apr 16-Jun 15 and the Jun 1-Aug 15 seasonal periods. The lowest values are those for the Feb 15-Mar 16 seasonal period. This is the time of the year when both natural flows and reservoir releases are lowest.

For the 1910-1927 time interval, the same characterizations as those for the 1895-1909 time interval can be seen. The actual flow values are much lower for all seasonal periods except Jul 16-Sep 30, which has higher flow values than the 1895-1909 time interval. Also, there is noticeably less decrease in all values with increasing averaging time.

By the 1942-1958 time interval, significant changes to the characterizations can be seen. The most noteworthy characterization change is that the flow values for this and all subsequent time intervals are less than those for the 1910-1927 time interval. Also, beginning with the 1942-1958 time interval, the flow values by time interval do not show much change from one time interval to the next, except that the values for the 1942-1958 time interval are somewhat lower, most likely due to the 1950's drought period. Decreasing values with increasing averaging time still exist, but these differences are quite small when compared with those for earlier time intervals.

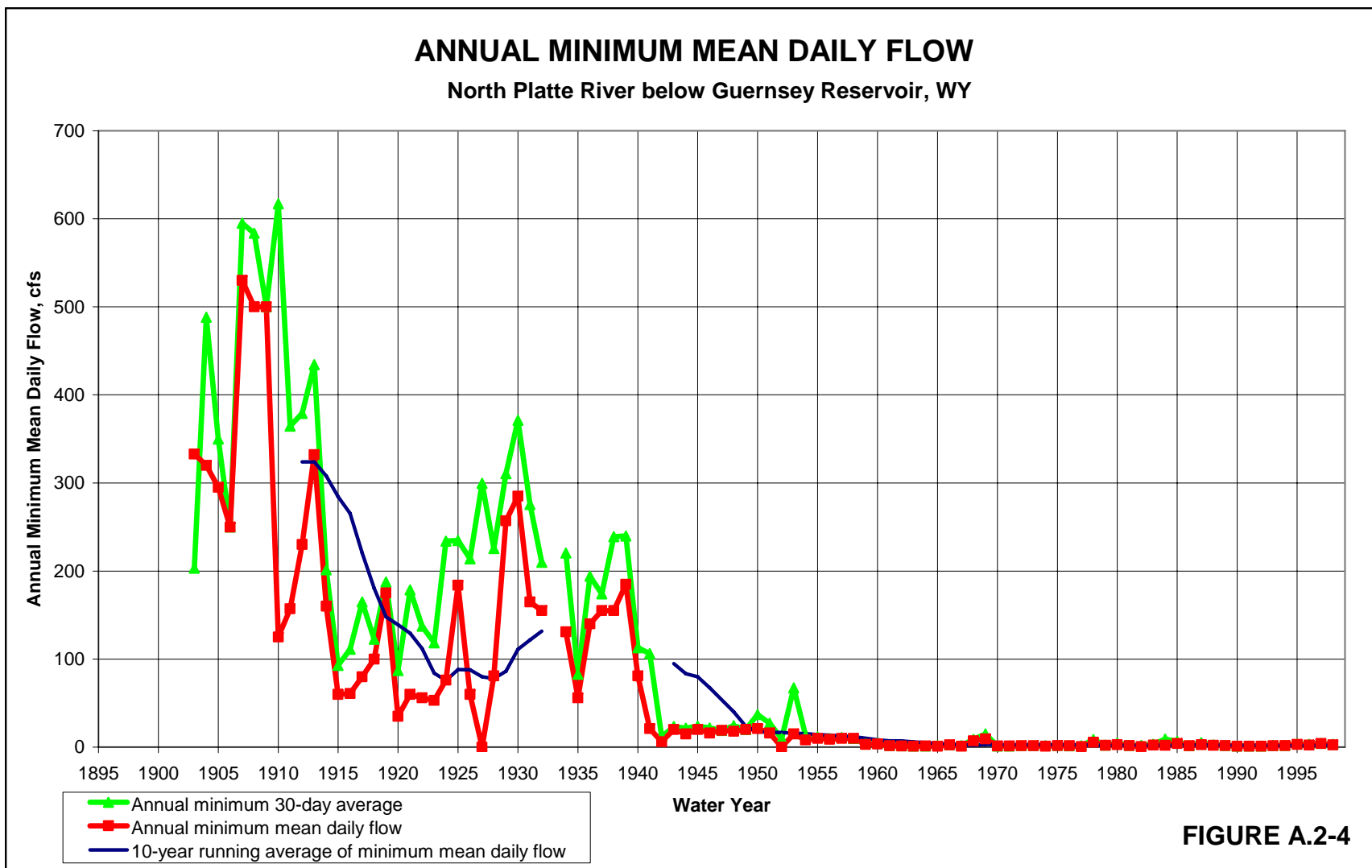


Figure A.2-4 Annual Minimum Mean Daily Flow.

Table A.2-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

North Platte River below Guernsey Reservoir, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	7,489	9,891	5,761	15,184	9,407	7,111	5,142	5,943	6,077
Median Annual Maximum Mean Daily Flow (cfs)	5,570	8,000	5,400	13,900	8,190	5,940	5,000	5,395	5,545
Avg. Ann. Max. 3-day Avg. Flow (cfs)	7,228	9,331	5,715	14,152	8,910	6,773	5,092	5,905	6,029
Median Ann. Max. 3-day Avg. Flow (cfs)	5,507	7,393	5,350	12,700	7,765	5,670	4,947	5,377	5,518
Avg. Ann. Max. 7-day Avg. Flow (cfs)	6,907	8,663	5,644	13,148	8,100	6,504	5,017	5,834	5,962
Median Ann. Max. 7-day Avg. Flow (cfs)	5,454	6,914	5,320	11,814	6,921	5,597	4,884	5,347	5,482
Avg. Ann. Max. 15-day Avg. Flow (cfs)	6,545	7,991	5,504	11,799	7,544	6,118	4,894	5,667	5,828
Median Ann. Max. 15-day Avg. Flow (cfs)	5,319	6,273	5,221	11,456	6,502	5,277	4,787	5,210	5,382
Avg. Ann. Max. 30-day Avg. Flow (cfs)	6,088	7,216	5,277	10,411	6,830	5,658	4,681	5,456	5,579
Median Ann. Max. 30-day Avg. Flow (cfs)	5,139	6,076	5,073	10,738	6,069	4,956	4,685	5,126	5,151
Average Annual Minimum Mean Daily Flow (cfs)	73	174	6	390	111	144	14	2	2
Median Annual Minimum Mean Daily Flow (cfs)	10	155	2	333	78	155	15	1	2
Avg. Ann. Min. 3-day Avg. Flow (cfs)	80	190	6	390	125	174	14	3	2
Median Ann. Min. 3-day Avg. Flow (cfs)	15	164	3	333	95	162	15	1	2
Avg. Ann. Min. 7-day Avg. Flow (cfs)	88	212	6	382	163	187	15	3	2
Median Ann. Min. 7-day Avg. Flow (cfs)	15	174	3	330	140	168	16	2	2
Avg. Ann. Min. 15-day Avg. Flow (cfs)	101	242	7	393	214	200	17	3	3
Median Ann. Min. 15-day Avg. Flow (cfs)	16	209	3	373	180	196	17	2	2
Avg. Ann. Min. 30-day Avg. Flow (cfs)	110	261	9	424	232	212	21	3	3
Median Ann. Min. 30-day Avg. Flow (cfs)	19	223	3	488	194	220	20	2	2

Table A.2-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

North Platte River below Guernsey Reservoir, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	7,228	9,331	5,715	14,152	8,910	6,773	5,092	5,905	6,029
Median Ann. Max. 3-day Avg. Flow (cfs)	5,507	7,393	5,350	12,700	7,765	5,670	4,947	5,377	5,518
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	543	762	394	1,281	753	514	288	538	373
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	7,012	8,956	5,614	14,152	8,106	6,709	4,952	5,787	5,968
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	7,028	8,872	5,702	14,152	7,981	6,623	5,082	5,892	6,015
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	5,158	4,953	5,305	3,364	5,761	4,935	4,837	5,345	5,611
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	233	535	19	1,227	607	284	205	23	8
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	5,460	6,727	5,337	12,700	6,857	5,670	4,910	5,223	5,430
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	5,495	6,650	5,350	12,700	6,848	5,593	4,947	5,377	5,518
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	5,090	5,070	5,090	2,243	5,798	4,952	4,900	5,243	5,120
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	6,907	8,663	5,644	13,148	8,100	6,504	5,017	5,834	5,962
Median Ann. Max. 7-day Avg. Flow (cfs)	5,454	6,914	5,320	11,814	6,921	5,597	4,884	5,347	5,482
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	484	646	374	1,165	641	393	274	511	353
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	6,699	8,434	5,450	13,148	7,593	6,483	4,719	5,609	5,863
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	6,771	8,346	5,638	13,029	7,564	6,342	5,015	5,819	5,958
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	4,990	4,658	5,230	3,110	5,319	4,803	4,759	5,298	5,517
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	214	516	18	1,190	578	274	179	20	8
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	5,361	6,284	5,244	11,814	5,794	5,597	4,763	5,157	5,379
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	5,414	6,379	5,320	11,586	6,241	5,527	4,884	5,347	5,482
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	4,991	4,981	4,996	1,964	5,588	4,871	4,876	5,210	5,085
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	6,545	7,991	5,504	11,799	7,544	6,118	4,894	5,667	5,828
Median Ann. Max. 15-day Avg. Flow (cfs)	5,319	6,273	5,221	11,456	6,502	5,277	4,787	5,210	5,382
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	416	561	316	1,102	538	321	253	433	284
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	6,163	7,724	5,039	11,799	7,001	6,035	4,212	5,122	5,570
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	6,373	7,610	5,484	11,437	7,023	5,903	4,890	5,613	5,818
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	4,805	4,405	5,093	2,734	5,053	4,645	4,648	5,183	5,347
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	195	411	13	1,190	452	259	160	17	7
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	5,203	6,210	4,955	11,456	5,390	5,275	4,448	4,999	5,261
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	5,292	6,272	5,221	10,453	5,975	5,209	4,775	5,210	5,382
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	4,881	4,804	4,893	1,617	5,414	4,778	4,734	5,094	5,027
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	6,088	7,216	5,277	10,411	6,830	5,658	4,681	5,456	5,579
Median Ann. Max. 30-day Avg. Flow (cfs)	5,139	6,076	5,073	10,738	6,069	4,956	4,685	5,126	5,151
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	303	463	194	902	430	286	174	250	170
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	5,284	6,865	4,146	10,411	6,249	5,378	3,462	4,248	4,562
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	5,881	6,775	5,238	9,735	6,359	5,408	4,622	5,401	5,565
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	4,571	4,094	4,914	2,294	4,749	4,408	4,498	5,031	5,130
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	176	358	12	881	390	240	140	15	5
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	4,395	5,680	3,876	10,738	5,096	4,760	3,510	3,832	4,342
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	5,135	5,993	5,073	9,317	5,674	4,956	4,630	5,126	5,151
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	4,777	4,482	4,808	1,324	5,050	4,639	4,587	5,001	4,879

A.2.4 Flow Frequency and Exceedance.

A.2.4.1 Flow Ranges.

Table A.2-4 and **Figure A.2-5** show that, for both frequency in Percentage of Years and frequency in Percentage of Days, there is a noticeable change in the frequency distribution of flows by time interval. For Percentage of Years, there is a broad range of flows, from 201 cfs to 10,000 cfs, which occur from 88% to 100% of the time in the 1895-1909 time interval. For each succeeding time interval this range becomes both narrower and lower in magnitude. By the 1942-1958 time interval this range of flows is between 0 and 5,000 cfs, and the range is between 0 and 6,000 cfs for the 1959-1974 and 1975-1998 time intervals. For Percentage of Days, there is no flow range for which the frequency equals or exceeds 20 percent for the 1895-1909 time interval. After this time interval, the 201-500-cfs flow range has the greatest frequency for the 1910-1927 and 1928-1941 time intervals. For all subsequent time intervals, the 0-200-cfs flow range has the greatest frequency, always being near or greater than 40 percent.

A.2.4.2 Maximum Mean Flow Exceedance.

Table A.2-5 through **Table A.2-9** show the flow exceedance values and probabilities for, annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13) for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.2-5 shows the exceedance probabilities and values for annual maximum flow data. **Table A.2-5** shows that the characterizations discussed in **Sections A.2.2** and **A.2.4.2** can also be applied to all exceedance probabilities for annual maximum flows. For the multi-day averaging periods, changes in the flow values by time interval similar to those for the Annual Maximum mean daily flow were noted, along with a similar decrease in the difference between exceedance values with increasing averaging time for the more recent time intervals.

Table A.2-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.2-6** shows dramatic decreases in flow values from the 1895-1909 through 1975-1998 time intervals for all averaging times and for all exceedance probabilities except the 10-percent and maximum exceedance probabilities, for which the changes are mixed. Between the 1942-1958 and 1959-1974 time intervals, flow decreases do not occur for the maximum flow and the 10-, 20-, and 30-percent exceedance probabilities (higher flows), but do occur for the higher exceedance probabilities (lower flows).

Table A.2-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.2-7** shows a characterization quite similar to that for annual data (**Table A.2-5**). There are significant decreases in flow values by time interval from 1895-1909 through 1942-1958 for all averaging times and all exceedance

Table A.2-4 Flow Frequency Distributions.

North Platte River below Guernsey Reservoir, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	89	73	100	22	89	86	100	100	100
201 to 500	97	98	96	89	100	100	100	100	92
501 to 750	97	100	95	100	100	100	88	100	96
751 to 1,000	99	100	98	100	100	100	100	100	96
1,001 to 2,000	100	100	100	100	100	100	100	100	100
2,001 to 3,000	100	100	100	100	100	100	100	100	100
3,001 to 4,000	100	100	100	100	100	100	100	100	100
4,001 to 5,000	100	100	100	100	100	100	100	100	100
5,001 to 6,000	88	98	81	100	100	93	47	94	96
6,001 to 8,000	40	71	18	100	78	43	6	25	21
8,001 to 10,000	24	49	7	100	50	14	0	6	13
10,001 to 12,000	16	34	4	78	28	14	0	0	8
12,001 to 15,000	10	24	0	56	17	14	0	0	0
Greater than 15,000	5	12	0	33	11	0	0	0	0
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
North Platte River below Guernsey Reservoir, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	32.3	11.3	47.0	0.9	12.2	16.0	39.1	48.8	51.4
201 to 500	13.6	26.3	4.6	18.1	22.0	36.5	12.2	2.0	1.0
501 to 750	4.2	8.2	1.5	16.6	8.4	3.1	1.7	1.5	1.2
751 to 1,000	5.1	5.9	4.6	13.4	3.9	4.0	5.7	5.7	3.1
1,001 to 2,000	9.7	11.4	8.4	18.5	11.1	7.8	10.1	7.2	8.1
2,001 to 3,000	6.9	7.5	6.5	5.4	9.8	5.6	7.7	6.3	5.9
3,001 to 4,000	8.1	7.7	8.3	4.8	8.4	8.6	7.7	8.2	8.9
4,001 to 5,000	10.9	8.4	12.5	4.1	10.3	8.5	14.6	12.2	11.3
5,001 to 6,000	5.2	6.3	4.5	2.4	7.2	7.3	1.0	5.0	6.7
6,001 to 8,000	2.4	4.0	1.2	6.6	4.8	1.5	0.2	2.4	1.1
8,001 to 10,000	0.9	1.2	0.7	3.9	0.8	0.3	0.0	0.6	1.2
10,001 to 12,000	0.4	0.9	0.1	2.9	0.4	0.3	0.0	0.0	0.1
12,001 to 15,000	0.3	0.6	0.0	1.8	0.2	0.4	0.0	0.0	0.0
Greater than 15,000	0.1	0.3	0.0	0.5	0.4	0.0	0.0	0.0	0.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
North Platte River below Guernsey Reservoir, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	117	40	172	3	45	58	143	178	188
201 to 500	49	94	17	59	80	133	44	7	4
501 to 750	15	29	5	54	31	11	6	6	4
751 to 1,000	18	21	17	43	14	15	21	21	11
1,001 to 2,000	35	41	31	60	40	29	37	26	29
2,001 to 3,000	25	27	24	18	36	21	28	23	22
3,001 to 4,000	29	28	30	16	31	31	28	30	32
4,001 to 5,000	39	30	46	13	37	31	53	44	41
5,001 to 6,000	19	22	17	8	26	27	4	18	24
6,001 to 8,000	9	14	4	21	18	5	1	9	4
8,001 to 10,000	3	4	2	13	3	1	0	2	4
10,001 to 12,000	1	3	0	10	1	1	0	0	0
12,001 to 15,000	1	2	0	6	1	2	0	0	0
Greater than 15,000	0	1	0	2	2	0	0	0	0
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

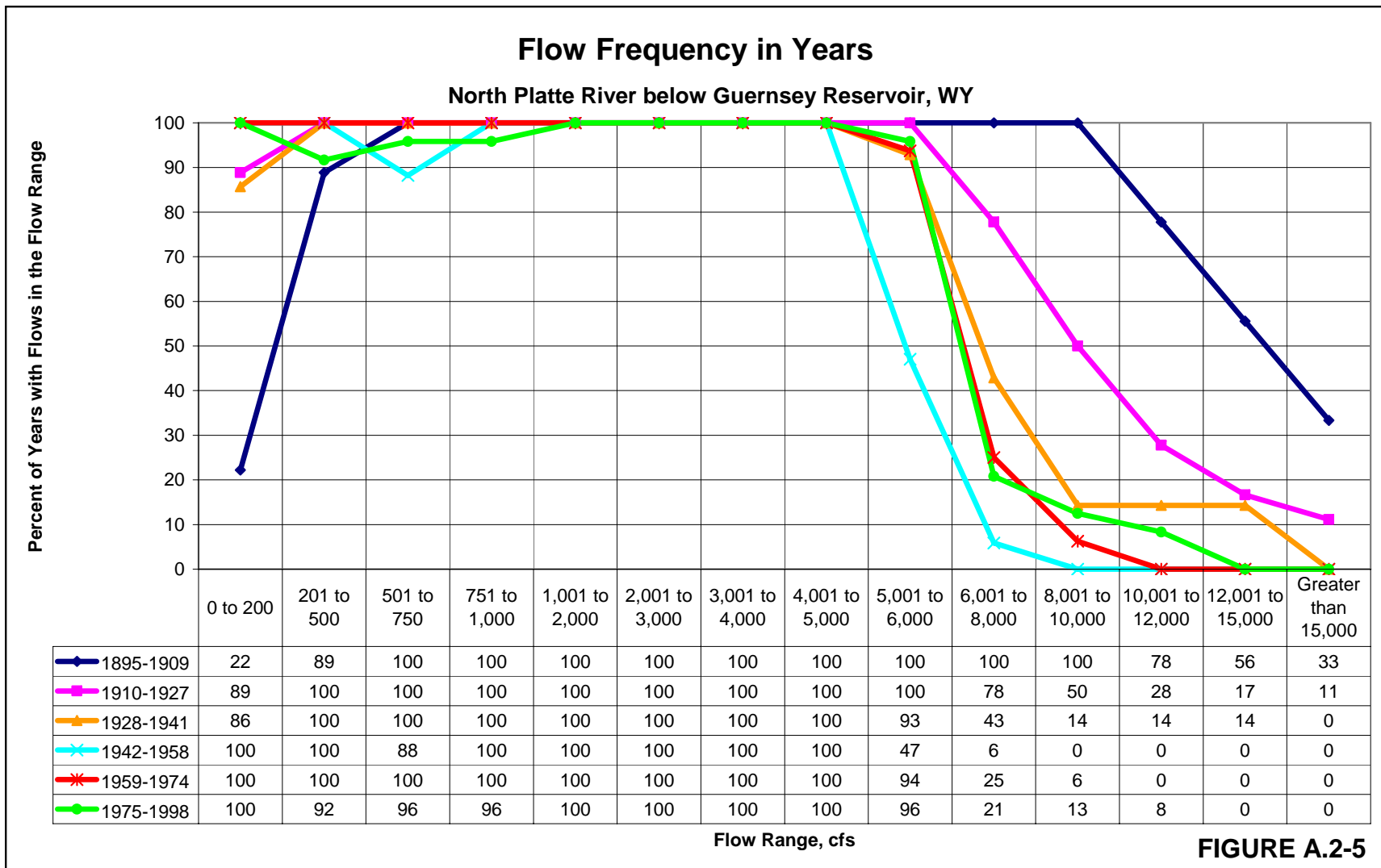


Figure A.2-5 Flow Frequency in Years.

Table A.2-5 Maximum Flow Exceedance Values, Annual Data.

North Platte River below Guernsey Reservoir, WY Mean Daily Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	4,100	4,100	4,280	8,160	5,280	4,100	4,280	4,980	4,980	
Maximum exceeded in 90% of the years	4,980	5,280	4,944	10,912	5,574	5,146	4,808	5,235	5,329	
Maximum exceeded in 80% of the years	5,224	5,580	5,024	11,600	6,194	5,208	4,860	5,250	5,384	
Maximum exceeded in 70% of the years	5,323	6,620	5,228	11,640	6,730	5,276	4,916	5,275	5,429	
Maximum exceeded in 60% of the years	5,438	7,230	5,308	12,140	7,666	5,588	4,960	5,300	5,464	
Maximum exceeded in 50% of the years	5,570	8,000	5,400	13,900	8,190	5,940	5,000	5,395	5,545	
Maximum exceeded in 40% of the years	6,002	8,650	5,446	13,900	8,602	6,484	5,032	5,500	5,612	
Maximum exceeded in 30% of the years	7,293	11,600	5,542	14,920	9,577	7,237	5,062	5,520	5,714	
Maximum exceeded in 20% of the years	8,626	13,900	5,742	17,440	11,560	7,380	5,150	6,380	6,034	
Maximum exceeded in 10% of the years	12,430	15,600	7,284	22,160	15,190	12,120	5,382	7,430	7,917	
Maximum	30,000	30,000	10,200	30,000	21,000	14,500	7,800	9,960	10,200	
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	4,050	4,050	4,227	7,900	5,097	4,050	4,227	4,973	4,933	
Maximum exceeded in 90% of the years	4,944	5,110	4,874	10,513	5,435	5,011	4,724	5,205	5,274	
Maximum exceeded in 80% of the years	5,114	5,470	4,976	11,167	5,751	5,090	4,805	5,237	5,347	
Maximum exceeded in 70% of the years	5,284	6,093	5,196	11,247	6,348	5,197	4,859	5,260	5,396	
Maximum exceeded in 60% of the years	5,394	6,600	5,275	11,633	7,133	5,347	4,901	5,287	5,427	
Maximum exceeded in 50% of the years	5,507	7,393	5,350	12,700	7,765	5,670	4,947	5,377	5,518	
Maximum exceeded in 40% of the years	5,915	8,493	5,409	13,393	8,293	6,110	4,977	5,437	5,587	
Maximum exceeded in 30% of the years	6,763	11,133	5,515	14,627	10,170	6,514	5,021	5,503	5,659	
Maximum exceeded in 20% of the years	8,523	12,700	5,673	16,027	10,872	6,743	5,117	6,177	5,980	
Maximum exceeded in 10% of the years	11,227	15,333	7,232	19,073	12,683	11,620	5,356	7,358	7,855	
Maximum	27,100	27,100	10,167	27,100	20,933	13,900	7,780	9,957	10,167	
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	3,944	3,944	4,127	7,826	4,719	3,944	4,127	4,926	4,884	
Maximum exceeded in 90% of the years	4,818	5,011	4,810	10,166	5,115	4,673	4,615	5,091	5,200	
Maximum exceeded in 80% of the years	5,005	5,283	4,910	10,901	5,373	5,016	4,764	5,223	5,317	
Maximum exceeded in 70% of the years	5,228	5,651	5,014	11,074	5,662	5,094	4,802	5,233	5,360	
Maximum exceeded in 60% of the years	5,331	5,824	5,240	11,311	6,361	5,311	4,815	5,254	5,399	
Maximum exceeded in 50% of the years	5,454	6,914	5,320	11,814	6,921	5,597	4,884	5,347	5,482	
Maximum exceeded in 40% of the years	5,673	7,826	5,371	12,831	7,426	5,813	4,923	5,373	5,563	
Maximum exceeded in 30% of the years	6,369	10,397	5,481	14,003	7,875	5,870	4,974	5,474	5,597	
Maximum exceeded in 20% of the years	7,870	11,814	5,605	14,820	9,463	6,322	5,014	5,820	5,862	
Maximum exceeded in 10% of the years	11,056	14,614	7,152	16,689	12,069	11,134	5,270	7,252	7,803	
Maximum	22,929	22,929	10,057	22,929	20,629	13,486	7,757	9,954	10,057	
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	3,235	3,235	4,061	7,657	4,049	3,235	4,061	4,849	4,869	
Maximum exceeded in 90% of the years	4,721	4,563	4,743	9,454	4,806	4,338	4,462	4,932	5,129	
Maximum exceeded in 80% of the years	4,875	5,041	4,853	10,215	5,106	4,693	4,660	5,059	5,233	
Maximum exceeded in 70% of the years	5,085	5,332	4,968	10,436	5,413	4,925	4,725	5,154	5,259	
Maximum exceeded in 60% of the years	5,217	5,780	5,130	10,654	5,879	5,113	4,757	5,177	5,293	
Maximum exceeded in 50% of the years	5,319	6,273	5,221	11,456	6,502	5,277	4,787	5,210	5,382	
Maximum exceeded in 40% of the years	5,462	7,657	5,275	12,163	6,785	5,513	4,837	5,270	5,439	
Maximum exceeded in 30% of the years	6,185	9,848	5,378	12,840	7,722	5,823	4,889	5,334	5,475	
Maximum exceeded in 20% of the years	7,757	11,456	5,466	13,571	8,484	6,235	4,968	5,425	5,671	
Maximum exceeded in 10% of the years	10,433	13,173	6,783	14,657	11,268	10,398	5,100	6,899	7,590	
Maximum	19,420	19,420	9,955	16,619	19,420	12,265	7,272	9,840	9,955	
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	2,789	2,789	3,724	6,941	3,632	2,789	3,724	4,755	4,749	
Maximum exceeded in 90% of the years	4,574	4,263	4,608	8,358	4,505	3,612	4,247	4,782	4,881	
Maximum exceeded in 80% of the years	4,747	4,795	4,746	9,333	4,819	4,417	4,561	4,832	4,957	
Maximum exceeded in 70% of the years	4,817	5,112	4,807	9,873	5,180	4,600	4,595	5,024	5,097	
Maximum exceeded in 60% of the years	5,035	5,722	4,919	10,198	5,848	4,796	4,621	5,095	5,128	
Maximum exceeded in 50% of the years	5,139	6,076	5,073	10,738	6,069	4,956	4,685	5,126	5,151	
Maximum exceeded in 40% of the years	5,223	6,794	5,131	11,051	6,197	5,374	4,715	5,136	5,206	
Maximum exceeded in 30% of the years	5,977	8,712	5,174	11,229	6,783	5,749	4,753	5,184	5,242	
Maximum exceeded in 20% of the years	6,896	10,294	5,232	11,454	7,783	6,037	4,803	5,198	5,509	
Maximum exceeded in 10% of the years	9,842	11,435	6,109	12,031	9,560	9,037	4,871	6,404	7,087	
Maximum	16,903	16,903	9,545	13,380	16,903	11,435	6,304	9,243	9,545	

Table A.2-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

North Platte River below Guernsey Reservoir, WY		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years	2	150	2	800	238	150	13	3	2	
Maximum exceeded in 90% of the years	5	236	3	968	391	203	21	3	3	
Maximum exceeded in 80% of the years	11	298	6	1,102	416	224	80	7	3	
Maximum exceeded in 70% of the years	22	402	9	1,168	450	255	178	9	6	
Maximum exceeded in 60% of the years	195	426	12	1,214	548	286	198	19	8	
Maximum exceeded in 50% of the years	248	565	19	1,250	616	297	218	26	9	
Maximum exceeded in 40% of the years	404	648	128	1,304	644	375	246	172	11	
Maximum exceeded in 30% of the years	551	976	222	1,486	745	405	273	389	12	
Maximum exceeded in 20% of the years	970	1,444	405	1,924	1,288	423	405	841	15	
Maximum exceeded in 10% of the years	1,885	2,072	1,015	2,074	1,658	1,657	688	1,520	2,036	
Maximum	4,160	3,060	4,160	2,080	3,060	2,280	1,040	4,160	3,100	
3-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years	1	128	1	800	233	128	13	2	1	
Maximum exceeded in 90% of the years	4	231	3	968	370	196	20	3	2	
Maximum exceeded in 80% of the years	10	287	6	1,102	390	218	57	6	3	
Maximum exceeded in 70% of the years	21	364	8	1,168	414	250	176	9	5	
Maximum exceeded in 60% of the years	179	400	12	1,205	517	263	183	19	8	
Maximum exceeded in 50% of the years	233	535	19	1,227	607	284	205	23	8	
Maximum exceeded in 40% of the years	356	637	69	1,283	624	334	218	93	11	
Maximum exceeded in 30% of the years	497	968	191	1,369	712	358	253	226	12	
Maximum exceeded in 20% of the years	938	1,264	323	1,517	1,004	385	396	806	15	
Maximum exceeded in 10% of the years	1,560	1,610	1,012	1,653	1,453	1,422	674	1,501	2,007	
Maximum	4,153	2,340	4,153	1,783	2,340	2,027	1,037	4,153	3,037	
7-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years	1	117	1	800	214	117	13	2	1	
Maximum exceeded in 90% of the years	4	214	3	938	324	186	18	3	2	
Maximum exceeded in 80% of the years	10	276	5	1,040	333	205	47	4	3	
Maximum exceeded in 70% of the years	18	328	8	1,070	398	233	152	8	4	
Maximum exceeded in 60% of the years	141	342	11	1,124	495	242	163	19	7	
Maximum exceeded in 50% of the years	214	516	18	1,190	578	274	179	20	8	
Maximum exceeded in 40% of the years	327	610	40	1,265	598	289	207	51	10	
Maximum exceeded in 30% of the years	465	740	162	1,315	627	334	243	127	11	
Maximum exceeded in 20% of the years	744	1,106	302	1,319	728	344	387	719	14	
Maximum exceeded in 10% of the years	1,313	1,315	1,005	1,361	956	907	645	1,465	1,708	
Maximum	4,131	2,046	4,131	1,421	2,046	1,312	1,026	4,131	3,017	
15-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years	1	114	1	800	198	114	12	2	1	
Maximum exceeded in 90% of the years	3	198	2	892	257	178	16	3	2	
Maximum exceeded in 80% of the years	7	250	4	978	282	191	43	3	2	
Maximum exceeded in 70% of the years	13	274	7	1,055	370	223	138	8	4	
Maximum exceeded in 60% of the years	118	327	10	1,124	407	234	145	10	6	
Maximum exceeded in 50% of the years	195	411	13	1,190	452	259	160	17	7	
Maximum exceeded in 40% of the years	279	515	30	1,194	485	278	169	35	7	
Maximum exceeded in 30% of the years	392	628	145	1,206	554	316	214	86	11	
Maximum exceeded in 20% of the years	613	916	276	1,236	594	331	366	347	12	
Maximum exceeded in 10% of the years	1,135	1,191	956	1,246	767	592	616	1,265	1,048	
Maximum	3,767	1,893	3,767	1,246	1,893	892	966	3,767	2,687	
30-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years	1	114	1	707	172	114	12	2	1	
Maximum exceeded in 90% of the years	3	191	2	747	222	176	15	2	2	
Maximum exceeded in 80% of the years	7	217	3	782	246	187	34	3	2	
Maximum exceeded in 70% of the years	12	252	6	802	264	200	83	6	3	
Maximum exceeded in 60% of the years	83	302	9	838	352	216	111	9	5	
Maximum exceeded in 50% of the years	176	358	12	881	390	240	140	15	5	
Maximum exceeded in 40% of the years	248	420	26	942	413	267	156	28	7	
Maximum exceeded in 30% of the years	323	510	105	996	482	301	192	53	9	
Maximum exceeded in 20% of the years	501	756	179	1,038	503	311	273	180	11	
Maximum exceeded in 10% of the years	819	902	502	1,075	608	450	399	799	533	
Maximum	2,027	1,259	2,027	1,110	1,259	744	503	2,027	1,830	

Table A.2-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

North Platte River below Guernsey Reservoir, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	3,190	3,190	3,210	8,160	3,190	4,100	3,210	4,250	4,980
Maximum exceeded in 90% of the years	4,847	5,140	4,846	10,912	4,483	5,146	4,736	5,035	5,329
Maximum exceeded in 80% of the years	5,122	5,500	4,988	11,600	5,696	5,208	4,776	5,220	5,384
Maximum exceeded in 70% of the years	5,241	5,940	5,158	11,640	6,062	5,276	4,848	5,230	5,429
Maximum exceeded in 60% of the years	5,416	6,730	5,244	12,140	6,708	5,588	4,932	5,240	5,450
Maximum exceeded in 50% of the years	5,520	7,500	5,360	13,900	7,315	5,940	4,980	5,250	5,470
Maximum exceeded in 40% of the years	5,900	8,590	5,446	13,900	8,422	6,484	5,032	5,500	5,544
Maximum exceeded in 30% of the years	6,919	11,600	5,520	14,920	8,644	7,237	5,062	5,520	5,714
Maximum exceeded in 20% of the years	8,578	13,900	5,742	17,440	10,592	7,380	5,150	6,380	5,807
Maximum exceeded in 10% of the years	11,730	15,600	7,284	22,160	13,510	12,120	5,346	7,430	7,867
Maximum	30,000	30,000	10,200	30,000	21,000	14,500	7,800	9,960	10,200
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	2,873	2,873	2,973	7,900	2,873	4,050	2,973	4,177	4,880
Maximum exceeded in 90% of the years	4,783	4,990	4,769	10,513	4,419	5,003	4,527	4,988	5,274
Maximum exceeded in 80% of the years	5,007	5,317	4,918	11,167	5,390	5,079	4,669	5,120	5,341
Maximum exceeded in 70% of the years	5,204	5,870	5,117	11,247	5,979	5,197	4,781	5,187	5,362
Maximum exceeded in 60% of the years	5,342	6,170	5,206	11,633	6,197	5,347	4,801	5,203	5,407
Maximum exceeded in 50% of the years	5,460	6,727	5,337	12,700	6,857	5,670	4,910	5,223	5,430
Maximum exceeded in 40% of the years	5,761	8,137	5,404	13,393	7,947	5,883	4,939	5,437	5,501
Maximum exceeded in 30% of the years	6,313	11,133	5,494	14,627	8,233	6,202	5,010	5,503	5,659
Maximum exceeded in 20% of the years	8,201	12,700	5,673	16,027	9,817	6,585	5,117	6,177	5,786
Maximum exceeded in 10% of the years	11,227	15,333	7,232	19,073	12,683	11,608	5,313	7,358	7,855
Maximum	27,100	27,100	10,167	27,100	20,933	13,900	7,780	9,957	10,167
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	2,200	2,561	2,200	7,826	2,561	3,944	2,200	3,667	4,799
Maximum exceeded in 90% of the years	4,558	4,646	4,513	10,166	4,315	4,588	3,942	4,632	5,078
Maximum exceeded in 80% of the years	4,802	5,103	4,799	10,901	4,872	4,902	4,429	4,863	5,295
Maximum exceeded in 70% of the years	5,021	5,333	4,863	11,074	5,170	5,094	4,585	4,992	5,325
Maximum exceeded in 60% of the years	5,244	5,771	5,053	11,311	5,588	5,311	4,662	5,074	5,355
Maximum exceeded in 50% of the years	5,361	6,284	5,244	11,814	5,794	5,597	4,763	5,157	5,379
Maximum exceeded in 40% of the years	5,598	7,826	5,348	12,831	7,426	5,813	4,829	5,357	5,449
Maximum exceeded in 30% of the years	5,828	10,397	5,441	14,003	7,875	5,870	4,866	5,469	5,597
Maximum exceeded in 20% of the years	7,870	11,814	5,605	14,820	9,463	6,322	4,981	5,820	5,739
Maximum exceeded in 10% of the years	11,056	14,614	7,152	16,689	12,069	11,134	5,243	7,252	7,803
Maximum	22,929	22,929	10,014	22,929	20,629	13,486	7,757	9,954	10,014
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,403	2,345	1,403	7,657	2,345	3,209	1,403	2,621	4,139
Maximum exceeded in 90% of the years	3,579	4,049	3,552	9,454	3,885	3,870	3,180	3,269	4,596
Maximum exceeded in 80% of the years	4,378	4,529	4,225	10,215	4,416	4,465	3,576	4,264	4,922
Maximum exceeded in 70% of the years	4,647	5,021	4,562	10,436	4,663	4,869	3,756	4,586	5,178
Maximum exceeded in 60% of the years	4,930	5,384	4,796	10,654	5,080	5,061	4,200	4,936	5,228
Maximum exceeded in 50% of the years	5,203	6,210	4,955	11,456	5,390	5,275	4,448	4,999	5,261
Maximum exceeded in 40% of the years	5,352	7,657	5,159	12,163	6,668	5,513	4,563	5,009	5,335
Maximum exceeded in 30% of the years	5,767	9,848	5,265	12,840	7,722	5,823	4,638	5,207	5,447
Maximum exceeded in 20% of the years	7,733	11,456	5,432	13,571	8,484	6,235	4,766	5,363	5,637
Maximum exceeded in 10% of the years	10,433	13,173	6,783	14,657	11,268	10,398	4,846	6,899	7,237
Maximum	19,420	19,420	9,840	16,619	19,420	12,265	7,272	9,840	9,348
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,006	2,206	1,006	6,941	2,206	2,789	1,006	1,882	2,472
Maximum exceeded in 90% of the years	2,859	3,291	2,809	8,358	3,530	2,958	2,628	2,852	3,017
Maximum exceeded in 80% of the years	3,259	4,223	3,127	9,333	4,036	3,362	2,920	3,017	3,715
Maximum exceeded in 70% of the years	3,724	4,608	3,408	9,873	4,450	4,248	3,167	3,283	3,996
Maximum exceeded in 60% of the years	4,003	5,034	3,725	10,198	4,682	4,537	3,259	3,706	4,150
Maximum exceeded in 50% of the years	4,395	5,680	3,876	10,738	5,096	4,760	3,510	3,832	4,342
Maximum exceeded in 40% of the years	4,761	6,794	4,041	11,051	5,911	5,333	3,656	4,014	4,672
Maximum exceeded in 30% of the years	5,510	8,712	4,431	11,229	6,722	5,663	3,736	4,305	4,854
Maximum exceeded in 20% of the years	6,816	10,294	4,841	11,454	7,762	5,849	3,792	4,753	5,129
Maximum exceeded in 10% of the years	9,842	11,435	6,109	12,031	9,560	9,037	4,230	6,404	6,321
Maximum	16,903	16,903	9,243	13,380	16,903	11,435	6,304	9,243	8,722

Table A.2-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

North Platte River below Guernsey Reservoir, WY		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		2,610	2,610	4,160	7,900	2,610	4,100	4,160	4,980	4,980
Maximum exceeded in 90% of the years		4,948	5,160	4,944	10,860	4,812	4,985	4,808	5,135	5,250
Maximum exceeded in 80% of the years		5,118	5,290	5,024	11,600	5,696	5,160	4,860	5,250	5,356
Maximum exceeded in 70% of the years		5,271	5,940	5,154	11,640	6,658	5,169	4,916	5,275	5,418
Maximum exceeded in 60% of the years		5,400	6,730	5,274	12,140	6,730	5,420	4,960	5,300	5,464
Maximum exceeded in 50% of the years		5,545	7,230	5,360	13,900	7,030	5,940	5,000	5,395	5,545
Maximum exceeded in 40% of the years		5,940	8,090	5,446	13,900	8,018	6,484	5,032	5,500	5,612
Maximum exceeded in 30% of the years		6,856	11,600	5,542	14,920	8,090	6,735	5,062	5,520	5,714
Maximum exceeded in 20% of the years		8,090	13,900	5,742	17,440	10,072	7,338	5,150	6,380	6,034
Maximum exceeded in 10% of the years		11,730	15,600	7,284	22,160	13,510	12,120	5,310	7,430	7,917
Maximum		30,000	30,000	10,200	30,000	21,000	14,500	7,800	9,960	10,200
3-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		2,580	2,580	4,153	7,900	2,580	4,050	4,153	4,973	4,933
Maximum exceeded in 90% of the years		4,853	4,730	4,874	10,513	4,578	4,616	4,724	5,102	5,225
Maximum exceeded in 80% of the years		4,987	5,290	4,965	11,167	5,390	4,928	4,805	5,237	5,347
Maximum exceeded in 70% of the years		5,251	5,870	5,117	11,247	5,904	5,144	4,859	5,260	5,396
Maximum exceeded in 60% of the years		5,350	6,170	5,259	11,633	6,275	5,295	4,901	5,287	5,427
Maximum exceeded in 50% of the years		5,495	6,650	5,350	12,700	6,848	5,593	4,947	5,377	5,518
Maximum exceeded in 40% of the years		5,862	7,860	5,409	13,393	7,281	5,883	4,977	5,437	5,587
Maximum exceeded in 30% of the years		6,473	11,133	5,515	14,627	7,808	6,202	5,021	5,503	5,659
Maximum exceeded in 20% of the years		7,884	12,700	5,673	16,027	9,675	6,507	5,117	6,177	5,980
Maximum exceeded in 10% of the years		11,227	15,333	7,232	19,073	12,683	11,550	5,298	7,358	7,855
Maximum		27,100	27,100	10,167	27,100	20,933	13,900	7,780	9,957	10,167
7-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		2,536	2,536	4,127	7,826	2,536	3,944	4,127	4,791	4,780
Maximum exceeded in 90% of the years		4,746	4,187	4,787	9,926	4,366	4,064	4,615	5,052	5,200
Maximum exceeded in 80% of the years		4,895	5,011	4,892	10,631	4,919	4,367	4,761	5,223	5,317
Maximum exceeded in 70% of the years		5,172	5,333	5,014	10,851	5,365	4,959	4,801	5,233	5,360
Maximum exceeded in 60% of the years		5,313	5,823	5,232	11,117	5,737	5,161	4,815	5,254	5,399
Maximum exceeded in 50% of the years		5,414	6,379	5,320	11,586	6,241	5,527	4,884	5,347	5,482
Maximum exceeded in 40% of the years		5,616	7,351	5,371	12,786	6,917	5,813	4,923	5,373	5,563
Maximum exceeded in 30% of the years		6,169	10,397	5,481	14,003	7,309	5,870	4,974	5,474	5,597
Maximum exceeded in 20% of the years		7,745	11,586	5,605	14,820	9,280	6,322	5,014	5,820	5,862
Maximum exceeded in 10% of the years		10,826	14,614	7,142	16,666	12,069	11,134	5,253	7,239	7,803
Maximum		22,814	22,814	10,057	22,814	20,629	13,486	7,757	9,954	10,057
15-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		2,345	2,345	4,061	7,657	2,345	3,001	4,061	4,371	4,656
Maximum exceeded in 90% of the years		4,407	4,049	4,663	9,306	3,885	3,505	4,462	4,922	5,129
Maximum exceeded in 80% of the years		4,775	4,619	4,823	10,066	4,501	4,248	4,655	5,059	5,233
Maximum exceeded in 70% of the years		5,000	5,085	4,959	10,336	5,076	4,730	4,721	5,154	5,259
Maximum exceeded in 60% of the years		5,176	5,501	5,130	10,406	5,404	4,935	4,757	5,177	5,293
Maximum exceeded in 50% of the years		5,292	6,272	5,221	10,453	5,975	5,209	4,775	5,210	5,382
Maximum exceeded in 40% of the years		5,429	6,777	5,275	11,963	6,666	5,467	4,824	5,270	5,439
Maximum exceeded in 30% of the years		5,944	9,719	5,378	12,840	6,773	5,823	4,889	5,334	5,475
Maximum exceeded in 20% of the years		7,153	10,453	5,466	13,571	8,049	6,235	4,959	5,425	5,671
Maximum exceeded in 10% of the years		10,327	13,173	6,664	14,281	11,268	10,234	5,100	6,716	7,590
Maximum		19,420	19,420	9,955	14,736	19,420	12,167	7,272	9,833	9,955
30-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		2,206	2,206	3,695	6,130	2,206	2,276	3,695	4,297	4,606
Maximum exceeded in 90% of the years		4,266	3,632	4,546	8,196	3,530	3,133	4,247	4,779	4,881
Maximum exceeded in 80% of the years		4,614	4,462	4,645	8,878	4,326	3,960	4,530	4,832	4,957
Maximum exceeded in 70% of the years		4,784	4,816	4,753	9,057	4,850	4,414	4,551	4,966	5,097
Maximum exceeded in 60% of the years		4,959	5,384	4,854	9,191	5,169	4,668	4,587	5,095	5,128
Maximum exceeded in 50% of the years		5,135	5,993	5,073	9,317	5,674	4,956	4,630	5,126	5,151
Maximum exceeded in 40% of the years		5,201	6,130	5,131	10,266	6,065	5,374	4,715	5,136	5,206
Maximum exceeded in 30% of the years		5,716	8,712	5,174	10,555	6,569	5,749	4,729	5,184	5,242
Maximum exceeded in 20% of the years		6,638	9,317	5,232	10,714	7,225	6,037	4,743	5,198	5,509
Maximum exceeded in 10% of the years		9,206	10,902	5,890	11,384	9,560	8,409	4,800	6,313	7,087
Maximum		16,903	16,903	9,545	13,313	16,903	11,068	5,832	9,118	9,545

Table A.2-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

North Platte River below Guernsey Reservoir, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,330	1,330	4,280	1,330	2,590	3,140	4,280	4,760	4,760
Maximum exceeded in 90% of the years	3,713	2,460	4,874	1,402	3,571	3,896	4,448	5,010	4,955
Maximum exceeded in 80% of the years	4,802	3,550	4,944	1,768	5,084	4,214	4,858	5,050	5,032
Maximum exceeded in 70% of the years	4,960	4,230	4,990	2,060	5,332	4,698	4,898	5,095	5,118
Maximum exceeded in 60% of the years	5,058	5,040	5,064	2,212	5,904	4,948	4,916	5,210	5,126
Maximum exceeded in 50% of the years	5,120	5,160	5,110	2,460	6,050	5,110	4,960	5,250	5,165
Maximum exceeded in 40% of the years	5,214	5,800	5,166	2,524	6,458	5,152	4,960	5,280	5,180
Maximum exceeded in 30% of the years	5,457	5,990	5,272	3,878	6,668	5,610	5,000	5,330	5,495
Maximum exceeded in 20% of the years	5,896	6,670	5,424	5,830	6,814	5,764	5,056	5,430	5,596
Maximum exceeded in 10% of the years	7,035	8,000	5,684	7,566	8,150	5,902	5,090	5,620	7,161
Maximum	14,200	14,200	10,200	8,150	14,200	8,300	5,400	7,470	10,200
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,330	1,330	4,227	1,330	2,337	3,060	4,227	4,720	4,750
Maximum exceeded in 90% of the years	3,580	2,243	4,799	1,370	3,524	3,733	4,385	4,973	4,917
Maximum exceeded in 80% of the years	4,721	3,393	4,902	1,636	4,762	4,162	4,795	5,003	5,005
Maximum exceeded in 70% of the years	4,897	4,210	4,966	1,883	5,100	4,660	4,811	5,085	5,089
Maximum exceeded in 60% of the years	4,981	4,723	5,014	2,046	5,301	4,743	4,840	5,207	5,101
Maximum exceeded in 50% of the years	5,090	5,070	5,090	2,243	5,798	4,952	4,900	5,243	5,120
Maximum exceeded in 40% of the years	5,167	5,480	5,121	2,273	5,903	5,064	4,939	5,263	5,169
Maximum exceeded in 30% of the years	5,349	5,840	5,258	3,536	6,472	5,501	4,964	5,318	5,485
Maximum exceeded in 20% of the years	5,776	6,527	5,393	5,453	6,619	5,750	5,001	5,403	5,575
Maximum exceeded in 10% of the years	6,710	7,073	5,668	7,218	7,619	5,882	5,054	5,617	7,000
Maximum	10,357	10,357	10,100	7,797	10,357	6,850	5,340	7,443	10,100
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,120	1,120	4,127	1,120	2,119	3,043	4,127	4,651	4,711
Maximum exceeded in 90% of the years	3,469	1,964	4,714	1,199	3,416	3,559	4,314	4,898	4,886
Maximum exceeded in 80% of the years	4,481	3,200	4,876	1,442	4,141	4,107	4,718	4,914	4,907
Maximum exceeded in 70% of the years	4,776	3,987	4,891	1,721	4,528	4,457	4,765	5,042	4,999
Maximum exceeded in 60% of the years	4,907	4,477	4,938	1,924	4,986	4,609	4,791	5,176	5,059
Maximum exceeded in 50% of the years	4,991	4,981	4,996	1,964	5,588	4,871	4,876	5,210	5,085
Maximum exceeded in 40% of the years	5,096	5,356	5,087	2,051	5,685	5,026	4,877	5,239	5,139
Maximum exceeded in 30% of the years	5,259	5,679	5,195	3,114	6,284	5,388	4,895	5,294	5,272
Maximum exceeded in 20% of the years	5,619	6,176	5,322	4,907	6,534	5,711	4,965	5,349	5,536
Maximum exceeded in 10% of the years	6,419	6,650	5,650	6,793	6,919	5,821	4,991	5,566	6,791
Maximum	10,057	8,256	10,057	7,741	8,256	6,176	4,996	7,420	10,057
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,043	1,043	3,779	1,043	1,991	2,652	3,779	4,513	4,531
Maximum exceeded in 90% of the years	3,092	1,617	4,600	1,132	3,184	3,290	4,232	4,811	4,688
Maximum exceeded in 80% of the years	4,333	3,020	4,704	1,316	4,037	3,981	4,602	4,868	4,779
Maximum exceeded in 70% of the years	4,696	3,771	4,781	1,492	4,343	4,304	4,695	4,915	4,866
Maximum exceeded in 60% of the years	4,802	4,292	4,842	1,599	4,888	4,555	4,700	5,077	4,988
Maximum exceeded in 50% of the years	4,881	4,804	4,893	1,617	5,414	4,778	4,734	5,094	5,027
Maximum exceeded in 40% of the years	5,015	5,275	5,006	1,834	5,536	4,950	4,750	5,139	5,052
Maximum exceeded in 30% of the years	5,174	5,532	5,084	2,567	6,068	5,324	4,793	5,172	5,179
Maximum exceeded in 20% of the years	5,493	5,708	5,178	3,922	6,219	5,641	4,840	5,239	5,400
Maximum exceeded in 10% of the years	6,129	6,273	5,522	5,737	6,660	5,699	4,894	5,406	6,254
Maximum	9,955	7,589	9,955	7,589	6,777	5,732	4,983	7,305	9,955
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	802	802	3,613	802	1,884	2,190	3,613	4,066	4,307
Maximum exceeded in 90% of the years	2,868	1,324	4,382	952	3,024	2,915	3,805	4,696	4,549
Maximum exceeded in 80% of the years	4,008	2,190	4,583	1,074	3,785	3,665	4,382	4,743	4,645
Maximum exceeded in 70% of the years	4,524	3,480	4,656	1,160	4,233	4,216	4,530	4,770	4,740
Maximum exceeded in 60% of the years	4,656	3,968	4,741	1,227	4,780	4,456	4,568	4,820	4,818
Maximum exceeded in 50% of the years	4,777	4,482	4,808	1,324	5,050	4,639	4,587	5,001	4,879
Maximum exceeded in 40% of the years	4,867	4,823	4,878	1,587	5,258	4,816	4,648	5,038	4,971
Maximum exceeded in 30% of the years	5,009	5,216	4,982	1,973	5,533	4,946	4,696	5,080	5,011
Maximum exceeded in 20% of the years	5,160	5,503	5,060	2,900	5,664	5,326	4,795	5,102	5,125
Maximum exceeded in 10% of the years	5,652	5,665	5,178	4,652	5,933	5,499	4,868	5,176	5,642
Maximum	9,465	7,386	9,465	7,386	6,683	5,648	4,898	7,284	9,465

probabilities. Beginning with the 1942-1958 time interval, the changes in flow values by time interval appear to generally coincide with known climatic conditions.

Table A.2-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.2-8** shows that the flow values are generally similar to those for the Apr 16-Jul 15 time interval (**Table A.2-7**). Thus, the characterizations for the two seasonal periods are essentially the same.

Table A.2-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. It shows that, during this late part of the growing season, climatological effects begin to influence the characterizations again. The sharp decrease in flow values from the 1910-1927 time interval to the 1928-1941 time interval are coincident with both climatic and human-caused conditions; there was the severe drought during the 1930's, and Guernsey Dam began operation in 1927. A different characterization than what has been noted for other seasonal periods can be seen between the 1895-1909 and 1910-1927 time intervals. The flow values increase from the 1895-1909 time interval to the 1910-1927 time interval for all averaging periods and for all exceedance probabilities except the 10 percent exceedance probability for the 30-day averaging period. This is the opposite of what was expected based on what has been noted for previous seasonal periods and because a major reservoir project (Pathfinder) began operation near the end of the 1895-1909 time interval. The likely explanation of this is the magnitude of the release of water for irrigation in eastern Wyoming and Western Nebraska during this seasonal period.

A.2.4.3 Mean Daily Flow Exceedance.

Table A.2-10 through **Table A.2-14** show probabilities and exceedance values considering all flows for, annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.2-10 shows the exceedance probabilities and values of flows for annual data. **Table A.2-10** shows that the large decreases in flow values that were noted for maximum flows (**Table A.2-5**) over the time intervals 1895-1909 through 1942-1958 are also seen for mean flows. For exceedance probabilities of 50 percent and lower (higher flows), a significant decrease occurs from the 1910-1927 time interval to the 1928-1941 time interval, coincident with the beginning of operation of Guernsey Dam. There is a smaller decrease in flow values from the 1928-1941 time interval to the 1942-1958 time interval, coincident with the beginning of operation of Alcova and Seminoe reservoirs. Beginning with the 1942-1958 time interval, the changes in the flow values by time interval are generally consistent with known climatological conditions for exceedance probabilities of 50 percent and lower (high flows). For exceedance probabilities of 60 percent and higher (low flows), there are significant reductions in flows between the 1942-1958 and 1959-1974 time intervals. As with **Table A.2-5**, the difference between exceedance values decreases with increasing averaging time for the more recent time intervals.

Table A.2-11 shows the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.2-11** shows that, as for the maximum flows (**Table A.2-6**) there is a substantial decrease in flow values for all averaging periods and all exceedance probabilities from the 1895-1909 time interval to the 1910-1927 time interval, coincident with the beginning of operation of Pathfinder Reservoir. There are also substantial decreases in flow values from the 1910-1927 time interval to the 1928-1941 time interval, coincident mainly with the severe drought conditions of the 1930's and with the beginning of operation of Guernsey Dam in 1928. There are also decreases in flow values from the 1928-1941 time interval through the 1975-1998 time interval, coincident with various combinations of climatic conditions and reservoir operations.

Table A.2-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.2-12** shows steady decreases in flow values for all time intervals from 1895-1909 through 1942-1958 for all averaging times, coincident with the beginning of operation of the major upstream reservoir projects (**Table 2** of the main report). For the 1942-1958 time interval and all time intervals thereafter, the flow values are generally consistent with known climatological conditions by time interval. For exceedance probability of 90 percent (low flows), there is a decrease in flows from the 1942-1958 time interval to the 1959-1974 time interval. This is coincident with the beginning of operation of Glendo Dam in 1958.

It can also be seen in **Table A.2-12** that the flow values increase with increasing averaging time for all time intervals and all exceedance probabilities. The explanation for this is given in **Section A.1.4.3**.

Table A.2-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 seasonal period. **Table A.2-13** shows similar characterizations to those for the Apr 16-Jul 15 seasonal period, but with some differences. The most noteworthy difference is that, for exceedance probabilities of 50 percent and greater (low flows), flow values increase from the 1895-1909 time interval to the 1910-1927 time interval. This is not consistent with characterizations for this seasonal period at other locations. It could be the result of the 1910-1927 time interval possibly being somewhat wetter than the 1895-1909 time interval during this seasonal period. However, the available climatic data for these two time intervals are insufficient to document whether the changes are due to climate. Another possible explanation is that water is being released for irrigation in eastern Wyoming and western Nebraska. Other differences are that the decrease in flow values from the 1910-1927 through the 1942-1958 time intervals are not as great for this seasonal period.

Table A.2-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.2-14** shows a general return to variations by time interval that are mainly due to climatic factors. Like the Jun 1-Aug 15 seasonal period, there is an increase in flows from the 1895-1909 time interval to the 1910-1927 time interval. This characterization occurs over a larger range of exceedance probabilities for this seasonal period than for the Jun 1-Jul 15 seasonal period. This is not consistent with

Table A.2-10 Exceedance Values Considering All Flows, Annual Data.

North Platte River below Guernsey Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	0	80	0	21	0	1	1
Flow exceeded for 90% of the days	5	195	2	420	190	170	13	2	2
Flow exceeded for 80% of the days	18	277	6	515	298	226	23	3	4
Flow exceeded for 70% of the days	170	387	12	691	425	269	130	10	6
Flow exceeded for 60% of the days	329	565	46	800	650	324	207	24	9
Flow exceeded for 50% of the days	744	931	305	1,010	1,330	437	400	315	65
Flow exceeded for 40% of the days	1,300	1,660	1,080	1,280	2,190	1,030	1,040	1,080	1,140
Flow exceeded for 30% of the days	2,790	2,940	2,658	2,560	3,300	2,456	2,170	2,840	2,910
Flow exceeded for 20% of the days	4,020	4,220	3,890	4,480	4,320	3,820	3,480	4,022	4,050
Flow exceeded for 10% of the days	4,960	5,520	4,790	7,740	5,621	4,990	4,520	4,900	4,960
Maximum	30,000	30,000	10,200	30,000	21,000	14,500	7,800	9,960	10,200
3-day Average Flows									
Flow exceeded for 100% of the days	0	25	0	80	25	66	0	1	1
Flow exceeded for 90% of the days	5	200	2	420	190	177	14	2	2
Flow exceeded for 80% of the days	19	278	6	525	300	230	25	3	4
Flow exceeded for 70% of the days	175	387	13	691	427	269	135	10	6
Flow exceeded for 60% of the days	331	569	54	800	656	323	208	28	9
Flow exceeded for 50% of the days	750	940	309	1,023	1,343	437	397	315	77
Flow exceeded for 40% of the days	1,317	1,666	1,083	1,289	2,218	1,050	1,039	1,080	1,150
Flow exceeded for 30% of the days	2,790	2,940	2,650	2,580	3,303	2,475	2,213	2,847	2,917
Flow exceeded for 20% of the days	4,013	4,211	3,880	4,531	4,333	3,817	3,473	4,010	4,047
Flow exceeded for 10% of the days	4,943	5,512	4,783	7,715	5,587	4,980	4,505	4,900	4,947
Maximum	27,100	27,100	10,167	27,100	20,933	13,900	7,780	9,957	10,167
7-day Average Flows									
Flow exceeded for 100% of the days	0	62	0	143	62	74	0	1	1
Flow exceeded for 90% of the days	5	202	2	429	197	177	15	2	2
Flow exceeded for 80% of the days	20	281	6	529	306	234	30	3	4
Flow exceeded for 70% of the days	186	395	14	688	434	271	140	12	6
Flow exceeded for 60% of the days	344	584	69	800	668	325	213	35	10
Flow exceeded for 50% of the days	751	958	351	1,029	1,377	456	422	397	157
Flow exceeded for 40% of the days	1,353	1,713	1,097	1,274	2,264	1,100	1,040	1,084	1,183
Flow exceeded for 30% of the days	2,779	2,955	2,619	2,599	3,326	2,496	2,200	2,794	2,912
Flow exceeded for 20% of the days	4,010	4,200	3,850	4,533	4,316	3,793	3,459	3,987	4,045
Flow exceeded for 10% of the days	4,926	5,496	4,763	7,706	5,557	4,947	4,478	4,889	4,940
Maximum	22,929	22,929	10,057	22,929	20,629	13,486	7,757	9,954	10,057
15-day Average Flows									
Flow exceeded for 100% of the days	0	73	0	187	73	77	0	1	1
Flow exceeded for 90% of the days	5	210	3	430	200	179	16	2	2
Flow exceeded for 80% of the days	29	285	7	542	315	240	58	3	4
Flow exceeded for 70% of the days	204	409	17	687	447	276	148	15	6
Flow exceeded for 60% of the days	371	600	122	827	675	332	221	43	11
Flow exceeded for 50% of the days	753	980	444	1,036	1,432	495	490	519	351
Flow exceeded for 40% of the days	1,479	1,775	1,189	1,281	2,283	1,143	1,060	1,224	1,354
Flow exceeded for 30% of the days	2,747	2,977	2,567	2,786	3,329	2,517	2,210	2,697	2,810
Flow exceeded for 20% of the days	3,969	4,172	3,804	4,740	4,296	3,749	3,402	3,926	4,011
Flow exceeded for 10% of the days	4,877	5,432	4,711	7,735	5,484	4,893	4,432	4,843	4,903
Maximum	19,420	19,420	9,955	16,619	19,420	12,265	7,272	9,840	9,955
30-day Average Flows									
Flow exceeded for 100% of the days	1	83	1	189	87	83	10	1	1
Flow exceeded for 90% of the days	6	216	3	453	213	187	20	2	2
Flow exceeded for 80% of the days	69	293	8	551	326	244	109	5	4
Flow exceeded for 70% of the days	232	433	28	682	478	283	171	17	7
Flow exceeded for 60% of the days	413	638	178	845	754	362	250	89	32
Flow exceeded for 50% of the days	804	1,029	555	1,034	1,471	573	581	620	475
Flow exceeded for 40% of the days	1,604	1,881	1,387	1,393	2,276	1,355	1,161	1,457	1,527
Flow exceeded for 30% of the days	2,703	2,988	2,513	2,890	3,342	2,537	2,185	2,571	2,720
Flow exceeded for 20% of the days	3,882	4,143	3,707	4,857	4,270	3,626	3,339	3,845	3,918
Flow exceeded for 10% of the days	4,795	5,429	4,628	7,871	5,468	4,799	4,373	4,746	4,790
Maximum	16,903	16,903	9,545	13,380	16,903	11,435	6,304	9,243	9,545

Table A.2-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

North Platte River below Guernsey Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	1	300	0	88	12	1	1
Flow exceeded for 90% of the days	3	165	2	500	157	150	13	2	2
Flow exceeded for 80% of the days	6	200	3	680	200	175	17	2	2
Flow exceeded for 70% of the days	12	232	5	783	231	190	23	3	3
Flow exceeded for 60% of the days	20	280	7	800	312	221	99	6	4
Flow exceeded for 50% of the days	142	326	12	900	387	241	130	8	6
Flow exceeded for 40% of the days	205	408	16	1,010	411	269	157	15	7
Flow exceeded for 30% of the days	292	500	23	1,080	482	290	179	19	9
Flow exceeded for 20% of the days	429	650	151	1,120	554	320	216	20	11
Flow exceeded for 10% of the days	848	1,010	374	1,195	650	364	376	807	30
Maximum	4,160	3,060	4,160	2,080	3,060	2,280	1,040	4,160	3,100
3-day Average Flows									
Flow exceeded for 100% of the days	1	25	1	300	25	106	12	2	1
Flow exceeded for 90% of the days	3	168	2	500	158	160	13	2	2
Flow exceeded for 80% of the days	6	200	3	700	200	176	20	2	2
Flow exceeded for 70% of the days	12	235	5	783	241	191	23	3	3
Flow exceeded for 60% of the days	21	279	7	800	315	220	96	6	4
Flow exceeded for 50% of the days	149	322	12	900	371	244	134	9	6
Flow exceeded for 40% of the days	205	405	17	1,010	411	266	157	17	7
Flow exceeded for 30% of the days	294	504	24	1,080	477	289	179	19	10
Flow exceeded for 20% of the days	416	650	151	1,120	558	314	215	21	11
Flow exceeded for 10% of the days	840	1,010	374	1,190	642	356	375	794	30
Maximum	4,153	2,340	4,153	1,783	2,340	2,027	1,037	4,153	3,037
7-day Average Flows									
Flow exceeded for 100% of the days	1	62	1	300	62	110	12	2	1
Flow exceeded for 90% of the days	3	169	2	538	158	165	13	2	2
Flow exceeded for 80% of the days	6	200	3	700	200	175	20	2	2
Flow exceeded for 70% of the days	12	236	5	783	244	189	24	3	3
Flow exceeded for 60% of the days	23	285	8	830	311	222	98	7	4
Flow exceeded for 50% of the days	153	318	12	914	380	245	137	9	6
Flow exceeded for 40% of the days	206	403	17	992	410	268	157	17	7
Flow exceeded for 30% of the days	300	502	40	1,062	464	292	174	19	10
Flow exceeded for 20% of the days	422	642	155	1,107	545	306	226	65	11
Flow exceeded for 10% of the days	833	976	386	1,190	611	344	379	675	31
Maximum	4,131	2,046	4,131	1,421	2,046	1,312	1,026	4,131	3,017
15-day Average Flows									
Flow exceeded for 100% of the days	1	73	1	359	73	112	12	2	1
Flow exceeded for 90% of the days	3	176	2	653	183	170	13	2	2
Flow exceeded for 80% of the days	6	200	3	732	206	177	22	3	2
Flow exceeded for 70% of the days	12	242	5	801	259	188	64	3	3
Flow exceeded for 60% of the days	58	283	8	890	308	214	115	7	4
Flow exceeded for 50% of the days	166	317	12	923	366	246	138	9	6
Flow exceeded for 40% of the days	221	411	19	961	412	271	156	18	7
Flow exceeded for 30% of the days	305	488	91	1,016	449	298	186	21	10
Flow exceeded for 20% of the days	448	702	166	1,068	492	308	270	97	11
Flow exceeded for 10% of the days	871	942	398	1,121	583	340	383	875	433
Maximum	3,767	1,893	3,767	1,246	1,893	892	966	3,767	2,687
30-day Average Flows									
Flow exceeded for 100% of the days	1	114	1	707	172	114	12	2	1
Flow exceeded for 90% of the days	3	191	2	747	222	176	15	2	2
Flow exceeded for 80% of the days	7	217	3	782	246	187	34	3	2
Flow exceeded for 70% of the days	12	252	6	802	264	200	83	6	3
Flow exceeded for 60% of the days	83	302	9	838	352	216	111	9	5
Flow exceeded for 50% of the days	176	358	12	881	390	240	140	15	5
Flow exceeded for 40% of the days	248	420	26	942	413	267	156	28	7
Flow exceeded for 30% of the days	323	510	105	996	482	301	192	53	9
Flow exceeded for 20% of the days	501	756	179	1,038	503	311	273	180	11
Flow exceeded for 10% of the days	819	902	502	1,075	608	450	399	799	533
Maximum	2,027	1,259	2,027	1,110	1,259	744	503	2,027	1,830

Table A.2-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

North Platte River below Guernsey Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	5	95	5	1,070	204	95	10	9	5
Flow exceeded for 90% of the days	696	1,070	210	2,540	1,410	718	492	141	146
Flow exceeded for 80% of the days	1,060	1,820	949	3,260	2,024	1,016	974	934	959
Flow exceeded for 70% of the days	1,630	2,510	1,110	4,060	2,601	1,459	1,100	1,080	1,200
Flow exceeded for 60% of the days	2,340	3,230	1,760	4,808	3,200	2,162	1,550	1,610	2,140
Flow exceeded for 50% of the days	3,000	4,000	2,410	6,060	3,960	3,000	1,970	2,490	2,740
Flow exceeded for 40% of the days	3,650	4,640	3,010	7,056	4,490	3,820	2,540	3,070	3,310
Flow exceeded for 30% of the days	4,440	5,390	3,630	8,166	5,119	4,571	3,050	3,910	3,940
Flow exceeded for 20% of the days	5,200	6,380	4,498	9,910	5,866	5,240	3,740	4,800	4,950
Flow exceeded for 10% of the days	6,600	8,540	5,281	11,600	7,680	5,914	4,594	5,520	5,387
Maximum	30,000	30,000	10,200	30,000	21,000	14,500	7,800	9,960	10,200
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	5	116	5	1,070	218	116	10	11	5
Flow exceeded for 90% of the days	739	1,124	252	2,593	1,494	773	503	153	228
Flow exceeded for 80% of the days	1,080	1,893	956	3,360	2,100	1,047	971	934	959
Flow exceeded for 70% of the days	1,683	2,548	1,133	4,170	2,611	1,552	1,115	1,083	1,227
Flow exceeded for 60% of the days	2,360	3,251	1,786	4,967	3,197	2,187	1,589	1,658	2,123
Flow exceeded for 50% of the days	2,993	4,030	2,410	6,263	3,993	3,032	2,017	2,453	2,740
Flow exceeded for 40% of the days	3,633	4,645	2,998	7,173	4,497	3,793	2,511	3,053	3,287
Flow exceeded for 30% of the days	4,427	5,423	3,603	8,260	5,120	4,553	3,023	3,814	3,870
Flow exceeded for 20% of the days	5,183	6,423	4,427	9,980	5,920	5,180	3,659	4,740	4,853
Flow exceeded for 10% of the days	6,586	8,572	5,266	11,500	7,535	5,897	4,536	5,527	5,363
Maximum	27,100	27,100	10,167	27,100	20,933	13,900	7,780	9,957	10,167
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	6	129	6	1,184	233	129	12	13	6
Flow exceeded for 90% of the days	782	1,239	345	2,810	1,583	823	596	177	351
Flow exceeded for 80% of the days	1,138	2,010	968	3,533	2,174	1,177	993	937	965
Flow exceeded for 70% of the days	1,798	2,636	1,212	4,383	2,689	1,729	1,207	1,098	1,338
Flow exceeded for 60% of the days	2,380	3,351	1,847	5,290	3,284	2,253	1,690	1,742	2,110
Flow exceeded for 50% of the days	3,001	4,046	2,380	6,384	3,996	3,036	2,073	2,416	2,699
Flow exceeded for 40% of the days	3,579	4,658	2,958	7,295	4,463	3,761	2,451	3,023	3,243
Flow exceeded for 30% of the days	4,350	5,419	3,480	8,653	5,109	4,509	2,939	3,656	3,730
Flow exceeded for 20% of the days	5,165	6,432	4,250	10,192	5,873	5,133	3,519	4,638	4,610
Flow exceeded for 10% of the days	6,595	8,853	5,222	11,418	7,576	5,839	4,350	5,705	5,337
Maximum	22,929	22,929	10,014	22,929	20,629	13,486	7,757	9,954	10,014
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	6	136	6	1,500	357	136	12	18	6
Flow exceeded for 90% of the days	843	1,561	464	3,256	1,816	965	654	233	458
Flow exceeded for 80% of the days	1,387	2,220	1,031	4,142	2,317	1,468	1,065	1,000	1,026
Flow exceeded for 70% of the days	1,961	2,823	1,472	4,960	2,895	1,991	1,436	1,340	1,584
Flow exceeded for 60% of the days	2,425	3,436	1,947	5,776	3,385	2,469	1,878	1,873	2,114
Flow exceeded for 50% of the days	2,951	4,101	2,359	6,643	4,031	2,960	2,138	2,392	2,600
Flow exceeded for 40% of the days	3,487	4,722	2,810	7,777	4,381	3,627	2,407	2,883	3,079
Flow exceeded for 30% of the days	4,190	5,466	3,292	9,157	5,144	4,310	2,807	3,439	3,549
Flow exceeded for 20% of the days	5,088	6,617	3,870	10,133	6,187	5,151	3,247	4,251	4,229
Flow exceeded for 10% of the days	6,686	9,261	4,934	11,608	7,452	6,022	4,017	5,705	5,207
Maximum	19,420	19,420	9,840	16,619	19,420	12,265	7,272	9,840	9,348
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	7	175	7	2,835	1,175	175	100	18	7
Flow exceeded for 90% of the days	1,125	1,981	662	4,280	2,127	1,412	962	515	557
Flow exceeded for 80% of the days	1,729	2,533	1,359	5,148	2,667	1,965	1,367	1,222	1,422
Flow exceeded for 70% of the days	2,125	3,113	1,760	5,976	3,194	2,335	1,674	1,755	1,849
Flow exceeded for 60% of the days	2,498	3,542	2,069	6,794	3,534	2,659	1,930	2,088	2,173
Flow exceeded for 50% of the days	2,865	4,168	2,351	7,618	3,987	3,112	2,164	2,352	2,504
Flow exceeded for 40% of the days	3,380	4,891	2,651	8,457	4,432	3,438	2,448	2,719	2,808
Flow exceeded for 30% of the days	4,000	5,821	2,982	9,303	5,129	4,109	2,670	3,153	3,243
Flow exceeded for 20% of the days	5,021	7,141	3,553	10,059	6,126	4,933	2,999	3,770	3,743
Flow exceeded for 10% of the days	6,929	9,434	4,415	11,039	7,498	6,095	3,531	5,656	4,482
Maximum	16,903	16,903	9,243	13,380	16,903	11,435	6,304	9,243	8,722

Table A.2-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

North Platte River below Guernsey Reservoir, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	5	301	5	430	892	301	25	9	5
Flow exceeded for 90% of the days	1,360	1,770	1,170	975	2,850	1,830	1,340	841	1,230
Flow exceeded for 80% of the days	2,600	2,910	2,330	1,300	3,554	2,990	1,990	2,300	2,740
Flow exceeded for 70% of the days	3,530	3,695	3,350	1,920	4,080	3,600	2,870	3,350	3,951
Flow exceeded for 60% of the days	4,210	4,270	4,170	3,152	4,418	4,114	3,590	4,410	4,500
Flow exceeded for 50% of the days	4,610	4,680	4,590	4,785	4,795	4,530	4,120	4,760	4,760
Flow exceeded for 40% of the days	4,860	5,120	4,790	6,990	5,192	4,890	4,390	4,920	4,980
Flow exceeded for 30% of the days	5,090	5,645	4,960	7,923	5,690	5,200	4,640	5,060	5,130
Flow exceeded for 20% of the days	5,460	6,340	5,140	9,648	6,100	5,544	4,788	5,230	5,330
Flow exceeded for 10% of the days	6,650	8,410	5,500	11,600	7,000	6,050	4,920	6,200	5,684
Maximum	30,000	30,000	10,200	30,000	21,000	14,500	7,800	9,960	10,200
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	5	349	5	430	1,033	349	25	11	5
Flow exceeded for 90% of the days	1,409	1,795	1,203	1,010	2,893	1,853	1,356	904	1,268
Flow exceeded for 80% of the days	2,617	2,934	2,321	1,330	3,587	2,950	2,028	2,282	2,753
Flow exceeded for 70% of the days	3,559	3,736	3,370	1,905	4,130	3,615	2,878	3,336	4,002
Flow exceeded for 60% of the days	4,220	4,281	4,193	3,233	4,461	4,120	3,620	4,396	4,507
Flow exceeded for 50% of the days	4,610	4,687	4,580	4,763	4,818	4,517	4,113	4,765	4,772
Flow exceeded for 40% of the days	4,867	5,130	4,790	7,057	5,234	4,880	4,404	4,925	4,983
Flow exceeded for 30% of the days	5,097	5,647	4,967	7,900	5,706	5,192	4,640	5,060	5,131
Flow exceeded for 20% of the days	5,477	6,323	5,143	9,643	6,117	5,560	4,773	5,223	5,330
Flow exceeded for 10% of the days	6,650	8,389	5,498	11,400	6,996	6,017	4,898	6,170	5,661
Maximum	27,100	27,100	10,167	27,100	20,933	13,900	7,780	9,957	10,167
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	6	362	6	466	1,421	362	67	13	6
Flow exceeded for 90% of the days	1,534	1,880	1,327	1,048	2,968	1,919	1,441	982	1,443
Flow exceeded for 80% of the days	2,660	2,982	2,401	1,349	3,717	2,925	2,101	2,291	2,797
Flow exceeded for 70% of the days	3,581	3,784	3,418	1,977	4,153	3,608	2,957	3,336	4,064
Flow exceeded for 60% of the days	4,245	4,279	4,220	3,243	4,477	4,144	3,651	4,387	4,528
Flow exceeded for 50% of the days	4,616	4,712	4,576	4,837	4,832	4,531	4,106	4,759	4,770
Flow exceeded for 40% of the days	4,869	5,170	4,775	6,989	5,265	4,894	4,379	4,938	4,992
Flow exceeded for 30% of the days	5,106	5,622	4,969	7,810	5,648	5,216	4,616	5,066	5,142
Flow exceeded for 20% of the days	5,472	6,309	5,149	9,499	6,133	5,549	4,739	5,217	5,333
Flow exceeded for 10% of the days	6,650	8,525	5,489	10,974	7,043	6,033	4,871	6,179	5,645
Maximum	22,814	22,814	10,057	22,814	20,629	13,486	7,757	9,954	10,057
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	12	431	12	532	1,787	431	247	83	12
Flow exceeded for 90% of the days	1,862	1,985	1,709	1,082	3,028	2,096	1,727	1,339	1,957
Flow exceeded for 80% of the days	2,807	3,025	2,565	1,517	3,882	2,860	2,318	2,421	3,087
Flow exceeded for 70% of the days	3,681	3,892	3,526	2,206	4,183	3,621	3,029	3,353	4,192
Flow exceeded for 60% of the days	4,284	4,305	4,263	3,431	4,487	4,183	3,687	4,368	4,576
Flow exceeded for 50% of the days	4,595	4,755	4,551	4,868	4,914	4,555	4,097	4,738	4,799
Flow exceeded for 40% of the days	4,863	5,255	4,749	6,896	5,339	4,889	4,385	4,952	5,004
Flow exceeded for 30% of the days	5,119	5,615	4,971	7,805	5,695	5,271	4,520	5,066	5,128
Flow exceeded for 20% of the days	5,449	6,267	5,126	9,307	6,242	5,530	4,664	5,193	5,315
Flow exceeded for 10% of the days	6,624	8,485	5,461	10,412	6,955	5,987	4,818	6,230	5,629
Maximum	19,420	19,420	9,955	14,736	19,420	12,167	7,272	9,833	9,955
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	413	780	413	780	1,881	841	427	459	413
Flow exceeded for 90% of the days	2,317	2,222	2,355	1,412	3,091	2,388	2,194	2,001	2,834
Flow exceeded for 80% of the days	3,133	3,197	3,089	2,061	3,903	3,137	2,838	2,884	3,614
Flow exceeded for 70% of the days	3,777	3,905	3,679	2,759	4,284	3,650	3,189	3,613	4,278
Flow exceeded for 60% of the days	4,275	4,397	4,161	3,799	4,607	4,200	3,609	4,098	4,603
Flow exceeded for 50% of the days	4,592	4,822	4,513	4,939	5,064	4,598	3,951	4,637	4,817
Flow exceeded for 40% of the days	4,825	5,294	4,701	6,237	5,437	5,033	4,323	4,817	4,963
Flow exceeded for 30% of the days	5,096	5,691	4,894	7,491	5,801	5,294	4,485	5,051	5,084
Flow exceeded for 20% of the days	5,541	6,162	5,091	8,212	6,198	5,614	4,600	5,130	5,211
Flow exceeded for 10% of the days	6,566	7,889	5,507	9,422	7,513	5,964	4,718	5,993	5,840
Maximum	16,903	16,903	9,545	13,313	16,903	11,068	5,832	9,118	9,545

Table A.2-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

North Platte River below Guernsey Reservoir, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	3	80	3	80	1,310	131	10	20	3
Flow exceeded for 90% of the days	1,080	540	1,948	320	2,070	453	1,888	2,421	1,790
Flow exceeded for 80% of the days	2,240	1,240	2,980	435	2,750	1,890	2,740	3,060	3,120
Flow exceeded for 70% of the days	3,050	2,090	3,490	555	3,175	2,912	3,300	3,473	3,680
Flow exceeded for 60% of the days	3,560	2,920	3,970	735	3,650	3,310	3,810	3,964	4,118
Flow exceeded for 50% of the days	4,040	3,460	4,340	900	4,050	3,710	4,140	4,420	4,470
Flow exceeded for 40% of the days	4,420	3,956	4,590	1,080	4,290	4,190	4,410	4,700	4,650
Flow exceeded for 30% of the days	4,680	4,410	4,750	1,300	4,695	4,560	4,600	4,860	4,840
Flow exceeded for 20% of the days	4,900	4,910	4,900	1,846	5,260	4,960	4,700	5,000	5,010
Flow exceeded for 10% of the days	5,250	5,640	5,110	3,508	5,920	5,400	4,840	5,200	5,284
Maximum	14,200	14,200	10,200	8,150	14,200	8,300	5,400	7,470	10,200
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	4	80	4	80	1,353	162	25	141	4
Flow exceeded for 90% of the days	1,156	555	2,137	330	2,106	503	2,036	2,619	1,963
Flow exceeded for 80% of the days	2,333	1,269	3,023	460	2,767	1,959	2,796	3,089	3,165
Flow exceeded for 70% of the days	3,080	2,113	3,533	562	3,210	2,952	3,341	3,536	3,705
Flow exceeded for 60% of the days	3,587	2,942	3,983	735	3,696	3,319	3,822	3,974	4,132
Flow exceeded for 50% of the days	4,057	3,463	4,350	903	4,065	3,727	4,140	4,420	4,482
Flow exceeded for 40% of the days	4,423	3,971	4,593	1,080	4,290	4,174	4,407	4,693	4,653
Flow exceeded for 30% of the days	4,674	4,409	4,743	1,317	4,670	4,562	4,593	4,847	4,833
Flow exceeded for 20% of the days	4,893	4,890	4,893	1,804	5,191	4,957	4,690	4,993	5,003
Flow exceeded for 10% of the days	5,217	5,587	5,100	3,372	5,920	5,339	4,830	5,187	5,268
Maximum	10,357	10,357	10,100	7,797	10,357	6,850	5,340	7,443	10,100
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	99	143	99	143	1,379	166	202	199	99
Flow exceeded for 90% of the days	1,257	613	2,415	349	2,159	741	2,258	2,731	2,328
Flow exceeded for 80% of the days	2,488	1,259	3,099	468	2,792	2,174	2,891	3,164	3,227
Flow exceeded for 70% of the days	3,146	2,181	3,615	590	3,230	3,013	3,404	3,594	3,759
Flow exceeded for 60% of the days	3,643	2,979	4,023	731	3,705	3,344	3,827	4,054	4,151
Flow exceeded for 50% of the days	4,076	3,483	4,349	897	4,052	3,749	4,160	4,413	4,469
Flow exceeded for 40% of the days	4,415	3,987	4,580	1,080	4,283	4,184	4,389	4,680	4,637
Flow exceeded for 30% of the days	4,664	4,397	4,723	1,268	4,644	4,542	4,575	4,834	4,816
Flow exceeded for 20% of the days	4,870	4,851	4,873	1,714	5,087	4,944	4,683	4,983	4,985
Flow exceeded for 10% of the days	5,176	5,524	5,084	3,215	5,920	5,273	4,810	5,168	5,222
Maximum	10,057	8,256	10,057	7,741	8,256	6,176	4,996	7,420	10,057
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	187	187	260	187	1,497	199	260	274	809
Flow exceeded for 90% of the days	1,432	659	2,685	380	2,255	993	2,509	2,909	2,718
Flow exceeded for 80% of the days	2,671	1,286	3,282	484	2,855	2,302	3,077	3,307	3,365
Flow exceeded for 70% of the days	3,257	2,269	3,697	608	3,289	3,082	3,541	3,666	3,867
Flow exceeded for 60% of the days	3,709	3,031	4,076	707	3,750	3,434	3,849	4,107	4,187
Flow exceeded for 50% of the days	4,110	3,548	4,357	887	4,076	3,829	4,202	4,421	4,454
Flow exceeded for 40% of the days	4,415	4,020	4,548	1,060	4,321	4,243	4,386	4,655	4,635
Flow exceeded for 30% of the days	4,641	4,405	4,694	1,229	4,608	4,570	4,517	4,797	4,766
Flow exceeded for 20% of the days	4,827	4,817	4,835	1,548	4,964	4,880	4,658	4,955	4,968
Flow exceeded for 10% of the days	5,125	5,423	5,040	3,136	5,920	5,254	4,768	5,123	5,154
Maximum	9,955	7,589	9,955	7,589	6,777	5,732	4,983	7,305	9,955
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	189	189	1,102	189	1,669	251	1,159	1,102	1,295
Flow exceeded for 90% of the days	1,694	700	3,108	420	2,401	1,630	2,955	3,228	3,132
Flow exceeded for 80% of the days	2,954	1,431	3,546	528	2,919	2,480	3,398	3,636	3,619
Flow exceeded for 70% of the days	3,472	2,407	3,839	630	3,409	3,217	3,633	3,902	3,966
Flow exceeded for 60% of the days	3,818	3,119	4,116	709	3,773	3,527	3,885	4,146	4,218
Flow exceeded for 50% of the days	4,141	3,618	4,342	849	4,064	3,897	4,204	4,421	4,421
Flow exceeded for 40% of the days	4,411	4,030	4,513	1,028	4,386	4,262	4,372	4,600	4,600
Flow exceeded for 30% of the days	4,593	4,445	4,632	1,155	4,611	4,576	4,489	4,716	4,714
Flow exceeded for 20% of the days	4,758	4,738	4,763	1,487	4,890	4,802	4,559	4,851	4,875
Flow exceeded for 10% of the days	5,051	5,243	4,986	3,297	5,487	5,168	4,709	5,066	5,131
Maximum	9,465	7,386	9,465	7,386	6,683	5,648	4,898	7,284	9,465

characterizations for this seasonal period at other locations. The likely explanations are the same as those for the Apr 16-Jul 15 seasonal period.

A.2.5 Median Mean Daily Flow.

The plot of the median mean daily flow by calendar day is shown on **Figure A.2-6**. **Figure A.2-6** shows the highest values clearly occurring in May and June for the 1895-1909 time interval; a broad spread of lower values from May through September with a peak in July for the 1910-1927 and 1928-1941 time intervals; and a distinct drop in values from late May through late June with a peak in July, followed by a gradual decrease through September, for all time intervals after 1928-1941. Also, the values for the non-irrigation season are noticeably lower than those for the 1895-1909 time interval for all subsequent time intervals until the 1959-1974 time interval. The non-irrigation season flows are essentially the same for the 1959-1974 and the 1975-1998 time intervals. These characterizations are generally coincident with the beginning of operation of the major upstream reservoir projects (**Table 2** of the main report).

A.2.6 USGS Annual Peak Flow.

The flow characterizations for the USGS Annual Peak flow are shown in **Figure A.2-7** and **Figure A.2-8** and in **Table A.2-15** and **Table A.2-16**. Because the continuous period of record for USGS Annual Peak flow begins in 1941, only incomplete characterizations are possible. However, because a few years of record also exist for the 1895-1909 time interval, some partial characterizations are possible.

Figure A.2-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak flow, and the 10-year running average of the USGS Annual Peak flow. **Figure A.2-7** shows that, except for 2 major flood events in the 1980's, the USGS Annual Peak flow and the Annual Maximum mean daily flow almost exactly coincide or show only small differences over the continuous period of record. This is most likely attributable to the extensive control of North Platte River flows at this location by upstream reservoirs. By contrast, the data that exist for the 1895-1909 time interval show an irregular pattern, with the two quantities sometimes being close in value and sometimes not. The year 1909 stands out as a year in which there was a large difference between the Annual Maximum mean daily flow and the USGS Annual Peak flow. Since the river was uncontrolled during this time interval, instantaneous peaks were not attenuated by reservoirs, and were often greater than the mean daily values.

Figure A.2-8 shows the date of occurrences of the USGS Annual Peak flow over the Period of Record. **Figure A.2-8** shows that, for the 1895-1909 time interval, the Peak flows were significantly higher than almost all of the Peak flows over the continuous period of record. Also, the limited number of Peak flows that were recorded during this time interval all occurred between mid May and late June, which is the time frame in which the greatest runoff from high country snowmelt occurs. By contrast, most of the Peak flows over the continuous period of record occurred in July or early August, which is the height of the downstream irrigation season. Only a small number of Peak flows

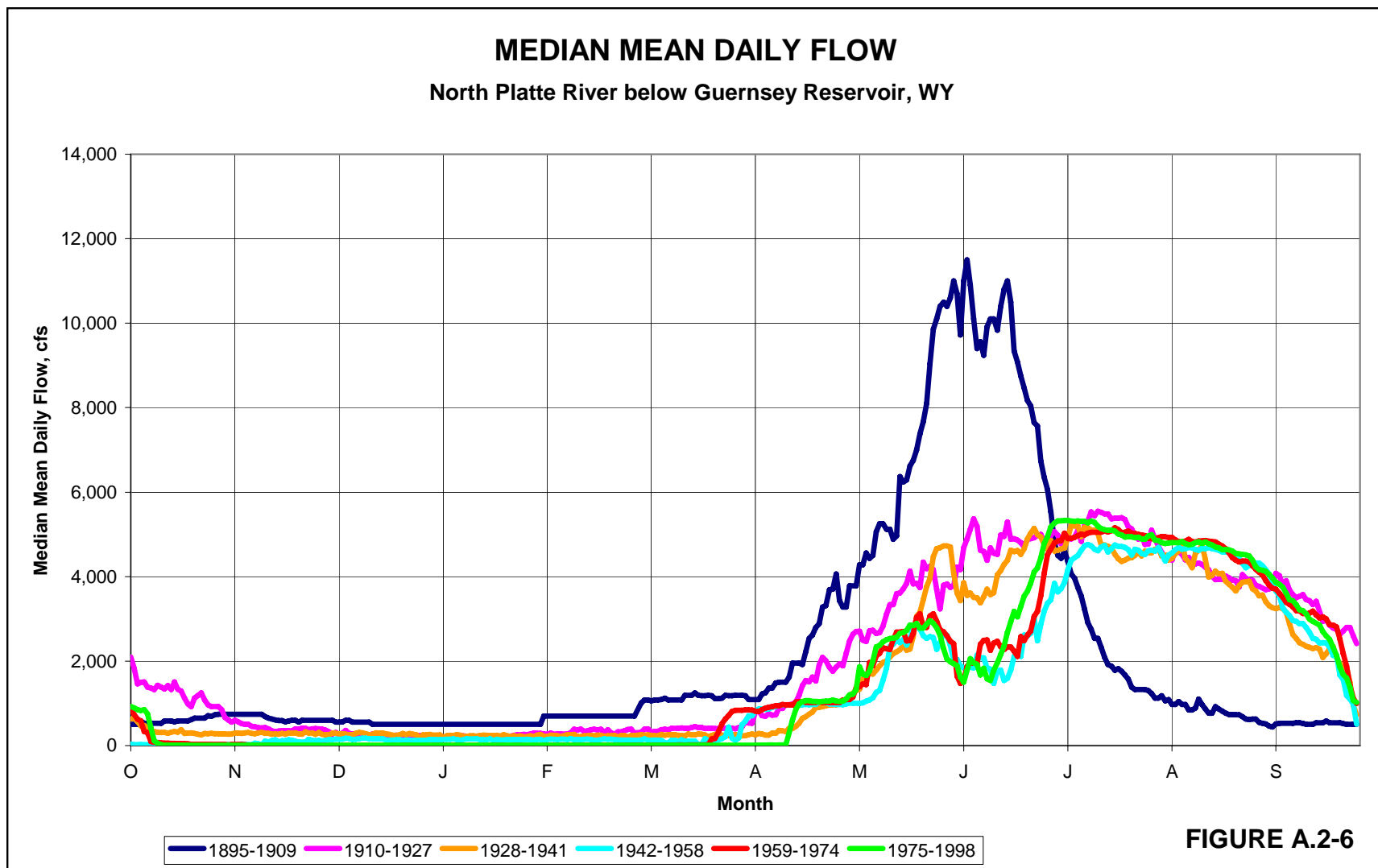
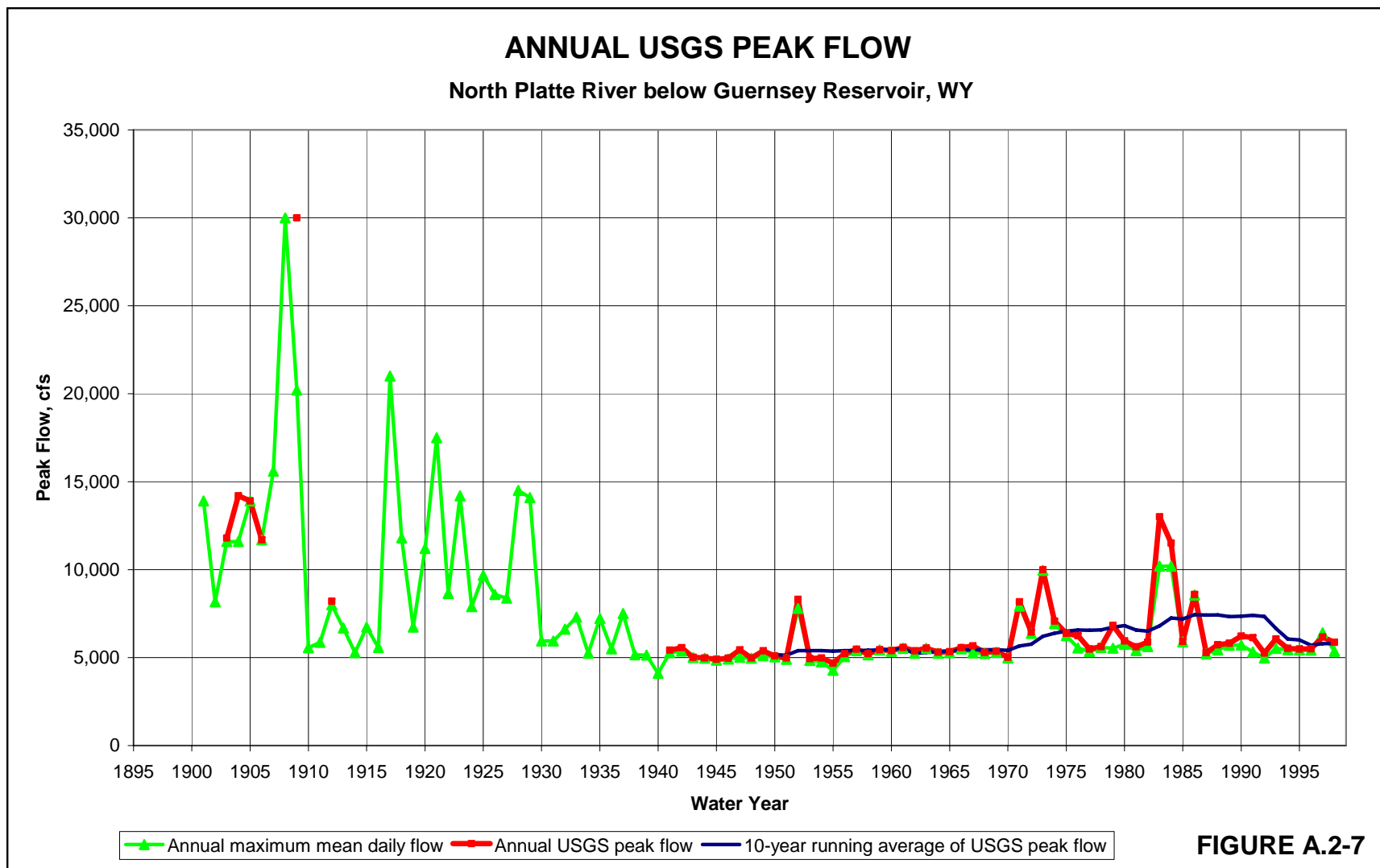


Figure A.2-6 Median Mean Daily Flow.

**FIGURE A.2-7****Figure A.2-7** Annual USGS Peak Flow.

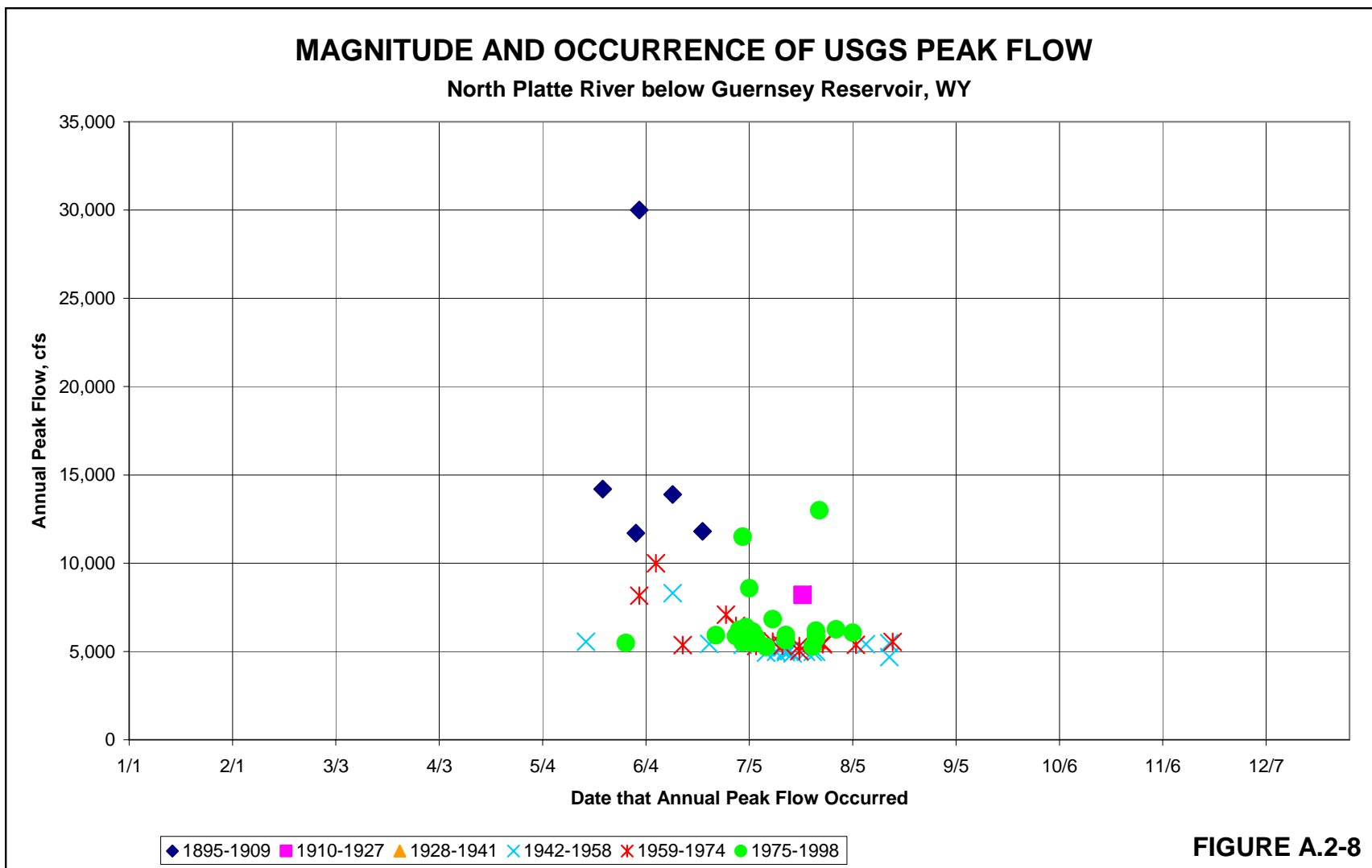


Figure A.2-8 Magnitude and Occurrence of Annual USGS Peak Flow

over the continuous period of record occurred during the period of greatest high country snowmelt runoff.

Table A.2-15 compares the average and median values of the USGS Annual Peak flow by time interval. **Table A.2-15** shows that, for the 1942-1958 through 1975-1998 time intervals, the average USGS Annual Peak flow is greater than the median, and that the difference increases by time interval. It is smallest for the 1942-1958 time interval, during which drought conditions with the resulting low flows occurred for much of the time; and greatest for the 1975-1998 time interval, during which there were several major high flow events. The time intervals prior to 1942 were not considered for this characterization due to insufficient data. It is worth mentioning, however, that, for the limited record available for the 1895-1909 time interval, both the average and median occurred in early June, whereas for the time intervals 1942-1958 through 1975-1998, both the average and median occurred in mid-July. This characterization was also identified in **Figure A.2-8**.

Table A.2-16 shows the exceedance probabilities and values for the USGS Annual Peak flow. It is analogous to **Table A.2-5** for Annual Maximum mean daily flows. **Table A.2-16** shows a very large increase in flow values with decreasing exceedance probability for the 1895-1909 time interval, and smaller decreases with increasing averaging time for the 1942-1958 through 1975-1998 time intervals. This characterization is consistent with river conditions during the respective time intervals, with the North Platte River being uncontrolled during the 1895-1909 time interval and extensively controlled during the 1942-1958 through 1975-1998 time intervals. The 1910-1927 and 1928-1942 time intervals were not considered for this characterization due to insufficient data.

Table A.2-15 Summary of USGS Peak Flows.

North Platte River below Guernsey Reservoir, WY	Time Period								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	6,843	13,603	6,013	16,320	8,200	5,420	5,299	6,036	6,502
Median Annual Peak Flow (cfs)	5,560	11,800	5,530	13,900	8,200	5,420	5,020	5,495	5,900
Average Occurrence of Peak Flow	7/9	6/21	7/11	6/5	7/21	8/9	7/12	7/11	7/10
Median Occurrence of Peak Flow	7/12	6/12	7/13	6/2	7/21	8/9	7/16	7/15	7/7

Table A.2-16 USGS Peak Flow Exceedance Values.

North Platte River below Guernsey Reservoir, WY Annual Peak Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Peak exceeded in 100% of the years	4,680	5,420	4,680	11,700	8,200	5,420	4,680	5,020	5,260
Peak exceeded in 90% of the years	4,980	7,088	4,980	11,740	8,200	5,420	4,924	5,305	5,480
Peak exceeded in 80% of the years	5,244	8,900	5,220	11,780	8,200	5,420	4,964	5,340	5,518
Peak exceeded in 70% of the years	5,378	11,000	5,334	12,220	8,200	5,420	4,980	5,370	5,628
Peak exceeded in 60% of the years	5,472	11,740	5,438	13,060	8,200	5,420	4,980	5,400	5,830
Peak exceeded in 50% of the years	5,560	11,800	5,530	13,900	8,200	5,420	5,020	5,495	5,900
Peak exceeded in 40% of the years	5,802	13,060	5,622	14,020	8,200	5,420	5,168	5,560	6,036
Peak exceeded in 30% of the years	6,134	13,960	5,888	14,140	8,200	5,420	5,252	5,615	6,175
Peak exceeded in 20% of the years	6,930	14,140	6,210	17,360	8,200	5,420	5,420	6,450	6,302
Peak exceeded in 10% of the years	11,050	20,520	7,512	23,680	8,200	5,420	5,506	7,620	8,055
Peak Flow	30,000	30,000	13,000	30,000	8,200	5,420	8,300	10,000	13,000

A.3 NORTH PLATTE RIVER BELOW WHALEN DIVERSION DAM, WYOMING

A.3.1 Methodology.

For this location, a single continuous streamflow record was constructed using records from gages located near the present site of the Whalen Diversion Dam, as follows:

Gage	Records Used	Data Source
North Platte River below Whalen, WY	5/1/1909-9/30/1914	Nebraska, 1914, Hydrographic Report
North Platte River passing Whalen, WY	10/1/1914-12/31/1914	Nebraska, 1929, Hydrographic Report
North Platte River below Whalen Diversion Dam, WY	1/1-11/30/1915 1/1/1916-9/30/1998	USGS website
Note: This record has been published in the USGS "Water Resources data for Wyoming" under the following titles for the following dates:		
North Platte River below Whalen, WY	1/1/1915-9/30/1974	
North Platte River below Whalen Diversion Dam, WY	10/1/1974-9/30/1998	

Data are not available from the USGS website prior to 1/1/1915 and data from Nebraska's 1914 and 1929 Hydrographic reports were used. The inclusion of data from the Nebraska Hydrographic reports does not significantly affect the flow characteristics for the reach of the river as the USGS considers all the locations listed to be the same gage.

Summary statistics characterizing this record are presented in **Table A.3-1** (mean daily values), **Table A.3-2** (annual 3-, 7-, 15- and 30-day running averages), **Table A.3-3** (seasonal 3-, 7-, 15- and 30-day running averages), and **Table A.3-4** (flow frequencies).

A.3.2 Maximum and Minimum Mean Daily Flows and Annual Flow Volume .

Table A.3-1 shows that there was a steady decrease in both average and median Annual Maximum mean daily flow and annual flow volume by time interval from the beginning of the period of record through 1942-1958. Since the 1942-1958 time interval, these quantities have remained generally constant, except for relatively small variations by time interval which correspond to climatic variations such as the 1950's drought period (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). The decreases are coincident with the times when the major North Platte reservoirs began operation (**Table 2** of the main report), except that there was no significant change coincident with the beginning of operation of Glendo Reservoir in 1958. The 1895-1909 time interval was not considered in any of the characterizations for this location due to insufficient data.

Table A.3-1 Summary of Mean Daily Flow Values.

North Platte River below Whalen Diversion Dam, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	4,517	7,532	2,772	19,886	9,076	4,664	2,404	2,831	2,995
Median Annual Maximum Mean Daily Flow (cfs)	2,910	6,100	2,050	19,886	7,175	3,055	1,580	2,075	2,150
Average Annual Flow Volume (kaf)	571	884	390	1,867	1,139	486	252	432	459
Median Annual Flow Volume (kaf)	335	832	284	1,867	961	353	235	303	300
Average Mean Daily Flow (cfs)	830	1,334	538	6,153	1,580	672	348	597	633
Median Mean Daily Flow (cfs)	98	525	46	6,299	838	116	27	73	43
Average Number of Mean Daily Flow Measurements	362	358	365	153	363	365	365	365	365
Number of Years of Data	90 of 104	33 of 47	57 of 57	1 of 15	18 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	429	668	295		836	452	60	418	379
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	4,298	7,027	2,719	19,886	8,240	4,549	2,404	2,799	2,889
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	3,922	6,202	2,602	19,886	6,976	4,229	2,117	2,781	2,825
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	2,527	3,738	1,825	7,812	4,720	2,185	1,413	1,835	2,111
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	35	403	15		583	154	20	21	9
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	2,685	5,620	2,030	19,886	6,255	2,675	1,580	2,075	2,105
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	2,315	4,610	1,930	19,886	5,400	2,355	1,580	2,015	2,015
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	1,705	3,540	1,620	7,812	4,035	1,880	1,370	1,680	1,645
Difference ("Apr-Jul Average" - "Jul-Sep Average")	1,772	3,288	894	12,074	3,520	2,364	991	964	778
Difference ("Apr-Jul Median" - "Jul-Sep Median")	980	2,080	410	12,074	2,220	795	210	395	460
Average Occurrence of Maximum Mean Daily Flow	6/15	6/11	6/17	6/3	6/18	6/2	6/19	6/21	6/13
Median Occurrence of Maximum Mean Daily Flow	6/17	6/5	6/27	6/3	6/17	6/4	6/26	7/1	6/27
Average Annual Minimum Mean Daily Flow (cfs)	17	47	2		75	14	5	1	2
Median Annual Minimum Mean Daily Flow (cfs)	3	24	2		50	10	5	0	1
Average occurrences per year of the Minimum	10	14	9		4	22	9	9	9
Occurring between	11/18	11/6	11/24		11/26	10/20	12/23	1/17	9/25
and	1/9	12/28	1/14		2/11	11/20	2/2	2/7	12/15
Median occurrences per year of the Minimum	2	3	2		3	4	2	3	2
Occurring between	1/4	12/13	1/8		1/31	11/19	1/13	1/15	12/22
and	2/10	2/21	2/10		2/26	1/29	3/4	2/10	2/4

Figure A.3-1 (maximum flows) and **Figure A.3-2** (annual flow volume) show changes in mean daily and annual flow characteristics that are coincident with the beginning of operation of the upstream reservoirs. **Figure A.3-1** shows that, between 1910 and 1941, there is a steady decrease in the difference between the Annual Maximum mean daily flow and the annual maximum 30-day average flow. After 1941, the difference is relatively small in most years. It is particularly noteworthy that for several significant individual high water events in the 1970's and 1980's there is almost no difference between the Annual Maximum mean daily flow and the annual maximum 30-day average flow.

Figure A.3-1 also shows a steadily decreasing 10-Year running average maximum mean daily flow until about 1942, after which time it remains relatively steady until the 1970's when it increases somewhat, most likely due to wetter climate conditions. **Figure A.3-2** shows a large decline between annual flow volume and the 10-year running average of annual volume from 1910 through 1941, relatively little difference from 1941 to 1971, and increased variability after 1971 due to some individual high water events in the 1970's, 1980's, and 1990's.

Figure A.3-3 shows considerable scatter in the timing of Annual Maximum mean daily flows at this location for all time intervals. The majority of the Annual Maximum mean daily flows greater than 5,000 cfs occur in May and June, whereas annual maximums less than 5,000 cfs are scattered between March and August. Very few flow events greater than 5,000 cfs occur after the 1928-1941 time interval. Maximum mean daily flow values are noticeably lower for all time intervals after the 1928-1941 time interval, coincident with the beginning of operation of Alcova and Seminoe Reservoirs in 1938 and 1939, respectively.

The average maximum mean daily flows are highest in the Apr 16-Jul 15 seasonal period for all time intervals (**Table A.3-1**). The median maximum mean daily flows are highest in the Apr 16-Jul 15 seasonal period for the 1910-1927 and 1928-1941 time intervals; the values for the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods are nearly equal for all time intervals thereafter. Differences between the average maximum mean daily flows from the Apr 16-Jul 15 seasonal period to the Jul 16-Sep 30 seasonal period are over 3,500 cfs for the 1910-1927 time interval and decrease to less than 1,000 cfs for the 1942-1958 time interval and all subsequent time intervals. Both the average and median Dates of Maximum Flow occur in June for all time intervals except 1959-1974, when the median date occurs in July.

In **Table A.3-1**, the average and median Annual Minimum mean daily flow decreases from 70 cfs in the 1910-1927 time interval to less than 10 cfs in the 1942-1958 time interval and all subsequent time intervals. The average and median Annual Minimum mean daily flows are essentially zero for the 1959-1974 and 1975-1998 time intervals. **Figure A.3-4** shows a pattern of high variability from one year to the next through 1939, and very little variability thereafter. **Table A.3-1** also shows significant variability in the Dates of Minimum Flow from the end of September to the beginning of February.

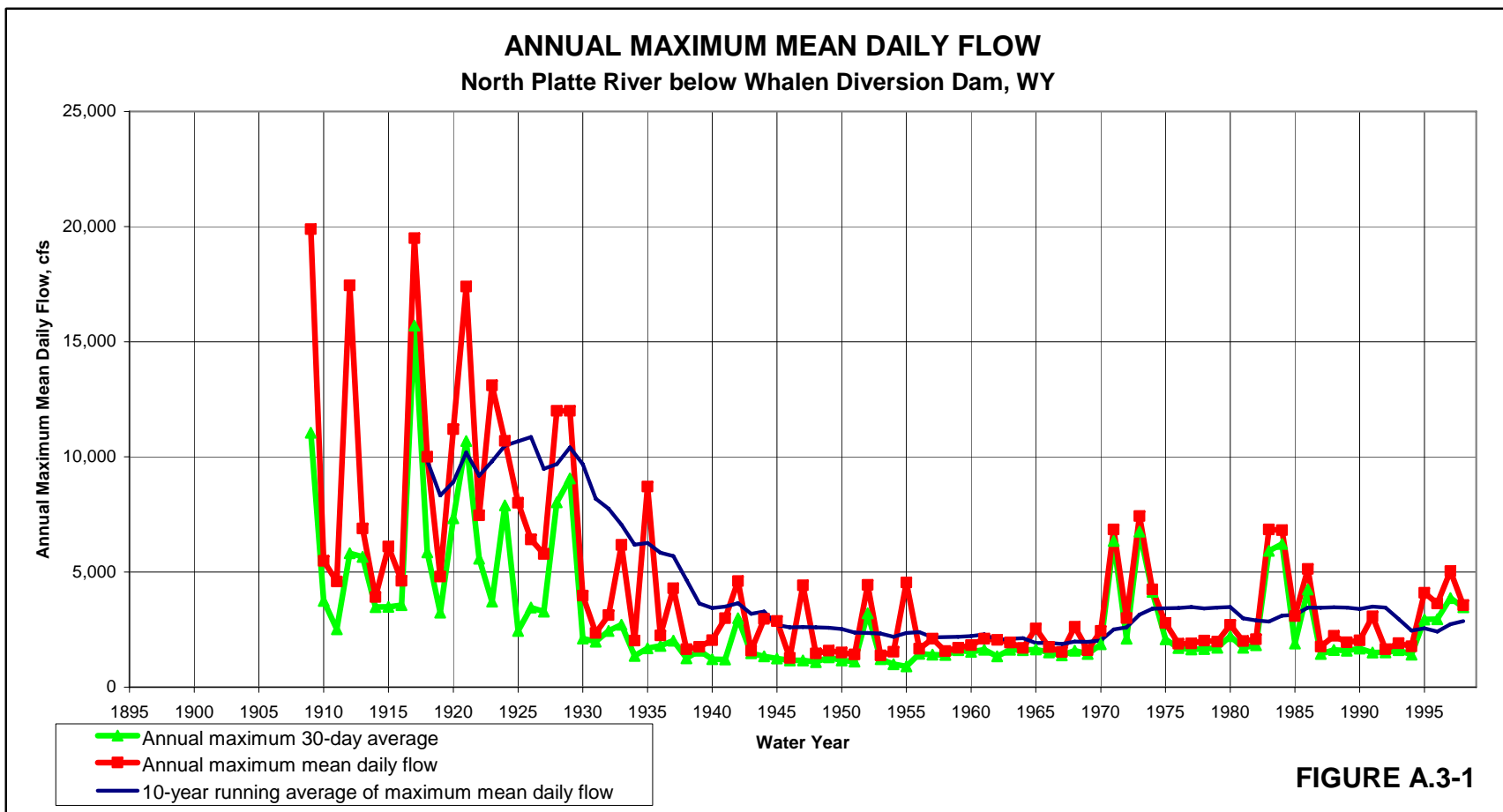


Figure A.3-1 Annual Maximum Mean Daily Flow.

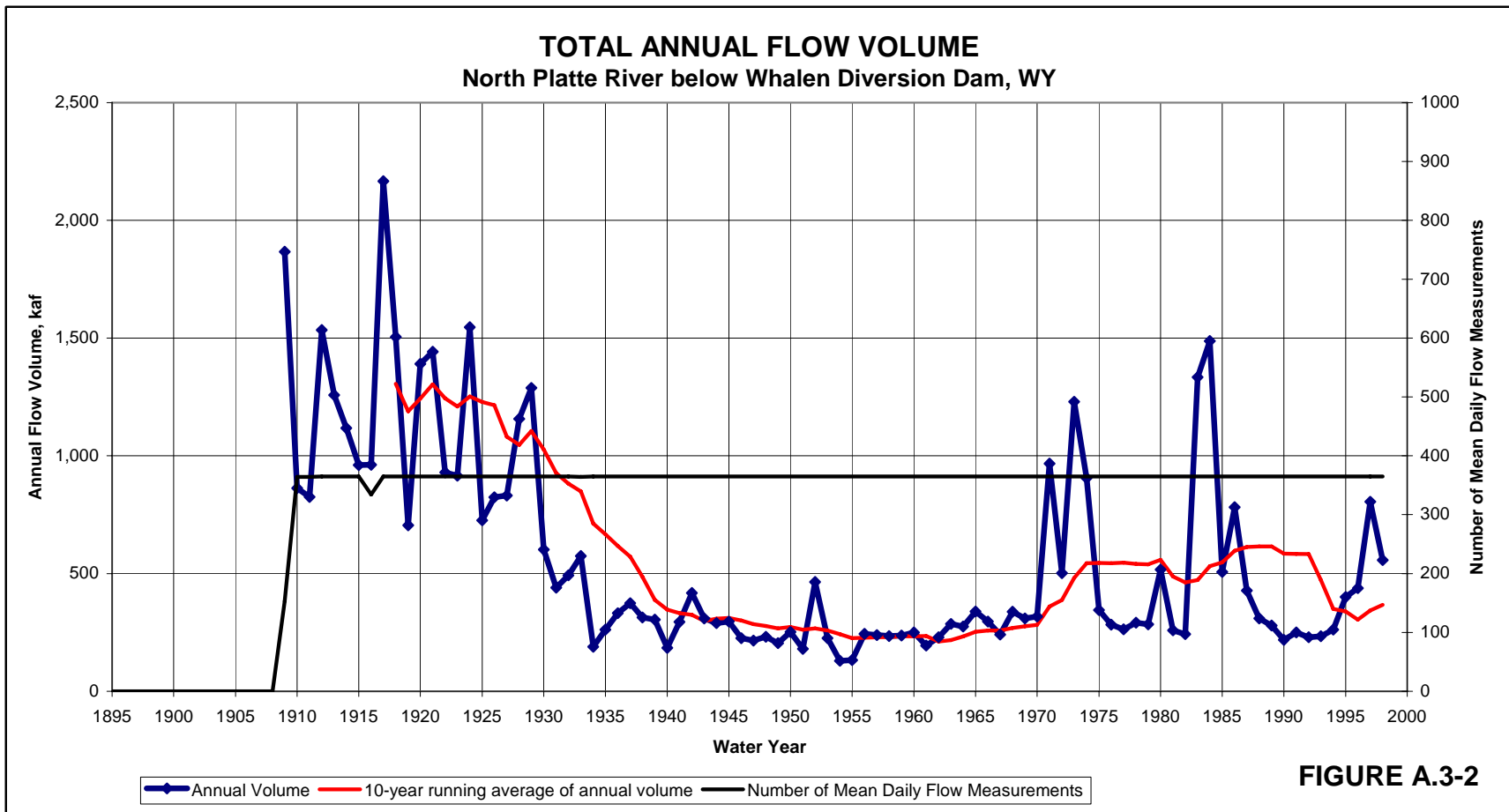


Figure A.3-2 Total Annual Flow Volume.

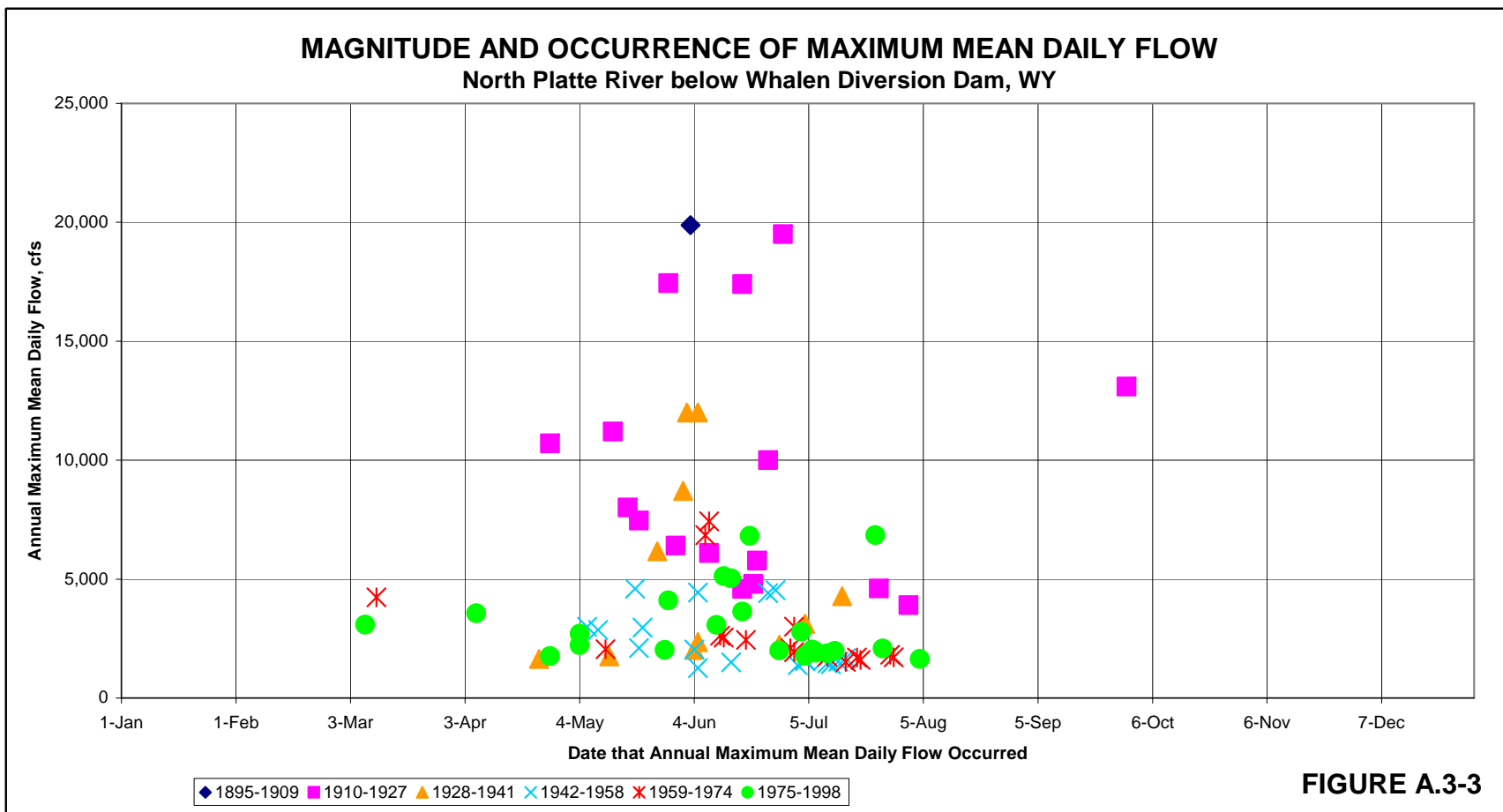


FIGURE A.3-3

Figure A.3-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

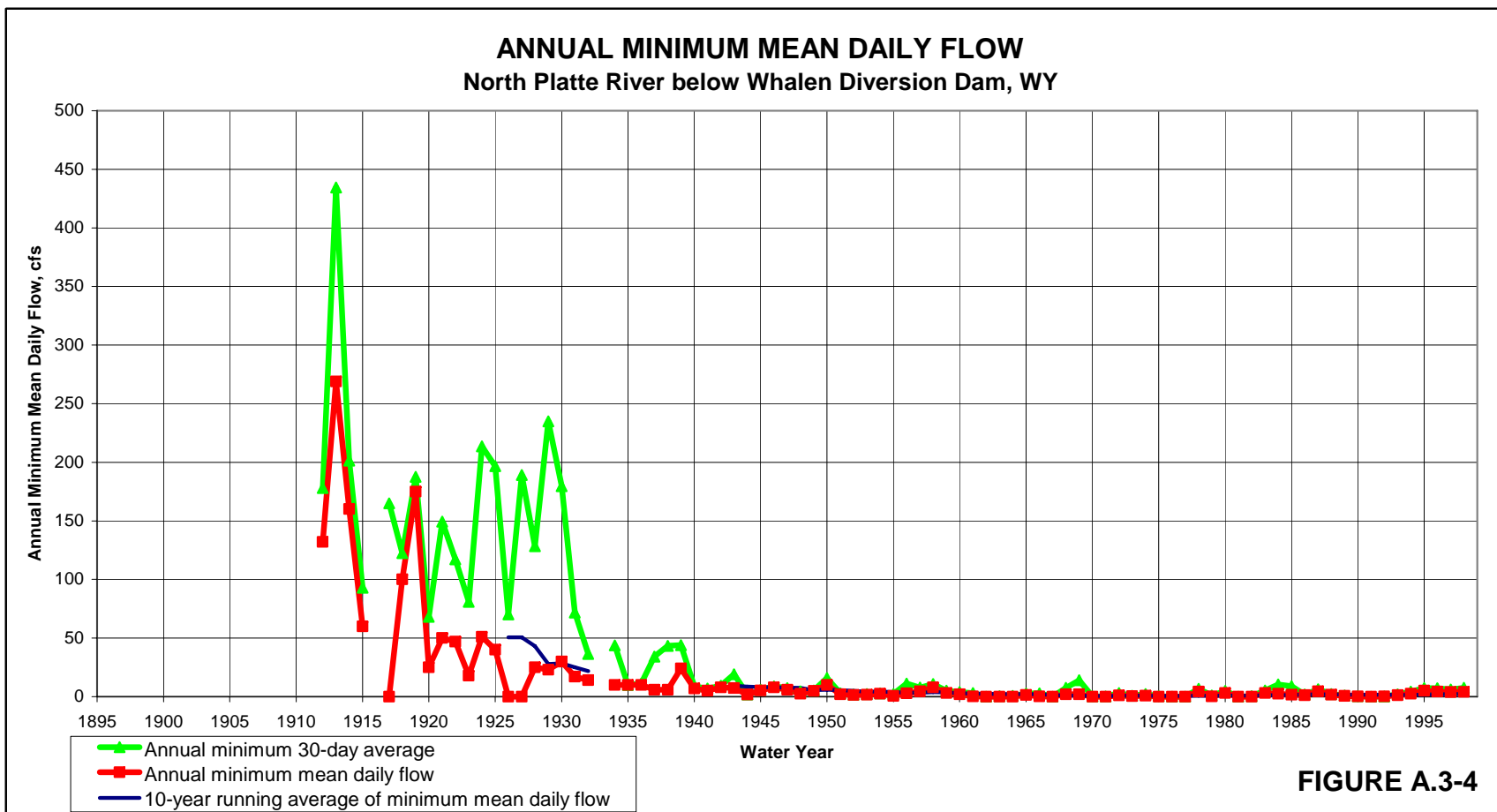


FIGURE A.3-4

Figure A.3-4 Annual Minimum Mean Daily Flow.

A.3.3 3-, 7-, 15-, and 30-day Averages of Mean Daily Flows.

Table A.3-2 shows that there was some attenuation of all flow values due to the 3-, 7-, 15-, and 30-day flow averaging, but not a large attenuation. For maximum flows, the attenuation due to averaging grows smaller by time interval through the 1942-1958 time interval, and is very small for all subsequent time intervals. The 1942-1958 time interval is coincident with the beginning of operation of the Glendo Reservoir in 1958. For minimum flows, the values generally increased with increasing averaging time but decreased by time interval from the 1910-1927 through the 1942-1958 time intervals. For all subsequent time intervals, the values were too small to detect any patterns. All other flow characterizations are essentially the same as those for the Annual Maximum and Minimum mean daily flows.

Table A.3-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.3-3** shows that there is a significant decrease in all values with increasing averaging time for the 1910-1927 time interval. Also, the highest average and median flows occur in the Apr 16-Jun 15 and the Jun 1–Aug 15 seasonal periods. The lowest values are those for the Feb 15-Mar 16 seasonal period, which is the time of the year when both natural flows and reservoir releases are lowest.

For the 1928-1941 time interval, the same characterizations as those for the 1910-1927 time interval can be seen, but the actual flow values are lower for all seasonal periods. Also, there is noticeably less decrease in all values with increasing averaging time.

For the 1942-1958 time interval and all time intervals thereafter, the most noteworthy characterization is that the flow values are less than those for the 1910-1927 time interval by 50 percent or more. Also, beginning with the 1942-1958 time interval, the flow values by time interval do not show much change from one time interval to the next, except that the values for the 1942-1958 time interval are somewhat lower, possibly due to the 1950's drought period. Decreasing values with increasing averaging time still exist, but these differences are quite small when compared with those for 1910-1928 time interval. For all time intervals, the average values are greater than the median values for both the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods. This suggests that lower flows were the rule during these seasonal periods for all time intervals, with the average values being skewed higher by the occurrence of a small number of very high flow events during which it is possible that the upstream reservoirs spilled.

Table A.3-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

North Platte River below Whalen Diversion Dam, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	4,517	7,532	2,772	19,886	9,076	4,664	2,404	2,831	2,995
Median Annual Maximum Mean Daily Flow (cfs)	2,910	6,100	2,050	19,886	7,175	3,055	1,580	2,075	2,150
Avg. Ann. Max. 3-day Avg. Flow (cfs)	4,074	6,564	2,632	16,780	7,825	4,213	2,086	2,771	2,926
Median Ann. Max. 3-day Avg. Flow (cfs)	2,673	5,473	1,987	16,780	6,444	2,862	1,577	2,027	2,080
Avg. Ann. Max. 7-day Avg. Flow (cfs)	3,701	5,770	2,503	14,941	6,945	3,604	1,871	2,700	2,819
Median Ann. Max. 7-day Avg. Flow (cfs)	2,357	4,186	1,906	14,941	5,149	2,554	1,466	1,954	1,976
Avg. Ann. Max. 15-day Avg. Flow (cfs)	3,349	5,091	2,341	12,999	6,206	3,092	1,678	2,558	2,665
Median Ann. Max. 15-day Avg. Flow (cfs)	1,945	3,604	1,759	12,999	4,560	2,082	1,447	1,786	1,897
Avg. Ann. Max. 30-day Avg. Flow (cfs)	2,975	4,450	2,122	11,043	5,411	2,743	1,445	2,379	2,430
Median Ann. Max. 30-day Avg. Flow (cfs)	1,748	3,454	1,606	11,043	3,727	1,880	1,242	1,615	1,707
Average Annual Minimum Mean Daily Flow (cfs)	17	47	2		75	14	5	1	2
Median Annual Minimum Mean Daily Flow (cfs)	3	24	2		50	10	5	0	1
Avg. Ann. Min. 3-day Avg. Flow (cfs)	22	60	3		89	27	5	1	2
Median Ann. Min. 3-day Avg. Flow (cfs)	4	35	2		63	24	5	1	2
Avg. Ann. Min. 7-day Avg. Flow (cfs)	28	79	3		111	43	5	2	2
Median Ann. Min. 7-day Avg. Flow (cfs)	5	45	2		106	29	5	1	2
Avg. Ann. Min. 15-day Avg. Flow (cfs)	35	100	4		137	58	6	2	3
Median Ann. Min. 15-day Avg. Flow (cfs)	5	73	2		117	30	6	2	2
Avg. Ann. Min. 30-day Avg. Flow (cfs)	42	119	4		164	66	7	3	4
Median Ann. Min. 30-day Avg. Flow (cfs)	7	105	3		165	43	6	2	2

Table A.3-3 Multiple Day Averages of Mean Daily Flows.

North Platte River below Whalen Diversion Dam, WY									
3-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 3-day Avg. Flow (cfs)	4,074	6,564	2,632	16,780	7,825	4,213	2,086	2,771	2,926
Median Ann. Max. 3-day Avg. Flow (cfs)	2,673	5,473	1,987	16,780	6,444	2,862	1,577	2,027	2,080
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	392	583	285		731	392	52	415	364
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	3,873	6,115	2,575	16,780	7,164	4,004	2,077	2,735	2,822
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	3,633	5,638	2,473	16,780	6,519	3,709	1,845	2,718	2,754
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,364	3,354	1,791	7,127	4,178	2,025	1,376	1,811	2,071
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	27	352	14		568	114	19	19	9
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	2,410	4,621	1,983	16,780	5,568	2,555	1,560	2,027	2,070
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	2,172	4,193	1,870	16,780	5,093	2,307	1,560	1,975	1,985
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	1,665	3,107	1,587	7,127	3,692	1,813	1,297	1,647	1,635

North Platte River below Whalen Diversion Dam, WY									
7-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 7-day Avg. Flow (cfs)	3,701	5,770	2,503	14,941	6,945	3,604	1,871	2,700	2,819
Median Ann. Max. 7-day Avg. Flow (cfs)	2,357	4,186	1,906	14,941	5,149	2,554	1,466	1,954	1,976
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	343	471	272		621	278	42	408	343
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	3,531	5,445	2,422	14,941	6,420	3,515	1,843	2,645	2,685
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	3,356	5,098	2,348	14,941	5,966	3,278	1,646	2,614	2,667
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	2,164	2,917	1,728	6,873	3,610	1,743	1,311	1,758	2,005
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	21	326	11		550	98	15	19	8
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	2,266	3,737	1,871	14,941	4,761	2,381	1,457	1,954	1,951
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	2,028	3,438	1,859	14,941	4,504	2,179	1,453	1,923	1,941
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,614	2,693	1,551	6,873	3,561	1,656	1,293	1,595	1,589

North Platte River below Whalen Diversion Dam, WY									
15-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 15-day Avg. Flow (cfs)	3,349	5,091	2,341	12,999	6,206	3,092	1,678	2,558	2,665
Median Ann. Max. 15-day Avg. Flow (cfs)	1,945	3,604	1,759	12,999	4,560	2,082	1,447	1,786	1,897
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	284	378	232		512	206	34	380	273
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	3,128	4,773	2,175	12,999	5,646	3,063	1,568	2,417	2,444
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	3,071	4,562	2,208	12,999	5,328	2,975	1,519	2,464	2,525
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,988	2,618	1,624	6,608	3,235	1,539	1,240	1,667	1,867
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	17	283	10		405	96	14	16	6
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	1,886	3,353	1,737	12,999	3,804	2,082	1,371	1,786	1,789
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	1,886	3,219	1,745	12,999	3,680	2,024	1,394	1,786	1,866
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,526	2,285	1,455	6,608	3,281	1,551	1,261	1,489	1,524

North Platte River below Whalen Diversion Dam, WY									
30-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 30-day Avg. Flow (cfs)	2,975	4,450	2,122	11,043	5,411	2,743	1,445	2,379	2,430
Median Ann. Max. 30-day Avg. Flow (cfs)	1,748	3,454	1,606	11,043	3,727	1,880	1,242	1,615	1,707
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	195	299	137		402	168	24	217	164
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	2,624	4,100	1,769	11,043	4,823	2,675	1,205	2,003	2,013
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	2,700	3,944	1,980	10,550	4,641	2,576	1,314	2,198	2,307
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,809	2,370	1,484	6,322	2,909	1,395	1,131	1,547	1,693
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	13	230	8		319	83	12	11	5
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	1,557	2,893	1,251	11,043	3,303	1,800	1,045	1,259	1,438
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,691	2,901	1,584	10,550	3,358	1,870	1,220	1,605	1,698
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,427	2,097	1,370	6,322	2,949	1,474	1,151	1,413	1,427

A.3.4 Flow Frequency and Exceedance

A.3.4.1 Flow Ranges

Table A.3-4 and **Figure A.3-5** show that, for both frequency in percentage of years and frequency in percentage of days, there is a noticeable change in the frequency distribution of flows by time interval. For percentage of years, there is a broad range of flows, from 0 to 5,000 cfs, which occur from 94% to 100% of the time in the 1910-1927 time interval. For each succeeding time interval this range becomes both narrower and lower in magnitude; by the 1942-1958 time interval this range is between 0 and 2,000 cfs. This range then remains constant through the 1975-1998 time interval. Since the 1928-1941 time interval, there have been no years with flows greater than 8,000 cfs. For percentage of days, there is no flow range for which the frequency equals or exceeds 22 percent for the 1910-1927 time interval. After this time interval, the 0-200-cfs flow range has the greatest frequency, always being greater than 50 percent.

A.3.4.2 Maximum Mean Flow Exceedance.

Table A.3-5 through **Table A.3-9** show the exceedance values and probabilities for maximum flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13), for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.3-5 shows the exceedance probabilities and values for annual maximum flow data. **Table A.3-5** shows that the characterizations discussed in **Sections A.3.2** and **A.3.4.2** for annual maximum flow can also be applied to all exceedance probabilities for maximum flows over all time intervals and all averaging times. For the multi-day averaging periods, changes in the flow values by time interval that were similar to those for the Annual Maximum mean daily flow were noted, along with a similar decrease in the differences between exceedance values with increasing averaging time for the more recent time intervals.

Table A.3-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.3-6** shows dramatic decreases in flow values from the 1910-1927 through 1942-1958 time intervals for all averaging times and for all exceedance probabilities. These decreases by time interval all coincide with the beginning of operation of the major upstream reservoir projects (**Table 2** of the main report). From the 1942-1958 time interval to the 1959-1974 time interval, flow values increase for the maximum flow and the 10-percent exceedance probability (high flows). Flow values decrease for the higher exceedance probabilities (lower flows). The decrease for the higher exceedance probabilities (lower flows) is most likely attributable to the beginning of operation of Glendo Reservoir in 1958.

Table A.3-4 Flow Frequency Distributions.

North Platte River below Whalen Diversion Dam, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	98	94	100	0	94	100	100	100	100
201 to 500	99	97	100	0	100	100	100	100	100
501 to 750	97	97	96	0	100	100	100	94	96
751 to 1,000	99	97	100	0	100	100	100	100	100
1,001 to 2,000	100	100	100	100	100	100	100	100	100
2,001 to 3,000	68	94	53	100	100	86	35	56	63
3,001 to 4,000	43	73	26	100	100	36	18	19	38
4,001 to 5,000	38	67	21	100	94	29	24	19	21
5,001 to 6,000	26	52	11	100	72	21	0	13	17
6,001 to 8,000	20	42	7	100	56	21	0	13	8
8,001 to 10,000	11	30	0	100	33	21	0	0	0
10,001 to 12,000	9	24	0	100	28	14	0	0	0
12,001 to 15,000	4	12	0	100	17	0	0	0	0
Greater than 15,000	4	12	0	100	17	0	0	0	0
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
North Platte River below Whalen Diversion Dam, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	50.4	30.9	61.5	0.0	16.7	50.1	66.8	59.8	58.7
201 to 500	11.1	18.4	7.0	0.0	21.2	15.3	6.2	8.5	6.6
501 to 750	5.8	7.7	4.6	0.0	9.9	5.2	5.7	3.7	4.5
751 to 1,000	5.0	5.4	4.9	0.0	6.3	4.3	6.5	4.0	4.3
1,001 to 2,000	16.8	17.6	16.4	8.5	17.4	18.1	13.7	17.2	17.7
2,001 to 3,000	5.1	9.4	2.6	16.3	12.7	4.9	0.5	2.8	4.0
3,001 to 4,000	2.6	4.6	1.4	3.3	7.7	0.5	0.4	1.8	1.9
4,001 to 5,000	1.0	1.5	0.7	0.7	2.6	0.2	0.3	0.9	0.9
5,001 to 6,000	0.9	1.6	0.5	14.4	2.4	0.2	0.0	0.4	0.8
6,001 to 8,000	0.9	1.5	0.5	37.3	1.6	0.4	0.0	0.9	0.6
8,001 to 10,000	0.2	0.6	0.0	10.5	0.6	0.4	0.0	0.0	0.0
10,001 to 12,000	0.1	0.4	0.0	4.6	0.3	0.4	0.0	0.0	0.0
12,001 to 15,000	0.1	0.2	0.0	2.6	0.3	0.0	0.0	0.0	0.0
Greater than 15,000	0.1	0.2	0.0	2.0	0.4	0.0	0.0	0.0	0.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
North Platte River below Whalen Diversion Dam, WY		Time Interval							
Flow Range (cfs)	Period of record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
0 to 200	183	111	224	0	61	183	244	218	214
201 to 500	40	66	26	0	77	56	23	31	24
501 to 750	21	28	17	0	36	19	21	13	17
751 to 1,000	18	19	18	0	23	16	24	15	16
1,001 to 2,000	61	63	60	13	63	66	50	63	65
2,001 to 3,000	18	34	9	25	46	18	2	10	14
3,001 to 4,000	9	16	5	5	28	2	1	7	7
4,001 to 5,000	4	5	3	1	9	1	1	3	3
5,001 to 6,000	3	6	2	22	9	1	0	2	3
6,001 to 8,000	3	5	2	57	6	1	0	3	2
8,001 to 10,000	1	2	0	16	2	1	0	0	0
10,001 to 12,000	0	1	0	7	1	1	0	0	0
12,001 to 15,000	0	1	0	4	1	0	0	0	0
Greater than 15,000	0	1	0	3	1	0	0	0	0
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

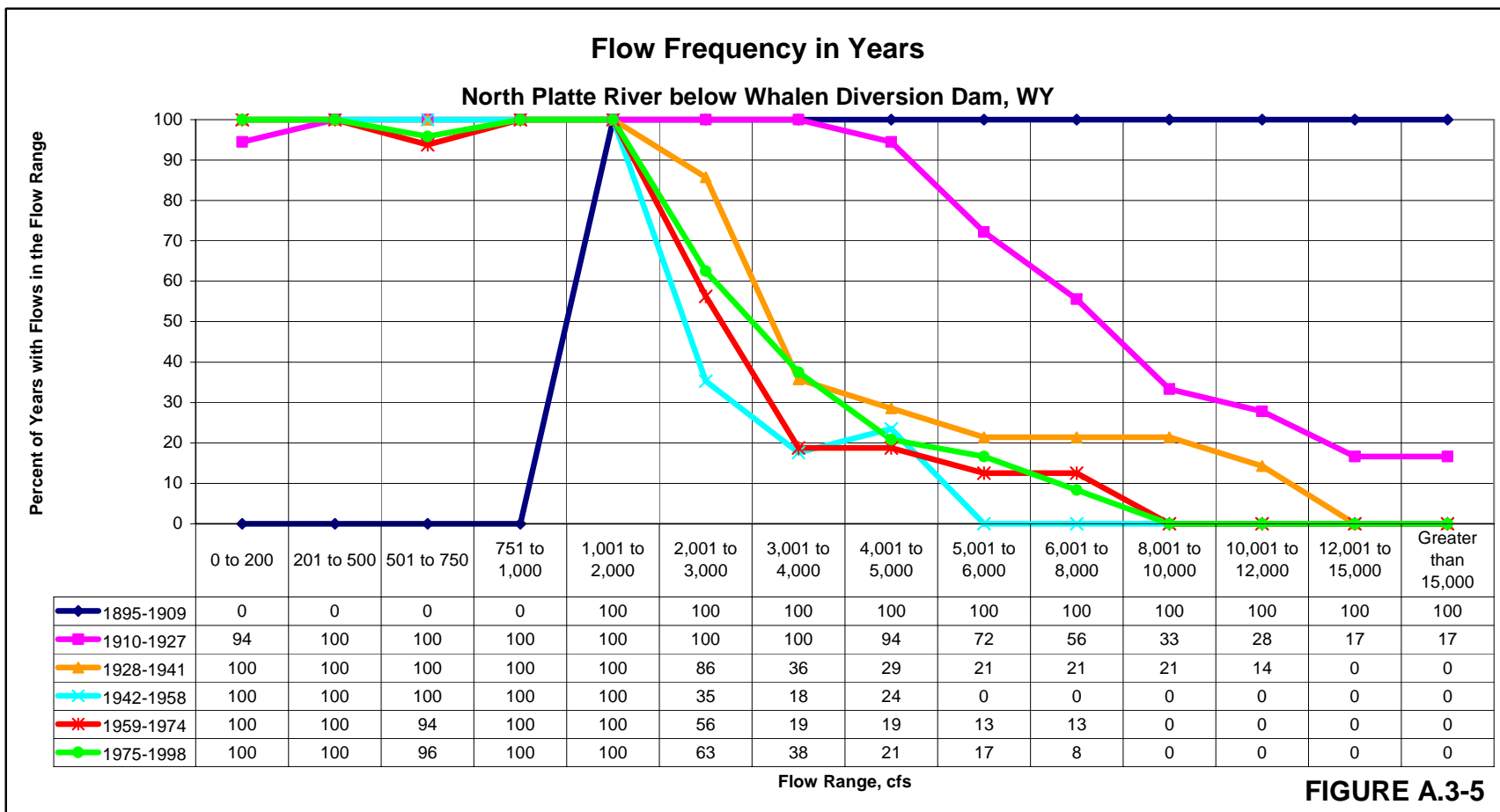


Figure A.3-5 Flow Frequency in Years.

Table A.3-5 Maximum Flow Exceedance Values, Annual Data.

North Platte River below Whalen Diversion Dam, WY Mean Daily Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,260	1,640	1,260	19,886	3,905	1,640	1,260	1,520	1,640
Maximum exceeded in 90% of the years		1,580	2,080	1,526	19,886	4,603	1,831	1,404	1,650	1,803
Maximum exceeded in 80% of the years		1,758	3,042	1,646	19,886	5,072	2,032	1,468	1,710	1,896
Maximum exceeded in 70% of the years		1,994	4,162	1,768	19,886	5,812	2,220	1,524	1,780	1,976
Maximum exceeded in 60% of the years		2,172	4,762	1,934	19,886	6,348	2,478	1,568	1,930	2,022
Maximum exceeded in 50% of the years		2,910	6,100	2,050	19,886	7,175	3,055	1,580	2,075	2,150
Maximum exceeded in 40% of the years		3,931	7,003	2,500	19,886	8,408	3,800	1,928	2,440	2,764
Maximum exceeded in 30% of the years		4,603	9,226	2,968	19,886	10,630	4,478	2,880	2,580	3,128
Maximum exceeded in 20% of the years		6,492	11,680	4,006	19,886	12,340	7,186	4,128	3,000	3,818
Maximum exceeded in 10% of the years		10,070	16,540	4,776	19,886	17,414	11,013	4,480	5,545	5,103
Maximum		19,886	19,886	7,430	19,886	19,500	12,000	4,600	7,430	6,850
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,230	1,550	1,230	16,780	3,677	1,550	1,230	1,477	1,633
Maximum exceeded in 90% of the years		1,559	2,014	1,475	16,780	4,331	1,754	1,361	1,647	1,758
Maximum exceeded in 80% of the years		1,717	2,849	1,635	16,780	4,919	1,912	1,388	1,697	1,864
Maximum exceeded in 70% of the years		1,869	3,987	1,725	16,780	5,482	2,203	1,460	1,765	1,939
Maximum exceeded in 60% of the years		2,038	4,612	1,863	16,780	5,571	2,403	1,532	1,900	1,989
Maximum exceeded in 50% of the years		2,673	5,473	1,987	16,780	6,444	2,862	1,577	2,027	2,080
Maximum exceeded in 40% of the years		3,579	5,761	2,272	16,780	7,255	2,955	1,732	2,367	2,736
Maximum exceeded in 30% of the years		4,481	7,263	2,704	16,780	9,093	4,682	1,936	2,410	3,109
Maximum exceeded in 20% of the years		5,594	9,601	3,609	16,780	9,601	5,409	2,595	2,820	3,731
Maximum exceeded in 10% of the years		7,580	11,733	4,613	16,780	12,183	9,636	3,878	5,498	4,985
Maximum		19,433	19,433	7,390	16,780	19,433	11,833	4,440	7,390	6,607
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,033	1,501	1,033	14,941	3,438	1,501	1,033	1,430	1,587
Maximum exceeded in 90% of the years		1,465	1,871	1,394	14,941	3,631	1,679	1,233	1,621	1,714
Maximum exceeded in 80% of the years		1,677	2,553	1,554	14,941	3,917	1,755	1,327	1,681	1,845
Maximum exceeded in 70% of the years		1,849	3,153	1,680	14,941	4,691	2,110	1,340	1,731	1,861
Maximum exceeded in 60% of the years		1,952	3,641	1,839	14,941	4,978	2,295	1,451	1,871	1,936
Maximum exceeded in 50% of the years		2,357	4,186	1,906	14,941	5,149	2,554	1,466	1,954	1,976
Maximum exceeded in 40% of the years		2,872	4,987	1,994	14,941	6,229	2,616	1,547	2,230	2,588
Maximum exceeded in 30% of the years		3,765	6,329	2,361	14,941	6,676	2,822	1,789	2,290	3,079
Maximum exceeded in 20% of the years		4,964	8,873	3,315	14,941	8,873	3,582	2,263	2,607	3,474
Maximum exceeded in 10% of the years		6,749	10,913	4,535	14,941	11,458	8,649	3,089	5,420	4,931
Maximum		19,143	19,143	7,356	14,941	19,143	10,963	4,313	7,356	6,491
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,000	1,332	1,000	12,999	2,605	1,332	1,000	1,380	1,483
Maximum exceeded in 90% of the years		1,380	1,662	1,298	12,999	3,298	1,383	1,159	1,491	1,597
Maximum exceeded in 80% of the years		1,525	2,079	1,488	12,999	3,558	1,551	1,185	1,659	1,753
Maximum exceeded in 70% of the years		1,667	2,539	1,589	12,999	3,781	1,699	1,278	1,663	1,786
Maximum exceeded in 60% of the years		1,796	2,874	1,666	12,999	4,046	1,861	1,344	1,667	1,834
Maximum exceeded in 50% of the years		1,945	3,604	1,759	12,999	4,560	2,082	1,447	1,786	1,897
Maximum exceeded in 40% of the years		2,494	4,082	1,835	12,999	5,875	2,229	1,512	1,875	2,363
Maximum exceeded in 30% of the years		3,530	5,907	1,992	12,999	6,499	2,463	1,553	2,049	2,599
Maximum exceeded in 20% of the years		4,253	7,834	3,104	12,999	7,834	2,744	1,694	2,413	3,434
Maximum exceeded in 10% of the years		6,620	9,947	4,342	12,999	10,348	7,568	2,552	5,367	4,619
Maximum		18,020	18,020	7,225	12,999	18,020	10,039	3,920	7,225	6,300
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		898	1,204	898	11,043	2,440	1,204	898	1,339	1,410
Maximum exceeded in 90% of the years		1,210	1,398	1,159	11,043	3,022	1,222	1,051	1,407	1,503
Maximum exceeded in 80% of the years		1,406	1,861	1,346	11,043	3,349	1,310	1,119	1,508	1,597
Maximum exceeded in 70% of the years		1,524	2,306	1,440	11,043	3,473	1,563	1,158	1,555	1,629
Maximum exceeded in 60% of the years		1,624	2,668	1,517	11,043	3,545	1,708	1,179	1,603	1,681
Maximum exceeded in 50% of the years		1,748	3,454	1,606	11,043	3,727	1,880	1,242	1,615	1,707
Maximum exceeded in 40% of the years		2,149	3,590	1,650	11,043	5,593	2,006	1,315	1,625	1,874
Maximum exceeded in 30% of the years		3,218	5,610	1,825	11,043	5,801	2,139	1,396	1,748	2,288
Maximum exceeded in 20% of the years		3,770	6,741	2,797	11,043	6,741	2,550	1,442	2,099	3,155
Maximum exceeded in 10% of the years		6,226	8,851	3,976	11,043	8,726	6,432	2,078	5,240	4,130
Maximum		15,697	15,697	6,755	11,043	15,697	9,057	3,208	6,755	6,212

Table A.3-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

North Platte River below Whalen Diversion Dam, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	0	10	0		238	10	2	0	1
Maximum exceeded in 90% of the years	2	64	1		363	19	4	1	1
Maximum exceeded in 80% of the years	8	132	3		381	48	7	2	2
Maximum exceeded in 70% of the years	13	232	7		403	83	14	9	6
Maximum exceeded in 60% of the years	19	368	10		517	115	18	17	7
Maximum exceeded in 50% of the years	35	403	15		583	154	20	21	9
Maximum exceeded in 40% of the years	117	495	20		644	204	29	23	13
Maximum exceeded in 30% of the years	245	629	29		745	248	44	33	15
Maximum exceeded in 20% of the years	472	791	60		1,279	405	111	63	26
Maximum exceeded in 10% of the years	1,630	1,665	238		1,635	1,648	190	1,110	1,940
Maximum	4,240	3,056	4,240		3,056	2,280	250	4,240	3,080
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	0	10	0		233	10	2	0	1
Maximum exceeded in 90% of the years	2	46	1		338	17	3	1	1
Maximum exceeded in 80% of the years	7	111	2		351	36	6	2	2
Maximum exceeded in 70% of the years	12	225	6		380	63	14	9	5
Maximum exceeded in 60% of the years	17	348	10		505	98	15	16	6
Maximum exceeded in 50% of the years	27	352	14		568	114	19	19	9
Maximum exceeded in 40% of the years	89	475	17		621	185	24	22	11
Maximum exceeded in 30% of the years	239	610	22		697	234	35	27	15
Maximum exceeded in 20% of the years	444	716	52		986	349	62	57	18
Maximum exceeded in 10% of the years	1,423	1,538	229		1,439	1,407	168	1,101	1,926
Maximum	4,227	2,339	4,227		2,339	2,027	243	4,227	3,060
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	0	10	0		214	10	2	0	1
Maximum exceeded in 90% of the years	1	35	1		294	16	3	1	1
Maximum exceeded in 80% of the years	6	86	2		314	28	5	1	1
Maximum exceeded in 70% of the years	10	209	5		339	54	11	8	3
Maximum exceeded in 60% of the years	14	305	9		480	78	13	9	5
Maximum exceeded in 50% of the years	21	326	11		550	98	15	19	8
Maximum exceeded in 40% of the years	73	446	15		598	163	17	20	10
Maximum exceeded in 30% of the years	211	591	20		627	218	27	24	11
Maximum exceeded in 20% of the years	413	684	30		702	322	49	47	14
Maximum exceeded in 10% of the years	807	1,100	188		942	899	148	1,069	1,614
Maximum	4,214	2,048	4,214		2,048	1,312	193	4,214	3,046
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	0	10	0		198	10	2	0	0
Maximum exceeded in 90% of the years	1	28	1		252	13	3	0	0
Maximum exceeded in 80% of the years	4	84	2		261	22	5	1	1
Maximum exceeded in 70% of the years	8	199	4		288	48	8	6	2
Maximum exceeded in 60% of the years	12	260	7		314	64	10	8	4
Maximum exceeded in 50% of the years	17	283	10		405	96	14	16	6
Maximum exceeded in 40% of the years	59	317	13		485	148	15	18	8
Maximum exceeded in 30% of the years	200	464	16		554	210	17	19	10
Maximum exceeded in 20% of the years	316	564	21		582	294	33	31	13
Maximum exceeded in 10% of the years	621	665	161		746	565	120	1,052	965
Maximum	3,833	1,894	3,833		1,894	892	167	3,833	2,527
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	0	9	0		172	9	2	0	0
Maximum exceeded in 90% of the years	1	21	0		215	11	3	0	0
Maximum exceeded in 80% of the years	4	75	2		227	16	4	1	1
Maximum exceeded in 70% of the years	7	174	3		230	43	7	4	1
Maximum exceeded in 60% of the years	10	223	6		231	62	9	7	4
Maximum exceeded in 50% of the years	13	230	8		319	83	12	11	5
Maximum exceeded in 40% of the years	49	278	11		395	107	12	13	7
Maximum exceeded in 30% of the years	177	371	12		477	186	13	17	9
Maximum exceeded in 20% of the years	264	477	17		489	264	26	18	11
Maximum exceeded in 10% of the years	490	490	100		591	408	87	677	490
Maximum	2,018	1,260	2,018		1,260	743	102	2,018	1,743

Table A.3-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

North Platte River below Whalen Diversion Dam, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,260	1,640	1,260	19,886	2,670	1,640	1,260	1,520	1,630
Maximum exceeded in 90% of the years	1,578	2,080	1,526	19,886	3,443	1,831	1,404	1,575	1,788
Maximum exceeded in 80% of the years	1,748	2,484	1,606	19,886	4,313	2,032	1,468	1,650	1,886
Maximum exceeded in 70% of the years	1,968	3,068	1,756	19,886	4,882	2,220	1,524	1,710	1,936
Maximum exceeded in 60% of the years	2,148	4,258	1,912	19,886	5,748	2,352	1,568	1,930	2,004
Maximum exceeded in 50% of the years	2,685	5,620	2,030	19,886	6,255	2,675	1,580	2,075	2,105
Maximum exceeded in 40% of the years	3,090	6,218	2,352	19,886	7,570	3,094	1,928	2,440	2,604
Maximum exceeded in 30% of the years	4,470	8,290	2,880	19,886	9,801	4,478	2,880	2,580	2,989
Maximum exceeded in 20% of the years	6,060	11,000	3,998	19,886	11,000	7,186	4,128	3,000	3,818
Maximum exceeded in 10% of the years	8,839	16,320	4,776	19,886	17,414	11,013	4,480	5,470	5,103
Maximum	19,886	19,886	7,430	19,886	19,500	12,000	4,600	7,430	6,820
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	1,167	1,550	1,167	16,780	2,550	1,550	1,167	1,460	1,603
Maximum exceeded in 90% of the years	1,547	2,014	1,468	16,780	3,333	1,754	1,361	1,547	1,721
Maximum exceeded in 80% of the years	1,716	2,406	1,571	16,780	4,125	1,912	1,388	1,643	1,857
Maximum exceeded in 70% of the years	1,865	2,874	1,716	16,780	4,454	2,203	1,460	1,693	1,870
Maximum exceeded in 60% of the years	2,031	3,997	1,856	16,780	5,385	2,305	1,528	1,900	1,984
Maximum exceeded in 50% of the years	2,410	4,621	1,983	16,780	5,568	2,555	1,560	2,027	2,070
Maximum exceeded in 40% of the years	2,939	5,565	2,156	16,780	6,329	2,899	1,707	2,367	2,588
Maximum exceeded in 30% of the years	4,114	6,559	2,661	16,780	7,284	3,129	1,936	2,410	2,969
Maximum exceeded in 20% of the years	5,491	9,601	3,496	16,780	9,601	5,043	2,595	2,820	3,731
Maximum exceeded in 10% of the years	7,299	11,733	4,613	16,780	12,183	9,636	3,878	5,412	4,985
Maximum	19,433	19,433	7,390	16,780	19,433	11,833	4,440	7,390	6,607
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	901	1,450	901	14,941	2,249	1,450	901	1,311	1,569
Maximum exceeded in 90% of the years	1,441	1,871	1,334	14,941	3,149	1,679	1,189	1,464	1,662
Maximum exceeded in 80% of the years	1,613	2,244	1,476	14,941	3,516	1,755	1,306	1,586	1,818
Maximum exceeded in 70% of the years	1,820	2,545	1,613	14,941	3,749	2,110	1,337	1,656	1,851
Maximum exceeded in 60% of the years	1,937	3,302	1,814	14,941	4,341	2,233	1,409	1,871	1,870
Maximum exceeded in 50% of the years	2,266	3,737	1,871	14,941	4,761	2,381	1,457	1,954	1,951
Maximum exceeded in 40% of the years	2,616	4,502	1,975	14,941	4,987	2,553	1,509	2,230	2,307
Maximum exceeded in 30% of the years	3,509	4,987	2,355	14,941	6,512	2,643	1,767	2,290	2,698
Maximum exceeded in 20% of the years	4,702	8,873	2,872	14,941	8,873	3,185	2,263	2,607	3,400
Maximum exceeded in 10% of the years	6,749	10,913	4,535	14,941	11,458	8,649	3,089	5,315	4,931
Maximum	19,143	19,143	7,356	14,941	19,143	10,963	4,313	7,356	6,491
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	836	1,299	836	12,999	1,812	1,299	836	1,133	1,304
Maximum exceeded in 90% of the years	1,267	1,662	1,090	12,999	2,311	1,383	873	1,178	1,474
Maximum exceeded in 80% of the years	1,398	1,913	1,314	12,999	3,057	1,551	979	1,328	1,617
Maximum exceeded in 70% of the years	1,619	2,174	1,467	12,999	3,441	1,699	1,021	1,487	1,737
Maximum exceeded in 60% of the years	1,747	2,587	1,572	12,999	3,530	1,854	1,289	1,547	1,759
Maximum exceeded in 50% of the years	1,886	3,353	1,737	12,999	3,804	2,082	1,371	1,786	1,789
Maximum exceeded in 40% of the years	2,230	3,594	1,770	12,999	3,944	2,146	1,453	1,875	2,001
Maximum exceeded in 30% of the years	3,280	3,993	1,968	12,999	6,313	2,231	1,538	2,049	2,470
Maximum exceeded in 20% of the years	3,822	7,834	2,472	12,999	7,834	2,744	1,653	2,413	3,295
Maximum exceeded in 10% of the years	6,620	9,947	4,113	12,999	10,348	7,568	2,552	5,071	4,547
Maximum	18,020	18,020	7,225	12,999	18,020	10,039	3,920	7,225	6,279
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	582	1,122	582	11,043	1,268	1,122	582	730	781
Maximum exceeded in 90% of the years	826	1,222	785	11,043	2,155	1,152	612	799	979
Maximum exceeded in 80% of the years	1,086	1,666	886	11,043	2,663	1,210	812	968	1,200
Maximum exceeded in 70% of the years	1,194	2,012	1,062	11,043	3,035	1,336	848	1,096	1,260
Maximum exceeded in 60% of the years	1,274	2,352	1,152	11,043	3,207	1,627	898	1,131	1,312
Maximum exceeded in 50% of the years	1,557	2,893	1,251	11,043	3,303	1,800	1,045	1,259	1,438
Maximum exceeded in 40% of the years	1,999	3,249	1,350	11,043	3,457	1,942	1,120	1,414	1,570
Maximum exceeded in 30% of the years	2,823	3,460	1,590	11,043	5,366	2,118	1,175	1,748	1,905
Maximum exceeded in 20% of the years	3,289	6,741	2,098	11,043	6,741	2,516	1,249	2,099	2,945
Maximum exceeded in 10% of the years	6,226	8,851	3,473	11,043	8,726	6,432	1,957	4,570	3,946
Maximum	15,697	15,697	6,755	11,043	15,697	9,057	3,208	6,755	6,212

Table A.3-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

North Platte River below Whalen Diversion Dam, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	1,260	1,600	1,260	19,886	2,174	1,600	1,260	1,520	1,540
Maximum exceeded in 90% of the years	1,560	2,024	1,526	19,886	3,736	1,639	1,404	1,650	1,749
Maximum exceeded in 80% of the years	1,694	2,284	1,584	19,886	4,271	1,876	1,468	1,710	1,886
Maximum exceeded in 70% of the years	1,877	3,156	1,734	19,886	4,623	2,038	1,524	1,780	1,918
Maximum exceeded in 60% of the years	2,012	4,029	1,846	19,886	4,788	2,262	1,560	1,830	1,972
Maximum exceeded in 50% of the years	2,315	4,610	1,930	19,886	5,400	2,355	1,580	2,015	2,015
Maximum exceeded in 40% of the years	3,090	5,382	2,060	19,886	5,764	2,968	1,634	2,440	2,160
Maximum exceeded in 30% of the years	4,329	5,908	2,460	19,886	6,068	3,291	1,830	2,580	2,809
Maximum exceeded in 20% of the years	5,178	9,484	3,518	19,886	8,885	6,058	2,294	3,000	3,678
Maximum exceeded in 10% of the years	7,234	12,000	4,740	19,886	12,780	11,013	4,428	5,255	5,103
Maximum	19,886	19,886	7,430	19,886	19,500	12,000	4,540	7,430	6,850
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	1,230	1,527	1,230	16,780	2,040	1,527	1,230	1,477	1,513
Maximum exceeded in 90% of the years	1,525	1,824	1,475	16,780	3,331	1,561	1,361	1,647	1,716
Maximum exceeded in 80% of the years	1,683	2,259	1,581	16,780	3,716	1,709	1,388	1,697	1,857
Maximum exceeded in 70% of the years	1,822	2,947	1,710	16,780	4,213	1,943	1,460	1,755	1,870
Maximum exceeded in 60% of the years	1,931	3,335	1,814	16,780	4,539	2,245	1,519	1,803	1,915
Maximum exceeded in 50% of the years	2,172	4,193	1,870	16,780	5,093	2,307	1,560	1,975	1,985
Maximum exceeded in 40% of the years	2,861	4,703	1,981	16,780	5,491	2,801	1,615	2,367	2,137
Maximum exceeded in 30% of the years	3,609	5,509	2,215	16,780	5,635	2,966	1,801	2,410	2,771
Maximum exceeded in 20% of the years	4,905	8,159	2,953	16,780	8,159	3,642	1,851	2,820	3,569
Maximum exceeded in 10% of the years	6,623	11,733	4,499	16,780	11,682	9,320	2,638	5,180	4,985
Maximum	19,433	19,433	7,390	16,780	19,433	11,833	4,250	7,390	6,607
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	1,014	1,367	1,014	14,941	1,603	1,367	1,014	1,430	1,497
Maximum exceeded in 90% of the years	1,431	1,521	1,394	14,941	2,790	1,419	1,233	1,577	1,681
Maximum exceeded in 80% of the years	1,549	2,086	1,498	14,941	3,373	1,495	1,327	1,676	1,818
Maximum exceeded in 70% of the years	1,690	2,425	1,614	14,941	3,673	1,588	1,340	1,688	1,861
Maximum exceeded in 60% of the years	1,861	2,815	1,725	14,941	4,096	2,073	1,438	1,769	1,873
Maximum exceeded in 50% of the years	2,028	3,438	1,859	14,941	4,504	2,179	1,453	1,923	1,941
Maximum exceeded in 40% of the years	2,356	4,245	1,922	14,941	4,654	2,238	1,484	1,989	2,098
Maximum exceeded in 30% of the years	3,246	4,656	2,124	14,941	4,955	2,569	1,543	2,256	2,385
Maximum exceeded in 20% of the years	4,491	7,588	2,558	14,941	7,588	2,820	1,725	2,607	3,296
Maximum exceeded in 10% of the years	6,505	10,913	4,451	14,941	11,058	8,375	2,034	5,053	4,931
Maximum	19,143	19,143	7,356	14,941	19,143	10,963	4,173	7,356	6,491
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	1,000	1,156	1,000	12,999	1,402	1,156	1,000	1,306	1,483
Maximum exceeded in 90% of the years	1,303	1,311	1,295	12,999	2,518	1,200	1,159	1,448	1,597
Maximum exceeded in 80% of the years	1,436	1,867	1,434	12,999	3,003	1,281	1,185	1,659	1,697
Maximum exceeded in 70% of the years	1,649	2,231	1,565	12,999	3,441	1,329	1,278	1,663	1,774
Maximum exceeded in 60% of the years	1,756	2,645	1,660	12,999	3,494	1,839	1,309	1,667	1,809
Maximum exceeded in 50% of the years	1,886	3,219	1,745	12,999	3,680	2,024	1,394	1,786	1,866
Maximum exceeded in 40% of the years	2,161	3,517	1,813	12,999	3,979	2,166	1,435	1,875	1,923
Maximum exceeded in 30% of the years	2,865	4,002	1,905	12,999	4,133	2,301	1,510	2,049	2,072
Maximum exceeded in 20% of the years	3,764	6,606	2,360	12,999	6,606	2,744	1,633	2,413	3,057
Maximum exceeded in 10% of the years	6,281	9,942	4,108	12,999	10,106	7,551	1,714	4,690	4,619
Maximum	18,020	18,020	7,225	12,999	18,020	10,039	3,773	7,225	6,300
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	764	764	898	10,550	1,250	764	898	1,197	1,410
Maximum exceeded in 90% of the years	1,158	1,163	1,159	10,550	2,369	1,078	1,051	1,383	1,503
Maximum exceeded in 80% of the years	1,317	1,722	1,298	10,550	2,666	1,134	1,119	1,508	1,578
Maximum exceeded in 70% of the years	1,505	2,069	1,440	10,550	3,139	1,239	1,158	1,537	1,608
Maximum exceeded in 60% of the years	1,604	2,443	1,509	10,550	3,272	1,705	1,179	1,580	1,663
Maximum exceeded in 50% of the years	1,691	2,901	1,584	10,550	3,358	1,870	1,220	1,605	1,698
Maximum exceeded in 40% of the years	1,987	3,289	1,624	10,550	3,529	2,005	1,271	1,623	1,790
Maximum exceeded in 30% of the years	2,550	3,537	1,704	10,550	3,694	2,139	1,347	1,741	1,907
Maximum exceeded in 20% of the years	3,338	5,719	2,039	10,550	5,719	2,550	1,442	2,099	2,599
Maximum exceeded in 10% of the years	5,865	8,340	3,220	10,550	8,335	6,042	1,485	4,101	4,127
Maximum	15,697	15,697	6,426	10,550	15,697	8,558	2,645	6,426	6,212

Table A.3-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

North Platte River below Whalen Diversion Dam, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	681	681	1,210	7,812	1,228	681	1,210	1,500	1,310
Maximum exceeded in 90% of the years	1,307	1,384	1,298	7,812	3,059	1,186	1,210	1,520	1,512
Maximum exceeded in 80% of the years	1,498	1,752	1,444	7,812	3,420	1,472	1,234	1,540	1,572
Maximum exceeded in 70% of the years	1,560	2,034	1,510	7,812	3,617	1,650	1,274	1,580	1,608
Maximum exceeded in 60% of the years	1,640	2,650	1,560	7,812	3,909	1,716	1,332	1,640	1,624
Maximum exceeded in 50% of the years	1,705	3,540	1,620	7,812	4,035	1,880	1,370	1,680	1,645
Maximum exceeded in 40% of the years	1,842	3,906	1,656	7,812	4,466	1,964	1,416	1,710	1,746
Maximum exceeded in 30% of the years	2,160	4,250	1,734	7,812	4,628	2,079	1,470	1,740	1,866
Maximum exceeded in 20% of the years	3,618	4,696	1,820	7,812	5,370	2,228	1,542	1,820	2,008
Maximum exceeded in 10% of the years	4,612	6,880	2,112	7,812	7,022	3,226	1,704	1,995	3,341
Maximum	13,100	13,100	6,850	7,812	13,100	6,640	1,820	4,120	6,850
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	662	662	1,137	7,127	1,013	662	1,137	1,473	1,303
Maximum exceeded in 90% of the years	1,232	1,225	1,263	7,127	2,816	1,113	1,193	1,493	1,488
Maximum exceeded in 80% of the years	1,476	1,701	1,421	7,127	3,073	1,376	1,217	1,523	1,548
Maximum exceeded in 70% of the years	1,531	1,981	1,485	7,127	3,325	1,626	1,231	1,567	1,575
Maximum exceeded in 60% of the years	1,608	2,503	1,536	7,127	3,576	1,677	1,289	1,617	1,600
Maximum exceeded in 50% of the years	1,665	3,107	1,587	7,127	3,692	1,813	1,297	1,647	1,635
Maximum exceeded in 40% of the years	1,795	3,549	1,635	7,127	4,038	1,877	1,397	1,693	1,668
Maximum exceeded in 30% of the years	2,144	3,825	1,694	7,127	4,453	2,056	1,437	1,722	1,858
Maximum exceeded in 20% of the years	3,439	4,539	1,789	7,127	4,789	2,209	1,503	1,783	1,976
Maximum exceeded in 10% of the years	4,207	6,158	2,073	7,127	6,542	3,083	1,654	1,978	3,297
Maximum	9,293	9,293	6,563	7,127	9,293	5,200	1,790	4,070	6,563
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	617	617	1,033	6,873	864	617	1,033	1,373	1,264
Maximum exceeded in 90% of the years	1,185	1,178	1,206	6,873	2,464	1,087	1,093	1,421	1,449
Maximum exceeded in 80% of the years	1,380	1,627	1,363	6,873	2,625	1,268	1,163	1,471	1,487
Maximum exceeded in 70% of the years	1,471	1,937	1,439	6,873	2,863	1,382	1,184	1,544	1,535
Maximum exceeded in 60% of the years	1,560	2,401	1,485	6,873	3,315	1,624	1,241	1,589	1,570
Maximum exceeded in 50% of the years	1,614	2,693	1,551	6,873	3,561	1,656	1,293	1,595	1,589
Maximum exceeded in 40% of the years	1,702	3,089	1,587	6,873	3,659	1,769	1,357	1,609	1,630
Maximum exceeded in 30% of the years	2,080	3,557	1,623	6,873	3,870	2,037	1,407	1,679	1,764
Maximum exceeded in 20% of the years	2,878	3,800	1,715	6,873	4,265	2,135	1,468	1,721	1,959
Maximum exceeded in 10% of the years	3,897	4,816	2,050	6,873	5,297	2,566	1,516	1,949	3,120
Maximum	6,873	6,873	6,439	6,873	6,676	3,071	1,689	3,993	6,439
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	553	553	890	6,608	776	553	890	1,271	1,235
Maximum exceeded in 90% of the years	1,143	1,085	1,155	6,608	2,250	859	1,045	1,349	1,370
Maximum exceeded in 80% of the years	1,311	1,439	1,280	6,608	2,362	1,185	1,097	1,392	1,426
Maximum exceeded in 70% of the years	1,389	1,742	1,363	6,608	2,582	1,290	1,143	1,430	1,442
Maximum exceeded in 60% of the years	1,461	2,156	1,420	6,608	2,799	1,409	1,162	1,467	1,473
Maximum exceeded in 50% of the years	1,526	2,285	1,455	6,608	3,281	1,551	1,261	1,489	1,524
Maximum exceeded in 40% of the years	1,635	2,584	1,489	6,608	3,524	1,678	1,297	1,524	1,565
Maximum exceeded in 30% of the years	1,942	3,252	1,548	6,608	3,542	1,789	1,332	1,643	1,634
Maximum exceeded in 20% of the years	2,499	3,537	1,638	6,608	3,939	2,017	1,406	1,661	1,837
Maximum exceeded in 10% of the years	3,529	4,126	1,926	6,608	4,425	2,208	1,466	1,797	2,593
Maximum	6,608	6,608	6,300	6,608	6,003	2,327	1,539	3,943	6,300
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	439	439	739	6,322	693	439	739	1,183	1,074
Maximum exceeded in 90% of the years	1,020	981	1,022	6,322	1,963	600	845	1,209	1,226
Maximum exceeded in 80% of the years	1,199	1,328	1,185	6,322	2,115	1,068	981	1,310	1,337
Maximum exceeded in 70% of the years	1,303	1,612	1,255	6,322	2,251	1,200	1,020	1,338	1,370
Maximum exceeded in 60% of the years	1,371	1,939	1,328	6,322	2,495	1,287	1,057	1,372	1,384
Maximum exceeded in 50% of the years	1,427	2,097	1,370	6,322	2,949	1,474	1,151	1,413	1,427
Maximum exceeded in 40% of the years	1,520	2,275	1,400	6,322	3,186	1,562	1,249	1,439	1,488
Maximum exceeded in 30% of the years	1,676	2,929	1,437	6,322	3,339	1,656	1,262	1,497	1,543
Maximum exceeded in 20% of the years	2,133	3,328	1,522	6,322	3,448	1,873	1,305	1,523	1,632
Maximum exceeded in 10% of the years	3,309	3,694	1,632	6,322	3,874	2,010	1,370	1,585	2,019
Maximum	6,322	6,322	5,850	6,322	5,816	2,115	1,409	3,847	5,850

Table A.3-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.3-7** shows a characterization quite similar to that for the annual data (**Table A.3-7**). There are significant decreases in flow values by time interval from 1910-1927 through 1942-1958 for all averaging times and all exceedance probabilities. Beginning with the 1942-1958 time interval, the changes in flow values by time interval are relatively small.

Table A.3-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.3-8** shows that the flow values are generally similar to those for the Apr 16-Jul 15 time interval (**Table A.3-7**).

Table A.3-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.3-9** shows that, during this late part of the growing season, the flow values are mainly consistent with known climatological conditions. The sharp decrease in flow values from the 1910-1927 time interval to the 1928-1941 time interval is coincident with both climatic and human-caused effects. There was the severe drought during the 1930's, and the beginning of operation of Guernsey Reservoir in 1928.

A.3.4.3 Mean Flow Exceedance.

Table A.3-10 through **Table A.3-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30), for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.3-10 shows the exceedance probabilities and values of flows for annual data. **Table A.3-10** shows that the large decreases in flow values that were noted for maximum flows (**Table A.3-5**) over the time intervals 1910-1927 through 1942-1958 are also seen when all flow data are considered. However, a large decrease occurs only from the 1910-1927 time interval to the 1928-1941 time interval, coincident with the beginning of operation of Guernsey Reservoir. There is a smaller decrease in flow values from the 1928-1941 time interval to the 1942-1958 time for all exceedance probabilities, coincident with the beginning of operation of the Alcova and Seminole Reservoirs. Beginning with the 1942-1958 time interval, the changes in the flow values by time interval are generally consistent with known climatological conditions for exceedance probabilities of 50 percent and lower (higher flows). For exceedance probabilities of 60 percent and higher (lower flows), there are no significant changes in flow values between the 1942-1958 and the 1975-1998 time intervals, due to the very low flow values over this range of exceedance probabilities for these time intervals.

Table A.3-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.3-11** shows that, as for the maximum flows (**Table A.3-6**), there is a significant decrease in flow values for all averaging periods and all exceedance probabilities from the 1910-1927 time interval to the 1928-1941 time

Table A.3-10 Exceedance Values Considering All Flows, Annual Data.

North Platte River below Whalen Diversion Dam, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	0	1,742	0	5	1	0	0
Flow exceeded for 90% of the days	4	40	2	2,104	158	19	6	2	2
Flow exceeded for 80% of the days	10	103	6	2,355	237	35	10	5	5
Flow exceeded for 70% of the days	26	197	10	5,177	370	62	14	10	8
Flow exceeded for 60% of the days	80	327	19	5,842	541	109	22	24	13
Flow exceeded for 50% of the days	198	519	56	6,299	835	200	47	63	54
Flow exceeded for 40% of the days	450	892	168	6,412	1,298	365	108	203	255
Flow exceeded for 30% of the days	891	1,400	576	6,946	1,905	717	324	602	757
Flow exceeded for 20% of the days	1,350	2,001	1,090	7,766	2,624	1,260	806	1,210	1,260
Flow exceeded for 10% of the days	2,100	3,112	1,520	9,669	3,600	1,810	1,160	1,600	1,790
Maximum	19,886	19,886	7,430	19,886	19,500	12,000	4,600	7,430	6,850
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	0	1,795	0	5	1	0	0
Flow exceeded for 90% of the days	4	44	2	2,104	160	19	6	2	2
Flow exceeded for 80% of the days	10	105	6	2,313	241	40	10	5	5
Flow exceeded for 70% of the days	28	200	10	5,177	372	65	15	10	8
Flow exceeded for 60% of the days	84	334	20	5,842	548	110	23	25	13
Flow exceeded for 50% of the days	204	524	57	6,299	851	205	51	66	57
Flow exceeded for 40% of the days	458	901	178	6,536	1,304	368	113	217	270
Flow exceeded for 30% of the days	893	1,406	577	7,022	1,930	722	344	616	763
Flow exceeded for 20% of the days	1,347	2,013	1,085	7,796	2,642	1,259	804	1,210	1,260
Flow exceeded for 10% of the days	2,100	3,087	1,513	9,935	3,577	1,813	1,160	1,600	1,780
Maximum	19,433	19,433	7,390	16,780	19,433	11,833	4,440	7,390	6,607
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	6	0	1,810	16	6	1	0	0
Flow exceeded for 90% of the days	5	49	3	2,100	167	19	6	2	2
Flow exceeded for 80% of the days	10	112	6	2,756	247	43	10	5	5
Flow exceeded for 70% of the days	30	206	11	5,452	382	69	15	10	8
Flow exceeded for 60% of the days	89	345	21	6,007	568	113	25	28	14
Flow exceeded for 50% of the days	220	545	63	6,299	878	217	55	73	63
Flow exceeded for 40% of the days	475	914	205	6,757	1,321	384	125	239	300
Flow exceeded for 30% of the days	892	1,411	591	7,039	1,972	749	391	628	765
Flow exceeded for 20% of the days	1,340	2,041	1,079	8,055	2,638	1,261	786	1,195	1,259
Flow exceeded for 10% of the days	2,106	3,063	1,501	10,355	3,540	1,814	1,149	1,584	1,769
Maximum	19,143	19,143	7,356	14,941	19,143	10,963	4,313	7,356	6,491
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	6	0	1,852	43	6	2	0	0
Flow exceeded for 90% of the days	5	55	3	2,120	175	19	6	2	2
Flow exceeded for 80% of the days	11	122	6	3,571	255	47	11	5	5
Flow exceeded for 70% of the days	34	217	11	5,666	416	74	16	12	8
Flow exceeded for 60% of the days	102	368	24	6,012	579	122	28	31	15
Flow exceeded for 50% of the days	248	564	72	6,433	933	238	63	83	78
Flow exceeded for 40% of the days	505	953	255	6,846	1,375	433	139	285	341
Flow exceeded for 30% of the days	903	1,413	616	7,198	2,013	759	457	676	773
Flow exceeded for 20% of the days	1,331	2,043	1,067	8,180	2,656	1,235	775	1,186	1,253
Flow exceeded for 10% of the days	2,094	3,061	1,474	11,033	3,487	1,799	1,123	1,559	1,737
Maximum	18,020	18,020	7,225	12,999	18,020	10,039	3,920	7,225	6,300
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	7	0	2,036	68	7	2	0	0
Flow exceeded for 90% of the days	5	61	3	2,711	193	19	6	2	2
Flow exceeded for 80% of the days	13	140	7	4,361	267	53	12	6	6
Flow exceeded for 70% of the days	43	237	13	5,863	427	81	18	15	9
Flow exceeded for 60% of the days	125	397	31	6,334	616	143	35	37	22
Flow exceeded for 50% of the days	290	599	100	6,653	980	288	80	119	123
Flow exceeded for 40% of the days	541	978	314	7,090	1,432	472	194	342	388
Flow exceeded for 30% of the days	904	1,412	650	8,011	2,004	825	485	703	783
Flow exceeded for 20% of the days	1,302	2,031	1,041	9,484	2,714	1,186	777	1,160	1,248
Flow exceeded for 10% of the days	2,071	3,036	1,438	10,603	3,391	1,756	1,067	1,508	1,668
Maximum	15,697	15,697	6,755	11,043	15,697	9,057	3,208	6,755	6,212

Table A.3-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

North Platte River below Whalen Diversion Dam, WY	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	0		0	5	2	0	0
Flow exceeded for 90% of the days	1	15	0		140	10	2	0	0
Flow exceeded for 80% of the days	3	51	1		177	13	3	1	1
Flow exceeded for 70% of the days	6	118	3		204	25	6	2	1
Flow exceeded for 60% of the days	9	172	5		245	49	6	5	3
Flow exceeded for 50% of the days	13	210	7		310	84	9	7	5
Flow exceeded for 40% of the days	25	258	9		373	118	11	9	7
Flow exceeded for 30% of the days	120	340	12		450	190	15	16	9
Flow exceeded for 20% of the days	231	445	17		541	236	23	20	11
Flow exceeded for 10% of the days	493	590	61		644	333	75	76	25
Maximum	4,240	3,056	4,240		3,056	2,280	250	4,240	3,080
3-day Average Flows									
Flow exceeded for 100% of the days	0	5	0		25	5	2	0	0
Flow exceeded for 90% of the days	1	15	0		146	10	2	0	0
Flow exceeded for 80% of the days	3	54	1		186	13	3	1	1
Flow exceeded for 70% of the days	6	118	3		206	32	6	2	1
Flow exceeded for 60% of the days	9	177	5		247	49	7	5	3
Flow exceeded for 50% of the days	13	209	7		315	75	9	7	5
Flow exceeded for 40% of the days	27	263	9		370	118	12	10	7
Flow exceeded for 30% of the days	124	339	12		451	190	15	16	9
Flow exceeded for 20% of the days	233	441	17		538	250	24	20	12
Flow exceeded for 10% of the days	486	583	65		639	333	76	93	27
Maximum	4,227	2,339	4,227		2,339	2,027	243	4,227	3,060
7-day Average Flows									
Flow exceeded for 100% of the days	0	6	0		45	6	2	0	0
Flow exceeded for 90% of the days	1	14	0		151	10	2	0	0
Flow exceeded for 80% of the days	3	55	1		185	13	3	1	1
Flow exceeded for 70% of the days	6	129	3		210	33	6	1	1
Flow exceeded for 60% of the days	9	178	5		246	51	7	6	3
Flow exceeded for 50% of the days	14	212	7		303	73	9	7	5
Flow exceeded for 40% of the days	32	261	9		371	118	12	12	7
Flow exceeded for 30% of the days	135	332	12		448	190	15	16	9
Flow exceeded for 20% of the days	238	448	17		521	248	25	20	12
Flow exceeded for 10% of the days	484	578	81		606	312	78	100	24
Maximum	4,214	2,048	4,214		2,048	1,312	193	4,214	3,046
15-day Average Flows									
Flow exceeded for 100% of the days	0	7	0		56	7	2	0	0
Flow exceeded for 90% of the days	1	14	0		177	10	2	0	0
Flow exceeded for 80% of the days	3	63	1		192	12	4	1	1
Flow exceeded for 70% of the days	7	139	3		206	41	6	2	1
Flow exceeded for 60% of the days	10	188	6		245	51	8	6	3
Flow exceeded for 50% of the days	14	213	7		283	72	10	8	4
Flow exceeded for 40% of the days	48	256	10		387	115	12	15	7
Flow exceeded for 30% of the days	152	312	13		445	193	14	17	9
Flow exceeded for 20% of the days	245	446	18		484	238	25	29	11
Flow exceeded for 10% of the days	485	557	99		567	312	77	801	376
Maximum	3,833	1,894	3,833		1,894	892	167	3,833	2,527
30-day Average Flows									
Flow exceeded for 100% of the days	0	9	0		172	9	2	0	0
Flow exceeded for 90% of the days	1	21	0		215	11	3	0	0
Flow exceeded for 80% of the days	4	75	2		227	16	4	1	1
Flow exceeded for 70% of the days	7	174	3		230	43	7	4	1
Flow exceeded for 60% of the days	10	223	6		231	62	9	7	4
Flow exceeded for 50% of the days	13	230	8		319	83	12	11	5
Flow exceeded for 40% of the days	49	278	11		395	107	12	13	7
Flow exceeded for 30% of the days	177	371	12		477	186	13	17	9
Flow exceeded for 20% of the days	264	477	17		489	264	26	18	11
Flow exceeded for 10% of the days	490	490	100		591	408	87	677	490
Maximum	2,018	1,260	2,018		1,260	743	102	2,018	1,743

Table A.3-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

North Platte River below Whalen Diversion Dam, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1	17	1	2,536	40	17	2	4	1
Flow exceeded for 90% of the days	41	125	28	5,177	805	43	18	44	28
Flow exceeded for 80% of the days	114	674	72	6,299	1,220	110	43	98	100
Flow exceeded for 70% of the days	307	1,080	150	6,412	1,580	346	79	182	212
Flow exceeded for 60% of the days	700	1,450	341	6,784	2,020	810	180	350	514
Flow exceeded for 50% of the days	1,050	1,810	668	7,286	2,463	1,120	444	762	797
Flow exceeded for 40% of the days	1,420	2,200	962	7,697	2,884	1,460	680	1,140	1,318
Flow exceeded for 30% of the days	1,810	2,750	1,360	8,917	3,309	1,750	897	1,470	1,700
Flow exceeded for 20% of the days	2,450	3,511	1,730	9,669	4,110	2,040	1,170	1,880	2,090
Flow exceeded for 10% of the days	3,620	5,849	2,614	11,946	6,303	2,690	1,470	3,040	2,930
Maximum	19,886	19,886	7,430	19,886	19,500	12,000	4,600	7,430	6,820
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1	20	1	2,543	40	20	2	6	1
Flow exceeded for 90% of the days	44	154	30	5,268	860	52	19	44	31
Flow exceeded for 80% of the days	129	734	80	6,299	1,270	135	49	103	109
Flow exceeded for 70% of the days	348	1,117	172	6,648	1,619	418	90	194	224
Flow exceeded for 60% of the days	710	1,470	379	7,024	2,069	813	222	410	515
Flow exceeded for 50% of the days	1,038	1,833	666	7,324	2,488	1,127	455	748	794
Flow exceeded for 40% of the days	1,417	2,213	940	7,972	2,885	1,437	671	1,143	1,273
Flow exceeded for 30% of the days	1,818	2,770	1,337	9,169	3,353	1,765	876	1,447	1,697
Flow exceeded for 20% of the days	2,460	3,539	1,723	9,939	4,166	2,057	1,150	1,871	2,087
Flow exceeded for 10% of the days	3,642	5,939	2,603	12,591	6,304	2,733	1,463	3,079	2,938
Maximum	19,433	19,433	7,390	16,780	19,433	11,833	4,440	7,390	6,607
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	2	28	2	3,490	41	28	2	6	4
Flow exceeded for 90% of the days	51	219	34	5,646	975	59	24	50	35
Flow exceeded for 80% of the days	169	797	98	6,299	1,323	207	64	116	124
Flow exceeded for 70% of the days	426	1,151	219	6,823	1,730	529	142	243	286
Flow exceeded for 60% of the days	725	1,503	438	7,138	2,143	835	314	460	542
Flow exceeded for 50% of the days	1,023	1,868	664	7,462	2,546	1,117	503	767	793
Flow exceeded for 40% of the days	1,403	2,243	896	8,274	2,890	1,444	656	1,090	1,176
Flow exceeded for 30% of the days	1,818	2,790	1,291	9,262	3,348	1,775	828	1,391	1,669
Flow exceeded for 20% of the days	2,469	3,519	1,701	10,544	4,193	2,066	1,087	1,841	2,085
Flow exceeded for 10% of the days	3,624	5,975	2,569	13,056	6,313	2,715	1,424	3,050	2,971
Maximum	19,143	19,143	7,356	14,941	19,143	10,963	4,313	7,356	6,491
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	3	29	3	4,689	43	29	3	10	7
Flow exceeded for 90% of the days	83	463	49	5,949	1,103	116	38	70	52
Flow exceeded for 80% of the days	278	936	152	6,964	1,473	397	111	172	171
Flow exceeded for 70% of the days	516	1,227	337	7,135	1,847	685	281	324	366
Flow exceeded for 60% of the days	732	1,573	499	7,488	2,235	949	449	552	548
Flow exceeded for 50% of the days	1,022	1,907	659	7,917	2,631	1,149	552	800	764
Flow exceeded for 40% of the days	1,353	2,324	855	8,738	2,923	1,374	650	1,038	1,065
Flow exceeded for 30% of the days	1,775	2,835	1,183	10,162	3,235	1,692	764	1,332	1,560
Flow exceeded for 20% of the days	2,488	3,436	1,593	11,355	4,140	2,059	971	1,741	1,977
Flow exceeded for 10% of the days	3,648	6,224	2,539	12,536	6,379	2,757	1,341	3,114	2,909
Maximum	18,020	18,020	7,225	12,999	18,020	10,039	3,920	7,225	6,279
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	8	30	8	6,193	379	30	33	19	8
Flow exceeded for 90% of the days	227	709	147	7,587	1,244	401	166	145	132
Flow exceeded for 80% of the days	408	992	304	8,015	1,730	688	283	302	312
Flow exceeded for 70% of the days	576	1,237	421	8,474	2,001	858	384	487	435
Flow exceeded for 60% of the days	754	1,638	544	9,161	2,388	980	489	634	555
Flow exceeded for 50% of the days	954	1,960	666	9,681	2,769	1,159	567	739	716
Flow exceeded for 40% of the days	1,276	2,435	807	10,194	2,961	1,289	656	927	911
Flow exceeded for 30% of the days	1,795	2,926	1,020	10,552	3,231	1,571	769	1,270	1,295
Flow exceeded for 20% of the days	2,603	3,629	1,457	10,734	4,715	1,969	904	1,631	1,922
Flow exceeded for 10% of the days	3,834	6,289	2,589	10,890	6,024	3,754	1,157	3,431	2,893
Maximum	15,697	15,697	6,755	11,043	15,697	9,057	3,208	6,755	6,212

Table A.3-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

North Platte River below Whalen Diversion Dam, WY Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	5	20	5	5,822	256	20	9	14	5
Flow exceeded for 90% of the days	326	838	187	5,842	1,530	397	150	195	238
Flow exceeded for 80% of the days	802	1,260	604	6,412	1,950	873	411	745	787
Flow exceeded for 70% of the days	1,130	1,600	934	6,412	2,265	1,090	667	1,110	1,190
Flow exceeded for 60% of the days	1,310	1,890	1,160	6,784	2,600	1,282	820	1,290	1,350
Flow exceeded for 50% of the days	1,460	2,172	1,300	6,987	2,896	1,515	1,010	1,380	1,450
Flow exceeded for 40% of the days	1,630	2,606	1,410	7,498	3,155	1,670	1,140	1,480	1,570
Flow exceeded for 30% of the days	1,950	3,014	1,530	7,914	3,515	1,870	1,230	1,590	1,710
Flow exceeded for 20% of the days	2,660	3,585	1,710	9,668	3,992	2,090	1,320	1,790	1,950
Flow exceeded for 10% of the days	3,720	5,746	2,400	11,946	5,620	2,637	1,470	3,095	3,127
Maximum	19,886	19,886	7,430	19,886	19,500	12,000	4,540	7,430	6,850
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	5	20	5	5,835	280	20	13	23	5
Flow exceeded for 90% of the days	366	860	219	5,963	1,585	448	190	240	249
Flow exceeded for 80% of the days	817	1,260	618	6,334	1,987	875	441	738	816
Flow exceeded for 70% of the days	1,140	1,603	950	6,526	2,315	1,087	656	1,127	1,197
Flow exceeded for 60% of the days	1,313	1,913	1,167	6,774	2,609	1,279	822	1,297	1,353
Flow exceeded for 50% of the days	1,467	2,172	1,303	7,012	2,910	1,513	1,018	1,377	1,453
Flow exceeded for 40% of the days	1,633	2,612	1,410	7,271	3,170	1,687	1,147	1,473	1,573
Flow exceeded for 30% of the days	1,954	3,043	1,530	7,818	3,480	1,873	1,233	1,590	1,712
Flow exceeded for 20% of the days	2,673	3,561	1,710	9,310	3,934	2,070	1,319	1,787	1,933
Flow exceeded for 10% of the days	3,680	5,751	2,360	12,591	5,600	2,627	1,463	3,093	3,185
Maximum	19,433	19,433	7,390	16,780	19,433	11,833	4,250	7,390	6,607
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	6	50	6	5,839	595	50	24	32	6
Flow exceeded for 90% of the days	459	890	307	6,015	1,658	509	258	358	362
Flow exceeded for 80% of the days	849	1,302	662	6,281	2,085	891	522	803	897
Flow exceeded for 70% of the days	1,146	1,643	957	6,604	2,389	1,061	684	1,128	1,214
Flow exceeded for 60% of the days	1,326	1,952	1,175	6,823	2,617	1,289	827	1,307	1,363
Flow exceeded for 50% of the days	1,470	2,239	1,314	6,909	2,911	1,507	1,000	1,379	1,474
Flow exceeded for 40% of the days	1,647	2,616	1,410	7,243	3,160	1,681	1,140	1,483	1,573
Flow exceeded for 30% of the days	1,980	3,028	1,534	7,734	3,464	1,874	1,222	1,593	1,713
Flow exceeded for 20% of the days	2,645	3,540	1,707	9,061	3,929	2,073	1,304	1,793	1,914
Flow exceeded for 10% of the days	3,640	5,798	2,339	12,654	5,670	2,605	1,443	3,121	3,236
Maximum	19,143	19,143	7,356	14,941	19,143	10,963	4,173	7,356	6,491
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	22	131	22	5,992	602	131	37	78	22
Flow exceeded for 90% of the days	571	933	467	6,091	1,773	595	412	515	563
Flow exceeded for 80% of the days	908	1,274	764	6,398	2,188	926	568	900	1,019
Flow exceeded for 70% of the days	1,150	1,735	999	6,699	2,463	1,075	733	1,157	1,269
Flow exceeded for 60% of the days	1,319	2,037	1,184	6,827	2,729	1,251	863	1,302	1,382
Flow exceeded for 50% of the days	1,479	2,285	1,308	6,932	2,947	1,552	994	1,404	1,479
Flow exceeded for 40% of the days	1,661	2,689	1,419	7,128	3,161	1,756	1,106	1,492	1,575
Flow exceeded for 30% of the days	2,021	3,067	1,539	7,705	3,449	1,931	1,209	1,603	1,720
Flow exceeded for 20% of the days	2,703	3,508	1,697	8,662	3,874	2,119	1,275	1,786	1,899
Flow exceeded for 10% of the days	3,634	5,704	2,303	10,907	5,663	2,556	1,400	3,137	3,243
Maximum	18,020	18,020	7,225	12,999	18,020	10,039	3,773	7,225	6,300
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	126	310	126	6,303	689	310	245	215	126
Flow exceeded for 90% of the days	745	975	679	6,407	1,945	638	554	717	887
Flow exceeded for 80% of the days	989	1,250	896	6,532	2,236	959	703	993	1,167
Flow exceeded for 70% of the days	1,168	1,838	1,057	6,693	2,516	1,086	807	1,183	1,342
Flow exceeded for 60% of the days	1,328	2,063	1,196	6,855	2,795	1,250	905	1,295	1,418
Flow exceeded for 50% of the days	1,482	2,388	1,314	7,024	3,004	1,589	1,002	1,407	1,497
Flow exceeded for 40% of the days	1,648	2,748	1,419	7,282	3,168	1,781	1,077	1,487	1,574
Flow exceeded for 30% of the days	2,037	3,101	1,523	7,650	3,370	1,970	1,153	1,558	1,674
Flow exceeded for 20% of the days	2,726	3,456	1,650	8,340	3,833	2,148	1,240	1,753	1,873
Flow exceeded for 10% of the days	3,581	5,700	2,313	9,418	5,720	2,542	1,330	2,766	3,416
Maximum	15,697	15,697	6,426	10,550	15,697	8,558	2,645	6,426	6,212

Table A.3-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

North Platte River below Whalen Diversion Dam, WY	Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows	Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days	10	10	25	1,742	110	10	34	76	25
Flow exceeded for 90% of the days	228	315	210	1,821	836	82	120	243	305
Flow exceeded for 80% of the days	460	674	388	2,104	1,200	241	243	362	474
Flow exceeded for 70% of the days	710	1,055	576	2,229	1,560	502	517	522	674
Flow exceeded for 60% of the days	974	1,330	820	2,355	1,820	734	720	806	950
Flow exceeded for 50% of the days	1,150	1,580	1,020	4,758	2,080	1,040	888	1,040	1,120
Flow exceeded for 40% of the days	1,300	1,850	1,160	5,842	2,430	1,260	1,000	1,250	1,260
Flow exceeded for 30% of the days	1,470	2,150	1,280	5,842	2,770	1,440	1,110	1,350	1,380
Flow exceeded for 20% of the days	1,740	2,650	1,410	6,355	3,300	1,610	1,200	1,460	1,500
Flow exceeded for 10% of the days	2,580	3,540	1,580	6,412	3,805	1,903	1,292	1,620	1,750
Maximum	13,100	13,100	6,850	7,812	13,100	6,640	1,820	4,120	6,850
3-day Average Flows	Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
	Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days	10	10	29	1,795	137	10	36	93	29
Flow exceeded for 90% of the days	246	338	228	1,832	854	88	126	253	328
Flow exceeded for 80% of the days	477	690	404	2,102	1,230	270	267	380	489
Flow exceeded for 70% of the days	723	1,063	585	2,229	1,555	515	535	521	679
Flow exceeded for 60% of the days	980	1,343	828	2,313	1,860	742	725	807	969
Flow exceeded for 50% of the days	1,149	1,583	1,017	4,558	2,110	1,061	892	1,047	1,127
Flow exceeded for 40% of the days	1,303	1,867	1,153	5,838	2,431	1,259	1,002	1,241	1,255
Flow exceeded for 30% of the days	1,467	2,150	1,277	5,935	2,766	1,447	1,113	1,350	1,373
Flow exceeded for 20% of the days	1,740	2,627	1,400	6,264	3,273	1,600	1,183	1,453	1,493
Flow exceeded for 10% of the days	2,573	3,458	1,569	6,429	3,691	1,930	1,290	1,617	1,721
Maximum	9,293	9,293	6,563	7,127	9,293	5,200	1,790	4,070	6,563
7-day Average Flows	Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
	Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days	14	14	35	1,810	379	14	41	98	35
Flow exceeded for 90% of the days	285	387	262	1,847	889	100	149	289	350
Flow exceeded for 80% of the days	502	726	430	2,065	1,236	311	305	411	503
Flow exceeded for 70% of the days	749	1,088	614	2,229	1,562	549	566	552	719
Flow exceeded for 60% of the days	990	1,352	840	2,442	1,844	773	734	840	976
Flow exceeded for 50% of the days	1,153	1,573	1,022	4,607	2,113	1,051	883	1,054	1,129
Flow exceeded for 40% of the days	1,303	1,857	1,151	5,842	2,421	1,266	996	1,229	1,249
Flow exceeded for 30% of the days	1,454	2,153	1,269	6,017	2,708	1,454	1,096	1,339	1,363
Flow exceeded for 20% of the days	1,715	2,585	1,383	6,098	3,184	1,593	1,177	1,426	1,474
Flow exceeded for 10% of the days	2,549	3,415	1,541	6,412	3,609	1,909	1,275	1,589	1,693
Maximum	6,873	6,873	6,439	6,873	6,676	3,071	1,689	3,993	6,439
15-day Average Flows	Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
	Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days	22	22	58	1,852	432	22	58	132	193
Flow exceeded for 90% of the days	357	434	340	1,935	1,014	142	195	327	409
Flow exceeded for 80% of the days	543	771	488	2,088	1,321	376	407	458	557
Flow exceeded for 70% of the days	786	1,131	680	2,210	1,575	541	608	632	775
Flow exceeded for 60% of the days	994	1,379	861	2,872	1,821	794	767	887	967
Flow exceeded for 50% of the days	1,158	1,573	1,013	4,446	2,117	1,078	875	1,074	1,133
Flow exceeded for 40% of the days	1,280	1,871	1,147	5,684	2,366	1,247	980	1,198	1,235
Flow exceeded for 30% of the days	1,432	2,139	1,242	5,962	2,686	1,440	1,069	1,293	1,349
Flow exceeded for 20% of the days	1,712	2,541	1,359	6,028	3,104	1,584	1,166	1,385	1,445
Flow exceeded for 10% of the days	2,504	3,303	1,493	6,289	3,488	1,923	1,257	1,538	1,618
Maximum	6,608	6,608	6,300	6,608	6,003	2,327	1,539	3,943	6,300
30-day Average Flows	Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
	Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days	44	44	148	2,036	472	44	148	288	347
Flow exceeded for 90% of the days	489	472	495	2,116	1,144	213	407	477	564
Flow exceeded for 80% of the days	659	822	628	2,394	1,424	427	563	602	704
Flow exceeded for 70% of the days	831	1,170	753	2,920	1,604	627	682	746	835
Flow exceeded for 60% of the days	992	1,401	892	3,566	1,834	833	767	905	984
Flow exceeded for 50% of the days	1,146	1,588	996	4,214	2,059	1,076	888	1,050	1,108
Flow exceeded for 40% of the days	1,249	1,857	1,118	4,839	2,348	1,210	966	1,169	1,201
Flow exceeded for 30% of the days	1,403	2,080	1,209	5,470	2,620	1,409	1,016	1,239	1,302
Flow exceeded for 20% of the days	1,711	2,545	1,306	5,923	3,022	1,579	1,145	1,335	1,406
Flow exceeded for 10% of the days	2,496	3,151	1,439	6,153	3,355	1,912	1,219	1,465	1,577
Maximum	6,322	6,322	5,850	6,322	5,816	2,115	1,409	3,847	5,850

interval, coincident with the beginning of operation of Guernsey Reservoir in 1928. The drought conditions of the 1930's also occurred during this time interval. There are also decreases in flow values from the 1928-1941 time interval through the 1959-1974 time interval, coincident with the beginning of operation of the other upstream reservoir projects (**Table 2** of the main report).

Table A.3-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.3-12** shows steady decreases in flow values for all time intervals from 1910-1927 through 1942-1958 for all averaging times, coincident with the beginning of operation of the major upstream reservoir projects. For the 1942-1958 time interval and all time intervals thereafter, the flow values are generally consistent with known climatological conditions.

Table A.3-13 shows the exceedance probabilities and values of flows for the Jun1-Aug 15 seasonal period. **Table A.3-13** shows a similar characterization to that for the Apr 16-Jul 15 seasonal period, except that the decreases in flow values for the 1910-1927 through the 1942-1958 time intervals are not as great for this seasonal period as for the preceding seasonal period.

Table A.3-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.3-14** shows a general return to variations by time interval that are mainly due to climatic factors. There are some decreases in flow values from the 1910-1927 through the 1942-1958 time intervals, coincident with the beginning of operation of previously mentioned major reservoir projects, but the decreases are considerably smaller than those for the two preceding seasonal periods.

A.3.5 Median Mean Daily Flow

The Median mean daily flow by calendar day is shown on **Figure A.3-6**. **Figure A.3-6** shows a broad spread of values from May through September with a poorly defined peak in June through August for the 1910-1927 time interval; and much lower values with a somewhat better defined peak in late June and early July, followed by a gradual decrease through September, for the 1928-1941 through 1975-1998 time intervals. Also, the values for the non-irrigation season are lower than those for the 1910-1927 time interval for all subsequent time intervals. These characterizations are generally coincident with the beginning of operation of the major upstream reservoir projects (**Table 2** of the main report), except that there is little change coincident with the beginning of operation of Glendo Dam in 1958.

A.3.6 USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.3-7** and **Figure A.3-8** and in **Table A.3-15** and **Table A.3-16**. Because the continuous period of record for USGS Annual Peak Flow begins in 1938, only incomplete characterizations are possible.

Figure A.3-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak flow, and the 10-year running average of the USGS Annual Peak Flow. **Figure A.3-7** shows that, except for a major flood event in 1955, the USGS Annual Peak flow and the Annual Maximum mean daily flow very closely coincide or show only small differences over the available period of record. All of the major upstream reservoir projects except Glendo Reservoir had begun operation by 1942.

Figure A.3-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.3-8** shows that more than half of the Peak flows over the available period of record occurred in July or early August. This is coincident with the height of the downstream irrigation season. Less than half of the Peak flows over the available period of record occurred during May and June, which is the natural period of greatest high country snowmelt runoff. The May-June Peak flows were generally higher than the majority of the Peak flows that occurred during other times of the year.

Table A.3-15 compares the average and median values of the USGS Annual Peak flow by time interval. **Table A.3-15** shows that, for the 1959-1974 through 1975-1998 time intervals, the average USGS Annual Peak flow is greater than the median, and that the difference increases by time interval. For the 1942-1958 time interval, during which drought conditions with the resulting low flows occurred for part of the time, the values are nearly equal. The values are greatest for the 1975-1998 time interval, during which there were several major flood events. The time intervals prior to 1928-1941 were not considered due to a lack of data.

Table A.3-16 shows the exceedance probabilities and values for the USGS Annual flow. It is analogous to **Table A.3-5** for Annual Maximum mean daily flows. **Table A.3-16** shows only small decreases in the difference between exceedance values with increasing averaging time for the 1928-1941 through 1975-1998 time intervals. All of the major upstream reservoir projects except Glendo Reservoir had begun operation by 1942. The 1895-1909 and 1910-1927 time intervals were not considered due to a lack of data.

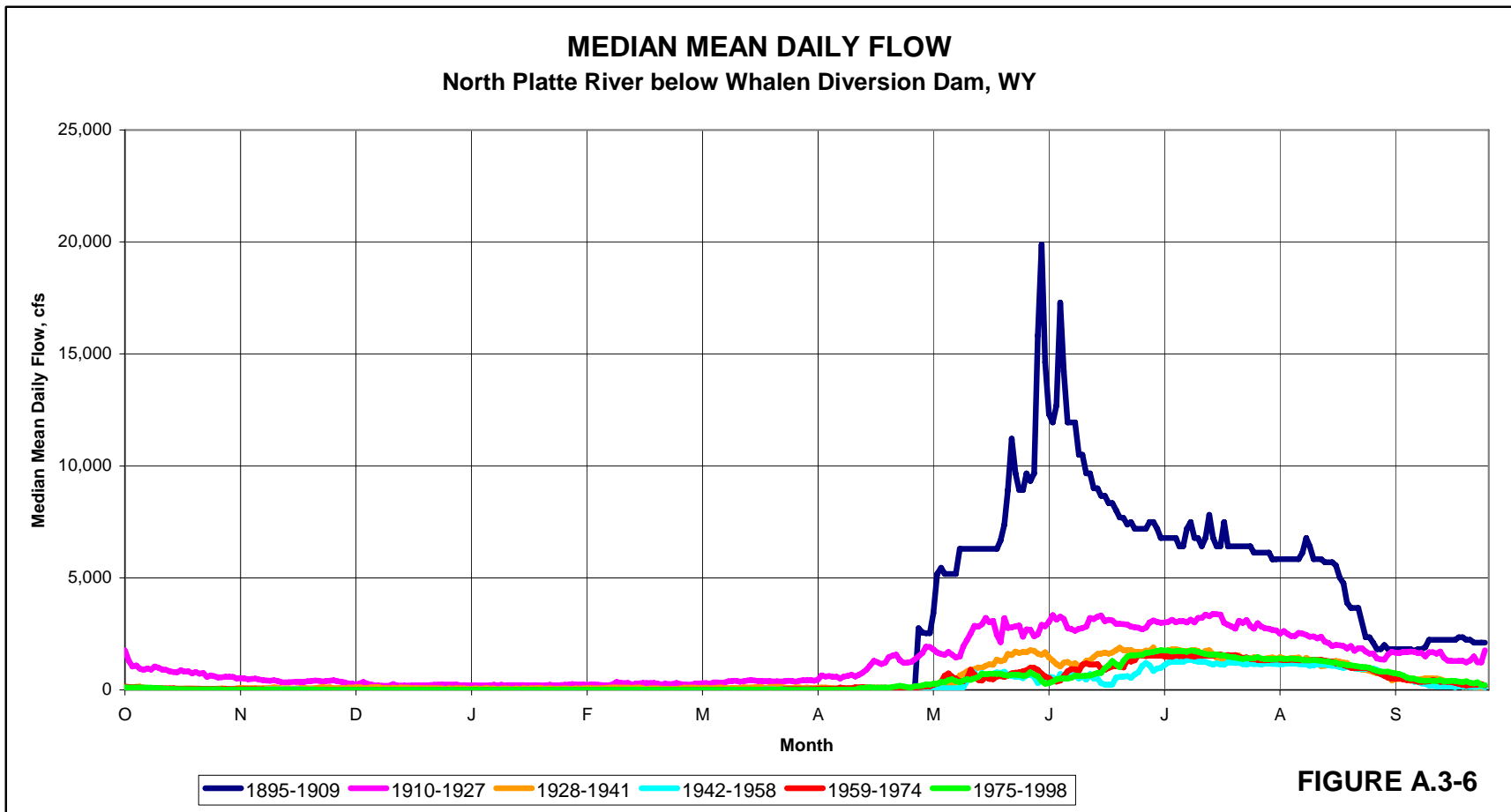


Figure A.3-6 Median Mean Daily Flow.

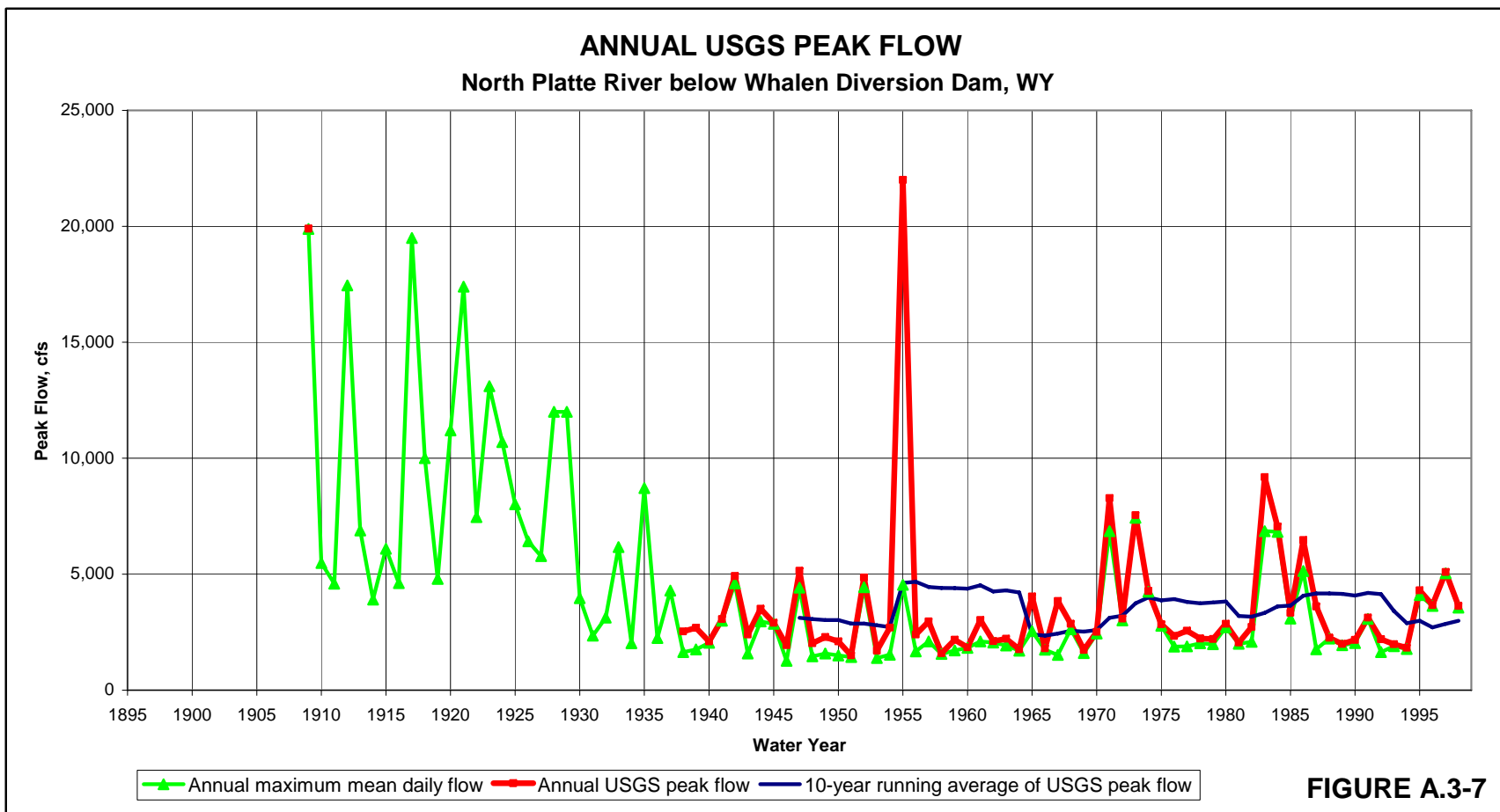


FIGURE A.3-7

Figure A.3-7 Annual USGS Peak Flow.

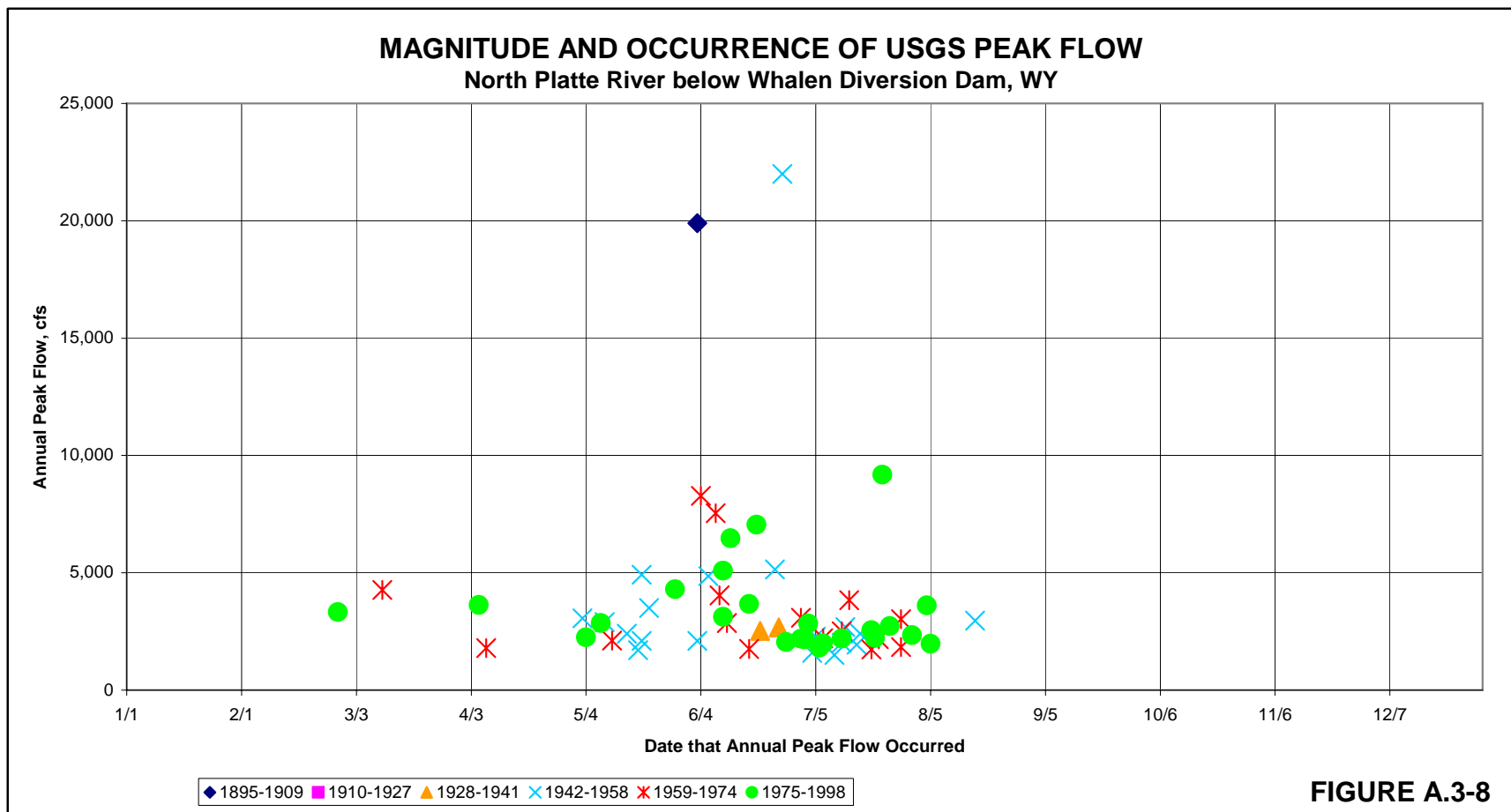


Table A.3-15 Summary of USGS Peak Flows.

North Platte River below Whalen Diversion Dam, WY	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	3,740	6,054	3,537	19,900		2,593	3,935	3,316	3,402
Median Annual Peak Flow (cfs)	2,685	2,680	2,690	19,900		2,605	2,400	2,685	2,785
Average Occurrence of Peak Flow	6/18	6/4	6/19	6/3		6/5	6/19	6/16	6/21
Median Occurrence of Peak Flow	6/26	6/3	7/1	6/3		6/20	6/26	7/1	7/2

Table A.3-16 USGS Peak Flow Exceedance Values.

North Platte River below Whalen Diversion Dam, WY Annual Peak Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Peak exceeded in 100% of the years	1,500	2,100	1,500	19,900		2,100	1,500	1,730	1,820
Peak exceeded in 90% of the years	1,822	2,272	1,812	19,900		2,229	1,656	1,780	2,008
Peak exceeded in 80% of the years	2,060	2,444	2,026	19,900		2,358	1,956	1,840	2,178
Peak exceeded in 70% of the years	2,193	2,560	2,186	19,900		2,487	2,084	2,140	2,218
Peak exceeded in 60% of the years	2,364	2,620	2,304	19,900		2,560	2,328	2,210	2,384
Peak exceeded in 50% of the years	2,685	2,680	2,690	19,900		2,605	2,400	2,685	2,785
Peak exceeded in 40% of the years	2,936	2,832	2,936	19,900		2,650	2,816	3,020	3,068
Peak exceeded in 30% of the years	3,449	2,984	3,522	19,900		2,718	3,068	3,460	3,612
Peak exceeded in 20% of the years	4,224	6,428	4,224	19,900		2,832	4,588	4,040	3,922
Peak exceeded in 10% of the years	6,337	13,164	5,672	19,900		2,946	5,008	5,905	6,056
Peak Flow	22,000	19,900	22,000	19,900		3,060	22,000	8,280	9,180

A.4 NORTH PLATTE RIVER ABOVE LAKE MCCONAUGHY, NEBRASKA

A.4.1 Methodology

For this location, a single continuous streamflow record was constructed using records from four gages, as follows:

Gage	Records Used	Data Source
North Platte River at Camp Clarke, NE	6/27/1896 – 10/31/1900 (mainly warm season only)	1914 Nebraska Hydrographic Report
North Platte River at Mitchell, NE	6/9/1901 – 7/20/1901; 8/12/1901 – 11/12/1901; 4/1/1907 – 12/23/1911	1914 Nebraska Hydrographic Report
North Platte at Scottsbluff, NE	6/1/1912 – 9/16/1912	1914 Nebraska Hydrographic Report
North Platte River at Bridgeport, NE	5/4/1902 – 11/10/1906; 6/5/1915 – 12/31/1921 (mainly warm season only); 4/1/1922-9/30/1998	Prior to 1915, 1914 Nebraska Hydrographic Report; 1915-1928, 1929 Nebraska Hydrographic Report; 1929-1932, 1935 Nebraska Hydrographic Report; 1931-9/30/1991, USGS website; 10/1/1991-1998, Nebraska DNR website.
Note: The USGS states that the North Platte River at Bridgeport gage was published as the North Platte River near Camp Clark gage for the years 1896-1900.		

Where data does not exist for the North Platte River at Bridgeport, Nebraska, data from the other gages were substituted. The gages cover approximately 40 miles of the North Platte River from Mitchell, Nebraska to Bridgeport, Nebraska. The Bridgeport and Camp Clark gages are approximately four miles apart and the Mitchell and Scottsbluff gages are approximately ten miles apart. For the period 10/1/1930 through 9/30/1991, there are 679 days where the mean daily flow at the Mitchell gage was greater than the flow at the Bridgeport gage and 21,584 days that the Bridgeport gage had the greater flow. The average difference between the two gages when Mitchell had the greater flow is 192 cfs and the average difference when Bridgeport had the greater flow is 527 cfs. Therefore, the Mitchell gage used as an estimator of flows at the Bridgeport gage does not significantly increase the flow characteristics for this reach of the river.

These gage locations are farther downstream of Guernsey Reservoir than the locations discussed in **Sections A.2** and **A.3**, both of which are only a short distance downstream of Guernsey Reservoir. Thus, there is a significant intervening uncontrolled drainage area between Guernsey Reservoir and the gage locations considered in this section. This

uncontrolled drainage area has an effect on some of the characterizations discussed in the following paragraphs due to runoff from local rainfall and snowmelt within the area.

Summary statistics characterizing this record are presented in **Table A.4-1** (mean daily values), **Table A.4-2** (annual 3-, 7-, 15- and 30-day running averages), **Table A.4-3** (seasonal 3-, 7-, 15- and 30-day running averages), and **Table A.4-4** (flow frequencies).

A.4.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.4-1 shows that there was a steady decrease in both average and median Annual Maximum mean daily flow and annual flow volume by time interval from the beginning of the period of record through the 1942-1958 time interval. Since the 1942-1958 time interval, these quantities have remained relatively constant, except for small variations by time interval which correspond to climatic variations such as the 1950's drought period (climate data is shown in **Figures 3, 4, 5, and 8** of the main report).

Figure A.4-1 (maximum flows) and **Figure A.4-2** (annual flow volume) show decreases in mean daily and annual flow values coincident with the development of the upstream reservoirs (**Table 2** of the main report). The decrease is particularly noticeable from the 1910-1927 time interval to the 1928-1942 interval; Guernsey Reservoir began operation in 1927. **Figure A.4-1** shows that, prior to 1927, the Annual Maximum mean daily flow was usually noticeably higher than the annual maximum 30-day average flow. Between 1928 and 1941 there are an increasing number of years where this difference is not as great. After 1941, the difference is relatively small in most years; it is particularly noteworthy that for several significant individual high water events in the 1970's and 1980's there is almost no difference between the Annual Maximum mean daily and the maximum 30-day average. **Figure A.4-1** also shows a steadily decreasing 10-year running average of the Annual Maximum mean daily flow from 1928 through 1945, after which time it remains more or less steady, except for increases due to periods of high water in the early 1970's and mid-1980's. **Figure A.4-2** shows major fluctuations by year between high and low annual flow volume through 1927, less fluctuation and fewer extremes from 1928 through 1941, and relatively little change from year to year after 1941, except for the previously mentioned high water events in the 1970's and 1980's.

Figure A.4-3 shows that the majority of Annual Maximum mean daily flows occurred in mid-May through mid-June for the 1895-1909 and 1910-1927 time intervals. However, there is a broader distribution of the timing of the Annual Maximum mean daily flows at this location, particularly into July and August, for all subsequent time intervals.

The average maximum mean daily flows are highest during the Apr 16-Jul 15 seasonal period for all time intervals (**Table A.4-1**).

Table A.4-1 Summary of Mean Daily Flow Values.

North Platte River above Lake McConaughy , NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	6,569	10,014	4,030	15,065	8,960	6,017	4,006	4,283	3,878
Median Annual Maximum Mean Daily Flow (cfs)	4,410	8,310	3,130	14,838	7,550	3,810	3,460	2,895	3,350
Average Annual Flow Volume (kaf)	1,069	1,262	926	1,530	1,248	1,009	839	973	957
Median Annual Flow Volume (kaf)	873	1,133	838	1,391	1,258	752	851	804	758
Average Mean Daily Flow (cfs)	1,771	2,439	1,280	3,511	2,413	1,393	1,159	1,344	1,322
Median Mean Daily Flow (cfs)	1,130	1,483	1,020	1,735	1,850	1,103	1,190	1,005	977
Average Number of Mean Daily Flow Measurements	329	280	365	210	265	365	365	365	365
Number of Years of Data	99 of 104	42 of 47	57 of 57	14 of 15	14 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	1,531	1,916	1,376	1,255	2,390	1,773	1,329	1,479	1,341
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	6,191	9,540	3,723	15,065	8,281	5,274	3,719	4,014	3,533
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	5,807	8,977	3,471	14,458	7,630	4,844	3,300	3,804	3,371
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	2,919	3,818	2,257	4,376	4,566	2,512	1,994	2,196	2,484
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	1,260	1,600	1,100	1,255	2,200	1,520	1,320	1,060	986
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	4,150	7,550	2,900	14,838	7,400	2,590	3,220	2,865	2,445
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	3,500	7,075	2,800	13,318	6,990	2,100	3,130	2,850	2,145
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	2,160	3,040	2,090	2,725	4,300	1,620	1,760	2,125	2,090
Difference ("Apr-Jul Average" - "Jul-Sep Average")	3,272	5,722	1,466	10,689	3,714	2,761	1,725	1,818	1,049
Difference ("Apr-Jul Median" - "Jul-Sep Median")	1,990	4,510	810	12,113	3,100	970	1,460	740	355
Average Occurrence of Maximum Mean Daily Flow	6/18	6/14	6/21	6/9	6/20	6/13	6/23	6/18	6/23
Median Occurrence of Maximum Mean Daily Flow	6/12	6/9	6/16	6/9	6/19	6/7	6/14	6/17	6/16
Average Annual Minimum Mean Daily Flow (cfs)	372	460	343		942	288	285	281	425
Median Annual Minimum Mean Daily Flow (cfs)	314	396	310		1,050	194	271	224	413
Average occurrences per year of the Minimum	1	2	1		4	1	1	1	1
Occurring between	7/19	7/25	7/17		9/24	7/4	7/4	7/19	7/25
and	7/24	8/10	7/18		11/21	7/5	7/6	7/20	7/27
Median occurrences per year of the Minimum	1	1	1		1	1	1	1	1
Occurring between	7/12	6/18	7/12		7/13	6/18	7/10	7/15	7/15
and	7/13	7/2	7/13		2/20	6/19	7/11	7/16	7/16

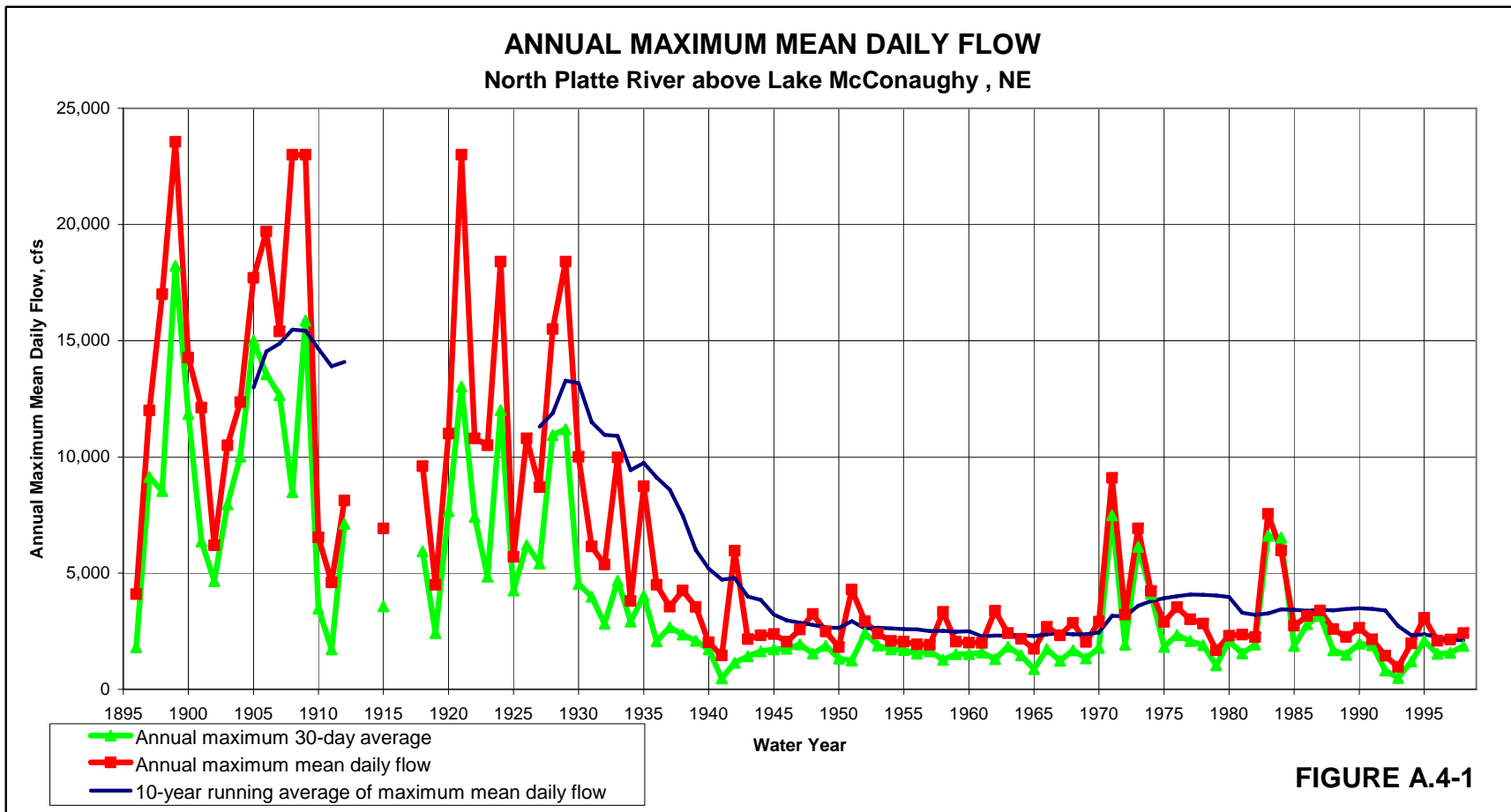


Figure A.4-1 Annual Maximum Mean Daily Flow.

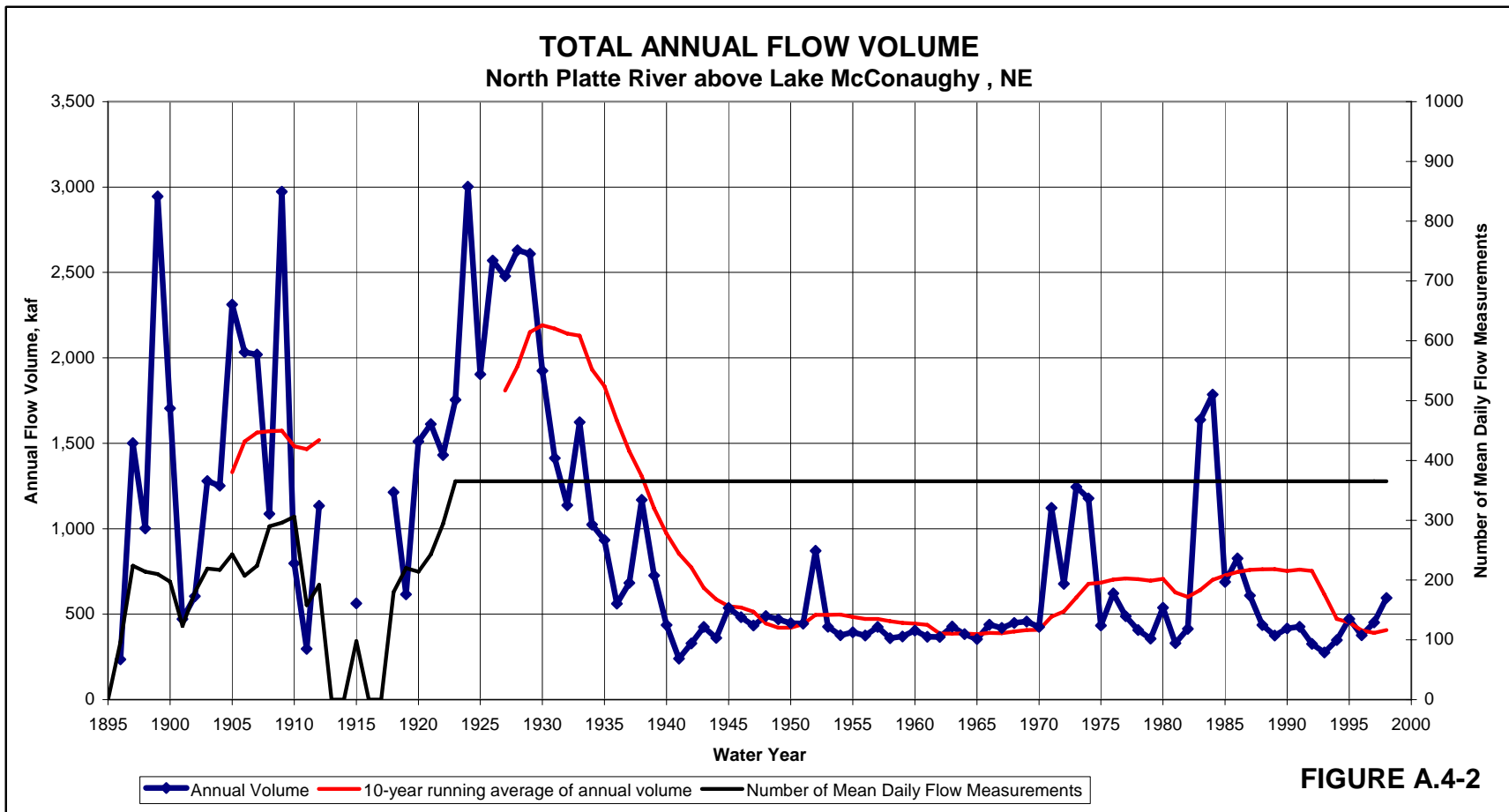


Figure A.4-2 Total Annual Flow Volume.

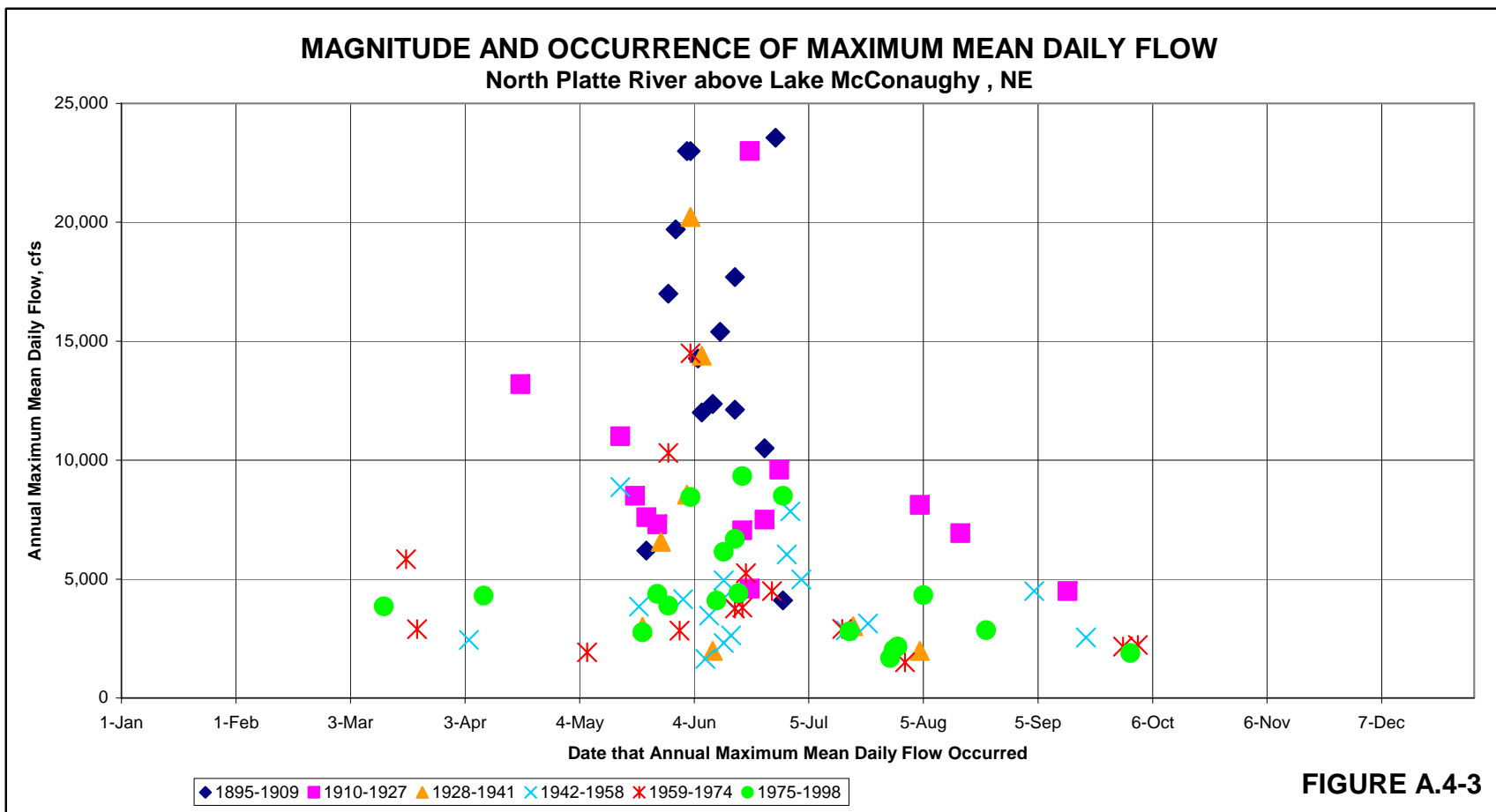


Figure A.4-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

Decreases in the maximum flows from the Apr 16-Jul 15 seasonal period to June 1-Aug 15 are quite large for the 1895-1909 time interval and noticeably smaller for all subsequent time intervals. Both the average and median Dates of Maximum Flow occur in June for all time intervals

Table A.4-1 also shows that the average Annual Minimum mean daily flow is less than the median for the 1910-1927 time interval. For all other time intervals the average is greater than the median. The average and median Annual Minimum mean daily flow are noticeably higher for the 1910-1927 time interval than for any other time interval.

Figure A.4-4 shows a pattern of high variability from one year to the next through the 1928-1941 time interval, and less variability for all subsequent time intervals. **Table A.4-1** does show a change in the Dates of Minimum Flow. During the 1910-1927 time interval, the Annual Minimum mean daily flow occurred most often between September and February. The occurrence of the Annual Minimum shifted to the first half of June for the 1928-1941 time interval and July for all other time intervals. Annual Minimum mean daily flows were not calculated for years with incomplete flow records. Hence, there is no characterization of minimum flows for the 1895-1909 time interval.

A.4.3 3-, 7-, 15-, and 30-Day Averages of Mean Daily Flows

Table A.4-2 shows that there was some attenuation of all flow values due to the 3-, 7-, 15-, and 30-day flow averaging, but not a large attenuation. For maximum flows, the attenuation due to averaging is greatest for the 1895-1909 time interval and grows smaller for subsequent time intervals. There was no clear pattern by time interval to the attenuation by averaging for the minimum flows. All other flow characteristics are essentially the same as those for the Annual Maximum and Annual Minimum mean daily flows.

Table A.4-3 shows the average and median maximum 3-, 7-, 15-, and 30-day mean flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal periods defined in the introduction to this Appendix. **Table A.4-3** shows that, for the 1895-1909 time interval, there is a significant decrease in all values with increasing averaging time. Also, the highest average and median flows occur in the Apr 16-Jun 15 and the Jun 1-Aug 15 seasonal periods, with the values for the Apr 16-Jun 15 seasonal period being slightly higher. The lowest values are those for the Feb 15-Mar 16 seasonal period. This is what one would expect for a predominantly climatologically driven system such as this basin was prior to 1909.

For the 1910-1927 time interval, the same characterizations as those for the 1895-1909 time interval are seen, but the actual flow values are nearly half of the 1895-1909 values for the Apr 16-Jul 15 and the Jun 1-Aug 15 time intervals. Also, there is noticeably less decrease in all values with increasing averaging time.

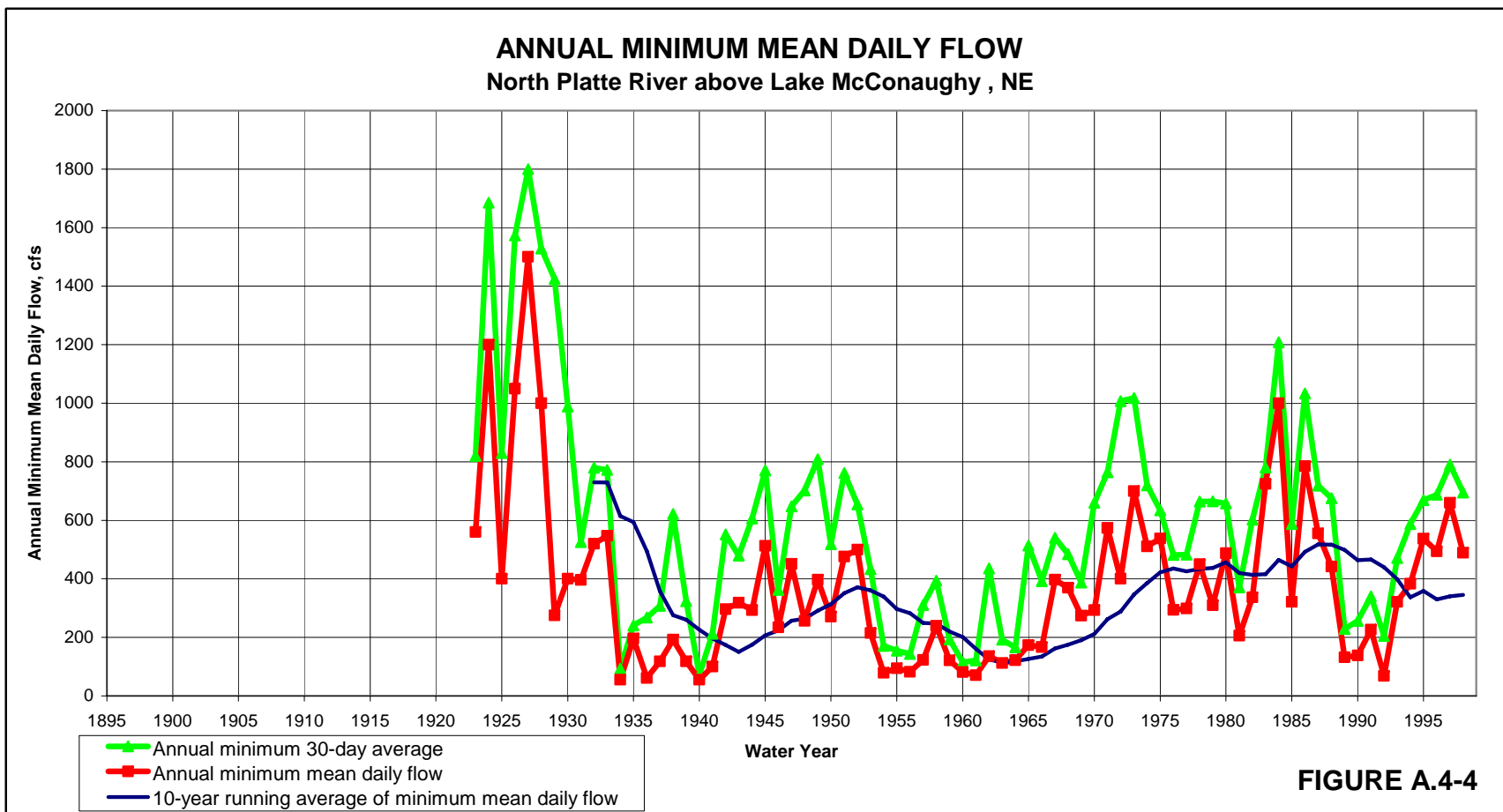


FIGURE A.4-4

Figure A.4-4 Annual Minimum Mean Daily Flow.

Table A.4-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

North Platte River above Lake McConaughy , NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	6,569	10,014	4,030	15,065	8,960	6,017	4,006	4,283	3,878
Median Annual Maximum Mean Daily Flow (cfs)	4,410	8,310	3,130	14,838	7,550	3,810	3,460	2,895	3,350
Avg. Ann. Max. 3-day Avg. Flow (cfs)	6,064	9,197	3,755	14,077	8,044	5,470	3,609	4,019	3,682
Median Ann. Max. 3-day Avg. Flow (cfs)	4,027	7,375	2,830	14,788	7,100	3,553	2,830	2,698	3,053
Avg. Ann. Max. 7-day Avg. Flow (cfs)	5,521	8,336	3,447	12,954	7,339	4,716	3,118	3,828	3,426
Median Ann. Max. 7-day Avg. Flow (cfs)	3,346	6,929	2,491	13,548	6,704	2,839	2,491	2,459	2,633
Avg. Ann. Max. 15-day Avg. Flow (cfs)	4,925	7,359	3,132	11,680	6,402	3,994	2,670	3,546	3,183
Median Ann. Max. 15-day Avg. Flow (cfs)	3,047	5,602	2,192	10,748	5,602	2,220	2,192	2,368	2,076
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,331	6,402	2,805	10,295	5,463	3,447	2,194	3,237	2,949
Median Ann. Max. 30-day Avg. Flow (cfs)	2,701	4,791	1,876	9,579	4,791	1,920	1,884	1,992	1,778
Average Annual Minimum Mean Daily Flow (cfs)	372	460	343		942	288	285	281	425
Median Annual Minimum Mean Daily Flow (cfs)	314	396	310		1,050	194	271	224	413
Avg. Ann. Min. 3-day Avg. Flow (cfs)	400	513	362		1,060	317	301	301	447
Median Ann. Min. 3-day Avg. Flow (cfs)	333	433	329		1,250	206	283	234	442
Avg. Ann. Min. 7-day Avg. Flow (cfs)	437	566	394		1,120	369	331	334	479
Median Ann. Min. 7-day Avg. Flow (cfs)	377	514	371		1,279	245	331	272	496
Avg. Ann. Min. 15-day Avg. Flow (cfs)	506	660	454		1,234	456	402	399	528
Median Ann. Min. 15-day Avg. Flow (cfs)	450	537	448		1,467	302	436	341	556
Avg. Ann. Min. 30-day Avg. Flow (cfs)	599	782	538		1,342	583	498	482	604
Median Ann. Min. 30-day Avg. Flow (cfs)	587	772	552		1,574	425	519	460	646

Table A.4-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

North Platte River above Lake McConaughy , NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	6,064	9,197	3,755	14,077	8,044	5,470	3,609	4,019	3,682
Median Ann. Max. 3-day Avg. Flow (cfs)	4,027	7,375	2,830	14,788	7,100	3,553	2,830	2,698	3,053
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	1,484	1,850	1,336	1,145	2,304	1,724	1,290	1,441	1,298
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	5,669	8,734	3,410	14,077	7,399	4,727	3,283	3,731	3,286
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	5,398	8,360	3,216	13,652	7,129	4,299	2,947	3,520	3,204
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,667	3,423	2,110	3,894	4,249	2,127	1,806	2,082	2,344
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	1,202	1,533	1,077	1,145	2,200	1,508	1,293	1,030	975
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	3,680	6,883	2,457	14,788	6,883	2,303	2,617	2,505	2,183
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	3,307	6,767	2,463	12,971	6,767	2,007	2,617	2,505	1,992
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,080	2,645	1,993	2,113	4,050	1,470	1,677	2,015	1,995
North Platte River above Lake McConaughy , NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	5,521	8,336	3,447	12,954	7,339	4,716	3,118	3,828	3,426
Median Ann. Max. 7-day Avg. Flow (cfs)	3,346	6,929	2,491	13,548	6,704	2,839	2,491	2,459	2,633
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	1,411	1,739	1,279	990	2,144	1,644	1,235	1,387	1,239
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	5,129	7,916	3,075	12,954	6,723	4,069	2,797	3,505	2,986
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	4,852	7,559	2,858	12,412	6,530	3,735	2,412	3,262	2,905
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	2,398	3,065	1,906	3,490	3,884	1,821	1,624	1,840	2,151
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	1,124	1,514	1,049	990	2,200	1,491	1,239	1,015	961
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	3,144	6,236	2,237	13,548	6,236	2,013	2,267	2,182	1,926
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	2,754	6,004	2,030	12,508	6,004	1,784	2,227	2,143	1,734
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,889	2,461	1,797	1,774	3,679	1,267	1,567	1,825	1,838
North Platte River above Lake McConaughy , NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	4,925	7,359	3,132	11,680	6,402	3,994	2,670	3,546	3,183
Median Ann. Max. 15-day Avg. Flow (cfs)	3,047	5,602	2,192	10,748	5,602	2,220	2,192	2,368	2,076
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	1,305	1,636	1,184	880	2,061	1,508	1,180	1,271	1,128
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	4,541	6,970	2,751	11,680	5,782	3,447	2,369	3,204	2,721
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	4,253	6,619	2,509	11,187	5,525	3,143	1,967	2,934	2,610
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	2,072	2,639	1,653	2,944	3,416	1,557	1,406	1,583	1,876
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	1,071	1,391	988	880	2,128	1,359	1,214	982	932
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	2,485	5,227	1,791	10,748	5,090	1,630	1,791	2,106	1,612
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	2,112	5,135	1,552	10,186	4,998	1,474	1,552	2,032	1,450
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,575	2,169	1,540	1,561	3,315	1,053	1,359	1,553	1,512
North Platte River above Lake McConaughy , NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,331	6,402	2,805	10,295	5,463	3,447	2,194	3,237	2,949
Median Ann. Max. 30-day Avg. Flow (cfs)	2,701	4,791	1,876	9,579	4,791	1,920	1,884	1,992	1,778
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	1,174	1,470	1,075		1,860	1,330	1,134	1,113	1,008
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	3,940	6,112	2,377	10,947	4,867	2,869	1,856	2,832	2,443
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	3,531	5,496	2,083	9,655	4,337	2,497	1,524	2,406	2,264
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,735	2,175	1,411	2,328	2,887	1,310	1,134	1,374	1,632
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	1,015	1,256	949		1,933	1,172	1,161	945	888
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	2,034	4,773	1,473	10,015	4,663	1,352	1,470	1,969	1,473
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,693	3,968	1,235	8,770	3,878	1,157	1,125	1,856	1,197
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,310	1,617	1,226	1,280	2,777	828	1,080	1,384	1,280

Beginning with the 1928-1941 time interval, the most noteworthy characterization is that, except for the Feb 15-Mar 16 seasonal period, the flow values for this and all succeeding time intervals are less than those for the 1910-1927 time interval by 50 percent or more. The flow values by time interval do not show much change from one time interval to the next for the 1942-1958 through the 1975-1998 time intervals and the differences in flow values between seasonal periods are noticeably less. Decreasing values with increasing averaging time still exist, but these differences are quite small when compared with those for earlier time intervals. On the other hand, the difference between the average and the median values are quite large for the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods, with the average values being higher than the median values. This suggests that lower flows occurred more frequently during these time intervals and the average values are skewed higher by the occurrence of a small number of very high flow events.

A.4.4 Flow Frequency and Exceedance

A.4.4.1 Flow Ranges

Table A.4-4 and **Figure A.4-5** show that, for both frequency in percentage of years and frequency in percentage of days, there is a noticeable change in the frequency distribution of flows by time interval. For Percentage of Years, there is a broad range of flows, from 201 cfs to 8,000 cfs, which occur from 93% to 100% of the time in the years of the 1895-1909 time interval. For each succeeding time interval this range becomes both narrower and lower in magnitude; by the 1959-1974 time interval this range is between 201 and 2,000 cfs. This range then remains constant through the 1975-1998 time interval. For percentage of days, there is no flow range for which the frequency equals or exceeds 20 percent for the 1895-1909 time interval. For the 1910-1927 time interval, the 1,001-2,000 cfs and 2,001-3,000 cfs flow ranges have the greatest frequency, with both being in the 20-to-30-percent range. For the 1928-1941 time interval and subsequent all time intervals, the 1001-2000 cfs flow range has the greatest frequency, and this always exceeds 35 percent.

A.4.4.2 Maximum Mean Flow Exceedance

Table A.4-5 through **Table A.4-9** show the exceedance values and probabilities for, annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.4-5 shows the exceedance probabilities and values for annual maximum flow data. **Table A.4-5** shows that the characterizations discussed in **Section A.4.3** for the Annual Maximum mean daily flows can also be applied to all exceedance over all time intervals. During the 1942-1958 time interval, the flow values for all exceedance probabilities greater than 20 percent (i.e. lower flows) are greater than the corresponding values for the 1959-1974 and 1975-1998 time intervals, even though there was severe

drought in the region during the 1950's. The higher flows for these exceedance probabilities in the 1959-74 and 1975-1998 time intervals are coincident with the beginning of operation of Glendo Dam in 1958. For the multi-day averaging periods, changes in the flow values by time interval similar to those for the annual maximum flows were noted, along with a similar decrease in the differences between exceedance values with increasing averaging time for the most recent time intervals.

Table A.4-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.4-6** shows a noticeable decrease in flow values between time intervals from the 1910-1927 time interval to the 1928-1941 time interval for all averaging periods and all exceedance probabilities. This is coincident with the beginning of operation of Guernsey Dam in 1928. Also, flows generally show a slight decrease from the 1928-1941 time interval to the 1942-1958 time interval, even though the latter time interval was not as dry. This is coincident with the beginning of operation of Alcova and Seminoe Reservoirs in 1938 and 1939, respectively. Flow values for all exceedance probabilities greater than 20 percent (lower flows) are less than the preceding time interval for all applicable time intervals. The 1895-1909 time interval was not considered in the characterizations for this seasonal period due to insufficient data.

Table A.4-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.4-7** shows a distribution of flow values that is quite similar to that for the annual data (**Table A.4-5**). There are significant decreases in flow values by time interval from 1895-1909 through 1942-1958 for all averaging times and all exceedance probabilities. This is coincident with the beginning of operation of the major upstream reservoir projects (**Table 2** of the main report). The difference between flow values for the same exceedance probability and different averaging times decreases for the 1942-1958 through 1975-1998 time intervals. Also, for exceedance probabilities of 50 percent and greater (i.e. lower flows), flow values decrease from one time interval to the next beginning in the 1942-1958 time interval.

Table A.4-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.4-8** shows that the flow values are generally slightly lower than those for the Apr 16-Jul 15 time interval (**Table A.4-7**). Otherwise, the flow values for the Jun 1-Aug 15 seasonal period are very similar as those for the Apr 16-Jun 15 seasonal period.

Table A.4-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.4-9** shows evidence of greater climatological effects on the flow values for this seasonal period than for the earlier seasonal periods. The sharp decrease in flow values from the 1910-1927 time interval to the 1928-1941 time interval is coincident to both the severe drought during the 1930's, and the beginning of operation of Guernsey Dam in 1928. The flow values increase from the 1895-1909 time interval to the 1910-1927 time interval for all averaging periods and for all exceedance probabilities except the 10 and 20 percent exceedance probabilities (i.e. the highest flows). This is the opposite of what was expected because of what has been

Table A.4-4 Flow Frequency Distributions.

North Platte River above Lake McConaughy , NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	35	48	26	71	14	57	24	50	13
201 to 500	77	71	81	93	43	79	94	81	71
501 to 750	90	81	96	100	50	93	100	100	92
751 to 1,000	95	88	100	93	71	100	100	100	100
1,001 to 2,000	100	100	100	100	100	100	100	100	100
2,001 to 3,000	87	90	84	100	100	71	94	88	75
3,001 to 4,000	65	86	49	100	100	57	53	44	50
4,001 to 5,000	56	81	37	100	100	43	35	31	42
5,001 to 6,000	41	69	21	93	86	29	18	25	21
6,001 to 8,000	38	67	18	93	79	29	18	13	21
8,001 to 10,000	28	52	11	86	43	29	6	13	13
10,001 to 12,000	18	38	4	79	21	14	0	13	0
12,001 to 15,000	15	33	2	71	14	14	0	6	0
Greater than 15,000	9	21	0	50	7	7	0	0	0
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
North Platte River above Lake McConaughy , NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	2.9	4.8	1.9	8.0	1.9	5.0	2.4	3.3	0.5
201 to 500	7.8	9.6	6.8	13.4	2.7	12.3	7.6	8.8	5.0
501 to 750	10.5	7.8	12.0	7.6	4.8	10.2	10.8	8.9	14.8
751 to 1,000	20.9	11.5	26.3	11.4	6.3	15.3	20.7	23.2	32.3
1,001 to 2,000	40.6	35.5	43.5	16.0	42.3	41.8	53.0	44.9	35.9
2,001 to 3,000	7.6	13.2	4.4	7.1	22.6	9.9	3.8	4.9	4.4
3,001 to 4,000	2.9	4.6	1.9	4.9	6.8	2.8	0.9	1.9	2.6
4,001 to 5,000	1.7	2.8	1.0	4.4	4.1	1.0	0.3	1.4	1.4
5,001 to 6,000	1.3	2.0	1.0	3.8	2.9	0.2	0.2	1.0	1.5
6,001 to 8,000	1.5	2.9	0.7	6.5	3.4	0.4	0.2	0.5	1.3
8,001 to 10,000	0.9	1.8	0.3	5.1	1.2	0.3	0.0	0.5	0.4
10,001 to 12,000	0.6	1.3	0.1	4.6	0.3	0.2	0.0	0.4	0.0
12,001 to 15,000	0.5	1.4	0.0	4.5	0.1	0.5	0.0	0.2	0.0
Greater than 15,000	0.3	0.9	0.0	2.8	0.5	0.1	0.0	0.0	0.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
North Platte River above Lake McConaughy , NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	10	13	7	17	5	18	9	12	2
201 to 500	26	27	25	28	7	45	28	32	18
501 to 750	34	22	44	16	13	37	39	33	54
751 to 1,000	69	32	96	24	17	56	76	85	118
1,001 to 2,000	134	99	159	34	112	153	194	164	131
2,001 to 3,000	25	37	16	15	60	36	14	18	16
3,001 to 4,000	9	13	7	10	18	10	3	7	9
4,001 to 5,000	6	8	4	9	11	4	1	5	5
5,001 to 6,000	4	6	4	8	8	1	1	4	5
6,001 to 8,000	5	8	3	14	9	1	1	2	5
8,001 to 10,000	3	5	1	11	3	1	0	2	2
10,001 to 12,000	2	4	0	10	1	1	0	1	0
12,001 to 15,000	2	4	0	9	0	2	0	1	0
Greater than 15,000	1	2	0	6	1	0	0	0	0
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

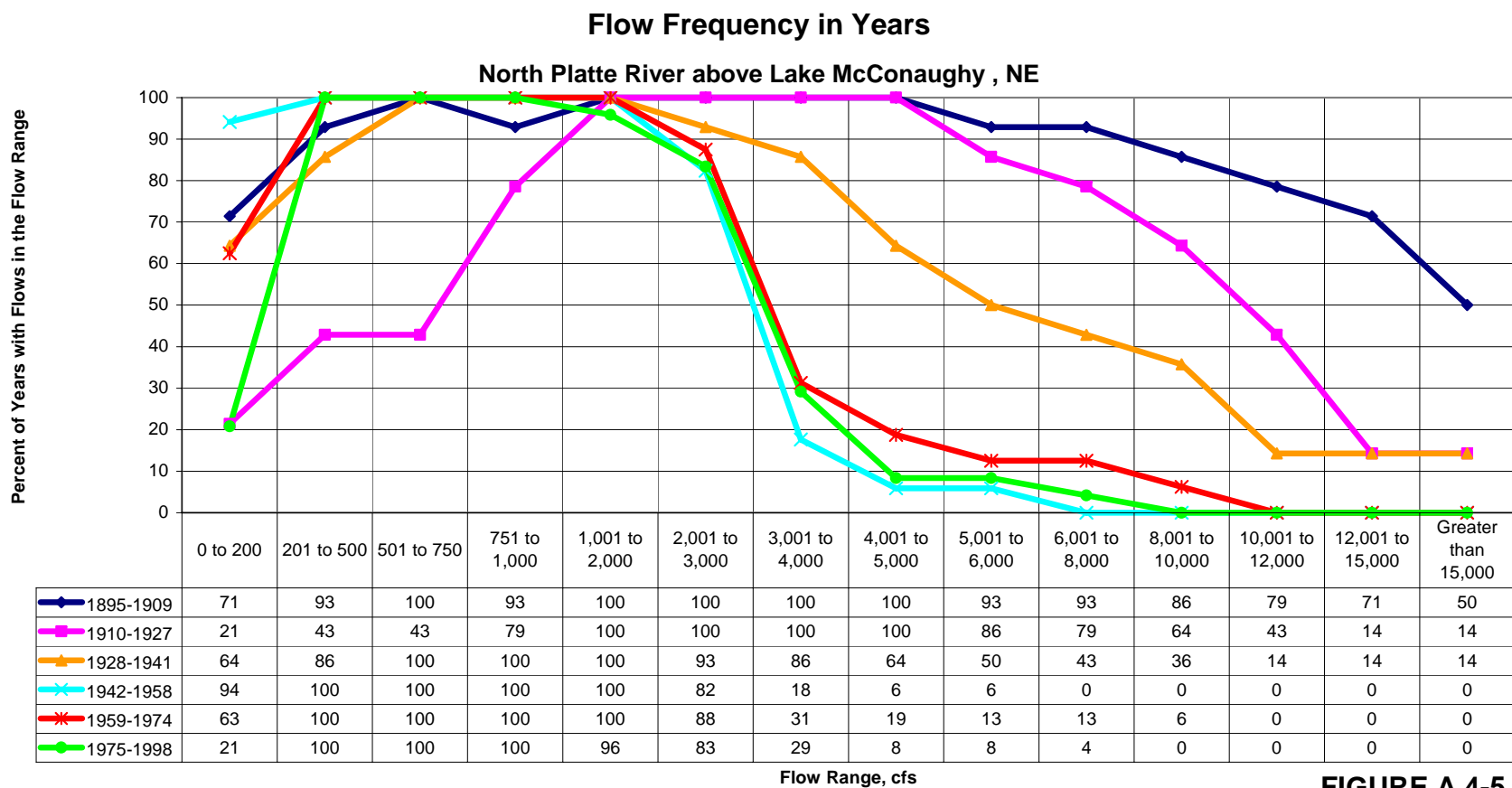


FIGURE A.4-5

Figure A.4-5 Flow Frequency in Years.

Table A.4-5 Maximum Flow Exceedance Values, Annual Data.

North Platte River above Lake McConaughy, NE Mean Daily Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,330	1,640	1,330	4,100	4,500	1,640	1,540	1,500	1,330
Maximum exceeded in 90% of the years		1,952	2,468	1,830	7,490	5,182	1,805	2,388	1,965	1,698
Maximum exceeded in 80% of the years		2,278	4,520	2,076	11,400	6,774	1,980	2,558	2,140	1,932
Maximum exceeded in 70% of the years		2,844	6,302	2,414	12,108	7,038	2,367	2,750	2,195	2,057
Maximum exceeded in 60% of the years		3,842	7,150	2,812	12,743	7,340	2,996	2,956	2,830	2,768
Maximum exceeded in 50% of the years		4,410	8,310	3,130	14,838	7,550	3,810	3,460	2,895	3,350
Maximum exceeded in 40% of the years		6,000	10,140	3,868	16,680	8,016	4,880	4,026	3,760	4,048
Maximum exceeded in 30% of the years		7,560	12,288	4,340	17,900	8,610	6,768	4,260	4,150	4,335
Maximum exceeded in 20% of the years		9,438	15,200	5,198	21,020	10,160	8,810	4,892	5,250	5,106
Maximum exceeded in 10% of the years		14,420	20,168	8,090	23,000	12,540	12,840	6,764	8,070	7,922
Maximum		23,560	23,560	14,500	23,560	23,000	20,220	8,870	14,500	9,330
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,303	1,417	1,303	3,675	3,600	1,417	1,523	1,340	1,303
Maximum exceeded in 90% of the years		1,846	2,425	1,717	7,073	4,197	1,755	2,321	1,912	1,692
Maximum exceeded in 80% of the years		2,169	3,658	2,029	9,871	5,603	1,895	2,431	2,123	1,796
Maximum exceeded in 70% of the years		2,591	5,535	2,175	11,161	6,080	2,353	2,487	2,163	2,002
Maximum exceeded in 60% of the years		3,452	6,083	2,517	12,248	6,937	2,634	2,727	2,177	2,480
Maximum exceeded in 50% of the years		4,027	7,375	2,830	14,788	7,100	3,553	2,830	2,698	3,053
Maximum exceeded in 40% of the years		5,395	9,605	3,608	15,720	7,450	4,441	3,631	3,433	3,704
Maximum exceeded in 30% of the years		6,943	11,627	4,035	17,507	8,025	5,892	4,035	3,667	4,109
Maximum exceeded in 20% of the years		9,128	15,155	4,809	18,440	9,753	7,234	4,115	5,107	5,060
Maximum exceeded in 10% of the years		13,902	18,293	7,545	20,747	11,460	12,383	5,931	7,975	7,300
Maximum		23,340	23,340	13,300	23,340	19,933	18,340	7,900	13,300	9,013
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,214	1,319	1,214	3,123	2,981	1,319	1,493	1,214	1,271
Maximum exceeded in 90% of the years		1,722	2,170	1,664	6,773	3,427	1,580	2,137	1,828	1,591
Maximum exceeded in 80% of the years		2,079	3,125	1,932	9,698	4,571	1,684	2,193	1,930	1,708
Maximum exceeded in 70% of the years		2,249	4,305	2,093	10,212	5,243	2,116	2,235	2,000	1,933
Maximum exceeded in 60% of the years		2,931	5,422	2,201	11,607	6,156	2,305	2,337	2,091	2,119
Maximum exceeded in 50% of the years		3,346	6,929	2,491	13,548	6,704	2,839	2,491	2,459	2,633
Maximum exceeded in 40% of the years		4,325	9,123	3,051	14,319	7,017	4,092	2,765	3,161	3,139
Maximum exceeded in 30% of the years		6,332	10,465	3,618	15,391	7,917	4,350	3,028	3,505	3,890
Maximum exceeded in 20% of the years		8,728	13,794	4,195	17,117	9,213	5,467	3,788	4,964	4,932
Maximum exceeded in 10% of the years		13,351	16,857	6,598	18,417	10,407	11,644	5,061	7,751	6,406
Maximum		21,913	21,913	12,800	21,913	18,743	15,960	7,077	12,800	8,844
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,181	1,263	1,181	2,337	2,485	1,263	1,439	1,181	1,267
Maximum exceeded in 90% of the years		1,560	1,641	1,442	6,198	2,898	1,482	1,519	1,642	1,430
Maximum exceeded in 80% of the years		1,708	2,367	1,615	8,993	3,623	1,572	1,622	1,731	1,593
Maximum exceeded in 70% of the years		1,969	3,286	1,778	9,808	4,577	1,611	1,915	1,880	1,640
Maximum exceeded in 60% of the years		2,330	4,762	1,952	10,267	4,994	1,926	2,049	1,985	1,793
Maximum exceeded in 50% of the years		3,047	5,602	2,192	10,748	5,602	2,220	2,192	2,368	2,076
Maximum exceeded in 40% of the years		3,956	8,027	2,709	12,439	6,391	3,080	2,256	2,754	2,929
Maximum exceeded in 30% of the years		5,581	9,728	3,191	13,593	6,999	3,394	2,720	3,228	3,773
Maximum exceeded in 20% of the years		8,089	12,086	4,140	15,821	7,899	4,380	3,377	4,203	4,787
Maximum exceeded in 10% of the years		11,039	15,540	6,062	17,399	9,233	10,180	4,566	7,383	6,218
Maximum		20,727	20,727	11,880	20,727	17,500	14,161	6,265	11,880	8,623
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		1,070	1,224	1,070	1,811	1,717	1,224	1,070	1,151	1,235
Maximum exceeded in 90% of the years		1,374	1,538	1,363	5,175	2,583	1,264	1,274	1,526	1,351
Maximum exceeded in 80% of the years		1,546	1,907	1,499	7,321	3,269	1,324	1,450	1,630	1,471
Maximum exceeded in 70% of the years		1,734	3,044	1,609	8,427	3,561	1,519	1,704	1,711	1,545
Maximum exceeded in 60% of the years		1,939	3,920	1,747	8,655	4,597	1,544	1,793	1,876	1,638
Maximum exceeded in 50% of the years		2,701	4,791	1,876	9,579	4,791	1,920	1,884	1,992	1,778
Maximum exceeded in 40% of the years		3,479	6,822	2,053	11,487	5,508	2,433	2,017	2,655	2,630
Maximum exceeded in 30% of the years		4,794	8,517	2,854	12,740	6,065	3,254	2,074	2,856	3,596
Maximum exceeded in 20% of the years		7,299	10,590	3,643	14,131	7,339	3,865	2,603	3,029	4,417
Maximum exceeded in 10% of the years		10,159	12,983	5,283	15,610	8,437	8,846	3,700	7,008	5,588
Maximum		18,230	18,230	11,263	18,230	13,020	11,866	4,960	11,263	8,512

Table A.4-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

North Platte River above Lake McConaughy , NE		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		707	874	707	1,130	1,600	874	850	905	707
Maximum exceeded in 90% of the years		901	1,186	884	1,155	1,600	1,194	943	972	852
Maximum exceeded in 80% of the years		960	1,332	941	1,180	1,640	1,292	1,054	990	894
Maximum exceeded in 70% of the years		1,027	1,440	981	1,205	1,760	1,347	1,222	1,005	933
Maximum exceeded in 60% of the years		1,136	1,520	1,024	1,230	1,960	1,488	1,304	1,020	944
Maximum exceeded in 50% of the years		1,260	1,600	1,100	1,255	2,200	1,520	1,320	1,060	986
Maximum exceeded in 40% of the years		1,328	1,742	1,216	1,280	2,440	1,640	1,358	1,140	1,098
Maximum exceeded in 30% of the years		1,513	1,860	1,310	1,305	2,666	1,736	1,428	1,215	1,155
Maximum exceeded in 20% of the years		1,740	2,440	1,402	1,330	2,864	1,854	1,508	1,310	1,284
Maximum exceeded in 10% of the years		2,702	3,146	1,848	1,355	3,358	2,825	1,732	2,015	2,352
Maximum		5,770	4,000	5,770	1,380	4,000	4,000	1,950	5,770	4,180
3-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		699	874	699	1,030	1,533	874	841	899	699
Maximum exceeded in 90% of the years		874	1,142	857	1,053	1,533	1,148	905	960	829
Maximum exceeded in 80% of the years		948	1,232	923	1,076	1,587	1,204	1,047	968	865
Maximum exceeded in 70% of the years		1,011	1,391	961	1,099	1,747	1,297	1,215	992	918
Maximum exceeded in 60% of the years		1,107	1,515	1,006	1,122	1,960	1,457	1,285	999	928
Maximum exceeded in 50% of the years		1,202	1,533	1,077	1,145	2,200	1,508	1,293	1,030	975
Maximum exceeded in 40% of the years		1,296	1,688	1,133	1,168	2,440	1,624	1,333	1,077	1,089
Maximum exceeded in 30% of the years		1,454	1,860	1,291	1,191	2,619	1,679	1,383	1,120	1,125
Maximum exceeded in 20% of the years		1,674	2,440	1,364	1,214	2,675	1,836	1,463	1,273	1,212
Maximum exceeded in 10% of the years		2,609	3,099	1,777	1,237	3,123	2,825	1,592	1,993	2,130
Maximum		5,650	3,767	5,650	1,260	3,767	3,733	1,907	5,650	4,163
7-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		690	865	690	979	1,514	865	795	874	690
Maximum exceeded in 90% of the years		863	1,015	831	982	1,514	1,083	877	915	814
Maximum exceeded in 80% of the years		932	1,123	891	984	1,571	1,125	1,015	943	839
Maximum exceeded in 70% of the years		987	1,355	942	986	1,743	1,260	1,151	967	879
Maximum exceeded in 60% of the years		1,051	1,495	993	988	1,960	1,424	1,235	987	917
Maximum exceeded in 50% of the years		1,124	1,514	1,049	990	2,200	1,491	1,239	1,015	961
Maximum exceeded in 40% of the years		1,245	1,573	1,103	993	2,282	1,523	1,279	1,052	1,043
Maximum exceeded in 30% of the years		1,411	1,851	1,235	995	2,390	1,563	1,305	1,071	1,088
Maximum exceeded in 20% of the years		1,569	2,282	1,284	997	2,547	1,759	1,403	1,206	1,141
Maximum exceeded in 10% of the years		2,363	2,954	1,726	999	2,777	2,799	1,509	1,951	1,750
Maximum		5,283	3,343	5,283	1,001	3,043	3,343	1,870	5,283	4,037
15-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		670	826	670	880	1,304	826	783	791	670
Maximum exceeded in 90% of the years		815	944	796	880	1,552	979	846	867	784
Maximum exceeded in 80% of the years		889	1,093	837	880	1,800	1,081	954	915	814
Maximum exceeded in 70% of the years		946	1,304	913	880	1,944	1,210	1,076	938	823
Maximum exceeded in 60% of the years		987	1,346	948	880	2,089	1,326	1,181	948	899
Maximum exceeded in 50% of the years		1,071	1,391	988	880	2,128	1,359	1,214	982	932
Maximum exceeded in 40% of the years		1,206	1,625	1,049	880	2,167	1,387	1,225	1,008	968
Maximum exceeded in 30% of the years		1,314	1,860	1,175	880	2,287	1,468	1,253	1,055	1,015
Maximum exceeded in 20% of the years		1,427	2,167	1,226	880	2,407	1,719	1,322	1,171	1,083
Maximum exceeded in 10% of the years		2,239	2,537	1,455	880	2,503	2,334	1,455	1,900	1,293
Maximum		4,013	3,060	4,013	880	2,600	3,060	1,710	4,013	3,536
30-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		666	802	666		1,237	802	779	760	666
Maximum exceeded in 90% of the years		783	991	778		1,447	921	793	834	756
Maximum exceeded in 80% of the years		861	1,099	800		1,657	1,046	929	903	783
Maximum exceeded in 70% of the years		903	1,156	879		1,796	1,117	1,002	908	798
Maximum exceeded in 60% of the years		949	1,191	915		1,865	1,153	1,140	934	862
Maximum exceeded in 50% of the years		1,015	1,256	949		1,933	1,172	1,161	945	888
Maximum exceeded in 40% of the years		1,126	1,499	997		1,976	1,241	1,182	954	930
Maximum exceeded in 30% of the years		1,179	1,752	1,092		2,019	1,299	1,205	1,021	966
Maximum exceeded in 20% of the years		1,305	1,947	1,176		2,097	1,628	1,298	1,126	1,014
Maximum exceeded in 10% of the years		1,899	2,097	1,412		2,212	1,898	1,412	1,513	1,083
Maximum		2,826	2,458	2,826		2,327	2,458	1,577	2,696	2,826

Table A.4-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

North Platte River above Lake McConaughy , NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		890	1,040	890	4,100	2,930	1,040	1,070	924	890
Maximum exceeded in 90% of the years		1,414	1,908	1,162	7,490	3,480	1,514	1,486	1,235	1,099
Maximum exceeded in 80% of the years		1,766	2,992	1,514	11,400	4,660	1,730	2,014	1,500	1,450
Maximum exceeded in 70% of the years		2,398	4,630	1,802	12,108	5,825	1,889	2,566	1,790	1,579
Maximum exceeded in 60% of the years		3,044	6,348	2,398	12,743	7,100	2,022	2,892	2,530	1,864
Maximum exceeded in 50% of the years		4,150	7,550	2,900	14,838	7,400	2,590	3,220	2,865	2,445
Maximum exceeded in 40% of the years		4,982	10,140	3,824	16,680	7,580	3,918	3,688	3,760	3,960
Maximum exceeded in 30% of the years		7,200	12,288	4,212	17,900	8,610	5,112	4,160	4,150	4,272
Maximum exceeded in 20% of the years		9,438	15,200	5,198	21,020	10,160	7,362	4,832	5,250	5,106
Maximum exceeded in 10% of the years		14,420	20,168	8,090	23,000	12,540	12,645	6,764	7,840	7,922
Maximum		23,560	23,560	14,500	23,560	23,000	20,220	8,870	14,500	9,330
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		757	997	757	3,675	2,700	997	1,037	890	757
Maximum exceeded in 90% of the years		1,217	1,884	1,046	7,073	3,111	1,305	1,403	1,158	1,045
Maximum exceeded in 80% of the years		1,590	2,749	1,373	9,871	3,605	1,626	1,964	1,243	1,309
Maximum exceeded in 70% of the years		2,168	3,727	1,593	11,161	5,285	1,874	2,172	1,682	1,439
Maximum exceeded in 60% of the years		2,714	5,661	2,168	12,248	5,783	1,895	2,430	2,170	1,570
Maximum exceeded in 50% of the years		3,680	6,883	2,457	14,788	6,883	2,303	2,617	2,505	2,183
Maximum exceeded in 40% of the years		4,393	9,605	3,437	15,720	6,947	3,621	2,965	3,433	3,632
Maximum exceeded in 30% of the years		6,272	11,627	3,933	17,507	7,680	4,550	4,035	3,667	3,928
Maximum exceeded in 20% of the years		9,128	15,155	4,809	18,440	9,753	5,947	4,115	5,107	5,060
Maximum exceeded in 10% of the years		13,902	18,293	7,545	20,747	11,460	11,500	5,931	7,768	7,300
Maximum		23,340	23,340	13,300	23,340	19,933	18,340	7,900	13,300	9,013
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		708	969	708	3,123	2,171	969	875	863	708
Maximum exceeded in 90% of the years		1,050	1,574	958	6,773	2,803	1,064	1,266	1,013	878
Maximum exceeded in 80% of the years		1,431	2,373	1,127	9,698	3,218	1,395	1,701	1,103	1,095
Maximum exceeded in 70% of the years		1,741	3,295	1,453	10,212	4,034	1,570	1,851	1,466	1,220
Maximum exceeded in 60% of the years		2,295	4,400	1,735	11,607	5,120	1,627	2,151	1,655	1,320
Maximum exceeded in 50% of the years		3,144	6,236	2,237	13,548	6,236	2,013	2,267	2,182	1,926
Maximum exceeded in 40% of the years		3,949	9,123	2,821	14,319	6,450	3,089	2,441	3,161	2,878
Maximum exceeded in 30% of the years		6,053	10,465	3,380	15,391	7,114	3,410	2,922	3,505	3,586
Maximum exceeded in 20% of the years		8,728	13,794	4,099	17,117	9,213	4,400	3,709	4,964	4,886
Maximum exceeded in 10% of the years		13,351	16,857	6,598	18,417	10,407	10,920	5,061	7,601	6,406
Maximum		21,913	21,913	12,800	21,913	18,743	15,960	7,077	12,800	8,844
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		589	774	589	2,337	1,912	774	712	827	589
Maximum exceeded in 90% of the years		913	1,379	825	6,198	2,376	960	1,113	908	738
Maximum exceeded in 80% of the years		1,168	1,952	989	8,993	2,500	1,101	1,386	992	907
Maximum exceeded in 70% of the years		1,486	2,492	1,176	9,808	2,804	1,346	1,465	1,127	1,036
Maximum exceeded in 60% of the years		1,965	3,293	1,450	10,267	3,990	1,525	1,535	1,328	1,206
Maximum exceeded in 50% of the years		2,485	5,227	1,791	10,748	5,090	1,630	1,791	2,106	1,612
Maximum exceeded in 40% of the years		3,398	7,898	2,226	12,439	5,650	2,031	1,990	2,754	2,191
Maximum exceeded in 30% of the years		5,231	9,728	2,984	13,593	6,547	2,994	2,298	3,228	3,047
Maximum exceeded in 20% of the years		8,089	12,086	3,968	15,821	7,705	3,293	3,377	4,203	4,699
Maximum exceeded in 10% of the years		11,039	15,540	6,062	17,399	9,233	9,679	4,566	7,272	6,218
Maximum		20,727	20,727	11,880	20,727	17,500	14,161	6,265	11,880	8,623
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		509	509	571	4,665	1,704	509	611	763	571
Maximum exceeded in 90% of the years		801	1,033	773	6,685	1,726	740	883	835	661
Maximum exceeded in 80% of the years		978	1,544	862	8,166	2,007	793	1,054	865	811
Maximum exceeded in 70% of the years		1,213	2,180	994	8,512	2,549	1,013	1,127	1,020	942
Maximum exceeded in 60% of the years		1,589	2,978	1,180	9,021	3,293	1,240	1,247	1,211	1,030
Maximum exceeded in 50% of the years		2,034	4,773	1,473	10,015	4,663	1,352	1,470	1,969	1,473
Maximum exceeded in 40% of the years		2,884	6,367	1,796	12,014	4,801	1,522	1,539	2,094	1,721
Maximum exceeded in 30% of the years		4,654	8,533	2,215	13,011	5,710	2,474	1,677	2,856	2,198
Maximum exceeded in 20% of the years		7,082	10,733	3,529	14,419	6,633	2,812	2,566	3,029	4,203
Maximum exceeded in 10% of the years		10,231	13,020	5,132	15,698	8,437	8,482	3,700	6,364	5,588
Maximum		18,230	18,230	11,263	18,230	13,020	11,866	4,960	11,263	8,512

Table A.4-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

North Platte River above Lake McConaughy , NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	667	868	667	4,100	1,620	868	817	667	959
Maximum exceeded in 90% of the years	1,388	1,653	1,254	7,490	3,480	1,460	1,476	1,350	1,238
Maximum exceeded in 80% of the years	1,672	2,376	1,520	10,560	5,140	1,568	1,924	1,500	1,386
Maximum exceeded in 70% of the years	2,142	4,250	1,802	11,860	5,950	1,757	2,292	1,790	1,674
Maximum exceeded in 60% of the years	2,852	6,080	2,184	12,168	6,666	1,980	2,714	2,530	1,862
Maximum exceeded in 50% of the years	3,500	7,075	2,800	13,318	6,990	2,100	3,130	2,850	2,145
Maximum exceeded in 40% of the years	4,580	9,180	3,184	15,175	7,090	2,860	3,364	3,330	2,768
Maximum exceeded in 30% of the years	6,654	11,580	3,858	17,610	7,562	3,465	3,630	3,780	4,114
Maximum exceeded in 20% of the years	8,750	14,375	4,482	19,820	8,712	6,390	4,190	4,500	5,106
Maximum exceeded in 10% of the years	14,300	19,968	7,154	23,000	10,020	12,645	5,410	7,150	7,922
Maximum	23,560	23,560	14,500	23,560	23,000	20,220	7,850	14,500	9,330
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	627	646	627	3,675	1,447	646	633	627	924
Maximum exceeded in 90% of the years	1,313	1,460	1,168	6,989	2,986	1,305	1,475	1,165	1,127
Maximum exceeded in 80% of the years	1,591	2,211	1,417	9,871	4,741	1,392	1,854	1,340	1,375
Maximum exceeded in 70% of the years	1,975	3,660	1,641	10,651	5,515	1,565	2,313	1,682	1,593
Maximum exceeded in 60% of the years	2,617	5,624	2,093	11,393	6,120	1,887	2,439	2,170	1,676
Maximum exceeded in 50% of the years	3,307	6,767	2,463	12,971	6,767	2,007	2,617	2,505	1,992
Maximum exceeded in 40% of the years	4,115	8,733	2,721	15,155	6,947	2,515	2,713	3,307	2,657
Maximum exceeded in 30% of the years	6,095	10,563	3,447	17,137	7,313	2,916	3,069	3,467	3,466
Maximum exceeded in 20% of the years	8,637	14,107	4,115	18,200	8,450	5,065	4,059	3,833	5,060
Maximum exceeded in 10% of the years	13,407	18,253	6,801	20,747	9,907	11,500	4,445	7,050	7,300
Maximum	23,340	23,340	13,300	23,340	19,933	18,340	7,443	13,300	9,013
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	489	489	492	3,123	1,140	489	492	570	639
Maximum exceeded in 90% of the years	1,110	1,304	920	6,161	2,414	1,038	1,253	895	1,003
Maximum exceeded in 80% of the years	1,352	1,893	1,286	8,963	3,657	1,242	1,685	971	1,271
Maximum exceeded in 70% of the years	1,733	3,024	1,481	9,828	4,803	1,327	1,828	1,466	1,368
Maximum exceeded in 60% of the years	2,160	4,552	1,733	10,438	5,757	1,605	1,939	1,655	1,538
Maximum exceeded in 50% of the years	2,754	6,004	2,030	12,508	6,004	1,784	2,227	2,143	1,734
Maximum exceeded in 40% of the years	3,607	8,084	2,299	13,994	6,387	2,091	2,255	3,161	2,294
Maximum exceeded in 30% of the years	5,843	9,816	2,961	14,631	7,116	2,554	2,342	3,287	2,820
Maximum exceeded in 20% of the years	8,182	13,794	3,746	16,580	8,161	3,707	2,840	3,674	4,886
Maximum exceeded in 10% of the years	12,974	16,292	6,290	18,297	9,375	10,870	3,818	6,891	6,406
Maximum	21,913	21,913	12,800	21,913	18,743	15,960	6,710	12,800	8,844
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	390	434	390	2,337	844	434	390	409	415
Maximum exceeded in 90% of the years	839	1,096	810	5,813	2,084	727	1,022	681	883
Maximum exceeded in 80% of the years	1,131	1,606	1,068	8,006	2,500	1,012	1,353	819	1,089
Maximum exceeded in 70% of the years	1,369	2,179	1,232	8,771	3,630	1,108	1,414	1,127	1,201
Maximum exceeded in 60% of the years	1,600	3,462	1,395	9,421	4,365	1,220	1,483	1,328	1,289
Maximum exceeded in 50% of the years	2,112	5,135	1,552	10,186	4,998	1,474	1,552	2,032	1,450
Maximum exceeded in 40% of the years	3,040	7,114	1,842	12,369	5,213	1,670	1,577	2,754	1,683
Maximum exceeded in 30% of the years	5,012	8,809	2,299	13,415	5,995	2,064	1,984	3,038	2,272
Maximum exceeded in 20% of the years	7,222	12,020	3,516	14,753	7,065	2,574	2,153	3,415	4,699
Maximum exceeded in 10% of the years	10,764	14,137	5,876	17,399	8,333	9,660	3,578	6,319	6,218
Maximum	20,727	20,727	11,827	20,727	17,500	14,161	5,842	11,827	8,623
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	266	361	266	1,811	774	361	385	266	362
Maximum exceeded in 90% of the years	732	785	665	4,920	1,726	541	885	478	751
Maximum exceeded in 80% of the years	913	1,245	873	6,768	1,808	741	933	704	924
Maximum exceeded in 70% of the years	1,051	1,726	967	7,393	2,706	870	1,036	826	969
Maximum exceeded in 60% of the years	1,248	2,438	1,051	7,953	3,151	945	1,058	1,052	1,025
Maximum exceeded in 50% of the years	1,693	3,968	1,235	8,770	3,878	1,157	1,125	1,856	1,197
Maximum exceeded in 40% of the years	2,426	5,907	1,469	9,733	4,003	1,264	1,349	2,094	1,242
Maximum exceeded in 30% of the years	3,884	7,592	1,995	12,068	4,770	1,473	1,539	2,668	1,754
Maximum exceeded in 20% of the years	6,204	9,733	2,859	13,208	5,812	1,834	1,630	2,861	4,096
Maximum exceeded in 10% of the years	9,514	12,354	5,114	15,442	7,191	7,894	2,855	5,185	5,530
Maximum	18,230	18,230	9,498	18,230	13,020	11,702	4,319	9,498	8,041

Table A.4-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

North Platte River above Lake McConaughy , NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	355	355	468	1,294	580	355	468	661	1,050
Maximum exceeded in 90% of the years	1,048	586	1,148	1,359	2,320	536	951	1,275	1,344
Maximum exceeded in 80% of the years	1,386	1,305	1,454	1,692	3,080	566	1,278	1,500	1,632
Maximum exceeded in 70% of the years	1,714	1,978	1,670	1,969	3,940	634	1,454	1,975	1,744
Maximum exceeded in 60% of the years	2,012	2,600	1,836	2,176	4,100	1,164	1,576	2,020	1,918
Maximum exceeded in 50% of the years	2,160	3,040	2,090	2,725	4,300	1,620	1,760	2,125	2,090
Maximum exceeded in 40% of the years	2,528	3,760	2,160	3,124	4,500	2,524	1,998	2,160	2,154
Maximum exceeded in 30% of the years	3,044	4,500	2,366	3,615	4,788	3,024	2,464	2,215	2,404
Maximum exceeded in 20% of the years	4,108	5,880	2,750	6,428	6,998	3,876	2,528	2,390	3,150
Maximum exceeded in 10% of the years	5,816	7,235	3,808	10,056	7,205	5,310	3,278	2,730	4,267
Maximum	14,900	14,900	6,650	14,900	8,120	8,900	4,500	5,770	6,650
3-day Average Flows									
Maximum exceeded in 100% of the years	346	346	438	1,027	395	346	438	542	1,017
Maximum exceeded in 90% of the years	1,021	554	1,071	1,281	2,320	484	865	1,181	1,269
Maximum exceeded in 80% of the years	1,273	1,249	1,341	1,460	2,980	543	1,197	1,343	1,553
Maximum exceeded in 70% of the years	1,619	1,683	1,607	1,666	3,563	567	1,363	1,955	1,645
Maximum exceeded in 60% of the years	1,923	2,216	1,721	1,976	3,793	1,094	1,505	1,997	1,727
Maximum exceeded in 50% of the years	2,080	2,645	1,993	2,113	4,050	1,470	1,677	2,015	1,995
Maximum exceeded in 40% of the years	2,248	3,453	2,106	2,587	4,200	2,222	1,891	2,123	2,115
Maximum exceeded in 30% of the years	2,671	4,183	2,205	3,078	4,520	2,624	2,162	2,133	2,348
Maximum exceeded in 20% of the years	3,739	5,593	2,557	5,919	5,899	3,521	2,445	2,200	2,967
Maximum exceeded in 10% of the years	5,448	6,189	3,477	9,498	6,912	4,953	2,720	2,580	3,693
Maximum	13,167	13,167	6,600	13,167	7,883	5,867	3,983	5,377	6,600
7-day Average Flows									
Maximum exceeded in 100% of the years	264	264	388	433	264	333	388	504	971
Maximum exceeded in 90% of the years	711	437	995	904	2,320	416	799	954	1,180
Maximum exceeded in 80% of the years	1,113	1,021	1,174	1,295	2,711	455	1,082	1,015	1,394
Maximum exceeded in 70% of the years	1,426	1,451	1,417	1,473	2,946	515	1,261	1,695	1,444
Maximum exceeded in 60% of the years	1,695	1,923	1,600	1,695	3,546	1,021	1,451	1,797	1,506
Maximum exceeded in 50% of the years	1,889	2,461	1,797	1,774	3,679	1,267	1,567	1,825	1,838
Maximum exceeded in 40% of the years	2,048	2,893	1,917	2,278	3,886	1,929	1,823	1,866	2,002
Maximum exceeded in 30% of the years	2,420	3,868	2,008	2,970	4,193	2,124	2,009	1,909	2,127
Maximum exceeded in 20% of the years	3,414	4,493	2,183	5,506	4,805	3,183	2,064	1,940	2,484
Maximum exceeded in 10% of the years	4,560	5,816	2,968	8,692	6,481	4,372	2,313	2,344	3,434
Maximum	12,229	12,229	6,516	12,229	7,836	4,500	3,346	4,863	6,516
15-day Average Flows									
Maximum exceeded in 100% of the years	243	243	353	399	243	281	353	466	806
Maximum exceeded in 90% of the years	563	403	821	738	1,872	365	711	768	1,052
Maximum exceeded in 80% of the years	994	783	1,083	1,107	2,445	414	971	832	1,225
Maximum exceeded in 70% of the years	1,283	1,274	1,288	1,382	2,453	468	1,228	1,342	1,294
Maximum exceeded in 60% of the years	1,405	1,551	1,340	1,458	3,171	783	1,291	1,399	1,343
Maximum exceeded in 50% of the years	1,575	2,169	1,540	1,561	3,315	1,053	1,359	1,553	1,512
Maximum exceeded in 40% of the years	1,729	2,451	1,585	1,900	3,411	1,372	1,564	1,575	1,660
Maximum exceeded in 30% of the years	2,008	3,409	1,716	2,540	3,775	1,929	1,610	1,646	1,817
Maximum exceeded in 20% of the years	2,983	3,899	1,909	4,314	4,148	2,804	1,758	1,784	1,999
Maximum exceeded in 10% of the years	3,915	4,865	2,485	6,837	5,517	3,728	1,985	2,149	3,256
Maximum	11,191	11,191	6,208	11,191	7,289	4,043	2,721	4,351	6,208
30-day Average Flows									
Maximum exceeded in 100% of the years	188	188	307	350	188	224	307	391	699
Maximum exceeded in 90% of the years	466	371	668	531	1,407	272	502	573	976
Maximum exceeded in 80% of the years	805	628	955	726	1,826	371	878	824	1,025
Maximum exceeded in 70% of the years	1,052	960	1,062	1,110	2,114	407	1,014	1,014	1,187
Maximum exceeded in 60% of the years	1,202	1,266	1,192	1,234	2,726	651	1,072	1,205	1,211
Maximum exceeded in 50% of the years	1,310	1,617	1,226	1,280	2,777	828	1,080	1,384	1,280
Maximum exceeded in 40% of the years	1,431	2,135	1,381	1,392	2,830	1,078	1,202	1,428	1,389
Maximum exceeded in 30% of the years	1,702	2,790	1,437	2,157	2,914	1,556	1,367	1,492	1,560
Maximum exceeded in 20% of the years	2,458	2,982	1,641	3,061	3,701	2,466	1,393	1,619	1,750
Maximum exceeded in 10% of the years	3,197	3,882	2,042	5,162	4,433	2,981	1,561	1,788	2,646
Maximum	9,763	9,763	5,968	9,763	7,125	3,750	2,211	4,018	5,968

noted for previous seasonal periods; however, this has been noted for upstream locations. The likely explanation is the release of water for irrigation in eastern Wyoming and Western Nebraska during this seasonal period beginning with the completion of construction of Pathfinder Reservoir in 1909.

A.4.4.3 Mean Daily Flow Exceedance

Table A.4-10 through **Table A.4-14** show probabilities and exceedance values considering all flows and probabilities for, annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.4-10 shows the exceedance probabilities and values of flows for annual data. **Table A.4-10** shows that the decrease in flow values by time interval for annual data generally follows a similar pattern to that for maximum flows (**Table A.4-5**) for the 1895-1909 through the 1942-1958 time intervals. The exception is for the 50 percent through 100 percent exceedance probabilities (i.e. lower flows) for the 1895-1909 time interval, which are biased due to a lack of data for the times of the year when low flows are most likely to occur. Beginning with the 1942-1958 time interval, there is not much systematic variation either by time interval or by averaging period for the respective exceedance probabilities.

Table A.4-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.4-11** shows that, as for the maximum flows (**Table A.4-6**), there is a significant decrease in flow values for all averaging periods and all exceedance probabilities from the 1910-1927 through 1942-1958 time intervals, coincident with the severe drought conditions of the 1930's and the beginning operation of Guernsey Reservoir in 1928 and Alcova and Seminoe Reservoirs in 1938 and 1939, respectively. There is also a slight decrease in flow values for the 1928-1941 time interval through the 1975-1998 time interval, possibly as a result of the beginning of operation of Glendo Reservoir in 1958. Otherwise, the flow values are consistent with known climatological conditions. The 1895-1909 time interval was not considered for this seasonal period due to insufficient data.

Table A.4-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.4-12** shows sharp decreases in flow value by time interval from the 1895-1909 through 1942-1958 time intervals for all averaging times and exceedance probabilities. These are coincident with the previously noted years when major upstream reservoir projects began operation. From the 1942-1958 through 1975-1998 time intervals, flow values do not vary much by time interval; what small variations exist are generally consistent with known climatic conditions. It can also be seen in **Table A.4-12** that the flow values increase with increasing averaging time for exceedance probabilities of 50 percent and greater. The explanation for this is given in **Section A.1.4.3**.

Table A.4-10 Exceedance Values Considering All Flows, Annual Data.

North Platte River above Lake McConaughy , NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	68	0	50	55	79	71	68
Flow exceeded for 90% of the days	475	380	541	270	800	324	500	429	612
Flow exceeded for 80% of the days	731	700	741	474	1,150	567	737	732	746
Flow exceeded for 70% of the days	865	930	851	760	1,500	800	878	869	828
Flow exceeded for 60% of the days	981	1,160	943	1,000	1,700	971	990	965	904
Flow exceeded for 50% of the days	1,110	1,420	1,040	1,400	1,900	1,140	1,080	1,070	982
Flow exceeded for 40% of the days	1,270	1,750	1,140	2,440	2,100	1,300	1,200	1,180	1,080
Flow exceeded for 30% of the days	1,500	2,100	1,290	4,400	2,400	1,540	1,340	1,330	1,200
Flow exceeded for 20% of the days	1,860	2,700	1,500	6,900	2,950	1,850	1,500	1,550	1,440
Flow exceeded for 10% of the days	2,915	5,160	1,950	10,700	4,700	2,350	1,730	2,070	2,260
Maximum	23,560	23,560	14,500	23,560	23,000	20,220	8,870	14,500	9,330
3-day Average Flows									
Flow exceeded for 100% of the days	10	10	73	10	85	59	80	73	73
Flow exceeded for 90% of the days	482	385	550	273	800	335	512	438	616
Flow exceeded for 80% of the days	738	705	747	470	1,200	569	748	739	750
Flow exceeded for 70% of the days	869	936	854	760	1,500	807	886	872	831
Flow exceeded for 60% of the days	983	1,170	945	992	1,700	976	993	965	907
Flow exceeded for 50% of the days	1,110	1,433	1,037	1,447	1,900	1,137	1,083	1,068	982
Flow exceeded for 40% of the days	1,267	1,750	1,140	2,521	2,100	1,300	1,203	1,177	1,080
Flow exceeded for 30% of the days	1,500	2,083	1,283	4,506	2,367	1,537	1,343	1,327	1,203
Flow exceeded for 20% of the days	1,867	2,717	1,497	7,030	2,997	1,850	1,497	1,547	1,433
Flow exceeded for 10% of the days	2,928	5,133	1,947	10,617	4,678	2,350	1,732	2,060	2,263
Maximum	23,340	23,340	13,300	23,340	19,933	18,340	7,900	13,300	9,013
7-day Average Flows									
Flow exceeded for 100% of the days	10	10	75	10	85	61	90	75	81
Flow exceeded for 90% of the days	496	390	563	284	864	347	527	454	624
Flow exceeded for 80% of the days	749	723	755	474	1,207	584	764	752	755
Flow exceeded for 70% of the days	879	951	861	760	1,529	826	896	883	836
Flow exceeded for 60% of the days	989	1,177	950	980	1,729	986	999	971	907
Flow exceeded for 50% of the days	1,110	1,447	1,039	1,457	1,912	1,139	1,090	1,073	987
Flow exceeded for 40% of the days	1,264	1,750	1,141	2,644	2,119	1,299	1,200	1,173	1,079
Flow exceeded for 30% of the days	1,497	2,086	1,279	4,657	2,386	1,547	1,336	1,326	1,200
Flow exceeded for 20% of the days	1,859	2,729	1,491	7,204	2,949	1,850	1,493	1,539	1,434
Flow exceeded for 10% of the days	2,900	5,130	1,930	10,711	4,721	2,355	1,714	2,031	2,253
Maximum	21,913	21,913	12,800	21,913	18,743	15,960	7,077	12,800	8,844
15-day Average Flows									
Flow exceeded for 100% of the days	13	13	85	13	86	63	101	85	92
Flow exceeded for 90% of the days	527	398	593	287	909	360	555	479	647
Flow exceeded for 80% of the days	766	754	772	486	1,270	635	781	771	767
Flow exceeded for 70% of the days	888	975	869	765	1,577	845	912	897	845
Flow exceeded for 60% of the days	998	1,190	958	1,012	1,760	999	1,006	982	909
Flow exceeded for 50% of the days	1,114	1,458	1,042	1,580	1,950	1,130	1,097	1,075	989
Flow exceeded for 40% of the days	1,266	1,777	1,145	2,936	2,133	1,301	1,203	1,175	1,080
Flow exceeded for 30% of the days	1,497	2,112	1,278	4,911	2,399	1,538	1,329	1,325	1,201
Flow exceeded for 20% of the days	1,858	2,737	1,487	7,408	2,982	1,867	1,485	1,531	1,434
Flow exceeded for 10% of the days	2,897	5,127	1,885	10,753	4,600	2,353	1,678	2,025	2,224
Maximum	20,727	20,727	11,880	20,727	17,500	14,161	6,265	11,880	8,623
30-day Average Flows									
Flow exceeded for 100% of the days	45	45	114	45	93	72	143	114	205
Flow exceeded for 90% of the days	576	425	626	306	968	386	618	535	667
Flow exceeded for 80% of the days	786	783	787	509	1,356	687	805	788	776
Flow exceeded for 70% of the days	899	1,005	877	792	1,597	853	922	908	856
Flow exceeded for 60% of the days	1,008	1,206	962	1,074	1,815	1,012	1,005	1,002	911
Flow exceeded for 50% of the days	1,122	1,476	1,047	1,770	1,997	1,129	1,101	1,078	994
Flow exceeded for 40% of the days	1,274	1,812	1,149	3,606	2,138	1,280	1,201	1,183	1,083
Flow exceeded for 30% of the days	1,493	2,114	1,290	5,486	2,498	1,512	1,324	1,331	1,223
Flow exceeded for 20% of the days	1,847	2,805	1,485	7,757	3,118	1,881	1,488	1,515	1,453
Flow exceeded for 10% of the days	2,873	5,195	1,856	10,919	4,432	2,392	1,662	2,008	2,286
Maximum	18,230	18,230	11,263	18,230	13,020	11,866	4,960	11,263	8,512

Table A.4-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

North Platte River above Lake McConaughy , NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	351	0	560	512	351	460	582
Flow exceeded for 90% of the days	764	835	757	720	1,250	810	797	806	715
Flow exceeded for 80% of the days	833	973	806	720	1,500	910	889	856	763
Flow exceeded for 70% of the days	887	1,100	860	720	1,600	1,047	1,000	894	801
Flow exceeded for 60% of the days	935	1,210	904	744	1,700	1,126	1,080	933	843
Flow exceeded for 50% of the days	1,000	1,360	944	915	1,800	1,200	1,140	962	879
Flow exceeded for 40% of the days	1,100	1,500	1,000	921	1,800	1,294	1,200	990	906
Flow exceeded for 30% of the days	1,200	1,670	1,090	930	2,000	1,463	1,250	1,030	943
Flow exceeded for 20% of the days	1,380	1,800	1,190	1,022	2,200	1,600	1,322	1,102	996
Flow exceeded for 10% of the days	1,778	2,200	1,380	1,130	2,600	1,800	1,471	1,310	1,140
Maximum	5,770	4,000	5,770	1,380	4,000	4,000	1,950	5,770	4,180
3-day Average Flows									
Flow exceeded for 100% of the days	428	480	428	480	753	520	428	473	595
Flow exceeded for 90% of the days	766	834	758	720	1,258	827	793	819	717
Flow exceeded for 80% of the days	833	986	809	720	1,500	928	893	857	763
Flow exceeded for 70% of the days	888	1,121	860	785	1,667	1,058	1,005	893	800
Flow exceeded for 60% of the days	936	1,214	905	820	1,700	1,142	1,087	933	840
Flow exceeded for 50% of the days	1,001	1,360	945	907	1,800	1,202	1,138	963	879
Flow exceeded for 40% of the days	1,097	1,500	998	930	1,800	1,293	1,200	988	909
Flow exceeded for 30% of the days	1,200	1,667	1,087	997	1,967	1,458	1,243	1,033	940
Flow exceeded for 20% of the days	1,391	1,800	1,180	1,030	2,200	1,600	1,320	1,107	997
Flow exceeded for 10% of the days	1,783	2,200	1,370	1,040	2,600	1,800	1,472	1,298	1,140
Maximum	5,650	3,767	5,650	1,260	3,767	3,733	1,907	5,650	4,163
7-day Average Flows									
Flow exceeded for 100% of the days	551	624	551	739	901	624	592	551	617
Flow exceeded for 90% of the days	774	880	759	793	1,226	845	781	819	717
Flow exceeded for 80% of the days	837	1,009	807	810	1,500	991	895	864	762
Flow exceeded for 70% of the days	895	1,114	870	858	1,700	1,067	1,012	895	798
Flow exceeded for 60% of the days	939	1,217	904	926	1,769	1,150	1,100	925	840
Flow exceeded for 50% of the days	1,004	1,366	947	949	1,800	1,210	1,141	963	884
Flow exceeded for 40% of the days	1,100	1,500	999	957	1,844	1,303	1,193	987	910
Flow exceeded for 30% of the days	1,196	1,700	1,093	979	2,097	1,454	1,234	1,041	940
Flow exceeded for 20% of the days	1,372	1,800	1,182	979	2,246	1,600	1,292	1,111	1,001
Flow exceeded for 10% of the days	1,797	2,240	1,354	979	2,600	1,818	1,486	1,328	1,134
Maximum	5,283	3,343	5,283	1,001	3,043	3,343	1,870	5,283	4,037
15-day Average Flows									
Flow exceeded for 100% of the days	645	795	645	819	1,071	795	753	687	645
Flow exceeded for 90% of the days	774	936	762	830	1,132	918	779	792	724
Flow exceeded for 80% of the days	838	1,060	799	841	1,700	1,013	902	877	764
Flow exceeded for 70% of the days	901	1,148	876	852	1,767	1,086	1,006	901	795
Flow exceeded for 60% of the days	937	1,221	907	863	1,798	1,187	1,114	913	840
Flow exceeded for 50% of the days	1,006	1,302	936	874	1,803	1,240	1,150	949	886
Flow exceeded for 40% of the days	1,113	1,543	994	875	2,004	1,298	1,181	986	917
Flow exceeded for 30% of the days	1,194	1,751	1,104	876	2,129	1,412	1,220	1,035	940
Flow exceeded for 20% of the days	1,328	1,911	1,180	878	2,316	1,624	1,281	1,135	992
Flow exceeded for 10% of the days	1,800	2,333	1,369	879	2,437	2,064	1,509	1,401	1,123
Maximum	4,013	3,060	4,013	880	2,600	3,060	1,710	4,013	3,536
30-day Average Flows									
Flow exceeded for 100% of the days	666	802	666		1,237	802	779	760	666
Flow exceeded for 90% of the days	783	991	778		1,447	921	793	834	756
Flow exceeded for 80% of the days	861	1,099	800		1,657	1,046	929	903	783
Flow exceeded for 70% of the days	903	1,156	879		1,796	1,117	1,002	908	798
Flow exceeded for 60% of the days	949	1,191	915		1,865	1,153	1,140	934	862
Flow exceeded for 50% of the days	1,015	1,256	949		1,933	1,172	1,161	945	888
Flow exceeded for 40% of the days	1,126	1,499	997		1,976	1,241	1,182	954	930
Flow exceeded for 30% of the days	1,179	1,752	1,092		2,019	1,299	1,205	1,021	966
Flow exceeded for 20% of the days	1,305	1,947	1,176		2,097	1,628	1,298	1,126	1,014
Flow exceeded for 10% of the days	1,899	2,097	1,412		2,212	1,898	1,412	1,513	1,083
Maximum	2,826	2,458	2,826		2,327	2,458	1,577	2,696	2,826

Table A.4-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

North Platte River above Lake McConaughy , NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	50	50	68	500	50	55	79	71	68
Flow exceeded for 90% of the days	382	438	357	2,166	740	211	352	273	417
Flow exceeded for 80% of the days	586	780	537	3,150	1,150	368	528	503	560
Flow exceeded for 70% of the days	755	1,200	665	4,400	1,600	528	658	676	661
Flow exceeded for 60% of the days	938	1,770	788	5,624	2,000	683	801	792	772
Flow exceeded for 50% of the days	1,170	2,400	924	6,670	2,360	900	925	969	909
Flow exceeded for 40% of the days	1,610	3,316	1,080	8,160	2,860	1,150	1,030	1,200	1,048
Flow exceeded for 30% of the days	2,460	4,850	1,322	9,843	3,700	1,450	1,190	1,615	1,350
Flow exceeded for 20% of the days	4,000	6,850	2,090	11,700	5,000	2,000	1,460	2,520	2,734
Flow exceeded for 10% of the days	6,860	10,500	3,804	13,900	6,650	3,470	2,374	4,640	4,444
Maximum	23,560	23,560	14,500	23,560	23,000	20,220	8,870	14,500	9,330
3-day Average Flows									
Flow exceeded for 100% of the days	64	64	73	600	87	64	80	73	73
Flow exceeded for 90% of the days	398	440	375	2,297	740	218	374	300	428
Flow exceeded for 80% of the days	593	785	544	3,392	1,167	378	537	520	562
Flow exceeded for 70% of the days	757	1,238	667	4,552	1,583	532	666	675	665
Flow exceeded for 60% of the days	946	1,800	790	5,661	2,043	692	815	800	774
Flow exceeded for 50% of the days	1,183	2,400	932	6,769	2,383	903	924	987	914
Flow exceeded for 40% of the days	1,627	3,400	1,083	8,267	2,894	1,172	1,048	1,213	1,049
Flow exceeded for 30% of the days	2,500	4,951	1,327	9,852	3,913	1,450	1,190	1,638	1,340
Flow exceeded for 20% of the days	4,033	6,910	2,110	11,767	5,100	2,000	1,481	2,491	2,773
Flow exceeded for 10% of the days	6,908	10,433	3,820	14,068	6,617	3,488	2,339	4,720	4,530
Maximum	23,340	23,340	13,300	23,340	19,933	18,340	7,900	13,300	9,013
7-day Average Flows									
Flow exceeded for 100% of the days	73	73	75	737	154	73	90	75	81
Flow exceeded for 90% of the days	417	447	405	2,589	755	240	410	324	444
Flow exceeded for 80% of the days	610	814	561	3,629	1,205	395	561	534	576
Flow exceeded for 70% of the days	773	1,280	681	4,832	1,743	533	700	680	674
Flow exceeded for 60% of the days	966	1,868	806	5,911	2,114	710	827	811	777
Flow exceeded for 50% of the days	1,196	2,529	948	7,037	2,457	925	944	1,014	919
Flow exceeded for 40% of the days	1,701	3,596	1,103	8,513	2,960	1,193	1,054	1,232	1,066
Flow exceeded for 30% of the days	2,593	5,121	1,343	10,063	3,960	1,479	1,196	1,698	1,363
Flow exceeded for 20% of the days	4,157	7,130	2,106	11,896	5,169	2,144	1,515	2,533	2,841
Flow exceeded for 10% of the days	7,096	10,619	3,821	14,152	6,503	3,602	2,303	4,806	4,698
Maximum	21,913	21,913	12,800	21,913	18,743	15,960	7,077	12,800	8,844
15-day Average Flows									
Flow exceeded for 100% of the days	85	90	85	1,293	191	90	121	85	92
Flow exceeded for 90% of the days	451	484	438	3,088	778	287	479	378	454
Flow exceeded for 80% of the days	645	857	589	4,294	1,382	420	621	553	592
Flow exceeded for 70% of the days	808	1,355	709	5,373	1,832	589	748	681	692
Flow exceeded for 60% of the days	983	1,998	834	6,555	2,229	761	861	838	816
Flow exceeded for 50% of the days	1,233	2,720	968	7,586	2,530	942	969	1,043	939
Flow exceeded for 40% of the days	1,770	4,039	1,120	8,884	3,335	1,181	1,070	1,286	1,061
Flow exceeded for 30% of the days	2,706	5,421	1,426	10,304	4,371	1,512	1,244	1,768	1,490
Flow exceeded for 20% of the days	4,485	7,598	2,145	11,638	5,177	2,150	1,569	2,602	2,898
Flow exceeded for 10% of the days	7,404	10,766	3,851	14,129	6,635	3,592	2,288	4,880	4,966
Maximum	20,727	20,727	11,880	20,727	17,500	14,161	6,265	11,880	8,623
30-day Average Flows									
Flow exceeded for 100% of the days	142	142	160	1,486	299	142	212	160	205
Flow exceeded for 90% of the days	512	555	500	4,211	893	355	540	497	470
Flow exceeded for 80% of the days	687	898	628	5,215	1,480	467	683	599	625
Flow exceeded for 70% of the days	832	1,385	752	6,395	1,762	685	797	719	736
Flow exceeded for 60% of the days	1,020	2,090	853	7,383	2,442	833	893	838	829
Flow exceeded for 50% of the days	1,321	3,268	1,001	8,203	3,177	975	995	1,134	978
Flow exceeded for 40% of the days	1,797	4,569	1,203	9,158	3,961	1,135	1,084	1,356	1,153
Flow exceeded for 30% of the days	2,911	6,139	1,544	10,656	4,539	1,419	1,327	1,813	1,587
Flow exceeded for 20% of the days	4,781	7,979	2,206	12,090	5,321	2,390	1,622	2,473	3,142
Flow exceeded for 10% of the days	7,764	10,919	3,968	14,112	6,793	4,718	2,387	5,911	4,851
Maximum	18,230	18,230	11,263	18,230	13,020	11,866	4,960	11,263	8,512

Table A.4-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

North Platte River above Lake McConaughy , NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	50	50	71	75	50	55	79	71	132
Flow exceeded for 90% of the days	281	320	261	810	675	189	248	175	347
Flow exceeded for 80% of the days	461	582	406	1,260	1,150	305	397	274	522
Flow exceeded for 70% of the days	629	950	559	1,875	1,697	409	524	433	634
Flow exceeded for 60% of the days	799	1,360	673	2,819	2,100	526	629	592	737
Flow exceeded for 50% of the days	1,040	1,900	798	4,475	2,400	695	755	756	848
Flow exceeded for 40% of the days	1,400	2,450	978	6,200	2,800	918	920	1,050	996
Flow exceeded for 30% of the days	2,031	3,535	1,230	8,475	3,400	1,230	1,120	1,470	1,240
Flow exceeded for 20% of the days	3,191	5,658	1,758	11,000	4,500	1,684	1,420	2,200	1,844
Flow exceeded for 10% of the days	6,007	9,620	3,249	13,800	6,050	2,999	2,099	3,295	4,655
Maximum	23,560	23,560	14,500	23,560	23,000	20,220	7,850	14,500	9,330
3-day Average Flows									
Flow exceeded for 100% of the days	59	59	73	75	110	59	80	73	140
Flow exceeded for 90% of the days	293	337	263	834	718	201	253	180	351
Flow exceeded for 80% of the days	468	598	419	1,300	1,184	312	411	277	526
Flow exceeded for 70% of the days	637	973	568	1,893	1,702	414	535	439	641
Flow exceeded for 60% of the days	807	1,380	678	2,865	2,100	531	636	600	735
Flow exceeded for 50% of the days	1,054	1,920	804	4,550	2,400	702	770	756	848
Flow exceeded for 40% of the days	1,400	2,500	987	6,245	2,867	927	935	1,056	994
Flow exceeded for 30% of the days	2,046	3,567	1,240	8,550	3,452	1,233	1,120	1,500	1,240
Flow exceeded for 20% of the days	3,192	5,550	1,767	10,860	4,372	1,687	1,415	2,177	1,863
Flow exceeded for 10% of the days	5,991	9,677	3,243	14,011	5,987	2,767	2,090	3,309	4,672
Maximum	23,340	23,340	13,300	23,340	19,933	18,340	7,443	13,300	9,013
7-day Average Flows									
Flow exceeded for 100% of the days	61	61	75	96	114	61	90	75	144
Flow exceeded for 90% of the days	308	359	276	950	741	232	270	183	376
Flow exceeded for 80% of the days	487	629	439	1,362	1,257	335	433	287	542
Flow exceeded for 70% of the days	657	1,012	585	1,962	1,786	420	553	464	650
Flow exceeded for 60% of the days	834	1,400	695	2,961	2,157	529	657	626	740
Flow exceeded for 50% of the days	1,071	1,950	825	4,576	2,401	717	805	761	872
Flow exceeded for 40% of the days	1,415	2,507	1,005	6,304	2,793	951	977	1,079	1,006
Flow exceeded for 30% of the days	2,068	3,607	1,246	8,497	3,495	1,234	1,135	1,518	1,225
Flow exceeded for 20% of the days	3,154	5,414	1,771	10,711	4,300	1,621	1,421	2,217	1,851
Flow exceeded for 10% of the days	5,944	9,509	3,163	13,901	5,814	2,641	2,003	3,294	4,698
Maximum	21,913	21,913	12,800	21,913	18,743	15,960	6,710	12,800	8,844
15-day Average Flows									
Flow exceeded for 100% of the days	72	72	85	158	168	72	101	85	181
Flow exceeded for 90% of the days	339	386	302	1,096	790	261	304	184	396
Flow exceeded for 80% of the days	526	693	471	1,428	1,422	343	487	333	579
Flow exceeded for 70% of the days	694	1,072	620	2,149	1,860	429	607	491	669
Flow exceeded for 60% of the days	862	1,449	728	3,223	2,190	567	721	665	773
Flow exceeded for 50% of the days	1,095	2,035	849	4,515	2,430	765	865	792	863
Flow exceeded for 40% of the days	1,396	2,527	1,029	6,269	2,840	972	1,024	1,142	989
Flow exceeded for 30% of the days	2,080	3,644	1,238	8,221	3,426	1,167	1,172	1,496	1,182
Flow exceeded for 20% of the days	3,199	5,191	1,664	10,379	4,257	1,533	1,375	2,335	1,865
Flow exceeded for 10% of the days	5,816	9,140	3,178	13,852	5,265	2,742	1,781	3,347	4,638
Maximum	20,727	20,727	11,827	20,727	17,500	14,161	5,842	11,827	8,623
30-day Average Flows									
Flow exceeded for 100% of the days	93	93	114	444	186	93	147	114	229
Flow exceeded for 90% of the days	362	418	314	1,353	863	271	392	195	442
Flow exceeded for 80% of the days	582	774	531	1,816	1,485	371	575	330	612
Flow exceeded for 70% of the days	739	1,118	668	2,711	1,832	440	693	492	701
Flow exceeded for 60% of the days	868	1,475	757	3,707	2,171	638	802	624	758
Flow exceeded for 50% of the days	1,069	2,112	848	4,804	2,557	801	898	808	830
Flow exceeded for 40% of the days	1,380	2,843	993	6,068	2,910	1,012	997	1,192	931
Flow exceeded for 30% of the days	2,094	3,678	1,195	7,663	3,484	1,122	1,069	1,545	1,142
Flow exceeded for 20% of the days	3,214	5,198	1,597	9,970	3,949	1,297	1,264	2,225	1,778
Flow exceeded for 10% of the days	5,393	8,301	3,027	13,457	5,140	2,924	1,571	3,171	4,493
Maximum	18,230	18,230	9,498	18,230	13,020	11,702	4,319	9,498	8,041

Table A.4-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

North Platte River above Lake McConaughy , NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	10	10	88	10	85	55	94	88	223
Flow exceeded for 90% of the days	250	169	314	111	443	151	263	211	533
Flow exceeded for 80% of the days	416	325	493	250	850	283	424	338	659
Flow exceeded for 70% of the days	600	476	636	375	1,218	364	574	458	757
Flow exceeded for 60% of the days	746	740	747	540	1,692	463	661	620	872
Flow exceeded for 50% of the days	901	960	873	800	1,900	632	779	750	996
Flow exceeded for 40% of the days	1,100	1,360	1,020	1,000	2,200	830	896	950	1,170
Flow exceeded for 30% of the days	1,370	1,800	1,210	1,210	2,500	1,100	1,030	1,210	1,360
Flow exceeded for 20% of the days	1,800	2,300	1,470	1,700	3,100	1,650	1,210	1,450	1,676
Flow exceeded for 10% of the days	2,570	3,300	1,962	3,004	4,100	2,270	1,564	1,940	2,400
Maximum	14,900	14,900	6,650	14,900	8,120	8,900	4,500	5,770	6,650
3-day Average Flows									
Flow exceeded for 100% of the days	10	10	95	10	85	59	100	95	225
Flow exceeded for 90% of the days	256	178	316	120	481	158	266	213	538
Flow exceeded for 80% of the days	418	330	503	260	850	285	428	338	659
Flow exceeded for 70% of the days	605	472	640	386	1,260	358	576	462	759
Flow exceeded for 60% of the days	750	735	753	518	1,663	449	669	630	877
Flow exceeded for 50% of the days	902	960	876	790	1,892	625	793	755	993
Flow exceeded for 40% of the days	1,097	1,350	1,017	974	2,200	827	908	944	1,158
Flow exceeded for 30% of the days	1,359	1,800	1,207	1,250	2,498	1,112	1,026	1,193	1,353
Flow exceeded for 20% of the days	1,777	2,250	1,447	1,667	3,050	1,650	1,191	1,439	1,647
Flow exceeded for 10% of the days	2,549	3,275	1,925	2,873	4,038	2,250	1,559	1,917	2,360
Maximum	13,167	13,167	6,600	13,167	7,883	5,867	3,983	5,377	6,600
7-day Average Flows									
Flow exceeded for 100% of the days	10	10	100	10	85	61	106	100	239
Flow exceeded for 90% of the days	266	193	324	129	499	173	279	214	561
Flow exceeded for 80% of the days	421	325	517	286	851	285	434	346	678
Flow exceeded for 70% of the days	613	468	650	378	1,265	348	581	483	770
Flow exceeded for 60% of the days	754	736	759	505	1,679	439	689	638	879
Flow exceeded for 50% of the days	901	958	877	784	1,886	621	799	760	1,000
Flow exceeded for 40% of the days	1,083	1,356	1,007	960	2,171	819	909	928	1,146
Flow exceeded for 30% of the days	1,343	1,764	1,172	1,243	2,483	1,118	1,018	1,155	1,326
Flow exceeded for 20% of the days	1,740	2,243	1,408	1,644	3,035	1,686	1,156	1,404	1,601
Flow exceeded for 10% of the days	2,511	3,234	1,867	2,957	4,047	2,250	1,492	1,806	2,293
Maximum	12,229	12,229	6,516	12,229	7,836	4,500	3,346	4,863	6,516
15-day Average Flows									
Flow exceeded for 100% of the days	13	13	110	13	86	63	110	148	272
Flow exceeded for 90% of the days	277	199	332	150	525	186	298	238	602
Flow exceeded for 80% of the days	421	328	531	286	875	283	441	361	698
Flow exceeded for 70% of the days	635	481	673	371	1,361	344	590	494	789
Flow exceeded for 60% of the days	770	752	775	530	1,695	433	702	656	884
Flow exceeded for 50% of the days	898	955	880	810	1,917	638	818	770	995
Flow exceeded for 40% of the days	1,070	1,332	1,001	953	2,148	819	906	930	1,131
Flow exceeded for 30% of the days	1,290	1,786	1,152	1,214	2,400	1,121	1,005	1,139	1,270
Flow exceeded for 20% of the days	1,687	2,204	1,343	1,491	2,921	1,697	1,126	1,343	1,547
Flow exceeded for 10% of the days	2,437	3,181	1,748	2,788	3,918	2,327	1,367	1,640	2,231
Maximum	11,191	11,191	6,208	11,191	7,289	4,043	2,721	4,351	6,208
30-day Average Flows									
Flow exceeded for 100% of the days	72	72	143	93	93	72	143	164	338
Flow exceeded for 90% of the days	289	187	356	186	533	148	291	251	614
Flow exceeded for 80% of the days	436	343	559	319	857	293	424	357	726
Flow exceeded for 70% of the days	656	526	693	403	1,453	347	617	509	805
Flow exceeded for 60% of the days	786	756	792	616	1,668	419	716	667	885
Flow exceeded for 50% of the days	890	1,000	866	851	1,813	636	820	783	950
Flow exceeded for 40% of the days	1,028	1,378	957	980	2,017	784	870	878	1,072
Flow exceeded for 30% of the days	1,239	1,770	1,073	1,138	2,300	1,063	963	1,057	1,267
Flow exceeded for 20% of the days	1,599	2,130	1,272	1,556	2,638	1,696	1,040	1,216	1,457
Flow exceeded for 10% of the days	2,350	2,808	1,567	2,800	3,688	2,337	1,236	1,443	2,234
Maximum	9,763	9,763	5,968	9,763	7,125	3,750	2,211	4,018	5,968

Table A.4-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 time interval. **Table A.4-13** shows distribution of flow values that is similar to those previously evaluated for the 1895-1909 through 1928-1941 time intervals at upstream locations, and a somewhat complicated distribution of flow values for the 1942-1958 through 1975-1998 time intervals. There is more variability within the parameters considered than what has been seen for previously evaluations for these time intervals at upstream locations. There is the effect of the severe drought of the 1930's on the 1928-1941 time interval, resulting in most flow values being lower than those for the 1942-1958 time interval. There is a small decrease in the flow values from the 1942-1958 time interval to the 1959-1974 time interval for the 100 percent through the 60 percent exceedance probabilities (i.e. lower flows) over all averaging times, coincident with the beginning of operation of Glendo Reservoir in 1958). For the lower exceedance probabilities (higher flows) , known climatological conditions appear to have the greatest effect. Finally, the gradual increase in flow values by averaging time that was noted for the Apr 16-Jul 15 seasonal period is also seen in this seasonal period.

Table A.4-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.4-14** shows a general return to variations by time interval that are mainly due to climatic factors, except from the 1942-1958 time interval to the 1959-1974 time interval, when flows generally decreased for the higher exceedance probabilities (lower flows). This is coincident with the beginning of operation of Glendo Reservoir in 1958.

A.4.5 Median Mean Daily Flow

The Median mean daily flow by calendar day is shown on **Figure A.4-6**. **Figure A.4-6** shows the highest values clearly occurring in May and June for the 1895-1909 time interval; a less evident trend of this kind for the 1910-1927 time interval; and very little variation by day and by month for all time intervals thereafter, except for a slight maximum in late September, and a peak in June for the 1959-1974 time interval which could be the result of high-flow events in the early 1970's.

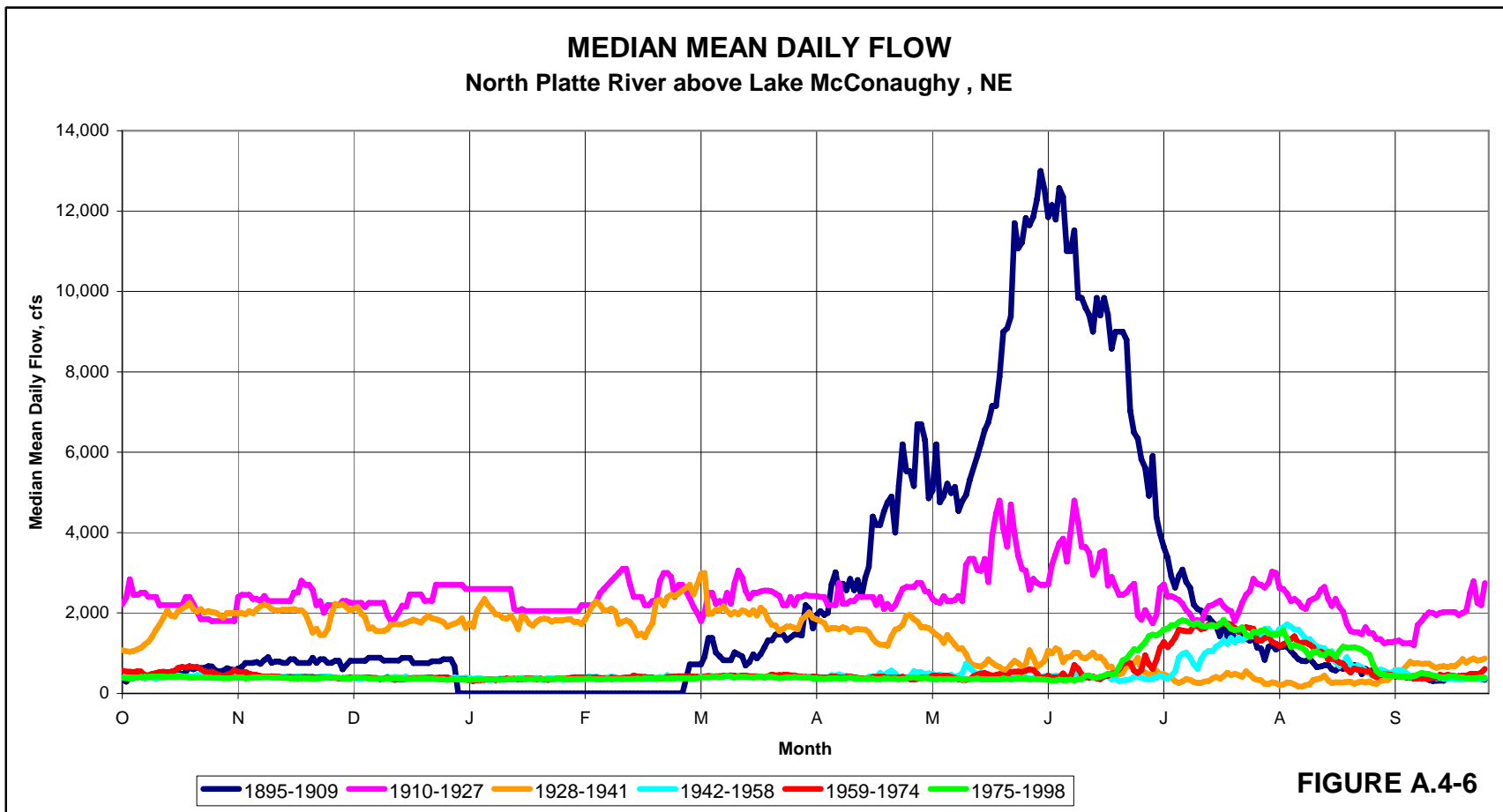


Figure A.4-6 Median Mean Daily Flow.

A.4.6. USGS Annual Peak Flow

The flow distributions for the USGS Annual Peak Flow are shown in **Figure A.4-7** and **Figure A.4-8** and in **Tables A.4-15** and **A.4-16**.

Figure A.4-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak flow, and the 10-year running average of the USGS Annual Peak flow. **Figure A.4-7** shows that, for the 1895-1909 time interval, there is considerable variation in the difference between the USGS Annual Peak flow and the Annual Maximum mean daily flow. In some years, the USGS Annual Peak flow is much higher than the Annual Maximum mean daily flow; in other years, the two quantities are nearly equal. This is consistent with an unregulated basin in which year-to-year climate variations predominate. Beginning with the 1910-1927 time interval, such year-by-year variations decrease in both frequency and magnitude; from the 1942-1958 time interval through the 1975-1998 time interval there are only small differences between the two quantities for both higher and lower peak flows. These differences are somewhat greater than those for the two upstream locations which are only a short distance downstream of Guernsey Dam. This is likely due to the effect of the intervening uncontrolled drainage area, as discussed in **Section A.4.1**.

Figure A.4-8 shows the date of occurrences of the USGS Annual Peak flow over the Period of Record. **Figure A.4-8** shows that, for the 1895-1909 time interval, the peak flows were significantly higher than almost all of the Peak flows over the rest of the period of record. Also, the Peak flows for this time interval all occurred between late May and late June, which is the time frame in which the greatest runoff from high country snowmelt occurs. By contrast, the Peak flows for all time intervals after the 1895-1909 time interval occurred over a much broader range of months, though there is still some tendency for the Peak flows to favor May and June, especially for the wetter time intervals. This is likely due at least in part to the fact that May and June are the months with the most precipitation in the uncontrolled drainage area.

Table A.4-15 compares the average and median values of the USGS Annual Peak flow by time interval. **Table A.4-16** shows that, for the 1895-1909 and the 1910-1927 time intervals, the difference between the average and median Peak flow values is relatively small, with the average being higher than the median. The relative difference between the average and the median shows a steady increase for the 1928-1941 and the 1942-1958 time intervals, coincident with the beginning of operation of major reservoir projects. From the 1942-1958 through the 1975-1998 time intervals, the relative differences remain more or less the same. The averages are 28 to 45 percent greater than the medians for these time intervals, compared to only a 5 percent difference for the 1895-1909 time interval. This is consistent with the suggestion made in **Section A.4.4.2** that lower flows were the rule during these time intervals, and that the average values were skewed higher by the occurrence of a small number of high flow events during which it is possible that the upstream reservoirs spilled.

Table A.4-16 shows the exceedance probabilities and values for the USGS Annual Peak flow. It is analogous to **Table A.4-5** for Annual Maximum mean daily flows. **Table A.4-16** shows a very large increase in flow values with decreasing exceedance probability for the 1895-1909 time interval, and smaller increases with decreasing exceedance probability for all time intervals thereafter. For the 1942-1958 through 1975-1998 time intervals, the magnitude of the increase with decreasing exceedance probability is about the same. This is consistent with known river conditions during the respective time intervals. The North Platte River was uncontrolled during the 1895-1909 time interval; most of the major North Platte River reservoir projects began operation during the 1910-1927 and 1928-1941 time intervals.

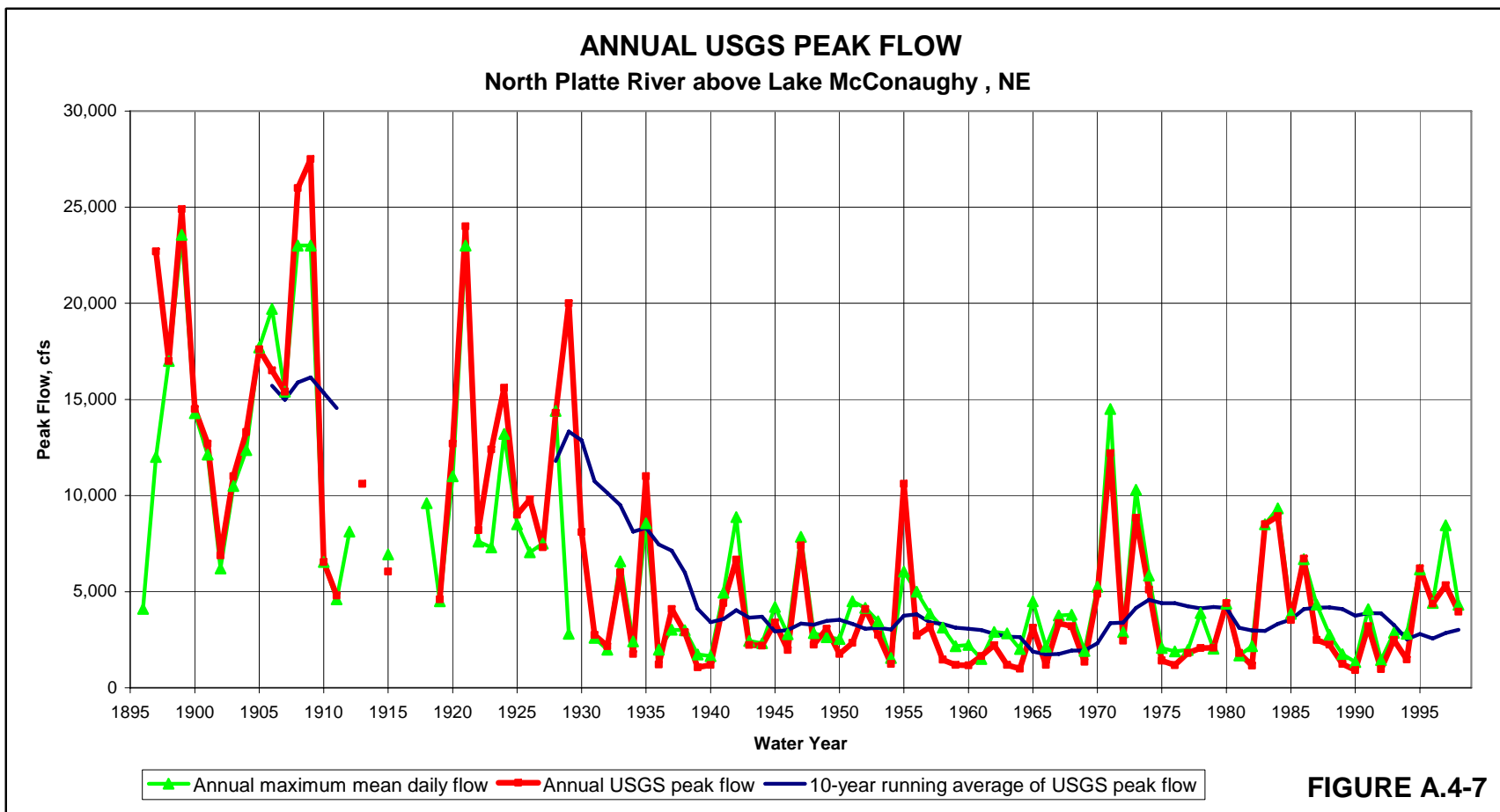


FIGURE A.4-7

Figure A.4-7 Annual USGS Peak Flow.

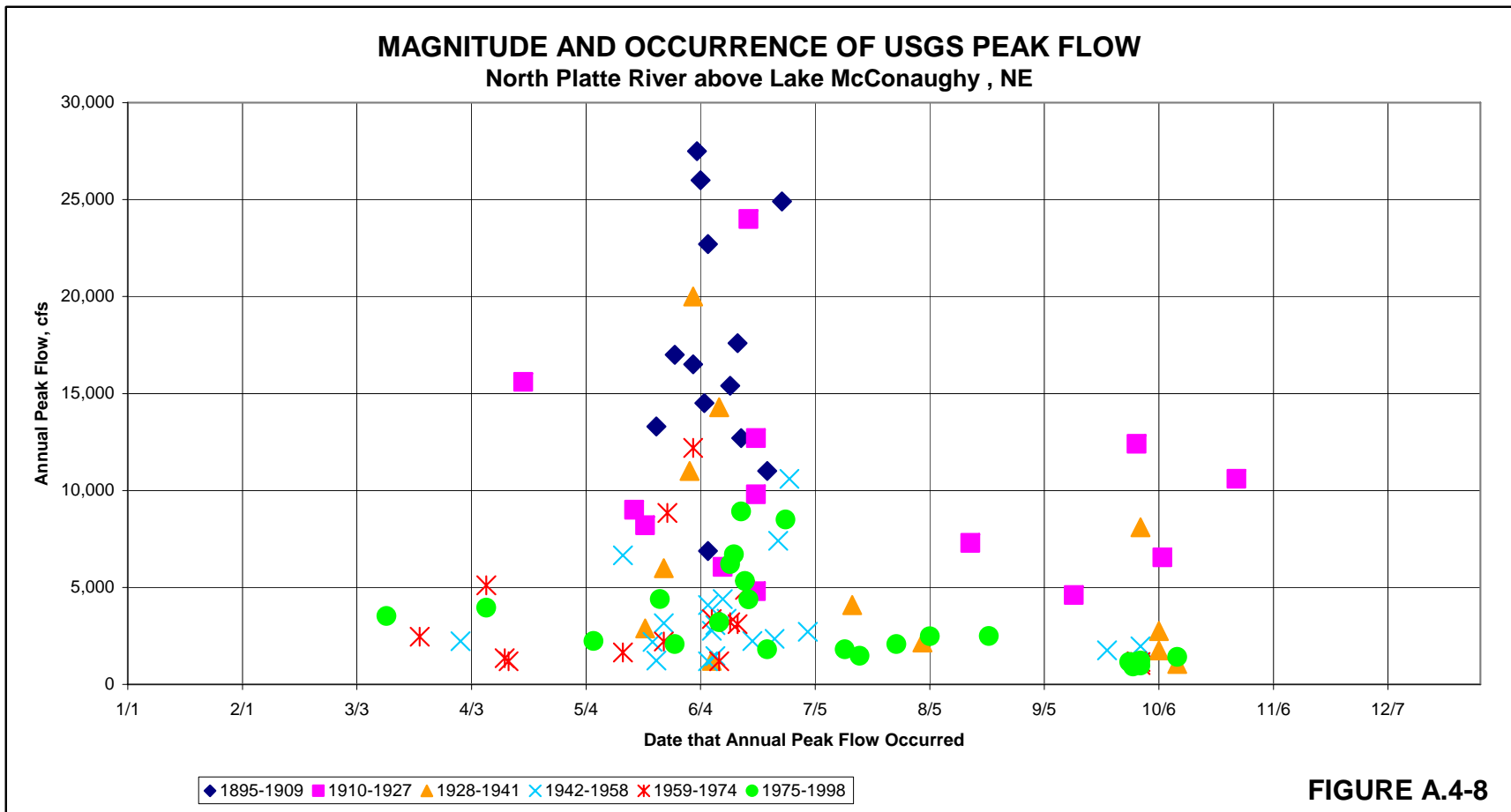


FIGURE A.4-8

Figure A.4-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.4-16 Summary of USGS Peak Flows.

North Platte River above Lake McConaughy , NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	6,497	10,962	3,364	17,383	10,122	5,778	3,485	3,380	3,267
Median Annual Peak Flow (cfs)	3,960	10,200	2,450	16,500	9,000	3,485	2,710	2,330	2,360
Average Occurrence of Peak Flow	6/29	7/3	6/25	6/8	7/15	7/15	6/17	6/11	7/11
Median Occurrence of Peak Flow	6/12	6/12	6/13	6/6	6/19	6/10	6/8	6/7	6/27

Table A.4-16 USGS Peak Flow Exceedance Values.

North Platte River above Lake McConaughy , NE Annual Peak Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Peak exceeded in 100% of the years	915	1,060	915	6,880	4,600	1,060	1,230	992	915
Peak exceeded in 90% of the years	1,190	2,120	1,182	11,340	5,050	1,196	1,640	1,175	1,156
Peak exceeded in 80% of the years	1,760	4,338	1,362	12,940	6,246	1,540	2,014	1,190	1,338
Peak exceeded in 70% of the years	2,218	6,032	1,792	14,020	6,996	2,120	2,214	1,270	1,767
Peak exceeded in 60% of the years	2,808	7,780	2,198	15,220	8,020	2,776	2,280	1,640	2,072
Peak exceeded in 50% of the years	3,960	10,200	2,450	16,500	9,000	3,485	2,710	2,330	2,360
Peak exceeded in 40% of the years	5,242	12,520	3,090	17,120	9,960	4,338	2,940	3,110	3,058
Peak exceeded in 30% of the years	7,548	14,360	3,416	19,640	11,320	6,201	3,206	3,280	4,002
Peak exceeded in 20% of the years	10,920	16,600	4,784	24,020	12,580	9,260	3,950	4,880	4,772
Peak exceeded in 10% of the years	15,480	22,830	6,990	25,780	15,020	13,310	6,960	6,975	6,557
Peak Flow	27,500	27,500	12,200	27,500	24,000	20,000	10,600	12,200	8,920

A.5 NORTH PLATTE RIVER AT NORTH PLATTE, NEBRASKA

A.5.1 Methodology

For this location, a single gage record was used, as follows:

Gage	Records Used	Data Source
North Platte River at North Platte, NE	1/1/1895 – 9/30/1998	Prior to 1915, 1914 Nebraska Hydrographic Report. 1915-1928, 1929 Nebraska Hydrographic Report. 1929-1930, 1931 Nebraska Hydrographic Report. 1931-9/30/1994, USGS website. 10/1/1994-1998, Nebraska DNR website.

Summary statistics characterizing this record are presented in **Table A.5-1** (mean daily values), **Table A.5-2** (annual 3-, 7-, 15-, and 30-day running averages), **Table A.5-3** (seasonal 3-, 7-, 15-, and 30-day running averages), and **Table A.5-4** (flow frequencies).

A.5.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.5-1 shows that there was a steady decrease in both average and median Annual Maximum mean daily flow and annual flow volume by time interval from the beginning of the period of record through the 1942-1958 time interval. Since then, these quantities have remained generally constant except for relatively small variations by time interval, which correspond to climatic variations such as the 1950's drought period (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). The decreases are coincident with the times when the major North Platte reservoirs began operation (**Table 2** of the main report), except that there were no significant changes when Glendo Reservoir began operation in 1958.

Figure A.5-1 (maximum flows) and **Figure A.5-2** (annual flow volume) show the same trends in mean daily and annual flow characteristics for this site as for the sites farther upstream above Lake McConaughy (Lake McConaughy began operation in 1941) except that here these trends are even more evident at North Platte. **Figure A.5-1** shows that, prior to 1909, the Annual Maximum mean daily flow was always significantly higher than the annual maximum 30-day average flow. Between 1910 and 1939 there are an increasing number of years where this difference is not as great. After 1939, the difference is relatively small in most years; it is particularly noteworthy that, for several significant individual high water events in the 1970's and 1980's, there is almost no

difference between the Annual Maximum mean daily flow and the annual maximum 30-day average flow.

Table A.5-1 Summary of Mean Daily Flow Values.

North Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	7,049	12,078	2,902	18,430	10,773	6,949	2,702	3,254	2,808
Median Annual Maximum Mean Daily Flow (cfs)	3,540	10,500	2,420	17,700	9,620	4,935	2,380	2,550	2,505
Average Annual Flow Volume (kaf)	1,016	1,602	533	1,902	1,646	1,222	450	568	568
Median Annual Flow Volume (kaf)	615	1,540	428	1,706	1,678	1,081	426	426	435
Average Mean Daily Flow (cfs)	1,720	2,914	736	3,685	3,225	1,689	621	785	785
Median Mean Daily Flow (cfs)	500	2,100	404	1,954	2,690	1,580	408	406	387
Average Number of Mean Daily Flow Measurements	332	291	365	260	259	365	365	365	365
Number of Years of Data	104 of 104	47 of 47	57 of 57	15 of 15	18 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	2,212	4,731	798	6,050	5,071	3,523	853	812	751
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	6,485	11,515	2,425	18,324	10,284	5,714	1,954	2,983	2,387
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	6,254	10,779	2,601	17,950	9,368	4,812	2,198	3,008	2,616
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	3,219	4,241	2,394	3,918	6,083	2,350	2,461	2,179	2,490
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	680	3,925	560	4,995	4,700	3,650	611	565	517
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	2,910	10,240	2,030	17,700	9,400	3,110	1,790	2,375	2,075
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	2,640	9,125	2,230	17,700	9,060	2,540	2,100	2,375	2,305
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	2,360	4,265	2,150	2,968	5,400	1,520	2,080	2,045	2,215
Difference ("Apr-Jul Average" - "Jul-Sep Average")	3,266	7,274	31	14,405	4,201	3,364	-507	804	-103
Difference ("Apr-Jul Median" - "Jul-Sep Median")	550	5,975	-120	14,732	4,000	1,590	-290	330	-140
Average Occurrence of Maximum Mean Daily Flow	6/18	5/18	7/11	6/2	5/24	4/24	7/17	6/25	7/18
Median Occurrence of Maximum Mean Daily Flow	6/18	6/6	7/21	6/7	5/29	4/3	7/23	7/9	7/21
Average Annual Minimum Mean Daily Flow (cfs)	243	392	193		915	206	143	187	233
Median Annual Minimum Mean Daily Flow (cfs)	195	175	200		1,000	77	122	188	230
Average occurrences per year of the Minimum	2	2	1		3	2	1	2	1
Occurring between	9/4	8/3	9/17		7/12	8/10	11/19	9/13	8/3
and	9/7	8/7	9/19		7/23	8/13	11/23	9/16	8/4
Median occurrences per year of the Minimum	1	1	1		2	1	1	2	1
Occurring between	7/29	7/30	7/19		7/11	8/14	1/12	8/31	6/15
and	7/31	8/6	7/20		7/13	8/15	1/13	9/2	6/16

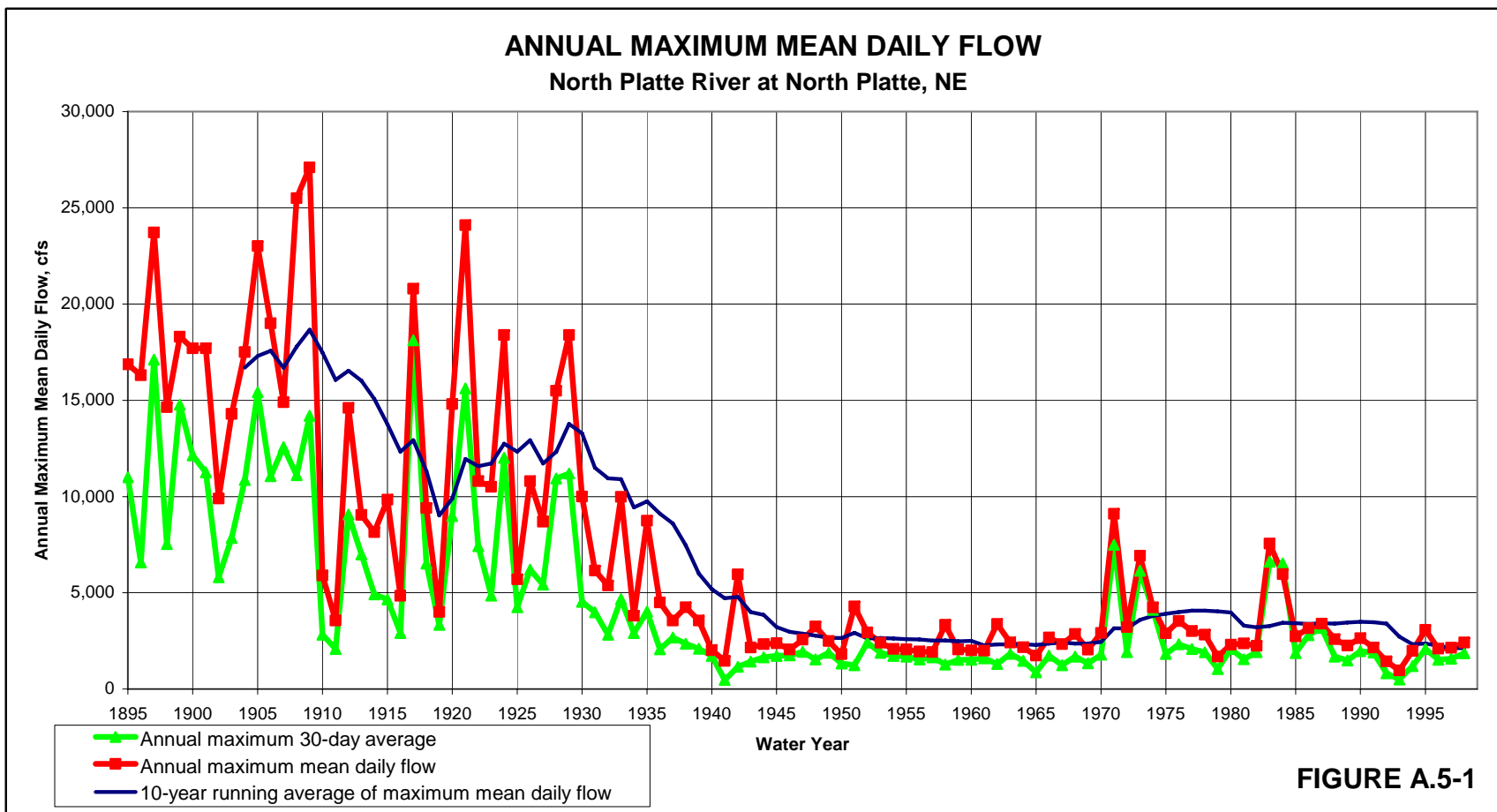


Figure A.5-1 Annual Maximum Mean Daily Flow.

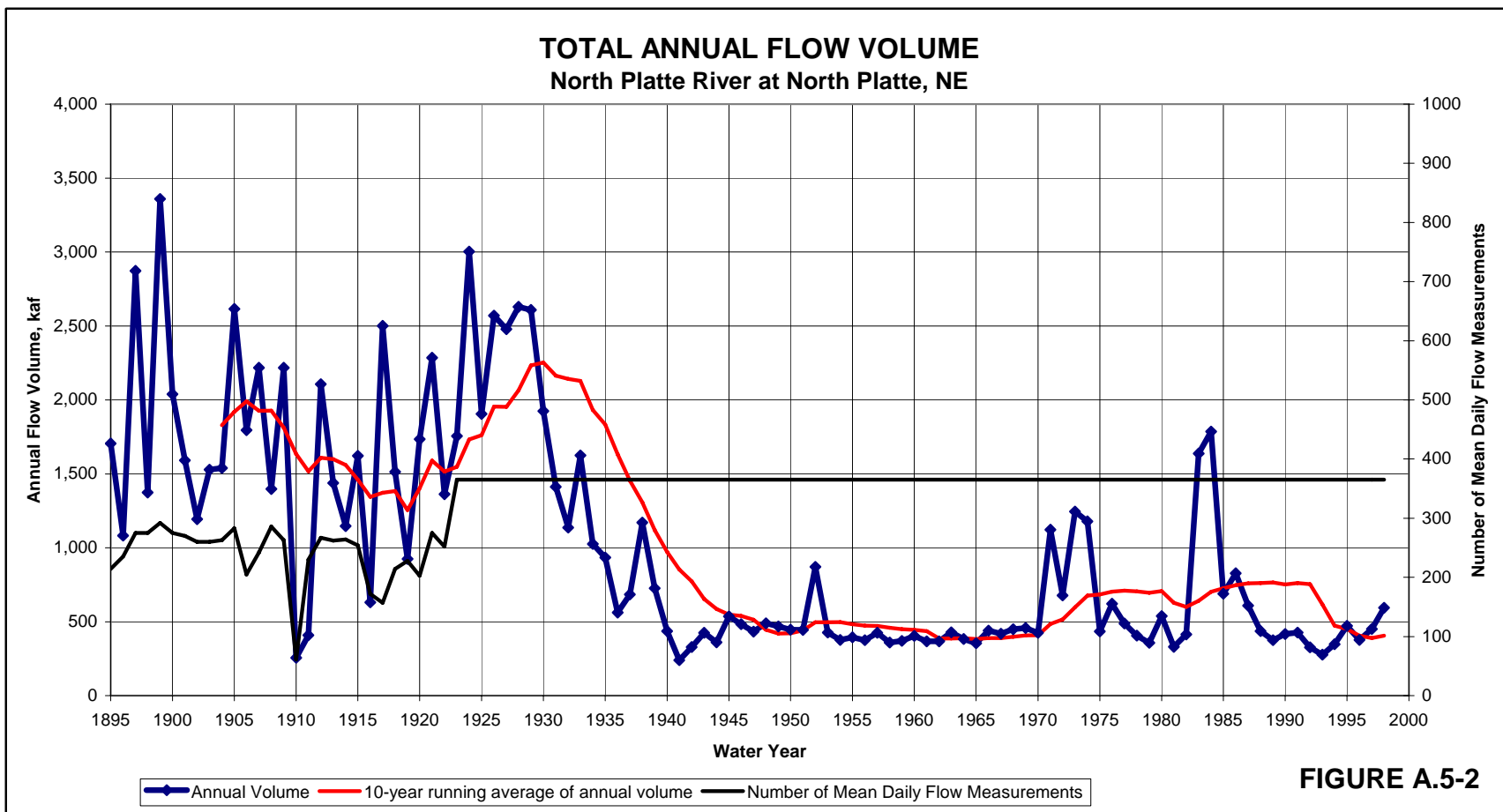


Figure A.5-2 Total Annual Flow Volume.

Figure A.5-1 shows that Annual Maximum mean daily flow have been greatly reduced since 1940. **Figure A.5-2** shows major fluctuations by year between high and low annual flow volume through 1939 and relatively little change from year to year after 1939, except for the previously mentioned individual high water events in the 1970's and 1980's.

Figure A.5-3 shows that, while the highest Annual Maximum mean daily flows occurred in mid-May through mid-June, the same as for the upstream locations, otherwise there is considerable scatter. **Figure A.5-3** also shows a steady increase in the amount of scatter, along with the previously noted decrease in the magnitude of the maximums with time. For the 1895-1909 time interval, most maximums were near or above 15,000 cfs and occurred in May and June. For all time intervals after 1895-1909, Annual Maximum mean daily flows greater than 5,000 cfs occur infrequently and increasing number of these flows occur in months other than May or June. For the 1928-1941 time interval, the majority of the Annual Maximum mean daily flow values were near or below 5,000 cfs, and occurred between late February and early April. **Figure A.5-1** shows that these low values occurred during or shortly after the severe drought period of the 1930's. For the 1942-1958 time interval and all subsequent time intervals, all but 2 of the maximums were less than 5,000 cfs and most maximums occurred in July or August during the peak of the irrigation season.

Before 1940, average and median maximum mean daily flows are highest in the Apr 16-Jul 15 seasonal period, with significant decreases from the Apr 16-Jul 15 to the Jul 16-Sep 30 seasonal period (**Table A.5-1**). After 1940, the highest average and median maximum mean daily flows are in the Jul 16-Sep 30 and the Jun 1-Aug 15 seasonal periods. Both the average and median Dates of Maximum Flow occur in April, May or early June through the 1928-1941 time interval, and in late June or early July for all subsequent time intervals (**Table A.5-1**). The months of July-August constitute the height of the irrigation season for the central Platte River projects served by Lake McConaughy.

Both **Table A.5-1** and **Figure A.5-4** show high variability in Annual Minimum mean daily flow from one year to the next through 1939 and little variability thereafter, concurrent with the regulation of Lake McConaughy. As for the timing of Annual Minimum mean daily flow, **Table A.5-1** does not show a consistent pattern by time interval for either the average or the median Dates of Minimum Flow. Annual Minimum mean daily flows were not calculated for years with incomplete flow records.

A.5.3 3-, 5-, 7-, 15-, and 30-day Averages of Mean Daily Flows

Table A.5-2 shows that there was a modest attenuation of all flow values due to the averaging process. For maximum flows, the attenuation due to averaging is greatest for the 1895-1909 time interval and grows smaller by time interval through the 1942-1958 time interval. For all subsequent time intervals, there is very little attenuation due to the averaging process, concurrent with the regulation of Lake McConaughy. For minimum flows, the general pattern was for increasing flow values with increasing averaging time.

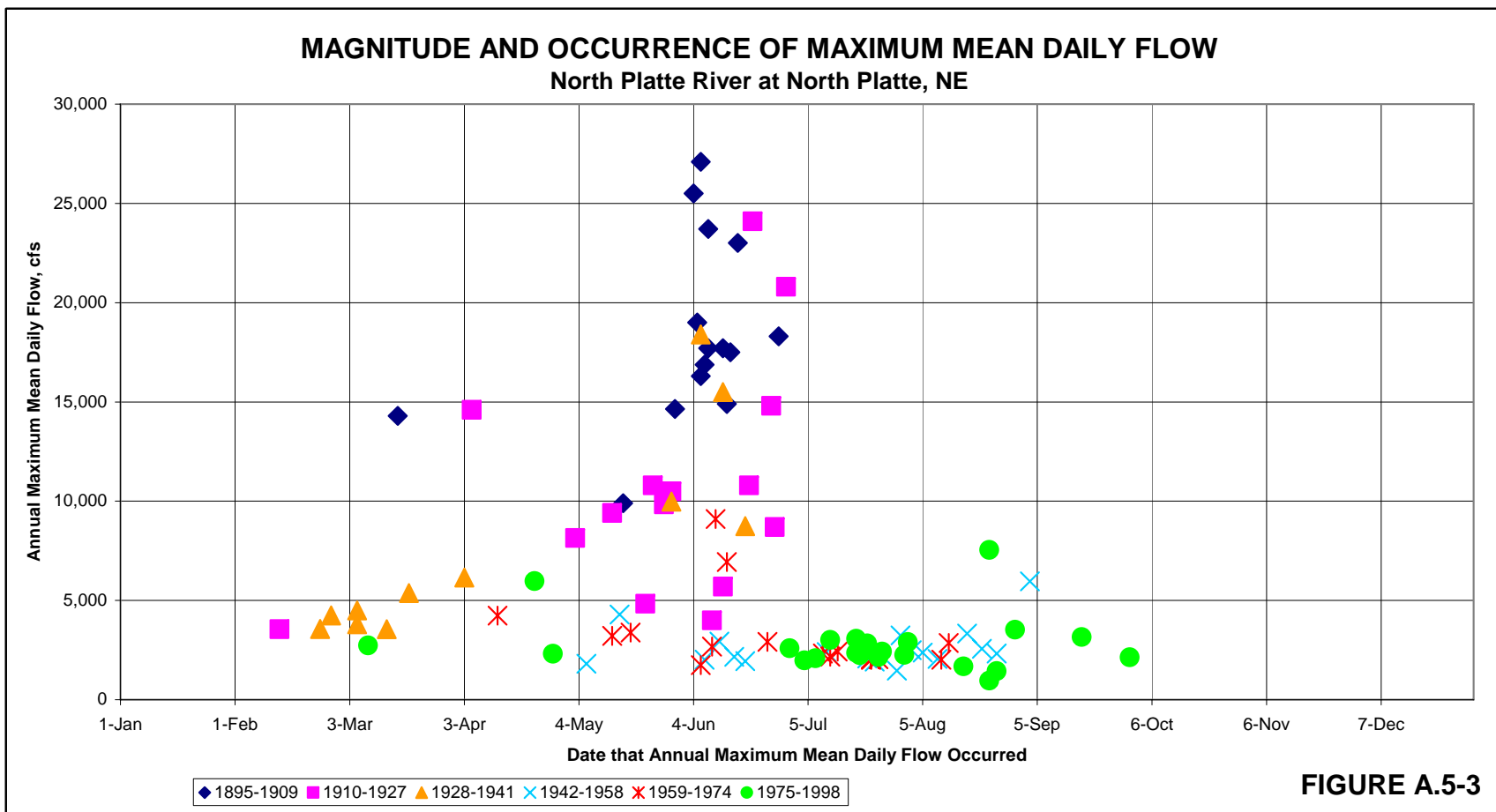


FIGURE A.5-3

Figure A.5-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

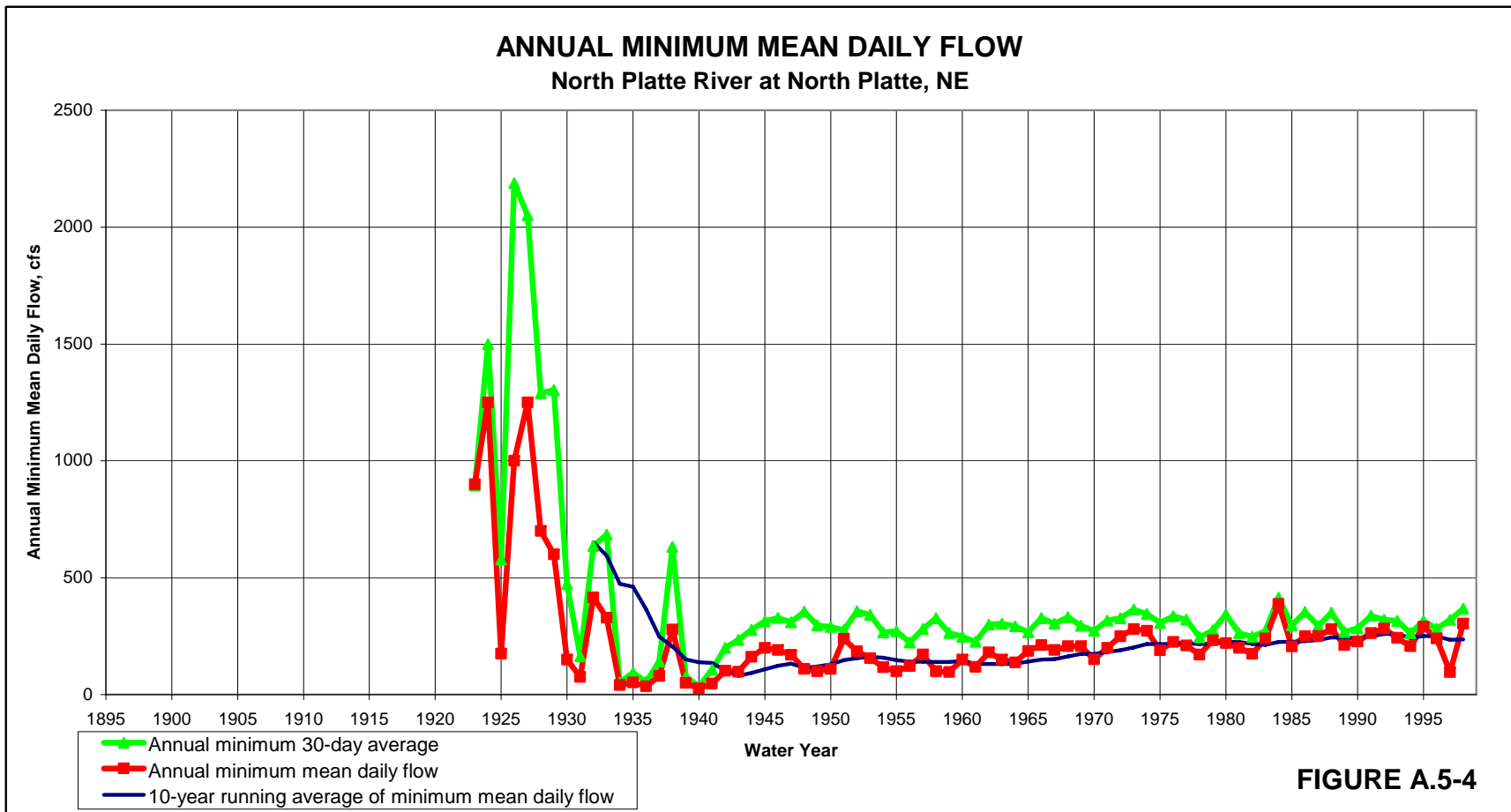


FIGURE A.5-4

Figure A.5-4 Annual Minimum Mean Daily Flow.

Table A.5-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

North Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	7,049	12,078	2,902	18,430	10,773	6,949	2,702	3,254	2,808
Median Annual Maximum Mean Daily Flow (cfs)	3,540	10,500	2,420	17,700	9,620	4,935	2,380	2,550	2,505
Avg. Ann. Max. 3-day Avg. Flow (cfs)	6,496	11,062	2,731	16,832	9,904	6,370	2,422	3,109	2,698
Median Ann. Max. 3-day Avg. Flow (cfs)	3,262	9,333	2,360	16,200	8,572	4,590	2,307	2,368	2,407
Avg. Ann. Max. 7-day Avg. Flow (cfs)	5,893	9,981	2,522	15,205	9,196	5,395	2,092	2,916	2,564
Median Ann. Max. 7-day Avg. Flow (cfs)	3,027	8,429	2,160	14,680	7,996	3,924	2,100	2,101	2,191
Avg. Ann. Max. 15-day Avg. Flow (cfs)	5,211	8,731	2,309	13,211	8,148	4,681	1,853	2,652	2,403
Median Ann. Max. 15-day Avg. Flow (cfs)	2,644	7,608	1,925	13,227	6,767	3,017	1,861	1,825	2,024
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,514	7,488	2,062	11,285	7,010	4,034	1,633	2,345	2,178
Median Ann. Max. 30-day Avg. Flow (cfs)	2,087	6,512	1,718	11,105	5,818	2,867	1,642	1,636	1,880
Average Annual Minimum Mean Daily Flow (cfs)	243	392	193		915	206	143	187	233
Median Annual Minimum Mean Daily Flow (cfs)	195	175	200		1,000	77	122	188	230
Avg. Ann. Min. 3-day Avg. Flow (cfs)	266	428	211		970	234	169	200	250
Median Ann. Min. 3-day Avg. Flow (cfs)	212	183	214		1,100	79	171	205	245
Avg. Ann. Min. 7-day Avg. Flow (cfs)	297	497	231		1,093	284	194	223	262
Median Ann. Min. 7-day Avg. Flow (cfs)	235	299	234		1,250	84	199	223	255
Avg. Ann. Min. 15-day Avg. Flow (cfs)	343	578	265		1,263	334	249	253	283
Median Ann. Min. 15-day Avg. Flow (cfs)	267	316	264		1,277	95	252	262	279
Avg. Ann. Min. 30-day Avg. Flow (cfs)	396	682	300		1,442	410	291	299	308
Median Ann. Min. 30-day Avg. Flow (cfs)	303	577	299		1,500	152	289	301	311

For median mean daily flows, both maximum and minimum, the averages are greater than the medians in most cases. This suggests that lower flows were the rule with the averages being skewed higher by the occurrence of a small number of high flow events. For the 1942-1958 time interval, which is the first time interval after the beginning of operation of Lake McConaughy, **Table A.5-2** shows significantly reduced flows.

Table A.5-3 shows the average and median maximum 3-, 7-, 15-, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.5-3** shows that, for the 1895-1909 time interval, there is a significant decrease in all values with increasing averaging time (i.e. from daily to 15-day; data were insufficient to calculate a 30-day average for the Feb 15-Mar 16 time interval). Also, the highest average and median flows occur in the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods, with the values for the Apr 16-Jul 15 seasonal period being slightly higher. The lowest values are those for the Feb 15-Mar 16 seasonal period. This is what one would expect for what was a predominantly climatologically driven basin during this time interval.

For the 1910-1927 time interval, the same characterizations as those for the 1895-1909 time interval can be seen, but the actual flow values are lower for the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods. Also, there is noticeably less decrease in all values with increasing averaging time. Beginning with the 1928-1941 time interval, a noteworthy change is that the flow values for the Apr 16-Jul 15 seasonal periods are less than those for the 1910-1927 time interval.

Beginning with the 1942-1958 time interval, substantial changes to the characterizations can be seen. The flow values for this and all succeeding time intervals are less than those for the 1928-1941 time interval. This coincides with the beginning of operation of Alcova, Seminoe, and Lake McConaughy Reservoirs in 1938, 1939, and 1941, respectively. The flow values by time interval do not show much change from one time interval to the next and the differences in flow values between seasonal periods are noticeably less after 1941. Decreasing values with increasing averaging time still exist, but these differences are quite small when compared with those for earlier time intervals. For the 1959-1974 and 1975-1998 time intervals, the difference between the average and the median values are quite large, with the average values being higher than the median values. This suggests that lower flows were the rule during these time intervals, with the average values being skewed higher by the occurrence of a small number of very high flow events during which it is possible that the upstream reservoirs spilled.

Table A.5-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

North Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	6,496	11,062	2,731	16,832	9,904	6,370	2,422	3,109	2,698
Median Ann. Max. 3-day Avg. Flow (cfs)	3,262	9,333	2,360	16,200	8,572	4,590	2,307	2,368	2,407
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	1,897	4,064	757	5,027	4,502	3,225	802	757	724
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	5,952	10,541	2,248	16,743	9,505	5,155	1,669	2,811	2,282
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	5,839	10,021	2,464	16,544	8,857	4,446	2,069	2,840	2,493
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,929	3,762	2,257	3,603	5,245	2,132	2,258	2,077	2,376
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	624	3,483	533	4,229	4,000	3,438	572	536	478
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	2,543	8,867	1,920	16,200	8,127	2,885	1,597	2,192	1,988
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	2,493	9,133	2,123	16,200	8,500	2,333	2,017	2,230	2,198
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,220	3,325	2,057	2,678	4,567	1,318	2,030	1,978	2,163
North Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	5,893	9,981	2,522	15,205	9,196	5,395	2,092	2,916	2,564
Median Ann. Max. 7-day Avg. Flow (cfs)	3,027	8,429	2,160	14,680	7,996	3,924	2,100	2,101	2,191
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	1,633	3,487	690	4,358	3,667	2,850	698	686	687
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	5,379	9,504	2,050	15,176	8,721	4,377	1,416	2,578	2,148
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	5,302	9,018	2,303	14,993	8,121	3,706	1,902	2,649	2,358
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	2,629	3,349	2,049	3,237	4,625	1,919	1,979	1,879	2,212
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	555	3,214	497	3,238	3,536	3,153	513	493	459
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	2,279	8,024	1,780	14,680	6,986	2,471	1,351	1,879	1,883
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	2,266	8,004	1,967	14,680	7,771	1,728	1,856	1,939	2,149
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	2,100	3,061	1,910	2,187	4,129	1,157	1,987	1,872	2,023
North Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	5,211	8,731	2,309	13,211	8,148	4,681	1,853	2,652	2,403
Median Ann. Max. 15-day Avg. Flow (cfs)	2,644	7,608	1,925	13,227	6,767	3,017	1,861	1,825	2,024
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	1,370	2,956	618	3,860	3,031	2,472	616	601	630
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	4,693	8,287	1,792	13,211	7,587	3,863	1,193	2,250	1,910
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	4,596	7,688	2,099	12,725	6,933	3,210	1,651	2,424	2,201
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	2,316	2,914	1,834	2,708	4,136	1,651	1,728	1,711	1,991
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	494	2,965	444	3,868	3,080	2,616	459	447	427
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	1,995	6,811	1,491	13,227	5,790	2,074	1,199	1,556	1,658
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	2,045	6,349	1,845	12,736	5,630	1,601	1,646	1,825	1,975
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,834	2,718	1,797	1,947	3,813	854	1,801	1,735	1,800
North Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,514	7,488	2,062	11,285	7,010	4,034	1,633	2,345	2,178
Median Ann. Max. 30-day Avg. Flow (cfs)	2,087	6,512	1,718	11,105	5,818	2,867	1,642	1,636	1,880
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	991	2,249	550		2,576	2,110	545	532	565
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	3,936	7,051	1,422	11,285	6,507	3,173	946	1,796	1,511
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	3,798	6,238	1,830	10,514	5,551	2,491	1,395	2,086	1,967
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,953	2,389	1,601	2,152	3,422	1,387	1,525	1,509	1,717
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	437	2,351	413		2,745	2,166	419	414	401
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	1,432	6,011	1,058	11,105	4,912	1,655	921	1,138	1,112
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,829	5,157	1,593	10,600	4,015	1,123	1,478	1,636	1,843
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,570	2,146	1,525	1,306	3,257	648	1,641	1,518	1,503

A.5.4 Flow Frequency and Exceedance

A.5.4.1 Flow Ranges

Table A.5-4 and **Figure A.5-5** show that, for both frequency in percentage of years and frequency in percentage of days, there is a noticeable change in the frequency distribution of flows by time interval. On an annual basis, there is a broad range of flows, from 501 cfs to 10,000 cfs, which occur 100% of the time in the 1895-1909 time interval. For each succeeding time interval this range becomes both narrower and smaller in magnitude; by the 1942-1958 time interval this range is between 200 cfs and 2,000 cfs. This range then narrows further to between 201 cfs and 1,000 cfs by the 1975-1998 time interval.

On a daily basis, there is only one flow range in the 1985-1909 time interval, 1,001-2,000 cfs, for which the daily frequency equals or exceeds 20 percent. After this time interval, the 1,001-2,000-cfs flow range and the 2,001-4,000-cfs range both exceed 20 percent in frequency for the 1910-1927 and 1928-1941 time intervals. For the 1942-1958 time interval and all subsequent time intervals there is a drastic change in the percentage frequency distribution: the 201-500-cfs range exceeds 60 percent in frequency, and no other flow range equals or exceeds 15 percent in frequency.

A.5.4.2 Maximum Mean Flow Exceedance.

Table A.5-5 through **Table A.5-9** show the exceedance values and probabilities for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.5-5 shows the exceedance probabilities and values for annual maximum flow data. There are two noteworthy characterizations that can be seen in **Table A.5-5**. The first is the dramatic decreases in the flow values from the 1928-1941 time interval to the 1942-1958 time interval, especially for the lower exceedance probabilities (higher flows). The second is how small the differences in the flow values are with decreasing exceedance probability (higher flows) for the 1942-1958 time interval and all subsequent time intervals. Both of these characterizations are more evident for this location than for the locations upstream of Lake McConaughy on the North Platte River (**Section A.2, A.3 and A.4**).

Table A.5-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.5-6** shows the same dramatic decreases in flow values as those seen in **Table A.5-5** from the 1928-1941 time interval to the 1942-1958 time interval for all averaging periods and all exceedance probabilities. Smaller decreases are noted from the 1895-1909 time interval through the 1928-1941 time interval, coincident with the beginning of operation of most of the reservoirs upstream of Lake McConaughy (**Table 2** of the main report). The decreases are smaller than those for upstream locations closer to Guernsey Reservoir over the same time intervals, most

Table A.5-4 Flow Frequency Distributions.

North Platte River at North Platte, NE									
Flow Range (cfs)	Period of record	Time Interval							
		1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	52	49	54	67	22	64	94	63	21
201 to 500	88	72	100	93	44	86	100	100	100
501 to 750	90	79	100	100	44	100	100	100	100
751 to 1,000	94	87	100	100	67	100	100	100	100
1,001 to 2,000	99	100	98	100	100	100	100	100	96
2,001 to 3,000	90	98	84	100	100	93	82	88	83
3,001 to 4,000	58	96	26	100	100	86	18	31	29
4,001 to 5,000	44	85	11	100	89	64	6	19	8
5,001 to 6,000	39	77	9	100	78	50	6	13	8
6,001 to 8,000	36	72	5	100	72	43	0	13	4
8,001 to 10,000	33	70	2	100	72	36	0	6	0
10,001 to 12,000	23	51	0	93	44	14	0	0	0
12,001 to 15,000	20	45	0	93	28	14	0	0	0
Greater than 15,000	15	34	0	73	17	14	0	0	0
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
North Platte River at North Platte, NE									
Flow Range (cfs)	Period of record	Time Interval							
		1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	3.3	6.2	1.4	5.4	0.9	11.7	2.5	1.9	0.1
201 to 500	41.8	8.7	63.5	6.6	3.6	15.0	62.0	60.4	66.6
501 to 750	8.5	5.7	10.4	7.2	2.4	7.6	13.2	10.8	8.2
751 to 1,000	5.6	6.1	5.2	7.5	4.0	7.0	5.7	5.8	4.5
1,001 to 2,000	17.6	23.2	13.9	22.7	22.6	24.0	14.0	14.9	13.1
2,001 to 3,000	10.6	21.6	3.4	11.6	30.2	21.4	2.4	3.0	4.3
3,001 to 4,000	4.8	10.9	0.7	7.3	16.9	8.3	0.1	1.1	0.9
4,001 to 5,000	2.2	4.9	0.4	6.3	6.5	2.5	0.0	0.9	0.4
5,001 to 6,000	1.4	2.8	0.5	4.7	3.4	0.8	0.0	0.3	1.0
6,001 to 8,000	1.8	3.7	0.6	7.4	3.9	0.7	0.0	0.7	0.9
8,001 to 10,000	1.0	2.4	0.0	4.5	3.0	0.3	0.0	0.2	0.0
10,001 to 12,000	0.5	1.3	0.0	3.5	0.6	0.3	0.0	0.0	0.0
12,001 to 15,000	0.5	1.3	0.0	3.3	0.8	0.4	0.0	0.0	0.0
Greater than 15,000	0.4	1.1	0.0	2.2	1.3	0.1	0.0	0.0	0.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
North Platte River at North Platte, NE									
Flow Range (cfs)	Period of record	Time Interval							
		1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	11	18	5	14	2	43	9	7	1
201 to 500	138	25	232	17	9	55	226	221	243
501 to 750	28	17	38	19	6	28	48	39	30
751 to 1,000	19	18	19	19	10	26	21	21	17
1,001 to 2,000	58	67	51	59	59	88	51	54	48
2,001 to 3,000	35	63	12	30	78	78	9	11	16
3,001 to 4,000	16	32	3	19	44	30	0	4	3
4,001 to 5,000	7	14	2	16	17	9	0	3	1
5,001 to 6,000	5	8	2	12	9	3	0	1	4
6,001 to 8,000	6	11	2	19	10	2	0	3	3
8,001 to 10,000	3	7	0	12	8	1	0	1	0
10,001 to 12,000	2	4	0	9	2	1	0	0	0
12,001 to 15,000	2	4	0	8	2	1	0	0	0
Greater than 15,000	1	3	0	6	3	0	0	0	0
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited.									
All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

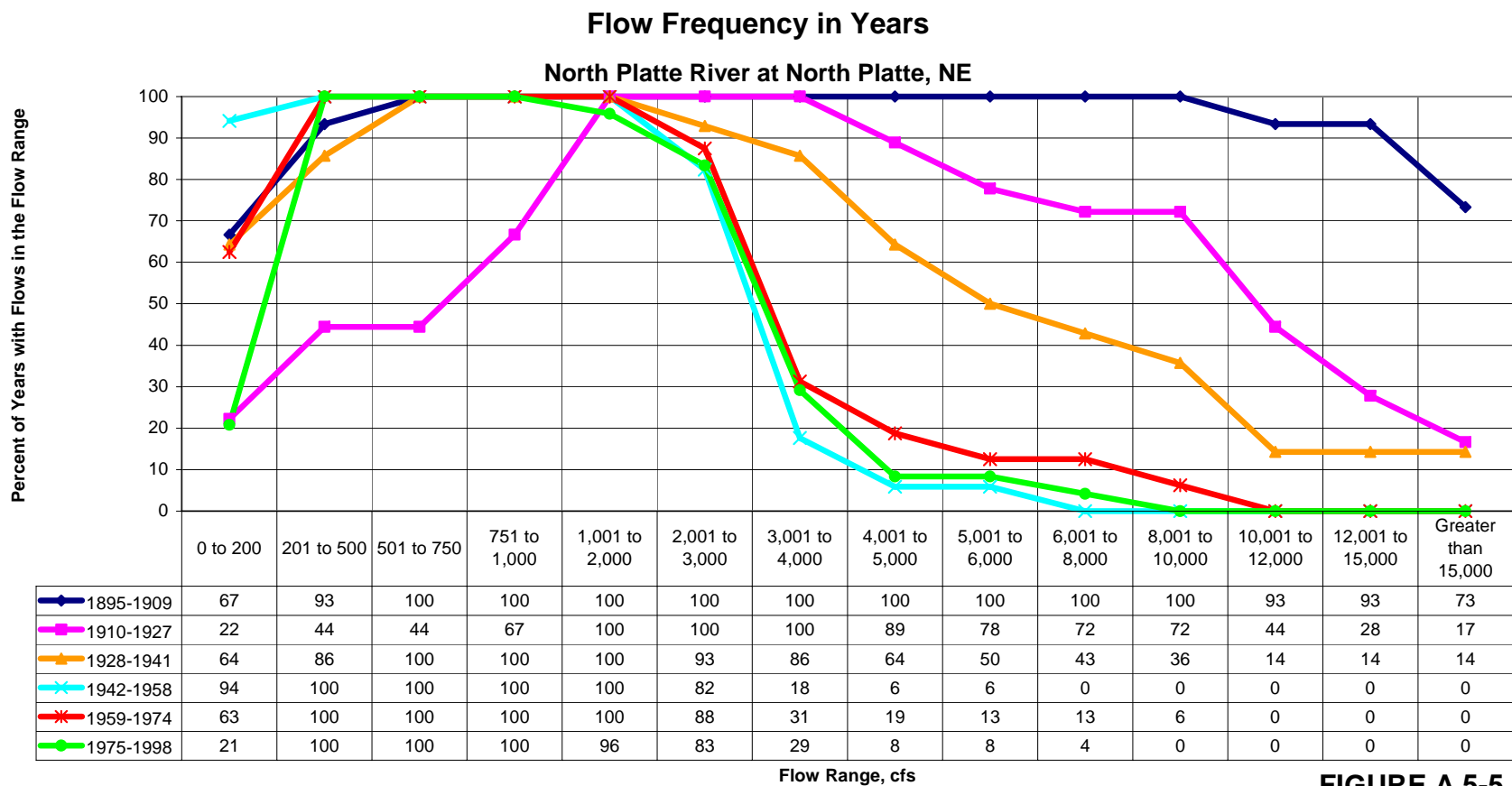


FIGURE A.5-5

Figure A.5- 1 Flow Frequency in Years.

Table A.5-5 Maximum Flow Exceedance Values, Annual Data.

North Platte River at North Platte, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years	963	1,460	963	9,900	3,550	1,460	1,810	1,740	963	
Maximum exceeded in 90% of the years	2,013	3,704	1,932	14,438	4,588	2,479	1,932	2,005	1,770	
Maximum exceeded in 80% of the years	2,166	4,946	2,050	14,849	5,780	3,556	2,050	2,040	2,120	
Maximum exceeded in 70% of the years	2,420	7,750	2,148	16,415	8,205	3,776	2,074	2,110	2,231	
Maximum exceeded in 60% of the years	2,914	9,576	2,318	17,250	8,972	4,300	2,228	2,330	2,320	
Maximum exceeded in 50% of the years	3,540	10,500	2,420	17,700	9,620	4,935	2,380	2,550	2,505	
Maximum exceeded in 40% of the years	5,264	14,628	2,664	17,942	10,560	5,994	2,454	2,860	2,720	
Maximum exceeded in 30% of the years	8,770	16,415	2,914	18,861	10,800	8,864	2,642	3,065	2,911	
Maximum exceeded in 20% of the years	12,200	18,184	3,236	23,152	14,720	9,988	3,178	3,380	3,106	
Maximum exceeded in 10% of the years	17,700	21,684	4,254	24,788	19,120	13,850	3,714	5,580	3,488	
Maximum	27,100	27,100	9,100	27,100	24,100	18,400	5,960	9,100	7,550	
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	873	1,087	873	8,200	3,317	1,087	1,690	1,580	873	
Maximum exceeded in 90% of the years	1,915	3,444	1,802	12,644	4,180	2,236	1,802	1,948	1,705	
Maximum exceeded in 80% of the years	2,071	4,507	1,952	14,140	5,420	3,329	1,863	1,960	2,007	
Maximum exceeded in 70% of the years	2,363	6,440	2,033	14,955	7,892	3,461	1,996	2,038	2,111	
Maximum exceeded in 60% of the years	2,830	8,311	2,193	15,738	8,125	4,012	2,105	2,123	2,237	
Maximum exceeded in 50% of the years	3,262	9,333	2,360	16,200	8,572	4,590	2,307	2,368	2,407	
Maximum exceeded in 40% of the years	4,369	13,167	2,488	17,307	9,253	5,307	2,422	2,520	2,523	
Maximum exceeded in 30% of the years	8,118	15,033	2,830	17,719	10,353	6,833	2,547	2,940	2,727	
Maximum exceeded in 20% of the years	11,181	16,947	3,059	21,262	13,647	8,886	3,014	3,150	3,018	
Maximum exceeded in 10% of the years	16,174	20,715	3,681	22,406	16,683	13,373	3,190	5,515	3,439	
Maximum	23,800	23,800	8,787	23,800	23,033	18,000	3,987	8,787	7,417	
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	651	651	735	7,619	3,076	651	1,549	1,321	735	
Maximum exceeded in 90% of the years	1,780	3,173	1,709	10,671	3,772	2,064	1,709	1,791	1,632	
Maximum exceeded in 80% of the years	1,914	3,914	1,803	12,404	4,997	2,920	1,737	1,856	1,853	
Maximum exceeded in 70% of the years	2,163	5,369	1,895	13,187	6,734	3,216	1,913	1,884	1,914	
Maximum exceeded in 60% of the years	2,349	7,043	1,997	14,129	7,100	3,369	2,027	1,910	2,143	
Maximum exceeded in 50% of the years	3,027	8,429	2,160	14,680	7,996	3,924	2,100	2,101	2,191	
Maximum exceeded in 40% of the years	3,935	11,381	2,253	16,347	8,516	4,668	2,158	2,266	2,292	
Maximum exceeded in 30% of the years	6,806	13,724	2,349	16,902	9,578	5,325	2,250	2,594	2,600	
Maximum exceeded in 20% of the years	9,903	15,656	2,687	19,125	12,750	6,217	2,339	3,040	2,890	
Maximum exceeded in 10% of the years	14,617	19,136	3,326	20,228	15,553	12,082	2,516	5,480	3,352	
Maximum	22,400	22,400	8,560	21,357	22,400	15,900	2,687	8,560	7,083	
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	533	533	556	6,882	2,553	533	1,409	1,008	556	
Maximum exceeded in 90% of the years	1,570	2,801	1,461	8,755	3,460	1,926	1,485	1,513	1,424	
Maximum exceeded in 80% of the years	1,774	3,457	1,627	9,550	4,491	2,489	1,590	1,568	1,670	
Maximum exceeded in 70% of the years	1,938	4,795	1,708	11,821	5,137	2,876	1,697	1,667	1,789	
Maximum exceeded in 60% of the years	2,130	5,439	1,823	12,758	5,709	2,968	1,768	1,797	1,937	
Maximum exceeded in 50% of the years	2,644	7,608	1,925	13,227	6,767	3,017	1,861	1,825	2,024	
Maximum exceeded in 40% of the years	3,460	9,437	2,011	13,789	7,726	4,329	1,911	2,045	2,121	
Maximum exceeded in 30% of the years	5,923	12,089	2,130	14,870	8,911	4,754	1,979	2,175	2,296	
Maximum exceeded in 20% of the years	8,711	13,524	2,411	16,227	10,451	4,908	2,014	2,732	2,688	
Maximum exceeded in 10% of the years	13,245	16,423	3,105	17,272	14,365	10,795	2,169	5,384	3,194	
Maximum	21,290	21,290	8,161	20,492	21,290	13,900	2,637	8,161	6,804	
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	473	473	491	5,811	2,076	473	1,149	867	491	
Maximum exceeded in 90% of the years	1,309	2,250	1,218	6,955	2,880	1,823	1,259	1,269	1,083	
Maximum exceeded in 80% of the years	1,547	2,908	1,352	7,783	3,701	2,080	1,342	1,335	1,507	
Maximum exceeded in 70% of the years	1,721	4,206	1,522	10,893	4,679	2,331	1,511	1,489	1,566	
Maximum exceeded in 60% of the years	1,895	4,875	1,612	11,037	4,900	2,706	1,581	1,519	1,832	
Maximum exceeded in 50% of the years	2,087	6,512	1,718	11,105	5,818	2,867	1,642	1,636	1,880	
Maximum exceeded in 40% of the years	3,120	7,719	1,831	11,609	6,608	3,770	1,707	1,729	1,921	
Maximum exceeded in 30% of the years	4,963	10,954	1,895	12,491	7,379	4,079	1,727	1,811	2,079	
Maximum exceeded in 20% of the years	7,449	11,243	2,056	14,313	9,040	4,589	1,854	1,915	2,185	
Maximum exceeded in 10% of the years	11,174	14,428	2,951	15,159	13,093	9,061	1,907	5,127	3,061	
Maximum	18,123	18,123	7,489	17,122	18,123	11,203	2,416	7,489	6,610	

Table A.5-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

North Platte River at North Platte, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		360	645	360	950	3,200	645	450	420	360
Maximum exceeded in 90% of the years		423	2,055	415	2,000	3,320	2,264	512	452	381
Maximum exceeded in 80% of the years		513	3,220	459	2,550	3,460	3,318	550	500	408
Maximum exceeded in 70% of the years		550	3,445	500	3,138	3,640	3,528	566	526	420
Maximum exceeded in 60% of the years		602	3,640	545	4,050	4,100	3,568	598	549	470
Maximum exceeded in 50% of the years		680	3,925	560	4,995	4,700	3,650	611	565	517
Maximum exceeded in 40% of the years		1,400	4,402	598	6,900	5,000	3,780	648	580	547
Maximum exceeded in 30% of the years		3,260	4,640	644	8,000	5,600	4,258	669	601	607
Maximum exceeded in 20% of the years		3,770	6,560	712	9,489	6,800	4,378	756	640	703
Maximum exceeded in 10% of the years		4,759	8,090	1,240	10,180	7,560	4,478	1,820	943	810
Maximum		14,300	14,300	4,130	14,300	8,100	4,500	2,350	4,130	3,750
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		357	585	357	1,833	3,083	585	420	409	357
Maximum exceeded in 90% of the years		416	2,196	403	2,156	3,253	2,143	475	443	372
Maximum exceeded in 80% of the years		478	3,049	443	2,476	3,373	3,051	496	477	402
Maximum exceeded in 70% of the years		513	3,170	476	2,802	3,393	3,192	527	486	410
Maximum exceeded in 60% of the years		569	3,387	493	3,286	3,640	3,295	555	510	467
Maximum exceeded in 50% of the years		624	3,483	533	4,229	4,000	3,438	572	536	478
Maximum exceeded in 40% of the years		1,303	3,905	564	6,366	4,400	3,493	602	557	509
Maximum exceeded in 30% of the years		3,045	4,127	605	7,384	5,000	3,717	621	574	597
Maximum exceeded in 20% of the years		3,455	5,000	668	7,824	6,000	3,905	679	603	663
Maximum exceeded in 10% of the years		4,142	6,981	1,227	8,130	6,467	4,044	1,733	919	734
Maximum		8,650	8,650	3,703	8,650	6,667	4,247	2,317	3,647	3,703
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		354	458	354	1,643	2,804	458	390	386	354
Maximum exceeded in 90% of the years		401	1,895	390	1,895	2,974	1,810	417	423	362
Maximum exceeded in 80% of the years		437	2,561	409	2,223	3,143	2,538	440	441	392
Maximum exceeded in 70% of the years		462	2,809	437	2,566	3,179	2,787	488	446	404
Maximum exceeded in 60% of the years		510	3,102	459	2,901	3,214	2,883	504	461	415
Maximum exceeded in 50% of the years		555	3,214	497	3,238	3,536	3,153	513	493	459
Maximum exceeded in 40% of the years		1,063	3,237	511	5,261	3,857	3,227	540	502	480
Maximum exceeded in 30% of the years		2,534	3,626	545	5,840	3,893	3,244	555	514	531
Maximum exceeded in 20% of the years		3,214	3,916	600	6,538	3,929	3,403	635	544	585
Maximum exceeded in 10% of the years		3,624	5,791	1,187	7,609	4,493	3,644	1,387	836	683
Maximum		8,000	8,000	3,549	8,000	5,057	3,907	2,114	3,223	3,549
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		340	402	340	1,400	2,310	402	346	383	340
Maximum exceeded in 90% of the years		379	1,683	375	1,683	2,472	1,522	392	402	347
Maximum exceeded in 80% of the years		403	2,151	384	1,951	2,633	2,047	410	424	375
Maximum exceeded in 70% of the years		432	2,380	404	2,192	2,830	2,370	433	426	379
Maximum exceeded in 60% of the years		455	2,602	430	2,910	3,027	2,527	441	440	384
Maximum exceeded in 50% of the years		494	2,965	444	3,868	3,080	2,616	459	447	427
Maximum exceeded in 40% of the years		622	3,021	460	4,233	3,133	2,903	482	455	443
Maximum exceeded in 30% of the years		2,045	3,117	487	4,668	3,213	2,980	491	466	480
Maximum exceeded in 20% of the years		2,602	3,491	522	5,243	3,293	3,031	598	514	526
Maximum exceeded in 10% of the years		3,127	4,111	876	6,341	3,540	3,096	1,040	672	613
Maximum		7,701	7,701	3,184	7,701	3,787	3,540	2,036	2,580	3,184
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		334	348	334		1,961	348	340	350	334
Maximum exceeded in 90% of the years		354	1,502	350		2,032	1,240	368	365	343
Maximum exceeded in 80% of the years		372	1,861	369		2,103	1,560	386	395	353
Maximum exceeded in 70% of the years		403	2,042	383		2,415	1,897	399	410	368
Maximum exceeded in 60% of the years		415	2,101	405		2,727	2,081	409	412	373
Maximum exceeded in 50% of the years		437	2,351	413		2,745	2,166	419	414	401
Maximum exceeded in 40% of the years		460	2,556	420		2,763	2,421	433	437	416
Maximum exceeded in 30% of the years		902	2,692	443		2,837	2,532	446	442	425
Maximum exceeded in 20% of the years		2,063	2,793	461		2,910	2,633	486	453	474
Maximum exceeded in 10% of the years		2,633	2,950	639		2,950	2,865	739	542	513
Maximum		3,403	3,403	2,911		2,990	3,403	2,010	2,123	2,911

Table A.5-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

North Platte River at North Platte, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		660	977	660	9,900	2,650	977	805	660	839
Maximum exceeded in 90% of the years		1,350	2,515	1,216	13,478	4,480	1,789	1,260	1,245	1,221
Maximum exceeded in 80% of the years		1,794	3,800	1,568	14,849	5,012	2,032	1,294	1,740	1,776
Maximum exceeded in 70% of the years		2,026	5,550	1,748	16,415	7,580	2,346	1,590	1,775	1,977
Maximum exceeded in 60% of the years		2,326	8,740	1,868	17,250	8,370	2,900	1,680	2,170	2,006
Maximum exceeded in 50% of the years		2,910	10,240	2,030	17,700	9,400	3,110	1,790	2,375	2,075
Maximum exceeded in 40% of the years		4,030	14,646	2,166	17,942	10,236	3,664	1,816	2,680	2,130
Maximum exceeded in 30% of the years		8,090	16,588	2,404	18,861	10,800	5,734	1,984	3,065	2,315
Maximum exceeded in 20% of the years		10,800	17,700	2,926	23,152	14,000	9,236	2,352	3,380	2,518
Maximum exceeded in 10% of the years		17,660	21,905	3,688	24,788	18,460	13,844	2,986	5,540	3,010
Maximum		27,100	27,100	9,100	27,100	24,100	18,400	4,290	9,100	7,060
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		568	774	568	8,200	2,373	774	668	568	696
Maximum exceeded in 90% of the years		1,163	2,158	1,044	12,041	4,075	1,445	1,033	1,157	1,141
Maximum exceeded in 80% of the years		1,631	3,173	1,323	13,944	4,640	1,751	1,082	1,320	1,583
Maximum exceeded in 70% of the years		1,917	5,367	1,589	14,955	7,093	2,105	1,295	1,693	1,869
Maximum exceeded in 60% of the years		2,123	7,867	1,705	15,738	7,687	2,303	1,557	2,080	1,923
Maximum exceeded in 50% of the years		2,543	8,867	1,920	16,200	8,127	2,885	1,597	2,192	1,988
Maximum exceeded in 40% of the years		3,293	12,251	2,067	17,307	8,940	3,145	1,706	2,377	2,095
Maximum exceeded in 30% of the years		7,125	15,033	2,291	17,719	9,560	5,285	1,804	2,940	2,289
Maximum exceeded in 20% of the years		10,013	17,133	2,762	21,262	13,320	7,381	1,958	3,150	2,463
Maximum exceeded in 10% of the years		16,183	20,760	3,170	22,406	17,233	13,066	2,543	5,368	2,935
Maximum		23,800	23,800	8,787	23,800	23,033	18,000	3,200	8,787	6,897
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		493	508	493	7,619	2,167	508	523	493	619
Maximum exceeded in 90% of the years		988	1,766	905	10,500	3,528	1,098	877	985	1,026
Maximum exceeded in 80% of the years		1,358	2,656	1,025	12,318	4,062	1,328	924	1,100	1,395
Maximum exceeded in 70% of the years		1,696	4,536	1,348	13,187	5,857	1,606	1,004	1,431	1,686
Maximum exceeded in 60% of the years		1,901	6,836	1,541	14,129	6,839	1,995	1,299	1,780	1,843
Maximum exceeded in 50% of the years		2,279	8,024	1,780	14,680	6,986	2,471	1,351	1,879	1,883
Maximum exceeded in 40% of the years		3,025	10,843	1,883	16,347	7,909	2,641	1,505	2,169	2,067
Maximum exceeded in 30% of the years		6,396	13,868	2,157	16,902	9,023	4,420	1,576	2,594	2,185
Maximum exceeded in 20% of the years		9,340	15,900	2,292	19,125	12,823	5,558	1,719	3,040	2,285
Maximum exceeded in 10% of the years		14,638	19,142	2,927	20,228	16,194	11,937	2,157	5,161	2,566
Maximum		22,400	22,400	8,560	21,357	22,400	15,900	2,670	8,560	6,859
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		462	462	477	6,882	1,577	462	499	477	556
Maximum exceeded in 90% of the years		792	1,439	708	8,755	3,117	797	645	864	911
Maximum exceeded in 80% of the years		1,073	2,446	880	9,550	3,455	1,086	752	881	1,030
Maximum exceeded in 70% of the years		1,392	3,800	1,042	11,821	4,557	1,283	786	1,024	1,297
Maximum exceeded in 60% of the years		1,667	5,059	1,290	12,758	5,033	1,826	927	1,299	1,523
Maximum exceeded in 50% of the years		1,995	6,811	1,491	13,227	5,790	2,074	1,199	1,556	1,658
Maximum exceeded in 40% of the years		2,742	9,098	1,628	13,789	6,381	2,377	1,362	1,699	1,856
Maximum exceeded in 30% of the years		5,108	12,128	1,781	14,870	8,355	4,201	1,439	2,118	1,979
Maximum exceeded in 20% of the years		8,394	13,592	2,070	16,227	10,550	4,873	1,537	2,732	2,144
Maximum exceeded in 10% of the years		13,248	16,521	2,588	17,272	15,089	10,795	1,692	4,816	2,290
Maximum		21,290	21,290	8,161	20,492	21,290	13,900	2,493	8,161	6,630
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		361	361	433	5,811	996	361	438	450	433
Maximum exceeded in 90% of the years		598	1,005	547	6,955	2,596	574	544	582	686
Maximum exceeded in 80% of the years		813	2,152	638	7,783	2,935	870	577	691	801
Maximum exceeded in 70% of the years		1,018	3,267	769	10,893	3,886	1,003	599	763	1,017
Maximum exceeded in 60% of the years		1,220	4,670	985	11,037	4,736	1,170	692	979	1,052
Maximum exceeded in 50% of the years		1,432	6,011	1,058	11,105	4,912	1,655	921	1,138	1,112
Maximum exceeded in 40% of the years		2,170	7,526	1,206	11,609	5,776	2,069	995	1,234	1,299
Maximum exceeded in 30% of the years		4,742	10,969	1,308	12,491	6,694	3,538	1,128	1,508	1,405
Maximum exceeded in 20% of the years		7,083	11,253	1,434	14,313	8,682	4,285	1,247	1,846	1,507
Maximum exceeded in 10% of the years		11,184	14,486	1,899	15,159	13,453	9,061	1,315	4,029	1,881
Maximum		18,123	18,123	7,489	17,122	18,123	11,203	2,240	7,489	6,382

Table A.5-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

North Platte River at North Platte, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		802	802	951	6,900	2,150	802	1,500	1,740	951
Maximum exceeded in 90% of the years		1,742	1,870	1,746	12,300	2,864	1,098	1,840	1,930	1,652
Maximum exceeded in 80% of the years		2,044	2,700	2,002	14,460	4,100	1,332	1,954	2,010	2,028
Maximum exceeded in 70% of the years		2,160	4,250	2,050	16,415	5,460	1,694	2,042	2,045	2,144
Maximum exceeded in 60% of the years		2,380	8,700	2,154	17,250	8,780	2,092	2,062	2,170	2,208
Maximum exceeded in 50% of the years		2,640	9,125	2,230	17,700	9,060	2,540	2,100	2,375	2,305
Maximum exceeded in 40% of the years		3,084	12,500	2,392	17,942	9,130	3,180	2,160	2,470	2,460
Maximum exceeded in 30% of the years		6,912	15,900	2,502	18,861	9,680	3,580	2,260	2,615	2,659
Maximum exceeded in 20% of the years		10,240	17,700	2,854	23,152	12,160	6,292	2,396	2,860	2,944
Maximum exceeded in 10% of the years		17,660	21,905	3,058	24,788	17,200	13,472	2,666	4,920	3,064
Maximum		27,100	27,100	9,100	27,100	24,100	18,400	3,240	9,100	7,060
3-day Average Flows										
Maximum exceeded in 100% of the years		613	613	873	6,900	2,127	613	1,337	1,375	873
Maximum exceeded in 90% of the years		1,483	1,473	1,488	11,093	2,636	895	1,605	1,713	1,376
Maximum exceeded in 80% of the years		1,948	2,580	1,863	13,873	3,729	1,085	1,755	1,950	1,948
Maximum exceeded in 70% of the years		2,071	3,823	1,965	14,955	5,276	1,398	1,840	1,978	2,027
Maximum exceeded in 60% of the years		2,289	6,900	2,031	15,738	7,647	1,635	1,955	2,080	2,171
Maximum exceeded in 50% of the years		2,493	9,133	2,123	16,200	8,500	2,333	2,017	2,230	2,198
Maximum exceeded in 40% of the years		2,916	11,400	2,325	17,307	9,140	2,831	2,062	2,360	2,401
Maximum exceeded in 30% of the years		6,717	14,967	2,417	17,719	9,347	3,404	2,131	2,412	2,497
Maximum exceeded in 20% of the years		9,373	17,133	2,528	21,262	11,000	5,804	2,349	2,520	2,679
Maximum exceeded in 10% of the years		16,183	20,760	2,981	22,406	16,633	12,518	2,605	4,852	2,992
Maximum		23,800	23,800	8,787	23,800	23,033	18,000	3,183	8,787	6,897
7-day Average Flows										
Maximum exceeded in 100% of the years		518	518	735	6,744	1,755	518	1,168	1,062	735
Maximum exceeded in 90% of the years		1,169	1,175	1,171	9,716	2,236	651	1,390	1,458	1,327
Maximum exceeded in 80% of the years		1,763	2,073	1,724	12,318	3,147	834	1,641	1,803	1,795
Maximum exceeded in 70% of the years		1,892	2,996	1,804	13,187	4,524	1,038	1,715	1,864	1,884
Maximum exceeded in 60% of the years		2,113	5,771	1,890	14,129	6,314	1,350	1,753	1,896	2,035
Maximum exceeded in 50% of the years		2,266	8,004	1,967	14,680	7,771	1,728	1,856	1,939	2,149
Maximum exceeded in 40% of the years		2,678	10,029	2,151	16,347	8,046	2,127	1,945	2,123	2,169
Maximum exceeded in 30% of the years		5,699	13,861	2,241	16,902	8,599	2,572	2,022	2,250	2,280
Maximum exceeded in 20% of the years		8,802	15,900	2,355	19,000	9,879	3,882	2,218	2,281	2,458
Maximum exceeded in 10% of the years		14,638	19,063	2,825	19,985	16,186	11,704	2,516	4,819	2,857
Maximum		22,400	22,400	8,560	21,357	22,400	15,900	2,687	8,560	6,859
15-day Average Flows										
Maximum exceeded in 100% of the years		382	382	556	6,317	1,130	382	926	859	556
Maximum exceeded in 90% of the years		994	829	1,047	8,389	1,846	509	1,087	1,185	1,245
Maximum exceeded in 80% of the years		1,541	1,725	1,510	9,550	2,838	615	1,227	1,523	1,630
Maximum exceeded in 70% of the years		1,708	2,695	1,618	11,821	3,459	654	1,473	1,572	1,747
Maximum exceeded in 60% of the years		1,858	4,756	1,727	12,159	4,856	1,099	1,586	1,797	1,914
Maximum exceeded in 50% of the years		2,045	6,349	1,845	12,736	5,630	1,601	1,646	1,825	1,975
Maximum exceeded in 40% of the years		2,285	9,047	1,958	13,224	6,212	1,721	1,791	2,045	2,048
Maximum exceeded in 30% of the years		4,856	11,912	2,051	13,912	7,085	1,855	1,877	2,073	2,134
Maximum exceeded in 20% of the years		8,063	13,227	2,182	16,227	8,931	3,463	1,944	2,146	2,265
Maximum exceeded in 10% of the years		13,124	16,521	2,553	17,272	14,337	10,702	2,079	4,469	2,684
Maximum		21,290	21,290	8,161	18,076	21,290	13,900	2,637	8,161	6,630
30-day Average Flows										
Maximum exceeded in 100% of the years		279	279	491	5,409	831	279	782	646	491
Maximum exceeded in 90% of the years		792	580	839	6,555	1,490	393	839	956	989
Maximum exceeded in 80% of the years		1,185	1,180	1,194	7,654	2,447	416	861	1,314	1,409
Maximum exceeded in 70% of the years		1,472	2,125	1,419	9,324	2,670	478	975	1,412	1,548
Maximum exceeded in 60% of the years		1,592	3,504	1,527	10,229	3,623	755	1,303	1,510	1,604
Maximum exceeded in 50% of the years		1,829	5,157	1,593	10,600	4,015	1,123	1,478	1,636	1,843
Maximum exceeded in 40% of the years		2,079	6,878	1,742	10,854	4,692	1,179	1,538	1,729	1,905
Maximum exceeded in 30% of the years		3,695	9,478	1,867	12,201	5,865	1,389	1,697	1,811	1,979
Maximum exceeded in 20% of the years		6,365	10,892	1,960	13,573	7,304	2,489	1,745	1,915	2,082
Maximum exceeded in 10% of the years		10,784	13,696	2,218	14,381	11,643	8,711	1,852	3,819	2,470
Maximum		18,123	18,123	6,992	14,774	18,123	11,197	2,416	6,992	6,382

Table A.5-9 Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

North Platte River at North Platte, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		206	206	963	1,413	1,950	206	1,460	1,220	963
Maximum exceeded in 90% of the years		1,460	804	1,668	1,638	3,386	305	1,680	1,690	1,707
Maximum exceeded in 80% of the years		1,800	1,580	1,854	1,800	4,242	471	1,880	1,740	1,874
Maximum exceeded in 70% of the years		2,006	2,238	1,984	2,335	4,722	535	1,992	1,950	2,098
Maximum exceeded in 60% of the years		2,140	3,140	2,050	2,704	4,800	1,148	2,050	2,010	2,156
Maximum exceeded in 50% of the years		2,360	4,265	2,150	2,968	5,400	1,520	2,080	2,045	2,215
Maximum exceeded in 40% of the years		2,798	4,800	2,298	3,748	6,180	2,028	2,360	2,050	2,338
Maximum exceeded in 30% of the years		3,294	5,275	2,474	4,669	8,130	3,443	2,506	2,320	2,550
Maximum exceeded in 20% of the years		4,800	6,500	2,760	5,180	8,490	5,080	2,746	2,470	2,858
Maximum exceeded in 10% of the years		6,392	8,400	3,192	7,400	9,476	5,305	3,276	2,705	3,133
Maximum		10,100	10,100	7,550	9,851	10,100	5,900	5,960	3,950	7,550
3-day Average Flows										
Maximum exceeded in 100% of the years		147	147	779	1,174	1,740	147	1,337	1,068	779
Maximum exceeded in 90% of the years		1,223	739	1,600	1,420	3,100	291	1,601	1,608	1,645
Maximum exceeded in 80% of the years		1,720	1,550	1,755	1,703	3,320	419	1,810	1,723	1,795
Maximum exceeded in 70% of the years		1,850	1,733	1,901	1,811	3,867	453	1,901	1,882	2,015
Maximum exceeded in 60% of the years		2,033	2,890	2,001	2,385	4,237	1,036	1,971	1,950	2,069
Maximum exceeded in 50% of the years		2,220	3,325	2,057	2,678	4,567	1,318	2,030	1,978	2,163
Maximum exceeded in 40% of the years		2,515	4,300	2,201	3,427	5,161	1,643	2,271	2,007	2,211
Maximum exceeded in 30% of the years		3,049	4,718	2,380	4,261	6,410	3,154	2,467	2,193	2,454
Maximum exceeded in 20% of the years		4,095	5,400	2,509	4,948	7,210	4,721	2,635	2,360	2,520
Maximum exceeded in 10% of the years		5,390	7,483	3,049	7,127	8,497	4,962	3,111	2,483	3,029
Maximum		9,750	9,750	7,417	9,173	9,750	5,350	3,987	3,840	7,417
7-day Average Flows										
Maximum exceeded in 100% of the years		116	116	575	881	1,283	116	1,174	795	575
Maximum exceeded in 90% of the years		1,026	519	1,416	1,271	2,692	269	1,498	1,400	1,562
Maximum exceeded in 80% of the years		1,518	1,283	1,640	1,473	3,046	367	1,698	1,609	1,671
Maximum exceeded in 70% of the years		1,721	1,539	1,764	1,674	3,211	400	1,763	1,744	1,774
Maximum exceeded in 60% of the years		1,890	2,578	1,858	2,086	3,840	705	1,896	1,809	1,867
Maximum exceeded in 50% of the years		2,100	3,061	1,910	2,187	4,129	1,157	1,987	1,872	2,023
Maximum exceeded in 40% of the years		2,279	3,871	2,079	2,950	4,843	1,401	2,095	1,896	2,155
Maximum exceeded in 30% of the years		2,713	4,307	2,164	3,854	5,259	3,007	2,250	1,939	2,181
Maximum exceeded in 20% of the years		3,675	5,243	2,299	4,806	5,383	4,121	2,339	2,123	2,376
Maximum exceeded in 10% of the years		5,216	6,039	2,562	6,079	7,884	4,589	2,391	2,234	2,952
Maximum		9,550	9,550	7,083	9,019	9,550	5,107	2,676	3,460	7,083
15-day Average Flows										
Maximum exceeded in 100% of the years		110	110	476	710	1,154	110	926	627	476
Maximum exceeded in 90% of the years		845	373	1,182	937	2,309	194	1,324	1,085	1,271
Maximum exceeded in 80% of the years		1,284	891	1,409	1,306	2,693	291	1,517	1,500	1,365
Maximum exceeded in 70% of the years		1,546	1,385	1,555	1,440	2,931	342	1,628	1,544	1,601
Maximum exceeded in 60% of the years		1,709	2,070	1,671	1,634	3,594	483	1,745	1,634	1,659
Maximum exceeded in 50% of the years		1,834	2,718	1,797	1,947	3,813	854	1,801	1,735	1,800
Maximum exceeded in 40% of the years		1,982	3,397	1,830	2,531	3,934	1,188	1,847	1,790	1,909
Maximum exceeded in 30% of the years		2,361	3,908	1,917	3,362	4,597	2,650	1,883	1,815	1,973
Maximum exceeded in 20% of the years		3,241	4,494	2,053	4,353	5,012	3,385	1,967	1,969	2,198
Maximum exceeded in 10% of the years		4,459	5,010	2,239	4,637	6,651	4,165	2,071	2,122	2,830
Maximum		9,413	9,413	6,804	7,783	9,413	4,723	2,191	3,253	6,804
30-day Average Flows										
Maximum exceeded in 100% of the years		97	97	474	481	1,004	97	865	577	474
Maximum exceeded in 90% of the years		644	291	989	695	1,561	159	1,112	1,006	954
Maximum exceeded in 80% of the years		1,072	689	1,148	1,025	2,121	221	1,303	1,323	1,075
Maximum exceeded in 70% of the years		1,284	1,114	1,333	1,108	2,515	288	1,418	1,399	1,151
Maximum exceeded in 60% of the years		1,429	1,339	1,467	1,224	3,140	355	1,563	1,477	1,408
Maximum exceeded in 50% of the years		1,570	2,146	1,525	1,306	3,257	648	1,641	1,518	1,503
Maximum exceeded in 40% of the years		1,683	3,015	1,638	1,830	3,365	1,085	1,652	1,525	1,656
Maximum exceeded in 30% of the years		1,984	3,290	1,667	2,808	3,625	2,146	1,664	1,582	1,734
Maximum exceeded in 20% of the years		2,969	3,549	1,752	3,327	4,285	3,136	1,734	1,663	1,992
Maximum exceeded in 10% of the years		3,546	4,363	1,992	4,056	4,906	3,480	1,804	1,737	2,256
Maximum		9,069	9,069	6,610	6,496	9,069	3,750	1,937	3,088	6,610

likely due to the effect of precipitation and irrigation return flow from the large intervening uncontrolled drainage area between Guernsey Reservoir and North Platte prior to the beginning of operation of Lake McConaughy.

There are large decreases in flow values for all exceedance probabilities and all averaging times between the 1928-1941 time interval and the 1942-1958 time interval. These decreases are coincident with the beginning of operation of Alcova, Seminole, and Lake McConaughy Reservoirs in 1938, 1939, and 1941, respectively. Changes in flow values by time interval, averaging time, and exceedance probability are all relatively small from the 1942-1958 time interval through the 1975-1998 time interval.

Table A.5-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.5-7** shows flow values that is quite similar to those for the annual data (**Table A.5-5**). There are substantial decreases in flow values by time interval from the 1895-1909 time interval through the 1942-1958 time interval for all averaging times and all exceedance probabilities. These decreases are similar to those for the upstream locations closer to Guernsey Reservoir, except that the decreases are greater from the 1928-1941 time interval to the 1942-1958 time interval, especially for the lower exceedance probabilities (higher flows). Also, for the 1942-1958 time interval and all subsequent time intervals there are smaller increases in flow values with decreasing exceedance probability (higher flows) and smaller decreases in the differences between exceedance values with increasing averaging time. The changes between the 1928-1941 and 1942-1958 time intervals are coincident with the beginning of operation of Alcova, Seminole, and Lake McConaughy Reservoirs in 1938, 1939, and 1941, respectively.

Table A.5-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.5-8** shows that the flow values are generally slightly lower than those for the Apr 16-Jul 15 seasonal period (**Table A.5-7**) for the 1895-1909 through the 1928-1941 time intervals, and slightly higher for the 1942-1958 through 1975-1998 time intervals. A possible explanation for this is that, for the later time intervals, irrigation releases from Lake McConaughy are somewhat greater over the Jun 1-Aug 15 seasonal period. Otherwise, the characterizations for the Jun 1-Aug 15 seasonal period are generally the same as those for the Apr 16-Jul 15 seasonal period.

Table A.5-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.5-9** shows that, in this late part of the growing season, climatological effects begin to influence the flow values again. The sharp decrease in flow values from the 1910-1927 time interval to the 1928-1941 time interval is coincident with both the beginning of operation of Guernsey Reservoir in 1928 and the severe drought conditions during the 1930's. There is a significant jump in the flow values from the 1928-1941 time interval to the 1942-1958 time interval for exceedance probabilities of 40 percent and higher (lower flows), whereas the flow values decrease between these time intervals for exceedance probabilities of 30 percent and

lower (high flows). Again, a possible explanation for this is the regulation of Lake McConaughy for downstream irrigation.

Small decreases in flow values from the 1942-1958 time interval to the 1959-1974 time interval are present for this seasonal period for most exceedance probabilities. A different characterization than what has been noted for other seasonal periods can be seen between the 1895-1909 and 1910-1927 time intervals for this seasonal period. The flow values increase from the 1895-1909 time interval to the 1910-1927 time interval for all averaging periods and all exceedance probabilities. This situation has been noted and discussed for other locations (**Sections A.2.4.3** and **A.4.4.3**).

A.5.4.3 Mean Daily Flow Exceedance

Table A.5-10 through **Table A.5-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.5-10 shows the exceedance probabilities and values of flows for annual data. **Table A.5-10** shows that the decrease in flow values by time interval for annual data generally follows a similar pattern to that for maximum flows (**Table A.5-5**) for the 1895-1909 through the 1942-1958 time intervals. The exception is for the 50 percent through 100 percent exceedance probabilities (low flows) for the 1895-1909 time interval, which are biased due to a lack of data during the fall and winter. For the 1942-1958 through the 1975-1998 time intervals, there is not much systematic variation except for some indication of climatic influences by time interval.

Table A.5-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.5-11** shows that, as for the maximum flows (**Table A.5-6**), there is a significant decrease in flow values for all averaging periods and all exceedance probabilities from the 1928-1941 time interval to the 1942-1958 time interval, coincident with the beginning of operation of Alcova, Seminoe, and Lake McConaughy Reservoirs in 1938, 1939, and 1941, respectively. Decreases in flow values from the 1895-1909 through the 1928-1941 time intervals are relatively small, and are less than those for upstream locations closer to Guernsey Reservoir. This could be the result of the effects of runoff from the large intervening uncontrolled drainage area that existed in these upstream areas before the beginning of operation of Lake McConaughy.

Table A.5-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.5-12** shows sharp decreases in flow value by time interval for the 1895-1909 through 1942-1958 time intervals for all averaging times and exceedance probabilities. These are coincident with the beginning of operation of the upstream reservoir projects. It can also be seen in **Table A.5-12** that the flow values increase with increasing averaging time for exceedance probabilities of 50 percent and

Table A.5-10 Exceedance Values Considering All Flows, Annual Data.

North Platte River at North Platte, NE Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	96	0	75	26	98	97	96
Flow exceeded for 90% of the days	300	327	296	403	980	178	276	290	310
Flow exceeded for 80% of the days	350	730	332	800	1,530	354	321	338	335
Flow exceeded for 70% of the days	387	1,140	358	1,120	1,900	611	358	368	353
Flow exceeded for 60% of the days	444	1,600	380	1,500	2,250	974	388	392	370
Flow exceeded for 50% of the days	621	2,020	410	2,070	2,600	1,400	420	421	399
Flow exceeded for 40% of the days	1,060	2,500	458	2,950	2,900	1,800	465	480	440
Flow exceeded for 30% of the days	1,600	2,960	590	4,233	3,300	2,223	563	650	566
Flow exceeded for 20% of the days	2,296	3,700	979	6,130	4,000	2,678	841	1,080	1,050
Flow exceeded for 10% of the days	3,450	5,900	1,620	9,769	5,900	3,300	1,400	1,660	1,741
Maximum	27,100	27,100	9,100	27,100	24,100	18,400	5,960	9,100	7,550
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	27	27	101	27	90	28	108	101	177
Flow exceeded for 90% of the days	303	335	300	426	988	185	281	296	311
Flow exceeded for 80% of the days	350	747	334	814	1,548	359	326	338	336
Flow exceeded for 70% of the days	388	1,147	360	1,120	1,917	619	361	368	354
Flow exceeded for 60% of the days	445	1,607	382	1,500	2,267	983	388	392	373
Flow exceeded for 50% of the days	625	2,033	412	2,064	2,600	1,417	421	423	398
Flow exceeded for 40% of the days	1,060	2,500	459	2,967	2,933	1,803	470	477	440
Flow exceeded for 30% of the days	1,600	2,970	594	4,227	3,300	2,250	566	647	575
Flow exceeded for 20% of the days	2,283	3,700	985	6,224	3,981	2,667	854	1,084	1,050
Flow exceeded for 10% of the days	3,433	5,941	1,617	9,719	5,901	3,283	1,399	1,650	1,750
Maximum	23,800	23,800	8,787	23,800	23,033	18,000	3,987	8,787	7,417
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	29	29	111	32	118	29	111	128	188
Flow exceeded for 90% of the days	311	345	308	441	1,039	198	294	306	316
Flow exceeded for 80% of the days	354	764	340	844	1,594	375	333	346	339
Flow exceeded for 70% of the days	391	1,176	362	1,129	1,957	635	366	371	356
Flow exceeded for 60% of the days	447	1,639	385	1,529	2,289	1,001	393	395	374
Flow exceeded for 50% of the days	634	2,050	415	2,071	2,617	1,440	425	424	401
Flow exceeded for 40% of the days	1,059	2,511	463	2,944	2,954	1,836	474	480	445
Flow exceeded for 30% of the days	1,603	2,966	603	4,294	3,300	2,268	570	655	590
Flow exceeded for 20% of the days	2,271	3,693	976	6,236	3,929	2,645	849	1,070	1,044
Flow exceeded for 10% of the days	3,407	5,901	1,603	9,692	5,800	3,250	1,385	1,629	1,743
Maximum	22,400	22,400	8,560	21,357	22,400	15,900	2,687	8,560	7,083
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	33	33	127	36	181	33	127	161	222
Flow exceeded for 90% of the days	323	365	319	467	1,099	220	313	321	322
Flow exceeded for 80% of the days	359	782	345	812	1,653	378	344	353	343
Flow exceeded for 70% of the days	396	1,226	367	1,150	2,010	669	372	375	359
Flow exceeded for 60% of the days	458	1,677	390	1,528	2,347	1,026	402	400	378
Flow exceeded for 50% of the days	649	2,079	422	2,157	2,647	1,509	432	433	405
Flow exceeded for 40% of the days	1,052	2,520	474	2,942	2,977	1,856	481	493	456
Flow exceeded for 30% of the days	1,598	2,953	627	4,450	3,307	2,240	598	674	624
Flow exceeded for 20% of the days	2,260	3,700	971	6,323	3,999	2,627	836	1,067	1,021
Flow exceeded for 10% of the days	3,398	5,840	1,561	9,783	5,702	3,207	1,345	1,580	1,715
Maximum	21,290	21,290	8,161	20,492	21,290	13,900	2,637	8,161	6,804
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	35	35	199	89	308	35	199	226	246
Flow exceeded for 90% of the days	335	389	331	476	1,141	254	331	337	328
Flow exceeded for 80% of the days	368	818	353	844	1,750	400	357	363	348
Flow exceeded for 70% of the days	405	1,262	374	1,143	2,078	717	384	383	364
Flow exceeded for 60% of the days	471	1,713	398	1,569	2,379	1,096	409	411	383
Flow exceeded for 50% of the days	677	2,111	434	2,281	2,710	1,523	442	446	415
Flow exceeded for 40% of the days	1,044	2,527	499	3,254	3,020	1,863	499	532	474
Flow exceeded for 30% of the days	1,544	2,989	669	4,758	3,357	2,244	625	701	683
Flow exceeded for 20% of the days	2,232	3,768	982	6,603	4,027	2,617	854	1,063	1,037
Flow exceeded for 10% of the days	3,383	5,968	1,468	9,880	5,714	3,206	1,249	1,498	1,632
Maximum	18,123	18,123	7,489	17,122	18,123	11,203	2,416	7,489	6,610

Table A.5-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

North Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	100	0	1,200	126	100	170	217
Flow exceeded for 90% of the days	338	1,000	321	1,316	1,600	644	300	320	330
Flow exceeded for 80% of the days	360	1,400	349	1,692	1,800	1,138	352	368	343
Flow exceeded for 70% of the days	389	1,700	365	2,064	2,000	1,477	372	388	350
Flow exceeded for 60% of the days	413	2,064	382	2,150	2,200	1,786	390	402	365
Flow exceeded for 50% of the days	456	2,300	402	2,550	2,450	2,180	410	418	382
Flow exceeded for 40% of the days	549	2,552	420	3,161	2,600	2,472	434	432	402
Flow exceeded for 30% of the days	1,300	2,900	456	4,528	3,000	2,772	481	456	434
Flow exceeded for 20% of the days	2,116	3,206	509	6,692	3,200	3,000	549	497	480
Flow exceeded for 10% of the days	2,858	4,000	666	7,514	4,000	3,550	744	601	658
Maximum	14,300	14,300	4,130	14,300	8,100	4,500	2,350	4,130	3,750
3-day Average Flows									
Flow exceeded for 100% of the days	167	191	167	652	1,383	191	167	187	260
Flow exceeded for 90% of the days	337	1,033	328	1,500	1,609	705	309	327	332
Flow exceeded for 80% of the days	360	1,500	348	1,826	1,793	1,144	355	370	343
Flow exceeded for 70% of the days	388	1,767	365	2,007	2,000	1,500	370	390	353
Flow exceeded for 60% of the days	415	2,080	385	2,296	2,200	1,899	390	405	366
Flow exceeded for 50% of the days	453	2,358	404	2,516	2,400	2,217	416	415	385
Flow exceeded for 40% of the days	534	2,600	423	3,058	2,633	2,500	441	431	404
Flow exceeded for 30% of the days	1,338	2,852	454	4,581	2,877	2,767	481	453	433
Flow exceeded for 20% of the days	2,120	3,200	499	6,103	3,147	3,030	539	481	481
Flow exceeded for 10% of the days	2,810	3,800	656	7,440	3,810	3,400	754	590	651
Maximum	8,650	8,650	3,703	8,650	6,667	4,247	2,317	3,647	3,703
7-day Average Flows									
Flow exceeded for 100% of the days	218	265	218	1,071	1,471	265	218	233	277
Flow exceeded for 90% of the days	341	1,139	332	1,643	1,678	930	315	347	334
Flow exceeded for 80% of the days	365	1,623	350	1,873	1,873	1,234	359	373	345
Flow exceeded for 70% of the days	388	1,904	369	2,029	2,070	1,674	371	391	353
Flow exceeded for 60% of the days	411	2,162	386	2,338	2,217	2,041	389	405	370
Flow exceeded for 50% of the days	449	2,420	404	2,563	2,446	2,329	413	413	386
Flow exceeded for 40% of the days	509	2,604	422	3,477	2,609	2,569	446	429	404
Flow exceeded for 30% of the days	1,334	2,831	455	5,092	2,830	2,757	481	444	431
Flow exceeded for 20% of the days	2,117	3,123	493	5,880	3,106	2,961	518	481	480
Flow exceeded for 10% of the days	2,805	3,600	647	7,440	3,529	3,218	875	543	631
Maximum	8,000	8,000	3,549	8,000	5,057	3,907	2,114	3,223	3,549
15-day Average Flows									
Flow exceeded for 100% of the days	279	347	279	1,367	1,582	347	279	299	315
Flow exceeded for 90% of the days	344	1,275	338	1,554	1,815	1,129	334	363	335
Flow exceeded for 80% of the days	370	1,782	358	1,805	2,093	1,507	363	384	344
Flow exceeded for 70% of the days	392	2,084	374	1,937	2,290	1,959	383	401	359
Flow exceeded for 60% of the days	412	2,319	392	2,243	2,447	2,238	397	413	372
Flow exceeded for 50% of the days	435	2,467	407	3,282	2,537	2,400	413	419	388
Flow exceeded for 40% of the days	478	2,573	423	4,071	2,603	2,533	430	428	403
Flow exceeded for 30% of the days	1,180	2,795	443	4,456	2,800	2,746	459	443	428
Flow exceeded for 20% of the days	2,147	2,981	477	5,388	3,000	2,942	487	457	477
Flow exceeded for 10% of the days	2,707	3,164	614	6,772	3,313	3,066	944	514	566
Maximum	7,701	7,701	3,184	7,701	3,787	3,540	2,036	2,580	3,184
30-day Average Flows									
Flow exceeded for 100% of the days	334	348	334		1,961	348	340	350	334
Flow exceeded for 90% of the days	354	1,502	350		2,032	1,240	368	365	343
Flow exceeded for 80% of the days	372	1,861	369		2,103	1,560	386	395	353
Flow exceeded for 70% of the days	403	2,042	383		2,415	1,897	399	410	368
Flow exceeded for 60% of the days	415	2,101	405		2,727	2,081	409	412	373
Flow exceeded for 50% of the days	437	2,351	413		2,745	2,166	419	414	401
Flow exceeded for 40% of the days	460	2,556	420		2,763	2,421	433	437	416
Flow exceeded for 30% of the days	902	2,692	443		2,837	2,532	446	442	425
Flow exceeded for 20% of the days	2,063	2,793	461		2,910	2,633	486	453	474
Flow exceeded for 10% of the days	2,633	2,950	639		2,950	2,865	739	542	513
Maximum	3,403	3,403	2,911		2,990	3,403	2,010	2,123	2,911

Table A.5-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

North Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	97	0	90	38	98	97	171
Flow exceeded for 90% of the days	270	363	258	2,520	780	171	240	250	270
Flow exceeded for 80% of the days	330	920	300	3,560	1,400	269	288	298	308
Flow exceeded for 70% of the days	399	1,625	333	4,500	2,000	405	332	337	334
Flow exceeded for 60% of the days	544	2,400	372	5,450	2,450	629	376	383	364
Flow exceeded for 50% of the days	920	3,150	428	6,440	2,900	919	432	456	410
Flow exceeded for 40% of the days	1,560	4,050	530	7,665	3,550	1,300	525	604	495
Flow exceeded for 30% of the days	2,400	5,420	773	9,304	4,360	1,922	700	909	760
Flow exceeded for 20% of the days	4,050	7,400	1,240	11,160	5,900	2,780	960	1,550	1,354
Flow exceeded for 10% of the days	6,908	11,100	1,900	13,500	8,800	4,700	1,364	2,620	2,030
Maximum	27,100	27,100	9,100	27,100	24,100	18,400	4,290	9,100	7,060
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	40	40	101	443	90	40	108	101	177
Flow exceeded for 90% of the days	274	379	263	2,759	812	178	249	259	273
Flow exceeded for 80% of the days	332	938	305	3,780	1,467	270	298	302	310
Flow exceeded for 70% of the days	402	1,680	336	4,682	2,050	425	334	340	335
Flow exceeded for 60% of the days	549	2,437	376	5,637	2,517	623	381	388	368
Flow exceeded for 50% of the days	916	3,233	433	6,596	2,967	923	437	462	412
Flow exceeded for 40% of the days	1,547	4,167	535	7,688	3,600	1,347	535	605	497
Flow exceeded for 30% of the days	2,450	5,600	765	9,445	4,433	1,933	700	891	748
Flow exceeded for 20% of the days	4,150	7,442	1,207	11,354	5,930	2,800	959	1,498	1,337
Flow exceeded for 10% of the days	6,967	11,233	1,880	13,543	8,747	4,717	1,345	2,628	2,010
Maximum	23,800	23,800	8,787	23,800	23,033	18,000	3,200	8,787	6,897
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	42	42	128	687	118	42	146	128	188
Flow exceeded for 90% of the days	284	405	274	3,091	889	200	263	275	280
Flow exceeded for 80% of the days	342	968	311	4,080	1,573	287	308	309	314
Flow exceeded for 70% of the days	415	1,764	345	4,865	2,142	436	346	348	342
Flow exceeded for 60% of the days	557	2,571	385	5,851	2,651	659	392	401	374
Flow exceeded for 50% of the days	916	3,378	438	6,748	3,100	931	450	472	418
Flow exceeded for 40% of the days	1,526	4,380	539	8,090	3,687	1,311	540	609	501
Flow exceeded for 30% of the days	2,535	5,707	745	9,656	4,604	1,973	684	901	708
Flow exceeded for 20% of the days	4,359	7,629	1,129	11,543	5,977	2,923	927	1,453	1,209
Flow exceeded for 10% of the days	7,058	11,342	1,827	13,377	8,573	4,789	1,288	2,590	1,977
Maximum	22,400	22,400	8,560	21,357	22,400	15,900	2,670	8,560	6,859
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	54	54	161	1,364	186	54	195	161	222
Flow exceeded for 90% of the days	302	432	291	3,711	1,001	242	291	292	291
Flow exceeded for 80% of the days	352	1,009	322	4,614	1,651	323	326	325	318
Flow exceeded for 70% of the days	430	1,891	352	5,317	2,277	457	352	356	350
Flow exceeded for 60% of the days	570	2,793	396	6,272	2,799	688	405	418	385
Flow exceeded for 50% of the days	877	3,785	460	7,312	3,217	953	470	491	430
Flow exceeded for 40% of the days	1,481	4,694	543	8,543	4,015	1,344	549	640	499
Flow exceeded for 30% of the days	2,740	5,948	723	10,044	4,695	1,971	650	866	696
Flow exceeded for 20% of the days	4,643	8,119	1,031	11,694	5,870	3,227	837	1,384	1,048
Flow exceeded for 10% of the days	7,532	11,441	1,686	13,307	8,545	4,920	1,247	2,689	1,841
Maximum	21,290	21,290	8,161	20,492	21,290	13,900	2,493	8,161	6,630
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	115	115	223	2,580	308	115	223	226	246
Flow exceeded for 90% of the days	322	476	310	4,522	1,248	284	317	313	302
Flow exceeded for 80% of the days	382	1,074	341	5,343	1,943	368	344	349	336
Flow exceeded for 70% of the days	442	2,093	382	6,233	2,344	467	391	393	364
Flow exceeded for 60% of the days	586	3,077	419	7,161	2,896	732	428	443	404
Flow exceeded for 50% of the days	847	4,097	466	8,089	3,714	1,011	476	553	432
Flow exceeded for 40% of the days	1,347	5,071	563	9,426	4,141	1,349	550	673	499
Flow exceeded for 30% of the days	2,988	6,617	683	10,503	4,859	2,093	596	838	664
Flow exceeded for 20% of the days	4,882	8,748	953	11,345	6,221	3,369	807	1,212	916
Flow exceeded for 10% of the days	7,959	11,028	1,385	13,394	8,565	5,109	1,140	3,658	1,355
Maximum	18,123	18,123	7,489	17,122	18,123	11,203	2,240	7,489	6,382

Table A.5-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

North Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	26	26	97	30	75	26	98	97	171
Flow exceeded for 90% of the days	261	179	282	622	650	68	245	272	311
Flow exceeded for 80% of the days	372	490	353	1,212	1,065	118	314	353	380
Flow exceeded for 70% of the days	567	875	456	2,306	1,600	200	390	500	514
Flow exceeded for 60% of the days	895	1,350	650	3,440	2,050	315	502	773	761
Flow exceeded for 50% of the days	1,260	2,100	960	4,500	2,465	522	676	1,095	1,110
Flow exceeded for 40% of the days	1,630	2,890	1,280	6,100	2,896	759	986	1,340	1,410
Flow exceeded for 30% of the days	2,000	4,050	1,560	8,000	3,740	1,040	1,330	1,600	1,660
Flow exceeded for 20% of the days	2,900	6,317	1,770	10,600	5,180	1,600	1,608	1,800	1,934
Flow exceeded for 10% of the days	6,173	10,300	2,100	13,373	8,350	3,375	1,840	2,090	2,280
Maximum	27,100	27,100	9,100	27,100	24,100	18,400	3,240	9,100	7,060
3-day Average Flows									
Flow exceeded for 100% of the days	28	28	101	37	100	28	108	101	177
Flow exceeded for 90% of the days	267	195	286	663	641	72	254	280	318
Flow exceeded for 80% of the days	384	516	362	1,245	1,098	128	321	363	391
Flow exceeded for 70% of the days	587	905	474	2,304	1,618	202	400	509	533
Flow exceeded for 60% of the days	912	1,387	675	3,564	2,066	315	515	778	789
Flow exceeded for 50% of the days	1,270	2,115	978	4,467	2,475	523	677	1,120	1,119
Flow exceeded for 40% of the days	1,633	2,877	1,297	6,183	2,883	767	975	1,349	1,420
Flow exceeded for 30% of the days	2,000	4,067	1,563	7,933	3,700	1,037	1,336	1,597	1,667
Flow exceeded for 20% of the days	2,880	6,411	1,770	10,575	5,150	1,553	1,600	1,790	1,940
Flow exceeded for 10% of the days	6,200	10,357	2,087	13,501	8,243	3,323	1,833	2,068	2,280
Maximum	23,800	23,800	8,787	23,800	23,033	18,000	3,183	8,787	6,897
7-day Average Flows									
Flow exceeded for 100% of the days	29	29	111	45	134	29	111	128	188
Flow exceeded for 90% of the days	285	216	304	743	685	81	273	304	335
Flow exceeded for 80% of the days	412	555	381	1,382	1,135	143	333	394	420
Flow exceeded for 70% of the days	629	935	508	2,354	1,657	219	415	556	595
Flow exceeded for 60% of the days	936	1,408	716	3,535	2,104	350	528	845	840
Flow exceeded for 50% of the days	1,280	2,129	987	4,503	2,443	550	689	1,118	1,158
Flow exceeded for 40% of the days	1,653	2,949	1,293	6,151	2,893	783	958	1,363	1,435
Flow exceeded for 30% of the days	1,997	4,117	1,586	7,861	3,714	1,001	1,315	1,610	1,701
Flow exceeded for 20% of the days	2,893	6,286	1,777	10,610	5,143	1,527	1,605	1,771	1,951
Flow exceeded for 10% of the days	6,143	10,473	2,079	13,033	7,829	3,415	1,803	2,026	2,242
Maximum	22,400	22,400	8,560	21,357	22,400	15,900	2,687	8,560	6,859
15-day Average Flows									
Flow exceeded for 100% of the days	33	33	127	99	186	33	127	161	222
Flow exceeded for 90% of the days	320	252	331	850	779	95	306	331	378
Flow exceeded for 80% of the days	485	632	440	1,523	1,153	171	357	493	519
Flow exceeded for 70% of the days	695	931	577	2,731	1,650	252	447	658	727
Flow exceeded for 60% of the days	953	1,450	767	3,668	2,107	368	565	853	958
Flow exceeded for 50% of the days	1,322	2,205	1,016	4,772	2,507	579	667	1,155	1,218
Flow exceeded for 40% of the days	1,642	2,998	1,324	6,143	2,980	793	890	1,408	1,457
Flow exceeded for 30% of the days	1,976	4,159	1,554	7,710	3,713	964	1,199	1,548	1,714
Flow exceeded for 20% of the days	2,984	6,010	1,773	9,962	4,867	1,436	1,577	1,761	1,929
Flow exceeded for 10% of the days	5,863	10,039	2,043	12,641	7,698	3,557	1,780	2,015	2,187
Maximum	21,290	21,290	8,161	18,076	21,290	13,900	2,637	8,161	6,630
30-day Average Flows									
Flow exceeded for 100% of the days	46	46	199	343	572	46	199	226	301
Flow exceeded for 90% of the days	399	345	420	1,258	835	115	336	486	533
Flow exceeded for 80% of the days	588	696	561	2,159	1,153	197	418	597	722
Flow exceeded for 70% of the days	794	1,025	686	3,045	1,661	310	459	736	926
Flow exceeded for 60% of the days	1,040	1,502	876	3,979	2,099	394	586	972	1,111
Flow exceeded for 50% of the days	1,312	2,262	1,087	5,022	2,457	539	702	1,156	1,304
Flow exceeded for 40% of the days	1,597	3,158	1,311	6,101	3,094	777	852	1,352	1,464
Flow exceeded for 30% of the days	1,970	4,290	1,496	7,335	3,791	927	1,109	1,537	1,638
Flow exceeded for 20% of the days	3,135	5,846	1,707	9,063	4,573	1,281	1,436	1,694	1,867
Flow exceeded for 10% of the days	5,615	8,975	1,971	11,448	7,369	3,719	1,702	1,949	2,073
Maximum	18,123	18,123	6,992	14,774	18,123	11,197	2,416	6,992	6,382

Table A.5-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

North Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	20	20	102	20	75	26	102	147	245
Flow exceeded for 90% of the days	238	108	324	100	679	64	288	310	344
Flow exceeded for 80% of the days	360	265	379	271	1,050	102	365	368	396
Flow exceeded for 70% of the days	470	522	456	465	1,450	151	449	454	463
Flow exceeded for 60% of the days	670	800	598	615	1,800	227	593	576	632
Flow exceeded for 50% of the days	950	1,104	832	800	2,200	427	812	772	929
Flow exceeded for 40% of the days	1,250	1,510	1,130	1,054	2,600	684	1,058	1,020	1,220
Flow exceeded for 30% of the days	1,600	2,100	1,400	1,320	2,980	1,000	1,350	1,320	1,470
Flow exceeded for 20% of the days	2,000	2,800	1,660	1,986	3,500	1,519	1,604	1,630	1,766
Flow exceeded for 10% of the days	2,900	3,800	2,020	3,500	4,800	2,750	1,820	1,920	2,313
Maximum	10,100	10,100	7,550	9,851	10,100	5,900	5,960	3,950	7,550
3-day Average Flows									
Flow exceeded for 100% of the days	27	27	108	27	100	28	108	161	256
Flow exceeded for 90% of the days	243	112	328	117	682	64	296	316	350
Flow exceeded for 80% of the days	366	261	383	269	1,066	99	373	376	398
Flow exceeded for 70% of the days	476	529	463	465	1,501	153	461	454	471
Flow exceeded for 60% of the days	677	808	613	623	1,835	220	614	583	647
Flow exceeded for 50% of the days	953	1,102	838	807	2,233	430	823	760	921
Flow exceeded for 40% of the days	1,250	1,533	1,130	1,054	2,590	700	1,064	1,030	1,210
Flow exceeded for 30% of the days	1,590	2,105	1,403	1,367	2,967	1,017	1,367	1,332	1,471
Flow exceeded for 20% of the days	1,993	2,817	1,657	1,917	3,478	1,533	1,605	1,617	1,757
Flow exceeded for 10% of the days	2,900	3,801	2,010	3,463	4,680	2,704	1,827	1,880	2,294
Maximum	9,750	9,750	7,417	9,173	9,750	5,350	3,987	3,840	7,417
7-day Average Flows									
Flow exceeded for 100% of the days	29	29	111	32	164	29	111	168	272
Flow exceeded for 90% of the days	258	114	340	128	709	66	311	326	354
Flow exceeded for 80% of the days	377	273	400	282	1,079	100	389	390	416
Flow exceeded for 70% of the days	504	556	487	483	1,516	152	491	461	497
Flow exceeded for 60% of the days	699	814	649	623	1,894	220	671	594	678
Flow exceeded for 50% of the days	964	1,086	859	774	2,227	436	850	770	924
Flow exceeded for 40% of the days	1,246	1,521	1,134	1,033	2,557	739	1,099	1,037	1,199
Flow exceeded for 30% of the days	1,570	2,114	1,378	1,336	2,954	1,002	1,375	1,318	1,416
Flow exceeded for 20% of the days	1,971	2,771	1,639	1,877	3,584	1,494	1,600	1,576	1,745
Flow exceeded for 10% of the days	2,867	3,775	1,973	3,305	4,674	2,690	1,787	1,811	2,243
Maximum	9,550	9,550	7,083	9,019	9,550	5,107	2,676	3,460	7,083
15-day Average Flows									
Flow exceeded for 100% of the days	33	33	181	36	281	33	221	181	289
Flow exceeded for 90% of the days	273	127	360	146	712	73	352	339	378
Flow exceeded for 80% of the days	406	282	441	274	1,137	104	452	417	450
Flow exceeded for 70% of the days	557	583	549	494	1,624	146	589	520	546
Flow exceeded for 60% of the days	731	796	708	635	1,927	225	749	628	731
Flow exceeded for 50% of the days	962	1,108	894	725	2,213	385	896	804	942
Flow exceeded for 40% of the days	1,239	1,560	1,112	1,030	2,487	765	1,123	1,044	1,150
Flow exceeded for 30% of the days	1,521	2,101	1,333	1,347	2,973	995	1,351	1,294	1,346
Flow exceeded for 20% of the days	1,906	2,700	1,555	1,786	3,481	1,504	1,555	1,473	1,685
Flow exceeded for 10% of the days	2,814	3,627	1,867	3,097	4,494	2,618	1,725	1,702	2,243
Maximum	9,413	9,413	6,804	7,783	9,413	4,723	2,191	3,253	6,804
30-day Average Flows									
Flow exceeded for 100% of the days	35	35	236	89	313	35	271	236	316
Flow exceeded for 90% of the days	293	137	432	188	775	81	438	413	437
Flow exceeded for 80% of the days	478	283	547	307	1,213	118	650	506	553
Flow exceeded for 70% of the days	648	581	677	455	1,747	154	773	588	680
Flow exceeded for 60% of the days	804	804	804	623	1,999	231	864	682	804
Flow exceeded for 50% of the days	969	1,163	917	746	2,157	348	944	851	919
Flow exceeded for 40% of the days	1,185	1,675	1,052	1,051	2,497	736	1,082	1,028	1,045
Flow exceeded for 30% of the days	1,450	2,095	1,229	1,305	2,945	1,072	1,248	1,154	1,298
Flow exceeded for 20% of the days	1,890	2,684	1,419	1,842	3,245	1,560	1,399	1,321	1,547
Flow exceeded for 10% of the days	2,767	3,262	1,712	2,947	4,222	2,579	1,578	1,537	2,224
Maximum	9,069	9,069	6,610	6,496	9,069	3,750	1,937	3,088	6,610

greater (lower flows). The explanation for this characterization is given in **Section A.1.4.3**.

Table A.5-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 time interval. **Table A.5-13** shows that the characterizations are essentially the same as those for maximum flows (**Table A.5-8**) for this seasonal period. The flow values are generally slightly lower than those for the Apr 16-Jul 15 seasonal period (**Table A.5-12**) for the 1895-1909 through 1928-1941 time intervals, and slightly higher for the 1942-1958 through 1975-1998 time intervals. A possible explanation for this occurrence in the more recent time intervals is that irrigation releases from Lake McConaughy would have been somewhat greater for the Jun 1-Aug 15 seasonal period. Otherwise, the characterizations for the Jun 1-Aug 15 seasonal period are generally the same as those for the Apr 16-Jul 15 seasonal period.

Table A.5-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.5-14** shows that the characterizations are essentially the same as those for maximum flows (**Table A.5-9**) for this seasonal period. In this seasonal period, climatological effects begin to influence the flow values again. The sharp decrease in flow values from the 1910-1927 time interval to the 1928-1941 time interval is coincident with both the beginning of operation of Guernsey Reservoir in 1928 and the severe drought conditions during the 1930's. There is a significant jump in the flow values from the 1928-1941 time interval to the 1942-1958 time interval for exceedance probabilities of 40 percent and higher (lower flows), whereas the flow values decrease between these time intervals for exceedance probabilities of 30 percent and lower. Again, a possible explanation for this is the regulation of Lake McConaughy for downstream irrigation.

A different characterization than what has been noted for other seasonal periods can be seen between the 1895-1909 and 1910-1927 time intervals for this seasonal period. The flow values increase from the 1895-1909 time interval to the 1910-1927 time interval for all averaging periods and all exceedance probabilities. This situation has been noted and discussed for other locations (**Sections A.2.4.3** and **A.4.4.3**).

A.5.5 Median Mean Daily Flow

The Median mean daily flow by calendar day is shown on **Figure A.5-6**. **Figure A.5-6** shows the highest values clearly occurring in May and June for the 1895-1909 time interval. For the 1910-1927 time interval, the Median mean daily flow generally remains in or near the 2,000-4,000-cfs range, with a slight tendency for the highest values to be in May and June; for the 1928-1941 time interval, the values are near 2,000 cfs for October through May and generally less than 1,000 cfs for June through September. For the 1942-1958 time interval and all subsequent time intervals, the values are very low (less than 600 cfs most of the time) from the beginning of September through mid-June; from mid-June through the end of August there is a “hump” of higher values peaking in July or early August at less than 2,000 cfs. This “hump” coincides with the period of maximum releases from Lake McConaughy to meet downstream irrigation demand.

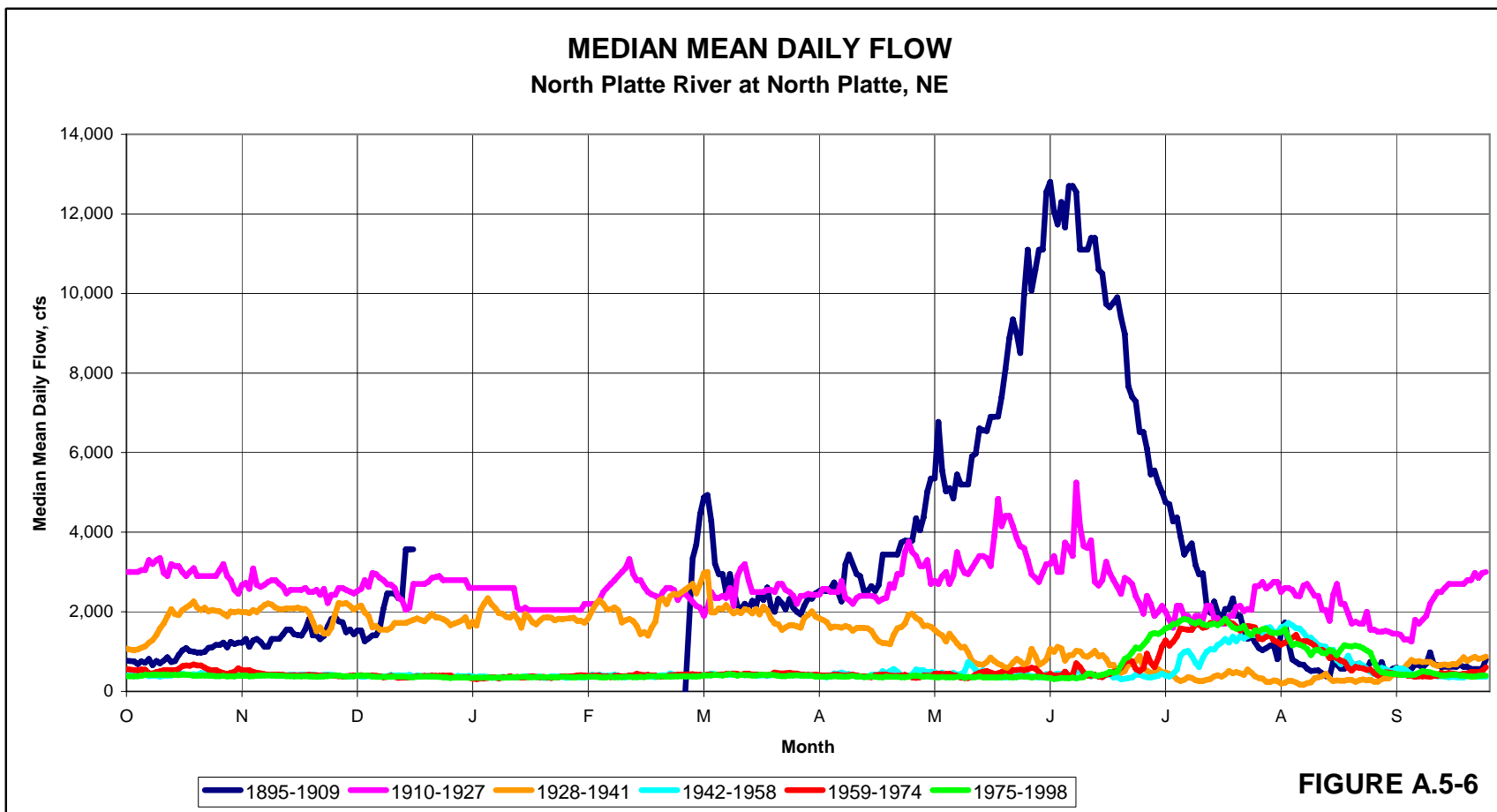


Figure A.5-6 Median Mean Daily Flow.

A.5.6. USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak flow are shown in **Figure A.5-7** and **Figure A.5-8**, and in **Table A.5-15** and **Table A.5-16**.

Figure A.5-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak flow, and the 10-year running average of the USGS Annual Peak flow. **Figure A.5-7** shows that, for the entire available period of record, the difference between the Annual Maximum mean daily flow and the USGS Annual Peak flow is quite small.

For the 1895-1909 time interval, there is considerable variation on a year-to-year basis. This characterization is consistent with an unregulated basin in which year-to-year climate variations predominate. Beginning with the 1910-1927 time interval, such year-by-year variations decrease in both frequency and magnitude. From the 1942-1958 time interval through the 1975-1998 time interval, there are only small differences on a year-by-year basis, except for short periods of very high flows in the 1940's and early 1950's, the early 1970's, and the mid-1980's. Also, there is much less variation in the curve for the 10-year running average of USGS Annual Peak flow after 1950 than for other locations on the North Platte River downstream of Guernsey Reservoir.

Figure A.5-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.5-8** shows that, for the 1895-1909 and 1910-1927 time intervals, the Peak flows were significantly higher than most of the Peak flows over the rest of the period of record. Also, the Peak flows for these time intervals all occurred between late May and late June, which is the time frame in which the greatest runoff from high country snowmelt occurs. The timing of the USGS Peak flows for the 1928-1941 time interval shows two time frames of occurrence of the USGS Annual Peak flow. These are basically March and June. The former can be attributed to lower elevation precipitation and snowmelt runoff from the uncontrolled drainage area downstream of Guernsey Reservoir; the latter coincides with the usual occurrence of high country snowmelt runoff (Lake McConaughy did not exist during this time interval).

Beginning with the 1942-1958 time interval, the Peak flows occurred over a larger range of months. Otherwise, the time of occurrence of the USGS Annual Peak flow for these later time intervals coincides with the greatest releases from Lake McConaughy for downstream irrigation.

Table A.5-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.5-15** shows noticeable differences between the average and median Peak flow values for all time intervals, with the average always being higher than the median. The time of occurrence of both the average and median Peak flows was in June and July for all time intervals except 1928-1941, when they occurred in May.

Table A.5-16 shows the exceedance probabilities and values for the USGS Annual Peak flow. It is analogous to **Table A.5-5** for annual maximum flows. **Table A.5-16** shows a very large increase in flow values with decreasing exceedance probability for the 1895-

1909 time interval, and smaller decreases between exceedance values for all subsequent time intervals. The North Platte River was uncontrolled during the 1895-1909 time interval, control increased at this location during the 1910-1927 and 1928-1941 time intervals, and there was extensive control during the 1942-1958 through 1975-1998 time intervals. The decrease from the 1928-1941 time interval to the 1942-1958 time interval is particularly noticeable for the lower exceedance probabilities (higher Peak flows). This is coincident with the beginning of operation of Alcova, Seminoe, and Lake McConaughy Reservoirs in 1938, 1939, and 1941, respectively.

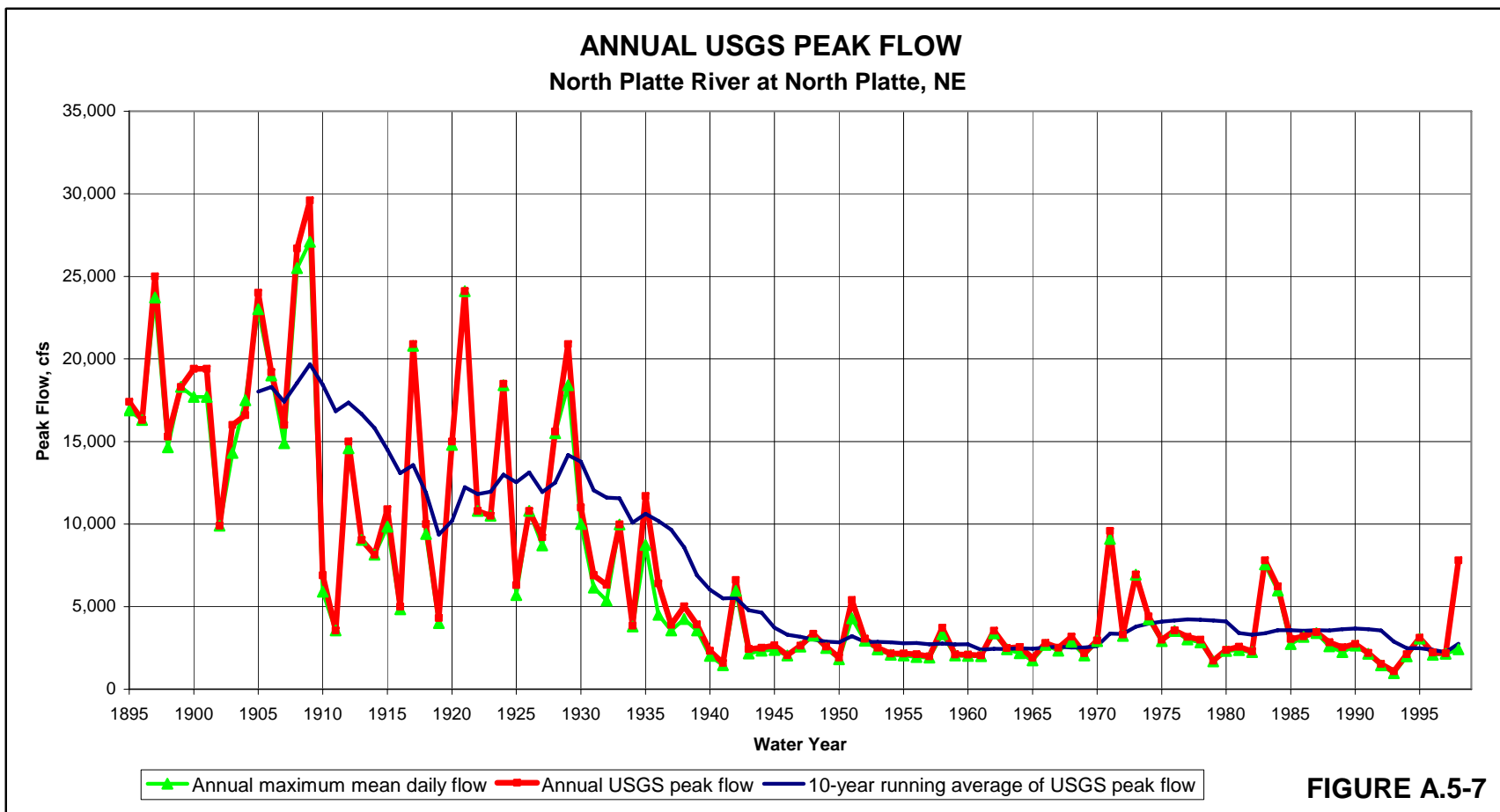


FIGURE A.5-7

Figure A.5-7 Annual USGS Peak Flow.

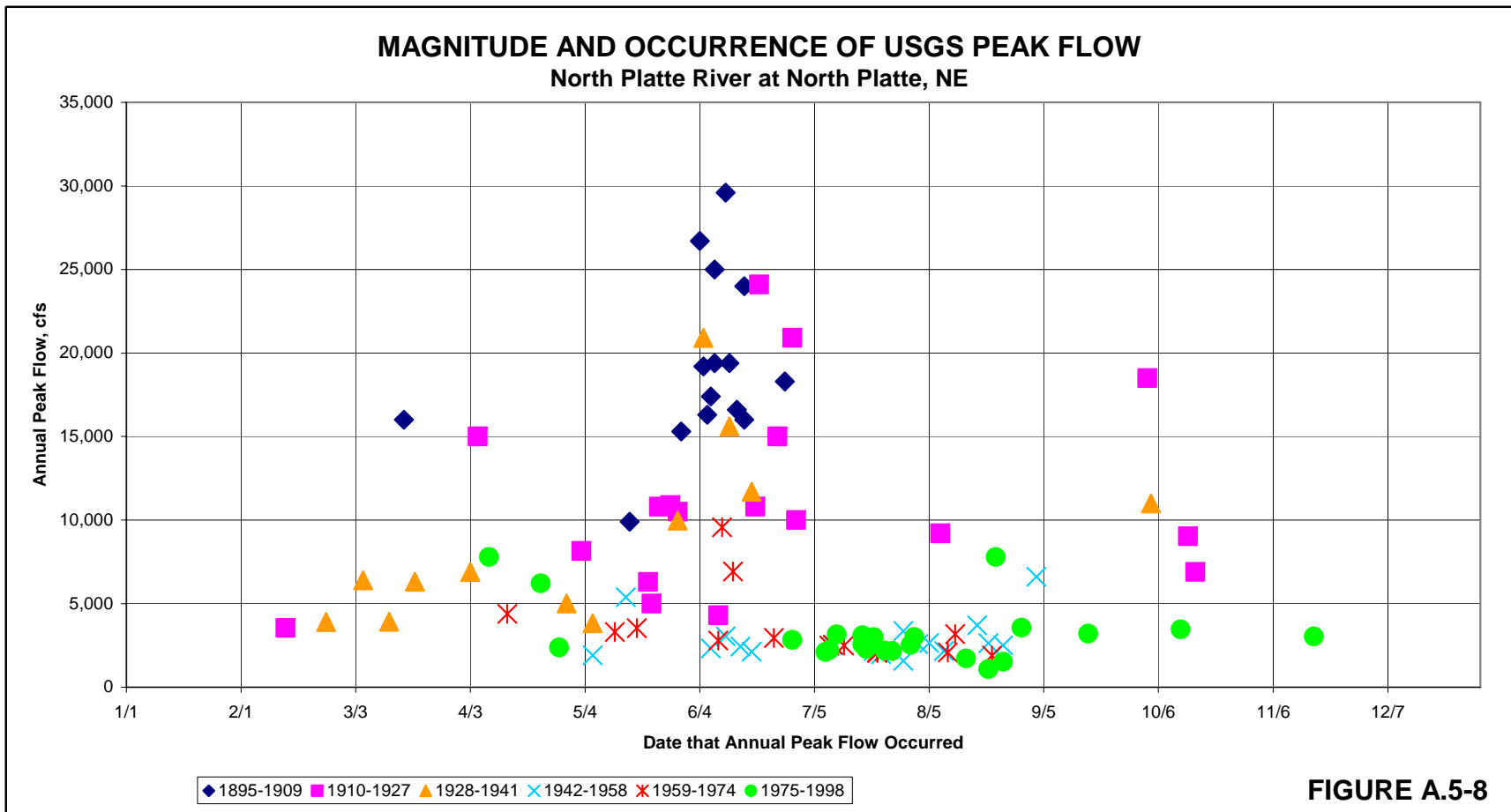


FIGURE A.5-8

Figure A.5-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.5-15 Summary of USGS Peak Flows.

North Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	7,475	12,711	3,158	19,273	11,052	7,812	2,930	3,407	3,153
Median Annual Peak Flow (cfs)	3,775	10,900	2,580	18,300	10,250	6,360	2,510	2,670	2,785
Average Occurrence of Peak Flow	6/26	6/4	7/15	6/2	6/20	5/14	7/17	6/30	7/25
Median Occurrence of Peak Flow	6/25	6/7	7/21	6/8	6/19	5/29	7/23	7/10	7/24

Table A.5-16 USGS Peak Flow Exceedance Values.

North Platte River at North Platte, NE Annual Peak Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Peak exceeded in 100% of the years	1,080	1,580	1,080	9,900	3,550	1,580	1,910	1,900	1,080
Peak exceeded in 90% of the years	2,103	3,912	2,022	15,580	4,790	2,776	2,028	2,065	1,837
Peak exceeded in 80% of the years	2,356	6,304	2,128	16,000	6,540	3,876	2,128	2,100	2,182
Peak exceeded in 70% of the years	2,625	7,900	2,214	16,360	8,239	3,918	2,160	2,330	2,283
Peak exceeded in 60% of the years	3,122	9,988	2,500	17,080	9,168	5,272	2,458	2,500	2,536
Peak exceeded in 50% of the years	3,775	10,900	2,580	18,300	10,250	6,360	2,510	2,670	2,785
Peak exceeded in 40% of the years	6,316	15,180	2,906	19,280	10,800	6,800	2,610	2,950	2,998
Peak exceeded in 30% of the years	9,238	16,360	3,122	19,400	10,890	10,082	2,730	3,245	3,116
Peak exceeded in 20% of the years	13,020	19,060	3,440	24,200	15,000	11,280	3,298	3,540	3,304
Peak exceeded in 10% of the years	18,440	22,140	5,722	26,020	19,220	14,430	4,382	5,660	5,422
Peak Flow	29,600	29,600	9,580	29,600	24,100	20,900	6,610	9,580	7,800

A.6 SOUTH PLATTE RIVER AT DENVER, COLORADO

A.6.1 Methodology

This is the farthest upstream location in the South Platte River drainage basin evaluated in this report. For this location, a single gage record was used, as follows:

Gage	Records Used	Data Source
South Platte River at Denver, CO	7/1/1895 – 9/30/1998	USGS website.

There are three Corps of Engineers flood control reservoirs a short distance upstream of the gage on the South Platte River at Denver. These are: Cherry Creek Reservoir, which began operation in 1950; Chatfield Reservoir on the South Platte River, which began operation in 1976; and Bear Creek Reservoir, which began operation in 1982. Prior to these times, the South Platte River basin upstream of the Denver gage was largely uncontrolled downstream of the confluence of the North and South Forks of the South Platte River. Three Denver Water reservoirs exist on the South Fork upstream of Denver: Cheesman, which began operation in 1890; Antero, which began operation in 1907, and Elevenmile Canyon, which began operation in 1932. Additional details concerning these reservoirs can be found in **Table 2** of the main report. Also, Spinney Mountain Reservoir, which is owned by the City of Aurora, Colorado, began operation in 1982. The trans-basin diversion through the Harold D. Roberts tunnel into the North Fork of the South Platte River (“Roberts Tunnel Diversion”) was completed in 1962 (Shoumatoff, 1986).

Summary statistics characterizing this record are presented in **Table A.6-1** (mean daily values), **Table A.6-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.6-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.6-4** (flow frequencies).

A.6.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.6-1 shows that there are no notable changes in either the average or the median Annual Maximum mean daily flow before the 1959-1974 time interval, except for lower average maximums in the 1895-1909 time interval. In the 1959-1974 time interval there was a dramatic increase in the average but a decrease in the median. The increase in the average can be attributed to three major short-duration high flow events in a time interval when the maximum flows were otherwise relatively low. The 1959-1974 time interval was followed by an equally dramatic decrease in the average accompanied by some increase in the median for the 1975-1998 time interval. This is coincident with the beginning of operation of two of the three upstream Corps of Engineers reservoirs (Chatfield and Bear Creek) early in the 1975-1998 time interval. With respect to annual flow volume, no definite characterization is apparent.

Table A.6-1 Summary of Mean Daily Flow Values.

South Platte River at Denver, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	2,532	2,246	2,767	1,830	2,601	2,237	2,822	3,595	2,176
Median Annual Maximum Mean Daily Flow (cfs)	1,695	1,950	1,660	1,420	2,360	1,770	2,280	1,210	1,735
Average Annual Flow Volume (kaf)	254	254	253	235	313	198	246	232	273
Median Annual Flow Volume (kaf)	215	232	188	226	263	195	173	194	192
Average Mean Daily Flow (cfs)	355	361	350	358	432	274	340	320	377
Median Mean Daily Flow (cfs)	162	175	148	180	201	141	126	133	178
Average Number of Mean Daily Flow Measurements	362	359	365	347	365	365	365	365	365
Number of Years of Data	104 of 104	47 of 47	57 of 57	15 of 15	18 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	287	281	292	212	295	332	274	202	365
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	2,160	1,755	2,495	1,436	2,301	1,394	2,270	3,510	1,978
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	1,910	1,858	1,953	1,529	2,475	1,417	2,146	2,180	1,664
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	1,406	1,543	1,292	1,116	1,719	1,775	1,383	885	1,499
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	197	165	202	202	199	118	155	157	264
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	1,305	1,340	1,300	1,170	2,055	1,135	1,130	1,210	1,595
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	1,425	1,700	1,160	1,390	2,015	1,605	1,430	1,095	1,345
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	1,000	1,050	1,000	758	1,250	993	1,390	676	1,100
Difference ("Apr-Jul Average" - "Jul-Sep Average")	755	212	1,203	321	582	-381	887	2,625	479
Difference ("Apr-Jul Median" - "Jul-Sep Median")	305	290	300	412	805	142	-260	534	495
Average Occurrence of Maximum Mean Daily Flow	6/19	6/27	6/12	6/26	6/28	6/27	6/25	5/28	6/13
Median Occurrence of Maximum Mean Daily Flow	6/14	6/20	6/2	6/14	7/16	6/21	6/21	5/28	5/31
Average Annual Minimum Mean Daily Flow (cfs)	57	54	60	43	73	42	39	53	79
Median Annual Minimum Mean Daily Flow (cfs)	50	49	59	44	61	35	34	40	73
Average occurrences per year of the Minimum	3	5	2	10	3	2	2	2	2
Occurring between	10/21	10/16	10/25	8/22	9/27	12/27	9/27	11/7	11/7
and	11/29	12/9	11/20	1/1	10/28	1/6	10/12	12/14	12/4
Median occurrences per year of the Minimum	1	2	1	4	1	1	1	1	1
Occurring between	10/31	11/30	10/24	8/30	9/29	1/16	9/27	12/21	1/4
and	1/12	1/20	1/7	2/5	12/20	1/20	9/28	1/26	1/9

In contrast to **Table A.6-1**, **Figure A.6-1** shows that, prior to 1950, there was considerable variation in the magnitude of the Annual Maximum mean daily flow. **Figure A.6-1** also shows that, for the higher Annual Maximum mean daily flows (greater than 4,000 cfs), there was usually a large difference between the Annual Maximum mean daily flow and the maximum 30-day average flow, indicating that the lack of upstream regulation of flows. From 1950 through the mid-1960's, which was a generally dry period, the Annual Maximum mean daily flows were low. This time range is also coincident with the beginning of operation of Cherry Creek Reservoir in 1950. In 1965, 1969, and 1973, there were high flow events whose origins were outside of the Cherry Creek basin (NWS, 2004). All three of these events had Annual Maximum mean daily flows far exceeding the maximum 30-day averages, similar to the high water events prior to 1950. Since 1973, all Annual Maximum mean daily flows have been 4,000 cfs or lower and there is less difference between the Annual Maximum mean daily flows and the maximum 30-day average flows, even though there have been some weather events comparable to those which caused the aforementioned high flows (NWS, 2004). In fact, there have been no flows greater than 4,000 cfs since 1976 coincident with the beginning of operation of Chatfield Reservoir.

Amid all of the changes in the system and occasional high flow events over the period of record, the 10-year running average of the Annual Maximum mean daily flow has varied in a way mainly consistent with climatic variation (climate data are shown in **Figures 3, 4, 5**, and **8** of the main report). This is apparent on **Figure A.6-2**, which shows high variability in annual flow volume from one year to the next throughout the period of record, with the least variability and lowest values generally having occurred in the 1930's and 1950's, coincident with drought conditions which occurred during these decades.

The Colorado Front Range has two seasons of heavier precipitation and runoff. The first is in the spring, when general rains combine with snowmelt to produce high runoff (NOAA, 2005 [Colorado]). The second occurs in conjunction with the "monsoon" season in the middle and late summer (NWS, 2004). During this monsoon season, scattered thunderstorms can produce locally very heavy rain and runoff in very short periods of time. In years when spring runoff is relatively low, the runoff generated by these monsoon events can be enough to produce mean daily flows higher than those which occurred in the preceding spring. **Figure A.6-3**, which reflects these climatic patterns, has two concentrations in the occurrences of the Annual Maximum mean daily flow. The primary season is late April through Mid-June; a secondary season is apparent in late July through August. It is additionally noteworthy from **Figure A.6-3** that the distribution of the dates of the annual maximums in one or the other of these two seasons appears to be similar for all time intervals, suggesting the consistent influence of these seasons of spring runoff and heavy late summer precipitation.

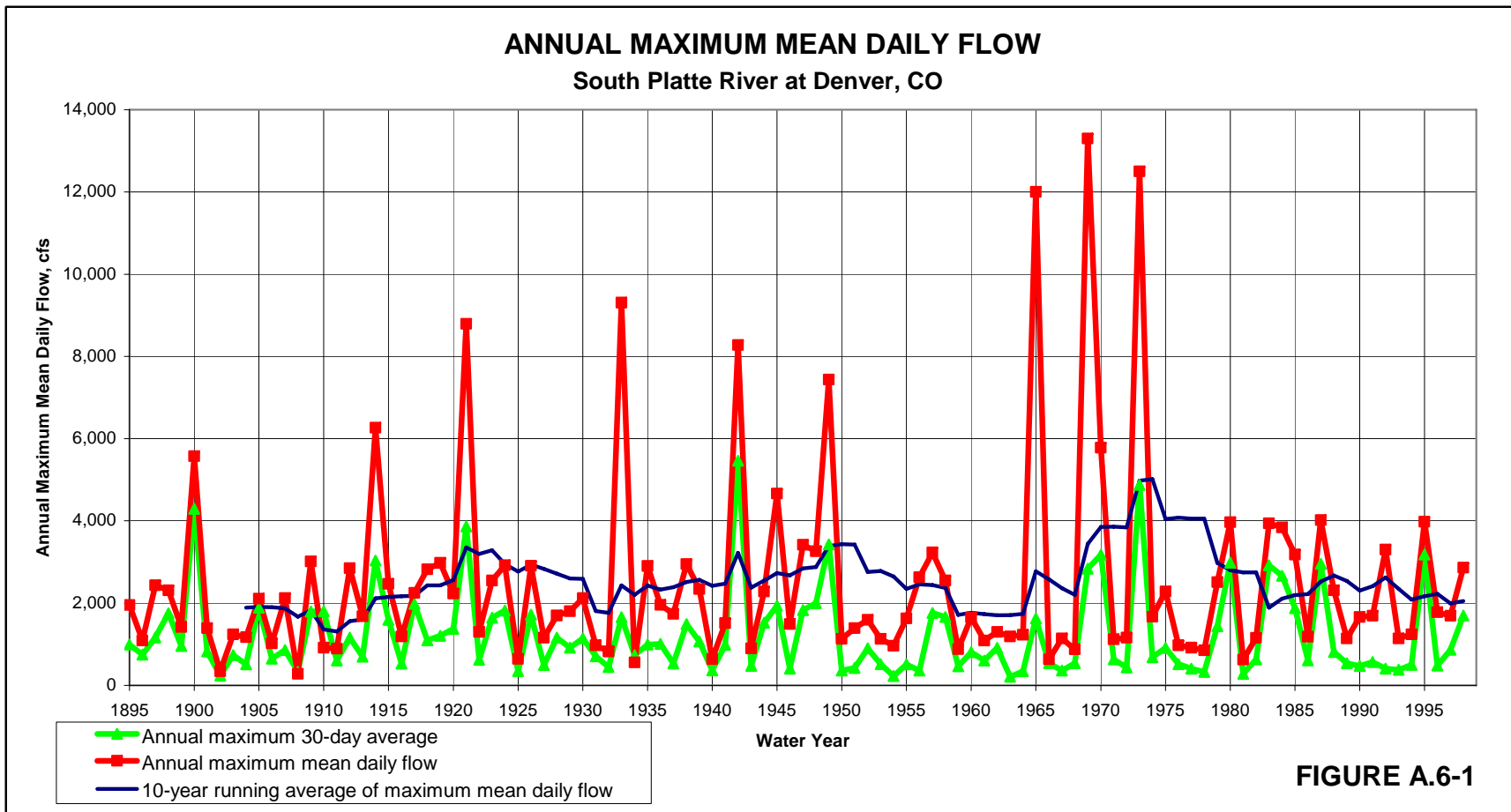


Figure A.6-1 Annual Maximum Mean Daily Flow.

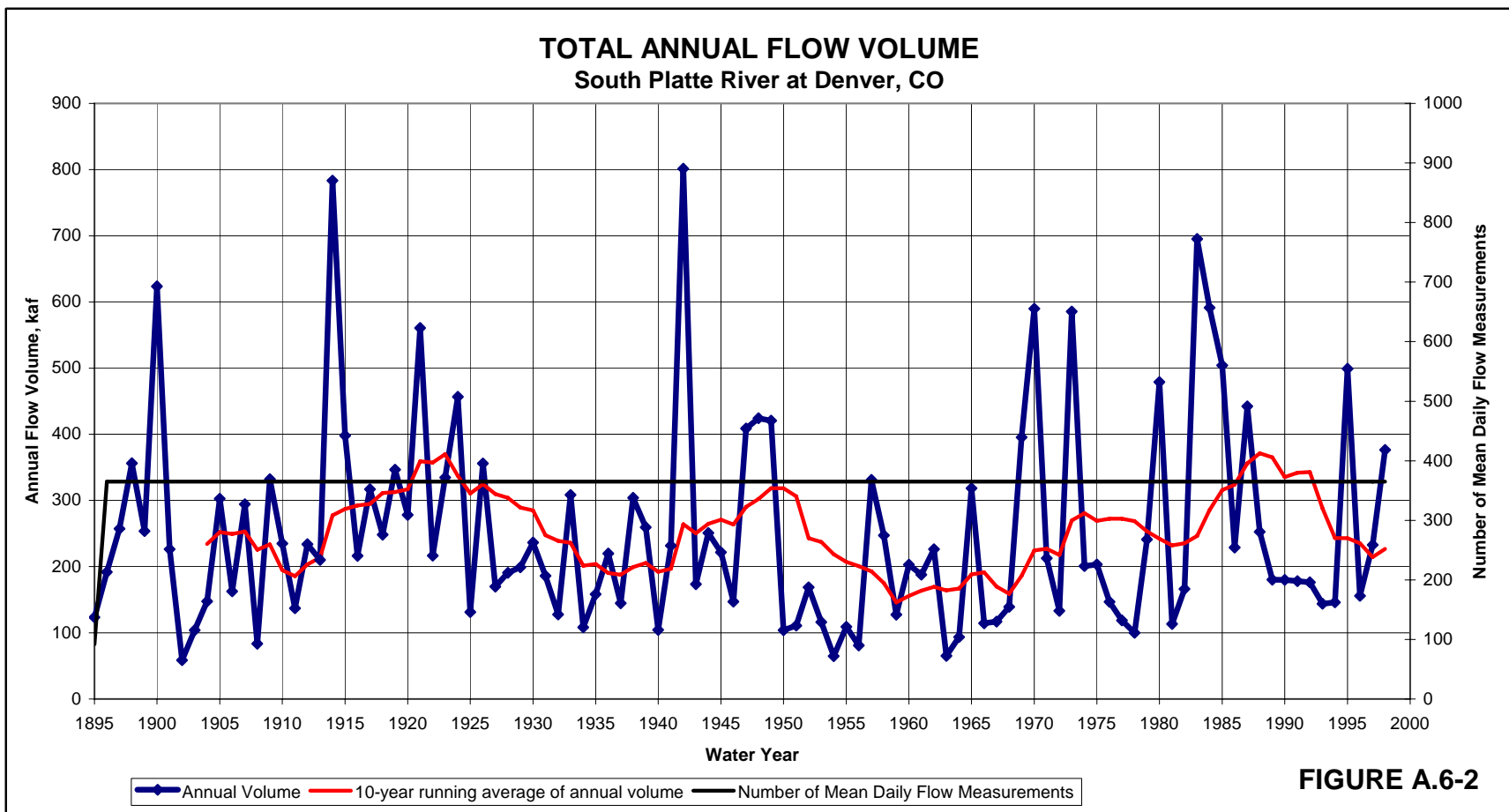
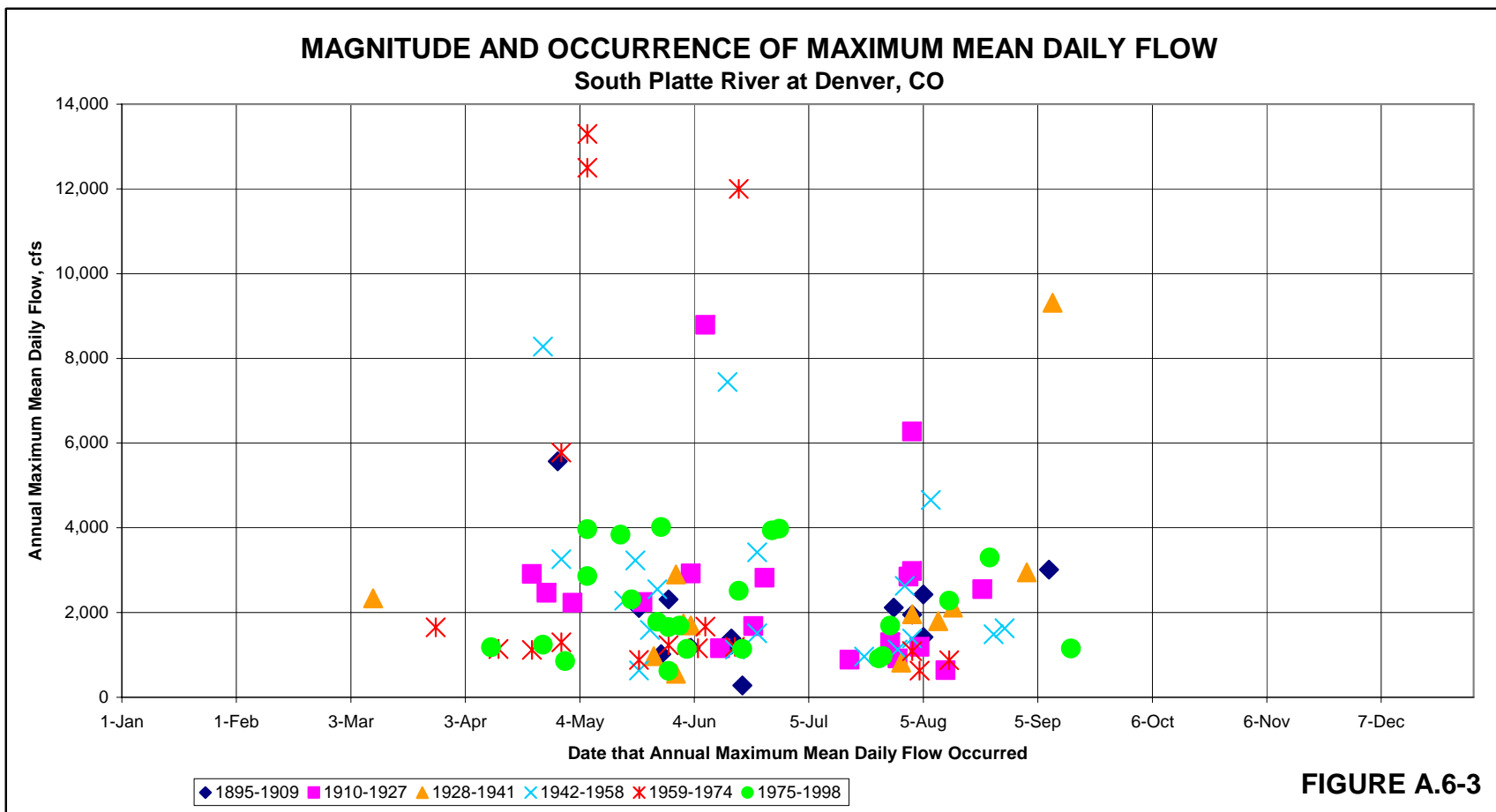


Figure A.6-2 Total Annual Flow Volume.



The average maximum mean daily flows are highest during the Apr 16-Jul 15 seasonal period for all time intervals except for the 1910-1927 and 1928-1941 time intervals, when they are highest during the Jul 16-Sep 30 seasonal period (**Table A.6-1**). The very high seasonal average maximum for the Apr 16-Jul 15 seasonal period for the 1959-1974 time interval can be attributed to the previously mentioned high flow events. The median seasonal maximum mean daily flows are highest during the Apr 16-Jul 15 or the Jun 1-Aug 15 seasonal periods for all time intervals (**Table A.6-1**). Decreases from the Apr 16-Jul 15 to Jul 16-Sep 30 seasonal periods are otherwise moderate except for the large decrease for the 1958-1974 time interval. The Dates of Maximum Flow are highly variable from one time interval to the next and show no definite pattern. Both **Table A.6-1** and **Figure A.6-4** suggest that both the magnitudes of the Annual Minimum mean daily flow and the Dates of Minimum Flow at this location have been strongly influenced by climatic variation over the period of record. Minimum flows were not calculated for years with incomplete flow records.

A.6.3 3-, 7-, 15-, and 30-day Averages of Mean Daily Flows

Table A.6-2 shows some attenuation of all annual flow maximums and minimums due to the averaging process. Averaging these values over longer time intervals reduces the influence of the high flow events which occurred during the 1959-1974 time interval

Table A.6-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. For annual flows, the average and median values are fairly close in value for the 1895-1909 through 1928-1941 time intervals, whereas the average is noticeably greater than the median for the 1942-1958 through 1975-1998 time intervals for all averaging times. This is coincident with the beginning of operation of the Corps of Engineers reservoirs.

For seasonal average flows, the general characterization is that the flow values are consistent with known climatological conditions during the respective time intervals. There might also have been some effect caused by the Roberts Tunnel Diversion, which began operation in 1963, and other trans-basin imports. Otherwise, for all averaging times and all time intervals, the highest seasonal flow values occurred in the Apr 16-Jul 15 seasonal period, except for the 1910-1927 time interval, for which the seasonal flows were nearly the same for the Apr 16-Jul 15 and Jun 1-Aug 15 seasonal periods. This exception for the 1910-1927 time interval disappears for the 15-day and 30-day averaging times. The lowest seasonal flow occurred in the Feb 15-Mar 16 seasonal period for all time intervals and all averaging times.

For seasonal median flows, the characterizations are similar to those for the seasonal average flows, although all median flow values are smaller than their corresponding average flow values. The differences are small for the 1895-1909 through 1928-1941 time intervals, and much larger for the 1942-1948 through 1975-1998 time intervals, again coincident with the beginning of operation of the Corps of Engineers reservoirs.

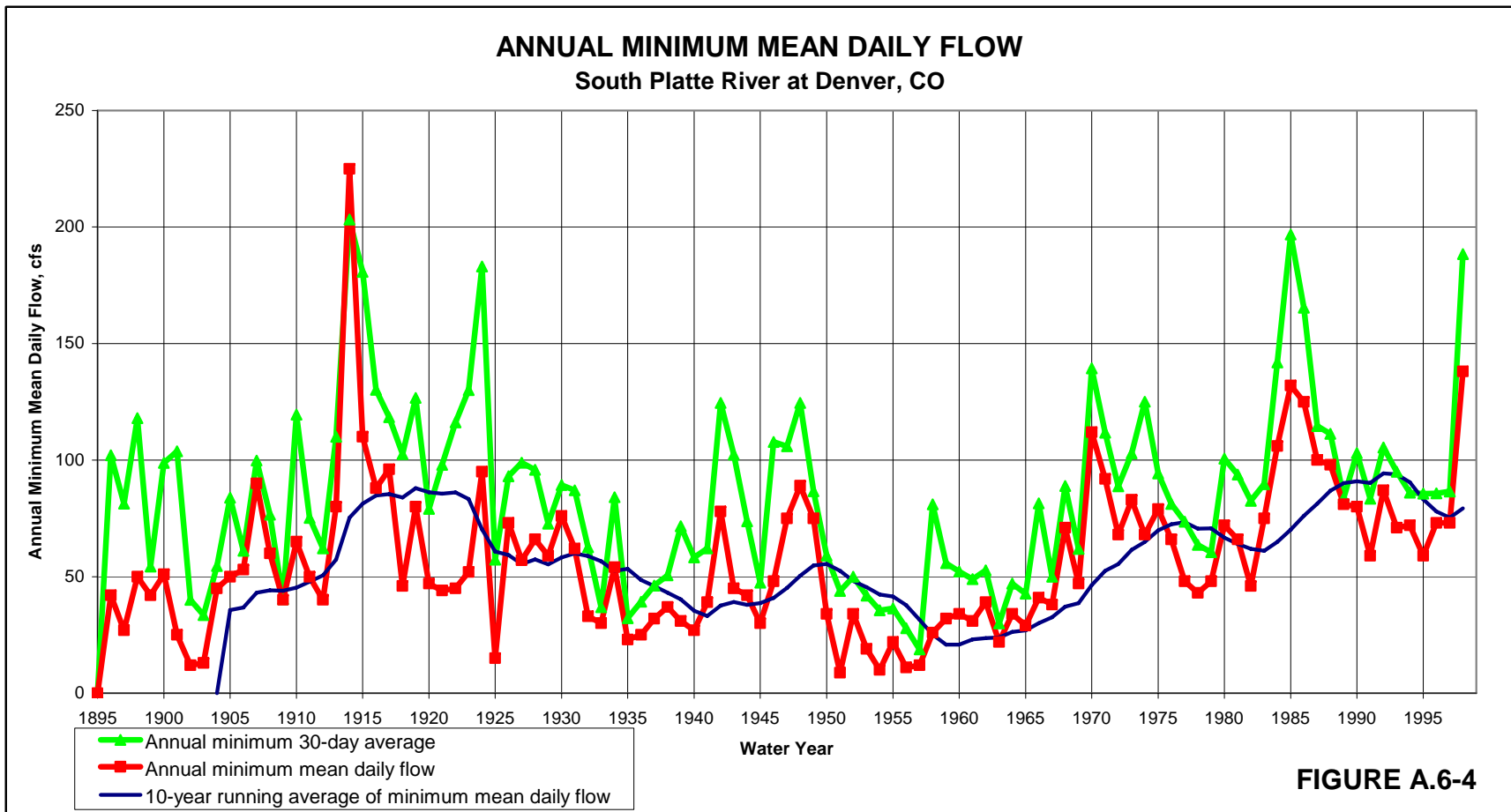


FIGURE A.6-4

Figure A.6-4 Annual Minimum Mean Daily Flow.

Table A.6-2 Comparison Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

South Platte River at Denver, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	2,532	2,246	2,767	1,830	2,601	2,237	2,822	3,595	2,176
Median Annual Maximum Mean Daily Flow (cfs)	1,695	1,950	1,660	1,420	2,360	1,770	2,280	1,210	1,735
Avg. Ann. Max. 3-day Avg. Flow (cfs)	2,096	1,931	2,233	1,701	2,364	1,621	2,403	2,719	1,787
Median Ann. Max. 3-day Avg. Flow (cfs)	1,425	1,660	1,165	1,313	2,213	1,547	1,443	1,009	1,247
Avg. Ann. Max. 7-day Avg. Flow (cfs)	1,741	1,652	1,815	1,495	2,061	1,294	2,048	1,936	1,568
Median Ann. Max. 7-day Avg. Flow (cfs)	1,169	1,491	889	1,167	1,970	1,364	1,274	788	894
Avg. Ann. Max. 15-day Avg. Flow (cfs)	1,467	1,422	1,504	1,361	1,739	1,079	1,718	1,505	1,351
Median Ann. Max. 15-day Avg. Flow (cfs)	1,047	1,209	734	1,050	1,510	1,140	1,155	683	736
Avg. Ann. Max. 30-day Avg. Flow (cfs)	1,228	1,203	1,249	1,183	1,421	943	1,399	1,189	1,183
Median Ann. Max. 30-day Avg. Flow (cfs)	860	989	629	855	1,289	987	895	615	619
Average Annual Minimum Mean Daily Flow (cfs)	57	54	60	43	73	42	39	53	79
Median Annual Minimum Mean Daily Flow (cfs)	50	49	59	44	61	35	34	40	73
Avg. Ann. Min. 3-day Avg. Flow (cfs)	61	59	63	46	78	47	43	56	83
Median Ann. Min. 3-day Avg. Flow (cfs)	53	51	68	49	69	40	37	43	75
Avg. Ann. Min. 7-day Avg. Flow (cfs)	68	66	69	54	86	53	52	60	88
Median Ann. Min. 7-day Avg. Flow (cfs)	66	61	74	56	77	49	43	48	81
Avg. Ann. Min. 15-day Avg. Flow (cfs)	76	76	76	65	98	59	60	66	94
Median Ann. Min. 15-day Avg. Flow (cfs)	73	71	77	68	90	58	54	52	86
Avg. Ann. Min. 30-day Avg. Flow (cfs)	86	87	85	75	116	63	69	74	103
Median Ann. Min. 30-day Avg. Flow (cfs)	84	84	86	79	113	62	59	59	92

Table A.6-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

South Platte River at Denver, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	2,096	1,931	2,233	1,701	2,364	1,621	2,403	2,719	1,787
Median Ann. Max. 3-day Avg. Flow (cfs)	1,425	1,660	1,165	1,313	2,213	1,547	1,443	1,009	1,247
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	239	244	234	190	255	283	233	174	276
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	1,863	1,603	2,077	1,355	2,120	1,206	2,088	2,644	1,693
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	1,621	1,647	1,599	1,405	2,227	1,160	1,827	1,633	1,416
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	1,126	1,262	1,013	1,010	1,482	1,249	1,060	787	1,132
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	165	154	177	176	183	111	142	131	247
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	1,098	1,270	977	1,127	1,917	964	829	961	1,084
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	1,237	1,327	977	1,297	1,852	1,270	1,387	875	1,061
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	845	847	844	564	982	875	843	621	937
South Platte River at Denver, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	1,741	1,652	1,815	1,495	2,061	1,294	2,048	1,936	1,568
Median Ann. Max. 7-day Avg. Flow (cfs)	1,169	1,491	889	1,167	1,970	1,364	1,274	788	894
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	199	200	197	169	219	208	191	152	232
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	1,583	1,436	1,704	1,256	1,869	1,073	1,823	1,882	1,501
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	1,365	1,402	1,335	1,205	1,927	940	1,570	1,245	1,229
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	914	1,010	835	814	1,244	920	858	663	934
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	144	142	154	145	165	102	138	122	196
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	951	1,049	745	1,047	1,676	912	801	748	742
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	979	1,153	746	1,100	1,693	906	1,047	664	816
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	709	714	703	497	750	726	615	520	761
South Platte River at Denver, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	1,467	1,422	1,504	1,361	1,739	1,079	1,718	1,505	1,351
Median Ann. Max. 15-day Avg. Flow (cfs)	1,047	1,209	734	1,050	1,510	1,140	1,155	683	736
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	168	169	167	156	190	154	151	133	201
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	1,350	1,261	1,423	1,177	1,600	917	1,552	1,471	1,300
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	1,132	1,168	1,103	1,054	1,566	777	1,280	970	1,067
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	741	817	679	653	1,028	722	687	552	758
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	134	133	137	131	147	92	99	108	174
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	817	875	635	867	1,376	785	610	657	655
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	799	1,021	624	1,050	1,372	711	847	511	657
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	554	574	523	413	624	570	512	384	567
South Platte River at Denver, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	1,228	1,203	1,249	1,183	1,421	943	1,399	1,189	1,183
Median Ann. Max. 30-day Avg. Flow (cfs)	860	989	629	855	1,289	987	895	615	619
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	142	143	142	138	166	119	123	120	169
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	1,133	1,071	1,183	1,084	1,284	783	1,269	1,151	1,142
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	895	901	889	848	1,182	598	968	760	918
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	590	643	547	505	809	576	551	465	599
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	121	120	122	116	129	87	96	106	155
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	697	813	565	813	1,069	695	477	580	581
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	628	812	495	855	1,038	603	562	430	575
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	453	453	444	384	519	453	357	339	463

A.6.4 Flow Frequency and Exceedance

A.6.4.1 Flow Ranges

Table A.6-4 and **Figure A.6-5** show that, for all flow frequency measures, the flow distributions are largely the same for all time intervals, with only small variations in magnitude that can largely be explained by variations in climate. The lowest flow ranges have the highest frequency in percentage of years, and the lowest individual flow range (0 to 200 cfs) has the highest frequency in percentage of days. Flows greater than 4,000 cfs occurred during less than 1.0 percent of days for all time intervals except 1975-1998, when they occurred 1.1 percent of the time. Also, in the 1975-1998 time interval the percentage of flows in the 0-200-cfs range is slightly lower than in the preceding time intervals (except for 1910-1927, for which data are incomplete), and the percentage of flows in the 201-400-cfs range is slightly higher, a possible effect of the operation of Chatfield and Bear Creek Reservoirs, the result of the Roberts Tunnel Diversion and other trans-basin imports, or the result of runoff and return flow from urbanized areas.

A.6.4.2 Maximum Mean Flow Exceedance.

Table A.6-5 through **Table A.6-9** show the exceedance values and probabilities for maximum flow for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13), for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.6-5 shows the exceedance probabilities and values for annual data. **Table A.6-5** shows that, for the 1895-1929 through 1942-1958 time intervals, the flow values generally vary according to known climatological conditions for all averaging times and all exceedance probabilities. Also, the flow values increase steadily with decreasing exceedance probability and decrease steadily with increasing averaging time, as one would expect. From the 1942-1958 time interval to the 1959-1974 time interval there is a decrease in flow values for all averaging times and all exceedance probabilities of 30 percent and higher (lower flows), and an increase in flow values of 20 percent and lower (higher flows). The decrease for the higher exceedance probabilities are coincident with the beginning of operation of Cherry Creek Reservoir (**Section A.6-1**). The increase for the lower exceedance probabilities and the maximum can be attributed to three high flow events in 1965, 1969, and 1973 (**Figure A.6-1** and **Figure A.6-7**). These events had their origin outside of the Cherry Creek basin (NWS, 2004). Otherwise, the same pattern of increasing flow values with decreasing exceedance probability and decreasing flow values with increasing averaging time that occur in previous time in intervals also occurs in the 1959-1974 time interval.

The characterizations for the 1975-1998 time interval are noticeably different from those for the preceding time intervals. The biggest differences are that the changes in flow values with decreasing exceedance probability and increasing averaging time are

Table A.6-4 Flow Frequency Distributions.

South Platte River at Denver, CO		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	99	98	100	100	94	100	100	100	100
201 to 500	100	100	100	100	100	100	100	100	100
501 to 750	97	96	98	87	100	100	100	94	100
751 to 1,000	90	89	91	87	94	86	88	94	92
1,001 to 2,000	82	81	82	87	83	71	82	81	83
2,001 to 3,000	43	47	40	40	61	36	53	25	42
3,001 to 4,000	20	11	28	13	11	7	35	19	29
4,001 to 5,000	11	6	14	7	11	0	18	25	4
5,001 to 6,000	8	6	9	7	11	0	12	19	0
6,001 to 8,000	6	4	7	0	11	0	12	13	0
8,001 to 10,000	4	4	4	0	6	7	6	6	0
10,001 to 12,000	1	0	2	0	0	0	0	6	0
12,001 to 15,000	2	0	4	0	0	0	0	13	0
Greater than 15,000	0	0	0	0	0	0	0	0	0
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
South Platte River at Denver, CO		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	55.9	52.9	58.3	56.1	43.7	61.7	63.1	61.1	52.9
201 to 500	27.2	28.2	26.3	26.5	33.3	23.4	22.0	24.7	30.4
501 to 750	6.6	7.6	5.8	7.0	8.5	7.1	4.4	6.6	6.3
751 to 1,000	3.4	4.2	2.7	4.1	4.6	3.7	2.5	2.6	2.9
1,001 to 2,000	4.7	5.4	4.1	4.4	7.4	3.8	5.6	2.9	3.9
2,001 to 3,000	1.4	1.1	1.7	0.8	1.8	0.3	1.4	1.1	2.4
3,001 to 4,000	0.5	0.3	0.7	0.6	0.3	0.0	0.4	0.3	1.1
4,001 to 5,000	0.2	0.2	0.2	0.3	0.2	0.0	0.2	0.3	0.0
5,001 to 6,000	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.2	0.0
6,001 to 8,000	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.1	0.0
8,001 to 10,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10,001 to 12,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12,001 to 15,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Greater than 15,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
South Platte River at Denver, CO		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	202	190	213	195	159	225	230	223	193
201 to 500	98	101	96	92	122	85	80	90	111
501 to 750	24	27	21	24	31	26	16	24	23
751 to 1,000	12	15	10	14	17	14	9	10	11
1,001 to 2,000	17	19	15	15	27	14	21	11	14
2,001 to 3,000	5	4	6	3	7	1	5	4	9
3,001 to 4,000	2	1	2	2	1	0	2	1	4
4,001 to 5,000	1	1	1	1	1	0	1	1	0
5,001 to 6,000	0	0	0	0	0	0	1	1	0
6,001 to 8,000	0	0	0	0	0	0	1	0	0
8,001 to 10,000	0	0	0	0	0	0	0	0	0
10,001 to 12,000	0	0	0	0	0	0	0	0	0
12,001 to 15,000	0	0	0	0	0	0	0	0	0
Greater than 15,000	0	0	0	0	0	0	0	0	0
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

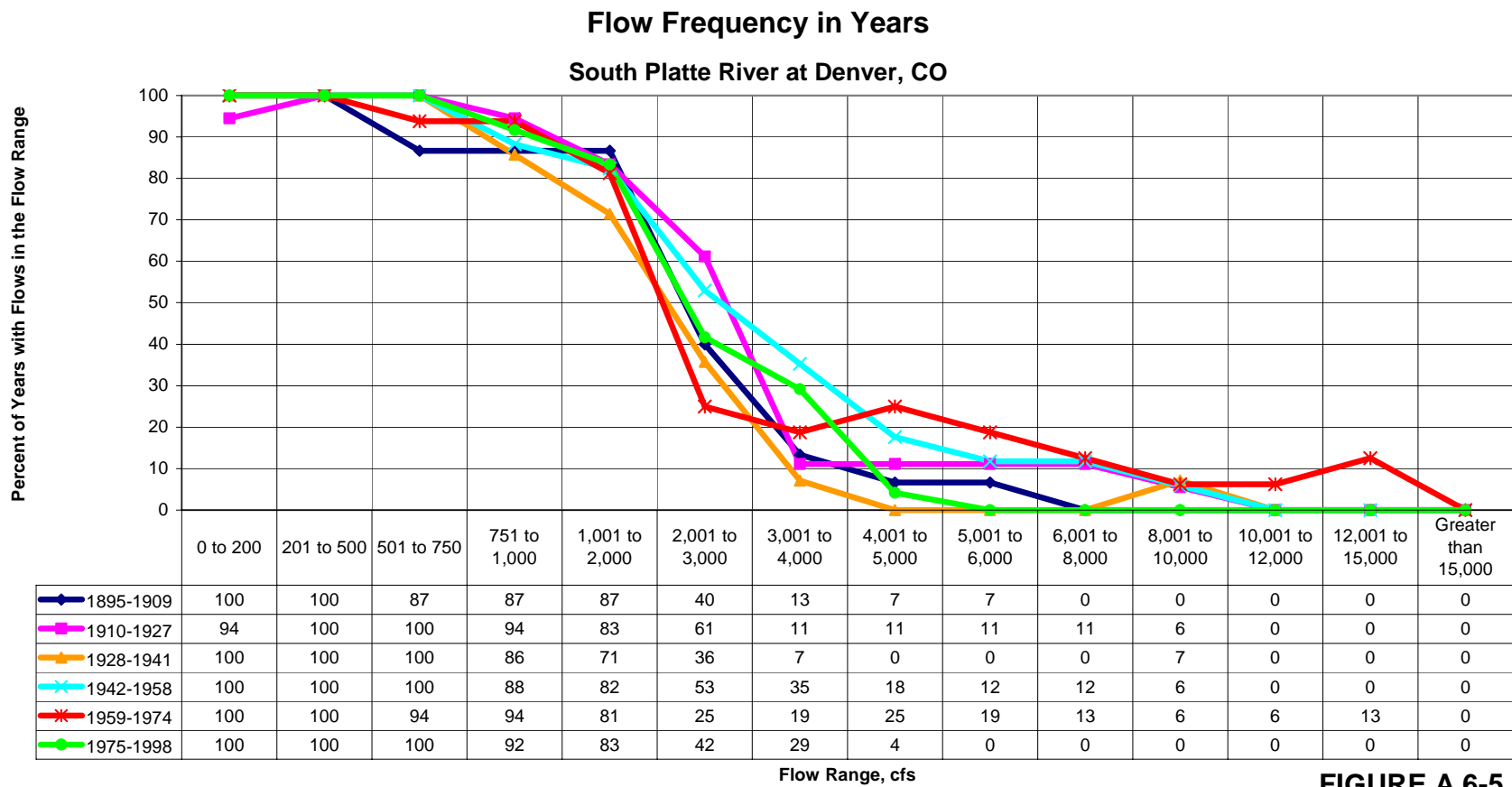


FIGURE A.6-5

Figure A.6-5 Flow Frequency in Years.

Table A.6-5 Maximum Flow Exceedance Values, Annual Data.

South Platte River at Denver, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years	280	280	626	280	643	554	900	630	626	
Maximum exceeded in 90% of the years	884	750	911	613	910	692	1,063	878	934	
Maximum exceeded in 80% of the years	1,108	1,034	1,130	1,076	1,172	912	1,182	1,090	1,140	
Maximum exceeded in 70% of the years	1,179	1,230	1,158	1,184	1,338	1,456	1,470	1,130	1,177	
Maximum exceeded in 60% of the years	1,434	1,578	1,336	1,330	2,120	1,708	1,606	1,160	1,666	
Maximum exceeded in 50% of the years	1,695	1,950	1,660	1,420	2,360	1,770	2,280	1,210	1,735	
Maximum exceeded in 40% of the years	2,246	2,186	2,280	2,014	2,604	1,928	2,598	1,300	2,304	
Maximum exceeded in 30% of the years	2,558	2,438	2,924	2,118	2,847	2,142	3,236	1,660	2,892	
Maximum exceeded in 20% of the years	3,078	2,890	3,756	2,334	2,916	2,564	3,388	5,780	3,516	
Maximum exceeded in 10% of the years	4,468	2,992	5,108	2,778	3,967	2,935	5,772	12,250	3,961	
Maximum	13,300	9,310	13,300	5,570	8,790	9,310	8,280	13,300	4,020	
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	208	208	466	208	502	495	466	583	512	
Maximum exceeded in 90% of the years	675	623	714	563	804	584	785	720	626	
Maximum exceeded in 80% of the years	837	895	818	938	866	813	818	815	879	
Maximum exceeded in 70% of the years	942	1,064	909	1,011	1,116	1,285	844	875	943	
Maximum exceeded in 60% of the years	1,077	1,335	986	1,269	1,981	1,465	1,163	944	1,066	
Maximum exceeded in 50% of the years	1,425	1,660	1,165	1,313	2,213	1,547	1,443	1,009	1,247	
Maximum exceeded in 40% of the years	1,947	2,026	1,462	1,880	2,281	1,641	2,371	1,073	1,529	
Maximum exceeded in 30% of the years	2,238	2,150	2,534	2,076	2,418	1,721	2,967	1,319	2,490	
Maximum exceeded in 20% of the years	2,792	2,394	3,487	2,103	2,681	2,014	3,284	5,247	3,021	
Maximum exceeded in 10% of the years	3,972	2,907	4,515	2,625	3,812	2,259	5,052	8,035	3,707	
Maximum	10,933	8,443	10,933	5,243	8,443	4,460	7,820	10,933	3,843	
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	202	202	331	202	407	477	331	457	428	
Maximum exceeded in 90% of the years	478	521	474	451	683	501	568	473	479	
Maximum exceeded in 80% of the years	677	789	652	848	820	725	683	632	668	
Maximum exceeded in 70% of the years	761	945	705	931	964	957	757	674	728	
Maximum exceeded in 60% of the years	893	1,115	765	1,067	1,714	1,228	802	718	774	
Maximum exceeded in 50% of the years	1,169	1,491	889	1,167	1,970	1,364	1,274	788	894	
Maximum exceeded in 40% of the years	1,493	1,622	1,263	1,482	2,037	1,507	2,186	891	1,306	
Maximum exceeded in 30% of the years	2,026	1,938	2,302	1,491	2,107	1,558	2,679	1,152	2,298	
Maximum exceeded in 20% of the years	2,559	2,073	3,221	1,961	2,145	1,687	2,855	3,677	2,855	
Maximum exceeded in 10% of the years	3,568	2,634	3,724	2,396	3,475	1,756	4,223	5,496	3,532	
Maximum	7,441	7,403	7,441	5,093	7,403	2,631	6,804	7,441	3,794	
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	216	216	270	216	362	417	270	278	325	
Maximum exceeded in 90% of the years	428	484	419	410	580	464	442	425	428	
Maximum exceeded in 80% of the years	521	661	497	721	698	618	547	493	511	
Maximum exceeded in 70% of the years	609	764	549	780	919	751	585	506	548	
Maximum exceeded in 60% of the years	755	1,065	612	886	1,371	1,092	598	624	622	
Maximum exceeded in 50% of the years	1,047	1,209	734	1,050	1,510	1,140	1,155	683	736	
Maximum exceeded in 40% of the years	1,294	1,322	1,078	1,151	1,770	1,201	1,903	760	1,089	
Maximum exceeded in 30% of the years	1,775	1,547	1,978	1,294	1,785	1,322	2,202	991	1,818	
Maximum exceeded in 20% of the years	2,097	1,847	2,450	1,875	2,071	1,369	2,421	2,358	2,447	
Maximum exceeded in 10% of the years	3,314	2,221	3,396	2,269	2,859	1,599	3,328	4,155	3,314	
Maximum	6,301	5,965	6,301	5,059	5,965	1,961	6,301	6,050	3,399	
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	206	237	206	237	347	367	223	206	275	
Maximum exceeded in 90% of the years	364	473	358	400	515	473	360	350	386	
Maximum exceeded in 80% of the years	473	607	412	621	611	639	409	432	443	
Maximum exceeded in 70% of the years	537	728	479	739	737	730	467	500	499	
Maximum exceeded in 60% of the years	657	880	539	794	1,144	931	513	541	546	
Maximum exceeded in 50% of the years	860	989	629	855	1,289	987	895	615	619	
Maximum exceeded in 40% of the years	1,056	1,149	883	970	1,605	1,003	1,609	686	855	
Maximum exceeded in 30% of the years	1,531	1,394	1,634	1,130	1,715	1,076	1,774	856	1,464	
Maximum exceeded in 20% of the years	1,798	1,710	1,922	1,765	1,812	1,146	1,912	1,626	2,193	
Maximum exceeded in 10% of the years	2,894	1,848	2,966	1,853	2,298	1,390	2,570	3,006	2,943	
Maximum	5,465	4,293	5,465	4,293	3,865	1,658	5,465	4,878	3,178	

Table A.6-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

South Platte River at Denver, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		55	55	62	70	115	55	62	86	125
Maximum exceeded in 90% of the years		86	85	87	84	138	75	67	98	157
Maximum exceeded in 80% of the years		113	108	115	103	149	86	81	112	192
Maximum exceeded in 70% of the years		143	129	148	117	158	96	99	115	213
Maximum exceeded in 60% of the years		157	155	179	155	168	100	144	116	230
Maximum exceeded in 50% of the years		197	165	202	202	199	118	155	157	264
Maximum exceeded in 40% of the years		216	201	233	216	233	150	178	197	293
Maximum exceeded in 30% of the years		252	241	261	242	249	158	213	206	326
Maximum exceeded in 20% of the years		307	256	335	248	289	210	256	249	502
Maximum exceeded in 10% of the years		628	719	530	302	767	659	489	411	620
Maximum		2,340	2,340	1,600	672	925	2,340	1,600	494	1,220
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		52	52	57	70	90	52	57	78	122
Maximum exceeded in 90% of the years		80	82	80	82	129	69	58	82	128
Maximum exceeded in 80% of the years		102	90	108	98	140	80	76	90	143
Maximum exceeded in 70% of the years		126	121	127	108	147	87	96	102	182
Maximum exceeded in 60% of the years		144	145	143	135	154	91	121	111	216
Maximum exceeded in 50% of the years		165	154	177	176	183	111	142	131	247
Maximum exceeded in 40% of the years		190	179	211	189	193	142	157	177	258
Maximum exceeded in 30% of the years		221	209	245	216	213	154	177	183	279
Maximum exceeded in 20% of the years		262	236	290	236	242	193	218	187	383
Maximum exceeded in 10% of the years		435	572	419	277	645	480	409	363	434
Maximum		2,003	2,003	1,327	561	726	2,003	1,327	416	742
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		47	47	54	70	76	47	54	69	102
Maximum exceeded in 90% of the years		71	71	71	81	125	56	57	73	117
Maximum exceeded in 80% of the years		90	82	97	93	133	69	70	82	123
Maximum exceeded in 70% of the years		116	118	116	101	138	72	87	90	179
Maximum exceeded in 60% of the years		135	137	130	125	140	79	105	109	189
Maximum exceeded in 50% of the years		144	142	154	145	165	102	138	122	196
Maximum exceeded in 40% of the years		175	159	183	175	178	137	141	152	204
Maximum exceeded in 30% of the years		197	189	199	213	195	146	155	162	237
Maximum exceeded in 20% of the years		236	217	238	227	210	186	178	173	334
Maximum exceeded in 10% of the years		379	405	350	245	474	338	327	304	377
Maximum		1,264	1,264	1,001	423	648	1,264	1,001	349	552
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		44	44	48	70	71	44	48	64	94
Maximum exceeded in 90% of the years		67	68	66	78	113	51	53	68	102
Maximum exceeded in 80% of the years		81	78	86	83	117	65	63	74	110
Maximum exceeded in 70% of the years		101	109	99	91	127	67	71	87	130
Maximum exceeded in 60% of the years		113	118	110	112	131	74	87	102	160
Maximum exceeded in 50% of the years		134	133	137	131	147	92	99	108	174
Maximum exceeded in 40% of the years		151	146	155	153	162	130	136	129	190
Maximum exceeded in 30% of the years		176	176	176	203	181	138	145	151	229
Maximum exceeded in 20% of the years		211	204	228	206	197	170	150	162	280
Maximum exceeded in 10% of the years		311	324	310	227	400	239	271	228	330
Maximum		736	736	630	396	508	736	630	308	472
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		42	42	47	57	67	42	47	61	86
Maximum exceeded in 90% of the years		61	63	59	69	101	47	48	63	91
Maximum exceeded in 80% of the years		71	71	78	76	109	60	53	68	95
Maximum exceeded in 70% of the years		93	98	91	83	119	65	55	80	113
Maximum exceeded in 60% of the years		107	108	106	99	120	71	71	96	142
Maximum exceeded in 50% of the years		121	120	122	116	129	87	96	106	155
Maximum exceeded in 40% of the years		133	130	142	139	133	108	122	116	184
Maximum exceeded in 30% of the years		151	146	155	154	152	122	134	138	206
Maximum exceeded in 20% of the years		193	185	204	199	186	140	142	147	231
Maximum exceeded in 10% of the years		275	275	273	220	347	174	230	194	276
Maximum		450	450	387	323	390	450	387	276	308

Table A.6-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

South Platte River at Denver, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		95	95	354	95	423	529	354	436	626
Maximum exceeded in 90% of the years		576	544	640	346	843	579	477	652	721
Maximum exceeded in 80% of the years		855	857	855	779	947	705	713	881	895
Maximum exceeded in 70% of the years		979	1,016	910	1,036	1,212	950	845	1,050	1,140
Maximum exceeded in 60% of the years		1,152	1,160	1,144	1,136	1,960	1,020	875	1,160	1,270
Maximum exceeded in 50% of the years		1,305	1,340	1,300	1,170	2,055	1,135	1,130	1,210	1,595
Maximum exceeded in 40% of the years		1,678	1,692	1,666	1,280	2,234	1,442	2,004	1,300	1,762
Maximum exceeded in 30% of the years		2,232	2,046	2,518	1,380	2,448	1,704	2,686	1,490	2,533
Maximum exceeded in 20% of the years		2,876	2,298	3,388	1,582	2,874	1,804	3,254	5,780	3,252
Maximum exceeded in 10% of the years		3,977	2,914	4,724	2,230	3,253	2,600	5,028	12,250	3,961
Maximum		13,300	8,790	13,300	5,570	8,790	3,060	8,280	13,300	4,020
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		95	95	335	95	344	495	335	398	492
Maximum exceeded in 90% of the years		499	510	501	294	741	528	441	554	517
Maximum exceeded in 80% of the years		707	761	683	777	780	623	656	765	716
Maximum exceeded in 70% of the years		795	877	764	909	968	844	714	805	787
Maximum exceeded in 60% of the years		907	983	848	1,043	1,707	886	777	877	921
Maximum exceeded in 50% of the years		1,098	1,270	977	1,127	1,917	964	829	961	1,084
Maximum exceeded in 40% of the years		1,343	1,421	1,151	1,244	2,159	1,266	1,869	1,073	1,233
Maximum exceeded in 30% of the years		1,998	1,857	2,476	1,305	2,249	1,471	2,587	1,148	2,490
Maximum exceeded in 20% of the years		2,624	2,135	3,284	1,521	2,524	1,672	3,067	5,247	3,021
Maximum exceeded in 10% of the years		3,744	2,704	4,405	2,110	3,188	1,802	4,634	8,035	3,707
Maximum		10,933	8,443	10,933	5,243	8,443	3,007	7,820	10,933	3,843
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		95	95	274	95	319	456	274	311	428
Maximum exceeded in 90% of the years		431	468	428	255	641	478	367	431	439
Maximum exceeded in 80% of the years		535	621	485	571	697	521	530	475	496
Maximum exceeded in 70% of the years		671	819	609	866	903	702	542	652	628
Maximum exceeded in 60% of the years		744	928	680	971	1,433	846	642	677	732
Maximum exceeded in 50% of the years		951	1,049	745	1,047	1,676	912	801	748	742
Maximum exceeded in 40% of the years		1,169	1,293	1,031	1,088	1,905	976	1,750	825	1,122
Maximum exceeded in 30% of the years		1,795	1,608	2,271	1,154	2,023	1,262	2,345	1,025	2,298
Maximum exceeded in 20% of the years		2,312	1,991	2,855	1,455	2,145	1,524	2,730	3,677	2,850
Maximum exceeded in 10% of the years		3,553	2,351	3,724	1,997	2,972	1,708	3,968	5,496	3,532
Maximum		7,441	7,403	7,441	5,093	7,403	2,631	6,804	7,441	3,794
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		95	95	228	95	253	417	228	272	325
Maximum exceeded in 90% of the years		366	427	354	231	531	437	329	319	392
Maximum exceeded in 80% of the years		442	558	400	544	608	484	395	379	427
Maximum exceeded in 70% of the years		511	679	459	772	776	577	442	486	492
Maximum exceeded in 60% of the years		630	816	527	855	1,187	704	504	496	559
Maximum exceeded in 50% of the years		817	875	635	867	1,376	785	610	657	655
Maximum exceeded in 40% of the years		1,079	1,187	994	959	1,557	820	1,545	760	977
Maximum exceeded in 30% of the years		1,520	1,370	1,837	1,090	1,773	1,110	2,015	991	1,818
Maximum exceeded in 20% of the years		1,986	1,773	2,329	1,369	1,989	1,322	2,210	2,358	2,388
Maximum exceeded in 10% of the years		3,289	2,027	3,396	1,899	2,658	1,564	3,292	4,155	3,314
Maximum		6,301	5,965	6,301	5,059	5,965	1,961	6,301	6,050	3,399
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		95	95	204	95	226	356	204	206	275
Maximum exceeded in 90% of the years		308	362	298	184	479	368	266	288	341
Maximum exceeded in 80% of the years		364	496	348	436	524	414	315	342	374
Maximum exceeded in 70% of the years		455	530	376	635	630	501	361	395	424
Maximum exceeded in 60% of the years		529	697	469	749	833	564	386	464	506
Maximum exceeded in 50% of the years		697	813	565	813	1,069	695	477	580	581
Maximum exceeded in 40% of the years		896	989	808	932	1,240	715	1,272	668	774
Maximum exceeded in 30% of the years		1,273	1,161	1,544	1,065	1,563	985	1,684	852	1,464
Maximum exceeded in 20% of the years		1,744	1,585	1,869	1,402	1,781	1,056	1,815	1,626	2,193
Maximum exceeded in 10% of the years		2,902	1,855	2,966	1,851	2,294	1,390	2,570	3,006	2,943
Maximum		5,465	4,293	5,465	4,293	3,865	1,658	5,465	4,878	3,092

Table A.6-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

South Platte River at Denver, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		80	80	480	80	643	480	679	630	480
Maximum exceeded in 90% of the years		683	638	737	420	910	564	924	731	694
Maximum exceeded in 80% of the years		859	866	859	732	1,172	770	1,106	772	851
Maximum exceeded in 70% of the years		1,042	1,154	953	1,114	1,338	856	1,130	831	917
Maximum exceeded in 60% of the years		1,144	1,336	1,112	1,212	1,784	1,206	1,240	875	1,068
Maximum exceeded in 50% of the years		1,425	1,700	1,160	1,390	2,015	1,605	1,430	1,095	1,345
Maximum exceeded in 40% of the years		1,808	1,956	1,682	1,632	2,126	1,732	1,820	1,160	1,818
Maximum exceeded in 30% of the years		2,020	2,038	1,930	1,990	2,757	1,816	2,046	1,430	2,001
Maximum exceeded in 20% of the years		2,462	2,230	2,654	2,040	2,892	2,024	2,902	2,950	2,456
Maximum exceeded in 10% of the years		3,288	2,878	3,956	2,306	3,967	2,204	3,916	4,160	2,786
Maximum		12,000	8,790	12,000	4,350	8,790	2,270	7,440	12,000	3,980
3-day Average Flows										
Maximum exceeded in 100% of the years		80	80	433	80	502	392	466	583	433
Maximum exceeded in 90% of the years		579	500	620	324	723	549	715	648	583
Maximum exceeded in 80% of the years		676	694	676	517	833	676	805	676	668
Maximum exceeded in 70% of the years		802	887	764	937	1,115	767	825	738	733
Maximum exceeded in 60% of the years		901	1,232	829	1,176	1,345	1,144	942	815	807
Maximum exceeded in 50% of the years		1,237	1,327	977	1,297	1,852	1,270	1,387	875	1,061
Maximum exceeded in 40% of the years		1,449	1,551	1,336	1,503	2,012	1,321	1,585	977	1,492
Maximum exceeded in 30% of the years		1,766	1,835	1,716	1,811	2,381	1,458	1,745	1,057	1,714
Maximum exceeded in 20% of the years		2,126	2,028	2,598	1,980	2,612	1,543	2,625	2,777	2,088
Maximum exceeded in 10% of the years		3,192	2,548	3,415	2,062	3,812	1,632	3,609	3,662	2,651
Maximum		8,443	8,443	6,590	4,243	8,443	2,030	6,590	6,347	3,670
7-day Average Flows										
Maximum exceeded in 100% of the years		80	80	318	80	407	359	331	457	318
Maximum exceeded in 90% of the years		416	389	460	255	645	376	516	466	434
Maximum exceeded in 80% of the years		545	567	522	401	708	493	610	471	498
Maximum exceeded in 70% of the years		645	734	622	692	802	680	723	587	618
Maximum exceeded in 60% of the years		744	966	688	1,067	1,208	876	783	632	661
Maximum exceeded in 50% of the years		979	1,153	746	1,100	1,693	906	1,047	664	816
Maximum exceeded in 40% of the years		1,242	1,363	1,121	1,290	1,833	1,105	1,407	711	1,229
Maximum exceeded in 30% of the years		1,493	1,506	1,441	1,488	1,931	1,227	1,625	818	1,395
Maximum exceeded in 20% of the years		1,903	1,807	2,277	1,515	2,100	1,317	2,597	2,633	1,890
Maximum exceeded in 10% of the years		2,823	2,095	2,993	1,809	3,456	1,477	3,051	3,136	2,503
Maximum		7,403	7,403	5,599	4,024	7,403	1,557	5,599	3,677	3,564
15-day Average Flows										
Maximum exceeded in 100% of the years		80	80	227	80	310	262	227	278	253
Maximum exceeded in 90% of the years		348	300	369	213	534	311	424	367	355
Maximum exceeded in 80% of the years		428	516	422	374	619	457	461	392	414
Maximum exceeded in 70% of the years		524	634	486	638	689	599	534	423	493
Maximum exceeded in 60% of the years		617	792	543	854	986	643	589	489	586
Maximum exceeded in 50% of the years		799	1,021	624	1,050	1,372	711	847	511	657
Maximum exceeded in 40% of the years		1,064	1,095	928	1,093	1,414	970	1,160	624	1,031
Maximum exceeded in 30% of the years		1,283	1,285	1,220	1,216	1,559	1,045	1,524	672	1,202
Maximum exceeded in 20% of the years		1,550	1,388	1,790	1,285	1,839	1,087	2,078	2,325	1,547
Maximum exceeded in 10% of the years		2,407	1,891	2,470	1,640	2,747	1,151	2,509	2,393	2,305
Maximum		5,965	5,965	4,519	3,664	5,965	1,357	4,519	2,684	3,377
30-day Average Flows										
Maximum exceeded in 100% of the years		79	79	179	79	257	181	192	179	212
Maximum exceeded in 90% of the years		262	234	296	172	449	228	290	297	334
Maximum exceeded in 80% of the years		353	451	345	323	528	390	330	325	364
Maximum exceeded in 70% of the years		437	507	392	523	612	463	395	360	463
Maximum exceeded in 60% of the years		491	663	449	718	821	485	462	396	486
Maximum exceeded in 50% of the years		628	812	495	855	1,038	603	562	430	575
Maximum exceeded in 40% of the years		852	868	672	900	1,161	684	793	478	835
Maximum exceeded in 30% of the years		980	981	950	983	1,207	815	1,288	521	930
Maximum exceeded in 20% of the years		1,295	1,144	1,436	1,035	1,400	853	1,427	1,626	1,287
Maximum exceeded in 10% of the years		1,910	1,490	1,992	1,355	2,116	898	1,985	1,953	1,914
Maximum		3,826	3,826	3,430	2,718	3,826	978	3,430	2,037	3,178

Table A.6-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

South Platte River at Denver, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		70	70	337	70	595	278	337	348	411
Maximum exceeded in 90% of the years		430	413	445	279	752	401	449	400	523
Maximum exceeded in 80% of the years		595	598	574	424	860	544	605	501	859
Maximum exceeded in 70% of the years		695	790	652	515	916	801	643	555	970
Maximum exceeded in 60% of the years		916	894	932	605	1,136	875	1,029	630	1,000
Maximum exceeded in 50% of the years		1,000	1,050	1,000	758	1,250	993	1,390	676	1,100
Maximum exceeded in 40% of the years		1,324	1,342	1,142	1,080	1,424	1,274	1,478	875	1,510
Maximum exceeded in 30% of the years		1,565	1,608	1,562	1,406	1,552	1,816	1,614	945	1,763
Maximum exceeded in 20% of the years		1,964	2,120	1,764	1,984	2,556	2,024	1,646	1,090	2,202
Maximum exceeded in 10% of the years		2,679	2,890	2,504	2,306	2,889	2,701	2,138	1,435	2,980
Maximum		9,310	9,310	4,660	3,010	6,270	9,310	4,660	2,700	3,540
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		50	50	299	50	502	262	299	303	307
Maximum exceeded in 90% of the years		348	362	358	242	608	339	401	353	415
Maximum exceeded in 80% of the years		484	499	470	396	721	445	473	430	561
Maximum exceeded in 70% of the years		552	572	536	467	767	565	526	493	673
Maximum exceeded in 60% of the years		758	764	669	531	845	774	649	529	869
Maximum exceeded in 50% of the years		845	847	844	564	982	875	843	621	937
Maximum exceeded in 40% of the years		974	1,028	924	936	1,058	990	938	829	1,000
Maximum exceeded in 30% of the years		1,240	1,369	1,068	1,270	1,306	1,531	1,337	880	1,252
Maximum exceeded in 20% of the years		1,557	2,028	1,444	1,833	2,270	1,752	1,489	920	1,487
Maximum exceeded in 10% of the years		2,187	2,375	1,631	2,062	2,504	2,259	1,557	1,353	1,842
Maximum		6,010	6,010	4,027	2,963	6,010	4,460	4,027	2,180	3,483
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		44	44	243	44	407	225	243	258	248
Maximum exceeded in 90% of the years		302	321	298	221	539	309	294	294	332
Maximum exceeded in 80% of the years		395	390	405	330	613	339	405	382	416
Maximum exceeded in 70% of the years		469	496	447	367	653	393	437	426	560
Maximum exceeded in 60% of the years		587	642	560	405	707	595	541	471	706
Maximum exceeded in 50% of the years		709	714	703	497	750	726	615	520	761
Maximum exceeded in 40% of the years		769	844	761	753	812	864	753	692	798
Maximum exceeded in 30% of the years		926	1,231	817	1,022	1,219	1,253	871	732	909
Maximum exceeded in 20% of the years		1,320	1,493	1,134	1,478	1,896	1,561	1,201	816	1,162
Maximum exceeded in 10% of the years		1,695	1,995	1,457	1,491	2,091	1,694	1,417	1,188	1,508
Maximum		5,204	5,204	3,373	2,639	5,204	2,283	3,306	1,667	3,373
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		42	42	203	42	362	206	203	227	241
Maximum exceeded in 90% of the years		243	238	253	208	473	246	222	268	259
Maximum exceeded in 80% of the years		313	343	302	235	523	270	357	295	313
Maximum exceeded in 70% of the years		376	417	369	265	558	356	381	361	483
Maximum exceeded in 60% of the years		498	533	447	358	591	532	437	370	529
Maximum exceeded in 50% of the years		554	574	523	413	624	570	512	384	567
Maximum exceeded in 40% of the years		603	660	587	514	696	690	534	585	610
Maximum exceeded in 30% of the years		746	1,018	661	711	993	1,119	655	642	750
Maximum exceeded in 20% of the years		1,074	1,278	998	1,048	1,465	1,222	1,033	671	1,029
Maximum exceeded in 10% of the years		1,388	1,470	1,198	1,219	1,859	1,340	1,181	905	1,326
Maximum		4,009	4,009	2,999	2,499	4,009	1,439	2,533	1,559	2,999
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		41	41	138	41	335	173	138	182	199
Maximum exceeded in 90% of the years		198	182	204	159	394	189	184	221	217
Maximum exceeded in 80% of the years		267	284	266	176	424	209	278	265	273
Maximum exceeded in 70% of the years		331	376	316	218	452	273	322	286	415
Maximum exceeded in 60% of the years		415	433	348	318	470	432	340	316	446
Maximum exceeded in 50% of the years		453	453	444	384	519	453	357	339	463
Maximum exceeded in 40% of the years		513	557	499	465	596	541	471	453	509
Maximum exceeded in 30% of the years		632	728	553	581	780	922	566	530	643
Maximum exceeded in 20% of the years		809	967	776	729	1,026	982	786	601	795
Maximum exceeded in 10% of the years		1,081	1,108	985	905	1,513	1,063	976	746	1,096
Maximum		3,035	3,035	2,033	1,796	3,035	1,139	1,933	1,380	2,033

noticeably smaller for the 1975-1998 time interval than those for the preceding time intervals, and that the flow values for the 20 percent and lower exceedance probabilities (higher flows) are much lower for the 1975-1998 time interval than for the 1959-1974 time interval. These characterizations are coincident with the beginning of operation of Chatfield and Bear Creek Reservoirs (**Section A.6-1**), which were designed to hold significant high-flow events. On the other hand, flow values generally increase from the 1959-1974 time interval to the 1975-1998 time interval for exceedance probabilities of 30 through 60 percent. This is coincident with the beginning of operation of the Roberts Tunnel diversion in 1962 (Note: this characterization is also seen for all seasonal periods discussed in the following four paragraphs).

Table A.6-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.6-6** shows that flow values generally vary according to known climatological conditions for all averaging times and all exceedance probabilities.

Table A.6-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.6-7** shows that the flow values for this seasonal period are generally similar to those for annual data. The flow values for the 1895-1909 through 1928-1941 time intervals are generally somewhat less than those for annual data. On the other hand, the flow values for the 1942-1958 through 1975-1998 time intervals are close to, and often identical to, those for annual data for exceedance probabilities of 30 percent and lower (higher flows). For exceedance probabilities of 40 percent and higher (lower flows) the flow values are somewhat lower than those for annual data. This is consistent with the observation made in **Section A.6.2 (Table A.6-1)** that the greatest seasonal maximum mean daily flows occurred in this seasonal period for all time intervals except 1910-1927 and 1928-1941.

Table A.6-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.6-8** shows that the flow values for this seasonal period are generally similar to those for the Apr 16-Jul 15 seasonal period. The biggest difference for this seasonal period is that flow values for the 20 percent and lower exceedance probabilities (higher flows) are much lower than those for the Apr 16-Jul 15 seasonal period. This is particularly true for all of the multi-day averaging times. As previously noted, most of the Annual Maximum mean daily flows occurred in the Apr 16-Jul 15 seasonal period. It is interesting to note that the maximum flow values for the 1910-1927 time interval are the same for this seasonal period as those for the Apr 16-Jul 15 seasonal period. This indicates that, in the 1910-1927 time interval, the maximum flows occurred in the days when the Jun 1-Aug 15 and the Apr 16-Jul 15 seasonal periods overlapped. This is consistent with what was seen in **Table A.6-1**, in which the values for the maximum mean daily flow for these two seasonal periods were nearly the same. Otherwise, flow values for the 30 percent and higher exceedance probabilities (lower flows) were generally somewhat lower for this seasonal period. This makes sense, since the Apr 16-Jul 15 seasonal period has historically had more precipitation (NOAA, 2005 [Colorado]) and includes the later part of the spring snowmelt runoff period.

Table A.6-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.6-9** shows that flow values for this seasonal period are lower than those for the Jun 1-Aug 15 seasonal period. This makes sense, since the wettest months of the year are those before this seasonal period begins, and both the average precipitation and the frequency of short-duration heavy rainfall events decrease by month throughout this seasonal period (NOAA, 2005 [Colorado]). Otherwise, the same or similar characterizations exist for this seasonal period as those for the previous two seasonal periods.

A.6.4.3 Mean Flow Exceedance.

Table A.6-10 through **Table A.6-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30), for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix. The seasonal periods considered were those defined in the introduction to this Appendix. Unlike the characterizations for the North Platte Basin (**Sections A.1** through **A.5**), the characterizations considering all flows have relatively little in common with those for maximum flows.

Table A.6-10 shows the exceedance probabilities and values of flows for annual data. **Table A.6-10** shows that, as a general rule, climatological conditions during the respective time intervals are the predominant influence on the characterizations for annual data for the 1895-1909 through 1959-1974 time intervals, except for a slight decrease in flow values from the 1928-1941 time interval to the 1942-1958 time interval. This is coincident with to the beginning of operation of Cherry Creek Reservoir in 1950. One distinct difference in the characterizations considering all flows compared to those for maximum flows is a slight increase in flows with increasing averaging time. A basic discussion of the likely cause of this effect is given in **Section A.1.4.3**.

Table A.6-11 shows the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.6-11** shows that climatological conditions account for essentially all of the flow variations for the 1895-1909 through 1959-1974 time intervals. The flow values show the expected increase with decreasing exceedance probability; otherwise, there is no systematic change in flow with increasing averaging time.

Table A.6-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.6-12** shows that climatological conditions by time interval account for all of the flow variations for the 1895 -1909 through 1928-1941 time intervals. For the 1942-1958 and 1959-1974 time intervals, changes in flow values coincident with the regulation of Cherry Creek Reservoir can be seen. Flows increase with increasing averaging time for all time intervals and all exceedance probabilities. At this location, this is most likely attributable to climatic factors, i.e. steady decreases in flow values throughout the seasonal period due to decreasing high country snowmelt, usually after early May, and decreasing local precipitation beginning in June (NOAA,

Table A.6-10 Exceedance Values Considering All Flows, Annual Data.

South Platte River at Denver, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days		9	12	9	12	15	23	9	22	43
Flow exceeded for 90% of the days		67	70	65	60	99	59	46	60	87
Flow exceeded for 80% of the days		90	92	87	80	126	76	66	79	105
Flow exceeded for 70% of the days		111	116	108	100	155	93	87	99	126
Flow exceeded for 60% of the days		137	147	131	132	188	114	111	119	154
Flow exceeded for 50% of the days		174	188	163	174	228	143	140	149	190
Flow exceeded for 40% of the days		225	242	210	220	290	189	182	195	241
Flow exceeded for 30% of the days		305	325	291	290	390	273	257	270	321
Flow exceeded for 20% of the days		438	472	411	422	569	403	376	390	443
Flow exceeded for 10% of the days		765	806	723	760	998	655	799	630	768
Maximum		13,300	9,310	13,300	5,570	8,790	9,310	8,280	13,300	4,020
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		12	13	12	13	18	24	12	24	47
Flow exceeded for 90% of the days		68	70	66	62	100	60	47	62	89
Flow exceeded for 80% of the days		91	94	89	81	127	77	67	80	108
Flow exceeded for 70% of the days		113	119	110	103	155	94	89	101	130
Flow exceeded for 60% of the days		140	150	134	133	188	116	112	121	160
Flow exceeded for 50% of the days		177	189	167	177	230	145	142	151	193
Flow exceeded for 40% of the days		228	243	215	219	297	192	186	197	247
Flow exceeded for 30% of the days		310	329	294	297	394	278	261	274	331
Flow exceeded for 20% of the days		439	478	412	435	567	411	376	389	439
Flow exceeded for 10% of the days		760	802	719	755	994	656	785	623	760
Maximum		10,933	8,443	10,933	5,243	8,443	4,460	7,820	10,933	3,843
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		14	22	14	22	32	28	14	28	50
Flow exceeded for 90% of the days		70	72	68	66	103	62	48	63	91
Flow exceeded for 80% of the days		93	96	91	83	130	79	69	81	111
Flow exceeded for 70% of the days		116	122	112	105	158	96	91	103	134
Flow exceeded for 60% of the days		143	151	137	136	191	118	115	122	165
Flow exceeded for 50% of the days		181	191	172	177	234	147	144	152	197
Flow exceeded for 40% of the days		233	248	221	222	304	199	190	205	251
Flow exceeded for 30% of the days		315	342	297	312	401	284	261	279	334
Flow exceeded for 20% of the days		443	484	417	442	564	416	390	390	442
Flow exceeded for 10% of the days		744	790	705	735	995	665	774	619	749
Maximum		7,441	7,403	7,441	5,093	7,403	2,631	6,804	7,441	3,794
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		15	29	15	29	47	30	15	29	55
Flow exceeded for 90% of the days		72	74	70	69	108	64	51	64	94
Flow exceeded for 80% of the days		96	99	94	86	133	81	73	82	112
Flow exceeded for 70% of the days		119	125	114	108	159	99	94	106	139
Flow exceeded for 60% of the days		146	153	140	135	194	121	119	125	170
Flow exceeded for 50% of the days		186	195	177	179	241	148	146	157	203
Flow exceeded for 40% of the days		238	251	226	226	309	205	197	214	254
Flow exceeded for 30% of the days		322	354	302	326	419	285	268	285	336
Flow exceeded for 20% of the days		451	490	417	458	568	422	386	385	449
Flow exceeded for 10% of the days		745	793	690	739	1,027	656	769	603	737
Maximum		6,301	5,965	6,301	5,059	5,965	1,961	6,301	6,050	3,399
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		19	32	19	34	57	32	19	30	61
Flow exceeded for 90% of the days		76	77	74	70	113	67	53	66	98
Flow exceeded for 80% of the days		99	104	97	91	139	84	79	85	119
Flow exceeded for 70% of the days		123	127	120	111	162	103	97	107	143
Flow exceeded for 60% of the days		150	157	144	140	198	124	125	129	175
Flow exceeded for 50% of the days		190	197	184	180	246	158	150	166	206
Flow exceeded for 40% of the days		244	263	232	226	329	206	203	224	257
Flow exceeded for 30% of the days		330	364	307	327	424	311	278	294	343
Flow exceeded for 20% of the days		452	492	414	466	573	436	374	382	453
Flow exceeded for 10% of the days		776	816	722	718	1,038	662	822	593	773
Maximum		5,465	4,293	5,465	4,293	3,865	1,658	5,465	4,878	3,178

Table A.6-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

South Platte River at Denver, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	22	28	22	40	50	28	22	42	59	
Flow exceeded for 90% of the days	55	55	53	60	80	43	41	59	79	
Flow exceeded for 80% of the days	70	70	70	70	98	53	49	67	89	
Flow exceeded for 70% of the days	83	82	83	80	110	62	55	75	105	
Flow exceeded for 60% of the days	97	98	96	95	118	71	71	90	129	
Flow exceeded for 50% of the days	114	112	116	108	130	80	92	96	146	
Flow exceeded for 40% of the days	132	128	134	137	141	97	112	112	167	
Flow exceeded for 30% of the days	152	151	154	178	167	115	132	129	190	
Flow exceeded for 20% of the days	187	187	188	205	200	138	146	156	224	
Flow exceeded for 10% of the days	246	242	254	232	315	178	193	207	283	
Maximum	2,340	2,340	1,600	672	925	2,340	1,600	494	1,220	
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	27	30	27	40	52	30	27	47	63	
Flow exceeded for 90% of the days	56	57	55	63	84	43	42	61	81	
Flow exceeded for 80% of the days	70	70	71	73	100	54	49	68	91	
Flow exceeded for 70% of the days	84	83	84	81	110	62	57	76	110	
Flow exceeded for 60% of the days	99	100	98	93	118	70	71	90	131	
Flow exceeded for 50% of the days	114	112	117	108	130	79	94	97	147	
Flow exceeded for 40% of the days	132	129	135	133	142	99	115	111	170	
Flow exceeded for 30% of the days	153	152	154	180	170	116	132	129	190	
Flow exceeded for 20% of the days	187	187	187	205	194	142	145	156	227	
Flow exceeded for 10% of the days	246	234	257	232	312	174	193	204	293	
Maximum	2,003	2,003	1,327	561	726	2,003	1,327	416	742	
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	30	30	33	40	61	30	33	49	68	
Flow exceeded for 90% of the days	58	61	56	66	88	45	45	63	86	
Flow exceeded for 80% of the days	71	71	71	76	104	55	50	67	96	
Flow exceeded for 70% of the days	86	85	86	85	112	64	58	75	111	
Flow exceeded for 60% of the days	102	102	101	96	118	70	70	85	133	
Flow exceeded for 50% of the days	116	115	118	114	127	76	93	98	149	
Flow exceeded for 40% of the days	134	130	137	135	145	99	118	114	174	
Flow exceeded for 30% of the days	153	152	154	185	172	121	134	129	192	
Flow exceeded for 20% of the days	188	187	188	204	191	144	145	154	226	
Flow exceeded for 10% of the days	246	238	257	234	308	179	184	217	301	
Maximum	1,264	1,264	1,001	423	648	1,264	1,001	349	552	
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	37	37	42	44	62	37	42	53	71	
Flow exceeded for 90% of the days	61	63	59	68	96	44	47	62	92	
Flow exceeded for 80% of the days	73	72	73	77	108	57	53	67	99	
Flow exceeded for 70% of the days	89	90	89	84	113	64	60	77	108	
Flow exceeded for 60% of the days	105	108	103	95	121	70	70	89	139	
Flow exceeded for 50% of the days	120	119	122	118	129	75	85	101	151	
Flow exceeded for 40% of the days	134	130	139	131	143	105	119	114	175	
Flow exceeded for 30% of the days	151	154	150	187	169	125	135	134	206	
Flow exceeded for 20% of the days	192	190	196	203	190	140	142	143	229	
Flow exceeded for 10% of the days	250	234	254	224	295	198	190	200	282	
Maximum	736	736	630	396	508	736	630	308	472	
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	42	42	47	57	67	42	47	61	86	
Flow exceeded for 90% of the days	61	63	59	69	101	47	48	63	91	
Flow exceeded for 80% of the days	71	71	78	76	109	60	53	68	95	
Flow exceeded for 70% of the days	93	98	91	83	119	65	55	80	113	
Flow exceeded for 60% of the days	107	108	106	99	120	71	71	96	142	
Flow exceeded for 50% of the days	121	120	122	116	129	87	96	106	155	
Flow exceeded for 40% of the days	133	130	142	139	133	108	122	116	184	
Flow exceeded for 30% of the days	151	146	155	154	152	122	134	138	206	
Flow exceeded for 20% of the days	193	185	204	199	186	140	142	147	231	
Flow exceeded for 10% of the days	275	275	273	220	347	174	230	194	276	
Maximum	450	450	387	323	390	450	387	276	308	

Table A.6-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

South Platte River at Denver, CO	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	10	29	10	29	40	49	10	22	49
Flow exceeded for 90% of the days	121	117	123	80	182	129	97	112	159
Flow exceeded for 80% of the days	197	214	187	151	268	195	148	165	235
Flow exceeded for 70% of the days	264	287	247	268	356	250	203	219	300
Flow exceeded for 60% of the days	336	371	315	341	458	310	269	286	362
Flow exceeded for 50% of the days	416	462	390	422	565	380	344	364	426
Flow exceeded for 40% of the days	534	585	477	578	705	467	464	439	509
Flow exceeded for 30% of the days	720	760	679	765	968	574	790	574	714
Flow exceeded for 20% of the days	1,080	1,030	1,130	1,004	1,320	755	1,300	843	1,174
Flow exceeded for 10% of the days	1,750	1,530	2,054	1,640	1,793	1,040	1,852	1,680	2,307
Maximum	13,300	8,790	13,300	5,570	8,790	3,060	8,280	13,300	4,020
3-day Average Flows									
Flow exceeded for 100% of the days	14	35	14	35	40	54	14	24	50
Flow exceeded for 90% of the days	129	127	131	81	196	145	104	120	174
Flow exceeded for 80% of the days	206	224	193	153	275	203	157	172	249
Flow exceeded for 70% of the days	274	297	257	276	377	258	213	231	316
Flow exceeded for 60% of the days	348	381	328	348	469	316	273	290	374
Flow exceeded for 50% of the days	422	469	393	435	572	389	349	367	430
Flow exceeded for 40% of the days	537	593	484	591	701	470	474	448	513
Flow exceeded for 30% of the days	728	768	686	771	975	593	792	585	731
Flow exceeded for 20% of the days	1,083	1,049	1,126	1,000	1,335	764	1,333	836	1,183
Flow exceeded for 10% of the days	1,750	1,547	2,083	1,653	1,790	1,067	1,855	1,701	2,345
Maximum	10,933	8,443	10,933	5,243	8,443	3,007	7,820	10,933	3,843
7-day Average Flows									
Flow exceeded for 100% of the days	26	38	26	38	44	71	26	28	54
Flow exceeded for 90% of the days	142	142	142	85	211	156	111	129	192
Flow exceeded for 80% of the days	221	242	210	148	298	219	170	184	267
Flow exceeded for 70% of the days	287	319	270	303	400	273	226	243	328
Flow exceeded for 60% of the days	363	400	334	384	486	328	273	305	380
Flow exceeded for 50% of the days	434	486	406	448	574	397	352	382	435
Flow exceeded for 40% of the days	545	602	491	593	717	485	474	456	529
Flow exceeded for 30% of the days	733	771	691	765	993	612	863	587	739
Flow exceeded for 20% of the days	1,100	1,034	1,170	1,005	1,350	779	1,350	842	1,259
Flow exceeded for 10% of the days	1,784	1,555	2,202	1,704	1,790	1,028	1,888	1,884	2,383
Maximum	7,441	7,403	7,441	5,093	7,403	2,631	6,804	7,441	3,794
15-day Average Flows									
Flow exceeded for 100% of the days	29	40	29	40	50	79	37	29	72
Flow exceeded for 90% of the days	167	169	167	91	225	188	126	134	212
Flow exceeded for 80% of the days	241	267	226	144	341	254	194	201	281
Flow exceeded for 70% of the days	311	357	285	337	435	298	238	262	334
Flow exceeded for 60% of the days	379	431	347	400	512	369	289	330	386
Flow exceeded for 50% of the days	459	517	410	491	602	423	363	384	448
Flow exceeded for 40% of the days	561	627	493	602	775	530	526	459	517
Flow exceeded for 30% of the days	770	792	734	778	1,053	640	958	573	783
Flow exceeded for 20% of the days	1,160	1,073	1,304	1,018	1,342	764	1,416	943	1,367
Flow exceeded for 10% of the days	1,825	1,549	2,251	1,725	1,745	1,055	1,891	2,281	2,452
Maximum	6,301	5,965	6,301	5,059	5,965	1,961	6,301	6,050	3,399
30-day Average Flows									
Flow exceeded for 100% of the days	30	59	30	59	104	92	80	30	101
Flow exceeded for 90% of the days	196	211	192	93	252	249	178	166	238
Flow exceeded for 80% of the days	273	311	254	222	388	296	212	219	292
Flow exceeded for 70% of the days	334	396	311	354	468	339	269	302	343
Flow exceeded for 60% of the days	404	472	354	454	520	409	317	340	393
Flow exceeded for 50% of the days	482	548	418	544	648	477	393	387	463
Flow exceeded for 40% of the days	599	663	518	637	896	577	686	459	541
Flow exceeded for 30% of the days	847	865	807	794	1,128	662	1,145	560	796
Flow exceeded for 20% of the days	1,280	1,122	1,458	1,052	1,360	816	1,451	1,466	1,465
Flow exceeded for 10% of the days	1,819	1,555	2,287	1,715	1,756	1,000	1,791	2,241	2,518
Maximum	5,465	4,293	5,465	4,293	3,865	1,658	5,465	4,878	3,092

Table A.6-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

South Platte River at Denver, CO	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	21	25	21	25	79	38	21	23	55
Flow exceeded for 90% of the days	130	129	131	80	221	125	101	130	170
Flow exceeded for 80% of the days	204	221	195	146	293	201	156	184	245
Flow exceeded for 70% of the days	268	284	254	230	374	259	215	222	301
Flow exceeded for 60% of the days	328	353	314	290	470	312	287	270	363
Flow exceeded for 50% of the days	408	438	387	374	562	370	356	338	427
Flow exceeded for 40% of the days	498	544	465	522	670	429	452	418	503
Flow exceeded for 30% of the days	640	684	604	686	816	509	651	521	648
Flow exceeded for 20% of the days	884	885	883	888	1,150	651	1,028	692	908
Flow exceeded for 10% of the days	1,370	1,320	1,400	1,200	1,730	864	1,460	1,220	1,457
Maximum	12,000	8,790	12,000	4,350	8,790	2,270	7,440	12,000	3,980
3-day Average Flows									
Flow exceeded for 100% of the days	24	29	24	29	82	40	24	24	55
Flow exceeded for 90% of the days	137	137	136	80	228	126	103	139	178
Flow exceeded for 80% of the days	215	229	205	153	307	204	167	187	252
Flow exceeded for 70% of the days	276	294	263	238	392	264	227	229	310
Flow exceeded for 60% of the days	342	365	324	298	480	317	293	277	376
Flow exceeded for 50% of the days	413	446	391	383	569	371	360	338	430
Flow exceeded for 40% of the days	502	544	469	513	664	427	449	422	504
Flow exceeded for 30% of the days	641	675	603	685	833	507	638	523	650
Flow exceeded for 20% of the days	873	876	868	895	1,163	631	1,024	690	922
Flow exceeded for 10% of the days	1,336	1,287	1,382	1,157	1,677	859	1,437	1,231	1,400
Maximum	8,443	8,443	6,590	4,243	8,443	2,030	6,590	6,347	3,670
7-day Average Flows									
Flow exceeded for 100% of the days	27	40	27	40	87	47	27	30	58
Flow exceeded for 90% of the days	147	148	147	83	245	130	109	146	185
Flow exceeded for 80% of the days	227	245	219	162	341	214	187	199	266
Flow exceeded for 70% of the days	289	313	275	254	428	278	240	239	325
Flow exceeded for 60% of the days	353	384	331	325	503	327	295	289	380
Flow exceeded for 50% of the days	425	460	398	399	575	378	370	352	440
Flow exceeded for 40% of the days	510	550	470	511	660	437	454	422	514
Flow exceeded for 30% of the days	631	661	592	674	825	505	610	518	648
Flow exceeded for 20% of the days	868	872	862	899	1,133	608	1,008	677	906
Flow exceeded for 10% of the days	1,298	1,216	1,363	1,114	1,669	820	1,423	1,264	1,339
Maximum	7,403	7,403	5,599	4,024	7,403	1,664	5,599	3,677	3,564
15-day Average Flows									
Flow exceeded for 100% of the days	31	40	31	40	91	64	32	31	72
Flow exceeded for 90% of the days	161	153	166	106	249	131	135	159	200
Flow exceeded for 80% of the days	241	252	235	162	359	232	206	217	285
Flow exceeded for 70% of the days	303	331	289	258	458	281	261	259	331
Flow exceeded for 60% of the days	361	403	338	337	521	345	311	299	388
Flow exceeded for 50% of the days	429	475	390	404	595	395	369	350	456
Flow exceeded for 40% of the days	508	555	469	517	697	440	432	389	521
Flow exceeded for 30% of the days	632	668	594	714	868	510	573	494	657
Flow exceeded for 20% of the days	860	850	876	847	1,112	568	953	669	896
Flow exceeded for 10% of the days	1,235	1,126	1,334	1,047	1,446	712	1,394	1,305	1,323
Maximum	5,965	5,965	4,519	3,664	5,965	1,389	4,519	2,684	3,377
30-day Average Flows									
Flow exceeded for 100% of the days	40	40	49	40	147	87	49	51	83
Flow exceeded for 90% of the days	170	162	172	114	269	119	157	164	210
Flow exceeded for 80% of the days	255	270	248	174	397	244	221	233	302
Flow exceeded for 70% of the days	313	348	299	280	454	307	261	274	342
Flow exceeded for 60% of the days	363	413	331	336	521	368	310	300	400
Flow exceeded for 50% of the days	430	462	384	425	607	409	348	329	465
Flow exceeded for 40% of the days	507	554	465	591	789	436	407	376	543
Flow exceeded for 30% of the days	652	687	606	691	892	459	544	479	684
Flow exceeded for 20% of the days	849	841	864	817	1,027	546	1,014	813	838
Flow exceeded for 10% of the days	1,129	1,026	1,329	974	1,212	649	1,326	1,295	1,358
Maximum	3,826	3,826	3,430	2,718	3,826	1,016	3,430	2,037	3,178

Table A.6-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

South Platte River at Denver, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	11	25	11	25	65	31	11	24	48	
Flow exceeded for 90% of the days	87	94	80	76	155	79	58	67	112	
Flow exceeded for 80% of the days	128	140	116	120	200	111	88	107	145	
Flow exceeded for 70% of the days	167	190	152	147	242	150	120	142	180	
Flow exceeded for 60% of the days	213	234	197	190	288	210	162	188	218	
Flow exceeded for 50% of the days	265	288	246	235	330	277	227	227	268	
Flow exceeded for 40% of the days	323	343	303	285	403	344	288	276	326	
Flow exceeded for 30% of the days	404	430	380	350	500	426	359	353	408	
Flow exceeded for 20% of the days	529	570	502	456	670	554	490	482	517	
Flow exceeded for 10% of the days	785	843	734	700	1,060	778	770	640	788	
Maximum	9,310	9,310	4,660	3,010	6,270	9,310	4,660	2,700	3,540	
3-day Average Flows										
Flow exceeded for 100% of the days	12	29	12	29	78	32	12	24	51	
Flow exceeded for 90% of the days	89	98	83	79	164	80	59	66	117	
Flow exceeded for 80% of the days	131	145	121	129	210	115	91	110	154	
Flow exceeded for 70% of the days	175	195	162	150	249	159	123	149	186	
Flow exceeded for 60% of the days	220	240	204	196	300	217	168	191	230	
Flow exceeded for 50% of the days	273	297	254	237	339	290	238	228	279	
Flow exceeded for 40% of the days	330	352	311	287	408	354	296	284	341	
Flow exceeded for 30% of the days	409	435	386	356	501	434	361	355	414	
Flow exceeded for 20% of the days	529	565	500	459	662	559	495	478	514	
Flow exceeded for 10% of the days	777	851	729	675	1,034	795	772	637	774	
Maximum	6,010	6,010	4,027	2,963	6,010	4,460	4,027	2,180	3,483	
7-day Average Flows										
Flow exceeded for 100% of the days	15	40	15	40	83	47	15	30	55	
Flow exceeded for 90% of the days	94	109	86	87	181	85	64	68	127	
Flow exceeded for 80% of the days	139	153	129	130	224	126	99	114	167	
Flow exceeded for 70% of the days	187	205	171	156	264	166	129	156	197	
Flow exceeded for 60% of the days	231	255	217	199	310	228	184	205	238	
Flow exceeded for 50% of the days	281	309	258	251	354	295	237	239	287	
Flow exceeded for 40% of the days	341	363	319	299	423	365	300	284	354	
Flow exceeded for 30% of the days	421	447	398	363	508	457	377	353	427	
Flow exceeded for 20% of the days	533	566	500	461	625	574	504	469	525	
Flow exceeded for 10% of the days	749	878	709	661	1,049	781	739	629	754	
Maximum	5,204	5,204	3,373	2,639	5,204	2,283	3,306	1,667	3,373	
15-day Average Flows										
Flow exceeded for 100% of the days	21	40	21	40	93	61	21	31	62	
Flow exceeded for 90% of the days	105	120	99	102	209	90	74	70	143	
Flow exceeded for 80% of the days	152	168	141	134	250	140	110	122	184	
Flow exceeded for 70% of the days	202	223	188	157	282	183	143	164	212	
Flow exceeded for 60% of the days	245	269	227	201	316	236	201	217	243	
Flow exceeded for 50% of the days	293	324	268	262	372	302	258	254	301	
Flow exceeded for 40% of the days	354	387	326	328	430	404	310	291	376	
Flow exceeded for 30% of the days	433	463	409	371	497	492	385	356	449	
Flow exceeded for 20% of the days	531	560	510	463	589	604	496	463	538	
Flow exceeded for 10% of the days	776	943	670	731	1,104	900	728	589	735	
Maximum	4,009	4,009	2,999	2,499	4,009	1,439	2,533	1,559	2,999	
30-day Average Flows										
Flow exceeded for 100% of the days	28	40	28	40	120	72	28	52	74	
Flow exceeded for 90% of the days	119	129	114	111	232	114	89	82	173	
Flow exceeded for 80% of the days	173	178	168	137	276	160	125	131	197	
Flow exceeded for 70% of the days	213	240	202	164	305	188	169	182	233	
Flow exceeded for 60% of the days	261	295	242	211	338	233	219	226	275	
Flow exceeded for 50% of the days	311	334	284	290	384	335	258	256	333	
Flow exceeded for 40% of the days	364	402	334	329	429	431	320	295	384	
Flow exceeded for 30% of the days	435	465	403	403	475	508	380	329	438	
Flow exceeded for 20% of the days	527	588	501	492	649	683	495	450	514	
Flow exceeded for 10% of the days	791	895	671	708	1,043	917	732	576	713	
Maximum	3,035	3,035	2,033	1,796	3,035	1,139	1,933	1,380	2,033	

2004 [Colorado]). The high country snowmelt season ends sooner in the upper South Platte Basin than in the North Platte Basin because the South Platte Basin is smaller and farther south, and more of the snow is captured west of the continental divide due to the alignment of the highest mountains. The increase with increasing averaging time is greatest for the highest exceedance probabilities (lower flows) and becomes increasingly less evident with decreasing exceedance probability (higher flows).

Table A.6-13 shows the exceedance probabilities and values of flows for the Jun1-Aug 15 seasonal period. **Table A.6-13** shows that the characterizations for this seasonal period are similar to those for the Apr 16-Jul 15 seasonal period except for the 1928-1941 time interval. For this time interval, all flow values are lower than those for the Apr 16-Jul 15 seasonal period. The increases in flow values with increasing averaging time are noticeably less than those for the previous seasonal period. For exceedance probabilities of 20 percent and less (higher flows), the trend actually reverts to a decrease with increasing averaging time. For all other time intervals in this seasonal period, the flow values and their characterizations are almost identical to those for the Apr 16-Jul 15 seasonal period, except that the increase in flow values with increasing averaging time ends with the 20 percent exceedance probability.

Table A.6-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.6-14** shows that the characterizations for this seasonal period are generally similar to those for the Jun 1-Aug 15 seasonal period. The most visible difference is that the flow values are generally lower. Also, the increase in flow values with increasing averaging time generally ends with the 30 percent exceedance probability. The 1928-1941 time interval is an exception. It shows some increases in flow values compared to the Jun 1- Aug 15 seasonal period, whereas the other time intervals show a decrease. The increases are seen for the 15-day and 30-day averaging period and for exceedance probabilities of 20 percent and lower (high flows). The likely cause for this is an isolated high-flow event in this seasonal period (**Figure A.6-3** and **Figure A.6-8**) during what was otherwise a very dry time interval.

A.6.5 Median Mean Daily Flow

The Median mean daily flow by calendar day is shown in **Figure A.6-6**. **Figure A.6-6** shows a clear seasonal pattern to the variation in Median mean daily flow by calendar day for all time intervals. The highest values almost always occur in May and June, with a secondary maximum in the July and August “monsoon” season. There is also a possible indication of the effects of the operation of the Corps of Engineers reservoirs, in the form of somewhat lower values in May and June for the 1959-1974 and 1975-1998 time intervals. From October through March, the values are all very low, almost never exceeding 200 cfs.

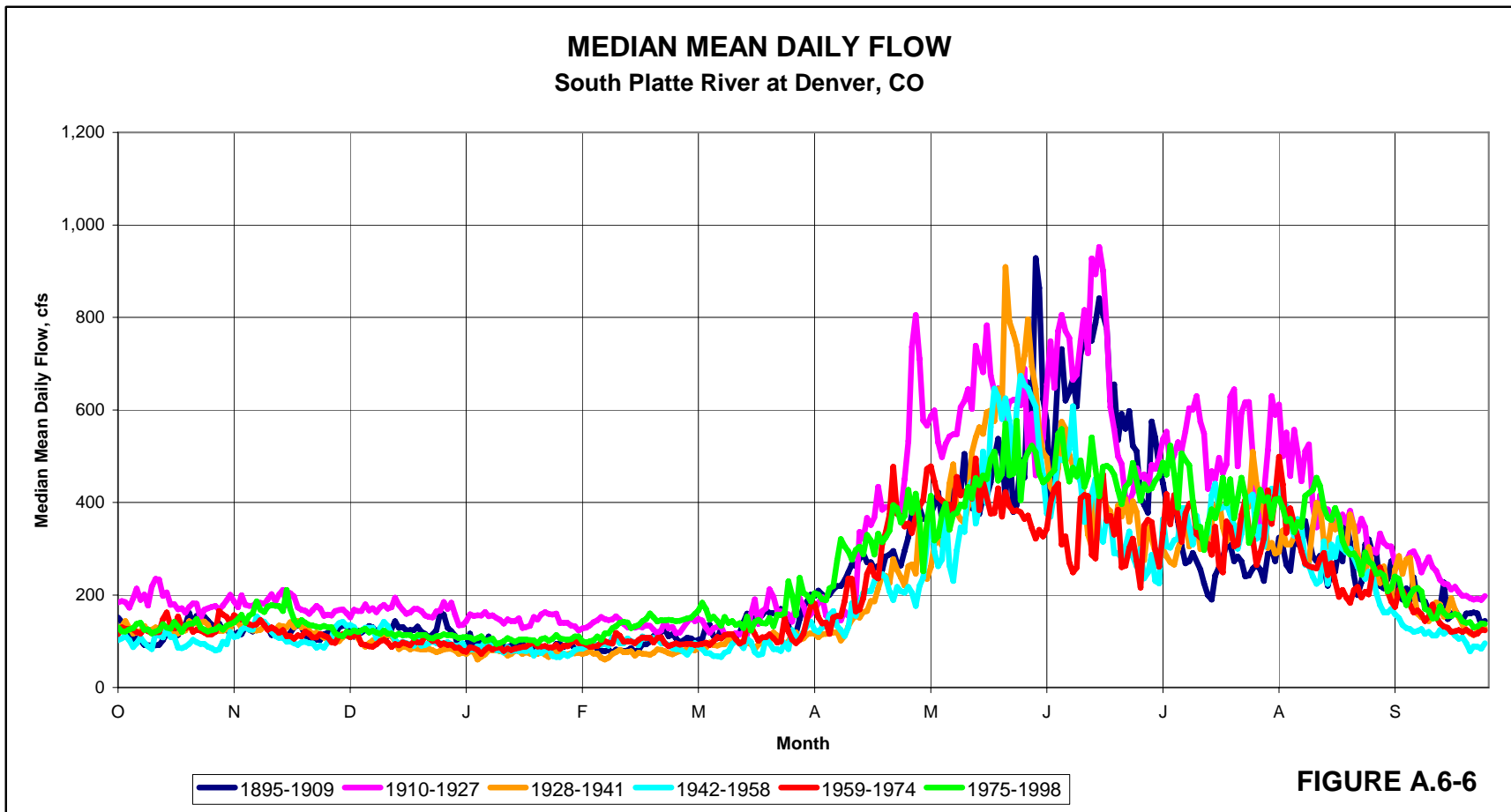


Figure A.6-6 Median Mean Daily Flow.

A.6.6 USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak flow are shown on **Figure A.6-7** and **Figure A.6-8** and in **Table A.6-15** and **Table A.6-16**.

Figure A.6-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak flow, and the 10-year running average of the USGS Annual Peak flow. **Figure A.6-7** shows that, for the entire period of record except the 1895-1909 time interval, the USGS Annual Peak flows are significantly higher than the Annual Maximum mean daily flows. Three of the highest Peaks occurred during the 1959-1974 time interval, after Cherry Creek Reservoir began operation but before Chatfield and Bear Creek Reservoirs began operation. This indicates that these events had their origin outside of the Cherry Creek basin (**Section A.6.2**). Another very high Peak occurred in 1933, during what was otherwise a very dry period. This is the event referred to in the exceedance discussion considering all flows for the Jul 16-Sep 30 seasonal period (**Section A.6.4.3**). After 1975, both the magnitude and range of variability decrease for both the USGS Annual Peak flow and the Annual Maximum mean daily flow. This is coincident with the beginning of operation of Chatfield Reservoir (1976) and Bear Creek Reservoir (1982). For the 1895-1909 time interval, the limited data available show that the USGS Annual Peak flow and the Annual Maximum mean daily flow have nearly the same values. In reality, this is unlikely, given the characterization for the rest of the period of record. However, the data are insufficient to effectively document why this situation exists.

Figure A.6-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.6-8** shows a similar pattern to that shown in **Figure A.6-3** for Annual Maximum mean daily flow, which can be explained in the same way. However, the bi-modal distribution of the date of occurrence of USGS Annual Peak flows is not as distinct as that for the Annual Maximum mean daily flow; there is more of a “spread” seen in **Figure A.6-8** than in **Figure A.6-3**. This “spread” is seen more for Peak flows which occurred in the later time intervals (i.e. beginning with 1942-1958) than for Peak flows in the earlier time intervals. This could be the result of the ongoing steady increase in urbanization which began in the latter half of the 20th century, resulting in more frequent short-duration peak flow events due to urban runoff.

Table A.6-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.6-15** shows that the average and median USGS Annual Peak flow values for the 1910-1927 through the 1959-1974 time intervals were generally consistent with known climatological conditions during these time intervals except for the 1928-1941 time interval. For this time interval, a small number of short-duration very high flow events skews the values higher for the entire time interval, thereby masking the existence of what were otherwise very dry conditions (USGS, 2004). As for the difference between the average and the median, for the 1910-1927 and the 1928-1941 time intervals, the average is greater than the median by more than 1,000 cfs, or more than 40 percent. This indicates that the average values are skewed higher by the occurrence of isolated very high Peak flow events. For the 1942-1958 time interval, the difference between the average and the median is much smaller. This is possibly the

result of the attenuation of short-duration high Peak flow events by Cherry Creek Reservoir after it began operation. For the 1959-1974 time interval, the average is once again much higher than the median, as a result of the previously mentioned high Peak flow events whose origin was most likely outside of the Cherry Creek basin. For the 1975-1998 time interval, there is little difference between the average and the median, coincident with the beginning of operation of Chatfield and Bear Creek Reservoirs.

The timing of the USGS Peak flows for the 1910-1927 and 1928-1941 time intervals shows that, for these time intervals, the median occurred about 3 weeks later than the average. This indicates that the Peak flows in these time intervals usually occurred later in the summer season, as a result of monsoon rainfall events (**Section A.6-2**), with a few Peak flows occurring in spring snowmelt seasons preceding relatively dry summers, or as a result of high spring snowmelt from a very large snow pack. For the 1942-1958 and 1959-1974 time intervals, the averages and the medians all occurred in a one-week period in late June, most likely as a result of the way in which Cherry Creek Reservoir was regulated. For the 1975-1998 time interval, the occurrence of the average and the median are also fairly close together, but occur a month later, coincident with the regulation by Chatfield and Bear Creek Reservoirs.

The 1895-1909 time interval was not considered for these characterizations due to insufficient data.

Table A.6-16 shows the exceedance probabilities and values for the USGS Annual Peak Flow. It is analogous to **Table A.6-5** for Annual Maximum mean daily flows. The data in **Table A.6-16** suggest that the regulation of the reservoirs near Denver, Colorado do not have the same repressive effect on flow values in the South Platte River as do the North Platte River reservoirs on flows in the North Platte River. There is a range of about a factor of 5 between the 90 percent and the 10 percent exceedance probability values for the 1910-1927 and the 1928-1941 time intervals. For the 1942-1958 time interval, the range is smaller, but still about a factor of 4, even with whatever effects there might be as a result of the regulation of Cherry Creek Reservoir after it began operation. For the 1959-1974 time interval, the range is again very large (about a factor of 9), as a result of the previously mentioned very high Peak flow events which occurred during this time interval. For the 1975-1998 time interval, the range shrinks back to about a factor of 4, possibly as a result of regulation by Chatfield and Bear Creek Reservoirs. At the same time, the flow values are higher than those for the 1959-1974 time interval for all exceedance probabilities except the 10 percent exceedance probability (highest flows).

It is interesting to note that, for the 1928-1941 time interval, the values are higher than those for the 1910-1927 time interval for the 50 percent and lower exceedance probabilities (higher flows), even though drought conditions existed for much of the 1928-1941 time interval. This is because, although the 1910-1927 time interval was wetter, there were a small number of very high flow events in the 1928-1941 time interval which resulted in higher values for the lower exceedance probabilities (higher flows). In particular, the Peak flow for the entire 1928-1941 time interval was almost twice that for the 1910-1927 time interval.

The 1895-1909 time interval was again not considered for these characterizations due to insufficient data.

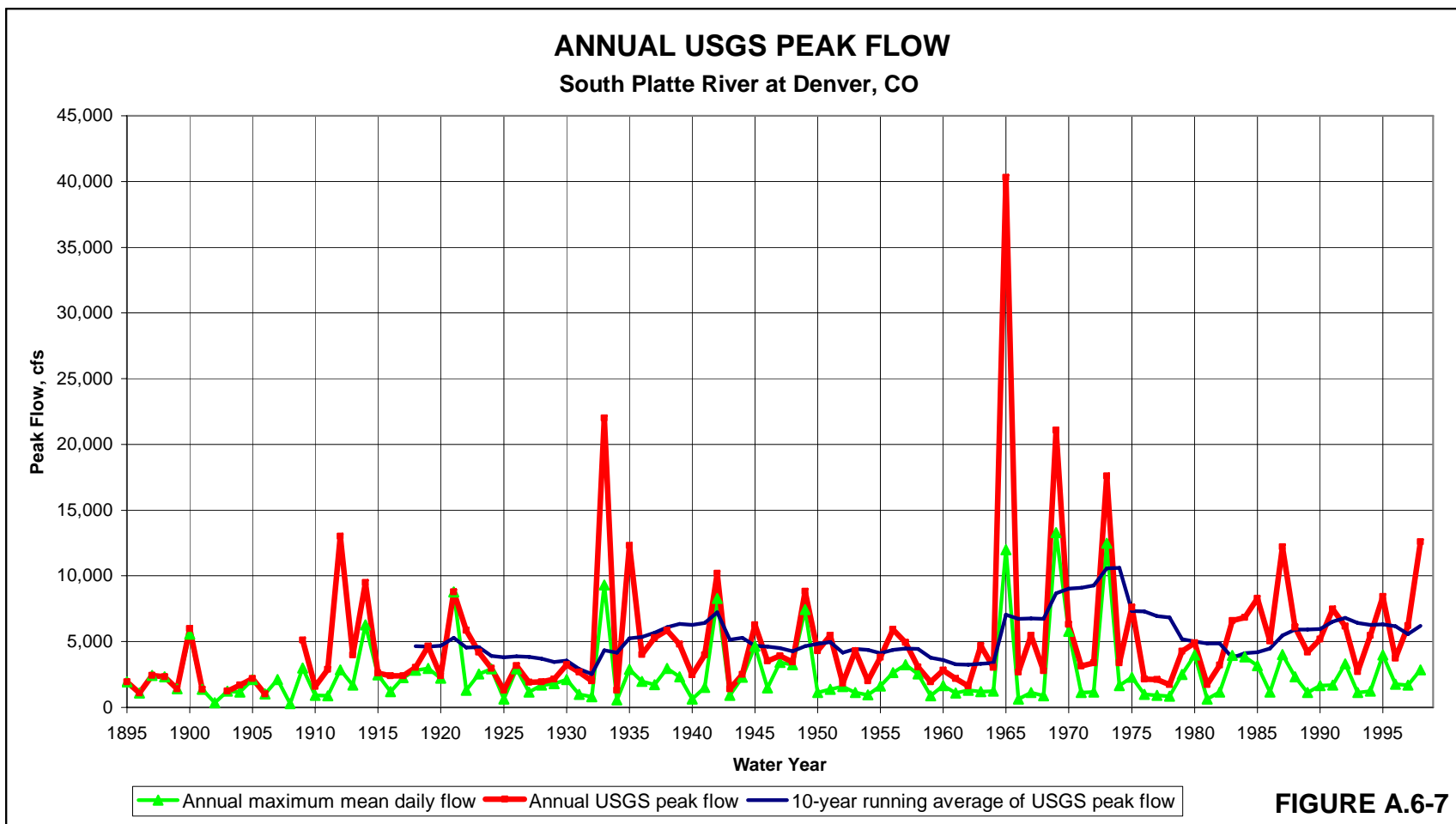


FIGURE A.6-7

Figure A.6-7 Annual USGS Peak Flow.

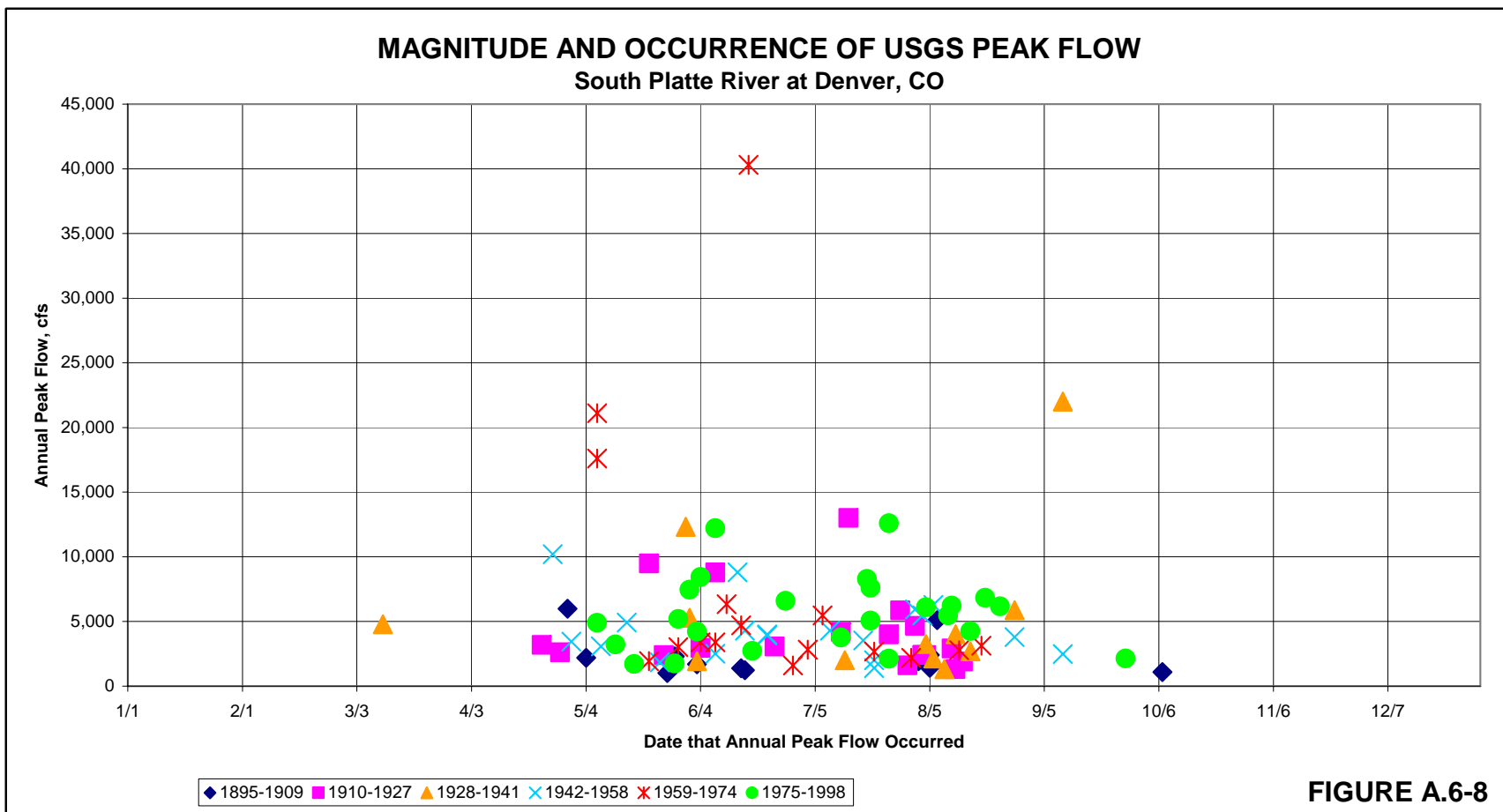


FIGURE A.6-8

Figure A.6-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.6-15 Summary of USGS Peak Flows.

South Platte River at Denver, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	5,066	4,058	5,844	2,318	4,261	5,290	4,453	7,651	5,625
Median Annual Peak Flow (cfs)	3,530	2,650	4,290	1,820	3,000	3,625	3,920	3,255	5,330
Average Occurrence of Peak Flow	7/2	7/6	6/28	6/29	7/4	7/15	6/24	6/22	7/6
Median Occurrence of Peak Flow	7/7	7/25	6/27	6/16	7/25	8/6	6/22	6/17	7/19

Table A.6-16 USGS Peak Flow exceedance values.

South Platte River at Denver, CO	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Annual Peak Flows									
Peak exceeded in 100% of the years	1,020	1,020	1,400	1,020	1,310	1,300	1,400	1,610	1,720
Peak exceeded in 90% of the years	1,700	1,334	1,978	1,105	1,803	1,951	1,946	2,065	2,126
Peak exceeded in 80% of the years	2,120	1,814	2,680	1,270	2,400	2,084	2,616	2,670	3,020
Peak exceeded in 70% of the years	2,480	2,126	3,120	1,399	2,431	2,446	3,368	2,800	4,164
Peak exceeded in 60% of the years	3,020	2,402	3,618	1,532	2,844	2,794	3,638	3,020	4,924
Peak exceeded in 50% of the years	3,530	2,650	4,290	1,820	3,000	3,625	3,920	3,255	5,330
Peak exceeded in 40% of the years	4,290	3,162	5,144	2,096	3,352	4,016	4,290	3,390	6,156
Peak exceeded in 30% of the years	5,280	4,038	6,114	2,277	4,180	4,839	5,030	5,080	6,624
Peak exceeded in 20% of the years	6,220	5,172	6,792	2,398	5,370	5,516	5,830	6,330	7,516
Peak exceeded in 10% of the years	8,800	7,947	9,360	4,832	8,997	10,385	7,288	19,350	8,392
Peak Flow	40,300	22,000	40,300	5,980	13,000	22,000	10,200	40,300	12,600

A.7 SOUTH PLATTE RIVER AT JULESBURG, COLORADO

A.7.1 Methodology.

For this location, a single gage record was used, as follows:

Gage	Records Used	Data Source
South Platte River at Julesburg, CO	4/1/1902 – 12/31/1906; 1/1/1908 – 12/31/1912; 10/1/1913 – 4/30/1922; and 1/1/1923 – 12/31/1998	USGS website.

Summary statistics characterizing this record are presented in **Table A.7-1** (mean daily values), **Table A.7-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.7-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.7-4** (flow frequencies).

A.7.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume.

Table A.7-1 shows no obvious changes to either the average or the median Annual Maximum mean daily flow over time. **Table A.7-1** also shows that the averages are substantially greater than the medians, indicating the influence of relatively few very high Annual Maximum mean daily flows, possibly attributable to unusual late spring precipitation and/or snowmelt events (NOAA, 2005 [Colorado]). A different characterization occurs for the annual flow volume over time, both average and median. Annual volumes were lowest in the 1928-1941 time interval and increased steadily for each subsequent time interval. The Colorado – Big Thompson trans-basin diversion project, which delivers an average of approximately 230,000 acre feet to the Platte River basin annually, was completed in 1950 (Simons and Associates, 2000) and the trans-basin diversion through the Harold D. Roberts tunnel into the North Fork of the South Platte River (“Roberts Tunnel Diversion”) was completed in 1962 (Shoumatoff, 1986).

Figure A.7-1 (maximum flows) **Figure A.7-2** (annual flow volume) show characterizations consistent with those previously shown in **Table A.7-1**. **Figure A.7-1** shows a fairly consistent pattern of variation in the Annual Maximum mean daily flow through the period of record, with generally lower maximums in the 1930’s and 1950’s, due most likely to severe drought conditions. **Figure A.7-1** also shows the 10-year running average to be more or less constant through the period of record. The most notable change in flow characteristics is that, during the 1980’s and 1990’s, the Annual Maximum mean daily flow and the maximum 30-Day average flow were of similar magnitude, whereas before 1980 the Annual Maximum mean daily flows were usually significantly higher than the 30-day average maximums. This is a possible effect of the operation of the Corps of Engineers reservoirs near Denver. In fact, there have been no

Table A.7-1 Summary of Mean Daily Flow Values.

South Platte River at Julesburg, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	4,986	4,901	5,046	3,624	6,191	3,971	4,598	6,280	4,540
Median Annual Maximum Mean Daily Flow (cfs)	2,230	1,880	2,370	1,900	2,445	1,745	2,030	2,570	2,615
Average Annual Flow Volume (kaf)	394	304	457	274	405	192	348	414	564
Median Annual Flow Volume (kaf)	286	231	360	172	309	141	259	351	380
Average Mean Daily Flow (cfs)	559	455	632	472	596	265	481	571	779
Median Mean Daily Flow (cfs)	276	262	286	147	331	107	297	258	292
Average Number of Mean Daily Flow Measurements	354	338	365	297	336	365	365	365	365
Number of Years of Data	97 of 104	40 of 47	57 of 57	8 of 15	18 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	1,115	1,298	996	562	1,564	1,291	781	870	1,232
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	4,397	4,079	4,608	3,478	5,509	2,644	4,289	5,461	4,266
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	3,904	3,896	3,909	3,294	5,544	2,313	3,400	4,731	3,722
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	1,043	855	1,165	1,243	583	972	619	1,378	1,409
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	775	600	938	408	707	537	608	965	1,080
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	1,660	1,130	1,880	880	2,400	747	1,160	1,770	2,120
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	1,405	538	1,790	248	1,215	266	1,850	1,480	1,835
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	513	402	622	662	441	217	345	724	679
Difference ("Apr-Jul Average" - "Jul-Sep Average")	3,354	3,224	3,443	2,235	4,925	1,673	3,670	4,083	2,857
Difference ("Apr-Jul Median" - "Jul-Sep Median")	1,148	728	1,258	218	1,960	530	815	1,046	1,442
Average Occurrence of Maximum Mean Daily Flow	5/17	5/6	5/26	6/6	5/6	4/20	5/29	5/1	6/8
Median Occurrence of Maximum Mean Daily Flow	6/1	5/26	6/1	6/8	6/8	4/26	5/30	5/13	6/14
Average Annual Minimum Mean Daily Flow (cfs)	25	19	28	16	20	20	26	20	34
Median Annual Minimum Mean Daily Flow (cfs)	22	17	24	7	16	20	28	20	31
Average occurrences per year of the Minimum	3	4	2	6	4	4	2	2	2
Occurring between	8/5	7/27	8/10	7/6	7/21	8/10	8/9	8/19	8/5
and	8/12	8/5	8/16	7/13	7/28	8/21	8/19	8/21	8/11
Median occurrences per year of the Minimum	2	2	1	6	2	2	2	2	1
Occurring between	8/8	7/30	8/19	7/25	7/29	8/14	8/13	8/26	8/14
and	8/20	8/6	8/24	8/7	7/31	8/31	8/24	8/30	8/21

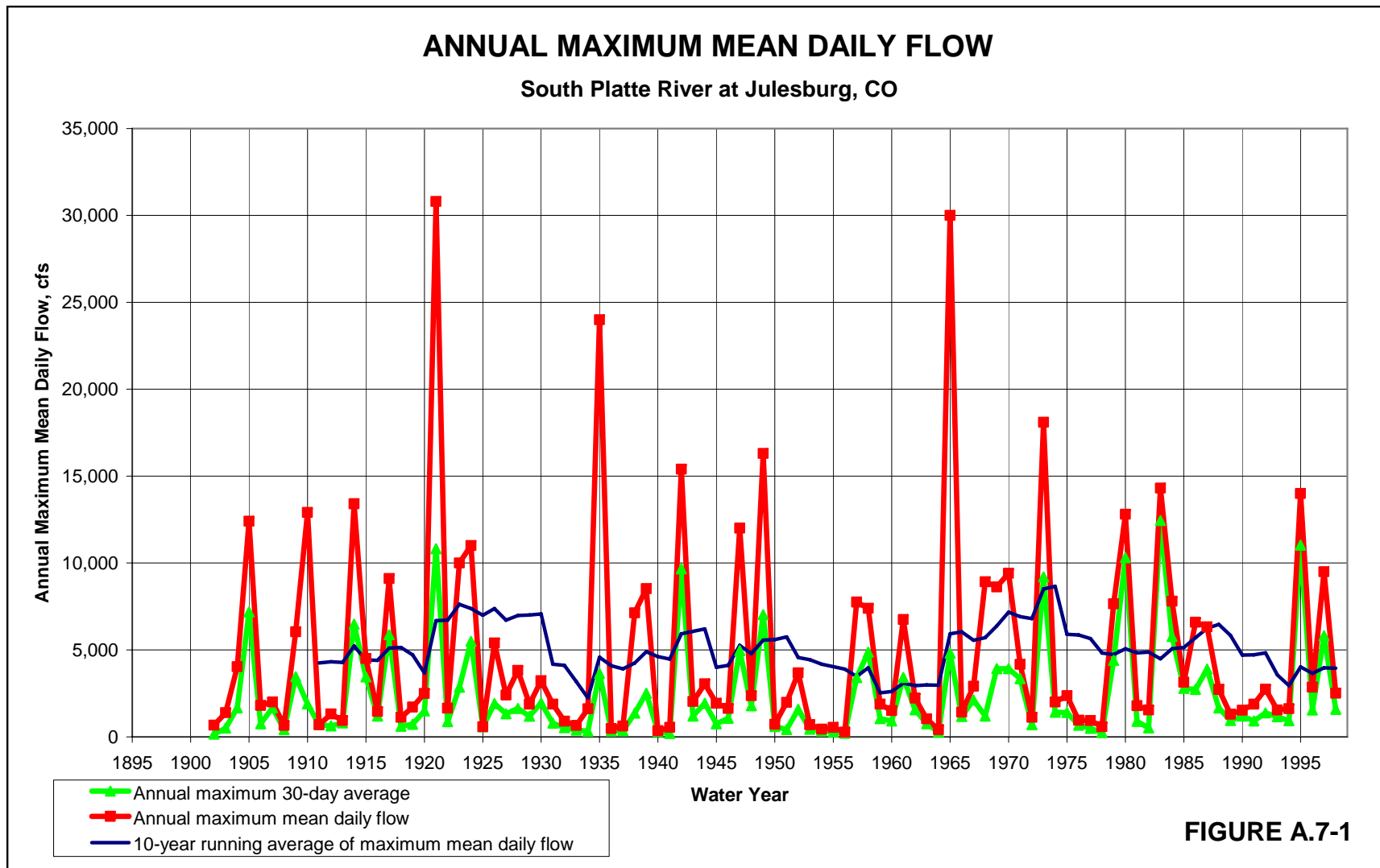


Figure A.7-1 Annual Maximum Mean Daily Flow.

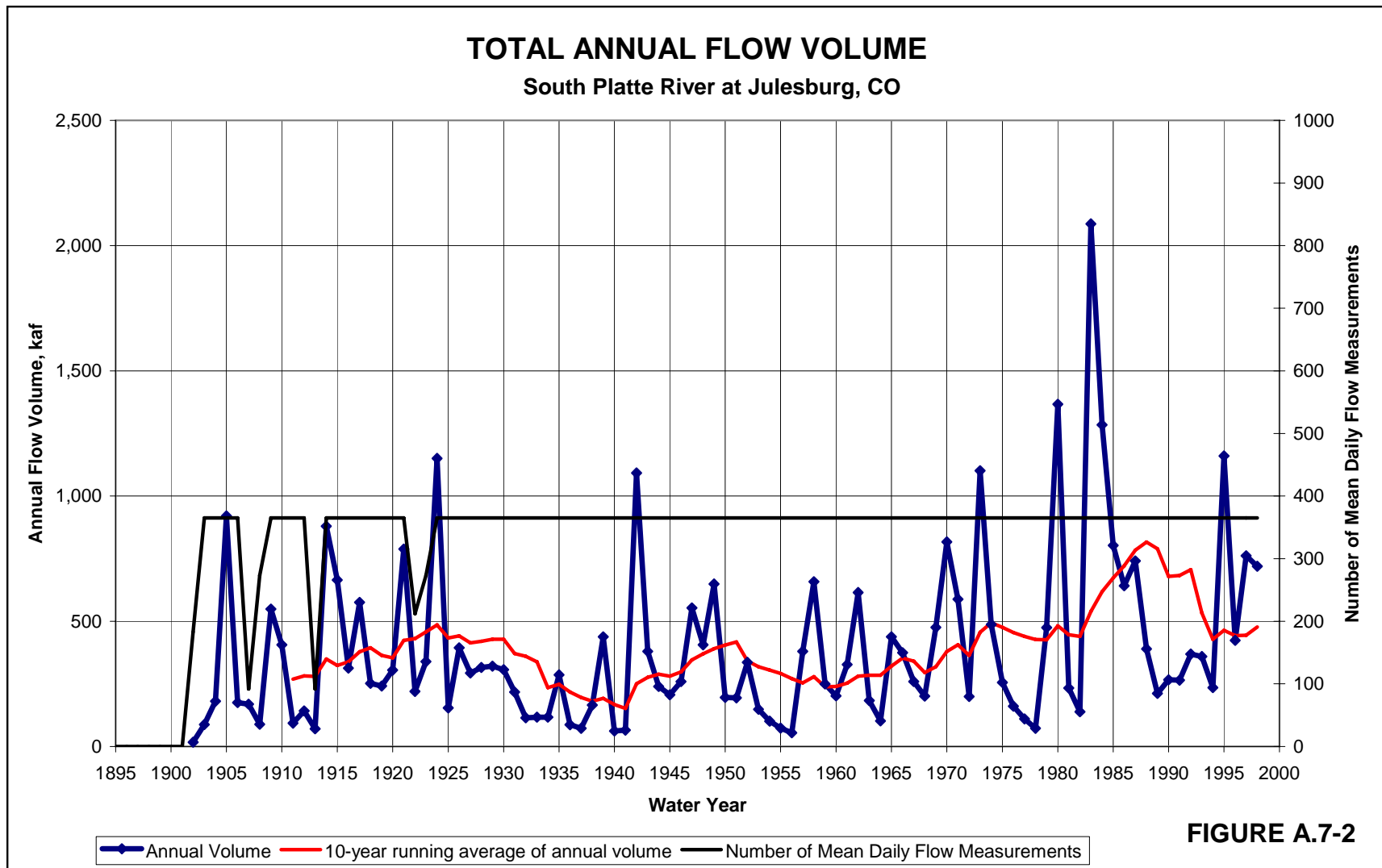


Figure A.7-2 Total Annual Flow Volume.

flows greater than 15,000 cfs since 1976, coincident with the beginning of operation of Chatfield reservoir. **Figure A.7-2** shows a gradual increase in magnitude of both the annual flow volume and the 10-year average flow volume, beginning in about 1950. This is coincident with the beginning of operation of the Colorado-Big Thompson and other trans-basin projects that import water into the South Platte River basin. The proportionally large urbanized area in the South Platte River basin has also grown steadily since the 1950's. Thus, short-duration heavy rainfall events covering a small area are capable of producing high maximum flows.

Figure A.7-3 shows the highest (greater than 5,000 cfs) Annual Maximum mean daily flows have generally occurred in May and June, but there is considerable scatter throughout the year with respect to the occurrence of the lower Annual Maximum mean daily flows. This characterization exists for all time intervals. This is consistent with the preceding discussion based on **Table A.7-1** regarding the Annual Maximum mean daily flows at Julesburg generally being low except for a few very high maximums associated with high precipitation/runoff events, which usually occur in May and June. Also, it is possible that diversions into off-channel reservoirs between Denver and Julesburg take much of the higher spring flow during normal flow years, but do not divert or divert a smaller percentage of the very high Annual Maximum mean daily flow events.

Both average and median seasonal maximum mean daily flows are highest in the May-June season for all time intervals except 1895-1909, for which data are incomplete. All maximum flow quantities drop off in value from Apr 16-Jun 15 seasonal period to Jul 16-Sep 30 seasonal period in a way generally proportional to the magnitude of the seasonal maximums. It is interesting to note the large difference between the average and median seasonal maximums, especially for the Apr 16-Jul 15 and Jun 1-Aug 15 seasonal periods. The changes in the flow values for the median are more in line with the known climatic variation by time interval. The median maximum flow for the Feb 15-Mar 16 seasonal period is greater than the average for the 1959-1974 time interval, which indicates high seasonal maximums with a few very low years. Another oddity is the decrease in the average maximum flow (but not the median maximum flow) for the Feb 15-Mar 16 and the Jul 16-Sep 30 seasonal periods between the 1928-1941 and 1942-1958 time intervals since the 1942-1958 time interval was climatologically wetter. Both the average and median Dates of Maximum Flow occur in May or June for all time intervals after 1895-1909 except for the 1928-1941 time interval, when the Dates of Maximum Flow occur in mid-April, a likely effect of severe drought conditions during the 1930's.

Table A.7-1 shows that both the average and median Annual Minimum mean daily flow are similar in value from the 1910-1927 time interval through the 1959-1974 time interval, then increase significantly for the relatively wet 1975-1994 time interval (the record for the 1895-1909 time interval is incomplete). **Figure A.7-4** shows a consistent pattern of very low values for all minimum flow quantities throughout the period of record, with one exception. Both the Annual Minimum mean daily flow and the annual minimum 30-Day Average flow are significantly higher in 1983 than in all other years in the period of record. The high annual minimum carries over into the 10-year running

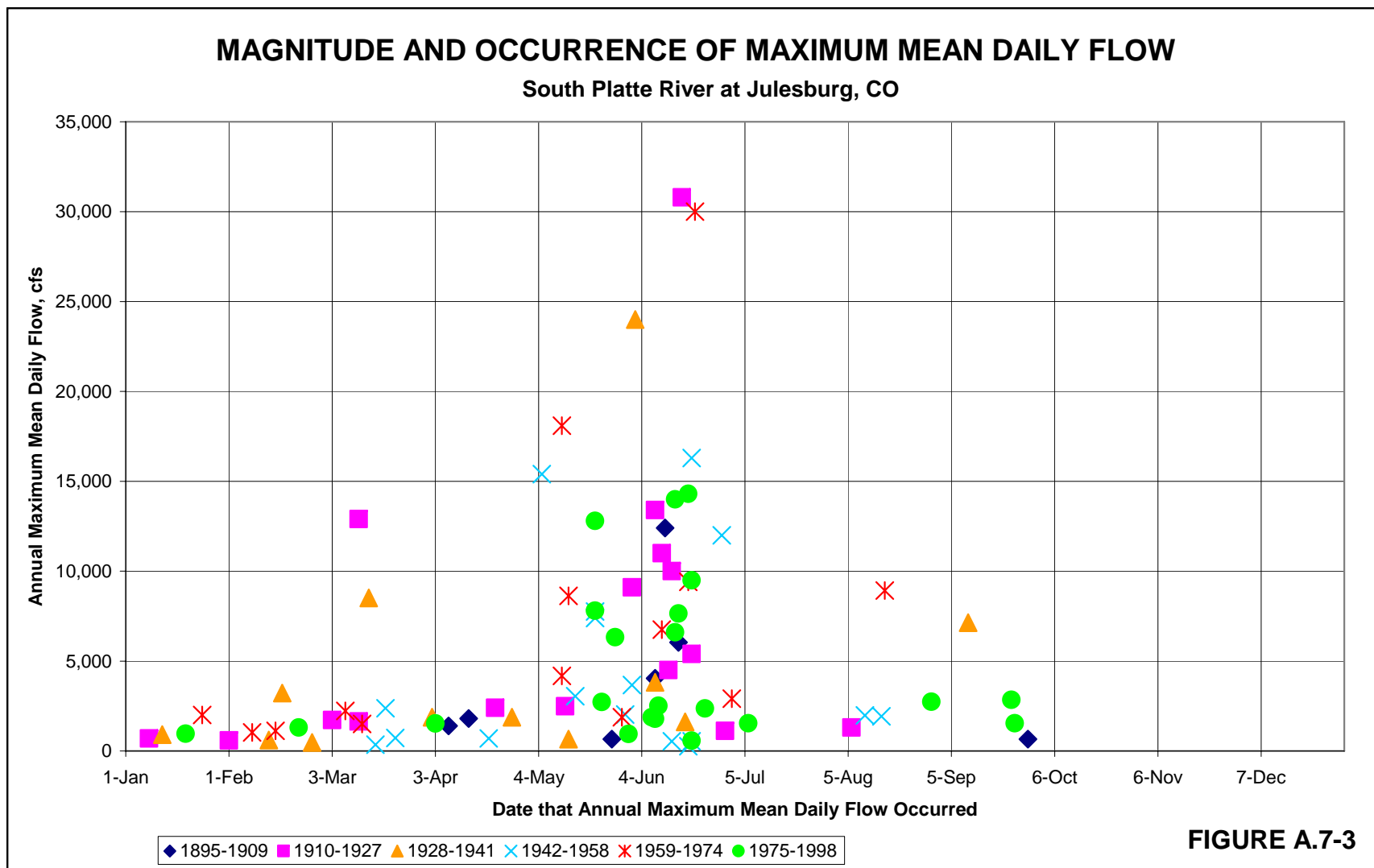


Figure A.7-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

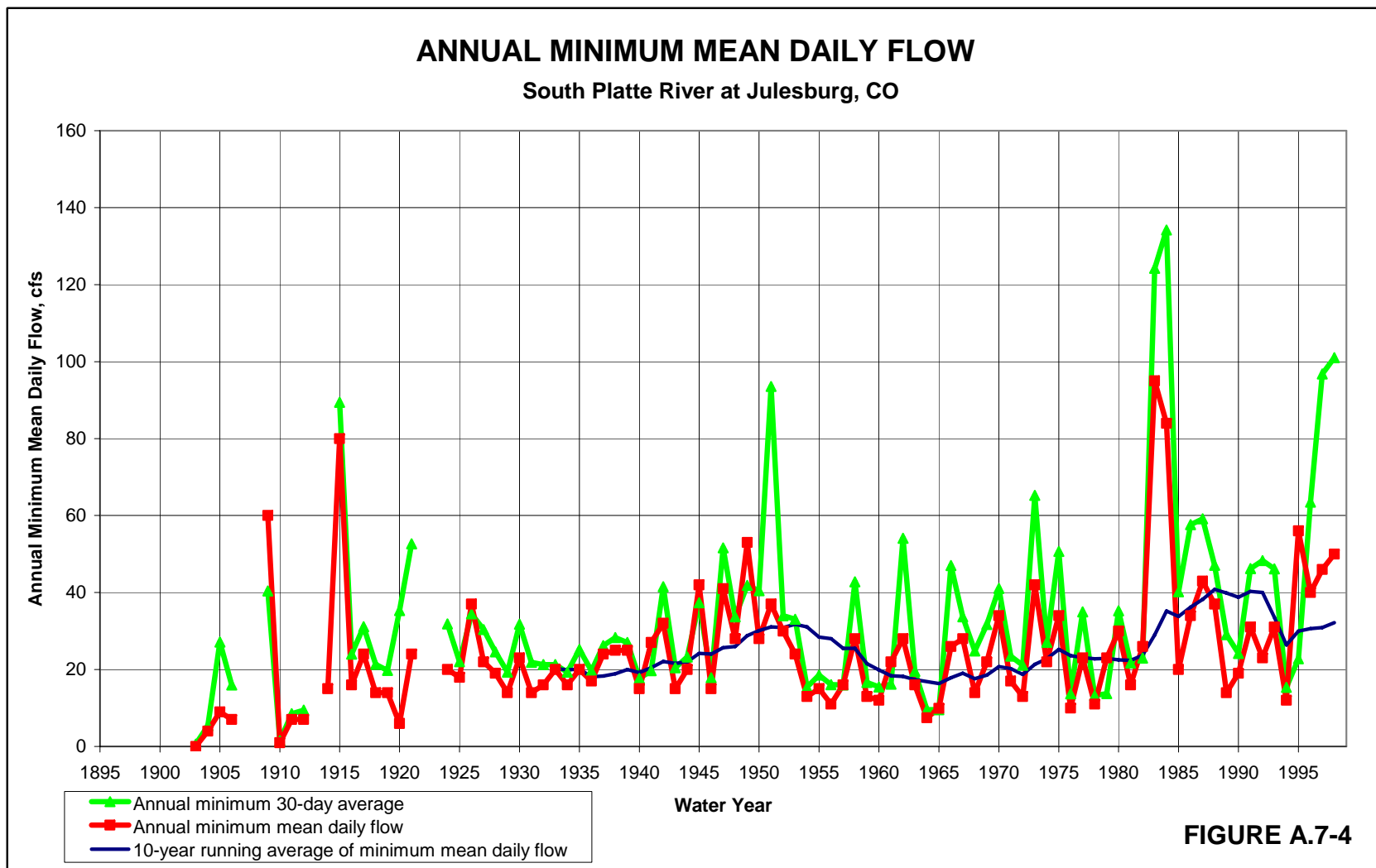


Figure A.7-4 Annual Minimum Mean Daily Flow.

average through 1992. In 1983, flows were unusually high in the South Platte River and its tributaries, and in many western rivers, throughout the year (USGS, 2004). Both the average and median Dates of Minimum Flow were in July or August for all time intervals. Minimum flows were not calculated for years with incomplete flow records.

A.7.3 3-, 7-, 15-, and 30-day Averages of Mean Daily Flows.

Table A.7-2 shows that there was some attenuation of all flow values due to the averaging process. Otherwise, there were no significant differences in the flow characterizations with respect to those for the Annual Maximum mean daily flow.

Table A.7-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.7-3** shows changes in flow values by time interval that are mainly, but not entirely, attributable to climatic variations by time interval. Of some note are the large difference between the average and median seasonal maximums, the median maximum flow greater than the average for the Feb 15-Mar 16 seasonal period, and the decrease in the average maximum flow (but not the median maximum flow) for the Feb 15-Mar 16 and the Jul 16-Sep 30 seasonal periods between the 1928-1941 and 1942-1958 time intervals. These are discussed in **Section A.7.2** and are also seen in the multiple day averages. The decreases in the average maximum flow (but not the median maximum flow) for the Feb 15-Mar 16 and the Jul 16-Sep 30 seasonal periods between the 1928-1941 and 1942-1958 time intervals become less noticeable with increasing average time. This suggests that the large increases between the time intervals for the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods could be the result of isolated high flow events which occurred during the 1928-1941 time interval. Finally, the flow characterizations for the 1975-1998 time interval are noticeably different from those for all preceding time intervals. In particular, the flow values for the Feb 15-Mar 16 and the Jul 15-Sep 30 seasonal periods are higher than those for the preceding time intervals, and the flow values for all seasonal periods decrease less with increasing averaging time. This is possibly attributable to many effects, such as the beginning of operation of the Chatfield and Bear Creek Reservoirs, increasing trans-basin imports, and increasing urbanization in the South Platte River basin in Colorado.

A.7.4 Flow Frequency and Exceedance.

A.7.4.1 Flow Ranges.

Table A.7-4 and **Figure A.7-5** show that the flow frequency distributions for Percentage of Years and Percentage of Days for each time interval are consistent with known climatological conditions (climate data are shown in **Figures 3, 4, 5, and 8** of the main report).

Table A.7-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

South Platte River at Julesburg, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	4,986	4,901	5,046	3,624	6,191	3,971	4,598	6,280	4,540
Median Annual Maximum Mean Daily Flow (cfs)	2,230	1,880	2,370	1,900	2,445	1,745	2,030	2,570	2,615
Avg. Ann. Max. 3-day Avg. Flow (cfs)	4,412	4,117	4,618	3,154	5,433	2,975	4,299	5,407	4,318
Median Ann. Max. 3-day Avg. Flow (cfs)	2,127	1,772	2,293	1,617	2,367	1,558	1,910	2,505	2,390
Avg. Ann. Max. 7-day Avg. Flow (cfs)	3,800	3,410	4,074	2,718	4,699	2,148	3,841	4,346	4,058
Median Ann. Max. 7-day Avg. Flow (cfs)	1,903	1,645	1,983	1,483	2,230	1,274	1,620	2,401	2,054
Avg. Ann. Max. 15-day Avg. Flow (cfs)	3,160	2,696	3,486	2,427	3,724	1,529	3,289	3,402	3,680
Median Ann. Max. 15-day Avg. Flow (cfs)	1,692	1,464	1,742	1,285	1,877	845	1,569	1,959	1,717
Avg. Ann. Max. 30-day Avg. Flow (cfs)	2,411	1,973	2,718	1,973	2,649	1,105	2,383	2,486	3,110
Median Ann. Max. 30-day Avg. Flow (cfs)	1,364	1,187	1,412	1,208	1,408	661	1,196	1,486	1,472
Average Annual Minimum Mean Daily Flow (cfs)	25	19	28	16	20	20	26	20	34
Median Annual Minimum Mean Daily Flow (cfs)	22	17	24	7	16	20	28	20	31
Avg. Ann. Min. 3-day Avg. Flow (cfs)	25	20	29	13	22	20	27	21	35
Median Ann. Min. 3-day Avg. Flow (cfs)	21	19	25	8	20	20	29	18	32
Avg. Ann. Min. 7-day Avg. Flow (cfs)	26	21	30	13	24	21	28	22	36
Median Ann. Min. 7-day Avg. Flow (cfs)	22	20	28	10	21	21	31	18	34
Avg. Ann. Min. 15-day Avg. Flow (cfs)	29	23	32	16	26	22	30	24	39
Median Ann. Min. 15-day Avg. Flow (cfs)	25	22	29	12	24	22	32	21	32
Avg. Ann. Min. 30-day Avg. Flow (cfs)	34	25	39	18	29	23	34	29	48
Median Ann. Min. 30-day Avg. Flow (cfs)	27	22	34	16	27	22	34	24	43

Table A.7-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

South Platte River at Julesburg, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	4,412	4,117	4,618	3,154	5,433	2,975	4,299	5,407	4,318
Median Ann. Max. 3-day Avg. Flow (cfs)	2,127	1,772	2,293	1,617	2,367	1,558	1,910	2,505	2,390
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	964	978	955	465	1,059	1,098	730	842	1,189
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	3,977	3,585	4,238	3,022	5,160	1,955	4,022	4,734	4,060
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	3,484	3,409	3,532	2,885	5,197	1,627	3,130	3,911	3,564
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	907	715	1,031	1,027	531	770	538	1,170	1,289
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	734	580	921	390	701	518	539	951	1,057
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	1,567	1,019	1,727	720	2,313	597	1,097	1,720	2,010
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	1,254	454	1,477	208	1,150	226	1,443	1,355	1,710
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	472	353	604	492	421	132	317	662	669
South Platte River at Julesburg, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	3,800	3,410	4,074	2,718	4,699	2,148	3,841	4,346	4,058
Median Ann. Max. 7-day Avg. Flow (cfs)	1,903	1,645	1,983	1,483	2,230	1,274	1,620	2,401	2,054
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	850	805	879	452	866	882	658	776	1,104
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	3,439	2,988	3,740	2,560	4,499	1,367	3,587	3,842	3,779
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	2,929	2,814	3,004	2,450	4,542	1,022	2,633	3,041	3,242
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	738	562	852	807	440	579	436	872	1,133
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	679	580	867	390	670	462	477	943	1,015
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	1,366	697	1,606	649	2,210	500	1,024	1,596	1,724
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	967	340	1,208	137	949	148	1,024	1,001	1,573
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	341	249	445	217	364	94	240	447	609
South Platte River at Julesburg, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	3,160	2,696	3,486	2,427	3,724	1,529	3,289	3,402	3,680
Median Ann. Max. 15-day Avg. Flow (cfs)	1,692	1,464	1,742	1,285	1,877	845	1,569	1,959	1,717
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	728	670	766	433	744	681	566	680	966
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	2,847	2,340	3,186	2,307	3,482	969	3,065	3,014	3,386
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	2,329	2,128	2,459	2,161	3,402	657	2,061	2,255	2,878
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	561	416	655	641	333	399	315	566	955
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	597	470	712	390	596	394	431	772	896
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	1,074	473	1,248	446	1,842	389	846	1,186	1,465
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	644	261	977	90	730	96	647	724	1,344
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	247	195	314	195	309	69	172	283	532
South Platte River at Julesburg, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	2,411	1,973	2,718	1,973	2,649	1,105	2,383	2,486	3,110
Median Ann. Max. 30-day Avg. Flow (cfs)	1,364	1,187	1,412	1,208	1,408	661	1,196	1,486	1,472
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	616	546	662	354	626	532	498	605	816
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	2,130	1,655	2,447	1,851	2,398	656	2,176	2,152	2,834
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,618	1,352	1,791	1,441	2,121	428	1,387	1,524	2,256
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	378	275	445	421	234	248	205	345	681
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	509	408	639	351	567	312	374	642	833
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	858	363	901	436	1,249	257	559	931	1,000
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	434	162	696	68	434	66	455	529	856
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	161	118	199	100	193	58	111	199	394

Table A.7-4 Flow Frequency Distributions.

Flow Frequency in Percentage of Years in Specified Flow Ranges									
South Platte River at Julesburg, CO		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	100	100	100	100	100	100	100	100	100
201 to 500	100	100	100	100	100	100	100	100	100
501 to 750	95	95	95	100	100	86	88	94	100
751 to 1,000	84	78	88	75	89	64	71	94	96
1,001 to 2,000	79	73	84	75	83	57	71	94	88
2,001 to 3,000	49	43	54	38	50	36	53	50	58
3,001 to 4,000	39	38	40	38	39	36	41	44	38
4,001 to 5,000	34	33	35	38	39	21	29	44	33
5,001 to 6,000	27	20	32	25	28	7	29	31	33
6,001 to 8,000	29	23	33	25	28	14	29	38	33
8,001 to 10,000	20	18	21	13	28	7	18	31	17
10,001 to 12,000	10	8	12	0	17	0	18	6	13
12,001 to 15,000	11	10	12	13	17	0	12	13	13
Greater than 15,000	6	5	7	0	6	7	12	13	0
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
South Platte River at Julesburg, CO		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	46.7	51.7	43.4	54.5	40.0	64.4	48.0	43.9	39.7
201 to 500	26.3	27.2	25.8	28.3	29.6	23.7	32.1	26.3	21.0
501 to 750	8.1	7.7	8.3	5.0	11.4	4.5	8.0	6.1	10.0
751 to 1,000	5.8	4.6	6.6	2.7	6.9	2.8	3.7	8.0	7.6
1,001 to 2,000	8.6	5.5	10.6	5.1	7.4	3.5	4.6	11.2	14.5
2,001 to 3,000	1.9	1.3	2.3	0.9	1.9	0.8	1.2	1.9	3.3
3,001 to 4,000	0.6	0.5	0.7	0.6	0.7	0.1	0.5	0.9	0.7
4,001 to 5,000	0.5	0.5	0.5	1.1	0.5	0.1	0.3	0.4	0.6
5,001 to 6,000	0.4	0.3	0.5	0.6	0.4	0.0	0.4	0.4	0.5
6,001 to 8,000	0.5	0.4	0.5	0.8	0.6	0.1	0.5	0.2	0.7
8,001 to 10,000	0.3	0.2	0.3	0.3	0.3	0.0	0.2	0.3	0.4
10,001 to 12,000	0.2	0.0	0.3	0.0	0.1	0.0	0.2	0.1	0.5
12,001 to 15,000	0.2	0.1	0.2	0.1	0.1	0.0	0.2	0.0	0.4
Greater than 15,000	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
South Platte River at Julesburg, CO		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	165	175	158	162	134	235	175	160	145
201 to 500	93	92	94	84	100	87	117	96	77
501 to 750	29	26	30	15	38	16	29	22	36
751 to 1,000	21	16	24	8	23	10	14	29	28
1,001 to 2,000	30	19	39	15	25	13	17	41	53
2,001 to 3,000	7	4	8	3	6	3	4	7	12
3,001 to 4,000	2	2	3	2	2	1	2	3	2
4,001 to 5,000	2	2	2	3	2	0	1	1	2
5,001 to 6,000	1	1	2	2	1	0	2	2	2
6,001 to 8,000	2	1	2	2	2	0	2	1	3
8,001 to 10,000	1	1	1	1	1	0	1	1	2
10,001 to 12,000	1	0	1	0	0	0	1	1	2
12,001 to 15,000	1	0	1	0	0	0	1	0	1
Greater than 15,000	0	0	0	0	0	0	0	0	0
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

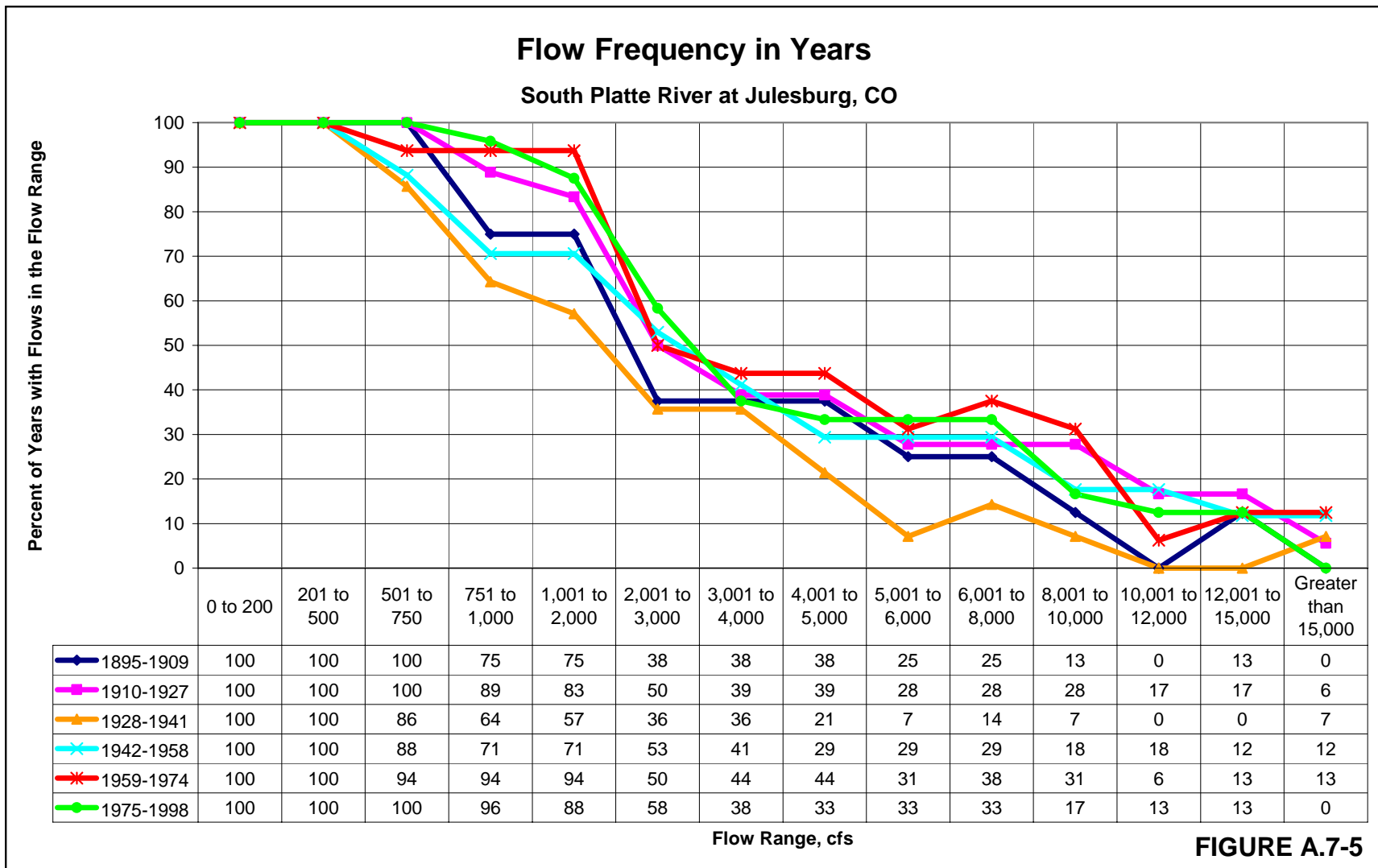


Figure A.7-5 Flow Frequency in Years.

A.7.4.2 Maximum Mean Flow Exceedance.

Table A.7-5 through **Table A.7-9** show the exceedance values and probabilities for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13), for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.7-5 shows the exceedance probabilities and values for annual data. **Table A.7-5** shows that, except for the 1975-1998 time interval, the variations in flow values by time interval were generally consistent with the known climatological conditions by time interval, and the flow values decreased with increasing averaging time. There is a large difference between the maximum for the 1-day (mean daily) and the 30-day averages for the 1928-1941 time interval. Also noteworthy is the increasing probability that a maximum mean daily flow greater than 1,000 cfs will be exceeded in the most recent time intervals. A maximum mean daily flow of 1,000 cfs was exceeded in 90% of the years for the 1959-1974 and 1975-1998 time intervals. For the 1975-1998 time interval, there is a much smaller decrease in flow values with increasing averaging time compared to the proceeding time intervals. Also, for the mean daily flows and the 3-day averaging time, the maximum flow values are higher for the 1959-1974 time interval than that for the 1975-1998 time interval. This is possibly attributable to many effects, such as the beginning of operation of the Chatfield and Bear Creek Reservoirs, increasing trans-basin imports, and increasing urbanization in the South Platte River basin in Colorado.

Table A.7-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.7-6** shows that, for the 1910-1927 through 1928-1941 time intervals, the flow values generally coincided with known climatological conditions. Beginning with the 1942-1958 time interval, the flow values for the 10-percent exceedance probability and the maximum flow (highest flows) are significantly lower than those for the 1928-1941 time interval for all averaging times. This is coincident with the beginning of operation of Cherry Creek in 1950. The probability of exceeding a maximum mean daily flow of 1,000 cfs increases for the more recent time intervals for this seasonal period. The 1895-1909 time interval was not considered for these characterizations due to insufficient data for this seasonal period.

Table A.7-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.7-7** shows that, for the 1910-1927 through 1959-1974 time intervals, the flow values generally coincide with known climatological conditions, and show the expected decreases with increasing averaging time for all exceedance probabilities. The characterizations for this seasonal period are similar to those for annual data (**Table A.7-5**). There are the large difference between 1-day and 30-day maximums for the 1928-1941 time interval, the increasing probability that a maximum mean daily flow greater than 1,000 cfs will be exceeded in the most recent time intervals, and less of a decrease in flow values with increasing averaging time for the 1975-1998 time interval compared to the proceeding time intervals. It is interesting that all exceedance probabilities except for the maximum for the 1928-1941 time interval

Table A.7-5 Maximum Flow Exceedance Values, Annual Data.

South Platte River at Julesburg, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years	265	343	265	660	580	343	265	412	574	
Maximum exceeded in 90% of the years	641	610	713	661	868	491	501	1,075	1,056	
Maximum exceeded in 80% of the years	968	692	1,324	953	1,196	584	700	1,420	1,536	
Maximum exceeded in 70% of the years	1,524	1,253	1,604	1,431	1,469	654	1,449	1,690	1,612	
Maximum exceeded in 60% of the years	1,832	1,628	1,950	1,718	1,696	1,044	1,950	2,000	1,976	
Maximum exceeded in 50% of the years	2,230	1,880	2,370	1,900	2,445	1,745	2,030	2,570	2,615	
Maximum exceeded in 40% of the years	2,994	2,782	2,994	2,408	4,680	1,880	2,778	4,170	2,828	
Maximum exceeded in 30% of the years	6,098	4,770	6,630	3,836	8,730	3,280	4,414	7,690	6,357	
Maximum exceeded in 20% of the years	8,608	8,636	8,464	5,240	10,600	5,144	7,678	8,920	7,710	
Maximum exceeded in 10% of the years	12,840	12,450	13,280	7,948	13,050	8,103	13,360	13,755	11,810	
Maximum	30,800	30,800	30,000	12,400	30,800	24,000	16,300	30,000	14,300	
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	232	338	232	467	580	338	232	451	557	
Maximum exceeded in 90% of the years	591	569	705	603	859	454	470	1,032	1,034	
Maximum exceeded in 80% of the years	943	692	1,278	823	1,128	541	693	1,333	1,395	
Maximum exceeded in 70% of the years	1,341	1,057	1,511	1,082	1,393	601	1,381	1,575	1,514	
Maximum exceeded in 60% of the years	1,577	1,393	1,759	1,200	1,564	925	1,610	1,917	1,840	
Maximum exceeded in 50% of the years	2,127	1,772	2,293	1,617	2,367	1,558	1,910	2,505	2,390	
Maximum exceeded in 40% of the years	2,921	2,648	2,921	2,325	4,559	1,803	2,635	3,917	2,607	
Maximum exceeded in 30% of the years	5,183	4,623	6,287	3,464	5,245	3,014	4,220	6,292	6,284	
Maximum exceeded in 20% of the years	7,170	5,606	7,443	4,709	8,919	3,991	7,145	8,380	7,190	
Maximum exceeded in 10% of the years	11,893	10,375	12,740	7,026	10,913	5,955	12,827	12,190	11,336	
Maximum	28,900	28,900	23,333	10,750	28,900	15,803	14,833	23,333	13,767	
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	224	322	224	407	580	322	224	507	432	
Maximum exceeded in 90% of the years	524	503	665	508	732	363	408	974	972	
Maximum exceeded in 80% of the years	902	676	1,156	707	1,067	474	661	1,183	1,189	
Maximum exceeded in 70% of the years	1,182	955	1,367	952	1,237	530	1,105	1,452	1,440	
Maximum exceeded in 60% of the years	1,451	1,209	1,611	1,038	1,346	762	1,418	1,806	1,655	
Maximum exceeded in 50% of the years	1,903	1,645	1,983	1,483	2,230	1,274	1,620	2,401	2,054	
Maximum exceeded in 40% of the years	2,658	2,324	2,816	2,084	3,063	1,681	2,477	3,729	2,459	
Maximum exceeded in 30% of the years	3,978	3,030	5,607	2,719	4,397	2,469	3,836	4,726	5,860	
Maximum exceeded in 20% of the years	6,753	4,701	6,855	4,052	7,770	3,084	6,741	7,241	6,716	
Maximum exceeded in 10% of the years	9,615	9,230	12,006	6,174	9,740	4,322	10,810	10,516	10,718	
Maximum	25,857	25,857	14,929	9,193	25,857	9,566	13,786	14,929	13,286	
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	214	261	214	304	580	261	214	385	339	
Maximum exceeded in 90% of the years	410	403	567	376	693	320	342	886	737	
Maximum exceeded in 80% of the years	699	571	882	531	921	394	561	1,006	1,162	
Maximum exceeded in 70% of the years	980	713	1,214	731	989	427	692	1,180	1,248	
Maximum exceeded in 60% of the years	1,243	975	1,388	821	1,240	545	1,178	1,674	1,495	
Maximum exceeded in 50% of the years	1,692	1,464	1,742	1,285	1,877	845	1,569	1,959	1,717	
Maximum exceeded in 40% of the years	2,097	1,984	2,216	1,834	2,604	1,525	2,128	2,561	2,049	
Maximum exceeded in 30% of the years	3,187	2,488	4,622	2,224	3,566	2,126	3,094	4,134	4,657	
Maximum exceeded in 20% of the years	5,435	3,786	6,139	3,612	6,374	2,481	6,216	6,055	5,964	
Maximum exceeded in 10% of the years	8,032	7,545	9,631	5,742	7,862	3,006	8,780	7,411	10,230	
Maximum	18,985	18,985	13,113	8,639	18,985	5,501	12,447	11,612	13,113	
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	153	153	206	153	574	197	206	271	243	
Maximum exceeded in 90% of the years	341	328	437	331	627	301	311	725	559	
Maximum exceeded in 80% of the years	578	481	703	444	705	324	430	915	900	
Maximum exceeded in 70% of the years	757	627	922	524	807	344	565	1,105	935	
Maximum exceeded in 60% of the years	1,052	773	1,180	699	1,126	415	877	1,199	1,234	
Maximum exceeded in 50% of the years	1,364	1,187	1,412	1,208	1,408	661	1,196	1,486	1,472	
Maximum exceeded in 40% of the years	1,646	1,543	1,734	1,668	1,899	1,105	1,704	2,120	1,644	
Maximum exceeded in 30% of the years	2,547	1,901	3,357	1,669	2,761	1,390	2,222	3,386	2,900	
Maximum exceeded in 20% of the years	3,847	2,974	4,296	2,740	4,669	1,759	4,577	3,922	4,941	
Maximum exceeded in 10% of the years	5,838	5,523	6,300	4,573	6,057	2,338	5,787	4,366	8,962	
Maximum	12,437	10,822	12,437	7,183	10,822	3,643	9,665	9,209	12,437	

Table A.7-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

South Platte River at Julesburg, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		151	207	151	280	207	210	151	237	310
Maximum exceeded in 90% of the years		289	313	286	303	340	306	279	270	481
Maximum exceeded in 80% of the years		347	344	361	325	402	337	361	285	716
Maximum exceeded in 70% of the years		460	436	517	343	596	457	401	302	808
Maximum exceeded in 60% of the years		602	535	773	360	660	526	494	332	1,052
Maximum exceeded in 50% of the years		775	600	938	408	707	537	608	965	1,080
Maximum exceeded in 40% of the years		933	664	1,084	455	821	560	811	1,120	1,254
Maximum exceeded in 30% of the years		1,126	843	1,292	553	988	636	911	1,225	1,410
Maximum exceeded in 20% of the years		1,394	1,250	1,424	650	1,584	942	1,254	1,310	1,812
Maximum exceeded in 10% of the years		1,851	1,822	1,842	975	1,822	2,569	1,574	1,445	2,292
Maximum		12,900	12,900	2,600	1,300	12,900	8,520	1,860	2,230	2,600
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		140	207	140	280	207	207	140	232	301
Maximum exceeded in 90% of the years		282	289	281	287	336	293	268	254	394
Maximum exceeded in 80% of the years		325	327	328	293	402	327	349	280	700
Maximum exceeded in 70% of the years		451	435	501	309	596	442	383	300	761
Maximum exceeded in 60% of the years		574	517	730	325	646	476	469	325	1,017
Maximum exceeded in 50% of the years		734	580	921	390	701	518	539	951	1,057
Maximum exceeded in 40% of the years		896	662	1,058	455	817	535	701	1,087	1,228
Maximum exceeded in 30% of the years		1,075	805	1,251	553	961	603	854	1,213	1,345
Maximum exceeded in 20% of the years		1,335	977	1,347	650	1,403	921	1,147	1,297	1,787
Maximum exceeded in 10% of the years		1,802	1,612	1,819	718	1,612	2,392	1,473	1,342	2,227
Maximum		6,310	6,310	2,460	787	5,166	6,310	1,830	2,127	2,460
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		126	196	126	274	196	203	126	199	283
Maximum exceeded in 90% of the years		273	278	272	277	334	265	253	242	359
Maximum exceeded in 80% of the years		318	325	317	280	402	306	334	273	589
Maximum exceeded in 70% of the years		408	394	439	303	591	394	350	296	721
Maximum exceeded in 60% of the years		529	462	656	325	605	424	424	318	963
Maximum exceeded in 50% of the years		679	580	867	390	670	462	477	943	1,015
Maximum exceeded in 40% of the years		869	635	982	455	797	484	667	960	1,117
Maximum exceeded in 30% of the years		1,008	795	1,145	553	924	555	797	1,150	1,249
Maximum exceeded in 20% of the years		1,200	911	1,253	650	1,198	889	886	1,174	1,592
Maximum exceeded in 10% of the years		1,629	1,421	1,652	689	1,421	2,209	1,285	1,225	2,060
Maximum		3,976	3,976	2,371	727	2,759	3,976	1,770	1,783	2,371
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		108	183	108	267	183	185	108	184	260
Maximum exceeded in 90% of the years		250	260	251	273	325	217	237	219	316
Maximum exceeded in 80% of the years		309	317	308	280	365	276	311	250	484
Maximum exceeded in 70% of the years		353	351	383	303	493	340	333	290	613
Maximum exceeded in 60% of the years		435	419	567	325	580	356	383	314	809
Maximum exceeded in 50% of the years		597	470	712	390	596	394	431	772	896
Maximum exceeded in 40% of the years		759	593	888	455	769	422	579	888	958
Maximum exceeded in 30% of the years		891	732	956	539	887	498	622	958	1,172
Maximum exceeded in 20% of the years		1,009	882	1,088	623	957	803	760	1,046	1,353
Maximum exceeded in 10% of the years		1,452	1,260	1,452	636	1,260	1,862	958	1,138	1,835
Maximum		2,309	2,309	2,079	650	1,849	2,309	1,728	1,453	2,079
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		86	129	86	171	170	129	86	158	221
Maximum exceeded in 90% of the years		220	178	226	218	265	165	211	198	275
Maximum exceeded in 80% of the years		268	268	269	266	294	234	269	240	408
Maximum exceeded in 70% of the years		312	287	336	293	389	270	305	272	495
Maximum exceeded in 60% of the years		384	325	455	319	517	276	345	306	649
Maximum exceeded in 50% of the years		509	408	639	351	567	312	374	642	833
Maximum exceeded in 40% of the years		641	509	702	383	633	374	491	654	885
Maximum exceeded in 30% of the years		760	613	875	430	705	442	574	876	1,055
Maximum exceeded in 20% of the years		883	740	958	476	780	713	705	950	1,137
Maximum exceeded in 10% of the years		1,262	1,089	1,219	493	1,089	1,381	761	1,046	1,405
Maximum		1,847	1,656	1,847	510	1,558	1,656	1,614	1,305	1,847

Table A.7-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

South Platte River at Julesburg, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		75	75	187	144	75	108	187	211	200
Maximum exceeded in 90% of the years		206	156	296	167	212	146	286	296	658
Maximum exceeded in 80% of the years		349	238	594	278	284	265	407	326	1,000
Maximum exceeded in 70% of the years		708	376	922	564	968	350	662	721	1,478
Maximum exceeded in 60% of the years		1,076	800	1,388	748	1,156	564	875	1,300	1,782
Maximum exceeded in 50% of the years		1,660	1,130	1,880	880	2,400	747	1,160	1,770	2,120
Maximum exceeded in 40% of the years		2,394	1,752	2,636	2,776	3,696	855	2,642	2,910	2,486
Maximum exceeded in 30% of the years		4,144	3,687	6,384	4,440	6,140	1,621	4,414	5,460	6,357
Maximum exceeded in 20% of the years		7,760	5,784	7,790	5,640	9,820	1,784	7,678	8,630	7,710
Maximum exceeded in 10% of the years		12,640	11,420	13,280	8,584	11,960	3,238	13,360	13,755	11,810
Maximum		30,800	30,800	30,000	12,400	30,800	24,000	16,300	30,000	14,300
3-day Average Flows										
Maximum exceeded in 100% of the years		67	67	145	80	67	96	148	145	187
Maximum exceeded in 90% of the years		175	104	239	82	181	119	212	245	610
Maximum exceeded in 80% of the years		287	211	564	160	247	231	368	286	902
Maximum exceeded in 70% of the years		618	317	736	390	855	301	649	643	1,222
Maximum exceeded in 60% of the years		1,008	599	1,194	568	1,042	482	795	1,160	1,592
Maximum exceeded in 50% of the years		1,567	1,019	1,727	720	2,313	597	1,097	1,720	2,010
Maximum exceeded in 40% of the years		2,311	1,735	2,463	2,464	3,612	770	2,532	2,883	2,369
Maximum exceeded in 30% of the years		3,859	3,152	6,096	3,987	5,962	1,428	4,220	4,983	6,284
Maximum exceeded in 20% of the years		7,273	5,359	7,443	5,069	8,959	1,757	7,145	8,380	7,190
Maximum exceeded in 10% of the years		12,007	10,458	12,740	7,558	11,107	2,810	12,827	12,190	11,336
Maximum		28,900	28,900	23,333	10,750	28,900	15,803	14,833	23,333	13,767
7-day Average Flows										
Maximum exceeded in 100% of the years		51	51	88	51	57	82	88	122	168
Maximum exceeded in 90% of the years		136	87	187	53	135	94	155	205	438
Maximum exceeded in 80% of the years		251	176	433	100	210	191	283	285	760
Maximum exceeded in 70% of the years		475	255	645	235	466	252	567	525	970
Maximum exceeded in 60% of the years		728	514	1,062	427	723	365	702	1,120	1,400
Maximum exceeded in 50% of the years		1,366	697	1,606	649	2,210	500	1,024	1,596	1,724
Maximum exceeded in 40% of the years		2,050	1,681	2,217	1,945	3,466	652	2,336	2,819	2,063
Maximum exceeded in 30% of the years		3,625	2,416	5,607	3,224	4,885	1,033	3,836	4,639	5,860
Maximum exceeded in 20% of the years		6,797	4,692	6,855	4,466	8,098	1,687	6,741	7,241	6,716
Maximum exceeded in 10% of the years		9,640	9,305	12,006	6,605	9,757	2,215	10,810	10,516	10,718
Maximum		25,857	25,857	14,929	9,193	25,857	9,566	13,786	14,929	13,286
15-day Average Flows										
Maximum exceeded in 100% of the years		41	41	63	45	41	61	63	82	138
Maximum exceeded in 90% of the years		94	67	157	46	93	77	106	176	266
Maximum exceeded in 80% of the years		209	126	291	75	166	159	194	263	529
Maximum exceeded in 70% of the years		324	215	519	163	266	228	457	395	743
Maximum exceeded in 60% of the years		530	336	811	294	420	279	573	1,041	1,107
Maximum exceeded in 50% of the years		1,074	473	1,248	446	1,842	389	846	1,186	1,465
Maximum exceeded in 40% of the years		1,712	1,519	2,029	1,546	2,675	514	2,003	2,561	1,732
Maximum exceeded in 30% of the years		3,062	2,074	4,622	2,723	3,820	711	3,094	4,134	4,657
Maximum exceeded in 20% of the years		5,567	4,143	6,139	4,056	6,943	1,546	6,216	6,055	5,964
Maximum exceeded in 10% of the years		8,093	7,611	9,631	6,156	7,869	1,953	8,780	7,411	10,230
Maximum		18,985	18,985	13,113	8,639	18,985	5,501	12,447	11,612	13,113
30-day Average Flows										
Maximum exceeded in 100% of the years		0	0	52	36	0	52	52	62	99
Maximum exceeded in 90% of the years		66	48	128	39	46	59	83	142	181
Maximum exceeded in 80% of the years		142	68	201	60	86	110	150	177	352
Maximum exceeded in 70% of the years		219	145	412	119	158	160	341	302	511
Maximum exceeded in 60% of the years		419	197	583	257	319	174	430	759	871
Maximum exceeded in 50% of the years		858	363	901	436	1,249	257	559	931	1,000
Maximum exceeded in 40% of the years		1,312	923	1,578	1,175	1,744	311	1,428	2,056	1,537
Maximum exceeded in 30% of the years		2,048	1,612	3,357	2,025	2,974	456	2,222	3,386	2,846
Maximum exceeded in 20% of the years		3,903	3,211	4,296	3,097	5,077	987	4,577	3,922	4,941
Maximum exceeded in 10% of the years		5,850	5,601	6,300	4,946	6,118	1,492	5,787	4,366	8,962
Maximum		12,437	10,822	12,437	7,183	10,822	3,643	9,665	9,209	12,437

Table A.7-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

South Platte River at Julesburg, CO		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		25	25	42	25	32	82	42	211	140
Maximum exceeded in 90% of the years		130	80	252	56	80	120	192	306	337
Maximum exceeded in 80% of the years		223	119	547	107	88	136	320	593	639
Maximum exceeded in 70% of the years		526	172	825	195	435	159	677	923	1,228
Maximum exceeded in 60% of the years		739	234	1,390	234	930	178	965	1,330	1,588
Maximum exceeded in 50% of the years		1,405	538	1,790	248	1,215	266	1,850	1,480	1,835
Maximum exceeded in 40% of the years		1,920	1,044	2,300	2,523	4,500	498	1,960	2,910	2,330
Maximum exceeded in 30% of the years		3,968	3,864	3,998	4,440	7,250	538	3,728	5,305	4,016
Maximum exceeded in 20% of the years		6,516	5,912	6,572	5,640	10,000	968	5,520	6,750	7,020
Maximum exceeded in 10% of the years		10,700	11,560	9,446	8,584	12,200	3,157	8,604	8,935	9,116
Maximum		30,800	30,800	30,000	12,400	30,800	24,000	16,300	30,000	14,300
3-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		23	23	39	23	26	72	39	145	139
Maximum exceeded in 90% of the years		87	73	151	53	65	82	141	232	300
Maximum exceeded in 80% of the years		152	80	397	75	79	102	217	265	648
Maximum exceeded in 70% of the years		280	138	663	81	395	142	494	570	1,180
Maximum exceeded in 60% of the years		635	195	1,236	133	863	159	754	866	1,468
Maximum exceeded in 50% of the years		1,254	454	1,477	208	1,150	226	1,443	1,355	1,710
Maximum exceeded in 40% of the years		1,668	967	1,982	2,259	4,407	278	1,687	1,477	2,215
Maximum exceeded in 30% of the years		3,649	3,312	3,855	3,987	7,025	460	3,619	4,467	3,990
Maximum exceeded in 20% of the years		6,275	5,395	6,303	5,069	9,000	868	5,208	6,390	6,583
Maximum exceeded in 10% of the years		10,006	10,500	8,785	7,558	11,300	2,682	8,415	8,430	8,946
Maximum		28,900	28,900	23,333	10,750	28,900	15,803	14,567	23,333	13,767
7-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		22	22	33	22	24	50	33	109	93
Maximum exceeded in 90% of the years		67	53	113	41	47	64	88	139	229
Maximum exceeded in 80% of the years		113	64	264	55	74	75	152	210	391
Maximum exceeded in 70% of the years		219	99	450	55	311	104	393	459	920
Maximum exceeded in 60% of the years		457	141	900	88	684	123	605	514	1,206
Maximum exceeded in 50% of the years		967	340	1,208	137	949	148	1,024	1,001	1,573
Maximum exceeded in 40% of the years		1,505	708	1,766	1,741	4,277	185	1,437	1,211	1,967
Maximum exceeded in 30% of the years		2,903	2,509	3,679	3,224	5,598	342	2,967	3,974	3,674
Maximum exceeded in 20% of the years		5,471	4,786	5,523	4,466	8,394	602	4,278	5,549	6,154
Maximum exceeded in 10% of the years		9,113	9,213	8,219	6,605	9,774	1,993	7,049	7,494	8,324
Maximum		25,857	25,857	14,929	9,193	25,857	9,243	12,786	14,929	13,286
15-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		19	19	32	19	21	42	32	73	66
Maximum exceeded in 90% of the years		57	40	78	30	39	47	64	107	164
Maximum exceeded in 80% of the years		78	52	192	39	60	57	101	151	234
Maximum exceeded in 70% of the years		152	64	315	46	204	75	269	308	685
Maximum exceeded in 60% of the years		323	91	643	65	474	90	459	362	939
Maximum exceeded in 50% of the years		644	261	977	90	730	96	647	724	1,344
Maximum exceeded in 40% of the years		1,206	511	1,501	1,404	3,183	108	1,090	1,041	1,591
Maximum exceeded in 30% of the years		2,565	2,129	2,683	2,723	4,137	262	1,800	3,328	3,145
Maximum exceeded in 20% of the years		4,625	4,322	4,629	4,056	6,469	377	2,943	4,631	5,101
Maximum exceeded in 10% of the years		6,912	6,722	6,599	5,963	7,506	1,625	5,918	6,108	7,600
Maximum		18,985	18,985	13,113	8,157	18,985	5,369	11,083	8,663	13,113
30-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Maximum exceeded in 100% of the years		14	14	29	14	15	35	29	51	51
Maximum exceeded in 90% of the years		46	34	60	25	31	39	53	88	108
Maximum exceeded in 80% of the years		58	45	134	34	48	47	77	123	161
Maximum exceeded in 70% of the years		121	50	206	42	118	56	194	180	486
Maximum exceeded in 60% of the years		198	66	405	54	321	60	276	257	659
Maximum exceeded in 50% of the years		434	162	696	68	434	66	455	529	856
Maximum exceeded in 40% of the years		847	310	900	1,028	1,912	71	736	909	1,058
Maximum exceeded in 30% of the years		1,692	1,635	2,138	2,025	2,613	165	1,012	2,565	2,283
Maximum exceeded in 20% of the years		3,102	2,758	3,531	3,097	4,469	231	2,086	3,661	3,379
Maximum exceeded in 10% of the years		4,646	4,570	4,557	3,994	4,982	1,227	4,350	3,922	5,387
Maximum		12,437	10,822	12,437	4,805	10,822	3,241	7,027	4,808	12,437

Table A.7-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

South Platte River at Julesburg, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years	24	24	25	62	32	24	31	25	54	
Maximum exceeded in 90% of the years	48	45	68	138	58	43	77	33	124	
Maximum exceeded in 80% of the years	106	63	145	282	250	45	98	301	175	
Maximum exceeded in 70% of the years	237	174	289	566	317	48	169	371	328	
Maximum exceeded in 60% of the years	362	328	380	661	385	98	255	403	628	
Maximum exceeded in 50% of the years	513	402	622	662	441	217	345	724	679	
Maximum exceeded in 40% of the years	683	645	747	883	640	337	450	853	1,034	
Maximum exceeded in 30% of the years	882	746	1,146	1,398	687	580	711	1,098	1,628	
Maximum exceeded in 20% of the years	1,540	1,096	1,918	2,502	830	1,188	768	1,390	2,784	
Maximum exceeded in 10% of the years	2,817	2,030	3,034	3,014	1,210	2,117	1,950	2,855	3,828	
Maximum	8,920	7,130	8,920	3,230	1,770	7,130	2,080	8,920	4,970	
3-day Average Flows										
Maximum exceeded in 100% of the years	23	23	24	62	26	23	28	24	45	
Maximum exceeded in 90% of the years	44	43	53	103	50	39	59	31	115	
Maximum exceeded in 80% of the years	91	59	138	156	245	43	84	279	156	
Maximum exceeded in 70% of the years	178	123	270	230	291	44	136	337	274	
Maximum exceeded in 60% of the years	318	252	334	350	353	91	227	357	608	
Maximum exceeded in 50% of the years	472	353	604	492	421	132	317	662	669	
Maximum exceeded in 40% of the years	654	502	709	594	620	259	412	749	1,008	
Maximum exceeded in 30% of the years	821	675	1,114	1,030	674	555	529	1,049	1,589	
Maximum exceeded in 20% of the years	1,397	945	1,560	2,132	821	1,125	729	1,353	2,534	
Maximum exceeded in 10% of the years	2,491	1,675	2,887	2,736	1,047	1,801	1,608	2,630	3,507	
Maximum	6,533	5,127	6,533	3,090	1,463	5,127	1,913	6,533	4,057	
7-day Average Flows										
Maximum exceeded in 100% of the years	22	22	23	42	24	22	26	23	37	
Maximum exceeded in 90% of the years	39	40	39	75	45	37	44	29	104	
Maximum exceeded in 80% of the years	70	43	111	106	170	40	65	230	130	
Maximum exceeded in 70% of the years	140	93	228	131	232	41	105	261	233	
Maximum exceeded in 60% of the years	235	180	275	171	270	66	184	317	494	
Maximum exceeded in 50% of the years	341	249	445	217	364	94	240	447	609	
Maximum exceeded in 40% of the years	528	473	597	418	519	178	301	504	976	
Maximum exceeded in 30% of the years	729	592	1,064	777	618	519	477	961	1,460	
Maximum exceeded in 20% of the years	1,214	799	1,370	1,454	724	970	612	1,176	2,142	
Maximum exceeded in 10% of the years	1,869	1,304	2,675	2,177	820	1,365	1,280	2,201	2,991	
Maximum	3,903	3,543	3,903	2,921	1,173	3,543	1,571	3,903	3,876	
15-day Average Flows										
Maximum exceeded in 100% of the years	21	21	21	40	21	21	24	21	27	
Maximum exceeded in 90% of the years	33	35	31	64	41	32	32	25	73	
Maximum exceeded in 80% of the years	52	41	82	90	105	35	48	170	116	
Maximum exceeded in 70% of the years	112	75	167	124	145	37	81	195	210	
Maximum exceeded in 60% of the years	176	116	215	159	208	46	131	233	360	
Maximum exceeded in 50% of the years	247	195	314	195	309	69	172	283	532	
Maximum exceeded in 40% of the years	406	327	446	261	427	107	219	342	893	
Maximum exceeded in 30% of the years	568	431	670	491	432	358	388	609	1,214	
Maximum exceeded in 20% of the years	953	561	1,140	1,052	468	628	446	681	1,647	
Maximum exceeded in 10% of the years	1,330	985	2,055	1,742	641	970	864	1,638	2,743	
Maximum	3,123	2,498	3,123	2,498	957	2,433	1,147	2,101	3,123	
30-day Average Flows										
Maximum exceeded in 100% of the years	18	20	18	32	20	20	22	18	24	
Maximum exceeded in 90% of the years	26	29	25	50	35	28	25	23	53	
Maximum exceeded in 80% of the years	42	34	64	68	60	29	38	116	83	
Maximum exceeded in 70% of the years	73	57	109	87	97	33	66	136	145	
Maximum exceeded in 60% of the years	118	74	150	96	148	37	89	160	220	
Maximum exceeded in 50% of the years	161	118	199	100	193	58	111	199	394	
Maximum exceeded in 40% of the years	277	199	296	132	273	73	152	200	647	
Maximum exceeded in 30% of the years	371	280	464	280	323	279	247	332	794	
Maximum exceeded in 20% of the years	652	407	741	660	393	357	284	461	1,127	
Maximum exceeded in 10% of the years	852	667	1,184	1,160	459	640	529	993	1,946	
Maximum	2,325	1,720	2,325	1,720	634	1,364	750	1,199	2,325	

are much lower than any other time interval. There is also a large difference between the maximum and the 10% exceedance probabilities. This is possibly attributable to many effects, such as the beginning of operation of the Chatfield and Bear Creek Reservoirs, increasing trans-basin imports, and increasing urbanization in the South Platte River basin in Colorado.

Table A.7-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.7-8** shows that flow values for this seasonal period are very similar to those for the Apr 16-Jul 15 seasonal period, except that they are somewhat lower. This seasonal period is past the time of the greatest precipitation and snowmelt runoff in most years.

Table A.7-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.7-9** shows that, for the 1895-1909 through 1959-1974 time intervals, the flow values generally coincided with known climatological conditions. An exception to this can be seen for the 1910-1928 and 1942-1958 time interval for the 30-percent and lower exceedance probabilities (high flows) for all averaging times except mean daily flows. These flow values are less than those for the 1928-1941 time interval. This is coincident with the regulation of Cherry Creek Reservoir, as discussed for the Feb 15-Mar 16 seasonal period (**Table A.7-6**). Flow values for the 1975-1998 time interval are greater than those for the 1959-1974 time interval for all averaging times and all exceedance probabilities. This is possibly attributable to many effects, such as the beginning of operation of the Chatfield and Bear Creek Reservoirs, increasing trans-basin imports, and increasing urbanization in the South Platte River basin in Colorado.

A.7.4.3 Mean Daily Flow Exceedance.

Table A.7-10 through **Table A.7-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows.

Table A.7-10 shows the exceedance probabilities and values of flows for annual data. **Table A.7-10** shows that the flow values for annual data were consistent with known climatological conditions. The characterizations for this seasonal period are similar to those for annual maximums (**Table A.7-5**). There are the large difference between 1-day and 30-day maximums for the 1928-1941 time interval, the increasing probability that a mean daily flow greater than 1,000 cfs will be exceeded in the most recent time intervals, and less of a decrease in flow values with increasing averaging time for the 1975-1998 time interval compared to the proceeding time intervals. Also, it can be seen in **Table A.7-10** that flow values increased with increasing averaging time for all averaging times for most exceedance probabilities (but never the maximum) and all time intervals. This characterization is discussed in detail in **Section A.1.4.3**.

Table A.7-10 Exceedance Values Considering All Flows, Annual Data.

South Platte River at Julesburg, CO		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	0	0	8	0	1	14	11	8	10	
Flow exceeded for 90% of the days	29	23	35	10	23	26	33	29	45	
Flow exceeded for 80% of the days	50	37	67	28	46	36	55	54	82	
Flow exceeded for 70% of the days	90	56	110	38	115	48	97	107	127	
Flow exceeded for 60% of the days	146	102	171	75	202	64	142	165	203	
Flow exceeded for 50% of the days	238	184	262	150	302	98	223	249	310	
Flow exceeded for 40% of the days	323	290	355	250	390	158	313	314	490	
Flow exceeded for 30% of the days	443	371	520	313	508	271	379	492	735	
Flow exceeded for 20% of the days	710	538	850	407	730	363	499	880	1,050	
Flow exceeded for 10% of the days	1,200	899	1,300	958	1,230	562	869	1,250	1,590	
Maximum	30,800	30,800	30,000	12,400	30,800	24,000	16,300	30,000	14,300	
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	8	0	1	14	14	8	11	
Flow exceeded for 90% of the days	30	24	36	11	24	26	33	29	46	
Flow exceeded for 80% of the days	50	38	69	30	46	36	56	55	83	
Flow exceeded for 70% of the days	91	58	112	43	119	49	99	110	128	
Flow exceeded for 60% of the days	148	104	173	80	211	66	143	168	207	
Flow exceeded for 50% of the days	239	189	264	155	303	99	226	250	313	
Flow exceeded for 40% of the days	325	290	356	250	392	160	315	315	493	
Flow exceeded for 30% of the days	446	375	525	313	513	271	378	494	737	
Flow exceeded for 20% of the days	712	538	853	407	726	367	503	883	1,054	
Flow exceeded for 10% of the days	1,200	899	1,297	961	1,241	561	872	1,240	1,571	
Maximum	28,900	28,900	23,333	10,750	28,900	15,803	14,833	23,333	13,767	
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	8	0	1	15	14	8	11	
Flow exceeded for 90% of the days	31	25	37	15	25	27	34	30	48	
Flow exceeded for 80% of the days	53	39	72	34	49	37	58	61	87	
Flow exceeded for 70% of the days	96	60	115	45	126	50	101	114	130	
Flow exceeded for 60% of the days	151	109	180	84	222	69	145	174	211	
Flow exceeded for 50% of the days	244	197	267	155	310	103	234	251	322	
Flow exceeded for 40% of the days	327	293	361	250	398	163	316	318	497	
Flow exceeded for 30% of the days	449	377	531	309	522	275	379	498	744	
Flow exceeded for 20% of the days	721	539	859	414	726	370	499	886	1,050	
Flow exceeded for 10% of the days	1,196	905	1,286	934	1,235	566	869	1,219	1,569	
Maximum	25,857	25,857	14,929	9,193	25,857	9,566	13,786	14,929	13,286	
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	9	0	1	16	15	9	12	
Flow exceeded for 90% of the days	33	26	41	18	27	28	36	33	53	
Flow exceeded for 80% of the days	58	41	78	35	56	40	63	67	94	
Flow exceeded for 70% of the days	102	66	121	48	146	53	104	120	138	
Flow exceeded for 60% of the days	163	117	193	89	237	74	153	186	226	
Flow exceeded for 50% of the days	253	207	277	173	321	109	245	255	340	
Flow exceeded for 40% of the days	336	298	369	250	408	173	317	324	513	
Flow exceeded for 30% of the days	459	386	547	312	526	283	379	526	758	
Flow exceeded for 20% of the days	740	543	869	432	736	368	511	898	1,051	
Flow exceeded for 10% of the days	1,194	913	1,299	980	1,316	580	892	1,236	1,557	
Maximum	18,985	18,985	13,113	8,639	18,985	5,501	12,447	11,612	13,113	
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1	1	10	1	2	18	15	10	13	
Flow exceeded for 90% of the days	36	29	47	21	30	29	40	39	63	
Flow exceeded for 80% of the days	67	47	90	40	67	44	72	84	104	
Flow exceeded for 70% of the days	113	77	137	59	174	58	113	132	162	
Flow exceeded for 60% of the days	184	140	213	99	263	83	175	204	246	
Flow exceeded for 50% of the days	266	226	294	188	330	122	264	262	385	
Flow exceeded for 40% of the days	347	301	390	262	418	192	322	349	544	
Flow exceeded for 30% of the days	481	392	574	313	530	278	381	599	774	
Flow exceeded for 20% of the days	758	556	875	491	746	377	538	919	1,048	
Flow exceeded for 10% of the days	1,234	977	1,332	1,016	1,422	593	921	1,285	1,556	
Maximum	12,437	10,822	12,437	7,183	10,822	3,643	9,665	9,209	12,437	

Table A.7-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

South Platte River at Julesburg, CO		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		20	20	45	20	57	56	45	99	116
Flow exceeded for 90% of the days		187	165	210	250	180	122	182	188	253
Flow exceeded for 80% of the days		256	249	262	260	302	195	240	243	325
Flow exceeded for 70% of the days		306	300	313	280	357	245	295	271	445
Flow exceeded for 60% of the days		354	325	400	301	450	296	325	312	620
Flow exceeded for 50% of the days		460	400	540	320	550	325	363	499	743
Flow exceeded for 40% of the days		600	488	691	325	600	396	457	747	900
Flow exceeded for 30% of the days		763	600	869	350	708	487	576	881	1,010
Flow exceeded for 20% of the days		917	780	1,012	455	880	810	653	970	1,190
Flow exceeded for 10% of the days		1,190	941	1,260	650	1,024	926	886	1,160	1,510
Maximum		12,900	12,900	2,600	1,300	12,900	8,520	1,860	2,230	2,600
3-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		20	20	46	20	57	58	46	107	117
Flow exceeded for 90% of the days		191	171	214	250	182	127	188	188	258
Flow exceeded for 80% of the days		257	250	262	260	307	199	238	243	325
Flow exceeded for 70% of the days		307	300	314	280	357	244	290	270	445
Flow exceeded for 60% of the days		353	325	402	301	466	297	325	312	634
Flow exceeded for 50% of the days		466	400	542	320	550	327	368	497	758
Flow exceeded for 40% of the days		600	505	693	325	600	401	455	750	916
Flow exceeded for 30% of the days		767	600	864	350	715	497	563	879	1,014
Flow exceeded for 20% of the days		928	793	1,020	455	880	850	650	968	1,171
Flow exceeded for 10% of the days		1,180	981	1,255	650	1,066	928	881	1,151	1,488
Maximum		6,310	6,310	2,460	787	5,166	6,310	1,830	2,127	2,460
7-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		23	23	50	23	80	64	50	114	157
Flow exceeded for 90% of the days		201	180	219	250	186	143	201	181	260
Flow exceeded for 80% of the days		258	250	263	260	311	202	241	242	320
Flow exceeded for 70% of the days		308	301	314	280	364	251	289	270	443
Flow exceeded for 60% of the days		363	332	405	313	496	293	328	312	652
Flow exceeded for 50% of the days		469	410	539	320	555	342	379	488	798
Flow exceeded for 40% of the days		596	507	701	325	600	405	459	753	920
Flow exceeded for 30% of the days		780	600	863	369	734	473	554	869	1,004
Flow exceeded for 20% of the days		933	799	1,013	455	888	850	637	974	1,151
Flow exceeded for 10% of the days		1,164	1,000	1,227	620	1,086	915	845	1,122	1,444
Maximum		3,976	3,976	2,371	727	2,759	3,976	1,770	1,783	2,371
15-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		65	74	65	74	157	91	65	136	191
Flow exceeded for 90% of the days		211	190	223	227	228	171	212	183	260
Flow exceeded for 80% of the days		265	260	268	262	315	206	252	238	339
Flow exceeded for 70% of the days		313	311	314	277	416	273	302	268	446
Flow exceeded for 60% of the days		368	346	407	318	506	297	331	308	614
Flow exceeded for 50% of the days		477	417	534	325	561	346	368	517	836
Flow exceeded for 40% of the days		592	506	687	363	642	387	457	753	888
Flow exceeded for 30% of the days		777	612	859	408	754	464	555	856	1,025
Flow exceeded for 20% of the days		908	800	1,006	455	885	855	634	945	1,140
Flow exceeded for 10% of the days		1,122	973	1,198	544	1,027	981	783	1,094	1,392
Maximum		2,309	2,309	2,079	650	1,849	2,309	1,728	1,453	2,079
30-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		86	129	86	171	170	129	86	158	221
Flow exceeded for 90% of the days		220	178	226	218	265	165	211	198	275
Flow exceeded for 80% of the days		268	268	269	266	294	234	269	240	408
Flow exceeded for 70% of the days		312	287	336	293	389	270	305	272	495
Flow exceeded for 60% of the days		384	325	455	319	517	276	345	306	649
Flow exceeded for 50% of the days		509	408	639	351	567	312	374	642	833
Flow exceeded for 40% of the days		641	509	702	383	633	374	491	654	885
Flow exceeded for 30% of the days		760	613	875	430	705	442	574	876	1,055
Flow exceeded for 20% of the days		883	740	958	476	780	713	705	950	1,137
Flow exceeded for 10% of the days		1,262	1,089	1,219	493	1,089	1,381	761	1,046	1,405
Maximum		1,847	1,656	1,847	510	1,558	1,656	1,614	1,305	1,847

Table A.7-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

South Platte River at Julesburg, CO	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	1	1	13	2	1	15	13	19	17
Flow exceeded for 90% of the days	28	22	33	12	21	27	32	30	37
Flow exceeded for 80% of the days	40	32	50	23	34	35	46	44	61
Flow exceeded for 70% of the days	56	42	82	32	50	41	71	68	102
Flow exceeded for 60% of the days	89	54	126	44	87	47	106	108	151
Flow exceeded for 50% of the days	148	80	192	73	170	58	164	169	232
Flow exceeded for 40% of the days	249	154	340	140	338	74	278	292	413
Flow exceeded for 30% of the days	540	308	698	386	820	118	534	696	997
Flow exceeded for 20% of the days	1,260	888	1,530	1,100	1,750	222	989	1,460	1,984
Flow exceeded for 10% of the days	3,000	2,316	3,624	4,336	3,280	621	2,754	2,890	5,150
Maximum	30,800	30,800	30,000	12,400	30,800	24,000	16,300	30,000	14,300
3-day Average Flows									
Flow exceeded for 100% of the days	1	1	14	3	1	17	14	19	18
Flow exceeded for 90% of the days	28	22	34	15	21	28	33	30	39
Flow exceeded for 80% of the days	41	34	52	26	35	36	48	45	63
Flow exceeded for 70% of the days	58	43	85	36	52	41	73	71	104
Flow exceeded for 60% of the days	92	55	130	47	94	48	108	110	155
Flow exceeded for 50% of the days	150	81	195	76	180	59	162	175	238
Flow exceeded for 40% of the days	259	158	356	140	358	75	291	306	432
Flow exceeded for 30% of the days	553	316	714	378	845	124	543	709	1,032
Flow exceeded for 20% of the days	1,284	900	1,557	1,193	1,816	233	1,017	1,449	1,993
Flow exceeded for 10% of the days	3,077	2,385	3,710	4,323	3,418	606	2,889	2,897	5,210
Maximum	28,900	28,900	23,333	10,750	28,900	15,803	14,833	23,333	13,767
7-day Average Flows									
Flow exceeded for 100% of the days	1	1	15	3	1	17	15	21	22
Flow exceeded for 90% of the days	30	24	37	19	22	29	35	33	42
Flow exceeded for 80% of the days	44	36	56	32	36	37	52	49	67
Flow exceeded for 70% of the days	61	44	90	39	54	42	78	77	114
Flow exceeded for 60% of the days	100	56	132	47	105	50	114	113	168
Flow exceeded for 50% of the days	160	90	208	81	214	62	173	183	264
Flow exceeded for 40% of the days	283	170	391	147	397	80	302	368	483
Flow exceeded for 30% of the days	609	352	796	410	908	133	589	806	1,070
Flow exceeded for 20% of the days	1,373	963	1,617	1,249	1,985	249	1,204	1,518	1,983
Flow exceeded for 10% of the days	3,265	2,639	3,873	4,394	3,629	664	2,948	3,184	5,435
Maximum	25,857	25,857	14,929	9,193	25,857	9,566	13,786	14,929	13,286
15-day Average Flows									
Flow exceeded for 100% of the days	1	1	17	4	1	18	17	22	24
Flow exceeded for 90% of the days	34	27	42	27	23	32	38	40	50
Flow exceeded for 80% of the days	49	37	64	35	38	40	59	58	87
Flow exceeded for 70% of the days	72	47	102	37	60	45	85	83	129
Flow exceeded for 60% of the days	114	65	148	50	130	53	126	127	202
Flow exceeded for 50% of the days	188	108	248	95	261	69	186	219	306
Flow exceeded for 40% of the days	339	209	481	174	500	95	344	447	646
Flow exceeded for 30% of the days	750	424	969	435	1,157	156	633	945	1,153
Flow exceeded for 20% of the days	1,576	1,139	1,916	1,556	2,364	272	1,557	1,932	2,190
Flow exceeded for 10% of the days	3,644	2,893	4,278	4,419	3,963	768	3,454	3,547	5,597
Maximum	18,985	18,985	13,113	8,639	18,985	5,501	12,447	11,612	13,113
30-day Average Flows									
Flow exceeded for 100% of the days	3	3	21	6	3	21	21	23	27
Flow exceeded for 90% of the days	41	33	53	29	27	39	43	52	76
Flow exceeded for 80% of the days	58	43	86	35	45	45	67	79	109
Flow exceeded for 70% of the days	91	52	131	41	71	50	96	113	154
Flow exceeded for 60% of the days	146	79	186	70	160	59	163	164	242
Flow exceeded for 50% of the days	232	142	341	113	300	86	250	301	499
Flow exceeded for 40% of the days	458	262	672	308	873	140	435	693	822
Flow exceeded for 30% of the days	996	541	1,233	797	1,696	205	964	1,247	1,316
Flow exceeded for 20% of the days	1,916	1,480	2,227	1,626	2,783	293	1,895	2,196	2,710
Flow exceeded for 10% of the days	3,876	3,243	4,210	4,658	4,967	900	3,712	3,540	5,507
Maximum	12,437	10,822	12,437	7,183	10,822	3,643	9,665	9,209	12,437

Table A.7-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

South Platte River at Julesburg, CO	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	11	0	1	15	13	13	11
Flow exceeded for 90% of the days	20	16	24	4	12	21	21	23	27
Flow exceeded for 80% of the days	27	22	32	12	22	24	32	28	39
Flow exceeded for 70% of the days	35	27	44	23	26	27	40	37	51
Flow exceeded for 60% of the days	47	33	64	32	37	32	58	60	70
Flow exceeded for 50% of the days	68	43	97	48	51	37	87	94	105
Flow exceeded for 40% of the days	114	59	162	72	96	45	141	161	184
Flow exceeded for 30% of the days	230	115	371	162	261	60	285	292	515
Flow exceeded for 20% of the days	676	360	903	518	649	92	594	839	1,330
Flow exceeded for 10% of the days	2,100	1,430	2,509	2,158	2,330	322	1,847	2,095	3,507
Maximum	30,800	30,800	30,000	12,400	30,800	24,000	16,300	30,000	14,300
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	12	0	1	16	14	13	12
Flow exceeded for 90% of the days	21	17	24	3	14	21	21	23	27
Flow exceeded for 80% of the days	27	22	33	12	22	25	33	28	39
Flow exceeded for 70% of the days	36	27	46	25	27	28	41	39	51
Flow exceeded for 60% of the days	48	35	66	38	37	32	60	65	71
Flow exceeded for 50% of the days	70	43	100	47	52	38	88	100	107
Flow exceeded for 40% of the days	118	62	166	74	98	46	145	169	191
Flow exceeded for 30% of the days	237	118	381	202	274	62	305	291	518
Flow exceeded for 20% of the days	678	363	912	549	657	94	608	847	1,343
Flow exceeded for 10% of the days	2,127	1,478	2,565	2,122	2,396	316	1,738	2,073	3,472
Maximum	28,900	28,900	23,333	10,750	28,900	15,803	14,567	23,333	13,767
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	14	0	1	17	14	14	14
Flow exceeded for 90% of the days	22	18	25	4	14	22	21	24	28
Flow exceeded for 80% of the days	28	23	34	17	22	25	33	29	41
Flow exceeded for 70% of the days	37	28	48	31	28	28	45	42	53
Flow exceeded for 60% of the days	50	36	68	40	38	33	64	71	71
Flow exceeded for 50% of the days	74	45	106	48	55	39	93	108	112
Flow exceeded for 40% of the days	124	64	182	91	114	50	150	174	208
Flow exceeded for 30% of the days	265	123	400	221	294	64	320	356	532
Flow exceeded for 20% of the days	703	379	938	754	676	93	610	862	1,348
Flow exceeded for 10% of the days	2,220	1,606	2,641	2,229	2,798	339	1,791	2,318	3,414
Maximum	25,857	25,857	14,929	9,193	25,857	9,243	12,786	14,929	13,286
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	15	0	1	18	15	15	16
Flow exceeded for 90% of the days	23	19	26	5	17	23	22	26	29
Flow exceeded for 80% of the days	29	25	37	19	23	26	34	31	44
Flow exceeded for 70% of the days	40	29	52	33	28	29	49	44	55
Flow exceeded for 60% of the days	55	37	71	41	40	35	68	73	72
Flow exceeded for 50% of the days	78	49	121	52	70	42	108	123	132
Flow exceeded for 40% of the days	144	71	222	90	145	50	195	219	251
Flow exceeded for 30% of the days	308	140	413	256	352	63	342	363	583
Flow exceeded for 20% of the days	732	422	950	859	774	83	595	953	1,260
Flow exceeded for 10% of the days	2,322	1,610	2,842	2,273	2,639	469	2,110	2,461	3,507
Maximum	18,985	18,985	13,113	8,157	18,985	5,369	11,083	8,663	13,113
30-day Average Flows									
Flow exceeded for 100% of the days	1	1	15	1	2	20	15	18	21
Flow exceeded for 90% of the days	25	20	28	7	14	24	24	29	31
Flow exceeded for 80% of the days	33	26	40	17	25	28	39	35	46
Flow exceeded for 70% of the days	43	34	55	33	35	33	48	50	62
Flow exceeded for 60% of the days	59	42	90	42	59	37	90	77	98
Flow exceeded for 50% of the days	99	56	153	60	112	43	153	130	170
Flow exceeded for 40% of the days	187	74	279	140	212	51	237	272	339
Flow exceeded for 30% of the days	370	188	471	364	396	59	358	500	585
Flow exceeded for 20% of the days	757	521	960	961	899	77	554	1,176	1,098
Flow exceeded for 10% of the days	2,176	1,503	2,747	2,237	2,016	388	2,203	2,697	3,172
Maximum	12,437	10,822	12,437	4,805	10,822	3,241	7,027	4,808	12,437

Table A.7-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

South Platte River at Julesburg, CO		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	8	0	1	14	11	8	10
Flow exceeded for 90% of the days		18	16	18	2	18	19	18	16	21
Flow exceeded for 80% of the days		23	21	25	4	23	23	22	22	33
Flow exceeded for 70% of the days		29	25	34	15	30	25	32	26	44
Flow exceeded for 60% of the days		37	30	44	28	37	27	38	34	56
Flow exceeded for 50% of the days		47	36	56	34	52	30	48	45	77
Flow exceeded for 40% of the days		67	45	80	44	82	35	62	64	127
Flow exceeded for 30% of the days		112	80	134	62	144	41	90	106	226
Flow exceeded for 20% of the days		212	155	248	155	250	65	152	179	542
Flow exceeded for 10% of the days		526	380	659	576	420	172	288	379	1,100
Maximum		8,920	7,130	8,920	3,230	1,770	7,130	2,080	8,920	4,970
3-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	8	0	1	14	14	8	11
Flow exceeded for 90% of the days		18	17	18	2	19	19	18	17	21
Flow exceeded for 80% of the days		23	22	25	5	23	23	22	22	34
Flow exceeded for 70% of the days		30	26	34	15	30	25	32	27	44
Flow exceeded for 60% of the days		37	30	44	28	37	27	39	34	56
Flow exceeded for 50% of the days		47	37	56	38	53	30	48	45	78
Flow exceeded for 40% of the days		69	46	81	45	82	35	62	66	126
Flow exceeded for 30% of the days		113	80	135	71	144	41	89	109	233
Flow exceeded for 20% of the days		218	156	248	155	257	66	150	181	544
Flow exceeded for 10% of the days		527	380	643	481	410	186	287	392	1,094
Maximum		6,533	5,127	6,533	3,090	1,463	5,127	1,913	6,533	4,057
7-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	8	0	2	15	14	8	11
Flow exceeded for 90% of the days		18	18	18	2	19	19	18	17	21
Flow exceeded for 80% of the days		24	22	25	7	24	23	22	22	36
Flow exceeded for 70% of the days		30	26	35	20	32	25	33	27	47
Flow exceeded for 60% of the days		38	31	46	31	38	27	39	35	60
Flow exceeded for 50% of the days		49	37	59	39	54	30	49	46	76
Flow exceeded for 40% of the days		70	48	82	45	87	35	62	67	127
Flow exceeded for 30% of the days		118	83	138	90	142	42	91	115	243
Flow exceeded for 20% of the days		219	164	253	178	253	65	149	186	523
Flow exceeded for 10% of the days		521	384	640	452	416	202	280	400	1,089
Maximum		3,903	3,543	3,903	2,921	1,173	3,543	1,571	3,903	3,876
15-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	9	0	8	16	15	9	12
Flow exceeded for 90% of the days		18	18	18	3	19	19	18	17	21
Flow exceeded for 80% of the days		24	23	26	15	26	23	23	22	41
Flow exceeded for 70% of the days		32	27	37	23	33	25	35	28	51
Flow exceeded for 60% of the days		40	32	48	30	40	28	40	35	62
Flow exceeded for 50% of the days		53	39	62	41	65	30	51	46	81
Flow exceeded for 40% of the days		73	55	86	53	102	37	66	69	130
Flow exceeded for 30% of the days		123	94	143	93	159	46	96	122	284
Flow exceeded for 20% of the days		230	185	275	180	262	72	150	182	516
Flow exceeded for 10% of the days		513	390	638	483	406	268	317	463	1,062
Maximum		3,123	2,498	3,123	2,498	957	2,433	1,147	2,101	3,123
30-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		1	1	10	1	11	18	16	10	13
Flow exceeded for 90% of the days		19	20	19	6	21	20	20	17	21
Flow exceeded for 80% of the days		25	25	27	20	31	24	23	22	47
Flow exceeded for 70% of the days		34	28	42	24	36	27	37	28	59
Flow exceeded for 60% of the days		47	35	54	40	52	28	44	38	67
Flow exceeded for 50% of the days		61	46	68	52	69	33	55	57	87
Flow exceeded for 40% of the days		83	63	95	57	113	42	72	82	150
Flow exceeded for 30% of the days		133	110	146	98	206	55	100	113	283
Flow exceeded for 20% of the days		271	240	310	200	277	106	142	199	556
Flow exceeded for 10% of the days		486	390	653	650	389	285	361	403	1,041
Maximum		2,325	1,720	2,325	1,720	634	1,364	750	1,199	2,325

Table A.7-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.7-11** shows that the flow values for this seasonal period were consistent with known climatological conditions. Beginning with the 1942-1958 time interval, the flow values for the maximum flow are significantly lower than those for the 1928-1941 time interval for all averaging times. This is coincident with the beginning of operation of Cherry Creek Reservoir in 1950. The probability of exceeding a mean daily flow of 1,000 cfs increases for the most recent time intervals for this seasonal period.

Table A.7-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.7-12** shows that the flow values for this seasonal period were consistent with known climatological conditions except for the 1975-1998 time interval. The flow values for all exceedance probabilities except the maximum for the 1975-1998 time interval are greater than any other time interval and even the maximum is greater than any other time interval for the 30-day average flows. There is also less of a decrease in flow values with increasing averaging time for the 1975-1998 time interval compared to the proceeding time intervals. Also, it can be seen in **Table A.7-12** that flow values increased with increasing averaging time for all averaging times, time intervals and exceedance probabilities. The reasons for this are discussed in detail in **Section A.1.4.3**.

Table A.7-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 seasonal period. **Table A.7-13** shows that the flow values for this seasonal period are generally similar to those for the Apr 16-Jul 15 seasonal period. Changes in flow values with increasing averaging time are somewhat irregular, sometimes increasing and sometimes decreasing. This is likely the result of the precipitation characteristics in the geographic area around Julesburg. Most precipitation falls in short-duration convective events during this seasonal period, but significant longer-duration precipitation events also occasionally occur. The runoff characteristics of these events (and hence, flow values by averaging time) are affected by the duration of the event, soil conditions, and diversions.

Table A.7-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.7-14** shows that the flow characterizations for this seasonal period were consistent with known climatological conditions during the respective time intervals except for 1975-1998. The flow values for all exceedance probabilities except the maximum for the 1975-1998 time interval are greater than any other time interval and even the maximum is greater than any other time interval for the 30-day average flows. There is also less of a decrease in flow values with increasing averaging time compared to the proceeding time intervals for the 1975-1998 time interval. The changes in flow values by averaging time are similar to those noted for the Jun 1-Aug 15 seasonal period, except that the actual flow values are generally lower, especially for exceedance probabilities of 50 percent and lower (higher flows).

A.7.5 Median Mean Daily Flow.

The median mean daily flow by calendar day is shown on **Figure A.7-6**. **Figure A.7-6** shows a pattern of generally higher median mean daily flow values in the winter months, decreasing values in the spring, lower values in the summer months, and increasing values in the fall. Most time intervals show at least one “spike” of higher values in the June caused by high spring flood flows. This is particularly evident for the 1975-1998 time interval, which is known to have been a wet period. By contrast, the 1928-1941 time interval shows extremely low values from April through November, a probable effect of the severe drought conditions during the 1930’s. A similar but less pronounced pattern of this kind can be seen for the 1942-1958 time interval, a likely effect of the drought conditions during the 1950’s. The occurrence of very low values in July and August for all time intervals corresponds to the maximum period of upstream irrigation and the hot, dry summer climate of the South Platte River basin downstream of the Rocky Mountains. The decrease in Median mean daily flow values that is generally apparent from March through May is possibly associated with diversions into off-line reservoirs between Denver and Julesburg. This pattern differs markedly from the seasonal flow characteristics apparent upstream at the Denver gage (**Figure A.7-6**), where daily flows tend to rise during this season.

A.7.6 USGS Annual Peak Flow.

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.7-7** and **Figure A.7-8** and in **Table A.7-15** and **Table A.7-16**.

Figure A.7-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak Flow, and the 10-year running average of the USGS Annual Peak Flow. **Figure A.7-7** shows no distinct patterns with time other than those resulting from known historic climatological conditions, with one exception. It can be seen on **Figure A.7-7** that all of the highest annual peak flows occurred before 1975. Chatfield Reservoir began operation in 1976; Bear Creek Reservoir began operation in 1982.

Figure A.7-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.7-8** shows that the higher annual peak flows tended to occur in May and June, while the lower peak flows occurred at different times throughout the year. This suggests that the higher peak flows occurred as a result of high-country snowmelt runoff occurring in its usual season, and that the lower peak flows could be the result of any one (or more) of a number of local or regional causes such as thunderstorms, prolonged regional rain events, regional low-elevation snowmelt runoff, and others.

Table A.7-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.7-15** shows that the average values are greater than the median values for all time intervals. This is consistent with the known climate of the region around Julesburg for which lower peak flows are the rule, with a small number of high peak flow events originating upstream skewing the average peak flow values higher. Of some interest is that the average of the annual peak flows for the 1975-1998 time interval

is about 2,500 cfs lower than that for the 1959-1974 time interval, even though climatological conditions during these two time intervals were similar. This is possibly attributable to many effects, such as the beginning of operation of the Chatfield and Bear Creek Reservoirs, increasing trans-basin imports, and increasing urbanization in the South Platte River basin in Colorado. The lower USGS Annual Peak flows during the 1928-1941 and the 1942-1958 time intervals can be attributed to severe drought conditions during these time intervals.

Both the average and median annual peak flows occurred between mid-May and mid-June for all time intervals except 1928-1941, when they occurred in April. The 1928-1941 time interval included the severe drought period of the 1930's, during which the high-country snowpacks were deficient and thus the melting of these snowpacks would have occurred earlier than usual.

Table A.7-16 shows the exceedance probabilities and values for the USGS Annual Peak Flow. It is analogous to **Table A.7-5** for Annual Maximum mean daily flows. **Table A.7-16** shows that, for the 1910-1927 through 1959-1974 time intervals, the peak flow values are generally consistent with known climatological conditions for all exceedance probabilities. The peak flow values for the 1975-1998 time intervals are lower than those for the 1959-1974 time interval for all exceedance probabilities, with the difference increasing with decreasing exceedance probability, even though climatological conditions during these two time intervals were similar. The probability of exceeding a peak flow of 1,000 cfs is increasing for the most recent time intervals. This is possibly attributable to many effects, such as the beginning of operation of the Chatfield and Bear Creek Reservoirs, increasing trans-basin imports, and increasing urbanization in the South Platte River basin in Colorado.

MEDIAN MEAN DAILY FLOW

South Platte River at Julesburg, CO

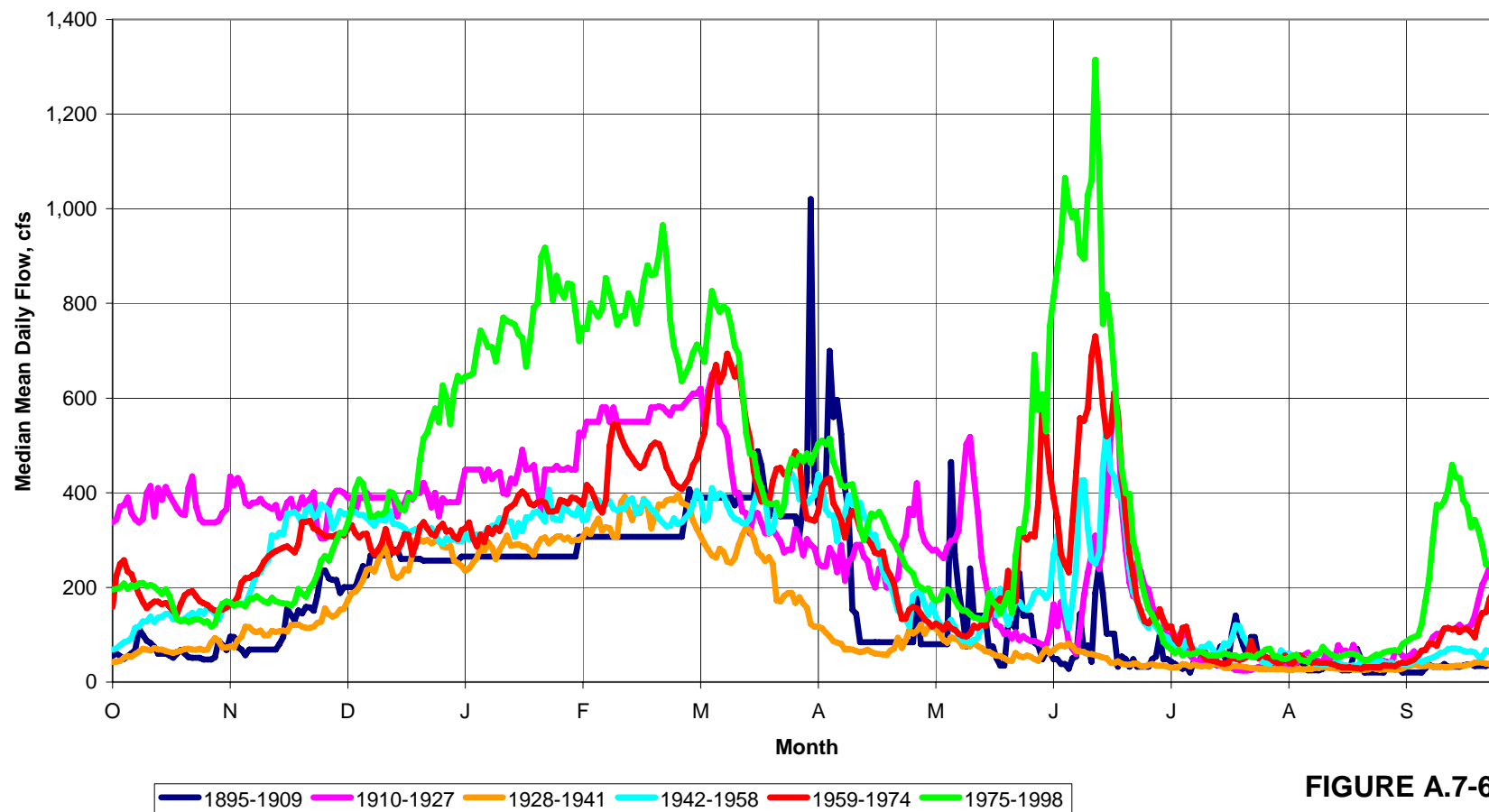


FIGURE A.7-6

Figure A.7-6 Median Mean Daily Flow.

ANNUAL USGS PEAK FLOW

South Platte River at Julesburg, CO

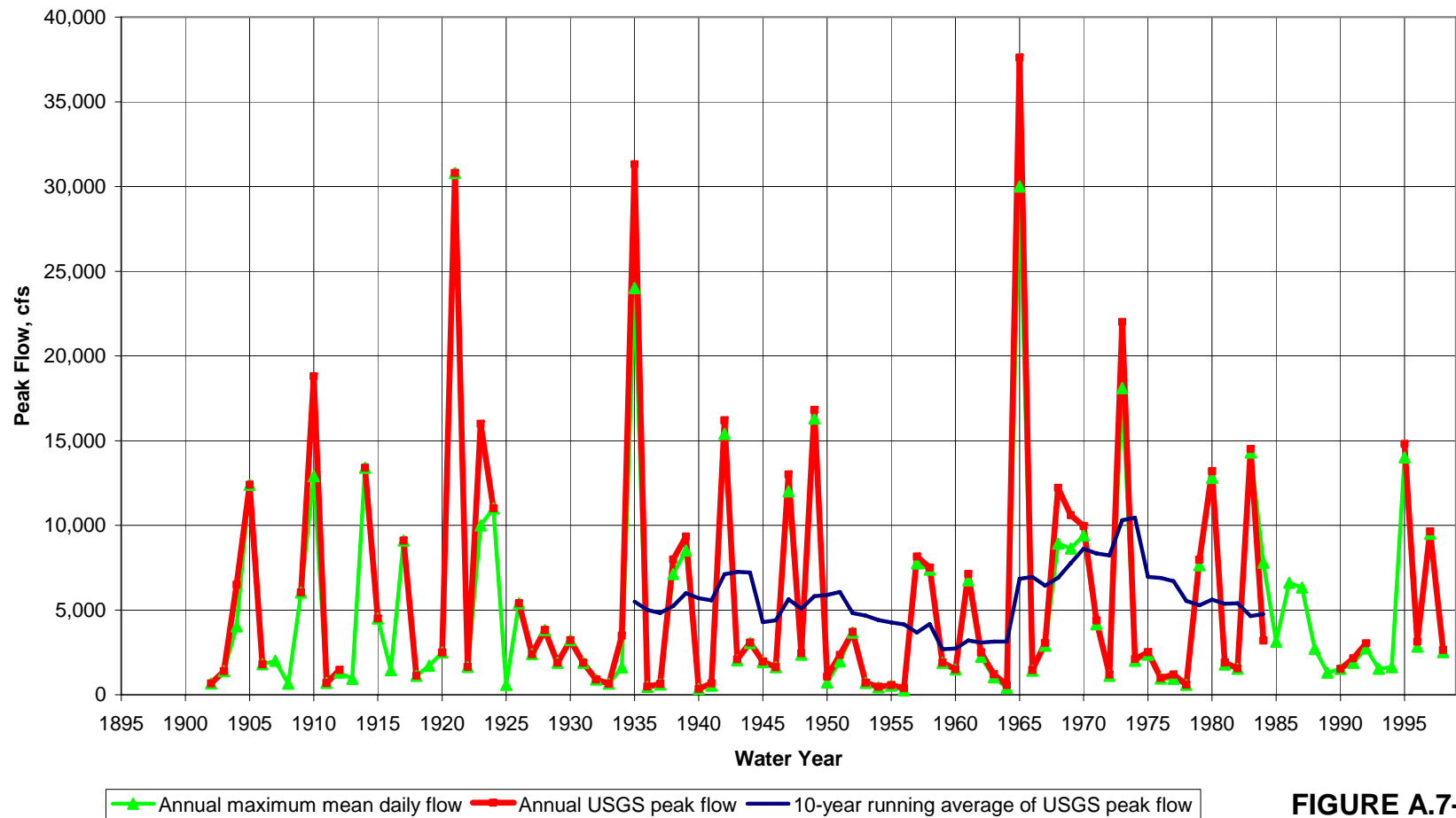


FIGURE A.7-7

Figure A.7-7 Annual USGS Peak Flow.

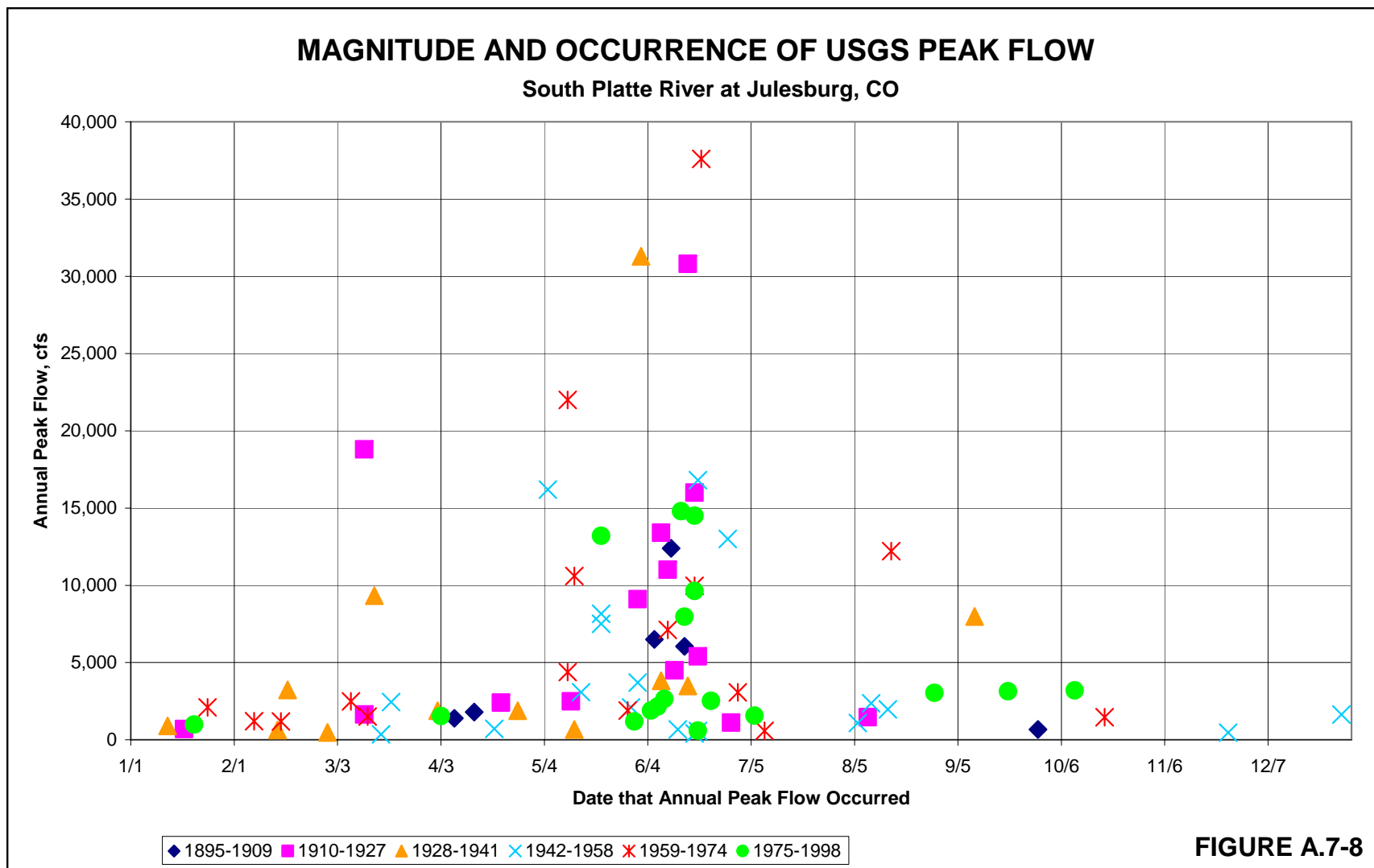
**FIGURE A.7-8****Figure A.7-8** Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.7-15 Summary of USGS Peak Flows.

South Platte River at Julesburg, CO	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	5,955	6,300	5,720	4,799	8,486	4,756	4,832	7,458	4,973
Median Annual Peak Flow (cfs)	2,500	2,855	2,500	3,920	4,950	1,880	2,350	2,775	2,640
Average Occurrence of Peak Flow	5/29	5/10	6/11	6/8	5/18	4/20	6/30	5/16	6/17
Median Occurrence of Peak Flow	6/8	6/2	6/14	6/11	6/10	4/26	6/18	5/29	6/15

Table A.7-16 USGS Peak Flow Exceedance Values.

South Platte River at Julesburg, CO Annual Peak Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Peak exceeded in 100% of the years	349	349	399	662	700	349	399	572	588
Peak exceeded in 90% of the years	660	660	695	1,026	1,222	529	522	1,195	1,108
Peak exceeded in 80% of the years	1,162	822	1,198	1,390	1,568	652	782	1,460	1,536
Peak exceeded in 70% of the years	1,557	1,453	1,609	1,595	2,324	661	1,520	1,700	1,832
Peak exceeded in 60% of the years	1,986	1,880	2,096	1,800	2,892	1,098	2,012	2,100	2,294
Peak exceeded in 50% of the years	2,500	2,855	2,500	3,920	4,950	1,880	2,350	2,775	2,640
Peak exceeded in 40% of the years	3,428	4,364	3,104	6,040	8,360	2,952	2,828	4,380	3,100
Peak exceeded in 30% of the years	7,159	6,648	7,237	6,270	11,240	3,514	4,462	8,540	4,154
Peak exceeded in 20% of the years	10,216	9,998	10,088	6,500	14,440	5,484	8,030	10,600	9,298
Peak exceeded in 10% of the years	14,710	15,220	14,530	9,450	17,960	8,925	14,280	17,100	13,720
Peak Flow	37,600	31,300	37,600	12,400	30,800	31,300	16,800	37,600	14,800

A.8 SOUTH PLATTE RIVER AT NORTH PLATTE, NEBRASKA

A.8.1 Methodology

For this location, a single gage record was used, as follows:

Gage	Records Used	Data Source
South Platte River at North Platte, NE	1/1/1914 – 9/30/1998	Prior to 1915, 1914 Nebraska Hydrographic Report. 1915-1928, 1929 Nebraska Hydrographic Report. 1929-1930, 1931 Nebraska Hydrographic Report. 1931-9/30/1994, USGS website. 10/1/1994-1998, Nebraska DNR website.

Summary statistics characterizing this record are presented in **Table A.8-1** (mean daily values), **Table A.8-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.8-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.8-4** (flow frequencies).

A.8.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.8-1 shows that there is no obvious pattern to changes in either average or median annual maximum mean daily flow by time interval. **Table A.8-1** does show that the averages were higher than the medians, indicating the occurrence of a relatively small number of very high maximum flow events. Annual flow volumes, both average and median, were lowest in the 1928-1941 time interval and increased steadily in subsequent time intervals, similar to the trend at Julesburg. However, this trend is less pronounced at North Platte than at Julesburg, possibly due to the effects of the Keystone Diversion, which began operation in 1935, and the Korty Diversion, which began operation in 1946 (GEI Consultants, Inc, 1997).

Figure A.8-1 (maximum flows) shows no obvious changes in the pattern of the maximum mean daily flow quantities. This is consistent with **Table A.8-1**. Whatever effect the upstream reservoirs near Denver and at other locations in the South Platte basin may have had on Annual Maximum mean daily flow upstream is not discernible at North Platte. **Figure A.8-2** (annual flow volumes) shows the effects of both the dry periods of the 1930's and 1950's and the major high flow events of 1973 and 1983 on the annual flow volume. These effects carry over into the 10-year running average.

Table A.8-1 Summary of Mean Daily Flow Values.

South Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	4,443	5,056	4,153		6,655	3,336	4,121	4,380	4,024
Median Annual Maximum Mean Daily Flow (cfs)	2,015	2,600	1,680		4,100	1,060	1,640	1,725	1,760
Average Annual Flow Volume (kaf)	324	279	346		362	189	295	270	433
Median Annual Flow Volume (kaf)	221	214	221		369	106	260	209	247
Average Mean Daily Flow (cfs)	519	607	478		928	261	408	373	598
Median Mean Daily Flow (cfs)	179	250	170		300	73	166	167	227
Average Number of Mean Daily Flow Measurements	342	295	365	0	230	365	365	365	365
Number of Years of Data	84 of 104	27 of 47	57 of 57	0 of 15	14 of 18	13 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	914	1,510	705		1,569	1,478	582	503	927
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	4,028	4,429	3,838		6,385	2,322	3,951	3,936	3,693
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	3,388	3,875	3,157		5,682	1,928	2,934	3,106	3,350
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	701	587	754		473	711	406	695	1,041
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	587	841	490		1,350	700	278	302	631
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	1,420	1,550	1,380		4,000	860	1,340	1,046	1,420
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	659	650	783		3,125	344	783	478	1,285
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	308	210	333		300	84	322	325	491
Difference ("Apr-Jul Average" - "Jul-Sep Average")	3,327	3,841	3,084		5,912	1,612	3,545	3,241	2,652
Difference ("Apr-Jul Median" - "Jul-Sep Median")	1,112	1,340	1,047		3,700	776	1,018	721	930
Average Occurrence of Maximum Mean Daily Flow	5/6	4/22	5/12		4/30	4/15	5/17	5/5	5/13
Median Occurrence of Maximum Mean Daily Flow	5/23	4/17	5/28		4/20	3/16	5/23	6/2	6/11
Average Annual Minimum Mean Daily Flow (cfs)	73	6	93		0	7	67	93	112
Median Annual Minimum Mean Daily Flow (cfs)	82	0	90		0	0	65	90	107
Average occurrences per year of the Minimum	15	52	1		45	54	1	2	1
Occurring between	9/24	7/13	10/20		7/21	7/12	12/6	10/9	9/23
and	10/21	10/8	10/25		9/23	10/12	12/7	10/14	10/2
Median occurrences per year of the Minimum	1	47	1		59	46	1	1	1
Occurring between	8/23	7/24	9/14		7/24	7/8	1/16	8/29	9/3
and	9/30	9/30	10/2		9/21	9/30	1/22	9/7	9/9

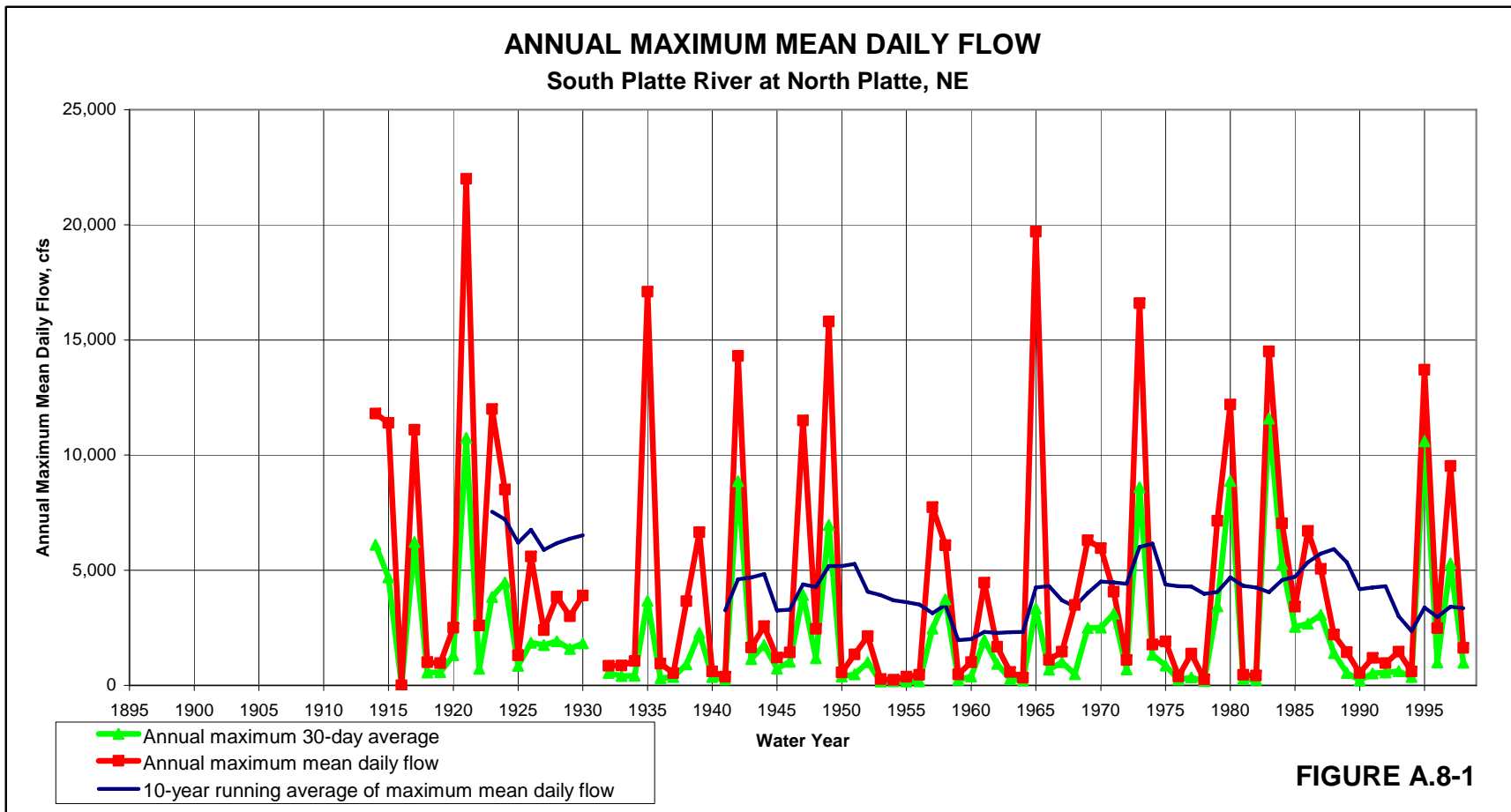


Figure A.8-1 Annual Maximum Mean Daily Flow.

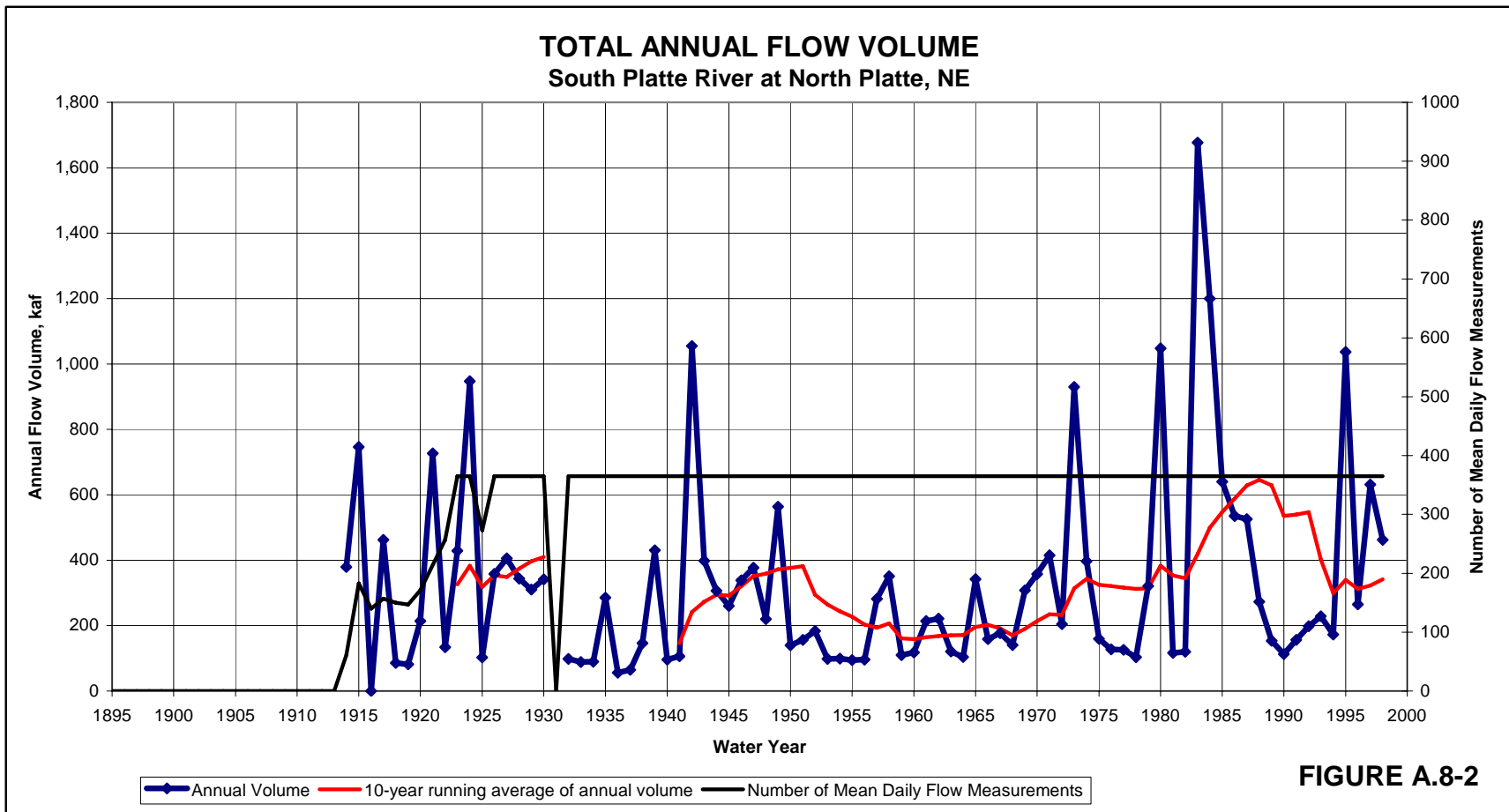


Figure A.8-2 Total Annual Flow Volume.

Figure A.8-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.8-3** shows that the highest values of Annual Maximum mean daily flow occurred in May and June, as at other South Platte River locations. However the scatter through other months shows a somewhat different pattern. There are noticeably more occurrences of annual maximums before May and June than after. This may result from the combined effects of upstream irrigation, the dry summer climate of the basin, and the operation of the Korty Diversion. **Figure A.8-3** also shows a secondary concentration of occurrences of annual maximum mean daily flow in Late February through mid-March. This concentration most likely is the result of occurrences of seasons when there is a below-normal high-country snowpack and/or below normal precipitation in April through June. In these situations, the Annual Maximum mean daily flow would often occur earlier, and be caused by regional precipitation events, including snowmelt runoff from late-season snowstorms.

Both the average and median Dates of Maximum Flow are in the Apr 16-Jul 15 seasonal period except for the median in 1959-1974, which was highest in the Feb 15-Mar 16 seasonal period (**Table A.8-1**). All maximum flow quantities drop off in value from the Apr 16-Jul 15 seasonal period to the Jul 15-Sep 30 seasonal period in a way generally proportional to the magnitude of the maximums themselves. The average Dates of Maximum Flow are fairly consistent, usually occurring in May. The median Dates of Maximum Flow are similarly consistent except in the 1928-1941 time interval, when the date is April 3, a possible effect of severe drought conditions of the 1930's.

Figure A.8-4 shows that, for the 1910-1927 time interval, the 30-day average minimum flows were quite high, suggesting relatively few extended dry periods. Another explanation for this is that, for most of this time interval, data exist only for the high-flow time of the year, which would introduce a bias into the averaging process. Both **Table A.8-1** and **Figure A.8-4** show the effect of the 1930's drought period. For the 1928-1941 time interval (**Table A.8-1**), the average minimum is 3 cfs and the median minimum is 0 cfs, whereas both of these quantities are greater than 60 cfs for all later time intervals. Average Annual Minimum mean daily flows (**Figure A.8-4**) were at or near 0 cfs for most of the decade of the 1930's. The Annual Minimum mean daily flows then rose rapidly from the late 1930's through the early 1940's, and have risen slowly since then. This trend also shows up in the 10-year running average. The trend since the late 1930's is a possible result of increased irrigation return flows. These would have increased after the 1930's in part because of increased precipitation, and in part because of the new availability of water from Lake McConaughy to provide flow in the North Platte and the Sutherland Canal at otherwise-dry times of the year. Since the late 1930's the difference between the Annual Minimum mean daily flow and the annual minimum 30-day average flow has remained relatively constant. Neither the average nor the median Dates of Minimum Flow show a consistent pattern (**Table A.8-1**). Minimum flows were not calculated for years with incomplete flow records.

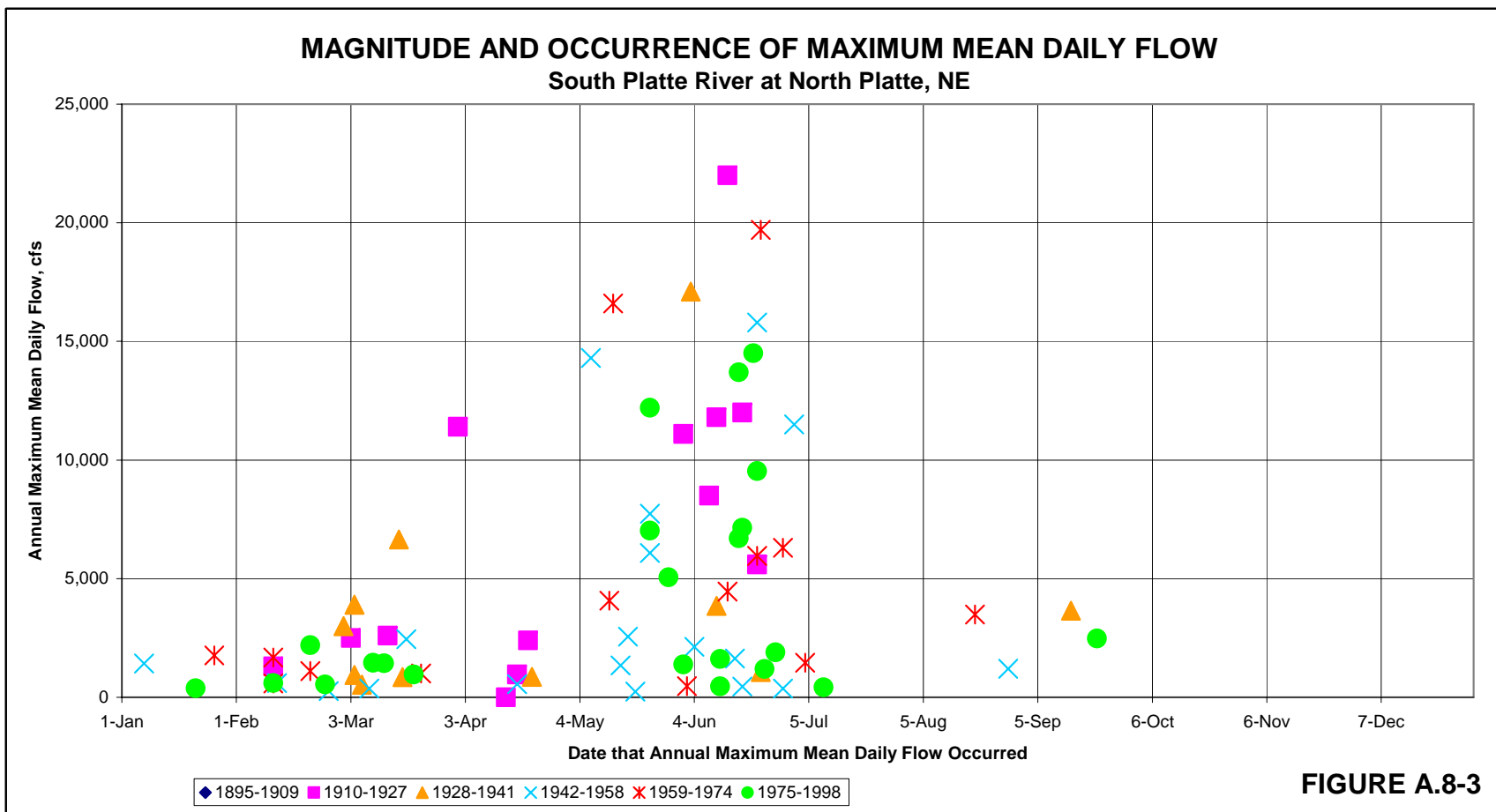


FIGURE A.8-3

Figure A.8-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow

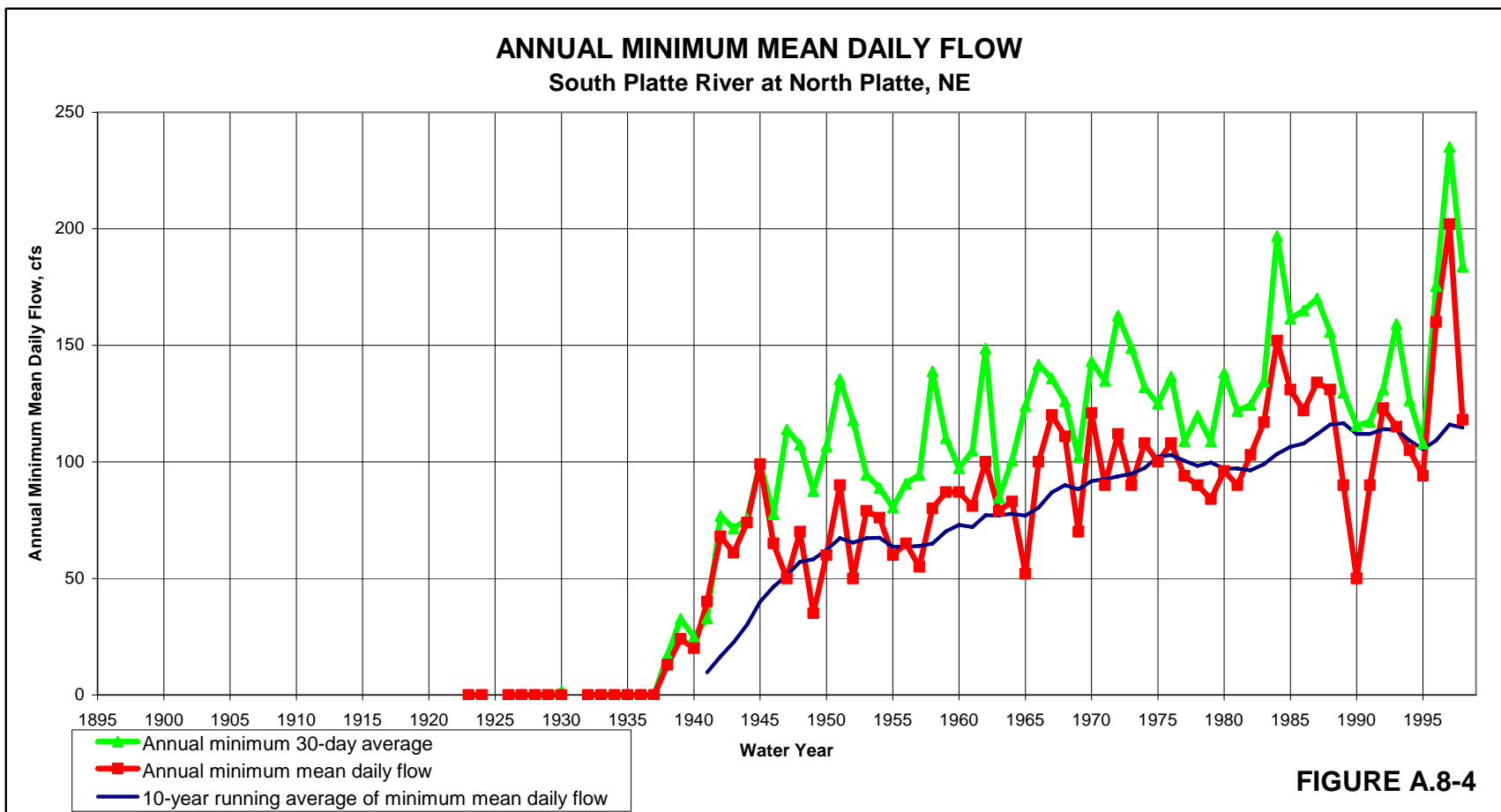


Figure A.8-4 Annual Minimum Mean Daily Flow.

Table A.8-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

South Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	4,443	5,056	4,153		6,655	3,336	4,121	4,380	4,024
Median Annual Maximum Mean Daily Flow (cfs)	2,015	2,600	1,680		4,100	1,060	1,640	1,725	1,760
Avg. Ann. Max. 3-day Avg. Flow (cfs)	4,061	4,584	3,814		6,179	2,867	3,843	3,797	3,804
Median Ann. Max. 3-day Avg. Flow (cfs)	1,838	2,333	1,560		3,850	826	1,533	1,645	1,640
Avg. Ann. Max. 7-day Avg. Flow (cfs)	3,552	3,902	3,386		5,629	2,043	3,454	3,179	3,475
Median Ann. Max. 7-day Avg. Flow (cfs)	1,526	2,286	1,470		3,375	743	1,493	1,431	1,430
Avg. Ann. Max. 15-day Avg. Flow (cfs)	2,929	3,049	2,872		4,480	1,509	2,926	2,501	3,080
Median Ann. Max. 15-day Avg. Flow (cfs)	1,334	1,648	1,290		2,643	633	1,346	1,306	1,152
Avg. Ann. Max. 30-day Avg. Flow (cfs)	2,175	2,166	2,179		3,118	1,141	2,018	1,766	2,568
Median Ann. Max. 30-day Avg. Flow (cfs)	996	1,298	993		1,802	537	1,029	966	920
Average Annual Minimum Mean Daily Flow (cfs)	73	6	93		0	7	67	93	112
Median Annual Minimum Mean Daily Flow (cfs)	82	0	90		0	0	65	90	107
Avg. Ann. Min. 3-day Avg. Flow (cfs)	80	6	101		0	8	78	99	118
Median Ann. Min. 3-day Avg. Flow (cfs)	90	0	97		0	0	80	93	110
Avg. Ann. Min. 7-day Avg. Flow (cfs)	87	6	110		0	8	88	107	126
Median Ann. Min. 7-day Avg. Flow (cfs)	100	0	109		0	0	87	110	119
Avg. Ann. Min. 15-day Avg. Flow (cfs)	93	6	117		0	8	94	116	134
Median Ann. Min. 15-day Avg. Flow (cfs)	104	0	114		0	0	95	122	123
Avg. Ann. Min. 30-day Avg. Flow (cfs)	99	7	125		0	9	97	125	144
Median Ann. Min. 30-day Avg. Flow (cfs)	109	0	124		0	0	94	129	133

Table A.8-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

South Platte River at North Platte, NE 3-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 3-day Avg. Flow (cfs)	4,061	4,584	3,814		6,179	2,867	3,843	3,797	3,804
Median Ann. Max. 3-day Avg. Flow (cfs)	1,838	2,333	1,560		3,850	826	1,533	1,645	1,640
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	800	1,204	658		1,306	1,148	548	473	860
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	3,693	4,014	3,541		5,870	2,015	3,686	3,431	3,511
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	3,149	3,552	2,958		5,331	1,636	2,775	2,800	3,194
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	628	516	681		424	615	373	587	962
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	517	719	460		1,183	600	244	275	585
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	1,240	1,517	1,117		3,850	727	1,117	1,016	1,238
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	620	589	710		3,100	277	710	445	1,056
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	286	197	315		247	80	315	291	443

South Platte River at North Platte, NE 7-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 7-day Avg. Flow (cfs)	3,552	3,902	3,386		5,629	2,043	3,454	3,179	3,475
Median Ann. Max. 7-day Avg. Flow (cfs)	1,526	2,286	1,470		3,375	743	1,493	1,431	1,430
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	680	977	581		1,052	942	485	412	762
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	3,255	3,454	3,160		5,347	1,417	3,319	2,900	3,220
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	2,741	3,062	2,588		4,925	1,056	2,471	2,268	2,885
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	529	411	585		341	487	328	451	855
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	471	603	325		1,022	486	209	232	506
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	1,055	1,450	1,034		3,375	512	1,076	951	928
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	499	493	593		2,607	261	593	383	712
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	263	159	288		206	72	299	263	348

South Platte River at North Platte, NE 15-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 15-day Avg. Flow (cfs)	2,929	3,049	2,872		4,480	1,509	2,926	2,501	3,080
Median Ann. Max. 15-day Avg. Flow (cfs)	1,334	1,648	1,290		2,643	633	1,346	1,306	1,152
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	577	820	496		928	770	423	353	642
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	2,710	2,770	2,682		4,343	1,076	2,810	2,284	2,857
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	2,203	2,413	2,103		3,970	736	1,941	1,661	2,512
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	433	296	498		250	346	292	360	737
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	396	500	258		879	406	192	202	404
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	827	1,317	713		2,643	384	956	840	702
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	389	323	416		1,821	224	468	322	554
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	235	88	245		155	58	245	242	291

South Platte River at North Platte, NE 30-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 30-day Avg. Flow (cfs)	2,175	2,166	2,179		3,118	1,141	2,018	1,766	2,568
Median Ann. Max. 30-day Avg. Flow (cfs)	996	1,298	993		1,802	537	1,029	966	920
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	455	616	404		720	576	360	304	502
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	2,001	1,946	2,026		3,016	794	1,915	1,598	2,391
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,574	1,669	1,531		2,815	522	1,266	1,108	1,999
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	319	189	378		162	216	233	266	554
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	342	390	227		505	344	167	189	347
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	679	888	636		1,727	316	723	572	576
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	300	211	344		1,855	145	344	275	441
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	192	40	217		36	45	217	216	250

Table A.8-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.8-3** shows changes in flow values by time interval that are mainly, but not entirely, attributable to climatic variations by time interval. In particular, the increase in the flow values between the 1928-1941 and 1942-1958 time intervals for the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods appears to be much larger than what would be expected considering the known climatic variation by time interval. These effects are possibly the result of the coincident beginning of operation of Cherry Creek Reservoir and the Colorado-Big Thompson Project. On the other hand, the changes in the flow values for the median are more in line with the known climatic variation by time interval. This suggests that the large increases between the time intervals for the Apr 16-Jul 15 and the Jun 1-Aug 15 time interval are, at this location, more likely the result of isolated high flow events which occurred during the 1942-1958 time interval.

The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to insufficient data for these time intervals.

A.8.4 Flow Frequency and Exceedance

A.8.4.1 Flow Ranges

In **Table A.8-4** and **Figure A.8-5**, the flow frequency distributions for Percentage of Years and Percentage of Days for the time intervals 1928-1941 through 1959-1974 are fairly similar. On an annual basis, flows between 0 and 500 cfs occurred in between 93 and 100 percent of the years in these time intervals; on a daily basis, the frequency exceeded 60 percent for the 0-200-cfs flow range, and exceeded 20 percent for the 201-500-cfs flow range. For the 1910-1927 and 1975-1998 time intervals, the frequencies were lower than for the intervening time intervals for the 0-200-cfs flow range and higher for all flow ranges greater than 200 cfs. These were generally wet periods relative to the intervening time intervals. The effects of the 1930's drought period show up in the higher flow ranges for percentage of years, and are also apparent for percentage of days, as indicated by the zero percent frequencies for flow ranges above 5,000 cfs.

A.8.4.2 Maximum Mean Flow Exceedance.

Table A.8-5 through **Table A.8-9** show the exceedance values and probabilities for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13), for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix. The 1895-1909 and 1910-1927 time intervals were not considered for any of the following characterizations due to insufficient data for these time intervals.

Table A.8-5 shows the exceedance probabilities and values for annual maximum flow data. **Table A.8-5** shows that, except for the 1975-1998 time interval, the variations in

flow values by time interval were generally consistent with the known climatological conditions by time interval, and the flow values decreased with increasing averaging time in the usual way. For all averaging times of 3 days and greater, the flow values are somewhat higher for the 1959-1974 time interval than that for the 1975-1998 time interval for exceedance probabilities of 50 percent and higher (lower flows). These differences could be at least partially attributable to the offsetting effects of the beginning of operation of the Chatfield and Bear Creek Reservoirs and the beginning of operation of the Roberts Tunnel Diversion, to the extent that the effects of these features are discernable this far downstream of their location. Also, for the 20 percent and lower exceedance probabilities (Higher flows), the flow values for the 1942-1958 time interval are somewhat higher than those for the 1959-1974 time interval. This is most likely the result of isolated very high flow events during the high-flow seasons of the 1942-1958 time interval.

Table A.8-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.8-6** shows that, for the 1928-1941 through 1975-1998 time intervals, the flow values generally coincided with known climatological conditions. An exception to this characterization is the 1942-1958 time interval, for which the flow values for the 10-percent exceedance probability (highest flows) are significantly lower than those for the 1928-1941 time interval for all averaging times. This is coincident with the beginning of operation of Cherry Creek Reservoir in 1950.

Table A.8-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.8-7** shows that, for the 1928-1941 through 1959-1974 time intervals, the flow values generally coincided with known climatological conditions for the respective time intervals, and showed the expected decreases with increasing averaging time for all exceedance probabilities. The characterizations for the 1975-1998 time interval showed the same differences with respect to the preceding time intervals for this seasonal period as those for annual data (**Table A.8-5**). This again could be attributable to the offsetting effects of the beginning of operation of the Chatfield and Bear Creek Reservoirs and the beginning of operation of the Roberts Tunnel Diversion. For the 20 percent and lower exceedance probabilities (higher flows), the flow values for the 1942-1958 time interval are higher than those for the 1959-1974 time interval, most likely for reasons explained in the discussion for annual data (**Table A.8-5**).

Table A.8-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.8-8** shows characterizations for this seasonal period that are very similar to those for the Apr 16-Jul 15 seasonal period, except that the flow values are generally somewhat lower across the board. This seasonal period is past the time of the most precipitation and snowmelt runoff in most years.

Table A.8-4 Flow Frequency Distributions.

South Platte River at North Platte, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	99	100	98	0	100	100	100	100	96
201 to 500	99	96	100	0	93	100	100	100	100
501 to 750	86	93	82	0	93	92	76	88	83
751 to 1,000	75	78	74	0	86	69	71	75	75
1,001 to 2,000	70	67	72	0	79	54	71	75	71
2,001 to 3,000	50	59	46	0	71	46	47	44	46
3,001 to 4,000	39	44	37	0	50	38	29	44	38
4,001 to 5,000	33	33	33	0	50	15	29	38	33
5,001 to 6,000	31	33	30	0	50	15	29	25	33
6,001 to 8,000	26	26	26	0	43	8	29	19	29
8,001 to 10,000	19	26	16	0	43	8	18	13	17
10,001 to 12,000	14	19	12	0	36	0	18	6	13
12,001 to 15,000	10	4	12	0	7	0	12	13	13
Greater than 15,000	6	7	5	0	7	8	6	13	0
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
South Platte River at North Platte, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	56.9	56.3	57.2	0.0	42.9	65.4	63.5	65.9	46.9
201 to 500	25.3	23.8	25.8	0.0	25.3	22.8	21.4	21.8	31.6
501 to 750	5.1	5.7	4.9	0.0	6.8	4.9	5.9	3.4	5.3
751 to 1,000	3.7	3.6	3.8	0.0	6.1	1.8	3.3	2.8	4.7
1,001 to 2,000	5.2	6.8	4.5	0.0	11.3	3.8	3.2	3.7	6.1
2,001 to 3,000	1.3	1.4	1.3	0.0	2.1	0.8	0.8	0.5	2.1
3,001 to 4,000	0.6	0.8	0.6	0.0	1.6	0.2	0.3	0.7	0.7
4,001 to 5,000	0.5	0.4	0.5	0.0	0.8	0.1	0.4	0.4	0.6
5,001 to 6,000	0.3	0.3	0.4	0.0	0.7	0.0	0.4	0.2	0.5
6,001 to 8,000	0.3	0.3	0.3	0.0	0.7	0.0	0.2	0.1	0.5
8,001 to 10,000	0.3	0.3	0.3	0.0	0.7	0.0	0.2	0.2	0.5
10,001 to 12,000	0.2	0.2	0.2	0.0	0.6	0.0	0.1	0.2	0.4
12,001 to 15,000	0.1	0.0	0.2	0.0	0.1	0.0	0.2	0.1	0.2
Greater than 15,000	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
South Platte River at North Platte, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	195	166	209	0	98	239	232	241	171
201 to 500	86	70	94	0	58	83	78	80	115
501 to 750	18	17	18	0	16	18	22	13	19
751 to 1,000	13	11	14	0	14	7	12	10	17
1,001 to 2,000	18	20	17	0	26	14	12	13	22
2,001 to 3,000	4	4	5	0	5	3	3	2	8
3,001 to 4,000	2	2	2	0	4	1	1	3	3
4,001 to 5,000	2	1	2	0	2	0	1	1	2
5,001 to 6,000	1	1	1	0	2	0	1	1	2
6,001 to 8,000	1	1	1	0	2	0	1	0	2
8,001 to 10,000	1	1	1	0	2	0	1	1	2
10,001 to 12,000	1	1	1	0	1	0	0	1	1
12,001 to 15,000	0	0	1	0	0	0	1	0	1
Greater than 15,000	0	0	0	0	1	0	0	0	0
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

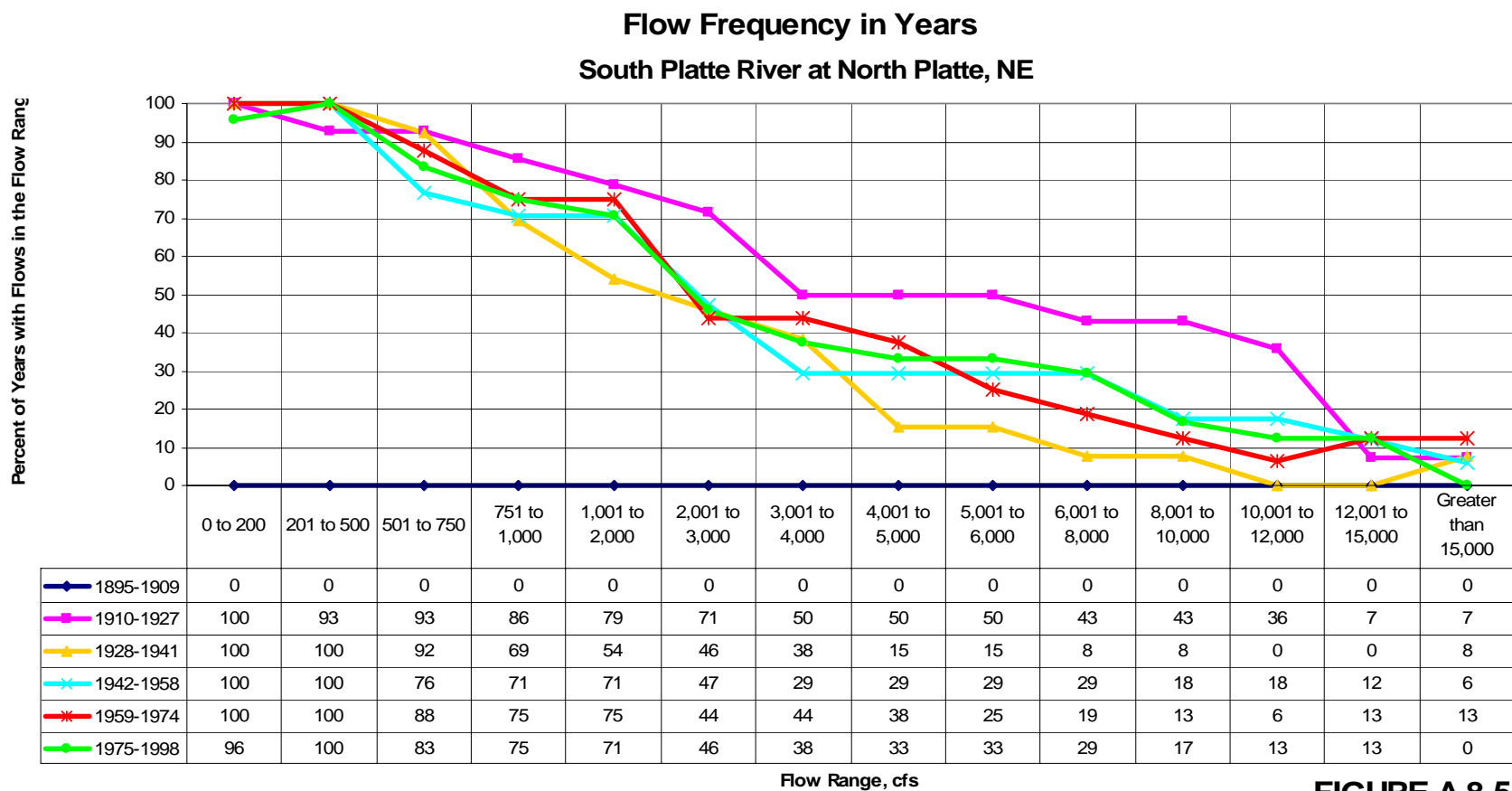


FIGURE A.8-5

Figure A.8-5 Flow Frequency in Years.

Table A.8-5 Maximum Flow Exceedance Values, Annual Data.

South Platte River at North Platte, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	3	3	236		3	369	236	327	256
Maximum exceeded in 90% of the years	431	572	405			972	544	530	432
Maximum exceeded in 80% of the years	600	876	562		1,180	700	475	1,000	576
Maximum exceeded in 70% of the years	1,054	992	1,108		2,290	856	1,071	1,105	1,168
Maximum exceeded in 60% of the years	1,432	1,740	1,434		2,520	926	1,376	1,460	1,444
Maximum exceeded in 50% of the years	2,015	2,600	1,680		4,100	1,060	1,640	1,725	1,760
Maximum exceeded in 40% of the years	2,920	3,770	2,468		7,920	3,130	2,322	3,490	2,424
Maximum exceeded in 30% of the years	5,114	5,810	4,580		11,130	3,730	3,264	4,265	5,224
Maximum exceeded in 20% of the years	7,386	10,580	6,964		11,560	3,880	7,408	5,960	7,078
Maximum exceeded in 10% of the years	12,140	11,880	12,800		11,940	6,100	12,620	11,450	11,399
Maximum	22,000	22,000	19,700		22,000	17,100	15,800	19,700	14,500
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	3	3	228		3	348	232	320	228
Maximum exceeded in 90% of the years	365	529	353		925	512	269	496	391
Maximum exceeded in 80% of the years	549	754	497		1,126	618	398	909	476
Maximum exceeded in 70% of the years	946	880	988		1,771	733	852	1,108	994
Maximum exceeded in 60% of the years	1,235	1,459	1,258		2,093	801	1,235	1,440	1,232
Maximum exceeded in 50% of the years	1,838	2,333	1,560		3,850	826	1,533	1,645	1,640
Maximum exceeded in 40% of the years	2,497	3,262	2,207		7,473	3,016	2,163	2,350	2,154
Maximum exceeded in 30% of the years	5,085	5,419	4,352		10,163	3,201	3,204	4,040	5,172
Maximum exceeded in 20% of the years	6,632	9,707	6,235		10,553	3,393	6,087	5,727	6,632
Maximum exceeded in 10% of the years	11,720	11,053	12,293		11,293	5,184	12,060	9,917	11,046
Maximum	21,000	21,000	15,600		21,000	14,267	15,067	15,600	13,967
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	3	3	204		3	332	209	287	204
Maximum exceeded in 90% of the years	318	470	297		810	468	221	399	318
Maximum exceeded in 80% of the years	496	566	422		1,039	488	325	701	397
Maximum exceeded in 70% of the years	754	770	750		1,348	539	665	1,074	753
Maximum exceeded in 60% of the years	1,121	1,233	1,109		1,760	593	1,154	1,286	901
Maximum exceeded in 50% of the years	1,526	2,286	1,470		3,375	743	1,493	1,431	1,430
Maximum exceeded in 40% of the years	2,393	2,601	1,911		7,236	2,446	1,864	1,560	2,002
Maximum exceeded in 30% of the years	4,070	4,011	4,188		9,060	2,584	3,039	3,816	4,900
Maximum exceeded in 20% of the years	6,251	8,279	5,615		9,709	2,854	5,448	5,283	6,251
Maximum exceeded in 10% of the years	10,234	9,709	10,378		10,281	3,718	10,381	8,006	9,997
Maximum	19,400	19,400	14,029		19,400	8,367	14,029	12,286	12,900
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	2	2	187		2	317	187	230	194
Maximum exceeded in 90% of the years	259	402	238		694	398	189	309	259
Maximum exceeded in 80% of the years	417	442	351		927	413	259	520	359
Maximum exceeded in 70% of the years	616	630	612		1,031	427	587	843	594
Maximum exceeded in 60% of the years	957	992	948		1,581	480	1,026	1,003	731
Maximum exceeded in 50% of the years	1,334	1,648	1,290		2,643	633	1,346	1,306	1,152
Maximum exceeded in 40% of the years	2,029	2,336	1,475		5,002	1,757	1,412	1,428	1,758
Maximum exceeded in 30% of the years	3,231	2,804	3,556		6,645	2,287	2,616	3,285	4,019
Maximum exceeded in 20% of the years	5,372	5,372	5,186		7,355	2,465	5,120	4,222	5,438
Maximum exceeded in 10% of the years	8,242	7,355	8,617		8,981	2,660	8,460	5,208	9,080
Maximum	16,093	16,093	12,027		16,093	5,059	11,865	10,716	12,027
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	2	2	168		2	259	168	203	183
Maximum exceeded in 90% of the years	236	343	213		563	323	171	255	237
Maximum exceeded in 80% of the years	365	402	285		654	365	215	386	315
Maximum exceeded in 70% of the years	514	556	484		837	386	457	585	502
Maximum exceeded in 60% of the years	695	767	687		1,388	413	837	692	569
Maximum exceeded in 50% of the years	996	1,298	993		1,802	537	1,029	966	920
Maximum exceeded in 40% of the years	1,546	1,794	1,268		3,437	1,043	1,164	1,325	1,318
Maximum exceeded in 30% of the years	2,464	1,988	2,495		4,491	1,680	1,895	2,226	2,715
Maximum exceeded in 20% of the years	3,528	3,800	3,297		5,251	1,879	3,478	2,508	4,166
Maximum exceeded in 10% of the years	5,860	5,251	5,960		6,191	2,206	5,136	3,230	7,798
Maximum	11,590	10,747	11,590		10,747	3,672	8,860	8,611	11,590

Table A.8-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

South Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	139	290	139		700	290	139	148	175
Maximum exceeded in 90% of the years	176	402	173		880	376	164	159	223
Maximum exceeded in 80% of the years	217	515	179		1,026	428	177	174	272
Maximum exceeded in 70% of the years	280	649	241		1,104	501	189	180	347
Maximum exceeded in 60% of the years	428	700	279		1,218	530	244	213	508
Maximum exceeded in 50% of the years	587	841	490		1,350	700	278	302	631
Maximum exceeded in 40% of the years	754	1,052	677		1,560	708	406	539	803
Maximum exceeded in 30% of the years	1,018	1,455	838		1,860	821	811	747	1,188
Maximum exceeded in 20% of the years	1,322	2,520	1,150		2,340	2,177	1,059	821	1,532
Maximum exceeded in 10% of the years	2,224	3,090	1,532		2,540	3,720	1,302	1,095	2,242
Maximum	6,650	6,650	2,610		2,600	6,650	1,920	1,190	2,610
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	138	268	138		517	268	138	146	165
Maximum exceeded in 90% of the years	169	377	167		747	354	161	156	212
Maximum exceeded in 80% of the years	211	478	174		935	382	171	170	247
Maximum exceeded in 70% of the years	250	513	217		1,041	455	187	173	313
Maximum exceeded in 60% of the years	382	616	248		1,119	503	223	211	466
Maximum exceeded in 50% of the years	517	719	460		1,183	600	244	275	585
Maximum exceeded in 40% of the years	714	971	605		1,433	642	382	477	708
Maximum exceeded in 30% of the years	918	1,308	760		1,647	715	760	700	1,011
Maximum exceeded in 20% of the years	1,179	1,873	1,053		1,787	2,095	998	800	1,448
Maximum exceeded in 10% of the years	1,913	3,040	1,490		1,913	3,320	1,257	1,035	2,207
Maximum	3,477	3,477	2,503		2,033	3,477	1,763	1,090	2,503
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	136	258	136		500	258	136	145	156
Maximum exceeded in 90% of the years	164	348	156		613	336	151	153	201
Maximum exceeded in 80% of the years	196	414	171		725	356	168	165	226
Maximum exceeded in 70% of the years	229	474	202		817	414	181	169	280
Maximum exceeded in 60% of the years	332	489	229		909	464	199	190	344
Maximum exceeded in 50% of the years	471	603	325		1,022	486	209	232	506
Maximum exceeded in 40% of the years	583	720	510		1,136	509	359	339	602
Maximum exceeded in 30% of the years	725	1,045	672		1,282	642	666	530	764
Maximum exceeded in 20% of the years	1,026	1,503	871		1,429	1,549	847	717	1,258
Maximum exceeded in 10% of the years	1,589	2,219	1,308		1,521	2,531	1,068	912	2,027
Maximum	3,000	3,000	2,393		1,614	3,000	1,564	1,045	2,393
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	135	201	135		500	201	135	143	146
Maximum exceeded in 90% of the years	157	314	150		518	308	148	149	172
Maximum exceeded in 80% of the years	176	363	167		536	327	164	157	197
Maximum exceeded in 70% of the years	198	393	177		602	363	174	163	241
Maximum exceeded in 60% of the years	277	425	198		668	383	181	168	280
Maximum exceeded in 50% of the years	396	500	258		879	406	192	202	404
Maximum exceeded in 40% of the years	487	614	436		1,090	425	342	277	519
Maximum exceeded in 30% of the years	605	921	560		1,205	510	620	441	586
Maximum exceeded in 20% of the years	835	1,375	775		1,320	1,195	775	508	947
Maximum exceeded in 10% of the years	1,388	1,693	1,021		1,388	2,066	831	764	1,765
Maximum	2,433	2,433	2,163		1,457	2,433	1,313	959	2,163
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	130	144	130		420	144	130	137	143
Maximum exceeded in 90% of the years	147	251	146		442	249	146	144	153
Maximum exceeded in 80% of the years	158	274	153		463	252	149	148	179
Maximum exceeded in 70% of the years	178	343	164		480	284	158	154	213
Maximum exceeded in 60% of the years	235	345	185		492	335	165	164	244
Maximum exceeded in 50% of the years	342	390	227		505	344	167	189	347
Maximum exceeded in 40% of the years	404	480	353		721	349	335	241	410
Maximum exceeded in 30% of the years	508	508	475		937	419	476	343	546
Maximum exceeded in 20% of the years	582	1,112	575		1,067	917	571	453	630
Maximum exceeded in 10% of the years	1,091	1,265	813		1,112	1,392	745	585	1,256
Maximum	1,755	1,755	1,575		1,157	1,755	1,049	883	1,575

Table A.8-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

South Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	3	3	196		3	159	217	210	196
Maximum exceeded in 90% of the years	233	179	245		250	227	320	227	258
Maximum exceeded in 80% of the years	365	412	309		760	381	457	274	327
Maximum exceeded in 70% of the years	465	627	457		1,086	440	539	386	417
Maximum exceeded in 60% of the years	706	1,000	612		2,000	627	834	480	718
Maximum exceeded in 50% of the years	1,420	1,550	1,380		4,000	860	1,340	1,046	1,420
Maximum exceeded in 40% of the years	1,766	1,848	1,700		7,920	1,158	1,934	1,610	1,716
Maximum exceeded in 30% of the years	4,520	4,200	4,580		11,130	1,630	3,264	4,265	5,224
Maximum exceeded in 20% of the years	7,386	10,580	6,964		11,560	1,762	7,408	5,960	7,078
Maximum exceeded in 10% of the years	12,140	11,880	12,800		11,940	3,434	12,620	11,450	11,399
Maximum	22,000	22,000	19,700		22,000	17,100	15,800	19,700	14,500
3-day Average Flows									
Maximum exceeded in 100% of the years	3	3	195		3	122	208	205	195
Maximum exceeded in 90% of the years	221	163	235		247	201	267	214	253
Maximum exceeded in 80% of the years	323	407	289		716	367	362	259	317
Maximum exceeded in 70% of the years	433	561	374		1,049	420	513	361	372
Maximum exceeded in 60% of the years	642	853	573		1,880	558	743	456	648
Maximum exceeded in 50% of the years	1,240	1,517	1,117		3,850	727	1,117	1,016	1,238
Maximum exceeded in 40% of the years	1,710	1,744	1,543		7,473	964	1,853	1,550	1,506
Maximum exceeded in 30% of the years	4,264	3,780	4,352		9,149	1,593	3,204	4,040	5,172
Maximum exceeded in 20% of the years	6,632	8,832	6,235		10,253	1,709	6,087	5,727	6,632
Maximum exceeded in 10% of the years	11,720	10,873	12,293		11,203	3,049	12,060	9,917	11,046
Maximum	21,000	21,000	15,600		21,000	14,267	15,067	15,600	13,967
7-day Average Flows									
Maximum exceeded in 100% of the years	3	3	185		3	107	185	190	193
Maximum exceeded in 90% of the years	208	121	221		210	154	221	203	250
Maximum exceeded in 80% of the years	276	348	263		630	316	274	233	290
Maximum exceeded in 70% of the years	367	476	329		888	374	444	323	331
Maximum exceeded in 60% of the years	520	643	495		1,760	475	614	389	517
Maximum exceeded in 50% of the years	1,055	1,450	1,034		3,375	512	1,076	951	928
Maximum exceeded in 40% of the years	1,616	1,650	1,465		6,501	732	1,747	1,424	1,190
Maximum exceeded in 30% of the years	4,070	2,933	4,188		8,091	1,497	3,039	3,816	4,900
Maximum exceeded in 20% of the years	6,251	7,745	5,615		9,709	1,626	5,448	5,283	6,251
Maximum exceeded in 10% of the years	10,234	9,709	10,378		10,281	2,373	10,381	8,006	9,997
Maximum	19,400	19,400	14,029		19,400	8,367	14,029	12,286	12,900
15-day Average Flows									
Maximum exceeded in 100% of the years	2	2	160		2	84	160	171	190
Maximum exceeded in 90% of the years	190	94	195		174	126	189	193	228
Maximum exceeded in 80% of the years	229	287	228		530	248	206	217	250
Maximum exceeded in 70% of the years	299	371	279		707	294	351	271	282
Maximum exceeded in 60% of the years	423	504	411		1,496	316	498	337	420
Maximum exceeded in 50% of the years	827	1,317	713		2,643	384	956	840	702
Maximum exceeded in 40% of the years	1,349	1,517	1,287		4,903	607	1,408	1,290	1,082
Maximum exceeded in 30% of the years	3,231	2,631	3,556		6,645	1,355	2,616	3,285	4,019
Maximum exceeded in 20% of the years	5,336	5,274	5,186		7,355	1,517	5,120	4,222	5,438
Maximum exceeded in 10% of the years	8,242	7,355	8,617		8,981	2,307	8,460	5,208	9,080
Maximum	16,093	16,093	12,027		16,093	5,059	11,865	10,716	12,027
30-day Average Flows									
Maximum exceeded in 100% of the years	2	2	155		2	66	155	164	178
Maximum exceeded in 90% of the years	171	80	178		127	99	170	183	214
Maximum exceeded in 80% of the years	210	187	214		414	156	173	204	227
Maximum exceeded in 70% of the years	243	300	243		558	207	306	235	247
Maximum exceeded in 60% of the years	348	404	344		1,358	235	396	306	349
Maximum exceeded in 50% of the years	679	888	636		1,727	316	723	572	576
Maximum exceeded in 40% of the years	1,085	1,233	952		3,437	465	1,084	897	854
Maximum exceeded in 30% of the years	2,010	1,867	2,467		4,491	975	1,895	2,226	2,715
Maximum exceeded in 20% of the years	3,528	3,800	3,294		5,251	1,123	3,478	2,508	4,166
Maximum exceeded in 10% of the years	5,860	5,251	5,960		6,191	1,759	5,136	3,227	7,798
Maximum	11,590	10,747	11,590		10,747	3,672	8,860	8,611	11,590

Table A.8-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

South Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	3	3	176		3	80	176	182	206
Maximum exceeded in 90% of the years	202	117	232		172	114	231	221	258
Maximum exceeded in 80% of the years	247	168	275		380	121	352	232	319
Maximum exceeded in 70% of the years	358	263	382		568	180	373	351	417
Maximum exceeded in 60% of the years	468	480	465		928	263	521	440	502
Maximum exceeded in 50% of the years	659	650	783		3,125	344	783	478	1,285
Maximum exceeded in 40% of the years	1,444	980	1,556		5,490	503	1,440	1,460	1,588
Maximum exceeded in 30% of the years	3,905	4,090	2,712		8,760	657	2,162	3,075	4,417
Maximum exceeded in 20% of the years	6,150	7,920	6,032		11,380	903	5,066	5,960	6,880
Maximum exceeded in 10% of the years	11,380	11,880	8,828		11,940	3,292	8,230	6,735	9,179
Maximum	22,000	22,000	19,700		22,000	17,100	15,800	19,700	14,500
3-day Average Flows									
Maximum exceeded in 100% of the years	3	3	170		3	80	170	177	195
Maximum exceeded in 90% of the years	178	110	210		172	109	198	208	240
Maximum exceeded in 80% of the years	230	157	262		355	112	296	227	313
Maximum exceeded in 70% of the years	337	255	344		466	139	336	337	372
Maximum exceeded in 60% of the years	434	444	435		769	246	445	434	463
Maximum exceeded in 50% of the years	620	589	710		3,100	277	710	445	1,056
Maximum exceeded in 40% of the years	1,321	765	1,439		5,303	465	1,367	1,440	1,422
Maximum exceeded in 30% of the years	3,463	3,717	2,601		8,213	613	2,095	2,943	4,289
Maximum exceeded in 20% of the years	6,012	7,473	5,855		10,253	756	4,745	5,727	6,343
Maximum exceeded in 10% of the years	10,343	10,873	8,739		11,203	2,872	7,839	6,662	9,013
Maximum	21,000	21,000	15,600		21,000	14,267	15,067	15,600	13,967
7-day Average Flows									
Maximum exceeded in 100% of the years	2	2	161		2	69	161	172	193
Maximum exceeded in 90% of the years	163	82	195		131	77	178	194	233
Maximum exceeded in 80% of the years	217	104	231		276	88	233	210	290
Maximum exceeded in 70% of the years	297	231	314		423	95	294	292	319
Maximum exceeded in 60% of the years	364	345	370		639	221	395	373	387
Maximum exceeded in 50% of the years	499	493	593		2,607	261	593	383	712
Maximum exceeded in 40% of the years	1,141	588	1,314		4,735	366	1,326	1,393	1,189
Maximum exceeded in 30% of the years	2,651	2,933	2,353		8,091	496	1,944	2,762	3,601
Maximum exceeded in 20% of the years	5,357	7,303	5,264		9,709	532	4,464	5,283	5,784
Maximum exceeded in 10% of the years	8,874	9,709	7,453		10,281	2,151	6,499	5,617	8,369
Maximum	19,400	19,400	14,029		19,400	8,367	14,029	10,361	12,900
15-day Average Flows									
Maximum exceeded in 100% of the years	1	1	150		1	54	150	165	175
Maximum exceeded in 90% of the years	151	57	176		82	55	158	173	205
Maximum exceeded in 80% of the years	184	81	203		191	64	181	179	249
Maximum exceeded in 70% of the years	244	194	263		316	86	237	232	274
Maximum exceeded in 60% of the years	285	251	297		418	194	318	305	314
Maximum exceeded in 50% of the years	389	323	416		1,821	224	468	322	554
Maximum exceeded in 40% of the years	895	402	1,097		3,804	254	1,106	1,190	895
Maximum exceeded in 30% of the years	2,519	2,631	1,775		6,645	305	1,379	2,203	2,877
Maximum exceeded in 20% of the years	4,281	4,838	4,242		7,355	365	2,724	4,222	4,842
Maximum exceeded in 10% of the years	6,539	7,355	5,725		8,839	2,066	5,355	4,289	7,245
Maximum	16,093	16,093	12,027		16,093	5,059	11,694	6,084	12,027
30-day Average Flows									
Maximum exceeded in 100% of the years	1	1	135		1	31	135	155	158
Maximum exceeded in 90% of the years	136	32	159		42	31	137	157	181
Maximum exceeded in 80% of the years	159	45	174		92	37	164	167	222
Maximum exceeded in 70% of the years	193	109	221		233	64	205	191	243
Maximum exceeded in 60% of the years	236	154	261		310	129	265	242	271
Maximum exceeded in 50% of the years	300	211	344		1,855	145	344	275	441
Maximum exceeded in 40% of the years	691	310	729		3,078	182	707	999	701
Maximum exceeded in 30% of the years	1,734	1,885	1,198		4,088	210	1,065	1,471	2,056
Maximum exceeded in 20% of the years	3,030	3,453	2,643		5,303	273	1,539	2,491	3,248
Maximum exceeded in 10% of the years	3,901	5,164	3,702		6,054	1,594	3,726	2,925	4,844
Maximum	11,590	10,747	11,590		10,747	3,453	6,961	3,639	11,590

Table A.8-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

South Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	0	0	120		0	0	144	120	188
Maximum exceeded in 90% of the years	56	3	165		6	6	147	153	200
Maximum exceeded in 80% of the years	154	14	206		38	11	177	207	213
Maximum exceeded in 70% of the years	207	49	235		95	33	216	265	236
Maximum exceeded in 60% of the years	245	90	268		228	66	242	281	271
Maximum exceeded in 50% of the years	308	210	333		300	84	322	325	491
Maximum exceeded in 40% of the years	414	318	433		324	269	393	365	642
Maximum exceeded in 30% of the years	601	580	612		463	689	506	396	908
Maximum exceeded in 20% of the years	982	953	964		739	1,229	573	1,080	1,694
Maximum exceeded in 10% of the years	1,825	1,660	1,982		1,276	2,100	713	1,650	2,981
Maximum	4,190	3,650	4,190		1,900	3,650	1,200	3,490	4,190
3-day Average Flows									
Maximum exceeded in 100% of the years	0	0	120		0	0	138	120	172
Maximum exceeded in 90% of the years	47	3	160		4	5	143	149	182
Maximum exceeded in 80% of the years	149	10	185		29	8	169	195	207
Maximum exceeded in 70% of the years	193	41	218		88	28	182	240	230
Maximum exceeded in 60% of the years	225	85	254		199	56	222	272	258
Maximum exceeded in 50% of the years	286	197	315		247	80	315	291	443
Maximum exceeded in 40% of the years	362	289	380		291	256	338	327	576
Maximum exceeded in 30% of the years	530	487	533		442	609	472	352	849
Maximum exceeded in 20% of the years	890	752	945		589	939	516	1,045	1,499
Maximum exceeded in 10% of the years	1,677	1,527	1,775		1,216	1,963	649	1,510	2,883
Maximum	3,900	3,080	3,900		1,717	3,080	1,127	2,350	3,900
7-day Average Flows									
Maximum exceeded in 100% of the years	0	0	116		0	0	119	116	161
Maximum exceeded in 90% of the years	38	2	150		2	4	134	143	169
Maximum exceeded in 80% of the years	139	6	174		20	6	155	180	195
Maximum exceeded in 70% of the years	173	32	200		76	22	170	215	213
Maximum exceeded in 60% of the years	205	76	230		126	46	205	254	238
Maximum exceeded in 50% of the years	263	159	288		206	72	299	263	348
Maximum exceeded in 40% of the years	314	254	320		259	209	309	288	479
Maximum exceeded in 30% of the years	458	412	466		390	453	393	304	715
Maximum exceeded in 20% of the years	729	554	761		483	761	450	777	1,398
Maximum exceeded in 10% of the years	1,280	1,239	1,326		1,024	1,567	570	1,183	2,593
Maximum	3,601	2,420	3,601		1,264	2,420	945	1,386	3,601
15-day Average Flows									
Maximum exceeded in 100% of the years	0	0	108		0	0	108	113	156
Maximum exceeded in 90% of the years	23	0	139		0	3	125	138	160
Maximum exceeded in 80% of the years	125	4	160		2	4	139	177	187
Maximum exceeded in 70% of the years	160	18	188		19	18	158	186	197
Maximum exceeded in 60% of the years	194	46	209		74	35	189	230	213
Maximum exceeded in 50% of the years	235	88	245		155	58	245	242	291
Maximum exceeded in 40% of the years	276	242	292		249	163	288	247	432
Maximum exceeded in 30% of the years	343	297	411		272	310	311	263	615
Maximum exceeded in 20% of the years	609	444	610		382	504	352	506	1,135
Maximum exceeded in 10% of the years	1,021	851	1,065		638	1,195	506	773	2,373
Maximum	2,903	1,648	2,903		1,063	1,648	921	1,280	2,903
30-day Average Flows									
Maximum exceeded in 100% of the years	0	0	104		0	0	105	104	147
Maximum exceeded in 90% of the years	6	0	126		0	2	122	125	152
Maximum exceeded in 80% of the years	104	0	152		0	3	126	158	170
Maximum exceeded in 70% of the years	138	3	166		0	11	138	162	183
Maximum exceeded in 60% of the years	164	17	191		13	29	170	203	193
Maximum exceeded in 50% of the years	192	40	217		36	45	217	216	250
Maximum exceeded in 40% of the years	219	99	239		62	116	232	219	324
Maximum exceeded in 30% of the years	261	188	322		158	204	247	228	424
Maximum exceeded in 20% of the years	410	349	440		296	303	255	347	800
Maximum exceeded in 10% of the years	740	660	706		423	796	388	502	1,711
Maximum	1,982	933	1,982		883	933	643	757	1,982

Table A.8-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.8-9** shows that, for the 1928-1941 through 1959-1974 time intervals, the flow values generally coincided with known climatological conditions. An exception to this characterization can be seen for the 1942-1958 time interval for the 30-percent and lower exceedance probabilities (higher flows) for all averaging times except mean daily flows; these flow values are less than those for the 1928-1941 time interval. This could be partly attributable to the regulation of Cherry Creek Reservoir, as discussed for the Feb 15-Mar 16 seasonal period (**Table A.8-6**). Flow values for the 1975-1998 time interval are greater than those for the 1959-1974 time interval for all averaging times and all exceedance probabilities. This could be partly attributable to the additional flow entering the South Platte River through the Roberts Tunnel Diversion and other trans-basin imports.

A.8.4.3 Mean Daily Flow Exceedance.

Table A.8-10 through **Table A.8-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix. The 1895-1909 and 1910-1927 time intervals were not considered for any of the following characterizations due to insufficient data for these time intervals.

Table A.8-10 shows the exceedance probabilities and values of flows for annual data. **Table A.8-10** shows that the flow characterizations for annual data were consistent across the board with known climatological conditions. It can also be seen in **Table A.8-10** that flow values for the 1942-1958 time interval are somewhat higher than those for the 1959-1974 time interval. This is most likely the result of isolated very high flow events during the high-flow seasons of the 1942-1958 time interval.

Table A.8-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.8-11** shows that the flow characterizations for this seasonal period were consistent across the board with known climatological conditions. An exception to this is that flow values decrease from the 1942-1958 time interval to the 1959-1974 time interval for exceedance probabilities of 40 percent and lower (higher flows) over all averaging times. An evaluation of the raw data for the 1942-1958 time interval shows that, during this seasonal period, there were frequent occurrences of mean daily flows in excess of 1,000 cfs, with some values approaching 2,000 cfs, in the years 1948 and 1949. These values are significantly higher than the highest mean daily flows values for any day of this seasonal period during the 1959-1974 time interval. It can be concluded that these high flow values skewed the average flow values higher for the higher flow ranges (lower exceedance probabilities). Climate records for 1948 and 1949 for northern Colorado suggest that above average snowfall and below normal temperatures occurred in western Nebraska in the two months preceding this seasonal

Table A.8-10 Exceedance Values Considering All Flows, Annual Data.

South Platte River at North Platte, NE		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
Mean Daily Flows		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	35		0	0	35	52	50
Flow exceeded for 90% of the days		60	0	123		0	0	110	128	130
Flow exceeded for 80% of the days		123	4	136		8	3	126	138	147
Flow exceeded for 70% of the days		140	39	149		70	28	137	148	164
Flow exceeded for 60% of the days		157	80	162		198	60	147	158	185
Flow exceeded for 50% of the days		180	152	182		300	100	161	170	210
Flow exceeded for 40% of the days		215	250	211		375	169	185	188	246
Flow exceeded for 30% of the days		285	350	264		600	250	243	216	314
Flow exceeded for 20% of the days		450	500	408		1,000	350	379	290	576
Flow exceeded for 10% of the days		944	1,100	886		1,700	600	701	640	1,150
Maximum		22,000	22,000	19,700		22,000	17,100	15,800	19,700	14,500
3-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	40		0	0	40	71	67
Flow exceeded for 90% of the days		64	0	124		0	0	111	128	130
Flow exceeded for 80% of the days		124	5	137		8	4	127	138	148
Flow exceeded for 70% of the days		141	40	149		75	29	137	148	164
Flow exceeded for 60% of the days		158	83	163		197	60	147	159	185
Flow exceeded for 50% of the days		180	159	182		297	106	160	170	210
Flow exceeded for 40% of the days		217	250	212		390	173	185	188	246
Flow exceeded for 30% of the days		286	350	265		575	250	246	216	318
Flow exceeded for 20% of the days		449	503	412		1,000	354	380	294	581
Flow exceeded for 10% of the days		945	1,083	883		1,700	600	703	640	1,136
Maximum		21,000	21,000	15,600		21,000	14,267	15,067	15,600	13,967
7-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	58		0	0	58	73	77
Flow exceeded for 90% of the days		69	0	125		0	0	113	129	131
Flow exceeded for 80% of the days		126	7	138		11	5	128	139	149
Flow exceeded for 70% of the days		141	44	150		83	33	137	148	164
Flow exceeded for 60% of the days		159	90	163		200	63	147	160	187
Flow exceeded for 50% of the days		182	169	183		303	111	161	170	212
Flow exceeded for 40% of the days		219	250	213		396	179	188	188	249
Flow exceeded for 30% of the days		291	353	271		586	250	249	220	320
Flow exceeded for 20% of the days		454	500	421		1,021	358	390	299	595
Flow exceeded for 10% of the days		948	1,100	887		1,700	593	697	667	1,126
Maximum		19,400	19,400	14,029		19,400	8,367	14,029	12,286	12,900
15-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	65		0	0	65	79	101
Flow exceeded for 90% of the days		76	0	126		0	0	115	130	132
Flow exceeded for 80% of the days		128	11	139		17	9	128	140	151
Flow exceeded for 70% of the days		143	49	151		101	37	138	149	167
Flow exceeded for 60% of the days		160	100	165		213	68	148	161	188
Flow exceeded for 50% of the days		184	175	185		319	119	162	172	213
Flow exceeded for 40% of the days		223	251	217		411	187	189	189	255
Flow exceeded for 30% of the days		299	355	277		617	250	262	231	344
Flow exceeded for 20% of the days		469	515	445		1,057	357	405	315	604
Flow exceeded for 10% of the days		945	1,126	888		1,787	591	725	690	1,140
Maximum		16,093	16,093	12,027		16,093	5,059	11,865	10,716	12,027
30-day Average Flows		Period of	1895-	1942-	1895-	1910-	1928-	1942-	1959-	1975-
		Record	1941	1998	1909	1927	1941	1958	1974	1998
Flow exceeded for 100% of the days		0	0	71		0	0	71	85	108
Flow exceeded for 90% of the days		87	1	128		1	1	118	132	136
Flow exceeded for 80% of the days		131	23	141		30	18	130	142	154
Flow exceeded for 70% of the days		146	59	153		130	50	140	151	171
Flow exceeded for 60% of the days		164	118	168		241	81	148	163	190
Flow exceeded for 50% of the days		190	186	190		335	137	162	176	216
Flow exceeded for 40% of the days		233	257	227		433	192	201	199	272
Flow exceeded for 30% of the days		321	354	303		716	251	281	243	370
Flow exceeded for 20% of the days		493	526	482		1,204	351	429	358	629
Flow exceeded for 10% of the days		975	1,206	920		1,850	631	777	729	1,211
Maximum		11,590	10,747	11,590		10,747	3,672	8,860	8,611	11,590

Table A.8-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

South Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	50	50	60		100	50	60	118	112
Flow exceeded for 90% of the days	139	151	139		340	120	137	138	145
Flow exceeded for 80% of the days	153	250	150		372	200	144	144	165
Flow exceeded for 70% of the days	174	311	162		440	258	153	154	199
Flow exceeded for 60% of the days	210	350	183		500	319	166	164	243
Flow exceeded for 50% of the days	280	400	222		745	350	180	183	290
Flow exceeded for 40% of the days	355	500	294		1,000	395	242	212	356
Flow exceeded for 30% of the days	475	700	413		1,000	500	434	268	483
Flow exceeded for 20% of the days	678	1,000	588		1,100	700	587	467	692
Flow exceeded for 10% of the days	1,050	1,300	881		1,300	1,196	785	720	1,321
Maximum	6,650	6,650	2,610		2,600	6,650	1,920	1,190	2,610
3-day Average Flows									
Flow exceeded for 100% of the days	51	51	61		233	51	61	123	113
Flow exceeded for 90% of the days	139	180	139		323	136	136	137	146
Flow exceeded for 80% of the days	154	255	149		400	203	146	145	165
Flow exceeded for 70% of the days	175	320	163		455	267	154	154	201
Flow exceeded for 60% of the days	213	350	184		500	323	168	164	240
Flow exceeded for 50% of the days	282	400	222		731	350	182	183	294
Flow exceeded for 40% of the days	358	500	299		1,000	380	243	211	367
Flow exceeded for 30% of the days	475	695	424		1,028	487	434	269	489
Flow exceeded for 20% of the days	668	1,011	590		1,100	700	590	458	688
Flow exceeded for 10% of the days	1,055	1,300	888		1,317	1,244	758	706	1,319
Maximum	3,477	3,477	2,503		2,033	3,477	1,763	1,090	2,503
7-day Average Flows									
Flow exceeded for 100% of the days	57	57	88		289	57	88	126	118
Flow exceeded for 90% of the days	141	200	139		329	180	137	138	149
Flow exceeded for 80% of the days	157	278	150		428	230	146	145	168
Flow exceeded for 70% of the days	177	324	164		459	289	157	154	208
Flow exceeded for 60% of the days	218	350	184		500	326	170	164	240
Flow exceeded for 50% of the days	293	423	222		656	346	180	180	303
Flow exceeded for 40% of the days	372	470	307		1,000	395	253	214	385
Flow exceeded for 30% of the days	477	664	432		1,033	466	444	269	504
Flow exceeded for 20% of the days	660	1,043	596		1,103	700	614	443	667
Flow exceeded for 10% of the days	1,059	1,413	888		1,387	1,570	738	699	1,371
Maximum	3,000	3,000	2,393		1,614	3,000	1,564	1,045	2,393
15-day Average Flows									
Flow exceeded for 100% of the days	89	89	119		305	89	119	131	123
Flow exceeded for 90% of the days	144	248	142		373	220	143	140	151
Flow exceeded for 80% of the days	159	305	154		438	285	147	146	168
Flow exceeded for 70% of the days	180	338	164		464	314	159	156	216
Flow exceeded for 60% of the days	233	368	184		483	338	168	160	244
Flow exceeded for 50% of the days	317	403	232		520	364	178	184	329
Flow exceeded for 40% of the days	385	468	335		1,000	393	320	215	395
Flow exceeded for 30% of the days	485	611	436		1,031	428	463	297	506
Flow exceeded for 20% of the days	639	1,046	586		1,155	920	645	419	665
Flow exceeded for 10% of the days	1,065	1,430	831		1,259	1,835	754	603	1,377
Maximum	2,433	2,433	2,163		1,457	2,433	1,313	959	2,163
30-day Average Flows									
Flow exceeded for 100% of the days	130	144	130		420	144	130	137	143
Flow exceeded for 90% of the days	147	251	146		442	249	146	144	153
Flow exceeded for 80% of the days	158	274	153		463	252	149	148	179
Flow exceeded for 70% of the days	178	343	164		480	284	158	154	213
Flow exceeded for 60% of the days	235	345	185		492	335	165	164	244
Flow exceeded for 50% of the days	342	390	227		505	344	167	189	347
Flow exceeded for 40% of the days	404	480	353		721	349	335	241	410
Flow exceeded for 30% of the days	508	508	475		937	419	476	343	546
Flow exceeded for 20% of the days	582	1,112	575		1,067	917	571	453	630
Flow exceeded for 10% of the days	1,091	1,265	813		1,112	1,392	745	585	1,256
Maximum	1,755	1,755	1,575		1,157	1,755	1,049	883	1,575

Table A.8-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

South Platte River at North Platte, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	80		0	0	80	83	98
Flow exceeded for 90% of the days	72	0	135		0	0	120	139	148
Flow exceeded for 80% of the days	132	21	153		40	17	136	153	173
Flow exceeded for 70% of the days	158	64	172		100	45	150	166	192
Flow exceeded for 60% of the days	184	109	195		246	75	175	180	215
Flow exceeded for 50% of the days	217	179	223		370	111	214	200	243
Flow exceeded for 40% of the days	271	289	266		600	150	260	240	292
Flow exceeded for 30% of the days	412	493	381		1,050	222	362	316	494
Flow exceeded for 20% of the days	944	1,000	914		1,900	350	749	750	1,250
Flow exceeded for 10% of the days	2,523	2,200	2,888		4,000	950	2,038	1,665	4,348
Maximum	22,000	22,000	19,700		22,000	17,100	15,800	19,700	14,500
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	82		0	0	82	84	101
Flow exceeded for 90% of the days	77	2	136		1	2	121	140	151
Flow exceeded for 80% of the days	135	28	155		40	20	137	155	173
Flow exceeded for 70% of the days	160	68	173		118	51	151	168	194
Flow exceeded for 60% of the days	186	117	197		253	80	177	181	217
Flow exceeded for 50% of the days	220	183	225		394	117	217	202	242
Flow exceeded for 40% of the days	275	296	270		600	154	262	243	293
Flow exceeded for 30% of the days	421	483	394		1,050	230	360	326	512
Flow exceeded for 20% of the days	967	1,050	937		1,900	363	768	785	1,247
Flow exceeded for 10% of the days	2,653	2,267	2,983		4,187	967	2,066	1,829	4,437
Maximum	21,000	21,000	15,600		21,000	14,267	15,067	15,600	13,967
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	85		0	0	88	85	107
Flow exceeded for 90% of the days	85	2	139		2	5	123	142	156
Flow exceeded for 80% of the days	139	36	158		51	24	138	158	175
Flow exceeded for 70% of the days	163	76	176		140	58	153	169	197
Flow exceeded for 60% of the days	191	128	201		284	88	181	182	219
Flow exceeded for 50% of the days	225	200	229		407	124	221	206	248
Flow exceeded for 40% of the days	287	311	280		659	165	271	251	305
Flow exceeded for 30% of the days	453	493	420		1,110	236	389	350	578
Flow exceeded for 20% of the days	1,028	1,100	990		2,063	366	874	845	1,247
Flow exceeded for 10% of the days	2,892	2,341	3,173		4,393	1,050	2,223	2,209	4,659
Maximum	19,400	19,400	14,029		19,400	8,367	14,029	12,286	12,900
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	87		0	0	93	87	115
Flow exceeded for 90% of the days	100	9	145		2	11	125	146	161
Flow exceeded for 80% of the days	146	45	162		71	37	142	162	182
Flow exceeded for 70% of the days	171	93	183		188	68	157	174	202
Flow exceeded for 60% of the days	200	147	207		325	100	188	188	221
Flow exceeded for 50% of the days	239	233	241		484	133	236	216	258
Flow exceeded for 40% of the days	307	336	301		731	194	296	271	368
Flow exceeded for 30% of the days	555	579	539		1,318	250	448	380	685
Flow exceeded for 20% of the days	1,191	1,236	1,153		2,478	361	1,070	984	1,503
Flow exceeded for 10% of the days	3,352	2,895	3,449		4,645	1,103	2,828	2,661	4,804
Maximum	16,093	16,093	12,027		16,093	5,059	11,865	10,716	12,027
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	109		0	0	109	109	128
Flow exceeded for 90% of the days	122	25	152		22	28	129	154	173
Flow exceeded for 80% of the days	156	57	172		113	54	149	171	190
Flow exceeded for 70% of the days	181	124	193		205	78	166	183	207
Flow exceeded for 60% of the days	213	173	224		369	129	229	205	234
Flow exceeded for 50% of the days	263	239	266		494	161	272	240	281
Flow exceeded for 40% of the days	367	367	367		1,168	204	395	290	460
Flow exceeded for 30% of the days	726	787	720		1,773	272	715	618	772
Flow exceeded for 20% of the days	1,546	1,480	1,597		3,282	408	1,261	1,162	2,437
Flow exceeded for 10% of the days	3,408	3,452	3,385		4,412	1,088	3,120	2,498	4,827
Maximum	11,590	10,747	11,590		10,747	3,672	8,860	8,611	11,590

Table A.8-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

South Platte River at North Platte, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	0	0	68			0	0	68	79	90
Flow exceeded for 90% of the days	8	0	116			0	0	102	115	140
Flow exceeded for 80% of the days	92	0	137			0	0	118	134	163
Flow exceeded for 70% of the days	128	4	157			12	2	132	150	183
Flow exceeded for 60% of the days	153	25	177			50	15	150	170	202
Flow exceeded for 50% of the days	182	53	201			110	31	169	189	227
Flow exceeded for 40% of the days	218	104	235			255	60	201	217	263
Flow exceeded for 30% of the days	277	228	287			500	104	250	262	339
Flow exceeded for 20% of the days	500	518	489			1,100	197	391	362	764
Flow exceeded for 10% of the days	1,782	1,740	1,820			4,300	553	1,218	1,090	3,147
Maximum	22,000	22,000	19,700			22,000	17,100	15,800	19,700	14,500
3-day Average Flows										
Flow exceeded for 100% of the days	0	0	68			0	0	68	80	99
Flow exceeded for 90% of the days	8	0	118			0	0	103	115	143
Flow exceeded for 80% of the days	93	0	138			0	0	119	135	163
Flow exceeded for 70% of the days	129	4	157			16	2	132	150	183
Flow exceeded for 60% of the days	155	27	179			53	15	150	170	203
Flow exceeded for 50% of the days	183	58	203			118	31	170	190	227
Flow exceeded for 40% of the days	219	109	233			267	60	203	217	262
Flow exceeded for 30% of the days	279	233	291			521	103	250	266	340
Flow exceeded for 20% of the days	509	533	498			1,133	205	397	362	775
Flow exceeded for 10% of the days	1,865	1,867	1,858			4,380	567	1,214	1,088	3,155
Maximum	21,000	21,000	15,600			21,000	14,267	15,067	15,600	13,967
7-day Average Flows										
Flow exceeded for 100% of the days	0	0	74			0	0	74	80	107
Flow exceeded for 90% of the days	11	0	119			0	0	104	117	145
Flow exceeded for 80% of the days	96	0	139			1	0	120	134	165
Flow exceeded for 70% of the days	131	7	159			19	3	134	150	185
Flow exceeded for 60% of the days	157	27	181			61	14	150	169	205
Flow exceeded for 50% of the days	187	59	205			126	35	174	193	225
Flow exceeded for 40% of the days	220	118	235			312	61	208	222	265
Flow exceeded for 30% of the days	288	236	298			558	106	258	276	353
Flow exceeded for 20% of the days	545	543	548			1,303	202	404	375	831
Flow exceeded for 10% of the days	2,007	1,973	2,025			4,453	554	1,233	1,179	3,149
Maximum	19,400	19,400	14,029			19,400	8,367	14,029	10,361	12,900
15-day Average Flows										
Flow exceeded for 100% of the days	0	0	78			0	0	78	82	111
Flow exceeded for 90% of the days	13	0	121			0	0	104	120	147
Flow exceeded for 80% of the days	100	1	142			3	1	122	135	169
Flow exceeded for 70% of the days	134	9	162			21	4	135	149	185
Flow exceeded for 60% of the days	162	32	183			82	18	152	169	205
Flow exceeded for 50% of the days	189	68	208			171	38	184	193	227
Flow exceeded for 40% of the days	227	133	244			338	63	213	237	266
Flow exceeded for 30% of the days	293	239	305			800	119	271	293	390
Flow exceeded for 20% of the days	686	730	669			1,888	203	445	562	906
Flow exceeded for 10% of the days	2,321	2,263	2,359			4,604	675	1,352	1,623	3,279
Maximum	16,093	16,093	12,027			16,093	5,059	11,694	6,084	12,027
30-day Average Flows										
Flow exceeded for 100% of the days	0	0	81			0	0	81	85	118
Flow exceeded for 90% of the days	23	0	124			1	0	109	125	149
Flow exceeded for 80% of the days	114	4	143			9	2	123	138	172
Flow exceeded for 70% of the days	139	15	161			39	8	134	149	194
Flow exceeded for 60% of the days	162	38	192			138	27	159	160	212
Flow exceeded for 50% of the days	200	88	219			248	41	192	204	231
Flow exceeded for 40% of the days	240	151	255			540	72	246	246	279
Flow exceeded for 30% of the days	342	259	371			1,050	137	307	414	476
Flow exceeded for 20% of the days	848	929	795			1,916	172	587	848	1,049
Flow exceeded for 10% of the days	2,421	1,912	2,491			3,791	923	2,222	2,110	3,088
Maximum	11,590	10,747	11,590			10,747	3,453	6,961	3,639	11,590

Table A.8-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

South Platte River at North Platte, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days		0	0	61		0	0	61	79	68
Flow exceeded for 90% of the days		0	0	106		0	0	90	105	129
Flow exceeded for 80% of the days		46	0	121		0	0	104	121	145
Flow exceeded for 70% of the days		105	0	138		0	0	114	135	156
Flow exceeded for 60% of the days		126	2	154		0	2	122	151	171
Flow exceeded for 50% of the days		150	15	170		15	12	142	170	186
Flow exceeded for 40% of the days		171	30	186		55	24	162	183	208
Flow exceeded for 30% of the days		196	55	208		135	34	181	200	245
Flow exceeded for 20% of the days		234	141	247		225	60	210	220	322
Flow exceeded for 10% of the days		354	310	377		375	175	275	264	678
Maximum		4,190	3,650	4,190		1,900	3,650	1,200	3,490	4,190
3-day Average Flows										
Flow exceeded for 100% of the days		0	0	63		0	0	63	80	71
Flow exceeded for 90% of the days		0	0	106		0	0	90	106	130
Flow exceeded for 80% of the days		47	0	121		0	0	105	122	146
Flow exceeded for 70% of the days		106	0	139		0	1	114	136	158
Flow exceeded for 60% of the days		127	2	155		0	3	123	152	171
Flow exceeded for 50% of the days		151	15	170		22	12	141	169	186
Flow exceeded for 40% of the days		172	30	186		55	25	163	184	208
Flow exceeded for 30% of the days		195	54	208		137	34	181	196	247
Flow exceeded for 20% of the days		233	142	248		220	59	210	219	322
Flow exceeded for 10% of the days		353	310	371		379	198	273	263	674
Maximum		3,900	3,080	3,900		1,717	3,080	1,127	2,350	3,900
7-day Average Flows										
Flow exceeded for 100% of the days		0	0	63		0	0	63	80	77
Flow exceeded for 90% of the days		1	0	107		0	0	90	107	132
Flow exceeded for 80% of the days		48	0	122		0	0	104	122	146
Flow exceeded for 70% of the days		108	0	140		0	1	114	136	159
Flow exceeded for 60% of the days		128	2	155		0	3	122	154	170
Flow exceeded for 50% of the days		152	15	171		21	12	141	170	187
Flow exceeded for 40% of the days		172	29	187		56	26	164	184	210
Flow exceeded for 30% of the days		194	54	207		129	33	184	195	249
Flow exceeded for 20% of the days		232	141	249		223	61	209	217	322
Flow exceeded for 10% of the days		360	328	381		375	212	277	261	668
Maximum		3,601	2,420	3,601		1,264	2,420	945	1,386	3,601
15-day Average Flows										
Flow exceeded for 100% of the days		0	0	65		0	0	65	82	107
Flow exceeded for 90% of the days		2	0	109		0	0	91	108	136
Flow exceeded for 80% of the days		56	0	124		0	0	104	121	149
Flow exceeded for 70% of the days		110	0	142		0	1	114	135	157
Flow exceeded for 60% of the days		131	3	155		1	4	124	157	175
Flow exceeded for 50% of the days		152	16	173		17	15	142	169	186
Flow exceeded for 40% of the days		174	30	186		60	26	166	181	208
Flow exceeded for 30% of the days		193	56	205		129	34	187	192	266
Flow exceeded for 20% of the days		236	137	253		222	62	206	215	343
Flow exceeded for 10% of the days		374	313	403		380	257	269	261	689
Maximum		2,903	1,648	2,903		1,063	1,648	921	1,280	2,903
30-day Average Flows										
Flow exceeded for 100% of the days		0	0	71		0	0	71	88	117
Flow exceeded for 90% of the days		3	0	110		0	0	91	105	139
Flow exceeded for 80% of the days		67	0	125		0	1	107	122	148
Flow exceeded for 70% of the days		113	1	144		0	2	116	144	161
Flow exceeded for 60% of the days		136	6	157		5	6	126	157	173
Flow exceeded for 50% of the days		154	21	172		25	19	143	168	185
Flow exceeded for 40% of the days		174	36	186		65	31	163	179	213
Flow exceeded for 30% of the days		193	65	204		121	43	190	194	282
Flow exceeded for 20% of the days		242	136	268		231	75	201	209	335
Flow exceeded for 10% of the days		390	338	417		377	234	259	290	778
Maximum		1,982	933	1,982		883	933	643	757	1,982

period, followed by near-normal temperatures in February which would have melted most of this snow at lower elevations (WRCC, 2004). This was not noted for Julesburg (**Section A.7**), possibly because at least some the runoff from snowmelt in upstream areas was diverted to the upstream off-line reservoirs.

Table A.8-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.8-12** shows that the flow characterizations for this seasonal period were consistent across the board with known climatological conditions. An exception to this is that flow values decreased from the 1942-1958 time interval to the 1959-1974 time interval for exceedance probabilities of 30 percent and lower (higher flows) for all averaging periods. This is most likely the result of isolated very high flow events during the 1942-1958 time interval.

Table A.8-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 seasonal period. **Table A.8-13** shows that the flow characterizations for this seasonal period were similar to those for the Apr 16-Jul 15 seasonal period (**Table A.8-12**), except that flow values were generally lower across the board. The Jun 1-Aug 15 seasonal period is past the time of the high-country snowmelt season and the months with the most precipitation.

Table A.8-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.8-14** shows that the flow characterizations for this seasonal period were consistent across the board with known climatological conditions.

A.8.5 Median Mean Daily Flow

The median mean daily flow by calendar day is shown on **Figure A.8-6**. **Figure A.8-6** shows the effects of the 1930's drought period, with median mean daily flows at or near 0 cfs for July through October for the 1928-1941 time interval. For the time intervals 1942-1958 through 1975-1994, the values are quite similar throughout the year, except for somewhat higher values for the generally wetter 1975-1998 time interval early in the year and again in June.

The 1910-1927 time interval must be viewed with caution because the average number of days of data for this time interval is relatively small (236 days) compared to the complete or nearly complete record for the later time intervals (most of the absent data are for the winter months). The very high values in June are consistent with high flows which show up for this time interval in **Figure A.8-1** through **Figure A.8-3**.

A.8.6 USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.8-7** and **Figure A.8-8** and in **Table A.8-15** and **Table A.8-16**. The 1895-1909 time interval was not considered for any of the following characterizations due to insufficient data.

The 1910-1927 time interval was considered because the characterizations are for peak flow only; no low-flow characterizations were done for the USGS Annual Peak flow.

Figure A.8-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak Flow, and the 10-year running average of the USGS Annual Peak Flow. **Figure A.8-7** shows no distinct patterns with time other than those resulting from known historic climatological conditions, with one exception. It can be seen in **Figure A.8-7** that all of the highest annual peak flows (i.e. at or above 15,000 cfs) occurred before 1975, except for the peak flow event of 1983. This is coincident with the beginning of operation of Chatfield Reservoir in 1976 and Bear Creek Reservoir in 1982.

Figure A.8-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.8-8** shows that the higher annual peak flows tended to occur in May and June, while the lower peak flows occurred at different times throughout the year. This suggests that the higher peak flows occurred as a result of high-country snowmelt runoff occurring in its usual season, and that the lower peak flows could be the result of any one (or more) of a number of local or regional causes such as thunderstorms, prolonged regional rain events, regional low-elevation snowmelt runoff, and others.

Table A.8-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.8-15** shows that the average values are greater than the median values for all time intervals (the 1895-1909 time interval was not considered due to insufficient data). This is consistent with the known climate of the region around Julesburg for which lower peak flows would be the rule, with a small number of high peak flow events originating outside of the region skewing the average peak flow values higher. Of some interest is that the average of the annual peak flows for the 1975-1998 time interval is about 1,500 cfs lower than that for the 1959-1974 time interval, even though climatological conditions during these two time intervals were similar. This could be attributable in part to the beginning of operation of Chatfield and Bear Creek Reservoirs.

Both the average and median annual peak flows occurred between mid-May and mid-June for all time intervals except 1928-1941, when they occurred in April. The 1928-1941 time interval included the severe drought period of the 1930's, during which the high-country snowpacks were deficient and thus the melting of these snowpacks would have occurred earlier than usual.

Table A.8-16 shows the exceedance probabilities and values for the USGS Annual Peak Flow. It is analogous to **Table A.8-5** for Annual Maximum mean daily flows. **Table A.8-16** shows that, for the 1910-1927 through 1959-1974 time intervals, the peak flow values are generally consistent with known climatological conditions. The peak flow values for the 1975-1998 time intervals are lower than those for the 1959-1974 time interval for all exceedance probabilities, with increasing differences between exceedance values with decreasing exceedance probability (increasing flow), even though climatological conditions during these two time intervals were similar. This could be attributable in part to the beginning of operation of Chatfield and Bear Creek Reservoirs.

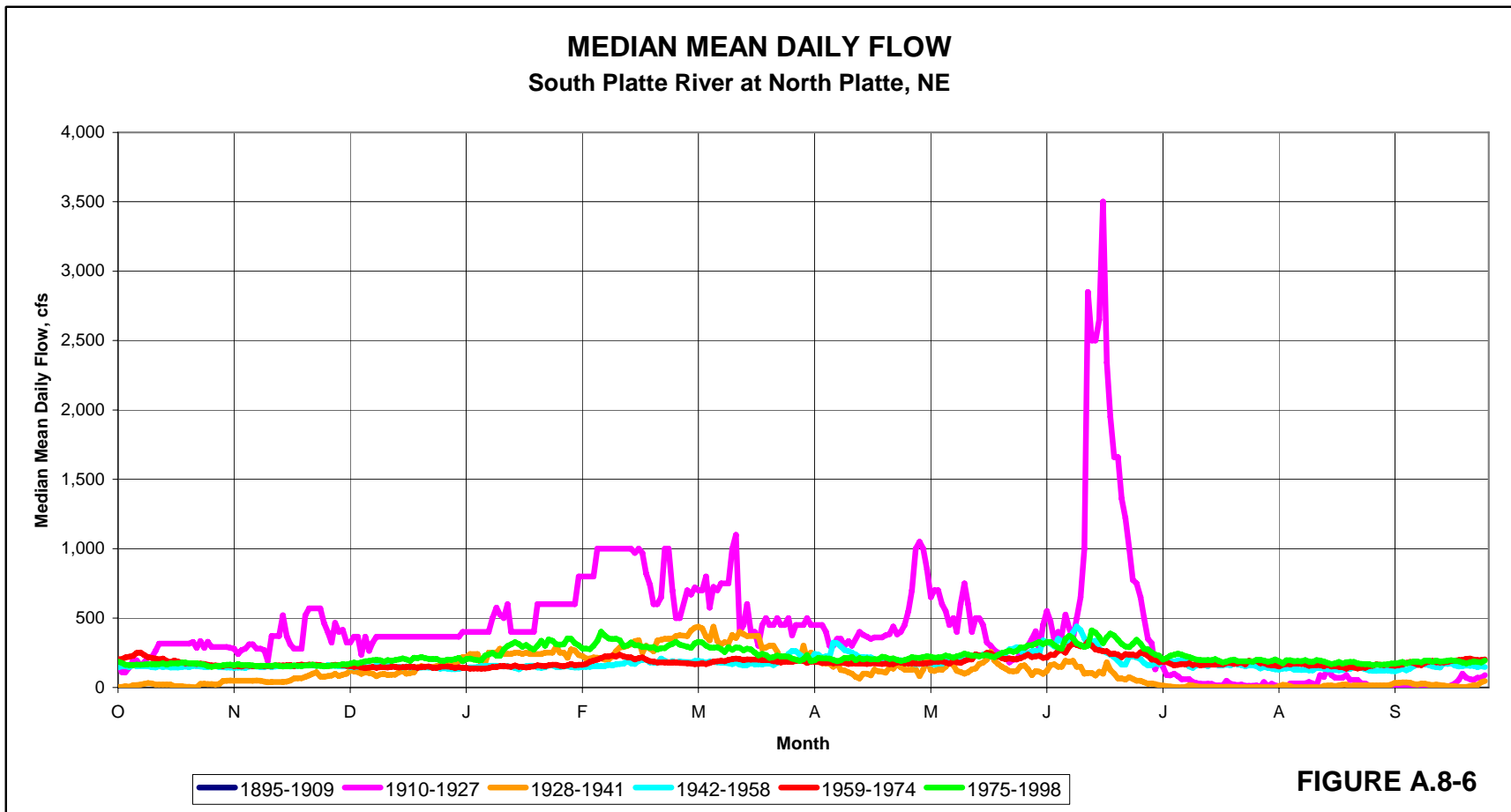


Figure A.8-6 Median Mean Daily Flow.

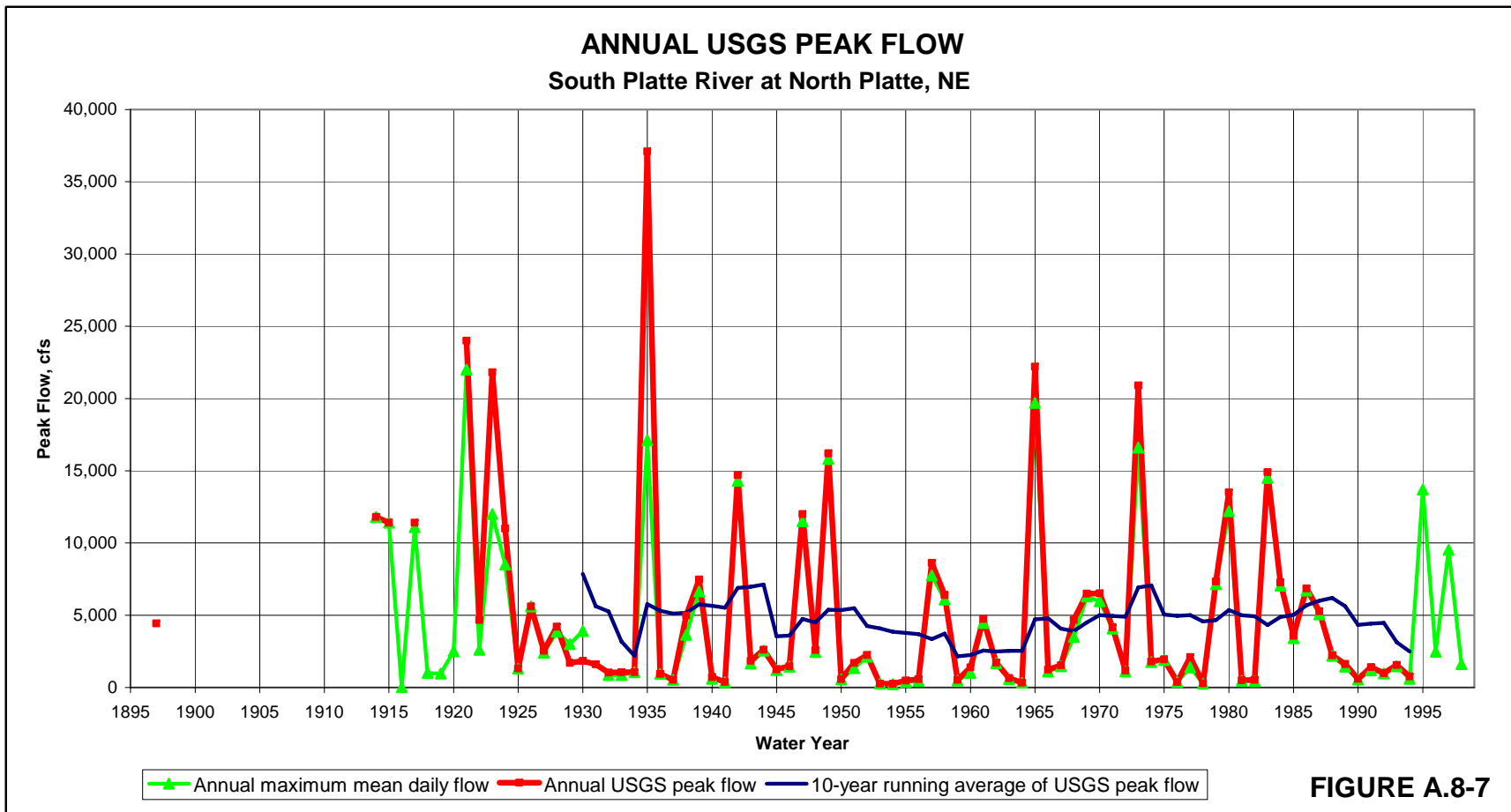


FIGURE A.8-7

Figure A.8-7 Annual USGS Peak Flow.

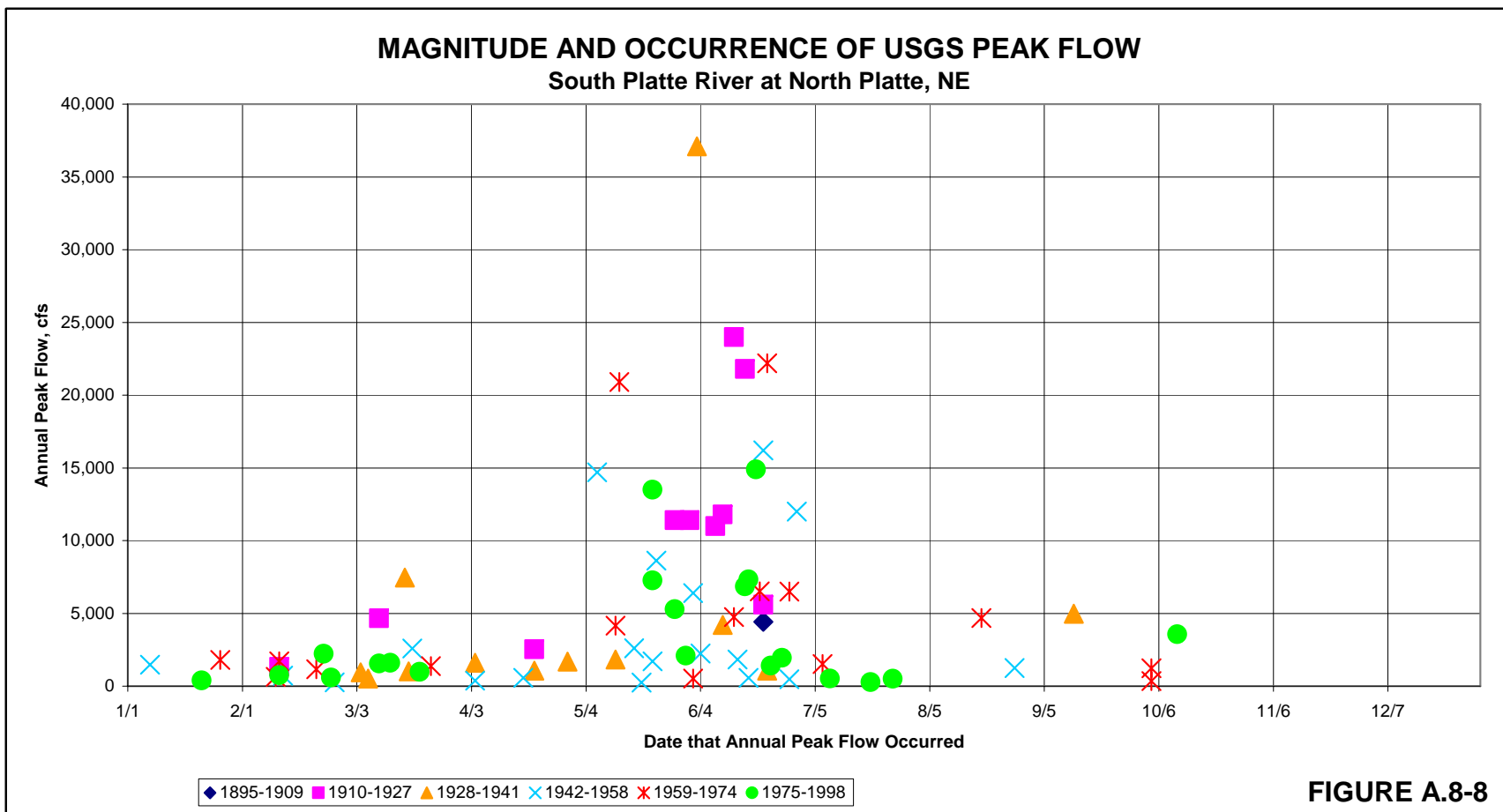


FIGURE A.8-8

Figure A.8-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.8-15 Summary of USGS Peak Flows.

South Platte River at North Platte, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	5,151	6,981	4,288		10,552	4,613	4,337	5,001	3,676
Median Annual Peak Flow (cfs)	1,890	4,210	1,800		11,200	1,330	1,840	1,755	1,775
Average Occurrence of Peak Flow	5/14	5/5	5/19		5/14	4/25	5/18	5/24	5/15
Median Occurrence of Peak Flow	5/28	5/12	5/31		6/8	4/20	5/23	6/13	5/31

Table A.8-16 USGS Peak Flow exceedance values.

South Platte River at North Platte, NE Annual Peak Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Peak exceeded in 100% of the years	239	384	239		1,320	384	239	336	274
Peak exceeded in 90% of the years	515	804	477		2,418	585	391	585	489
Peak exceeded in 80% of the years	731	1,052	582		4,236	850	570	1,170	578
Peak exceeded in 70% of the years	1,232	1,376	1,206		5,318	1,012	1,115	1,305	916
Peak exceeded in 60% of the years	1,590	1,774	1,518		8,840	1,060	1,562	1,530	1,490
Peak exceeded in 50% of the years	1,890	4,210	1,800		11,200	1,330	1,840	1,755	1,775
Peak exceeded in 40% of the years	3,688	4,788	2,308		11,400	1,672	2,444	4,160	2,146
Peak exceeded in 30% of the years	5,250	7,088	4,708		11,520	2,068	3,360	4,715	4,083
Peak exceeded in 20% of the years	7,408	11,400	6,714		13,800	4,518	8,176	6,490	6,932
Peak exceeded in 10% of the years	13,860	17,800	13,200		22,020	6,716	13,080	13,705	7,947
Peak Flow	37,100	37,100	22,200		24,000	37,100	16,200	22,200	14,900

A.9 PLATTE RIVER NEAR OVERTON, NEBRASKA

A.9.1 Methodology

For this location, a single continuous streamflow record was constructed using records from three gages, as follows:

Gage	Records Used	Data Source
Platte River at Lexington, Nebraska	4/8/1902 – 9/30/1906; 5/21/1917 – 5/21/1919 (mainly warm season only)	Prior to 1915, 1914 Nebraska Hydrographic Report. 1915-1928, 1929 Nebraska Hydrographic Report.
Platte River at Elm Creek, Nebraska	4/16/1915 – 10/31/1917 (warm season only)	1915-1928, 1929 Nebraska Hydrographic Report.
Platte River at Overton, Nebraska	5/22/1919 – 12/31/1923 (mainly warm season only); 1/1/1925 – 12/31/1998	1915-1928, 1929 Nebraska Hydrographic Report. 1929-1930, 1931 Nebraska Hydrographic Report. 1931-9/30/1998, USGS website.

Where data do not exist for the Platte River at Overton, Nebraska, data from the other gages were substituted. The gages cover approximately 25 miles of the Platte River from Lexington, Nebraska to Elm Creek, Nebraska.

Summary statistics characterizing this record are presented in **Table A.9-1** (mean daily values), **Table A.9-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.9-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.9-4** (flow frequencies).

A.9.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.9-1 shows that there was a steady and substantial decrease in both average and median Annual Maximum mean daily flow and annual flow volume by time interval from the beginning of the period of record through the 1942-1958 time interval. For all subsequent time intervals, these values remained relatively constant, except for relatively small variations by time interval which may be attributable to climatic variations such as the 1950's drought period (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). The pre-1959 decreases are coincident with the times when the major North Platte reservoirs began operation (**Table 2** of the main report), except that there were no significant changes in the flow characterizations when Glendo Reservoir began operation in 1958.

Table A.9-1 Summary of Mean Daily Flow Values.

Platte River near Overton, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	9,155	14,007	6,431	18,986	16,278	10,119	5,662	6,803	6,728
Median Annual Maximum Mean Daily Flow (cfs)	6,670	11,600	4,710	18,000	13,500	7,855	4,480	6,015	4,740
Average Annual Flow Volume (kaf)	1,387	1,744	1,187	1,796	2,163	1,336	885	1,184	1,403
Median Annual Flow Volume (kaf)	1,021	1,523	900	1,527	2,160	1,111	860	931	904
Average Mean Daily Flow (cfs)	2,230	3,280	1,640	4,584	4,323	1,845	1,223	1,636	1,938
Median Mean Daily Flow (cfs)	1,315	2,600	1,190	2,700	3,000	1,238	1,160	1,250	1,253
Average Number of Mean Daily Flow Measurements	340	296	365	193	262	365	365	365	365
Number of Years of Data	89 of 104	32 of 47	57 of 57	5 of 15	13 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	3,513	5,787	2,715		7,117	5,217	2,251	2,546	3,156
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	8,459	13,059	5,877	18,986	15,871	8,331	5,299	6,386	5,946
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	7,678	12,000	5,251	17,602	14,865	7,338	4,407	5,579	5,631
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	3,145	4,367	2,459	3,696	7,035	2,130	1,646	2,125	3,258
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	2,880	5,450	2,320		6,950	5,075	2,090	2,245	2,840
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	5,200	10,900	4,140	18,000	13,500	4,585	3,390	4,870	3,940
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	4,580	8,674	3,470	17,000	13,500	3,365	2,750	3,005	3,690
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	2,310	3,800	1,940	3,500	4,650	466	1,600	1,715	2,735
Difference ("Apr-Jul Average" - "Jul-Sep Average")	5,314	8,692	3,418	15,290	8,836	6,201	3,653	4,261	2,689
Difference ("Apr-Jul Median" - "Jul-Sep Median")	2,890	7,100	2,200	14,500	8,850	4,120	1,790	3,155	1,205
Average Occurrence of Maximum Mean Daily Flow	5/13	5/13	5/14	6/8	6/6	4/8	4/28	5/11	5/27
Median Occurrence of Maximum Mean Daily Flow	5/27	5/29	5/25	6/13	6/9	3/18	5/18	6/9	5/31
Average Annual Minimum Mean Daily Flow (cfs)	141	53	171		200	0	96	154	234
Median Annual Minimum Mean Daily Flow (cfs)	132	0	143		250	0	52	149	183
Average occurrences per year of the Minimum	14	51	1		6	67	1	1	1
Occurring between	7/29	7/16	8/3		7/30	7/12	8/12	8/5	7/26
and	8/15	9/17	8/4		8/5	10/3	8/14	8/6	7/27
Median occurrences per year of the Minimum	1	41	1		1	66	1	1	1
Occurring between	7/30	7/12	8/9		7/29	7/12	8/31	8/13	7/25
and	8/17	9/30	8/11		7/31	9/30	9/1	8/14	7/26

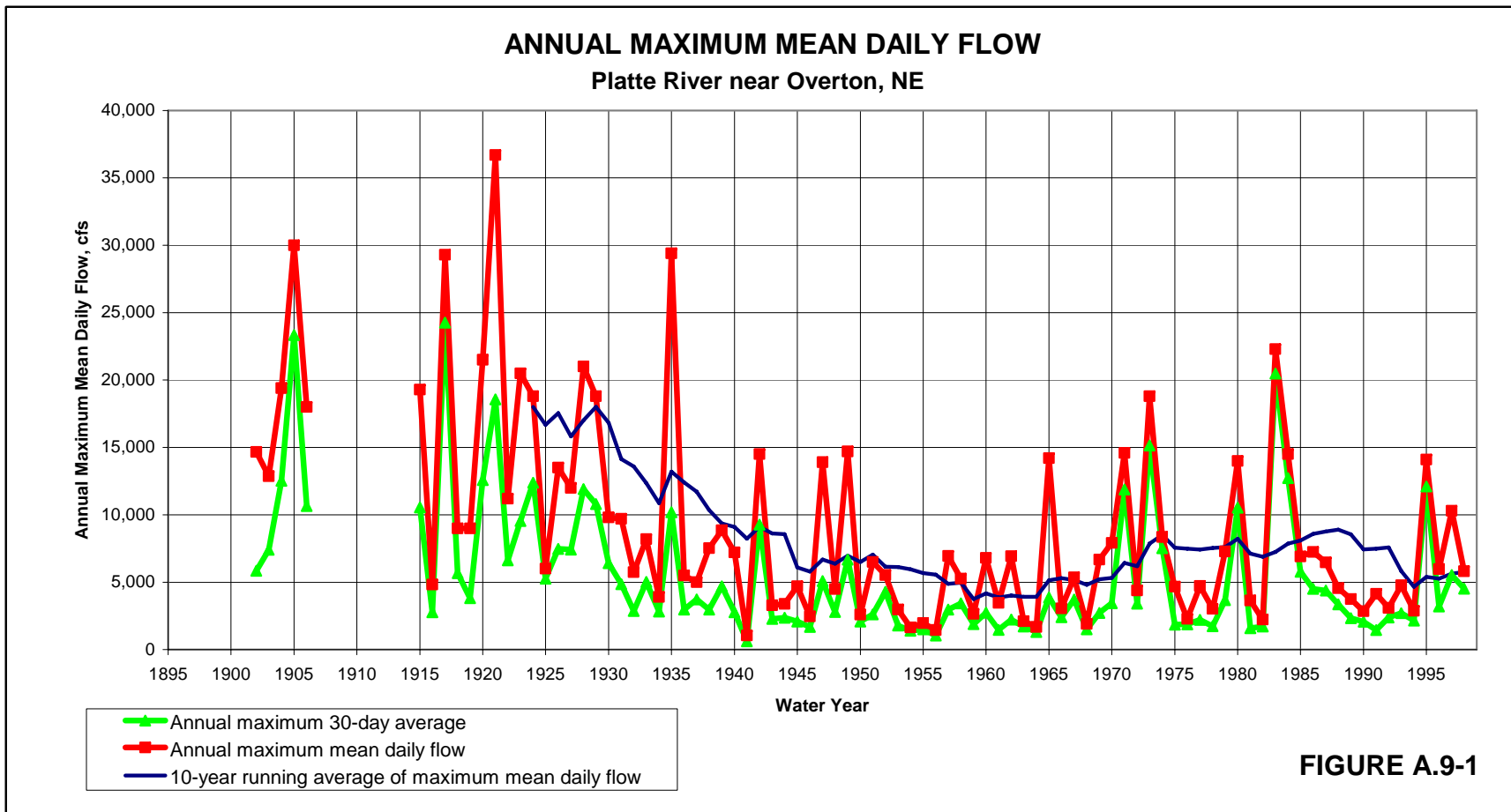


Figure A.9-1 Annual Maximum Mean Daily Flow.

The most striking information shown in **Figure A.9-1** (maximum flows) is the steady decrease in the Annual Maximum mean daily flows and in the 10-year running average from the 1920's through the 1950's. This is consistent with the previously discussed decreases in Annual Maximum mean daily flow by time interval shown in **Table A.9-1**. It is noteworthy that there are substantial differences between the values of the Annual Maximums and those of the maximum 30-day averages early in the period of record; this difference narrows beginning in about 1940, and narrows even more dramatically by the 1970's. All three maximum mean daily flow quantities show the effect of climatic variations such as the 1950's drought period (climate data are shown in **Figures 3, 4, 5** and **8** of the main report), followed by increases in the maximums and averages in later wet periods. These same patterns can also be seen on **Figure A.9-2** (annual flow volume).

Figure A.9-3 shows that, while the higher maximum daily flows have mainly occurred in May and June, there is also a secondary higher frequency of occurrence in March. This March pattern could be largely attributable to runoff from rainfall and snowmelt in the intervening uncontrolled drainage area between Lake McConaughy and Overton, and to inflow from the South Platte River.

All seasonal maximum flow quantities were highest in the Apr 16-Jun 15 seasonal period and decreased beginning with the Apr 16-Jun 15 seasonal period through the Jul 15-Sep 30 seasonal period (**Table A.9-1**). The average and median Dates of Maximum Flow are in late April through mid-June, with the exception of the 1928-1941 time interval, when they occur in March and early April, a possible effect of the 1930's drought.

Figure A.9-4 (minimum flows) shows that, for the available data for the 1910-1927 time interval, both the daily minimum flows and the 30-day average minimum flows were relatively high. Both **Table A.9-1** and **Figure A.9-4** show low minimum flows in the 1928-1941 time interval, a possible effect of the 1930's drought. For the 1928-1941 time interval, the average minimum is 4 cfs and the median minimum is 0 cfs, whereas both of these quantities are greater than 60 cfs for all subsequent time intervals. Average Annual Minimum mean daily flows (**Figure A.9-4**) were at or near 0 cfs for the entire decade of the 1930's. The Annual Minimum mean daily flows then rose through the 1940's, and have risen slowly since then, as is evident in the 10-year running average. The trend since the late 1930's may be due in part to increased irrigation return flows, which would have increased with the beginning of operations at Lake McConaughy. Since the late 1930's the difference between the Annual Minimum mean daily flow and the annual minimum 30-Day average flow has remained relatively constant. Both the average and the median Dates of Minimum Flow are between late July and early October for all time intervals. Minimum flows were not calculated for years with incomplete flow records.

A.9.3 3-, 7-, 15-, and 30- day Averages of Mean Daily Flows

Table A.9-2 shows that there were no significant differences in the flow averages for either Annual Maximum mean daily flow or Annual Minimum mean daily flow, except for the attenuation due to the averaging process. This attenuation is somewhat greater at

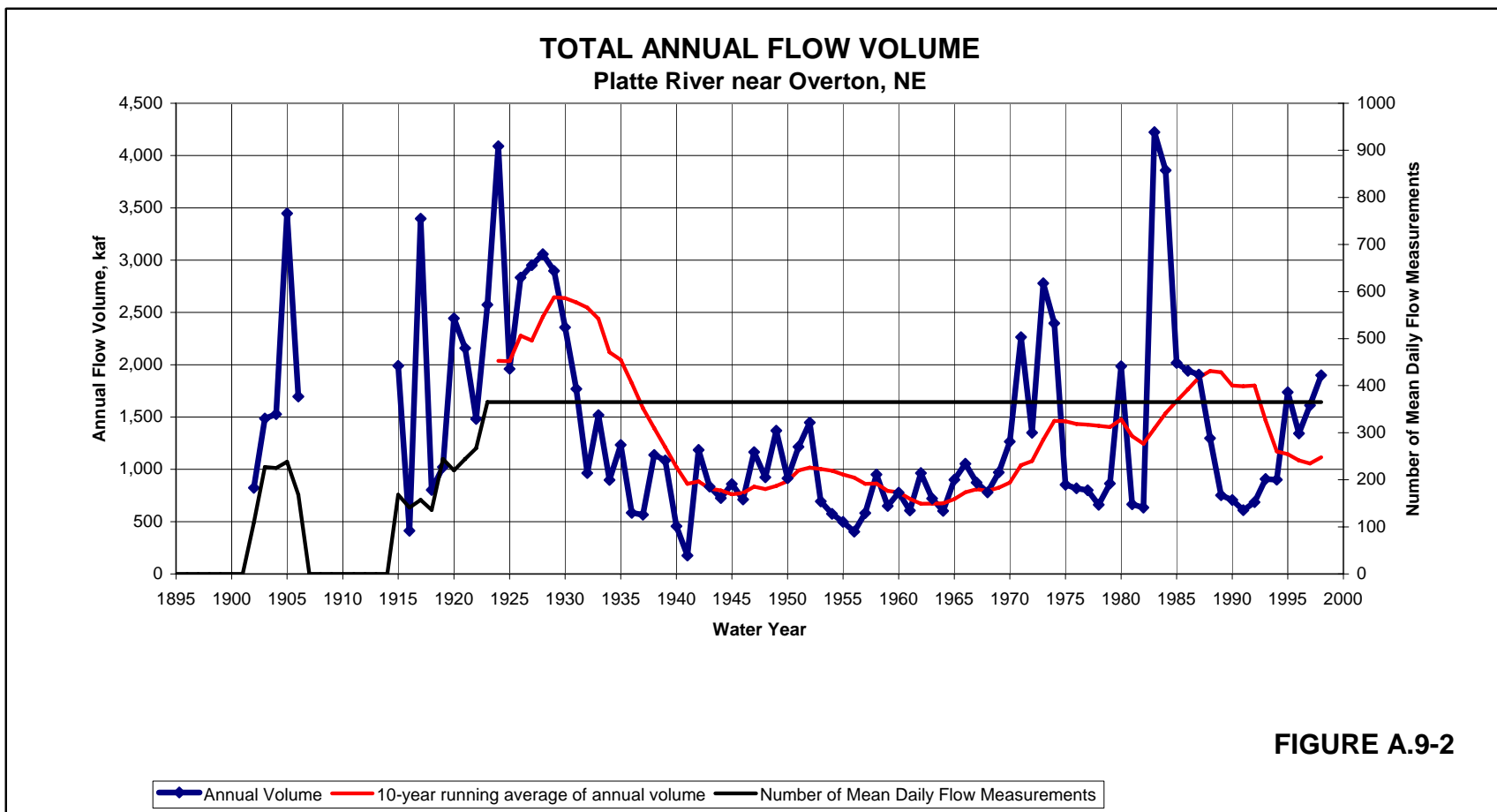


Figure A.9-2 Total Annual Flow Volume.

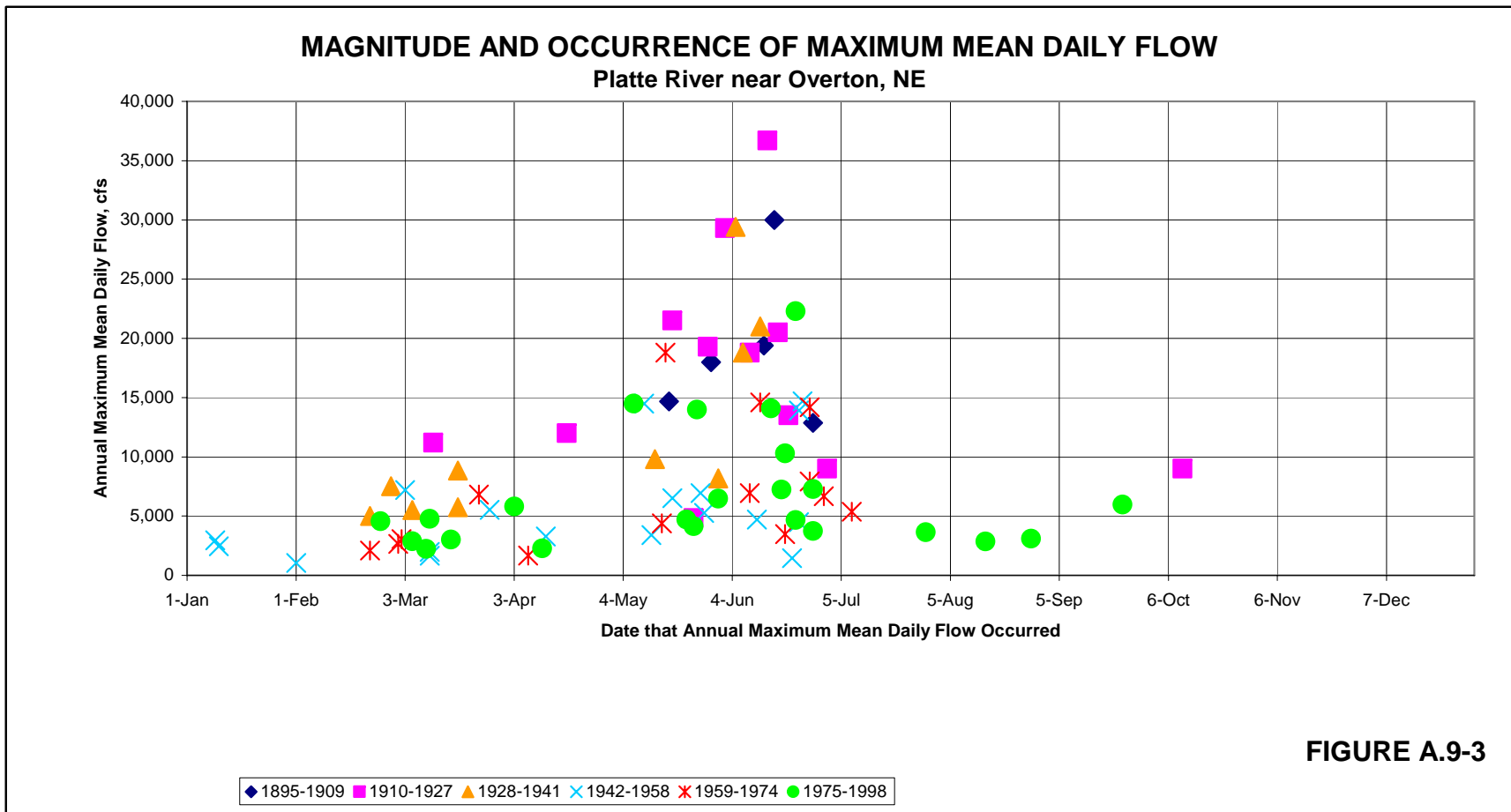


Figure A.9-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

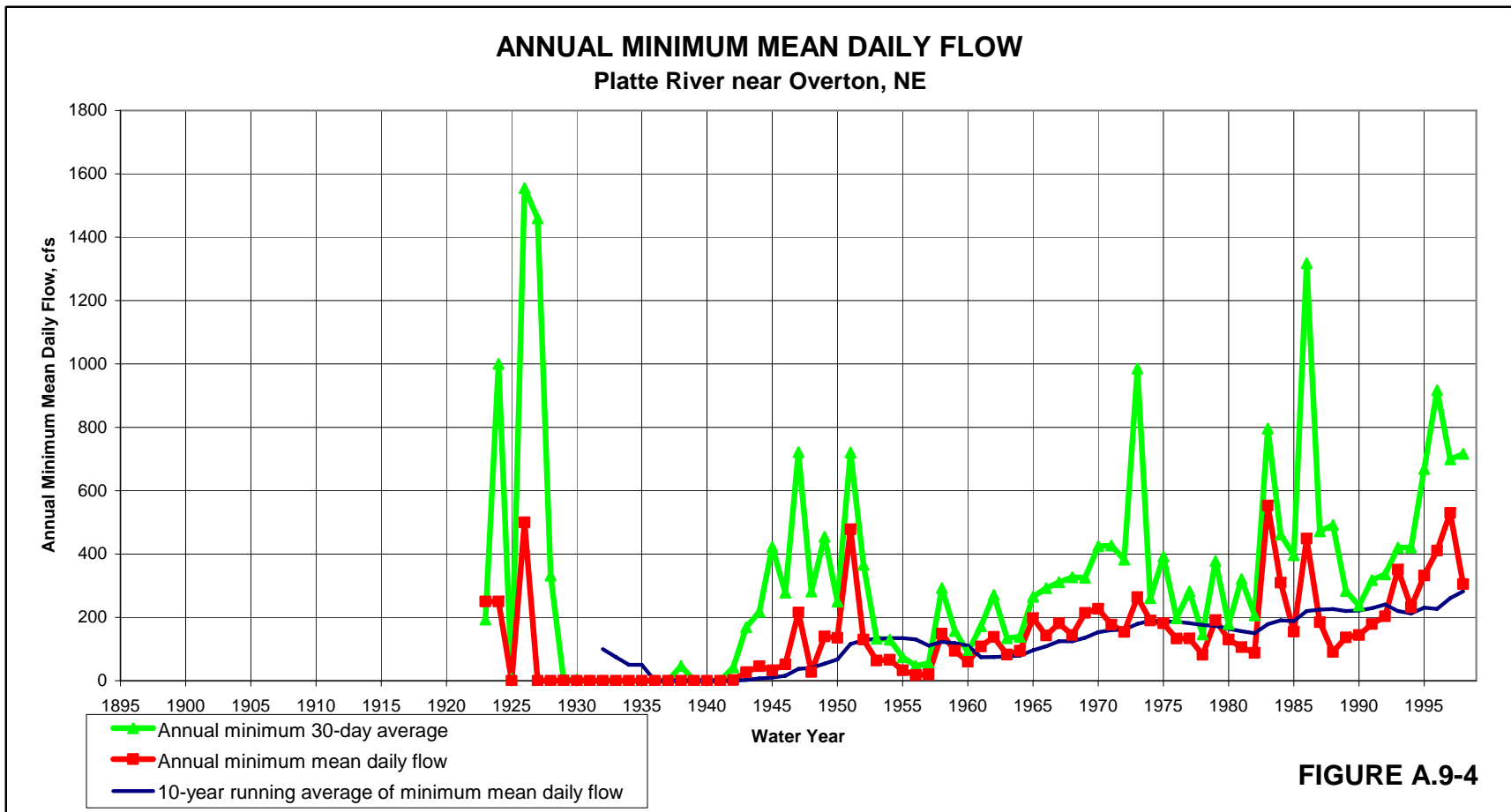


Figure A.9-4 Annual Minimum Mean Daily Flow.

Table A.9-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Platte River near Overton, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	9,155	14,007	6,431	18,986	16,278	10,119	5,662	6,803	6,728
Median Annual Maximum Mean Daily Flow (cfs)	6,670	11,600	4,710	18,000	13,500	7,855	4,480	6,015	4,740
Avg. Ann. Max. 3-day Avg. Flow (cfs)	8,417	12,671	6,029	17,541	14,837	8,920	5,112	6,405	6,427
Median Ann. Max. 3-day Avg. Flow (cfs)	5,700	10,583	4,490	16,800	13,200	7,017	3,890	5,387	4,497
Avg. Ann. Max. 7-day Avg. Flow (cfs)	7,619	11,422	5,484	16,049	13,647	7,703	4,524	5,752	5,985
Median Ann. Max. 7-day Avg. Flow (cfs)	5,167	9,032	3,903	16,214	12,064	5,538	3,237	4,576	4,131
Avg. Ann. Max. 15-day Avg. Flow (cfs)	6,658	9,864	4,859	14,170	11,949	6,389	3,999	4,912	5,433
Median Ann. Max. 15-day Avg. Flow (cfs)	4,463	7,884	3,197	13,793	9,183	4,548	2,668	3,638	3,602
Avg. Ann. Max. 30-day Avg. Flow (cfs)	5,557	8,105	4,126	11,958	9,764	5,188	3,139	4,186	4,785
Median Ann. Max. 30-day Avg. Flow (cfs)	3,443	6,518	2,708	10,650	7,477	4,214	2,375	2,728	2,956
Average Annual Minimum Mean Daily Flow (cfs)	141	53	171		200	0	96	154	234
Median Annual Minimum Mean Daily Flow (cfs)	132	0	143		250	0	52	149	183
Avg. Ann. Min. 3-day Avg. Flow (cfs)	159	64	191		243	0	124	170	252
Median Ann. Min. 3-day Avg. Flow (cfs)	136	0	156		300	0	73	174	187
Avg. Ann. Min. 7-day Avg. Flow (cfs)	193	90	227		341	0	165	200	289
Median Ann. Min. 7-day Avg. Flow (cfs)	155	0	175		271	0	103	189	211
Avg. Ann. Min. 15-day Avg. Flow (cfs)	252	138	290		522	0	215	247	373
Median Ann. Min. 15-day Avg. Flow (cfs)	207	0	233		360	0	160	223	251
Avg. Ann. Min. 30-day Avg. Flow (cfs)	333	242	363		843	27	274	310	461
Median Ann. Min. 30-day Avg. Flow (cfs)	280	0	311		1,000	0	250	282	394

Overton than at upstream locations, most likely due to a larger intervening uncontrolled drainage area and the resulting increased influence of short-duration rainfall events.

Table A.9-3 shows the average and median maximum 3-, 7-, 15-, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.9-3** shows that there is a substantial decrease in all values with increasing averaging time (i.e. from daily to 15-day; data were insufficient to calculate a 30-day average for the Feb 15-Mar 16 time interval). Also, the highest average and median flows occur in the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods, with the values for the Apr 16-Jul 15 seasonal period being slightly higher. The lowest values are those for the Feb 15-Mar 16 seasonal period. This is what one might expect for a river reach in which the seasonality of flows is at least partially climatologically driven.

A.9.4 Flow Frequency and Exceedance

A.9.4.1 Flow Ranges

Table A.9-4 and **Figure A.9-5** show an unusual flow frequency distribution for percentage of years in the 1928-1941 time interval. There is a frequency of 100 percent for all flow ranges up to 2,000 cfs, and every flow range between 2,000 cfs and 8,000 cfs is populated with frequencies of 25 percent or greater. This is a departure from flow frequency distributions at upstream locations for this time interval, which was generally very dry. A possible explanation is that there might have been a small number of intense events in this otherwise dry period whose origins were downstream of the North Platte-South Platte confluence. Information found in **Table A.9-1** suggests this possibility; the average Seasonal Maximum mean daily flow for May-June for this time interval is greater than the median by a factor of 2.3. Otherwise, the other time intervals show frequencies in percentage of years that are more consistent with known climatic conditions and coincident development in the basin.

For percentage of days, **Table A.9-4** shows frequency distributions which are more in line with known climatic conditions and coincident development. Flows in excess of 2,000 cfs occurred most frequently in the 1895-1909 and 1910-1927 time intervals. The 0-200-cfs flow range occurs most frequently in the 1928-1941 time interval. The 1,001-2,000-cfs flow range occurs at about the same frequency, roughly between 35 and 42 percent, for all time intervals after 1928-1941. The frequencies of flow in ranges greater than 2,000 cfs are somewhat higher for the 1975-1998 time interval than for the two preceding time intervals, which is consistent with other data showing this to have been a wet period.

All frequency tables show a greater frequency of flows in high flow ranges (i.e. greater than 3,000 cfs) in early time intervals. These time intervals also have a significant frequency of flows across the entire spectrum of flow ranges presented. These characteristics change with later time intervals, which have fewer high flows and more dominant single flow ranges.

Table A.9-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Platte River near Overton, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	8,417	12,671	6,029	17,541	14,837	8,920	5,112	6,405	6,427
Median Ann. Max. 3-day Avg. Flow (cfs)	5,700	10,583	4,490	16,800	13,200	7,017	3,890	5,387	4,497
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	3,300	5,332	2,587		6,600	4,789	2,089	2,450	3,031
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	7,787	11,902	5,476	17,541	14,713	7,278	4,736	5,989	5,659
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	7,095	11,041	4,880	16,739	13,919	6,333	3,941	5,231	5,311
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,802	3,734	2,278	3,018	5,941	1,940	1,455	1,991	3,053
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	2,740	5,183	2,130		6,417	4,868	1,933	2,190	2,752
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	4,633	10,367	3,307	16,800	13,200	4,040	3,127	4,645	3,287
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	3,890	8,042	3,257	16,800	13,200	2,942	2,670	2,823	3,260
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,007	3,167	1,770	3,060	3,850	350	1,407	1,597	2,448
Platte River near Overton, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	7,619	11,422	5,484	16,049	13,647	7,703	4,524	5,752	5,985
Median Ann. Max. 7-day Avg. Flow (cfs)	5,167	9,032	3,903	16,214	12,064	5,538	3,237	4,576	4,131
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	3,028	4,762	2,420		6,233	4,131	1,971	2,255	2,848
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	7,018	10,714	4,943	16,049	13,454	6,265	4,139	5,395	5,211
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	6,274	9,925	4,224	15,630	12,881	5,143	3,272	4,524	4,698
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	2,406	3,198	1,961	2,609	4,988	1,746	1,219	1,715	2,652
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	2,576	4,896	1,971		5,971	4,521	1,744	1,948	2,538
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	3,773	8,939	3,061	16,214	12,064	3,279	2,763	3,918	2,861
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	3,253	7,379	2,361	16,214	12,064	2,206	2,143	2,533	2,413
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,673	2,814	1,466	2,586	3,493	223	1,190	1,414	1,854
Platte River near Overton, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	6,658	9,864	4,859	14,170	11,949	6,389	3,999	4,912	5,433
Median Ann. Max. 15-day Avg. Flow (cfs)	4,463	7,884	3,197	13,793	9,183	4,548	2,668	3,638	3,602
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	2,651	3,883	2,241		5,168	3,425	1,819	2,096	2,635
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	6,054	9,171	4,305	14,170	11,569	5,158	3,563	4,519	4,688
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	5,252	8,341	3,518	13,613	10,979	4,009	2,663	3,598	4,069
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	2,003	2,664	1,631	2,033	4,127	1,531	984	1,437	2,219
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	2,295	3,833	1,795		5,240	3,652	1,593	1,739	2,285
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	3,065	7,865	2,580	13,793	9,183	2,818	2,570	2,979	2,437
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	2,563	5,622	1,698	12,273	9,183	1,477	1,640	1,779	1,785
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,280	2,417	1,186	2,380	3,177	154	926	1,105	1,423
Platte River near Overton, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	5,557	8,105	4,126	11,958	9,764	5,188	3,139	4,186	4,785
Median Ann. Max. 30-day Avg. Flow (cfs)	3,443	6,518	2,708	10,650	7,477	4,214	2,375	2,728	2,956
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	2,364	3,267	2,063		4,278	2,906	1,684	1,970	2,394
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	4,937	7,519	3,532	11,958	9,745	4,026	2,684	3,648	4,055
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	4,037	6,352	2,738	10,408	8,427	2,977	1,857	2,786	3,329
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,576	2,106	1,288	1,823	3,181	1,189	736	1,104	1,802
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	2,063	3,000	1,699		4,220	2,795	1,561	1,617	2,116
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	2,499	6,627	1,971	10,650	8,508	2,036	2,091	2,225	1,917
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,636	3,683	1,230	9,973	7,477	991	1,243	1,151	1,221
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,015	2,132	887	1,726	2,593	101	699	928	1,131

Table A.9-4 Flow Frequency Distributions.

Platte River near Overton, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	74	75	74	100	38	100	88	81	58
201 to 500	93	88	96	100	69	100	100	100	92
501 to 750	96	88	100	100	69	100	100	100	100
751 to 1,000	98	94	100	100	85	100	100	100	100
1,001 to 2,000	100	100	100	100	100	100	100	100	100
2,001 to 3,000	93	97	91	100	100	93	82	88	100
3,001 to 4,000	83	97	75	100	100	93	65	75	83
4,001 to 5,000	72	94	60	100	100	86	47	63	67
5,001 to 6,000	61	88	46	100	92	79	35	56	46
6,001 to 8,000	53	78	39	100	85	64	29	50	38
8,001 to 10,000	39	72	21	100	85	50	18	25	21
10,001 to 12,000	30	53	18	100	69	21	18	13	21
12,001 to 15,000	27	44	18	100	46	21	18	19	17
Greater than 15,000	16	38	4	60	46	21	0	6	4
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Platte River near Overton, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	9.5	17.1	6.0	6.1	3.7	28.1	11.5	5.5	2.5
201 to 500	10.6	6.4	12.5	2.5	3.1	9.4	12.8	12.4	12.4
501 to 750	7.3	3.6	8.9	4.4	1.6	4.9	10.7	7.0	8.9
751 to 1,000	9.8	4.0	12.5	6.0	2.6	4.5	13.5	12.4	11.8
1,001 to 2,000	30.7	15.4	37.6	22.5	14.1	14.9	38.4	40.6	35.0
2,001 to 3,000	14.5	18.9	12.4	13.5	24.4	16.3	8.9	13.2	14.4
3,001 to 4,000	6.8	12.7	4.1	8.1	18.2	9.9	2.0	3.1	6.3
4,001 to 5,000	3.3	6.8	1.7	5.4	8.2	6.2	1.0	1.5	2.4
5,001 to 6,000	2.0	4.1	1.1	5.3	6.8	2.1	0.3	0.8	1.8
6,001 to 8,000	2.4	4.8	1.4	8.8	7.6	2.2	0.2	1.8	2.0
8,001 to 10,000	1.1	2.0	0.6	4.4	3.5	0.5	0.3	0.4	1.1
10,001 to 12,000	0.7	1.1	0.5	3.4	1.7	0.3	0.1	0.7	0.6
12,001 to 15,000	0.7	1.2	0.5	3.3	1.8	0.4	0.3	0.4	0.6
Greater than 15,000	0.7	1.8	0.3	6.2	2.8	0.3	0.0	0.3	0.4
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Platte River near Overton, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	32	51	22	12	10	103	42	20	9
201 to 500	36	19	46	5	8	34	47	45	45
501 to 750	25	11	32	9	4	18	39	26	32
751 to 1,000	33	12	46	12	7	17	49	45	43
1,001 to 2,000	104	46	137	44	37	55	140	148	128
2,001 to 3,000	49	56	45	26	64	60	32	48	53
3,001 to 4,000	23	38	15	16	48	36	7	11	23
4,001 to 5,000	11	20	6	10	21	23	4	5	9
5,001 to 6,000	7	12	4	10	18	8	1	3	6
6,001 to 8,000	8	14	5	17	20	8	1	7	7
8,001 to 10,000	4	6	2	9	9	2	1	1	4
10,001 to 12,000	2	3	2	7	4	1	1	2	2
12,001 to 15,000	2	3	2	6	5	1	1	1	2
Greater than 15,000	3	5	1	12	7	1	0	1	1
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

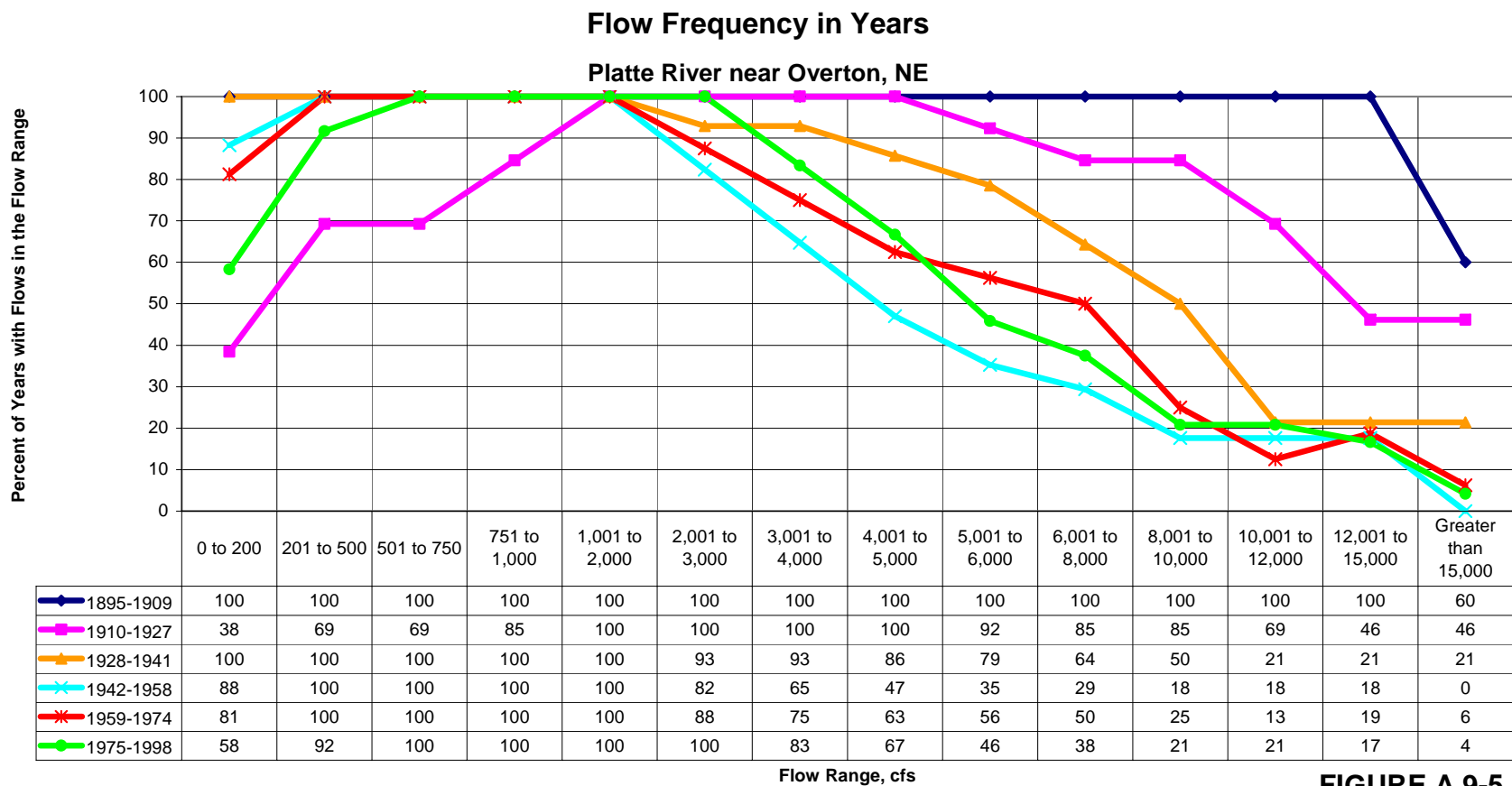


FIGURE A.9-5

Figure A.9-5 Flow Frequency in Years.

For the 1910-1927 time interval, the same characterizations as those for the 1895-1909 time interval can be seen, but the actual flow values are somewhat lower for the Apr 16- Jul 15 and the Jun 1-Aug 15 seasonal periods. Also, there is noticeably less decrease in all values with increasing averaging time.

Beginning with the 1928-1941 time interval, significant changes to the characterizations can be seen. The most noteworthy characterization change is that the flow values for this and all succeeding time intervals are less than those for the 1910-1927 time interval by 50 percent or more. This coincides with the beginning of operation of Alcova, Seminoe, and Lake McConaughy Reservoirs in 1938, 1939, and 1941, respectively, and is also consistent with generally drier conditions during the 1930's. Also, the flow values by time interval from 1928-1941 through 1975-1998 do not show much change from one time interval to the next and the differences in flow values between seasonal periods are noticeably less. Decreasing values with increasing averaging time still exist, but these differences are quite small when compared with those for earlier time intervals. For the 1959-1974 and 1975-1998 time intervals, the difference between the average and the median values are quite large for the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods, with the average values being higher than the median values. This suggests that lower flows were the rule during these seasonal periods for these time intervals, with the average values being skewed higher by the occurrence of a small number of very high flow events during which the upstream reservoirs could have spilled.

A.9.4.2 Maximum Mean Flow Exceedance

Table A.9-5 through **Table A.9-9** show the exceedance values and probabilities for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this appendix.

Table A.9-5 shows the exceedance probabilities and values for annual maximum flow data. There are two noteworthy characterizations that can be seen in **Table A.9-5**. The first is the decreases in the flow values from the 1928-1941 time interval to the 1942-1958 time interval, especially for the lower exceedance probabilities (higher flows). The second is that changes in the flow values with decreasing exceedance probability (increasing flow values) for the 1942-1958 time interval and all subsequent time intervals are noticeably smaller than those for the 1928-1941 time interval and all preceding time intervals. These changes are less dramatic for this location than for the North Platte River at North Platte, NE (**Section A.5**), probably in large part due to the inflow from the South Platte River and the intervening uncontrolled drainage area.

Table A.9-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.9-6** shows the same decreases in flow

Table A.9-5 Maximum Flow Exceedance Values, Annual Data.

Platte River near Overton, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		1,040	1,040	1,450	12,860	4,820	1,040	1,450	1,670	2,230
Maximum exceeded in 90% of the years		2,416	5,050	2,178	13,585	6,600	4,237	1,832	2,000	2,859
Maximum exceeded in 80% of the years		3,208	6,240	2,856	14,310	9,000	5,300	2,480	2,650	3,068
Maximum exceeded in 70% of the years		4,512	8,388	3,244	15,338	10,320	5,725	2,888	3,260	3,730
Maximum exceeded in 60% of the years		5,388	9,280	4,236	16,669	11,840	7,264	3,324	4,380	4,582
Maximum exceeded in 50% of the years		6,670	11,600	4,710	18,000	13,500	7,855	4,480	6,015	4,740
Maximum exceeded in 40% of the years		7,832	14,203	5,906	18,560	18,900	8,718	5,042	6,810	5,938
Maximum exceeded in 30% of the years		10,840	18,800	6,906	19,120	19,780	9,710	5,726	7,420	6,934
Maximum exceeded in 20% of the years		14,500	20,280	8,262	21,520	21,100	13,400	6,854	8,350	8,488
Maximum exceeded in 10% of the years		19,320	28,520	14,320	25,760	27,740	20,340	14,140	14,400	14,070
Maximum		36,700	36,700	22,300	30,000	36,700	29,400	14,700	18,800	22,300
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		887	887	1,247	11,980	4,180	887	1,247	1,603	1,957
Maximum exceeded in 90% of the years		2,267	4,887	1,991	12,064	5,460	4,175	1,755	1,935	2,731
Maximum exceeded in 80% of the years		3,027	5,580	2,573	12,148	6,860	5,153	2,312	2,537	2,805
Maximum exceeded in 70% of the years		3,901	7,007	3,042	13,112	9,240	5,532	2,491	3,205	3,266
Maximum exceeded in 60% of the years		5,168	8,280	3,607	14,956	11,133	6,652	3,085	4,130	3,981
Maximum exceeded in 50% of the years		5,700	10,583	4,490	16,800	13,200	7,017	3,890	5,387	4,497
Maximum exceeded in 40% of the years		7,028	12,796	5,467	17,173	16,533	7,477	4,553	6,183	5,680
Maximum exceeded in 30% of the years		9,807	16,893	6,437	17,547	17,893	8,173	5,209	7,142	6,666
Maximum exceeded in 20% of the years		13,587	19,027	8,097	19,987	19,453	12,600	6,140	8,200	8,182
Maximum exceeded in 10% of the years		17,860	21,050	13,587	24,493	26,707	19,340	12,489	13,198	13,627
Maximum		33,900	33,900	22,167	29,000	33,900	21,167	13,933	18,100	22,167
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		841	841	1,149	9,322	3,540	841	1,149	1,424	1,876
Maximum exceeded in 90% of the years		1,998	4,645	1,871	10,067	5,109	3,991	1,613	1,768	2,393
Maximum exceeded in 80% of the years		2,628	5,013	2,363	10,813	6,194	4,726	1,978	2,176	2,524
Maximum exceeded in 70% of the years		3,601	5,553	2,629	12,191	8,200	4,925	2,293	2,966	2,641
Maximum exceeded in 60% of the years		4,644	7,064	3,235	14,203	9,691	5,039	2,716	3,691	3,467
Maximum exceeded in 50% of the years		5,167	9,032	3,903	16,214	12,064	5,538	3,237	4,576	4,131
Maximum exceeded in 40% of the years		6,361	11,713	4,890	16,480	13,773	6,313	4,015	5,043	5,443
Maximum exceeded in 30% of the years		8,669	16,039	5,726	16,746	16,426	7,021	4,706	6,389	6,266
Maximum exceeded in 20% of the years		12,941	16,839	7,741	18,831	17,789	11,386	5,406	7,903	7,651
Maximum exceeded in 10% of the years		16,719	18,456	12,983	22,737	26,300	16,999	10,218	11,566	13,113
Maximum		32,457	32,457	21,214	26,643	32,457	17,804	13,257	17,271	21,214
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		829	829	1,074	7,892	3,079	829	1,074	1,326	1,811
Maximum exceeded in 90% of the years		1,863	3,381	1,804	8,634	4,413	3,257	1,506	1,683	1,989
Maximum exceeded in 80% of the years		2,331	4,183	2,045	9,375	5,849	3,437	1,850	2,037	2,234
Maximum exceeded in 70% of the years		2,808	4,997	2,334	10,555	7,335	3,858	2,248	2,466	2,487
Maximum exceeded in 60% of the years		3,545	6,067	2,620	12,174	8,178	4,251	2,544	2,893	2,671
Maximum exceeded in 50% of the years		4,463	7,884	3,197	13,793	9,183	4,548	2,668	3,638	3,602
Maximum exceeded in 40% of the years		5,403	9,521	4,364	14,175	11,313	5,565	3,115	4,229	4,885
Maximum exceeded in 30% of the years		7,762	13,356	5,029	14,556	13,995	5,956	4,497	4,957	5,351
Maximum exceeded in 20% of the years		10,994	14,556	6,122	16,732	15,293	9,949	4,506	6,084	6,921
Maximum exceeded in 10% of the years		13,984	15,479	11,601	20,703	24,456	13,652	8,887	10,119	12,448
Maximum		29,533	29,533	21,140	24,673	29,533	14,993	12,073	16,287	21,140
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		618	618	1,044	5,854	2,771	618	1,044	1,311	1,451
Maximum exceeded in 90% of the years		1,661	2,831	1,496	6,474	4,113	2,785	1,454	1,481	1,715
Maximum exceeded in 80% of the years		2,076	3,120	1,740	7,093	5,431	2,853	1,700	1,717	1,867
Maximum exceeded in 70% of the years		2,392	4,753	2,081	8,053	6,247	2,953	2,027	2,061	2,144
Maximum exceeded in 60% of the years		2,836	5,431	2,295	9,351	7,256	3,120	2,164	2,411	2,335
Maximum exceeded in 50% of the years		3,443	6,518	2,708	10,650	7,477	4,214	2,375	2,728	2,956
Maximum exceeded in 40% of the years		4,513	7,451	3,293	11,404	9,739	4,828	2,722	3,417	3,609
Maximum exceeded in 30% of the years		5,825	10,439	3,750	12,158	11,281	5,149	3,053	3,581	4,507
Maximum exceeded in 20% of the years		9,381	11,692	4,972	14,697	12,507	7,926	4,119	3,875	5,631
Maximum exceeded in 10% of the years		12,166	12,580	9,781	19,022	17,373	10,614	5,723	9,705	11,639
Maximum		24,255	24,255	20,477	23,347	24,255	11,917	9,276	15,137	20,477

Table A.9-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Platte River near Overton, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	688	980	688		4,200	980	688	1,370	1,300
Maximum exceeded in 90% of the years	1,572	4,140	1,460		4,800	3,897	1,080	1,450	1,657
Maximum exceeded in 80% of the years	1,846	4,910	1,746		5,400	4,830	1,696	1,740	1,906
Maximum exceeded in 70% of the years	2,088	5,000	1,928		6,100	4,999	1,952	1,785	2,203
Maximum exceeded in 60% of the years	2,346	5,090	2,094		6,800	5,000	2,068	1,840	2,416
Maximum exceeded in 50% of the years	2,880	5,450	2,320		6,950	5,075	2,090	2,245	2,840
Maximum exceeded in 40% of the years	3,516	5,976	2,716		7,100	5,430	2,160	2,650	3,220
Maximum exceeded in 30% of the years	4,254	6,625	2,964		7,550	5,964	2,282	2,830	3,417
Maximum exceeded in 20% of the years	5,000	7,120	3,598		8,000	6,220	2,418	2,950	3,918
Maximum exceeded in 10% of the years	6,650	7,568	4,200		9,600	7,005	3,924	3,350	4,707
Maximum	11,200	11,200	8,000		11,200	7,520	4,470	6,870	8,000
3-day Average Flows									
Maximum exceeded in 100% of the years	594	594	646		3,700	594	646	1,223	1,193
Maximum exceeded in 90% of the years	1,467	3,676	1,379		4,550	3,559	1,007	1,368	1,604
Maximum exceeded in 80% of the years	1,768	4,249	1,654		5,400	4,134	1,636	1,643	1,826
Maximum exceeded in 70% of the years	1,936	4,589	1,841		5,600	4,516	1,839	1,702	1,949
Maximum exceeded in 60% of the years	2,257	4,875	1,942		5,800	4,657	1,871	1,773	2,352
Maximum exceeded in 50% of the years	2,740	5,183	2,130		6,417	4,868	1,933	2,190	2,752
Maximum exceeded in 40% of the years	3,344	5,507	2,583		7,033	4,981	2,013	2,537	2,966
Maximum exceeded in 30% of the years	3,850	5,968	2,788		7,517	5,397	2,079	2,683	3,398
Maximum exceeded in 20% of the years	4,789	6,652	3,365		8,000	5,944	2,274	2,887	3,825
Maximum exceeded in 10% of the years	6,346	7,130	4,047		8,833	6,505	3,513	3,295	4,499
Maximum	9,667	9,667	7,893		9,667	6,993	4,323	6,663	7,893
7-day Average Flows									
Maximum exceeded in 100% of the years	433	433	623		3,314	433	623	1,171	1,149
Maximum exceeded in 90% of the years	1,348	3,051	1,297		4,357	2,952	960	1,290	1,553
Maximum exceeded in 80% of the years	1,625	3,383	1,541		5,400	3,267	1,557	1,361	1,709
Maximum exceeded in 70% of the years	1,771	4,206	1,705		5,429	3,700	1,696	1,544	1,870
Maximum exceeded in 60% of the years	2,041	4,543	1,789		5,457	4,410	1,711	1,737	2,205
Maximum exceeded in 50% of the years	2,576	4,896	1,971		5,971	4,521	1,744	1,948	2,538
Maximum exceeded in 40% of the years	2,990	5,071	2,225		6,486	4,759	1,866	2,176	2,741
Maximum exceeded in 30% of the years	3,586	5,374	2,629		7,243	5,001	1,987	2,461	3,272
Maximum exceeded in 20% of the years	4,413	5,469	3,217		8,000	5,071	2,183	2,604	3,616
Maximum exceeded in 10% of the years	5,423	6,637	3,791		8,371	5,304	3,293	3,191	4,222
Maximum	8,743	8,743	7,670		8,743	5,514	4,273	6,163	7,670
15-day Average Flows									
Maximum exceeded in 100% of the years	382	382	415		3,060	382	415	1,141	1,134
Maximum exceeded in 90% of the years	1,256	2,416	1,201		3,815	2,390	893	1,197	1,447
Maximum exceeded in 80% of the years	1,548	2,872	1,442		4,569	2,623	1,346	1,325	1,565
Maximum exceeded in 70% of the years	1,618	3,184	1,584		5,005	2,930	1,579	1,430	1,768
Maximum exceeded in 60% of the years	1,811	3,643	1,634		5,123	3,423	1,588	1,609	2,093
Maximum exceeded in 50% of the years	2,295	3,833	1,795		5,240	3,652	1,593	1,739	2,285
Maximum exceeded in 40% of the years	2,585	4,177	2,206		5,248	3,800	1,701	1,795	2,502
Maximum exceeded in 30% of the years	3,125	4,720	2,493		5,256	3,935	1,910	2,371	3,000
Maximum exceeded in 20% of the years	3,669	4,968	2,946		5,675	4,391	2,151	2,493	3,162
Maximum exceeded in 10% of the years	4,870	5,244	3,475		6,504	4,738	2,909	3,081	3,887
Maximum	7,333	7,333	7,329		7,333	5,000	4,213	5,539	7,329
30-day Average Flows									
Maximum exceeded in 100% of the years	274	274	382		3,000	274	382	1,064	1,064
Maximum exceeded in 90% of the years	1,210	2,039	1,126		3,305	2,018	857	1,116	1,324
Maximum exceeded in 80% of the years	1,429	2,355	1,321		3,609	2,123	1,284	1,254	1,500
Maximum exceeded in 70% of the years	1,555	2,659	1,497		3,853	2,445	1,451	1,371	1,670
Maximum exceeded in 60% of the years	1,711	2,876	1,570		4,037	2,635	1,525	1,501	1,778
Maximum exceeded in 50% of the years	2,063	3,000	1,699		4,220	2,795	1,561	1,617	2,116
Maximum exceeded in 40% of the years	2,426	3,658	1,992		4,307	2,924	1,601	1,725	2,339
Maximum exceeded in 30% of the years	2,589	4,003	2,268		4,393	3,459	1,752	2,229	2,478
Maximum exceeded in 20% of the years	3,202	4,307	2,484		4,744	3,895	2,017	2,451	2,818
Maximum exceeded in 10% of the years	4,192	4,526	3,228		5,359	4,369	2,450	2,916	3,287
Maximum	7,254	5,973	7,254		5,973	4,800	4,113	5,021	7,254

Table A.9-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Platte River near Overton, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	879	900	879	12,860	4,820	900	1,200	1,440	879
Maximum exceeded in 90% of the years	1,602	3,105	1,522	13,585	5,440	1,570	1,374	1,780	1,780
Maximum exceeded in 80% of the years	2,338	4,420	2,060	14,310	7,440	2,930	1,636	2,060	2,182
Maximum exceeded in 70% of the years	3,098	5,230	2,370	15,338	9,180	3,225	2,308	2,455	2,614
Maximum exceeded in 60% of the years	4,264	8,514	3,092	16,669	11,460	4,032	2,906	3,470	3,184
Maximum exceeded in 50% of the years	5,200	10,900	4,140	18,000	13,500	4,585	3,390	4,870	3,940
Maximum exceeded in 40% of the years	6,938	14,203	4,706	18,560	18,900	5,210	4,612	6,670	4,586
Maximum exceeded in 30% of the years	10,100	18,800	6,722	19,120	19,780	8,351	5,518	7,410	6,547
Maximum exceeded in 20% of the years	14,500	20,280	7,906	21,520	21,100	13,400	6,854	7,910	8,488
Maximum exceeded in 10% of the years	19,320	28,520	14,320	25,760	27,740	20,340	14,140	14,400	14,070
Maximum	36,700	36,700	22,300	30,000	36,700	29,400	14,700	18,800	22,300
3-day Average Flows									
Maximum exceeded in 100% of the years	697	697	869	11,980	4,180	697	1,133	1,410	869
Maximum exceeded in 90% of the years	1,579	2,781	1,454	12,064	4,763	1,408	1,196	1,693	1,681
Maximum exceeded in 80% of the years	1,997	3,962	1,852	12,148	6,610	2,545	1,565	1,860	1,870
Maximum exceeded in 70% of the years	2,934	4,640	2,165	13,112	8,980	3,056	1,944	2,235	2,560
Maximum exceeded in 60% of the years	3,687	7,992	2,934	14,956	11,047	3,694	2,772	3,427	3,043
Maximum exceeded in 50% of the years	4,633	10,367	3,307	16,800	13,200	4,040	3,127	4,645	3,287
Maximum exceeded in 40% of the years	6,559	12,796	4,290	17,173	16,533	4,559	3,657	5,613	3,959
Maximum exceeded in 30% of the years	9,633	16,893	6,370	17,547	17,893	7,741	5,024	7,093	6,438
Maximum exceeded in 20% of the years	13,587	19,027	7,664	19,987	19,453	12,600	6,131	7,683	8,182
Maximum exceeded in 10% of the years	17,860	21,050	13,587	24,493	26,707	19,340	12,489	13,198	13,627
Maximum	33,900	33,900	22,167	29,000	33,900	21,167	13,933	18,100	22,167
7-day Average Flows									
Maximum exceeded in 100% of the years	457	457	766	9,322	3,540	457	766	1,247	811
Maximum exceeded in 90% of the years	1,337	2,061	1,269	10,067	3,956	1,240	1,004	1,371	1,321
Maximum exceeded in 80% of the years	1,784	3,247	1,456	10,813	5,976	1,938	1,425	1,710	1,483
Maximum exceeded in 70% of the years	2,551	3,801	1,893	12,191	8,110	2,351	1,701	2,022	2,317
Maximum exceeded in 60% of the years	3,227	7,064	2,565	14,203	9,147	3,030	2,562	3,234	2,564
Maximum exceeded in 50% of the years	3,773	8,939	3,061	16,214	12,064	3,279	2,763	3,918	2,861
Maximum exceeded in 40% of the years	5,857	11,713	3,768	16,480	13,773	3,924	3,081	5,043	3,688
Maximum exceeded in 30% of the years	8,579	16,039	5,599	16,746	16,426	7,021	4,267	6,389	5,935
Maximum exceeded in 20% of the years	12,941	16,839	7,244	18,831	17,789	11,386	5,406	7,281	7,593
Maximum exceeded in 10% of the years	16,719	18,456	12,983	22,737	26,300	16,999	10,218	11,566	13,113
Maximum	32,457	32,457	21,214	26,643	32,457	17,804	13,257	17,271	21,214
15-day Average Flows									
Maximum exceeded in 100% of the years	380	380	611	7,892	2,717	380	611	923	757
Maximum exceeded in 90% of the years	1,028	1,331	986	8,634	3,193	864	867	1,177	1,009
Maximum exceeded in 80% of the years	1,401	2,722	1,267	9,375	4,261	1,215	1,276	1,375	1,261
Maximum exceeded in 70% of the years	2,135	3,085	1,681	10,555	6,785	1,727	1,443	1,863	1,783
Maximum exceeded in 60% of the years	2,606	5,415	2,183	12,174	7,872	2,625	1,935	2,337	2,172
Maximum exceeded in 50% of the years	3,065	7,865	2,580	13,793	9,183	2,818	2,570	2,979	2,437
Maximum exceeded in 40% of the years	4,895	9,521	2,915	14,175	11,313	3,058	2,633	4,229	2,731
Maximum exceeded in 30% of the years	7,762	13,356	4,505	14,556	13,995	5,956	3,244	4,957	5,027
Maximum exceeded in 20% of the years	10,994	14,556	5,957	16,732	15,293	9,949	4,506	6,084	6,485
Maximum exceeded in 10% of the years	13,984	15,479	11,601	20,703	24,456	13,652	8,887	9,557	12,448
Maximum	29,533	29,533	21,140	24,673	29,533	14,993	12,073	16,287	21,140
30-day Average Flows									
Maximum exceeded in 100% of the years	355	355	416	5,854	1,967	355	416	716	640
Maximum exceeded in 90% of the years	809	831	819	6,474	2,797	530	774	1,012	759
Maximum exceeded in 80% of the years	1,194	1,967	1,127	7,093	3,744	801	1,210	1,306	979
Maximum exceeded in 70% of the years	1,470	2,649	1,314	8,053	6,798	976	1,227	1,390	1,400
Maximum exceeded in 60% of the years	1,971	5,009	1,613	9,351	7,309	1,948	1,647	1,531	1,760
Maximum exceeded in 50% of the years	2,499	6,627	1,971	10,650	8,508	2,036	2,091	2,225	1,917
Maximum exceeded in 40% of the years	3,489	7,477	2,362	11,404	10,140	2,538	2,316	2,723	2,141
Maximum exceeded in 30% of the years	5,480	10,542	3,424	12,158	11,836	5,149	2,690	3,581	3,731
Maximum exceeded in 20% of the years	9,434	11,917	4,271	14,697	12,546	7,926	3,328	3,875	4,777
Maximum exceeded in 10% of the years	12,194	12,585	9,781	19,022	17,972	10,614	5,684	8,331	11,639
Maximum	24,255	24,255	20,477	23,347	24,255	11,917	9,276	15,137	20,477

Table A.9-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Platte River near Overton, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	0	0	533	8,748	4,500	0	552	533	628
Maximum exceeded in 90% of the years	1,110	1,206	1,100	10,393	5,440	719	979	1,245	1,671
Maximum exceeded in 80% of the years	1,612	2,960	1,552	12,038	7,100	1,124	1,402	1,530	2,218
Maximum exceeded in 70% of the years	2,556	5,230	2,076	13,688	8,420	1,254	1,522	1,815	2,575
Maximum exceeded in 60% of the years	3,504	7,280	2,604	15,344	8,920	2,650	2,016	2,400	2,916
Maximum exceeded in 50% of the years	4,580	8,674	3,470	17,000	13,500	3,365	2,750	3,005	3,690
Maximum exceeded in 40% of the years	6,620	13,244	4,272	17,960	15,880	5,048	4,272	5,360	3,862
Maximum exceeded in 30% of the years	8,689	17,000	5,572	18,920	17,720	6,920	4,604	6,800	6,502
Maximum exceeded in 20% of the years	14,140	19,280	7,784	21,520	19,820	12,320	4,924	7,910	8,448
Maximum exceeded in 10% of the years	18,800	28,470	14,140	25,760	27,540	20,340	11,434	14,400	12,960
Maximum	36,700	36,700	22,300	30,000	36,700	29,400	14,700	17,000	22,300
3-day Average Flows									
Maximum exceeded in 100% of the years	0	0	462	7,974	4,117	0	552	462	591
Maximum exceeded in 90% of the years	964	923	1,002	9,660	4,763	534	893	1,141	1,567
Maximum exceeded in 80% of the years	1,578	2,523	1,510	11,347	6,363	876	1,201	1,290	1,983
Maximum exceeded in 70% of the years	2,204	4,309	1,855	13,112	8,053	1,223	1,471	1,715	2,204
Maximum exceeded in 60% of the years	3,258	7,042	2,275	14,956	8,500	2,102	1,906	2,200	2,567
Maximum exceeded in 50% of the years	3,890	8,042	3,257	16,800	13,200	2,942	2,670	2,823	3,260
Maximum exceeded in 40% of the years	6,083	12,796	3,667	17,173	14,533	4,064	3,499	5,160	3,635
Maximum exceeded in 30% of the years	8,053	16,560	5,251	17,547	16,373	6,913	3,869	6,107	6,261
Maximum exceeded in 20% of the years	13,060	17,787	7,554	19,987	18,493	11,500	4,629	7,683	8,182
Maximum exceeded in 10% of the years	17,093	21,050	12,525	24,493	26,707	19,340	10,342	13,198	12,078
Maximum	33,900	33,900	22,167	29,000	33,900	21,167	13,433	16,933	22,167
7-day Average Flows									
Maximum exceeded in 100% of the years	0	0	363	7,228	3,540	0	363	401	559
Maximum exceeded in 90% of the years	760	790	753	8,811	3,956	365	723	823	1,018
Maximum exceeded in 80% of the years	1,078	2,097	1,002	10,394	5,970	699	840	937	1,553
Maximum exceeded in 70% of the years	1,725	3,584	1,466	12,191	7,380	972	1,030	1,361	1,733
Maximum exceeded in 60% of the years	2,367	5,490	1,818	14,203	7,580	1,775	1,577	1,710	1,969
Maximum exceeded in 50% of the years	3,253	7,379	2,361	16,214	12,064	2,206	2,143	2,533	2,413
Maximum exceeded in 40% of the years	5,017	11,713	3,236	16,480	12,937	2,515	2,580	4,144	3,230
Maximum exceeded in 30% of the years	7,380	15,311	4,532	16,746	15,246	4,105	3,240	5,363	5,071
Maximum exceeded in 20% of the years	11,846	16,594	6,954	18,831	16,510	9,954	4,195	7,096	7,540
Maximum exceeded in 10% of the years	16,223	17,572	10,320	22,737	25,930	16,902	8,324	11,566	11,010
Maximum	32,457	32,457	21,214	26,643	32,457	17,586	12,800	14,800	21,214
15-day Average Flows									
Maximum exceeded in 100% of the years	0	0	298	6,624	2,717	0	314	298	467
Maximum exceeded in 90% of the years	565	575	553	7,873	3,193	331	527	554	631
Maximum exceeded in 80% of the years	788	1,425	757	9,122	4,261	570	682	703	1,057
Maximum exceeded in 70% of the years	1,236	2,361	1,097	10,251	5,353	600	808	977	1,252
Maximum exceeded in 60% of the years	1,652	4,261	1,327	11,262	5,715	1,303	1,302	1,216	1,484
Maximum exceeded in 50% of the years	2,563	5,622	1,698	12,273	9,183	1,477	1,640	1,779	1,785
Maximum exceeded in 40% of the years	4,112	9,521	2,472	13,263	11,185	1,734	2,101	2,893	2,511
Maximum exceeded in 30% of the years	5,653	12,122	3,340	14,252	12,984	2,526	2,566	4,346	4,501
Maximum exceeded in 20% of the years	9,997	13,709	5,442	16,732	14,308	7,935	3,010	5,451	6,273
Maximum exceeded in 10% of the years	13,122	14,987	9,014	20,703	24,032	13,186	7,111	9,319	9,694
Maximum	29,533	29,533	21,140	24,673	29,533	14,993	10,511	13,060	21,140
30-day Average Flows									
Maximum exceeded in 100% of the years	0	0	243	0	1,637	0	243	261	402
Maximum exceeded in 90% of the years	405	297	475	2,961	2,792	211	416	522	469
Maximum exceeded in 80% of the years	576	736	567	5,923	2,999	312	532	562	748
Maximum exceeded in 70% of the years	862	1,133	768	7,917	3,485	469	631	698	932
Maximum exceeded in 60% of the years	1,130	2,813	954	8,945	4,289	736	792	853	1,122
Maximum exceeded in 50% of the years	1,636	3,683	1,230	9,973	7,477	991	1,243	1,151	1,221
Maximum exceeded in 40% of the years	2,762	7,447	1,737	10,998	9,072	1,097	1,593	1,947	1,794
Maximum exceeded in 30% of the years	3,706	9,191	2,443	12,023	9,922	1,407	1,855	3,083	3,347
Maximum exceeded in 20% of the years	7,433	10,922	3,709	14,453	11,349	5,847	2,309	3,718	4,356
Maximum exceeded in 10% of the years	11,085	12,473	5,990	18,290	17,170	10,273	4,889	7,367	8,304
Maximum	24,087	24,087	20,477	22,127	24,087	11,917	6,678	11,593	20,477

Table A.9-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

Platte River near Overton, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	0	0	314	2,780	3,400	0	314	613	1,100
Maximum exceeded in 90% of the years	464	38	1,088	2,948	3,800	0	434	1,110	1,522
Maximum exceeded in 80% of the years	1,198	388	1,280	3,116	3,800	6	1,002	1,230	1,898
Maximum exceeded in 70% of the years	1,578	2,906	1,560	3,260	3,920	263	1,212	1,380	2,079
Maximum exceeded in 60% of the years	1,908	3,500	1,724	3,380	4,400	327	1,456	1,570	2,404
Maximum exceeded in 50% of the years	2,310	3,800	1,940	3,500	4,650	466	1,600	1,715	2,735
Maximum exceeded in 40% of the years	2,848	4,300	2,134	3,500	5,810	797	1,648	1,900	2,848
Maximum exceeded in 30% of the years	3,624	5,470	2,658	3,500	7,250	3,780	1,910	1,940	3,655
Maximum exceeded in 20% of the years	4,560	6,168	3,066	3,900	9,380	5,440	2,278	1,960	4,534
Maximum exceeded in 10% of the years	6,038	8,000	4,708	4,700	14,520	6,067	2,482	3,085	5,664
Maximum	17,300	17,300	9,450	5,500	17,300	6,600	4,380	8,270	9,450
3-day Average Flows									
Maximum exceeded in 100% of the years	0	0	257	1,764	3,000	0	257	573	1,083
Maximum exceeded in 90% of the years	379	30	971	2,192	3,073	0	410	1,082	1,472
Maximum exceeded in 80% of the years	1,103	325	1,188	2,619	3,271	4	868	1,127	1,663
Maximum exceeded in 70% of the years	1,470	2,085	1,463	2,879	3,391	215	980	1,307	1,942
Maximum exceeded in 60% of the years	1,714	3,013	1,526	2,969	3,673	282	1,217	1,480	2,277
Maximum exceeded in 50% of the years	2,007	3,167	1,770	3,060	3,850	350	1,407	1,597	2,448
Maximum exceeded in 40% of the years	2,670	3,613	2,004	3,076	5,177	622	1,517	1,710	2,670
Maximum exceeded in 30% of the years	3,084	4,707	2,417	3,092	7,043	3,111	1,680	1,795	3,277
Maximum exceeded in 20% of the years	3,878	5,521	2,783	3,347	9,013	5,180	2,139	1,873	4,403
Maximum exceeded in 10% of the years	5,595	7,827	4,403	3,840	10,327	5,494	2,382	2,867	5,458
Maximum	14,167	14,167	9,110	4,333	14,167	6,400	3,443	7,803	9,110
7-day Average Flows									
Maximum exceeded in 100% of the years	0	0	231	1,294	2,579	0	231	525	989
Maximum exceeded in 90% of the years	292	22	842	1,779	2,657	0	336	960	1,125
Maximum exceeded in 80% of the years	968	212	1,052	2,265	2,721	2	755	1,056	1,414
Maximum exceeded in 70% of the years	1,181	1,658	1,167	2,523	3,071	172	869	1,107	1,489
Maximum exceeded in 60% of the years	1,427	2,614	1,377	2,554	3,289	199	1,018	1,176	1,699
Maximum exceeded in 50% of the years	1,673	2,814	1,466	2,586	3,493	223	1,190	1,414	1,854
Maximum exceeded in 40% of the years	2,232	3,277	1,648	2,677	4,960	435	1,270	1,466	2,177
Maximum exceeded in 30% of the years	2,593	4,363	1,936	2,769	6,583	3,021	1,460	1,477	2,502
Maximum exceeded in 20% of the years	3,479	4,965	2,274	3,020	7,303	4,703	1,894	1,559	4,056
Maximum exceeded in 10% of the years	5,279	7,097	4,056	3,431	7,754	4,955	2,112	2,421	5,168
Maximum	10,856	10,856	8,893	3,843	10,856	5,829	2,277	6,893	8,893
15-day Average Flows									
Maximum exceeded in 100% of the years	0	0	204	0	1,922	0	204	379	602
Maximum exceeded in 90% of the years	197	0	639	816	1,987	0	259	767	921
Maximum exceeded in 80% of the years	759	137	788	1,633	2,277	1	612	775	1,010
Maximum exceeded in 70% of the years	927	761	929	2,109	2,719	93	732	927	1,186
Maximum exceeded in 60% of the years	1,171	2,095	1,010	2,244	3,092	137	797	993	1,290
Maximum exceeded in 50% of the years	1,280	2,417	1,186	2,380	3,177	154	926	1,105	1,423
Maximum exceeded in 40% of the years	1,644	3,047	1,272	2,391	4,272	244	1,077	1,221	1,609
Maximum exceeded in 30% of the years	2,204	3,787	1,501	2,401	5,224	2,794	1,171	1,258	2,099
Maximum exceeded in 20% of the years	3,153	4,434	1,830	2,593	6,226	4,097	1,450	1,418	3,473
Maximum exceeded in 10% of the years	4,644	5,887	3,473	2,965	6,531	4,414	1,650	1,898	4,576
Maximum	8,524	8,148	8,524	3,337	8,148	5,233	2,171	6,301	8,524
30-day Average Flows									
Maximum exceeded in 100% of the years	0	0	157	1,055	976	0	157	225	534
Maximum exceeded in 90% of the years	157	1	472	1,223	1,508	0	225	478	679
Maximum exceeded in 80% of the years	524	92	603	1,392	1,890	1	419	562	786
Maximum exceeded in 70% of the years	709	976	706	1,560	2,322	48	509	680	862
Maximum exceeded in 60% of the years	871	1,616	802	1,660	2,450	85	625	872	953
Maximum exceeded in 50% of the years	1,015	2,132	887	1,726	2,593	101	699	928	1,131
Maximum exceeded in 40% of the years	1,188	2,450	1,021	1,791	2,899	146	742	941	1,216
Maximum exceeded in 30% of the years	1,803	2,785	1,142	1,930	3,811	2,499	852	1,035	1,827
Maximum exceeded in 20% of the years	2,565	3,473	1,271	2,215	4,758	3,072	1,013	1,086	2,699
Maximum exceeded in 10% of the years	3,706	4,152	2,699	2,500	5,303	3,399	1,187	1,393	3,755
Maximum	8,040	6,613	8,040	2,785	6,613	4,032	1,899	4,945	8,040

values as those seen in **Table A.9-5** from the 1928-1941 time interval to the 1942-1958 time interval. Smaller decreases are noted between the 1910-1927 time interval and the 1928-1941 time interval, coincident with the beginning of operation of Guernsey Reservoir. The decreases are smaller than those for the North Platte River at North Platte for the reasons discussed in the preceding paragraph. The 1895-1909 time interval was not considered for the characterizations for this seasonal period due to lack of data. Changes in flow values by time interval are all relatively insignificant from the 1942-1958 through 1975-1998 time intervals for all averaging times and all exceedance probabilities.

Table A.9-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.9-7** shows a characterization quite similar to that for annual data (**Table A.9-5**). There are significant decreases in flow values by time interval from the 1895-1909 time interval through the 1942-1958 time interval for all averaging times and all exceedance probabilities. This is coincident with the beginning of operation of the major North Platte River reservoir projects (**Table 2** of the main report). These characterizations are similar to those for the North Platte River at North Platte, except that the decreases are smaller, as discussed in the paragraph accompanying **Table A.9-5**.

Table A.9-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.9-8** shows that the flow values are generally slightly lower than those for the Apr 16-Jul 15 seasonal period. Otherwise, the characterizations for the Jun 1-Aug 15 seasonal period are essentially the same as those for the Apr 16-Jul 15 seasonal period.

Table A.9-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.9-9** suggests that, in this late part of the growing season, climatological effects begin to strongly influence the characterizations again. The sharp decrease in flow values from the 1910-1927 time interval to the 1928-1941 time interval could be attributed to both the severe drought during the 1930's and the beginning of operation of Guernsey Reservoir in 1928. There is a significant jump in the flow values from the 1928-1941 time interval to the 1942-1958 time interval for exceedance probabilities of 40 percent and higher (lower flows), whereas the flow values decrease between these time intervals for exceedance probabilities of 30 percent and lower (higher flows). Flow regulation at Lake McConaughy likely contributes to the reduced variability of flows.

For the Jul 16 – Sep 30 seasonal period the flow values increase from the 1895-1909 time interval to the 1910-1927 time interval for all averaging periods and all exceedance probabilities. This is a marked contrast from the other seasonal periods for these time intervals. This situation has been noted and discussed for other locations (**Sections A.2.4.3 and A.4.4.3**).

A.9.4.3 Mean Daily Flow Exceedance

Table A.9-10 through **Table A.9-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.9-10 shows the exceedance probabilities and values of flows for annual data. **Table A.9-10** shows that the decrease in flow values by time interval for annual data generally follows a similar, but not identical, pattern to that for maximum flows (**Table A.9-5**) for the 1895-1909 through the 1942-1958 time intervals. A particularly noteworthy difference is the increase in flow values for the 60 percent and higher exceedance probabilities (lower flows), and the decrease in flow values for the 50 percent and lower exceedance probabilities (higher flows), between the 1928-1941 and 1942-1958 time intervals. This change is coincident with the beginning of operation of Lake McConaughy in 1941. This characterization persists for the 1942-1958 through 1975-1998 time intervals, during which flows were affected by the regulation of Lake McConaughy, although there is some indication of generally wetter climatic conditions during the 1975-1998 time interval.

Table A.9-11 shows the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.9-11** shows that, as for the maximum flows (**Table A.9-6**), there is a decrease in flow values for all averaging periods and all exceedance probabilities from the 1928-1941 time interval to the 1942-1958 time interval, coincident with the beginning of operation of Lake McConaughy. Also, Alcova and Seminole Reservoirs began operation in 1938 and 1939, respectively. Decreases in flow values from the 1895-1909 through the 1928-1941 time intervals are relatively small, and are coincident with the beginning of operation of Guernsey Reservoir. These changes are less dramatic for this location than for the North Platte River at North Platte, NE (**Section A.5**), possibly due to the effects of inflow from the South Platte River and the intervening uncontrolled drainage area.

Table A.9-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.9-12** shows sharp decreases in flow value by time interval for the 1895-1909 through 1942-1958 time intervals for all averaging times and all exceedance probabilities. These are coincident with the beginning of operation of the upstream reservoir projects (**Table 2** of the main report). This pattern persists from the 1942-1958 through 1975-1998 time intervals, during which flows were affected by regulation at Lake McConaughy, although there is some indication of generally wetter climatic conditions during the 1975-1998 time interval.

It can also be seen in **Table A.9-12** that the flow values generally increase with increasing averaging time for most exceedance probabilities and all time intervals. The explanation for this characterization is given in **Section A.1.4.4**.

Table A.9-10 Exceedance Values Considering All Flows, Annual Data.

Platte River near Overton, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days		0	0	2	32	0	0	2	60	82
Flow exceeded for 90% of the days		215	0	282	609	950	0	183	293	373
Flow exceeded for 80% of the days		500	325	544	1,050	1,750	7	400	570	656
Flow exceeded for 70% of the days		833	950	811	1,400	2,300	262	640	878	900
Flow exceeded for 60% of the days		1,080	1,600	1,010	2,000	2,700	630	856	1,050	1,100
Flow exceeded for 50% of the days		1,330	2,300	1,200	2,600	3,100	1,200	1,040	1,200	1,330
Flow exceeded for 40% of the days		1,670	2,800	1,410	3,500	3,500	1,900	1,230	1,400	1,600
Flow exceeded for 30% of the days		2,120	3,400	1,700	5,206	4,300	2,600	1,450	1,670	1,990
Flow exceeded for 20% of the days		2,840	4,290	2,120	7,510	5,550	3,260	1,720	2,100	2,542
Flow exceeded for 10% of the days		4,290	6,300	3,010	11,600	8,000	4,300	2,170	2,810	3,730
Maximum		36,700	36,700	22,300	30,000	36,700	29,400	14,700	18,800	22,300
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		0	0	3	100	0	0	3	62	86
Flow exceeded for 90% of the days		225	1	289	733	1,000	0	190	298	388
Flow exceeded for 80% of the days		520	350	561	1,129	1,767	13	415	577	666
Flow exceeded for 70% of the days		847	979	827	1,517	2,350	276	655	893	912
Flow exceeded for 60% of the days		1,085	1,650	1,022	2,117	2,700	646	876	1,066	1,103
Flow exceeded for 50% of the days		1,333	2,300	1,195	2,700	3,117	1,220	1,047	1,206	1,331
Flow exceeded for 40% of the days		1,663	2,800	1,417	3,800	3,500	1,927	1,221	1,401	1,607
Flow exceeded for 30% of the days		2,123	3,400	1,700	5,475	4,300	2,600	1,443	1,654	1,970
Flow exceeded for 20% of the days		2,833	4,300	2,110	7,324	5,600	3,267	1,713	2,097	2,534
Flow exceeded for 10% of the days		4,280	6,233	3,007	11,960	7,977	4,333	2,143	2,787	3,717
Maximum		33,900	33,900	22,167	29,000	33,900	21,167	13,933	18,100	22,167
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		0	0	5	143	0	0	5	67	91
Flow exceeded for 90% of the days		240	4	309	920	1,079	0	198	316	416
Flow exceeded for 80% of the days		543	374	580	1,239	1,855	35	431	591	686
Flow exceeded for 70% of the days		864	1,036	842	1,583	2,421	284	668	895	924
Flow exceeded for 60% of the days		1,100	1,707	1,033	2,290	2,771	664	891	1,070	1,111
Flow exceeded for 50% of the days		1,343	2,314	1,203	3,000	3,164	1,283	1,063	1,214	1,331
Flow exceeded for 40% of the days		1,667	2,843	1,421	4,228	3,500	1,955	1,234	1,394	1,599
Flow exceeded for 30% of the days		2,117	3,400	1,693	5,705	4,371	2,595	1,450	1,648	1,944
Flow exceeded for 20% of the days		2,829	4,343	2,094	7,400	5,563	3,236	1,707	2,106	2,535
Flow exceeded for 10% of the days		4,295	6,110	2,984	12,600	7,961	4,343	2,127	2,766	3,677
Maximum		32,457	32,457	21,214	26,643	32,457	17,804	13,257	17,271	21,214
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		0	0	36	235	0	0	36	69	112
Flow exceeded for 90% of the days		279	23	353	1,081	1,180	0	217	362	457
Flow exceeded for 80% of the days		570	413	599	1,297	1,943	70	464	611	727
Flow exceeded for 70% of the days		887	1,102	858	2,022	2,446	333	675	907	926
Flow exceeded for 60% of the days		1,119	1,794	1,049	2,603	2,809	717	904	1,077	1,120
Flow exceeded for 50% of the days		1,357	2,333	1,205	3,682	3,198	1,411	1,092	1,214	1,341
Flow exceeded for 40% of the days		1,680	2,859	1,421	4,823	3,593	1,973	1,227	1,393	1,618
Flow exceeded for 30% of the days		2,122	3,476	1,693	6,163	4,440	2,559	1,451	1,657	1,927
Flow exceeded for 20% of the days		2,820	4,333	2,087	7,779	5,510	3,252	1,698	2,125	2,538
Flow exceeded for 10% of the days		4,267	6,080	2,951	13,567	7,782	4,253	2,107	2,767	3,648
Maximum		29,533	29,533	21,140	24,673	29,533	14,993	12,073	16,287	21,140
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		0	0	42	835	7	0	42	90	147
Flow exceeded for 90% of the days		340	68	412	1,263	1,347	0	262	415	512
Flow exceeded for 80% of the days		612	485	638	1,996	2,063	126	478	625	750
Flow exceeded for 70% of the days		906	1,208	872	2,875	2,523	383	714	923	952
Flow exceeded for 60% of the days		1,128	1,888	1,057	4,282	2,914	787	915	1,084	1,119
Flow exceeded for 50% of the days		1,380	2,382	1,212	5,084	3,263	1,522	1,094	1,229	1,361
Flow exceeded for 40% of the days		1,700	2,905	1,435	5,754	3,697	2,039	1,246	1,418	1,637
Flow exceeded for 30% of the days		2,117	3,513	1,708	7,019	4,400	2,488	1,473	1,701	1,922
Flow exceeded for 20% of the days		2,853	4,334	2,081	9,849	5,482	3,241	1,693	2,131	2,544
Flow exceeded for 10% of the days		4,188	6,109	2,997	13,050	7,886	4,163	2,061	2,716	3,595
Maximum		24,255	24,255	20,477	23,347	24,255	11,917	9,276	15,137	20,477

Table A.9-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Platte River near Overton, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	95	95	116		750	95	116	600	855
Flow exceeded for 90% of the days	1,070	1,150	1,060		2,700	895	657	1,080	1,210
Flow exceeded for 80% of the days	1,290	1,950	1,250		3,000	1,698	1,060	1,190	1,390
Flow exceeded for 70% of the days	1,500	2,280	1,400		3,200	2,010	1,307	1,300	1,570
Flow exceeded for 60% of the days	1,700	2,758	1,550		3,500	2,280	1,466	1,450	1,750
Flow exceeded for 50% of the days	1,950	3,140	1,720		4,000	2,780	1,575	1,600	2,000
Flow exceeded for 40% of the days	2,280	3,500	1,944		4,720	3,308	1,700	1,850	2,300
Flow exceeded for 30% of the days	2,680	4,100	2,270		5,400	3,665	1,870	2,303	2,590
Flow exceeded for 20% of the days	3,326	4,906	2,630		6,000	4,410	2,052	2,542	2,950
Flow exceeded for 10% of the days	4,476	5,400	3,400		7,310	5,000	2,631	3,181	3,820
Maximum	11,200	11,200	8,000		11,200	7,520	4,470	6,870	8,000
3-day Average Flows									
Flow exceeded for 100% of the days	100	100	128		1,100	100	128	793	930
Flow exceeded for 90% of the days	1,088	1,258	1,083		2,800	850	679	1,099	1,230
Flow exceeded for 80% of the days	1,312	1,956	1,267		3,000	1,738	1,073	1,179	1,397
Flow exceeded for 70% of the days	1,500	2,313	1,415		3,300	2,045	1,353	1,307	1,574
Flow exceeded for 60% of the days	1,691	2,900	1,560		3,500	2,339	1,467	1,443	1,743
Flow exceeded for 50% of the days	1,943	3,228	1,705		4,033	2,862	1,580	1,593	2,032
Flow exceeded for 40% of the days	2,269	3,616	1,933		4,600	3,478	1,697	1,825	2,292
Flow exceeded for 30% of the days	2,674	4,100	2,253		5,333	3,768	1,848	2,283	2,584
Flow exceeded for 20% of the days	3,361	4,833	2,613		5,533	4,385	2,030	2,549	2,953
Flow exceeded for 10% of the days	4,459	5,400	3,388		7,333	5,000	2,667	3,160	3,833
Maximum	9,667	9,667	7,893		9,667	6,993	4,323	6,663	7,893
7-day Average Flows									
Flow exceeded for 100% of the days	119	119	169		1,671	119	169	910	987
Flow exceeded for 90% of the days	1,120	1,450	1,096		2,864	1,128	657	1,114	1,232
Flow exceeded for 80% of the days	1,354	2,058	1,287		3,029	1,890	1,162	1,195	1,467
Flow exceeded for 70% of the days	1,521	2,490	1,457		3,274	2,126	1,426	1,322	1,584
Flow exceeded for 60% of the days	1,697	3,000	1,554		3,500	2,504	1,481	1,468	1,744
Flow exceeded for 50% of the days	1,955	3,321	1,701		4,057	3,000	1,559	1,599	2,036
Flow exceeded for 40% of the days	2,297	3,686	1,932		4,520	3,486	1,672	1,796	2,311
Flow exceeded for 30% of the days	2,725	4,211	2,243		5,174	3,907	1,784	2,249	2,543
Flow exceeded for 20% of the days	3,400	4,714	2,591		5,400	4,409	2,034	2,468	2,971
Flow exceeded for 10% of the days	4,414	5,135	3,453		6,829	4,975	2,810	3,143	3,857
Maximum	8,743	8,743	7,670		8,743	5,514	4,273	6,163	7,670
15-day Average Flows									
Flow exceeded for 100% of the days	166	166	285		2,880	166	285	949	1,020
Flow exceeded for 90% of the days	1,159	1,952	1,127		2,971	1,680	661	1,116	1,233
Flow exceeded for 80% of the days	1,437	2,366	1,277		3,057	2,143	1,183	1,200	1,469
Flow exceeded for 70% of the days	1,561	2,834	1,501		3,561	2,424	1,466	1,324	1,617
Flow exceeded for 60% of the days	1,697	3,086	1,572		3,742	2,779	1,531	1,511	1,741
Flow exceeded for 50% of the days	2,078	3,368	1,685		4,228	3,191	1,563	1,615	2,071
Flow exceeded for 40% of the days	2,366	3,669	1,997		4,659	3,445	1,619	1,735	2,287
Flow exceeded for 30% of the days	2,798	4,037	2,278		4,920	3,754	1,830	2,234	2,546
Flow exceeded for 20% of the days	3,326	4,569	2,622		5,181	4,167	2,143	2,440	2,972
Flow exceeded for 10% of the days	4,384	4,984	3,262		6,550	4,607	2,757	3,157	3,766
Maximum	7,333	7,333	7,329		7,333	5,000	4,213	5,539	7,329
30-day Average Flows									
Flow exceeded for 100% of the days	274	274	382		3,000	274	382	1,064	1,064
Flow exceeded for 90% of the days	1,210	2,039	1,126		3,305	2,018	857	1,116	1,324
Flow exceeded for 80% of the days	1,429	2,355	1,321		3,609	2,123	1,284	1,254	1,500
Flow exceeded for 70% of the days	1,555	2,659	1,497		3,853	2,445	1,451	1,371	1,670
Flow exceeded for 60% of the days	1,711	2,876	1,570		4,037	2,635	1,525	1,501	1,778
Flow exceeded for 50% of the days	2,063	3,000	1,699		4,220	2,795	1,561	1,617	2,116
Flow exceeded for 40% of the days	2,426	3,658	1,992		4,307	2,924	1,601	1,725	2,339
Flow exceeded for 30% of the days	2,589	4,003	2,268		4,393	3,459	1,752	2,229	2,478
Flow exceeded for 20% of the days	3,202	4,307	2,484		4,744	3,895	2,017	2,451	2,818
Flow exceeded for 10% of the days	4,192	4,526	3,228		5,359	4,369	2,450	2,916	3,287
Maximum	7,254	5,973	7,254		5,973	4,800	4,113	5,021	7,254

Table A.9-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Platte River near Overton, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	42	1,000	0	0	42	90	82
Flow exceeded for 90% of the days	218	72	256	2,520	1,200	0	182	244	303
Flow exceeded for 80% of the days	401	422	400	3,500	1,968	60	368	384	426
Flow exceeded for 70% of the days	636	1,100	562	4,400	2,650	240	595	520	572
Flow exceeded for 60% of the days	939	2,192	785	5,232	3,200	400	822	727	802
Flow exceeded for 50% of the days	1,300	2,970	1,040	6,530	4,500	702	1,050	972	1,090
Flow exceeded for 40% of the days	1,840	4,144	1,320	7,700	6,030	1,260	1,260	1,190	1,430
Flow exceeded for 30% of the days	2,780	5,971	1,720	9,100	7,535	2,513	1,600	1,605	1,881
Flow exceeded for 20% of the days	4,680	7,800	2,520	12,256	9,500	3,860	2,088	2,510	3,260
Flow exceeded for 10% of the days	8,510	12,000	5,030	16,430	14,000	6,450	2,924	5,435	7,277
Maximum	36,700	36,700	22,300	30,000	36,700	29,400	14,700	18,800	22,300
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	50	1,000	0	0	50	97	86
Flow exceeded for 90% of the days	235	99	268	2,734	1,317	0	193	254	317
Flow exceeded for 80% of the days	414	439	409	3,750	2,100	79	382	388	433
Flow exceeded for 70% of the days	648	1,155	578	4,573	2,717	254	610	538	588
Flow exceeded for 60% of the days	949	2,267	804	5,473	3,333	415	847	737	808
Flow exceeded for 50% of the days	1,327	3,033	1,036	6,525	4,583	703	1,043	971	1,110
Flow exceeded for 40% of the days	1,863	4,292	1,333	7,527	6,100	1,292	1,293	1,189	1,440
Flow exceeded for 30% of the days	2,800	6,000	1,717	9,417	7,600	2,530	1,645	1,617	1,883
Flow exceeded for 20% of the days	4,800	7,893	2,522	12,367	9,633	3,967	2,113	2,536	3,260
Flow exceeded for 10% of the days	8,620	12,100	5,153	16,425	14,000	6,646	2,853	5,589	7,373
Maximum	33,900	33,900	22,167	29,000	33,900	21,167	13,933	18,100	22,167
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	61	1,018	0	0	61	112	91
Flow exceeded for 90% of the days	256	137	296	2,868	1,421	1	206	282	341
Flow exceeded for 80% of the days	444	481	432	4,154	2,283	121	421	412	463
Flow exceeded for 70% of the days	678	1,264	598	4,874	2,885	281	647	568	604
Flow exceeded for 60% of the days	984	2,386	822	5,697	3,437	457	856	764	818
Flow exceeded for 50% of the days	1,361	3,193	1,055	6,519	4,829	728	1,068	994	1,110
Flow exceeded for 40% of the days	1,921	4,586	1,350	7,786	6,267	1,503	1,328	1,207	1,452
Flow exceeded for 30% of the days	2,886	6,125	1,743	10,079	7,937	2,622	1,681	1,620	1,899
Flow exceeded for 20% of the days	4,963	8,118	2,538	13,111	10,017	4,203	2,134	2,593	3,239
Flow exceeded for 10% of the days	8,757	12,300	5,344	16,214	13,857	6,656	2,935	5,685	7,820
Maximum	32,457	32,457	21,214	26,643	32,457	17,804	13,257	17,271	21,214
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	89	1,037	27	0	89	128	112
Flow exceeded for 90% of the days	317	216	344	3,798	1,772	14	261	343	392
Flow exceeded for 80% of the days	503	559	488	4,416	2,598	199	480	473	495
Flow exceeded for 70% of the days	731	1,420	635	5,305	3,163	364	666	606	638
Flow exceeded for 60% of the days	1,028	2,525	851	6,122	4,061	527	909	783	850
Flow exceeded for 50% of the days	1,394	3,587	1,085	7,060	5,264	882	1,147	1,020	1,125
Flow exceeded for 40% of the days	2,054	5,007	1,365	7,886	6,508	1,548	1,353	1,209	1,489
Flow exceeded for 30% of the days	3,037	6,495	1,834	10,263	8,560	2,570	1,766	1,634	1,992
Flow exceeded for 20% of the days	5,273	8,655	2,620	13,772	10,309	4,599	2,237	2,767	3,189
Flow exceeded for 10% of the days	9,339	12,487	5,442	16,379	13,631	6,867	3,372	5,538	7,717
Maximum	29,533	29,533	21,140	24,673	29,533	14,993	12,073	16,287	21,140
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	115	2,358	927	0	115	222	176
Flow exceeded for 90% of the days	401	311	411	4,442	1,875	131	337	415	427
Flow exceeded for 80% of the days	563	730	528	5,097	2,647	288	527	531	525
Flow exceeded for 70% of the days	796	1,637	697	5,502	3,595	473	829	685	671
Flow exceeded for 60% of the days	1,068	2,638	895	6,239	4,527	671	976	845	841
Flow exceeded for 50% of the days	1,512	4,252	1,132	7,218	5,839	900	1,181	1,021	1,204
Flow exceeded for 40% of the days	2,058	5,429	1,431	9,256	7,217	1,628	1,430	1,234	1,558
Flow exceeded for 30% of the days	3,219	6,845	1,950	10,602	9,307	2,744	1,973	1,742	2,033
Flow exceeded for 20% of the days	5,641	9,538	2,646	12,670	11,022	4,991	2,214	2,516	3,485
Flow exceeded for 10% of the days	9,798	11,803	5,935	18,553	13,226	7,912	3,289	7,304	8,320
Maximum	24,255	24,255	20,477	23,347	24,255	11,917	9,276	15,137	20,477

Table A.9-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Platte River near Overton, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	30	32	0	0	30	83	82
Flow exceeded for 90% of the days	94	0	163	1,123	422	0	128	157	220
Flow exceeded for 80% of the days	197	8	231	1,950	1,150	0	183	220	286
Flow exceeded for 70% of the days	297	212	305	2,520	1,600	0	236	295	355
Flow exceeded for 60% of the days	430	800	400	3,160	2,200	3	335	391	441
Flow exceeded for 50% of the days	658	1,600	528	4,290	2,900	88	464	495	607
Flow exceeded for 40% of the days	1,080	2,514	728	5,913	3,800	217	688	656	878
Flow exceeded for 30% of the days	1,750	3,662	1,130	7,984	5,500	502	939	946	1,421
Flow exceeded for 20% of the days	3,058	6,140	1,750	11,000	7,600	1,494	1,480	1,570	2,230
Flow exceeded for 10% of the days	6,709	10,600	3,680	16,400	12,700	4,821	2,260	3,345	5,640
Maximum	36,700	36,700	22,300	30,000	36,700	29,400	14,700	17,000	22,300
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	38	150	0	0	38	90	86
Flow exceeded for 90% of the days	103	0	172	1,400	447	0	140	158	223
Flow exceeded for 80% of the days	207	16	241	2,000	1,200	0	193	225	289
Flow exceeded for 70% of the days	304	239	312	2,567	1,633	0	246	299	367
Flow exceeded for 60% of the days	437	829	412	3,160	2,172	8	332	396	465
Flow exceeded for 50% of the days	663	1,602	545	4,333	2,950	94	482	500	630
Flow exceeded for 40% of the days	1,097	2,567	738	6,233	3,717	233	683	655	885
Flow exceeded for 30% of the days	1,753	3,660	1,132	7,853	5,467	514	941	955	1,407
Flow exceeded for 20% of the days	3,055	6,133	1,739	11,600	7,667	1,549	1,529	1,551	2,160
Flow exceeded for 10% of the days	6,652	10,960	3,700	16,383	12,590	5,000	2,285	3,377	5,493
Maximum	33,900	33,900	22,167	29,000	33,900	21,167	13,433	16,033	22,167
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	45	599	0	0	45	103	91
Flow exceeded for 90% of the days	119	0	182	1,629	481	0	152	167	236
Flow exceeded for 80% of the days	219	35	251	2,226	1,186	0	200	237	306
Flow exceeded for 70% of the days	323	251	329	2,697	1,714	0	263	319	400
Flow exceeded for 60% of the days	472	846	437	3,403	2,257	21	339	418	511
Flow exceeded for 50% of the days	689	1,694	569	4,491	2,986	119	497	529	666
Flow exceeded for 40% of the days	1,092	2,586	758	6,290	3,737	237	706	669	925
Flow exceeded for 30% of the days	1,763	3,714	1,121	8,043	5,470	560	945	950	1,352
Flow exceeded for 20% of the days	3,094	6,143	1,727	11,101	7,791	1,550	1,594	1,601	2,096
Flow exceeded for 10% of the days	6,744	10,789	3,793	15,680	12,494	5,051	2,308	3,503	5,550
Maximum	32,457	32,457	21,214	26,643	32,457	17,586	12,800	14,800	21,214
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	64	1,160	0	0	64	123	112
Flow exceeded for 90% of the days	135	0	201	1,876	582	0	170	185	263
Flow exceeded for 80% of the days	244	72	280	2,359	1,191	0	215	270	348
Flow exceeded for 70% of the days	363	282	369	2,889	1,823	1	280	361	438
Flow exceeded for 60% of the days	511	908	467	3,827	2,315	54	369	444	554
Flow exceeded for 50% of the days	743	1,720	599	5,120	2,923	134	530	554	749
Flow exceeded for 40% of the days	1,137	2,579	825	6,757	4,053	256	701	709	925
Flow exceeded for 30% of the days	1,789	3,994	1,164	8,165	5,381	560	988	1,100	1,329
Flow exceeded for 20% of the days	3,137	6,154	1,726	10,952	8,175	1,288	1,510	1,711	2,172
Flow exceeded for 10% of the days	6,515	10,519	4,037	14,596	12,260	4,824	2,427	3,784	5,482
Maximum	29,533	29,533	21,140	24,673	29,533	14,993	10,511	13,060	21,140
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	140	1,560	7	0	140	143	147
Flow exceeded for 90% of the days	173	0	229	2,272	725	0	196	228	302
Flow exceeded for 80% of the days	280	116	319	2,940	1,344	0	244	297	372
Flow exceeded for 70% of the days	397	385	398	3,810	1,721	13	323	388	501
Flow exceeded for 60% of the days	554	885	507	4,980	2,474	102	422	435	648
Flow exceeded for 50% of the days	811	1,673	688	6,193	3,370	155	518	583	803
Flow exceeded for 40% of the days	1,151	2,801	889	7,040	4,289	321	754	860	1,002
Flow exceeded for 30% of the days	1,877	4,247	1,200	7,782	5,675	620	969	1,285	1,286
Flow exceeded for 20% of the days	3,509	6,418	1,913	10,462	7,655	1,026	1,433	2,535	2,028
Flow exceeded for 10% of the days	6,436	9,380	3,681	14,135	10,783	4,249	3,292	3,491	5,164
Maximum	24,087	24,087	20,477	22,127	24,087	11,917	6,678	11,593	20,477

Table A.9-14 Exceedance Values Considering All Flows, Jul 16 – Sep 30 Seasonal Period.

Platte River near Overton, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	2	32	0	0	2	60	88
Flow exceeded for 90% of the days	1	0	152	100	250	0	96	145	221
Flow exceeded for 80% of the days	152	0	216	230	650	0	152	209	278
Flow exceeded for 70% of the days	237	5	282	599	1,190	0	197	277	379
Flow exceeded for 60% of the days	351	189	380	780	1,550	0	248	355	539
Flow exceeded for 50% of the days	540	650	521	1,050	1,900	0	360	490	714
Flow exceeded for 40% of the days	780	1,300	693	1,350	2,300	6	478	646	935
Flow exceeded for 30% of the days	1,090	1,900	896	1,700	2,700	105	639	813	1,319
Flow exceeded for 20% of the days	1,700	2,600	1,210	2,040	3,500	354	837	1,000	1,890
Flow exceeded for 10% of the days	2,700	3,668	1,940	2,700	4,810	2,546	1,160	1,419	2,880
Maximum	17,300	17,300	9,450	5,500	17,300	6,600	4,380	8,270	9,450
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	3	100	0	0	3	62	114
Flow exceeded for 90% of the days	4	0	156	199	250	0	99	145	225
Flow exceeded for 80% of the days	158	0	219	478	698	0	157	214	278
Flow exceeded for 70% of the days	245	10	286	633	1,200	0	200	280	396
Flow exceeded for 60% of the days	363	215	389	840	1,600	0	260	364	557
Flow exceeded for 50% of the days	558	692	536	1,167	1,933	0	353	479	719
Flow exceeded for 40% of the days	773	1,333	696	1,452	2,300	12	474	630	934
Flow exceeded for 30% of the days	1,083	1,933	886	1,693	2,713	105	646	805	1,313
Flow exceeded for 20% of the days	1,683	2,567	1,190	2,087	3,383	342	823	984	1,863
Flow exceeded for 10% of the days	2,690	3,650	1,900	2,645	4,832	2,567	1,103	1,397	2,841
Maximum	14,167	14,167	9,110	4,333	14,167	6,400	3,443	7,803	9,110
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	5	143	0	0	5	67	138
Flow exceeded for 90% of the days	18	0	163	371	293	0	110	147	236
Flow exceeded for 80% of the days	170	0	230	600	750	0	168	224	297
Flow exceeded for 70% of the days	257	28	298	722	1,214	0	211	291	427
Flow exceeded for 60% of the days	376	229	403	998	1,613	0	275	372	577
Flow exceeded for 50% of the days	564	721	543	1,329	1,943	1	358	480	740
Flow exceeded for 40% of the days	775	1,361	698	1,523	2,257	30	482	618	930
Flow exceeded for 30% of the days	1,079	1,943	870	1,729	2,643	132	656	804	1,294
Flow exceeded for 20% of the days	1,663	2,529	1,169	2,153	3,271	315	792	965	1,802
Flow exceeded for 10% of the days	2,586	3,543	1,845	2,591	4,819	2,533	1,077	1,319	2,740
Maximum	10,856	10,856	8,893	3,843	10,856	5,829	2,277	6,893	8,893
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	36	235	0	0	36	69	158
Flow exceeded for 90% of the days	42	0	172	605	307	0	128	153	261
Flow exceeded for 80% of the days	177	0	255	826	957	0	173	234	353
Flow exceeded for 70% of the days	285	57	337	1,007	1,338	0	225	320	456
Flow exceeded for 60% of the days	416	230	432	1,103	1,620	0	310	403	587
Flow exceeded for 50% of the days	571	920	549	1,277	1,933	6	396	488	750
Flow exceeded for 40% of the days	768	1,408	682	1,453	2,160	50	510	590	919
Flow exceeded for 30% of the days	1,042	1,933	836	1,764	2,592	134	613	737	1,203
Flow exceeded for 20% of the days	1,593	2,443	1,094	2,125	3,130	360	760	901	1,803
Flow exceeded for 10% of the days	2,506	3,588	1,803	2,383	4,835	2,418	1,035	1,169	2,651
Maximum	8,524	8,148	8,524	3,337	8,148	5,233	2,171	6,301	8,524
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	47	835	43	0	47	90	184
Flow exceeded for 90% of the days	55	0	201	890	487	0	141	171	341
Flow exceeded for 80% of the days	210	2	321	942	1,207	0	201	309	435
Flow exceeded for 70% of the days	366	64	411	1,031	1,397	0	265	386	504
Flow exceeded for 60% of the days	460	228	468	1,122	1,661	2	381	451	597
Flow exceeded for 50% of the days	555	1,021	537	1,263	2,033	29	440	492	706
Flow exceeded for 40% of the days	723	1,437	632	1,382	2,333	67	482	545	818
Flow exceeded for 30% of the days	965	1,948	759	1,502	2,569	155	601	617	1,107
Flow exceeded for 20% of the days	1,512	2,438	951	1,702	2,953	590	738	750	1,645
Flow exceeded for 10% of the days	2,429	3,172	1,620	2,225	4,566	2,115	890	973	2,402
Maximum	8,040	6,613	8,040	2,785	6,613	4,032	1,899	4,945	8,040

Table A.9-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 time interval. **Table A.9-13** shows that the flow values are generally slightly lower than those for the Apr 16-Jul 15 seasonal period (**Table A.9-12**) for all time intervals. Otherwise, the characterizations for the Jun 1-Aug 15 seasonal period are essentially the same as those for the Apr 16-Jul 15 seasonal period.

Table A.9-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.9-14** shows that, for this seasonal period, climatological effects begin to influence the characterizations again. The sharp decrease in flow values from the 1910-1927 time interval to the 1928-1941 time interval could be attributed to the severe drought during the 1930's, and/or the beginning of operation of Guernsey Reservoir in 1928. There is a significant jump in the flow values from the 1928-1941 time interval to the 1942-1958 time interval for exceedance probabilities of 20 percent and higher (lower flows). This results in relatively small decreases in flow values with decreasing exceedance probability (increasing flow values) for all averaging times for the 1942-1958 time interval and all subsequent time intervals. This coincides with the regulation of flows out of Lake McConaughy for downstream irrigation.

For the Jul 16 – Sep 30 seasonal period the flow values increase from the 1895-1909 time interval to the 1910-1927 time interval for all averaging periods and all exceedance probabilities. This is a marked contrast from the other seasonal periods for these time intervals. This situation has been noted and discussed for other locations (**Sections A.2.4.3 and A.4.4.3**).

A.9.5 Median Mean Daily Flow

The median mean daily flow by calendar day in **Figure A.9-6** reflects both the effects of climate and changes coincident with development. Both the 1895-1909 and the 1910-1927 time intervals, which were generally wet periods, show high values of median mean daily flow in May and June. The 1928-1941 time interval shows no high values in May and June, and values at or near 0 cfs for all of July and August, a likely effect of the 1930's drought period. Median mean daily flows for all subsequent time intervals show a fairly consistent and steady pattern of highest values in March, values decreasing to their lowest in July and August, and a gradual increase thereafter through the end of the year.

A.9.6. USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.9-7** and **Figure A.9-8** and in **Table A.9-15** and **Table A.9-16**. The 1895-1909 time interval was not considered for the following characterizations due to a lack of data.

Figure A.9-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak Flow, and the 10-year running average of the USGS Annual Peak Flow. **Figure A.9-7** shows that, for the entire available period of record, the difference between the Annual Maximum mean daily flow and the USGS Annual Peak flow is quite small. For the 1910-1927 and 1928-1941 time intervals, there is some noticeable variation on a year-to-

year basis. This characterization is consistent with an unregulated basin in which year-to-year climate variations predominate. From the 1942-1958 time interval through the 1975-1998 time interval, there are only small differences on a year-by-year basis, except for a few of very high peak flow events in the 1940's and early 1950's.

Figure A.9-8 shows the date of occurrences of the USGS Annual Peak Flow over the period of record. **Figure A.9-8** shows that, for the 1895-1909 and 1910-1927 time intervals, the Peak flows were typically higher than most of the Peak flows over the rest of the period of record. Also, Peak flows for the time intervals preceding 1928 occurred almost exclusively between May and late June, the typical period of peak snowmelt at higher elevations in the basin. While Peak flows also commonly occurred in May and June during later time intervals, time intervals beginning with the 1928-1941 time interval display a secondary high frequency of Peak flow occurrences in March. These early spring peak flow occurrences may reflect an increased influence of lower elevation precipitation, snowmelt runoff from the uncontrolled drainage area downstream of Lake McConaughy, and inflow from the South Platte River on Peak flows at this location.

Beginning with the 1942-1958 time interval, the Peak flows occurred over a wider range of months, though there was still a tendency for the Peak flows to favor the two time frames discussed in the preceding paragraph. The regulation of Lake McConaughy has an influence on the magnitude and the timing of the Peak flows during these time intervals, but runoff from the uncontrolled drainage area downstream of Lake McConaughy, and also possibly inflow from the South Platte River, appear to define this characterization.

Table A.9-15 compares the average and median values of the USGS Annual Peak flow by time interval. **Table A.9-15** shows that the average is higher than the median for the 1928-1941 through 1975-1998 time intervals, and lower than the median for the 1910-1927 time interval. The difference between the average and median values is not great for any of the time intervals. This suggests a relatively uniform distribution of Peak flows throughout the period of record. This is possibly attributable to an increased influence of runoff from the uncontrolled drainage area downstream of Lake McConaughy and inflow from the South Platte River. Overton is located in a transitional climate zone where summer precipitation is greater and more reliable than at most basin locations upstream.

The time of occurrence of both the average and median Peak flows was in May and June for all time intervals except 1928-1941, when they occurred in April and March, respectively. This is most likely the result of drought conditions during the 1930's.

Table A.9-16 shows the exceedance probabilities and values for the USGS Annual Peak flow. It is analogous to **Table A.9-5** for Annual Maximum mean daily flows. **Table A.9-16** shows a very large increase in flow values with decreasing exceedance probability for the 1895-1909 and 1910-1927 time intervals, and smaller increases with decreasing exceedance probability for all subsequent time intervals. For the 1942-1958 through 1975-1998 time intervals, the magnitude of the decrease with increasing

exceedance probability is about the same. A general decrease in flow values by time interval is also noted between the 1895-1909 and 1942-1958 time intervals, with little change in the values for subsequent time intervals. This characterization is consistent with river conditions during the respective time intervals, with the North Platte River being uncontrolled during the 1895-1909 time interval, control increasing at this location during the 1910-1927 and 1928-1941 time intervals, and extensive control in place during the 1942-1958 through 1975-1998 time intervals. The decrease from the 1928-1941 time interval to the 1942-1958 time interval is particularly noticeable for the lower exceedance probabilities (i.e. higher peak flows). This is coincident with the beginning of operation of Lake McConaughy.

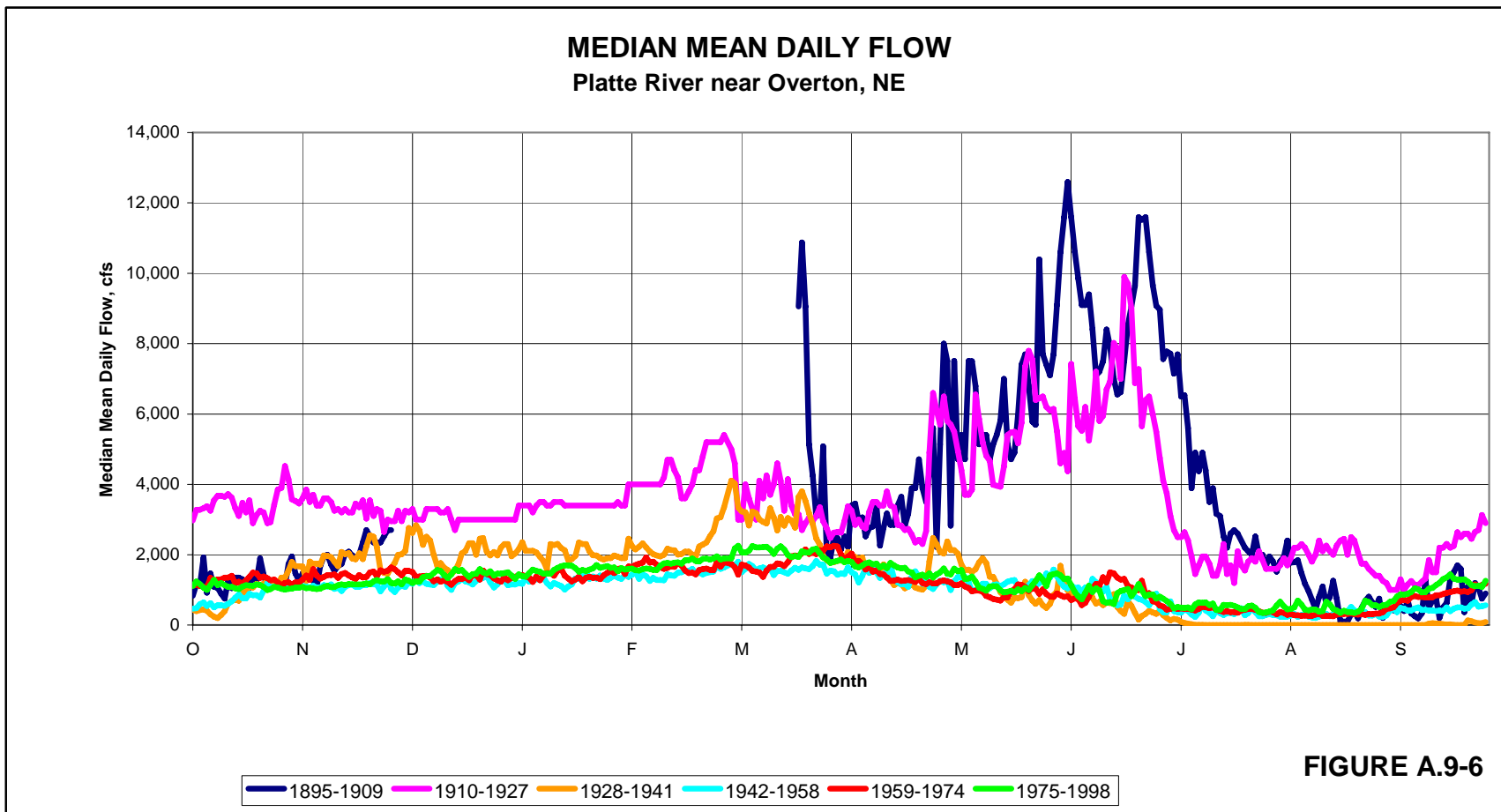


Figure A.9-6 Median Mean Daily Flow.

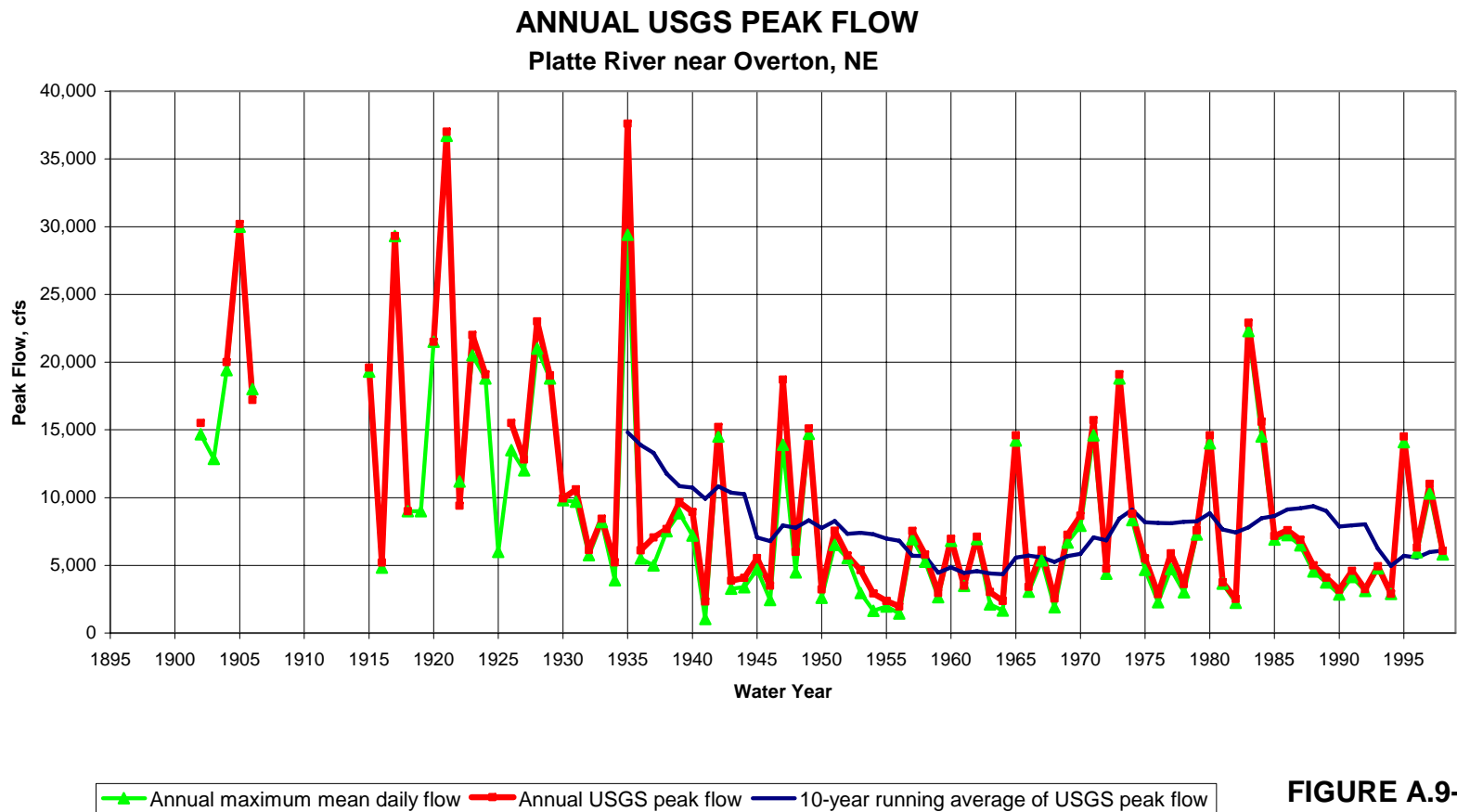


FIGURE A.9-7

Figure A.9-7 Annual USGS Peak Flow

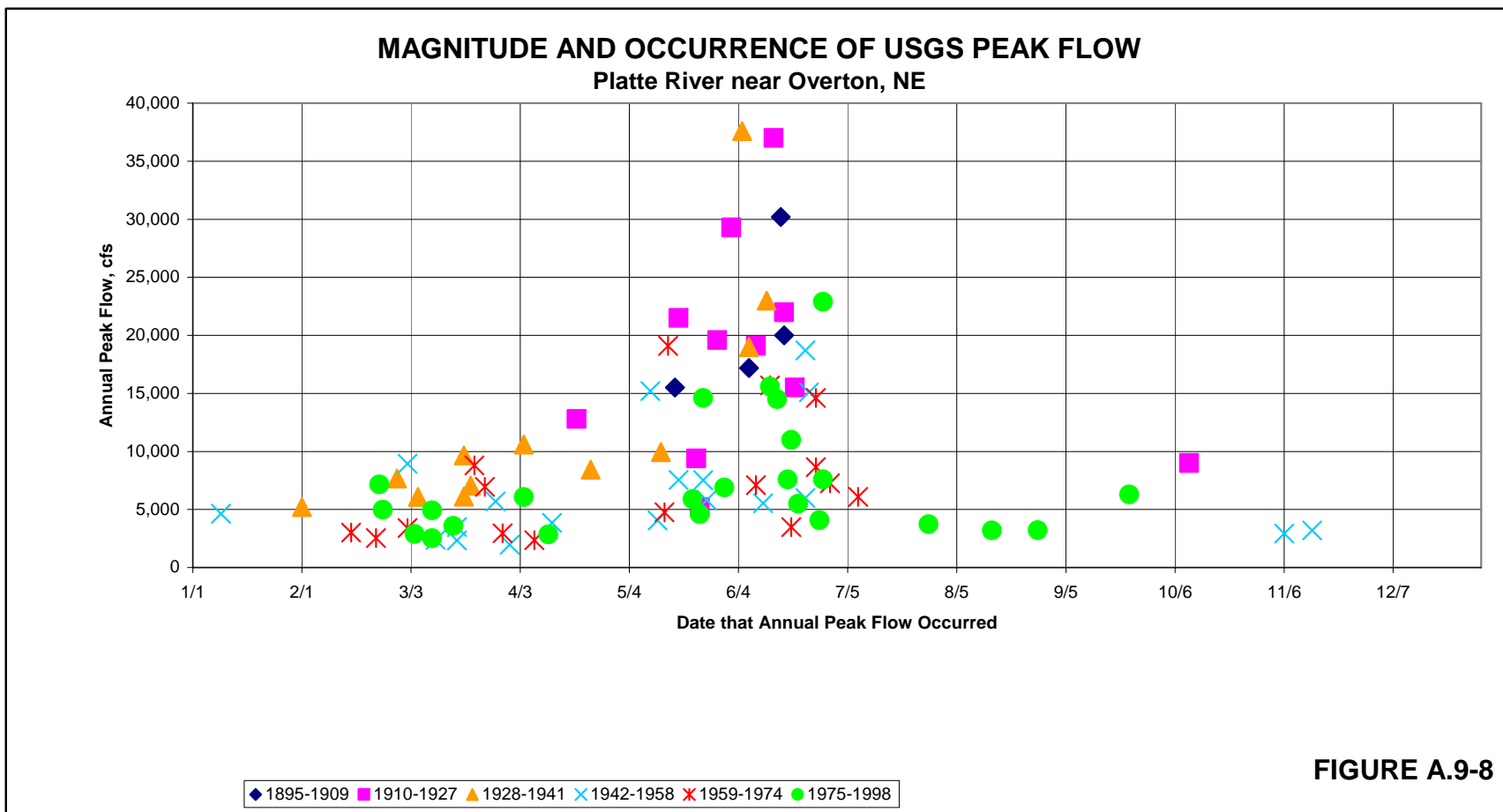


Table A.9-15 Summary of USGS Peak Flows.

Platte River near Overton, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	9,857	15,344	7,065	20,725	18,218	11,548	6,685	7,301	7,176
Median Annual Peak Flow (cfs)	7,075	12,800	5,710	18,600	19,100	8,690	5,530	6,525	5,695
Average Occurrence of Peak Flow	5/15	5/9	5/18	6/6	6/11	4/5	5/23	5/4	5/24
Median Occurrence of Peak Flow	5/24	5/23	5/25	6/16	6/2	3/20	5/18	5/15	6/13

Table A.9-16 USGS Peak Flow Exceedance Values

Platte River near Overton, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Annual Peak Flows									
Peak exceeded in 100% of the years	1,970	2,330	1,970	15,500	5,200	2,330	1,970	2,360	2,520
Peak exceeded in 90% of the years	2,945	5,922	2,884	16,010	9,000	5,477	2,706	2,755	2,990
Peak exceeded in 80% of the years	3,600	7,428	3,214	16,520	9,400	6,112	3,266	3,020	3,452
Peak exceeded in 70% of the years	4,960	8,964	3,704	17,030	12,800	6,957	3,786	3,450	4,054
Peak exceeded in 60% of the years	5,990	9,716	4,684	17,760	15,500	7,832	4,298	4,750	4,942
Peak exceeded in 50% of the years	7,075	12,800	5,710	18,600	19,100	8,690	5,530	6,525	5,695
Peak exceeded in 40% of the years	8,440	16,860	6,220	19,440	19,600	9,516	5,764	7,100	6,254
Peak exceeded in 30% of the years	10,800	19,400	7,314	21,020	21,500	10,006	6,298	7,960	7,202
Peak exceeded in 20% of the years	15,500	21,700	8,780	24,080	22,000	13,960	7,546	8,810	8,954
Peak exceeded in 10% of the years	19,800	29,480	15,140	27,140	29,300	21,800	15,140	15,150	14,570
Peak Flow	37,600	37,600	22,900	30,200	37,000	37,600	18,700	19,100	22,900

A.10 PLATTE RIVER NEAR GRAND ISLAND, NEBRASKA

A.10.1 Methodology

For this location, a single gage record was used, as follows:

Gage	Records Used	Data Source
Platte River Near Grand Island, NE	4/1/1934 – 9/30/1998	1934-9/30/1998, USGS website.

Summary statistics characterizing this record are presented in **Table A.10-1** (mean daily values), **Table A.10-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.10-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.10-4** (flow frequencies). The period of record begins on April 1, 1934; no data exist for either the 1895-1909 or the 1910-1927 time intervals.

A.10.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.10-1 shows that the average annual flow volumes for each time interval after 1940 are very similar to those at the Overton location. Maximum daily flows in each time interval are somewhat higher at this downstream location. From Grand Island downstream, the influence of local runoff becomes increasingly greater due to the increasing drainage area downstream of the North Platte projects and due to greater spring and summer precipitation in this region compared to upstream locations (NOAA, 2005 [Nebraska]). In the 1928-1941 time interval, both the average and median Annual Maximum mean daily flows are higher than for the later time intervals. These are both skewed higher, however, by the occurrences of 2 high-flow events in excess of 10,000 cfs during this otherwise very dry time interval.

Figure A.10-1 (maximum flows) and **Figure A.10-2** (annual flow volume) show moderate-to-high values in the 1940's, lower values in the 1950's, and moderate-to-high values from the 1960's through the end of the record, including several major flood maximums. This pattern also shows up in the 10-year running average, albeit on a delayed basis due to the averaging process. This pattern is consistent with climate variability between these time intervals, and thus suggests a greater influence of local climate on flows at Grand Island as compared to upstream locations. This influence can be attributed to a larger intervening uncontrolled drainage area. It can also be seen in **Figure A.10-1** that, similar to Overton, there is a substantial difference between the values of the annual maximums and those of the maximum 30-day averages early in the period of record; this difference decreases through the period of record, and narrows even more dramatically by the 1970's. For the 1928-1941 time interval, there are two significant high flow "spikes" in the Annual Maximum mean daily flow. The influence of these "spikes" is significantly attenuated in the annual maximum 30-day average flow (**Figure A.10-1**), and is only slightly evident in the annual flow volume (**Figure A.10-2**).

Table A.10-1 Summary of Mean Daily Flow Values.

Platte River near Grand Island, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	7,539	8,281	7,434			8,281	6,737	7,688	7,760
Median Annual Maximum Mean Daily Flow (cfs)	5,950	7,760	5,900			7,760	4,880	6,600	6,055
Average Annual Flow Volume (kaf)	1,097	531	1,176			531	846	1,146	1,430
Median Annual Flow Volume (kaf)	861	473	912			473	810	992	1,095
Average Mean Daily Flow (cfs)	1,516	747	1,624			747	1,169	1,582	1,975
Median Mean Daily Flow (cfs)	1,000	123	1,050			123	1,000	1,100	1,310
Average Number of Mean Daily Flow Measurements	362	342	365	0	0	342	365	365	365
Number of Years of Data	65 of 104	8 of 47	57 of 57	0 of 15	0 of 18	8 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	4,043	6,094	3,791			6,094	3,392	3,150	4,501
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	6,040	4,412	6,268			4,412	5,638	6,809	6,353
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	5,459	3,606	5,719			3,606	5,009	5,915	6,091
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	2,263	683	2,485			683	1,729	2,253	3,176
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	3,275	4,850	3,100			4,850	2,890	3,100	3,690
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	4,510	2,805	4,880			2,805	4,510	5,520	5,125
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	3,190	1,525	4,260			1,525	2,900	3,155	5,025
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	1,580	0	1,940			0	1,460	1,295	2,655
Difference ("Apr-Jul Average" - "Jul-Sep Average")	3,776	3,729	3,783			3,729	3,910	4,557	3,177
Difference ("Apr-Jul Median" - "Jul-Sep Median")	2,930	2,805	2,940			2,805	3,050	4,225	2,470
Average Occurrence of Maximum Mean Daily Flow	4/25	3/17	4/30			3/17	4/25	5/8	4/29
Median Occurrence of Maximum Mean Daily Flow	4/26	3/8	5/20			3/8	5/9	6/1	5/26
Average Annual Minimum Mean Daily Flow (cfs)	93	0	105			0	23	44	203
Median Annual Minimum Mean Daily Flow (cfs)	11	0	23			0	0	12	112
Average occurrences per year of the Minimum	31	127	19			127	42	13	4
Occurring between	7/31	6/26	8/4			6/26	7/26	7/29	8/17
and	9/8	11/19	8/30			11/19	9/20	8/17	8/22
Median occurrences per year of the Minimum	1	135	1			135	10	5	1
Occurring between	8/3	7/3	8/6			7/3	8/2	8/4	8/12
and	9/1	11/15	8/24			11/15	9/3	8/31	8/20

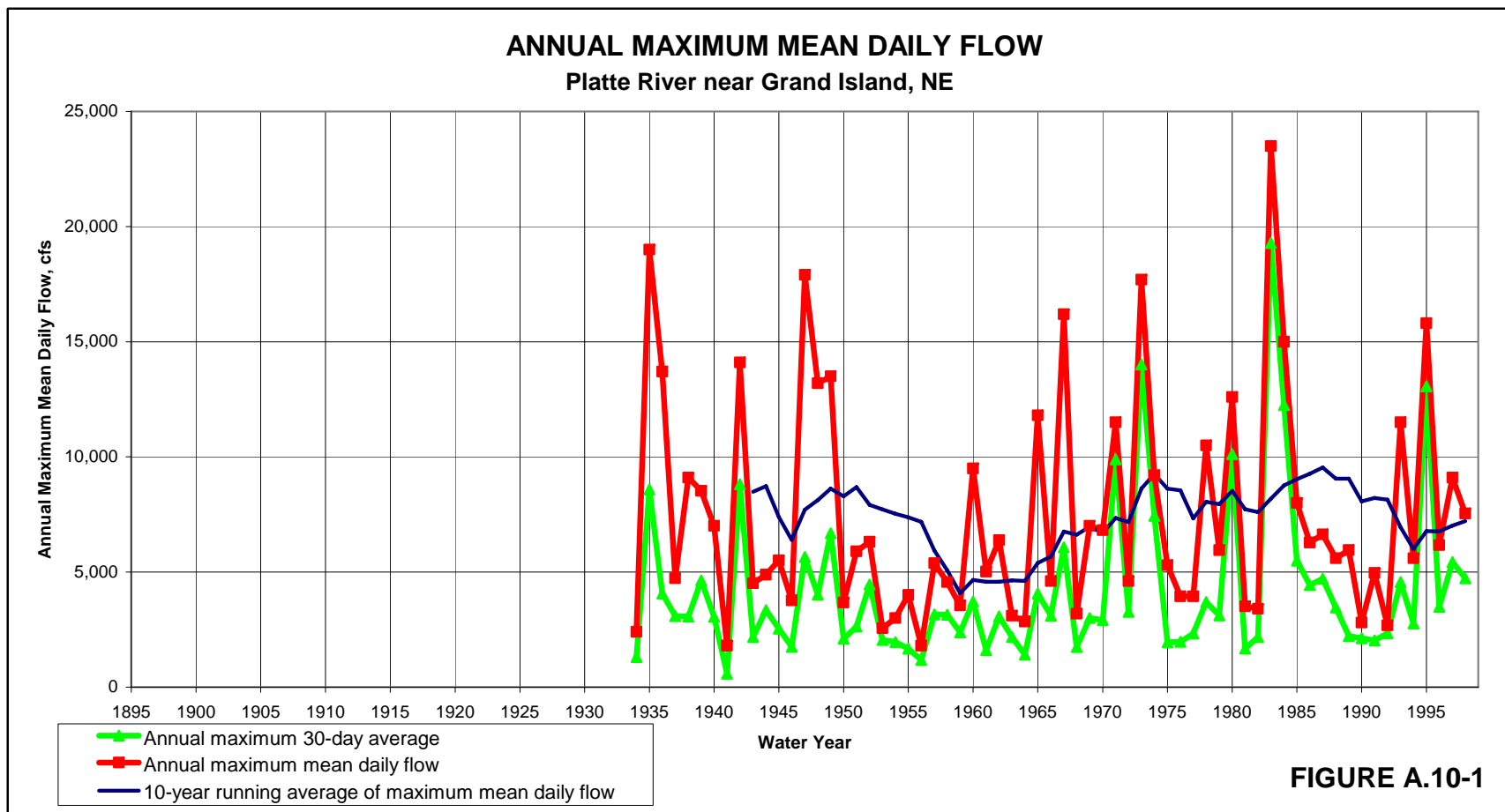


Figure A.10-1 Annual Maximum Mean Daily Flow.

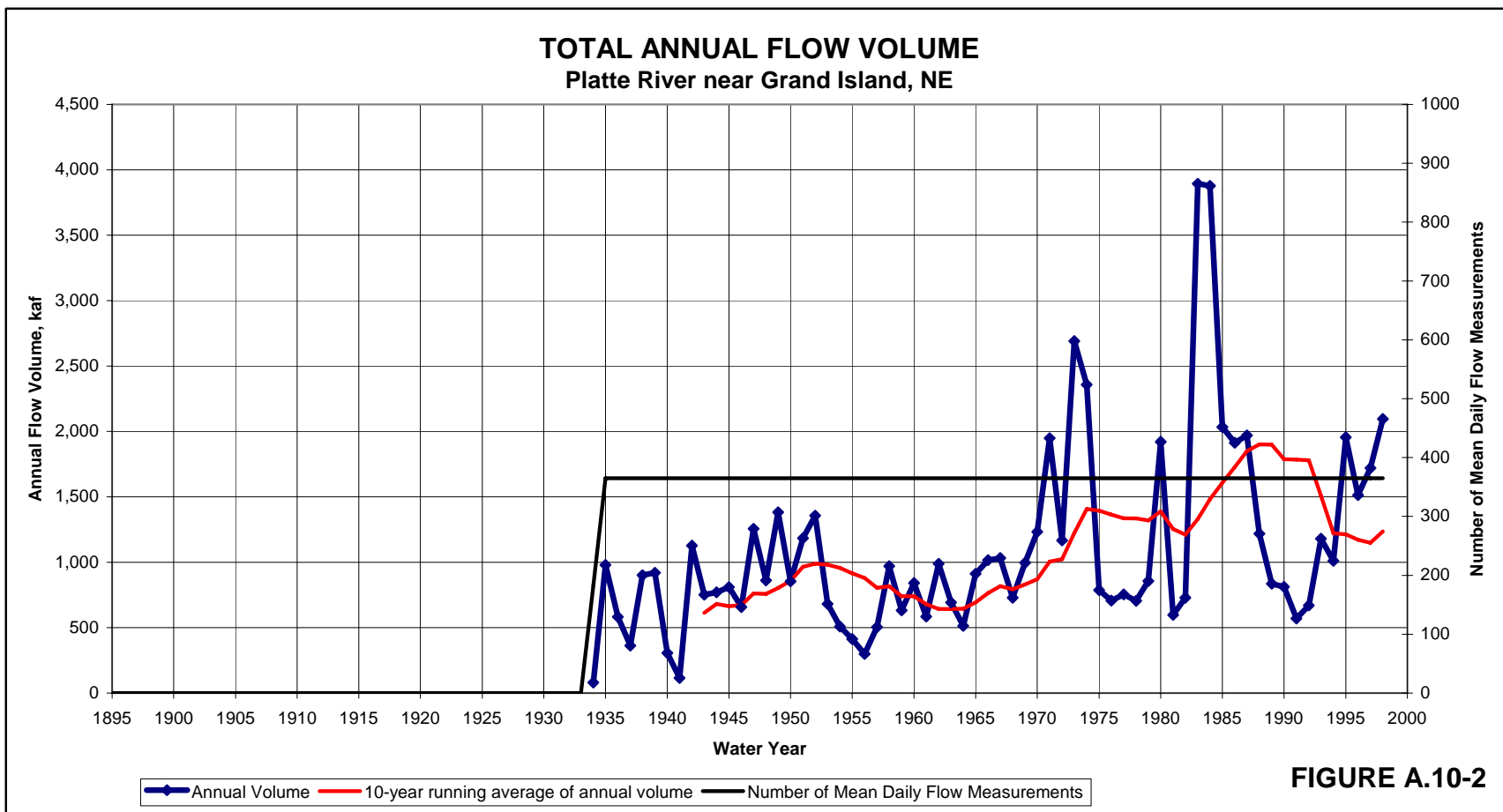


Figure A.10-2 Total Annual Flow Volume.

Figure A.10-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.10-3** shows that, while the higher maximums are found in May and June, there is otherwise considerable scatter in the timing of the maximums. Of some interest is the occurrence of an early-season maximum in excess of 10,000 cfs in the 1928-1941 time interval (1935 – see **Figure A.10-1**); **Figure A.10-1** and **Figure A.10-2** show that this high individual value does not carry over into either the 30-day average or the annual volume. This indicates that this was a very short-duration maximum superimposed on an otherwise-dry climatic period (climate data are shown in **Figures 3, 4, 5, and 8** of the main report).

Average and median seasonal maximum mean daily flows are highest in the Feb 15-Mar 16 seasonal period in 1928-1941, and in the Apr 16-Jul 15 seasonal period for the 1942-1958 time interval and all subsequent time intervals (**Table A.10-1**). Both average and median seasonal maximum flows decrease from the Apr 16-Jul 15 seasonal period to the Jun 1-Aug 15 seasonal period for all time intervals. The average and median Dates of Maximum Flow are in late April through the end of May in the 1942-1958 through 1975-1998 time intervals, and in March in the 1928-1941 time interval (**Table A.10-1**). These early dates for the 1928-1941 time interval are most likely the result of the combination of the effect of the 1930's drought and the two previously mentioned high-flow events.

Both **Table A.10-1** and **Figure A.10-4** (minimum flows) show possible effects of the 1930's and 1950's drought periods. For the 1928-1941 time interval, both the average and the median Annual Minimum mean daily flow are 0 cfs (**Table A.10-1**). Average Annual Minimum mean daily flows (**Figure A.10-4**) were at or near 0 cfs for the entire 1928-1941 time interval. The Annual Minimum mean daily flows then rose slightly though the later 1940's. The Annual Minimum mean daily flows were again at or near 0 cfs for most of the 1950's, a likely effect of the 1950's drought period. All minimum flow quantities have generally been higher since the early 1960's; in the 1980's and 1990's minimum flows have been significantly higher. Since the early 1940's the difference between the Annual Minimum mean daily flow and the annual minimum 30-Day average flow has remained relatively constant, except for the zero flows for both quantities in the 1950's. The average and median Dates of Minimum Flow are between the end of July and late September for the 1942-1958 through 1975-1998 time intervals, and occur more than 130 times (0 cfs) between June and November for the 1928-1941 time interval. Minimum flows were not calculated for years with incomplete flow records.

A.10.3 3-, 7-, 15-, and 30-day Averages of Mean Daily Flows

Table A.10-2 shows that average and median annual running average maximum flows show some attenuation due to the averaging process, but otherwise follow the same trends with time as for the Annual Maximum mean daily flow.

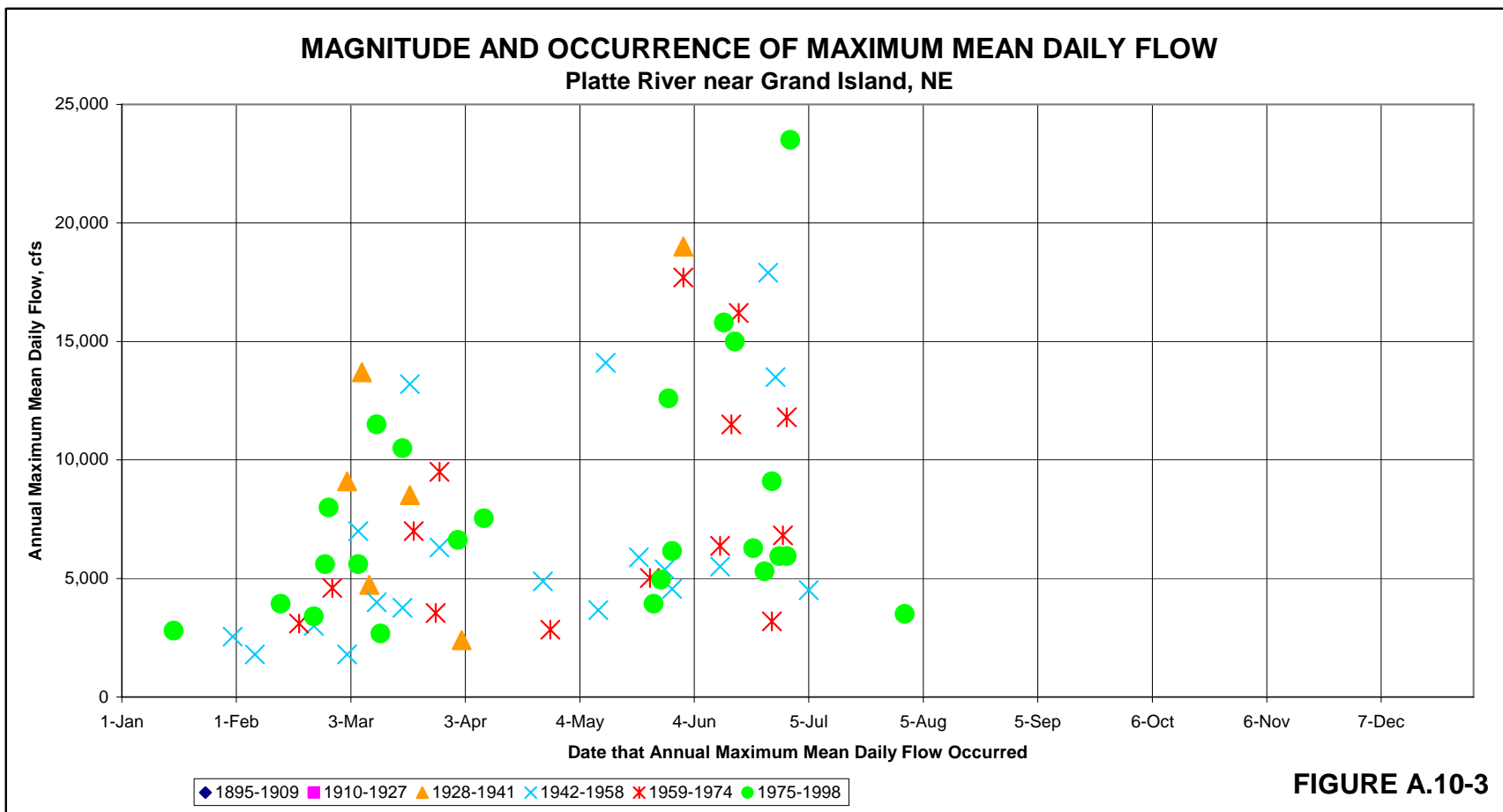


FIGURE A.10-3

Figure A.10-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

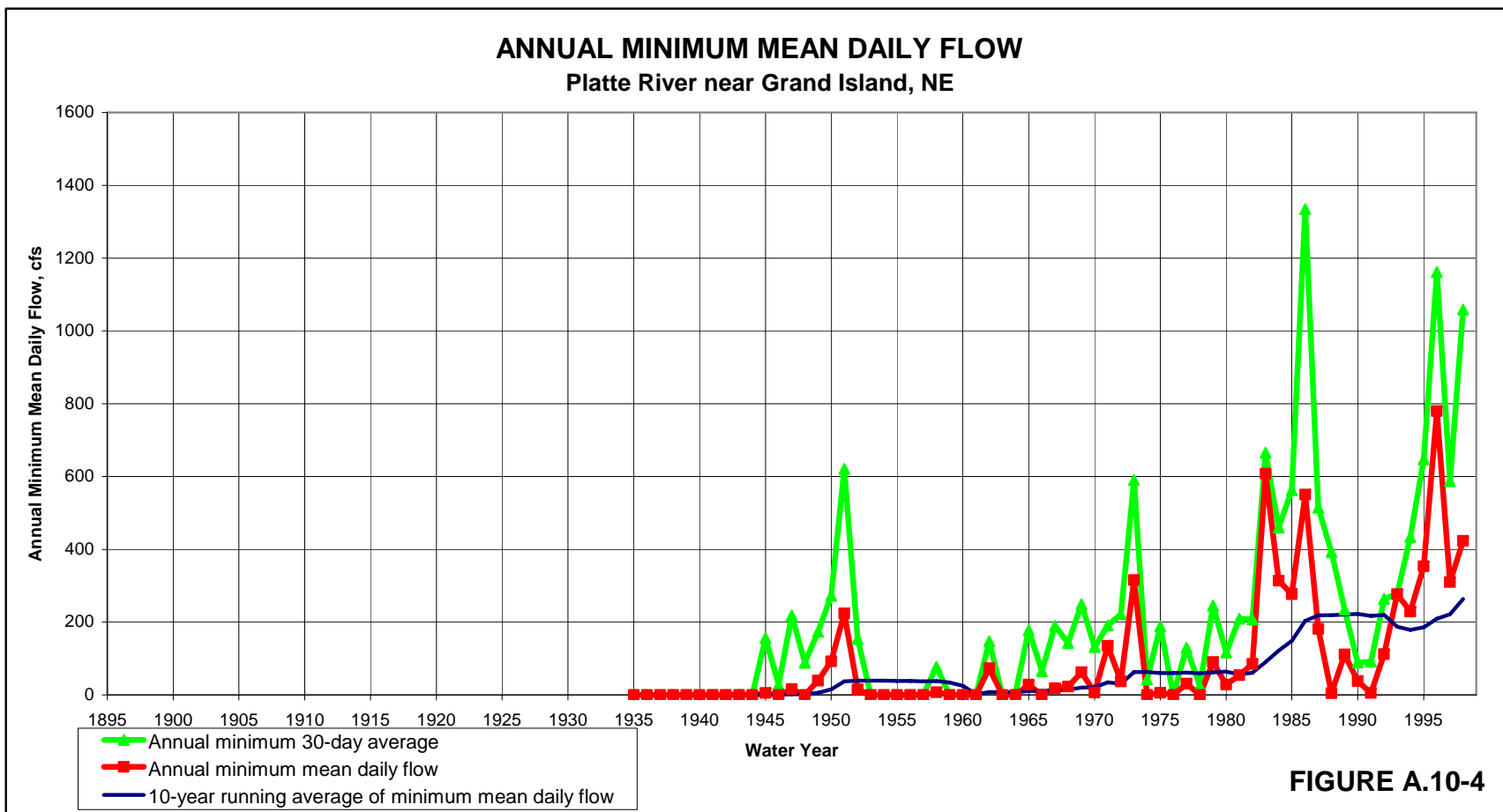


Figure A.10-4 Annual Minimum Mean Daily Flow.

Table A.10-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Platte River near Grand Island, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	7,539	8,281	7,434			8,281	6,737	7,688	7,760
Median Annual Maximum Mean Daily Flow (cfs)	5,950	7,760	5,900			7,760	4,880	6,600	6,055
Avg. Ann. Max. 3-day Avg. Flow (cfs)	7,017	7,578	6,938			7,578	6,111	7,233	7,327
Median Ann. Max. 3-day Avg. Flow (cfs)	5,467	6,712	5,330			6,712	4,757	6,182	5,638
Avg. Ann. Max. 7-day Avg. Flow (cfs)	6,117	6,381	6,080			6,381	5,131	6,278	6,622
Median Ann. Max. 7-day Avg. Flow (cfs)	4,971	5,362	4,866			5,362	4,109	5,136	5,152
Avg. Ann. Max. 15-day Avg. Flow (cfs)	5,115	4,729	5,170			4,729	4,239	5,279	5,756
Median Ann. Max. 15-day Avg. Flow (cfs)	4,066	4,000	4,066			4,000	3,283	4,095	4,349
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,228	3,546	4,324			3,546	3,370	4,364	4,973
Median Ann. Max. 30-day Avg. Flow (cfs)	3,107	3,075	3,111			3,075	2,626	3,087	3,472
Average Annual Minimum Mean Daily Flow (cfs)	93	0	105			0	23	44	203
Median Annual Minimum Mean Daily Flow (cfs)	11	0	23			0	0	12	112
Avg. Ann. Min. 3-day Avg. Flow (cfs)	101	0	114			0	30	55	212
Median Ann. Min. 3-day Avg. Flow (cfs)	20	0	29			0	0	18	123
Avg. Ann. Min. 7-day Avg. Flow (cfs)	118	0	132			0	44	73	234
Median Ann. Min. 7-day Avg. Flow (cfs)	25	0	48			0	0	25	147
Avg. Ann. Min. 15-day Avg. Flow (cfs)	160	0	179			0	69	105	307
Median Ann. Min. 15-day Avg. Flow (cfs)	53	0	79			0	3	50	176
Avg. Ann. Min. 30-day Avg. Flow (cfs)	216	0	243			0	105	135	412
Median Ann. Min. 30-day Avg. Flow (cfs)	137	0	156			0	28	137	271

Table A.10-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Platte River near Grand Island, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	7,017	7,578	6,938			7,578	6,111	7,233	7,327
Median Ann. Max. 3-day Avg. Flow (cfs)	5,467	6,712	5,330			6,712	4,757	6,182	5,638
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	3,750	5,619	3,521			5,619	3,100	2,913	4,223
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	5,631	4,040	5,854			4,040	5,178	6,362	5,994
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	5,072	3,234	5,330			3,234	4,544	5,523	5,758
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,049	543	2,260			543	1,458	2,024	2,986
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	3,100	4,660	2,933			4,660	2,567	2,725	3,283
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	4,167	2,350	4,340			2,350	3,950	5,292	4,572
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	2,853	1,345	3,630			1,345	2,847	2,833	4,588
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	1,493	0	1,757			0	1,227	1,165	2,423
Platte River near Grand Island, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	6,117	6,381	6,080			6,381	5,131	6,278	6,622
Median Ann. Max. 7-day Avg. Flow (cfs)	4,971	5,362	4,866			5,362	4,109	5,136	5,152
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	3,284	4,747	3,104			4,747	2,685	2,680	3,684
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	4,949	3,448	5,159			3,448	4,364	5,574	5,446
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	4,311	2,714	4,535			2,714	3,591	4,687	5,103
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,750	462	1,930			462	1,144	1,688	2,649
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	2,644	4,334	2,600			4,334	2,286	2,511	2,821
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	3,371	1,886	3,783			1,886	3,559	4,309	3,694
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	2,489	911	2,720			911	2,355	2,621	3,801
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,189	0	1,478			0	954	1,084	2,192
Platte River near Grand Island, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	5,115	4,729	5,170			4,729	4,239	5,279	5,756
Median Ann. Max. 15-day Avg. Flow (cfs)	4,066	4,000	4,066			4,000	3,283	4,095	4,349
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	2,742	3,487	2,650			3,487	2,220	2,401	3,121
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	4,174	2,573	4,399			2,573	3,583	4,608	4,838
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	3,465	1,926	3,681			1,926	2,781	3,675	4,324
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,400	374	1,544			374	837	1,286	2,218
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	2,363	3,578	2,279			3,578	2,031	2,320	2,529
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	2,753	1,329	2,932			1,329	2,932	3,358	2,855
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	1,843	504	2,129			504	1,768	2,092	2,825
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	929	0	1,100			0	767	911	1,710
Platte River near Grand Island, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,228	3,546	4,324			3,546	3,370	4,364	4,973
Median Ann. Max. 30-day Avg. Flow (cfs)	3,107	3,075	3,111			3,075	2,626	3,087	3,472
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	2,287	2,376	2,276			2,376	1,857	2,150	2,657
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	3,430	1,873	3,648			1,873	2,788	3,695	4,226
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	2,689	1,363	2,876			1,363	1,985	2,774	3,574
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,035	220	1,149			220	564	911	1,723
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	2,049	2,680	1,988			2,680	1,720	2,064	2,203
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	2,030	859	2,368			859	2,434	2,519	2,096
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,377	288	1,454			288	1,256	1,412	1,947
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	698	0	749			0	616	637	1,282

Table A.10-3 shows the average and median maximum 3-, 7-, 15-, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.10-3** shows that the flow values by time interval from 1928-1941 through 1975-1998 do not show much change from one time interval to the next. For the 1959-1974 and 1975-1998 time intervals, the difference between the average and the median values are not as large for the Apr 16-Jul 15 and the Jun 1-Aug 15 seasonal periods as they are at upstream locations, although the average values are still higher than the median values.

A.10.4 Flow Frequency

A.10.4.1 Flow Ranges

For flow frequency as a percentage of years, **Table A.10-4** and **Figure A.10-5** show a pattern for the 1928-1941 time interval that is very similar to that for the 1928-1941 time interval at Overton. There is a frequency of 100 percent for all flow ranges up to 2,000 cfs, and every flow range between 3,000 cfs and 15,000 cfs is populated with frequencies of 25 percent or greater. The most plausible explanation is that this is the result of the downstream propagation of the flow patterns which caused the similar distribution at Overton (**Section A.9-3**). Information found in **Table A.10-1** suggests this possibility; the average seasonal maximum mean daily flow for May-June for this time interval is greater than the median by about a factor of 2, similar to the factor of 2.3 at the Overton gage from 1928 – 1939 (**Table A.9-1**). Otherwise, the other time intervals show frequencies in percentage of years and percentage of days that are more consistent with known climatic conditions and coincident water-related development in the basin. The 0-200-cfs flow range occurs most frequently in the 1928-1941 time interval. The 1,001-2,000-cfs flow range occurs at about the same frequency, roughly between 31 and 33 percent, for all time intervals after 1928-1941. The frequencies of flow in ranges greater than 2,000 cfs are somewhat higher for the 1975-1998 time interval than for the two preceding time intervals, which is consistent with other data showing this to have been a wet period.

A.10.4.2 Maximum Mean Flow Exceedance

Table A.10-5 through **Table A.10-9** show the exceedance values and probabilities for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 13) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.10-5 shows the exceedance probabilities and values for annual maximum flow data. There are two noteworthy characterizations that can be seen in **Table A.10-5**. The first is the decreases in the flow values from the 1928-1941 time interval to the 1942-1958 time interval for all but the most commonly exceeded flows (i.e. flows exceeded in 70 percent of years or less). This can be attributed to the previously discussed high flow

event during the 1928-1941 time interval. The second is that reductions in the flow values with decreasing exceedance probability (higher flows) for the 1942-1958 time interval and all subsequent time intervals are noticeably smaller than those for the 1928-1941 time interval. These changes are not as noticeable for this location as for the North Platte River at Overton, NE (**Section A.9**), probably mainly due to the intervening uncontrolled drainage area.

Table A.10-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 Seasonal period. **Table A.10-6** shows the same general pattern of decreases in flow values as those seen in **Table A.10-5** from the 1928-1941 time interval to the 1942-1958 time interval. Changes in flow values by time interval from the 1942-1958 through the 1975-1998 time intervals are generally consistent with the known climatological conditions. However, the variations between time intervals are not large, which possibly reflects a consistency in the flow storage and carryover effect of the North Platte River reservoirs.

Table A.10-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.10-7** shows that changes in flow values by time interval are generally consistent with known climatological conditions. As previously noted, there is a large intervening uncontrolled drainage area between the upstream reservoir projects and Grand Island. Also, Grand Island and points downstream are in a region of increasing average precipitation with downstream distance, especially in the warm-season months (NOAA, 2005 [Nebraska]).

Table A.10-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.10-8** shows that the flow values are generally somewhat lower than those for the Apr 16-Jul 15 seasonal period. Otherwise, the characterizations for the Jun 1-Aug 15 seasonal period are essentially the same as those for the Apr 16-Jul 15 seasonal period.

Table A.10-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.10-9** shows that changes in flow values by time interval are generally consistent with known climatological conditions. The high frequency of zero-flow values for the 1928-1941 time interval can be attributed to the severe drought conditions of the 1930's.

Table A.10-4 Flow Frequency Distributions.

Platte River near Grand Island, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	82	100	79	0	0	100	94	94	58
201 to 500	95	100	95	0	0	100	100	100	88
501 to 750	98	100	98	0	0	100	100	100	96
751 to 1,000	100	100	100	0	0	100	100	100	100
1,001 to 2,000	100	100	100	0	0	100	100	100	100
2,001 to 3,000	97	88	98	0	0	88	94	100	100
3,001 to 4,000	88	75	89	0	0	75	82	94	92
4,001 to 5,000	72	75	72	0	0	75	65	75	75
5,001 to 6,000	58	50	60	0	0	50	47	56	71
6,001 to 8,000	46	63	44	0	0	63	24	56	50
8,001 to 10,000	32	50	30	0	0	50	24	38	29
10,001 to 12,000	20	25	19	0	0	25	12	19	25
12,001 to 15,000	18	25	18	0	0	25	24	13	17
Greater than 15,000	9	13	9	0	0	13	6	13	8
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Platte River near Grand Island, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	16.8	52.4	12.1	0.0	0.0	52.4	21.7	12.1	5.3
201 to 500	10.6	11.5	10.5	0.0	0.0	11.5	11.3	10.4	9.9
501 to 750	8.9	6.4	9.3	0.0	0.0	6.4	9.7	9.3	9.0
751 to 1,000	11.2	6.2	11.9	0.0	0.0	6.2	11.2	11.6	12.5
1,001 to 2,000	29.5	10.7	31.9	0.0	0.0	10.7	31.4	33.2	31.5
2,001 to 3,000	12.2	7.2	12.8	0.0	0.0	7.2	9.3	12.7	15.5
3,001 to 4,000	4.3	2.3	4.5	0.0	0.0	2.3	2.4	3.9	6.4
4,001 to 5,000	2.3	1.4	2.4	0.0	0.0	1.4	1.5	2.1	3.3
5,001 to 6,000	1.3	0.6	1.3	0.0	0.0	0.6	0.5	1.2	2.0
6,001 to 8,000	1.4	0.4	1.5	0.0	0.0	0.4	0.4	1.7	2.1
8,001 to 10,000	0.7	0.4	0.7	0.0	0.0	0.4	0.4	0.9	0.9
10,001 to 12,000	0.4	0.2	0.4	0.0	0.0	0.2	0.2	0.3	0.6
12,001 to 15,000	0.3	0.1	0.4	0.0	0.0	0.1	0.2	0.2	0.6
Greater than 15,000	0.2	0.1	0.2	0.0	0.0	0.1	0.0	0.3	0.4
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Platte River near Grand Island, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	61	179	44	0	0	179	79	44	20
201 to 500	38	39	38	0	0	39	41	38	36
501 to 750	32	22	34	0	0	22	35	34	33
751 to 1,000	41	21	43	0	0	21	41	43	46
1,001 to 2,000	107	37	117	0	0	37	115	121	115
2,001 to 3,000	44	25	47	0	0	25	34	46	56
3,001 to 4,000	15	8	17	0	0	8	9	14	24
4,001 to 5,000	8	5	9	0	0	5	5	8	12
5,001 to 6,000	5	2	5	0	0	2	2	4	7
6,001 to 8,000	5	1	5	0	0	1	1	6	8
8,001 to 10,000	3	1	3	0	0	1	1	3	3
10,001 to 12,000	1	1	1	0	0	1	1	1	2
12,001 to 15,000	1	1	1	0	0	1	1	1	2
Greater than 15,000	1	1	1	0	0	1	0	1	1
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

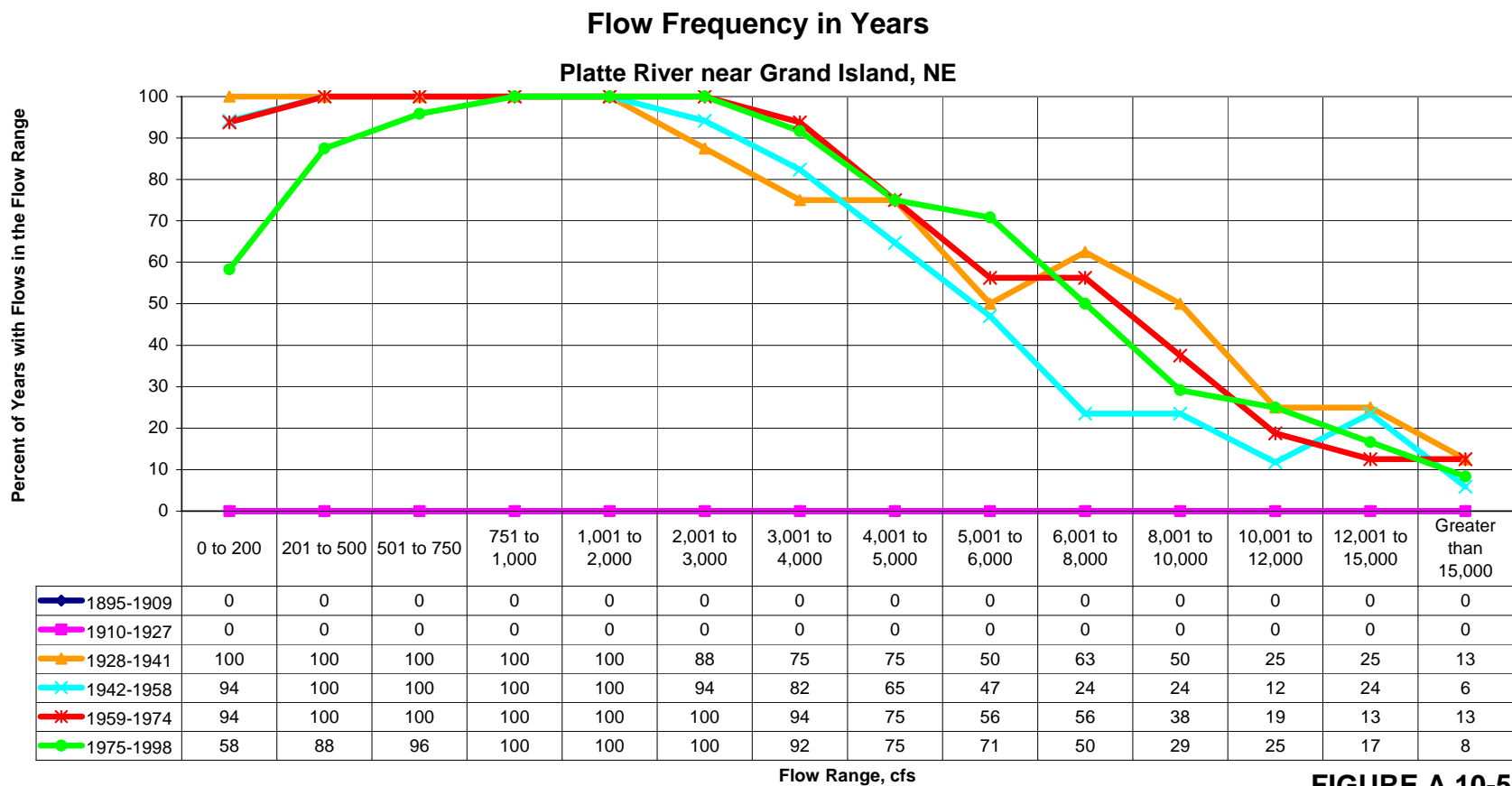


FIGURE A.10-5

Figure A.10-5 Flow Frequency in Years.

Table A.10-5 Maximum Flow Exceedance Values, Annual Data.

Platte River near Grand Island, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	1,800	1,800	1,800			1,800	1,800	2,840	2,680
Maximum exceeded in 90% of the years	2,904	2,220	3,060			2,220	2,820	3,145	3,433
Maximum exceeded in 80% of the years	3,646	3,332	3,690			3,332	3,690	3,550	3,940
Maximum exceeded in 70% of the years	4,568	4,957	4,550			4,957	3,954	4,600	5,265
Maximum exceeded in 60% of the years	5,188	6,546	5,132			6,546	4,530	5,020	5,670
Maximum exceeded in 50% of the years	5,950	7,760	5,900			7,760	4,880	6,600	6,055
Maximum exceeded in 40% of the years	6,706	8,636	6,352			8,636	5,452	7,000	6,560
Maximum exceeded in 30% of the years	8,984	9,042	8,220			9,042	5,982	9,350	8,110
Maximum exceeded in 20% of the years	11,560	11,860	11,500			11,860	11,822	11,500	10,900
Maximum exceeded in 10% of the years	14,640	15,290	14,460			15,290	13,740	14,000	14,280
Maximum	23,500	19,000	23,500			19,000	17,900	17,700	23,500
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	1,733	1,733	1,760			1,733	1,760	1,957	2,657
Maximum exceeded in 90% of the years	2,623	2,048	2,703			2,048	2,548	2,617	3,143
Maximum exceeded in 80% of the years	3,215	3,138	3,255			3,138	2,980	3,303	3,529
Maximum exceeded in 70% of the years	4,187	4,746	4,066			4,746	3,345	4,447	4,740
Maximum exceeded in 60% of the years	4,785	5,981	4,775			5,981	3,913	4,753	5,357
Maximum exceeded in 50% of the years	5,467	6,712	5,330			6,712	4,757	6,182	5,638
Maximum exceeded in 40% of the years	6,203	7,295	5,947			7,295	5,091	6,537	6,089
Maximum exceeded in 30% of the years	8,000	8,014	7,793			8,014	5,335	9,147	7,679
Maximum exceeded in 20% of the years	11,153	11,007	11,087			11,007	10,399	10,900	10,453
Maximum exceeded in 10% of the years	13,740	14,353	13,727			14,353	13,007	12,967	13,310
Maximum	22,967	17,667	22,967			17,667	16,033	17,567	22,967
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	1,537	1,537	1,617			1,537	1,617	1,713	2,543
Maximum exceeded in 90% of the years	2,419	1,975	2,486			1,975	2,390	2,429	2,641
Maximum exceeded in 80% of the years	2,665	3,031	2,670			3,031	2,457	2,933	3,042
Maximum exceeded in 70% of the years	3,342	4,419	3,311			4,419	2,635	3,683	3,738
Maximum exceeded in 60% of the years	4,115	5,012	4,064			5,012	3,321	4,034	4,644
Maximum exceeded in 50% of the years	4,971	5,362	4,866			5,362	4,109	5,136	5,152
Maximum exceeded in 40% of the years	5,328	5,660	5,268			5,660	4,123	5,839	5,574
Maximum exceeded in 30% of the years	6,666	6,070	6,823			6,070	4,930	7,893	6,987
Maximum exceeded in 20% of the years	9,035	9,046	8,976			9,046	7,409	9,003	8,903
Maximum exceeded in 10% of the years	11,714	12,245	11,714			12,245	11,640	10,785	12,964
Maximum	21,543	15,171	21,543			15,171	12,700	17,071	21,543
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	1,048	1,048	1,388			1,048	1,388	1,535	2,027
Maximum exceeded in 90% of the years	2,072	1,556	2,092			1,556	2,067	2,087	2,331
Maximum exceeded in 80% of the years	2,329	2,503	2,330			2,503	2,160	2,533	2,561
Maximum exceeded in 70% of the years	2,623	3,628	2,589			3,628	2,316	3,118	2,882
Maximum exceeded in 60% of the years	3,554	3,848	3,384			3,848	2,642	3,683	3,646
Maximum exceeded in 50% of the years	4,066	4,000	4,066			4,000	3,283	4,095	4,349
Maximum exceeded in 40% of the years	4,404	4,232	4,419			4,232	3,781	4,373	5,104
Maximum exceeded in 30% of the years	5,264	4,730	5,295			4,730	4,405	5,897	5,835
Maximum exceeded in 20% of the years	7,327	6,279	7,377			6,279	5,042	7,753	6,974
Maximum exceeded in 10% of the years	10,712	8,489	10,540			8,489	9,044	9,267	12,161
Maximum	20,133	11,349	20,133			11,349	11,343	15,660	20,133
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	583	583	1,183			583	1,183	1,410	1,674
Maximum exceeded in 90% of the years	1,699	1,087	1,742			1,087	1,713	1,670	1,983
Maximum exceeded in 80% of the years	2,042	2,003	2,057			2,003	1,977	2,174	2,151
Maximum exceeded in 70% of the years	2,238	3,054	2,207			3,054	2,092	2,642	2,315
Maximum exceeded in 60% of the years	2,851	3,063	2,682			3,063	2,319	2,998	2,835
Maximum exceeded in 50% of the years	3,107	3,075	3,111			3,075	2,626	3,087	3,472
Maximum exceeded in 40% of the years	3,469	3,280	3,474			3,280	3,150	3,265	4,278
Maximum exceeded in 30% of the years	4,353	3,967	4,431			3,967	3,476	3,887	4,710
Maximum exceeded in 20% of the years	5,440	4,404	5,479			4,404	4,366	6,068	5,453
Maximum exceeded in 10% of the years	8,721	5,816	9,244			5,816	6,064	8,663	11,609
Maximum	19,293	8,584	19,293			8,584	8,813	14,012	19,293

Table A.10-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Platte River near Grand Island, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		480	480	820			480	820	1,650	1,750
Maximum exceeded in 90% of the years		1,815	1,872	1,830			1,872	1,592	2,025	2,025
Maximum exceeded in 80% of the years		2,496	3,186	2,492			3,186	2,516	2,290	2,668
Maximum exceeded in 70% of the years		2,645	4,344	2,600			4,344	2,548	2,495	2,698
Maximum exceeded in 60% of the years		2,852	4,778	2,820			4,778	2,704	2,600	2,960
Maximum exceeded in 50% of the years		3,275	4,850	3,100			4,850	2,890	3,100	3,690
Maximum exceeded in 40% of the years		3,944	6,140	3,460			6,140	3,576	3,200	4,080
Maximum exceeded in 30% of the years		4,510	7,420	4,118			7,420	4,038	3,375	5,600
Maximum exceeded in 20% of the years		5,600	8,680	5,288			8,680	4,438	3,400	6,134
Maximum exceeded in 10% of the years		7,070	10,940	6,134			10,940	5,496	4,800	8,028
Maximum		13,700	13,700	11,500			13,700	7,100	5,670	11,500
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		400	400	813			400	813	1,450	1,653
Maximum exceeded in 90% of the years		1,743	1,552	1,746			1,552	1,532	1,745	1,950
Maximum exceeded in 80% of the years		2,240	2,770	2,180			2,770	2,403	2,130	2,473
Maximum exceeded in 70% of the years		2,465	4,120	2,464			4,120	2,451	2,225	2,623
Maximum exceeded in 60% of the years		2,576	4,606	2,561			4,606	2,501	2,423	2,833
Maximum exceeded in 50% of the years		3,100	4,660	2,933			4,660	2,567	2,725	3,283
Maximum exceeded in 40% of the years		3,340	5,664	3,197			5,664	2,961	3,100	3,811
Maximum exceeded in 30% of the years		4,147	6,690	3,689			6,690	3,457	3,135	5,344
Maximum exceeded in 20% of the years		5,369	7,760	5,193			7,760	3,655	3,233	5,614
Maximum exceeded in 10% of the years		6,707	10,043	5,614			10,043	5,343	4,595	7,669
Maximum		12,933	12,933	11,133			12,933	6,867	5,427	11,133
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		269	269	696			269	696	1,337	1,503
Maximum exceeded in 90% of the years		1,530	1,362	1,545			1,362	1,318	1,474	1,805
Maximum exceeded in 80% of the years		2,033	2,519	2,023			2,519	2,074	1,913	2,161
Maximum exceeded in 70% of the years		2,206	3,802	2,204			3,802	2,203	2,031	2,545
Maximum exceeded in 60% of the years		2,396	4,272	2,339			4,272	2,225	2,193	2,634
Maximum exceeded in 50% of the years		2,644	4,334	2,600			4,334	2,286	2,511	2,821
Maximum exceeded in 40% of the years		2,911	4,843	2,861			4,843	2,499	2,879	3,469
Maximum exceeded in 30% of the years		3,790	5,371	3,177			5,371	2,708	2,938	4,543
Maximum exceeded in 20% of the years		4,629	5,939	4,533			5,939	3,061	2,967	5,096
Maximum exceeded in 10% of the years		5,494	8,074	5,096			8,074	4,684	4,306	6,449
Maximum		10,991	10,991	9,164			10,991	6,257	5,076	9,164
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		197	197	519			197	519	1,235	1,253
Maximum exceeded in 90% of the years		1,367	1,234	1,376			1,234	1,135	1,368	1,593
Maximum exceeded in 80% of the years		1,761	2,229	1,709			2,229	1,813	1,447	1,923
Maximum exceeded in 70% of the years		1,941	3,140	1,940			3,140	1,907	1,780	2,204
Maximum exceeded in 60% of the years		2,086	3,498	2,041			3,498	1,959	1,943	2,352
Maximum exceeded in 50% of the years		2,363	3,578	2,279			3,578	2,031	2,320	2,529
Maximum exceeded in 40% of the years		2,586	3,778	2,479			3,778	2,147	2,465	3,139
Maximum exceeded in 30% of the years		3,275	3,947	2,779			3,947	2,303	2,656	3,375
Maximum exceeded in 20% of the years		3,655	4,054	3,501			4,054	2,785	2,729	4,108
Maximum exceeded in 10% of the years		4,507	5,360	4,396			5,360	3,447	3,798	5,646
Maximum		7,271	7,264	7,271			7,264	4,780	4,748	7,271
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		162	162	518			162	518	1,158	1,228
Maximum exceeded in 90% of the years		1,238	1,057	1,247			1,057	942	1,231	1,462
Maximum exceeded in 80% of the years		1,587	1,806	1,584			1,806	1,596	1,355	1,757
Maximum exceeded in 70% of the years		1,664	2,260	1,663			2,260	1,628	1,514	1,872
Maximum exceeded in 60% of the years		1,862	2,519	1,847			2,519	1,653	1,692	2,074
Maximum exceeded in 50% of the years		2,049	2,680	1,988			2,680	1,720	2,064	2,203
Maximum exceeded in 40% of the years		2,259	2,688	2,147			2,688	1,871	2,110	2,483
Maximum exceeded in 30% of the years		2,518	2,758	2,427			2,758	1,980	2,379	2,897
Maximum exceeded in 20% of the years		3,112	2,954	3,173			2,954	2,210	2,549	3,342
Maximum exceeded in 10% of the years		3,603	3,416	3,545			3,416	2,796	3,366	3,930
Maximum		7,009	4,010	7,009			4,010	3,661	4,427	7,009

Table A.10-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Platte River near Grand Island, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	734	897	734			897	734	1,410	1,300
Maximum exceeded in 90% of the years	1,874	997	1,982			997	1,898	2,530	1,991
Maximum exceeded in 80% of the years	2,260	1,488	2,434			1,488	2,052	2,840	2,562
Maximum exceeded in 70% of the years	2,852	2,221	3,114			2,221	2,756	3,155	3,189
Maximum exceeded in 60% of the years	3,296	2,648	4,112			2,648	3,950	4,450	4,066
Maximum exceeded in 50% of the years	4,510	2,805	4,880			2,805	4,510	5,520	5,125
Maximum exceeded in 40% of the years	5,332	2,876	5,472			2,876	4,752	6,380	5,846
Maximum exceeded in 30% of the years	6,006	3,002	6,128			3,002	5,404	7,130	6,124
Maximum exceeded in 20% of the years	7,772	3,350	8,768			3,350	5,820	11,500	7,408
Maximum exceeded in 10% of the years	14,640	8,199	14,460			8,199	13,740	14,000	14,280
Maximum	23,500	19,000	23,500			19,000	17,900	17,700	23,500
3-day Average Flows									
Maximum exceeded in 100% of the years	653	834	653			834	653	1,250	1,290
Maximum exceeded in 90% of the years	1,700	962	1,812			962	1,720	2,028	1,887
Maximum exceeded in 80% of the years	1,957	1,352	2,020			1,352	1,861	2,217	2,382
Maximum exceeded in 70% of the years	2,641	1,872	2,852			1,872	2,661	2,672	2,991
Maximum exceeded in 60% of the years	2,995	2,003	3,643			2,003	3,248	4,223	3,764
Maximum exceeded in 50% of the years	4,167	2,350	4,340			2,350	3,950	5,292	4,572
Maximum exceeded in 40% of the years	4,835	2,689	5,091			2,689	4,589	5,897	5,214
Maximum exceeded in 30% of the years	5,673	2,789	5,843			2,789	4,979	6,912	5,719
Maximum exceeded in 20% of the years	7,627	3,189	8,647			3,189	5,238	10,900	7,183
Maximum exceeded in 10% of the years	13,740	7,713	13,727			7,713	13,007	12,967	13,310
Maximum	22,967	17,667	22,967			17,667	16,033	17,567	22,967
7-day Average Flows									
Maximum exceeded in 100% of the years	618	728	618			728	618	1,149	1,210
Maximum exceeded in 90% of the years	1,258	903	1,431			903	1,291	1,628	1,571
Maximum exceeded in 80% of the years	1,587	1,043	1,719			1,043	1,486	2,137	2,161
Maximum exceeded in 70% of the years	2,301	1,191	2,441			1,191	2,181	2,404	2,504
Maximum exceeded in 60% of the years	2,519	1,548	2,927			1,548	2,499	3,371	3,241
Maximum exceeded in 50% of the years	3,371	1,886	3,783			1,886	3,559	4,309	3,694
Maximum exceeded in 40% of the years	4,064	2,236	4,123			2,236	4,026	5,301	4,149
Maximum exceeded in 30% of the years	5,038	2,632	5,235			2,632	4,121	6,449	5,234
Maximum exceeded in 20% of the years	7,381	2,940	8,349			2,940	4,717	9,003	6,772
Maximum exceeded in 10% of the years	11,714	6,726	11,714			6,726	11,640	10,785	12,964
Maximum	21,543	15,171	21,543			15,171	12,700	17,071	21,543
15-day Average Flows									
Maximum exceeded in 100% of the years	550	555	550			555	550	1,049	961
Maximum exceeded in 90% of the years	1,058	564	1,168			564	944	1,381	1,240
Maximum exceeded in 80% of the years	1,294	674	1,501			674	1,304	1,960	1,750
Maximum exceeded in 70% of the years	1,805	877	1,919			877	1,464	2,036	2,131
Maximum exceeded in 60% of the years	2,105	1,187	2,279			1,187	1,899	2,129	2,616
Maximum exceeded in 50% of the years	2,753	1,329	2,932			1,329	2,932	3,358	2,855
Maximum exceeded in 40% of the years	3,299	1,547	3,496			1,547	3,151	4,066	3,622
Maximum exceeded in 30% of the years	4,052	2,125	4,371			2,125	3,637	5,429	4,485
Maximum exceeded in 20% of the years	6,490	2,331	6,503			2,331	4,281	6,508	6,103
Maximum exceeded in 10% of the years	10,712	5,093	10,540			5,093	9,044	8,974	12,161
Maximum	20,133	11,349	20,133			11,349	11,343	15,660	20,133
30-day Average Flows									
Maximum exceeded in 100% of the years	377	377	435			377	435	820	688
Maximum exceeded in 90% of the years	767	397	993			397	810	1,123	1,048
Maximum exceeded in 80% of the years	1,045	432	1,216			432	1,051	1,492	1,513
Maximum exceeded in 70% of the years	1,507	501	1,600			501	1,271	1,615	1,644
Maximum exceeded in 60% of the years	1,715	718	1,864			718	1,780	1,803	1,982
Maximum exceeded in 50% of the years	2,030	859	2,368			859	2,434	2,519	2,096
Maximum exceeded in 40% of the years	2,573	1,066	2,680			1,066	2,590	2,687	2,983
Maximum exceeded in 30% of the years	3,153	1,520	3,371			1,520	3,144	3,485	3,573
Maximum exceeded in 20% of the years	4,507	1,742	4,768			1,742	3,306	4,855	4,823
Maximum exceeded in 10% of the years	8,721	3,868	9,244			3,868	6,044	7,980	11,609
Maximum	19,293	8,584	19,293			8,584	8,813	14,012	19,293

Table A.10-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Platte River near Grand Island, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		0	0	199			0	199	592	822
Maximum exceeded in 90% of the years		888	322	1,080			322	1,138	1,230	1,160
Maximum exceeded in 80% of the years		1,364	592	1,754			592	1,454	1,770	2,184
Maximum exceeded in 70% of the years		2,112	799	2,228			799	2,030	2,100	2,548
Maximum exceeded in 60% of the years		2,542	870	2,888			870	2,304	2,880	3,772
Maximum exceeded in 50% of the years		3,190	1,525	4,260			1,525	2,900	3,155	5,025
Maximum exceeded in 40% of the years		4,776	2,270	5,232			2,270	4,410	6,020	5,820
Maximum exceeded in 30% of the years		5,950	2,655	6,040			2,655	4,844	6,600	6,136
Maximum exceeded in 20% of the years		7,276	2,788	8,644			2,788	5,788	11,500	7,498
Maximum exceeded in 10% of the years		14,480	7,688	14,220			7,688	13,580	14,000	13,980
Maximum		23,500	19,000	23,500			19,000	17,900	17,700	23,500
3-day Average Flows										
Maximum exceeded in 100% of the years		0	0	175			0	175	559	733
Maximum exceeded in 90% of the years		775	307	1,039			307	992	1,090	1,107
Maximum exceeded in 80% of the years		1,217	509	1,395			509	1,395	1,250	2,031
Maximum exceeded in 70% of the years		1,861	637	2,091			637	1,809	1,928	2,472
Maximum exceeded in 60% of the years		2,180	792	2,629			792	2,225	2,193	3,393
Maximum exceeded in 50% of the years		2,853	1,345	3,630			1,345	2,847	2,833	4,588
Maximum exceeded in 40% of the years		4,359	1,891	4,875			1,891	3,972	5,830	5,233
Maximum exceeded in 30% of the years		5,617	2,021	5,843			2,021	4,465	6,217	5,929
Maximum exceeded in 20% of the years		7,027	2,268	8,497			2,268	5,110	10,900	7,323
Maximum exceeded in 10% of the years		13,200	6,994	12,967			6,994	12,300	12,967	12,907
Maximum		22,967	17,667	22,967			17,667	16,033	17,567	22,967
7-day Average Flows										
Maximum exceeded in 100% of the years		0	0	90			0	90	474	624
Maximum exceeded in 90% of the years		632	260	783			260	821	782	882
Maximum exceeded in 80% of the years		956	406	1,038			406	1,038	870	1,725
Maximum exceeded in 70% of the years		1,552	480	1,685			480	1,182	1,618	2,229
Maximum exceeded in 60% of the years		1,874	638	2,280			638	1,742	1,889	2,718
Maximum exceeded in 50% of the years		2,489	911	2,720			911	2,355	2,621	3,801
Maximum exceeded in 40% of the years		3,702	1,242	3,831			1,242	3,026	4,624	4,127
Maximum exceeded in 30% of the years		4,535	1,599	5,180			1,599	3,687	5,570	5,229
Maximum exceeded in 20% of the years		6,405	2,005	8,105			2,005	3,889	9,003	6,690
Maximum exceeded in 10% of the years		11,291	6,120	11,141			6,120	10,401	10,579	11,452
Maximum		21,543	15,171	21,543			15,171	11,714	15,786	21,543
15-day Average Flows										
Maximum exceeded in 100% of the years		0	0	42			0	42	406	448
Maximum exceeded in 90% of the years		425	196	555			196	601	501	768
Maximum exceeded in 80% of the years		703	330	858			330	847	612	1,219
Maximum exceeded in 70% of the years		1,010	410	1,241			410	919	1,209	1,556
Maximum exceeded in 60% of the years		1,444	450	1,645			450	1,202	1,408	2,048
Maximum exceeded in 50% of the years		1,843	504	2,129			504	1,768	2,092	2,825
Maximum exceeded in 40% of the years		2,769	693	2,991			693	2,186	3,325	3,271
Maximum exceeded in 30% of the years		3,351	1,202	4,067			1,202	2,892	4,220	4,457
Maximum exceeded in 20% of the years		5,276	1,391	6,200			1,391	3,342	6,508	6,012
Maximum exceeded in 10% of the years		9,192	4,320	9,044			4,320	7,863	8,937	9,409
Maximum		20,133	10,974	20,133			10,974	9,487	12,631	20,133
30-day Average Flows										
Maximum exceeded in 100% of the years		0	0	21			0	21	234	326
Maximum exceeded in 90% of the years		286	133	403			133	427	395	678
Maximum exceeded in 80% of the years		516	208	669			208	576	450	915
Maximum exceeded in 70% of the years		698	238	836			238	673	746	1,240
Maximum exceeded in 60% of the years		950	266	1,252			266	786	1,011	1,390
Maximum exceeded in 50% of the years		1,377	288	1,454			288	1,256	1,412	1,947
Maximum exceeded in 40% of the years		1,946	399	2,276			399	1,778	2,305	2,918
Maximum exceeded in 30% of the years		2,670	732	2,926			732	2,291	2,798	3,112
Maximum exceeded in 20% of the years		3,930	864	4,029			864	2,529	4,062	4,509
Maximum exceeded in 10% of the years		6,440	3,104	6,316			3,104	5,305	7,559	8,128
Maximum		19,293	8,200	19,293			8,200	6,687	10,499	19,293

Table A.10-9 Maximum Flow Exceedance Values, Jul 16 -Sep 30 Seasonal Period.

Platte River near Grand Island, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	0	0	0			0	0	544	692
Maximum exceeded in 90% of the years	0	0	572			0	0	654	1,082
Maximum exceeded in 80% of the years	582	0	725			0	171	719	1,524
Maximum exceeded in 70% of the years	769	0	1,150			0	571	807	2,000
Maximum exceeded in 60% of the years	1,254	0	1,448			0	929	1,160	2,162
Maximum exceeded in 50% of the years	1,580	0	1,940			0	1,460	1,295	2,655
Maximum exceeded in 40% of the years	2,142	0	2,406			0	1,784	1,370	3,282
Maximum exceeded in 30% of the years	2,718	0	3,006			0	2,322	2,010	3,671
Maximum exceeded in 20% of the years	3,528	190	3,582			190	2,538	3,360	4,820
Maximum exceeded in 10% of the years	5,156	1,767	5,160			1,767	3,012	4,780	5,181
Maximum	9,800	5,150	9,800			5,150	7,960	9,800	9,510
3-day Average Flows									
Maximum exceeded in 100% of the years	0	0	0			0	0	492	602
Maximum exceeded in 90% of the years	0	0	500			0	0	597	874
Maximum exceeded in 80% of the years	503	0	679			0	151	675	1,293
Maximum exceeded in 70% of the years	698	0	1,037			0	485	702	1,868
Maximum exceeded in 60% of the years	1,102	0	1,263			0	840	1,056	2,062
Maximum exceeded in 50% of the years	1,493	0	1,757			0	1,227	1,165	2,423
Maximum exceeded in 40% of the years	2,029	0	2,071			0	1,579	1,287	3,185
Maximum exceeded in 30% of the years	2,435	0	2,545			0	2,030	1,905	3,395
Maximum exceeded in 20% of the years	3,273	172	3,291			172	2,337	3,067	4,722
Maximum exceeded in 10% of the years	4,731	1,419	4,830			1,419	2,546	4,008	5,034
Maximum	9,057	4,060	9,057			4,060	6,023	9,057	8,727
7-day Average Flows									
Maximum exceeded in 100% of the years	0	0	0			0	0	339	476
Maximum exceeded in 90% of the years	0	0	382			0	0	473	821
Maximum exceeded in 80% of the years	396	0	570			0	115	564	1,087
Maximum exceeded in 70% of the years	596	0	877			0	411	614	1,540
Maximum exceeded in 60% of the years	965	0	1,111			0	711	972	1,799
Maximum exceeded in 50% of the years	1,189	0	1,478			0	954	1,084	2,192
Maximum exceeded in 40% of the years	1,669	0	1,767			0	1,332	1,189	2,476
Maximum exceeded in 30% of the years	2,240	0	2,288			0	1,530	1,670	3,218
Maximum exceeded in 20% of the years	2,699	122	2,933			122	1,834	2,353	4,512
Maximum exceeded in 10% of the years	4,295	1,190	4,512			1,190	2,289	3,426	4,874
Maximum	7,670	3,493	7,670			3,493	3,885	7,064	7,670
15-day Average Flows									
Maximum exceeded in 100% of the years	0	0	0			0	0	194	378
Maximum exceeded in 90% of the years	0	0	211			0	0	250	633
Maximum exceeded in 80% of the years	213	0	417			0	68	368	853
Maximum exceeded in 70% of the years	457	0	660			0	293	471	1,056
Maximum exceeded in 60% of the years	783	0	894			0	560	794	1,398
Maximum exceeded in 50% of the years	929	0	1,100			0	767	911	1,710
Maximum exceeded in 40% of the years	1,240	0	1,394			0	979	1,100	2,026
Maximum exceeded in 30% of the years	1,567	0	1,668			0	1,189	1,329	2,826
Maximum exceeded in 20% of the years	2,060	69	2,088			69	1,468	1,568	4,043
Maximum exceeded in 10% of the years	3,808	943	4,043			943	1,775	2,377	4,088
Maximum	7,044	2,878	7,044			2,878	2,240	5,867	7,044
30-day Average Flows									
Maximum exceeded in 100% of the years	0	0	0			0	0	100	254
Maximum exceeded in 90% of the years	0	0	105			0	0	127	362
Maximum exceeded in 80% of the years	106	0	260			0	37	210	616
Maximum exceeded in 70% of the years	279	0	473			0	192	347	754
Maximum exceeded in 60% of the years	556	0	618			0	339	554	955
Maximum exceeded in 50% of the years	698	0	749			0	616	637	1,282
Maximum exceeded in 40% of the years	814	0	911			0	676	749	1,627
Maximum exceeded in 30% of the years	1,217	0	1,256			0	723	997	2,069
Maximum exceeded in 20% of the years	1,655	34	1,664			34	817	1,225	2,820
Maximum exceeded in 10% of the years	2,645	551	2,820			551	1,192	1,608	3,402
Maximum	6,575	1,704	6,575			1,704	1,828	4,299	6,575

A.10.4.3 Mean Daily Flow Exceedance

Table A.10-10 through **Table A.10-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.10-10 shows the exceedance probabilities and values of flows for annual data. **Table A.10-10** shows that, when all flow values are considered, the flow distributions by time interval are generally consistent with known climatological conditions.

Table A.10-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 Seasonal period. **Table A.10-11** shows that, when all flow values are considered, the flow distributions by time interval are generally consistent with known climatological conditions. An exception is the decrease in the flow values from the 1928-1941 time interval to the 1942-1958 time interval for all seasonal periods and most exceedance probabilities. This is most likely the result of the one early-season high flow event (1935 – see **Figure A.10-1**) out of only eight measured events for the 1928-1941 time interval. This event would have skewed most average flow values higher, especially for the lower exceedance probability ranges (higher flows). A likely additional factor is the beginning of operation of Lake McConaughy in 1941.

Table A.10-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 Seasonal period. **Table A.10-12** shows that, when all flow values are considered, the flow distributions by time interval are generally consistent with known climatological conditions.

Table A.10-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 time interval. **Table A.10-13** shows that the flow values are lower across the board than those for the Apr 16-Jul 15 Seasonal period (**Table A.10-12**). Otherwise, the characterizations for the Jun 1-Aug 15 Seasonal period are essentially the same as those for the Apr 16-Jul 15 Seasonal period. The high frequency of zero-flow values for the 1928-1941 time interval can be attributed to the severe drought conditions of the 1930's.

Table A.10-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 Seasonal period. **Table A.10-14** shows that, when all flow values are considered, the flow distributions by time interval are generally consistent with known climatological conditions. The high frequency of zero-flow values for the 1928-1941 time interval can be attributed to the severe drought conditions of the 1930's.

Table A.10-10 Exceedance Values Considering All Flows, Annual Data.

Platte River near Grand Island, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days		0	0	0			0	0	0	0
Flow exceeded for 90% of the days		13	0	135			0	0	142	350
Flow exceeded for 80% of the days		291	0	430			0	158	429	650
Flow exceeded for 70% of the days		584	0	711			0	425	701	873
Flow exceeded for 60% of the days		840	0	929			0	699	936	1,100
Flow exceeded for 50% of the days		1,070	146	1,160			146	915	1,130	1,390
Flow exceeded for 40% of the days		1,340	378	1,410			378	1,150	1,350	1,700
Flow exceeded for 30% of the days		1,700	740	1,760			740	1,400	1,703	2,100
Flow exceeded for 20% of the days		2,190	1,276	2,250			1,276	1,750	2,200	2,642
Flow exceeded for 10% of the days		3,130	2,350	3,240			2,350	2,340	3,091	4,000
Maximum		23,500	19,000	23,500			19,000	17,900	17,700	23,500
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		0	0	0			0	0	0	0
Flow exceeded for 90% of the days		18	0	143			0	0	145	357
Flow exceeded for 80% of the days		302	0	442			0	171	441	658
Flow exceeded for 70% of the days		597	0	723			0	442	712	878
Flow exceeded for 60% of the days		849	1	937			1	717	942	1,109
Flow exceeded for 50% of the days		1,073	159	1,159			159	941	1,130	1,383
Flow exceeded for 40% of the days		1,347	377	1,423			377	1,147	1,363	1,711
Flow exceeded for 30% of the days		1,697	762	1,763			762	1,417	1,703	2,100
Flow exceeded for 20% of the days		2,180	1,300	2,240			1,300	1,733	2,200	2,633
Flow exceeded for 10% of the days		3,137	2,330	3,257			2,330	2,330	3,071	3,977
Maximum		22,967	17,667	22,967			17,667	16,033	17,567	22,967
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		0	0	0			0	0	0	0
Flow exceeded for 90% of the days		31	0	157			0	1	160	380
Flow exceeded for 80% of the days		318	0	464			0	189	459	673
Flow exceeded for 70% of the days		622	0	749			0	476	751	891
Flow exceeded for 60% of the days		868	7	953			7	750	956	1,126
Flow exceeded for 50% of the days		1,087	183	1,171			183	962	1,144	1,405
Flow exceeded for 40% of the days		1,357	390	1,434			390	1,153	1,366	1,709
Flow exceeded for 30% of the days		1,693	780	1,764			780	1,430	1,700	2,093
Flow exceeded for 20% of the days		2,171	1,343	2,236			1,343	1,741	2,190	2,639
Flow exceeded for 10% of the days		3,143	2,251	3,270			2,251	2,303	3,066	3,959
Maximum		21,543	15,171	21,543			15,171	12,700	17,071	21,543
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		0	0	0			0	0	0	0
Flow exceeded for 90% of the days		58	0	190			0	12	184	397
Flow exceeded for 80% of the days		346	0	500			0	223	496	702
Flow exceeded for 70% of the days		659	0	773			0	506	774	907
Flow exceeded for 60% of the days		898	41	975			41	781	975	1,141
Flow exceeded for 50% of the days		1,115	207	1,188			207	998	1,166	1,420
Flow exceeded for 40% of the days		1,368	433	1,447			433	1,176	1,379	1,727
Flow exceeded for 30% of the days		1,708	859	1,773			859	1,427	1,694	2,090
Flow exceeded for 20% of the days		2,141	1,393	2,213			1,393	1,765	2,157	2,670
Flow exceeded for 10% of the days		3,150	2,177	3,243			2,177	2,257	3,100	3,907
Maximum		20,133	11,349	20,133			11,349	11,343	15,660	20,133
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days		0	0	0			0	0	0	0
Flow exceeded for 90% of the days		109	0	229			0	28	219	453
Flow exceeded for 80% of the days		397	0	547			0	258	520	751
Flow exceeded for 70% of the days		704	0	807			0	549	815	916
Flow exceeded for 60% of the days		919	90	992			90	809	1,004	1,163
Flow exceeded for 50% of the days		1,144	263	1,216			263	1,019	1,199	1,454
Flow exceeded for 40% of the days		1,397	504	1,464			504	1,203	1,395	1,756
Flow exceeded for 30% of the days		1,719	897	1,792			897	1,437	1,710	2,080
Flow exceeded for 20% of the days		2,143	1,486	2,203			1,486	1,745	2,183	2,725
Flow exceeded for 10% of the days		3,112	2,199	3,222			2,199	2,264	3,050	3,742
Maximum		19,293	8,584	19,293			8,584	8,813	14,012	19,293

Table A.10-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Platte River near Grand Island, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	74			0	74	520	195
Flow exceeded for 90% of the days	980	197	1,060			197	701	1,069	1,250
Flow exceeded for 80% of the days	1,250	690	1,290			690	1,068	1,258	1,410
Flow exceeded for 70% of the days	1,450	1,054	1,460			1,054	1,300	1,400	1,600
Flow exceeded for 60% of the days	1,650	1,534	1,650			1,534	1,480	1,650	1,850
Flow exceeded for 50% of the days	1,900	1,975	1,900			1,975	1,640	1,950	2,200
Flow exceeded for 40% of the days	2,214	2,350	2,210			2,350	1,828	2,264	2,500
Flow exceeded for 30% of the days	2,560	2,700	2,540			2,700	2,073	2,560	2,783
Flow exceeded for 20% of the days	2,992	3,352	2,952			3,352	2,460	2,912	3,400
Flow exceeded for 10% of the days	4,082	4,703	4,000			4,703	3,123	3,600	5,182
Maximum	13,700	13,700	11,500			13,700	7,100	5,670	11,500
3-day Average Flows									
Flow exceeded for 100% of the days	22	22	100			22	100	580	780
Flow exceeded for 90% of the days	1,024	202	1,090			202	725	1,103	1,257
Flow exceeded for 80% of the days	1,273	783	1,300			783	1,122	1,283	1,427
Flow exceeded for 70% of the days	1,463	1,120	1,475			1,120	1,333	1,417	1,612
Flow exceeded for 60% of the days	1,655	1,590	1,660			1,590	1,500	1,665	1,868
Flow exceeded for 50% of the days	1,928	2,020	1,923			2,020	1,633	1,937	2,233
Flow exceeded for 40% of the days	2,235	2,350	2,233			2,350	1,860	2,235	2,505
Flow exceeded for 30% of the days	2,559	2,678	2,535			2,678	2,125	2,503	2,799
Flow exceeded for 20% of the days	2,963	3,633	2,933			3,633	2,433	2,932	3,367
Flow exceeded for 10% of the days	4,083	4,722	3,990			4,722	3,192	3,604	5,251
Maximum	12,933	12,933	11,133			12,933	6,867	5,427	11,133
7-day Average Flows									
Flow exceeded for 100% of the days	30	30	240			30	240	760	849
Flow exceeded for 90% of the days	1,091	200	1,167			200	692	1,135	1,271
Flow exceeded for 80% of the days	1,321	936	1,334			936	1,248	1,301	1,450
Flow exceeded for 70% of the days	1,489	1,430	1,495			1,430	1,429	1,434	1,636
Flow exceeded for 60% of the days	1,721	1,828	1,711			1,828	1,534	1,673	1,867
Flow exceeded for 50% of the days	1,980	2,108	1,966			2,108	1,750	1,944	2,211
Flow exceeded for 40% of the days	2,234	2,559	2,210			2,559	1,968	2,202	2,536
Flow exceeded for 30% of the days	2,562	2,978	2,536			2,978	2,157	2,458	2,811
Flow exceeded for 20% of the days	2,979	3,918	2,913			3,918	2,438	2,884	3,443
Flow exceeded for 10% of the days	4,160	5,128	4,086			5,128	3,085	3,698	4,986
Maximum	10,991	10,991	9,164			10,991	6,257	5,076	9,164
15-day Average Flows									
Flow exceeded for 100% of the days	59	59	431			59	431	1,003	1,045
Flow exceeded for 90% of the days	1,181	141	1,189			141	691	1,142	1,266
Flow exceeded for 80% of the days	1,367	1,383	1,358			1,383	1,343	1,273	1,561
Flow exceeded for 70% of the days	1,598	1,787	1,594			1,787	1,489	1,406	1,661
Flow exceeded for 60% of the days	1,796	2,119	1,779			2,119	1,662	1,803	1,901
Flow exceeded for 50% of the days	2,010	2,844	1,952			2,844	1,795	1,946	2,203
Flow exceeded for 40% of the days	2,278	3,204	2,227			3,204	1,950	2,263	2,479
Flow exceeded for 30% of the days	2,582	3,512	2,480			3,512	2,156	2,442	2,952
Flow exceeded for 20% of the days	3,220	3,848	3,029			3,848	2,456	2,703	3,478
Flow exceeded for 10% of the days	3,955	4,327	3,905			4,327	3,244	3,714	4,604
Maximum	7,271	7,264	7,271			7,264	4,780	4,748	7,271
30-day Average Flows									
Flow exceeded for 100% of the days	162	162	518			162	518	1,158	1,228
Flow exceeded for 90% of the days	1,238	1,057	1,247			1,057	942	1,231	1,462
Flow exceeded for 80% of the days	1,587	1,806	1,584			1,806	1,596	1,355	1,757
Flow exceeded for 70% of the days	1,664	2,260	1,663			2,260	1,628	1,514	1,872
Flow exceeded for 60% of the days	1,862	2,519	1,847			2,519	1,653	1,692	2,074
Flow exceeded for 50% of the days	2,049	2,680	1,988			2,680	1,720	2,064	2,203
Flow exceeded for 40% of the days	2,259	2,688	2,147			2,688	1,871	2,110	2,483
Flow exceeded for 30% of the days	2,518	2,758	2,427			2,758	1,980	2,379	2,897
Flow exceeded for 20% of the days	3,112	2,954	3,173			2,954	2,210	2,549	3,342
Flow exceeded for 10% of the days	3,603	3,416	3,545			3,416	2,796	3,366	3,930
Maximum	7,009	4,010	7,009			4,010	3,661	4,427	7,009

Table A.10-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Platte River near Grand Island, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	117	0	212			0	87	210	313
Flow exceeded for 80% of the days	334	0	447			0	340	379	548
Flow exceeded for 70% of the days	560	65	669			65	599	597	769
Flow exceeded for 60% of the days	798	177	908			177	837	818	1,050
Flow exceeded for 50% of the days	1,060	293	1,200			293	1,100	1,050	1,445
Flow exceeded for 40% of the days	1,430	424	1,560			424	1,422	1,340	1,780
Flow exceeded for 30% of the days	1,850	694	2,010			694	1,780	1,820	2,340
Flow exceeded for 20% of the days	2,702	1,000	2,878			1,000	2,280	2,840	3,628
Flow exceeded for 10% of the days	4,812	2,163	5,220			2,163	3,304	5,835	7,056
Maximum	23,500	19,000	23,500			19,000	17,900	17,700	23,500
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	134	0	227			0	98	217	321
Flow exceeded for 80% of the days	346	2	462			2	354	394	563
Flow exceeded for 70% of the days	572	80	690			80	619	620	776
Flow exceeded for 60% of the days	812	196	923			196	878	829	1,060
Flow exceeded for 50% of the days	1,071	309	1,207			309	1,097	1,054	1,455
Flow exceeded for 40% of the days	1,447	433	1,580			433	1,428	1,326	1,800
Flow exceeded for 30% of the days	1,869	686	2,023			686	1,766	1,831	2,370
Flow exceeded for 20% of the days	2,694	1,044	2,893			1,044	2,280	2,835	3,610
Flow exceeded for 10% of the days	4,842	2,162	5,210			2,162	3,456	5,698	7,190
Maximum	22,967	17,667	22,967			17,667	16,033	17,567	22,967
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	2	1
Flow exceeded for 90% of the days	169	0	250			0	111	244	347
Flow exceeded for 80% of the days	379	24	488			24	408	422	589
Flow exceeded for 70% of the days	595	112	736			112	652	659	787
Flow exceeded for 60% of the days	837	231	933			231	897	851	1,114
Flow exceeded for 50% of the days	1,105	320	1,245			320	1,136	1,077	1,454
Flow exceeded for 40% of the days	1,475	448	1,615			448	1,459	1,384	1,791
Flow exceeded for 30% of the days	1,904	701	2,034			701	1,847	1,924	2,400
Flow exceeded for 20% of the days	2,763	1,121	2,992			1,121	2,354	2,930	3,603
Flow exceeded for 10% of the days	4,857	2,073	5,212			2,073	3,533	5,767	7,662
Maximum	21,543	15,171	21,543			15,171	12,700	17,071	21,543
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	11	9
Flow exceeded for 90% of the days	218	0	312			0	165	313	383
Flow exceeded for 80% of the days	412	74	528			74	437	458	640
Flow exceeded for 70% of the days	642	197	768			197	752	686	825
Flow exceeded for 60% of the days	875	268	988			268	959	874	1,126
Flow exceeded for 50% of the days	1,164	356	1,292			356	1,193	1,122	1,541
Flow exceeded for 40% of the days	1,526	474	1,667			474	1,485	1,466	1,862
Flow exceeded for 30% of the days	1,962	647	2,125			647	1,903	1,955	2,507
Flow exceeded for 20% of the days	2,857	1,265	3,032			1,265	2,461	3,031	3,498
Flow exceeded for 10% of the days	5,101	1,966	5,567			1,966	3,471	5,994	7,832
Maximum	20,133	11,349	20,133			11,349	11,343	15,660	20,133
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	5			0	5	104	81
Flow exceeded for 90% of the days	275	35	391			35	260	355	447
Flow exceeded for 80% of the days	452	185	587			185	512	507	696
Flow exceeded for 70% of the days	715	233	827			233	831	759	867
Flow exceeded for 60% of the days	935	275	1,057			275	1,007	1,013	1,136
Flow exceeded for 50% of the days	1,223	322	1,344			322	1,288	1,225	1,578
Flow exceeded for 40% of the days	1,550	480	1,730			480	1,611	1,427	1,922
Flow exceeded for 30% of the days	2,056	773	2,202			773	2,110	1,918	2,558
Flow exceeded for 20% of the days	2,827	1,307	2,994			1,307	2,468	2,662	3,358
Flow exceeded for 10% of the days	5,523	2,407	5,746			2,407	3,335	6,121	8,283
Maximum	19,293	8,584	19,293			8,584	8,813	14,012	19,293

Table A.10-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Platte River near Grand Island, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	0	0	7			0	0	5	115
Flow exceeded for 80% of the days	38	0	97			0	2	59	247
Flow exceeded for 70% of the days	154	0	234			0	70	191	418
Flow exceeded for 60% of the days	305	0	397			0	199	320	594
Flow exceeded for 50% of the days	495	0	602			0	386	484	818
Flow exceeded for 40% of the days	749	0	874			0	632	728	1,178
Flow exceeded for 30% of the days	1,160	146	1,317			146	993	1,075	1,801
Flow exceeded for 20% of the days	1,880	340	2,100			340	1,620	1,680	2,850
Flow exceeded for 10% of the days	3,832	883	4,220			883	2,647	4,190	5,377
Maximum	23,500	19,000	23,500			19,000	17,900	17,700	23,500
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	0	0	8			0	0	6	117
Flow exceeded for 80% of the days	43	0	101			0	5	68	244
Flow exceeded for 70% of the days	160	0	240			0	75	202	431
Flow exceeded for 60% of the days	312	0	410			0	209	324	604
Flow exceeded for 50% of the days	511	0	619			0	413	487	819
Flow exceeded for 40% of the days	758	1	874			1	654	743	1,197
Flow exceeded for 30% of the days	1,180	167	1,333			167	984	1,112	1,822
Flow exceeded for 20% of the days	1,920	356	2,117			356	1,639	1,709	2,833
Flow exceeded for 10% of the days	3,900	884	4,241			884	2,616	4,429	5,360
Maximum	22,967	17,667	22,967			17,667	16,033	17,367	22,967
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	0	0	15			0	0	7	122
Flow exceeded for 80% of the days	56	0	117			0	15	83	256
Flow exceeded for 70% of the days	178	0	254			0	88	209	444
Flow exceeded for 60% of the days	332	0	428			0	236	346	629
Flow exceeded for 50% of the days	536	0	649			0	436	518	828
Flow exceeded for 40% of the days	787	13	893			13	698	779	1,223
Flow exceeded for 30% of the days	1,199	213	1,374			213	991	1,145	1,778
Flow exceeded for 20% of the days	1,940	364	2,143			364	1,706	1,845	2,793
Flow exceeded for 10% of the days	3,902	882	4,229			882	2,652	4,451	5,219
Maximum	21,543	15,171	21,543			15,171	11,714	15,786	21,543
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	2
Flow exceeded for 90% of the days	0	0	37			0	0	19	141
Flow exceeded for 80% of the days	85	0	154			0	33	125	269
Flow exceeded for 70% of the days	210	0	281			0	144	220	482
Flow exceeded for 60% of the days	364	0	486			0	282	368	662
Flow exceeded for 50% of the days	583	0	694			0	517	592	913
Flow exceeded for 40% of the days	834	68	999			68	738	881	1,284
Flow exceeded for 30% of the days	1,283	229	1,435			229	1,050	1,322	1,783
Flow exceeded for 20% of the days	1,930	404	2,225			404	1,613	1,889	2,829
Flow exceeded for 10% of the days	4,049	799	4,315			799	2,746	4,316	5,192
Maximum	20,133	10,974	20,133			10,974	9,487	12,631	20,133
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	2	25
Flow exceeded for 90% of the days	21	0	90			0	9	76	165
Flow exceeded for 80% of the days	135	0	207			0	104	172	305
Flow exceeded for 70% of the days	251	0	355			0	246	253	553
Flow exceeded for 60% of the days	438	3	545			3	441	413	784
Flow exceeded for 50% of the days	638	46	789			46	553	635	1,079
Flow exceeded for 40% of the days	937	136	1,139			136	780	1,183	1,378
Flow exceeded for 30% of the days	1,356	258	1,534			258	1,055	1,419	1,874
Flow exceeded for 20% of the days	2,186	342	2,369			342	1,584	2,548	2,736
Flow exceeded for 10% of the days	3,884	737	4,191			737	3,391	3,888	5,311
Maximum	19,293	8,200	19,293			8,200	6,687	10,499	19,293

Table A.10-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

Platte River near Grand Island, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	0	0	0			0	0	0	85
Flow exceeded for 80% of the days	0	0	21			0	0	5	225
Flow exceeded for 70% of the days	29	0	108			0	0	62	348
Flow exceeded for 60% of the days	133	0	225			0	33	154	467
Flow exceeded for 50% of the days	269	0	359			0	92	253	676
Flow exceeded for 40% of the days	427	0	519			0	216	403	969
Flow exceeded for 30% of the days	662	0	742			0	352	560	1,410
Flow exceeded for 20% of the days	1,030	0	1,140			0	569	808	1,926
Flow exceeded for 10% of the days	1,826	0	1,982			0	915	1,199	3,003
Maximum	9,800	5,150	9,800			5,150	7,960	9,800	9,510
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	0	0	0			0	0	0	91
Flow exceeded for 80% of the days	0	0	24			0	0	6	231
Flow exceeded for 70% of the days	32	0	112			0	0	67	351
Flow exceeded for 60% of the days	136	0	224			0	37	157	467
Flow exceeded for 50% of the days	266	0	357			0	94	247	674
Flow exceeded for 40% of the days	425	0	509			0	209	387	935
Flow exceeded for 30% of the days	657	0	737			0	352	556	1,400
Flow exceeded for 20% of the days	1,022	0	1,127			0	554	806	1,914
Flow exceeded for 10% of the days	1,827	0	1,975			0	889	1,140	2,978
Maximum	9,057	4,060	9,057			4,060	6,023	9,057	8,727
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	0	0	0			0	0	0	103
Flow exceeded for 80% of the days	0	0	32			0	0	8	243
Flow exceeded for 70% of the days	39	0	124			0	4	81	361
Flow exceeded for 60% of the days	144	0	225			0	45	165	476
Flow exceeded for 50% of the days	266	0	351			0	111	233	669
Flow exceeded for 40% of the days	420	0	505			0	209	366	938
Flow exceeded for 30% of the days	638	0	725			0	325	521	1,409
Flow exceeded for 20% of the days	996	0	1,116			0	555	805	1,883
Flow exceeded for 10% of the days	1,769	2	1,904			2	886	1,111	2,965
Maximum	7,670	3,493	7,670			3,493	3,885	7,064	7,670
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	0	0	0			0	0	1	111
Flow exceeded for 80% of the days	1	0	48			0	0	19	272
Flow exceeded for 70% of the days	60	0	151			0	15	118	372
Flow exceeded for 60% of the days	170	0	242			0	52	176	487
Flow exceeded for 50% of the days	272	0	343			0	128	231	669
Flow exceeded for 40% of the days	412	0	496			0	226	320	932
Flow exceeded for 30% of the days	617	0	708			0	310	496	1,316
Flow exceeded for 20% of the days	963	0	1,075			0	530	725	1,830
Flow exceeded for 10% of the days	1,720	6	1,804			6	895	1,045	2,711
Maximum	7,044	2,878	7,044			2,878	2,240	5,867	7,044
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	0			0	0	0	0
Flow exceeded for 90% of the days	0	0	8			0	0	7	176
Flow exceeded for 80% of the days	9	0	99			0	2	84	320
Flow exceeded for 70% of the days	102	0	184			0	28	158	422
Flow exceeded for 60% of the days	193	0	252			0	98	192	533
Flow exceeded for 50% of the days	289	0	372			0	174	229	630
Flow exceeded for 40% of the days	423	0	484			0	240	327	910
Flow exceeded for 30% of the days	577	0	636			0	326	431	1,274
Flow exceeded for 20% of the days	884	0	996			0	477	564	1,857
Flow exceeded for 10% of the days	1,554	49	1,690			49	698	916	2,355
Maximum	6,575	1,704	6,575			1,704	1,828	4,299	6,575

A.10.5 Median Mean Daily Flow

The median mean daily flow by calendar day is shown on **Figure A.10-6**. **Figure A.10-6** shows both the effects of climate and changes coincident with development in each time interval. The 1928-1941 time interval shows values at or near 0 cfs for all of July and August, a likely effect of the 1930's drought period. Values at or near 0 cfs are also shown for the 1942-1958 time interval, a likely effect of the 1950's drought. Median mean daily flows for all subsequent time intervals show a fairly consistent and steady pattern of highest values in March, values decreasing to their lowest in July and August, and a gradual increase thereafter through the end of the year.

A.10.6. USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak flow are shown in **Figure A.10-7** and **Figure A.10-8** and in **Table A.10-15** and **Table A.10-16**. The 1895-1909 and 1910-1927 time intervals were not considered for the following characterizations due to a lack of data.

Figure A.10-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak flow, and the 10-year running average of the USGS Annual Peak flow. The magnitudes of the peak flows shown in **Figure A.10-7** appear to be consistent with known climatological conditions. Some effect of the upstream reservoir projects can be seen prior to 1941, in that the differences between the USGS Annual Peak flow and the Annual Maximum mean daily flow are generally greater before 1941 than after 1941, coincident with the beginning of operation of Lake McConaughy.

Figure A.10-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.10-8** shows that there are 2 time ranges of greatest Peak flow frequency, one between late May and Late June, the other between late February and early April. Late May through late June is the time frame in which the greatest runoff from high country snowmelt occurs. February through April is the time of increasing lower elevation precipitation and snowmelt runoff from the uncontrolled drainage area downstream of Lake McConaughy.

Table A.10-15 compares the average and median values of the USGS Annual Peak flow by time interval. **Table A.10-15** shows that the average is higher than the median for the 1928-1941 through 1975-1998 time intervals. The difference between the average and median values is not great for any of the time intervals. This suggests a generally uniform distribution of Peak flows over the period of record, possibly mainly attributable to precipitation and snowmelt runoff from the uncontrolled drainage area downstream of Lake McConaughy.

The time of occurrence of both the average and median Peak flows was in late April through early June for all time intervals except 1928-1941, when they occurred in March. The earlier peaks for the 1928-1841 time interval are most likely the result of drought conditions during the 1930's.

Table A.10-16 shows the exceedance probabilities and values for the USGS Annual Peak flow. It is analogous to **Table A.10-5** for Annual Maximum mean daily flows. **Table A.10-16** shows that, for the 1942-1958 through 1975-1998 time intervals, there is relatively little difference in the magnitude of the Peak flows by time interval for all exceedance probabilities; the Peak flow values for the 1942-1958 time interval are somewhat lower than those for the subsequent time intervals due to drought conditions during the 1950's. The flow values for the 1928-1941 time interval are greater than those for all subsequent time intervals for all exceedance probabilities. This is most likely the result of the previously discussed high flow events that occurred during this otherwise-dry time interval.

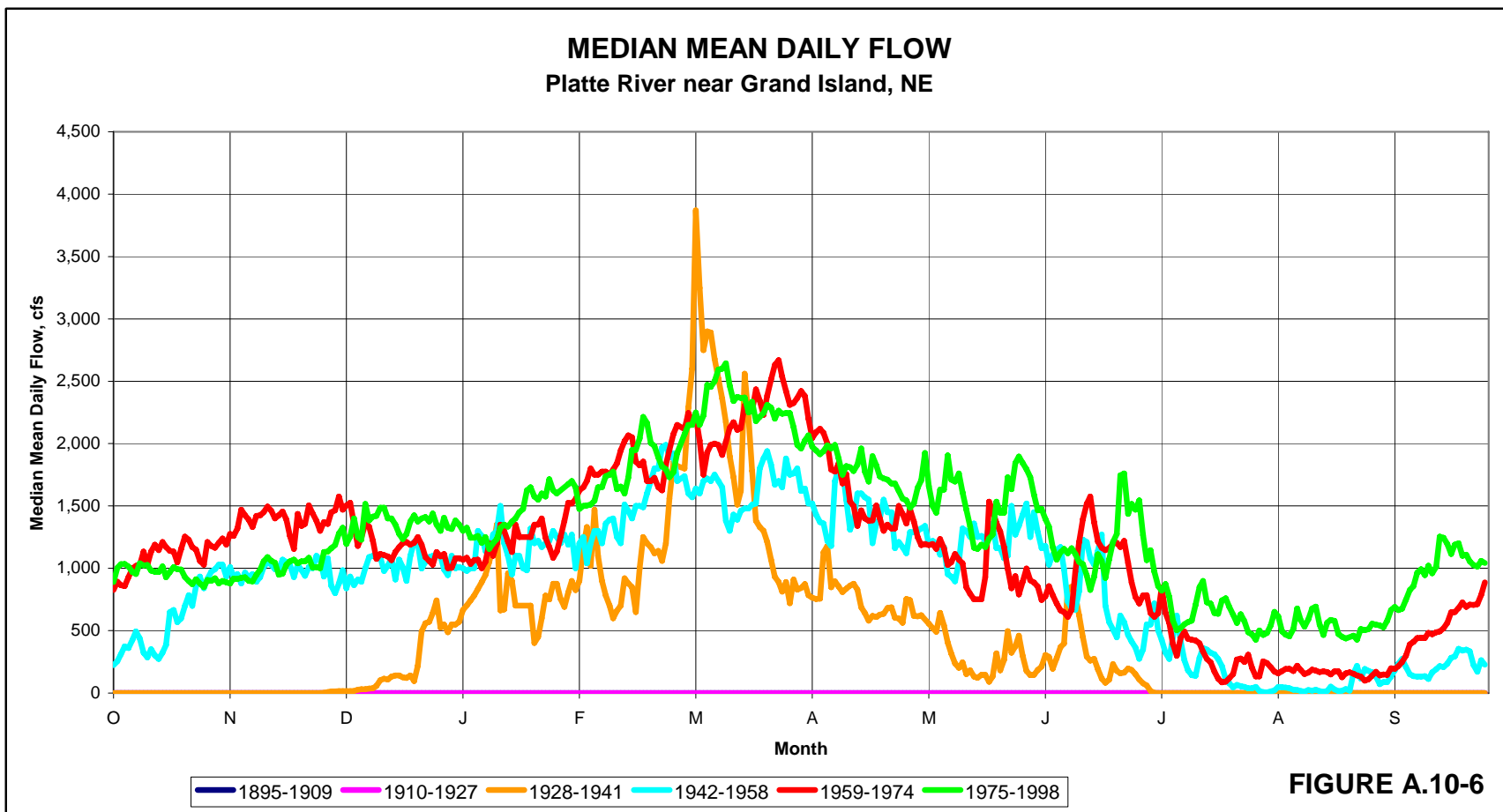


Figure A.10-6 Median Mean Daily Flow.

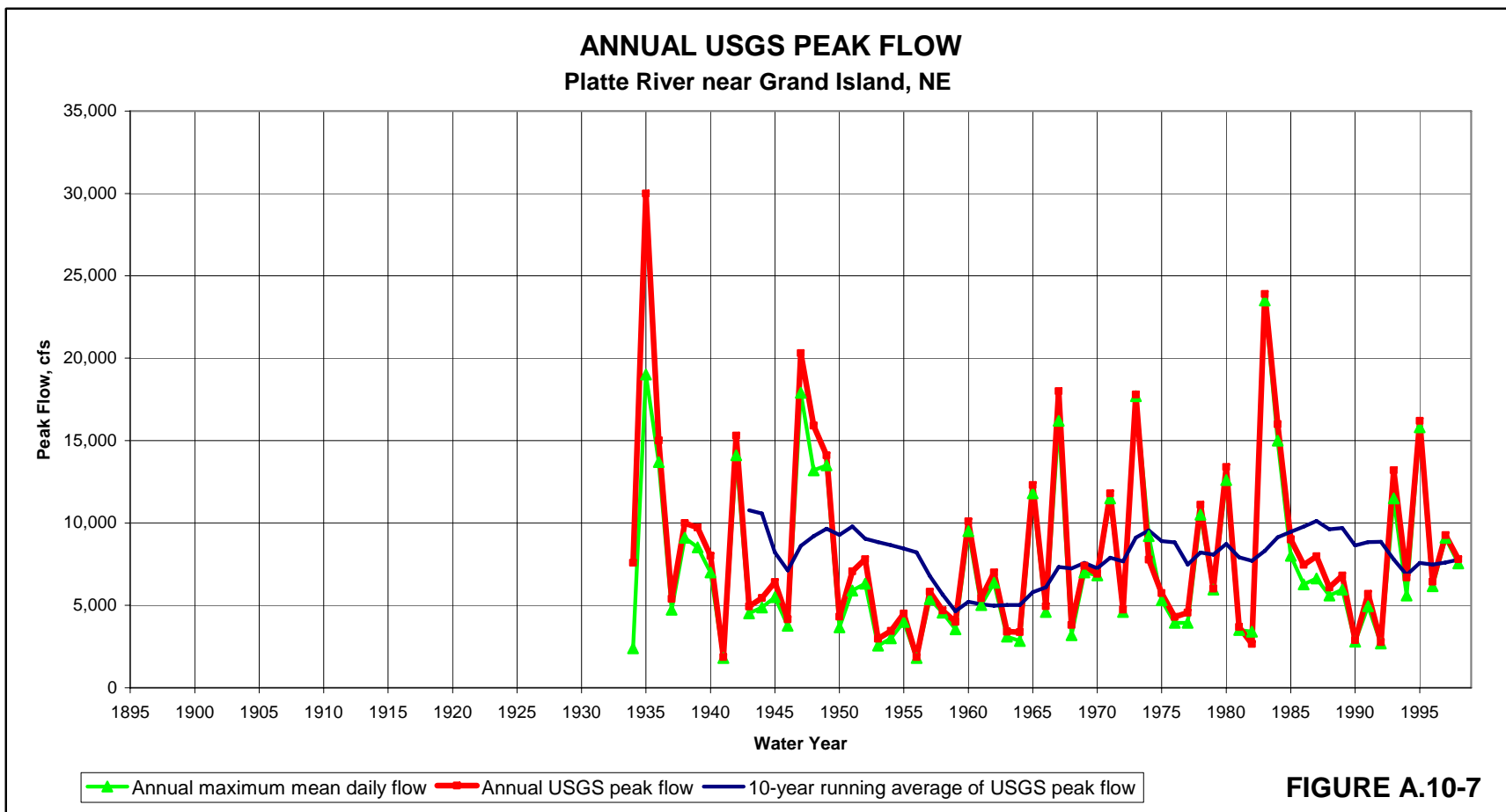


FIGURE A.10-7

Figure A.10-7 Annual USGS Peak Flow.

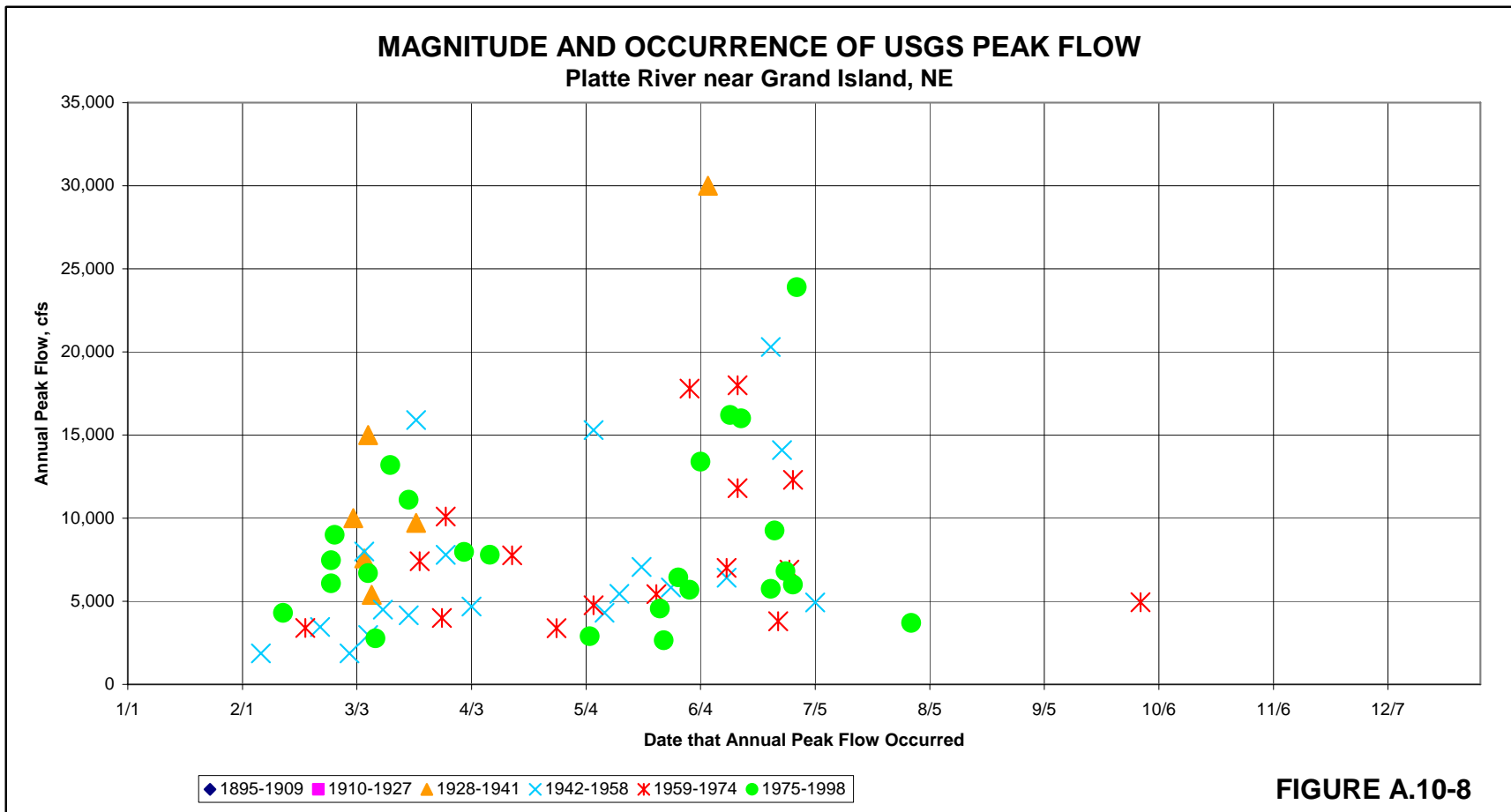


FIGURE A.10-8

Figure A.10-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.10-15 Summary of USGS Peak Flows.

Platte River near Grand Island, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	8,383	10,944	8,024			10,944	7,589	8,049	8,316
Median Annual Peak Flow (cfs)	6,800	8,860	6,430			8,860	5,450	6,955	6,745
Average Occurrence of Peak Flow	4/29	3/14	5/5			3/14	4/24	5/20	5/3
Median Occurrence of Peak Flow	5/6	3/6	5/13			3/6	5/6	6/1	5/25

Table A.10-16 USGS Peak Flow Exceedance Values.

Platte River near Grand Island, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Annual Peak Flows									
Peak exceeded in 100% of the years	1,860	1,860	1,860			1,860	1,860	3,380	2,650
Peak exceeded in 90% of the years	3,388	4,331	3,392			4,331	3,258	3,600	3,130
Peak exceeded in 80% of the years	4,270	6,266	4,180			6,266	4,182	4,000	4,450
Peak exceeded in 70% of the years	4,932	7,622	4,736			7,622	4,462	4,845	5,735
Peak exceeded in 60% of the years	5,794	7,916	5,710			7,916	4,780	5,430	6,150
Peak exceeded in 50% of the years	6,800	8,860	6,430			8,860	5,450	6,955	6,745
Peak exceeded in 40% of the years	7,656	9,776	7,264			9,776	6,184	7,400	7,732
Peak exceeded in 30% of the years	9,208	9,972	8,176			9,972	7,208	8,935	9,026
Peak exceeded in 20% of the years	12,480	13,000	12,200			13,000	12,840	11,800	11,940
Peak exceeded in 10% of the years	15,960	19,500	15,940			19,500	15,540	15,050	15,220
Peak Flow	30,000	30,000	23,900			30,000	20,300	18,000	23,900

A.11 PLATTE RIVER NEAR DUNCAN, NEBRASKA

A.11.1 Methodology

For this location, a single continuous streamflow record was constructed using records from three gages, as follows:

Gage	Records Used	Data Source
Platte River at Columbus, NE	5/3/1895 – 7/20/1914 (mainly warm season only, with large gaps)	1914 Nebraska Hydrographic Report
Platte River at Central City, NE	3/27/1922 – 9/30/1928 (mainly warm season only)	1929 Nebraska Hydrographic Report.
Platte River near Duncan, NE	10/1/1928 – 12/31/1998	USGS website.

Where data do not exist for the Platte River near Duncan, Nebraska, data from the other gages was substituted. The gages cover approximately 40 miles of the Platte River from Central City, Nebraska to Columbus, Nebraska. The Columbus and Duncan gages are eight miles apart.

Summary statistics characterizing this record are presented in **Table A.11-1** (mean daily values), **Table A.11-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.11-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.11-4** (flow frequencies).

A.11.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.11-1 shows that there was a steady decrease in both average and median Annual Maximum mean daily flow and annual flow volume by time interval from the beginning of the period of record through 1942-1958, coincident with the beginning of North Platte reservoir operations (**Table 2** of the main report). This trend is less pronounced at Duncan than at Grand Island because local climate exerts a greater influence on flows, particularly with respect to the 1950's drought period.

Both **Figure A.11-1** (maximum flows) and **Figure A.11-2** (annual flow volume) reinforce the indications provided by **Table A.11-1** that a decline in maximum flows coincided with the beginning of upstream reservoir operations. They also suggest an increasing influence of climatic factors on maximum flows, relative to locations upstream on the Platte River. Annual Maximum mean daily flow and annual maximum 30-day average flow (**Figure A.11-1**) all show relatively high values prior to 1940, lower values in the 1950's, and moderate-to-high values from the 1960's through the end of the record. Annual flow volume (**Figure A.11-2**) is generally high prior to 1930, low in the 1930's, somewhat higher in the 1940's, low again in the 1950's and generally higher from 1960

Table A.11-1 Summary of Mean Daily Flow Values.

Platte River near Duncan, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	12,579	17,293	9,271	26,480	11,175	12,255	7,831	9,448	10,173
Median Annual Maximum Mean Daily Flow (cfs)	10,000	15,700	7,110	24,600	10,600	11,400	5,660	6,600	8,600
Average Annual Flow Volume (kaf)	1,361	1,393	1,338	2,054	953	1,031	928	1,245	1,690
Median Annual Flow Volume (kaf)	1,084	1,151	1,011	1,748	1,046	958	863	1,097	1,432
Average Mean Daily Flow (cfs)	2,676	3,857	1,848	6,226	3,375	1,697	1,282	1,720	2,334
Median Mean Daily Flow (cfs)	1,528	2,580	1,135	4,230	2,750	880	919	1,155	1,733
Average Number of Mean Daily Flow Measurements	308	227	365	172	150	345	365	365	365
Number of Years of Data	97 of 104	40 of 47	57 of 57	15 of 15	11 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	6,005	8,497	5,087	8,801	3,828	9,840	4,471	3,996	6,251
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	10,539	15,621	7,151	26,480	10,372	7,361	6,321	7,446	7,542
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	9,417	14,043	6,414	23,424	9,635	6,511	5,399	6,332	7,188
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	3,482	4,609	2,790	7,241	5,576	1,493	1,979	2,208	3,752
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	5,135	7,560	4,080	8,620	3,325	8,580	4,010	3,540	5,700
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	6,870	14,700	5,990	24,600	10,600	3,975	4,940	5,725	6,575
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	5,940	13,000	4,870	22,100	9,315	2,290	3,880	3,940	6,030
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	2,650	4,100	2,110	5,310	4,200	276	1,530	1,415	3,375
Difference ("Apr-Jul Average" - "Jul-Sep Average")	7,057	11,012	4,361	19,239	4,797	5,868	4,342	5,238	3,790
Difference ("Apr-Jul Median" - "Jul-Sep Median")	4,220	10,600	3,880	19,290	6,400	3,699	3,410	4,310	3,200
Average Occurrence of Maximum Mean Daily Flow	4/29	5/13	4/19	5/30	6/3	4/9	4/17	4/21	4/20
Median Occurrence of Maximum Mean Daily Flow	5/3	5/27	3/28	6/7	5/26	3/13	3/23	3/28	4/8
Average Annual Minimum Mean Daily Flow (cfs)	87	1	107			1	34	53	195
Median Annual Minimum Mean Daily Flow (cfs)	7	0	12			0	0	20	143
Average occurrences per year of the Minimum	19	64	9			64	19	4	4
Occuring between	8/16	7/24	8/21			7/24	9/2	8/19	8/14
and	9/12	10/25	9/2			10/25	9/29	8/27	8/19
Median occurrences per year of the Minimum	2	66	1			66	3	2	1
Occuring between	8/7	7/24	8/20			7/24	9/4	8/19	8/6
and	9/7	9/30	9/2			9/30	9/23	8/29	8/8

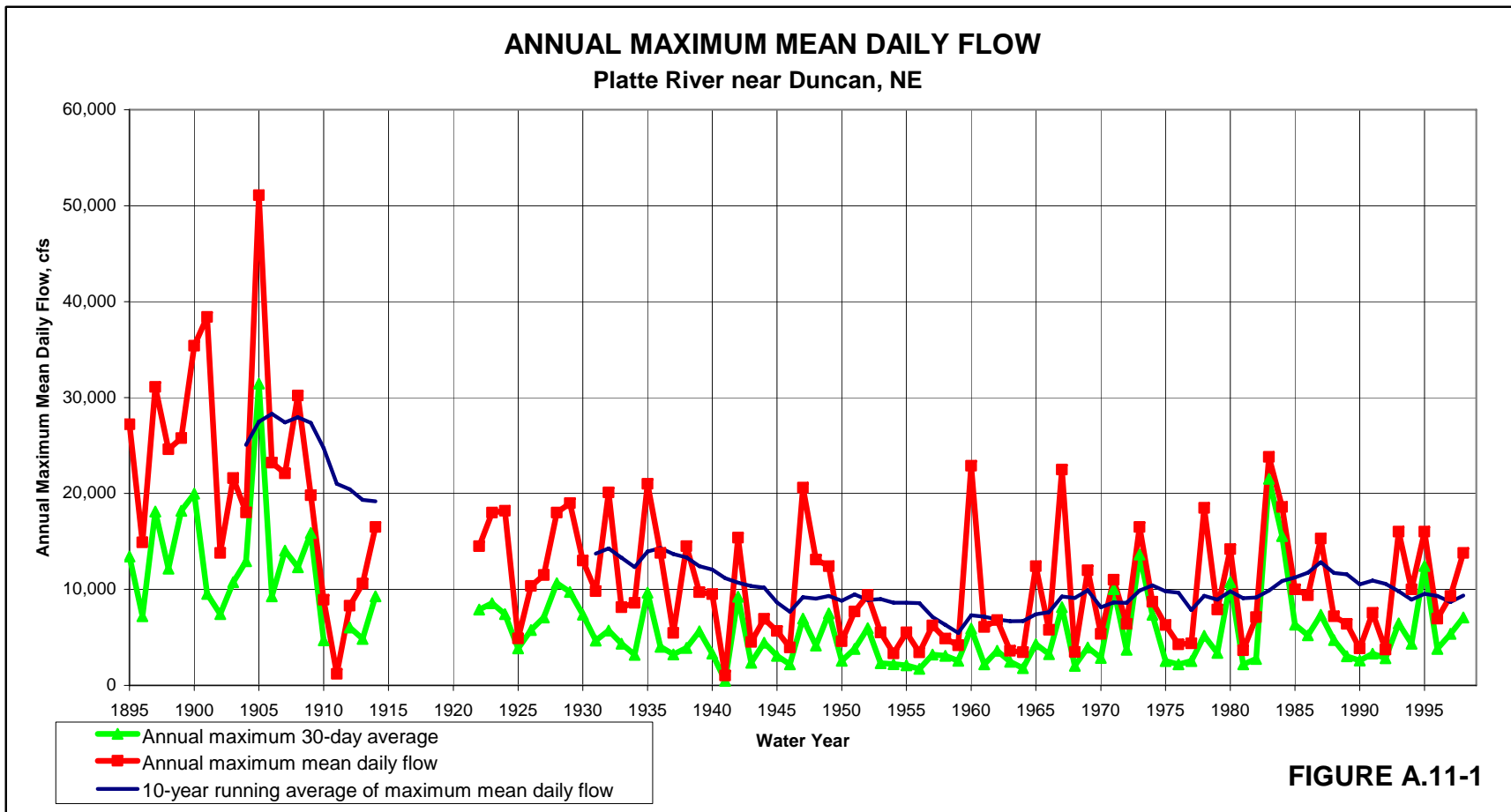


FIGURE A.11-1

Figure A.11-1 Annual Maximum Mean Daily Flow.

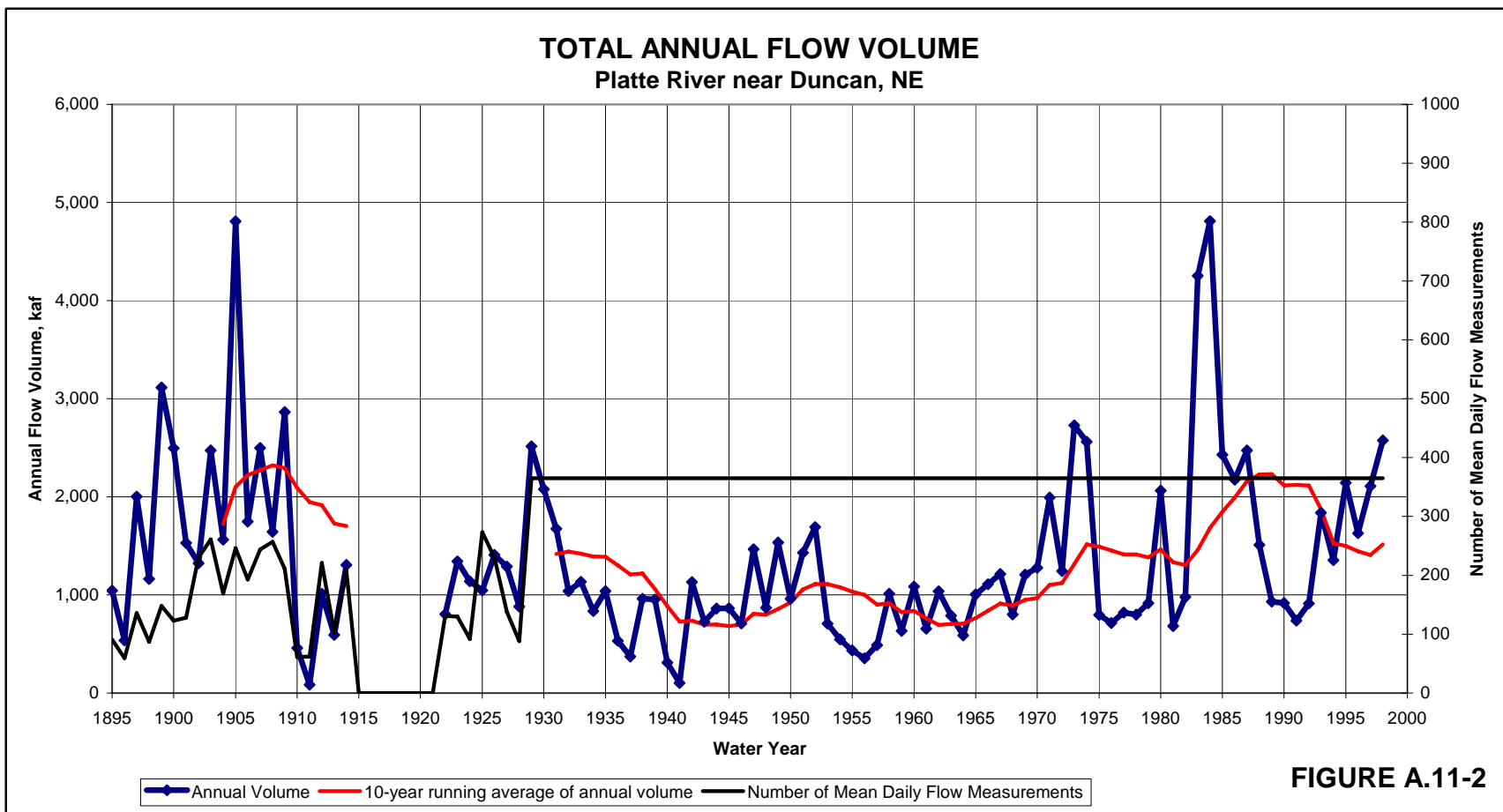


Figure A.11-2 Total Annual Flow Volume.

to the end of the period of record. Two major high-flow events, in 1973 and 1983, show up in the annual flow volume data. These patterns also show up in the 10-year running averages, albeit on a delayed basis due to the averaging process. It can also be seen in **Figure A.11-1** that, similar to Overton and Grand Island, there is a more substantial difference between the values of the annual maximums and those of the maximum 30-day averages early in the period of record; this difference decreases until about the mid-1950's, and remains more or less constant thereafter.

Figure A.11-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.11-3** shows that, while the higher maximums are found in May and June, there is otherwise considerable scatter in the data. It can be seen that, for the 1895-1909 time interval, before there were any major water storage projects in the basin, almost all maximums occurred in May and June. During the 1928-1941 time interval, most maximums occurred earlier in the season, a possible effect of the 1930's drought. Similarly, there is a cluster of maximums in the 1942-1958 time interval which occurred earlier in the season; these maximums all occurred during the 1950's drought period. For the 1959-1974 and 1975-1998 time intervals, the maximums are roughly evenly distributed between the early and late group of annual maximums. Of some interest is the occurrence of two maximums in excess of 10,000 cfs in the 1928-1941 time interval (1932 and 1935 – see **Figure A.11-1**), both of which occurred in early March. **Figure A.11-1** and **Figure A.11-2** show that these high individual values do not carry over into either the 30-day average or the annual volume, indicating that these were very short-duration maximums superimposed on an otherwise-dry climatic period (climate data are shown in **Figures 3, 4, 5, and 8** of the main report).

Average and median seasonal maximum mean daily flows are highest in the Apr 16-Jul 15 seasonal period for the 1895-1909 and 1910-1927 time intervals, in the Feb 15-Mar 16 seasonal period for the 1928-1941 time interval, and in the Apr 16-Jul 15 seasonal period for the 1942-1958 time interval and all subsequent time intervals (**Table A.11-1**). Both average and median seasonal maximum flows decrease from the Apr 16-Jul 15 seasonal period to the Jul 16 – Sep 30 seasonal period for all time intervals. The average and median Dates of Maximum Flow are generally in late May or early June for the 1895-1909 and 1910-1928 time intervals, and in March or April for all subsequent time intervals. The early dates for the 1928-1941 time interval are the likely result of the combination of the effect of the 1930's drought and the previously mentioned early-season high-flow events. The median Dates of Maximum Flow are consistently earlier than the averages by two weeks to a month.

Both **Table A.11-1** and **Figure A.11-4** (minimum flows) show effects of the 1930's drought period. For the 1928-1941 time interval, the average minimum is 6 cfs and the median minimum is 0 cfs (**Table A.11-1**). Average annual minimum mean daily flows (**Figure A.11-4**) were at or near 0 cfs throughout the 1930's into the early 1940's. The minimum flows then rose slightly through the 1940's. The minimum flows were again at or near 0 cfs for most of the 1950's, a possible effect of the 1950's drought period. All minimum flow quantities have generally been higher since the early 1960's. In the 1980's and 1990's minimum flows have been higher than in preceding decades. The

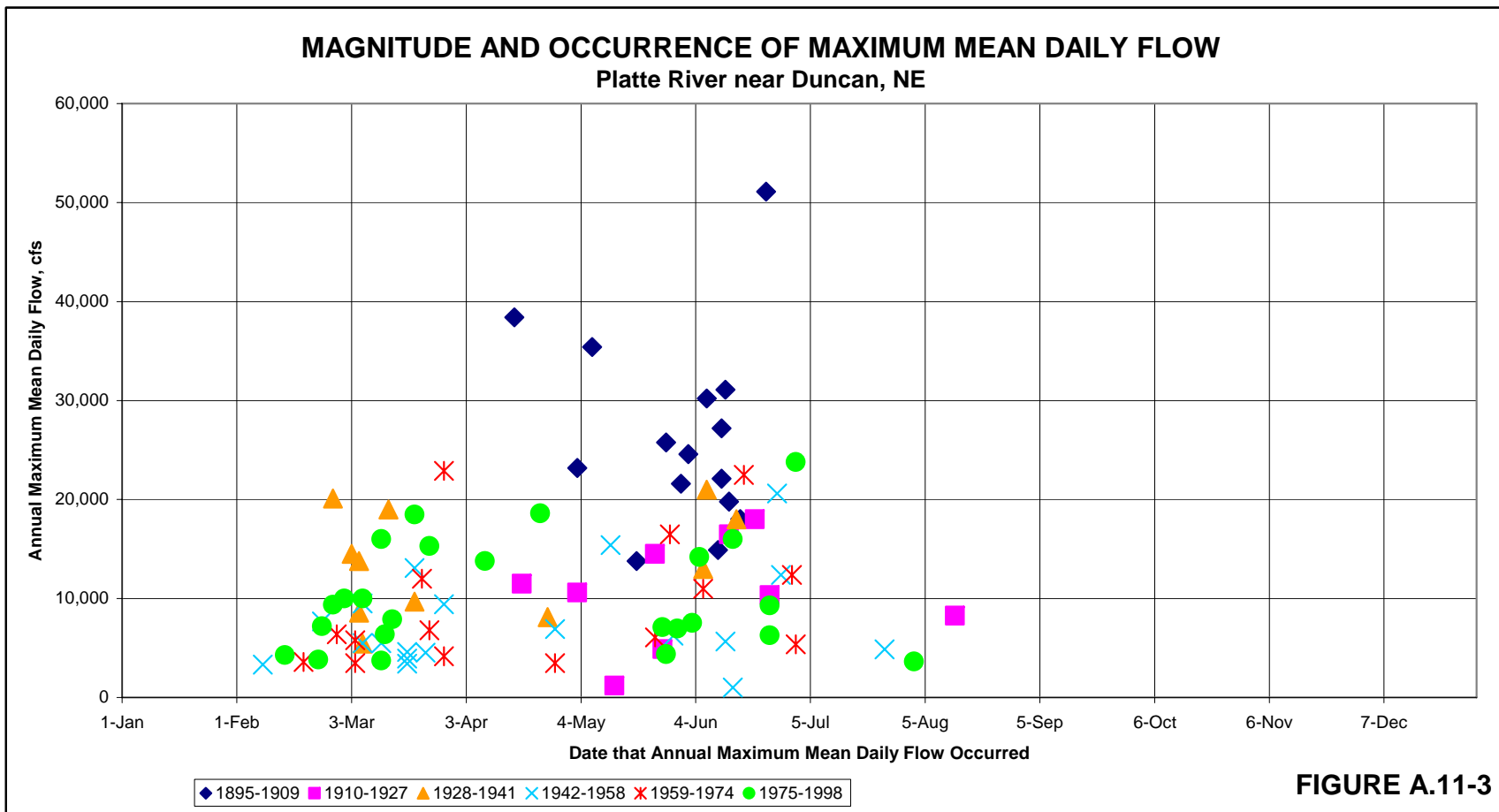


FIGURE A.11-3

Figure A.11-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

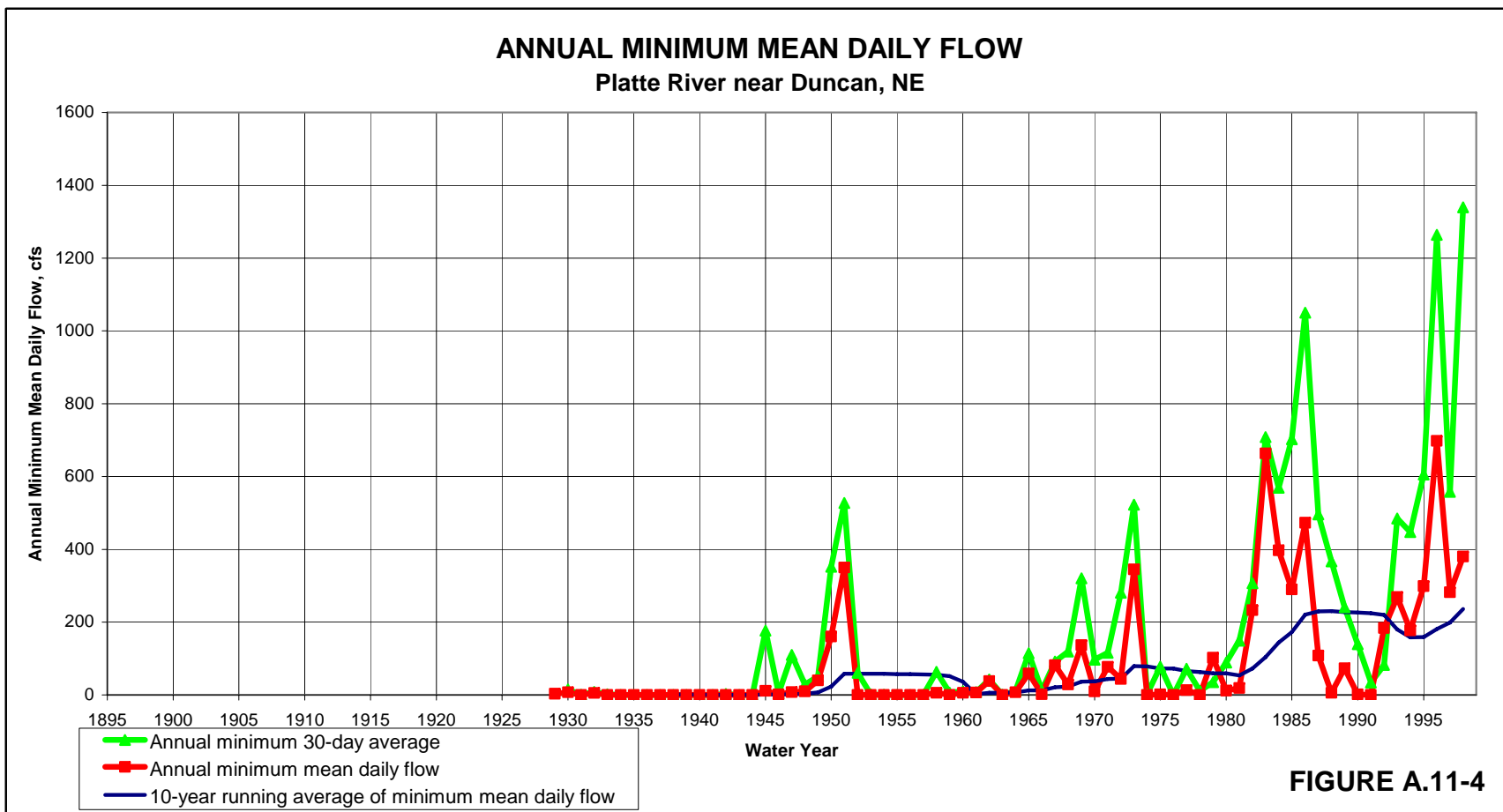


FIGURE A.11-4

Figure A.11-4 Annual Minimum Mean Daily Flow.

extremely high values of the annual minimum 30-day average flow in the 1895-1909 time interval can be attributed to bias resulting from the absence of data for the normally drier times of the year for that time interval. Since the early 1940's the difference between the Annual Minimum mean daily flow and the annual minimum 30-day average flow has remained relatively constant, except for the zero flows for both quantities in the 1930's, 1940's, and the 1950's. The average and median Dates of Minimum Flow are in August or September for the 1942-1958 through 1975-1998 time intervals, and between July and October for the 1928-1941 time interval, during which there were frequent occurrences of zero flow. Minimum flows were not calculated for years with incomplete flow records.

A.11.3 3-, 7-, 15- and 30-day Averages of Mean Daily Flows

Table A.11-2 shows that average and median running average flows once again show some attenuation due to the averaging process, but otherwise follow the same trends with time as for the Annual Maximum mean daily flow.

Table A.11-3 shows the average and median maximum 3-, 7-, 15-, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.11-3** shows that, for the 1895-1909 through 1942-1958 time intervals, there was a significant decrease in flow values by time interval for all averaging periods and for all seasonal periods except for the Feb 15-Mar 16 seasonal period.

The differences between the averages and the medians are generally small across the board, although the averages are always greater than the medians. For the Feb 15-Mar 16 seasonal period these differences are substantially less than for other seasonal periods, which is consistent with the known average climatological conditions for this seasonal period. Otherwise, the somewhat larger values for the averages are consistent with the known precipitation and runoff patterns in this region (NOAA, 2005 [Nebraska]), along with some influence of the regulation of the North Platte River reservoir projects (**Section A.9.4.2** and preceding North Platte River location discussions).

A.11.4 Flow Frequency

A.11.4.1 Flow Ranges

For flow frequencies as percentage of years, **Table A.11-4** and **Figure A.11-5** shows a pattern for the 1928-1941 time interval very similar to that for the comparable time intervals at Overton and Grand Island. There is a frequency of greater than 90 percent for all flow ranges up to 6,000 cfs, and every flow range greater than 6,000 cfs is populated with frequencies of 43 percent or greater, except for the "greater than 15,000 cfs" range, which has a frequency of 29 percent. The most plausible explanation is that this is the result of the downstream propagation of the flow patterns which caused similar

Table A.11-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Platte River near Duncan, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	12,579	17,293	9,271	26,480	11,175	12,255	7,831	9,448	10,173
Median Annual Maximum Mean Daily Flow (cfs)	10,000	15,700	7,110	24,600	10,600	11,400	5,660	6,600	8,600
Avg. Ann. Max. 3-day Avg. Flow (cfs)	11,253	15,042	8,594	22,601	10,047	10,868	7,090	8,839	9,497
Median Ann. Max. 3-day Avg. Flow (cfs)	8,880	14,117	6,573	22,600	10,183	10,357	5,393	6,233	7,498
Avg. Ann. Max. 7-day Avg. Flow (cfs)	9,699	13,001	7,382	19,825	8,818	8,977	5,982	7,495	8,298
Median Ann. Max. 7-day Avg. Flow (cfs)	7,700	11,566	5,754	18,971	9,357	8,047	4,847	5,463	6,596
Avg. Ann. Max. 15-day Avg. Flow (cfs)	8,034	10,794	6,097	16,838	7,288	7,073	4,914	6,016	6,989
Median Ann. Max. 15-day Avg. Flow (cfs)	6,365	9,337	4,745	15,613	7,043	6,115	3,981	4,631	5,447
Avg. Ann. Max. 30-day Avg. Flow (cfs)	6,686	9,077	5,050	14,179	6,542	5,421	3,929	4,857	5,974
Median Ann. Max. 30-day Avg. Flow (cfs)	5,002	7,423	3,702	12,935	6,546	4,508	3,089	3,657	4,529
Average Annual Minimum Mean Daily Flow (cfs)	87	1	107			1	34	53	195
Median Annual Minimum Mean Daily Flow (cfs)	7	0	12			0	0	20	143
Avg. Ann. Min. 3-day Avg. Flow (cfs)	94	1	115			1	40	55	209
Median Ann. Min. 3-day Avg. Flow (cfs)	8	0	14			0	2	21	156
Avg. Ann. Min. 7-day Avg. Flow (cfs)	110	1	135			1	48	64	243
Median Ann. Min. 7-day Avg. Flow (cfs)	8	0	39			0	3	32	164
Avg. Ann. Min. 15-day Avg. Flow (cfs)	140	2	170			2	61	85	303
Median Ann. Min. 15-day Avg. Flow (cfs)	17	0	65			0	4	61	216
Avg. Ann. Min. 30-day Avg. Flow (cfs)	188	2	227			2	81	110	410
Median Ann. Min. 30-day Avg. Flow (cfs)	51	0	89			0	4	67	337

Table A.11-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Platte River near Duncan, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	11,253	15,042	8,594	22,601	10,047	10,868	7,090	8,839	9,497
Median Ann. Max. 3-day Avg. Flow (cfs)	8,880	14,117	6,573	22,600	10,183	10,357	5,393	6,233	7,498
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	5,273	7,261	4,611	6,735	2,515	8,478	3,990	3,673	5,676
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	9,507	13,655	6,741	22,601	9,405	6,801	5,783	7,099	7,181
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	8,574	12,492	6,032	20,408	8,969	6,022	4,980	5,994	6,801
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	3,097	3,983	2,553	6,302	4,616	1,347	1,793	1,939	3,500
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	4,448	6,627	3,797	6,180	2,800	7,017	3,797	3,227	5,012
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	6,040	13,160	5,507	22,600	10,183	3,637	4,380	5,543	6,095
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	5,545	12,875	4,387	20,133	8,785	2,122	3,240	3,740	5,682
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,263	2,987	1,813	4,712	2,800	235	1,480	1,342	3,047
Platte River near Duncan, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	9,699	13,001	7,382	19,825	8,818	8,977	5,982	7,495	8,298
Median Ann. Max. 7-day Avg. Flow (cfs)	7,700	11,566	5,754	18,971	9,357	8,047	4,847	5,463	6,596
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	4,425	6,067	3,907	5,148	3,325	6,701	3,274	3,200	4,827
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	8,337	11,803	6,027	19,477	8,227	5,880	4,998	6,216	6,629
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	7,514	10,995	5,254	18,086	8,014	5,100	4,063	5,208	6,128
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	2,608	3,318	2,172	5,193	3,813	1,195	1,407	1,656	3,057
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	3,716	5,717	3,134	4,257	3,325	5,963	2,940	2,725	4,024
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	5,139	11,539	4,771	18,662	9,357	3,371	4,059	4,307	5,201
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	4,854	11,021	3,514	18,143	7,866	1,854	2,711	3,349	4,819
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,719	2,690	1,520	4,133	2,500	191	1,283	1,192	2,599
Platte River near Duncan, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	8,034	10,794	6,097	16,838	7,288	7,073	4,914	6,016	6,989
Median Ann. Max. 15-day Avg. Flow (cfs)	6,365	9,337	4,745	15,613	7,043	6,115	3,981	4,631	5,447
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	3,515	4,562	3,221	2,743	3,325	4,892	2,617	2,782	3,941
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	6,999	9,880	5,078	16,563	6,538	4,869	4,099	5,071	5,775
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	6,228	9,256	4,262	15,877	6,151	3,936	3,151	4,070	5,176
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	2,106	2,691	1,746	4,095	3,153	1,056	1,025	1,289	2,562
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	2,800	4,243	2,483	2,743	3,325	4,536	2,375	2,392	3,232
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	4,213	9,609	3,729	15,613	7,043	2,781	3,729	3,617	4,033
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	3,780	9,047	2,913	15,613	6,026	1,368	2,139	2,767	3,606
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,204	2,199	1,129	3,346	1,853	134	982	951	1,993
Platte River near Duncan, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	6,686	9,077	5,050	14,179	6,542	5,421	3,929	4,857	5,974
Median Ann. Max. 30-day Avg. Flow (cfs)	5,002	7,423	3,702	12,935	6,546	4,508	3,089	3,657	4,529
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	2,843	3,434	2,698		3,453	3,432	2,095	2,454	3,288
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	5,886	8,481	4,202	14,179	5,906	3,846	3,202	4,054	5,009
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	4,981	7,521	3,332	13,492	4,376	2,921	2,315	3,095	4,211
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,529	1,931	1,281	2,872	2,427	743	673	909	1,960
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	2,413	3,507	2,119		3,453	3,561	1,976	2,030	2,771
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	3,394	7,895	2,803	12,935	6,267	2,261	2,996	2,562	3,332
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	2,596	7,203	1,946	12,935	3,900	895	1,484	2,011	2,575
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	842	1,372	755	2,146	1,662	75	633	613	1,494

Table A.11-4 Flow Frequency Distributions.

Platte River near Duncan, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	81	85	79	87	64	100	94	94	58
201 to 500	92	85	96	87	64	100	100	100	92
501 to 750	95	88	100	87	73	100	100	100	100
751 to 1,000	96	90	100	87	82	100	100	100	100
1,001 to 2,000	99	98	100	100	91	100	100	100	100
2,001 to 3,000	97	93	100	100	82	93	100	100	100
3,001 to 4,000	97	93	100	100	82	93	100	100	100
4,001 to 5,000	89	95	84	100	91	93	82	81	88
5,001 to 6,000	81	93	74	100	82	93	65	75	79
6,001 to 8,000	74	88	65	100	82	79	47	63	79
8,001 to 10,000	61	88	42	100	73	86	29	44	50
10,001 to 12,000	44	70	26	100	64	43	24	31	25
12,001 to 15,000	41	65	25	100	36	50	24	13	33
Greater than 15,000	32	50	19	87	27	29	12	19	25
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Platte River near Duncan, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	16.5	23.7	13.4	2.6	12.0	38.9	22.7	13.8	6.4
201 to 500	8.3	6.7	9.0	6.0	4.6	7.8	10.2	9.0	8.3
501 to 750	7.5	4.9	8.6	4.1	4.4	5.5	10.2	7.9	8.0
751 to 1,000	9.0	6.5	10.1	6.9	5.6	6.6	10.9	10.0	9.6
1,001 to 2,000	24.2	13.7	28.7	12.0	15.2	14.1	26.8	32.4	27.6
2,001 to 3,000	13.5	11.6	14.3	10.6	15.6	10.8	11.0	14.0	16.8
3,001 to 4,000	6.8	8.1	6.2	9.3	11.0	6.5	3.6	4.7	9.1
4,001 to 5,000	4.0	5.9	3.2	7.7	9.8	3.6	1.7	2.1	4.9
5,001 to 6,000	2.7	3.9	2.2	5.3	6.9	2.2	1.0	2.3	2.9
6,001 to 8,000	3.0	5.4	1.9	9.8	9.0	1.9	1.0	1.9	2.6
8,001 to 10,000	1.5	2.7	1.1	5.6	2.9	1.0	0.5	1.0	1.5
10,001 to 12,000	1.0	2.1	0.5	5.5	1.7	0.5	0.2	0.4	0.7
12,001 to 15,000	0.9	2.0	0.5	5.7	0.8	0.5	0.2	0.2	0.8
Greater than 15,000	1.2	2.8	0.4	9.0	0.4	0.3	0.1	0.3	0.8
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Platte River near Duncan, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	51	54	49	5	18	134	83	50	24
201 to 500	26	15	33	10	7	27	37	33	30
501 to 750	23	11	31	7	7	19	37	29	29
751 to 1,000	28	15	37	12	8	23	40	37	35
1,001 to 2,000	74	31	105	21	23	49	98	118	101
2,001 to 3,000	41	26	52	18	23	37	40	51	61
3,001 to 4,000	21	18	23	16	17	22	13	17	33
4,001 to 5,000	12	13	12	13	15	13	6	8	18
5,001 to 6,000	8	9	8	9	10	7	4	8	11
6,001 to 8,000	9	12	7	17	14	6	3	7	9
8,001 to 10,000	5	6	4	10	4	4	2	4	6
10,001 to 12,000	3	5	2	9	3	2	1	1	3
12,001 to 15,000	3	5	2	10	1	2	1	1	3
Greater than 15,000	4	6	2	15	1	1	0	1	3
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

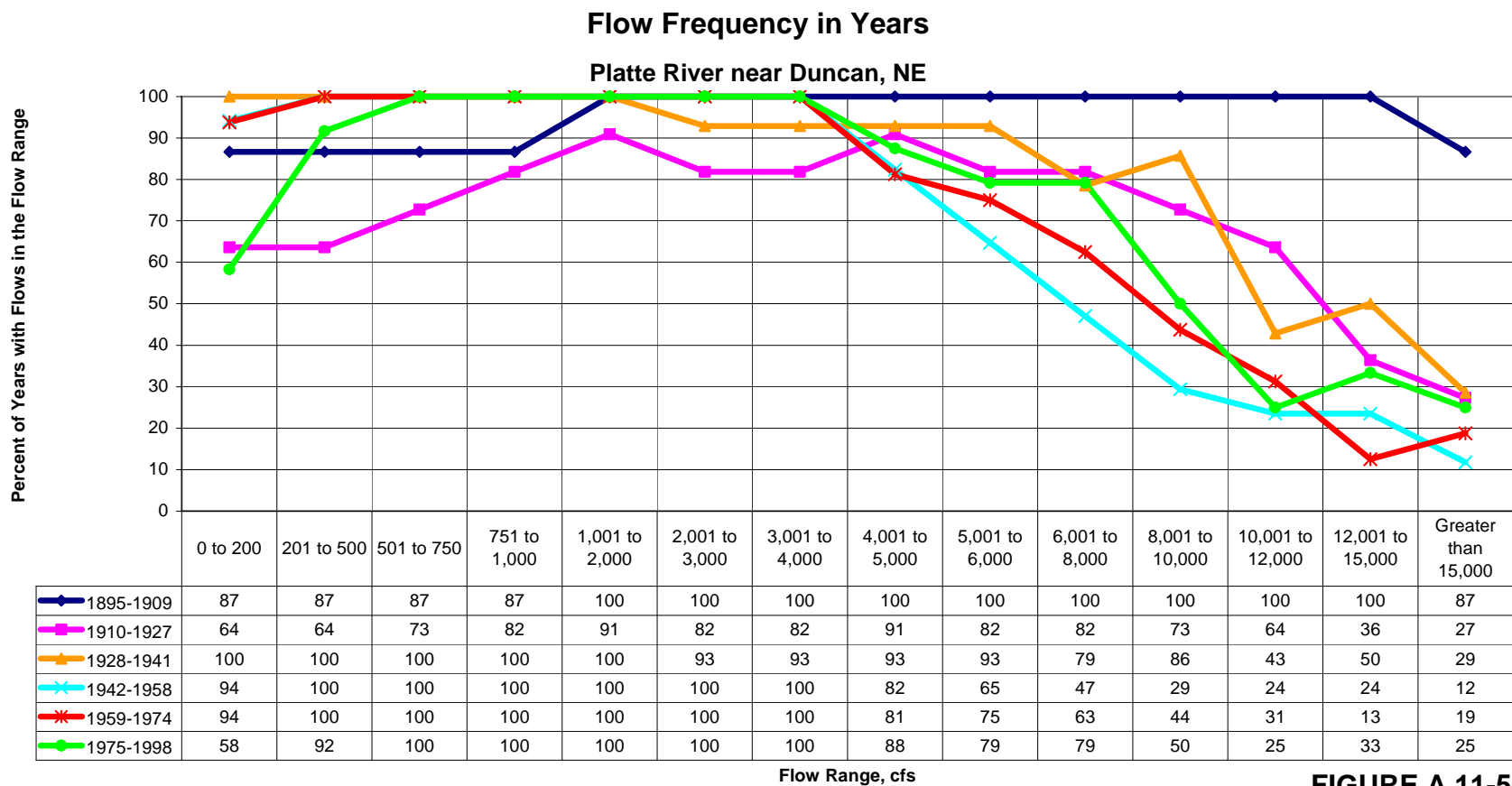


FIGURE A.11-5

Figure A.11-5 Flow Frequency in Years.

distributions at Overton and Grand Island (**Sections A.9-3 and A.10-3**). Information found in **Table A.11-1** suggests this possibility; the average seasonal maximum mean daily flow for May-June for this time interval is greater than the median by about a factor of 1.6. Otherwise, the other time intervals show frequencies in percentage of years and percentage of days that are more consistent with known climatic conditions and coincident development in the basin.

The 0-200-cfs flow range occurs most frequently in the 1928-1941 time interval. The 1,001-2,000-cfs flow range occurs at about the same frequency, roughly between 26 and 33 percent, for all time intervals after 1928-1941. The frequencies of flow ranges greater than 2,000 cfs are somewhat higher for the 1975-1998 time interval than for the two preceding time intervals, which is consistent with other data showing this to have been a wet period. For this seasonal period, all average values for the 1895-1909 and 1910-1927 time intervals are unreliable due to incomplete data. Otherwise, the changes in flow values by time interval generally coincide with the beginning of operation of the major North Platte River reservoir projects. For the 1942-1958 through 1975-1998 time intervals, the flow values generally are consistent with known climatological conditions during these time intervals.

A.11.4.2 Maximum Mean Flow Exceedance

Table A.11-5 through **Table A.11-9** show the exceedance values and probabilities for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.11-5 shows the exceedance probabilities and values for annual maximum flow data. The decreases in the flow values from the 1928-1941 time interval to the 1942-1958 time interval are noteworthy. This can be attributed to lingering downstream effects of the regulation of Lake McConaughy, and possibly also to the previously discussed high flow events during the 1928-1941 time interval, which would have skewed the averages higher. Otherwise, the changes in flow values by time interval are generally consistent with known climatological conditions. The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to insufficient data, especially for the Feb 15-Mar 16 seasonal period.

Table A.11-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.11-6** shows the same decreases in flow values as those seen in **Table A.11-5** from the 1928-1941 time interval to the 1942-1958 time interval. There is relatively little change in the flow values from the 1942-1958 time interval to the 1959-1974 time interval, which is a possible effect of the North Platte River reservoirs. The flow values increase significantly from the 1959-1974 to the 1975-1998 time interval; the latter time interval is known to have been wet during this

Table A.11-5 Maximum Flow Exceedance Values, Annual Data.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	1,010	1,010	3,330	13,800	1,200	1,010	3,330	3,460	3,640
Maximum exceeded in 90% of the years	3,900	7,862	3,694	16,152	4,900	6,254	3,732	3,540	3,972
Maximum exceeded in 80% of the years	5,460	9,380	4,408	19,446	8,280	8,400	4,536	4,160	5,520
Maximum exceeded in 70% of the years	6,720	10,525	5,500	21,700	8,900	9,408	4,816	5,580	6,904
Maximum exceeded in 60% of the years	8,400	13,800	6,328	22,760	10,350	9,720	5,500	6,080	7,270
Maximum exceeded in 50% of the years	10,000	15,700	7,110	24,600	10,600	11,400	5,660	6,600	8,600
Maximum exceeded in 40% of the years	13,060	18,098	9,068	26,342	11,500	13,640	6,654	8,720	9,876
Maximum exceeded in 30% of the years	15,520	20,370	11,200	29,600	14,500	14,850	8,036	11,500	13,840
Maximum exceeded in 20% of the years	18,580	23,480	14,120	31,960	16,500	18,400	11,804	12,400	15,580
Maximum exceeded in 10% of the years	23,020	30,290	17,300	37,200	18,000	19,770	14,020	19,500	17,750
Maximum	51,100	51,100	23,800	51,100	18,200	21,000	20,600	22,900	23,800
3-day Average Flows									
Maximum exceeded in 100% of the years	913	913	3,030	12,227	1,116	913	3,030	3,153	3,377
Maximum exceeded in 90% of the years	3,523	6,502	3,438	14,603	4,800	5,752	3,418	3,360	3,565
Maximum exceeded in 80% of the years	4,897	7,877	3,889	17,262	7,100	6,861	3,844	3,853	4,950
Maximum exceeded in 70% of the years	6,077	9,792	5,150	19,387	7,733	7,992	4,260	5,358	6,296
Maximum exceeded in 60% of the years	7,113	12,511	5,817	20,193	7,913	8,344	4,495	5,800	6,771
Maximum exceeded in 50% of the years	8,880	14,117	6,573	22,600	10,183	10,357	5,393	6,233	7,498
Maximum exceeded in 40% of the years	11,776	16,711	8,385	23,849	11,167	12,527	5,893	8,823	9,045
Maximum exceeded in 30% of the years	14,507	18,100	10,427	25,201	13,300	13,090	7,032	10,567	12,803
Maximum exceeded in 20% of the years	17,387	20,707	13,060	27,994	14,933	16,560	11,080	10,823	14,273
Maximum exceeded in 10% of the years	20,993	25,731	16,953	29,095	15,733	17,820	12,774	17,900	17,123
Maximum	38,157	38,157	23,533	38,157	16,533	18,333	19,300	22,133	23,533
7-day Average Flows									
Maximum exceeded in 100% of the years	804	804	2,299	10,619	1,016	804	2,299	2,659	2,894
Maximum exceeded in 90% of the years	3,089	5,577	3,013	13,057	4,314	5,242	2,913	3,029	3,147
Maximum exceeded in 80% of the years	4,187	6,407	3,247	16,262	6,181	5,831	3,131	3,529	4,229
Maximum exceeded in 70% of the years	5,067	8,204	4,146	17,224	6,350	6,376	3,342	4,366	5,013
Maximum exceeded in 60% of the years	6,207	10,281	4,953	17,829	7,334	7,269	3,761	5,030	6,065
Maximum exceeded in 50% of the years	7,700	11,566	5,754	18,971	9,357	8,047	4,847	5,463	6,596
Maximum exceeded in 40% of the years	10,281	14,469	7,099	19,885	10,214	9,768	4,982	8,149	7,600
Maximum exceeded in 30% of the years	12,149	16,381	8,449	21,934	11,671	10,439	6,332	8,602	10,585
Maximum exceeded in 20% of the years	14,956	18,309	11,283	23,924	12,057	12,523	8,177	10,686	12,596
Maximum exceeded in 10% of the years	17,920	22,498	13,780	25,907	13,500	15,394	12,180	14,586	13,986
Maximum	34,329	34,329	22,900	34,329	15,000	16,571	14,780	17,771	22,900
15-day Average Flows									
Maximum exceeded in 100% of the years	573	573	1,841	8,401	945	573	1,841	2,123	2,379
Maximum exceeded in 90% of the years	2,594	4,075	2,440	10,359	3,850	4,056	2,413	2,534	2,839
Maximum exceeded in 80% of the years	3,390	5,667	2,821	12,480	5,477	4,353	2,592	2,850	3,222
Maximum exceeded in 70% of the years	4,115	6,590	3,282	14,566	5,674	5,529	2,770	3,428	3,673
Maximum exceeded in 60% of the years	5,403	8,223	3,935	15,363	6,644	5,753	3,203	3,905	4,791
Maximum exceeded in 50% of the years	6,365	9,337	4,745	15,613	7,043	6,115	3,981	4,631	5,447
Maximum exceeded in 40% of the years	7,912	11,685	5,565	16,463	8,680	6,755	4,132	5,581	6,664
Maximum exceeded in 30% of the years	9,603	12,960	6,998	17,273	9,627	8,056	5,287	7,101	7,917
Maximum exceeded in 20% of the years	12,140	15,587	8,990	21,089	10,171	10,159	6,516	9,087	8,921
Maximum exceeded in 10% of the years	15,593	17,638	11,733	22,948	10,560	12,318	10,037	11,043	13,051
Maximum	32,634	32,634	22,547	32,634	11,493	13,993	12,182	15,233	22,547
30-day Average Flows									
Maximum exceeded in 100% of the years	482	482	1,712	7,203	3,850	482	1,712	1,786	2,175
Maximum exceeded in 90% of the years	2,251	3,742	2,183	8,163	4,613	3,184	2,137	2,113	2,522
Maximum exceeded in 80% of the years	2,842	4,542	2,478	9,489	4,803	3,278	2,221	2,467	2,683
Maximum exceeded in 70% of the years	3,308	5,677	2,719	11,027	5,486	3,848	2,344	2,710	3,018
Maximum exceeded in 60% of the years	4,020	7,094	3,132	12,258	5,922	4,084	2,773	3,244	3,458
Maximum exceeded in 50% of the years	5,002	7,423	3,702	12,935	6,546	4,508	3,089	3,657	4,529
Maximum exceeded in 40% of the years	6,339	9,292	4,318	13,670	7,209	5,453	3,550	3,945	5,195
Maximum exceeded in 30% of the years	7,417	10,274	5,470	15,519	7,565	5,888	4,205	5,091	6,351
Maximum exceeded in 20% of the years	9,650	12,564	7,049	18,129	8,031	8,290	5,654	7,347	7,182
Maximum exceeded in 10% of the years	13,177	16,332	9,551	19,264	8,648	9,700	7,177	9,077	11,924
Maximum	31,449	31,449	21,517	31,449	9,293	10,643	9,237	13,624	21,517

Table A.11-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	748	748	1,320	5,664	1,162	748	1,320	1,900	2,000
Maximum exceeded in 90% of the years	2,434	2,750	2,432	5,927	1,653	3,290	2,164	2,430	2,665
Maximum exceeded in 80% of the years	2,800	3,850	2,720	6,190	2,145	5,494	2,756	2,500	3,296
Maximum exceeded in 70% of the years	3,372	5,560	3,186	6,452	2,636	6,760	2,996	2,870	3,722
Maximum exceeded in 60% of the years	3,970	6,540	3,670	7,372	3,010	7,808	3,382	3,190	4,528
Maximum exceeded in 50% of the years	5,135	7,560	4,080	8,620	3,325	8,580	4,010	3,540	5,700
Maximum exceeded in 40% of the years	5,718	8,580	5,162	9,868	3,640	10,100	5,002	4,000	7,160
Maximum exceeded in 30% of the years	7,290	10,700	5,912	10,860	4,215	13,020	5,500	4,340	7,630
Maximum exceeded in 20% of the years	8,302	12,500	7,280	11,340	5,310	14,220	5,660	5,600	8,774
Maximum exceeded in 10% of the years	10,850	14,500	8,766	11,820	6,405	18,100	7,456	6,095	10,000
Maximum	20,100	20,100	16,000	12,300	7,500	20,100	9,360	8,200	16,000
3-day Average Flows									
Maximum exceeded in 100% of the years	652	652	1,034	5,458	895	652	1,034	1,767	1,900
Maximum exceeded in 90% of the years	2,277	2,003	2,309	5,602	1,276	2,855	1,929	2,187	2,548
Maximum exceeded in 80% of the years	2,633	3,430	2,593	5,747	1,657	5,243	2,641	2,433	3,069
Maximum exceeded in 70% of the years	3,047	5,243	2,784	5,891	2,038	6,127	2,721	2,592	3,446
Maximum exceeded in 60% of the years	3,503	5,602	3,296	6,036	2,419	6,821	2,914	2,760	3,868
Maximum exceeded in 50% of the years	4,448	6,627	3,797	6,180	2,800	7,017	3,797	3,227	5,012
Maximum exceeded in 40% of the years	5,377	6,987	4,592	6,657	3,010	8,668	4,257	3,400	6,433
Maximum exceeded in 30% of the years	6,403	8,380	5,425	7,135	3,220	11,297	4,627	3,880	7,043
Maximum exceeded in 20% of the years	7,133	11,297	6,759	7,612	3,430	12,393	5,237	5,267	7,425
Maximum exceeded in 10% of the years	9,022	13,253	7,865	8,089	3,640	14,713	6,568	5,748	9,044
Maximum	17,400	17,400	15,333	8,567	3,850	17,400	8,867	7,867	15,333
7-day Average Flows									
Maximum exceeded in 100% of the years	541	541	818	4,102	2,800	541	818	1,714	1,814
Maximum exceeded in 90% of the years	1,995	2,562	1,918	4,133	2,905	2,517	1,690	1,744	2,294
Maximum exceeded in 80% of the years	2,384	3,951	2,352	4,164	3,010	4,762	2,242	1,987	2,511
Maximum exceeded in 70% of the years	2,617	4,287	2,464	4,195	3,115	5,409	2,471	2,407	2,777
Maximum exceeded in 60% of the years	3,095	4,970	2,743	4,226	3,220	5,768	2,615	2,433	3,319
Maximum exceeded in 50% of the years	3,716	5,717	3,134	4,257	3,325	5,963	2,940	2,725	4,024
Maximum exceeded in 40% of the years	4,280	6,055	3,651	4,823	3,430	6,825	3,133	3,043	5,052
Maximum exceeded in 30% of the years	5,207	7,019	4,331	5,389	3,535	8,782	3,405	3,635	6,260
Maximum exceeded in 20% of the years	6,449	8,954	5,321	5,954	3,640	9,914	4,141	4,130	6,714
Maximum exceeded in 10% of the years	7,693	10,666	6,794	6,520	3,745	11,234	5,435	5,093	7,550
Maximum	12,886	11,594	12,886	7,086	3,850	11,594	7,683	6,691	12,886
15-day Average Flows									
Maximum exceeded in 100% of the years	330	330	707	2,743	2,800	330	707	1,399	1,700
Maximum exceeded in 90% of the years	1,709	2,258	1,668	2,743	2,905	2,214	1,428	1,571	1,927
Maximum exceeded in 80% of the years	2,088	2,800	2,036	2,743	3,010	4,006	2,055	1,620	2,103
Maximum exceeded in 70% of the years	2,258	3,914	2,223	2,743	3,115	4,066	2,178	2,201	2,257
Maximum exceeded in 60% of the years	2,460	4,046	2,368	2,743	3,220	4,342	2,303	2,320	2,780
Maximum exceeded in 50% of the years	2,800	4,243	2,483	2,743	3,325	4,536	2,375	2,392	3,232
Maximum exceeded in 40% of the years	3,591	4,536	3,030	2,743	3,430	5,661	2,478	2,557	4,048
Maximum exceeded in 30% of the years	4,166	5,694	3,591	2,743	3,535	6,181	2,584	3,144	4,646
Maximum exceeded in 20% of the years	4,999	6,827	4,292	2,743	3,640	6,899	3,053	3,616	5,350
Maximum exceeded in 10% of the years	5,873	7,139	5,542	2,743	3,745	7,254	4,229	4,245	6,559
Maximum	9,535	7,957	9,535	2,743	3,850	7,957	5,826	5,885	9,535
30-day Average Flows									
Maximum exceeded in 100% of the years	244	244	467		3,453	244	467	1,200	1,492
Maximum exceeded in 90% of the years	1,492	1,964	1,470		3,453	1,866	1,159	1,323	1,650
Maximum exceeded in 80% of the years	1,663	2,746	1,654		3,453	2,714	1,553	1,523	1,906
Maximum exceeded in 70% of the years	1,904	3,128	1,836		3,453	3,022	1,662	1,834	2,110
Maximum exceeded in 60% of the years	2,103	3,237	2,005		3,453	3,179	1,853	1,884	2,264
Maximum exceeded in 50% of the years	2,413	3,507	2,119		3,453	3,561	1,976	2,030	2,771
Maximum exceeded in 40% of the years	2,944	3,708	2,427		3,453	3,783	2,013	2,436	3,358
Maximum exceeded in 30% of the years	3,453	3,941	2,978		3,453	3,958	2,118	2,779	3,784
Maximum exceeded in 20% of the years	3,779	4,406	3,694		3,453	4,612	2,261	3,162	4,404
Maximum exceeded in 10% of the years	5,025	5,189	4,631		3,453	5,212	3,039	3,738	5,484
Maximum	9,051	5,380	9,051		3,453	5,380	5,763	5,651	9,051

Table A.11-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	675	1,010	675	13,800	1,200	1,010	675	2,010	1,880
Maximum exceeded in 90% of the years	2,082	1,859	2,298	16,152	4,160	1,439	2,106	3,000	2,457
Maximum exceeded in 80% of the years	3,394	3,944	3,202	19,446	5,440	1,822	2,392	3,420	3,476
Maximum exceeded in 70% of the years	4,556	6,033	3,952	21,700	7,620	2,420	3,592	4,160	4,524
Maximum exceeded in 60% of the years	5,744	11,320	5,004	22,760	10,400	3,572	4,230	5,100	5,876
Maximum exceeded in 50% of the years	6,870	14,700	5,990	24,600	10,600	3,975	4,940	5,725	6,575
Maximum exceeded in 40% of the years	7,992	18,000	6,400	26,342	11,320	5,266	5,858	6,190	7,080
Maximum exceeded in 30% of the years	13,640	20,880	7,138	29,600	13,300	8,617	6,378	7,125	7,343
Maximum exceeded in 20% of the years	18,000	24,040	9,020	31,960	15,300	14,800	7,122	11,000	8,460
Maximum exceeded in 10% of the years	22,920	30,470	15,640	37,200	16,800	17,850	13,600	14,450	15,460
Maximum	51,100	51,100	23,800	51,100	18,000	21,000	20,600	22,500	23,800
3-day Average Flows									
Maximum exceeded in 100% of the years	660	913	660	12,227	1,116	913	660	1,743	1,670
Maximum exceeded in 90% of the years	1,945	1,687	2,049	14,603	3,996	1,299	1,975	2,575	2,384
Maximum exceeded in 80% of the years	3,221	3,636	2,824	17,262	4,767	1,660	2,079	3,147	3,400
Maximum exceeded in 70% of the years	4,265	5,378	3,464	19,387	5,720	2,304	3,023	3,938	4,351
Maximum exceeded in 60% of the years	5,279	10,970	4,699	20,193	7,717	3,452	3,659	4,913	5,338
Maximum exceeded in 50% of the years	6,040	13,160	5,507	22,600	10,183	3,637	4,380	5,543	6,095
Maximum exceeded in 40% of the years	7,147	16,622	5,927	23,849	10,970	4,931	5,461	5,800	6,698
Maximum exceeded in 30% of the years	12,605	18,300	6,771	25,201	12,447	7,117	5,687	6,872	6,986
Maximum exceeded in 20% of the years	16,622	21,653	8,839	27,994	14,273	14,020	6,455	10,800	7,977
Maximum exceeded in 10% of the years	21,373	26,193	14,827	29,095	15,893	17,400	12,740	13,595	14,657
Maximum	38,157	38,157	23,533	38,157	16,533	18,333	19,300	22,133	23,533
7-day Average Flows									
Maximum exceeded in 100% of the years	629	737	629	10,619	737	804	629	1,264	1,430
Maximum exceeded in 90% of the years	1,566	1,250	1,621	13,057	3,352	1,052	1,555	2,277	2,173
Maximum exceeded in 80% of the years	2,701	3,349	2,613	16,262	4,191	1,228	1,676	2,659	3,245
Maximum exceeded in 70% of the years	3,721	4,397	3,194	17,224	4,644	1,830	2,522	3,431	3,934
Maximum exceeded in 60% of the years	4,437	9,814	4,110	17,829	5,982	3,210	2,939	4,156	4,639
Maximum exceeded in 50% of the years	5,139	11,539	4,771	18,662	9,357	3,371	4,059	4,307	5,201
Maximum exceeded in 40% of the years	6,447	15,189	5,037	19,229	9,814	3,829	4,817	5,030	5,966
Maximum exceeded in 30% of the years	10,954	16,544	6,005	20,156	11,206	6,050	4,928	6,452	6,138
Maximum exceeded in 20% of the years	15,189	18,454	8,513	22,690	12,634	11,706	5,803	8,840	7,581
Maximum exceeded in 10% of the years	17,994	20,907	13,780	25,907	13,800	15,394	12,180	13,400	13,874
Maximum	34,329	34,329	22,900	34,329	15,000	16,571	14,780	17,771	22,900
15-day Average Flows									
Maximum exceeded in 100% of the years	537	537	625	8,401	551	537	625	1,190	1,265
Maximum exceeded in 90% of the years	1,276	1,016	1,331	9,789	2,219	669	1,175	1,909	1,985
Maximum exceeded in 80% of the years	2,160	2,695	2,015	12,043	3,220	998	1,404	2,202	2,880
Maximum exceeded in 70% of the years	2,835	3,706	2,623	12,904	3,998	1,227	1,899	2,586	3,036
Maximum exceeded in 60% of the years	3,649	7,963	3,229	15,127	5,073	2,674	2,178	3,187	3,408
Maximum exceeded in 50% of the years	4,213	9,609	3,729	15,613	7,043	2,781	3,729	3,617	4,033
Maximum exceeded in 40% of the years	5,747	11,589	4,132	16,463	7,963	3,271	3,920	3,877	4,704
Maximum exceeded in 30% of the years	9,487	12,512	4,870	17,273	9,380	5,268	4,127	5,289	5,032
Maximum exceeded in 20% of the years	12,014	15,600	6,519	21,089	10,327	10,159	4,983	6,558	6,633
Maximum exceeded in 10% of the years	15,600	18,307	11,733	22,948	10,747	12,318	10,037	11,043	13,051
Maximum	32,634	32,634	22,547	32,634	11,493	13,993	12,182	15,233	22,547
30-day Average Flows									
Maximum exceeded in 100% of the years	361	361	553	7,203	1,953	361	553	982	894
Maximum exceeded in 90% of the years	1,002	775	1,103	8,163	2,772	417	928	1,492	1,724
Maximum exceeded in 80% of the years	1,801	2,236	1,718	9,489	3,424	623	1,159	2,032	2,147
Maximum exceeded in 70% of the years	2,338	3,725	2,115	11,027	4,065	810	1,491	2,154	2,516
Maximum exceeded in 60% of the years	2,841	6,941	2,467	12,258	5,388	1,902	1,900	2,416	2,586
Maximum exceeded in 50% of the years	3,394	7,895	2,803	12,935	6,267	2,261	2,996	2,562	3,332
Maximum exceeded in 40% of the years	4,897	9,440	3,262	13,670	6,992	2,854	3,087	2,803	3,718
Maximum exceeded in 30% of the years	7,421	10,663	3,938	15,519	7,782	4,642	3,314	3,710	4,463
Maximum exceeded in 20% of the years	9,678	12,811	5,118	18,129	8,304	8,290	4,303	5,013	5,219
Maximum exceeded in 10% of the years	13,274	16,777	9,551	19,264	8,792	9,700	7,177	9,077	11,924
Maximum	31,449	31,449	21,517	31,449	9,293	10,643	9,237	13,624	21,517

Table A.11-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	76	76	140	11,140	1,750	76	140	1,050	880
Maximum exceeded in 90% of the years	1,231	1,256	1,324	13,685	3,955	701	1,324	1,475	2,142
Maximum exceeded in 80% of the years	2,002	2,098	2,012	15,300	5,180	981	1,628	1,990	2,718
Maximum exceeded in 70% of the years	2,991	5,590	2,724	18,384	5,868	1,379	2,356	2,150	3,081
Maximum exceeded in 60% of the years	4,876	10,666	3,138	20,880	7,744	1,674	3,014	3,100	4,366
Maximum exceeded in 50% of the years	5,940	13,000	4,870	22,100	9,315	2,290	3,880	3,940	6,030
Maximum exceeded in 40% of the years	7,830	17,100	5,932	24,976	10,620	4,962	4,900	5,370	6,544
Maximum exceeded in 30% of the years	12,420	18,384	6,722	25,724	11,565	6,592	5,084	6,335	7,585
Maximum exceeded in 20% of the years	16,900	22,000	10,660	27,800	14,580	14,800	6,868	11,000	10,380
Maximum exceeded in 10% of the years	21,950	26,342	14,920	30,740	16,950	17,850	12,480	14,250	15,460
Maximum	51,100	51,100	23,800	51,100	18,000	21,000	20,600	22,500	23,800
3-day Average Flows									
Maximum exceeded in 100% of the years	53	53	140	11,140	1,467	53	140	1,004	849
Maximum exceeded in 90% of the years	1,044	923	1,275	12,933	3,800	661	1,216	1,275	2,025
Maximum exceeded in 80% of the years	1,781	1,909	1,863	13,831	5,067	899	1,636	1,743	2,705
Maximum exceeded in 70% of the years	2,794	5,191	2,600	17,048	5,684	928	2,180	1,970	2,860
Maximum exceeded in 60% of the years	4,399	10,033	3,055	18,453	7,203	1,553	3,027	2,407	3,843
Maximum exceeded in 50% of the years	5,545	12,875	4,387	20,133	8,785	2,122	3,240	3,740	5,682
Maximum exceeded in 40% of the years	7,191	15,893	5,531	20,924	9,983	4,450	4,315	5,287	6,291
Maximum exceeded in 30% of the years	11,573	17,467	6,113	23,387	10,158	5,998	4,703	5,920	7,114
Maximum exceeded in 20% of the years	15,940	19,947	10,465	24,305	13,513	14,020	5,865	10,800	9,981
Maximum exceeded in 10% of the years	19,883	23,849	13,847	26,885	15,973	17,400	11,593	13,362	14,657
Maximum	38,157	38,157	23,533	38,157	16,533	18,333	19,300	22,133	23,533
7-day Average Flows									
Maximum exceeded in 100% of the years	28	28	45	10,619	1,104	28	45	767	711
Maximum exceeded in 90% of the years	804	709	882	11,533	3,351	484	994	870	1,742
Maximum exceeded in 80% of the years	1,559	1,530	1,562	13,232	4,631	550	1,302	1,199	2,329
Maximum exceeded in 70% of the years	2,339	4,234	2,143	14,205	5,298	780	1,561	1,763	2,514
Maximum exceeded in 60% of the years	3,548	8,971	2,584	16,225	6,636	1,088	2,130	1,953	3,228
Maximum exceeded in 50% of the years	4,854	11,021	3,514	18,143	7,866	1,854	2,711	3,349	4,819
Maximum exceeded in 40% of the years	6,502	13,637	4,723	19,229	8,843	3,425	3,394	4,414	5,347
Maximum exceeded in 30% of the years	10,624	15,977	5,388	19,908	9,293	4,528	4,145	5,256	6,105
Maximum exceeded in 20% of the years	14,251	17,829	8,829	20,702	11,843	11,675	4,882	8,840	9,108
Maximum exceeded in 10% of the years	17,411	20,105	13,171	23,383	13,950	15,394	10,057	12,957	13,814
Maximum	34,329	34,329	22,900	34,329	15,000	16,571	14,780	17,771	22,900
15-day Average Flows									
Maximum exceeded in 100% of the years	15	15	22	8,401	758	15	22	590	468
Maximum exceeded in 90% of the years	578	502	611	9,053	2,073	340	687	608	1,375
Maximum exceeded in 80% of the years	1,114	1,188	1,167	10,360	3,602	412	982	843	1,782
Maximum exceeded in 70% of the years	1,814	2,734	1,672	11,612	5,099	528	1,228	1,213	1,870
Maximum exceeded in 60% of the years	2,404	6,676	1,963	15,127	5,438	672	1,624	1,676	2,396
Maximum exceeded in 50% of the years	3,780	9,047	2,913	15,613	6,026	1,368	2,139	2,767	3,606
Maximum exceeded in 40% of the years	5,438	10,815	3,621	16,463	6,622	2,034	2,616	3,481	4,404
Maximum exceeded in 30% of the years	8,465	12,671	4,261	17,273	6,991	3,174	3,381	4,045	4,955
Maximum exceeded in 20% of the years	11,139	15,607	6,732	18,476	8,920	8,938	4,084	6,365	7,719
Maximum exceeded in 10% of the years	15,241	17,555	10,422	21,910	10,568	12,230	7,933	11,015	11,871
Maximum	32,634	32,634	22,547	32,634	11,493	13,993	10,699	12,873	22,547
30-day Average Flows									
Maximum exceeded in 100% of the years	0	0	11	7,144	0	8	11	374	278
Maximum exceeded in 90% of the years	389	256	478	7,715	1,049	206	553	476	1,173
Maximum exceeded in 80% of the years	783	780	790	9,129	2,209	256	753	597	1,267
Maximum exceeded in 70% of the years	1,228	2,075	1,206	9,746	3,298	359	954	792	1,583
Maximum exceeded in 60% of the years	1,710	4,379	1,533	11,902	3,453	455	1,147	1,230	1,800
Maximum exceeded in 50% of the years	2,596	7,203	1,946	12,935	3,900	895	1,484	2,011	2,575
Maximum exceeded in 40% of the years	3,705	8,969	2,551	13,670	4,596	1,095	1,847	2,416	3,365
Maximum exceeded in 30% of the years	6,754	9,849	3,377	14,566	5,620	2,446	2,580	2,685	3,746
Maximum exceeded in 20% of the years	9,319	12,811	4,617	16,099	7,215	6,508	3,593	4,282	5,598
Maximum exceeded in 10% of the years	12,396	15,172	7,758	17,694	8,273	9,614	5,535	8,805	9,987
Maximum	31,175	31,175	21,517	31,175	8,487	10,643	7,508	11,073	21,517

Table A.11-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	0	0	0	1,550	2,250	0	0	377	215
Maximum exceeded in 90% of the years	185	25	424	2,893	2,490	7	136	513	698
Maximum exceeded in 80% of the years	558	331	593	4,139	2,680	23	242	590	1,125
Maximum exceeded in 70% of the years	1,168	1,690	858	4,251	2,770	26	531	676	2,081
Maximum exceeded in 60% of the years	1,636	2,740	1,534	4,660	3,360	109	956	1,120	2,766
Maximum exceeded in 50% of the years	2,650	4,100	2,110	5,310	4,200	276	1,530	1,415	3,375
Maximum exceeded in 40% of the years	3,436	4,396	2,778	7,384	6,270	570	2,164	1,570	3,746
Maximum exceeded in 30% of the years	4,242	5,470	3,560	8,573	7,776	1,597	2,682	1,990	4,430
Maximum exceeded in 20% of the years	5,382	7,896	4,570	10,788	8,154	3,580	3,122	3,200	5,288
Maximum exceeded in 10% of the years	8,232	10,232	5,652	14,430	9,448	4,954	4,072	5,070	6,265
Maximum	16,080	16,080	12,000	16,080	11,200	5,500	7,350	9,150	12,000
3-day Average Flows									
Maximum exceeded in 100% of the years	0	0	0	1,417	1,050	0	0	338	205
Maximum exceeded in 90% of the years	121	20	359	2,143	1,450	5	72	429	628
Maximum exceeded in 80% of the years	453	290	515	3,067	1,863	18	169	489	954
Maximum exceeded in 70% of the years	1,056	1,366	754	3,466	2,303	22	477	574	1,788
Maximum exceeded in 60% of the years	1,499	2,200	1,470	3,819	2,590	74	903	1,087	2,583
Maximum exceeded in 50% of the years	2,263	2,987	1,813	4,712	2,800	235	1,480	1,342	3,047
Maximum exceeded in 40% of the years	2,933	3,681	2,603	6,240	5,070	365	1,897	1,523	3,465
Maximum exceeded in 30% of the years	3,640	4,844	3,115	7,505	6,849	1,517	2,423	1,873	4,397
Maximum exceeded in 20% of the years	4,844	6,750	4,143	9,951	7,647	3,287	2,799	2,967	5,085
Maximum exceeded in 10% of the years	7,365	9,199	5,445	12,947	8,668	4,355	3,607	4,112	5,862
Maximum	14,463	14,463	11,267	14,463	9,800	5,200	6,900	7,957	11,267
7-day Average Flows									
Maximum exceeded in 100% of the years	0	0	0	0	1,007	0	0	249	184
Maximum exceeded in 90% of the years	49	10	249	1,311	1,179	3	38	279	553
Maximum exceeded in 80% of the years	294	93	408	2,244	1,451	11	116	383	855
Maximum exceeded in 70% of the years	698	1,045	580	3,158	1,927	19	376	452	1,473
Maximum exceeded in 60% of the years	1,262	1,463	1,207	3,545	2,251	45	808	966	2,260
Maximum exceeded in 50% of the years	1,719	2,690	1,520	4,133	2,500	191	1,283	1,192	2,599
Maximum exceeded in 40% of the years	2,564	3,352	2,230	5,398	4,317	289	1,466	1,413	2,875
Maximum exceeded in 30% of the years	3,312	4,381	2,639	6,420	5,811	1,405	1,727	1,660	4,191
Maximum exceeded in 20% of the years	4,278	5,763	3,528	8,368	6,660	2,991	2,507	2,536	4,654
Maximum exceeded in 10% of the years	6,280	7,206	4,869	10,550	7,099	3,631	2,984	3,514	5,550
Maximum	12,271	12,271	9,591	12,271	7,334	4,871	4,651	6,750	9,591
15-day Average Flows									
Maximum exceeded in 100% of the years	0	0	0	0	763	0	0	139	128
Maximum exceeded in 90% of the years	28	6	134	857	797	2	22	171	371
Maximum exceeded in 80% of the years	191	65	279	1,669	983	6	68	196	681
Maximum exceeded in 70% of the years	583	775	496	2,387	1,471	13	271	307	1,136
Maximum exceeded in 60% of the years	958	1,067	958	2,797	1,721	27	651	857	1,698
Maximum exceeded in 50% of the years	1,204	2,199	1,129	3,346	1,853	134	982	951	1,993
Maximum exceeded in 40% of the years	2,029	2,880	1,645	4,313	2,925	221	1,089	1,114	2,500
Maximum exceeded in 30% of the years	2,651	3,451	2,169	4,721	4,241	1,356	1,245	1,331	3,270
Maximum exceeded in 20% of the years	3,463	4,534	2,661	6,542	6,043	2,880	2,057	2,031	4,208
Maximum exceeded in 10% of the years	4,974	6,689	4,208	8,795	6,674	3,087	2,359	2,473	4,925
Maximum	9,755	9,755	8,053	9,755	6,720	4,127	2,681	5,827	8,053
30-day Average Flows									
Maximum exceeded in 100% of the years	0	0	0	0	0	0	0	76	105
Maximum exceeded in 90% of the years	3	0	93	0	0	1	18	104	207
Maximum exceeded in 80% of the years	81	0	165	0	241	4	36	129	542
Maximum exceeded in 70% of the years	186	8	362	1,235	963	7	219	191	748
Maximum exceeded in 60% of the years	634	120	640	1,545	1,387	15	364	560	1,254
Maximum exceeded in 50% of the years	842	1,372	755	2,146	1,662	75	633	613	1,494
Maximum exceeded in 40% of the years	1,366	1,623	1,252	2,783	2,097	124	705	668	1,897
Maximum exceeded in 30% of the years	1,658	2,588	1,532	4,190	3,052	813	931	1,010	2,339
Maximum exceeded in 20% of the years	2,588	3,612	1,930	5,114	5,046	1,623	1,254	1,526	3,161
Maximum exceeded in 10% of the years	4,198	5,900	3,161	6,511	5,836	2,345	1,476	1,742	4,046
Maximum	8,813	8,813	6,785	8,813	6,026	3,470	2,008	4,262	6,785

seasonal period, especially toward the downstream end of the portion of the basin upstream of Duncan ([Nebraska](#), 2004).

Table A.11-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.11-7** shows significant decreases in flow values by time interval from the 1895-1909 time interval through the 1942-1958 time interval for all averaging times and most exceedance probabilities. This is coincident with the beginning of operation of the major North Platte River reservoir projects. For the 1942-1958 through 1975-1998 time intervals, the flow characterization is generally consistent with the known climatological conditions during the respective time intervals. However, the variations between time intervals are not large, which is a possible effect of the North Platte River reservoirs.

Table A.11-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.11-8** shows that the flow values are generally somewhat lower than those for the Apr 16-Jul 15 seasonal period. Otherwise, the characterizations for the Jun 1-Aug 15 seasonal period are essentially the same as those for the Apr 16-Jul 15 seasonal period.

Table A.11-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.11-9** shows a characterization that is generally consistent with the known climatological conditions during the respective time intervals, though with some noticeable effects likely attributable to the North Platte River reservoirs, especially for the 1895-1909 through 1928-1941 time intervals. The high frequency of extremely low flow values for the 1928-1941 time interval can be attributed to the severe drought conditions of the 1930's.

A.11.4.3 Mean Daily Flow Exceedance

Table A.11-10 through **Table A.11-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.11-10 shows the exceedance probabilities and values of flows for annual data. **Table A.11-10** shows that, when all flow values are considered, they show a characterization that is generally consistent with the known climatological conditions during the respective time intervals for the 1942-1958 through 1975-1998 time intervals. The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to insufficient data.

Table A.11-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.11-11** shows that, when all flow values are considered, they are generally consistent with known climatological conditions.

Table A.11-10 Exceedance Values Considering All Flows, Annual Data.

Platte River near Duncan, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	0	0	0	0	0	0	0	0	0	0
Flow exceeded for 90% of the days	20	1	96	618	100	0	4	103	324	
Flow exceeded for 80% of the days	324	66	428	1,025	700	2	115	405	670	
Flow exceeded for 70% of the days	678	500	721	1,860	1,200	17	418	740	947	
Flow exceeded for 60% of the days	981	960	988	2,750	1,900	244	676	1,000	1,250	
Flow exceeded for 50% of the days	1,300	1,600	1,260	3,830	2,750	653	926	1,230	1,610	
Flow exceeded for 40% of the days	1,730	2,400	1,600	5,200	3,300	1,100	1,170	1,500	2,010	
Flow exceeded for 30% of the days	2,300	3,350	2,020	7,044	4,200	1,800	1,500	1,870	2,560	
Flow exceeded for 20% of the days	3,140	4,914	2,640	10,100	5,300	2,680	1,980	2,400	3,300	
Flow exceeded for 10% of the days	5,140	7,800	3,970	14,260	6,900	4,000	2,720	3,460	4,800	
Maximum	51,100	51,100	23,800	51,100	18,200	21,000	20,600	22,900	23,800	
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	0	11	0	0	0	0	0	0
Flow exceeded for 90% of the days	22	1	101	683	250	0	4	106	330	
Flow exceeded for 80% of the days	341	77	437	1,093	828	2	127	414	676	
Flow exceeded for 70% of the days	694	525	735	2,000	1,367	18	427	750	955	
Flow exceeded for 60% of the days	998	999	998	2,963	2,050	250	693	1,007	1,257	
Flow exceeded for 50% of the days	1,320	1,650	1,267	4,033	2,867	665	940	1,240	1,627	
Flow exceeded for 40% of the days	1,750	2,457	1,603	5,350	3,400	1,120	1,170	1,500	2,020	
Flow exceeded for 30% of the days	2,300	3,374	2,023	7,283	4,367	1,827	1,510	1,870	2,547	
Flow exceeded for 20% of the days	3,157	4,927	2,633	10,290	5,317	2,677	1,977	2,400	3,287	
Flow exceeded for 10% of the days	5,100	7,941	3,965	14,335	6,787	4,028	2,732	3,434	4,813	
Maximum	38,157	38,157	23,533	38,157	16,533	18,333	19,300	22,133	23,533	
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	0	32	0	0	0	0	0	0
Flow exceeded for 90% of the days	30	1	114	744	439	0	5	120	353	
Flow exceeded for 80% of the days	368	95	463	1,211	997	3	138	434	695	
Flow exceeded for 70% of the days	719	561	764	2,270	1,557	23	457	776	978	
Flow exceeded for 60% of the days	1,018	1,017	1,019	3,063	2,371	271	726	1,022	1,286	
Flow exceeded for 50% of the days	1,342	1,700	1,279	4,224	3,000	671	966	1,253	1,653	
Flow exceeded for 40% of the days	1,761	2,562	1,614	5,686	3,529	1,152	1,193	1,513	2,041	
Flow exceeded for 30% of the days	2,303	3,443	2,043	7,585	4,589	1,846	1,509	1,886	2,539	
Flow exceeded for 20% of the days	3,157	5,000	2,620	10,521	5,343	2,700	1,993	2,371	3,300	
Flow exceeded for 10% of the days	5,085	8,010	3,957	15,026	6,743	4,026	2,700	3,443	4,801	
Maximum	34,329	34,329	22,900	34,329	15,000	16,571	14,780	17,771	22,900	
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	0	71	0	0	0	0	0	0
Flow exceeded for 90% of the days	51	2	140	816	683	0	7	141	407	
Flow exceeded for 80% of the days	417	129	509	1,479	1,273	4	176	496	722	
Flow exceeded for 70% of the days	763	587	795	2,508	1,920	39	504	806	1,002	
Flow exceeded for 60% of the days	1,050	1,091	1,043	3,584	2,573	332	773	1,035	1,324	
Flow exceeded for 50% of the days	1,389	1,818	1,309	4,604	3,020	742	1,006	1,283	1,668	
Flow exceeded for 40% of the days	1,792	2,637	1,640	6,327	3,827	1,197	1,214	1,542	2,053	
Flow exceeded for 30% of the days	2,304	3,599	2,049	8,102	4,642	1,938	1,531	1,915	2,534	
Flow exceeded for 20% of the days	3,160	4,977	2,595	11,127	5,460	2,751	1,997	2,353	3,309	
Flow exceeded for 10% of the days	5,017	7,958	3,927	14,964	6,780	4,007	2,633	3,436	4,740	
Maximum	32,634	32,634	22,547	32,634	11,493	13,993	12,182	15,233	22,547	
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	0	0	0	269	0	0	0	1	0	0
Flow exceeded for 90% of the days	91	3	187	1,034	972	0	15	179	474	
Flow exceeded for 80% of the days	472	169	569	1,722	1,663	5	237	535	771	
Flow exceeded for 70% of the days	809	639	839	3,071	2,362	102	582	829	1,035	
Flow exceeded for 60% of the days	1,098	1,187	1,082	4,140	2,942	367	826	1,081	1,362	
Flow exceeded for 50% of the days	1,420	1,846	1,353	5,847	3,428	811	1,042	1,333	1,723	
Flow exceeded for 40% of the days	1,813	2,639	1,659	7,324	4,067	1,353	1,246	1,581	2,089	
Flow exceeded for 30% of the days	2,303	3,647	2,045	8,821	4,698	1,995	1,531	1,904	2,534	
Flow exceeded for 20% of the days	3,173	5,057	2,600	11,183	5,607	2,831	1,958	2,373	3,300	
Flow exceeded for 10% of the days	4,899	7,796	3,852	14,827	6,785	3,851	2,736	3,448	4,678	
Maximum	31,449	31,449	21,517	31,449	9,293	10,643	9,237	13,624	21,517	

Table A.11-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	33	0	831	45	33	590	540
Flow exceeded for 90% of the days	880	643	915	1,129	2,800	570	597	1,000	1,360
Flow exceeded for 80% of the days	1,360	1,324	1,360	1,956	2,800	1,200	848	1,328	1,608
Flow exceeded for 70% of the days	1,700	2,000	1,657	2,736	2,800	1,817	1,217	1,600	1,950
Flow exceeded for 60% of the days	2,000	2,500	1,960	2,760	3,000	2,300	1,572	1,900	2,200
Flow exceeded for 50% of the days	2,300	2,980	2,200	3,210	3,000	2,775	1,900	2,200	2,680
Flow exceeded for 40% of the days	2,700	3,204	2,500	4,660	3,000	3,200	2,084	2,494	3,014
Flow exceeded for 30% of the days	3,160	3,850	2,986	5,648	3,850	4,000	2,310	2,800	3,506
Flow exceeded for 20% of the days	3,856	5,000	3,600	6,532	3,850	5,000	2,652	3,300	4,400
Flow exceeded for 10% of the days	5,500	6,488	5,200	8,210	3,850	6,386	4,001	4,582	6,600
Maximum	20,100	20,100	16,000	12,300	7,500	20,100	9,360	8,200	16,000
3-day Average Flows									
Flow exceeded for 100% of the days	42	48	42	1,017	895	48	42	617	593
Flow exceeded for 90% of the days	915	751	952	1,357	2,800	633	626	1,068	1,358
Flow exceeded for 80% of the days	1,393	1,469	1,380	2,050	2,800	1,291	890	1,350	1,650
Flow exceeded for 70% of the days	1,733	2,112	1,677	2,706	2,800	1,927	1,288	1,652	1,967
Flow exceeded for 60% of the days	2,033	2,569	1,967	2,885	3,000	2,300	1,647	1,905	2,227
Flow exceeded for 50% of the days	2,317	3,000	2,217	3,977	3,000	2,937	1,908	2,218	2,697
Flow exceeded for 40% of the days	2,733	3,408	2,520	4,237	3,000	3,342	2,100	2,433	3,072
Flow exceeded for 30% of the days	3,200	4,007	2,992	5,093	3,850	4,315	2,338	2,800	3,533
Flow exceeded for 20% of the days	3,947	5,000	3,633	5,376	3,850	5,088	2,727	3,300	4,467
Flow exceeded for 10% of the days	5,445	6,401	5,253	6,227	3,850	6,601	4,047	4,550	6,462
Maximum	17,400	17,400	15,333	8,567	3,850	17,400	8,867	7,867	15,333
7-day Average Flows									
Flow exceeded for 100% of the days	54	54	91	1,260	2,686	54	91	704	640
Flow exceeded for 90% of the days	1,019	1,064	1,017	1,493	2,800	859	676	1,098	1,390
Flow exceeded for 80% of the days	1,486	1,603	1,457	1,957	2,800	1,550	984	1,430	1,726
Flow exceeded for 70% of the days	1,781	2,300	1,729	2,389	2,980	2,057	1,473	1,633	2,016
Flow exceeded for 60% of the days	2,098	2,809	2,007	3,268	3,000	2,635	1,755	1,958	2,213
Flow exceeded for 50% of the days	2,379	3,200	2,233	3,684	3,000	3,200	1,948	2,229	2,709
Flow exceeded for 40% of the days	2,838	3,710	2,537	4,102	3,340	3,715	2,177	2,409	3,121
Flow exceeded for 30% of the days	3,278	4,257	3,047	4,593	3,741	4,433	2,414	2,787	3,657
Flow exceeded for 20% of the days	4,072	5,082	3,687	5,386	3,850	5,240	2,888	3,331	4,569
Flow exceeded for 10% of the days	5,418	6,634	5,148	6,429	3,850	6,918	4,047	4,255	6,295
Maximum	12,886	11,594	12,886	7,086	3,850	11,594	7,683	6,691	12,886
15-day Average Flows									
Flow exceeded for 100% of the days	94	94	251	2,417	2,747	94	251	828	752
Flow exceeded for 90% of the days	1,289	1,469	1,249	2,470	2,980	1,414	754	1,260	1,457
Flow exceeded for 80% of the days	1,581	2,241	1,543	2,522	3,136	1,877	1,478	1,389	1,725
Flow exceeded for 70% of the days	1,920	3,057	1,831	2,574	3,232	3,016	1,770	1,671	1,978
Flow exceeded for 60% of the days	2,124	3,397	2,030	2,626	3,329	3,461	1,940	2,027	2,158
Flow exceeded for 50% of the days	2,400	3,702	2,236	2,678	3,425	3,874	2,051	2,253	2,818
Flow exceeded for 40% of the days	3,003	4,011	2,477	2,691	3,521	4,047	2,213	2,389	3,184
Flow exceeded for 30% of the days	3,533	4,400	3,066	2,704	3,618	4,512	2,397	2,925	3,843
Flow exceeded for 20% of the days	4,134	5,325	3,854	2,717	3,714	5,458	2,653	3,384	4,617
Flow exceeded for 10% of the days	5,333	6,516	5,129	2,730	3,810	6,618	3,848	4,110	5,776
Maximum	9,535	7,957	9,535	2,743	3,850	7,957	5,826	5,885	9,535
30-day Average Flows									
Flow exceeded for 100% of the days	244	244	467		3,453	244	467	1,200	1,492
Flow exceeded for 90% of the days	1,492	1,964	1,470		3,453	1,866	1,159	1,323	1,650
Flow exceeded for 80% of the days	1,663	2,746	1,654		3,453	2,714	1,553	1,523	1,906
Flow exceeded for 70% of the days	1,904	3,128	1,836		3,453	3,022	1,662	1,834	2,110
Flow exceeded for 60% of the days	2,103	3,237	2,005		3,453	3,179	1,853	1,884	2,264
Flow exceeded for 50% of the days	2,413	3,507	2,119		3,453	3,561	1,976	2,030	2,771
Flow exceeded for 40% of the days	2,944	3,708	2,427		3,453	3,783	2,013	2,436	3,358
Flow exceeded for 30% of the days	3,453	3,941	2,978		3,453	3,958	2,118	2,779	3,784
Flow exceeded for 20% of the days	3,779	4,406	3,694		3,453	4,612	2,261	3,162	4,404
Flow exceeded for 10% of the days	5,025	5,189	4,631		3,453	5,212	3,039	3,738	5,484
Maximum	9,051	5,380	9,051		3,453	5,380	5,763	5,651	9,051

Table A.11-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	0	198	0	0	0	10	1
Flow exceeded for 90% of the days	196	109	267	2,580	300	7	118	269	395
Flow exceeded for 80% of the days	539	478	552	3,900	850	74	410	470	803
Flow exceeded for 70% of the days	920	1,120	871	5,250	1,400	210	660	769	1,110
Flow exceeded for 60% of the days	1,330	2,300	1,180	6,500	2,100	380	940	1,060	1,472
Flow exceeded for 50% of the days	1,850	3,520	1,510	7,950	2,950	681	1,290	1,335	1,880
Flow exceeded for 40% of the days	2,550	4,900	1,920	10,100	3,900	1,070	1,640	1,630	2,370
Flow exceeded for 30% of the days	3,684	6,570	2,520	12,000	4,700	2,120	2,100	2,275	3,121
Flow exceeded for 20% of the days	5,580	9,300	3,488	14,675	5,800	3,536	2,720	3,140	4,384
Flow exceeded for 10% of the days	9,780	13,285	5,882	19,280	8,500	5,862	3,978	5,960	7,557
Maximum	51,100	51,100	23,800	51,100	18,000	21,000	20,600	22,500	23,800
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	297	0	0	0	11	3
Flow exceeded for 90% of the days	216	136	283	2,850	369	8	139	290	412
Flow exceeded for 80% of the days	548	500	567	4,157	963	93	428	493	818
Flow exceeded for 70% of the days	938	1,173	891	5,567	1,567	218	671	776	1,137
Flow exceeded for 60% of the days	1,350	2,427	1,196	6,777	2,347	412	960	1,057	1,473
Flow exceeded for 50% of the days	1,877	3,633	1,520	8,250	3,077	682	1,300	1,335	1,887
Flow exceeded for 40% of the days	2,597	4,987	1,947	10,347	4,000	1,090	1,643	1,671	2,380
Flow exceeded for 30% of the days	3,767	6,799	2,530	12,067	4,867	2,200	2,129	2,264	3,123
Flow exceeded for 20% of the days	5,645	9,333	3,500	14,558	5,973	3,627	2,815	3,161	4,353
Flow exceeded for 10% of the days	9,871	13,510	5,841	19,728	8,551	5,897	4,103	5,893	7,672
Maximum	38,157	38,157	23,533	38,157	16,533	18,333	19,300	22,133	23,533
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	464	0	0	0	17	16
Flow exceeded for 90% of the days	255	181	317	3,133	476	11	183	338	444
Flow exceeded for 80% of the days	583	529	609	4,643	1,142	136	473	531	844
Flow exceeded for 70% of the days	980	1,286	933	5,969	1,817	258	728	806	1,162
Flow exceeded for 60% of the days	1,381	2,664	1,215	7,287	2,581	446	1,008	1,079	1,504
Flow exceeded for 50% of the days	1,939	3,859	1,557	8,661	3,277	668	1,316	1,341	1,947
Flow exceeded for 40% of the days	2,690	5,261	1,993	10,521	4,160	1,221	1,666	1,741	2,397
Flow exceeded for 30% of the days	3,876	7,207	2,578	12,314	4,934	2,233	2,157	2,349	3,155
Flow exceeded for 20% of the days	5,810	9,686	3,595	15,404	6,168	3,644	2,851	3,332	4,392
Flow exceeded for 10% of the days	10,010	13,556	5,758	19,020	8,616	6,264	4,084	5,920	7,897
Maximum	34,329	34,329	22,900	34,329	15,000	16,571	14,780	17,771	22,900
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	685	68	0	0	25	27
Flow exceeded for 90% of the days	333	260	388	3,721	844	22	252	380	516
Flow exceeded for 80% of the days	645	565	673	5,388	1,543	207	501	583	849
Flow exceeded for 70% of the days	1,050	1,560	972	6,826	2,344	325	821	852	1,239
Flow exceeded for 60% of the days	1,493	2,824	1,262	7,934	2,987	460	1,079	1,098	1,608
Flow exceeded for 50% of the days	2,058	4,370	1,638	9,063	3,760	664	1,338	1,435	2,002
Flow exceeded for 40% of the days	2,834	5,837	2,083	11,125	4,511	1,306	1,758	1,873	2,563
Flow exceeded for 30% of the days	3,971	7,667	2,717	13,099	5,305	2,233	2,213	2,342	3,307
Flow exceeded for 20% of the days	6,248	9,900	3,571	15,246	6,431	3,818	3,030	3,188	4,274
Flow exceeded for 10% of the days	10,173	13,921	5,967	18,633	8,470	6,656	4,026	6,273	8,151
Maximum	32,634	32,634	22,547	32,634	11,493	13,993	12,182	15,233	22,547
30-day Average Flows									
Flow exceeded for 100% of the days	0	1	0	1,394	578	1	0	173	118
Flow exceeded for 90% of the days	387	291	460	4,840	1,400	139	339	458	619
Flow exceeded for 80% of the days	761	708	768	6,718	1,698	269	627	644	939
Flow exceeded for 70% of the days	1,162	1,663	1,063	7,417	2,483	346	919	899	1,303
Flow exceeded for 60% of the days	1,583	3,236	1,381	8,467	3,468	449	1,136	1,267	1,704
Flow exceeded for 50% of the days	2,135	4,730	1,750	9,495	4,193	780	1,467	1,562	2,164
Flow exceeded for 40% of the days	2,815	6,625	2,192	11,346	4,683	1,500	1,874	1,867	2,534
Flow exceeded for 30% of the days	4,055	7,830	2,666	13,051	5,531	2,069	2,558	2,250	3,236
Flow exceeded for 20% of the days	6,805	9,418	3,502	15,225	6,972	4,171	2,966	2,812	4,060
Flow exceeded for 10% of the days	9,627	13,741	6,486	18,246	8,141	6,796	4,025	7,519	8,647
Maximum	31,449	31,449	21,517	31,449	9,293	10,643	9,237	13,624	21,517

Table A.11-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	0	96	0	0	0	0	0
Flow exceeded for 90% of the days	6	1	15	1,380	20	0	3	12	92
Flow exceeded for 80% of the days	78	20	103	2,740	264	1	18	81	247
Flow exceeded for 70% of the days	260	246	266	4,203	663	4	102	197	502
Flow exceeded for 60% of the days	550	838	490	5,700	1,100	12	282	358	810
Flow exceeded for 50% of the days	953	2,050	778	7,050	1,600	47	523	559	1,140
Flow exceeded for 40% of the days	1,530	3,800	1,160	9,000	2,900	180	832	899	1,530
Flow exceeded for 30% of the days	2,540	5,700	1,657	11,275	4,100	530	1,310	1,355	2,251
Flow exceeded for 20% of the days	4,600	8,700	2,560	13,550	5,200	1,570	1,998	1,980	3,500
Flow exceeded for 10% of the days	9,050	12,900	4,919	17,220	7,000	4,604	3,200	4,565	6,421
Maximum	51,100	51,100	23,800	51,100	18,000	21,000	20,600	22,500	23,800
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	199	0	0	0	0	0
Flow exceeded for 90% of the days	7	1	17	1,507	43	0	3	14	94
Flow exceeded for 80% of the days	85	21	108	3,053	308	1	21	86	257
Flow exceeded for 70% of the days	273	272	274	4,400	722	5	111	210	515
Flow exceeded for 60% of the days	567	867	499	5,874	1,117	14	291	365	815
Flow exceeded for 50% of the days	967	2,157	797	7,325	1,765	51	539	566	1,165
Flow exceeded for 40% of the days	1,546	3,897	1,179	8,973	3,000	203	842	909	1,520
Flow exceeded for 30% of the days	2,575	5,848	1,650	11,315	4,148	533	1,315	1,364	2,255
Flow exceeded for 20% of the days	4,653	8,673	2,555	13,633	5,053	1,513	1,996	2,085	3,460
Flow exceeded for 10% of the days	8,968	12,938	4,974	17,200	7,135	4,706	3,252	4,526	6,375
Maximum	38,157	38,157	23,533	38,157	16,533	18,333	19,300	22,133	23,533
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	245	0	0	0	0	0
Flow exceeded for 90% of the days	9	3	23	1,962	121	0	4	16	106
Flow exceeded for 80% of the days	95	26	120	3,252	401	2	30	87	274
Flow exceeded for 70% of the days	298	307	297	4,698	807	6	126	221	545
Flow exceeded for 60% of the days	599	894	536	6,061	1,238	17	315	390	851
Flow exceeded for 50% of the days	1,025	2,369	833	7,591	1,875	63	580	623	1,193
Flow exceeded for 40% of the days	1,564	3,986	1,211	9,451	3,091	225	901	928	1,541
Flow exceeded for 30% of the days	2,656	5,979	1,704	11,377	4,104	515	1,319	1,347	2,227
Flow exceeded for 20% of the days	4,683	8,690	2,603	13,553	5,061	1,512	2,010	2,181	3,515
Flow exceeded for 10% of the days	9,046	12,859	4,851	17,340	6,920	4,315	3,234	4,510	6,087
Maximum	34,329	34,329	22,900	34,329	15,000	16,571	14,780	17,771	22,900
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	374	0	0	0	0	0
Flow exceeded for 90% of the days	14	4	29	2,542	203	1	6	26	130
Flow exceeded for 80% of the days	131	51	155	3,975	639	3	44	121	358
Flow exceeded for 70% of the days	371	362	375	5,208	970	10	182	282	608
Flow exceeded for 60% of the days	679	1,011	597	6,589	1,430	24	420	439	904
Flow exceeded for 50% of the days	1,098	2,545	900	7,871	2,277	108	704	675	1,254
Flow exceeded for 40% of the days	1,666	4,193	1,262	9,221	3,377	301	956	1,044	1,631
Flow exceeded for 30% of the days	2,795	6,197	1,749	11,360	4,177	518	1,312	1,545	2,272
Flow exceeded for 20% of the days	4,697	8,668	2,713	13,931	5,050	1,359	1,988	2,279	3,461
Flow exceeded for 10% of the days	8,800	12,748	4,775	16,511	6,917	4,023	3,362	4,379	6,153
Maximum	32,634	32,634	22,547	32,634	11,493	13,993	10,699	12,873	22,547
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	1,358	0	0	0	2	0
Flow exceeded for 90% of the days	41	8	77	3,195	521	1	16	69	164
Flow exceeded for 80% of the days	200	107	262	4,994	666	6	113	226	406
Flow exceeded for 70% of the days	435	360	446	6,188	1,039	18	362	355	792
Flow exceeded for 60% of the days	768	1,068	740	7,128	1,536	80	592	467	1,068
Flow exceeded for 50% of the days	1,193	2,789	1,039	7,914	2,631	174	773	748	1,356
Flow exceeded for 40% of the days	1,743	4,434	1,386	9,495	3,261	285	1,007	1,375	1,684
Flow exceeded for 30% of the days	2,824	6,399	1,856	11,426	4,115	545	1,341	1,823	2,301
Flow exceeded for 20% of the days	4,790	8,172	2,743	13,109	5,162	1,149	1,897	2,555	3,279
Flow exceeded for 10% of the days	7,959	12,135	4,776	15,669	6,463	4,007	3,960	4,106	5,877
Maximum	31,175	31,175	21,517	31,175	8,487	10,643	7,508	11,073	21,517

Table A.11-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	0	0	0	5	0	0	0	0	0
Flow exceeded for 90% of the days	0	0	2	235	40	0	0	6	37
Flow exceeded for 80% of the days	6	0	13	493	400	0	1	11	170
Flow exceeded for 70% of the days	32	5	74	865	800	0	5	42	295
Flow exceeded for 60% of the days	145	40	164	1,212	1,250	1	19	100	487
Flow exceeded for 50% of the days	296	300	295	1,861	1,600	2	74	160	686
Flow exceeded for 40% of the days	564	950	496	2,573	2,320	6	176	281	1,030
Flow exceeded for 30% of the days	966	1,750	766	3,400	3,228	16	342	474	1,569
Flow exceeded for 20% of the days	1,700	2,810	1,254	4,460	4,356	89	610	762	2,200
Flow exceeded for 10% of the days	3,100	4,500	2,280	6,400	6,200	1,463	1,120	1,308	3,600
Maximum	16,080	16,080	12,000	16,080	11,200	5,500	7,350	9,150	12,000
3-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	11	0	0	0	0	0
Flow exceeded for 90% of the days	0	0	2	256	50	0	0	6	43
Flow exceeded for 80% of the days	6	1	14	595	587	0	1	13	170
Flow exceeded for 70% of the days	37	5	75	908	935	0	5	48	297
Flow exceeded for 60% of the days	144	37	164	1,383	1,289	1	21	100	491
Flow exceeded for 50% of the days	294	317	291	1,960	1,767	2	77	164	693
Flow exceeded for 40% of the days	564	973	494	2,717	2,493	7	171	277	1,027
Flow exceeded for 30% of the days	966	1,793	764	3,447	3,339	17	332	443	1,546
Flow exceeded for 20% of the days	1,695	2,965	1,239	4,537	4,406	94	602	764	2,197
Flow exceeded for 10% of the days	3,129	4,550	2,249	6,314	6,241	1,497	1,104	1,275	3,590
Maximum	14,463	14,463	11,267	14,463	9,800	5,200	6,900	7,957	11,267
7-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	32	0	0	0	0	0
Flow exceeded for 90% of the days	0	0	3	296	243	0	0	7	46
Flow exceeded for 80% of the days	7	1	17	623	721	0	2	15	172
Flow exceeded for 70% of the days	43	5	81	915	1,050	0	6	55	312
Flow exceeded for 60% of the days	146	34	167	1,412	1,480	1	26	105	499
Flow exceeded for 50% of the days	292	338	285	2,213	1,957	3	86	163	698
Flow exceeded for 40% of the days	555	983	481	2,759	2,900	7	181	257	1,015
Flow exceeded for 30% of the days	950	1,832	774	3,573	3,486	17	305	407	1,525
Flow exceeded for 20% of the days	1,676	2,975	1,227	4,534	4,700	86	576	767	2,163
Flow exceeded for 10% of the days	3,033	4,534	2,203	5,980	6,113	1,305	1,055	1,206	3,450
Maximum	12,271	12,271	9,591	12,271	7,334	4,871	4,651	6,750	9,591
15-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	71	0	0	0	0	0
Flow exceeded for 90% of the days	1	0	4	422	457	0	0	9	63
Flow exceeded for 80% of the days	9	1	27	694	981	0	2	27	186
Flow exceeded for 70% of the days	56	5	98	1,067	1,431	0	7	71	359
Flow exceeded for 60% of the days	149	30	171	1,426	1,691	1	34	121	511
Flow exceeded for 50% of the days	297	362	292	2,263	2,180	3	103	162	718
Flow exceeded for 40% of the days	552	993	494	2,961	3,012	8	191	236	1,032
Flow exceeded for 30% of the days	930	1,810	751	3,846	3,790	20	287	386	1,530
Flow exceeded for 20% of the days	1,621	2,967	1,154	4,519	4,933	96	555	654	2,051
Flow exceeded for 10% of the days	2,873	4,503	2,049	5,405	5,917	1,190	1,018	1,084	3,038
Maximum	9,755	9,755	8,053	9,755	6,720	4,127	2,681	5,827	8,053
30-day Average Flows									
Flow exceeded for 100% of the days	0	0	0	269	170	0	0	1	0
Flow exceeded for 90% of the days	1	0	7	591	833	0	0	25	89
Flow exceeded for 80% of the days	18	1	63	848	1,091	0	3	67	222
Flow exceeded for 70% of the days	84	5	108	1,170	1,646	1	17	92	421
Flow exceeded for 60% of the days	167	33	193	1,560	2,169	2	63	116	606
Flow exceeded for 50% of the days	326	342	322	2,275	2,483	4	141	172	720
Flow exceeded for 40% of the days	571	936	513	2,930	3,822	8	200	251	1,018
Flow exceeded for 30% of the days	857	1,748	697	3,486	4,697	33	288	395	1,487
Flow exceeded for 20% of the days	1,450	2,751	1,115	4,159	5,135	112	495	557	1,985
Flow exceeded for 10% of the days	2,528	4,555	1,893	4,940	5,629	917	921	879	2,608
Maximum	8,813	8,813	6,785	8,813	6,026	3,470	2,008	4,262	6,785

An exception to this characterization is the decrease in the flow values from the 1928-1941 time interval to the 1942-1958 time interval for all seasonal periods and most exceedance probabilities. This is most likely the result of the early-season high flow events which occurred during the 1928-1941 time interval. These events would have skewed most average flow values higher, especially for the lower exceedance probability ranges (higher flows). A likely additional factor is the beginning of operation of Lake McConaughy in 1941. The 1895-1909 and 1910-1927 time intervals were not considered for the characterizations for this seasonal period due to insufficient data.

Table A.11-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.11-12** shows that flow values decrease by time interval from the 1895-1909 time interval through the 1942-1958 time interval for all averaging times and all exceedance probabilities. This is coincident with the beginning of operation of the major North Platte River reservoir projects. For the 1942-1958 through 1975-1998 time intervals, the flow values are generally consistent with the known climatological conditions during these time intervals. However, the variations between time intervals are not large, which is a possible effect of the North Platte River reservoirs.

Table A.11-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 time interval. **Table A.11-13** shows that the flow values are lower across the board than those for the Apr 16-Jul 15 seasonal period (**Table A.11-12**). Otherwise, the characterizations for the Jun 1-Aug 15 seasonal period are essentially the same as those for the Apr 16-Jul 15 seasonal period. The high frequency of zero-flow values for the 1928-1941 time interval can be attributed to the severe drought conditions of the 1930's.

Table A.11-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.11-14** shows that flow values decrease by time interval from the 1895-1909 time interval through the 1942-1958 time interval for all averaging times and all exceedance probabilities. This is coincident with the beginning of operation of the major North Platte River reservoir projects during this time. For the 1928-1941 through 1975-1998 time intervals, the flow values are generally consistent with the known climatological conditions during these time intervals. The high frequency of extremely low flow values for the 1928-1941 time interval can be attributed to the severe drought conditions of the 1930's.

A.11.5 Median Mean Daily Flow

The median mean daily flow by calendar day is shown on **Figure A.11-6**, reflecting both the effects of climate and changes coincident with development in each time interval. The 1895-1909 time interval shows high values of median mean daily flow in late May and June. The 1910-1927 time interval shows an irregular pattern of high and low values throughout that part of the year for which data are available. The 1928-1941 time interval shows values at or near 0 cfs from early July through mid-October, a likely effect of the 1930's drought period. Values at or near 0 cfs are also shown for early July through the end of September for the 1942-1958 time interval, a likely effect of the 1950's drought period. Median mean daily flows for all subsequent time intervals show a

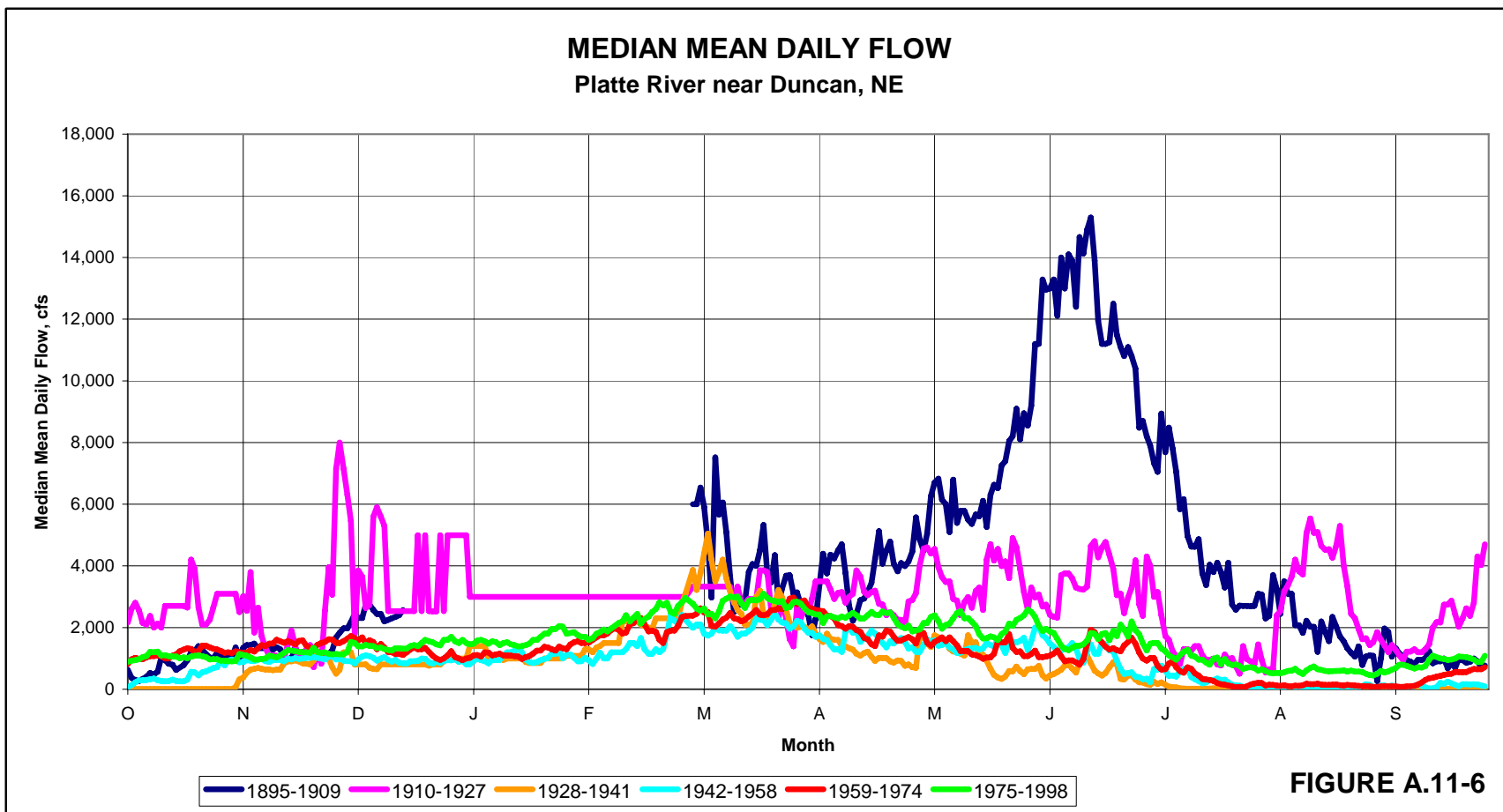


Figure A.11-6 Median Mean Daily Flow.

fairly consistent and steady pattern of highest values in March, values decreasing to their lowest in July and August, and a gradual increase thereafter through the end of the year.

A.11.6. USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.11-7** and **Figure A.11-8** and in **Table A.11-15** and **Table A.11-16**.

Figure A.11-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak flow, and the 10-year running average of the USGS Annual Peak flow. **Figure A.11-7** shows that the magnitudes of the Peak flows are generally consistent with known climatological conditions. The differences between the USGS Annual Peak flow and the Annual Maximum mean daily flow are generally greater before 1941 than after 1941, coincident with the beginning of operation of Lake McConaughy. This characterization is not as noticeable as it is for upstream locations.

Figure A.11-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.11-8** shows that there are 2 time ranges of greatest Peak flow frequency, one between late May and Late June, the other between mid-February and early April. This distinction is not as noticeable as it is for the other locations, possibly because of the shortage of data for the 1895-1909 and 1910-1927 time intervals. Late May through late June is the time frame in which the greatest runoff from high country snowmelt occurs. February through April is the time of increasing lower elevation precipitation and snowmelt runoff from the uncontrolled drainage area downstream of Lake McConaughy.

Table A.11-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.11-15** shows that the average is higher than the median for all time intervals except 1910-1927. This suggests a more uniform distribution of Peak flows over the period of record, from events caused mainly by precipitation and snowmelt runoff from the uncontrolled drainage area downstream of Lake McConaughy. The time of occurrence of both the average and median Peak flows was between late March and late April for all time intervals except 1895-1909. This suggests that at this location, which is far from the sources of mountain runoff and far downstream of the major reservoir projects, regional precipitation and snowmelt runoff is more likely to be the cause of the annual instantaneous Peak flow event.

Table A.11-16 shows the exceedance probabilities and values for the USGS Annual Peak Flow. It is analogous to **Table A.11-5** for Annual Maximum mean daily flows. **Table A.11-16** shows that, for the 1942-1958 through 1975-1998 time intervals, the flows are consistent with the known climatological conditions during these time intervals. For the 1928-1941 time interval, the flow values are skewed high by the very high short-duration Peak flow events during this otherwise very dry time interval.

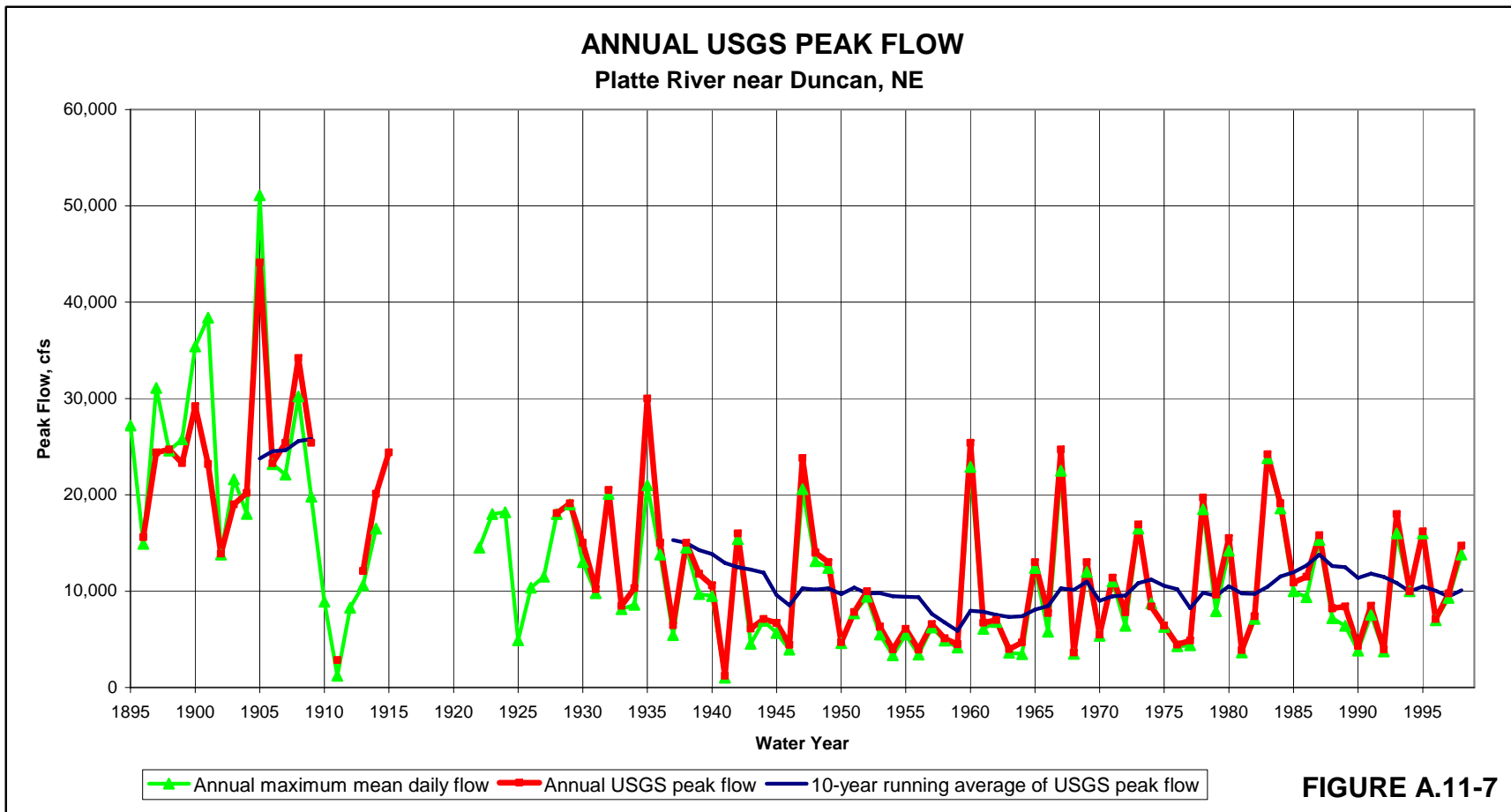


FIGURE A.11-7

Figure A.11-7 Annual USGS Peak Flow.

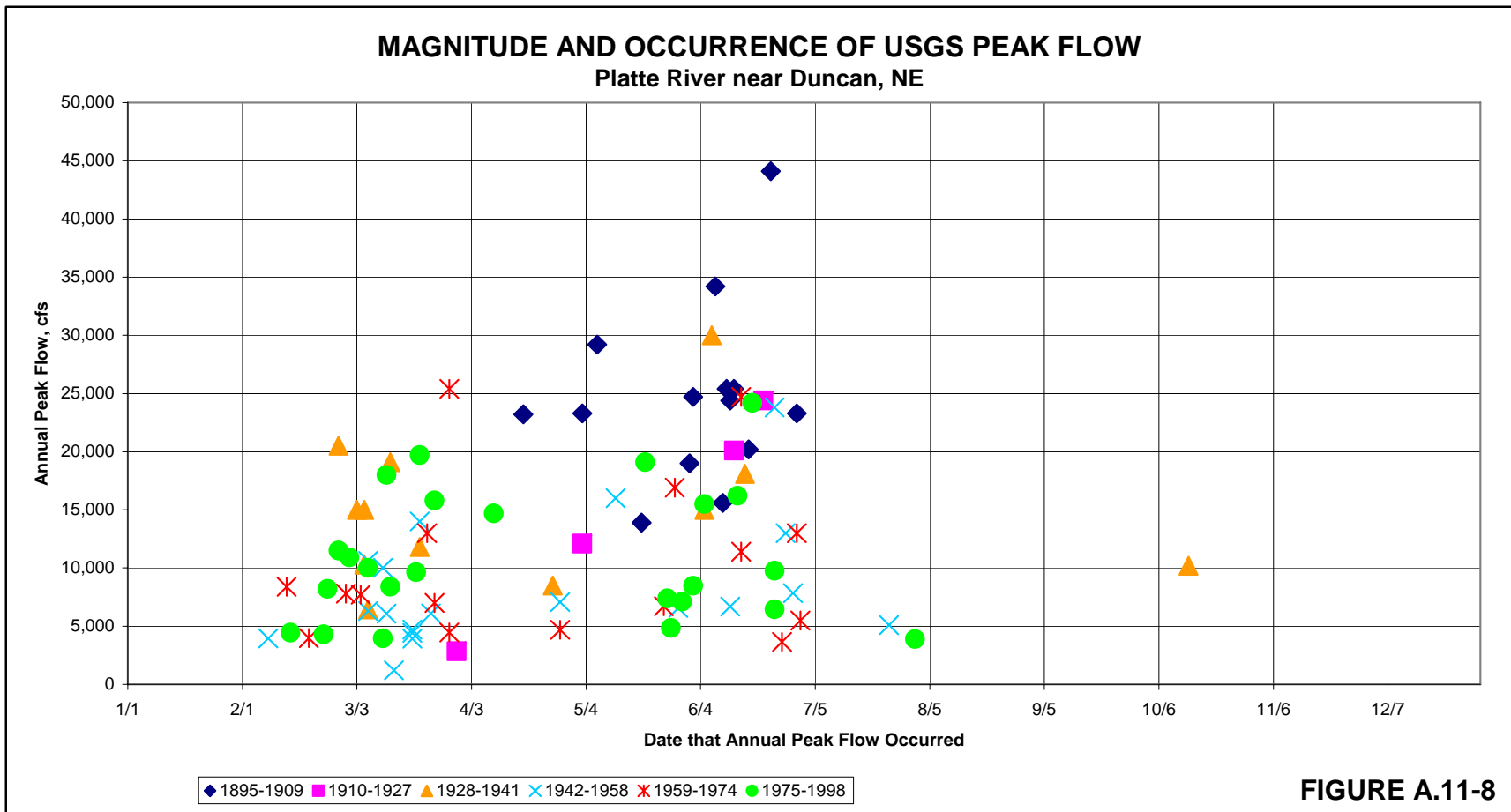


FIGURE A.11-8

Figure A.11-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.11-15 Summary of USGS Peak Flows.

Platte River near Duncan, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	13,140	18,659	10,041	24,707	14,860	13,696	8,564	10,268	10,936
Median Annual Peak Flow (cfs)	10,900	19,050	7,840	23,850	16,100	13,400	6,580	7,760	9,705
Average Occurrence of Peak Flow	4/25	4/28	4/22	6/1	4/12	4/15	4/23	4/24	4/21
Median Occurrence of Peak Flow	4/9	4/10	3/28	6/10	4/5	3/13	3/23	4/27	4/9

Table A.11-16 USGS Peak Flow Exceedance Values.

Platte River near Duncan, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Annual Peak Flows									
Peak exceeded in 100% of the years	1,210	1,210	3,640	13,900	2,840	1,210	3,920	3,640	3,890
Peak exceeded in 90% of the years	4,404	8,661	4,168	16,620	5,618	7,062	4,242	4,220	4,342
Peak exceeded in 80% of the years	6,092	10,840	4,732	19,720	8,396	9,516	4,778	4,680	5,808
Peak exceeded in 70% of the years	7,094	14,230	6,260	22,900	11,174	10,290	5,882	6,100	7,361
Peak exceeded in 60% of the years	8,482	15,240	7,036	23,300	13,700	10,840	6,180	7,000	8,416
Peak exceeded in 50% of the years	10,900	19,050	7,840	23,850	16,100	13,400	6,580	7,760	9,705
Peak exceeded in 40% of the years	13,980	20,380	9,718	24,640	18,500	15,000	6,934	8,400	10,720
Peak exceeded in 30% of the years	16,120	23,300	11,800	25,400	20,530	15,310	8,272	12,200	14,780
Peak exceeded in 20% of the years	20,140	24,640	15,340	26,920	21,820	18,500	12,400	13,000	15,960
Peak exceeded in 10% of the years	24,460	28,820	18,440	32,700	23,110	20,080	14,800	20,800	18,770
Peak Flow	44,100	44,100	25,400	44,100	24,400	30,000	23,800	25,400	24,200

A.12 LOUP RIVER NEAR COLUMBUS, NEBRASKA

A.12.1 Methodology

For this location, a single continuous streamflow record was constructed using records from three gages, as follows:

Gage	Records Used	Data Source
Loup River at Columbus, Nebraska	4/1/1895 – 10/31/1907 (mainly warm season only), 3/12/1911 – 9/30/1915 (mainly warm season only), 10/1/1929 – 9/30/1930, 4/1/1934 – 10/10/1978	Prior to 1915, 1914 Nebraska Hydrographic Report. 1929-1930, 1931 Nebraska Hydrographic Report. 1934-1978, USGS website.
Loup River at Genoa, Nebraska	10/11/1978 – 12/31/1998	USGS website.
Loup River Power Canal, Nebraska	1/1/1937 – 12/31/1998	USGS website.

Where data do not exist for the Loup River at Columbus, Nebraska, data from the Genoa gage were substituted. The gages cover approximately 20 miles of the Loup River from Genoa, Nebraska to Columbus, Nebraska.

For this analysis, flow through the Loup River Power Canal diversion was added to the flow at Columbus or Genoa, beginning on 1/1/1937, to approximate the total flow contributed by the Loup River system. The Loup River Power Canal diversion upstream of Genoa was used because the Loup River Power Canal return flows downstream of Columbus are not known. The flow characterizations for the Loup River at Columbus, Nebraska, are given in **Table A.12-1** (mean daily values), **Table A.12-2** (annual 3-, 7-, 15-, and 30- day running average values), **Table A.12-3** (seasonal 3-, 7-, 15-, and 30- day running average values), and **Table A.12-4** (flow frequencies).

As described in **Table 2** of the main report, three large reservoir storage projects affect streamflow in the Loup River basin. These are the Sherman Reservoir (Middle Loup basin), the Calamus Reservoir (North Loup basin), and the Davis Creek Reservoir (North Loup basin), which began operations in 1964, 1985, and 1992, respectively.

A.12.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.12-1 and **Figure A.12-1** show that, from the 1928-1941 time interval through the 1959-1974 time interval, there was a steady increase in the average Annual Maximum mean daily flow. This was followed by a decrease in the 1975-1998 time interval. The average and median maximum flows in the 1895-1909 time interval were similar to those in the 1928-1941 time interval; the 1910-1927 time interval cannot be meaningfully

Table A.12-1 Annual Maximum Mean Daily Flow.

Loup River near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	15,829	12,840	17,298	12,916	10,024	14,284	18,123	19,817	15,034
Median Annual Maximum Mean Daily Flow (cfs)	12,057	11,305	12,340	10,648	11,000	11,960	14,760	15,144	11,985
Average Annual Flow Volume (kaf)	1,720	1,508	1,825	1,424	1,501	1,645	1,788	1,728	1,915
Median Annual Flow Volume (kaf)	1,723	1,624	1,795	1,318	1,626	1,672	1,790	1,688	1,935
Average Mean Daily Flow (cfs)	2,660	2,944	2,520	3,209	3,219	2,379	2,470	2,386	2,645
Median Mean Daily Flow (cfs)	2,315	2,472	2,206	2,690	2,440	2,048	2,107	2,182	2,457
Average Number of Mean Daily Flow Measurements	331	262	365	218	235	345	365	365	365
Number of Years of Data	85 of 104	28 of 47	57 of 57	14 of 15	5 of 18	9 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	8,120	8,229	8,096	5,959	3,360	9,973	7,881	5,445	10,015
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	12,551	11,560	13,021	12,293	8,896	11,982	16,452	13,487	10,280
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	12,202	10,482	13,016	11,642	7,210	10,623	15,969	15,062	9,560
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	7,411	7,399	7,416	8,627	6,530	6,107	7,722	8,943	6,183
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	6,405	6,826	6,290	6,113	3,360	8,825	6,580	4,880	8,155
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	10,500	10,600	10,080	10,895	10,400	10,600	12,760	9,920	7,465
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	8,550	9,510	7,780	10,895	6,020	9,790	12,760	7,160	6,900
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	4,838	5,180	4,510	4,995	5,180	5,420	5,980	2,820	4,475
Difference ("Apr-Jul Average" - "Jul-Sep Average")	5,141	4,161	5,604	3,666	2,366	5,874	8,730	4,544	4,098
Difference ("Apr-Jul Median" - "Jul-Sep Median")	5,662	5,420	5,570	5,900	5,220	5,180	6,780	7,101	2,990
Average Occurrence of Maximum Mean Daily Flow	5/24	6/9	5/17	6/23	6/20	5/17	5/21	5/28	5/8
Median Occurrence of Maximum Mean Daily Flow	6/3	6/10	5/30	6/17	6/4	5/26	6/10	6/2	5/28
Average Annual Minimum Mean Daily Flow (cfs)	486	447	491			447	501	446	514
Median Annual Minimum Mean Daily Flow (cfs)	460	455	460			455	495	388	493
Average occurrences per year of the Minimum	1	1	1			1	1	1	1
Occuring between	10/6	12/28	9/23			12/28	10/26	8/22	9/19
and	10/7	12/29	9/24			12/29	10/27	8/23	9/20
Median occurrences per year of the Minimum	1	1	1			1	1	1	1
Occuring between	8/16	1/30	8/15			1/30	1/3	8/16	8/6
and	8/17	1/31	8/16			1/31	1/4	8/17	8/7

evaluated due to incomplete data. In contrast, the average flow volume increased in the 1975-1998 time interval (**Figure A.12-2**) after remaining relatively constant in the 1942-1958 and 1959-1974 time intervals.

Figure A.12-1 shows the Annual Maximum mean daily flow, the annual maximum 30-day average flow, and the 10-year running average of the Annual Maximum mean daily flow. Several characterizations can be made from **Figure A.12-1**. The most noteworthy is that, while there is considerable year-to-year variation in Annual Maximum mean daily flow, the annual maximum 30-day average flow is relatively constant. This indicates that most maximums on the Loup River are short-duration runoff maximums. It is also noteworthy that, after the high maximum in 1966, annual maximums tended to be somewhat lower than the maximums which occurred before 1966. This is reflected in the 10-year running average, which is lower after this time. Sherman Reservoir in the Middle Loup River basin began operation in 1964.

Figure A.12-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.12-3** shows some concentration in the occurrences of the Annual Maximum mean daily flow in March and June, but with significant scatter throughout the year except for mid-October through early February, a season in which no annual maximums have been recorded. This pattern is consistent with the following climatological characteristics of the Loup River basin: March is the main snowmelt month, June is the month with the most precipitation, and the winter months are consistently cold enough that the Loup River and its tributaries are frequently frozen over (NOAA, 2005 [Nebraska]).

The seasonal period exhibiting the highest average maximum mean daily flows was Apr 16-Jul 15 for all time intervals (**Table A.12-1**). This is also the case for the median seasonal maximum mean daily flows, except for the 1975-1998 time interval, when it occurred in the Feb 15-Mar 16 seasonal period. For both average and median seasonal maximum flows there was a decrease from the Apr 16-Jul 15 seasonal period to the Jun 1-Aug 15 seasonal period for all time intervals considered except 1895-1909 and 1942-1958, for which the median seasonal maximum flows were equal. The average and median Dates of Maximum Flow occurred in mid-May through mid-June for all time intervals.

Figure A.12-4 shows that the Annual Minimum mean daily flow and the 10-year running average of the annual minimum flow are relatively constant from the 1930's to the end of the period of record, except for a short period of very low values centered on 1980. On the other hand, there is significant variability in the values of the annual minimum 30-day average flow. The most plausible explanation for this overall pattern is that year-to-year climatic variations at this location are more likely to show up in a 30-day average computation than in an individual daily minimum value. The average and median Dates of Minimum Flow do not show a consistent season of occurrence. Minimum flows were not calculated for years with incomplete flow records.

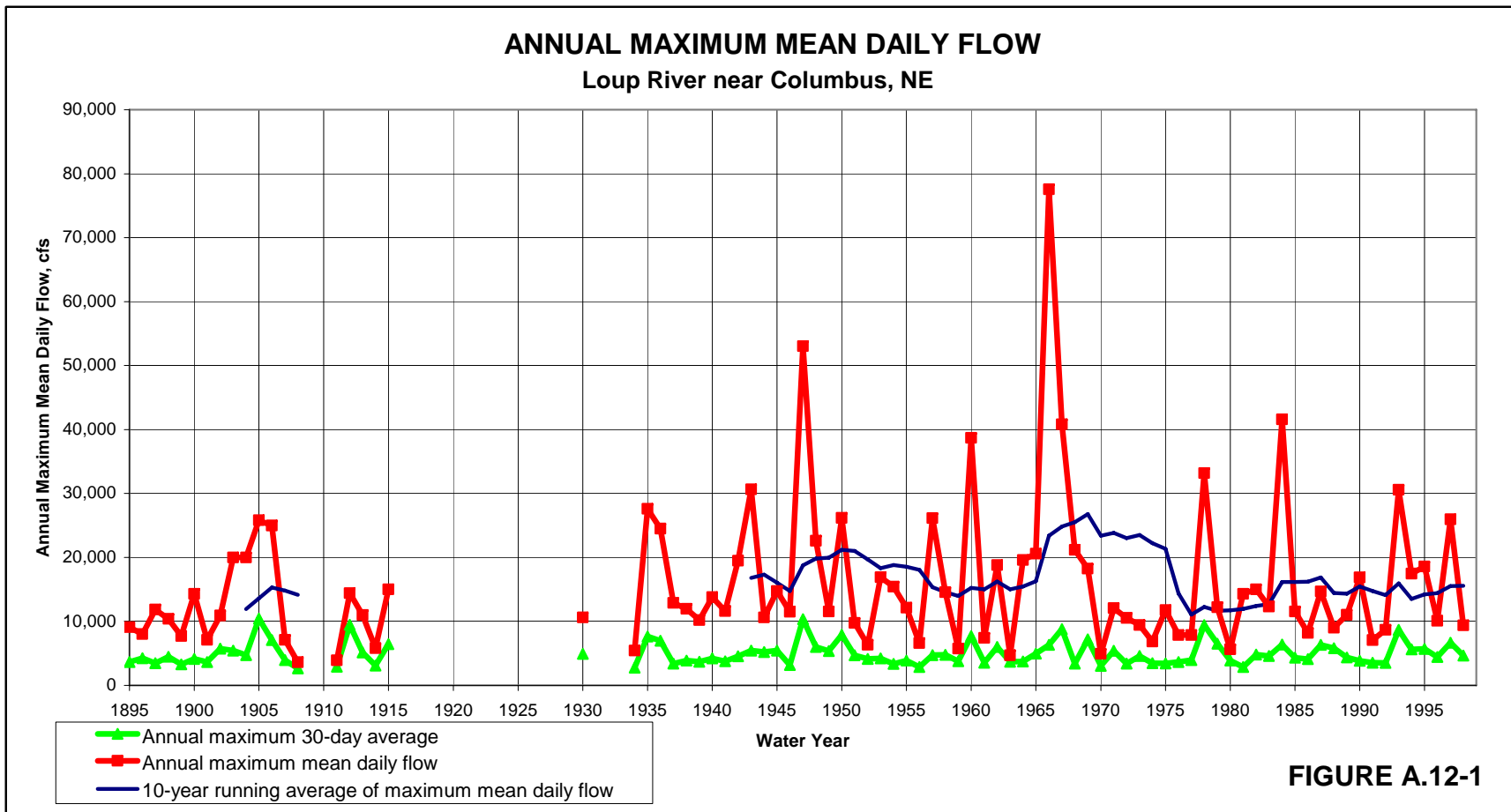


Figure A.12-1 Annual Maximum Mean Daily Flow.

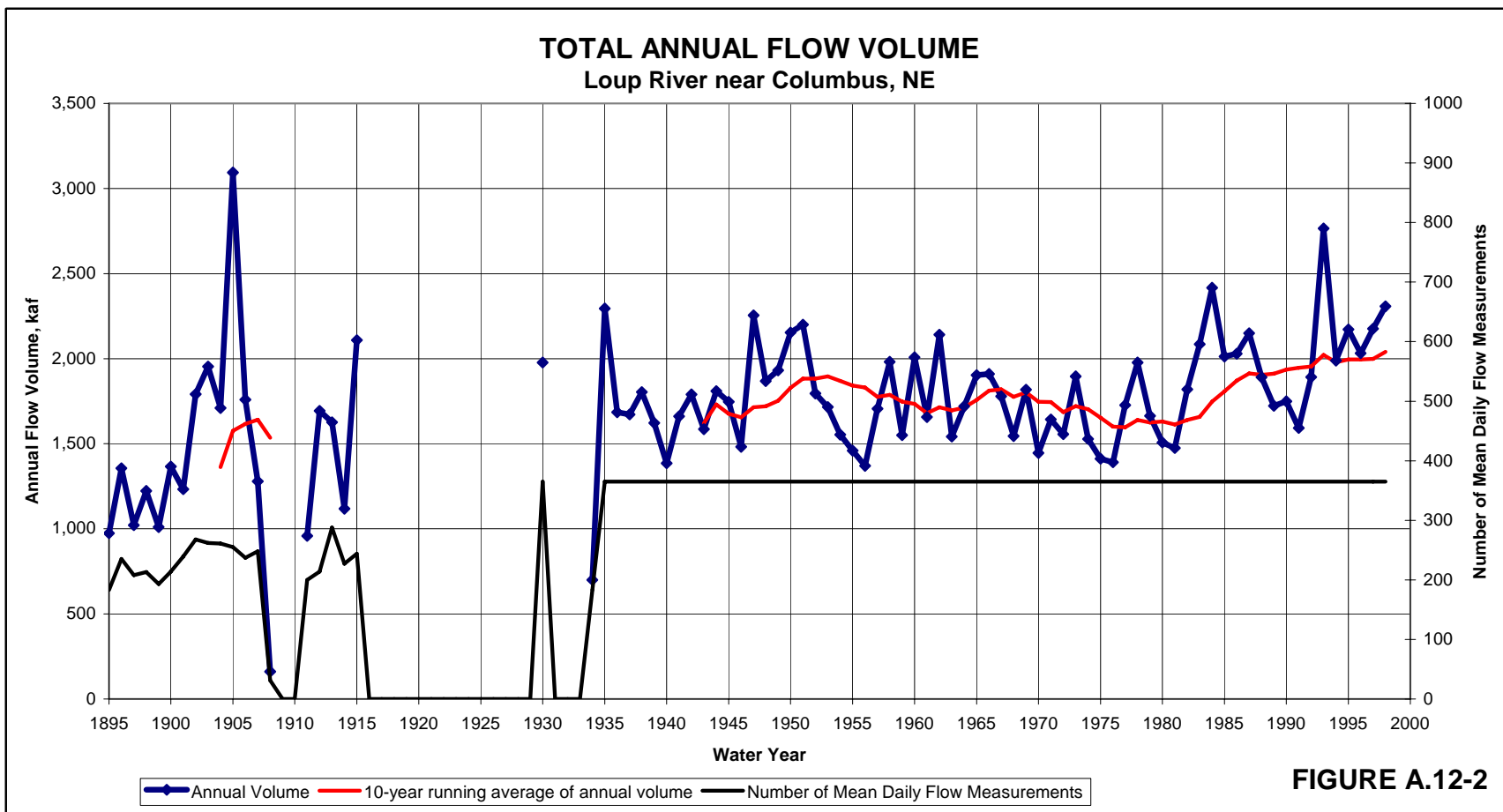


Figure A.12-2 Total annual flow volume.

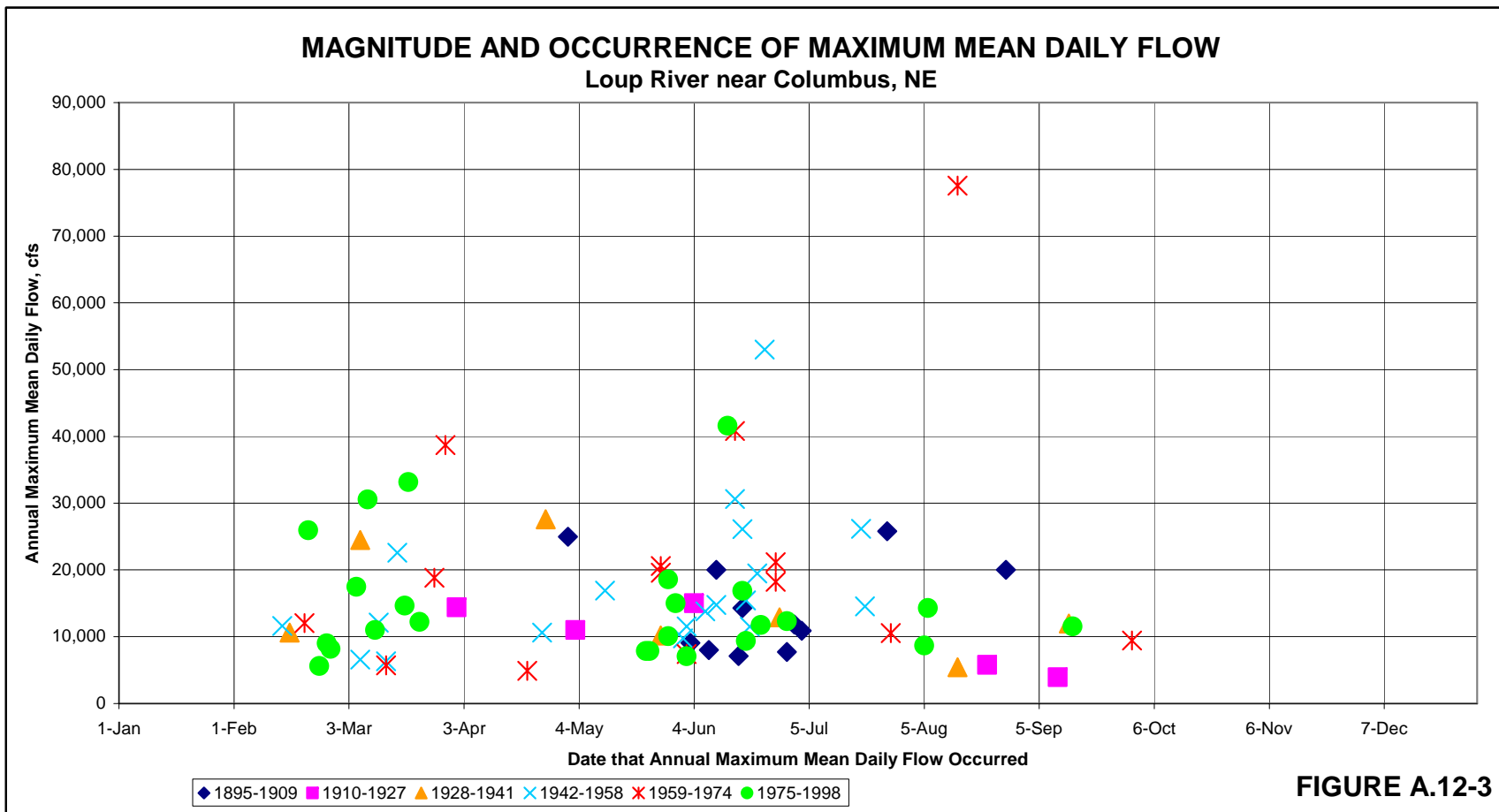


FIGURE A.12-3

Figure A.12-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

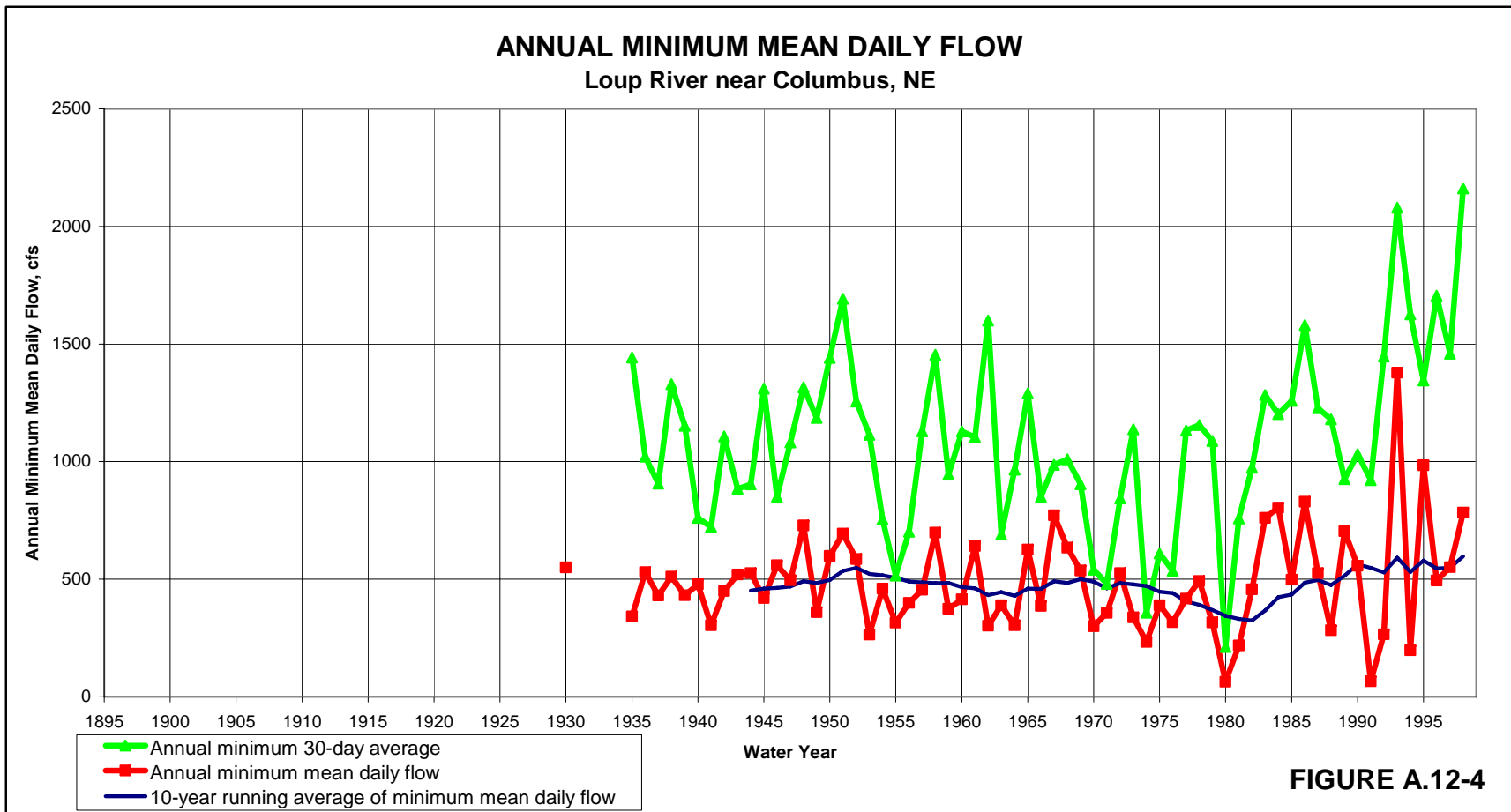


Figure A.12-4 Annual Minimum Mean Daily Flow.

A.12.3 3-, 7-, 15- and 30-day Averages of Mean Daily Flows

Table A.12-2 shows that there is significant attenuation of both average and median Annual Maximum mean daily flow due to the averaging process, indicating that most maximums at this location are short-duration runoff maximums.

Table A.12-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flows and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. Prior to April 1934, flow records for this location are incomplete; as a result, limited information can be gleaned for the 1895-1909 and 1910-1927 time intervals. The highest flows for all averaging times occur in the Apr 16 – Jul 15 seasonal period during the 1942-1958 and 1959-1974 time intervals. Flow distributions shift in the 1975-1998 time interval such that the highest flows for all averaging times occur in the Feb 15-Mar 16 period. These changes in distribution and timing may have been influenced by the beginning of operation of Sherman Reservoir in 1962, Calumet Reservoir in 1985, and Davis Creek Reservoir in 1992

The averages are greater than the medians across the board, but the differences between them decrease with increasing averaging time. This suggests that the averages are skewed higher by the occurrence of a small number of very high short-duration events such as those which occurred in 1947 and 1966 (**Figure A.12-1**).

A.12.4 Flow Frequency

A.12.4.1 Flow Ranges

Table A.12-4 and **Figure A.12-5** show a flow frequency pattern which is fairly consistent from one time interval to the next. For percentage of years, all flow ranges between 751 cfs and 6,000 cfs show a percentage frequency of 85 percent or higher for all time intervals except 1895-1909 and 1910-1927, which have lower percentages for the 751-1000-cfs flow range. Most of these flow ranges have a percentage frequency of 100 percent. The data for the 1895-1909 and 1910-1927 time intervals contain a bias resulting from the shortage of data for the drier times of the year for these time intervals.

For percentage of days, the flow ranges between 1,001 cfs and 4,000 cfs all show percentage frequencies of 10 percent or higher. The highest percentage frequencies, between approximately 38 and 46 percent, are found in the 2,001-3,000-cfs flow range for all time intervals except 1928-1941, when it is found in the 1,001-2,000-cfs flow range.

Table A.12-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Loup River near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	15,829	12,840	17,298	12,916	10,024	14,284	18,123	19,817	15,034
Median Annual Maximum Mean Daily Flow (cfs)	12,057	11,305	12,340	10,648	11,000	11,960	14,760	15,144	11,985
Avg. Ann. Max. 3-day Avg. Flow (cfs)	11,799	9,699	12,831	9,188	8,485	11,171	13,026	14,132	11,824
Median Ann. Max. 3-day Avg. Flow (cfs)	9,360	8,613	10,070	7,213	9,360	8,997	10,070	9,674	9,770
Avg. Ann. Max. 7-day Avg. Flow (cfs)	8,529	7,638	8,967	7,397	6,994	8,370	8,836	9,244	8,875
Median Ann. Max. 7-day Avg. Flow (cfs)	7,093	6,246	7,270	5,965	6,830	6,805	7,307	6,853	7,208
Avg. Ann. Max. 15-day Avg. Flow (cfs)	6,319	5,923	6,514	5,830	6,086	5,976	6,495	6,470	6,557
Median Ann. Max. 15-day Avg. Flow (cfs)	5,370	4,966	5,558	4,894	5,721	5,293	5,596	5,228	5,631
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,954	4,823	5,019	4,774	5,410	4,575	5,059	4,936	5,045
Median Ann. Max. 30-day Avg. Flow (cfs)	4,458	4,165	4,598	4,187	5,146	3,871	4,733	4,179	4,512
Average Annual Minimum Mean Daily Flow (cfs)	486	447	491			447	501	446	514
Median Annual Minimum Mean Daily Flow (cfs)	460	455	460			455	495	388	493
Avg. Ann. Min. 3-day Avg. Flow (cfs)	555	510	561			510	580	495	591
Median Ann. Min. 3-day Avg. Flow (cfs)	546	486	546			486	554	443	579
Avg. Ann. Min. 7-day Avg. Flow (cfs)	691	625	699			625	717	583	765
Median Ann. Min. 7-day Avg. Flow (cfs)	662	594	664			594	692	558	709
Avg. Ann. Min. 15-day Avg. Flow (cfs)	891	823	899			823	913	748	989
Median Ann. Min. 15-day Avg. Flow (cfs)	859	867	855			867	933	790	864
Avg. Ann. Min. 30-day Avg. Flow (cfs)	1,090	1,048	1,095			1,048	1,100	927	1,204
Median Ann. Min. 30-day Avg. Flow (cfs)	1,105	1,021	1,106			1,021	1,114	955	1,191

Table A.12-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Loup River near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	11,799	9,699	12,831	9,188	8,485	11,171	13,026	14,132	11,824
Median Ann. Max. 3-day Avg. Flow (cfs)	9,360	8,613	10,070	7,213	9,360	8,997	10,070	9,674	9,770
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	7,003	7,215	6,954	5,473	3,287	8,578	6,479	4,968	8,615
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	9,284	8,682	9,570	9,054	7,432	8,838	11,504	10,063	7,870
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	8,800	7,729	9,307	8,059	5,997	8,216	11,331	10,035	7,387
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	5,376	5,638	5,252	6,640	5,313	4,369	5,514	5,613	4,826
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	5,708	6,078	5,469	5,611	3,287	7,110	5,583	4,570	7,063
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	7,950	7,943	7,957	7,283	9,360	7,943	8,457	7,705	6,088
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	7,030	7,283	6,636	7,283	5,360	7,430	8,220	5,745	5,835
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	3,964	4,241	3,884	4,755	4,233	4,007	4,336	2,616	3,892
Loup River near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	8,529	7,638	8,967	7,397	6,994	8,370	8,836	9,244	8,875
Median Ann. Max. 7-day Avg. Flow (cfs)	7,093	6,246	7,270	5,965	6,830	6,805	7,307	6,853	7,208
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	5,668	6,644	5,514	4,342		6,932	5,067	4,240	6,680
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	6,684	6,830	6,615	7,381	6,135	6,421	7,720	6,664	5,800
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	6,255	6,052	6,351	6,587	5,064	5,827	7,632	6,440	5,385
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	4,060	4,379	3,909	5,151	4,355	3,276	4,215	3,751	3,798
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	4,886	5,359	4,754	4,342		5,399	4,881	4,026	5,678
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	5,882	6,014	5,386	6,014	6,830	5,976	6,491	4,994	5,123
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	5,302	5,915	4,846	6,014	4,789	5,329	6,064	4,275	4,255
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	3,289	3,532	3,040	4,447	3,440	2,967	3,130	2,304	3,121
Loup River near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	6,319	5,923	6,514	5,830	6,086	5,976	6,495	6,470	6,557
Median Ann. Max. 15-day Avg. Flow (cfs)	5,370	4,966	5,558	4,894	5,721	5,293	5,596	5,228	5,631
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	4,449	4,935	4,381			4,935	3,932	3,779	5,101
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	5,075	5,348	4,945	5,753	5,306	4,788	5,650	4,863	4,501
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	4,676	4,674	4,677	5,263	4,077	4,154	5,647	4,543	4,080
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	3,203	3,668	2,983	4,293	3,852	2,662	3,193	2,785	2,967
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	3,914	4,318	3,881			4,318	3,856	3,805	4,590
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	4,528	4,637	4,471	4,731	5,721	4,519	5,475	3,962	4,294
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	3,954	4,197	3,919	4,833	3,280	3,725	5,198	3,534	3,827
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	2,799	3,209	2,620	3,605	3,209	2,683	2,777	1,989	2,652
Loup River near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,954	4,823	5,019	4,774	5,410	4,575	5,059	4,936	5,045
Median Ann. Max. 30-day Avg. Flow (cfs)	4,458	4,165	4,598	4,187	5,146	3,871	4,733	4,179	4,512
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	3,584	3,664	3,573			3,664	3,189	3,255	4,057
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	4,085	4,409	3,931	4,574	4,878	3,911	4,430	3,811	3,658
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	3,657	3,846	3,567	4,208	3,405	3,569	4,249	3,352	3,228
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	2,576	3,016	2,376	3,720	2,659	2,275	2,504	2,212	2,393
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	3,338	3,320	3,355			3,320	3,019	3,210	3,827
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	3,541	3,798	3,427	4,135	5,146	3,375	4,525	3,338	3,417
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	3,233	3,558	3,153	3,767	2,765	3,308	4,230	2,898	2,692
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	2,336	2,709	2,073	3,006	2,783	2,336	2,214	1,740	2,190

Table A.12-4 Flow Frequency Distributions.

Loup River near Columbus, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	4	0	5	0	0	0	0	0	13
201 to 500	45	18	58	0	0	56	53	63	58
501 to 750	69	32	88	0	0	100	100	94	75
751 to 1,000	81	46	98	29	0	100	100	100	96
1,001 to 2,000	98	93	100	86	100	100	100	100	100
2,001 to 3,000	100	100	100	100	100	100	100	100	100
3,001 to 4,000	100	100	100	100	100	100	100	100	100
4,001 to 5,000	98	93	100	93	80	100	100	100	100
5,001 to 6,000	95	93	96	93	80	100	100	88	100
6,001 to 8,000	88	86	89	93	60	89	100	75	92
8,001 to 10,000	65	64	65	50	60	89	65	56	71
10,001 to 12,000	54	64	49	57	60	78	65	50	38
12,001 to 15,000	34	32	35	29	40	33	35	25	42
Greater than 15,000	35	21	42	29	0	22	47	50	33
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Loup River near Columbus, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2
201 to 500	0.9	0.3	1.1	0.0	0.0	0.8	0.7	1.7	0.9
501 to 750	2.1	1.0	2.5	0.0	0.0	2.3	2.6	3.0	2.1
751 to 1,000	3.8	2.9	4.1	0.4	0.0	6.4	3.7	5.2	3.6
1,001 to 2,000	28.9	25.9	29.9	14.4	21.0	39.1	35.2	31.5	25.2
2,001 to 3,000	40.1	39.9	40.2	46.4	43.4	32.3	37.9	41.0	41.2
3,001 to 4,000	13.9	15.2	13.5	19.7	16.0	10.6	10.8	11.0	17.0
4,001 to 5,000	4.8	6.1	4.3	8.2	7.3	3.5	4.5	3.1	5.0
5,001 to 6,000	2.1	3.1	1.7	4.1	3.8	1.7	1.6	1.4	2.0
6,001 to 8,000	1.8	2.9	1.5	4.1	4.0	1.3	1.6	1.1	1.6
8,001 to 10,000	0.6	1.1	0.4	1.0	2.5	0.8	0.5	0.3	0.5
10,001 to 12,000	0.4	0.7	0.2	0.5	1.4	0.6	0.3	0.2	0.2
12,001 to 15,000	0.2	0.4	0.2	0.5	0.6	0.2	0.2	0.1	0.2
Greater than 15,000	0.4	0.5	0.3	0.7	0.0	0.4	0.3	0.4	0.3
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Loup River near Columbus, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	0	0	0	0	0	0	0	0	1
201 to 500	3	1	4	0	0	3	3	6	3
501 to 750	7	3	9	0	0	8	10	11	8
751 to 1,000	12	8	15	1	0	22	13	19	13
1,001 to 2,000	96	68	109	31	49	135	128	115	92
2,001 to 3,000	133	104	147	101	102	111	138	150	150
3,001 to 4,000	46	40	49	43	38	37	40	40	62
4,001 to 5,000	16	16	16	18	17	12	16	11	18
5,001 to 6,000	7	8	6	9	9	6	6	5	7
6,001 to 8,000	6	8	5	9	9	5	6	4	6
8,001 to 10,000	2	3	2	2	6	3	2	1	2
10,001 to 12,000	1	2	1	1	3	2	1	1	1
12,001 to 15,000	1	1	1	1	1	1	1	0	1
Greater than 15,000	1	1	1	2	0	1	1	1	1
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

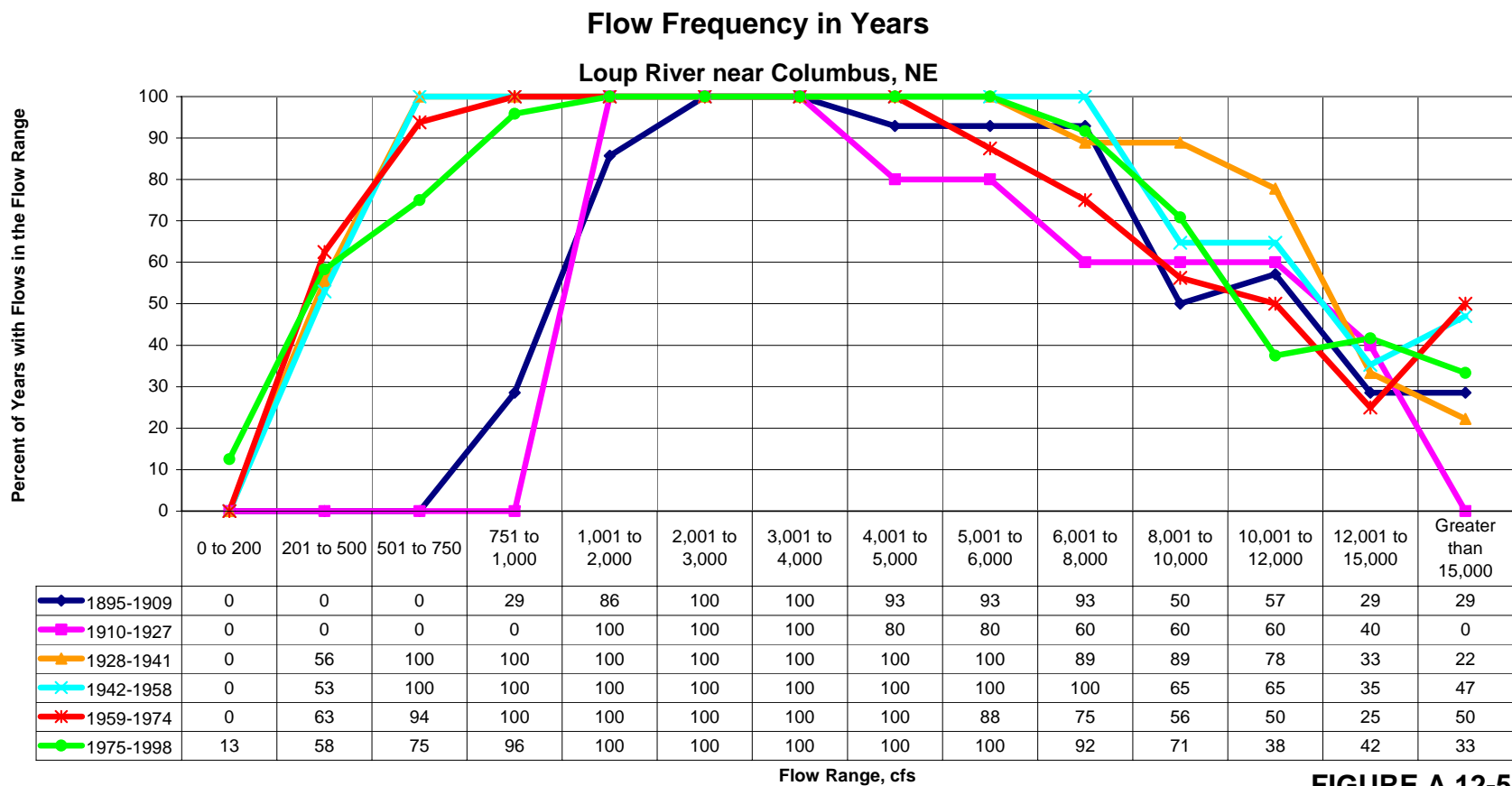


FIGURE A.12-5

Figure A.12-5 Flow Frequency in Years.

A.12.4.2 Maximum Mean Flow Exceedance

Table A.12-5 through **Table A.12-9** show the exceedance values and probabilities for the maximum flow for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.12-5 shows the exceedance probabilities and values for annual data. **Table A.12-5** shows that the flow values are lowest for the 1928-1941 time interval due to the drought conditions of the 1930's, and increase from the 1928-1941 time interval to the 1942-1958 time interval. The 1895-1909 and 1910-1927 time intervals are not included in this comparison due to the previously mentioned bias in the data for these time intervals. Flow values decrease from the 1942-1958 time interval to the 1959-1974 time interval for the higher exceedance probabilities (i.e. lower flows) and decrease for the lower exceedance probabilities (higher flows). The decreases for the higher exceedance probabilities coincide with the beginning of operation of Sherman Reservoir in 1962. The increases for the lower exceedance probabilities (higher flows) are most likely the result of the very high flow event of 1966 (**Figure A.12-1**). The flow values increase from the 1959-1974 time interval to the 1975-1998 time interval for the higher exceedance probabilities and decrease for the lower exceedance probabilities. The flow range between the 10 percent and 90 percent exceedance probabilities is smaller for the 1975-1998 time interval than it is for the 1959-1974 time interval for all averaging times. This might reflect the effect of the beginning of operation of Calamus and Davis Creek Reservoirs in 1985 and 1992, respectively.

Table A.12-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.12-6** shows that the flow values do not show a consistent characterization by time interval with respect to either climatological condition or human-caused effects. Since the Loup River system originates in semi-arid western Nebraska and has its confluence with the Platte River near Columbus, which has a more humid climate and more reliable precipitation during this seasonal period (NOAA, 2005 [Nebraska]), there is the potential for significant variations in weather conditions along the lengths of the Loup River and its tributaries at this time of year. This is a possible, but entirely speculative, explanation for this lack of a consistent characterization for the Loup River at Columbus for this seasonal period.

Table A.12-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.12-7** shows that the flow values are lowest for the 1928-1941 time interval due to the drought conditions of the 1930's, and generally increase from the 1928-1941 time interval to the 1942-1958 time interval. Flow values decrease from the 1942-1958 through 1975-1998 time intervals, for all exceedance probabilities and for all averaging times. This is coincident with the beginning of operation of the respective upstream reservoirs, as previously discussed in this section. For the 30-day averaging period, there are few notable changes by time

Table A.12-5 Maximum Flow Exceedance Values, Annual Data.

Loup River near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	3,620	3,620	4,690	3,620	3,920	5,420	6,320	4,690	5,620
Maximum exceeded in 90% of the years	6,424	5,686	6,742	7,098	4,672	9,236	8,476	5,315	7,850
Maximum exceeded in 80% of the years	7,850	7,345	8,290	7,468	5,424	10,436	10,788	6,850	8,490
Maximum exceeded in 70% of the years	9,808	9,191	10,012	7,971	6,840	11,004	11,532	8,420	9,335
Maximum exceeded in 60% of the years	11,006	10,560	11,534	9,344	8,920	11,680	13,102	10,530	11,114
Maximum exceeded in 50% of the years	12,057	11,305	12,340	10,648	11,000	11,960	14,760	15,144	11,985
Maximum exceeded in 40% of the years	14,464	12,148	15,266	11,639	12,360	12,712	16,306	18,820	13,900
Maximum exceeded in 30% of the years	17,362	14,248	18,620	14,870	13,720	13,428	20,102	20,088	15,206
Maximum exceeded in 20% of the years	20,698	18,000	22,306	20,000	14,520	18,068	25,430	21,170	17,916
Maximum exceeded in 10% of the years	27,028	24,650	31,650	23,500	14,760	25,120	27,954	39,755	29,187
Maximum	77,565	27,600	77,565	25,800	15,000	27,600	53,020	77,565	41,600
3-day Average Flows									
Maximum exceeded in 100% of the years	3,243	3,243	4,307	3,243	3,542	4,437	5,469	4,307	5,317
Maximum exceeded in 90% of the years	5,424	4,383	5,724	5,449	3,828	7,242	6,711	4,938	6,574
Maximum exceeded in 80% of the years	6,462	6,089	6,882	6,115	4,114	8,102	8,009	5,780	7,090
Maximum exceeded in 70% of the years	7,320	6,737	8,167	6,333	5,277	8,273	8,236	6,480	8,296
Maximum exceeded in 60% of the years	8,343	7,811	8,633	6,782	7,319	8,495	8,962	7,467	8,853
Maximum exceeded in 50% of the years	9,360	8,613	10,070	7,213	9,360	8,997	10,070	9,674	9,770
Maximum exceeded in 40% of the years	10,527	9,404	10,950	8,541	10,096	9,594	11,195	15,900	10,542
Maximum exceeded in 30% of the years	11,727	10,412	13,255	9,671	10,832	11,019	13,059	16,463	11,084
Maximum exceeded in 20% of the years	16,980	13,188	17,772	12,132	11,773	14,442	18,424	17,126	13,567
Maximum exceeded in 10% of the years	20,015	17,896	26,488	16,786	12,920	19,173	19,387	31,097	24,316
Maximum	40,457	22,667	40,457	19,267	14,067	22,667	40,457	38,234	28,467
7-day Average Flows									
Maximum exceeded in 100% of the years	2,849	2,849	3,994	2,849	3,334	3,517	4,277	3,994	4,860
Maximum exceeded in 90% of the years	4,475	3,736	4,711	4,480	3,532	4,966	5,306	4,225	5,452
Maximum exceeded in 80% of the years	5,313	5,298	5,328	5,308	3,731	5,717	5,518	4,607	5,741
Maximum exceeded in 70% of the years	5,634	5,517	5,994	5,496	4,430	6,173	6,425	4,705	6,394
Maximum exceeded in 60% of the years	6,357	5,964	6,643	5,612	5,630	6,537	6,799	4,843	7,061
Maximum exceeded in 50% of the years	7,093	6,246	7,270	5,965	6,830	6,805	7,307	6,853	7,208
Maximum exceeded in 40% of the years	7,738	7,005	7,865	6,021	7,642	8,147	7,597	8,996	7,896
Maximum exceeded in 30% of the years	8,968	8,498	9,456	7,785	8,454	8,706	9,689	10,700	9,154
Maximum exceeded in 20% of the years	12,084	8,858	12,461	8,562	9,511	10,143	12,112	14,666	9,860
Maximum exceeded in 10% of the years	15,649	12,866	17,124	12,826	10,814	13,225	13,038	18,816	15,775
Maximum	22,479	17,821	22,479	17,491	12,117	17,821	22,479	20,198	20,948
15-day Average Flows									
Maximum exceeded in 100% of the years	2,699	2,699	3,354	2,699	3,181	3,203	3,354	3,661	3,935
Maximum exceeded in 90% of the years	3,769	3,267	3,927	3,723	3,227	3,621	3,952	3,772	4,140
Maximum exceeded in 80% of the years	4,146	3,914	4,154	4,228	3,272	4,202	4,720	3,914	4,683
Maximum exceeded in 70% of the years	4,611	4,435	4,867	4,408	3,780	4,566	5,333	4,057	4,901
Maximum exceeded in 60% of the years	5,059	4,671	5,220	4,722	4,751	4,768	5,508	4,156	5,184
Maximum exceeded in 50% of the years	5,370	4,966	5,558	4,894	5,721	5,293	5,596	5,228	5,631
Maximum exceeded in 40% of the years	5,760	5,410	5,956	5,006	6,350	5,350	6,032	5,936	5,927
Maximum exceeded in 30% of the years	6,951	5,886	7,203	5,624	6,979	5,881	6,690	7,230	7,382
Maximum exceeded in 20% of the years	7,768	7,406	8,015	6,535	8,023	7,747	7,353	10,138	8,075
Maximum exceeded in 10% of the years	10,622	10,255	10,560	8,848	9,482	10,179	9,301	11,061	10,051
Maximum	14,887	14,614	14,887	14,614	10,941	10,786	14,887	13,024	14,494
30-day Average Flows									
Maximum exceeded in 100% of the years	2,625	2,625	2,875	2,625	2,899	2,746	2,877	3,056	2,875
Maximum exceeded in 90% of the years	3,315	3,041	3,390	3,338	2,980	3,250	3,272	3,388	3,504
Maximum exceeded in 80% of the years	3,523	3,406	3,558	3,561	3,062	3,558	3,935	3,481	3,748
Maximum exceeded in 70% of the years	3,764	3,658	3,872	3,654	3,511	3,718	4,208	3,607	3,950
Maximum exceeded in 60% of the years	4,115	3,852	4,268	3,987	4,329	3,796	4,599	3,741	4,339
Maximum exceeded in 50% of the years	4,458	4,165	4,598	4,187	5,146	3,871	4,733	4,179	4,512
Maximum exceeded in 40% of the years	4,792	4,513	4,904	4,415	5,659	4,130	5,040	4,969	4,779
Maximum exceeded in 30% of the years	5,431	5,125	5,474	4,801	6,171	4,635	5,372	5,701	5,722
Maximum exceeded in 20% of the years	6,325	6,157	6,259	5,561	7,037	5,744	5,434	6,322	6,349
Maximum exceeded in 10% of the years	7,453	7,231	7,386	6,667	8,255	7,099	6,738	7,438	6,621
Maximum	10,419	10,419	10,339	10,419	9,474	7,634	10,339	8,786	9,422

Table A.12-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Loup River near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	2,710	3,360	2,710	3,360	3,360	3,805	3,620	2,800	2,710
Maximum exceeded in 90% of the years	3,799	3,449	4,014	3,972	3,360	4,523	4,284	3,705	4,400
Maximum exceeded in 80% of the years	4,434	4,215	4,466	4,584	3,360	5,504	5,012	3,960	4,976
Maximum exceeded in 70% of the years	4,997	5,172	5,018	5,196	3,360	6,571	5,788	4,370	5,570
Maximum exceeded in 60% of the years	5,756	6,293	5,744	5,685	3,360	6,959	6,388	4,570	6,274
Maximum exceeded in 50% of the years	6,405	6,826	6,290	6,113	3,360	8,825	6,580	4,880	8,155
Maximum exceeded in 40% of the years	7,134	7,306	7,136	6,541	3,360	10,584	7,140	5,220	8,936
Maximum exceeded in 30% of the years	8,355	9,182	8,272	6,968	3,360	10,598	7,576	5,925	10,776
Maximum exceeded in 20% of the years	10,630	10,592	10,628	7,396	3,360	11,368	9,856	6,290	12,945
Maximum exceeded in 10% of the years	12,496	11,624	13,593	7,823	3,360	15,666	11,414	7,230	18,327
Maximum	30,573	24,500	30,573	8,250	3,360	24,500	22,590	12,057	30,573
3-day Average Flows									
Maximum exceeded in 100% of the years	2,680	3,200	2,680	3,287	3,287	3,200	3,383	2,750	2,680
Maximum exceeded in 90% of the years	3,376	3,287	3,607	3,899	3,287	4,171	3,987	3,286	4,003
Maximum exceeded in 80% of the years	4,053	3,807	4,101	4,511	3,287	5,183	4,770	3,539	4,577
Maximum exceeded in 70% of the years	4,689	5,031	4,701	5,123	3,287	6,149	5,293	3,775	4,749
Maximum exceeded in 60% of the years	5,323	5,782	5,093	5,440	3,287	6,648	5,446	4,307	6,074
Maximum exceeded in 50% of the years	5,708	6,078	5,469	5,611	3,287	7,110	5,583	4,570	7,063
Maximum exceeded in 40% of the years	6,120	6,909	6,073	5,782	3,287	7,569	6,073	4,867	8,104
Maximum exceeded in 30% of the years	7,441	7,402	7,475	6,044	3,287	8,057	6,595	5,365	9,503
Maximum exceeded in 20% of the years	9,192	7,848	9,378	6,491	3,287	9,097	8,952	5,833	11,313
Maximum exceeded in 10% of the years	10,956	9,420	11,313	6,937	3,287	13,620	9,701	6,717	14,080
Maximum	26,992	22,667	26,992	7,383	3,287	22,667	12,267	10,764	26,992
7-day Average Flows									
Maximum exceeded in 100% of the years	2,538	2,701	2,538	4,342		2,701	3,041	2,538	2,641
Maximum exceeded in 90% of the years	3,153	4,014	3,171	4,342		3,896	3,738	2,876	3,665
Maximum exceeded in 80% of the years	3,841	4,382	3,803	4,342		4,721	4,147	3,067	4,058
Maximum exceeded in 70% of the years	4,175	4,721	4,126	4,342		5,207	4,179	3,504	4,326
Maximum exceeded in 60% of the years	4,336	5,224	4,287	4,342		5,325	4,317	3,953	5,268
Maximum exceeded in 50% of the years	4,886	5,359	4,754	4,342		5,399	4,881	4,026	5,678
Maximum exceeded in 40% of the years	5,431	5,424	5,402	4,342		5,563	5,170	4,303	6,834
Maximum exceeded in 30% of the years	5,927	5,808	5,874	4,342		5,992	5,579	4,523	7,331
Maximum exceeded in 20% of the years	7,205	7,025	7,183	4,342		7,511	6,314	4,754	8,002
Maximum exceeded in 10% of the years	8,018	10,351	7,811	4,342		11,284	7,081	5,953	9,568
Maximum	18,582	17,821	18,582	4,342		17,821	7,307	7,465	18,582
15-day Average Flows									
Maximum exceeded in 100% of the years	2,059	2,474	2,059			2,474	2,727	2,059	2,584
Maximum exceeded in 90% of the years	3,012	2,934	3,013			2,934	3,141	2,478	3,254
Maximum exceeded in 80% of the years	3,259	3,428	3,267			3,428	3,281	3,014	3,562
Maximum exceeded in 70% of the years	3,519	3,909	3,513			3,909	3,388	3,309	3,820
Maximum exceeded in 60% of the years	3,835	4,165	3,799			4,165	3,445	3,542	4,324
Maximum exceeded in 50% of the years	3,914	4,318	3,881			4,318	3,856	3,805	4,590
Maximum exceeded in 40% of the years	4,333	4,471	4,298			4,471	3,924	3,867	5,102
Maximum exceeded in 30% of the years	4,743	4,726	4,708			4,726	4,298	3,897	5,317
Maximum exceeded in 20% of the years	5,270	5,393	5,248			5,393	4,485	4,153	6,016
Maximum exceeded in 10% of the years	6,086	7,305	6,016			7,305	5,156	5,245	7,307
Maximum	10,786	10,786	10,704			10,786	5,760	6,363	10,704
30-day Average Flows									
Maximum exceeded in 100% of the years	1,720	2,368	1,720			2,368	2,578	1,720	2,441
Maximum exceeded in 90% of the years	2,624	2,837	2,626			2,837	2,626	2,320	3,067
Maximum exceeded in 80% of the years	2,842	3,066	2,838			3,066	2,740	2,836	3,239
Maximum exceeded in 70% of the years	3,052	3,127	3,029			3,127	2,834	2,859	3,370
Maximum exceeded in 60% of the years	3,203	3,264	3,202			3,264	2,893	3,169	3,494
Maximum exceeded in 50% of the years	3,338	3,320	3,355			3,320	3,019	3,210	3,827
Maximum exceeded in 40% of the years	3,448	3,398	3,451			3,398	3,192	3,222	4,059
Maximum exceeded in 30% of the years	3,769	3,610	3,805			3,610	3,418	3,356	4,337
Maximum exceeded in 20% of the years	4,286	4,032	4,265			4,032	3,537	3,671	4,651
Maximum exceeded in 10% of the years	4,699	4,873	4,693			4,873	3,819	4,322	5,658
Maximum	6,628	6,228	6,628			6,228	4,682	5,334	6,628

Table A.12-7 Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Loup River near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	2,696	3,480	2,696	3,480	3,480	4,920	4,850	2,701	2,696
Maximum exceeded in 90% of the years	4,822	4,792	4,834	6,759	3,928	6,088	5,222	5,025	4,396
Maximum exceeded in 80% of the years	5,398	6,759	5,176	7,343	4,376	8,426	6,708	6,140	4,936
Maximum exceeded in 70% of the years	6,669	7,943	6,196	7,885	5,760	9,950	10,436	6,715	5,293
Maximum exceeded in 60% of the years	8,026	9,950	7,586	8,864	8,080	10,272	11,516	7,410	6,248
Maximum exceeded in 50% of the years	10,500	10,600	10,080	10,895	10,400	10,600	12,760	9,920	7,465
Maximum exceeded in 40% of the years	11,703	11,405	11,740	12,320	10,640	11,460	15,162	16,490	9,066
Maximum exceeded in 30% of the years	14,784	13,076	15,642	14,880	10,880	12,410	17,408	18,785	11,328
Maximum exceeded in 20% of the years	18,366	14,860	19,186	18,300	11,800	13,252	24,736	19,596	13,412
Maximum exceeded in 10% of the years	22,346	20,000	24,130	20,000	13,400	16,544	27,936	20,875	18,063
Maximum	53,020	27,600	53,020	25,000	15,000	27,600	53,020	40,810	41,600
3-day Average Flows									
Maximum exceeded in 100% of the years	2,617	2,887	2,617	2,887	2,887	3,823	3,764	2,683	2,617
Maximum exceeded in 90% of the years	4,159	4,073	4,163	4,670	3,428	5,509	4,557	4,373	4,066
Maximum exceeded in 80% of the years	4,577	5,946	4,515	6,020	3,969	6,530	5,341	5,527	4,289
Maximum exceeded in 70% of the years	5,915	6,289	5,448	6,226	5,264	7,130	7,365	5,858	4,620
Maximum exceeded in 60% of the years	6,802	7,198	6,087	6,984	7,312	7,533	8,062	5,947	5,235
Maximum exceeded in 50% of the years	7,950	7,943	7,957	7,283	9,360	7,943	8,457	7,705	6,088
Maximum exceeded in 40% of the years	8,760	8,910	8,533	9,000	9,448	8,285	9,810	8,584	7,938
Maximum exceeded in 30% of the years	9,629	9,580	10,263	9,943	9,536	8,716	11,103	12,192	8,808
Maximum exceeded in 20% of the years	11,432	10,972	12,599	11,245	9,883	10,116	16,591	14,333	10,115
Maximum exceeded in 10% of the years	17,201	14,211	16,763	16,529	10,488	13,156	19,123	15,942	12,387
Maximum	40,457	19,267	40,457	19,267	11,093	18,300	40,457	31,794	28,467
7-day Average Flows									
Maximum exceeded in 100% of the years	2,362	2,743	2,362	2,743	2,743	2,793	3,148	2,471	2,362
Maximum exceeded in 90% of the years	3,338	3,218	3,405	3,854	3,178	4,344	3,497	3,758	3,338
Maximum exceeded in 80% of the years	3,861	4,738	3,744	5,366	3,613	4,752	4,402	4,117	3,583
Maximum exceeded in 70% of the years	4,419	5,316	4,169	5,528	4,430	4,991	5,313	4,315	3,958
Maximum exceeded in 60% of the years	5,313	5,688	4,750	5,840	5,630	5,458	6,103	4,422	4,130
Maximum exceeded in 50% of the years	5,882	6,014	5,386	6,014	6,830	5,976	6,491	4,994	5,123
Maximum exceeded in 40% of the years	6,493	6,666	6,492	6,214	7,499	6,362	6,785	5,330	5,771
Maximum exceeded in 30% of the years	7,062	7,124	7,071	7,269	8,168	6,666	7,438	7,960	6,886
Maximum exceeded in 20% of the years	8,701	8,624	8,782	8,275	8,557	7,624	9,877	9,248	7,196
Maximum exceeded in 10% of the years	10,194	10,143	9,980	13,422	8,664	9,499	13,038	9,389	8,980
Maximum	22,479	17,491	22,479	17,491	8,771	12,076	22,479	20,198	16,151
15-day Average Flows									
Maximum exceeded in 100% of the years	2,185	2,420	2,185	2,574	2,649	2,420	2,557	2,242	2,185
Maximum exceeded in 90% of the years	2,922	2,943	2,926	3,351	2,907	3,401	3,198	3,107	2,784
Maximum exceeded in 80% of the years	3,227	3,662	3,157	4,217	3,165	3,693	3,652	3,294	3,065
Maximum exceeded in 70% of the years	3,614	4,102	3,435	4,349	3,780	3,724	3,977	3,550	3,202
Maximum exceeded in 60% of the years	4,125	4,420	3,778	4,424	4,751	3,884	5,267	3,736	3,304
Maximum exceeded in 50% of the years	4,528	4,637	4,471	4,731	5,721	4,519	5,475	3,962	4,294
Maximum exceeded in 40% of the years	5,019	4,979	5,031	4,925	6,132	4,613	5,581	4,279	4,816
Maximum exceeded in 30% of the years	5,562	5,277	5,566	5,257	6,543	4,973	5,724	4,873	4,975
Maximum exceeded in 20% of the years	6,067	6,543	5,963	6,726	7,022	5,197	6,972	5,936	5,734
Maximum exceeded in 10% of the years	7,625	8,644	7,337	9,043	7,570	6,164	7,337	7,154	6,888
Maximum	14,887	14,614	14,887	14,614	8,117	10,027	14,887	13,024	9,780
30-day Average Flows									
Maximum exceeded in 100% of the years	1,932	1,932	2,014	1,932	2,422	2,269	2,323	2,102	2,014
Maximum exceeded in 90% of the years	2,565	2,811	2,570	3,159	2,694	2,911	2,923	2,582	2,351
Maximum exceeded in 80% of the years	2,955	3,134	2,703	3,524	2,966	3,186	3,108	2,622	2,593
Maximum exceeded in 70% of the years	3,141	3,374	3,056	3,648	3,511	3,304	3,299	3,120	2,890
Maximum exceeded in 60% of the years	3,377	3,527	3,277	3,770	4,329	3,369	3,817	3,241	3,057
Maximum exceeded in 50% of the years	3,541	3,798	3,427	4,135	5,146	3,375	4,525	3,338	3,417
Maximum exceeded in 40% of the years	4,091	4,259	3,899	4,366	5,659	3,439	4,695	3,394	3,796
Maximum exceeded in 30% of the years	4,641	4,763	4,547	4,567	6,171	3,705	4,746	3,490	4,145
Maximum exceeded in 20% of the years	4,922	5,299	4,798	5,095	6,601	4,279	5,128	4,798	4,519
Maximum exceeded in 10% of the years	6,014	6,804	5,546	6,249	6,948	5,439	5,429	5,487	5,439
Maximum	10,419	10,419	10,339	10,419	7,294	7,634	10,339	8,786	6,372

Table A.12-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Loup River near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	2,361	2,610	2,361	2,610	2,610	3,260	2,740	2,379	2,361
Maximum exceeded in 90% of the years	3,410	3,584	3,512	6,759	3,086	4,988	4,664	3,965	3,326
Maximum exceeded in 80% of the years	5,036	6,151	4,600	7,343	3,562	6,279	6,388	5,332	4,022
Maximum exceeded in 70% of the years	6,077	7,048	6,034	7,885	4,244	7,915	9,340	6,060	4,500
Maximum exceeded in 60% of the years	7,160	8,248	6,796	8,864	5,132	9,566	11,516	6,140	6,110
Maximum exceeded in 50% of the years	8,550	9,510	7,780	10,895	6,020	9,790	12,760	7,160	6,900
Maximum exceeded in 40% of the years	10,586	10,777	10,214	11,645	7,060	10,438	14,680	7,980	7,748
Maximum exceeded in 30% of the years	12,774	12,040	13,066	12,815	8,100	11,980	16,240	13,510	8,758
Maximum exceeded in 20% of the years	15,558	14,196	16,802	15,170	9,896	13,252	24,808	18,230	11,992
Maximum exceeded in 10% of the years	25,110	17,450	27,678	19,150	12,448	15,724	27,954	30,990	16,103
Maximum	77,565	25,800	77,565	25,800	15,000	23,500	53,020	77,565	41,600
3-day Average Flows									
Maximum exceeded in 100% of the years	2,265	2,581	2,265	2,581	2,581	3,143	2,630	2,265	2,322
Maximum exceeded in 90% of the years	2,998	3,042	3,152	3,449	2,730	3,687	3,597	3,312	3,032
Maximum exceeded in 80% of the years	3,800	4,026	3,797	5,306	2,879	4,606	5,810	4,262	3,369
Maximum exceeded in 70% of the years	5,124	5,313	4,976	6,214	3,435	5,848	7,034	4,928	3,885
Maximum exceeded in 60% of the years	5,826	6,583	5,668	6,984	4,397	7,030	7,637	5,527	5,101
Maximum exceeded in 50% of the years	7,030	7,283	6,636	7,283	5,360	7,430	8,220	5,745	5,835
Maximum exceeded in 40% of the years	7,839	8,178	7,634	8,897	6,372	8,182	10,412	6,070	6,767
Maximum exceeded in 30% of the years	9,102	8,971	9,430	9,272	7,384	8,716	11,231	9,083	7,696
Maximum exceeded in 20% of the years	11,134	10,305	11,194	10,124	8,552	10,116	16,602	13,347	9,098
Maximum exceeded in 10% of the years	17,870	11,798	19,123	11,497	9,876	13,156	19,123	23,847	10,986
Maximum	40,457	18,300	40,457	17,723	11,200	18,300	40,457	35,251	28,467
7-day Average Flows									
Maximum exceeded in 100% of the years	2,065	2,450	2,065	2,571	2,450	2,793	2,251	2,065	2,283
Maximum exceeded in 90% of the years	2,624	2,704	2,661	3,080	2,498	2,954	3,022	2,857	2,624
Maximum exceeded in 80% of the years	3,103	3,106	3,184	4,337	2,546	3,636	4,482	3,456	2,849
Maximum exceeded in 70% of the years	3,984	4,598	3,665	5,528	3,014	4,331	4,947	4,124	3,152
Maximum exceeded in 60% of the years	4,429	5,403	4,268	5,840	3,901	4,851	5,299	4,169	3,531
Maximum exceeded in 50% of the years	5,302	5,915	4,846	6,014	4,789	5,329	6,064	4,275	4,255
Maximum exceeded in 40% of the years	5,973	5,999	5,406	6,161	5,643	5,835	7,207	4,405	5,241
Maximum exceeded in 30% of the years	6,873	6,756	6,878	6,820	6,497	5,970	8,107	5,992	6,072
Maximum exceeded in 20% of the years	7,726	7,560	7,676	7,415	7,257	7,127	10,227	8,996	6,652
Maximum exceeded in 10% of the years	11,339	8,735	13,038	8,465	7,921	9,431	13,038	12,631	7,118
Maximum	22,479	17,491	22,479	17,491	8,586	11,739	22,479	20,198	16,367
15-day Average Flows									
Maximum exceeded in 100% of the years	1,826	2,072	1,826	2,388	2,072	2,420	1,940	1,826	2,075
Maximum exceeded in 90% of the years	2,413	2,421	2,382	2,560	2,212	2,433	2,723	2,279	2,378
Maximum exceeded in 80% of the years	2,599	2,549	2,642	3,534	2,352	2,774	3,489	3,090	2,487
Maximum exceeded in 70% of the years	3,111	3,247	3,058	4,184	2,593	3,249	3,872	3,158	2,627
Maximum exceeded in 60% of the years	3,619	3,898	3,521	4,380	2,937	3,642	4,124	3,230	2,802
Maximum exceeded in 50% of the years	3,954	4,197	3,919	4,833	3,280	3,725	5,198	3,534	3,827
Maximum exceeded in 40% of the years	4,279	4,872	4,206	4,925	4,095	4,070	5,551	3,645	3,932
Maximum exceeded in 30% of the years	5,135	5,142	5,009	5,124	4,910	4,740	6,238	4,247	4,263
Maximum exceeded in 20% of the years	5,648	5,306	5,751	5,459	5,713	5,156	6,526	5,190	4,927
Maximum exceeded in 10% of the years	7,637	7,369	8,106	7,104	6,503	5,698	9,130	8,125	5,747
Maximum	14,887	14,614	14,887	14,614	7,294	7,704	14,887	13,024	10,654
30-day Average Flows									
Maximum exceeded in 100% of the years	1,536	1,915	1,536	1,915	2,000	1,931	1,713	1,647	1,536
Maximum exceeded in 90% of the years	1,942	1,952	1,991	2,128	2,018	1,959	2,452	1,936	1,896
Maximum exceeded in 80% of the years	2,205	2,175	2,233	3,128	2,036	2,404	2,800	2,222	2,170
Maximum exceeded in 70% of the years	2,546	2,883	2,453	3,515	2,189	2,894	2,886	2,334	2,370
Maximum exceeded in 60% of the years	2,876	3,335	2,764	3,619	2,477	3,213	3,333	2,660	2,484
Maximum exceeded in 50% of the years	3,233	3,558	3,153	3,767	2,765	3,308	4,230	2,898	2,692
Maximum exceeded in 40% of the years	3,544	3,780	3,409	3,930	3,174	3,362	4,302	3,193	3,187
Maximum exceeded in 30% of the years	3,918	3,930	3,792	4,298	3,584	3,662	4,555	3,327	3,443
Maximum exceeded in 20% of the years	4,570	4,611	4,486	4,721	4,316	4,003	4,739	3,548	3,875
Maximum exceeded in 10% of the years	5,831	6,022	5,608	5,548	5,372	4,897	6,413	5,291	4,498
Maximum	10,419	10,419	10,339	10,419	6,427	7,571	10,339	8,786	8,689

Table A.12-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

Loup River near Columbus, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	1,430	1,430	1,776	3,258	3,920	1,430	1,788	1,776	1,918
Maximum exceeded in 90% of the years	2,126	3,268	2,017	3,382	4,252	1,974	2,716	1,866	2,164
Maximum exceeded in 80% of the years	2,621	3,833	2,410	3,855	4,584	3,052	2,833	1,886	2,324
Maximum exceeded in 70% of the years	3,241	4,378	2,728	4,400	4,836	4,005	3,407	2,387	2,942
Maximum exceeded in 60% of the years	3,964	4,760	3,266	4,765	5,008	4,678	4,500	2,528	3,876
Maximum exceeded in 50% of the years	4,838	5,180	4,510	4,995	5,180	5,420	5,980	2,820	4,475
Maximum exceeded in 40% of the years	6,058	6,280	6,046	7,710	5,428	6,364	6,166	4,540	5,788
Maximum exceeded in 30% of the years	6,827	8,297	6,642	8,991	5,676	7,965	7,256	6,715	6,316
Maximum exceeded in 20% of the years	9,758	10,370	8,580	11,060	7,240	9,485	11,984	7,250	7,618
Maximum exceeded in 10% of the years	12,805	12,376	13,126	18,320	10,120	10,712	15,580	9,980	10,678
Maximum	77,565	25,800	77,565	25,800	13,000	11,960	26,170	77,565	29,940
3-day Average Flows									
Maximum exceeded in 100% of the years	1,319	1,319	1,630	3,102	3,333	1,319	1,630	1,652	1,718
Maximum exceeded in 90% of the years	1,964	3,061	1,793	3,161	3,417	1,813	2,173	1,698	2,028
Maximum exceeded in 80% of the years	2,261	3,334	2,113	3,420	3,500	2,575	2,590	1,826	2,076
Maximum exceeded in 70% of the years	2,855	3,533	2,494	3,696	3,680	3,199	2,811	2,252	2,523
Maximum exceeded in 60% of the years	3,506	3,882	2,812	4,153	3,957	3,599	3,584	2,319	3,205
Maximum exceeded in 50% of the years	3,964	4,241	3,884	4,755	4,233	4,007	4,336	2,616	3,892
Maximum exceeded in 40% of the years	4,533	4,935	4,487	5,991	4,243	4,845	4,755	3,922	4,404
Maximum exceeded in 30% of the years	5,441	5,991	5,313	6,998	4,252	5,274	5,586	5,222	5,183
Maximum exceeded in 20% of the years	6,725	7,183	6,073	8,344	5,645	6,004	7,845	5,537	6,007
Maximum exceeded in 10% of the years	10,240	9,920	9,615	13,493	8,423	7,146	11,502	6,373	8,151
Maximum	38,234	16,900	38,234	16,900	11,200	8,208	15,410	38,234	20,017
7-day Average Flows									
Maximum exceeded in 100% of the years	1,182	1,182	1,376	2,764	2,596	1,182	1,455	1,376	1,416
Maximum exceeded in 90% of the years	1,765	2,441	1,608	3,004	2,891	1,687	1,791	1,484	1,803
Maximum exceeded in 80% of the years	1,984	2,807	1,897	3,203	3,186	2,051	2,171	1,680	1,912
Maximum exceeded in 70% of the years	2,344	3,130	2,106	3,296	3,355	2,433	2,224	2,029	1,953
Maximum exceeded in 60% of the years	2,963	3,329	2,378	3,491	3,397	2,808	2,831	2,119	2,595
Maximum exceeded in 50% of the years	3,289	3,532	3,040	4,447	3,440	2,967	3,130	2,304	3,121
Maximum exceeded in 40% of the years	3,708	4,160	3,434	4,776	3,593	3,729	3,577	3,064	3,457
Maximum exceeded in 30% of the years	4,286	4,696	4,143	5,824	3,745	4,160	4,486	3,703	4,262
Maximum exceeded in 20% of the years	5,318	5,425	4,635	6,848	4,774	4,522	6,042	4,131	4,881
Maximum exceeded in 10% of the years	6,690	7,562	6,173	8,187	6,680	4,956	7,784	4,991	5,677
Maximum	18,620	11,469	18,620	11,469	8,586	5,474	12,490	18,620	16,367
15-day Average Flows									
Maximum exceeded in 100% of the years	1,066	1,066	1,106	2,315	2,266	1,066	1,365	1,239	1,106
Maximum exceeded in 90% of the years	1,484	1,978	1,353	2,709	2,632	1,609	1,525	1,259	1,447
Maximum exceeded in 80% of the years	1,773	2,389	1,728	2,823	2,998	1,762	1,735	1,623	1,746
Maximum exceeded in 70% of the years	2,006	2,757	1,815	3,004	3,187	1,910	1,967	1,824	1,811
Maximum exceeded in 60% of the years	2,474	3,113	2,039	3,151	3,198	2,228	2,302	1,846	2,212
Maximum exceeded in 50% of the years	2,799	3,209	2,620	3,605	3,209	2,683	2,777	1,989	2,652
Maximum exceeded in 40% of the years	3,173	3,291	2,806	3,772	3,250	3,133	2,852	2,728	2,917
Maximum exceeded in 30% of the years	3,389	3,607	3,241	4,576	3,290	3,272	3,552	2,799	3,466
Maximum exceeded in 20% of the years	4,210	4,680	3,888	5,476	4,107	3,291	4,353	3,173	3,761
Maximum exceeded in 10% of the years	4,808	6,109	4,376	6,313	5,700	3,584	5,329	4,037	4,261
Maximum	10,654	10,107	10,654	10,107	7,294	4,749	8,198	10,138	10,654
30-day Average Flows									
Maximum exceeded in 100% of the years	0	0	988	2,109	0	1,000	1,087	1,037	988
Maximum exceeded in 90% of the years	1,199	1,624	1,186	2,451	881	1,459	1,260	1,195	1,195
Maximum exceeded in 80% of the years	1,514	2,109	1,437	2,531	1,763	1,634	1,562	1,240	1,485
Maximum exceeded in 70% of the years	1,729	2,390	1,576	2,654	2,319	1,814	1,768	1,443	1,617
Maximum exceeded in 60% of the years	2,063	2,513	1,762	2,804	2,551	2,085	1,906	1,534	1,794
Maximum exceeded in 50% of the years	2,336	2,709	2,073	3,006	2,783	2,336	2,214	1,740	2,190
Maximum exceeded in 40% of the years	2,532	2,853	2,345	3,524	2,826	2,453	2,331	2,077	2,571
Maximum exceeded in 30% of the years	2,837	3,179	2,647	3,876	2,869	2,581	2,631	2,326	2,799
Maximum exceeded in 20% of the years	3,334	3,767	3,102	4,621	3,396	2,867	3,672	2,514	3,042
Maximum exceeded in 10% of the years	4,055	5,107	3,836	5,370	4,407	3,267	4,030	3,633	3,472
Maximum	8,272	8,272	7,085	8,272	5,418	3,541	5,728	6,322	7,085

interval from the 1942-1958 through 1975-1998 time intervals. This can most likely be attributed to smoothing out of the differences by the averaging process; the previously discussed decreases by time interval grew steadily smaller with increasing averaging time. Another possible contributing factor to this characterization is runoff from the large uncontrolled drainage area downstream of the reservoirs.

Table A.12-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.12-8** shows that the flow characterizations for this seasonal period are essentially the same as those for the Apr 16-Jul 15 seasonal period except that the flow values are lower across the board. This is the result of precipitation (and, consequently, runoff) being, on average, less for this seasonal period than for the Apr 16-Jul 15 seasonal period (NOAA, 2005 [Nebraska]).

Table A.12-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.12-9** shows that the flow characterizations for this seasonal period are almost identical to those for the Jun 1-Aug 15 seasonal period. The changes in flow values by time interval have the same general characterization as those for both the Apr 16-Jul 15 and Jun 1-Aug 15 seasonal periods, and the characterization can be explained in the same way. Also, flow values for this seasonal period are lower across the board than those for the Jun 1-Aug 15 seasonal period, again as the likely result of a decrease in average precipitation with respect to the earlier seasonal period (NOAA, 2005 [Nebraska]).

A.12.4.3 Mean Flow Exceedance

Table A.12-10 through **Table A.12-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix. Enough data exist for the 1895-1909 and 1910-1927 time intervals so that characterizations considering all flows are possible for most of the time periods discussed in the following paragraphs.

Table A.12-10 shows the exceedance probabilities and values of flows for annual data. All data were considered for these characterizations. **Table A.12-10** shows that, for the 1895-1909 through 1942-1958 time intervals, the characterizations are generally consistent with the known climatological conditions during the respective time intervals. Of some noteworthiness is that the flow values for the 1928-1941 and 1942-1958 are very similar. Both of these time intervals included periods of severe drought. A discussion of the characterizations for these time intervals for annual data is given in conjunction with the characterizations for the Jul 15-Sep 30 seasonal period. For the 1942-1958 through 1975-1998 time intervals, the characterizations are somewhat inconsistent. The flow values decrease from the 1942-1958 time interval to the 1959-1974 time interval, even though the latter time interval was, on the whole, wetter. The beginning of operation of Sherman Reservoir could be the cause of this. On the other hand, flow values increase from the 1959-1974 time interval to the 1975-1998 time interval even with the beginning

of operation of Calamus and Davis Creek Reservoirs. A possible explanation is that, during some years of the 1975-1998 time interval, there was considerably more precipitation with respect to normal in the downstream region of the basin than in the upstream region, particularly in the months of greatest precipitation and runoff ([Nebraska](#), 2004). This precipitation distribution was not as evident during the 1959-1974 time interval, and this might have allowed the regulation of Sherman Reservoir to have a greater impact on flow values.

Table A.12-11 shows the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to insufficient data. **Table A.12-11** shows that the flow values for the 1928-1941 and 1942-1948 time intervals were similar, as they were for annual data (**Table A.12-10**). From the 1942-1958 time interval through the 1975-1998 time intervals, the changes in the flow values showed considerable inconsistency from one averaging time to the next and from one exceedance probability range to the next. This is also the case for maximum flows, and the reasoning that was given for maximum flows (**Section A.12.4.3, Table A.12-6**) can be applied to this characterization as well.

Table A.12-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. All data were considered for these characterizations. **Table A.12-12** shows characterizations that are similar to those for annual data (**Table A.12-10**). The main difference is that the flow values are slightly but consistently higher for the 1942-1958 time interval than for the 1928-1941 time interval. This indicates that the drought conditions during the 1950's were not quite as severe as those during the 1930's in this region for this seasonal period.

Table A.12-13 shows the exceedance probabilities and values of flows for the Jun 1 - Aug 15 seasonal period. All data were considered for these characterizations. **Table A.12-13** shows characterizations that are very similar to those for the Apr 16-Jul 15 seasonal period except that the flow values are lower across the board. This is the result of precipitation (and, consequently, runoff) being, on average, less for this seasonal period than for the Apr 16-Jul 15 seasonal period (NOAA, 2005 [[Nebraska](#)]).

Table A.12-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. All data were considered for these characterizations. **Table A.12-14** shows characterizations that are similar to those for the Jun 1-Aug 15 seasonal period, but with one noticeable difference. The changes in flow values from the 1928-1941 time interval to the 1942-1958 time interval go both ways, and are not consistent either by seasonal period or by exceedance probability range as to which direction (i.e. increasing or decreasing) the changes go.

Table A.12-10 Exceedance Values Considering All Flows, Annual Data.

Loup River near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	64	304	64	1,000	1,120	304	264	233	64
Flow exceeded for 90% of the days	1,186	1,382	1,120	1,838	1,760	1,020	1,169	1,006	1,190
Flow exceeded for 80% of the days	1,584	1,740	1,525	2,150	1,964	1,367	1,493	1,420	1,617
Flow exceeded for 70% of the days	1,861	2,000	1,811	2,400	2,200	1,610	1,752	1,735	1,941
Flow exceeded for 60% of the days	2,095	2,240	2,052	2,573	2,390	1,822	1,957	1,968	2,216
Flow exceeded for 50% of the days	2,312	2,480	2,263	2,743	2,560	2,030	2,152	2,163	2,428
Flow exceeded for 40% of the days	2,535	2,700	2,474	3,000	2,860	2,264	2,341	2,352	2,658
Flow exceeded for 30% of the days	2,800	3,000	2,732	3,300	3,220	2,569	2,600	2,575	2,894
Flow exceeded for 20% of the days	3,193	3,500	3,100	3,908	3,936	2,940	2,999	2,894	3,250
Flow exceeded for 10% of the days	4,050	4,723	3,813	5,186	5,504	3,728	3,850	3,566	3,970
Maximum	77,565	27,600	77,565	25,800	15,000	27,600	53,020	77,565	41,600
3-day Average Flows									
Flow exceeded for 100% of the days	66	395	66	1,000	1,200	395	302	238	66
Flow exceeded for 90% of the days	1,218	1,400	1,160	1,870	1,813	1,040	1,208	1,030	1,228
Flow exceeded for 80% of the days	1,607	1,763	1,551	2,187	2,046	1,393	1,520	1,439	1,646
Flow exceeded for 70% of the days	1,881	2,025	1,829	2,420	2,217	1,633	1,780	1,758	1,957
Flow exceeded for 60% of the days	2,114	2,267	2,067	2,583	2,417	1,852	1,981	1,986	2,235
Flow exceeded for 50% of the days	2,332	2,494	2,277	2,775	2,580	2,053	2,169	2,172	2,453
Flow exceeded for 40% of the days	2,549	2,717	2,487	3,000	2,837	2,306	2,353	2,357	2,670
Flow exceeded for 30% of the days	2,809	3,017	2,739	3,350	3,217	2,601	2,606	2,576	2,911
Flow exceeded for 20% of the days	3,201	3,546	3,110	3,995	3,987	2,970	2,997	2,896	3,245
Flow exceeded for 10% of the days	4,067	4,735	3,844	5,230	5,467	3,760	3,919	3,613	3,957
Maximum	40,457	22,667	40,457	19,267	14,067	22,667	40,457	38,234	28,467
7-day Average Flows									
Flow exceeded for 100% of the days	95	466	95	1,031	1,381	466	409	260	95
Flow exceeded for 90% of the days	1,271	1,448	1,219	1,908	1,899	1,096	1,269	1,081	1,287
Flow exceeded for 80% of the days	1,641	1,804	1,594	2,218	2,085	1,439	1,580	1,488	1,682
Flow exceeded for 70% of the days	1,911	2,059	1,858	2,469	2,271	1,669	1,800	1,777	1,976
Flow exceeded for 60% of the days	2,146	2,307	2,101	2,627	2,435	1,896	2,015	2,003	2,270
Flow exceeded for 50% of the days	2,355	2,525	2,304	2,811	2,616	2,081	2,200	2,195	2,483
Flow exceeded for 40% of the days	2,566	2,731	2,507	3,066	2,828	2,356	2,383	2,384	2,681
Flow exceeded for 30% of the days	2,830	3,062	2,760	3,428	3,238	2,601	2,622	2,587	2,938
Flow exceeded for 20% of the days	3,220	3,593	3,120	4,089	4,087	3,001	3,024	2,949	3,242
Flow exceeded for 10% of the days	4,069	4,733	3,834	5,123	5,595	3,926	3,948	3,617	3,901
Maximum	22,479	17,821	22,479	17,491	12,117	17,821	22,479	20,198	20,948
15-day Average Flows									
Flow exceeded for 100% of the days	201	530	201	1,070	1,455	530	454	273	201
Flow exceeded for 90% of the days	1,347	1,480	1,299	1,993	1,977	1,241	1,354	1,178	1,355
Flow exceeded for 80% of the days	1,699	1,855	1,651	2,298	2,142	1,485	1,629	1,558	1,755
Flow exceeded for 70% of the days	1,948	2,116	1,897	2,502	2,267	1,720	1,842	1,809	2,027
Flow exceeded for 60% of the days	2,177	2,332	2,125	2,699	2,457	1,950	2,041	2,015	2,281
Flow exceeded for 50% of the days	2,377	2,567	2,326	2,922	2,624	2,150	2,228	2,217	2,489
Flow exceeded for 40% of the days	2,601	2,806	2,537	3,163	2,870	2,388	2,413	2,395	2,707
Flow exceeded for 30% of the days	2,862	3,113	2,791	3,520	3,211	2,685	2,697	2,613	2,917
Flow exceeded for 20% of the days	3,246	3,605	3,139	4,112	4,263	3,039	3,094	2,947	3,251
Flow exceeded for 10% of the days	4,008	4,589	3,781	4,946	5,614	3,783	3,810	3,577	3,883
Maximum	14,887	14,614	14,887	14,614	10,941	10,786	14,887	13,024	14,494
30-day Average Flows									
Flow exceeded for 100% of the days	212	722	212	1,194	1,630	722	515	357	212
Flow exceeded for 90% of the days	1,419	1,536	1,386	2,095	2,018	1,317	1,435	1,241	1,426
Flow exceeded for 80% of the days	1,756	1,924	1,718	2,374	2,179	1,565	1,691	1,664	1,793
Flow exceeded for 70% of the days	1,992	2,169	1,947	2,549	2,274	1,792	1,898	1,868	2,085
Flow exceeded for 60% of the days	2,205	2,383	2,152	2,792	2,489	1,999	2,060	2,061	2,344
Flow exceeded for 50% of the days	2,417	2,588	2,360	2,993	2,626	2,230	2,249	2,228	2,517
Flow exceeded for 40% of the days	2,622	2,840	2,563	3,245	2,841	2,445	2,493	2,412	2,702
Flow exceeded for 30% of the days	2,874	3,144	2,803	3,579	3,609	2,700	2,756	2,609	2,942
Flow exceeded for 20% of the days	3,246	3,612	3,153	4,043	4,283	3,047	3,129	2,945	3,278
Flow exceeded for 10% of the days	3,921	4,375	3,728	4,741	5,402	3,614	3,763	3,498	3,870
Maximum	10,419	10,419	10,339	10,419	9,474	7,634	10,339	8,786	9,422

Table A.12-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Loup River near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	341	341	428	2,945	3,150	341	668	428	667
Flow exceeded for 90% of the days	1,906	1,548	1,951	3,183	3,190	1,500	1,513	2,014	2,310
Flow exceeded for 80% of the days	2,271	2,063	2,290	3,250	3,230	1,987	1,893	2,259	2,570
Flow exceeded for 70% of the days	2,541	2,459	2,558	3,252	3,250	2,379	2,203	2,542	2,813
Flow exceeded for 60% of the days	2,804	2,659	2,822	3,313	3,250	2,600	2,436	2,777	3,033
Flow exceeded for 50% of the days	3,050	2,945	3,071	3,731	3,250	2,800	2,764	2,982	3,253
Flow exceeded for 40% of the days	3,336	3,237	3,370	4,828	3,250	3,070	3,130	3,274	3,570
Flow exceeded for 30% of the days	3,720	3,534	3,730	5,400	3,250	3,493	3,490	3,637	4,107
Flow exceeded for 20% of the days	4,426	4,502	4,410	6,500	3,272	4,336	4,121	3,982	4,771
Flow exceeded for 10% of the days	5,684	6,452	5,538	6,819	3,316	5,916	5,153	4,964	6,174
Maximum	30,573	24,500	30,573	8,250	3,360	24,500	22,590	12,057	30,573
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	539	807	539	3,118	3,217	807	870	539	1,240
Flow exceeded for 90% of the days	1,957	1,547	2,004	3,177	3,217	1,527	1,587	2,028	2,330
Flow exceeded for 80% of the days	2,304	2,153	2,320	3,217	3,217	2,090	1,953	2,274	2,601
Flow exceeded for 70% of the days	2,568	2,464	2,592	3,267	3,217	2,393	2,257	2,577	2,841
Flow exceeded for 60% of the days	2,822	2,617	2,855	3,289	3,217	2,570	2,493	2,816	3,061
Flow exceeded for 50% of the days	3,077	2,937	3,103	3,363	3,217	2,800	2,801	3,019	3,360
Flow exceeded for 40% of the days	3,385	3,217	3,410	4,443	3,231	3,102	3,128	3,337	3,644
Flow exceeded for 30% of the days	3,782	3,577	3,805	4,997	3,245	3,562	3,460	3,683	4,134
Flow exceeded for 20% of the days	4,395	4,423	4,387	5,554	3,259	4,352	4,131	4,031	4,749
Flow exceeded for 10% of the days	5,543	6,243	5,435	6,529	3,273	6,225	5,322	4,900	6,337
Maximum	26,992	22,667	26,992	7,383	3,287	22,667	12,267	10,764	26,992
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	673	1,346	673	3,336		1,346	1,128	673	1,555
Flow exceeded for 90% of the days	2,086	1,732	2,126	3,436		1,729	1,858	2,075	2,376
Flow exceeded for 80% of the days	2,409	2,136	2,423	3,536		2,095	2,194	2,368	2,688
Flow exceeded for 70% of the days	2,632	2,460	2,688	3,636		2,456	2,414	2,675	2,956
Flow exceeded for 60% of the days	2,892	2,599	2,935	3,737		2,592	2,567	2,854	3,145
Flow exceeded for 50% of the days	3,137	2,849	3,158	3,837		2,785	2,886	3,065	3,399
Flow exceeded for 40% of the days	3,459	3,215	3,483	3,938		3,171	3,135	3,403	3,717
Flow exceeded for 30% of the days	3,880	3,847	3,883	4,039		3,819	3,725	3,703	4,105
Flow exceeded for 20% of the days	4,358	4,811	4,309	4,140		4,856	4,130	4,030	4,947
Flow exceeded for 10% of the days	5,407	5,573	5,369	4,241		5,589	5,116	4,724	6,529
Maximum	18,582	17,821	18,582	4,342		17,821	7,307	7,465	18,582
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	838	1,707	838			1,707	1,430	838	2,146
Flow exceeded for 90% of the days	2,319	2,186	2,374			2,186	2,272	2,135	2,500
Flow exceeded for 80% of the days	2,590	2,307	2,628			2,307	2,535	2,587	2,806
Flow exceeded for 70% of the days	2,823	2,650	2,856			2,650	2,658	2,867	3,003
Flow exceeded for 60% of the days	3,005	2,851	3,033			2,851	2,856	2,995	3,239
Flow exceeded for 50% of the days	3,230	3,014	3,262			3,014	3,041	3,138	3,531
Flow exceeded for 40% of the days	3,514	3,363	3,517			3,363	3,288	3,417	3,827
Flow exceeded for 30% of the days	3,835	3,784	3,836			3,784	3,529	3,649	4,275
Flow exceeded for 20% of the days	4,279	4,230	4,301			4,230	3,981	3,879	4,906
Flow exceeded for 10% of the days	5,092	5,298	5,080			5,298	4,398	4,854	6,200
Maximum	10,786	10,786	10,704			10,786	5,760	6,363	10,704
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Flow exceeded for 100% of the days	1,720	2,368	1,720			2,368	2,578	1,720	2,441
Flow exceeded for 90% of the days	2,624	2,837	2,626			2,837	2,626	2,320	3,067
Flow exceeded for 80% of the days	2,842	3,066	2,838			3,066	2,740	2,836	3,239
Flow exceeded for 70% of the days	3,052	3,127	3,029			3,127	2,834	2,859	3,370
Flow exceeded for 60% of the days	3,203	3,264	3,202			3,264	2,893	3,169	3,494
Flow exceeded for 50% of the days	3,338	3,320	3,355			3,320	3,019	3,210	3,827
Flow exceeded for 40% of the days	3,448	3,398	3,451			3,398	3,192	3,222	4,059
Flow exceeded for 30% of the days	3,769	3,610	3,805			3,610	3,418	3,356	4,337
Flow exceeded for 20% of the days	4,286	4,032	4,265			4,032	3,537	3,671	4,651
Flow exceeded for 10% of the days	4,699	4,873	4,693			4,873	3,819	4,322	5,658
Maximum	6,628	6,228	6,628			6,228	4,682	5,334	6,628

Table A.12-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Loup River near Columbus, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	168	593	168	1,000	1,180	593	606	291	168
Flow exceeded for 90% of the days	1,500	1,690	1,440	2,060	1,867	1,396	1,587	1,320	1,404
Flow exceeded for 80% of the days	1,800	2,029	1,716	2,375	2,080	1,666	1,874	1,634	1,685
Flow exceeded for 70% of the days	2,037	2,298	1,950	2,562	2,323	1,872	2,082	1,845	1,921
Flow exceeded for 60% of the days	2,251	2,525	2,153	2,740	2,546	2,130	2,290	2,020	2,141
Flow exceeded for 50% of the days	2,479	2,750	2,350	2,920	2,880	2,320	2,502	2,202	2,344
Flow exceeded for 40% of the days	2,730	3,075	2,586	3,260	3,610	2,652	2,773	2,398	2,577
Flow exceeded for 30% of the days	3,099	3,593	2,900	3,710	4,300	3,052	3,133	2,683	2,864
Flow exceeded for 20% of the days	3,699	4,382	3,429	4,450	5,038	3,650	3,650	3,166	3,398
Flow exceeded for 10% of the days	4,934	5,900	4,484	6,058	6,522	5,265	4,808	3,986	4,447
Maximum	53,020	27,600	53,020	25,000	15,000	27,600	53,020	40,810	41,600
3-day Average Flows									
Flow exceeded for 100% of the days	177	820	177	1,000	1,330	820	697	293	177
Flow exceeded for 90% of the days	1,539	1,750	1,482	2,100	1,955	1,410	1,623	1,361	1,430
Flow exceeded for 80% of the days	1,838	2,093	1,746	2,427	2,134	1,708	1,925	1,664	1,714
Flow exceeded for 70% of the days	2,076	2,350	1,979	2,587	2,380	1,947	2,141	1,867	1,945
Flow exceeded for 60% of the days	2,294	2,580	2,185	2,769	2,581	2,172	2,327	2,044	2,172
Flow exceeded for 50% of the days	2,518	2,808	2,387	2,970	2,882	2,438	2,529	2,234	2,397
Flow exceeded for 40% of the days	2,770	3,135	2,618	3,351	3,610	2,773	2,808	2,447	2,606
Flow exceeded for 30% of the days	3,148	3,675	2,945	3,857	4,467	3,143	3,218	2,741	2,874
Flow exceeded for 20% of the days	3,800	4,516	3,487	4,527	5,179	3,867	3,822	3,216	3,412
Flow exceeded for 10% of the days	5,036	6,010	4,516	6,008	6,733	5,536	4,909	4,180	4,444
Maximum	40,457	19,267	40,457	19,267	11,093	18,300	40,457	31,794	28,467
7-day Average Flows									
Flow exceeded for 100% of the days	201	832	201	1,385	1,381	832	863	332	201
Flow exceeded for 90% of the days	1,605	1,885	1,553	2,223	1,995	1,483	1,701	1,439	1,499
Flow exceeded for 80% of the days	1,908	2,190	1,815	2,514	2,181	1,789	2,009	1,704	1,778
Flow exceeded for 70% of the days	2,151	2,470	2,041	2,671	2,472	2,094	2,210	1,919	2,007
Flow exceeded for 60% of the days	2,368	2,661	2,248	2,829	2,644	2,330	2,391	2,110	2,229
Flow exceeded for 50% of the days	2,586	2,864	2,454	3,074	3,026	2,561	2,622	2,303	2,445
Flow exceeded for 40% of the days	2,856	3,295	2,683	3,443	3,707	2,810	2,915	2,523	2,634
Flow exceeded for 30% of the days	3,245	3,811	3,043	3,871	4,614	3,456	3,384	2,955	2,955
Flow exceeded for 20% of the days	3,880	4,630	3,533	4,630	5,339	4,150	3,991	3,310	3,389
Flow exceeded for 10% of the days	5,041	6,025	4,588	6,221	6,687	5,270	5,021	4,155	4,496
Maximum	22,479	17,491	22,479	17,491	8,771	12,076	22,479	20,198	16,151
15-day Average Flows									
Flow exceeded for 100% of the days	358	889	358	1,741	1,455	889	1,222	453	358
Flow exceeded for 90% of the days	1,707	2,044	1,646	2,390	2,040	1,549	1,821	1,535	1,635
Flow exceeded for 80% of the days	2,010	2,347	1,903	2,667	2,295	2,084	2,160	1,804	1,865
Flow exceeded for 70% of the days	2,275	2,617	2,154	2,847	2,611	2,310	2,328	1,961	2,077
Flow exceeded for 60% of the days	2,480	2,842	2,349	3,053	2,880	2,498	2,520	2,221	2,303
Flow exceeded for 50% of the days	2,730	3,087	2,557	3,238	3,225	2,738	2,778	2,443	2,482
Flow exceeded for 40% of the days	3,002	3,432	2,836	3,563	3,675	3,032	3,148	2,750	2,721
Flow exceeded for 30% of the days	3,378	3,944	3,131	3,995	4,792	3,554	3,493	3,021	2,964
Flow exceeded for 20% of the days	3,921	4,495	3,587	4,382	5,555	4,266	3,968	3,422	3,440
Flow exceeded for 10% of the days	4,984	6,042	4,557	6,342	6,255	5,135	5,028	4,155	4,423
Maximum	14,887	14,614	14,887	14,614	8,117	10,027	14,887	13,024	9,780
30-day Average Flows									
Flow exceeded for 100% of the days	941	1,178	941	1,886	1,736	1,178	1,507	986	941
Flow exceeded for 90% of the days	1,832	2,183	1,770	2,601	2,241	1,860	2,018	1,709	1,724
Flow exceeded for 80% of the days	2,132	2,621	2,034	2,903	2,696	2,159	2,247	1,930	1,979
Flow exceeded for 70% of the days	2,401	2,894	2,251	3,048	2,936	2,565	2,461	2,108	2,176
Flow exceeded for 60% of the days	2,643	3,055	2,476	3,215	3,317	2,792	2,778	2,383	2,413
Flow exceeded for 50% of the days	2,907	3,250	2,680	3,466	3,760	2,983	3,062	2,596	2,566
Flow exceeded for 40% of the days	3,132	3,532	2,964	3,620	3,941	3,146	3,293	2,867	2,766
Flow exceeded for 30% of the days	3,417	3,815	3,233	3,846	4,394	3,347	3,774	3,074	3,076
Flow exceeded for 20% of the days	3,944	4,314	3,707	4,251	5,098	3,951	4,154	3,280	3,498
Flow exceeded for 10% of the days	4,654	5,738	4,431	5,977	6,118	4,839	4,617	4,321	4,273
Maximum	10,419	10,419	10,339	10,419	7,294	7,634	10,339	8,786	6,372

Table A.12-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Loup River near Columbus, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	64	476	64	1,000	1,180	476	315	233	64	
Flow exceeded for 90% of the days	866	1,241	767	1,680	1,550	916	938	658	765	
Flow exceeded for 80% of the days	1,174	1,590	1,044	2,004	1,700	1,110	1,214	881	1,057	
Flow exceeded for 70% of the days	1,455	1,825	1,304	2,200	1,899	1,342	1,464	1,113	1,319	
Flow exceeded for 60% of the days	1,696	2,040	1,528	2,482	2,020	1,584	1,743	1,357	1,541	
Flow exceeded for 50% of the days	1,975	2,298	1,781	2,700	2,180	1,740	2,036	1,565	1,764	
Flow exceeded for 40% of the days	2,246	2,620	2,075	2,995	2,490	1,927	2,273	1,845	2,051	
Flow exceeded for 30% of the days	2,605	3,011	2,409	3,421	2,956	2,270	2,655	2,162	2,402	
Flow exceeded for 20% of the days	3,190	3,890	2,885	4,300	4,362	2,910	3,284	2,626	2,769	
Flow exceeded for 10% of the days	4,600	5,459	4,158	5,750	5,840	4,387	4,650	3,750	3,797	
Maximum	77,565	25,800	77,565	25,800	15,000	23,500	53,020	77,565	41,600	
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	66	485	66	1,000	1,330	485	368	238	66	
Flow exceeded for 90% of the days	880	1,240	777	1,704	1,581	944	937	672	779	
Flow exceeded for 80% of the days	1,201	1,612	1,053	2,042	1,747	1,147	1,247	894	1,069	
Flow exceeded for 70% of the days	1,476	1,868	1,322	2,264	1,916	1,365	1,492	1,115	1,334	
Flow exceeded for 60% of the days	1,724	2,085	1,552	2,518	2,060	1,612	1,785	1,352	1,557	
Flow exceeded for 50% of the days	2,004	2,375	1,813	2,752	2,202	1,775	2,063	1,598	1,787	
Flow exceeded for 40% of the days	2,277	2,667	2,107	2,993	2,473	2,017	2,306	1,835	2,091	
Flow exceeded for 30% of the days	2,633	3,047	2,434	3,450	2,980	2,371	2,686	2,161	2,426	
Flow exceeded for 20% of the days	3,227	3,913	2,915	4,356	4,635	3,029	3,427	2,730	2,788	
Flow exceeded for 10% of the days	4,700	5,633	4,165	5,793	6,137	4,535	4,908	3,885	3,854	
Maximum	40,457	18,300	40,457	17,723	11,200	18,300	40,457	38,234	28,467	
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	95	500	95	1,031	1,381	500	438	260	95	
Flow exceeded for 90% of the days	913	1,294	805	1,777	1,666	974	953	683	811	
Flow exceeded for 80% of the days	1,232	1,673	1,092	2,087	1,834	1,183	1,310	929	1,126	
Flow exceeded for 70% of the days	1,519	1,929	1,357	2,345	1,976	1,432	1,579	1,158	1,360	
Flow exceeded for 60% of the days	1,764	2,125	1,590	2,599	2,058	1,664	1,847	1,392	1,573	
Flow exceeded for 50% of the days	2,047	2,440	1,841	2,821	2,225	1,838	2,117	1,604	1,814	
Flow exceeded for 40% of the days	2,327	2,729	2,149	3,109	2,460	2,086	2,357	1,857	2,130	
Flow exceeded for 30% of the days	2,685	3,174	2,472	3,557	2,804	2,483	2,765	2,242	2,427	
Flow exceeded for 20% of the days	3,319	4,060	3,029	4,616	4,944	3,169	3,621	2,962	2,771	
Flow exceeded for 10% of the days	4,799	5,622	4,230	6,009	6,408	4,465	4,996	4,002	3,736	
Maximum	22,479	17,491	22,479	17,491	8,586	11,739	22,479	20,198	16,367	
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	201	642	201	1,070	1,455	642	535	273	201	
Flow exceeded for 90% of the days	969	1,351	877	1,889	1,780	982	1,049	753	935	
Flow exceeded for 80% of the days	1,276	1,725	1,178	2,192	1,922	1,275	1,362	969	1,183	
Flow exceeded for 70% of the days	1,539	1,984	1,381	2,494	2,012	1,477	1,645	1,209	1,364	
Flow exceeded for 60% of the days	1,811	2,207	1,618	2,733	2,076	1,658	1,947	1,446	1,589	
Flow exceeded for 50% of the days	2,073	2,512	1,896	3,010	2,195	1,865	2,221	1,636	1,837	
Flow exceeded for 40% of the days	2,377	2,881	2,174	3,276	2,300	2,201	2,528	1,884	2,059	
Flow exceeded for 30% of the days	2,814	3,326	2,520	3,826	3,569	2,684	3,070	2,379	2,340	
Flow exceeded for 20% of the days	3,460	4,178	3,152	4,548	5,318	3,103	3,637	2,956	2,771	
Flow exceeded for 10% of the days	4,729	5,376	4,178	5,540	6,131	4,052	5,280	3,887	3,875	
Maximum	14,887	14,614	14,887	14,614	7,294	7,704	14,887	13,024	10,654	
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	212	760	212	1,194	1,630	760	701	357	212	
Flow exceeded for 90% of the days	1,112	1,334	1,025	1,990	1,845	1,074	1,204	846	1,051	
Flow exceeded for 80% of the days	1,358	1,827	1,298	2,458	1,952	1,241	1,493	1,126	1,313	
Flow exceeded for 70% of the days	1,601	2,017	1,458	2,784	2,017	1,471	1,766	1,306	1,436	
Flow exceeded for 60% of the days	1,866	2,286	1,680	2,956	2,126	1,732	2,125	1,485	1,611	
Flow exceeded for 50% of the days	2,114	2,750	1,936	3,255	2,220	1,938	2,447	1,699	1,797	
Flow exceeded for 40% of the days	2,466	3,056	2,193	3,546	2,341	2,372	2,653	1,995	2,045	
Flow exceeded for 30% of the days	2,836	3,434	2,549	3,843	3,724	2,684	2,971	2,285	2,252	
Flow exceeded for 20% of the days	3,358	3,893	3,042	4,313	5,441	3,084	3,789	2,887	2,756	
Flow exceeded for 10% of the days	4,311	5,483	4,025	5,694	5,983	3,611	4,678	3,381	3,428	
Maximum	10,419	10,419	10,339	10,419	6,427	7,571	10,339	8,786	8,689	

Table A.12-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

Loup River near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	64	476	64	1,000	1,200	476	315	233	64
Flow exceeded for 90% of the days	819	1,125	735	1,530	1,600	884	776	657	773
Flow exceeded for 80% of the days	1,046	1,466	950	1,800	1,764	1,011	1,021	826	1,004
Flow exceeded for 70% of the days	1,253	1,680	1,119	2,040	1,870	1,190	1,217	978	1,188
Flow exceeded for 60% of the days	1,465	1,870	1,297	2,260	2,132	1,346	1,346	1,110	1,405
Flow exceeded for 50% of the days	1,663	2,106	1,475	2,450	2,270	1,550	1,478	1,269	1,614
Flow exceeded for 40% of the days	1,876	2,370	1,664	2,668	2,580	1,698	1,619	1,484	1,795
Flow exceeded for 30% of the days	2,180	2,665	1,908	2,970	2,914	1,870	1,835	1,730	2,059
Flow exceeded for 20% of the days	2,582	3,070	2,266	3,419	3,220	2,148	2,214	2,027	2,449
Flow exceeded for 10% of the days	3,258	4,070	2,862	5,050	4,208	2,749	2,887	2,526	3,034
Maximum	77,565	25,800	77,565	25,800	13,000	11,960	26,170	77,565	29,940
3-day Average Flows									
Flow exceeded for 100% of the days	66	485	66	1,000	1,200	485	368	238	66
Flow exceeded for 90% of the days	833	1,154	742	1,538	1,631	904	787	670	796
Flow exceeded for 80% of the days	1,052	1,489	954	1,833	1,799	1,028	1,013	849	1,011
Flow exceeded for 70% of the days	1,264	1,710	1,127	2,050	1,923	1,211	1,223	987	1,193
Flow exceeded for 60% of the days	1,475	1,893	1,296	2,322	2,141	1,354	1,340	1,113	1,417
Flow exceeded for 50% of the days	1,676	2,147	1,486	2,466	2,403	1,600	1,484	1,267	1,629
Flow exceeded for 40% of the days	1,890	2,414	1,674	2,667	2,619	1,725	1,635	1,490	1,808
Flow exceeded for 30% of the days	2,205	2,694	1,908	2,971	2,995	1,869	1,835	1,733	2,080
Flow exceeded for 20% of the days	2,607	3,073	2,271	3,544	3,262	2,212	2,227	2,016	2,475
Flow exceeded for 10% of the days	3,277	4,115	2,899	5,170	4,104	2,844	2,930	2,538	3,052
Maximum	38,234	16,900	38,234	16,900	11,200	8,208	15,410	38,234	20,017
7-day Average Flows									
Flow exceeded for 100% of the days	95	500	95	1,031	1,439	500	409	260	95
Flow exceeded for 90% of the days	861	1,171	768	1,567	1,720	932	799	673	823
Flow exceeded for 80% of the days	1,074	1,512	973	1,859	1,882	1,048	1,005	877	1,029
Flow exceeded for 70% of the days	1,273	1,730	1,157	2,093	2,035	1,242	1,230	1,016	1,227
Flow exceeded for 60% of the days	1,485	1,939	1,308	2,341	2,280	1,418	1,345	1,139	1,440
Flow exceeded for 50% of the days	1,690	2,202	1,492	2,521	2,466	1,584	1,495	1,269	1,637
Flow exceeded for 40% of the days	1,903	2,458	1,680	2,712	2,636	1,730	1,645	1,476	1,819
Flow exceeded for 30% of the days	2,231	2,704	1,909	3,054	3,033	1,909	1,813	1,711	2,107
Flow exceeded for 20% of the days	2,627	3,172	2,302	3,636	3,334	2,225	2,213	2,044	2,509
Flow exceeded for 10% of the days	3,307	4,266	2,937	5,489	4,246	2,871	3,020	2,493	3,023
Maximum	18,620	11,469	18,620	11,469	8,586	5,474	12,490	18,620	16,367
15-day Average Flows									
Flow exceeded for 100% of the days	201	530	201	1,070	1,526	530	454	282	201
Flow exceeded for 90% of the days	895	1,241	806	1,620	1,840	948	847	718	866
Flow exceeded for 80% of the days	1,116	1,522	1,024	1,933	1,990	1,066	1,056	922	1,070
Flow exceeded for 70% of the days	1,284	1,778	1,177	2,215	2,117	1,329	1,245	1,081	1,247
Flow exceeded for 60% of the days	1,462	2,010	1,310	2,365	2,245	1,431	1,359	1,170	1,431
Flow exceeded for 50% of the days	1,680	2,236	1,469	2,533	2,428	1,586	1,480	1,249	1,624
Flow exceeded for 40% of the days	1,909	2,477	1,661	2,798	2,767	1,757	1,627	1,397	1,852
Flow exceeded for 30% of the days	2,240	2,826	1,888	3,127	3,166	1,981	1,822	1,628	2,127
Flow exceeded for 20% of the days	2,661	3,211	2,314	3,979	3,532	2,282	2,219	1,966	2,531
Flow exceeded for 10% of the days	3,361	4,289	2,867	5,377	4,319	3,054	3,240	2,570	2,916
Maximum	10,654	10,107	10,654	10,107	7,294	4,749	8,198	10,138	10,654
30-day Average Flows									
Flow exceeded for 100% of the days	246	722	246	1,212	1,894	722	515	467	246
Flow exceeded for 90% of the days	945	1,294	901	1,797	1,964	933	955	718	922
Flow exceeded for 80% of the days	1,147	1,552	1,082	2,108	2,008	1,174	1,131	1,005	1,136
Flow exceeded for 70% of the days	1,304	1,915	1,185	2,268	2,120	1,340	1,258	1,100	1,293
Flow exceeded for 60% of the days	1,453	2,114	1,323	2,382	2,227	1,457	1,340	1,152	1,451
Flow exceeded for 50% of the days	1,645	2,298	1,459	2,468	2,362	1,595	1,470	1,242	1,620
Flow exceeded for 40% of the days	1,979	2,440	1,620	2,768	2,714	1,797	1,585	1,371	1,863
Flow exceeded for 30% of the days	2,310	2,737	1,912	3,409	2,888	2,121	1,802	1,532	2,252
Flow exceeded for 20% of the days	2,598	3,376	2,352	4,058	3,795	2,455	2,286	1,881	2,497
Flow exceeded for 10% of the days	3,271	4,193	2,829	4,769	4,756	2,756	3,043	2,433	2,822
Maximum	8,272	8,272	7,085	8,272	5,418	3,541	5,728	6,322	7,085

A.12.5 Median Mean Daily Flow

The median mean daily flow by calendar day is shown on **Figure A.12-6**. **Figure A.12-6** shows a pattern for all time intervals which is consistent with the annual climate cycle in the greater Loup River basin. The erratic fluctuations in the daily values for the 1895-1909 and the 1910-1927 time intervals can be attributed to the incomplete record for these time intervals.

A.12.6 USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak flow are shown in **Figure A.12-7** and **Figure A.12-8** and in **Table A.12-15** and **Table A.12-16**. The 1910-1927 time interval was not considered for any of the following characterizations due to insufficient data.

Figure A.12-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak Flow, and the 10-year running average of the USGS Annual Peak Flow. **Figure A.12-7** generally shows more substantial differences between the USGS Annual Peak flow and the Annual Maximum mean daily flow prior to 1962. After 1962, these differences are much smaller except for the 1966 high flow event. A review of data from upstream locations show that this was a local event which occurred mainly near and downstream of St. Paul, Nebraska (USGS, 2004). It is also notable that, after 1962, there are no Peak flow events greater than 45,000 cfs except for the 1966 event; most were less than 25,000 cfs. These characterizations are consistent with the beginning of operation of the upstream reservoirs.

Figure A.12-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.12-8** shows some concentration in the occurrences of the USGS Annual Peak flow in March and June, but with significant scatter throughout the year except for January and the first half of February, during which no Annual Maximums have been recorded. This pattern is similar to that for the Annual Maximum mean daily flow, and is consistent with the relevant climatological characteristics of the Loup River basin, as discussed in **Section A.12.2**.

Table A.12-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.12-15** shows that, when average and median Annual Peak flows by time interval are considered, the values are consistent with the known climatological conditions by time interval for all time intervals except 1975-1998. For the 1975-1998 time interval, the average Peak flow values are lower than those for all other time intervals except 1928-1941. This is most likely attributable to the beginning of operation of the upstream reservoirs. For all time intervals, the average is greater than the median. This indicates that a small number of high Peak flow events skew the averages higher for all time intervals. The average time of occurrence for both the average and the median Peak flows is between late May and late June.

Table A.12-16 shows the exceedance probabilities and values for the USGS Annual Peak Flow. It is analogous to **Table A.12-5** for Annual Maximum mean daily flows. **Table A.12-16** shows that the Peak flow values are generally consistent with the known climatological conditions by time interval for the 1895-1909 through 1942-1958 time intervals. The changes in flow values from the 1942-1958 time interval to the 1959-1974 time interval go both ways, i.e. increasing for some exceedance probability ranges and decreasing for others, and do not show a consistent pattern of change with increasing or decreasing exceedance probability range. This is possibly the result of the beginning of operation of Sherman Reservoir in 1962. A more consistent pattern is evident for the 1959-1974 and 1975-1998 time intervals. The average Peak flow values increase from the 1959-1974 time interval to the 1975-1998 time interval for the higher exceedance probabilities, and decrease for the lower exceedance probabilities. Thus, the range of flow values over the range of exceedance probabilities is noticeably smaller for the 1975-1998 time interval than for the 1959-1994 time interval. This is coincident with the beginning of operation of Calamus and Davis Creek Reservoirs and the ongoing regulation of Sherman Reservoir.

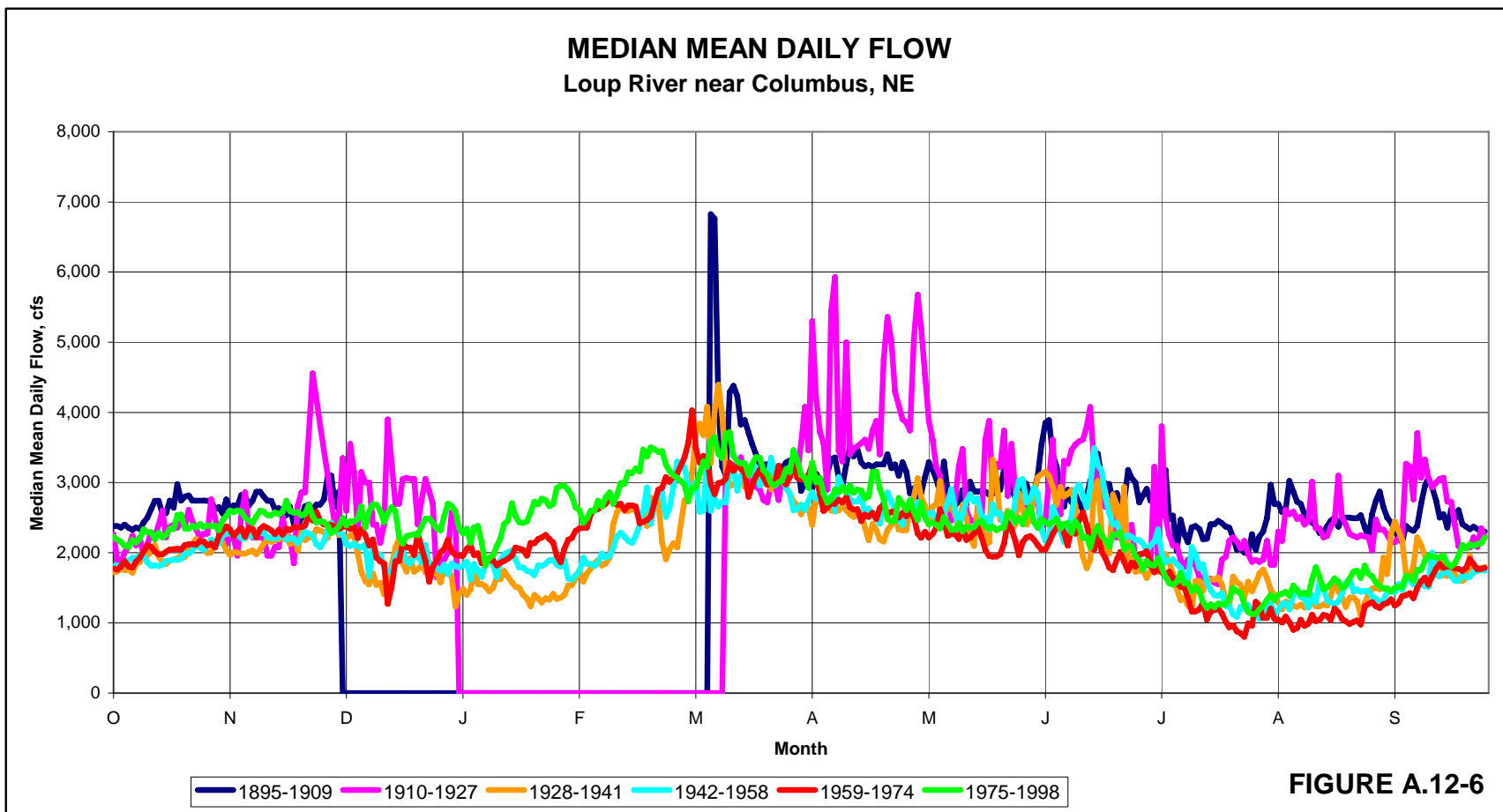


Figure A.12-6 Median Mean Daily Flow.

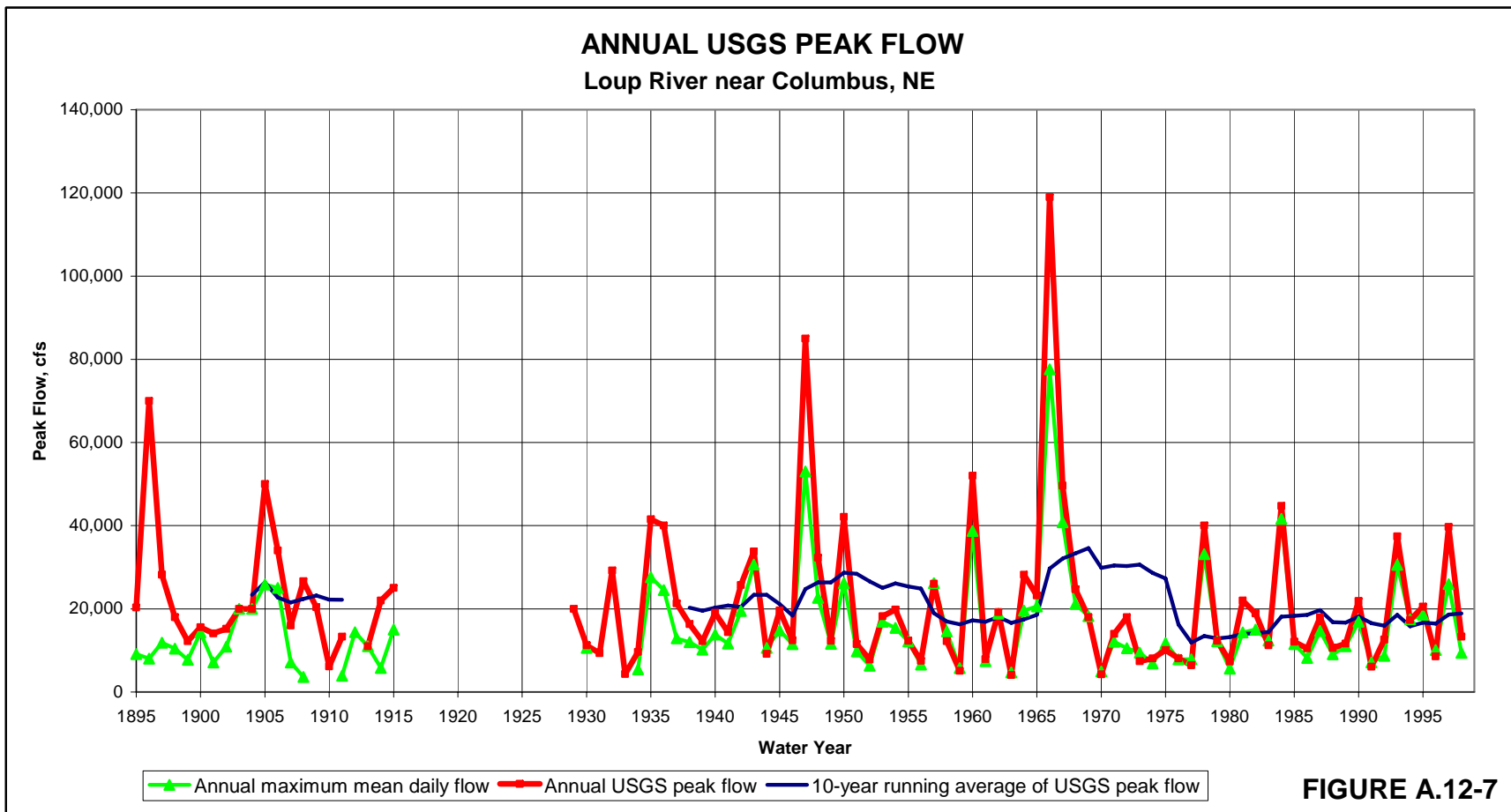


FIGURE A.12-7

Figure A.12-7 Annual USGS Peak Flow.

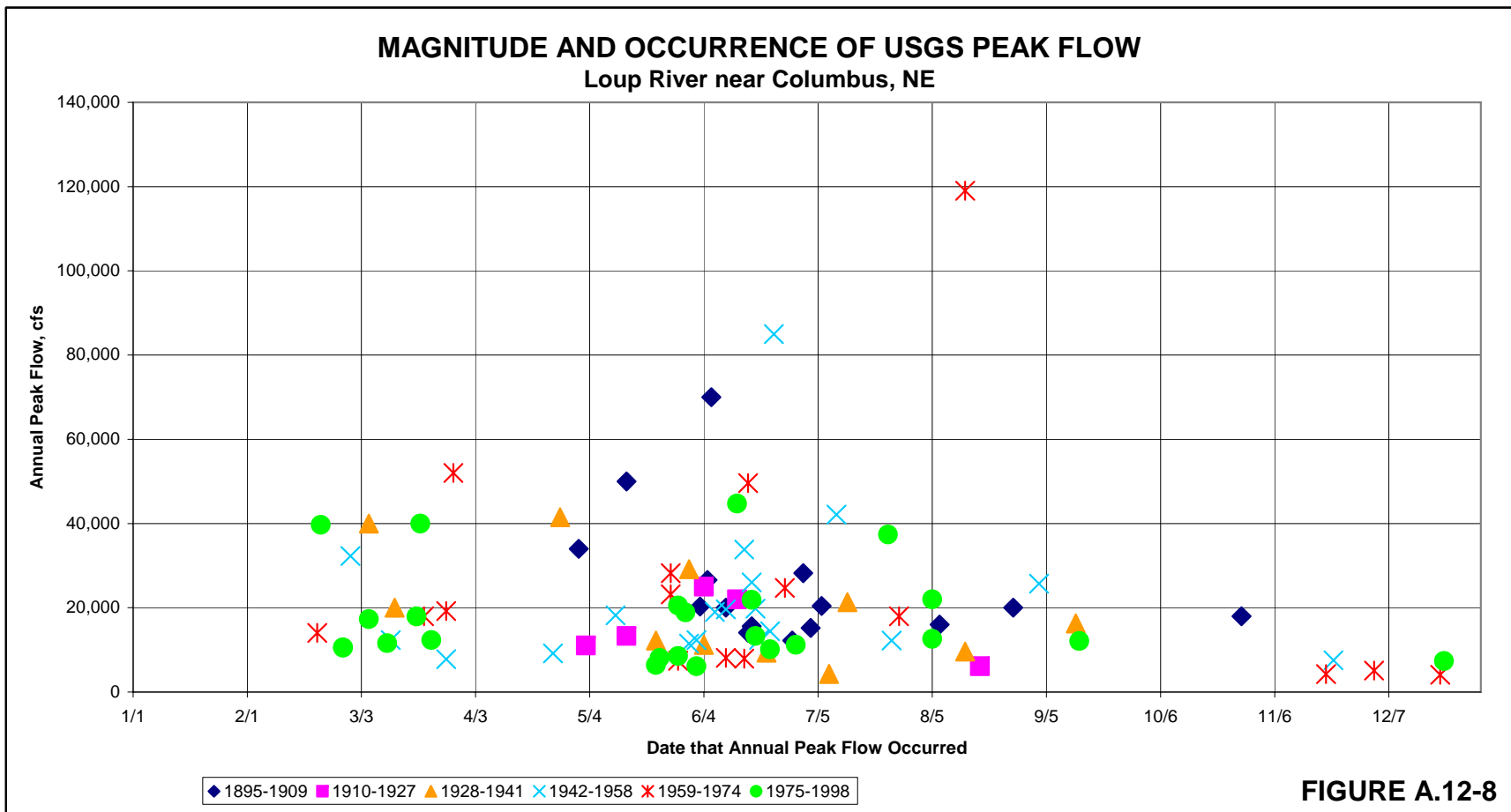


Figure A.12-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.12-15 Summary of USGS Peak Flows.

Loup River near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	21,308	21,405	21,252	25,373	15,480	19,105	22,803	25,169	17,543
Median Annual Peak Flow (cfs)	17,600	19,000	14,000	20,000	13,300	16,300	18,200	18,000	12,450
Average Occurrence of Peak Flow	6/12	6/18	6/9	6/29	6/10	6/8	6/10	6/27	5/26
Median Occurrence of Peak Flow	6/10	6/13	6/10	6/17	6/4	6/7	6/15	6/15	5/30

Table A.12-16 USGS Peak Flow Exceedance Values.

Loup River near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Annual Peak Flows									
Peak exceeded in 100% of the years	4,070	4,300	4,070	12,200	6,100	4,300	7,500	4,070	6,080
Peak exceeded in 90% of the years	7,490	9,896	7,372	14,540	8,060	9,404	8,612	4,660	7,561
Peak exceeded in 80% of the years	10,004	12,200	8,182	15,520	10,020	10,252	11,640	7,400	9,464
Peak exceeded in 70% of the years	12,170	14,280	11,080	16,400	11,460	11,800	12,280	8,005	10,590
Peak exceeded in 60% of the years	13,300	15,920	12,300	19,200	12,380	13,960	12,340	14,000	11,700
Peak exceeded in 50% of the years	17,600	19,000	14,000	20,000	13,300	16,300	18,200	18,000	12,450
Peak exceeded in 40% of the years	19,680	20,060	18,620	20,340	16,780	19,200	19,720	19,200	16,500
Peak exceeded in 30% of the years	21,930	21,580	21,920	25,360	20,260	20,520	25,760	23,950	19,060
Peak exceeded in 20% of the years	28,200	27,560	27,760	29,360	22,600	26,040	31,040	28,200	21,940
Peak exceeded in 10% of the years	40,150	38,800	40,840	43,600	23,800	37,840	37,120	50,800	39,010
Peak Flow	119,000	70,000	119,000	70,000	25,000	41,500	85,000	119,000	44,700

A.13 PLATTE RIVER-LOUP RIVER CONFLUENCE NEAR COLUMBUS, NEBRASKA

A.13.1 Methodology

For this location, a single continuous streamflow record was constructed using records from a total of six gages representing two, as shown in previous sections:

Gage	Records Used	Data Source
Loup River near Columbus, Nebraska	Section A.12	Section A.12
Platte River near Duncan, Nebraska	Section A.11	Section A.11

This record was synthesized by adding the flows of the Loup River at Columbus, Nebraska, including the Loup River Power Canal (**Section A.12**), to the Platte River near Duncan, Nebraska (**Section A.11**) for the time intervals common to both records. These common time intervals are: parts of 1895 through 1906 mainly in the irrigation season; 10/1/1929 through 9/30/1930 continuous record; and 4/1/1934 through 12/31/1998 continuous record. Over the time covered by these records, the average annual mean daily flow is 2,676 cfs in the Platte River near Duncan and 2,660 in the Loup River near Columbus. Thus, it can be seen that, historically, the contributions to the flow in the Platte River downstream of its confluence with the Loup River have come, on average, almost equally from the Platte River and the Loup River.

The flow characterizations for the Platte River-Loup River Confluence (Confluence) near Columbus, NE, are given in **Table A.13-1** (mean daily values), **Table A.13-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.13-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.13-4** (flow frequencies).

A.13.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.13-1 shows that Annual Maximum mean daily flow has increased since the 1928-1941 time interval despite the construction of three dams on the Loup River. This suggests that, since 1928, the predominant impacts on flow at the Confluence have been climate-driven (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). There was, however, a large decrease in both average and median Annual Maximum mean daily flow from the 1895-1909 time interval to the 1928-1941 time interval (no data exist for the 1910-1927 time interval). There is also a decrease in average and median annual flow volume from the 1895-1909 time interval to the 1928-1941 time interval, even though the annual flow volume for the 1895-1929 time interval is based on an average of less than 200 days of data per year. The 1975-1998 time interval is unusual in that the annual maximums decrease but the annual volumes increase relative to those in the 1959-1974 time interval. This is coincident with two of the three Loup River basin projects beginning operation, Calamus Reservoir in 1985 and Davis Creek Reservoir in 1992.

Table A.13-1 Summary of Mean Daily Flow Values.

Platte-Loup Confluence near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	21,881	26,598	20,060	32,639		17,873	20,280	21,997	18,613
Median Annual Maximum Mean Daily Flow (cfs)	17,973	26,815	16,840	30,100		17,040	16,840	18,845	14,948
Average Annual Flow Volume (kaf)	3,011	2,628	3,158	2,780		2,410	2,712	2,979	3,594
Median Annual Flow Volume (kaf)	2,771	2,613	2,847	2,708		2,258	2,680	2,846	3,569
Average Mean Daily Flow (cfs)	5,117	7,072	4,362	9,535		3,516	3,745	4,115	4,964
Median Mean Daily Flow (cfs)	3,608	6,000	3,505	7,682		2,900	3,169	3,442	4,292
Average Number of Mean Daily Flow Measurements	326	226	365	144	0	345	365	365	365
Number of Years of Data	79 of 104	22 of 47	57 of 57	13 of 15	0 of 18	9 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	10,114	12,467	9,701	14,845		11,872	9,012	7,137	11,899
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	19,437	26,736	16,748	34,430		16,477	19,155	16,379	15,288
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	18,761	24,071	16,805	29,998		16,168	18,680	18,558	14,308
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	12,082	11,588	12,255	13,387		9,389	11,247	14,137	11,715
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	8,434	11,535	8,085	14,845		9,507	8,085	6,515	10,383
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	17,074	27,660	13,700	30,620		16,070	16,720	14,875	12,032
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	16,375	19,292	12,069	27,830		16,070	16,720	11,125	10,261
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	9,182	9,675	9,042	12,200		6,732	9,940	8,134	9,271
Difference ("Apr-Jul Average" - "Jul-Sep Average")	7,355	15,148	4,493	21,043		7,088	7,909	2,242	3,573
Difference ("Apr-Jul Median" - "Jul-Sep Median")	7,892	17,986	4,658	18,420		9,338	6,780	6,741	2,761
Average Occurrence of Maximum Mean Daily Flow	5/31	5/31	5/31	6/6		5/24	6/4	5/28	5/30
Median Occurrence of Maximum Mean Daily Flow	6/8	6/7	6/10	6/11		6/3	6/10	6/15	5/30
Average Annual Minimum Mean Daily Flow (cfs)	1,078	535	1,155			535	788	953	1,549
Median Annual Minimum Mean Daily Flow (cfs)	796	521	905			521	780	796	1,366
Average occurrences per year of the Minimum	1	1	1			1	1	1	1
Occurring between	11/13	12/25	11/4			12/25	12/25	10/13	9/20
and	11/14	12/26	11/5			12/26	12/26	10/14	9/21
Median occurrences per year of the Minimum	1	1	1			1	1	1	1
Occurring between	1/1	1/30	9/30			1/30	1/3	9/30	9/12
and	1/2	1/31	10/1			1/31	1/4	10/1	9/13

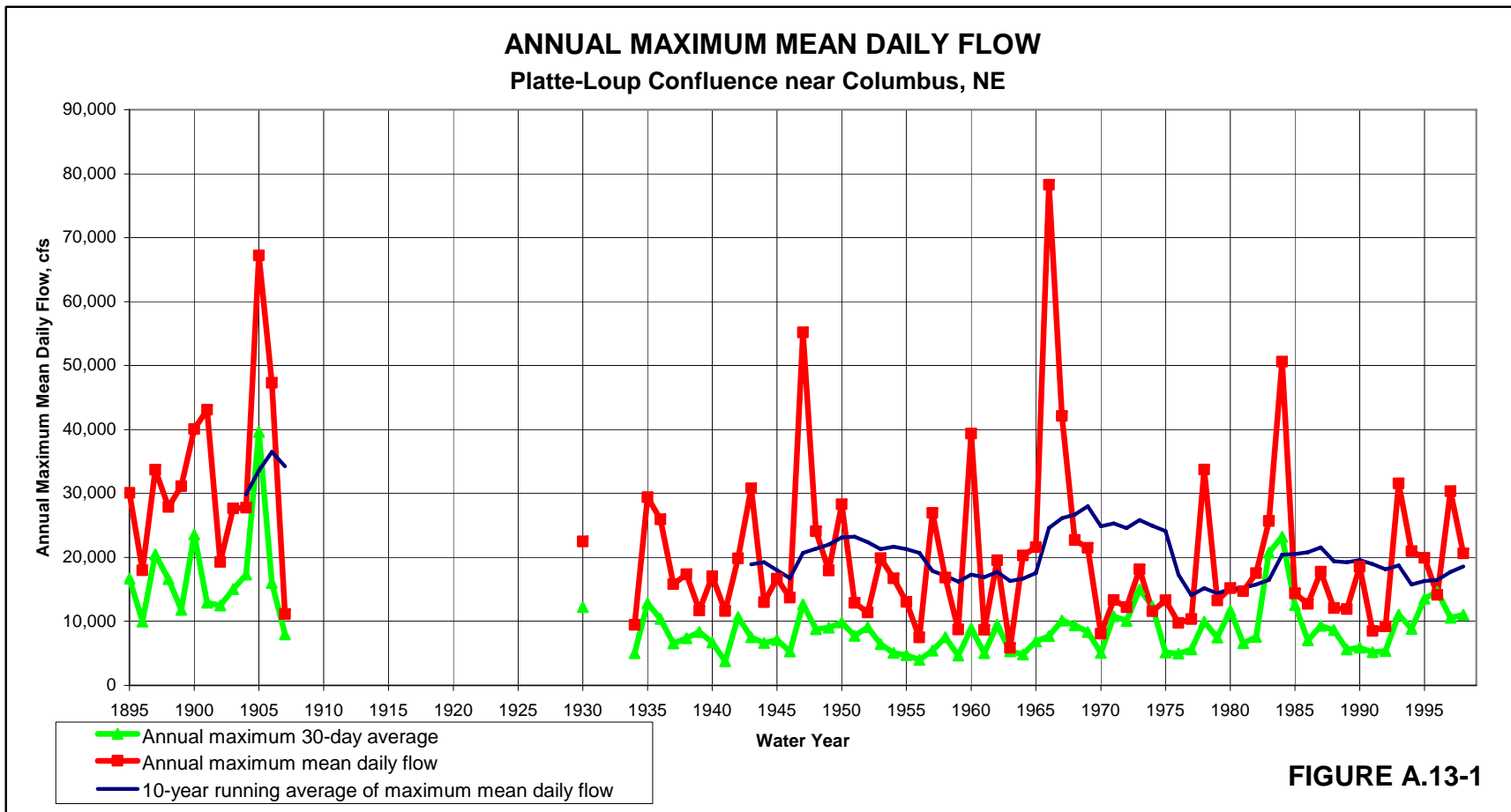


Figure A.13-1 Annual Maximum Mean Daily Flow.

Figure A.13-1 (maximum flows) shows that the 1895-1909 time interval is characterized by generally high annual maximums. Maximums are lower in the 1930's, somewhat higher in the 1940's, lower again in the 1950's, and higher in the 1960's, including a significant flood maximum in 1966. Maximums are then somewhat lower from the 1970's through the end of the period of record. There is generally a large difference between the Annual Maximum mean daily flow and the annual maximum 30-day average flow, especially for the higher maximums. This indicates that these maximums are short-duration runoff events. The 10-year running average shows a pattern generally similar to that for the Annual Maximum mean daily flow except for a delay caused by the averaging process.

Figure A.13-2 (annual flow volume) reflects the effects of both climate and water development activities on annual flow volume. For the 1895-1909 time interval, annual volumes were quite high, given the incomplete annual data record for those years. Over the continuous record, annual volumes are lower in the 1930's and early 1940's, higher in the late 1940's and early 1950's, lower in the mid-1950's through the early 1960's, somewhat higher with a few low years from the mid-1960's through the 1970's, and significantly higher in the 1980's and 1990's except for a dry period in the late 1980's and early 1990's. The high-volume years of the 1980's and 1990's are noteworthy because the annual maximums were not as high in these years as they were for some earlier years with lower annual volumes. As previously noted, two large Loup River basin storage projects began operation during the 1980's and 1990's.

Figure A.13-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.13-3** shows considerable scatter of the Annual Maximum mean daily flow dates throughout the year except for October through January, when no maximums occurred. There is some concentration of annual maximums in the months of March and June. March is the primary snowmelt month in the Platte River basin downstream of Grand Island and in the Loup River basin; June is the month that receives the most precipitation in these same areas. For the 1895-1909 time interval, the greatest number of maximums occur in June; this is the time of year when the most snowmelt from the upper Platte Basin would have reached the Confluence during this time interval. Precipitation decreases rapidly through October and November in the area around the Confluence, and in December and January temperatures are usually cold enough to cause ice formation on the rivers (NOAA, 2005 [Nebraska]).

The average and median seasonal maximum mean daily flows are highest in the Apr 16-Jul 15 seasonal period for all time intervals except 1959-1974, when they are highest in the Jun 1- Aug 15 seasonal period (**Table A.13-1**). The decrease in maximum flows from the Apr 16-Jul 15 seasonal period to the Jul 16-Sep 30 seasonal period is noticeably less for the 1959-1974 and 1975-1998 time intervals than it is for earlier time intervals. The average and median Dates of Maximum Flow are in May or June for all time intervals.

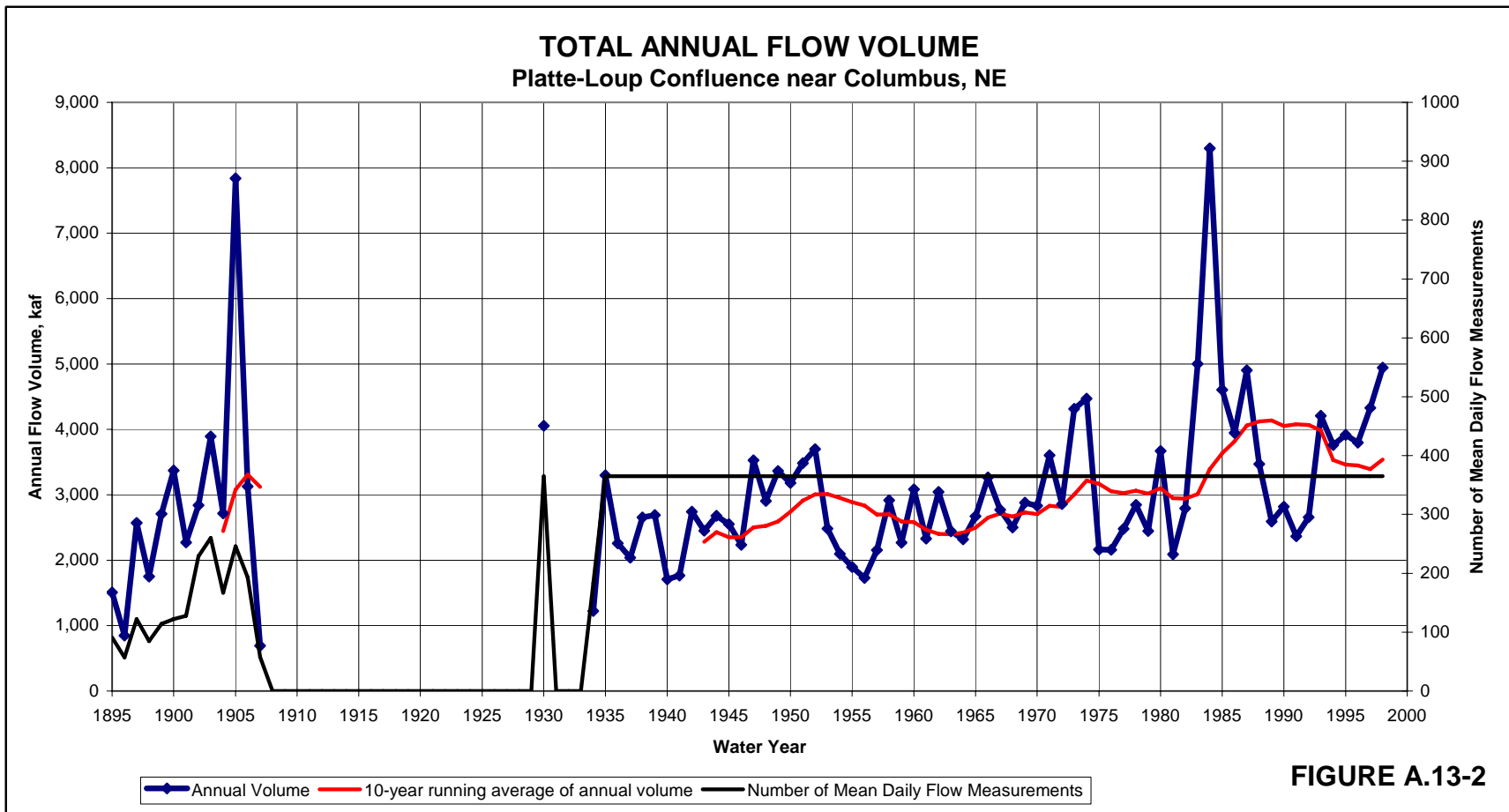


Figure A.13-2 Total Annual Flow Volume.

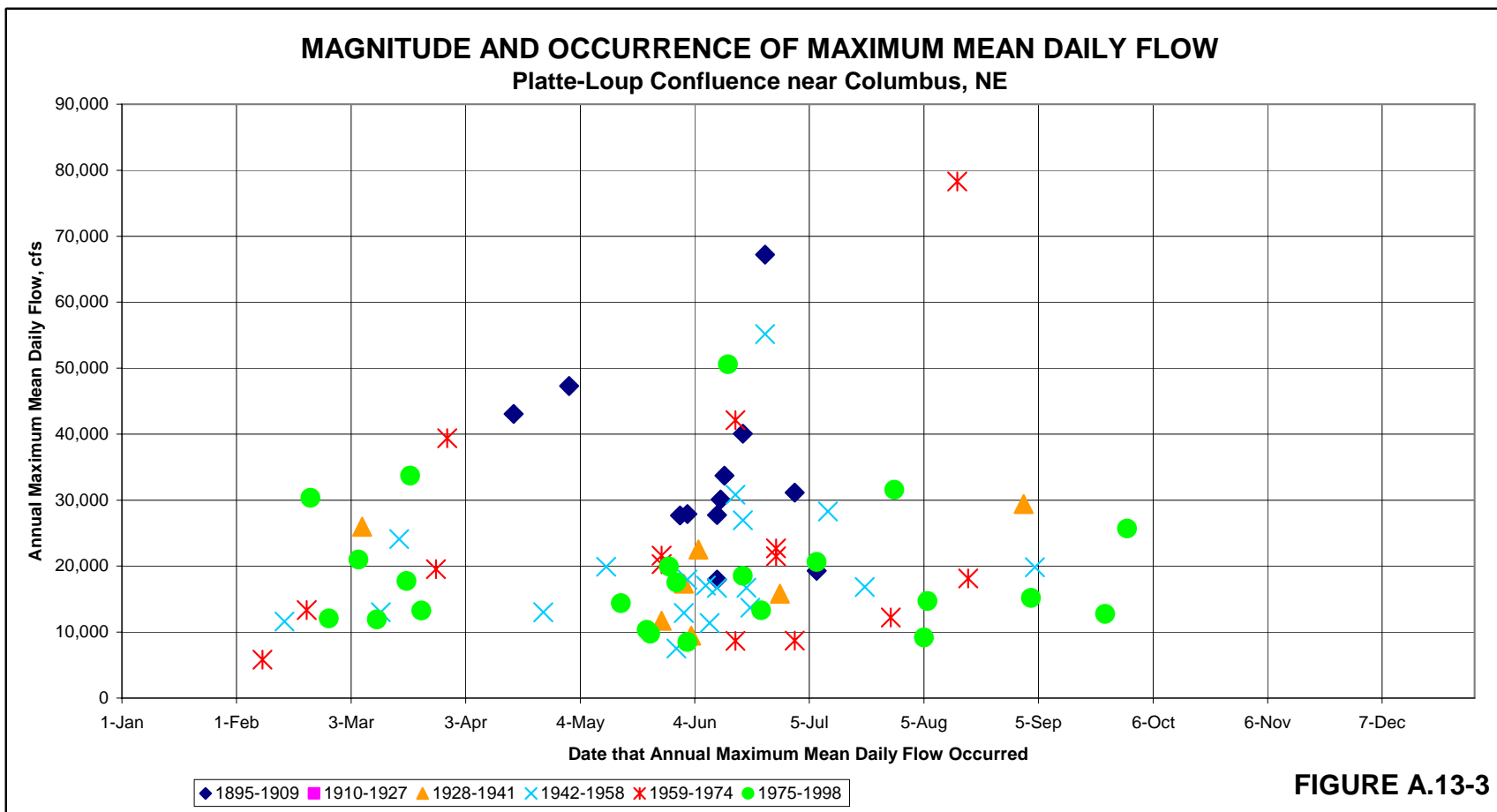


FIGURE A.13-3

Figure A.13-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

Figure A.13-4 (minimum flows) and **Table A.13-1** both show a pattern for the Annual Minimum mean daily flow that is similar to that for the annual flow volume (**Figure A.13-2**), suggesting that the combined effects of climate and development on the annual flow volume are affecting the Annual Minimum mean daily flow in a similar way. The one exception is for the 1895-1909 time interval, for which the minimum flow values are artificially high because of the shortage of data for the normally drier parts of the year for that time interval. For this reason, data for this time interval are not illustrated in **Figure A.13-4**. The differences between the Annual Minimum Mean Daily Flow and the annual minimum 30-Day average flow are not as great as those between the corresponding maximum flow quantities, indicating that changes in minimum flows do not occur as rapidly. The 10-year running average also demonstrates changes in Annual Minimum mean daily flow that may primarily reflect climate variations, but not as clearly as annual variations and with a delay due to the averaging process. The average and median Dates of Minimum Flow are in December and January for the 1928-1941 and 1942-1958 time intervals, and in September and October for the 1959-1974 and 1975-1998 time intervals. Minimum flows were not calculated for years with incomplete flow records.

A.13.3 3-, 7-, 15-, and 30- day Averages of Mean Daily Flows

Table A.13-2 shows that there is significant attenuation of both average and median annual maximum 10-day running average flows due to the averaging process, indicating that most maximums at this location are short-duration runoff maximums.

Table A.13-3 shows the average and median maximum 3-, 7-, 15-, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. The 1910-1927 time interval was not considered due to lack of data. **Table A.13-3** shows that, for the 1895-1909 time interval to the 1928-1941 time interval, there was a significant decrease in flow values by time interval for all averaging periods and for all seasonal periods (for the Feb 15-Mar 16 seasonal period, all average values for the 1895-1909 and 1910-1927 time intervals are unreliable due to incomplete data). This is coincident with the beginning of operation of the major North Platte River reservoir projects and the severe drought conditions of the 1930's. For the 1942-1958 through 1975-1998 time intervals, the flow characterizations appear to show a combined effect of known climatological conditions by time interval and the regulation of the reservoirs in the Loup River basin (**Section A.12.4.2**).

The differences between the averages and the medians are generally small across the board, although the averages are always greater than the medians. The somewhat larger values for the averages are consistent with the known precipitation and runoff patterns in this region (NOAA, 2005 [Nebraska]), along with any lingering downstream influence of the regulation of the North Platte River reservoir projects (**Section A.9.4.2** and preceding North Platte River location discussions).

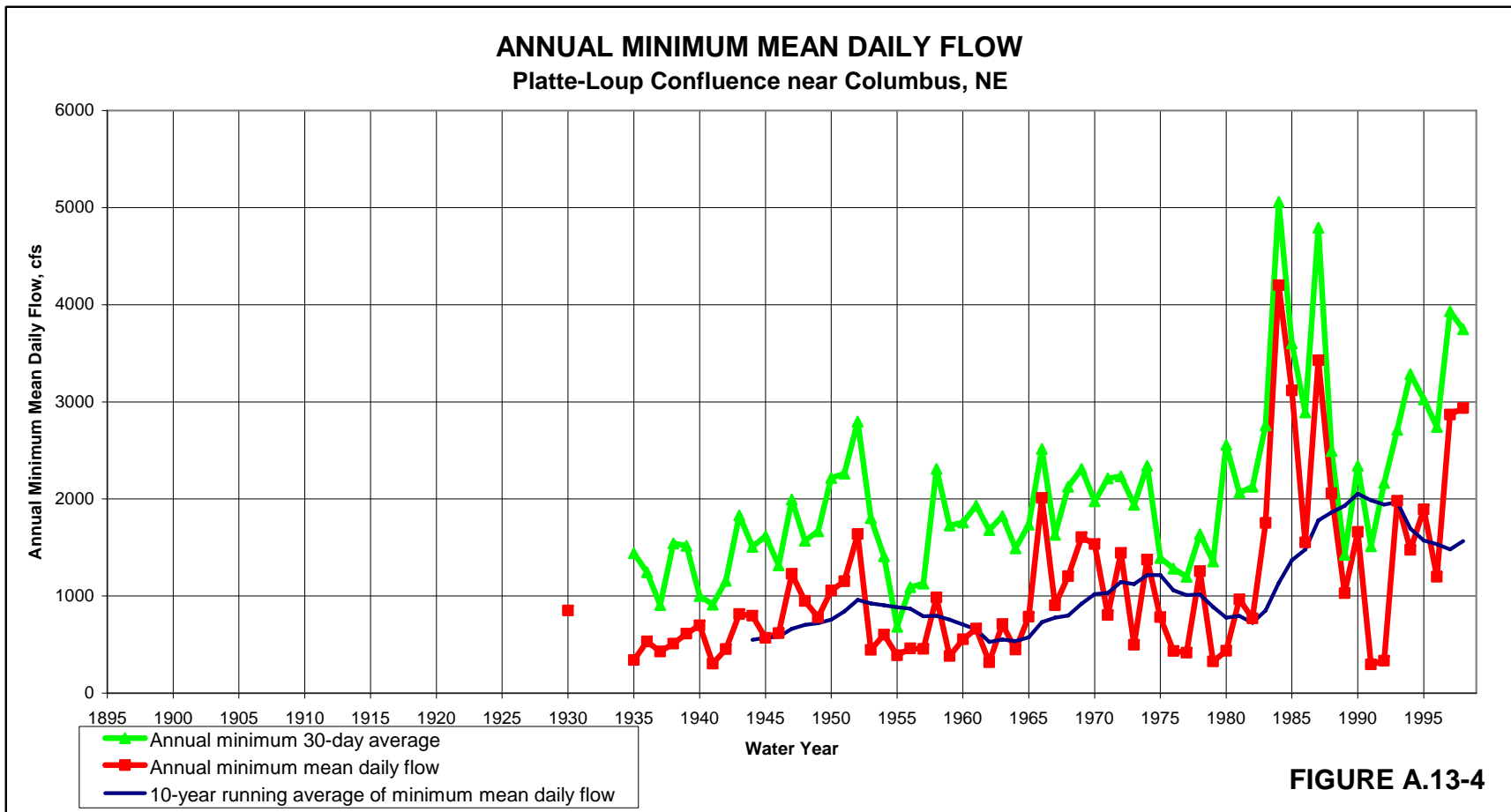


Figure A.13-4 Annual Minimum Mean Daily Flow.

Table A.13-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Platte-Loup Confluence near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	21,881	26,598	20,060	32,639		17,873	20,280	21,997	18,613
Median Annual Maximum Mean Daily Flow (cfs)	17,973	26,815	16,840	30,100		17,040	16,840	18,845	14,948
Avg. Ann. Max. 3-day Avg. Flow (cfs)	17,710	22,613	15,817	27,856		15,041	15,423	16,480	15,655
Median Ann. Max. 3-day Avg. Flow (cfs)	14,677	22,792	12,780	26,047		14,623	12,740	14,900	13,098
Avg. Ann. Max. 7-day Avg. Flow (cfs)	14,223	19,431	12,212	24,193		12,553	11,494	11,932	12,908
Median Ann. Max. 7-day Avg. Flow (cfs)	12,044	19,074	10,935	23,224		11,290	10,289	11,050	11,035
Avg. Ann. Max. 15-day Avg. Flow (cfs)	11,732	15,916	10,117	20,152		9,797	9,374	9,500	11,055
Median Ann. Max. 15-day Avg. Flow (cfs)	10,405	14,859	9,225	18,988		9,060	8,984	9,893	10,141
Avg. Ann. Max. 30-day Avg. Flow (cfs)	9,967	13,353	8,660	16,962		8,139	7,499	8,371	9,676
Median Ann. Max. 30-day Avg. Flow (cfs)	8,839	12,366	7,738	16,011		7,381	7,510	8,619	8,745
Average Annual Minimum Mean Daily Flow (cfs)	1,078	535	1,155			535	788	953	1,549
Median Annual Minimum Mean Daily Flow (cfs)	796	521	905			521	780	796	1,366
Avg. Ann. Min. 3-day Avg. Flow (cfs)	1,205	575	1,282			575	908	1,090	1,676
Median Ann. Min. 3-day Avg. Flow (cfs)	945	572	1,043			572	890	854	1,582
Avg. Ann. Min. 7-day Avg. Flow (cfs)	1,442	722	1,531			722	1,115	1,316	1,968
Median Ann. Min. 7-day Avg. Flow (cfs)	1,261	672	1,337			672	1,239	1,288	1,769
Avg. Ann. Min. 15-day Avg. Flow (cfs)	1,760	966	1,857			966	1,418	1,710	2,267
Median Ann. Min. 15-day Avg. Flow (cfs)	1,591	887	1,765			887	1,451	1,753	2,189
Avg. Ann. Min. 30-day Avg. Flow (cfs)	2,038	1,224	2,138			1,224	1,668	1,964	2,588
Median Ann. Min. 30-day Avg. Flow (cfs)	1,827	1,247	1,976			1,247	1,618	1,935	2,526

Table A.13-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Platte-Loup Confluence near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	17,710	22,613	15,817	27,856		15,041	15,423	16,480	15,655
Median Ann. Max. 3-day Avg. Flow (cfs)	14,677	22,792	12,780	26,047		14,623	12,740	14,900	13,098
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	8,780	10,314	8,537	11,354		10,184	7,530	6,651	10,508
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	15,648	22,223	13,226	28,851		13,385	14,336	12,904	12,655
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	14,996	20,133	13,103	25,223		13,347	14,446	13,385	11,965
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	9,934	9,372	10,132	10,839		7,578	9,055	10,936	10,359
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	7,625	8,285	7,320	11,354		8,206	6,733	5,913	9,742
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	12,592	19,760	11,510	26,512		14,623	11,883	11,387	10,570
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	11,943	18,616	10,359	23,856		14,623	12,740	9,293	9,808
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	8,034	7,475	8,034	8,892		5,557	8,563	7,681	8,544
Platte-Loup Confluence near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	14,223	19,431	12,212	24,193		12,553	11,494	11,932	12,908
Median Ann. Max. 7-day Avg. Flow (cfs)	12,044	19,074	10,935	23,224		11,290	10,289	11,050	11,035
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	7,264	8,477	7,073	8,445		8,481	6,152	5,846	8,543
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	12,466	18,666	10,182	24,531		10,846	10,440	9,796	10,256
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	11,894	17,354	9,883	22,503		10,487	10,756	9,684	9,397
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	8,292	7,428	8,595	8,513		6,102	7,780	8,427	9,283
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	6,458	7,041	6,365	8,445		6,550	5,838	5,396	7,976
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	10,185	16,559	9,301	22,892		11,290	9,529	9,271	8,910
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	9,661	16,700	8,141	19,819		9,810	9,909	7,888	7,712
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	6,785	5,767	6,887	8,154		4,704	7,086	6,016	6,988
Platte-Loup Confluence near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	11,732	15,916	10,117	20,152		9,797	9,374	9,500	11,055
Median Ann. Max. 15-day Avg. Flow (cfs)	10,405	14,859	9,225	18,988		9,060	8,984	9,893	10,141
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	5,977	6,389	5,920			6,389	4,976	5,395	6,937
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	10,224	15,582	8,250	20,689		8,773	8,377	7,957	8,356
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	9,722	14,564	7,938	19,525		7,950	8,598	7,683	7,641
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	6,843	6,066	7,116	6,909		5,037	6,282	6,646	8,020
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	5,332	5,050	5,350			5,050	4,828	5,085	6,472
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	8,767	14,073	7,583	19,674		9,060	8,268	7,297	7,483
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	7,645	13,417	6,956	17,317		8,604	7,867	6,788	6,614
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	5,263	4,435	5,534	6,865		4,123	5,534	5,090	5,968
Platte-Loup Confluence near Columbus, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	9,967	13,353	8,660	16,962		8,139	7,499	8,371	9,676
Median Ann. Max. 30-day Avg. Flow (cfs)	8,839	12,366	7,738	16,011		7,381	7,510	8,619	8,745
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	5,072	4,828	5,107			4,828	4,198	4,865	5,911
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	8,603	13,165	6,922	17,570		7,291	6,810	6,533	7,261
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	8,078	12,204	6,558	16,513		6,458	6,734	6,222	6,658
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	5,582	4,489	5,965	4,821		4,084	5,158	5,533	6,824
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	4,730	3,832	4,738			3,832	4,073	4,669	5,203
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	6,919	12,245	6,625	15,888		6,776	6,625	6,327	6,774
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	6,432	11,777	5,797	14,067		5,945	6,832	5,639	5,711
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	4,501	3,423	4,857	5,142		3,182	4,902	4,283	4,893

A.13.4 Flow Frequency

A.13.4.1 Flow Ranges

For percentage of years flow frequency, **Table A.13-4** and **Figure A.13-5** show that, for the 1895-1909 time interval, all flow ranges above 4,000 cfs have a frequency of 92 percent or greater. This is prior to the development of the large reservoir projects on the North Platte and Loup Rivers. The zero or near-zero percentage frequencies for flow ranges below 1,000 cfs are primarily the result of the previously-mentioned data shortages for this time interval.

For the later time intervals, the highest percentage frequencies occur between the 1,001-2,000-cfs flow range and the 3,001-4,000-cfs flow range. The frequencies in percentage of years show some variation by time interval due to climatic or other effects. This is more noticeable in the frequencies in percentage of days. For percentage of days, the flow ranges with the highest percentage frequency show some tendency to vary by time interval according to known climatic conditions in each time interval. The 1895-1909 time interval shows a relatively steady distribution of percentage frequencies over all flow ranges greater than 2,000 cfs. The greatest change in percentage frequency is from the 1895-1909 time interval to the 1928-1941 time interval. The 1928-1941 and 1942-1958 time intervals show the highest percentage frequencies occurring between the 1,001-2,000-cfs flow range and the 3,001-4,000-cfs flow range, with progressively decreasing percentage frequencies in the ranges greater than 4,000 cfs. This is a possible effect of the drought periods in the 1930's and the 1950's. For the 1959-1974 time interval, the highest percentage frequencies occur between the 2,001-3,000 cfs flow range and the 4,001-5,000-cfs flow range, and the percentage frequencies for flow ranges greater than 5,000 cfs are somewhat higher for this time interval than for the previous two time intervals. For the 1975-1998 time interval, all flow ranges between 2,000 cfs and 8,000 cfs have a percentage frequency of 10 percent or higher, which is consistent with other information (**Table A.13-2**) indicating this to have been a wet period.

A.13.4.2 Maximum Mean Flow Exceedance

Table A.13-5 through **Table A.13-9** show the exceedance values and probabilities for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix. The 1910-1927 time interval was not considered for any of the characterizations discussed in the following paragraphs due to a lack of data.

Table A.13-4 Flow Frequency Distributions.

Platte-Loup Confluence near Columbus, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	3	9	0	15	0	0	0	0	0
201 to 500	23	14	26	0	0	33	29	25	25
501 to 750	32	32	32	0	0	78	47	38	17
751 to 1,000	49	41	53	0	0	100	71	63	33
1,001 to 2,000	80	59	88	31	0	100	100	94	75
2,001 to 3,000	95	95	95	92	0	100	100	100	88
3,001 to 4,000	97	95	98	92	0	100	100	100	96
4,001 to 5,000	100	100	100	100	0	100	100	100	100
5,001 to 6,000	100	100	100	100	0	100	100	100	100
6,001 to 8,000	99	100	98	100	0	100	100	94	100
8,001 to 10,000	96	100	95	100	0	100	88	94	100
10,001 to 12,000	84	95	79	100	0	89	82	69	83
12,001 to 15,000	72	77	70	92	0	56	76	56	75
Greater than 15,000	63	82	56	92	0	67	65	56	50
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Platte-Loup Confluence near Columbus, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	0.3	1.4	0.0	3.8	0.0	0.0	0.0	0.0	0.0
201 to 500	0.2	0.3	0.2	0.0	0.0	0.5	0.2	0.2	0.2
501 to 750	0.5	0.9	0.4	0.0	0.0	1.4	0.9	0.2	0.2
751 to 1,000	0.8	1.7	0.6	0.0	0.0	2.7	1.2	0.4	0.3
1,001 to 2,000	10.6	16.8	9.1	1.1	0.0	26.3	14.1	9.0	5.6
2,001 to 3,000	23.1	20.9	23.6	8.3	0.0	28.5	29.3	26.7	17.7
3,001 to 4,000	20.9	12.5	22.9	11.0	0.0	13.4	22.0	24.8	22.4
4,001 to 5,000	14.9	8.8	16.3	7.7	0.0	9.5	13.5	17.0	17.8
5,001 to 6,000	9.0	5.8	9.8	7.3	0.0	5.0	7.7	8.8	12.0
6,001 to 8,000	9.1	9.2	9.1	14.2	0.0	6.2	6.5	6.8	12.5
8,001 to 10,000	4.4	6.2	3.9	11.9	0.0	2.8	2.3	3.1	5.7
10,001 to 12,000	2.2	4.2	1.7	9.0	0.0	1.3	1.1	1.7	2.1
12,001 to 15,000	1.5	3.5	1.1	7.5	0.0	1.1	0.7	0.4	1.7
Greater than 15,000	2.5	7.7	1.2	18.3	0.0	1.3	0.6	1.0	1.8
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Platte-Loup Confluence near Columbus, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	1	3	0	5	0	0	0	0	0
201 to 500	1	1	1	0	0	2	1	1	1
501 to 750	2	2	1	0	0	5	3	1	1
751 to 1,000	3	4	2	0	0	9	4	2	1
1,001 to 2,000	35	38	33	2	0	91	52	33	20
2,001 to 3,000	75	47	86	12	0	98	107	97	64
3,001 to 4,000	68	28	84	16	0	46	80	91	82
4,001 to 5,000	49	20	60	11	0	33	49	62	65
5,001 to 6,000	30	13	36	10	0	17	28	32	44
6,001 to 8,000	30	21	33	20	0	21	24	25	46
8,001 to 10,000	14	14	14	17	0	10	8	11	21
10,001 to 12,000	7	9	6	13	0	4	4	6	8
12,001 to 15,000	5	8	4	11	0	4	3	2	6
Greater than 15,000	8	17	4	26	0	4	2	4	7
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

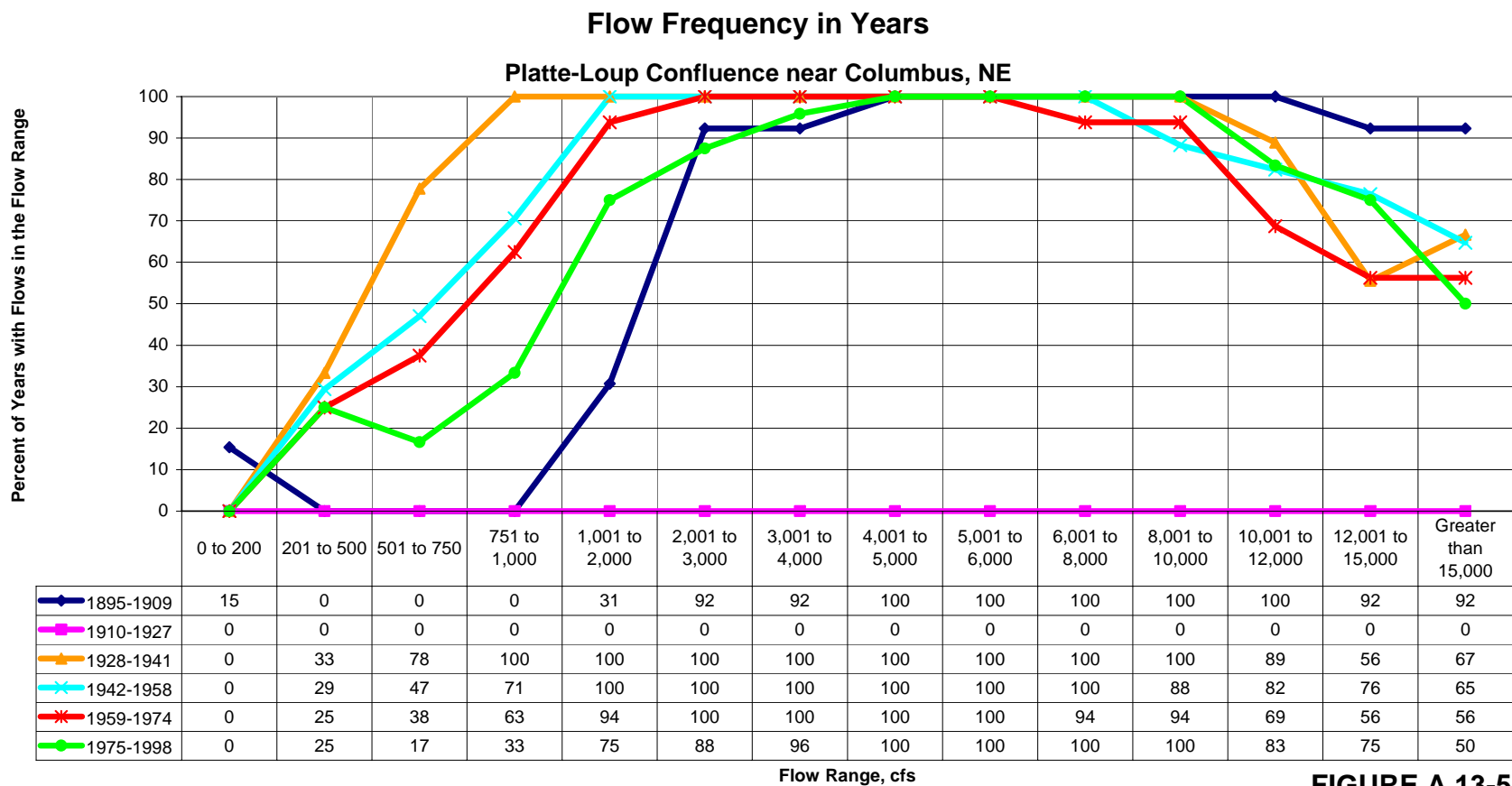


FIGURE A.13-5

Figure A.13-5 Flow Frequency in Years

Table A.13-5 shows the exceedance probabilities and values for annual data. **Table A.13-5** shows the expected decrease in flow values from the 1895-1909 time interval to the 1928-1941 time interval due to the lingering downstream effects of the regulation of the major North Platte River reservoirs and the severe drought conditions of the 1930's. For the 1928-1941 time interval and all subsequent time intervals, no consistent pattern is evident, most likely due to offsetting pattern in flow contributed by the Platte and Loup Rivers by seasonal period and by time interval. These will be discussed in detail in the following paragraphs.

Table A.13-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.13-6** shows that flow values increase for the higher exceedance probabilities (lower flows) and decrease for the lower exceedance probabilities (higher flows) from the 1928-1941 time interval to the 1942-1958 time interval. This can be attributed to lingering downstream effects of the regulation of the North Platte River reservoirs, with some offsetting effects caused by the inflow from the Loup River. From the 1942-1958 time interval to the 1959-1974 time interval, flow values decrease for the mean daily flow and the 3-day averaging times, are essentially the same for the 7-day averaging time, and increase for the 15-day and 30-day averaging times. This most likely reflects the effects of the inflow from the Loup River, which are largely independent of conditions in the Platte River and which, under wetter conditions, might help sustain higher flows at this location over multi-week periods. Flows increase nearly across the board from the 1959-1974 time interval to the 1975-1998 time interval. The latter time interval is known to have been wet during this seasonal period, especially toward the downstream end of the portion of the Platte River basin upstream of Duncan and the lower Loup River basin (NOAA, 2005 [Nebraska]; Nebraska, 2004).

Table A.13-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.13-7** shows significant decreases in flow values by time interval from the 1895-1909 time interval to the 1942-1958 time interval for all averaging times and most exceedance probabilities. This most likely reflects drier basin conditions during the 1942-1958 time interval as well as lingering downstream effects of the regulation of the major North Platte River reservoirs. For the 1942-1958 through 1975-1998 time intervals, the flow characterizations are generally similar to those for the Feb 15-Mar 16 seasonal period.

Table A.13-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.13-8** shows that, for the 1895-1909 through 1942-1958 time interval, the flow characterizations are generally consistent with the known climatological conditions during the respective time intervals, with some likely lingering downstream effects of the regulation of the North Platte River reservoirs, mainly for the higher exceedance probabilities (lower flows). For the 1942-1958 through 1975-1998 time intervals, the possible effects of the reservoirs in the Loup River basin can be seen, as discussed in **Section A.12.4.3**. The wet conditions of the 1975-1998 time interval generally did not carry through the later part of this seasonal period (NOAA, 2005 [Nebraska]).

Table A.13-5 Maximum Flow Exceedance Values, Annual Data.

Platte-Loup Confluence near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	5,830	9,460	5,830	11,140		9,460	7,500	5,830	8,480
Maximum exceeded in 90% of the years	9,700	11,618	8,997	18,237		11,180	12,287	8,371	9,937
Maximum exceeded in 80% of the years	11,994	16,080	11,938	22,639		11,658	13,012	8,720	11,994
Maximum exceeded in 70% of the years	13,309	17,537	13,016	27,720		13,350	13,564	11,890	13,199
Maximum exceeded in 60% of the years	16,688	20,575	14,243	27,872		16,080	16,696	13,337	14,198
Maximum exceeded in 50% of the years	17,973	26,815	16,840	30,100		17,040	16,840	18,845	14,948
Maximum exceeded in 40% of the years	20,233	27,844	19,136	31,651		17,288	19,080	20,306	17,704
Maximum exceeded in 30% of the years	25,041	29,890	20,700	36,248		20,440	20,738	21,540	20,009
Maximum exceeded in 20% of the years	29,680	33,188	25,358	41,871		23,888	26,394	22,700	22,858
Maximum exceeded in 10% of the years	39,510	42,771	32,430	46,454		26,656	29,298	40,740	31,205
Maximum	78,288	67,200	78,288	67,200		29,400	55,180	78,288	50,600
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	5,753	7,760	5,753	10,713		7,760	6,521	5,753	7,117
Maximum exceeded in 90% of the years	8,200	10,013	7,920	16,183		8,750	10,041	7,761	8,587
Maximum exceeded in 80% of the years	10,471	11,570	9,548	20,481		9,560	10,641	7,966	10,749
Maximum exceeded in 70% of the years	11,121	14,906	11,000	22,853		10,284	10,839	9,312	11,142
Maximum exceeded in 60% of the years	12,741	19,391	11,891	24,799		11,570	12,107	11,971	11,717
Maximum exceeded in 50% of the years	14,677	22,792	12,780	26,047		14,623	12,740	14,900	13,098
Maximum exceeded in 40% of the years	17,448	24,458	15,128	27,665		14,666	13,971	17,429	14,540
Maximum exceeded in 30% of the years	20,060	25,800	17,485	31,505		17,727	16,749	17,532	17,091
Maximum exceeded in 20% of the years	24,896	29,729	19,961	33,431		21,508	19,961	18,273	20,371
Maximum exceeded in 10% of the years	31,546	33,577	27,194	40,218		24,239	20,516	32,139	26,275
Maximum	53,950	53,950	42,453	53,950		24,677	42,453	39,001	37,667
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	5,290	6,470	5,290	9,844		6,470	5,290	5,570	6,446
Maximum exceeded in 90% of the years	6,742	8,973	6,571	14,806		7,260	7,382	5,980	7,067
Maximum exceeded in 80% of the years	8,293	10,133	7,741	17,643		8,311	8,311	6,309	8,159
Maximum exceeded in 70% of the years	9,641	12,717	8,890	20,026		9,252	9,331	8,212	8,894
Maximum exceeded in 60% of the years	10,667	16,688	10,347	22,218		10,106	9,681	10,434	10,615
Maximum exceeded in 50% of the years	12,044	19,074	10,935	23,224		11,290	10,289	11,050	11,035
Maximum exceeded in 40% of the years	13,911	21,005	12,474	24,433		11,893	11,802	11,926	13,268
Maximum exceeded in 30% of the years	16,359	23,024	13,616	27,192		14,753	13,179	14,301	14,591
Maximum exceeded in 20% of the years	19,709	26,096	15,754	29,987		17,681	13,849	16,958	17,026
Maximum exceeded in 10% of the years	23,976	30,978	19,709	31,404		19,713	15,301	19,522	20,945
Maximum	46,799	46,799	25,551	46,799		21,106	24,636	21,592	25,551
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	4,335	5,364	4,335	8,563		5,364	4,335	5,238	4,993
Maximum exceeded in 90% of the years	5,740	7,519	5,605	12,177		5,688	5,803	5,454	5,856
Maximum exceeded in 80% of the years	6,723	8,663	6,314	14,431		6,765	6,655	5,625	6,717
Maximum exceeded in 70% of the years	7,977	9,996	7,093	16,554		7,790	7,645	7,016	6,971
Maximum exceeded in 60% of the years	9,038	12,783	8,788	18,286		8,478	8,501	7,784	9,160
Maximum exceeded in 50% of the years	10,405	14,859	9,225	18,988		9,060	8,984	9,893	10,141
Maximum exceeded in 40% of the years	11,617	16,981	10,560	20,368		9,184	9,063	11,037	11,353
Maximum exceeded in 30% of the years	13,268	18,862	11,582	20,798		11,020	10,018	11,363	12,627
Maximum exceeded in 20% of the years	15,247	20,393	12,713	23,788		12,963	12,059	11,629	14,450
Maximum exceeded in 10% of the years	19,262	24,986	14,979	26,454		14,600	13,718	13,502	15,409
Maximum	43,358	43,358	24,238	43,358		16,711	17,528	16,227	24,238
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	3,777	3,777	3,993	7,966		3,777	3,993	4,661	4,935
Maximum exceeded in 90% of the years	5,059	6,573	5,052	10,345		4,768	4,930	4,936	5,221
Maximum exceeded in 80% of the years	5,550	7,498	5,335	12,078		5,942	5,315	5,066	5,624
Maximum exceeded in 70% of the years	6,749	8,829	6,324	12,747		6,613	6,236	6,080	6,520
Maximum exceeded in 60% of the years	7,585	10,951	7,260	14,633		6,831	6,816	7,708	7,507
Maximum exceeded in 50% of the years	8,839	12,366	7,738	16,011		7,381	7,510	8,619	8,745
Maximum exceeded in 40% of the years	9,933	12,897	8,958	16,633		8,145	7,655	9,391	9,832
Maximum exceeded in 30% of the years	10,929	15,726	9,853	16,926		9,563	8,819	9,788	11,030
Maximum exceeded in 20% of the years	12,588	16,663	10,762	19,215		11,127	9,074	10,134	12,033
Maximum exceeded in 10% of the years	16,133	20,169	12,588	22,950		12,368	10,165	11,571	14,318
Maximum	39,625	39,625	23,218	39,625		12,861	12,663	14,994	23,218

Table A.13-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Platte-Loup Confluence near Columbus, NE Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	3,600	3,807	3,600	12,490		3,807	3,620	4,486	3,600
Maximum exceeded in 90% of the years	5,092	4,728	5,160	12,961		4,523	5,422	5,090	5,825
Maximum exceeded in 80% of the years	5,888	6,627	5,888	13,432		5,728	6,592	5,740	6,946
Maximum exceeded in 70% of the years	6,696	8,027	6,666	13,903		7,212	6,872	5,825	7,269
Maximum exceeded in 60% of the years	7,212	9,722	7,143	14,374		8,162	7,404	5,918	8,886
Maximum exceeded in 50% of the years	8,434	11,535	8,085	14,845		9,507	8,085	6,515	10,383
Maximum exceeded in 40% of the years	9,178	13,646	8,938	15,316		11,540	8,680	7,118	11,636
Maximum exceeded in 30% of the years	11,008	15,926	10,255	15,787		14,900	9,230	7,530	11,987
Maximum exceeded in 20% of the years	12,210	17,540	11,874	16,258		17,492	10,730	8,740	14,113
Maximum exceeded in 10% of the years	17,880	19,607	14,765	16,729		21,021	11,969	9,470	20,461
Maximum	31,473	25,970	31,473	17,200		25,970	24,090	13,337	31,473
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	3,205	3,205	3,383	11,354		3,205	3,383	4,259	3,577
Maximum exceeded in 90% of the years	4,793	4,310	4,971	11,354		4,172	5,231	4,683	5,458
Maximum exceeded in 80% of the years	5,503	5,912	5,532	11,354		5,470	5,864	5,387	6,188
Maximum exceeded in 70% of the years	6,020	7,328	5,903	11,354		6,929	6,097	5,469	7,071
Maximum exceeded in 60% of the years	6,567	8,158	6,390	11,354		7,861	6,307	5,645	8,047
Maximum exceeded in 50% of the years	7,625	8,285	7,320	11,354		8,206	6,733	5,913	9,742
Maximum exceeded in 40% of the years	8,433	10,028	8,431	11,354		8,720	7,508	6,153	10,379
Maximum exceeded in 30% of the years	9,747	10,998	9,690	11,354		10,245	8,704	7,312	11,193
Maximum exceeded in 20% of the years	11,103	13,166	10,544	11,354		13,715	9,625	8,427	12,496
Maximum exceeded in 10% of the years	13,389	17,533	12,496	11,354		18,357	10,363	8,913	16,640
Maximum	27,939	24,130	27,939	11,354		24,130	13,667	11,971	27,939
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	2,712	2,712	3,041	8,445		2,712	3,041	3,784	3,544
Maximum exceeded in 90% of the years	4,416	4,070	4,533	8,445		3,900	4,623	3,914	4,943
Maximum exceeded in 80% of the years	4,927	5,027	4,929	8,445		4,821	4,854	4,686	5,613
Maximum exceeded in 70% of the years	5,363	5,688	5,295	8,445		5,502	5,379	4,923	6,210
Maximum exceeded in 60% of the years	5,838	6,256	5,725	8,445		5,936	5,567	5,004	7,117
Maximum exceeded in 50% of the years	6,458	7,041	6,365	8,445		6,550	5,838	5,396	7,976
Maximum exceeded in 40% of the years	7,227	7,598	7,223	8,445		7,180	6,573	5,650	8,644
Maximum exceeded in 30% of the years	7,976	8,162	7,960	8,445		7,668	7,119	6,792	8,936
Maximum exceeded in 20% of the years	8,702	11,100	8,696	8,445		12,145	7,596	7,227	9,929
Maximum exceeded in 10% of the years	10,080	15,939	9,303	8,445		16,367	8,076	8,045	12,662
Maximum	19,652	19,364	19,652	8,445		19,364	8,717	9,039	19,652
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	2,482	2,482	2,727			2,482	2,727	3,058	3,533
Maximum exceeded in 90% of the years	3,705	2,938	3,734			2,938	3,726	3,667	4,085
Maximum exceeded in 80% of the years	4,275	3,429	4,390			3,429	4,250	4,502	4,897
Maximum exceeded in 70% of the years	4,638	3,962	4,708			3,962	4,365	4,673	5,309
Maximum exceeded in 60% of the years	4,954	4,589	5,071			4,589	4,663	4,786	5,579
Maximum exceeded in 50% of the years	5,332	5,050	5,350			5,050	4,828	5,085	6,472
Maximum exceeded in 40% of the years	5,888	5,576	5,893			5,576	5,256	5,332	6,852
Maximum exceeded in 30% of the years	6,453	6,433	6,452			6,433	5,554	5,961	7,302
Maximum exceeded in 20% of the years	7,197	9,956	7,128			9,956	5,872	6,211	8,691
Maximum exceeded in 10% of the years	9,425	12,380	8,399			12,380	6,183	7,460	10,484
Maximum	14,122	12,747	14,122			12,747	7,249	8,745	14,122
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	2,373	2,373	2,578			2,373	2,578	2,978	3,343
Maximum exceeded in 90% of the years	3,224	2,840	3,398			2,840	3,011	3,470	3,836
Maximum exceeded in 80% of the years	3,759	3,159	3,957			3,159	3,305	3,998	4,233
Maximum exceeded in 70% of the years	4,020	3,369	4,068			3,369	3,952	4,129	4,732
Maximum exceeded in 60% of the years	4,253	3,583	4,289			3,583	3,985	4,282	5,034
Maximum exceeded in 50% of the years	4,730	3,832	4,738			3,832	4,073	4,669	5,203
Maximum exceeded in 40% of the years	4,999	4,175	5,058			4,175	4,230	4,983	5,949
Maximum exceeded in 30% of the years	5,420	4,717	5,448			4,717	4,628	5,257	6,334
Maximum exceeded in 20% of the years	6,005	6,566	6,000			6,566	4,800	5,439	7,747
Maximum exceeded in 10% of the years	7,874	8,324	7,747			8,324	5,585	6,486	8,350
Maximum	10,539	9,672	10,539			9,672	5,915	8,138	10,539

Table A.13-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Platte-Loup Confluence near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	5,414	9,460	5,414	17,973		9,460	7,500	5,414	8,020
Maximum exceeded in 90% of the years	8,592	11,690	8,412	20,129		9,926	8,219	7,410	8,473
Maximum exceeded in 80% of the years	9,885	16,070	9,322	27,680		11,031	11,684	8,720	9,446
Maximum exceeded in 70% of the years	11,708	17,350	10,550	27,802		13,350	12,986	10,190	10,130
Maximum exceeded in 60% of the years	13,618	19,292	11,989	28,780		15,886	14,892	11,460	11,716
Maximum exceeded in 50% of the years	17,074	27,660	13,700	30,620		16,070	16,720	14,875	12,032
Maximum exceeded in 40% of the years	18,672	27,900	17,355	32,676		16,846	18,354	17,990	14,162
Maximum exceeded in 30% of the years	20,598	30,100	19,034	38,159		17,226	19,828	20,893	17,621
Maximum exceeded in 20% of the years	27,384	33,700	20,565	42,471		19,410	25,556	21,600	19,280
Maximum exceeded in 10% of the years	31,907	43,071	26,454	46,877		23,660	29,298	24,020	20,447
Maximum	67,200	67,200	55,180	67,200		28,300	55,180	42,110	50,600
3-day Average Flows									
Maximum exceeded in 100% of the years	5,376	7,070	5,376	15,442		7,070	6,521	5,376	7,113
Maximum exceeded in 90% of the years	7,299	9,936	7,200	18,150		7,622	7,280	6,592	7,274
Maximum exceeded in 80% of the years	9,035	14,623	8,012	19,813		9,065	9,529	7,672	8,588
Maximum exceeded in 70% of the years	10,036	15,297	9,290	23,308		10,284	10,665	8,766	9,108
Maximum exceeded in 60% of the years	10,952	18,040	10,469	25,554		11,570	11,147	9,324	10,068
Maximum exceeded in 50% of the years	12,592	19,760	11,510	26,512		14,623	11,883	11,387	10,570
Maximum exceeded in 40% of the years	14,734	22,487	12,227	29,041		14,666	12,621	11,883	11,825
Maximum exceeded in 30% of the years	17,414	26,047	14,217	32,220		15,049	14,682	14,585	13,495
Maximum exceeded in 20% of the years	20,060	30,417	16,922	33,499		17,082	18,290	17,057	15,386
Maximum exceeded in 10% of the years	28,009	33,626	19,726	41,043		19,916	20,400	19,687	18,936
Maximum	53,950	53,950	42,453	53,950		20,540	42,453	33,128	37,667
7-day Average Flows									
Maximum exceeded in 100% of the years	4,883	4,883	5,091	12,122		4,883	5,290	5,091	5,977
Maximum exceeded in 90% of the years	6,044	8,880	5,999	14,737		6,942	6,168	5,583	6,271
Maximum exceeded in 80% of the years	7,473	11,290	6,425	19,199		8,311	6,970	6,015	7,160
Maximum exceeded in 70% of the years	8,677	12,122	7,976	21,341		9,252	8,283	7,165	8,374
Maximum exceeded in 60% of the years	9,289	13,653	8,785	22,509		10,106	9,316	8,373	8,799
Maximum exceeded in 50% of the years	10,185	16,559	9,301	22,892		11,290	9,529	9,271	8,910
Maximum exceeded in 40% of the years	11,350	20,854	10,012	23,617		11,893	10,137	9,762	9,913
Maximum exceeded in 30% of the years	12,630	22,559	11,009	25,819		12,643	11,338	10,530	10,993
Maximum exceeded in 20% of the years	15,985	23,879	12,146	30,376		13,286	12,071	12,154	12,017
Maximum exceeded in 10% of the years	22,759	31,308	15,011	31,417		14,234	14,154	14,329	14,527
Maximum	46,799	46,799	25,551	46,799		16,559	24,636	21,592	25,551
15-day Average Flows									
Maximum exceeded in 100% of the years	3,973	3,973	4,335	11,417		3,973	4,335	4,745	4,993
Maximum exceeded in 90% of the years	5,336	7,428	5,271	12,197		5,410	5,384	5,233	5,428
Maximum exceeded in 80% of the years	6,180	9,060	5,700	15,626		6,765	6,290	5,535	6,090
Maximum exceeded in 70% of the years	7,012	9,519	6,572	16,100		7,790	6,920	6,102	6,909
Maximum exceeded in 60% of the years	7,568	11,590	7,014	17,891		8,478	7,384	6,619	7,095
Maximum exceeded in 50% of the years	8,767	14,073	7,583	19,674		9,060	8,268	7,297	7,483
Maximum exceeded in 40% of the years	9,174	15,646	8,670	20,385		9,184	8,905	7,784	8,602
Maximum exceeded in 30% of the years	10,020	18,988	9,106	21,095		9,397	9,173	8,809	9,159
Maximum exceeded in 20% of the years	12,200	20,401	9,761	24,586		10,347	9,805	9,732	9,474
Maximum exceeded in 10% of the years	17,966	25,385	11,434	26,588		12,087	10,287	11,793	11,347
Maximum	43,358	43,358	19,703	43,358		14,073	17,528	14,422	19,703
30-day Average Flows									
Maximum exceeded in 100% of the years	3,526	3,526	3,993	9,980		3,526	3,993	4,311	4,257
Maximum exceeded in 90% of the years	4,760	6,560	4,717	11,122		4,718	4,930	4,641	4,884
Maximum exceeded in 80% of the years	5,209	6,776	5,083	12,563		5,942	5,315	4,778	5,282
Maximum exceeded in 70% of the years	5,649	8,336	5,460	13,563		6,613	5,495	4,975	5,609
Maximum exceeded in 60% of the years	6,612	9,980	5,923	15,097		6,710	5,918	5,465	6,071
Maximum exceeded in 50% of the years	6,919	12,245	6,625	15,888		6,776	6,625	6,327	6,774
Maximum exceeded in 40% of the years	7,482	12,922	6,923	16,653		7,260	6,995	6,833	6,933
Maximum exceeded in 30% of the years	8,877	15,153	7,365	17,117		7,954	7,303	7,077	7,572
Maximum exceeded in 20% of the years	10,459	16,673	8,548	19,851		8,635	7,683	8,612	8,502
Maximum exceeded in 10% of the years	15,088	20,488	9,244	23,258		9,716	9,020	9,178	10,152
Maximum	39,625	39,625	17,858	39,625		12,245	12,663	10,134	17,858

Table A.13-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Platte-Loup Confluence near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	5,140	9,460	5,140	17,973		9,460	6,010	5,140	7,006
Maximum exceeded in 90% of the years	8,138	11,458	7,514	18,438		9,926	8,035	5,946	8,042
Maximum exceeded in 80% of the years	9,185	16,070	8,516	18,880		10,892	10,108	8,660	8,418
Maximum exceeded in 70% of the years	10,189	17,350	9,422	21,802		13,211	12,588	9,250	9,156
Maximum exceeded in 60% of the years	11,995	18,400	10,359	27,700		15,886	14,892	10,373	9,513
Maximum exceeded in 50% of the years	16,375	19,292	12,069	27,830		16,070	16,720	11,125	10,261
Maximum exceeded in 40% of the years	17,976	25,750	15,890	29,220		16,846	17,500	12,200	11,995
Maximum exceeded in 30% of the years	19,758	27,760	18,098	30,827		17,226	18,866	19,735	14,945
Maximum exceeded in 20% of the years	26,482	30,100	20,508	33,188		19,410	25,538	22,700	18,654
Maximum exceeded in 10% of the years	31,268	33,700	29,298	39,433		23,150	29,298	33,725	20,447
Maximum	78,288	67,200	78,288	67,200		25,750	55,180	78,288	50,600
3-day Average Flows									
Maximum exceeded in 100% of the years	4,968	7,070	4,968	15,442		7,070	5,642	4,968	6,583
Maximum exceeded in 90% of the years	6,971	9,936	6,827	17,224		7,622	7,505	5,254	6,957
Maximum exceeded in 80% of the years	7,707	14,623	7,416	18,155		9,065	8,762	7,400	7,236
Maximum exceeded in 70% of the years	9,017	15,297	8,611	18,775		10,284	10,240	7,591	8,393
Maximum exceeded in 60% of the years	10,352	17,133	9,155	20,481		11,570	10,732	8,772	8,951
Maximum exceeded in 50% of the years	11,943	18,616	10,359	23,856		14,623	12,740	9,293	9,808
Maximum exceeded in 40% of the years	15,030	19,410	11,126	25,630		14,666	13,971	10,970	10,352
Maximum exceeded in 30% of the years	17,421	22,487	14,398	26,654		15,049	16,272	14,585	11,310
Maximum exceeded in 20% of the years	19,920	25,900	17,239	29,710		16,942	18,290	17,453	15,386
Maximum exceeded in 10% of the years	26,223	30,393	21,015	30,414		19,636	20,400	27,524	18,948
Maximum	52,907	52,907	42,453	52,907		20,540	42,453	36,096	37,667
7-day Average Flows									
Maximum exceeded in 100% of the years	4,588	4,883	4,588	14,287		4,883	4,588	4,758	4,909
Maximum exceeded in 90% of the years	5,803	8,880	5,496	16,718		6,942	6,406	4,924	5,892
Maximum exceeded in 80% of the years	6,529	9,810	6,278	17,109		8,311	7,166	5,683	6,318
Maximum exceeded in 70% of the years	7,461	13,041	7,037	18,049		9,109	7,717	6,098	6,633
Maximum exceeded in 60% of the years	8,385	14,287	7,553	18,386		9,525	8,574	7,278	7,200
Maximum exceeded in 50% of the years	9,661	16,700	8,141	19,819		9,810	9,909	7,888	7,712
Maximum exceeded in 40% of the years	12,059	18,018	9,287	22,276		11,597	11,614	9,762	8,622
Maximum exceeded in 30% of the years	13,298	18,785	11,651	23,682		12,643	12,133	11,294	8,865
Maximum exceeded in 20% of the years	16,522	23,224	12,605	25,451		13,148	13,004	12,403	12,017
Maximum exceeded in 10% of the years	21,076	25,844	15,850	26,569		13,748	15,301	16,527	14,527
Maximum	46,799	46,799	25,551	46,799		15,506	24,636	21,592	25,551
15-day Average Flows									
Maximum exceeded in 100% of the years	3,973	3,973	4,052	11,816		3,973	4,052	4,455	4,174
Maximum exceeded in 90% of the years	4,937	6,947	4,655	13,438		5,388	5,068	4,634	4,659
Maximum exceeded in 80% of the years	5,672	8,604	5,193	13,625		6,465	6,156	5,133	5,328
Maximum exceeded in 70% of the years	6,226	9,060	6,071	14,235		6,948	6,516	5,413	5,985
Maximum exceeded in 60% of the years	6,952	11,816	6,465	15,631		7,280	7,163	6,204	6,156
Maximum exceeded in 50% of the years	7,645	13,417	6,956	17,317		8,604	7,867	6,788	6,614
Maximum exceeded in 40% of the years	9,052	13,641	7,394	19,811		8,785	8,512	7,003	7,223
Maximum exceeded in 30% of the years	10,154	15,646	8,997	20,389		8,968	9,194	9,357	7,547
Maximum exceeded in 20% of the years	12,838	20,360	9,982	21,866		9,207	10,538	9,732	9,405
Maximum exceeded in 10% of the years	16,210	22,232	12,554	24,899		9,945	13,225	11,793	11,347
Maximum	43,358	43,358	19,703	43,358		12,015	17,528	14,422	19,703
30-day Average Flows									
Maximum exceeded in 100% of the years	3,289	3,509	3,289	9,980		3,509	3,708	4,100	3,289
Maximum exceeded in 90% of the years	4,296	5,270	4,273	11,780		4,683	4,546	4,245	4,262
Maximum exceeded in 80% of the years	4,806	5,945	4,672	11,911		5,153	4,964	4,460	4,677
Maximum exceeded in 70% of the years	5,309	8,336	5,022	12,379		5,515	5,104	4,688	5,285
Maximum exceeded in 60% of the years	5,790	8,954	5,419	12,624		5,894	5,790	4,917	5,515
Maximum exceeded in 50% of the years	6,432	11,777	5,797	14,067		5,945	6,832	5,639	5,711
Maximum exceeded in 40% of the years	7,335	12,334	6,547	16,125		6,415	7,178	6,111	5,858
Maximum exceeded in 30% of the years	8,710	12,830	7,118	17,117		7,614	7,474	6,881	6,924
Maximum exceeded in 20% of the years	10,064	16,673	8,145	18,013		8,490	7,536	8,612	7,835
Maximum exceeded in 10% of the years	12,713	18,189	9,539	19,675		8,768	9,253	9,166	10,397
Maximum	39,625	39,625	17,858	39,625		8,954	12,663	10,120	17,858

Table A.13-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

Platte-Loup Confluence near Columbus, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	2,737	2,899	2,737	3,600		2,899	2,737	4,815	2,807
Maximum exceeded in 90% of the years	4,030	3,798	4,860	5,633		3,636	3,426	5,054	5,581
Maximum exceeded in 80% of the years	5,470	5,152	6,086	6,350		3,956	4,255	6,052	7,318
Maximum exceeded in 70% of the years	6,865	6,135	7,202	6,502		4,599	6,744	6,559	8,175
Maximum exceeded in 60% of the years	8,124	6,640	8,209	10,092		5,690	7,809	6,919	8,790
Maximum exceeded in 50% of the years	9,182	9,675	9,042	12,200		6,732	9,940	8,134	9,271
Maximum exceeded in 40% of the years	10,432	10,935	10,419	15,640		8,978	10,859	8,510	10,494
Maximum exceeded in 30% of the years	13,150	13,670	13,082	15,860		9,701	14,928	12,067	12,937
Maximum exceeded in 20% of the years	16,722	16,107	16,722	17,094		11,015	16,872	16,250	15,615
Maximum exceeded in 10% of the years	22,806	24,315	20,818	23,750		16,140	20,818	20,869	19,125
Maximum	78,288	30,540	78,288	30,540		29,400	27,830	78,288	31,570
3-day Average Flows									
Maximum exceeded in 100% of the years	2,271	2,703	2,271	3,397		2,703	2,271	4,064	2,785
Maximum exceeded in 90% of the years	3,725	3,588	4,221	5,004		3,428	3,297	4,555	5,069
Maximum exceeded in 80% of the years	4,938	3,959	5,376	5,697		3,688	3,884	5,433	6,724
Maximum exceeded in 70% of the years	5,993	5,391	6,591	6,283		3,849	5,215	5,927	7,305
Maximum exceeded in 60% of the years	7,126	5,973	7,501	8,787		4,322	7,167	6,815	7,771
Maximum exceeded in 50% of the years	8,034	7,475	8,034	8,892		5,557	8,563	7,681	8,544
Maximum exceeded in 40% of the years	8,887	8,829	8,957	11,573		6,037	8,876	7,894	9,815
Maximum exceeded in 30% of the years	11,053	9,827	11,053	12,710		7,663	10,029	9,904	11,042
Maximum exceeded in 20% of the years	14,287	13,305	14,287	15,684		8,831	13,509	15,002	14,023
Maximum exceeded in 10% of the years	19,144	19,334	18,192	19,017		12,198	16,660	20,314	18,634
Maximum	39,001	24,677	39,001	22,190		24,677	20,947	39,001	25,289
7-day Average Flows									
Maximum exceeded in 100% of the years	0	0	1,849	0		2,008	1,849	3,497	2,651
Maximum exceeded in 90% of the years	3,279	2,896	3,690	4,449		2,797	2,895	3,926	4,707
Maximum exceeded in 80% of the years	4,161	3,395	4,512	5,232		3,200	3,366	4,075	5,742
Maximum exceeded in 70% of the years	5,137	4,628	5,809	5,939		3,366	4,084	4,985	6,378
Maximum exceeded in 60% of the years	5,946	5,035	6,147	6,785		3,669	6,045	5,887	6,623
Maximum exceeded in 50% of the years	6,785	5,767	6,887	8,154		4,704	7,086	6,016	6,988
Maximum exceeded in 40% of the years	7,364	6,881	7,482	10,177		4,732	7,364	7,156	8,183
Maximum exceeded in 30% of the years	9,359	8,761	9,383	10,211		5,252	9,131	8,914	9,295
Maximum exceeded in 20% of the years	13,084	10,798	13,108	13,143		6,167	12,979	11,474	13,116
Maximum exceeded in 10% of the years	16,208	13,765	16,641	13,513		9,842	14,549	17,907	17,617
Maximum	24,368	21,106	24,368	16,035		21,106	16,430	19,249	24,368
15-day Average Flows									
Maximum exceeded in 100% of the years	0	0	1,605	0		1,519	1,605	2,710	2,544
Maximum exceeded in 90% of the years	2,705	2,490	3,155	3,725		2,382	2,754	3,291	4,303
Maximum exceeded in 80% of the years	3,620	2,696	3,947	3,979		2,651	3,153	3,593	4,446
Maximum exceeded in 70% of the years	4,296	3,902	4,454	4,297		2,691	3,817	3,990	4,838
Maximum exceeded in 60% of the years	4,787	4,128	4,985	4,892		2,983	5,107	4,586	5,121
Maximum exceeded in 50% of the years	5,263	4,435	5,534	6,865		4,123	5,534	5,090	5,968
Maximum exceeded in 40% of the years	6,373	5,452	6,542	8,006		4,129	6,125	5,501	6,851
Maximum exceeded in 30% of the years	7,833	7,207	7,833	8,071		4,396	8,049	7,187	7,989
Maximum exceeded in 20% of the years	10,346	8,338	10,542	9,404		5,261	9,651	10,562	11,706
Maximum exceeded in 10% of the years	12,843	11,697	12,843	11,277		8,376	10,510	12,019	14,720
Maximum	24,238	16,711	24,238	15,479		16,711	13,738	16,227	24,238
30-day Average Flows									
Maximum exceeded in 100% of the years	0	0	1,410	0		1,273	1,410	2,476	2,295
Maximum exceeded in 90% of the years	2,248	0	2,869	0		1,997	2,433	2,888	3,458
Maximum exceeded in 80% of the years	2,922	1,019	3,176	0		2,277	2,889	3,098	3,728
Maximum exceeded in 70% of the years	3,405	2,294	3,677	0		2,363	3,023	3,271	4,054
Maximum exceeded in 60% of the years	3,800	2,865	4,145	3,506		2,549	4,385	3,684	4,240
Maximum exceeded in 50% of the years	4,501	3,423	4,857	5,142		3,182	4,902	4,283	4,893
Maximum exceeded in 40% of the years	5,284	4,355	5,443	5,890		3,309	5,426	4,877	6,111
Maximum exceeded in 30% of the years	6,457	5,516	6,775	6,563		3,634	6,539	5,759	6,845
Maximum exceeded in 20% of the years	7,590	7,032	7,590	8,908		4,440	7,422	7,062	8,526
Maximum exceeded in 10% of the years	10,750	10,885	10,718	10,728		6,856	8,165	9,962	13,006
Maximum	20,736	12,861	20,736	12,297		12,861	10,674	14,994	20,736

Table A.13-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.13-9** shows a characterization that is generally consistent with the known climatological conditions during the respective time intervals for the 1895-1909 through 1942-1958 time intervals. For the 1942-1958 through 1975-1998 time intervals, the effects of conditions in the Loup River can be seen, as discussed in **Section A.12.4.3**.

A.13.4.3 Mean Daily Flow Exceedance

Table A.13-10 through **Table A.13-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods (Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30) for 1-day (mean daily flow) and 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix. The 1910-1927 time interval was not considered for any of the following characterizations due to a lack of data.

Table A.13-10 shows the exceedance probabilities and values of flows for annual data. **Table A.13-10** shows that, when all flow values are considered, they are generally consistent with the known climatological conditions during the respective time intervals.

Table A.13-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.13-11** shows that, when all flow values are considered, they are generally consistent with the known climatological conditions during the respective time intervals. An exception to this characterization is the decrease in the flow values from the 1928-1941 time interval to the 1942-1958 time interval for the 30 percent and lower exceedance probabilities (higher flows) for all seasonal periods. This is most likely attributable to lingering downstream effects of the regulation of the North Platte River reservoirs. The 1895-1909 and 1910-1927 time intervals were not considered for the characterizations for this seasonal period due to insufficient data.

Table A.13-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.13-12** shows significant decreases in flow values by time interval from the 1895-1909 time interval through the 1942-1958 time interval for all averaging times and all exceedance probabilities. This is possibly attributable to lingering downstream effects of the regulation of the major North Platte River reservoirs as well as drier conditions in the later time intervals. For the 1942-1958 through 1975-1998 time intervals, the flow are generally consistent with known climatological conditions for the respective time intervals.

Table A.13-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 time interval. **Table A.13-13** shows that the flow values are lower across the board than those for the Apr 16-Jul 15 seasonal period (**Table A.13-12**). Otherwise, the

Table A.13-10 Exceedance Values Considering All Flows, Annual Data.

Platte-Loup Confluence near Columbus, NE Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	11	11	297	11		304	390	319	297
Flow exceeded for 90% of the days	1,860	1,475	1,985	2,750		1,345	1,705	2,020	2,278
Flow exceeded for 80% of the days	2,344	1,955	2,441	3,610		1,687	2,116	2,430	2,832
Flow exceeded for 70% of the days	2,763	2,386	2,841	4,743		1,976	2,438	2,750	3,270
Flow exceeded for 60% of the days	3,200	2,873	3,255	6,127		2,246	2,787	3,139	3,714
Flow exceeded for 50% of the days	3,670	3,605	3,678	7,500		2,592	3,172	3,523	4,194
Flow exceeded for 40% of the days	4,213	4,591	4,170	9,047		3,033	3,597	3,946	4,747
Flow exceeded for 30% of the days	4,898	6,158	4,768	10,964		3,760	4,152	4,480	5,452
Flow exceeded for 20% of the days	5,960	8,450	5,650	14,190		4,717	4,870	5,150	6,454
Flow exceeded for 10% of the days	8,160	12,840	7,410	19,488		6,760	6,241	6,801	8,305
Maximum	78,288	67,200	78,288	67,200		29,400	55,180	78,288	50,600
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	12	12	334	12		395	449	334	338
Flow exceeded for 90% of the days	1,885	1,496	2,015	2,805		1,362	1,733	2,050	2,298
Flow exceeded for 80% of the days	2,364	1,961	2,456	3,651		1,707	2,137	2,431	2,843
Flow exceeded for 70% of the days	2,782	2,387	2,861	4,891		1,990	2,467	2,766	3,283
Flow exceeded for 60% of the days	3,221	2,889	3,273	6,313		2,261	2,809	3,160	3,751
Flow exceeded for 50% of the days	3,696	3,607	3,709	7,733		2,604	3,195	3,534	4,205
Flow exceeded for 40% of the days	4,229	4,613	4,191	9,197		3,064	3,623	3,961	4,751
Flow exceeded for 30% of the days	4,916	6,180	4,778	11,090		3,744	4,179	4,484	5,473
Flow exceeded for 20% of the days	5,982	8,494	5,670	14,220		4,777	4,905	5,147	6,424
Flow exceeded for 10% of the days	8,186	12,659	7,422	19,132		6,737	6,293	6,778	8,303
Maximum	53,950	53,950	42,453	53,950		24,677	42,453	39,001	37,667
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	14	14	499	14		466	499	515	505
Flow exceeded for 90% of the days	1,926	1,545	2,055	2,926		1,437	1,776	2,107	2,345
Flow exceeded for 80% of the days	2,397	1,966	2,490	3,779		1,749	2,166	2,465	2,869
Flow exceeded for 70% of the days	2,804	2,399	2,892	5,236		2,007	2,505	2,776	3,343
Flow exceeded for 60% of the days	3,266	2,886	3,326	6,682		2,285	2,861	3,191	3,797
Flow exceeded for 50% of the days	3,738	3,606	3,753	8,240		2,627	3,251	3,602	4,226
Flow exceeded for 40% of the days	4,265	4,667	4,219	9,557		3,078	3,654	3,986	4,777
Flow exceeded for 30% of the days	4,945	6,213	4,810	11,528		3,854	4,207	4,518	5,506
Flow exceeded for 20% of the days	5,959	8,659	5,682	14,576		4,827	4,953	5,174	6,460
Flow exceeded for 10% of the days	8,149	12,685	7,360	19,342		6,730	6,243	6,692	8,288
Maximum	46,799	46,799	25,551	46,799		21,106	24,636	21,592	25,551
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	18	18	597	18		634	597	1,118	677
Flow exceeded for 90% of the days	1,990	1,587	2,104	2,994		1,493	1,859	2,146	2,390
Flow exceeded for 80% of the days	2,421	1,975	2,524	4,160		1,800	2,193	2,482	2,927
Flow exceeded for 70% of the days	2,845	2,389	2,939	5,792		2,047	2,536	2,811	3,428
Flow exceeded for 60% of the days	3,337	2,861	3,407	7,736		2,312	2,909	3,256	3,842
Flow exceeded for 50% of the days	3,806	3,615	3,826	8,859		2,634	3,338	3,677	4,269
Flow exceeded for 40% of the days	4,305	4,752	4,276	10,268		3,148	3,765	4,068	4,822
Flow exceeded for 30% of the days	4,970	6,215	4,824	11,935		3,938	4,303	4,533	5,550
Flow exceeded for 20% of the days	5,944	8,710	5,691	14,705		4,972	4,961	5,181	6,481
Flow exceeded for 10% of the days	8,068	12,374	7,241	19,624		6,642	6,088	6,622	8,156
Maximum	43,358	43,358	24,238	43,358		16,711	17,528	16,227	24,238
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	25	25	683	25		906	683	1,491	1,199
Flow exceeded for 90% of the days	2,056	1,655	2,164	3,401		1,585	1,938	2,218	2,426
Flow exceeded for 80% of the days	2,461	1,994	2,569	4,573		1,859	2,256	2,529	3,055
Flow exceeded for 70% of the days	2,939	2,354	3,049	6,579		2,089	2,579	2,878	3,501
Flow exceeded for 60% of the days	3,444	2,944	3,510	8,446		2,341	2,976	3,416	3,892
Flow exceeded for 50% of the days	3,862	3,540	3,895	10,044		2,722	3,463	3,732	4,289
Flow exceeded for 40% of the days	4,307	4,657	4,284	11,208		3,256	3,902	4,123	4,915
Flow exceeded for 30% of the days	4,993	6,007	4,896	12,334		3,907	4,300	4,520	5,541
Flow exceeded for 20% of the days	5,936	8,509	5,696	15,200		5,012	4,932	5,220	6,534
Flow exceeded for 10% of the days	7,764	12,005	7,137	20,124		6,452	6,103	6,657	7,975
Maximum	39,625	39,625	23,218	39,625		12,861	12,663	14,994	23,218

Table A.13-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Platte-Loup Confluence near Columbus, NE Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	342	342	823	5,954		342	823	2,038	1,894
Flow exceeded for 90% of the days	2,608	1,958	2,790	5,954		1,952	2,198	3,060	3,330
Flow exceeded for 80% of the days	3,166	2,374	3,300	6,021		2,357	2,660	3,419	3,639
Flow exceeded for 70% of the days	3,560	2,636	3,644	6,091		2,609	3,003	3,772	3,959
Flow exceeded for 60% of the days	3,930	3,092	4,040	6,125		3,022	3,389	4,219	4,333
Flow exceeded for 50% of the days	4,380	3,550	4,471	6,882		3,350	3,830	4,620	4,901
Flow exceeded for 40% of the days	4,890	4,210	4,974	9,201		3,914	4,248	5,018	5,789
Flow exceeded for 30% of the days	5,561	4,961	5,583	12,370		4,701	4,713	5,320	6,700
Flow exceeded for 20% of the days	6,670	6,882	6,656	12,490		6,521	5,434	5,874	7,647
Flow exceeded for 10% of the days	8,185	10,100	8,081	13,900		9,594	6,681	7,341	9,427
Maximum	31,473	25,970	31,473	17,200		25,970	24,090	13,337	31,473
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	809	809	932	6,022		809	932	2,224	2,393
Flow exceeded for 90% of the days	2,692	1,983	2,923	6,022		1,979	2,259	3,105	3,349
Flow exceeded for 80% of the days	3,204	2,387	3,349	6,029		2,385	2,764	3,451	3,680
Flow exceeded for 70% of the days	3,577	2,620	3,691	6,050		2,606	3,065	3,823	3,970
Flow exceeded for 60% of the days	3,973	3,096	4,085	6,162		3,011	3,467	4,274	4,362
Flow exceeded for 50% of the days	4,403	3,550	4,507	6,320		3,384	3,873	4,641	5,059
Flow exceeded for 40% of the days	4,970	4,172	5,030	6,970		4,031	4,287	5,019	5,809
Flow exceeded for 30% of the days	5,618	5,429	5,641	7,819		4,992	4,776	5,339	6,566
Flow exceeded for 20% of the days	6,561	6,797	6,530	9,068		6,779	5,481	5,906	7,671
Flow exceeded for 10% of the days	8,131	9,395	8,093	10,232		9,248	6,581	7,330	9,444
Maximum	27,939	24,130	27,939	11,354		24,130	13,667	11,971	27,939
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1,197	1,463	1,197	6,604		1,463	1,197	2,302	2,537
Flow exceeded for 90% of the days	2,811	2,023	3,048	6,787		2,018	2,510	3,195	3,455
Flow exceeded for 80% of the days	3,326	2,437	3,479	6,971		2,432	2,928	3,525	3,711
Flow exceeded for 70% of the days	3,677	2,621	3,817	7,154		2,609	3,276	3,946	4,126
Flow exceeded for 60% of the days	4,110	3,039	4,208	7,337		3,031	3,662	4,382	4,446
Flow exceeded for 50% of the days	4,518	3,512	4,592	7,521		3,499	4,032	4,688	5,066
Flow exceeded for 40% of the days	5,019	4,363	5,044	7,705		4,192	4,425	5,041	5,761
Flow exceeded for 30% of the days	5,567	5,731	5,560	7,890		5,621	4,866	5,287	6,546
Flow exceeded for 20% of the days	6,593	6,957	6,512	8,075		6,916	5,382	5,881	7,736
Flow exceeded for 10% of the days	7,879	8,937	7,838	8,260		9,003	6,463	7,222	9,458
Maximum	19,652	19,364	19,652	8,445		19,364	8,717	9,039	19,652
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1,452	1,926	1,452			1,926	1,452	2,396	2,978
Flow exceeded for 90% of the days	3,055	2,235	3,292			2,235	2,721	3,365	3,464
Flow exceeded for 80% of the days	3,492	2,564	3,598			2,564	3,329	3,652	3,827
Flow exceeded for 70% of the days	3,856	2,831	3,967			2,831	3,660	4,062	4,083
Flow exceeded for 60% of the days	4,139	3,204	4,219			3,204	3,887	4,522	4,490
Flow exceeded for 50% of the days	4,611	3,845	4,691			3,845	4,114	4,744	5,170
Flow exceeded for 40% of the days	5,067	4,574	5,095			4,574	4,408	5,062	5,730
Flow exceeded for 30% of the days	5,440	5,264	5,465			5,264	4,752	5,268	6,555
Flow exceeded for 20% of the days	6,368	6,672	6,316			6,672	5,289	5,981	7,574
Flow exceeded for 10% of the days	7,849	10,619	7,645			10,619	5,730	6,970	9,773
Maximum	14,122	12,747	14,122			12,747	7,249	8,745	14,122
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	2,373	2,373	2,578			2,373	2,578	2,978	3,343
Flow exceeded for 90% of the days	3,224	2,840	3,398			2,840	3,011	3,470	3,836
Flow exceeded for 80% of the days	3,759	3,159	3,957			3,159	3,305	3,998	4,233
Flow exceeded for 70% of the days	4,020	3,369	4,068			3,369	3,952	4,129	4,732
Flow exceeded for 60% of the days	4,253	3,583	4,289			3,583	3,985	4,282	5,034
Flow exceeded for 50% of the days	4,730	3,832	4,738			3,832	4,073	4,669	5,203
Flow exceeded for 40% of the days	4,999	4,175	5,058			4,175	4,230	4,983	5,949
Flow exceeded for 30% of the days	5,420	4,717	5,448			4,717	4,628	5,257	6,334
Flow exceeded for 20% of the days	6,005	6,566	6,000			6,566	4,800	5,439	7,747
Flow exceeded for 10% of the days	7,874	8,324	7,747			8,324	5,585	6,486	8,350
Maximum	10,539	9,672	10,539			9,672	5,915	8,138	10,539

Table A.13-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Platte-Loup Confluence near Columbus, NE Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	764	764	1,153	1,590		764	1,335	2,000	1,153
Flow exceeded for 90% of the days	2,920	2,498	2,983	5,914		2,010	2,705	3,071	3,113
Flow exceeded for 80% of the days	3,392	3,494	3,376	7,321		2,436	3,130	3,416	3,639
Flow exceeded for 70% of the days	3,852	4,444	3,760	8,569		2,942	3,408	3,741	4,027
Flow exceeded for 60% of the days	4,307	5,995	4,130	9,856		3,520	3,812	4,066	4,453
Flow exceeded for 50% of the days	4,810	7,500	4,565	11,350		4,070	4,263	4,416	4,939
Flow exceeded for 40% of the days	5,479	9,140	5,020	13,550		4,598	4,782	4,700	5,446
Flow exceeded for 30% of the days	6,485	11,118	5,637	16,151		5,672	5,402	5,120	6,119
Flow exceeded for 20% of the days	8,033	14,700	6,605	19,295		7,204	6,289	6,030	6,990
Flow exceeded for 10% of the days	11,460	19,977	8,275	25,586		9,642	7,878	7,763	8,897
Maximum	67,200	67,200	55,180	67,200		28,300	55,180	42,110	50,600
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1,191	1,191	1,246	2,456		1,191	1,368	2,077	1,246
Flow exceeded for 90% of the days	2,977	2,542	3,045	6,045		2,077	2,794	3,126	3,157
Flow exceeded for 80% of the days	3,453	3,663	3,426	7,623		2,523	3,194	3,475	3,689
Flow exceeded for 70% of the days	3,904	4,638	3,817	8,783		3,063	3,474	3,806	4,078
Flow exceeded for 60% of the days	4,350	6,137	4,204	10,050		3,680	3,890	4,139	4,463
Flow exceeded for 50% of the days	4,865	7,627	4,597	11,450		4,160	4,300	4,449	5,000
Flow exceeded for 40% of the days	5,586	9,288	5,083	13,746		4,813	4,828	4,733	5,494
Flow exceeded for 30% of the days	6,505	11,134	5,728	16,343		5,912	5,550	5,197	6,129
Flow exceeded for 20% of the days	8,110	14,437	6,603	19,107		7,349	6,414	6,196	7,007
Flow exceeded for 10% of the days	11,392	19,497	8,393	25,864		9,723	8,152	7,818	8,935
Maximum	53,950	53,950	42,453	53,950		20,540	42,453	33,128	37,667
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1,336	1,336	1,531	3,222		1,336	1,757	2,349	1,531
Flow exceeded for 90% of the days	3,104	2,670	3,150	6,598		2,130	2,936	3,253	3,267
Flow exceeded for 80% of the days	3,596	3,852	3,559	8,201		2,647	3,260	3,657	3,734
Flow exceeded for 70% of the days	4,019	4,851	3,919	9,273		3,415	3,595	3,901	4,133
Flow exceeded for 60% of the days	4,459	6,459	4,287	10,476		3,897	4,040	4,227	4,548
Flow exceeded for 50% of the days	5,001	8,076	4,692	12,115		4,376	4,403	4,552	5,109
Flow exceeded for 40% of the days	5,684	9,471	5,210	14,217		5,008	4,998	4,838	5,580
Flow exceeded for 30% of the days	6,627	11,443	5,808	16,377		6,080	5,805	5,322	6,097
Flow exceeded for 20% of the days	8,327	14,589	6,721	19,659		7,741	6,448	6,221	7,103
Flow exceeded for 10% of the days	11,302	19,889	8,500	25,080		9,541	8,285	8,021	8,952
Maximum	46,799	46,799	25,551	46,799		16,559	24,636	21,592	25,551
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1,588	1,588	1,867	3,459		1,588	1,867	2,613	2,135
Flow exceeded for 90% of the days	3,282	3,012	3,321	7,712		2,529	3,126	3,514	3,422
Flow exceeded for 80% of the days	3,820	4,159	3,785	9,012		3,012	3,513	3,862	3,896
Flow exceeded for 70% of the days	4,195	5,367	4,097	10,184		3,572	3,874	4,098	4,233
Flow exceeded for 60% of the days	4,605	7,058	4,430	11,264		4,213	4,275	4,374	4,664
Flow exceeded for 50% of the days	5,191	8,388	4,825	12,965		4,774	4,609	4,671	5,243
Flow exceeded for 40% of the days	5,896	9,871	5,342	14,523		5,569	5,129	4,988	5,726
Flow exceeded for 30% of the days	6,848	11,568	5,999	17,145		6,594	5,887	5,461	6,392
Flow exceeded for 20% of the days	8,271	14,529	6,850	20,130		7,687	6,660	6,493	7,051
Flow exceeded for 10% of the days	11,196	20,155	8,265	25,563		9,047	7,852	8,000	8,880
Maximum	43,358	43,358	19,703	43,358		14,073	17,528	14,422	19,703
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1,943	1,943	2,304	4,412		1,943	2,304	3,325	2,622
Flow exceeded for 90% of the days	3,619	3,464	3,648	9,116		2,919	3,542	3,806	3,572
Flow exceeded for 80% of the days	4,100	4,668	4,051	10,277		3,487	3,861	4,113	4,188
Flow exceeded for 70% of the days	4,444	5,927	4,320	11,064		4,189	4,187	4,256	4,548
Flow exceeded for 60% of the days	4,883	6,776	4,668	11,912		4,761	4,547	4,490	4,991
Flow exceeded for 50% of the days	5,395	8,654	5,092	12,912		5,339	4,930	4,816	5,428
Flow exceeded for 40% of the days	6,081	10,575	5,557	15,158		6,131	5,278	5,257	5,967
Flow exceeded for 30% of the days	6,750	11,748	6,155	16,937		6,532	5,886	5,810	6,552
Flow exceeded for 20% of the days	7,970	14,807	6,806	20,231		7,318	6,597	6,544	6,944
Flow exceeded for 10% of the days	11,105	20,116	7,935	27,873		8,915	7,471	8,050	8,193
Maximum	39,625	39,625	17,858	39,625		12,245	12,663	10,134	17,858

Table A.13-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Platte-Loup Confluence near Columbus, NE Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	390	608	390	1,590		608	390	1,342	1,026
Flow exceeded for 90% of the days	2,121	1,748	2,258	3,834		1,354	1,879	2,199	2,569
Flow exceeded for 80% of the days	2,781	2,450	2,854	5,194		1,712	2,647	2,668	3,159
Flow exceeded for 70% of the days	3,314	3,360	3,308	7,069		2,054	3,139	3,099	3,635
Flow exceeded for 60% of the days	3,839	4,436	3,739	8,252		2,443	3,556	3,446	4,095
Flow exceeded for 50% of the days	4,410	5,900	4,243	9,920		2,960	4,005	3,922	4,655
Flow exceeded for 40% of the days	5,058	7,635	4,776	11,599		3,734	4,601	4,396	5,160
Flow exceeded for 30% of the days	6,010	9,694	5,448	14,226		4,491	5,249	4,875	5,857
Flow exceeded for 20% of the days	7,577	12,570	6,452	17,692		5,922	6,227	5,762	6,794
Flow exceeded for 10% of the days	11,013	18,200	8,350	22,691		8,266	7,960	7,780	8,905
Maximum	78,288	67,200	78,288	67,200		25,750	55,180	78,288	50,600
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	489	633	489	2,275		633	489	1,361	1,040
Flow exceeded for 90% of the days	2,173	1,764	2,307	3,939		1,354	1,901	2,266	2,595
Flow exceeded for 80% of the days	2,838	2,541	2,905	5,463		1,745	2,697	2,722	3,202
Flow exceeded for 70% of the days	3,349	3,395	3,334	7,108		2,078	3,197	3,117	3,683
Flow exceeded for 60% of the days	3,870	4,511	3,794	8,547		2,516	3,627	3,487	4,101
Flow exceeded for 50% of the days	4,432	5,869	4,264	9,915		3,029	4,063	3,955	4,640
Flow exceeded for 40% of the days	5,085	7,629	4,801	11,462		3,740	4,624	4,426	5,236
Flow exceeded for 30% of the days	6,078	9,579	5,503	14,232		4,578	5,378	4,878	5,929
Flow exceeded for 20% of the days	7,599	12,268	6,451	17,202		6,013	6,314	5,802	6,732
Flow exceeded for 10% of the days	10,833	17,610	8,395	21,569		8,218	8,381	7,766	8,883
Maximum	52,907	52,907	42,453	52,907		20,540	42,453	39,001	37,667
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	640	640	650	2,431		640	650	1,449	1,065
Flow exceeded for 90% of the days	2,200	1,775	2,409	4,273		1,458	1,974	2,350	2,659
Flow exceeded for 80% of the days	2,931	2,568	3,000	5,818		1,767	2,810	2,811	3,283
Flow exceeded for 70% of the days	3,420	3,535	3,412	7,607		2,060	3,261	3,157	3,720
Flow exceeded for 60% of the days	3,950	4,540	3,888	9,112		2,534	3,712	3,601	4,132
Flow exceeded for 50% of the days	4,478	5,863	4,331	9,966		3,189	4,188	4,049	4,609
Flow exceeded for 40% of the days	5,194	7,822	4,837	11,837		3,855	4,749	4,474	5,309
Flow exceeded for 30% of the days	6,055	9,602	5,640	14,397		4,538	5,633	4,899	5,875
Flow exceeded for 20% of the days	7,626	12,304	6,423	16,484		5,648	6,348	5,824	6,727
Flow exceeded for 10% of the days	10,692	16,594	8,443	20,851		7,874	8,329	7,888	8,999
Maximum	46,799	46,799	25,551	46,799		15,506	24,636	21,592	25,551
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	697	953	697	2,712		953	697	1,526	1,137
Flow exceeded for 90% of the days	2,251	1,822	2,461	5,098		1,457	2,063	2,410	2,738
Flow exceeded for 80% of the days	3,045	2,699	3,109	6,737		1,822	2,889	2,966	3,373
Flow exceeded for 70% of the days	3,580	3,563	3,583	8,389		2,040	3,506	3,275	3,802
Flow exceeded for 60% of the days	4,051	4,774	3,981	9,416		2,698	3,987	3,747	4,124
Flow exceeded for 50% of the days	4,566	6,017	4,397	10,605		3,190	4,488	4,168	4,514
Flow exceeded for 40% of the days	5,258	7,977	4,956	11,980		3,855	5,035	4,566	5,272
Flow exceeded for 30% of the days	6,078	9,546	5,611	13,883		4,593	5,669	4,997	5,925
Flow exceeded for 20% of the days	7,571	12,001	6,460	15,621		5,458	6,558	5,727	6,759
Flow exceeded for 10% of the days	10,336	15,621	8,564	20,272		7,350	7,830	7,903	9,383
Maximum	43,358	43,358	19,703	43,358		12,015	17,528	14,422	19,703
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	1,140	1,150	1,140	3,411		1,150	1,140	1,722	1,732
Flow exceeded for 90% of the days	2,428	1,830	2,563	6,270		1,643	2,293	2,552	2,769
Flow exceeded for 80% of the days	3,273	2,652	3,384	7,913		1,856	3,202	3,273	3,530
Flow exceeded for 70% of the days	3,706	3,645	3,712	9,070		2,261	3,796	3,532	3,785
Flow exceeded for 60% of the days	4,060	4,795	4,005	10,394		2,771	4,186	3,827	4,076
Flow exceeded for 50% of the days	4,606	5,931	4,447	11,212		3,342	4,619	4,117	4,566
Flow exceeded for 40% of the days	5,116	7,838	4,900	11,909		3,790	5,025	4,538	5,097
Flow exceeded for 30% of the days	5,903	9,951	5,404	12,819		4,603	5,499	5,065	5,586
Flow exceeded for 20% of the days	7,338	11,743	6,475	15,797		5,064	6,477	5,681	6,751
Flow exceeded for 10% of the days	9,984	15,312	8,137	18,216		6,334	7,386	7,770	9,194
Maximum	39,625	39,625	17,858	39,625		8,954	12,663	10,120	17,858

Table A.13-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

Platte-Loup Confluence near Columbus, NE Mean Daily Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	29	29	390	29		608	390	1,063	990
Flow exceeded for 90% of the days	1,527	1,209	1,653	2,480		1,091	1,304	1,760	1,932
Flow exceeded for 80% of the days	1,991	1,628	2,096	2,932		1,348	1,766	2,044	2,423
Flow exceeded for 70% of the days	2,394	2,003	2,478	3,450		1,611	2,221	2,312	2,880
Flow exceeded for 60% of the days	2,775	2,490	2,859	4,141		1,809	2,627	2,558	3,363
Flow exceeded for 50% of the days	3,266	2,984	3,322	4,920		2,102	3,101	2,871	3,987
Flow exceeded for 40% of the days	3,878	3,651	3,944	5,870		2,423	3,610	3,260	4,561
Flow exceeded for 30% of the days	4,655	4,552	4,684	7,032		2,941	4,195	3,954	5,541
Flow exceeded for 20% of the days	5,902	6,042	5,870	8,326		3,710	5,146	5,006	6,859
Flow exceeded for 10% of the days	8,545	8,570	8,514	11,114		4,912	6,982	7,937	10,159
Maximum	78,288	30,540	78,288	30,540		29,400	27,830	78,288	31,570
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	30	30	449	30		633	449	1,122	1,040
Flow exceeded for 90% of the days	1,544	1,257	1,669	2,543		1,077	1,296	1,803	1,915
Flow exceeded for 80% of the days	2,003	1,641	2,132	3,055		1,362	1,796	2,061	2,452
Flow exceeded for 70% of the days	2,428	1,978	2,498	3,513		1,635	2,257	2,336	2,908
Flow exceeded for 60% of the days	2,813	2,521	2,888	4,234		1,821	2,639	2,580	3,455
Flow exceeded for 50% of the days	3,297	3,037	3,354	5,104		2,069	3,071	2,900	4,011
Flow exceeded for 40% of the days	3,888	3,642	3,972	6,050		2,506	3,639	3,279	4,598
Flow exceeded for 30% of the days	4,669	4,575	4,682	7,120		3,016	4,211	3,917	5,513
Flow exceeded for 20% of the days	5,935	6,105	5,880	8,830		3,673	5,185	5,032	6,875
Flow exceeded for 10% of the days	8,580	8,918	8,496	11,315		5,143	6,935	7,855	10,241
Maximum	39,001	24,677	39,001	22,190		24,677	20,947	39,001	25,289
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	32	32	499	32		640	499	1,139	1,061
Flow exceeded for 90% of the days	1,600	1,286	1,727	2,634		1,131	1,326	1,861	1,982
Flow exceeded for 80% of the days	2,033	1,699	2,162	3,231		1,460	1,843	2,107	2,489
Flow exceeded for 70% of the days	2,468	1,954	2,555	3,684		1,682	2,277	2,390	3,041
Flow exceeded for 60% of the days	2,853	2,558	2,913	4,401		1,842	2,706	2,617	3,541
Flow exceeded for 50% of the days	3,347	3,040	3,427	5,395		2,075	3,087	2,884	4,063
Flow exceeded for 40% of the days	3,961	3,582	4,027	6,236		2,622	3,707	3,292	4,548
Flow exceeded for 30% of the days	4,666	4,562	4,687	7,818		2,981	4,329	3,947	5,526
Flow exceeded for 20% of the days	5,898	6,118	5,863	9,148		3,587	5,151	5,060	6,766
Flow exceeded for 10% of the days	8,616	9,183	8,392	10,887		4,944	7,017	8,057	10,307
Maximum	24,368	21,106	24,368	16,035		21,106	16,430	19,249	24,368
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	597	698	597	1,631		698	597	1,354	1,137
Flow exceeded for 90% of the days	1,681	1,395	1,809	2,857		1,214	1,353	1,928	2,009
Flow exceeded for 80% of the days	2,097	1,718	2,222	3,337		1,474	1,933	2,187	2,536
Flow exceeded for 70% of the days	2,498	1,984	2,598	3,898		1,715	2,377	2,388	3,176
Flow exceeded for 60% of the days	2,877	2,475	2,956	4,709		1,897	2,781	2,665	3,621
Flow exceeded for 50% of the days	3,431	3,065	3,512	5,839		2,142	3,201	2,891	4,148
Flow exceeded for 40% of the days	4,026	3,626	4,117	6,942		2,564	3,858	3,271	4,602
Flow exceeded for 30% of the days	4,712	4,386	4,737	8,452		3,083	4,487	3,986	5,536
Flow exceeded for 20% of the days	5,827	6,442	5,719	9,018		3,777	5,053	4,861	6,621
Flow exceeded for 10% of the days	8,596	8,989	8,219	10,620		5,136	6,775	9,519	10,051
Maximum	24,238	16,711	24,238	15,479		16,711	13,738	16,227	24,238
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Flow exceeded for 100% of the days	683	912	683	2,011		912	683	1,631	1,282
Flow exceeded for 90% of the days	1,731	1,239	1,896	3,000		1,185	1,370	2,079	2,084
Flow exceeded for 80% of the days	2,191	1,737	2,338	3,349		1,608	2,093	2,310	2,580
Flow exceeded for 70% of the days	2,529	2,018	2,644	4,377		1,816	2,467	2,467	3,328
Flow exceeded for 60% of the days	2,954	2,205	3,041	4,832		1,985	2,837	2,667	3,715
Flow exceeded for 50% of the days	3,486	2,996	3,591	5,241		2,125	3,331	2,910	4,059
Flow exceeded for 40% of the days	4,029	3,442	4,087	6,278		2,386	4,090	3,300	4,724
Flow exceeded for 30% of the days	4,686	4,406	4,718	7,566		3,191	4,411	3,709	5,611
Flow exceeded for 20% of the days	5,878	5,351	5,916	8,239		3,624	4,988	4,989	6,474
Flow exceeded for 10% of the days	7,932	8,362	7,717	10,037		5,276	6,591	8,234	9,510
Maximum	20,736	12,861	20,736	12,297		12,861	10,674	14,994	20,736

characterizations for the Jun 1-Aug 15 seasonal period are essentially the same as those for the Apr 16-Jul 15 seasonal period.

Table A.13-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.13-14** shows that, when all flow values are considered, they are generally consistent with the known climatological conditions during the respective time intervals.

A.13.5 Median Mean Daily Flow

The median mean daily flow by calendar day is shown on **Figure A.13-6**. **Figure A.13-6** shows a pattern for the median mean daily flow similar to that for the Platte River near Duncan (**Figure A.11-6**) except that the flows are generally higher by about 2,000 cfs throughout the median year for all time intervals. This is primarily the result of inflow from the Loup River. Also, there is an indication of two seasons of higher median daily flows, one in March and one in June, for all time intervals. Median daily flows are not substantially higher for these seasons than for the rest of the median year except for the 1895-1909 time interval. These two seasons of higher flow may be explained by the same climatic factors which are the apparent cause of a similar pattern in the Dates of Maximum Flow (**Figure A.13-3**).

A.13.6 USGS Annual Peak Flow

No data for USGS Annual Peak flow exist for this location.

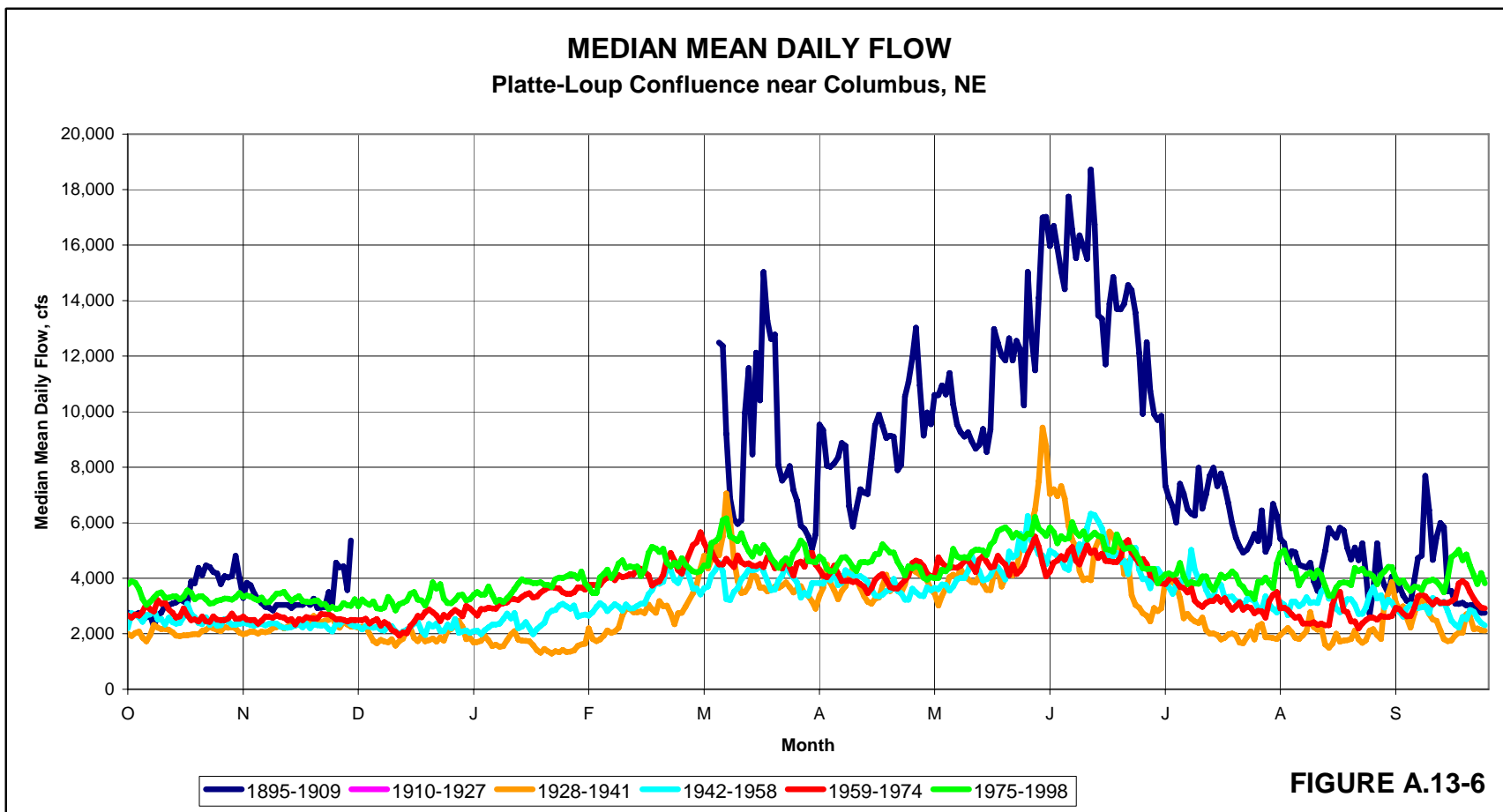


Figure A.13-6 Median Mean Daily Flow.

A.14 ELKHORN RIVER NEAR WATERLOO, NEBRASKA

A.14.1 Methodology

For this location, a single continuous streamflow record was constructed using records from two gages, as follows:

Gage	Records Used	Data Source
Elkhorn River near Arlington, Nebraska	5/1/1899 – 11/21/1903 (mainly warm season only), 7/21/1913 – 12/25/1913, 3/10/1914 – 9/30/1915	Prior to 1915, 1914 Nebraska Hydrographic Report. 1915-1928, 1929 Nebraska Hydrographic Report.
Elkhorn River at Waterloo, Nebraska	5/19/1911 – 7/20/1913 (mainly warm season only), 9/1/1928 – 12/31/1998	USGS website.

Where data do not exist for the Elkhorn River at Waterloo, Nebraska, data from the Arlington gage were substituted. The gages cover approximately 10 miles of the Elkhorn River from Arlington, Nebraska to Waterloo, Nebraska.

The flow characterizations for the Elkhorn River at Waterloo, Nebraska, are given in **Table A.14-1** (mean daily values), **Table A.14-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.14-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.14-4** (flow frequencies).

No large reservoirs exist in the Elkhorn River basin.

A.14.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.14-1 shows that the average Annual Maximum mean daily flow increases steadily from the 1928-1941 time interval through the 1959-1974 time interval, then levels off in the 1975-1998 time interval. The median Annual Maximum mean daily flow increases for every time interval from 1928-1941 onward (data are insufficient for adequate characterizations prior to the 1928-1941 time interval). Both average and median annual flow volumes increase from the 1928-1941 time interval onward.

Both **Figure A.14-1** (maximum flows) and **Figure A.14-2** (annual flow volume) suggest that climate effects are the predominant factor controlling these flow characterizations (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). All flow and volume quantities are lower in the 1930's, higher in the 1940's, lower in the 1950's, and generally higher from the 1960's through the end of the period of record, except for a period of lower flows and volumes in the mid-1970's and lower volumes in the late 1980's. The 1970's reduction in maximum and total flows shows up most clearly in the 10-year running averages, albeit with a delay due to the averaging process. Climate records show that drought conditions occurred during the mid-1970's and late

Table A.14-1 Summary of Mean Daily Flow Values.

Elkhorn River near Waterloo, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	14,305	6,636	17,669	5,662	5,980	7,287	16,528	18,329	18,037
Median Annual Maximum Mean Daily Flow (cfs)	11,000	4,745	14,100	4,530	4,290	5,565	12,200	14,550	16,650
Average Annual Flow Volume (kaf)	900	510	1,071	553	604	459	919	953	1,257
Median Annual Flow Volume (kaf)	738	453	933	406	529	444	863	878	1,028
Average Mean Daily Flow (cfs)	1,335	1,007	1,479	1,420	1,500	653	1,269	1,316	1,736
Median Mean Daily Flow (cfs)	665	590	688	786	770	411	647	687	1,025
Average Number of Mean Daily Flow Measurements	339	281	365	193	218	341	365	365	365
Number of Years of Data	82 of 104	25 of 47	57 of 57	6 of 15	5 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	5,326	3,257	5,907	2,029	1,685	3,594	6,070	4,872	6,482
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	11,612	6,036	13,862	5,884	5,428	6,328	13,479	13,384	14,452
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	11,066	5,315	13,387	5,686	5,172	5,227	14,612	12,144	13,349
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	4,526	2,877	5,221	4,030	3,478	2,250	5,529	3,515	6,141
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	2,800	2,160	3,140	2,029	1,685	2,350	3,280	2,165	3,800
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	8,445	4,630	11,600	4,745	4,290	4,630	10,400	12,500	12,600
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	7,030	4,230	10,400	4,745	3,670	3,250	11,000	8,110	10,270
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	2,590	1,920	3,020	4,160	1,350	2,000	3,000	2,100	3,665
Difference ("Apr-Jul Average" - "Jul-Sep Average")	7,086	3,159	8,641	1,854	1,950	4,078	7,950	9,869	8,311
Difference ("Apr-Jul Median" - "Jul-Sep Median")	5,855	2,710	8,580	585	2,940	2,630	7,400	10,400	8,935
Average Occurrence of Maximum Mean Daily Flow	5/20	6/10	5/11	7/24	6/2	5/28	5/16	5/11	5/7
Median Occurrence of Maximum Mean Daily Flow	6/6	6/13	5/29	7/10	5/28	6/7	6/12	6/1	5/28
Average Annual Minimum Mean Daily Flow (cfs)	261	144	288			144	209	260	362
Median Annual Minimum Mean Daily Flow (cfs)	224	130	230			130	200	233	265
Average occurrences per year of the Minimum	1	2	1			2	1	1	1
Occuring between	10/30	10/22	11/2			10/22	11/26	11/28	10/7
and	11/3	10/24	11/6			10/24	11/27	11/29	10/15
Median occurrences per year of the Minimum	1	1	1			1	1	1	1
Occuring between	9/25	9/16	10/1			9/16	12/1	1/7	9/4
and	9/30	9/18	12/1			9/18	12/2	1/8	9/7

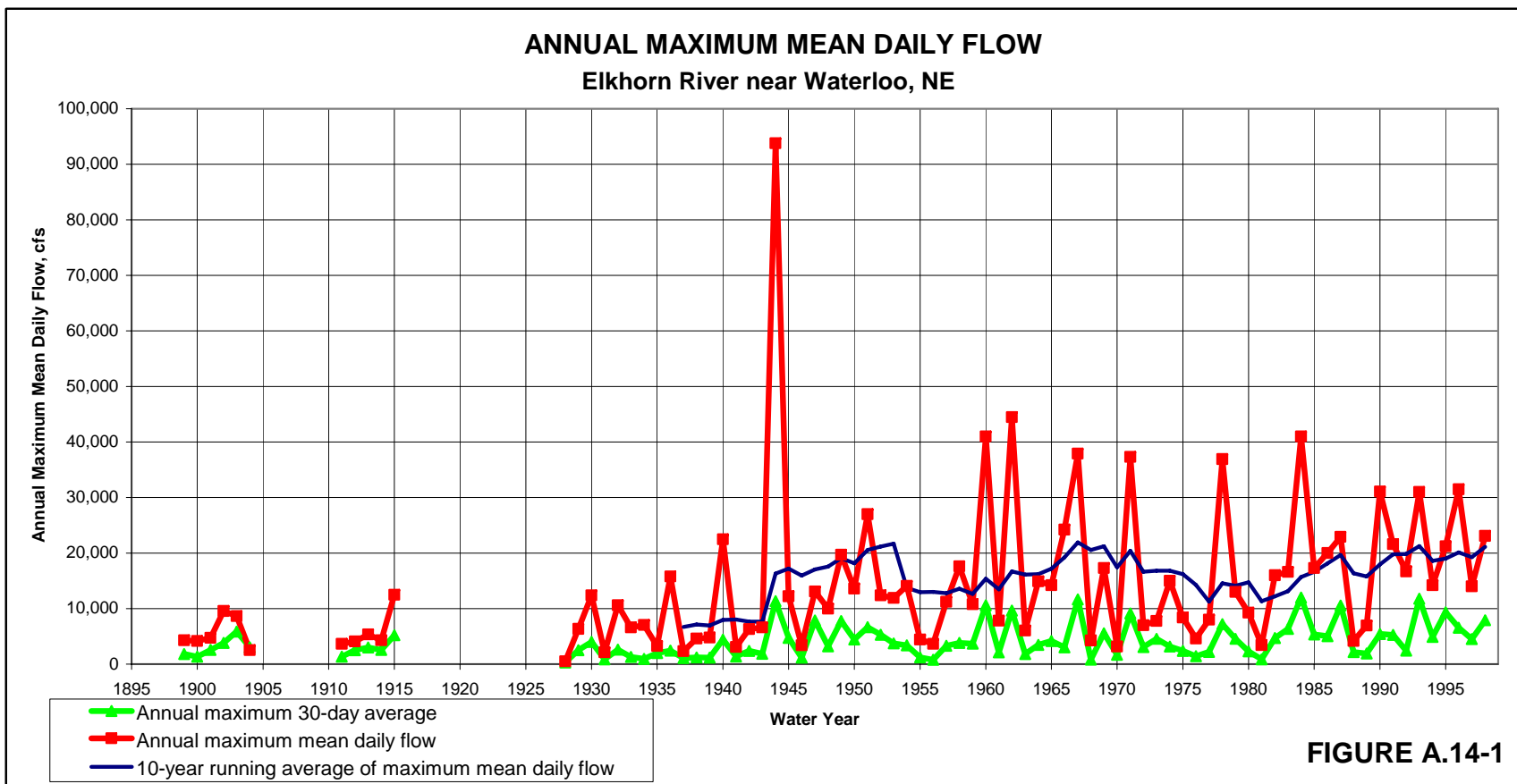


FIGURE A.14-1

Figure A.14-1 Annual Maximum Mean Daily Flow.

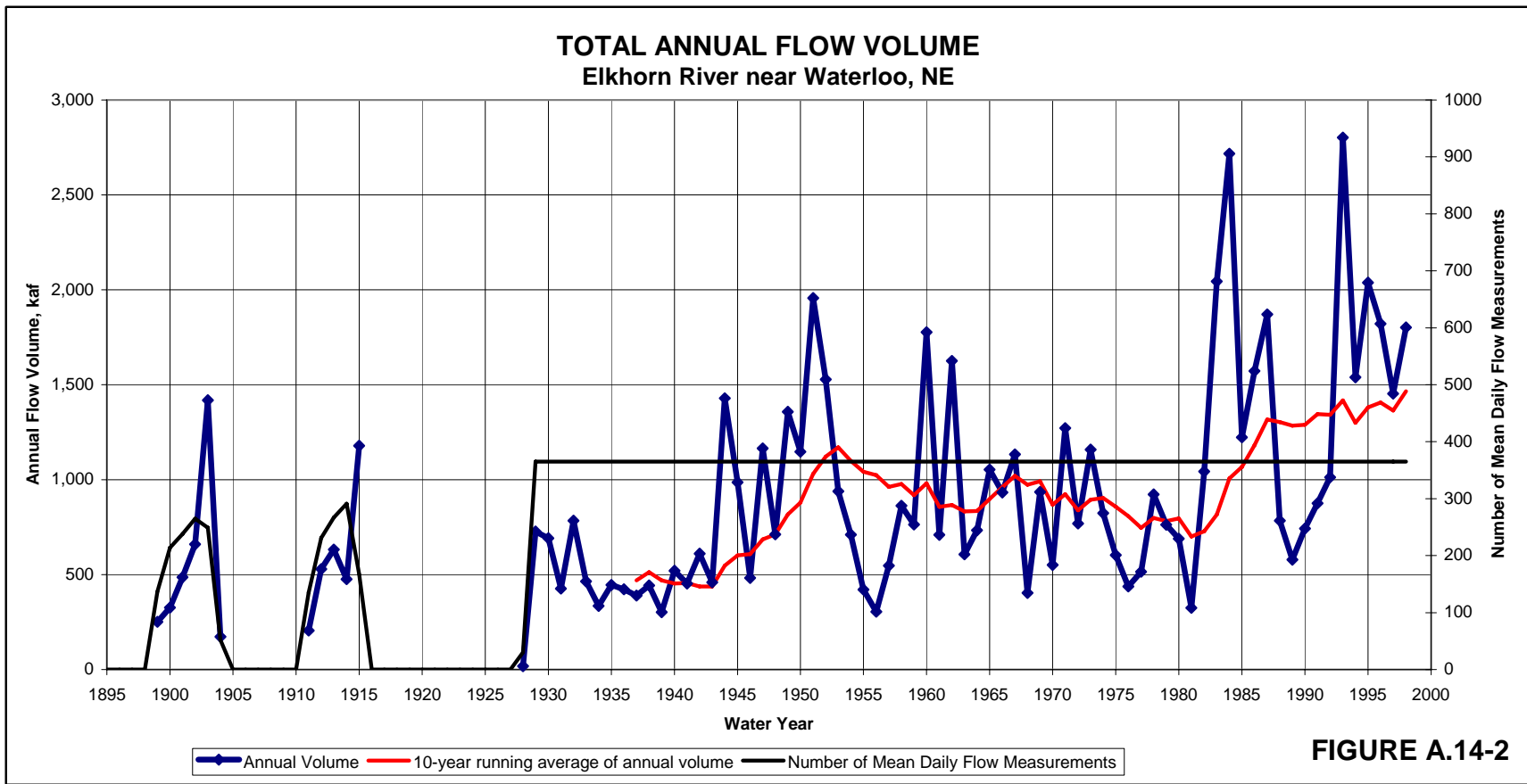


FIGURE A.14-2

Figure A.14-2 Total Annual Flow Volume.

1980's in the Elkhorn River basin and other parts of the region (NOAA, 2005 [Nebraska]). These do not show up in any of the averages by time interval, partly because they were relatively short periods and partly because the droughts straddle the 1959-1974 and the 1975-1998 time intervals. For the higher annual maximums, there is a large difference between the Annual Maximum mean daily flow and the annual maximum 30-day average flow (**Figure A.14-1**), indicating that these are mainly short-duration runoff maximums.

Figure A.14-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.14-3** shows that most annual maximums are concentrated in and close to the months of March and June. March is the primary snowmelt month in the Elkhorn River basin; June is the month that receives the most precipitation in the basin (NOAA, 2005 [Nebraska]).

The highest average and median seasonal maximum mean daily flows occur in the Apr 16-Jul 15 seasonal period for all time intervals except 1942-1958, when they occur in the Jun 1-Aug 15 seasonal period (**Table A.14-1**). During these time intervals the maximums are similar for the Feb 15-Mar 16 and Jul 16-Sep 30 seasonal periods. Both the average and median Dates of Maximum Flow are in May or June for all time intervals considered.

Figure A.14-4 and **Table A.14-1** both show a pattern for the Annual Minimum mean daily flow that is similar to that for the annual flow volume (**Figure A.14-2**), suggesting that the effects of climate on the annual flow volume are affecting the Annual Minimum mean daily flow in a similar way. The differences between the Annual Minimum mean daily flow and the annual minimum 30-Day average flow are not as great as those between the corresponding maximum flow quantities, indicating that changes in minimum flows do not occur as rapidly. The 10-year running average also demonstrates changes in Annual Minimum mean daily flow suggesting a strong climate influence, but less clearly than for annual values, and with a delay due to the averaging process. The average Dates of Minimum Flow are in October and November for all time intervals considered. The median Dates of Minimum Flow do not show a consistent season of occurrence. Minimum flows were not calculated for years with incomplete flow records.

A.14.3 3-, 7-, 15-, and 30- day Averages of Mean Daily Flows

Table A.14-2 shows that there is significant attenuation of both average and median annual running average flows due to the averaging process, indicating that most maximums at this location are short-duration runoff maximums.

Table A.14-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.14-3** shows that the characterizations are generally consistent with known climatological conditions by time interval (the 1895-

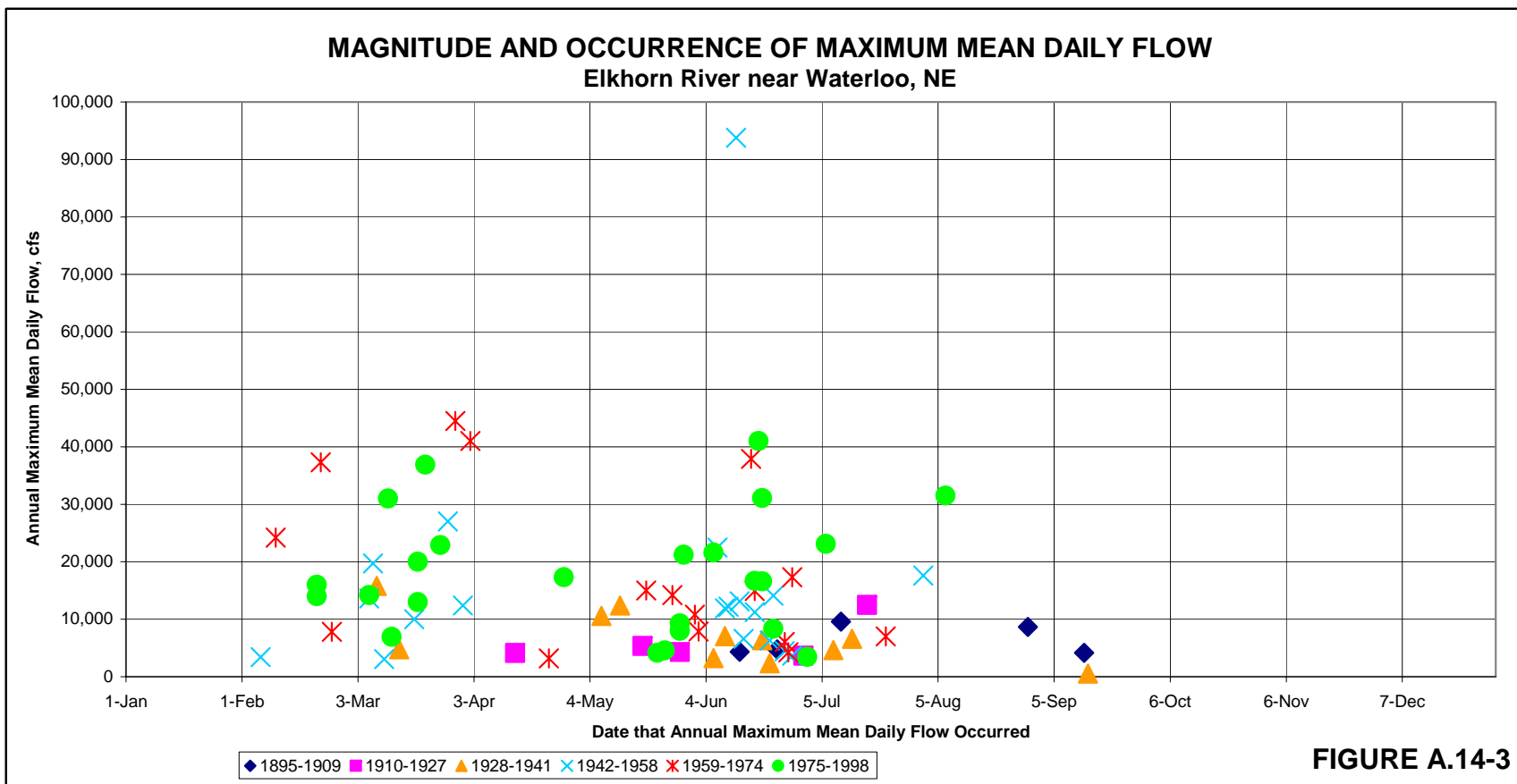


FIGURE A.14-3

Figure A.14-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

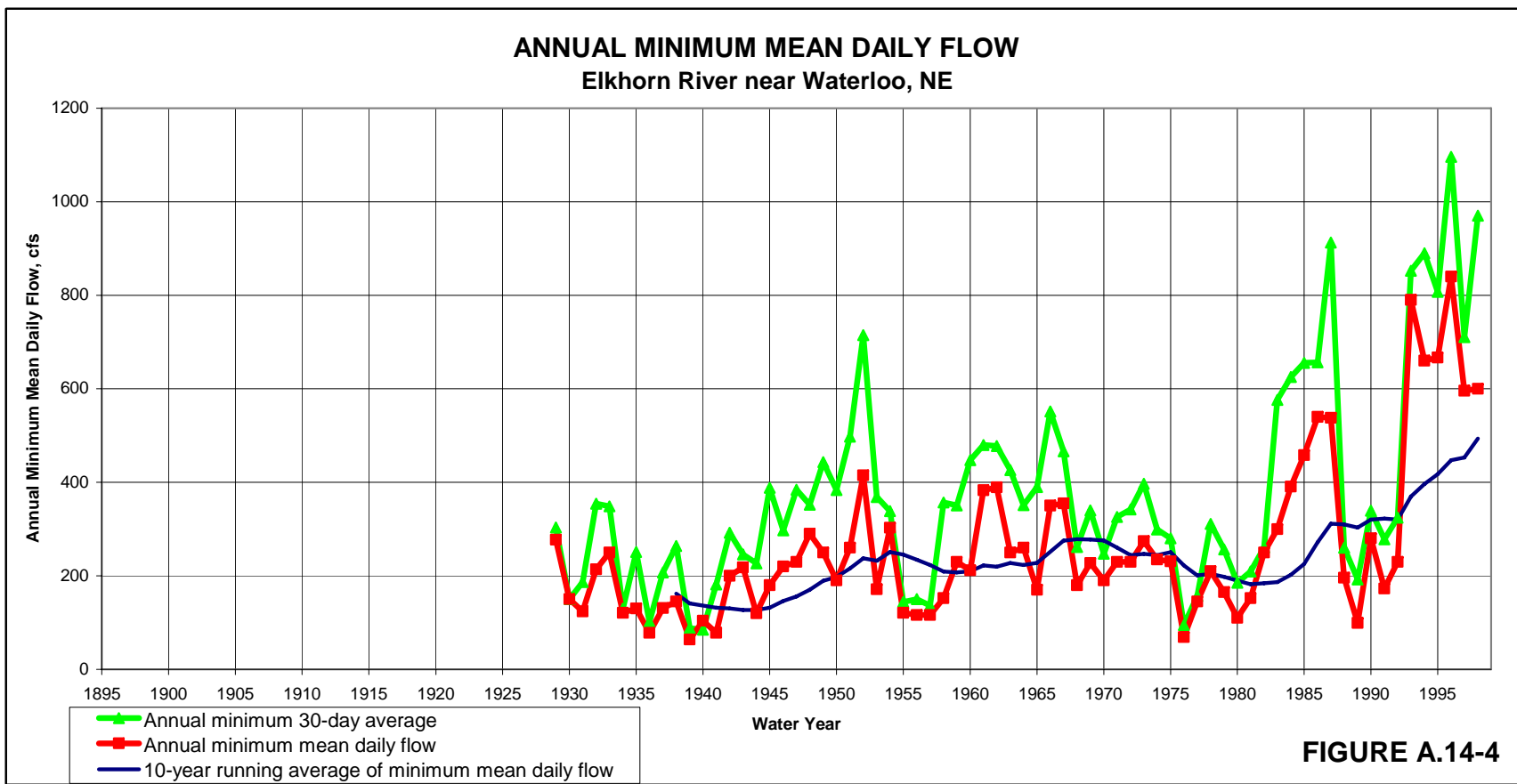


Figure A.14-4 Annual Minimum Mean Daily Flow.

Table A.14-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Elkhorn River near Waterloo, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	14,305	6,636	17,669	5,662	5,980	7,287	16,528	18,329	18,037
Median Annual Maximum Mean Daily Flow (cfs)	11,000	4,745	14,100	4,530	4,290	5,565	12,200	14,550	16,650
Avg. Ann. Max. 3-day Avg. Flow (cfs)	11,785	5,632	14,483	5,271	5,551	5,815	13,289	15,241	14,824
Median Ann. Max. 3-day Avg. Flow (cfs)	8,825	3,972	10,927	4,170	4,150	3,747	9,877	10,390	12,138
Avg. Ann. Max. 7-day Avg. Flow (cfs)	8,302	4,306	10,054	4,488	4,746	4,070	8,772	10,573	10,617
Median Ann. Max. 7-day Avg. Flow (cfs)	6,470	2,913	7,867	3,390	3,513	2,686	6,711	7,397	9,165
Avg. Ann. Max. 15-day Avg. Flow (cfs)	5,655	3,083	6,784	3,736	3,633	2,606	5,717	7,122	7,314
Median Ann. Max. 15-day Avg. Flow (cfs)	4,247	2,442	5,457	2,920	3,241	1,678	5,202	4,973	6,988
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,124	2,383	4,888	3,080	2,932	1,887	4,297	4,895	5,302
Median Ann. Max. 30-day Avg. Flow (cfs)	3,242	2,451	4,424	2,801	2,554	1,355	3,756	3,583	4,963
Average Annual Minimum Mean Daily Flow (cfs)	261	144	288			144	209	260	362
Median Annual Minimum Mean Daily Flow (cfs)	224	130	230			130	200	233	265
Avg. Ann. Min. 3-day Avg. Flow (cfs)	281	148	311			148	236	288	379
Median Ann. Min. 3-day Avg. Flow (cfs)	236	134	260			134	217	274	290
Avg. Ann. Min. 7-day Avg. Flow (cfs)	310	158	345			158	275	314	414
Median Ann. Min. 7-day Avg. Flow (cfs)	266	140	300			140	300	304	295
Avg. Ann. Min. 15-day Avg. Flow (cfs)	342	172	381			172	306	350	456
Median Ann. Min. 15-day Avg. Flow (cfs)	291	150	330			150	330	341	310
Avg. Ann. Min. 30-day Avg. Flow (cfs)	377	204	417			204	336	385	496
Median Ann. Min. 30-day Avg. Flow (cfs)	339	187	351			187	352	370	332

Table A.14-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Elkhorn River near Waterloo, NE 3-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 3-day Avg. Flow (cfs)	11,785	5,632	14,483	5,271	5,551	5,815	13,289	15,241	14,824
Median Ann. Max. 3-day Avg. Flow (cfs)	8,825	3,972	10,927	4,170	4,150	3,747	9,877	10,390	12,138
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	4,497	2,595	5,031	1,745	1,470	2,834	4,954	4,242	5,613
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	9,218	5,192	10,843	5,423	5,049	5,157	10,509	10,703	11,173
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	8,861	4,605	10,578	5,247	4,689	4,325	11,428	9,693	10,566
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	3,570	2,520	4,012	3,880	3,225	1,782	4,370	2,477	4,781
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	2,503	1,713	2,667	1,745	1,470	1,680	3,127	1,958	3,243
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	6,633	3,820	8,847	4,368	4,150	3,673	8,867	9,100	8,818
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	5,525	3,600	7,970	4,368	3,390	3,033	9,017	6,245	7,723
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	1,861	1,537	2,280	3,972	1,153	1,537	2,280	1,577	2,650

Elkhorn River near Waterloo, NE 7-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 7-day Avg. Flow (cfs)	8,302	4,306	10,054	4,488	4,746	4,070	8,772	10,573	10,617
Median Ann. Max. 7-day Avg. Flow (cfs)	6,470	2,913	7,867	3,390	3,513	2,686	6,711	7,397	9,165
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	3,283	1,945	3,659	1,656	1,341	2,060	3,386	3,042	4,263
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	6,608	4,046	7,642	4,678	4,335	3,692	6,896	7,460	8,291
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	6,150	3,572	7,190	4,508	3,925	3,076	7,304	6,620	7,491
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	2,590	2,010	2,835	3,301	2,631	1,327	3,010	1,758	3,428
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	2,104	1,483	2,340	1,656	1,341	1,310	2,480	1,618	2,755
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	4,741	2,913	6,101	3,867	3,513	2,617	5,766	6,458	6,317
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	3,891	2,746	5,766	3,867	2,746	2,403	6,034	4,087	6,091
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,466	1,118	1,597	2,841	985	1,118	1,597	1,220	1,937

Elkhorn River near Waterloo, NE 15-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 15-day Avg. Flow (cfs)	5,655	3,083	6,784	3,736	3,633	2,606	5,717	7,122	7,314
Median Ann. Max. 15-day Avg. Flow (cfs)	4,247	2,442	5,457	2,920	3,241	1,678	5,202	4,973	6,988
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	2,376	1,423	2,593			1,423	2,310	2,225	3,039
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	4,637	2,906	5,335	3,721	3,390	2,406	4,683	5,269	5,841
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	4,281	2,571	4,972	3,665	2,898	2,023	4,764	4,762	5,258
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,872	1,452	2,049	2,418	1,922	939	2,183	1,381	2,398
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	1,580	1,156	1,787			1,156	1,567	1,322	2,337
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	3,691	2,442	4,415	3,600	3,070	1,594	4,047	4,519	4,790
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	2,761	1,667	3,781	3,600	1,787	1,530	3,928	3,133	4,166
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,119	833	1,293	2,045	805	798	1,233	1,049	1,486

Elkhorn River near Waterloo, NE 30-day average of mean daily flows	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Avg. Ann. Max. 30-day Avg. Flow (cfs)	4,124	2,383	4,888	3,080	2,932	1,887	4,297	4,895	5,302
Median Ann. Max. 30-day Avg. Flow (cfs)	3,242	2,451	4,424	2,801	2,554	1,355	3,756	3,583	4,963
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	1,743	999	1,912			999	1,593	1,758	2,240
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	3,427	2,233	3,909	2,823	2,906	1,748	3,431	3,786	4,329
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	3,085	1,877	3,572	2,607	2,260	1,448	3,442	3,326	3,828
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	1,365	1,066	1,491	1,788	1,420	682	1,577	1,092	1,696
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	1,267	862	1,413			862	1,181	1,056	1,857
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	2,554	2,021	3,289	2,536	2,554	1,132	3,289	3,129	3,943
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	2,283	1,327	2,438	2,559	1,347	1,033	2,842	2,358	2,916
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	885	666	929	1,335	584	659	885	873	1,267

1909 and 1910-1927 time intervals were not considered for these characterizations due to insufficient data). The one exception is the 1942-1958 time interval, for which both the average and the median maximum flow values for the Apr 16-Jul 15 and Jun 1-Aug 15 seasonal periods are higher than what one would expect for a time interval that included a significant drought period. A review of other data relating to this time interval showed that there was an exceptionally high flow event in June 1944 (**Figure A.14-1**). This maximum was so much greater than all others in this time interval that it alone would be enough to skew the average flow values higher for either seasonal period for the entire time interval. Also, because it occurred in June, its effects are seen in both seasonal periods. Another difference with respect to the other time intervals is that, for both the averages and the medians, the flow values for the Jun 1-Aug 15 seasonal period are greater than those for the Apr 16-Jul 15 seasonal period for the 3-day and 7-day averaging times. An additional review of the data shows that there was one flow maximum in the later seasonal period that did not also occur in the earlier seasonal period (**Figure A.14-3**). Its value appears to be high enough to have raised both the averages and the medians for the Jun 1-Aug 15 seasonal period. For all averaging times and all seasonal periods, the averages are greater than the medians, with the greatest difference being for the Apr 16-Jun 15 and Jun 1-Aug 15 seasonal periods. This indicates that lower flows were the rule, and that the average values were skewed higher by infrequent excessive runoff events.

A.14.4 Flow Frequency

A.14.4.1 Flow Ranges

The information given in **Table A.14-4** and **Figure A.14-5** is generally consistent with **Table A.14-1** and with **Figure A.14-1** and **Figure A.14-2** in **Section A.14.1**, in terms of suggesting a predominant effect of climate on flows in the Elkhorn River at Waterloo. For percentage of years, the flow ranges between 201-500 cfs and 1,001-2,000 cfs all show 100 percent frequency for all time intervals except the 1928-1941 time interval, when severe drought is known to have occurred; for the 1942-1958 time interval the flow ranges showing 100 percent frequency are those between 201-500 cfs and 2,001-3,000 cfs. For both of these time intervals, the percentage frequency for the 0-200-cfs flow range is greater than 50 percent, most likely due to drought periods during both of these time intervals. The percentage frequencies of flow ranges higher than 3,000 cfs is greater for the 1942-1958 time interval than for the 1928-1941 time interval, indicating that at, for at least part of the 1942-1958 time interval, drought was not occurring (**Figures A.14-1 and A.14-2**). For the 1959-1974 time interval, the range of 100 percent flow frequency was the same as that for the 1942-1958 time interval, but the percentage frequency of the 0-200-cfs flow range was 19 percent, compared to 53 percent for the 1942-1958 time interval. For the 1975-1998 time interval, the flow ranges showing 100 percent frequency were those between 751-1,000 cfs and 3,001-4,000 cfs, with the 4,001-5,000 cfs flow range showing a percentage frequency of 96 percent.

For percentage of days, the flow range with the highest percentage frequency is the 201-500-cfs range for both the 1928-1941 and 1942-1958 time intervals. As previously

Table A.14-4 Flow Frequency Distributions.

Elkhorn River near Waterloo, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	38	44	35	0	20	71	53	19	33
201 to 500	87	88	86	67	80	100	100	100	67
501 to 750	95	92	96	83	80	100	100	100	92
751 to 1,000	99	96	100	100	100	93	100	100	100
1,001 to 2,000	99	96	100	100	100	93	100	100	100
2,001 to 3,000	99	96	100	100	100	93	100	100	100
3,001 to 4,000	91	80	96	83	100	71	94	94	100
4,001 to 5,000	76	52	86	83	80	29	82	75	96
5,001 to 6,000	66	32	81	33	40	29	76	81	83
6,001 to 8,000	65	32	79	33	20	36	71	81	83
8,001 to 10,000	52	20	67	33	20	14	65	56	75
10,001 to 12,000	38	16	47	0	20	21	59	31	50
12,001 to 15,000	40	12	53	0	20	14	47	44	63
Greater than 15,000	32	8	42	0	0	14	24	38	58
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Elkhorn River near Waterloo, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	2.5	5.6	1.5	0.0	0.5	8.1	2.0	0.3	2.0
201 to 500	28.3	37.3	25.3	14.7	21.6	46.4	32.0	24.0	21.4
501 to 750	20.9	21.3	20.8	23.3	22.2	20.6	23.8	30.6	12.0
751 to 1,000	12.8	11.6	13.2	15.0	15.4	9.9	11.1	14.7	13.8
1,001 to 2,000	20.3	15.4	22.0	26.7	21.4	11.3	16.9	18.0	28.3
2,001 to 3,000	6.6	4.5	7.3	10.0	9.1	2.1	6.2	4.9	9.6
3,001 to 4,000	3.0	1.8	3.4	3.9	4.4	0.7	2.4	2.6	4.7
4,001 to 5,000	1.6	0.9	1.9	3.0	1.7	0.1	1.6	1.3	2.5
5,001 to 6,000	1.0	0.5	1.1	1.0	1.2	0.2	1.0	0.9	1.4
6,001 to 8,000	1.2	0.6	1.4	1.6	1.3	0.2	1.2	1.2	1.6
8,001 to 10,000	0.7	0.3	0.8	0.7	0.8	0.1	0.9	0.4	1.0
10,001 to 12,000	0.3	0.1	0.4	0.0	0.4	0.1	0.4	0.2	0.5
12,001 to 15,000	0.3	0.0	0.4	0.0	0.1	0.0	0.1	0.3	0.5
Greater than 15,000	0.4	0.1	0.5	0.0	0.0	0.1	0.3	0.6	0.6
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Elkhorn River near Waterloo, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	9	16	5	0	1	28	7	1	7
201 to 500	96	105	92	28	47	158	117	88	78
501 to 750	71	60	76	45	48	70	87	112	44
751 to 1,000	44	33	48	29	34	34	40	54	50
1,001 to 2,000	69	43	80	51	47	39	62	66	103
2,001 to 3,000	22	13	27	19	20	7	23	18	35
3,001 to 4,000	10	5	12	8	10	2	9	9	17
4,001 to 5,000	6	2	7	6	4	1	6	5	9
5,001 to 6,000	3	1	4	2	3	1	4	3	5
6,001 to 8,000	4	2	5	3	3	1	4	4	6
8,001 to 10,000	2	1	3	1	2	0	3	2	4
10,001 to 12,000	1	0	1	0	1	0	1	1	2
12,001 to 15,000	1	0	1	0	0	0	1	1	2
Greater than 15,000	1	0	2	0	0	0	1	2	2
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

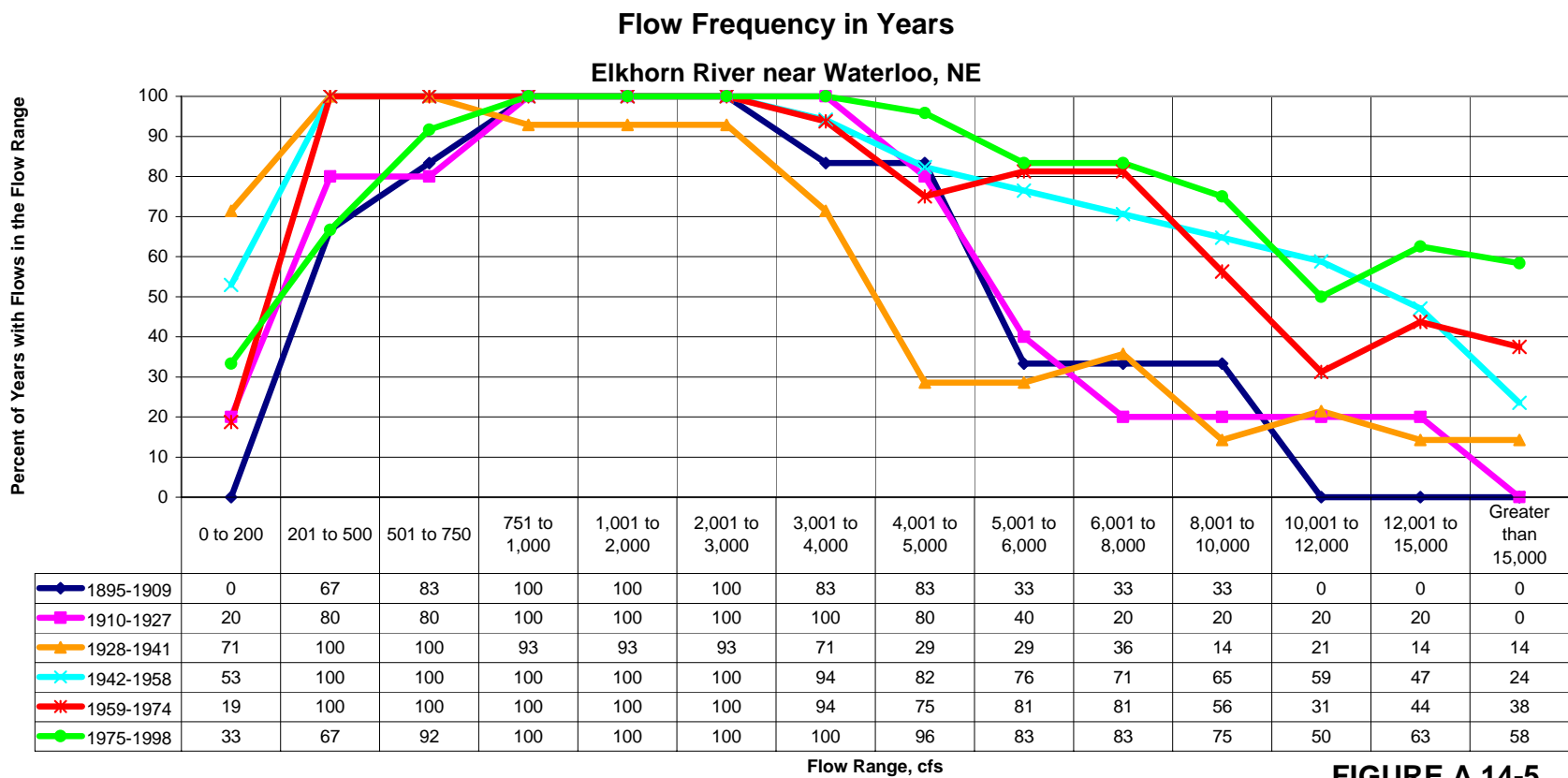


Figure A.14-5 Flow Frequency in Years.

noted, severe drought conditions existed during parts of these time intervals. For the 1959-1974 time interval, the flow range with the highest percentage frequency is the 501-750-cfs range; for the 1975-1998 time interval, it is the 1,001-2,000-cfs flow range.

A.14.4.2 Maximum Mean Flow Exceedance

Table A.14-5 through **Table A.14-9** show the exceedance values and probabilities for maximum flow for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.14-5 shows the exceedance probabilities and values for annual data. **Table A.14-5** shows that the flow characterizations for annual data are mostly consistent with known climatological conditions during the respective time intervals, albeit with some effect of the June 1944 record high flow event evident in the flow values for the 1942-1958 time interval.

Table A.14-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.14-6** shows that the maximum flow values for this seasonal period are consistent with known climatological conditions. However, the characterizations for the various exceedance probabilities show a number of irregularities, especially for the 1942-1958 time interval. These irregularities are possibly attributable to year-by-year variations in and between time intervals of hydrometeorological factors such as temperature, total precipitation, percent of precipitation falling as snow, river ice conditions, etc. The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to insufficient data.

Table A.14-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.14-7** shows that the flows for this seasonal period are generally consistent with known climatological conditions, albeit with some effect of the June 1944 event evident in the flow values for the 1942-1958 time interval. The departures from these characterizations that show up for the 1895-1909 and 1910-1927 time intervals are probably the result of incomplete data sets for these time intervals.

Table A.14-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.14-8** shows that the flows for this seasonal period are generally consistent with known climatological conditions, albeit with some effect of the June 1944 event evident in the flow values for the 1942-1958 time interval. This effect is more noticeable for this seasonal period than for the Apr 16-Jul 15 seasonal period.

Table A.14-5 Maximum Flow Exceedance Values, Annual Data.

Elkhorn River near Waterloo, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		534	534	3,180	2,515	3,670	534	3,400	3,180	3,440
Maximum exceeded in 90% of the years		3,460	2,416	4,368	3,338	3,842	2,182	4,120	5,160	5,298
Maximum exceeded in 80% of the years		4,340	3,216	6,964	4,160	4,014	2,788	6,352	7,020	8,218
Maximum exceeded in 70% of the years		6,308	4,112	9,098	4,238	4,138	3,233	9,320	7,820	12,628
Maximum exceeded in 60% of the years		7,900	4,305	12,280	4,315	4,214	4,660	11,480	10,800	14,560
Maximum exceeded in 50% of the years		11,000	4,745	14,100	4,530	4,290	5,565	12,200	14,550	16,650
Maximum exceeded in 40% of the years		13,400	5,744	16,360	4,745	4,710	6,550	12,820	15,000	19,460
Maximum exceeded in 30% of the years		15,940	6,952	19,760	6,708	5,130	7,396	13,700	20,750	21,730
Maximum exceeded in 20% of the years		20,960	9,774	23,980	8,670	6,772	11,320	16,900	37,300	26,260
Maximum exceeded in 10% of the years		31,090	12,460	37,060	9,119	9,636	14,780	22,620	39,450	31,380
Maximum		93,800	22,500	93,800	9,568	12,500	22,500	93,800	44,500	41,000
3-day Average Flows										
Maximum exceeded in 100% of the years		502	502	2,233	2,515	3,390	502	2,233	2,673	2,250
Maximum exceeded in 90% of the years		2,766	2,149	3,500	3,058	3,534	1,722	3,123	3,730	4,401
Maximum exceeded in 80% of the years		3,689	2,930	5,754	3,600	3,678	2,267	5,823	4,883	6,450
Maximum exceeded in 70% of the years		4,596	3,612	7,169	3,786	3,830	2,980	8,063	6,295	9,445
Maximum exceeded in 60% of the years		6,437	3,719	9,525	3,972	3,990	3,663	8,927	8,783	11,131
Maximum exceeded in 50% of the years		8,825	3,972	10,927	4,170	4,150	3,747	9,877	10,390	12,138
Maximum exceeded in 40% of the years		10,731	4,442	11,751	4,368	4,369	4,407	10,201	11,457	14,847
Maximum exceeded in 30% of the years		11,737	4,782	14,979	6,425	4,587	4,984	10,623	15,295	18,477
Maximum exceeded in 20% of the years		16,563	8,523	21,540	8,482	6,111	8,387	13,769	33,567	23,387
Maximum exceeded in 10% of the years		27,667	11,387	31,827	8,586	8,939	11,443	20,913	35,850	28,867
Maximum		69,567	22,033	69,567	8,690	11,767	22,033	69,567	39,367	34,800
7-day Average Flows										
Maximum exceeded in 100% of the years		409	409	1,380	2,405	2,746	409	1,380	1,911	1,397
Maximum exceeded in 90% of the years		2,109	1,684	2,674	2,623	2,964	1,304	1,979	3,106	3,091
Maximum exceeded in 80% of the years		2,779	2,405	4,217	2,841	3,182	1,813	4,435	3,704	4,583
Maximum exceeded in 70% of the years		3,586	2,643	5,597	2,877	3,336	2,370	5,521	4,923	6,177
Maximum exceeded in 60% of the years		4,541	2,806	6,682	2,913	3,424	2,517	6,294	5,963	8,630
Maximum exceeded in 50% of the years		6,470	2,913	7,867	3,390	3,513	2,686	6,711	7,397	9,165
Maximum exceeded in 40% of the years		7,838	3,522	8,766	3,867	3,809	2,861	7,528	8,069	9,915
Maximum exceeded in 30% of the years		8,862	4,176	9,812	5,469	4,105	3,610	7,941	8,585	12,268
Maximum exceeded in 20% of the years		10,182	7,067	17,007	7,071	5,388	5,393	9,450	20,779	17,699
Maximum exceeded in 10% of the years		18,563	8,393	20,767	7,452	7,658	8,257	14,867	25,700	20,048
Maximum		37,957	15,026	37,957	7,832	9,929	15,026	37,957	29,314	27,600
15-day Average Flows										
Maximum exceeded in 100% of the years		336	336	907	2,045	1,787	336	907	1,215	927
Maximum exceeded in 90% of the years		1,537	1,373	2,085	2,057	2,113	1,033	1,436	2,285	2,582
Maximum exceeded in 80% of the years		2,103	1,622	2,846	2,068	2,438	1,425	2,956	2,523	3,042
Maximum exceeded in 70% of the years		2,780	1,709	3,742	2,154	2,729	1,588	3,742	3,903	3,901
Maximum exceeded in 60% of the years		3,411	2,059	4,785	2,239	2,985	1,637	4,060	4,775	6,054
Maximum exceeded in 50% of the years		4,247	2,442	5,457	2,920	3,241	1,678	5,202	4,973	6,988
Maximum exceeded in 40% of the years		5,498	2,897	6,196	3,600	3,322	2,292	5,550	5,227	7,345
Maximum exceeded in 30% of the years		6,645	3,403	7,384	4,563	3,403	2,847	5,917	6,295	8,084
Maximum exceeded in 20% of the years		7,743	4,304	9,492	5,525	4,173	3,397	7,618	12,532	10,558
Maximum exceeded in 10% of the years		12,452	6,470	14,718	6,231	5,633	5,239	9,175	17,310	13,728
Maximum		19,997	7,805	19,997	6,936	7,093	7,805	19,997	18,143	19,659
30-day Average Flows										
Maximum exceeded in 100% of the years		304	304	784	1,335	1,347	304	784	832	870
Maximum exceeded in 90% of the years		1,195	1,013	1,597	1,585	1,825	900	1,219	1,758	1,986
Maximum exceeded in 80% of the years		1,730	1,213	2,178	1,834	2,304	1,044	1,983	2,121	2,276
Maximum exceeded in 70% of the years		2,253	1,338	2,926	2,196	2,545	1,183	3,034	3,060	2,449
Maximum exceeded in 60% of the years		2,556	1,657	3,421	2,559	2,549	1,238	3,327	3,182	4,594
Maximum exceeded in 50% of the years		3,242	2,451	4,424	2,801	2,554	1,355	3,756	3,583	4,963
Maximum exceeded in 40% of the years		4,105	2,547	4,830	3,044	2,726	1,895	4,189	4,178	5,319
Maximum exceeded in 30% of the years		4,848	2,616	5,463	3,445	2,897	2,460	4,840	5,060	6,359
Maximum exceeded in 20% of the years		5,801	3,204	7,688	3,845	3,433	2,573	6,381	9,138	7,503
Maximum exceeded in 10% of the years		9,015	4,256	10,017	4,855	4,334	3,585	7,822	10,142	10,187
Maximum		12,010	5,865	12,010	5,865	5,234	4,431	11,346	11,670	12,010

Table A.14-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Elkhorn River near Waterloo, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	620	620	670	2,029	1,080	620	786	670	1,100
Maximum exceeded in 90% of the years	983	878	1,064	2,029	1,201	819	849	865	1,295
Maximum exceeded in 80% of the years	1,170	1,080	1,346	2,029	1,322	1,034	1,464	1,100	1,752
Maximum exceeded in 70% of the years	1,530	1,125	1,712	2,029	1,443	1,126	1,800	1,325	2,777
Maximum exceeded in 60% of the years	2,238	1,500	2,586	2,029	1,564	1,426	2,136	1,530	3,156
Maximum exceeded in 50% of the years	2,800	2,160	3,140	2,029	1,685	2,350	3,280	2,165	3,800
Maximum exceeded in 40% of the years	3,536	2,350	4,042	2,029	1,806	2,656	4,202	2,700	4,430
Maximum exceeded in 30% of the years	4,548	2,815	6,160	2,029	1,927	3,672	8,552	3,300	6,455
Maximum exceeded in 20% of the years	7,668	4,560	9,938	2,029	2,048	4,692	11,680	4,540	10,780
Maximum exceeded in 10% of the years	13,920	6,125	14,080	2,029	2,169	6,932	14,560	7,400	14,140
Maximum	37,300	15,800	37,300	2,029	2,290	15,800	19,700	37,300	31,000
3-day Average Flows									
Maximum exceeded in 100% of the years	573	573	647	1,745	947	573	766	647	1,023
Maximum exceeded in 90% of the years	945	857	994	1,745	1,051	805	812	820	1,132
Maximum exceeded in 80% of the years	1,097	947	1,195	1,745	1,156	963	1,295	1,008	1,549
Maximum exceeded in 70% of the years	1,385	1,033	1,517	1,745	1,261	1,041	1,629	1,228	2,466
Maximum exceeded in 60% of the years	1,742	1,413	2,049	1,745	1,365	1,345	1,739	1,340	2,725
Maximum exceeded in 50% of the years	2,503	1,713	2,667	1,745	1,470	1,680	3,127	1,958	3,243
Maximum exceeded in 40% of the years	3,079	1,993	3,307	1,745	1,575	2,133	3,777	2,483	3,877
Maximum exceeded in 30% of the years	3,891	2,272	5,423	1,745	1,679	2,966	7,581	2,633	5,721
Maximum exceeded in 20% of the years	6,643	3,660	7,719	1,745	1,784	3,768	9,411	3,137	8,429
Maximum exceeded in 10% of the years	9,846	4,787	10,297	1,745	1,889	5,355	9,785	6,202	10,976
Maximum	33,567	11,613	33,567	1,745	1,993	11,613	18,033	33,567	29,267
7-day Average Flows									
Maximum exceeded in 100% of the years	563	563	583	1,656	851	563	711	583	880
Maximum exceeded in 90% of the years	830	787	873	1,656	949	765	786	736	972
Maximum exceeded in 80% of the years	962	851	1,035	1,656	1,047	836	1,168	913	1,316
Maximum exceeded in 70% of the years	1,168	907	1,212	1,656	1,145	918	1,399	1,105	2,283
Maximum exceeded in 60% of the years	1,558	1,234	1,887	1,656	1,243	1,179	1,535	1,114	2,455
Maximum exceeded in 50% of the years	2,104	1,483	2,340	1,656	1,341	1,310	2,480	1,618	2,755
Maximum exceeded in 40% of the years	2,482	1,760	2,710	1,656	1,439	1,803	3,350	2,104	3,230
Maximum exceeded in 30% of the years	3,179	1,903	4,055	1,656	1,537	2,181	4,708	2,144	4,184
Maximum exceeded in 20% of the years	4,604	2,491	4,951	1,656	1,635	2,623	5,285	2,247	6,223
Maximum exceeded in 10% of the years	6,881	3,494	8,326	1,656	1,733	3,965	6,003	4,860	8,561
Maximum	20,779	7,066	20,779	1,656	1,831	7,066	12,399	20,779	20,759
15-day Average Flows									
Maximum exceeded in 100% of the years	519	519	527			519	592	527	706
Maximum exceeded in 90% of the years	706	684	718			684	679	673	828
Maximum exceeded in 80% of the years	877	710	889			710	990	884	1,241
Maximum exceeded in 70% of the years	970	814	1,064			814	1,152	922	1,759
Maximum exceeded in 60% of the years	1,423	946	1,534			946	1,423	964	2,159
Maximum exceeded in 50% of the years	1,580	1,156	1,787			1,156	1,567	1,322	2,337
Maximum exceeded in 40% of the years	1,890	1,409	2,275			1,409	2,361	1,581	2,603
Maximum exceeded in 30% of the years	2,648	1,439	2,709			1,439	3,092	1,692	2,823
Maximum exceeded in 20% of the years	3,269	1,604	3,420			1,604	3,395	1,933	4,224
Maximum exceeded in 10% of the years	5,158	2,740	5,394			2,740	3,790	3,984	6,021
Maximum	12,532	3,886	12,532			3,886	7,818	12,532	11,421
30-day Average Flows									
Maximum exceeded in 100% of the years	406	406	493			406	493	504	550
Maximum exceeded in 90% of the years	581	563	589			563	567	594	672
Maximum exceeded in 80% of the years	695	634	735			634	765	665	1,020
Maximum exceeded in 70% of the years	834	691	936			691	959	762	1,394
Maximum exceeded in 60% of the years	1,001	720	1,185			720	1,006	892	1,521
Maximum exceeded in 50% of the years	1,267	862	1,413			862	1,181	1,056	1,857
Maximum exceeded in 40% of the years	1,524	893	1,737			893	1,613	1,294	2,057
Maximum exceeded in 30% of the years	1,886	1,050	2,066			1,050	1,934	1,489	2,265
Maximum exceeded in 20% of the years	2,229	1,240	2,499			1,240	2,225	1,602	3,197
Maximum exceeded in 10% of the years	3,783	1,901	3,943			1,901	2,930	3,190	4,295
Maximum	8,995	2,107	8,995			2,107	4,173	8,995	6,472

Table A.14-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Elkhorn River near Waterloo, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	1,010	1,300	1,010	2,283	3,670	1,300	2,280	3,180	1,010
Maximum exceeded in 90% of the years	2,989	1,938	3,632	3,096	3,778	1,466	3,396	4,750	3,813
Maximum exceeded in 80% of the years	3,886	2,310	4,720	3,909	3,886	1,946	3,800	6,060	5,640
Maximum exceeded in 70% of the years	4,711	3,502	6,548	4,401	4,010	2,198	5,776	7,710	8,332
Maximum exceeded in 60% of the years	6,500	4,220	8,740	4,573	4,150	3,070	6,414	8,380	11,680
Maximum exceeded in 50% of the years	8,445	4,630	11,600	4,745	4,290	4,630	10,400	12,500	12,600
Maximum exceeded in 40% of the years	10,960	5,542	12,940	6,251	4,710	6,400	11,040	14,900	16,020
Maximum exceeded in 30% of the years	12,820	6,776	15,000	7,757	5,130	6,776	11,960	15,000	17,330
Maximum exceeded in 20% of the years	15,800	9,145	17,300	8,722	6,252	9,176	12,920	17,300	21,360
Maximum exceeded in 10% of the years	21,690	10,460	25,300	9,145	8,076	12,040	14,700	23,250	27,440
Maximum	93,800	22,500	93,800	9,568	9,900	22,500	93,800	37,900	41,000
3-day Average Flows									
Maximum exceeded in 100% of the years	994	1,077	994	2,029	3,390	1,077	2,180	2,673	994
Maximum exceeded in 90% of the years	2,228	1,661	2,715	2,657	3,491	1,343	2,381	3,730	3,365
Maximum exceeded in 80% of the years	3,359	1,959	3,939	3,286	3,593	1,699	2,871	4,543	4,465
Maximum exceeded in 70% of the years	4,059	3,247	5,725	3,754	3,745	1,873	5,156	6,138	6,338
Maximum exceeded in 60% of the years	5,311	3,635	6,901	4,061	3,947	2,809	5,912	6,653	7,973
Maximum exceeded in 50% of the years	6,633	3,820	8,847	4,368	4,150	3,673	8,867	9,100	8,818
Maximum exceeded in 40% of the years	8,813	4,405	9,489	5,993	4,369	3,967	8,966	9,810	11,068
Maximum exceeded in 30% of the years	9,582	4,623	11,364	7,618	4,587	4,561	9,342	11,410	11,873
Maximum exceeded in 20% of the years	11,422	7,703	12,337	8,482	5,631	5,797	10,257	13,743	16,618
Maximum exceeded in 10% of the years	18,477	9,231	20,940	8,586	7,499	10,160	11,239	19,517	22,270
Maximum	69,567	22,033	69,567	8,690	9,367	22,033	69,567	34,033	34,800
7-day Average Flows									
Maximum exceeded in 100% of the years	826	924	826	1,708	2,746	924	1,380	1,911	826
Maximum exceeded in 90% of the years	1,612	1,160	1,969	2,190	2,964	1,057	1,797	3,106	2,575
Maximum exceeded in 80% of the years	2,597	1,651	3,111	2,672	3,182	1,226	2,013	3,704	3,211
Maximum exceeded in 70% of the years	3,222	2,491	3,923	3,104	3,336	1,537	3,555	3,971	4,485
Maximum exceeded in 60% of the years	3,896	2,753	5,035	3,485	3,424	2,163	4,461	4,873	5,818
Maximum exceeded in 50% of the years	4,741	2,913	6,101	3,867	3,513	2,617	5,766	6,458	6,317
Maximum exceeded in 40% of the years	6,309	3,517	7,041	5,148	3,809	2,782	6,411	7,620	7,264
Maximum exceeded in 30% of the years	7,336	3,923	7,857	6,430	4,105	3,147	6,789	7,955	10,021
Maximum exceeded in 20% of the years	8,302	5,944	9,966	7,223	4,977	3,819	7,404	8,186	10,919
Maximum exceeded in 10% of the years	12,261	7,866	15,926	7,528	6,426	7,815	8,652	13,226	17,828
Maximum	37,957	15,026	37,957	7,832	7,874	15,026	37,957	23,629	27,600
15-day Average Flows									
Maximum exceeded in 100% of the years	706	706	797	1,617	1,787	706	907	1,215	797
Maximum exceeded in 90% of the years	1,341	970	1,462	1,798	2,113	842	1,416	2,266	1,809
Maximum exceeded in 80% of the years	1,653	1,377	2,302	1,978	2,438	1,044	1,494	2,435	2,580
Maximum exceeded in 70% of the years	2,440	1,608	2,693	2,375	2,695	1,325	2,379	2,874	2,999
Maximum exceeded in 60% of the years	2,769	1,762	3,794	2,988	2,883	1,391	3,191	3,814	3,983
Maximum exceeded in 50% of the years	3,691	2,442	4,415	3,600	3,070	1,594	4,047	4,519	4,790
Maximum exceeded in 40% of the years	4,464	2,745	5,129	3,912	3,219	1,817	4,602	4,800	5,760
Maximum exceeded in 30% of the years	5,288	3,219	5,533	4,225	3,369	2,555	5,189	5,330	7,322
Maximum exceeded in 20% of the years	6,328	4,069	7,457	4,892	3,965	2,788	5,871	5,456	8,174
Maximum exceeded in 10% of the years	8,402	5,995	9,725	5,914	5,008	5,182	6,897	9,265	10,727
Maximum	19,997	7,805	19,997	6,936	6,051	7,805	19,997	18,077	19,659
30-day Average Flows									
Maximum exceeded in 100% of the years	601	601	715	1,324	1,347	601	726	832	715
Maximum exceeded in 90% of the years	1,055	806	1,132	1,528	1,773	760	1,094	1,724	1,384
Maximum exceeded in 80% of the years	1,294	1,101	1,820	1,732	2,199	842	1,186	1,805	2,156
Maximum exceeded in 70% of the years	1,880	1,139	2,218	1,974	2,441	1,040	1,776	2,549	2,345
Maximum exceeded in 60% of the years	2,344	1,342	2,636	2,255	2,497	1,103	2,347	3,025	2,525
Maximum exceeded in 50% of the years	2,554	2,021	3,289	2,536	2,554	1,132	3,289	3,129	3,943
Maximum exceeded in 40% of the years	3,322	2,437	3,674	2,544	2,726	1,320	3,379	3,477	4,617
Maximum exceeded in 30% of the years	3,827	2,543	4,378	2,551	2,897	2,085	3,672	3,640	5,342
Maximum exceeded in 20% of the years	5,024	2,812	5,420	3,217	3,433	2,394	4,528	4,178	6,103
Maximum exceeded in 10% of the years	6,622	4,343	7,876	4,541	4,334	3,702	6,124	6,753	7,956
Maximum	12,010	5,865	12,010	5,865	5,234	4,431	11,346	11,670	12,010

Table A.14-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Elkhorn River near Waterloo, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		879	968	879	1,293	2,490	968	3,060	2,390	879
Maximum exceeded in 90% of the years		2,314	1,420	3,046	2,502	2,682	1,314	4,120	3,875	2,254
Maximum exceeded in 80% of the years		3,058	2,122	3,764	3,711	2,874	1,946	5,578	5,200	3,046
Maximum exceeded in 70% of the years		4,251	2,462	5,928	4,401	3,110	2,198	6,538	6,540	3,436
Maximum exceeded in 60% of the years		5,796	3,194	7,492	4,573	3,390	2,406	9,002	7,260	6,562
Maximum exceeded in 50% of the years		7,030	4,230	10,400	4,745	3,670	3,250	11,000	8,110	10,270
Maximum exceeded in 40% of the years		9,191	4,653	11,960	6,251	3,894	4,974	11,620	10,800	15,680
Maximum exceeded in 30% of the years		12,060	6,450	15,120	7,757	4,118	6,450	12,380	14,950	17,890
Maximum exceeded in 20% of the years		16,620	6,936	17,600	8,722	5,884	6,708	13,900	17,300	22,200
Maximum exceeded in 10% of the years		22,560	9,356	28,880	9,145	9,192	6,988	16,400	23,250	30,560
Maximum		93,800	22,500	93,800	9,568	12,500	22,500	93,800	37,900	41,000
3-day Average Flows										
Maximum exceeded in 100% of the years		881	889	881	1,148	2,060	889	2,233	1,883	881
Maximum exceeded in 90% of the years		1,870	1,243	2,243	2,129	2,068	1,063	3,020	2,678	1,801
Maximum exceeded in 80% of the years		2,440	1,817	2,785	3,110	2,076	1,675	4,603	3,733	2,436
Maximum exceeded in 70% of the years		3,387	2,072	4,317	3,754	2,342	1,849	6,091	4,595	2,906
Maximum exceeded in 60% of the years		4,315	2,883	5,974	4,061	2,866	2,207	7,391	5,317	5,017
Maximum exceeded in 50% of the years		5,525	3,600	7,970	4,368	3,390	3,033	9,017	6,245	7,723
Maximum exceeded in 40% of the years		8,154	3,886	9,248	5,993	3,694	3,703	9,248	9,133	9,519
Maximum exceeded in 30% of the years		9,411	4,442	11,195	7,618	3,998	4,113	10,327	10,587	12,169
Maximum exceeded in 20% of the years		11,684	4,879	14,245	8,482	5,673	4,703	11,010	13,743	18,707
Maximum exceeded in 10% of the years		19,453	8,638	23,987	8,586	8,720	4,905	12,568	19,517	24,767
Maximum		69,567	22,033	69,567	8,690	11,767	22,033	69,567	34,033	34,800
7-day Average Flows										
Maximum exceeded in 100% of the years		677	677	733	998	1,823	677	1,380	1,586	733
Maximum exceeded in 90% of the years		1,395	1,017	1,596	1,764	1,846	878	1,887	2,157	1,414
Maximum exceeded in 80% of the years		1,870	1,356	2,297	2,530	1,870	1,181	2,804	3,260	1,835
Maximum exceeded in 70% of the years		2,518	1,780	3,240	3,104	2,054	1,379	4,248	3,386	2,363
Maximum exceeded in 60% of the years		3,212	2,299	4,081	3,485	2,400	1,657	5,030	3,916	3,583
Maximum exceeded in 50% of the years		3,891	2,746	5,766	3,867	2,746	2,403	6,034	4,087	6,091
Maximum exceeded in 40% of the years		5,873	2,892	6,692	5,148	2,946	2,645	6,692	4,169	6,717
Maximum exceeded in 30% of the years		7,080	3,363	7,819	6,430	3,147	2,808	7,243	7,731	9,463
Maximum exceeded in 20% of the years		8,195	3,809	9,683	7,195	4,583	3,276	7,896	8,186	12,745
Maximum exceeded in 10% of the years		13,998	7,566	14,885	7,442	7,256	3,684	8,842	13,226	16,746
Maximum		37,957	15,026	37,957	7,690	9,929	15,026	37,957	23,629	27,600
15-day Average Flows										
Maximum exceeded in 100% of the years		538	538	625	755	1,503	538	907	1,215	625
Maximum exceeded in 90% of the years		1,023	783	1,224	1,280	1,504	767	1,402	1,622	1,003
Maximum exceeded in 80% of the years		1,454	1,127	1,992	1,806	1,505	951	2,229	2,268	1,348
Maximum exceeded in 70% of the years		1,929	1,505	2,258	2,375	1,562	1,174	2,696	2,452	2,024
Maximum exceeded in 60% of the years		2,279	1,529	2,830	2,988	1,674	1,473	3,617	2,595	2,319
Maximum exceeded in 50% of the years		2,761	1,667	3,781	3,600	1,787	1,530	3,928	3,133	4,166
Maximum exceeded in 40% of the years		3,840	2,117	4,468	4,370	2,113	1,609	4,066	3,579	4,942
Maximum exceeded in 30% of the years		5,046	2,631	5,487	5,140	2,438	1,925	5,166	5,027	7,180
Maximum exceeded in 20% of the years		6,216	3,250	7,425	5,696	3,500	2,531	5,804	5,456	7,944
Maximum exceeded in 10% of the years		8,133	6,208	9,500	6,037	5,297	2,715	6,897	9,265	9,655
Maximum		19,997	7,805	19,997	6,378	7,093	7,805	19,997	18,077	19,659
30-day Average Flows										
Maximum exceeded in 100% of the years		441	441	518	610	1,210	441	761	832	518
Maximum exceeded in 90% of the years		866	628	986	1,046	1,257	591	1,181	1,265	873
Maximum exceeded in 80% of the years		1,092	903	1,444	1,482	1,303	768	1,610	1,747	1,116
Maximum exceeded in 70% of the years		1,410	1,020	1,798	1,872	1,331	920	1,862	1,878	1,563
Maximum exceeded in 60% of the years		1,794	1,216	2,201	2,216	1,339	992	2,403	2,149	1,949
Maximum exceeded in 50% of the years		2,283	1,327	2,438	2,559	1,347	1,033	2,842	2,358	2,916
Maximum exceeded in 40% of the years		2,508	1,713	3,408	3,073	1,723	1,218	3,329	2,474	4,028
Maximum exceeded in 30% of the years		3,536	2,215	4,114	3,588	2,099	1,435	3,763	3,297	5,078
Maximum exceeded in 20% of the years		4,478	2,524	5,313	3,940	2,856	2,005	4,402	3,591	5,578
Maximum exceeded in 10% of the years		6,159	4,225	7,097	4,130	3,994	2,411	5,833	6,576	7,373
Maximum		11,945	5,132	11,945	4,320	5,132	4,431	11,301	11,670	11,945

Table A.14-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

Elkhorn River near Waterloo, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		281	514	281	852	690	514	586	642	281
Maximum exceeded in 90% of the years		846	587	875	911	798	537	992	988	952
Maximum exceeded in 80% of the years		1,180	917	1,292	970	906	925	1,296	1,340	1,640
Maximum exceeded in 70% of the years		1,490	1,162	1,804	1,631	1,038	1,207	1,616	1,515	2,558
Maximum exceeded in 60% of the years		1,950	1,388	2,298	2,896	1,194	1,622	2,224	1,840	3,480
Maximum exceeded in 50% of the years		2,590	1,920	3,020	4,160	1,350	2,000	3,000	2,100	3,665
Maximum exceeded in 40% of the years		3,560	2,050	3,796	4,684	1,566	2,050	3,896	2,500	5,244
Maximum exceeded in 30% of the years		4,240	2,868	5,630	5,208	1,782	2,613	5,006	3,430	6,523
Maximum exceeded in 20% of the years		7,020	4,272	7,992	6,110	4,012	3,012	9,934	5,520	8,184
Maximum exceeded in 10% of the years		11,000	6,387	11,540	7,390	8,256	4,098	13,640	8,065	12,500
Maximum		31,500	12,500	31,500	8,670	12,500	6,780	20,600	12,200	31,500
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		262	388	262	824	657	388	559	592	262
Maximum exceeded in 90% of the years		718	548	794	872	685	462	821	925	831
Maximum exceeded in 80% of the years		1,021	785	1,099	920	713	799	1,234	1,025	1,527
Maximum exceeded in 70% of the years		1,247	993	1,374	1,550	812	1,074	1,308	1,165	1,860
Maximum exceeded in 60% of the years		1,573	1,193	1,815	2,761	983	1,385	1,512	1,520	2,107
Maximum exceeded in 50% of the years		1,861	1,537	2,280	3,972	1,153	1,537	2,280	1,577	2,650
Maximum exceeded in 40% of the years		2,633	1,782	2,811	4,454	1,421	1,603	2,663	1,843	3,857
Maximum exceeded in 30% of the years		3,673	2,398	4,237	4,936	1,689	2,268	3,537	3,107	4,979
Maximum exceeded in 20% of the years		5,177	3,793	5,735	5,838	3,812	2,483	8,625	3,690	5,908
Maximum exceeded in 10% of the years		8,630	4,988	9,078	7,160	7,789	3,367	11,928	5,180	8,896
Maximum		25,267	11,767	25,267	8,482	11,767	4,547	14,560	7,057	25,267
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		235	284	235	777	606	284	551	534	235
Maximum exceeded in 90% of the years		606	468	664	806	631	364	654	715	680
Maximum exceeded in 80% of the years		790	733	891	836	656	638	892	742	1,141
Maximum exceeded in 70% of the years		956	845	1,154	1,249	732	871	953	1,033	1,440
Maximum exceeded in 60% of the years		1,202	911	1,314	2,045	859	936	1,201	1,158	1,582
Maximum exceeded in 50% of the years		1,466	1,118	1,597	2,841	985	1,118	1,597	1,220	1,937
Maximum exceeded in 40% of the years		1,916	1,586	2,006	3,394	1,239	1,389	1,883	1,387	2,307
Maximum exceeded in 30% of the years		2,407	1,946	2,583	3,947	1,492	1,730	2,637	2,264	3,781
Maximum exceeded in 20% of the years		4,016	2,581	4,279	4,942	3,150	1,964	5,941	2,417	4,798
Maximum exceeded in 10% of the years		5,539	3,928	5,863	6,377	6,212	2,285	7,981	3,632	5,456
Maximum		14,971	9,274	14,971	7,813	9,274	3,237	9,874	4,169	14,971
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		217	255	217	680	503	255	411	466	217
Maximum exceeded in 90% of the years		515	386	559	704	554	290	555	593	558
Maximum exceeded in 80% of the years		630	569	651	729	605	472	651	630	834
Maximum exceeded in 70% of the years		756	671	900	1,002	666	573	824	886	993
Maximum exceeded in 60% of the years		983	737	1,047	1,523	736	688	966	1,027	1,307
Maximum exceeded in 50% of the years		1,119	833	1,293	2,045	805	798	1,233	1,049	1,486
Maximum exceeded in 40% of the years		1,468	1,023	1,528	2,439	984	959	1,438	1,119	1,752
Maximum exceeded in 30% of the years		1,788	1,448	2,306	2,833	1,163	1,074	1,767	1,664	2,561
Maximum exceeded in 20% of the years		2,510	1,967	2,946	3,542	2,286	1,455	3,438	2,301	3,122
Maximum exceeded in 10% of the years		3,634	2,735	3,755	4,567	4,353	1,797	5,646	2,392	3,829
Maximum		12,215	6,419	12,215	5,591	6,419	2,012	8,161	3,390	12,215
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		152	228	152	612	410	228	309	367	152
Maximum exceeded in 90% of the years		410	328	465	626	469	279	452	465	512
Maximum exceeded in 80% of the years		529	426	571	640	528	353	506	579	577
Maximum exceeded in 70% of the years		612	563	695	785	563	431	661	739	813
Maximum exceeded in 60% of the years		698	616	861	1,060	574	577	784	859	1,012
Maximum exceeded in 50% of the years		885	666	929	1,335	584	659	885	873	1,267
Maximum exceeded in 40% of the years		1,084	692	1,309	1,599	728	686	1,098	914	1,408
Maximum exceeded in 30% of the years		1,345	958	1,466	1,863	872	715	1,438	1,331	1,961
Maximum exceeded in 20% of the years		1,952	1,310	2,082	2,466	1,676	974	2,121	1,534	2,414
Maximum exceeded in 10% of the years		2,502	1,813	2,553	3,409	3,138	1,228	4,071	1,953	2,577
Maximum		7,978	4,601	7,978	4,353	4,601	1,390	5,621	2,502	7,978

Table A.14-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.14-9** shows that the flows for this seasonal period are generally consistent with known climatological conditions for all time intervals except for the 1942-1958 time interval. For this time interval, the values are skewed higher by a small number of relatively high flow events which occurred during this seasonal period. Other departures from typical flow distribution patterns show up for the 1895-1909 and 1910-1927 time intervals, and are probably the result of incomplete data sets for these time intervals.

A.14.4.3 Mean Flow Exceedance

Table A.14-10 through **Table A.14-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows.

Table A.14-10 shows the exceedance probabilities and values of flows for annual data. **Table A.14-10** shows that the flows for annual data are mostly consistent with known climatological conditions, albeit with some effect of the June 1944 event evident in the flow values for the 1942-1958 time interval. The daily data for the June 1944 event show that it rose from a relatively high base flow over 2 days to its maximum, then took 4 days to recede to below 10,000 cfs (USGS, 2004). The daily data also show that a lesser but still significant high-flow event occurred in May 1944. These two events alone are likely enough to explain the occurrences in **Table A.14-10** of flow values for the 1942-1958 time interval that exceed those for the 1959-1974 for the 30 percent and lower exceedance probabilities (higher flows).

Table A.14-11 shows the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.14-11** shows that the flows for this seasonal period are generally consistent with known climatological conditions, albeit with some differences in the flow values for the 1942-1958 time interval. For this time interval, the values are skewed somewhat higher for the 50 percent and lower exceedance probabilities (higher flows) by a small number of relatively high flow events. The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to insufficient data.

Table A.14-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.14-12** shows that the flows for this seasonal period are generally consistent with known climatological conditions, albeit with some effect of the June 1944 event evident in the flow values for the 1942-1958 time interval for exceedance probabilities of 50 percent and lower (higher flows), ranging down to 30 percent and lower for the 30-day averaging time.

Table A.14-10 Exceedance Values Considering All Flows, Annual Data.

Elkhorn River near Waterloo, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	64	64	69	273	165	64	116	170	69
Flow exceeded for 90% of the days	301	242	344	434	350	217	315	390	336
Flow exceeded for 80% of the days	402	305	447	564	480	272	406	476	460
Flow exceeded for 70% of the days	495	384	531	654	590	321	470	540	640
Flow exceeded for 60% of the days	600	475	644	776	690	390	550	616	847
Flow exceeded for 50% of the days	720	575	797	945	840	459	638	700	1,030
Flow exceeded for 40% of the days	900	690	992	1,179	1,020	555	793	823	1,260
Flow exceeded for 30% of the days	1,160	852	1,270	1,477	1,430	675	1,040	1,010	1,630
Flow exceeded for 20% of the days	1,630	1,150	1,800	2,016	1,920	845	1,500	1,390	2,200
Flow exceeded for 10% of the days	2,690	1,840	3,000	3,095	3,000	1,200	2,580	2,400	3,530
Maximum	93,800	22,500	93,800	9,568	12,500	22,500	93,800	44,500	41,000
3-day Average Flows									
Flow exceeded for 100% of the days	65	65	71	286	183	65	118	187	71
Flow exceeded for 90% of the days	306	245	346	433	344	219	318	393	337
Flow exceeded for 80% of the days	407	308	447	567	480	275	407	477	463
Flow exceeded for 70% of the days	498	386	537	659	598	325	473	544	650
Flow exceeded for 60% of the days	603	475	650	783	695	393	555	620	856
Flow exceeded for 50% of the days	731	582	807	948	850	465	644	702	1,043
Flow exceeded for 40% of the days	916	696	1,008	1,170	998	561	806	835	1,283
Flow exceeded for 30% of the days	1,173	860	1,300	1,509	1,412	688	1,063	1,034	1,650
Flow exceeded for 20% of the days	1,653	1,147	1,833	2,038	1,957	856	1,524	1,421	2,227
Flow exceeded for 10% of the days	2,720	1,853	3,043	3,052	3,033	1,206	2,643	2,440	3,580
Maximum	69,567	22,033	69,567	8,690	11,767	22,033	69,567	39,367	34,800
7-day Average Flows									
Flow exceeded for 100% of the days	66	66	73	291	185	66	121	189	73
Flow exceeded for 90% of the days	313	250	352	428	341	225	323	401	340
Flow exceeded for 80% of the days	415	314	455	575	478	279	414	483	470
Flow exceeded for 70% of the days	507	391	547	661	603	333	481	550	666
Flow exceeded for 60% of the days	614	487	661	786	694	400	564	627	876
Flow exceeded for 50% of the days	749	597	831	968	857	480	662	712	1,068
Flow exceeded for 40% of the days	932	706	1,039	1,198	1,001	583	827	862	1,334
Flow exceeded for 30% of the days	1,207	869	1,357	1,539	1,369	705	1,108	1,082	1,697
Flow exceeded for 20% of the days	1,702	1,161	1,877	2,061	1,909	868	1,599	1,486	2,300
Flow exceeded for 10% of the days	2,790	1,832	3,145	3,010	2,930	1,230	2,778	2,526	3,643
Maximum	37,957	15,026	37,957	7,832	9,929	15,026	37,957	29,314	27,600
15-day Average Flows									
Flow exceeded for 100% of the days	70	70	77	300	203	70	127	201	77
Flow exceeded for 90% of the days	325	253	365	436	348	232	332	415	346
Flow exceeded for 80% of the days	429	326	469	596	475	293	427	493	480
Flow exceeded for 70% of the days	522	400	560	676	609	345	499	559	691
Flow exceeded for 60% of the days	628	503	680	807	701	414	580	640	904
Flow exceeded for 50% of the days	772	612	866	1,036	828	507	679	743	1,099
Flow exceeded for 40% of the days	965	715	1,082	1,194	1,031	612	857	895	1,396
Flow exceeded for 30% of the days	1,260	862	1,429	1,553	1,343	718	1,167	1,130	1,756
Flow exceeded for 20% of the days	1,759	1,156	1,965	2,041	1,831	873	1,684	1,606	2,340
Flow exceeded for 10% of the days	2,844	1,787	3,222	2,868	2,686	1,291	3,007	2,580	3,739
Maximum	19,997	7,805	19,997	6,936	7,093	7,805	19,997	18,143	19,659
30-day Average Flows									
Flow exceeded for 100% of the days	85	85	94	312	235	85	137	247	94
Flow exceeded for 90% of the days	341	267	382	476	362	245	353	433	355
Flow exceeded for 80% of the days	446	345	480	601	449	302	442	510	497
Flow exceeded for 70% of the days	542	422	577	680	586	376	517	571	725
Flow exceeded for 60% of the days	646	518	704	881	707	439	594	661	944
Flow exceeded for 50% of the days	805	619	910	1,064	823	534	709	776	1,172
Flow exceeded for 40% of the days	1,019	718	1,150	1,249	1,001	631	926	972	1,451
Flow exceeded for 30% of the days	1,310	878	1,512	1,455	1,228	728	1,191	1,227	1,826
Flow exceeded for 20% of the days	1,840	1,136	2,061	1,968	1,840	903	1,870	1,674	2,342
Flow exceeded for 10% of the days	2,901	1,742	3,295	2,623	2,528	1,213	3,057	2,741	3,993
Maximum	12,010	5,865	12,010	5,865	5,234	4,431	11,346	11,670	12,010

Table A.14-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Elkhorn River near Waterloo, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days		130	130	211	1,421	700	130	211	389	230
Flow exceeded for 90% of the days		415	290	460	1,489	796	290	389	500	520
Flow exceeded for 80% of the days		547	370	589	1,537	820	339	480	582	778
Flow exceeded for 70% of the days		700	544	769	1,547	868	510	618	716	986
Flow exceeded for 60% of the days		830	649	921	1,599	1,008	620	779	811	1,240
Flow exceeded for 50% of the days		1,000	701	1,110	1,673	1,320	697	926	930	1,500
Flow exceeded for 40% of the days		1,250	780	1,364	1,683	1,630	750	1,104	1,090	1,800
Flow exceeded for 30% of the days		1,587	970	1,720	1,691	1,762	903	1,366	1,350	2,206
Flow exceeded for 20% of the days		2,100	1,300	2,322	1,696	1,784	1,200	1,890	1,760	2,732
Flow exceeded for 10% of the days		3,419	1,809	3,827	1,830	1,854	1,801	3,303	3,365	4,473
Maximum		37,300	15,800	37,300	2,029	2,290	15,800	19,700	37,300	31,000
3-day Average Flows										
Flow exceeded for 100% of the days		153	153	223	1,586	767	153	223	390	237
Flow exceeded for 90% of the days		439	300	469	1,588	767	298	398	503	524
Flow exceeded for 80% of the days		557	367	613	1,590	820	352	489	597	787
Flow exceeded for 70% of the days		709	529	791	1,593	860	513	651	730	1,002
Flow exceeded for 60% of the days		845	657	938	1,598	947	627	793	833	1,259
Flow exceeded for 50% of the days		1,028	702	1,153	1,603	1,663	697	943	948	1,510
Flow exceeded for 40% of the days		1,293	775	1,407	1,620	1,687	752	1,163	1,121	1,822
Flow exceeded for 30% of the days		1,627	944	1,767	1,637	1,757	900	1,427	1,350	2,289
Flow exceeded for 20% of the days		2,183	1,300	2,400	1,666	1,957	1,186	1,843	1,847	2,900
Flow exceeded for 10% of the days		3,493	1,972	3,920	1,705	1,987	1,960	3,260	3,422	4,737
Maximum		33,567	11,613	33,567	1,745	1,993	11,613	18,033	33,567	29,267
7-day Average Flows										
Flow exceeded for 100% of the days		215	215	253	1,656	851	215	268	393	253
Flow exceeded for 90% of the days		453	301	489	1,656	1,040	301	447	504	543
Flow exceeded for 80% of the days		577	393	652	1,656	1,228	388	527	599	820
Flow exceeded for 70% of the days		731	526	830	1,656	1,416	522	697	749	996
Flow exceeded for 60% of the days		870	668	980	1,656	1,605	667	885	843	1,336
Flow exceeded for 50% of the days		1,063	708	1,188	1,656	1,793	706	1,029	1,001	1,591
Flow exceeded for 40% of the days		1,351	788	1,487	1,656	1,801	783	1,217	1,175	1,930
Flow exceeded for 30% of the days		1,709	915	1,877	1,656	1,808	904	1,537	1,423	2,378
Flow exceeded for 20% of the days		2,281	1,193	2,509	1,656	1,816	1,180	2,011	1,979	3,036
Flow exceeded for 10% of the days		3,775	1,917	4,157	1,656	1,824	1,919	3,833	3,710	4,789
Maximum		20,779	7,066	20,779	1,656	1,831	7,066	12,399	20,779	20,759
15-day Average Flows										
Flow exceeded for 100% of the days		282	282	308			282	345	423	308
Flow exceeded for 90% of the days		507	367	545			367	561	521	616
Flow exceeded for 80% of the days		632	459	701			459	624	614	822
Flow exceeded for 70% of the days		786	570	871			570	882	760	1,052
Flow exceeded for 60% of the days		933	687	1,048			687	1,021	848	1,420
Flow exceeded for 50% of the days		1,138	731	1,329			731	1,187	973	1,699
Flow exceeded for 40% of the days		1,450	852	1,591			852	1,395	1,313	2,072
Flow exceeded for 30% of the days		1,797	945	2,107			945	1,860	1,552	2,312
Flow exceeded for 20% of the days		2,467	1,182	2,653			1,182	2,713	1,730	2,851
Flow exceeded for 10% of the days		3,427	2,054	3,953			2,054	3,224	4,453	5,179
Maximum		12,532	3,886	12,532			3,886	7,818	12,532	11,421
30-day Average Flows										
Flow exceeded for 100% of the days		406	406	493			406	493	504	550
Flow exceeded for 90% of the days		581	563	589			563	567	594	672
Flow exceeded for 80% of the days		695	634	735			634	765	665	1,020
Flow exceeded for 70% of the days		834	691	936			691	959	762	1,394
Flow exceeded for 60% of the days		1,001	720	1,185			720	1,006	892	1,521
Flow exceeded for 50% of the days		1,267	862	1,413			862	1,181	1,056	1,857
Flow exceeded for 40% of the days		1,524	893	1,737			893	1,613	1,294	2,057
Flow exceeded for 30% of the days		1,886	1,050	2,066			1,050	1,934	1,489	2,265
Flow exceeded for 20% of the days		2,229	1,240	2,499			1,240	2,225	1,602	3,197
Flow exceeded for 10% of the days		3,783	1,901	3,943			1,901	2,930	3,190	4,295
Maximum		8,995	2,107	8,995			2,107	4,173	8,995	6,472

Table A.14-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Elkhorn River near Waterloo, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	163	163	168	325	466	163	209	310	168
Flow exceeded for 90% of the days	514	398	576	596	660	334	528	630	565
Flow exceeded for 80% of the days	662	550	724	729	798	448	660	751	771
Flow exceeded for 70% of the days	800	656	894	808	925	545	775	895	1,010
Flow exceeded for 60% of the days	977	771	1,104	942	1,100	630	956	1,030	1,380
Flow exceeded for 50% of the days	1,200	905	1,390	1,119	1,400	742	1,220	1,195	1,760
Flow exceeded for 40% of the days	1,550	1,090	1,770	1,318	1,740	860	1,520	1,460	2,260
Flow exceeded for 30% of the days	2,040	1,367	2,300	1,745	2,200	1,080	2,022	1,820	2,871
Flow exceeded for 20% of the days	2,800	1,840	3,180	2,336	2,860	1,346	2,718	2,600	3,810
Flow exceeded for 10% of the days	4,490	2,859	5,134	4,088	3,795	1,928	4,508	4,205	6,160
Maximum	93,800	22,500	93,800	9,568	9,900	22,500	93,800	37,900	41,000
3-day Average Flows									
Flow exceeded for 100% of the days	169	169	179	331	492	169	250	315	179
Flow exceeded for 90% of the days	529	407	584	614	674	342	541	638	580
Flow exceeded for 80% of the days	679	565	737	730	829	463	667	774	778
Flow exceeded for 70% of the days	823	680	913	802	942	559	796	916	1,048
Flow exceeded for 60% of the days	1,003	790	1,143	953	1,123	646	996	1,067	1,443
Flow exceeded for 50% of the days	1,240	925	1,450	1,108	1,440	759	1,250	1,242	1,837
Flow exceeded for 40% of the days	1,597	1,107	1,857	1,323	1,755	910	1,569	1,509	2,300
Flow exceeded for 30% of the days	2,087	1,387	2,397	1,752	2,190	1,096	2,075	1,924	2,990
Flow exceeded for 20% of the days	2,887	1,864	3,299	2,370	2,841	1,376	2,781	2,685	3,947
Flow exceeded for 10% of the days	4,573	2,872	5,240	4,032	3,653	1,949	4,635	4,439	6,130
Maximum	69,567	22,033	69,567	8,690	9,367	22,033	69,567	34,033	34,800
7-day Average Flows									
Flow exceeded for 100% of the days	183	183	227	347	512	183	280	325	227
Flow exceeded for 90% of the days	555	437	604	638	742	351	565	664	593
Flow exceeded for 80% of the days	700	599	762	732	903	495	684	829	807
Flow exceeded for 70% of the days	860	706	967	801	989	597	824	959	1,125
Flow exceeded for 60% of the days	1,062	813	1,206	961	1,172	689	1,068	1,132	1,541
Flow exceeded for 50% of the days	1,310	942	1,569	1,168	1,407	805	1,357	1,291	1,917
Flow exceeded for 40% of the days	1,693	1,173	1,957	1,362	1,713	914	1,712	1,638	2,442
Flow exceeded for 30% of the days	2,217	1,384	2,561	1,707	2,255	1,173	2,107	2,140	3,158
Flow exceeded for 20% of the days	3,032	1,845	3,447	2,349	2,733	1,390	3,002	2,923	4,033
Flow exceeded for 10% of the days	4,690	2,829	5,350	3,821	3,477	1,973	4,780	4,560	6,138
Maximum	37,957	15,026	37,957	7,832	7,874	15,026	37,957	23,629	27,600
15-day Average Flows									
Flow exceeded for 100% of the days	224	224	285	374	714	224	325	385	285
Flow exceeded for 90% of the days	596	497	635	666	842	402	596	745	628
Flow exceeded for 80% of the days	756	658	836	734	982	539	716	926	880
Flow exceeded for 70% of the days	931	746	1,080	831	1,082	661	891	1,076	1,260
Flow exceeded for 60% of the days	1,158	847	1,339	1,005	1,212	734	1,207	1,213	1,673
Flow exceeded for 50% of the days	1,440	1,023	1,736	1,171	1,440	818	1,486	1,508	2,084
Flow exceeded for 40% of the days	1,845	1,199	2,182	1,388	1,727	993	1,880	1,903	2,621
Flow exceeded for 30% of the days	2,405	1,440	2,760	1,803	2,342	1,210	2,443	2,394	3,249
Flow exceeded for 20% of the days	3,163	1,945	3,643	2,551	2,563	1,487	3,396	3,089	4,277
Flow exceeded for 10% of the days	4,827	2,649	5,203	3,816	3,306	2,197	4,730	4,739	6,010
Maximum	19,997	7,805	19,997	6,936	6,051	7,805	19,997	18,077	19,659
30-day Average Flows									
Flow exceeded for 100% of the days	294	294	348	453	822	294	478	494	348
Flow exceeded for 90% of the days	635	552	666	675	991	487	606	827	679
Flow exceeded for 80% of the days	822	701	973	785	1,154	630	726	1,011	1,081
Flow exceeded for 70% of the days	1,026	784	1,199	831	1,224	712	1,008	1,171	1,489
Flow exceeded for 60% of the days	1,289	914	1,601	954	1,330	768	1,258	1,541	1,844
Flow exceeded for 50% of the days	1,666	1,061	1,934	1,139	1,554	889	1,718	1,789	2,177
Flow exceeded for 40% of the days	2,042	1,231	2,377	1,307	1,882	1,026	2,184	2,140	2,774
Flow exceeded for 30% of the days	2,577	1,605	3,041	1,595	2,287	1,265	2,730	2,698	3,467
Flow exceeded for 20% of the days	3,383	1,974	3,755	2,428	2,622	1,738	3,484	3,315	4,387
Flow exceeded for 10% of the days	4,654	2,771	5,206	4,235	2,920	2,132	4,545	4,775	5,641
Maximum	12,010	5,865	12,010	5,865	5,234	4,431	11,346	11,670	12,010

Table A.14-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Elkhorn River near Waterloo, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	85	90	85	322	210	90	168	210	85
Flow exceeded for 90% of the days	327	262	395	465	369	197	417	451	354
Flow exceeded for 80% of the days	471	338	537	567	546	284	535	559	519
Flow exceeded for 70% of the days	597	439	687	636	630	326	675	670	724
Flow exceeded for 60% of the days	736	554	826	745	700	401	784	784	937
Flow exceeded for 50% of the days	905	653	1,030	931	803	509	956	921	1,190
Flow exceeded for 40% of the days	1,160	800	1,346	1,220	1,012	611	1,240	1,160	1,550
Flow exceeded for 30% of the days	1,590	1,071	1,790	1,815	1,637	797	1,700	1,540	2,050
Flow exceeded for 20% of the days	2,300	1,627	2,580	2,558	2,480	1,096	2,528	2,120	2,914
Flow exceeded for 10% of the days	3,880	2,762	4,440	3,976	3,584	1,720	4,592	3,730	4,761
Maximum	93,800	22,500	93,800	9,568	12,500	22,500	93,800	37,900	41,000
3-day Average Flows									
Flow exceeded for 100% of the days	91	91	91	327	223	91	179	221	91
Flow exceeded for 90% of the days	334	271	405	477	372	205	426	454	362
Flow exceeded for 80% of the days	480	350	556	563	543	289	563	570	536
Flow exceeded for 70% of the days	615	456	706	646	633	336	700	693	734
Flow exceeded for 60% of the days	753	565	851	745	698	412	809	811	966
Flow exceeded for 50% of the days	929	668	1,067	950	834	524	988	956	1,228
Flow exceeded for 40% of the days	1,205	832	1,400	1,237	991	634	1,281	1,216	1,593
Flow exceeded for 30% of the days	1,624	1,081	1,873	1,937	1,601	842	1,793	1,574	2,128
Flow exceeded for 20% of the days	2,341	1,623	2,647	2,596	2,445	1,136	2,633	2,195	3,017
Flow exceeded for 10% of the days	4,033	2,860	4,615	3,816	3,397	1,677	4,550	3,898	5,128
Maximum	69,567	22,033	69,567	8,690	11,767	22,033	69,567	34,033	34,800
7-day Average Flows									
Flow exceeded for 100% of the days	95	95	105	342	232	95	199	244	105
Flow exceeded for 90% of the days	349	278	426	470	380	213	436	471	391
Flow exceeded for 80% of the days	505	356	585	580	540	298	605	599	564
Flow exceeded for 70% of the days	648	475	741	663	636	350	744	728	750
Flow exceeded for 60% of the days	791	592	903	799	704	448	871	860	1,012
Flow exceeded for 50% of the days	984	684	1,131	996	836	555	1,079	1,033	1,331
Flow exceeded for 40% of the days	1,282	836	1,508	1,347	1,057	669	1,410	1,276	1,686
Flow exceeded for 30% of the days	1,716	1,143	1,938	2,076	1,537	831	1,897	1,691	2,172
Flow exceeded for 20% of the days	2,423	1,644	2,802	2,791	2,377	1,160	2,703	2,280	3,208
Flow exceeded for 10% of the days	4,030	2,769	4,743	3,718	3,476	1,679	4,439	3,750	5,335
Maximum	37,957	15,026	37,957	7,690	9,929	15,026	37,957	23,629	27,600
15-day Average Flows									
Flow exceeded for 100% of the days	97	97	131	374	275	97	206	263	131
Flow exceeded for 90% of the days	386	303	457	503	390	227	490	485	432
Flow exceeded for 80% of the days	542	395	639	614	533	323	688	679	587
Flow exceeded for 70% of the days	690	518	819	710	636	393	828	794	837
Flow exceeded for 60% of the days	846	606	981	870	688	500	938	938	1,054
Flow exceeded for 50% of the days	1,064	703	1,241	1,131	902	568	1,179	1,129	1,438
Flow exceeded for 40% of the days	1,393	870	1,664	1,874	1,115	695	1,580	1,366	1,797
Flow exceeded for 30% of the days	1,836	1,174	2,072	2,264	1,408	812	2,042	1,852	2,351
Flow exceeded for 20% of the days	2,502	1,593	2,900	2,807	1,909	1,219	2,794	2,282	3,497
Flow exceeded for 10% of the days	4,089	2,565	4,722	3,338	3,337	1,583	4,029	3,603	5,420
Maximum	19,997	7,805	19,997	6,378	7,093	7,805	19,997	18,077	19,659
30-day Average Flows									
Flow exceeded for 100% of the days	110	110	131	433	334	110	292	299	131
Flow exceeded for 90% of the days	446	370	518	557	462	285	637	559	479
Flow exceeded for 80% of the days	593	448	729	608	568	395	758	793	598
Flow exceeded for 70% of the days	755	535	885	781	661	446	929	881	854
Flow exceeded for 60% of the days	933	625	1,076	1,044	780	507	1,052	1,008	1,160
Flow exceeded for 50% of the days	1,136	748	1,414	1,615	937	606	1,401	1,262	1,548
Flow exceeded for 40% of the days	1,517	936	1,776	2,267	1,118	695	1,806	1,529	1,994
Flow exceeded for 30% of the days	1,934	1,141	2,210	2,547	1,205	903	2,282	1,811	2,394
Flow exceeded for 20% of the days	2,522	1,620	2,933	2,649	1,332	1,044	2,731	2,295	3,507
Flow exceeded for 10% of the days	3,775	2,521	4,270	3,289	2,125	1,619	3,730	3,274	5,178
Maximum	11,945	5,132	11,945	4,320	5,132	4,431	11,301	11,670	11,945

Table A.14-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

Elkhorn River near Waterloo, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	64	64	69	288	165	64	116	190	69
Flow exceeded for 90% of the days	223	174	257	344	242	135	244	326	229
Flow exceeded for 80% of the days	308	232	354	447	310	188	340	406	329
Flow exceeded for 70% of the days	387	294	440	538	356	225	413	466	426
Flow exceeded for 60% of the days	465	350	515	598	433	272	480	510	574
Flow exceeded for 50% of the days	551	420	605	718	540	317	556	564	766
Flow exceeded for 40% of the days	665	520	734	895	597	380	654	632	926
Flow exceeded for 30% of the days	835	622	906	1,400	698	450	805	729	1,130
Flow exceeded for 20% of the days	1,130	882	1,180	1,959	1,316	560	1,040	875	1,480
Flow exceeded for 10% of the days	1,840	1,716	1,890	2,991	2,548	926	1,842	1,289	2,260
Maximum	31,500	12,500	31,500	8,670	12,500	6,780	20,600	12,200	31,500
3-day Average Flows									
Flow exceeded for 100% of the days	65	65	71	292	183	65	119	200	71
Flow exceeded for 90% of the days	225	177	260	342	244	137	246	326	232
Flow exceeded for 80% of the days	310	234	357	455	308	193	344	408	331
Flow exceeded for 70% of the days	392	300	442	533	362	228	416	472	434
Flow exceeded for 60% of the days	473	355	520	603	426	274	483	517	594
Flow exceeded for 50% of the days	558	427	618	715	540	321	564	566	778
Flow exceeded for 40% of the days	680	526	755	893	599	393	666	640	943
Flow exceeded for 30% of the days	854	634	927	1,398	710	461	820	742	1,146
Flow exceeded for 20% of the days	1,147	888	1,210	2,002	1,290	577	1,045	910	1,517
Flow exceeded for 10% of the days	1,870	1,617	1,952	3,081	2,504	936	1,881	1,311	2,289
Maximum	25,267	11,767	25,267	8,482	11,767	4,547	14,560	7,057	25,267
7-day Average Flows									
Flow exceeded for 100% of the days	66	66	73	308	185	66	125	219	73
Flow exceeded for 90% of the days	232	188	265	345	246	143	249	331	236
Flow exceeded for 80% of the days	317	246	361	449	313	198	345	414	337
Flow exceeded for 70% of the days	401	306	450	548	355	242	419	480	454
Flow exceeded for 60% of the days	488	366	535	614	432	274	482	524	617
Flow exceeded for 50% of the days	573	440	639	699	547	339	579	573	794
Flow exceeded for 40% of the days	701	541	783	887	604	413	700	657	959
Flow exceeded for 30% of the days	878	642	941	1,421	690	489	840	776	1,177
Flow exceeded for 20% of the days	1,149	888	1,224	2,058	1,315	616	1,079	933	1,585
Flow exceeded for 10% of the days	1,856	1,604	1,933	2,947	2,474	919	1,904	1,295	2,247
Maximum	14,971	9,274	14,971	7,813	9,274	3,237	9,874	4,169	14,971
15-day Average Flows									
Flow exceeded for 100% of the days	70	70	77	311	203	70	130	226	77
Flow exceeded for 90% of the days	237	198	282	364	243	162	253	345	249
Flow exceeded for 80% of the days	330	243	374	443	322	209	343	414	348
Flow exceeded for 70% of the days	414	326	463	555	361	238	426	485	490
Flow exceeded for 60% of the days	503	387	547	615	455	311	501	532	640
Flow exceeded for 50% of the days	594	472	665	693	543	374	606	597	836
Flow exceeded for 40% of the days	725	558	805	850	612	454	715	700	992
Flow exceeded for 30% of the days	885	663	948	1,337	710	529	844	811	1,216
Flow exceeded for 20% of the days	1,180	843	1,256	1,891	1,273	670	1,102	928	1,578
Flow exceeded for 10% of the days	1,859	1,518	1,998	2,804	2,288	870	2,381	1,294	2,355
Maximum	12,215	6,419	12,215	5,591	6,419	2,012	8,161	3,390	12,215
30-day Average Flows									
Flow exceeded for 100% of the days	88	88	94	326	235	88	144	247	94
Flow exceeded for 90% of the days	253	205	291	387	256	184	254	351	270
Flow exceeded for 80% of the days	345	256	392	447	337	210	359	439	353
Flow exceeded for 70% of the days	437	357	472	506	384	252	443	484	511
Flow exceeded for 60% of the days	510	420	562	584	426	345	500	518	672
Flow exceeded for 50% of the days	607	488	686	627	540	426	612	650	864
Flow exceeded for 40% of the days	738	558	816	762	585	489	729	725	1,028
Flow exceeded for 30% of the days	904	632	1,006	1,241	858	565	874	813	1,263
Flow exceeded for 20% of the days	1,185	889	1,281	1,397	1,043	635	1,145	975	1,605
Flow exceeded for 10% of the days	1,797	1,276	1,962	1,864	2,151	896	2,847	1,242	2,411
Maximum	7,978	4,601	7,978	4,353	4,601	1,390	5,621	2,502	7,978

Table A.14-13 shows the exceedance probabilities and values of flows for the Jun1-Aug 15 seasonal period. **Table A.14-13** shows that the flows for this seasonal period are generally consistent with known climatological conditions, albeit with some effect of the June 1944 event evident in the flow values for the 1942-1958 time interval for exceedance probabilities of 50 percent and lower (higher flows).

Table A.14-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.14-14** shows that the flows for this seasonal period are generally consistent with known climatological conditions. For this time interval, the values are skewed higher for exceedance probabilities of 50 percent and lower (higher flows) by a small number of relatively high flow events which occurred during this seasonal period (USGS, 2004).

A.14.5 Median Mean Daily Flow

The median mean daily flow by calendar day is shown on **Figure A.14-6**. **Figure A.14-6** reflects both the effects of climate by time interval (**Table A.14-1** and **Table A.14-3**; **Figure A.14-1**, **Figure A.14-2**, and **Figure A.14-4**) and, to a lesser extent, the seasonal effects by month (**Figure A.14-3**) in each time interval. Median mean daily flows are generally lower in the 1928-1941 and 1942-1958 time intervals and higher in the 1959-1974 and 1975-1998 time intervals. Median mean daily flows tend to be higher in March and June than the rest of the year, although this trend is less apparent than that for annual maximum mean daily flows shown on **Figure A.14-3**. There is less difference between time intervals than for locations in the North Platte River basin and the Platte River basin upstream of the confluence with the Loup River (**Sections A.2 through A.5** and **A.9 through A.11**).

A.14.6 USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.14-7** and **Figure A.14-8** and in **Table A.14-15** and **Table A.14-16**.

Figure A.14-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak Flow, and the 10-year running average of the USGS Annual Peak Flow. **Figure A.14-7** shows that the USGS Annual Peak flows are not much greater than the Annual Maximum mean daily flows for most years for which data are available for both quantities, even though the Elkhorn River basin is mostly uncontrolled. This suggests that sharp (“flashy”) hydrograph peaks are unusual at this location due to natural drainage basin characteristics such as climate, topography, soils, and land cover.

Figure A.14-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.14-8** shows that the timing of USGS Annual Peak flows are very similar to those for Annual Maximum mean daily flow (**Section A.14.2**, **Figure A.14-3**).

Table A.14-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.14-15** shows that, for all time intervals, the averages are greater than the medians, but not typically by a large amount. This indicates that the average values were skewed somewhat higher by infrequent extreme runoff events. Both the average and median USGS Annual Peak flows for all time intervals occur between mid-May and early July.

Table A.14-16 shows the exceedance probabilities and values for the USGS Annual Peak Flow. It is analogous to **Table A.14-5** for Annual Maximum mean daily flows. **Table A.14-16** shows that the flows for this seasonal period are generally consistent with known climatological conditions, albeit with some effect of the June 1944 event evident in the flow values for the 1942-1958 time interval. The 1895-1909 time interval was not considered for these characterizations due to insufficient data.

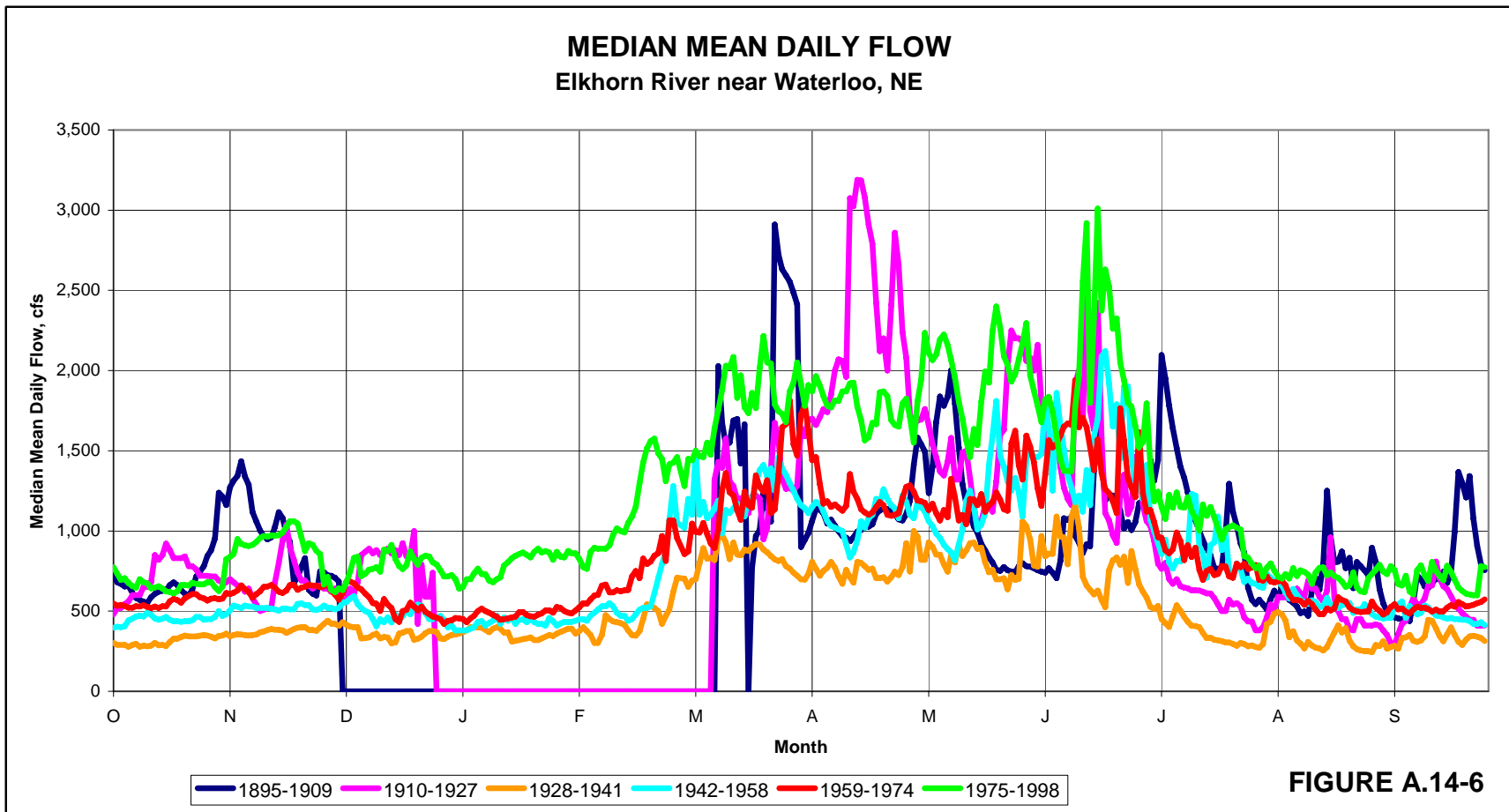


FIGURE A.14-6

Figure A.14-6 Median Mean Daily Flow.

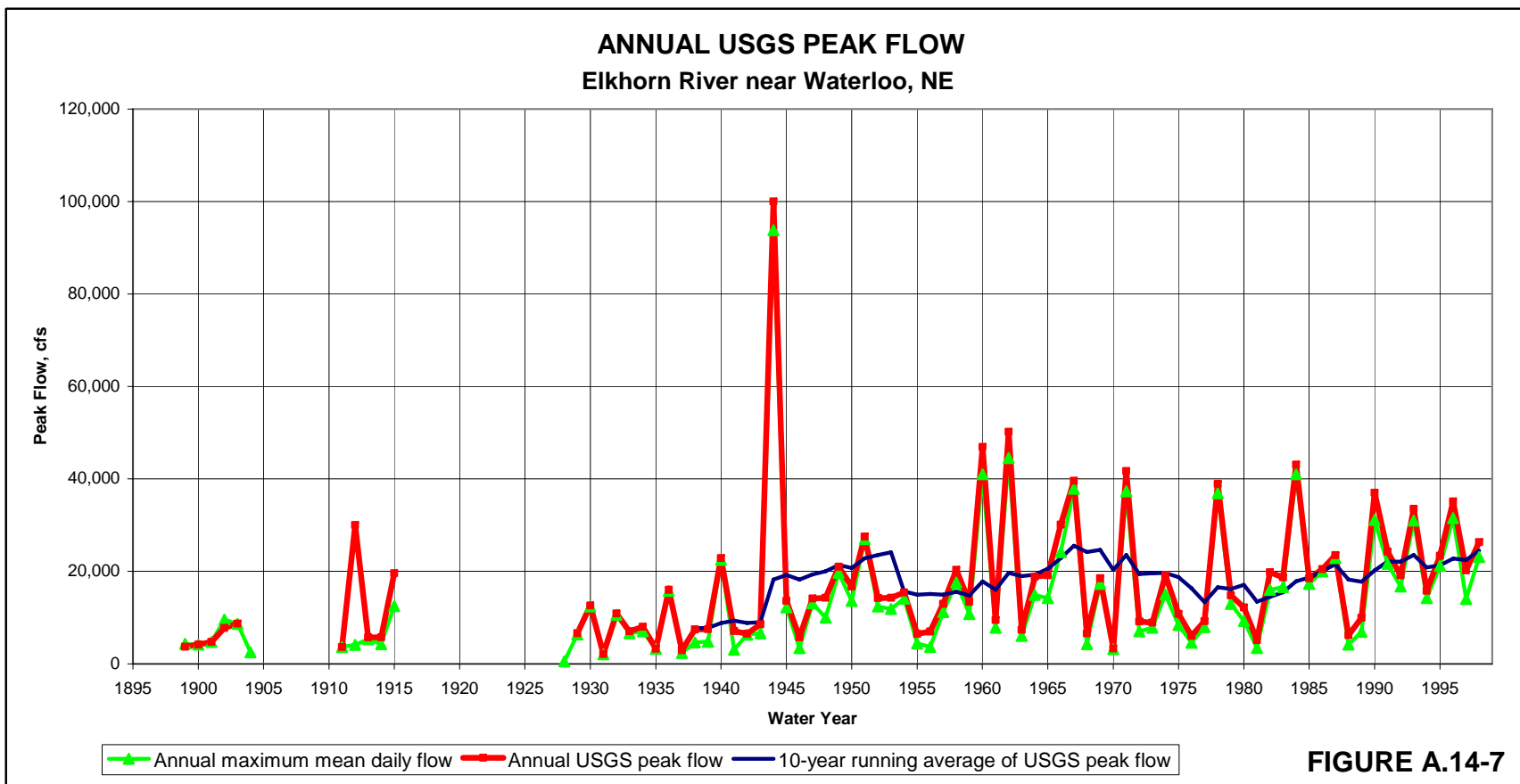


FIGURE A.14-7

Figure A.14-7 Annual USGS Peak Flow.

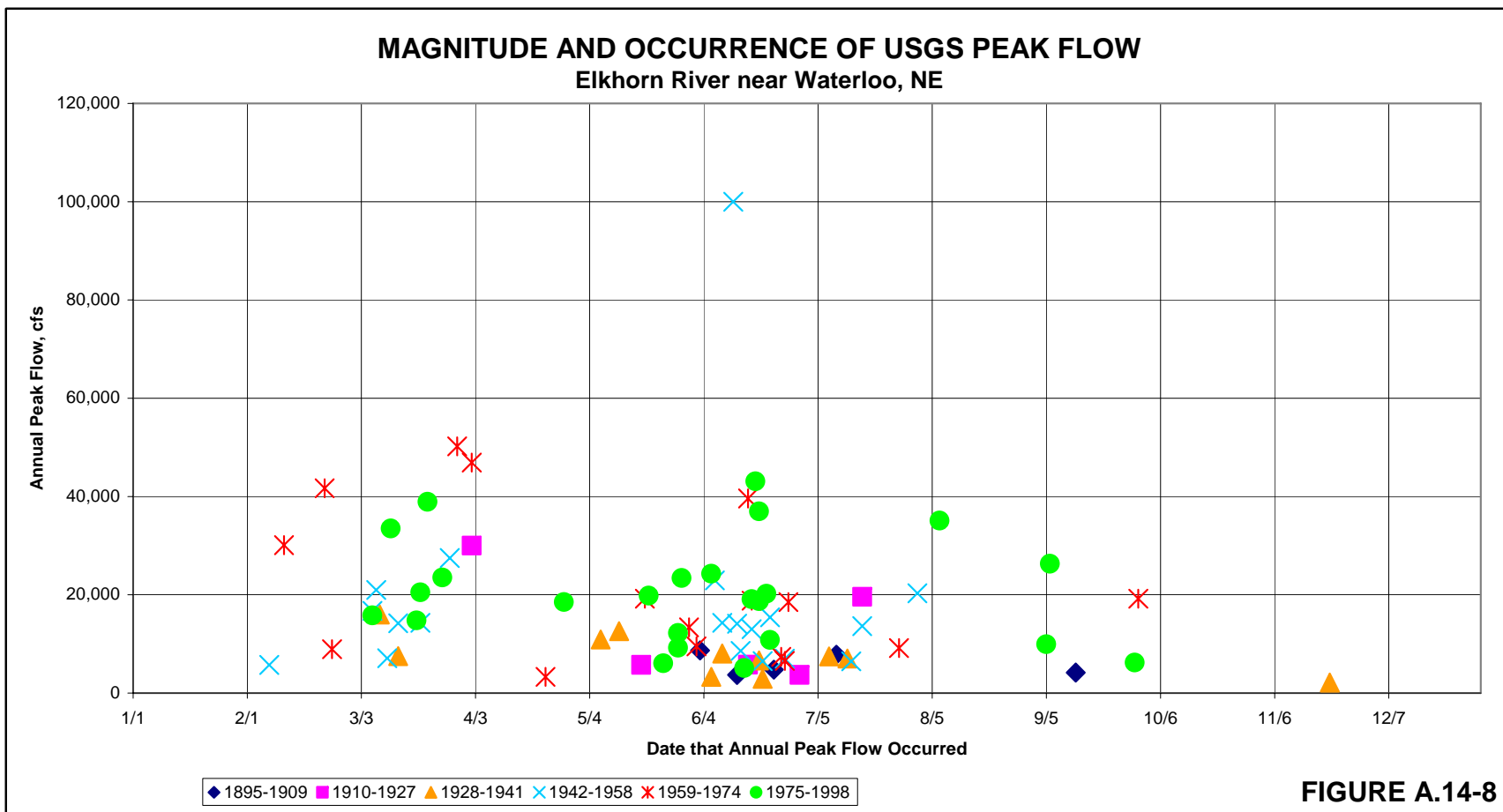


FIGURE A.14-8

Figure A.14-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.14-15 Summary of USGS Peak Flows.

Elkhorn River near Waterloo, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	17,015	9,055	20,227	5,812	12,952	8,804	18,741	21,396	20,500
Median Annual Peak Flow (cfs)	13,850	7,080	16,700	4,740	5,750	7,450	14,200	18,650	19,450
Average Occurrence of Peak Flow	5/28	6/10	5/24	7/6	6/4	6/2	5/18	5/19	5/31
Median Occurrence of Peak Flow	6/12	6/13	6/9	6/23	6/16	6/7	6/13	6/2	6/6

Table A.14-16 USGS Peak Flow Exceedance Values.

Elkhorn River near Waterloo, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Annual Peak Flows									
Peak exceeded in 100% of the years	2,120	2,120	3,310	3,700	3,670	2,120	5,720	3,310	5,100
Peak exceeded in 90% of the years	5,064	3,374	6,476	3,884	4,498	2,996	6,476	6,945	7,107
Peak exceeded in 80% of the years	6,532	3,884	8,952	4,068	5,326	4,628	7,282	8,900	10,460
Peak exceeded in 70% of the years	7,696	5,340	11,920	4,276	5,742	6,860	12,114	9,320	14,540
Peak exceeded in 60% of the years	9,762	6,446	14,240	4,508	5,746	7,068	13,800	13,400	18,540
Peak exceeded in 50% of the years	13,850	7,080	16,700	4,740	5,750	7,450	14,200	18,650	19,450
Peak exceeded in 40% of the years	16,280	7,556	19,160	5,956	11,290	7,608	14,300	19,200	20,440
Peak exceeded in 30% of the years	19,320	8,296	20,600	7,172	16,830	9,184	15,660	24,650	23,580
Peak exceeded in 20% of the years	23,420	11,920	27,260	7,960	21,680	11,920	19,580	39,600	29,180
Peak exceeded in 10% of the years	35,290	18,880	39,180	8,320	25,840	15,320	23,600	44,300	36,430
Peak Flow	100,000	30,000	100,000	8,680	30,000	22,900	100,000	50,200	43,100

A.15 PLATTE RIVER NEAR ASHLAND, NEBRASKA

A.15.1 Methodology

The record for the Platte River near Ashland, Nebraska, was constructed from Platte River at Ashland gage records plus synthesized data for the period 10/1/1960 through 7/22/1988, as follows (after Bentall, 1982):

Gage	Records Used	Data Source
Platte River at Ashland (continuous)	9/1/1928 – 9/30/1960	USGS website.
Platte River at Louisville (<i>see Section A.17</i>) – Salt Creek at Ashland (<i>see Section A.16</i>)	10/1/1960 – 9/30/1969	See Sections A.16 and A.17
Platte River at North Bend + Elkhorn at Waterloo (<i>see Section A.14</i>)	10/1/1969 – 7/22/1988	USGS website and See Section A.14
Platte River at Ashland (continuous)	7/23/1988 – 12/31/1998	USGS website.

Where data do not exist for the Platte River at Ashland, Nebraska, data from the other gages were substituted. The gages cover approximately 45 miles of the Platte River from North Bend, Nebraska to Louisville, Nebraska.

The flow characterizations for the Platte River near Ashland, Nebraska, are given in **Table A.15-1** (mean daily values), **Table A.15-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.15-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.15-4** (flow frequencies).

A.15.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

In **Table A.15-1**, mean daily flows by time interval do not show any obvious changes corresponding to the beginning of operation of the North Platte reservoir projects. Seasonal and multi-year climatic influences appear to predominate. Average and median annual maximum mean daily flows and annual flow volumes show a steady increase with each time interval, beginning with the earliest interval for which data are available (1928-1941), except for 1975-1998, for which there is a decrease in the median from the preceding time interval (the reason for this is unclear). This is very similar to the flow characteristics of the Elkhorn River at Waterloo (**Section A.14**), and it suggests that conditions in the Platte River near Ashland are strongly influenced by inflow from the Elkhorn River.

Both **Figure A.15-1** (maximum flows) and **Figure A.15-2** (annual flow volume) suggest that climatic effects are the predominant influence (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). All flow and volume quantities are lower in the 1930's, higher in the 1940's, lower in the 1950's, and generally higher from the 1960's through

Table A.15-1 Summary of Mean Daily Flow Values.

Platte River near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	37,158	24,026	40,383			24,026	36,680	40,998	42,596
Median Annual Maximum Mean Daily Flow (cfs)	33,600	21,700	35,100			21,700	35,100	40,240	34,050
Average Annual Flow Volume (kaf)	4,188	3,056	4,466			3,056	3,854	4,153	5,109
Median Annual Flow Volume (kaf)	3,987	2,791	4,061			2,791	3,719	4,127	4,331
Average Mean Daily Flow (cfs)	5,812	4,360	6,169			4,360	5,323	5,736	7,057
Median Mean Daily Flow (cfs)	4,090	3,020	4,305			3,020	3,945	4,283	5,541
Average Number of Mean Daily Flow Measurements	360	341	365	0	0	341	365	365	365
Number of Years of Data	71 of 104	14 of 47	57 of 57	0 of 15	0 of 18	14 of 14	17 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	20,443	21,390	20,227			21,390	20,566	14,921	23,523
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	29,189	20,778	31,107			20,778	30,430	32,320	30,779
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	28,877	19,446	31,028			19,446	31,358	31,413	30,537
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	13,216	8,181	14,452			8,181	12,188	12,911	17,084
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	14,850	14,400	15,000			14,400	16,500	12,247	18,730
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	24,100	16,300	24,200			16,300	24,000	26,290	24,050
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	24,550	16,300	25,000			16,300	24,900	28,250	23,495
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	8,658	6,615	8,820			6,615	8,630	7,843	14,550
Difference ("Apr-Jul Average" - "Jul-Sep Average")	15,973	12,597	16,655			12,597	18,242	19,409	13,695
Difference ("Apr-Jul Median" - "Jul-Sep Median")	15,442	9,685	15,380			9,685	15,370	18,448	9,500
Average Occurrence of Maximum Mean Daily Flow	5/7	5/9	5/7			5/9	5/5	5/22	4/28
Median Occurrence of Maximum Mean Daily Flow	5/28	6/3	5/26			6/3	6/1	5/28	4/27
Average Annual Minimum Mean Daily Flow (cfs)	1,014	833	1,055			833	836	779	1,396
Median Annual Minimum Mean Daily Flow (cfs)	850	600	892			600	673	806	1,069
Average occurrences per year of the Minimum	1	1	1			1	1	1	1
Occuring between	9/28	10/11	9/24			10/11	10/10	10/15	8/31
and	10/1	10/12	9/28			10/12	10/15	10/16	9/5
Median occurrences per year of the Minimum	1	1	1			1	1	1	1
Occuring between	8/21	9/14	8/21			9/14	9/12	8/29	8/20
and	8/23	9/15	8/23			9/15	9/13	8/30	8/21

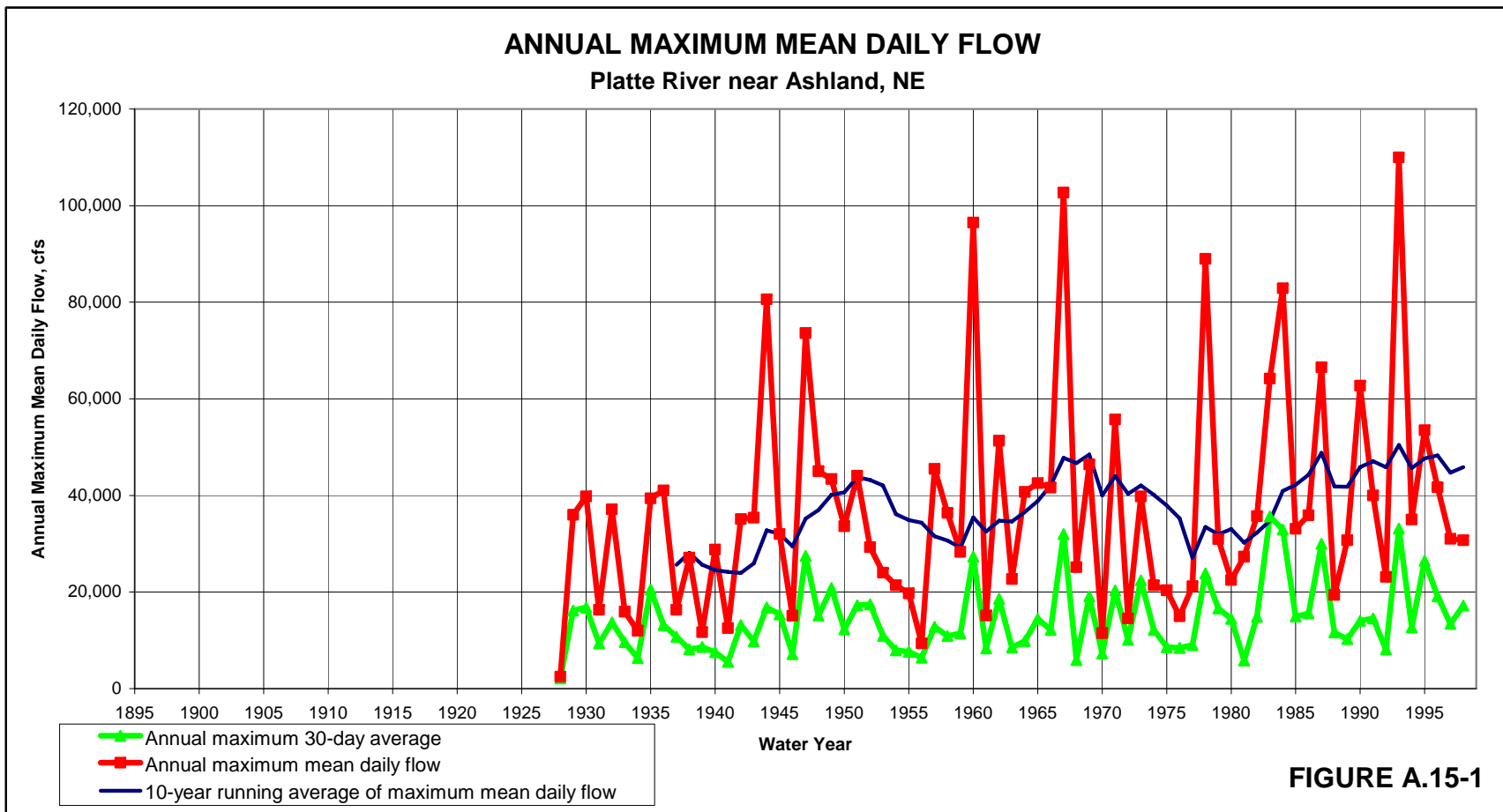


Figure A.15-1 Annual Maximum Mean Daily Flow.

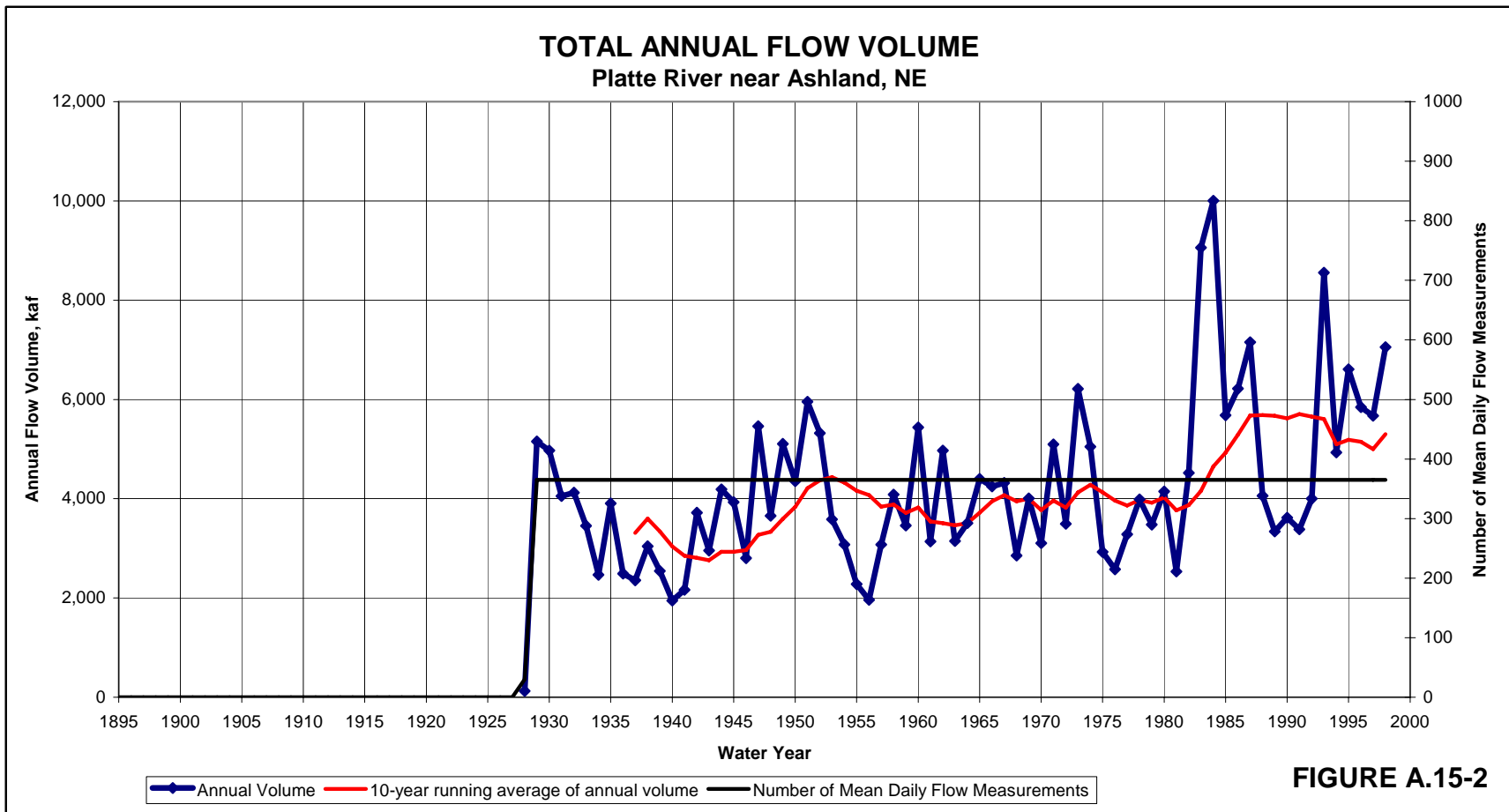


Figure A.15-2 Total Annual Flow Volume.

the end of the period of record, except for a period of lower maximum flows and volumes in the mid-1970's and lower volumes in the late 1980's. These characterizations show up most clearly in the 10-day running averages, albeit with a delay due to the averaging process. Climate records show that drought conditions occurred during the mid-1970's and late 1980's in the lower Platte River basin and other parts of the region, as discussed in **Section A.14-1**. For the higher annual maximums, there is a large difference between the Annual Maximum mean daily flow and the annual maximum 30-Day average flow throughout the period (**Figure A.15-1**), indicating that these are short-duration runoff maximums.

Figure A.15-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.15-3** shows that most annual maximums are concentrated in and close to the months of March and June. March is the primary snowmelt month in the lower Platte River basin, including the Loup and Elkhorn River basins; June is the month that receives the most precipitation in these areas (NOAA, 2005 [Nebraska]).

Highest average seasonal maximum mean daily flows occur in the Apr 16-Jul 15 seasonal period for all time intervals except 1942-1958, when it occurred in the Jun 1-Aug 15 seasonal period (**Table A.15-1**). However, the differences between these seasonal periods are relatively small. For the median seasonal maximum mean daily flows, the difference between these seasonal periods is less than 1,000 cfs for all time intervals except 1959-1974, when the difference was close to 2,000 cfs. There is a significant decrease in both average and median maximum flow values from the Jun 1-Aug 15 seasonal period to the Jul 16-Sep 30 seasonal period for all time intervals. The average and median Dates of Maximum Flow are in May for all time intervals except 1975-1998, when they are in April.

Figure A.15-4 (minimum flows) and **Table A.15-1** both show a pattern for the Annual Minimum mean daily flow that is similar to that for the annual flow volume (**Figure A.15-2**), suggesting that the climatic effects on the annual flow volume are affecting the Annual Minimum mean daily flow in a similar way. The differences between the Annual Minimum mean daily flow and the annual minimum 30-Day average flow are not as great as those between the corresponding maximum flow quantities, indicating that changes in minimum flows do not occur as rapidly. The 10-year running average also demonstrates changes in Annual Minimum mean daily flow that suggest a predominant climatic influence, though not as clearly as for annual values, and with a delay due to the averaging process. The average and median Dates of Minimum Flow are between late August and mid-October for all time intervals considered. Minimum flows were not calculated for years with incomplete flow records.

A.15.3 3-, 7-, 15-, and 30- Day Flow Averaging

Table A.15-2 shows that there is significant attenuation of both average and median annual running average flows due to the averaging process, indicating that most maximums at this location are short-duration runoff maximums.

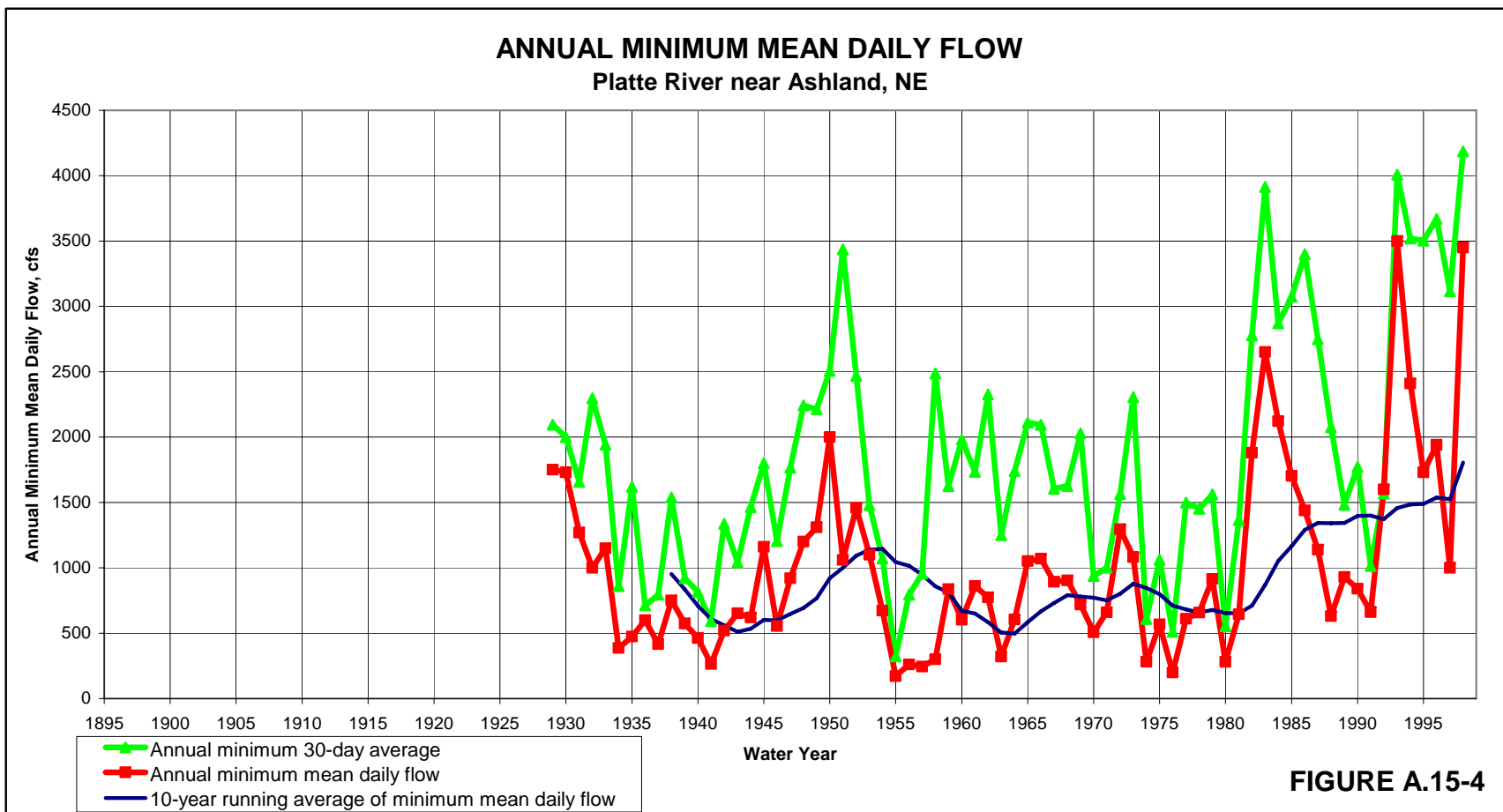


Figure A.15-4 Annual Minimum Mean Daily Flow.

Table A.15-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Platte River near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	37,158	24,026	40,383			24,026	36,680	40,998	42,596
Median Annual Maximum Mean Daily Flow (cfs)	33,600	21,700	35,100			21,700	35,100	40,240	34,050
Avg. Ann. Max. 3-day Avg. Flow (cfs)	31,803	20,911	34,479			20,911	31,246	34,932	36,466
Median Ann. Max. 3-day Avg. Flow (cfs)	28,633	18,017	28,887			18,017	28,800	30,645	28,417
Avg. Ann. Max. 7-day Avg. Flow (cfs)	25,001	17,813	26,767			17,813	23,373	27,054	28,979
Median Ann. Max. 7-day Avg. Flow (cfs)	21,754	15,276	22,863			15,276	22,086	20,836	23,500
Avg. Ann. Max. 15-day Avg. Flow (cfs)	18,718	13,508	19,997			13,508	16,977	20,055	22,097
Median Ann. Max. 15-day Avg. Flow (cfs)	16,822	11,746	17,580			11,746	17,713	14,517	18,105
Avg. Ann. Max. 30-day Avg. Flow (cfs)	14,493	10,598	15,450			10,598	13,490	14,997	17,141
Median Ann. Max. 30-day Avg. Flow (cfs)	13,174	9,496	14,048			9,496	12,813	12,175	14,719
Average Annual Minimum Mean Daily Flow (cfs)	1,014	833	1,055			833	836	779	1,396
Median Annual Minimum Mean Daily Flow (cfs)	850	600	892			600	673	806	1,069
Avg. Ann. Min. 3-day Avg. Flow (cfs)	1,124	911	1,172			911	970	912	1,489
Median Ann. Min. 3-day Avg. Flow (cfs)	965	740	1,002			740	927	947	1,186
Avg. Ann. Min. 7-day Avg. Flow (cfs)	1,286	1,032	1,344			1,032	1,118	1,076	1,682
Median Ann. Min. 7-day Avg. Flow (cfs)	1,135	1,006	1,154			1,006	1,054	1,135	1,663
Avg. Ann. Min. 15-day Avg. Flow (cfs)	1,556	1,159	1,646			1,159	1,402	1,387	1,992
Median Ann. Min. 15-day Avg. Flow (cfs)	1,466	1,271	1,479			1,271	1,388	1,474	1,980
Avg. Ann. Min. 30-day Avg. Flow (cfs)	1,853	1,373	1,962			1,373	1,682	1,659	2,363
Median Ann. Min. 30-day Avg. Flow (cfs)	1,642	1,538	1,740			1,538	1,479	1,681	2,412

Table A.15-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Platte River near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	31,803	20,911	34,479			20,911	31,246	34,932	36,466
Median Ann. Max. 3-day Avg. Flow (cfs)	28,633	18,017	28,887			18,017	28,800	30,645	28,417
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	17,812	18,292	17,703			18,292	17,529	13,802	20,426
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	24,735	16,998	26,500			16,998	26,046	27,131	26,401
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	24,193	15,838	26,098			15,838	26,852	25,334	26,074
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	10,623	6,545	11,625			6,545	10,157	9,806	13,876
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	13,567	13,700	13,500			13,700	13,767	11,130	17,828
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	19,270	11,700	19,400			11,700	18,133	20,488	19,597
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	19,270	11,070	19,600			11,070	21,100	21,634	18,777
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	7,293	4,628	7,885			4,628	6,830	6,438	11,702
Platte River near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	25,001	17,813	26,767			17,813	23,373	27,054	28,979
Median Ann. Max. 7-day Avg. Flow (cfs)	21,754	15,276	22,863			15,276	22,086	20,836	23,500
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	14,254	15,220	14,034			15,220	13,698	11,361	16,054
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	19,539	13,983	20,806			13,983	19,340	20,328	22,164
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	18,415	12,725	19,713			12,725	19,574	18,685	20,496
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	8,143	5,022	8,910			5,022	8,178	7,170	10,588
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	10,868	12,714	10,807			12,714	10,929	9,478	14,253
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	15,746	11,106	15,863			11,106	14,566	14,582	17,278
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	14,874	9,823	15,181			9,823	16,686	13,537	14,850
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	6,466	3,539	6,812			3,539	5,324	5,238	9,138
Platte River near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	18,718	13,508	19,997			13,508	16,977	20,055	22,097
Median Ann. Max. 15-day Avg. Flow (cfs)	16,822	11,746	17,580			11,746	17,713	14,517	18,105
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	10,937	11,206	10,876			11,206	10,155	9,473	12,322
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	15,156	11,283	16,040			11,283	14,230	16,020	17,335
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	14,036	10,131	14,926			10,131	14,210	14,155	15,948
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	6,430	4,147	6,990			4,147	6,490	5,702	8,204
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	9,407	10,245	9,393			10,245	9,051	8,362	11,314
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	12,774	9,629	13,345			9,629	13,345	11,892	14,226
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	11,464	7,737	12,793			7,737	13,631	9,567	12,248
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	4,933	3,182	6,114			3,182	4,397	4,157	7,197
Platte River near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	14,493	10,598	15,450			10,598	13,490	14,997	17,141
Median Ann. Max. 30-day Avg. Flow (cfs)	13,174	9,496	14,048			9,496	12,813	12,175	14,719
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	8,456	7,688	8,631			7,688	7,643	7,974	9,769
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	11,941	9,177	12,572			9,177	11,254	12,315	13,676
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	10,794	7,868	11,462			7,868	10,832	10,555	12,513
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	5,000	3,336	5,409			3,336	4,930	4,473	6,373
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	7,339	7,350	7,328			7,350	7,081	6,877	9,117
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	9,837	7,327	10,943			7,327	9,813	9,977	12,148
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	8,904	5,058	9,861			5,058	10,644	7,789	10,370
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	3,827	2,623	4,590			2,623	3,688	3,706	5,804

Table A.15-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.15-3** shows that the characterizations are generally consistent with known climatological conditions by time interval.

The one exception is the 1942-1958 time interval, for which both the average and the median maximum flow values for the Apr 16-Jul 15 and Jun 1-Aug 15 seasonal periods are higher than what one would expect for a time interval that included a significant drought period. There was an exceptionally high flow event in June 1944 in the Elkhorn River basin (**Figure A.14-1**), and its effects carried over into the lower Platte River at least as far downstream as Ashland. This maximum was so much greater than all others in this time interval that it alone would be enough to skew the average flow values higher for either seasonal period for the entire time interval. Also, because it occurred in June, its effects are seen in both seasonal periods. Another difference with respect to the other time intervals is that, for all averaging times and all seasonal periods, the averages are greater than the medians, with the greatest difference being for the Apr 16-Jun 15 and Jun 1-Aug 15 seasonal periods. This indicates that lower flows were the rule, and that the average values were skewed higher by infrequent extreme runoff events. The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to the absence of data for these time intervals.

A.15.4 Flow Frequency

A.15.4.1 Flow Averaging

The information given in **Table A.15-4** and **Figure A.15-5** generally supports the conclusions previously reached (**Table A.15-1**, **Figure A.15-1**, and **Figure A.15-2**), suggesting a predominant effect of climate on flows in the Platte River near Ashland. For percentage of years, only the 1,001-2,000 cfs and 2,001-3,000 cfs flow ranges show a 100 percent frequency of occurrence for the 1928-1941 time interval. The flow ranges between 1,001-2,000 cfs and 8,001-10,000 cfs all show 100 percent frequency for both the 1942-1958 and 1959-1974 time intervals. Drought periods occurred in both the 1928-1941 and 1942-1958 time intervals. The percentage frequencies of flow ranges higher than 10,000 cfs is greater for the 1942-1958 time interval than for the 1928-1941 time interval, indicating that, for the 1942-1958 time interval, the existence of drought conditions did not preclude the occurrence of isolated flow events in these higher ranges in at least some of these years, mainly in the 1940's (**Figure A.15-1**, and **Figure A.15-2**). For the 1975-1998 time interval, the flow ranges from 3,001-4,000 cfs to 12,001-15,000 cfs show a 100 percent frequency of occurrence.

For percentage of days, the flow range with the highest percentage frequency is the 1,001-2,000 cfs range for the 1928-1941 time interval and 2,001-3,000-cfs range for the 1942-1958 time interval. For the 1959-1974 time interval, the flow range with the highest percentage frequency is the 3,001-4,000-cfs range; for the 1975-1998 time interval, it is the 6,001-8,000-cfs flow range. Percentage frequencies are near or greater

Table A.15-4 Flow Frequency Distributions.

Platte River near Ashland, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	3	0	4	0	0	0	6	0	4
201 to 500	18	36	14	0	0	36	24	13	8
501 to 750	44	57	40	0	0	57	47	44	33
751 to 1,000	58	64	56	0	0	64	53	69	50
1,001 to 2,000	93	100	91	0	0	100	100	100	79
2,001 to 3,000	97	100	96	0	0	100	100	100	92
3,001 to 4,000	99	93	100	0	0	93	100	100	100
4,001 to 5,000	99	93	100	0	0	93	100	100	100
5,001 to 6,000	99	93	100	0	0	93	100	100	100
6,001 to 8,000	99	93	100	0	0	93	100	100	100
8,001 to 10,000	99	93	100	0	0	93	100	100	100
10,001 to 12,000	96	93	96	0	0	93	94	94	100
12,001 to 15,000	93	79	96	0	0	79	94	94	100
Greater than 15,000	89	71	93	0	0	71	94	88	96
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Platte River near Ashland, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
201 to 500	0.5	0.7	0.5	0.0	0.0	0.7	0.9	0.3	0.4
501 to 750	1.0	2.1	0.7	0.0	0.0	2.1	1.0	0.6	0.7
751 to 1,000	1.5	3.2	1.1	0.0	0.0	3.2	1.5	1.2	0.8
1,001 to 2,000	11.4	20.1	9.4	0.0	0.0	20.1	12.2	9.7	7.3
2,001 to 3,000	15.0	19.7	14.0	0.0	0.0	19.7	18.3	16.0	9.6
3,001 to 4,000	15.4	14.7	15.6	0.0	0.0	14.7	16.8	17.8	13.4
4,001 to 5,000	12.6	10.5	13.1	0.0	0.0	10.5	13.6	15.1	11.5
5,001 to 6,000	9.5	6.3	10.2	0.0	0.0	6.3	8.9	9.6	11.5
6,001 to 8,000	13.7	10.0	14.5	0.0	0.0	10.0	10.8	12.7	18.3
8,001 to 10,000	7.1	5.2	7.6	0.0	0.0	5.2	5.3	5.8	10.4
10,001 to 12,000	4.1	2.7	4.4	0.0	0.0	2.7	3.5	4.1	5.3
12,001 to 15,000	3.1	2.5	3.3	0.0	0.0	2.5	2.7	3.0	3.9
Greater than 15,000	4.9	2.5	5.5	0.0	0.0	2.5	4.6	4.3	7.0
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Platte River near Ashland, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	0	0	0	0	0	0	0	0	0
201 to 500	2	2	2	0	0	2	3	1	1
501 to 750	4	7	3	0	0	7	3	2	3
751 to 1,000	5	11	4	0	0	11	6	4	3
1,001 to 2,000	41	68	34	0	0	68	44	35	27
2,001 to 3,000	54	67	51	0	0	67	67	58	35
3,001 to 4,000	56	50	57	0	0	50	61	65	49
4,001 to 5,000	45	36	48	0	0	36	50	55	42
5,001 to 6,000	34	22	37	0	0	22	32	35	42
6,001 to 8,000	49	34	53	0	0	34	39	46	67
8,001 to 10,000	26	18	28	0	0	18	19	21	38
10,001 to 12,000	15	9	16	0	0	9	13	15	19
12,001 to 15,000	11	8	12	0	0	8	10	11	14
Greater than 15,000	18	8	20	0	0	8	17	16	26
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

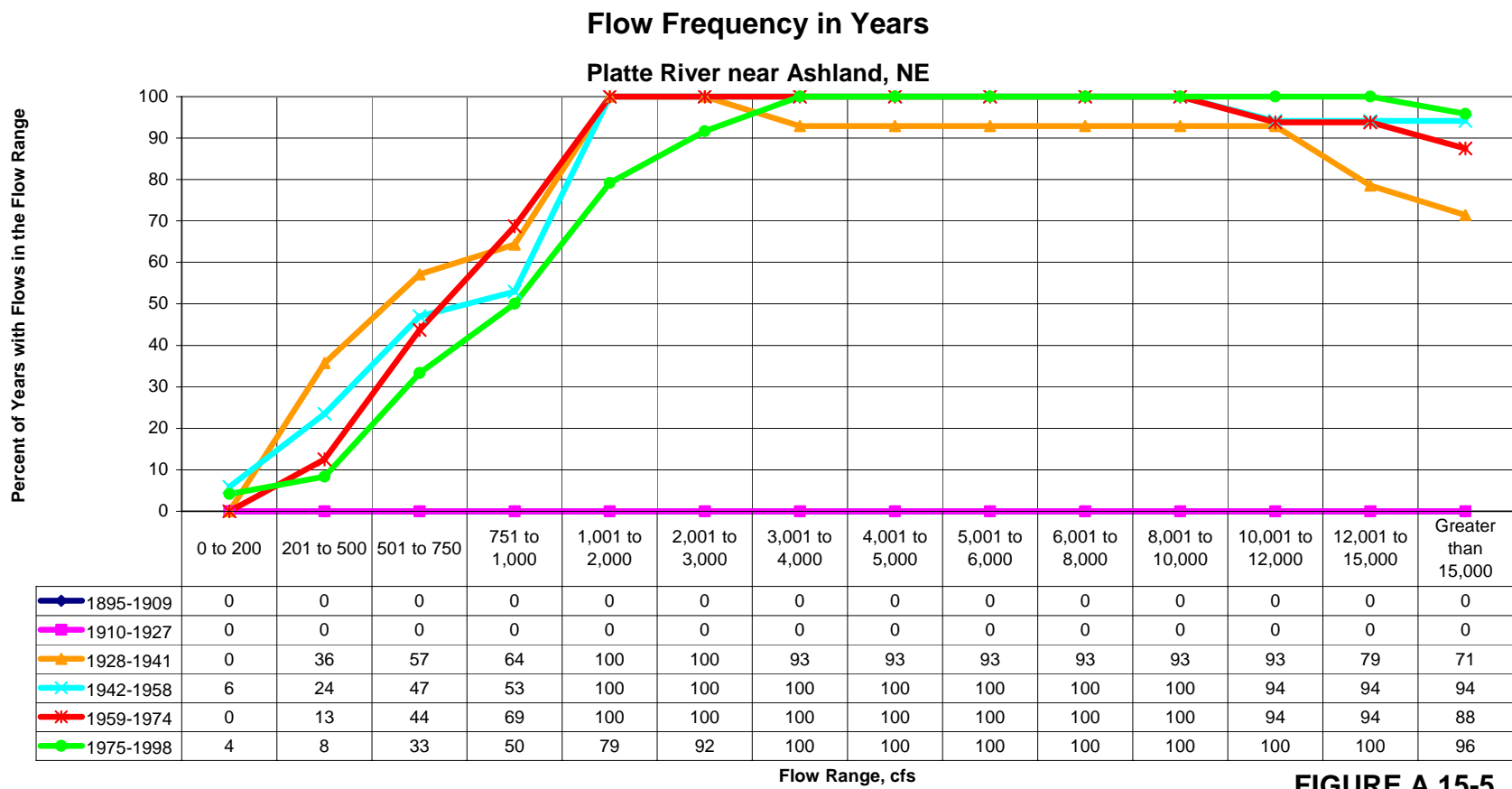


FIGURE A.15-5

Figure A.15-5 Flow Frequency in Years.

than 10 percent from the 1,001-2,000-cfs flow range to the 4,001-5,000-cfs flow range, and also the 6,001-8,000-cfs flow range, for both the 1928-1941 and the 1942-1958 time intervals; for all flow ranges from 1,001-2,000 cfs to 6,001-8,000 cfs for the 1959-1974 time interval; and from the 2,001-3,000-cfs to 8,001-10,000-cfs flow ranges for the 1975-1998 time interval.

A.15.4.2 Maximum Mean Flow Exceedance

Table A.15-5 through **Table A.15-9** show the exceedance values and probabilities for maximum flow for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix. The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to the absence of data for these time intervals.

Table A.15-5 shows the exceedance probabilities and values for annual data. **Table A.15-5** shows that the flow characterizations for annual data are mostly consistent with known climatological conditions, albeit with some effect of the June 1944 event in the Elkhorn River basin evident in the flow values for the 1942-1958 time interval.

Table A.15-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.15-6** shows that the maximum flow values for this seasonal period are consistent with known climatological conditions. However, the characterizations for the various exceedance probabilities show a number of irregularities. These irregularities are possibly attributable to year-by-year variations in and between time intervals of hydrometeorological factors such as temperature, total precipitation, percent of precipitation falling as snow, river ice conditions, etc.

Table A.15-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.15-7** shows that the flow characterizations for this seasonal period are generally consistent with known long-term climatological conditions during the respective time intervals.

Table A.15-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.15-8** shows that the drought conditions of the 1930's were still the predominant factor influencing the flow characterizations for the 1928-1941 time interval. For all subsequent time intervals, short-term wet and dry periods tended to offset each other and produce flow characterizations that do not necessarily reflect the long-term climate conditions by time interval that were evident at upstream locations. An example of this is the effect of the 1944 and 1947 events in the Elkhorn River basin on the flow values for the 1942-1958 time interval. These events tended to raise the flow values for most exceedance probabilities for this time interval, even though severe drought conditions prevailed after 1950. Another example is the effect of short-term drought periods in the mid-1970's and late 1980's (**Table A.15-1** and **Table A.15-3**), which tended to moderate the flow values

Table A.15-5 Maximum Flow Exceedance Values, Annual Data.

Platte River near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	2,470	2,470	9,360			2,470	9,360	11,500	15,000
Maximum exceeded in 90% of the years	15,000	11,790	17,670			11,790	17,860	14,842	20,595
Maximum exceeded in 80% of the years	19,700	12,300	21,624			12,300	21,920	21,410	22,852
Maximum exceeded in 70% of the years	23,100	15,560	26,864			15,560	28,240	23,911	30,360
Maximum exceeded in 60% of the years	29,300	16,300	30,964			16,300	32,640	28,300	30,952
Maximum exceeded in 50% of the years	33,600	21,700	35,100			21,700	35,100	40,240	34,050
Maximum exceeded in 40% of the years	36,400	28,460	39,912			28,460	36,000	41,600	35,860
Maximum exceeded in 30% of the years	41,000	36,110	43,540			36,110	43,540	44,470	42,880
Maximum exceeded in 20% of the years	45,500	38,020	53,066			38,020	44,820	51,330	63,300
Maximum exceeded in 10% of the years	66,500	39,680	76,400			39,680	56,740	76,100	77,980
Maximum	110,000	41,000	110,000			41,000	80,600	102,700	110,000
3-day Average Flows									
Maximum exceeded in 100% of the years	2,423	2,423	8,480			2,423	8,480	11,190	14,287
Maximum exceeded in 90% of the years	12,730	10,486	14,523			10,486	15,087	12,666	17,112
Maximum exceeded in 80% of the years	15,077	11,051	17,680			11,051	17,680	14,680	18,749
Maximum exceeded in 70% of the years	18,730	13,450	19,663			13,450	24,480	18,935	24,059
Maximum exceeded in 60% of the years	24,867	14,633	26,173			14,633	27,353	21,433	25,888
Maximum exceeded in 50% of the years	28,633	18,017	28,887			18,017	28,800	30,645	28,417
Maximum exceeded in 40% of the years	31,267	24,333	33,107			24,333	32,287	35,553	33,007
Maximum exceeded in 30% of the years	35,067	29,380	36,799			29,380	34,260	39,047	35,917
Maximum exceeded in 20% of the years	41,720	32,093	47,153			32,093	39,593	48,050	60,596
Maximum exceeded in 10% of the years	61,767	36,090	64,387			36,090	50,533	64,667	66,877
Maximum	96,090	37,500	96,090			37,500	66,567	96,090	88,333
7-day Average Flows									
Maximum exceeded in 100% of the years	2,336	2,336	7,301			2,336	7,301	9,649	10,613
Maximum exceeded in 90% of the years	10,321	9,173	11,008			9,173	11,597	10,115	13,082
Maximum exceeded in 80% of the years	12,714	10,025	14,294			10,025	14,294	11,724	16,821
Maximum exceeded in 70% of the years	15,117	12,488	16,859			12,488	18,189	14,071	18,059
Maximum exceeded in 60% of the years	18,809	13,262	20,453			13,262	21,591	16,800	20,808
Maximum exceeded in 50% of the years	21,754	15,276	22,863			15,276	22,086	20,836	23,500
Maximum exceeded in 40% of the years	23,800	18,316	24,585			18,316	23,514	24,340	25,409
Maximum exceeded in 30% of the years	27,157	23,876	28,534			23,876	26,929	33,290	32,487
Maximum exceeded in 20% of the years	33,850	27,231	38,025			27,231	27,603	35,954	44,208
Maximum exceeded in 10% of the years	47,671	30,371	48,965			30,371	38,163	55,051	55,144
Maximum	67,677	33,357	67,677			33,357	47,671	67,677	65,029
15-day Average Flows									
Maximum exceeded in 100% of the years	2,178	2,178	7,067			2,178	7,067	8,239	7,911
Maximum exceeded in 90% of the years	8,833	7,074	9,180			7,074	8,711	9,058	10,743
Maximum exceeded in 80% of the years	10,018	8,811	11,140			8,811	10,474	9,393	12,928
Maximum exceeded in 70% of the years	12,738	10,196	13,491			10,196	13,491	11,777	15,868
Maximum exceeded in 60% of the years	13,828	11,181	15,348			11,181	15,037	13,828	16,652
Maximum exceeded in 50% of the years	16,822	11,746	17,580			11,746	17,713	14,517	18,105
Maximum exceeded in 40% of the years	18,302	13,151	18,699			13,151	18,126	17,580	21,354
Maximum exceeded in 30% of the years	21,060	18,466	22,759			18,466	19,015	25,503	23,367
Maximum exceeded in 20% of the years	25,053	19,695	26,887			19,695	20,888	28,352	33,767
Maximum exceeded in 10% of the years	33,553	21,044	36,937			21,044	24,954	36,825	40,274
Maximum	48,134	25,260	48,134			25,260	33,553	48,134	46,819
30-day Average Flows									
Maximum exceeded in 100% of the years	2,118	2,118	5,812			2,118	6,391	5,925	5,812
Maximum exceeded in 90% of the years	7,259	5,760	7,821			5,760	7,455	7,796	8,480
Maximum exceeded in 80% of the years	8,433	7,051	8,677			7,051	8,309	8,530	9,765
Maximum exceeded in 70% of the years	9,813	8,086	10,761			8,086	10,672	9,977	12,578
Maximum exceeded in 60% of the years	11,426	8,763	12,219			8,763	11,470	11,426	14,132
Maximum exceeded in 50% of the years	13,174	9,496	14,048			9,496	12,813	12,175	14,719
Maximum exceeded in 40% of the years	14,550	10,520	15,051			10,520	14,348	14,460	15,433
Maximum exceeded in 30% of the years	16,596	13,229	17,201			13,229	15,677	18,829	17,378
Maximum exceeded in 20% of the years	19,081	14,697	20,078			14,697	17,167	20,320	24,909
Maximum exceeded in 10% of the years	26,487	16,619	27,377			16,619	18,790	24,867	32,050
Maximum	35,664	20,511	35,664			20,511	27,470	32,009	35,664

Table A.15-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Platte River near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	6,959	9,570	6,959			9,570	7,960	6,959	8,500
Maximum exceeded in 90% of the years	9,096	11,140	8,800			11,140	9,218	7,569	9,747
Maximum exceeded in 80% of the years	10,916	11,340	10,260			11,340	11,120	9,107	11,328
Maximum exceeded in 70% of the years	11,570	12,060	11,580			12,060	11,760	9,660	12,545
Maximum exceeded in 60% of the years	12,606	13,060	12,584			13,060	14,020	11,342	15,200
Maximum exceeded in 50% of the years	14,850	14,400	15,000			14,400	16,500	12,247	18,730
Maximum exceeded in 40% of the years	18,604	17,500	18,856			17,500	20,360	12,540	22,778
Maximum exceeded in 30% of the years	23,220	29,460	22,060			29,460	24,040	13,700	25,730
Maximum exceeded in 20% of the years	29,580	36,660	28,200			36,660	28,680	15,350	30,820
Maximum exceeded in 10% of the years	36,470	39,260	35,280			39,260	39,200	20,695	33,800
Maximum	110,000	41,000	110,000			41,000	45,000	55,700	110,000
3-day Average Flows									
Maximum exceeded in 100% of the years	6,716	9,210	6,716			9,210	7,297	6,716	6,760
Maximum exceeded in 90% of the years	8,289	9,588	8,018			9,588	8,956	7,357	8,895
Maximum exceeded in 80% of the years	9,701	10,535	9,684			10,535	10,687	8,305	10,395
Maximum exceeded in 70% of the years	10,809	10,965	10,747			10,965	10,980	8,708	11,598
Maximum exceeded in 60% of the years	11,427	11,171	11,585			11,171	12,113	9,678	13,764
Maximum exceeded in 50% of the years	13,567	13,700	13,500			13,700	13,767	11,130	17,828
Maximum exceeded in 40% of the years	16,507	15,207	16,527			15,207	16,527	11,519	20,219
Maximum exceeded in 30% of the years	20,121	22,260	20,109			22,260	18,860	12,950	22,623
Maximum exceeded in 20% of the years	24,648	29,560	24,041			29,560	25,447	14,943	24,703
Maximum exceeded in 10% of the years	30,937	32,947	30,360			32,947	30,507	19,408	29,530
Maximum	88,333	37,100	88,333			37,100	42,267	50,567	88,333
7-day Average Flows									
Maximum exceeded in 100% of the years	6,069	8,201	6,069			8,201	6,069	6,457	6,244
Maximum exceeded in 90% of the years	7,582	8,420	7,073			8,420	7,729	6,567	7,769
Maximum exceeded in 80% of the years	8,342	8,613	7,925			8,613	9,358	6,731	9,171
Maximum exceeded in 70% of the years	9,320	8,977	9,379			8,977	9,903	7,796	9,680
Maximum exceeded in 60% of the years	9,903	9,345	10,208			9,345	10,642	9,075	12,051
Maximum exceeded in 50% of the years	10,868	12,714	10,807			12,714	10,929	9,478	14,253
Maximum exceeded in 40% of the years	12,957	13,354	12,787			13,354	12,787	10,471	16,649
Maximum exceeded in 30% of the years	16,301	17,063	16,296			17,063	14,462	10,674	18,064
Maximum exceeded in 20% of the years	19,290	22,249	18,368			22,249	18,229	11,394	20,272
Maximum exceeded in 10% of the years	23,169	26,849	21,536			26,849	20,709	17,386	22,799
Maximum	57,429	33,357	57,429			33,357	35,043	33,850	57,429
15-day Average Flows									
Maximum exceeded in 100% of the years	4,863	5,976	4,863			5,976	4,863	5,483	5,913
Maximum exceeded in 90% of the years	6,118	6,210	6,276			6,210	6,717	6,012	6,687
Maximum exceeded in 80% of the years	6,795	6,781	6,821			6,781	7,070	6,123	7,429
Maximum exceeded in 70% of the years	7,536	7,005	7,709			7,005	7,891	6,655	8,375
Maximum exceeded in 60% of the years	8,263	7,778	8,466			7,778	8,215	7,159	9,756
Maximum exceeded in 50% of the years	9,407	10,245	9,393			10,245	9,051	8,362	11,314
Maximum exceeded in 40% of the years	10,137	11,955	9,839			11,955	9,659	9,270	13,416
Maximum exceeded in 30% of the years	12,866	13,945	12,518			13,945	10,188	9,370	13,985
Maximum exceeded in 20% of the years	14,484	15,253	14,045			15,253	11,755	9,422	16,184
Maximum exceeded in 10% of the years	16,875	17,869	16,600			17,869	14,545	14,796	17,318
Maximum	33,867	20,959	33,867			20,959	24,663	23,719	33,867
30-day Average Flows									
Maximum exceeded in 100% of the years	4,262	4,516	4,262			4,516	4,581	4,262	5,244
Maximum exceeded in 90% of the years	5,106	4,881	5,267			4,881	5,166	5,005	5,887
Maximum exceeded in 80% of the years	5,613	5,161	5,787			5,161	5,557	5,480	6,344
Maximum exceeded in 70% of the years	6,267	6,035	6,282			6,035	6,010	5,592	6,873
Maximum exceeded in 60% of the years	6,697	6,474	6,834			6,474	6,502	6,441	8,488
Maximum exceeded in 50% of the years	7,339	7,350	7,328			7,350	7,081	6,877	9,117
Maximum exceeded in 40% of the years	8,167	8,257	8,173			8,257	7,398	7,278	10,146
Maximum exceeded in 30% of the years	9,110	8,965	9,330			8,965	7,680	7,685	11,284
Maximum exceeded in 20% of the years	11,293	10,204	11,368			10,204	8,093	8,695	11,950
Maximum exceeded in 10% of the years	13,281	11,299	13,801			11,299	11,835	12,523	14,419
Maximum	20,072	11,485	20,072			11,485	14,718	20,072	19,593

Table A.15-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Platte River near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	5,947	7,040	5,947			7,040	6,910	11,500	5,947
Maximum exceeded in 90% of the years	10,650	9,624	11,404			9,624	10,500	14,842	12,097
Maximum exceeded in 80% of the years	14,750	10,800	16,428			10,800	15,260	20,800	17,268
Maximum exceeded in 70% of the years	18,542	11,880	21,112			11,880	18,460	22,055	21,105
Maximum exceeded in 60% of the years	22,368	15,120	22,768			15,120	21,720	23,900	22,916
Maximum exceeded in 50% of the years	24,100	16,300	24,200			16,300	24,000	26,290	24,050
Maximum exceeded in 40% of the years	27,515	27,200	28,114			27,200	29,160	29,000	26,600
Maximum exceeded in 30% of the years	33,220	28,080	35,440			28,080	35,160	38,140	33,350
Maximum exceeded in 20% of the years	39,824	30,180	42,188			30,180	42,360	40,700	45,240
Maximum exceeded in 10% of the years	53,140	33,020	57,180			33,020	56,740	42,930	59,940
Maximum	102,700	39,400	102,700			39,400	80,600	102,700	82,900
3-day Average Flows									
Maximum exceeded in 100% of the years	5,345	6,913	5,345			6,913	6,437	11,190	5,345
Maximum exceeded in 90% of the years	9,184	7,509	10,818			7,509	10,004	12,666	10,839
Maximum exceeded in 80% of the years	12,092	8,814	14,629			8,814	13,407	14,680	14,893
Maximum exceeded in 70% of the years	15,070	9,104	15,562			9,104	15,833	15,258	16,821
Maximum exceeded in 60% of the years	17,325	9,717	18,248			9,717	17,067	18,933	18,813
Maximum exceeded in 50% of the years	19,270	11,700	19,400			11,700	18,133	20,488	19,597
Maximum exceeded in 40% of the years	22,074	21,160	24,004			21,160	25,620	23,710	23,347
Maximum exceeded in 30% of the years	28,683	21,733	29,322			21,733	29,680	29,975	26,894
Maximum exceeded in 20% of the years	34,577	24,033	36,209			24,033	37,440	35,553	37,427
Maximum exceeded in 10% of the years	42,217	29,820	50,287			29,820	49,093	38,587	55,327
Maximum	96,090	37,500	96,090			37,500	66,567	96,090	69,067
7-day Average Flows									
Maximum exceeded in 100% of the years	4,523	5,689	4,523			5,689	4,523	9,649	4,690
Maximum exceeded in 90% of the years	7,324	6,004	9,209			6,004	8,433	10,115	9,214
Maximum exceeded in 80% of the years	9,597	6,395	10,337			6,395	9,787	10,400	10,427
Maximum exceeded in 70% of the years	11,539	6,872	12,783			6,872	12,724	11,985	13,350
Maximum exceeded in 60% of the years	13,634	8,095	14,119			8,095	13,970	13,026	15,675
Maximum exceeded in 50% of the years	15,746	11,106	15,863			11,106	14,566	14,582	17,278
Maximum exceeded in 40% of the years	18,495	16,368	19,748			16,368	19,926	18,809	19,957
Maximum exceeded in 30% of the years	23,279	18,166	23,766			18,166	23,229	23,147	23,969
Maximum exceeded in 20% of the years	26,929	19,443	27,564			19,443	26,486	25,638	33,403
Maximum exceeded in 10% of the years	36,061	25,460	39,691			25,460	33,766	30,198	40,553
Maximum	67,677	31,486	67,677			31,486	47,671	67,677	65,029
15-day Average Flows									
Maximum exceeded in 100% of the years	4,016	4,179	4,016			4,179	4,113	6,863	4,016
Maximum exceeded in 90% of the years	5,846	5,139	6,971			5,139	6,565	7,671	6,964
Maximum exceeded in 80% of the years	7,916	5,526	8,259			5,526	8,269	8,239	8,833
Maximum exceeded in 70% of the years	9,139	5,795	9,272			5,795	8,992	10,050	11,324
Maximum exceeded in 60% of the years	10,863	7,306	11,517			7,306	10,219	10,895	12,875
Maximum exceeded in 50% of the years	12,774	9,629	13,345			9,629	13,345	11,892	14,226
Maximum exceeded in 40% of the years	14,805	10,488	16,035			10,488	14,515	14,138	16,780
Maximum exceeded in 30% of the years	18,457	13,559	19,015			13,559	17,963	18,420	20,284
Maximum exceeded in 20% of the years	21,361	17,703	21,645			17,703	19,169	21,584	23,207
Maximum exceeded in 10% of the years	25,262	20,569	26,511			20,569	22,896	25,201	29,911
Maximum	48,134	25,260	48,134			25,260	33,553	48,134	46,819
30-day Average Flows									
Maximum exceeded in 100% of the years	2,857	2,857	3,560			2,857	3,954	5,298	3,560
Maximum exceeded in 90% of the years	4,832	4,501	5,353			4,501	5,198	5,562	5,492
Maximum exceeded in 80% of the years	5,871	4,735	6,827			4,735	6,146	6,756	8,108
Maximum exceeded in 70% of the years	7,744	4,910	8,280			4,910	7,682	8,158	8,731
Maximum exceeded in 60% of the years	8,860	6,641	9,137			6,641	9,201	9,300	9,425
Maximum exceeded in 50% of the years	9,837	7,327	10,943			7,327	9,813	9,977	12,148
Maximum exceeded in 40% of the years	12,602	7,965	13,037			7,965	12,065	11,426	14,382
Maximum exceeded in 30% of the years	14,491	10,759	14,618			10,759	13,375	14,760	14,894
Maximum exceeded in 20% of the years	16,383	14,684	16,530			14,684	15,145	16,334	17,563
Maximum exceeded in 10% of the years	19,249	16,686	20,433			16,686	16,978	19,499	24,273
Maximum	35,664	20,511	35,664			20,511	27,470	32,009	35,664

Table A.15-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Platte River near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	5,510	5,510	6,180			5,510	6,890	6,994	6,180
Maximum exceeded in 90% of the years	9,201	8,228	9,511			8,228	11,480	12,420	8,285
Maximum exceeded in 80% of the years	12,000	9,684	13,646			9,684	15,560	15,134	11,910
Maximum exceeded in 70% of the years	15,894	11,280	19,392			11,280	20,840	23,911	15,711
Maximum exceeded in 60% of the years	21,660	15,120	22,768			15,120	21,900	27,459	20,846
Maximum exceeded in 50% of the years	24,550	16,300	25,000			16,300	24,900	28,250	23,495
Maximum exceeded in 40% of the years	27,515	22,700	28,260			22,700	32,960	29,000	24,840
Maximum exceeded in 30% of the years	31,370	27,300	35,160			27,300	35,160	33,280	28,570
Maximum exceeded in 20% of the years	40,140	28,320	41,680			28,320	42,360	40,700	43,180
Maximum exceeded in 10% of the years	47,220	30,640	63,300			30,640	56,740	42,450	63,750
Maximum	102,700	39,400	102,700			39,400	80,600	102,700	99,100
3-day Average Flows									
Maximum exceeded in 100% of the years	4,827	4,827	5,184			4,827	6,437	6,879	5,184
Maximum exceeded in 90% of the years	8,555	7,109	9,215			7,109	10,526	10,170	7,685
Maximum exceeded in 80% of the years	10,004	8,814	11,015			8,814	13,640	12,601	10,082
Maximum exceeded in 70% of the years	12,787	9,104	14,997			9,104	16,760	15,072	13,985
Maximum exceeded in 60% of the years	17,182	9,717	17,783			9,717	18,380	19,141	17,588
Maximum exceeded in 50% of the years	19,270	11,070	19,600			11,070	21,100	21,634	18,777
Maximum exceeded in 40% of the years	21,594	19,533	22,985			19,533	27,607	23,263	19,827
Maximum exceeded in 30% of the years	25,390	21,187	28,817			21,187	29,680	26,298	25,213
Maximum exceeded in 20% of the years	33,427	21,967	34,920			21,967	37,440	29,167	37,853
Maximum exceeded in 10% of the years	43,867	24,567	60,596			24,567	49,093	35,932	60,768
Maximum	96,090	37,500	96,090			37,500	66,567	96,090	76,033
7-day Average Flows									
Maximum exceeded in 100% of the years	3,652	4,534	3,652			4,534	3,944	6,256	3,652
Maximum exceeded in 90% of the years	6,110	5,485	7,389			5,485	7,389	7,832	6,607
Maximum exceeded in 80% of the years	7,725	5,801	8,306			5,801	9,691	9,649	8,002
Maximum exceeded in 70% of the years	9,771	6,149	10,570			6,149	11,930	10,361	10,431
Maximum exceeded in 60% of the years	12,174	6,907	12,818			6,907	14,812	12,680	12,515
Maximum exceeded in 50% of the years	14,874	9,823	15,181			9,823	16,686	13,537	14,850
Maximum exceeded in 40% of the years	17,252	16,177	17,918			16,177	21,863	17,176	17,267
Maximum exceeded in 30% of the years	21,656	17,111	23,214			17,111	23,229	20,381	23,781
Maximum exceeded in 20% of the years	25,685	18,406	26,374			18,406	25,960	25,638	28,814
Maximum exceeded in 10% of the years	33,760	19,629	40,263			19,629	33,431	27,834	45,442
Maximum	67,677	31,486	67,677			31,486	47,671	67,677	65,029
15-day Average Flows									
Maximum exceeded in 100% of the years	3,042	3,843	3,042			3,843	3,253	5,268	3,042
Maximum exceeded in 90% of the years	5,061	4,177	5,782			4,177	5,901	6,609	5,275
Maximum exceeded in 80% of the years	5,920	4,367	6,856			4,367	7,333	6,863	6,202
Maximum exceeded in 70% of the years	7,211	5,314	7,803			5,314	8,595	7,197	8,012
Maximum exceeded in 60% of the years	8,570	5,807	9,157			5,807	10,946	7,684	11,177
Maximum exceeded in 50% of the years	11,464	7,737	12,793			7,737	13,631	9,567	12,248
Maximum exceeded in 40% of the years	13,834	10,086	14,214			10,086	16,357	12,793	14,092
Maximum exceeded in 30% of the years	16,580	12,857	17,957			12,857	17,957	16,698	16,717
Maximum exceeded in 20% of the years	19,433	15,326	21,293			15,326	18,958	21,584	22,268
Maximum exceeded in 10% of the years	24,920	18,262	25,917			18,262	21,646	22,010	37,025
Maximum	48,134	24,880	48,134			24,880	33,553	48,134	46,819
30-day Average Flows									
Maximum exceeded in 100% of the years	2,695	2,695	2,706			2,695	3,064	4,806	2,706
Maximum exceeded in 90% of the years	4,060	3,044	4,778			3,044	5,087	4,912	4,281
Maximum exceeded in 80% of the years	4,934	3,807	5,319			3,807	5,520	5,299	5,172
Maximum exceeded in 70% of the years	5,385	4,327	5,871			4,327	6,249	5,347	6,446
Maximum exceeded in 60% of the years	6,991	4,894	7,575			4,894	8,530	5,734	8,715
Maximum exceeded in 50% of the years	8,904	5,058	9,861			5,058	10,644	7,789	10,370
Maximum exceeded in 40% of the years	10,651	7,372	10,901			7,372	12,592	9,861	10,676
Maximum exceeded in 30% of the years	12,925	8,798	13,727			8,798	13,375	13,259	13,694
Maximum exceeded in 20% of the years	15,099	11,757	15,114			11,757	14,319	15,202	15,931
Maximum exceeded in 10% of the years	17,513	15,262	19,621			15,262	15,424	16,674	29,670
Maximum	35,664	20,457	35,664			20,457	27,470	32,009	35,664

Table A.15-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

Platte River near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	2,470	2,470	3,040			2,470	3,060	3,388	3,040
Maximum exceeded in 90% of the years	3,584	3,661	3,785			3,661	4,344	3,752	3,824
Maximum exceeded in 80% of the years	4,570	4,608	4,618			4,608	4,688	4,040	6,813
Maximum exceeded in 70% of the years	5,498	4,848	6,276			4,848	5,952	4,613	7,715
Maximum exceeded in 60% of the years	7,310	5,344	7,602			5,344	7,028	5,498	11,392
Maximum exceeded in 50% of the years	8,658	6,615	8,820			6,615	8,630	7,843	14,550
Maximum exceeded in 40% of the years	12,360	8,574	14,160			8,574	9,708	8,658	15,190
Maximum exceeded in 30% of the years	15,000	10,840	15,804			10,840	14,960	13,850	16,140
Maximum exceeded in 20% of the years	16,560	13,320	21,090			13,320	20,960	21,290	18,052
Maximum exceeded in 10% of the years	26,500	14,640	27,700			14,640	24,880	30,995	26,070
Maximum	99,100	15,000	99,100			15,000	33,600	41,600	99,100
3-day Average Flows									
Maximum exceeded in 100% of the years	2,423	2,423	2,643			2,423	2,643	3,249	2,677
Maximum exceeded in 90% of the years	3,263	3,288	3,408			3,288	3,471	3,529	3,302
Maximum exceeded in 80% of the years	3,740	3,589	4,061			3,589	4,040	3,688	5,677
Maximum exceeded in 70% of the years	4,533	3,736	5,460			3,736	5,256	4,120	7,029
Maximum exceeded in 60% of the years	6,380	4,347	6,743			4,347	6,509	4,818	9,255
Maximum exceeded in 50% of the years	7,293	4,628	7,885			4,628	6,830	6,438	11,702
Maximum exceeded in 40% of the years	10,310	6,779	11,735			6,779	8,018	7,885	12,806
Maximum exceeded in 30% of the years	12,337	9,011	13,652			9,011	12,983	12,079	13,691
Maximum exceeded in 20% of the years	15,162	10,322	15,860			10,322	18,847	15,162	15,647
Maximum exceeded in 10% of the years	19,600	10,751	19,867			10,751	19,867	19,115	18,584
Maximum	76,033	13,833	76,033			13,833	26,067	31,533	76,033
7-day Average Flows									
Maximum exceeded in 100% of the years	1,933	2,336	1,933			2,336	1,933	3,077	2,202
Maximum exceeded in 90% of the years	2,579	2,561	2,877			2,561	2,539	3,187	2,593
Maximum exceeded in 80% of the years	3,223	2,890	3,387			2,890	3,435	3,232	4,027
Maximum exceeded in 70% of the years	3,613	3,011	4,157			3,011	4,193	3,634	6,379
Maximum exceeded in 60% of the years	5,200	3,132	5,348			3,132	5,223	4,186	7,393
Maximum exceeded in 50% of the years	6,466	3,539	6,812			3,539	5,324	5,238	9,138
Maximum exceeded in 40% of the years	7,729	5,055	9,167			5,055	6,891	6,812	9,971
Maximum exceeded in 30% of the years	10,047	6,585	10,982			6,585	11,283	9,624	10,972
Maximum exceeded in 20% of the years	11,544	7,766	12,553			7,766	14,660	11,550	11,582
Maximum exceeded in 10% of the years	14,869	8,240	15,339			8,240	15,339	12,852	16,366
Maximum	54,957	10,769	54,957			10,769	21,529	16,791	54,957
15-day Average Flows									
Maximum exceeded in 100% of the years	1,442	2,019	1,442			2,019	1,442	2,524	1,786
Maximum exceeded in 90% of the years	2,178	2,143	2,428			2,143	2,085	2,769	2,298
Maximum exceeded in 80% of the years	2,722	2,239	2,838			2,239	2,841	3,014	2,822
Maximum exceeded in 70% of the years	3,053	2,385	3,722			2,385	3,851	3,272	4,924
Maximum exceeded in 60% of the years	4,141	2,773	4,309			2,773	4,183	3,780	6,238
Maximum exceeded in 50% of the years	4,933	3,182	6,114			3,182	4,397	4,157	7,197
Maximum exceeded in 40% of the years	6,449	4,435	7,205			4,435	5,928	5,647	7,806
Maximum exceeded in 30% of the years	7,653	5,327	8,298			5,327	8,078	7,279	8,515
Maximum exceeded in 20% of the years	9,111	5,872	9,606			5,872	9,947	9,559	9,118
Maximum exceeded in 10% of the years	10,583	7,022	12,387			7,022	13,796	10,100	13,210
Maximum	41,467	8,755	41,467			8,755	15,625	11,558	41,467
30-day Average Flows									
Maximum exceeded in 100% of the years	1,173	1,596	1,173			1,596	1,173	2,028	1,416
Maximum exceeded in 90% of the years	1,996	1,987	2,026			1,987	1,739	2,175	1,721
Maximum exceeded in 80% of the years	2,183	2,069	2,296			2,069	2,268	2,263	2,432
Maximum exceeded in 70% of the years	2,609	2,177	3,198			2,177	3,109	2,971	3,783
Maximum exceeded in 60% of the years	3,389	2,360	3,639			2,360	3,357	3,220	5,190
Maximum exceeded in 50% of the years	3,827	2,623	4,590			2,623	3,688	3,706	5,804
Maximum exceeded in 40% of the years	4,943	3,389	5,614			3,389	4,251	4,550	6,304
Maximum exceeded in 30% of the years	5,825	4,041	6,361			4,041	5,611	5,133	6,783
Maximum exceeded in 20% of the years	6,810	4,484	7,388			4,484	7,279	6,727	7,853
Maximum exceeded in 10% of the years	9,589	5,505	9,974			5,505	10,818	7,575	10,589
Maximum	26,498	6,810	26,498			6,810	11,392	9,652	26,498

for the 1959-1974 and 1975-1998 time intervals, both of which featured a few exceptionally high flow events during this seasonal period.

Table A.15-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.15-9** shows that the drought conditions of the 1930's were likely the predominant influencing factor on the flow characterizations for the 1928-1941 time interval, as flow magnitudes for almost all exceedance thresholds are lowest in this time interval. For all subsequent time intervals, short-term wet and dry periods tended to offset each other and produce flow characterizations that do not necessarily reflect the long-term climate conditions by time interval that were evident at upstream locations. An example of this is the effect of short-term drought periods in the mid-1970's and late 1980's (**Table A.15-1** and **Table A.15-3**), which tended to moderate the flow values for the 1959-1974 and 1975-1998 time intervals.

A.15.4.3 Mean Flow Exceedance

Table A.15-10 through **Table A.15-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix. The 1895-1909 and 1910-1927 time intervals were not considered for these characterizations due to the absence of data for these time intervals.

Table A.15-10 shows the exceedance probabilities and values of flows for annual data. **Table A.15-10** shows that, when all flows are considered, the flow characterizations for annual data are mostly consistent with known long-term climatological conditions. However, the increases in the flow values from the 1928-1941 time interval to the 1942-1958 time interval are smaller than those for upstream locations. This suggests that the drought conditions of the 1930's and the 1950's were of comparable magnitude at this downstream location, whereas the drought of the 1930's was more severe upstream in the greater Platte River basin.

Table A.15-11 shows the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.15-11** shows that, when all flows are considered, the flow characterizations for this seasonal period are generally consistent with known long-term climatological conditions during the respective time intervals. The changes in the flow values between the 1928-1941 and 1942-1958 time intervals show some irregularity, especially for averaging times greater than one day, but the differences between these two time intervals are generally relatively small. This is consistent with the suggestion made in the preceding paragraph that the drought periods of the 1930's and 1950's were of comparable magnitude at this location.

Table A.15-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.15-12** shows that, when all flows are considered, the flow

Table A.15-10 Exceedance Values Considering All Flows, Annual Data.

Platte River near Ashland, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	172	265	172				265	172	280	198
Flow exceeded for 90% of the days	1,680	1,330	1,850				1,330	1,600	1,850	2,110
Flow exceeded for 80% of the days	2,390	1,800	2,640				1,800	2,260	2,635	3,100
Flow exceeded for 70% of the days	3,034	2,190	3,250				2,190	2,800	3,109	3,830
Flow exceeded for 60% of the days	3,660	2,650	3,910				2,650	3,350	3,660	4,690
Flow exceeded for 50% of the days	4,380	3,300	4,620				3,300	3,980	4,300	5,580
Flow exceeded for 40% of the days	5,250	4,000	5,530				4,000	4,620	4,960	6,500
Flow exceeded for 30% of the days	6,380	4,960	6,620				4,960	5,620	5,991	7,595
Flow exceeded for 20% of the days	7,900	6,480	8,180				6,480	7,100	7,440	9,100
Flow exceeded for 10% of the days	10,980	8,920	11,367				8,920	10,400	10,531	12,701
Maximum	110,000	41,000	110,000				41,000	80,600	102,700	110,000
3-day Average Flows										
Flow exceeded for 100% of the days	193	285	193				285	193	307	209
Flow exceeded for 90% of the days	1,720	1,371	1,890				1,371	1,650	1,887	2,180
Flow exceeded for 80% of the days	2,433	1,840	2,670				1,840	2,303	2,673	3,118
Flow exceeded for 70% of the days	3,067	2,200	3,279				2,200	2,813	3,114	3,851
Flow exceeded for 60% of the days	3,677	2,700	3,933				2,700	3,375	3,675	4,733
Flow exceeded for 50% of the days	4,402	3,360	4,657				3,360	3,987	4,324	5,597
Flow exceeded for 40% of the days	5,277	4,041	5,557				4,041	4,650	4,943	6,540
Flow exceeded for 30% of the days	6,410	4,998	6,666				4,998	5,657	6,046	7,617
Flow exceeded for 20% of the days	7,927	6,516	8,264				6,516	7,074	7,457	9,142
Flow exceeded for 10% of the days	10,971	8,865	11,400				8,865	10,447	10,625	12,733
Maximum	96,090	37,500	96,090				37,500	66,567	96,090	88,333
7-day Average Flows										
Flow exceeded for 100% of the days	230	325	230				325	230	394	255
Flow exceeded for 90% of the days	1,800	1,432	1,969				1,432	1,715	1,963	2,269
Flow exceeded for 80% of the days	2,511	1,921	2,731				1,921	2,400	2,718	3,181
Flow exceeded for 70% of the days	3,107	2,271	3,321				2,271	2,885	3,149	3,908
Flow exceeded for 60% of the days	3,742	2,760	3,984				2,760	3,408	3,717	4,773
Flow exceeded for 50% of the days	4,457	3,409	4,698				3,409	4,037	4,367	5,663
Flow exceeded for 40% of the days	5,343	4,129	5,624				4,129	4,733	4,998	6,592
Flow exceeded for 30% of the days	6,466	5,022	6,745				5,022	5,708	6,141	7,708
Flow exceeded for 20% of the days	7,983	6,509	8,344				6,509	7,201	7,681	9,187
Flow exceeded for 10% of the days	11,023	8,614	11,421				8,614	10,721	10,496	12,844
Maximum	67,677	33,357	67,677				33,357	47,671	67,677	65,029
15-day Average Flows										
Flow exceeded for 100% of the days	278	381	278				381	278	436	383
Flow exceeded for 90% of the days	1,937	1,615	2,120				1,615	1,852	2,145	2,362
Flow exceeded for 80% of the days	2,609	1,982	2,833				1,982	2,504	2,816	3,255
Flow exceeded for 70% of the days	3,201	2,315	3,409				2,315	2,972	3,223	3,992
Flow exceeded for 60% of the days	3,831	2,880	4,046				2,880	3,503	3,790	4,925
Flow exceeded for 50% of the days	4,540	3,509	4,807				3,509	4,097	4,426	5,742
Flow exceeded for 40% of the days	5,451	4,210	5,747				4,210	4,784	5,135	6,697
Flow exceeded for 30% of the days	6,587	5,094	6,877				5,094	5,870	6,264	7,766
Flow exceeded for 20% of the days	8,090	6,592	8,435				6,592	7,452	7,819	9,239
Flow exceeded for 10% of the days	11,037	8,675	11,622				8,675	10,441	10,426	13,003
Maximum	48,134	25,260	48,134				25,260	33,553	48,134	46,819
30-day Average Flows										
Flow exceeded for 100% of the days	323	592	323				592	323	608	510
Flow exceeded for 90% of the days	2,084	1,689	2,272				1,689	2,026	2,379	2,462
Flow exceeded for 80% of the days	2,768	2,079	2,979				2,079	2,632	2,978	3,385
Flow exceeded for 70% of the days	3,348	2,493	3,508				2,493	3,129	3,341	4,162
Flow exceeded for 60% of the days	3,938	3,126	4,213				3,126	3,577	3,914	5,057
Flow exceeded for 50% of the days	4,683	3,701	4,936				3,701	4,245	4,576	5,864
Flow exceeded for 40% of the days	5,571	4,296	5,837				4,296	4,959	5,192	6,772
Flow exceeded for 30% of the days	6,680	5,249	6,982				5,249	6,117	6,234	7,840
Flow exceeded for 20% of the days	8,145	6,542	8,547				6,542	7,501	7,958	9,499
Flow exceeded for 10% of the days	10,974	8,419	11,412				8,419	10,375	10,859	12,638
Maximum	35,664	20,511	35,664				20,511	27,470	32,009	35,664

Table A.15-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Platte River near Ashland, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	386	386	720			386	1,100	720	1,800
Flow exceeded for 90% of the days	3,238	2,100	3,718			2,100	2,892	3,840	4,563
Flow exceeded for 80% of the days	4,378	2,850	4,655			2,850	3,750	4,500	5,353
Flow exceeded for 70% of the days	5,200	3,400	5,400			3,400	4,550	5,304	6,034
Flow exceeded for 60% of the days	5,965	5,000	6,070			5,000	5,278	5,969	7,000
Flow exceeded for 50% of the days	6,800	6,020	6,955			6,020	5,930	6,542	8,000
Flow exceeded for 40% of the days	7,900	7,424	8,000			7,424	6,980	7,281	9,200
Flow exceeded for 30% of the days	9,203	8,586	9,383			8,586	8,263	8,506	10,580
Flow exceeded for 20% of the days	11,000	10,600	11,000			10,600	9,878	10,042	12,618
Flow exceeded for 10% of the days	14,637	13,820	15,000			13,820	13,110	13,119	15,973
Maximum	110,000	41,000	110,000			41,000	45,000	55,700	110,000
3-day Average Flows									
Flow exceeded for 100% of the days	529	529	1,100			529	1,100	1,920	1,967
Flow exceeded for 90% of the days	3,349	2,118	3,840			2,118	2,972	3,884	4,701
Flow exceeded for 80% of the days	4,466	2,885	4,753			2,885	3,877	4,476	5,400
Flow exceeded for 70% of the days	5,286	3,572	5,480			3,572	4,715	5,370	6,108
Flow exceeded for 60% of the days	6,023	5,000	6,160			5,000	5,433	6,019	7,131
Flow exceeded for 50% of the days	6,884	6,270	6,988			6,270	6,072	6,558	8,120
Flow exceeded for 40% of the days	7,920	7,496	8,030			7,496	7,073	7,244	9,369
Flow exceeded for 30% of the days	9,354	8,700	9,477			8,700	8,175	8,497	10,633
Flow exceeded for 20% of the days	11,028	10,600	11,067			10,600	9,933	9,854	12,795
Flow exceeded for 10% of the days	14,901	14,390	15,062			14,390	12,867	13,151	16,214
Maximum	88,333	37,100	88,333			37,100	42,267	50,567	88,333
7-day Average Flows									
Flow exceeded for 100% of the days	1,397	1,469	1,397			1,469	1,397	2,669	2,771
Flow exceeded for 90% of the days	3,536	2,394	4,071			2,394	3,257	3,913	4,941
Flow exceeded for 80% of the days	4,797	3,214	5,043			3,214	4,529	4,617	5,671
Flow exceeded for 70% of the days	5,585	4,115	5,733			4,115	5,131	5,554	6,322
Flow exceeded for 60% of the days	6,285	5,436	6,348			5,436	5,740	6,194	7,291
Flow exceeded for 50% of the days	7,084	6,656	7,144			6,656	6,322	6,711	8,172
Flow exceeded for 40% of the days	7,992	7,672	8,059			7,672	7,217	7,406	9,380
Flow exceeded for 30% of the days	9,334	8,525	9,411			8,525	8,312	8,430	10,879
Flow exceeded for 20% of the days	11,133	11,385	11,107			11,385	10,219	9,681	13,664
Flow exceeded for 10% of the days	15,111	14,364	15,180			14,364	12,793	13,659	16,152
Maximum	57,429	33,357	57,429			33,357	35,043	33,850	57,429
15-day Average Flows									
Flow exceeded for 100% of the days	2,011	2,011	2,282			2,011	2,282	3,041	3,255
Flow exceeded for 90% of the days	4,318	3,231	4,672			3,231	4,580	4,230	5,293
Flow exceeded for 80% of the days	5,307	4,187	5,414			4,187	5,072	4,860	5,944
Flow exceeded for 70% of the days	5,952	5,489	6,068			5,489	5,777	5,670	6,639
Flow exceeded for 60% of the days	6,626	6,019	6,715			6,019	6,411	6,327	7,485
Flow exceeded for 50% of the days	7,329	6,789	7,462			6,789	6,909	6,993	8,528
Flow exceeded for 40% of the days	8,154	7,794	8,285			7,794	7,832	7,517	9,499
Flow exceeded for 30% of the days	9,498	9,651	9,496			9,651	8,838	8,049	12,007
Flow exceeded for 20% of the days	11,803	11,430	11,869			11,430	10,078	9,347	13,550
Flow exceeded for 10% of the days	14,600	14,803	14,511			14,803	11,949	14,420	15,313
Maximum	33,867	20,959	33,867			20,959	24,663	23,719	33,867
30-day Average Flows									
Flow exceeded for 100% of the days	4,262	4,516	4,262			4,516	4,581	4,262	5,244
Flow exceeded for 90% of the days	5,106	4,881	5,267			4,881	5,166	5,005	5,887
Flow exceeded for 80% of the days	5,613	5,161	5,787			5,161	5,557	5,480	6,344
Flow exceeded for 70% of the days	6,267	6,035	6,282			6,035	6,010	5,592	6,873
Flow exceeded for 60% of the days	6,697	6,474	6,834			6,474	6,502	6,441	8,488
Flow exceeded for 50% of the days	7,339	7,350	7,328			7,350	7,081	6,877	9,117
Flow exceeded for 40% of the days	8,167	8,257	8,173			8,257	7,398	7,278	10,146
Flow exceeded for 30% of the days	9,110	8,965	9,330			8,965	7,680	7,685	11,284
Flow exceeded for 20% of the days	11,293	10,204	11,368			10,204	8,093	8,695	11,950
Flow exceeded for 10% of the days	13,281	11,299	13,801			11,299	11,835	12,523	14,419
Maximum	20,072	11,485	20,072			11,485	14,718	20,072	19,593

Table A.15-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Platte River near Ashland, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	260	654	260				654	260	554	383
Flow exceeded for 90% of the days	2,460	1,750	2,738				1,750	2,740	2,724	2,742
Flow exceeded for 80% of the days	3,360	2,430	3,650				2,430	3,490	3,555	3,882
Flow exceeded for 70% of the days	4,169	2,960	4,520				2,960	4,180	4,321	4,985
Flow exceeded for 60% of the days	5,029	3,580	5,410				3,580	4,994	5,059	6,080
Flow exceeded for 50% of the days	6,070	4,340	6,410				4,340	5,900	5,945	7,105
Flow exceeded for 40% of the days	7,170	5,424	7,450				5,424	6,916	6,878	8,228
Flow exceeded for 30% of the days	8,680	6,890	9,038				6,890	8,260	8,348	10,100
Flow exceeded for 20% of the days	11,207	9,136	11,600				9,136	10,680	10,738	13,222
Flow exceeded for 10% of the days	16,134	13,280	16,794				13,280	14,800	14,404	19,597
Maximum	102,700	39,400	102,700				39,400	80,600	102,700	82,900
3-day Average Flows										
Flow exceeded for 100% of the days	593	672	593				672	1,357	631	593
Flow exceeded for 90% of the days	2,563	1,889	2,797				1,889	2,759	2,836	2,813
Flow exceeded for 80% of the days	3,427	2,537	3,743				2,537	3,586	3,674	3,951
Flow exceeded for 70% of the days	4,241	3,103	4,566				3,103	4,259	4,408	5,063
Flow exceeded for 60% of the days	5,113	3,733	5,471				3,733	5,095	5,160	6,197
Flow exceeded for 50% of the days	6,180	4,473	6,513				4,473	6,033	6,050	7,207
Flow exceeded for 40% of the days	7,264	5,519	7,562				5,519	6,984	7,010	8,417
Flow exceeded for 30% of the days	8,963	6,981	9,320				6,981	8,487	8,828	10,263
Flow exceeded for 20% of the days	11,410	9,571	11,879				9,571	10,884	10,957	13,560
Flow exceeded for 10% of the days	16,174	13,500	16,733				13,500	15,047	14,427	19,038
Maximum	96,090	37,500	96,090				37,500	66,567	96,090	69,067
7-day Average Flows										
Flow exceeded for 100% of the days	726	791	726				791	1,489	726	759
Flow exceeded for 90% of the days	2,736	2,055	2,936				2,055	2,916	2,960	2,934
Flow exceeded for 80% of the days	3,599	2,770	3,890				2,770	3,751	3,881	4,067
Flow exceeded for 70% of the days	4,389	3,367	4,699				3,367	4,415	4,562	5,132
Flow exceeded for 60% of the days	5,270	3,994	5,704				3,994	5,335	5,313	6,360
Flow exceeded for 50% of the days	6,308	4,594	6,734				4,594	6,126	6,253	7,419
Flow exceeded for 40% of the days	7,573	5,543	7,907				5,543	7,234	7,651	8,654
Flow exceeded for 30% of the days	9,248	6,997	9,671				6,997	8,877	9,202	10,619
Flow exceeded for 20% of the days	11,631	9,698	12,024				9,698	11,472	10,830	13,603
Flow exceeded for 10% of the days	15,873	13,754	16,606				13,754	14,580	14,501	19,230
Maximum	67,677	31,486	67,677				31,486	47,671	67,677	65,029
15-day Average Flows										
Flow exceeded for 100% of the days	1,071	1,073	1,071				1,073	1,901	1,071	1,207
Flow exceeded for 90% of the days	3,028	2,379	3,160				2,379	3,169	3,186	3,119
Flow exceeded for 80% of the days	3,891	3,270	4,171				3,270	4,003	4,265	4,405
Flow exceeded for 70% of the days	4,640	3,674	5,029				3,674	4,796	4,884	5,353
Flow exceeded for 60% of the days	5,514	4,113	5,920				4,113	5,641	5,586	6,518
Flow exceeded for 50% of the days	6,634	4,615	7,147				4,615	6,551	6,715	7,688
Flow exceeded for 40% of the days	7,991	5,553	8,327				5,553	7,778	8,040	9,097
Flow exceeded for 30% of the days	9,603	7,575	10,022				7,575	9,130	9,290	11,037
Flow exceeded for 20% of the days	12,031	9,961	12,531				9,961	11,846	11,248	13,811
Flow exceeded for 10% of the days	15,820	13,389	16,455				13,389	14,439	14,519	18,689
Maximum	48,134	25,260	48,134				25,260	33,553	48,134	46,819
30-day Average Flows										
Flow exceeded for 100% of the days	1,310	1,310	2,082				1,310	2,309	2,273	2,082
Flow exceeded for 90% of the days	3,312	2,847	3,480				2,847	3,220	3,847	3,404
Flow exceeded for 80% of the days	4,212	3,538	4,567				3,538	4,327	4,616	4,764
Flow exceeded for 70% of the days	4,911	3,805	5,322				3,805	5,323	4,960	5,837
Flow exceeded for 60% of the days	5,891	4,202	6,235				4,202	6,029	5,518	6,909
Flow exceeded for 50% of the days	7,109	4,738	7,655				4,738	7,197	7,246	8,160
Flow exceeded for 40% of the days	8,573	6,368	8,987				6,368	8,646	8,506	9,470
Flow exceeded for 30% of the days	10,245	7,448	10,695				7,448	10,049	10,004	11,284
Flow exceeded for 20% of the days	12,493	10,663	12,831				10,663	12,329	12,310	14,024
Flow exceeded for 10% of the days	15,632	14,018	15,792				14,018	14,257	15,325	17,332
Maximum	35,664	20,511	35,664				20,511	27,470	32,009	35,664

Table A.15-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Platte River near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	172	310	172			310	172	280	280
Flow exceeded for 90% of the days	1,300	947	1,390			947	1,460	1,360	1,356
Flow exceeded for 80% of the days	1,856	1,394	2,080			1,394	2,100	1,920	2,210
Flow exceeded for 70% of the days	2,430	1,760	2,740			1,760	2,740	2,491	3,090
Flow exceeded for 60% of the days	3,154	2,020	3,477			2,020	3,370	3,080	4,040
Flow exceeded for 50% of the days	4,000	2,440	4,440			2,440	4,180	3,778	4,950
Flow exceeded for 40% of the days	5,144	3,152	5,640			3,152	5,502	4,844	6,180
Flow exceeded for 30% of the days	6,750	4,265	7,170			4,265	7,044	6,504	7,621
Flow exceeded for 20% of the days	9,020	6,438	9,488			6,438	9,516	8,647	10,163
Flow exceeded for 10% of the days	14,700	11,330	15,500			11,330	14,990	13,068	17,500
Maximum	102,700	39,400	102,700			39,400	80,600	102,700	99,100
3-day Average Flows									
Flow exceeded for 100% of the days	304	364	304			364	314	307	304
Flow exceeded for 90% of the days	1,334	960	1,434			960	1,517	1,418	1,388
Flow exceeded for 80% of the days	1,897	1,433	2,144			1,433	2,151	1,984	2,268
Flow exceeded for 70% of the days	2,515	1,785	2,793			1,785	2,774	2,540	3,085
Flow exceeded for 60% of the days	3,190	2,061	3,529			2,061	3,396	3,120	4,062
Flow exceeded for 50% of the days	4,087	2,550	4,452			2,550	4,262	3,903	4,980
Flow exceeded for 40% of the days	5,220	3,195	5,710			3,195	5,553	5,000	6,217
Flow exceeded for 30% of the days	6,807	4,403	7,226			4,403	7,009	6,613	7,732
Flow exceeded for 20% of the days	9,117	6,429	9,676			6,429	9,459	8,973	10,373
Flow exceeded for 10% of the days	14,967	10,912	15,669			10,912	14,910	13,405	17,517
Maximum	96,090	37,500	96,090			37,500	66,567	96,090	76,033
7-day Average Flows									
Flow exceeded for 100% of the days	321	378	321			378	394	394	321
Flow exceeded for 90% of the days	1,404	1,007	1,517			1,007	1,604	1,497	1,481
Flow exceeded for 80% of the days	2,008	1,530	2,273			1,530	2,291	2,062	2,370
Flow exceeded for 70% of the days	2,627	1,873	2,886			1,873	2,937	2,676	3,122
Flow exceeded for 60% of the days	3,277	2,200	3,616			2,200	3,477	3,191	4,059
Flow exceeded for 50% of the days	4,206	2,699	4,662			2,699	4,546	4,086	5,061
Flow exceeded for 40% of the days	5,368	3,377	5,864			3,377	5,688	5,330	6,204
Flow exceeded for 30% of the days	6,944	4,489	7,462			4,489	7,150	6,953	8,009
Flow exceeded for 20% of the days	9,609	6,193	10,173			6,193	10,312	9,007	10,850
Flow exceeded for 10% of the days	14,525	11,174	15,047			11,174	14,386	12,909	17,172
Maximum	67,677	31,486	67,677			31,486	47,671	67,677	65,029
15-day Average Flows									
Flow exceeded for 100% of the days	436	676	436			676	544	436	447
Flow exceeded for 90% of the days	1,574	1,044	1,705			1,044	1,858	1,581	1,754
Flow exceeded for 80% of the days	2,182	1,692	2,406			1,692	2,467	2,209	2,462
Flow exceeded for 70% of the days	2,682	2,005	3,008			2,005	3,071	2,846	3,178
Flow exceeded for 60% of the days	3,546	2,265	3,942			2,265	4,010	3,648	4,088
Flow exceeded for 50% of the days	4,507	2,693	4,979			2,693	4,943	4,588	5,162
Flow exceeded for 40% of the days	5,598	3,559	6,132			3,559	5,871	5,979	6,397
Flow exceeded for 30% of the days	7,071	4,330	7,605			4,330	7,557	6,983	8,608
Flow exceeded for 20% of the days	9,608	5,743	10,388			5,743	10,608	8,713	11,077
Flow exceeded for 10% of the days	13,678	9,722	14,243			9,722	13,915	12,463	17,408
Maximum	48,134	24,880	48,134			24,880	33,553	48,134	46,819
30-day Average Flows									
Flow exceeded for 100% of the days	553	712	553			712	870	608	553
Flow exceeded for 90% of the days	1,831	1,248	2,068			1,248	2,155	1,904	2,107
Flow exceeded for 80% of the days	2,473	1,752	2,674			1,752	2,981	2,596	2,637
Flow exceeded for 70% of the days	3,158	2,202	3,597			2,202	3,970	3,524	3,378
Flow exceeded for 60% of the days	4,021	2,611	4,504			2,611	4,648	4,449	4,366
Flow exceeded for 50% of the days	4,789	3,113	5,122			3,113	5,213	4,841	5,736
Flow exceeded for 40% of the days	5,740	3,713	6,217			3,713	6,102	5,290	6,683
Flow exceeded for 30% of the days	7,153	4,593	7,967			4,593	7,503	6,830	8,573
Flow exceeded for 20% of the days	9,414	6,003	9,956			6,003	10,509	8,530	10,378
Flow exceeded for 10% of the days	12,641	8,507	13,176			8,507	12,608	11,454	15,737
Maximum	35,664	20,457	35,664			20,457	27,470	32,009	35,664

Table A.15-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

Platte River near Ashland, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	172	265	172			265	172	280	198
Flow exceeded for 90% of the days	1,010	775	1,093			775	999	1,110	1,190
Flow exceeded for 80% of the days	1,410	1,140	1,460			1,140	1,420	1,426	1,590
Flow exceeded for 70% of the days	1,735	1,510	1,810			1,510	1,670	1,705	2,226
Flow exceeded for 60% of the days	2,084	1,780	2,289			1,780	2,000	2,092	2,968
Flow exceeded for 50% of the days	2,540	1,930	2,770			1,930	2,330	2,476	3,614
Flow exceeded for 40% of the days	3,060	2,180	3,280			2,180	2,730	2,841	4,451
Flow exceeded for 30% of the days	3,740	2,560	4,020			2,560	3,320	3,164	5,510
Flow exceeded for 20% of the days	4,998	3,200	5,453			3,200	4,320	3,742	6,700
Flow exceeded for 10% of the days	7,227	4,750	7,606			4,750	6,676	5,572	8,552
Maximum	99,100	15,000	99,100			15,000	33,600	41,600	99,100
3-day Average Flows									
Flow exceeded for 100% of the days	193	285	193			285	193	307	209
Flow exceeded for 90% of the days	1,034	788	1,121			788	991	1,149	1,192
Flow exceeded for 80% of the days	1,424	1,160	1,477			1,160	1,420	1,436	1,580
Flow exceeded for 70% of the days	1,748	1,562	1,816			1,562	1,667	1,715	2,306
Flow exceeded for 60% of the days	2,107	1,780	2,315			1,780	1,980	2,079	2,996
Flow exceeded for 50% of the days	2,573	1,950	2,777			1,950	2,323	2,507	3,661
Flow exceeded for 40% of the days	3,064	2,217	3,285			2,217	2,745	2,875	4,443
Flow exceeded for 30% of the days	3,755	2,623	4,019			2,623	3,341	3,164	5,563
Flow exceeded for 20% of the days	4,996	3,177	5,480			3,177	4,211	3,691	6,721
Flow exceeded for 10% of the days	7,213	4,758	7,669			4,758	6,601	5,538	8,714
Maximum	76,033	13,833	76,033			13,833	26,067	31,533	76,033
7-day Average Flows									
Flow exceeded for 100% of the days	230	325	230			325	230	394	255
Flow exceeded for 90% of the days	1,066	843	1,149			843	995	1,205	1,249
Flow exceeded for 80% of the days	1,475	1,256	1,517			1,256	1,444	1,500	1,601
Flow exceeded for 70% of the days	1,763	1,577	1,830			1,577	1,689	1,748	2,347
Flow exceeded for 60% of the days	2,161	1,809	2,341			1,809	2,003	2,100	3,034
Flow exceeded for 50% of the days	2,579	2,004	2,800			2,004	2,361	2,512	3,686
Flow exceeded for 40% of the days	3,077	2,294	3,298			2,294	2,751	2,856	4,459
Flow exceeded for 30% of the days	3,700	2,551	3,998			2,551	3,296	3,180	5,600
Flow exceeded for 20% of the days	5,045	3,111	5,447			3,111	4,206	3,589	6,839
Flow exceeded for 10% of the days	7,304	4,856	7,782			4,856	6,951	5,357	8,640
Maximum	54,957	10,769	54,957			10,769	21,529	16,791	54,957
15-day Average Flows									
Flow exceeded for 100% of the days	278	381	278			381	278	436	383
Flow exceeded for 90% of the days	1,125	885	1,177			885	984	1,265	1,296
Flow exceeded for 80% of the days	1,545	1,362	1,577			1,362	1,450	1,602	1,688
Flow exceeded for 70% of the days	1,832	1,706	1,895			1,706	1,733	1,859	2,443
Flow exceeded for 60% of the days	2,157	1,862	2,342			1,862	2,012	2,126	3,011
Flow exceeded for 50% of the days	2,567	2,019	2,748			2,019	2,380	2,441	3,776
Flow exceeded for 40% of the days	3,012	2,250	3,299			2,250	2,743	2,735	4,491
Flow exceeded for 30% of the days	3,778	2,510	4,012			2,510	3,271	3,119	5,738
Flow exceeded for 20% of the days	5,061	3,089	5,638			3,089	4,069	3,656	6,925
Flow exceeded for 10% of the days	7,208	4,813	7,782			4,813	7,413	5,635	8,365
Maximum	41,467	8,755	41,467			8,755	15,625	11,558	41,467
30-day Average Flows									
Flow exceeded for 100% of the days	323	592	323			592	323	761	510
Flow exceeded for 90% of the days	1,169	1,039	1,203			1,039	1,109	1,290	1,274
Flow exceeded for 80% of the days	1,622	1,503	1,687			1,503	1,483	1,749	1,857
Flow exceeded for 70% of the days	1,928	1,664	2,011			1,664	1,867	1,969	2,344
Flow exceeded for 60% of the days	2,172	1,856	2,345			1,856	2,091	2,136	3,206
Flow exceeded for 50% of the days	2,573	1,996	2,800			1,996	2,410	2,406	3,868
Flow exceeded for 40% of the days	3,103	2,186	3,358			2,186	2,706	2,778	4,623
Flow exceeded for 30% of the days	3,793	2,600	4,090			2,600	3,273	3,083	5,657
Flow exceeded for 20% of the days	5,103	3,379	5,574			3,379	4,134	3,604	6,559
Flow exceeded for 10% of the days	6,700	4,332	7,198			4,332	7,090	4,872	8,468
Maximum	26,498	6,810	26,498			6,810	11,392	9,652	26,498

characterizations for this seasonal period are generally consistent with known long-term climatological conditions during the respective time intervals, albeit with some effect of the June 1944 event in the Elkhorn River basin evident in the flow values for the 1942-1958 time interval for exceedance probabilities of 20 percent and lower (higher flows).

Table A.15-13 shows the exceedance probabilities and values of flows for the Jun1-Aug 15 seasonal period. **Table A.15-13** shows that, when all flows are considered, the flow characterizations for this seasonal period are generally consistent with known long-term climatological conditions during the respective time intervals. There is some effect of the June 1944 event in the Elkhorn River basin evident in the flow values for the 1942-1958 time interval for exceedance probabilities of 30 percent and lower (higher flows), and some effect of the short-term drought period of the mid-1970's on the flow values for the 1959-1974 time interval. The result of the combination of these two effects is that flow values for the 1942-1958 time interval are somewhat higher than those for the 1959-1974 time interval.

Table A.15-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.15-14** shows that, when all flows are considered, the flow characterizations for this seasonal period are generally consistent with known long-term climatological conditions during the respective time intervals except for the 1942-1958 time interval. For this time interval, the values are skewed higher for exceedance probabilities of 30 percent and lower (higher flows) by a small number of relatively high flow events which occurred during this seasonal period (USGS, 2004).

A.15.5 Median Mean Daily Flow

The median mean daily flow by calendar day is shown on **Figure A.15-6**.

Figure A.15-6 shows both the climatic effects by time interval (**Table A.15-1** and **Table A.15-3** **Figure A.15-1**, **Figure A.15-2**, and **Figure A.15-3**) and the seasonal effects by month (**Figure A.15-3**). Median mean daily flows are generally lower in the 1928-1941 and 1942-1958 time intervals and higher in the 1959-1974 and 1975-1998 time intervals.

Median mean daily flows tend to be highest in March and June, and generally higher in March through June than the rest of the year. There is no substantial difference in the annual patterns between time intervals, in contrast to locations in the North Platte River basin and the Platte River basin upstream of the confluence with the Loup River.

A.15.6 USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.15-7** and **Figure A.15-8** and in **Table A.15-15** and **Table A.15-16**. Because the available data for this location are quite sparse, only limited characterizations of the USGS Annual Peak flow are possible.

Figure A.15-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak Flow, and the 10-year running average of the USGS Annual Peak Flow. **Figure A.15-7** shows that, for the limited data available, the USGS Annual Peak flows are lowest in the 1930's, generally higher in the 1940's before dropping off in value in the early 1950's, and highly variable from the late 1980's through the late 1990's with one exceptionally high peak flow event in 1993 (data for USGS Annual Peak flow are not available between 1964 and 1988). This is generally consistent with the known long-term climatological conditions and individual events during these time periods.

Figure A.15-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.15-8** shows that, for the limited data available, the timing characterizations for USGS Annual Peak flow are very similar to those for Annual Maximum mean daily flow (**Section A.15.2, Figure A.15-3**).

Table A.15-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.15-15** shows that, for the available data, the flow characterizations for both average and median flows are generally consistent with known long-term climatological conditions. An exception to this is the median for the 1942-1958 time interval, which is greater than the median for the 1975-1998 time interval. This is most likely the result of bias in the available data for the 1942-1958 time interval, for which a much of the of the 1950's drought period data are missing. This bias also shows up in the average value, but not to such an extent that it skews this value to one that is higher than that for the 1975-1998 time interval.

For all time intervals, the averages are greater than the medians. This indicates that the average values were skewed higher by infrequent extreme runoff events. Both the averages and the medians occur from May through early June for the 1942-1958 and 1975-1998 time intervals. For the 1928-1941 time interval, the average and median occur in April and March, respectively. This is most likely the result of drought conditions during the 1930's.

Table A.15-16 shows the exceedance probabilities and values for the USGS Annual Peak Flow. It is analogous to **Table A.15-5** for Annual Maximum mean daily flows. **Table A.15-16** shows that, for the limited data available, the flow characterizations for the exceedance probabilities and values for USGS Annual Peak Flow are generally consistent with known climatological conditions.

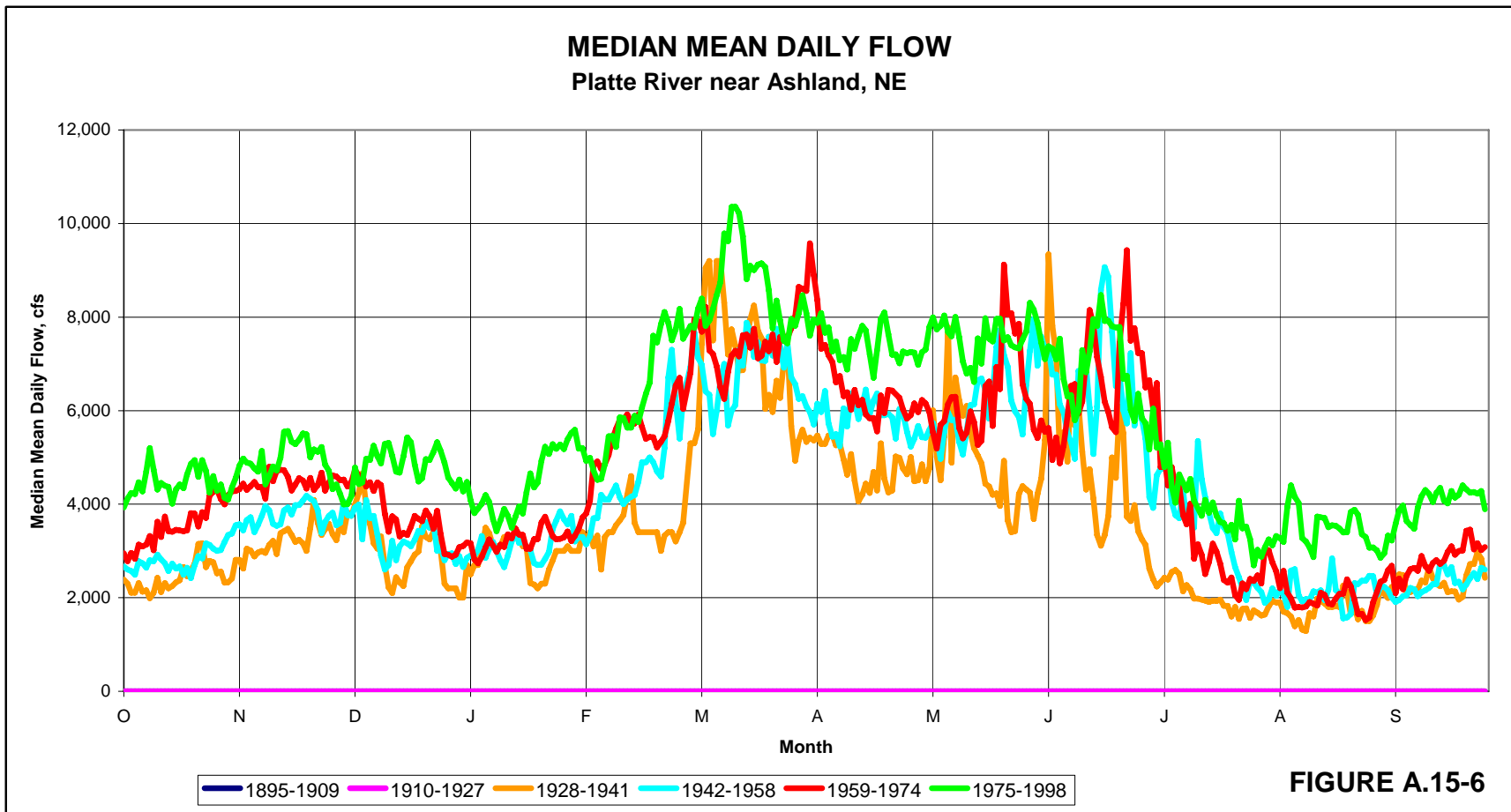


Figure A.15-6 Median Mean Daily Flow.

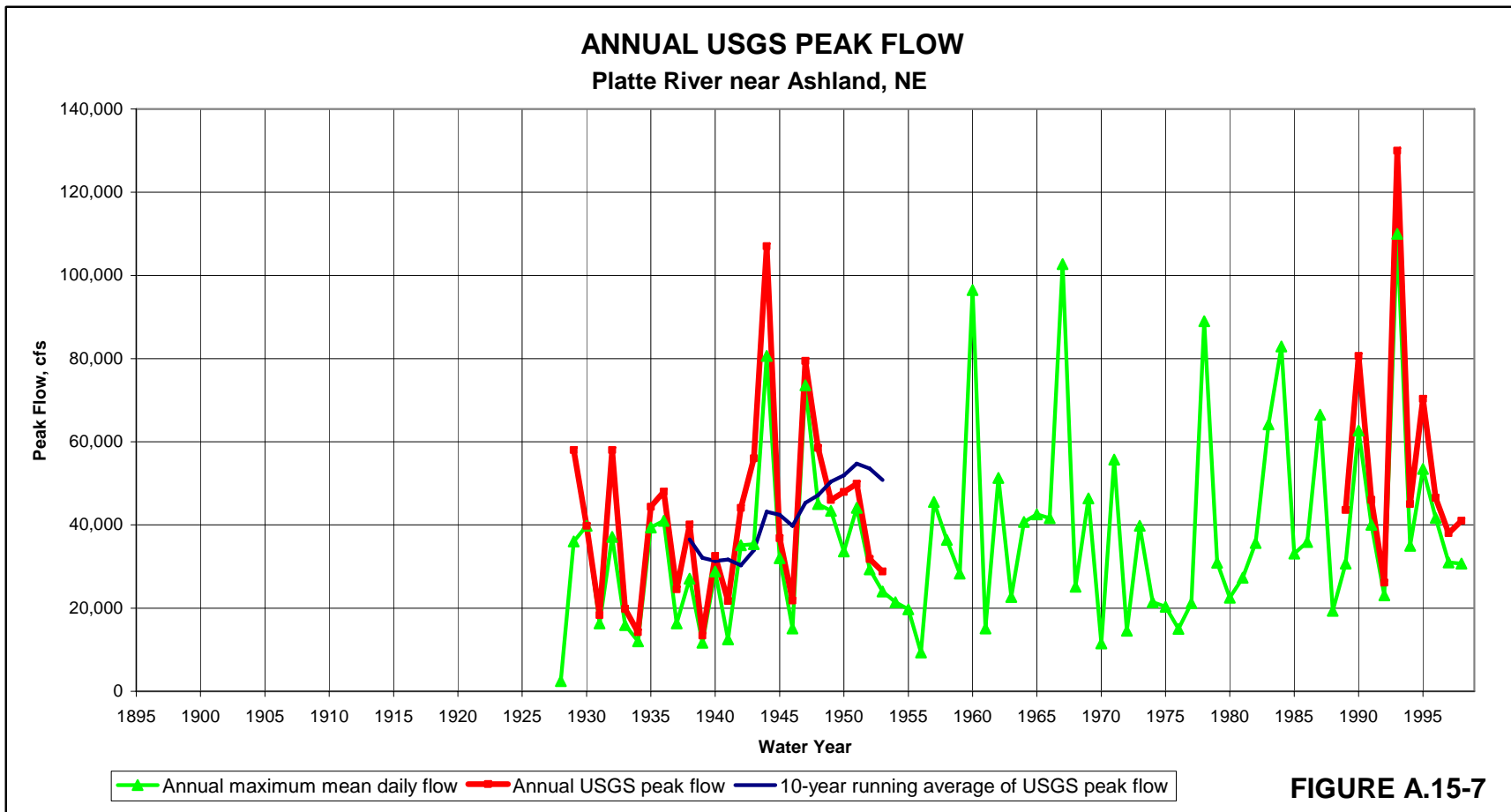


FIGURE A.15-7

Figure A.15-7 Annual USGS Peak Flow.

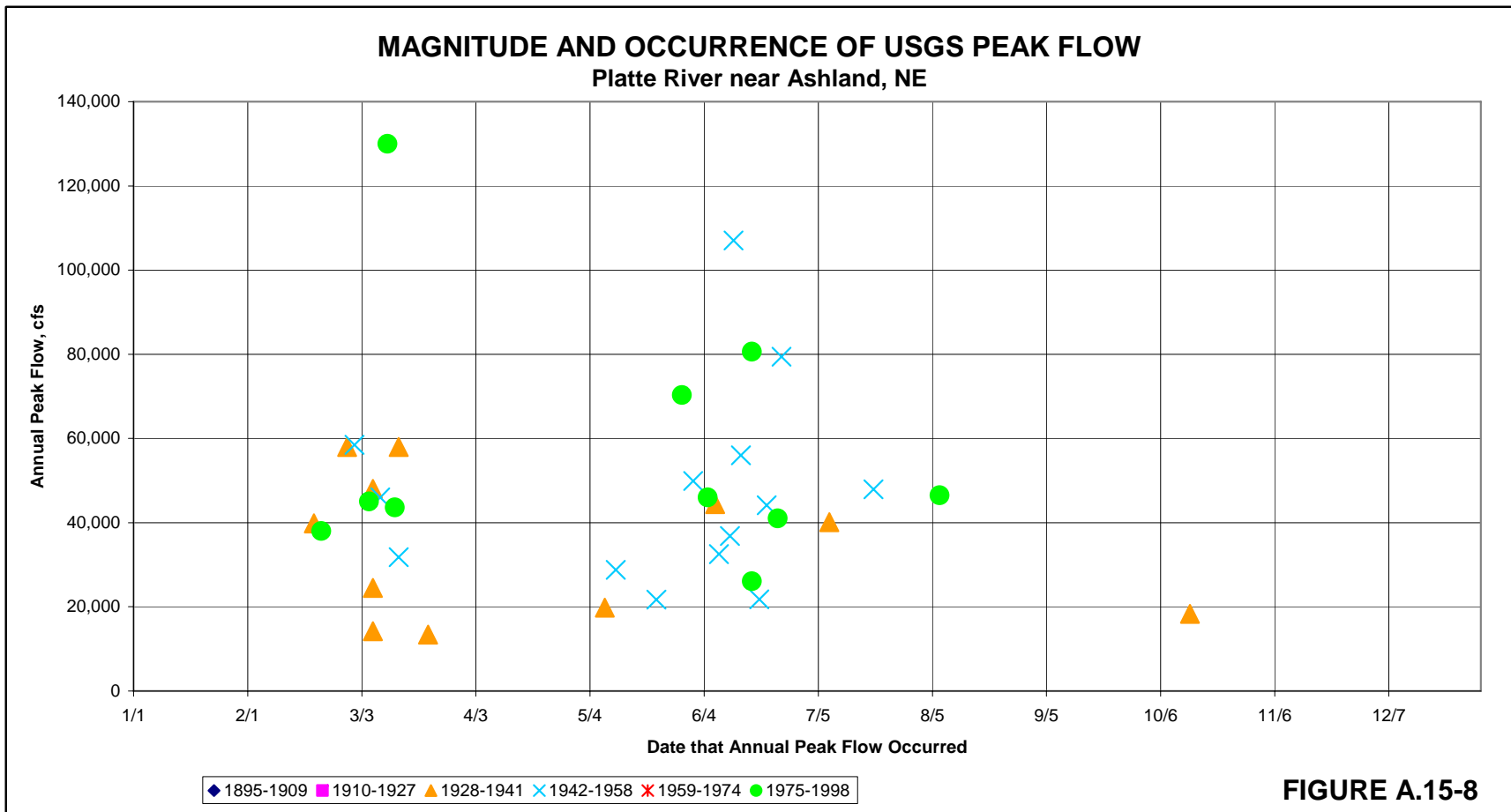


FIGURE A.15-8

Figure A.15-8 Magnitude and Occurrence of Annual USGS Peak Flow.

Table A.15-15 Summary of USGS Peak Flows.

Platte River near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	45,937	33,285	53,414			33,285	50,667		56,710
Median Annual Peak Flow (cfs)	44,100	32,500	46,000			32,500	46,950		45,500
Average Occurrence of Peak Flow	5/8	4/26	5/15			4/26	5/20		5/9
Median Occurrence of Peak Flow	5/29	3/21	6/11			3/21	6/12		6/5

Table A.15-16 USGS Peak Flow Exceedance Values.

Platte River near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Annual Peak Flows									
Peak exceeded in 100% of the years	13,400	13,400	21,800			13,400	21,800		26,100
Peak exceeded in 90% of the years	20,560	15,020	29,100			15,020	29,100		36,810
Peak exceeded in 80% of the years	25,780	18,900	37,040			18,900	32,800		40,400
Peak exceeded in 70% of the years	33,360	20,940	41,780			20,940	38,990		42,820
Peak exceeded in 60% of the years	39,980	23,940	44,460			23,940	44,860		44,440
Peak exceeded in 50% of the years	44,100	32,500	46,000			32,500	46,950		45,500
Peak exceeded in 40% of the years	46,000	39,860	47,340			39,860	49,100		46,200
Peak exceeded in 30% of the years	47,980	41,820	54,170			41,820	54,170		53,640
Peak exceeded in 20% of the years	58,000	46,560	67,940			46,560	58,000		72,360
Peak exceeded in 10% of the years	75,760	56,000	80,480			56,000	77,310		85,540
Peak Flow	130,000	58,000	130,000			58,000	107,000		130,000

A.16 SALT CREEK NEAR ASHLAND, NEBRASKA

A.16.1 Methodology

The record for Salt Creek near Ashland, Nebraska, was constructed from Salt Creek near Ashland gage records, plus synthesized data for the period 10/1/1969 through 12/31/1998, as follows:

Gage	Records Used	Data Source
Salt Creek near Ashland, Nebraska (continuous)	10/1/1947 – 9/30/1969	USGS website.
Regression relationship for Salt Creek at Ashland based on comparison with 11/1/1951-9/30/1969 period of record for Salt Creek at Greenwood. Ashland daily discharge = 1.3314 * Greenwood daily discharge + 83.408 cfs	10/1/1969 – 12/31/1998	USGS website for Salt Creek at Greenwood.

The flow characterizations for Salt Creek near Ashland, Nebraska, are given in **Table A.16-1** (mean daily values), **Table A.16-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.16-3** (seasonal 3-, 7-, 15- and 30-day running average values), and **Table A.16-4** (flow frequencies).

There are ten small reservoirs in the upper tributary reaches of the basin. Most of these reservoirs were constructed by the Corps of Engineers in the 1960's. They control about 11 percent of the drainage area. The remainder (89 percent) is uncontrolled. However, since the 1930's, City of Lincoln Wastewater Operations has been importing the majority of its public water supply from wells that are hydrologically connected to the Platte River. Since the 1980's, an average of approximately 24.2 million gallons per day has been discharged from its two wastewater treatment plants into Salt Creek (Lincoln Wastewater Operations, 2002; Lincoln Wastewater Operations, 2006a). This is equivalent to a mean daily flow of about 37 cfs, which is roughly 7 percent of the annual mean daily flow at Ashland, based on the records listed above.

A.16.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.16-1 shows that seasonal and multi-year climatic effects appear to have a predominant influence on daily flows (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). At the same time, however, there has been an incremental increase over the period of record of discharges of imported water into Salt Creek through the two City of Lincoln wastewater treatment plants. Average and median annual maximum mean daily flows and annual flow volumes show a steady increase by time interval. Data are not available for the 1895-1909 through 1928-1941 time intervals.

Both **Figure A.16-1** (maximum flows) and **Figure A.16-2** (annual flow volume) suggest that climatic effects are predominant. All flow and volume quantities are higher in the

Table A.16-1 Summary of Mean Daily Flow Values.

Salt Creek near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	16,049		16,049				14,565	14,458	17,789
Median Annual Maximum Mean Daily Flow (cfs)	12,639		12,639				14,200	8,633	12,758
Average Annual Flow Volume (kaf)	413		413				321	368	485
Median Annual Flow Volume (kaf)	387		387				267	379	438
Average Mean Daily Flow (cfs)	570		570				443	509	669
Median Mean Daily Flow (cfs)	249		249				140	226	323
Average Number of Mean Daily Flow Measurements	365	0	365	0	0	0	365	365	365
Number of Years of Data	51 of 104	0 of 47	51 of 57	0 of 15	0 of 18	0 of 14	11 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	3,406		3,406				5,896	1,928	3,250
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	11,086		11,086				11,429	11,093	10,923
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	11,768		11,768				11,285	9,660	13,395
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	7,061		7,061				4,649	3,374	10,624
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	1,007		1,007				2,320	741	983
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	7,166		7,166				8,270	5,828	7,726
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	7,620		7,620				8,270	2,863	8,005
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	3,020		3,020				3,840	2,100	4,896
Difference ("Apr-Jul Average" - "Jul-Sep Average")	4,025		4,025				6,781	7,719	299
Difference ("Apr-Jul Median" - "Jul-Sep Median")	4,146		4,146				4,430	3,728	2,829
Average Occurrence of Maximum Mean Daily Flow	6/9		6/9				5/22	5/28	6/26
Median Occurrence of Maximum Mean Daily Flow	6/17		6/17				6/2	6/15	6/27
Average Annual Minimum Mean Daily Flow (cfs)	145		145				52	120	204
Median Annual Minimum Mean Daily Flow (cfs)	159		159				53	120	191
Average occurrences per year of the Minimum	2		2				2	2	1
Occuring between	9/22		9/22				9/17	9/16	9/27
and	10/19		10/19				11/16	11/11	9/29
Median occurrences per year of the Minimum	1		1				1	1	1
Occuring between	9/11		9/11				9/9	8/20	9/23
and	9/29		9/29				1/10	1/1	9/24

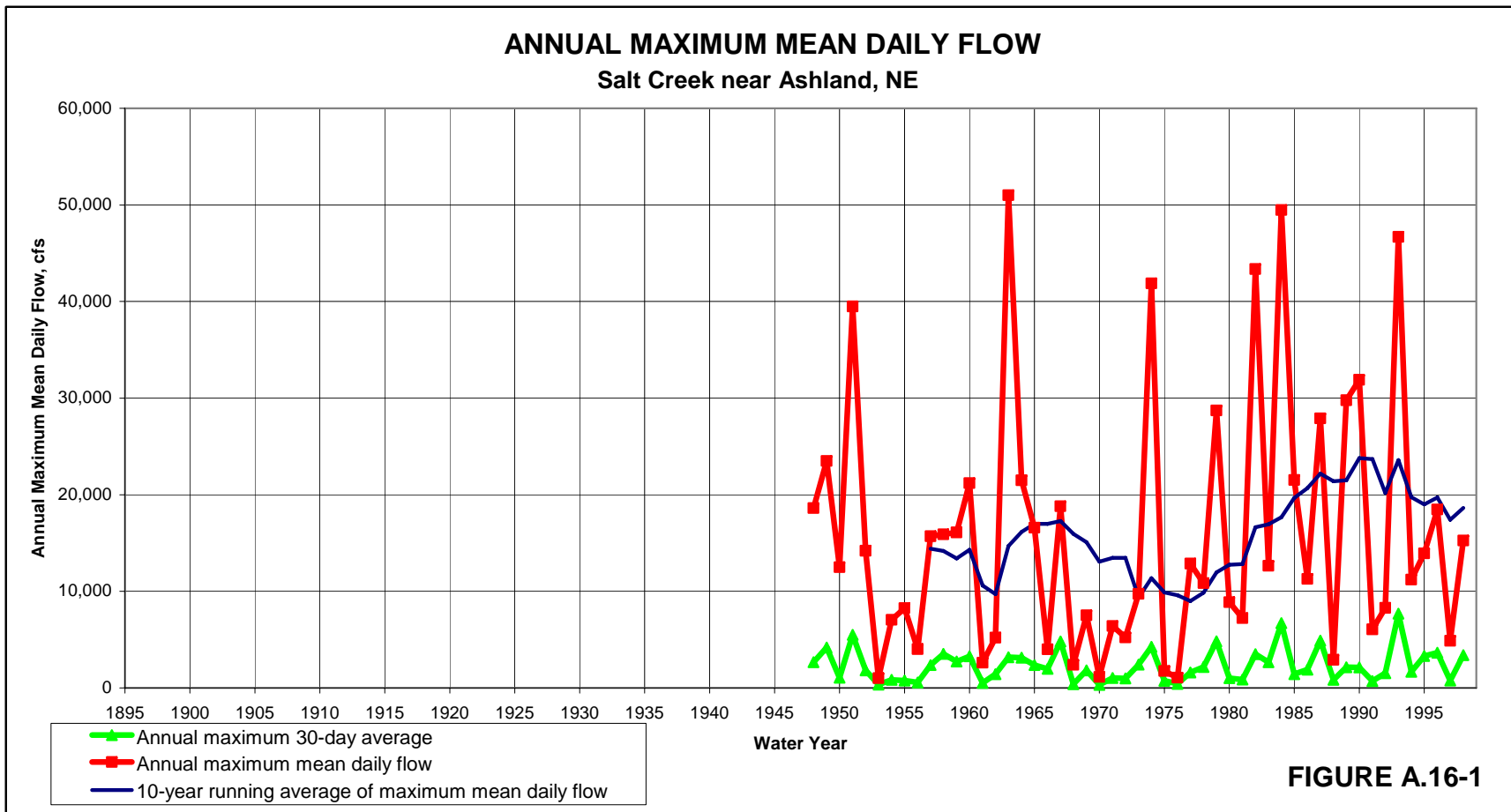


Figure A.16-1 Annual Maximum Mean Daily Flow.

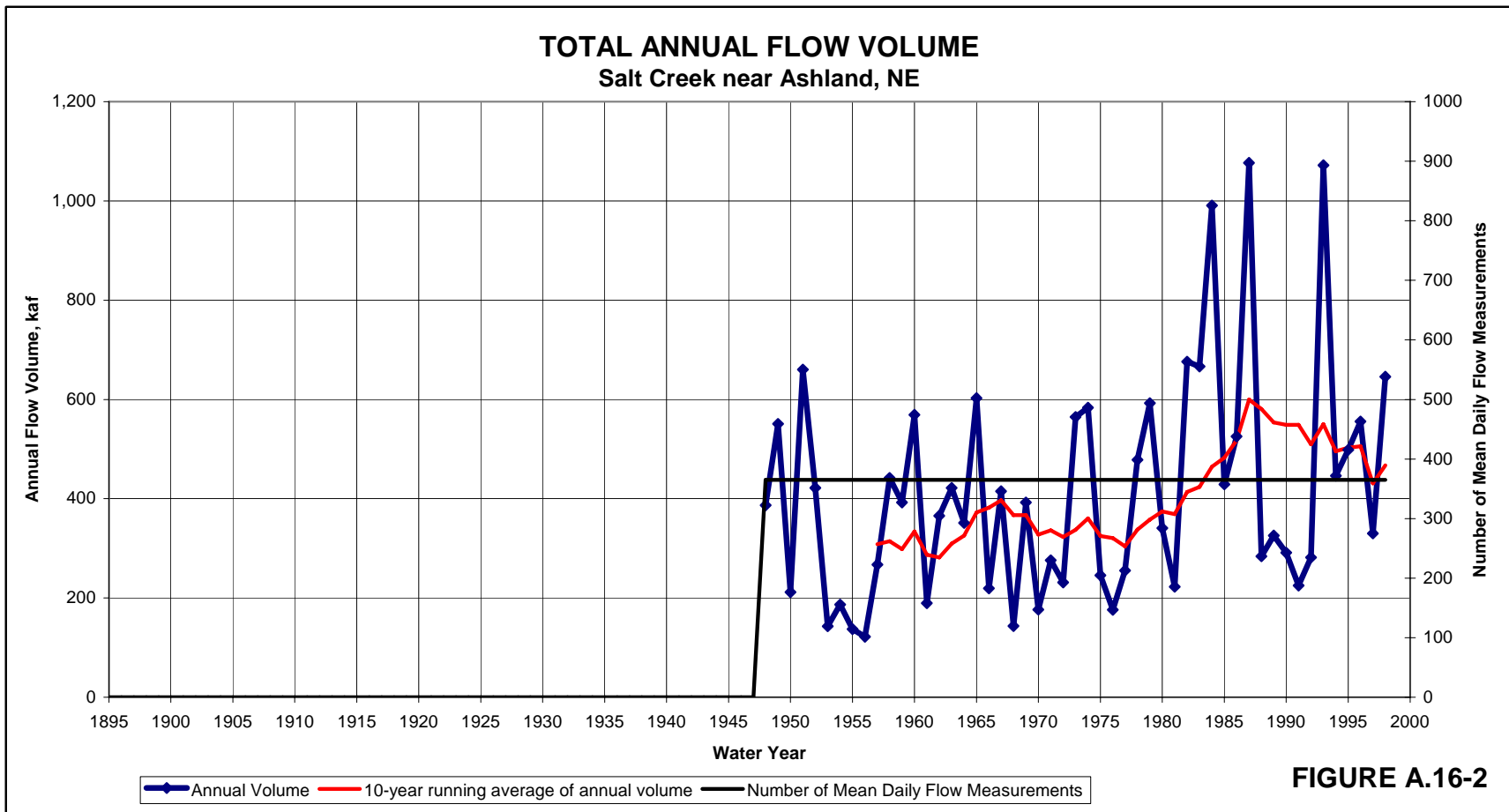


Figure A.16-2 Total Annual Flow Volume.

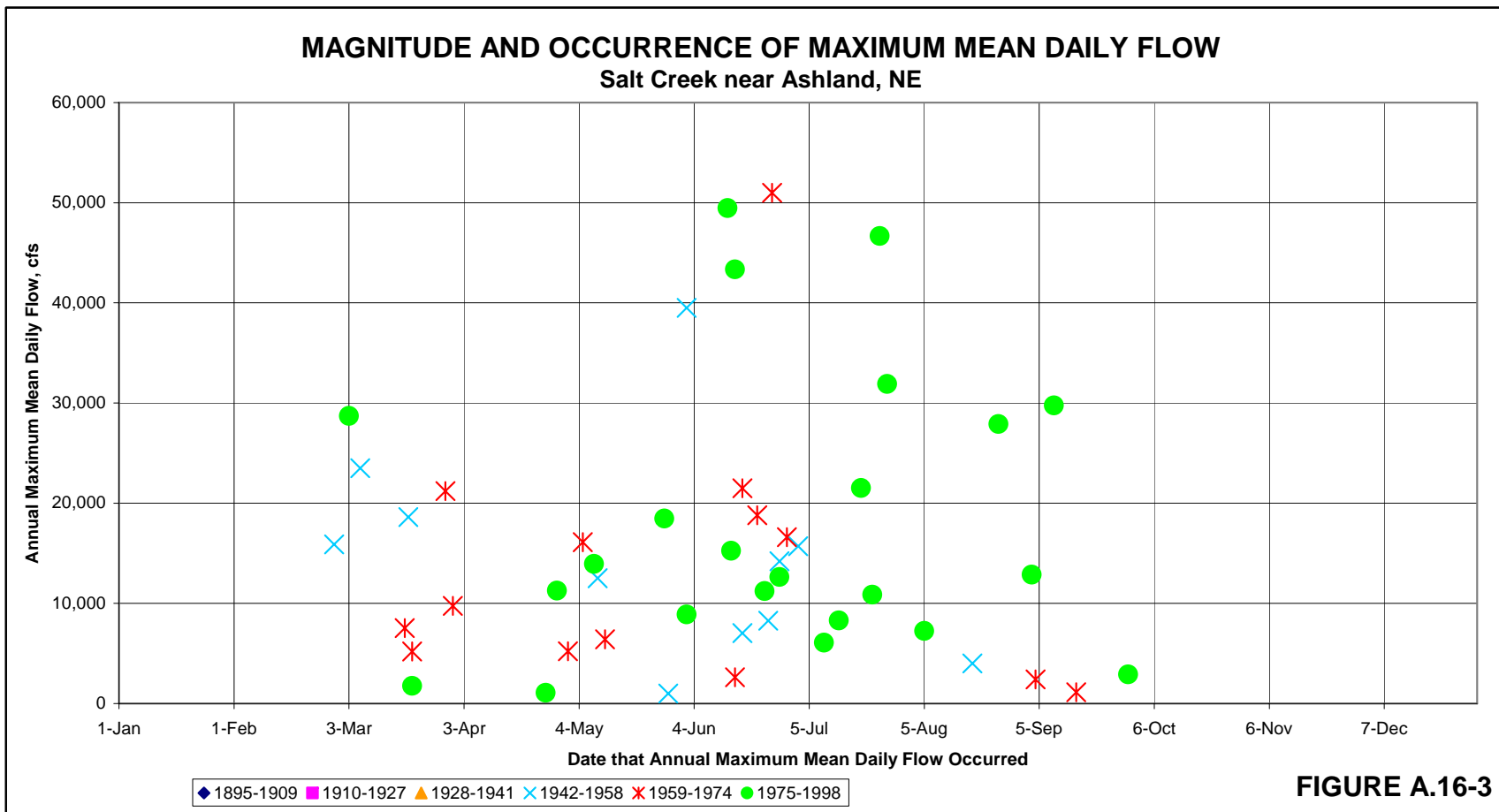


FIGURE A.16-3

Figure A.16-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

1940's, lower in the 1950's, and generally higher from the 1960's through the end of the period of record except for a period of lower flows in the mid-1970's. This shows up most clearly in the 10-year running averages, albeit with a delay due to the averaging process. Climate records show that drought conditions occurred during the mid-1970's in the greater mid-Missouri River basin, including the Salt Creek basin, as discussed in **Section A.14-1**. For the higher annual maximums, there is a large difference between the Annual Maximum mean daily flow and the annual maximum 30-day average flow (**Figure A.16-1**), indicating that these are short-duration runoff maximums. There is some increase in the 10-year running average annual flow volume through the 1970's and the early 1980's (**Figure A.16-2**), coincident with increases in the import of water from outside of the Salt Creek basin. The 10-year running average decreases somewhat during the 1990's, possibly due to improved water conservation practices in and around Lincoln (Lincoln Wastewater Operations, 2006b).

Figure A.16-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.16-3** shows considerable scatter throughout the year, except for the winter months, when no maximums have been observed. There is some evidence for a seasonal concentration of maximums around March and June. A similar but much more pronounced seasonality has already been noted at two upstream locations, the Elkhorn River at Waterloo and the Platte River near Ashland (**Sections A.14-1 and A.15-1**). The Salt Creek basin is very small compared to the Elkhorn River basin and the lower Platte River basin, and includes a significant urbanized area (Lincoln, Nebraska). Short-duration heavy rainfall events covering a small area are capable of producing high flow events, including annual maximums. This differs from larger basins, where the highest flows are more likely to be associated with events on a larger scale in both time and space (Linsley et al., 1975). During the winter, temperatures are usually cold enough for ice to form and remain in place throughout the season (NOAA, 2005).

Both the average and median seasonal maximum mean daily flow occur in the Apr 16-Jul 15 seasonal period for both the 1942-1958 and 1959-1974 time intervals (**Table A.16-1**). In the 1975-1998 time interval, the maximum occurs in the Jun 1-Aug 15 seasonal period. Decreases from the Apr 16-Jul 15 through Jul 16-Sep 30 seasonal periods for both the 1942-1958 and 1959-1975 time intervals are quite sharp. The median maximum mean daily flows do not show a consistent seasonal pattern by time interval. The average and median Dates of Maximum Flow are in late May or June for all time intervals.

Figure A.16-4 (minimum flows) and **Table A.16-1** both show a generally steady and substantial increase in all minimum flow quantities from the 1940's through the 1980's. **Figure A.16-4** shows the flow values more or less stabilizing in the 1990's. The steady rise from the 1960's through the 1980's may be related to the construction of a system of small reservoirs near and upstream of Lincoln, and/or urbanization in the Lincoln area, including outflows of imported water from the treatment plants. These outflows have increased incrementally since the 1930's, grew from an average of roughly 15 cfs in the 1960's to about 37 cfs in the 1980's, and have remained more or less constant since the

1980's (Lincoln Wastewater Operations, 2006b). The average and median Dates of Minimum Flow are in August or September for all time intervals considered, with additional occurrences in November for the average and January for the median in the 1942-1958 and 1959-1974 time intervals. Minimum flows were not calculated for years with incomplete flow records.

A.16.3 3-, 7-, 15-, and 30- day Averages of Mean Daily Flows

Table A.16-2 shows that there is significant attenuation of both average and median annual running average flows due to the averaging process, indicating that most maximums at this location are short-duration runoff maximums. Both maximum and minimum flows increase from the 1959-1974 time interval to the 1975-1998 time interval. This can be attributed at least in part to a generally wetter climate regime, and is also coincident with increases in the import of water from outside of the Salt Creek basin discharged primarily through the treatment plants.

Table A.16-3 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.16-3** shows that the highest flow values occur in the 1942-1958 time interval, and that there are many irregularities in the flow characterizations for all time intervals considered. There are several possible explanations for this. One is that, since the flow values from 1970 through 1998 were computed from a regression equation (**Section A.16-1**), rather than being actual measured values, inaccuracies were likely introduced, including possible underestimation of the highest maximums of the 1959-1974 and 1975-1998 time intervals. Another is that the highest maximums were partially attenuated by the system of small flood control reservoirs around Lincoln. Yet another is the nature of the Salt Creek basin itself. It is a small basin with heterogeneous topography in places, and is thus susceptible to relatively rapid hydrologic responses to weather events (i.e. a "flashy" basin). Despite the previously noted irregularities, there is a general tendency toward increased flow values from the 1959-1974 time interval to the 1975-1998 time interval. This can be attributed at least in part to a generally wetter climate regime during the 1975-1998 time interval, and is coincident with increases in the import of water from outside of the Salt Creek basin. With respect to timing, the average flow values show the expected variation by seasonal period except for the 1975-1998 time interval. For this time interval, the values are greater for the Jun 1-Aug 15 seasonal period than for the Apr 16-Jul 15 seasonal period, and the values for the Jul 16-Sep 30 seasonal period are closer to the values for the two preceding seasonal periods than they are for the 1942-1958 and 1959-1974 time intervals. **Figure A.16-3** shows that there were several very high maximums during this time interval which occurred in July and August, most of which occurred in the time range in which the Jun 1-Aug 15 and Jul 16-Sep 30 seasonal periods overlap.

For all time intervals considered, the averages are greater than the medians. This indicates that the values for the averages were skewed higher by infrequent extreme runoff events.

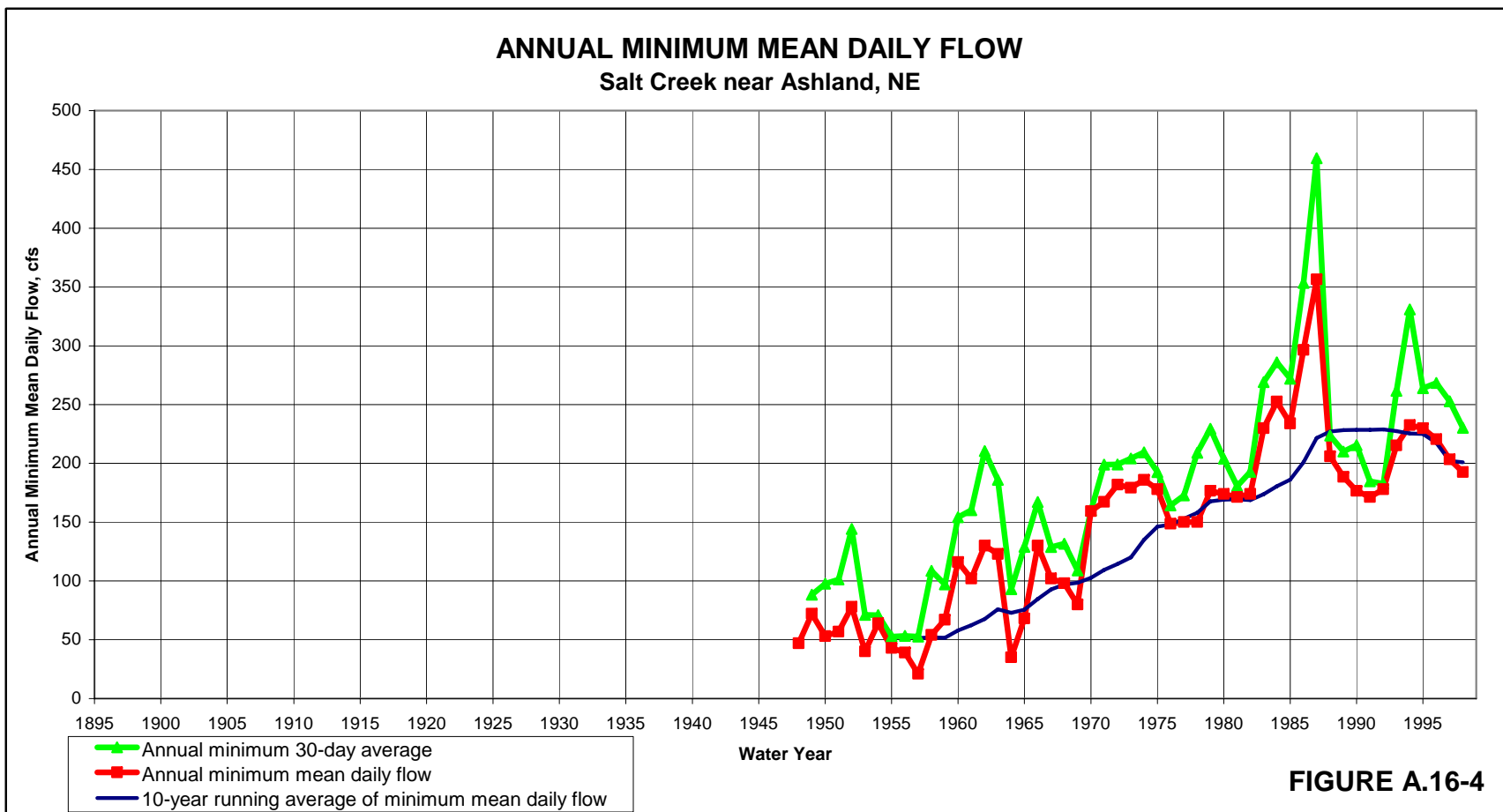


Figure A.16-4 Annual Minimum Mean Daily Flow.

Table A.16-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Salt Creek near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	16,049		16,049				14,565	14,458	17,789
Median Annual Maximum Mean Daily Flow (cfs)	12,639		12,639				14,200	8,633	12,758
Avg. Ann. Max. 3-day Avg. Flow (cfs)	9,945		9,945				10,062	9,545	10,157
Median Ann. Max. 3-day Avg. Flow (cfs)	7,681		7,681				8,653	6,741	7,889
Avg. Ann. Max. 7-day Avg. Flow (cfs)	5,625		5,625				5,299	5,486	5,867
Median Ann. Max. 7-day Avg. Flow (cfs)	4,338		4,338				4,243	3,891	4,747
Avg. Ann. Max. 15-day Avg. Flow (cfs)	3,374		3,374				3,052	3,350	3,538
Median Ann. Max. 15-day Avg. Flow (cfs)	2,709		2,709				2,274	2,802	3,049
Avg. Ann. Max. 30-day Avg. Flow (cfs)	2,329		2,329				2,145	2,165	2,524
Median Ann. Max. 30-day Avg. Flow (cfs)	1,962		1,962				1,814	2,162	2,011
Average Annual Minimum Mean Daily Flow (cfs)	145		145				52	120	204
Median Annual Minimum Mean Daily Flow (cfs)	159		159				53	120	191
Avg. Ann. Min. 3-day Avg. Flow (cfs)	152		152				60	126	209
Median Ann. Min. 3-day Avg. Flow (cfs)	170		170				64	129	194
Avg. Ann. Min. 7-day Avg. Flow (cfs)	159		159				70	131	214
Median Ann. Min. 7-day Avg. Flow (cfs)	177		177				74	139	202
Avg. Ann. Min. 15-day Avg. Flow (cfs)	170		170				78	144	225
Median Ann. Min. 15-day Avg. Flow (cfs)	180		180				79	148	211
Avg. Ann. Min. 30-day Avg. Flow (cfs)	184		184				84	159	242
Median Ann. Min. 30-day Avg. Flow (cfs)	185		185				80	160	227

Table A.16-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Salt Creek near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	9,945		9,945				10,062	9,545	10,157
Median Ann. Max. 3-day Avg. Flow (cfs)	7,681		7,681				8,653	6,741	7,889
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	2,399		2,399				4,143	1,435	2,242
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	6,641		6,641				7,437	6,985	6,047
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	7,111		7,111				7,426	6,024	7,690
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	4,319		4,319				3,098	2,208	6,287
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	936		936				1,621	668	876
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	4,371		4,371				5,577	3,337	4,655
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	4,113		4,113				5,577	1,840	4,658
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	2,271		2,271				2,617	1,221	2,798
Salt Creek near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	5,625		5,625				5,299	5,486	5,867
Median Ann. Max. 7-day Avg. Flow (cfs)	4,338		4,338				4,243	3,891	4,747
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	1,580		1,580				2,429	967	1,599
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	3,696		3,696				3,686	3,965	3,523
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	3,918		3,918				3,741	3,392	4,349
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	2,372		2,372				1,686	1,302	3,400
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	744		744				1,005	576	770
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	2,563		2,563				2,638	2,003	2,641
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	2,638		2,638				2,638	1,036	2,796
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	1,119		1,119				1,539	707	1,639
Salt Creek near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	3,374		3,374				3,052	3,350	3,538
Median Ann. Max. 15-day Avg. Flow (cfs)	2,709		2,709				2,274	2,802	3,049
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	1,013		1,013				1,423	686	1,044
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	2,309		2,309				2,148	2,459	2,283
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	2,385		2,385				2,332	2,067	2,621
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	1,377		1,377				1,065	808	1,899
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	515		515				572	425	556
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	1,474		1,474				1,735	1,360	1,556
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	1,521		1,521				2,046	742	1,617
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	797		797				841	483	1,102
Salt Creek near Ashland, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	2,329		2,329				2,145	2,165	2,524
Median Ann. Max. 30-day Avg. Flow (cfs)	1,962		1,962				1,814	2,162	2,011
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	682		682				812	525	727
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	1,632		1,632				1,500	1,595	1,717
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,574		1,574				1,725	1,273	1,706
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	909		909				813	557	1,187
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	449		449				413	350	476
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	1,048		1,048				1,048	1,031	1,183
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	1,029		1,029				1,213	548	1,228
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	534		534				604	361	767

A.16.4 Flow Frequency

A.16.4.1 Flow Averaging

The information on flow frequencies given in **Table A.16-4** and **Figure A.16-5** generally supports the conclusions previously reached (**Table A.16-1**, **Figure A.16-1** and **Figure A.16-2**), suggesting a predominant effect of climate on the distribution of flows in Salt Creek near Ashland. For percentage of years, the only flow ranges with a percentage frequency of 100 percent for the 1942-1958 time interval are those less than 1,000 cfs. This time interval included a substantial period of drought. For the 1959-1974 time interval, a frequency of 100 percent occurred for all flow ranges up to the 1,000-2,000-cfs range. For the 1975-1998 time interval, a frequency of 100 percent occurred for flow ranges between 201-500 cfs and 1,001-2,000 cfs. The decrease in frequency for the 0-200-cfs flow range is coincident with increases in the import of water from outside of the Salt Creek basin through the treatment plants. For percentage of days, the flow range with the highest percentage frequency is the 0-200-cfs range for the 1942-1958 time interval. For the 1959-1974 and 1975-1998 time intervals, the flow range with the highest percentage frequency is 201-500-cfs. The highest percentage frequencies (greater than 10 percent) are concentrated in two of the lowest three flow ranges for all time intervals for which data are available. The lack of data in early time intervals limits the ability to determine whether flow frequencies have changed over time.

A.16.4.2 Maximum Mean Flow Exceedance

Table A.16-5 through **Table A.16-9** show the exceedance values and probabilities for maximum flow for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.16-5 shows the exceedance probabilities and values for annual data. **Table A.16-5** shows similar irregularities by time interval to those noted in **Section A.16.3**. These irregularities likely have the same explanations, i.e. errors introduced by the regression computations for 1970 through 1998 and the flashy nature of the Salt Creek basin. Despite these irregularities, there is a general tendency toward increased flow values from the 1959-1974 time interval to the 1975-1998 time interval for 50 percent and higher exceedance probabilities (lower flows) for all averaging times except the 30-day averaging time. This can be attributed at least in part to a generally wetter climate regime during the 1975-1998 time interval and is coincident with increases in the import of water from outside of the Salt Creek basin.

Table A.16-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.16-6** shows that the highest

Table A.16-4 Flow Frequency Distributions.

Salt Creek near Ashland, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	78	0	78	0	0	0	100	100	54
201 to 500	100	0	100	0	0	0	100	100	100
501 to 750	100	0	100	0	0	0	100	100	100
751 to 1,000	100	0	100	0	0	0	100	100	100
1,001 to 2,000	98	0	98	0	0	0	91	100	100
2,001 to 3,000	88	0	88	0	0	0	82	94	88
3,001 to 4,000	76	0	76	0	0	0	73	75	79
4,001 to 5,000	63	0	63	0	0	0	55	63	67
5,001 to 6,000	53	0	53	0	0	0	55	50	54
6,001 to 8,000	67	0	67	0	0	0	73	56	71
8,001 to 10,000	39	0	39	0	0	0	55	13	50
10,001 to 12,000	33	0	33	0	0	0	45	25	33
12,001 to 15,000	39	0	39	0	0	0	45	38	38
Greater than 15,000	43	0	43	0	0	0	45	44	42
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Salt Creek near Ashland, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	29.2	0.0	29.2	0.0	0.0	0.0	67.6	36.4	6.9
201 to 500	50.0	0.0	50.0	0.0	0.0	0.0	19.6	45.8	66.7
501 to 750	8.5	0.0	8.5	0.0	0.0	0.0	3.6	7.2	11.5
751 to 1,000	3.5	0.0	3.5	0.0	0.0	0.0	2.3	3.2	4.2
1,001 to 2,000	4.7	0.0	4.7	0.0	0.0	0.0	3.2	3.9	5.9
2,001 to 3,000	1.6	0.0	1.6	0.0	0.0	0.0	1.4	1.3	1.9
3,001 to 4,000	0.8	0.0	0.8	0.0	0.0	0.0	0.7	0.7	1.0
4,001 to 5,000	0.4	0.0	0.4	0.0	0.0	0.0	0.3	0.4	0.6
5,001 to 6,000	0.3	0.0	0.3	0.0	0.0	0.0	0.3	0.2	0.3
6,001 to 8,000	0.4	0.0	0.4	0.0	0.0	0.0	0.3	0.3	0.4
8,001 to 10,000	0.2	0.0	0.2	0.0	0.0	0.0	0.2	0.1	0.2
10,001 to 12,000	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1
12,001 to 15,000	0.2	0.0	0.2	0.0	0.0	0.0	0.2	0.2	0.2
Greater than 15,000	0.2	0.0	0.2	0.0	0.0	0.0	0.2	0.2	0.2
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Salt Creek near Ashland, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	107	0	107	0	0	0	247	133	25
201 to 500	182	0	182	0	0	0	71	167	243
501 to 750	31	0	31	0	0	0	13	26	42
751 to 1,000	13	0	13	0	0	0	8	12	15
1,001 to 2,000	17	0	17	0	0	0	12	14	21
2,001 to 3,000	6	0	6	0	0	0	5	5	7
3,001 to 4,000	3	0	3	0	0	0	3	3	4
4,001 to 5,000	2	0	2	0	0	0	1	1	2
5,001 to 6,000	1	0	1	0	0	0	1	1	1
6,001 to 8,000	1	0	1	0	0	0	1	1	2
8,001 to 10,000	1	0	1	0	0	0	1	0	1
10,001 to 12,000	0	0	0	0	0	0	1	0	0
12,001 to 15,000	1	0	1	0	0	0	1	1	1
Greater than 15,000	1	0	1	0	0	0	1	1	1
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

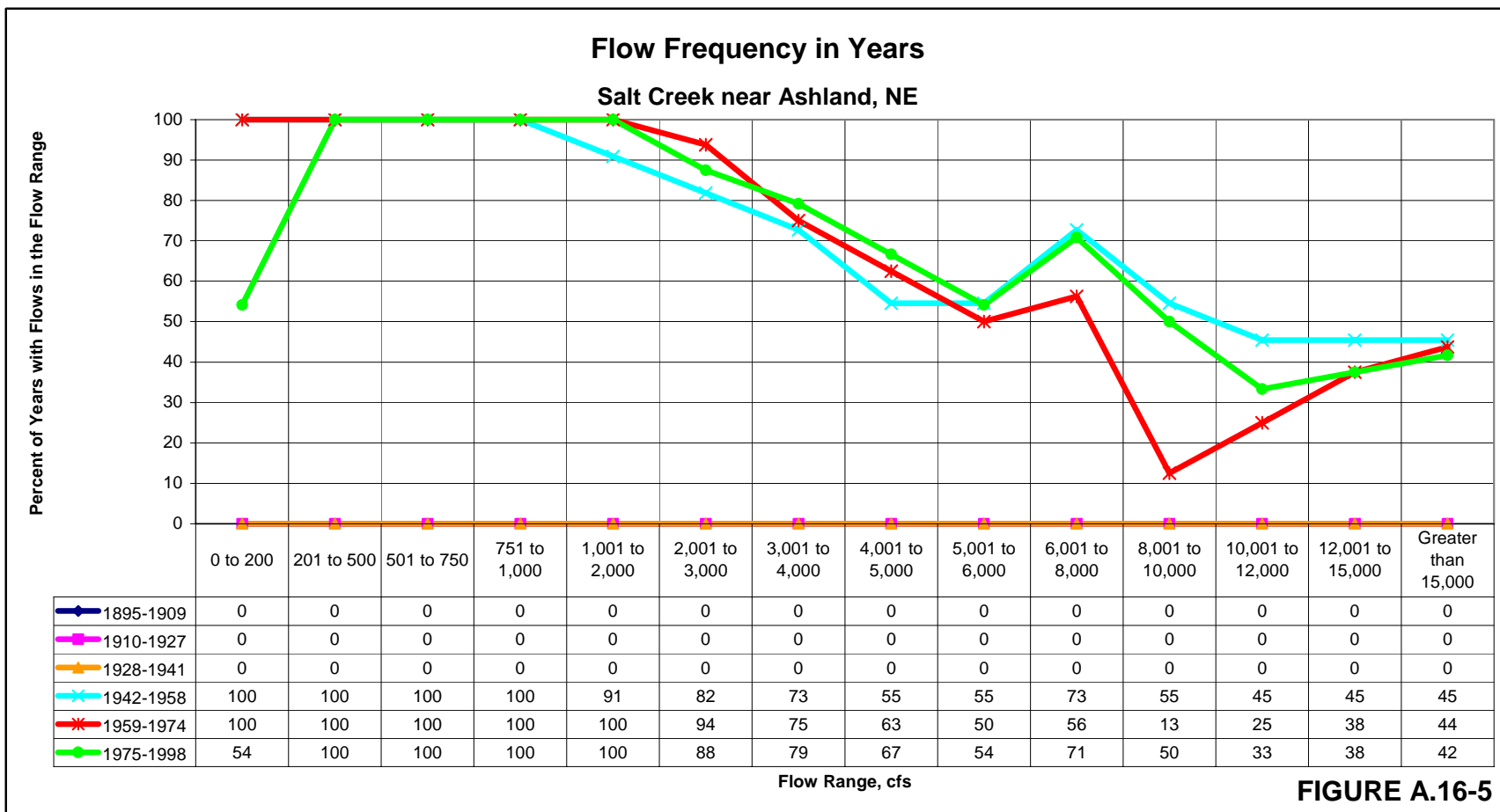


Figure A.16-5 Flow Frequency in Years.

Table A.16-5 Maximum Flow Exceedance Values, Annual Data.

Salt Creek near Ashland, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years	1,000			1,000				1,000	1,122	1,066
Maximum exceeded in 90% of the years	2,620			2,620				4,010	2,510	3,497
Maximum exceeded in 80% of the years	5,190			5,190				7,040	4,000	6,770
Maximum exceeded in 70% of the years	7,233			7,233				8,270	5,206	8,824
Maximum exceeded in 60% of the years	9,736			9,736				12,500	6,421	11,227
Maximum exceeded in 50% of the years	12,639			12,639				14,200	8,633	12,758
Maximum exceeded in 40% of the years	15,700			15,700				15,700	16,100	14,995
Maximum exceeded in 30% of the years	18,600			18,600				15,900	17,700	22,158
Maximum exceeded in 20% of the years	23,500			23,500				18,600	21,200	29,135
Maximum exceeded in 10% of the years	39,500			39,500				23,500	31,695	39,919
Maximum	51,000			51,000				39,500	51,000	49,478
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	700			700				700	797	801
Maximum exceeded in 90% of the years	1,718			1,718				2,990	1,483	2,130
Maximum exceeded in 80% of the years	3,125			3,125				4,113	2,569	3,519
Maximum exceeded in 70% of the years	4,137			4,137				5,577	3,824	5,112
Maximum exceeded in 60% of the years	5,800			5,800				7,387	4,137	6,542
Maximum exceeded in 50% of the years	7,681			7,681				8,653	6,741	7,889
Maximum exceeded in 40% of the years	9,880			9,880				9,880	10,750	9,616
Maximum exceeded in 30% of the years	11,150			11,150				11,107	12,208	11,047
Maximum exceeded in 20% of the years	15,088			15,088				13,610	15,567	13,962
Maximum exceeded in 10% of the years	20,433			20,433				20,433	21,529	18,121
Maximum	41,845			41,845				26,233	27,333	41,845
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	508			508				584	508	681
Maximum exceeded in 90% of the years	1,008			1,008				1,563	830	1,335
Maximum exceeded in 80% of the years	1,857			1,857				1,953	1,857	2,282
Maximum exceeded in 70% of the years	2,674			2,674				2,638	2,214	3,093
Maximum exceeded in 60% of the years	3,409			3,409				3,409	3,070	3,832
Maximum exceeded in 50% of the years	4,338			4,338				4,243	3,891	4,747
Maximum exceeded in 40% of the years	5,559			5,559				5,000	5,559	5,875
Maximum exceeded in 30% of the years	6,204			6,204				5,165	7,992	6,210
Maximum exceeded in 20% of the years	9,321			9,321				7,479	10,164	8,049
Maximum exceeded in 10% of the years	12,611			12,611				12,921	11,882	9,742
Maximum	23,233			23,233				13,339	13,000	23,233
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	357			357				471	357	512
Maximum exceeded in 90% of the years	707			707				882	607	882
Maximum exceeded in 80% of the years	1,289			1,289				1,289	1,337	1,282
Maximum exceeded in 70% of the years	1,474			1,474				1,353	1,654	1,844
Maximum exceeded in 60% of the years	2,246			2,246				1,735	2,221	2,314
Maximum exceeded in 50% of the years	2,709			2,709				2,274	2,802	3,049
Maximum exceeded in 40% of the years	3,392			3,392				2,709	3,392	3,739
Maximum exceeded in 30% of the years	4,036			4,036				3,714	4,682	4,043
Maximum exceeded in 20% of the years	5,662			5,662				4,093	6,017	4,388
Maximum exceeded in 10% of the years	6,842			6,842				7,051	6,479	6,402
Maximum	12,821			12,821				7,999	7,822	12,821
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	328			328				337	328	416
Maximum exceeded in 90% of the years	555			555				555	457	743
Maximum exceeded in 80% of the years	826			826				770	975	853
Maximum exceeded in 70% of the years	1,043			1,043				826	1,235	1,378
Maximum exceeded in 60% of the years	1,591			1,591				1,048	1,818	1,608
Maximum exceeded in 50% of the years	1,962			1,962				1,814	2,162	2,011
Maximum exceeded in 40% of the years	2,364			2,364				2,364	2,404	2,174
Maximum exceeded in 30% of the years	3,130			3,130				2,671	2,935	3,307
Maximum exceeded in 20% of the years	3,498			3,498				3,523	3,189	3,554
Maximum exceeded in 10% of the years	4,807			4,807				4,187	3,771	4,893
Maximum	7,683			7,683				5,497	4,807	7,683

Table A.16-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Salt Creek near Ashland, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	152		152				152	174	371
Maximum exceeded in 90% of the years	246		246				215	218	413
Maximum exceeded in 80% of the years	390		390				330	246	469
Maximum exceeded in 70% of the years	484		484				590	327	559
Maximum exceeded in 60% of the years	648		648				1,560	476	701
Maximum exceeded in 50% of the years	1,007		1,007				2,320	741	983
Maximum exceeded in 40% of the years	1,774		1,774				2,560	1,400	1,652
Maximum exceeded in 30% of the years	2,730		2,730				2,730	3,011	2,519
Maximum exceeded in 20% of the years	4,251		4,251				15,000	3,870	3,979
Maximum exceeded in 10% of the years	7,925		7,925				15,900	4,542	7,482
Maximum	28,709		28,709				23,500	7,000	28,709
3-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	126		126				126	173	340
Maximum exceeded in 90% of the years	228		228				209	200	358
Maximum exceeded in 80% of the years	344		344				322	228	417
Maximum exceeded in 70% of the years	412		412				404	284	451
Maximum exceeded in 60% of the years	591		591				1,177	391	637
Maximum exceeded in 50% of the years	936		936				1,621	668	876
Maximum exceeded in 40% of the years	1,344		1,344				1,797	1,160	1,322
Maximum exceeded in 30% of the years	2,169		2,169				2,330	1,931	1,744
Maximum exceeded in 20% of the years	3,533		3,533				7,263	3,453	3,423
Maximum exceeded in 10% of the years	6,035		6,035				9,887	3,630	5,918
Maximum	20,433		20,433				20,433	4,137	13,184
7-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	114		114				114	167	291
Maximum exceeded in 90% of the years	220		220				172	183	319
Maximum exceeded in 80% of the years	304		304				291	220	369
Maximum exceeded in 70% of the years	356		356				304	254	403
Maximum exceeded in 60% of the years	490		490				711	349	566
Maximum exceeded in 50% of the years	744		744				1,005	576	770
Maximum exceeded in 40% of the years	893		893				1,353	830	829
Maximum exceeded in 30% of the years	1,353		1,353				1,519	1,330	1,125
Maximum exceeded in 20% of the years	2,311		2,311				3,341	2,194	2,347
Maximum exceeded in 10% of the years	3,419		3,419				4,574	2,317	4,019
Maximum	13,339		13,339				13,339	2,399	9,321
15-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	103		103				103	160	274
Maximum exceeded in 90% of the years	209		209				132	176	294
Maximum exceeded in 80% of the years	274		274				209	213	329
Maximum exceeded in 70% of the years	331		331				273	245	369
Maximum exceeded in 60% of the years	459		459				508	331	500
Maximum exceeded in 50% of the years	515		515				572	425	556
Maximum exceeded in 40% of the years	675		675				780	515	686
Maximum exceeded in 30% of the years	866		866				866	924	786
Maximum exceeded in 20% of the years	1,477		1,477				2,528	1,297	1,448
Maximum exceeded in 10% of the years	2,136		2,136				2,636	1,502	2,082
Maximum	7,051		7,051				7,051	1,909	5,869
30-day Average Flows	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	91		91				91	154	267
Maximum exceeded in 90% of the years	171		171				106	162	272
Maximum exceeded in 80% of the years	267		267				171	210	286
Maximum exceeded in 70% of the years	284		284				231	228	328
Maximum exceeded in 60% of the years	358		358				358	284	426
Maximum exceeded in 50% of the years	449		449				413	350	476
Maximum exceeded in 40% of the years	513		513				463	500	589
Maximum exceeded in 30% of the years	647		647				513	752	662
Maximum exceeded in 20% of the years	962		962				1,407	895	969
Maximum exceeded in 10% of the years	1,407		1,407				1,463	1,001	1,391
Maximum	3,713		3,713				3,713	1,372	3,164

Table A.16-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Salt Creek near Ashland, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	737		737				1,000	737	1,066
Maximum exceeded in 90% of the years	1,220		1,220				1,890	1,777	1,242
Maximum exceeded in 80% of the years	2,620		2,620				3,500	3,420	1,613
Maximum exceeded in 70% of the years	4,757		4,757				7,040	4,090	5,200
Maximum exceeded in 60% of the years	6,088		6,088				7,620	5,223	6,868
Maximum exceeded in 50% of the years	7,166		7,166				8,270	5,828	7,726
Maximum exceeded in 40% of the years	11,214		11,214				12,500	6,421	10,748
Maximum exceeded in 30% of the years	12,718		12,718				14,200	15,200	11,884
Maximum exceeded in 20% of the years	15,261		15,261				14,500	16,600	13,203
Maximum exceeded in 10% of the years	18,800		18,800				15,700	20,150	17,498
Maximum	51,000		51,000				39,500	51,000	49,478
3-day Average Flows									
Maximum exceeded in 100% of the years	525		525				700	525	714
Maximum exceeded in 90% of the years	867		867				1,097	1,180	881
Maximum exceeded in 80% of the years	1,718		1,718				2,990	1,867	1,449
Maximum exceeded in 70% of the years	2,990		2,990				4,070	2,440	2,981
Maximum exceeded in 60% of the years	3,407		3,407				4,113	3,253	3,585
Maximum exceeded in 50% of the years	4,371		4,371				5,577	3,337	4,655
Maximum exceeded in 40% of the years	5,760		5,760				7,387	4,481	5,650
Maximum exceeded in 30% of the years	8,254		8,254				8,653	10,203	6,325
Maximum exceeded in 20% of the years	10,078		10,078				9,880	11,150	8,859
Maximum exceeded in 10% of the years	13,267		13,267				11,107	14,417	10,590
Maximum	27,333		27,333				26,233	27,333	26,223
7-day Average Flows									
Maximum exceeded in 100% of the years	369		369				475	369	526
Maximum exceeded in 90% of the years	675		675				690	656	677
Maximum exceeded in 80% of the years	961		961				1,563	961	902
Maximum exceeded in 70% of the years	1,563		1,563				1,953	1,601	1,537
Maximum exceeded in 60% of the years	1,954		1,954				2,508	1,857	2,014
Maximum exceeded in 50% of the years	2,563		2,563				2,638	2,003	2,641
Maximum exceeded in 40% of the years	3,368		3,368				3,409	2,572	3,321
Maximum exceeded in 30% of the years	4,243		4,243				4,243	5,198	3,734
Maximum exceeded in 20% of the years	5,559		5,559				5,000	5,981	5,296
Maximum exceeded in 10% of the years	8,975		8,975				5,143	10,084	6,247
Maximum	16,349		16,349				12,921	12,611	16,349
15-day Average Flows									
Maximum exceeded in 100% of the years	245		245				346	245	405
Maximum exceeded in 90% of the years	435		435				435	431	523
Maximum exceeded in 80% of the years	661		661				882	707	659
Maximum exceeded in 70% of the years	1,045		1,045				1,289	1,225	852
Maximum exceeded in 60% of the years	1,289		1,289				1,353	1,337	1,235
Maximum exceeded in 50% of the years	1,474		1,474				1,735	1,360	1,556
Maximum exceeded in 40% of the years	2,176		2,176				2,071	1,583	2,252
Maximum exceeded in 30% of the years	2,709		2,709				2,274	3,073	2,757
Maximum exceeded in 20% of the years	3,701		3,701				2,532	3,701	3,911
Maximum exceeded in 10% of the years	4,687		4,687				2,709	5,889	4,164
Maximum	9,559		9,559				7,999	7,822	9,559
30-day Average Flows									
Maximum exceeded in 100% of the years	209		209				291	209	349
Maximum exceeded in 90% of the years	381		381				320	396	396
Maximum exceeded in 80% of the years	509		509				549	509	524
Maximum exceeded in 70% of the years	706		706				770	825	677
Maximum exceeded in 60% of the years	829		829				826	910	796
Maximum exceeded in 50% of the years	1,048		1,048				1,048	1,031	1,183
Maximum exceeded in 40% of the years	1,514		1,514				1,313	1,513	1,625
Maximum exceeded in 30% of the years	1,823		1,823				1,739	2,009	2,052
Maximum exceeded in 20% of the years	2,661		2,661				1,788	2,740	2,915
Maximum exceeded in 10% of the years	3,406		3,406				2,364	3,155	3,470
Maximum	6,705		6,705				5,497	4,807	6,705

Table A.16-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Salt Creek near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	541		541				830	617	541
Maximum exceeded in 90% of the years	830		830				1,970	730	1,133
Maximum exceeded in 80% of the years	1,970		1,970				3,500	800	4,019
Maximum exceeded in 70% of the years	3,020		3,020				7,040	1,618	5,943
Maximum exceeded in 60% of the years	6,075		6,075				7,620	2,620	7,180
Maximum exceeded in 50% of the years	7,620		7,620				8,270	2,863	8,005
Maximum exceeded in 40% of the years	10,641		10,641				11,000	3,800	10,290
Maximum exceeded in 30% of the years	14,100		14,100				14,200	14,200	11,356
Maximum exceeded in 20% of the years	15,700		15,700				14,500	16,600	17,764
Maximum exceeded in 10% of the years	31,904		31,904				15,700	20,150	39,919
Maximum	51,000		51,000				39,500	51,000	49,478
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	406		406				611	525	406
Maximum exceeded in 90% of the years	642		642				1,244	584	854
Maximum exceeded in 80% of the years	1,244		1,244				2,990	676	2,574
Maximum exceeded in 70% of the years	2,236		2,236				3,770	1,078	3,113
Maximum exceeded in 60% of the years	3,125		3,125				4,113	1,718	3,663
Maximum exceeded in 50% of the years	4,113		4,113				5,577	1,840	4,658
Maximum exceeded in 40% of the years	5,577		5,577				7,510	2,593	5,302
Maximum exceeded in 30% of the years	8,254		8,254				8,653	8,277	6,896
Maximum exceeded in 20% of the years	10,810		10,810				9,880	11,150	9,732
Maximum exceeded in 10% of the years	15,567		15,567				11,107	14,417	16,805
Maximum	41,845		41,845				26,233	27,333	41,845
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	318		318				376	369	318
Maximum exceeded in 90% of the years	469		469				744	428	575
Maximum exceeded in 80% of the years	744		744				1,563	508	1,524
Maximum exceeded in 70% of the years	1,410		1,410				1,953	666	1,734
Maximum exceeded in 60% of the years	1,745		1,745				2,508	877	2,189
Maximum exceeded in 50% of the years	2,638		2,638				2,638	1,036	2,796
Maximum exceeded in 40% of the years	3,152		3,152				4,043	1,410	3,148
Maximum exceeded in 30% of the years	4,243		4,243				4,243	4,047	3,876
Maximum exceeded in 20% of the years	5,165		5,165				5,000	5,981	5,231
Maximum exceeded in 10% of the years	10,003		10,003				5,165	10,084	8,162
Maximum	23,233		23,233				12,921	12,611	23,233
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	260		260				260	296	273
Maximum exceeded in 90% of the years	357		357				672	365	417
Maximum exceeded in 80% of the years	557		557				882	428	849
Maximum exceeded in 70% of the years	843		843				1,289	492	1,056
Maximum exceeded in 60% of the years	1,079		1,079				1,353	586	1,483
Maximum exceeded in 50% of the years	1,521		1,521				2,046	742	1,617
Maximum exceeded in 40% of the years	2,046		2,046				2,071	1,079	2,122
Maximum exceeded in 30% of the years	2,289		2,289				2,274	2,267	2,352
Maximum exceeded in 20% of the years	3,357		3,357				2,709	3,357	3,524
Maximum exceeded in 10% of the years	5,662		5,662				4,093	5,889	4,513
Maximum	12,821		12,821				7,999	7,822	12,821
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	213		213				213	247	232
Maximum exceeded in 90% of the years	309		309				450	300	364
Maximum exceeded in 80% of the years	450		450				555	369	658
Maximum exceeded in 70% of the years	586		586				770	418	824
Maximum exceeded in 60% of the years	770		770				796	482	958
Maximum exceeded in 50% of the years	1,029		1,029				1,213	548	1,228
Maximum exceeded in 40% of the years	1,419		1,419				1,788	686	1,511
Maximum exceeded in 30% of the years	1,699		1,699				1,814	1,342	1,681
Maximum exceeded in 20% of the years	2,364		2,364				2,364	2,269	2,140
Maximum exceeded in 10% of the years	3,189		3,189				3,523	3,143	2,954
Maximum	7,683		7,683				5,484	4,807	7,683

Table A.16-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

Salt Creek near Ashland, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	362		362				679	752	362
Maximum exceeded in 90% of the years	701		701				795	938	574
Maximum exceeded in 80% of the years	938		938				1,970	1,040	810
Maximum exceeded in 70% of the years	1,610		1,610				2,550	1,366	1,122
Maximum exceeded in 60% of the years	2,400		2,400				3,750	1,670	2,925
Maximum exceeded in 50% of the years	3,020		3,020				3,840	2,100	4,896
Maximum exceeded in 40% of the years	4,010		4,010				4,010	2,400	7,119
Maximum exceeded in 30% of the years	6,381		6,381				4,410	3,330	11,057
Maximum exceeded in 20% of the years	10,854		10,854				5,530	5,316	23,809
Maximum exceeded in 10% of the years	21,519		21,519				11,000	6,620	29,214
Maximum	46,682		46,682				12,600	14,100	46,682
3-day Average Flows									
Maximum exceeded in 100% of the years	276		276				348	478	276
Maximum exceeded in 90% of the years	437		437				407	692	435
Maximum exceeded in 80% of the years	660		660				1,337	771	567
Maximum exceeded in 70% of the years	918		918				1,653	794	892
Maximum exceeded in 60% of the years	1,406		1,406				2,403	1,000	1,903
Maximum exceeded in 50% of the years	2,271		2,271				2,617	1,221	2,798
Maximum exceeded in 40% of the years	2,684		2,684				2,684	1,413	4,142
Maximum exceeded in 30% of the years	4,232		4,232				2,827	2,290	5,545
Maximum exceeded in 20% of the years	5,960		5,960				3,680	4,371	10,687
Maximum exceeded in 10% of the years	9,013		9,013				7,510	5,207	14,525
Maximum	41,845		41,845				8,613	6,897	41,845
7-day Average Flows									
Maximum exceeded in 100% of the years	201		201				201	342	256
Maximum exceeded in 90% of the years	361		361				243	453	362
Maximum exceeded in 80% of the years	489		489				927	508	469
Maximum exceeded in 70% of the years	578		578				1,092	515	645
Maximum exceeded in 60% of the years	909		909				1,119	563	999
Maximum exceeded in 50% of the years	1,119		1,119				1,539	707	1,639
Maximum exceeded in 40% of the years	1,637		1,637				1,637	815	2,634
Maximum exceeded in 30% of the years	2,674		2,674				1,739	1,211	3,271
Maximum exceeded in 20% of the years	3,379		3,379				1,916	2,726	5,194
Maximum exceeded in 10% of the years	4,716		4,716				4,043	3,263	7,116
Maximum	23,233		23,233				4,091	3,579	23,233
15-day Average Flows									
Maximum exceeded in 100% of the years	131		131				131	280	231
Maximum exceeded in 90% of the years	326		326				182	343	335
Maximum exceeded in 80% of the years	393		393				632	377	403
Maximum exceeded in 70% of the years	460		460				708	393	547
Maximum exceeded in 60% of the years	592		592				810	424	691
Maximum exceeded in 50% of the years	797		797				841	483	1,102
Maximum exceeded in 40% of the years	947		947				947	529	1,427
Maximum exceeded in 30% of the years	1,423		1,423				1,041	748	1,926
Maximum exceeded in 20% of the years	1,885		1,885				1,398	1,423	2,616
Maximum exceeded in 10% of the years	2,916		2,916				2,046	1,747	3,782
Maximum	12,420		12,420				2,977	2,471	12,420
30-day Average Flows									
Maximum exceeded in 100% of the years	93		93				93	265	226
Maximum exceeded in 90% of the years	278		278				167	282	302
Maximum exceeded in 80% of the years	322		322				504	287	359
Maximum exceeded in 70% of the years	366		366				518	313	423
Maximum exceeded in 60% of the years	471		471				590	330	537
Maximum exceeded in 50% of the years	534		534				604	361	767
Maximum exceeded in 40% of the years	756		756				756	406	937
Maximum exceeded in 30% of the years	937		937				788	496	1,184
Maximum exceeded in 20% of the years	1,158		1,158				985	872	1,639
Maximum exceeded in 10% of the years	1,757		1,757				1,481	1,048	2,152
Maximum	6,866		6,866				2,450	1,757	6,866

maximum flows occurred in the 1942-1958 time interval. A review of the climate records for Lincoln (Nebraska, [2004](#)) showed that, during this time interval, there were frequent occurrences of above-normal monthly precipitation in February and March. In most of these months, most of the precipitation fell as rain. Februaries and Marches with high rainfall were less frequent during the 1959-1974 time interval. During the 1959-1974 time interval, the reservoirs around Lincoln became operational, and this might have suppressed the maximum flow values. Flow values increased from the 1959-1974 time interval to the 1975-1998 time interval for almost all exceedance probabilities and averaging times. This can be attributed at least in part to a generally wetter climate regime during the 1975-1998 time interval, and is coincident with increases in the import of water from outside of the Salt Creek basin.

Table A.16-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.16-7** shows flow characterizations that are similar to those for annual data, including similar irregularities. There is a difference, however. For all averaging times, the distribution of flow values is consistent with known long-term climate conditions which existed elsewhere in the greater Platte River basin for 30 percent and lower exceedance probabilities (higher flows). This suggests that the flashy nature of the basin is the predominant factor influencing the characterizations for lower maximum flows, whereas the magnitude of the higher flow events was affected by larger-scale, longer-term conditions such as the drought period of the 1950's. Flow values increased from the 1959-1974 time interval to the 1975-1998 time interval for most exceedance probabilities and all averaging times. This can be attributed at least in part to a generally wetter climate regime during the 1975-1998 time interval, and is coincident with increases in the import of water from outside of the Salt Creek basin.

Table A.16-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.16-8** shows flow characterizations for this seasonal period that are similar to those for the Apr 16-Jul 15 seasonal period, including similar irregularities. However, the trend toward consistency with known long-term climate conditions by time interval for the lower exceedance probabilities (higher flows) is less well-defined. The Jun 1-Aug 15 seasonal period is characterized by decreasing average precipitation with time and a greater percentage of this precipitation falling as intense, short-duration convective events (NOAA, 2005). Thus, the flashy nature of the basin would be more evident in this seasonal period than for the Apr 16-Jun 15 seasonal period, which has the greatest average precipitation of the 4 seasonal periods considered. Flow values increased from the 1959-1974 time interval to the 1975-1998 time interval for most exceedance probabilities and all averaging times. This can be attributed at least in part to a generally wetter climate regime during the 1975-1998 time interval, and is coincident with increases in the import of water from outside of the Salt Creek basin.

Table A.16-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.16-9** shows that the highest flow values occurred in the 1975-1998 time interval for exceedance probabilities of 50 percent

and lower (higher flows). This can be attributed at least in part to a generally wetter climate regime during the 1975-1998 time interval. Otherwise, the flow values are highest in the 1942-1958 time interval, although the differences decrease with increasing averaging time, indicating that this is the result of infrequent short-duration excessive runoff events. Changes that might be related to the import of water from outside of the Salt Creek basin are not as evident for this seasonal period as they are for the earlier seasonal periods.

A.16.4.3 Mean Flow Exceedance

Table A.16-10 through **Table A.16-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.16-10 shows the exceedance probabilities and values of flows for annual data. **Table A.16-10** shows that, when all flows are considered, the flows are generally consistent with known long-term climatic conditions. There is some possible effect on flow values in the 1975-1998 time interval as a result of increases in the import of water from outside of the Salt Creek basin.

Table A.16-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.16-11** shows that, when all flows are considered, they are generally consistent with known climatic conditions. There are some effects of the extreme rainfall events in this seasonal period of the 1942-1958 time interval, as discussed in connection with **Table A.16-6** in **Section A.16.4.2**. Also, there is some possible effect on flow values in the 1975-1998 time interval as a result of increases in the import of water from outside of the Salt Creek basin.

Table A.16-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.16-12** shows that, when all flows are considered, the flows are generally consistent with known long-term climatic conditions. There is some possible effect on flow values in the 1975-1998 time interval as a result of increases in the import of water from outside of the Salt Creek basin.

Table A.16-13 shows the exceedance probabilities and values of flows for the Jun 1-Aug 15 seasonal period. **Table A.16-13** shows that, when all flows are considered, the flows are generally consistent with known long-term climatic conditions for the higher exceedance probabilities (lower flows). However, for the lower exceedance probabilities (higher flows) and the longer averaging times, the flow values for the 1942-1958 time interval increase and become the highest flow values for all time intervals considered. A review of the daily flow data for this seasonal period of this time interval ([Nebraska DNR, 2004](#)) shows that there were frequent occurrences of short-duration moderately high flow events separated by

Table A.16-10 Exceedance Values Considering All Flows, Annual Data.

Salt Creek near Ashland, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	21		21				21	35	149
Flow exceeded for 90% of the days	123		123				76	140	210
Flow exceeded for 80% of the days	170		170				95	165	235
Flow exceeded for 70% of the days	203		203				108	189	259
Flow exceeded for 60% of the days	230		230				120	209	288
Flow exceeded for 50% of the days	260		260				140	226	327
Flow exceeded for 40% of the days	306		306				170	251	379
Flow exceeded for 30% of the days	380		380				217	314	460
Flow exceeded for 20% of the days	515		515				309	460	597
Flow exceeded for 10% of the days	900		900				663	800	1,055
Maximum	51,000		51,000				39,500	51,000	49,478
3-day Average Flows									
Flow exceeded for 100% of the days	30		30				30	37	152
Flow exceeded for 90% of the days	125		125				78	143	213
Flow exceeded for 80% of the days	173		173				96	166	239
Flow exceeded for 70% of the days	207		207				109	192	264
Flow exceeded for 60% of the days	235		235				125	212	292
Flow exceeded for 50% of the days	267		267				147	231	336
Flow exceeded for 40% of the days	317		317				179	262	386
Flow exceeded for 30% of the days	398		398				232	333	477
Flow exceeded for 20% of the days	545		545				361	490	628
Flow exceeded for 10% of the days	984		984				809	849	1,169
Maximum	41,845		41,845				26,233	27,333	41,845
7-day Average Flows									
Flow exceeded for 100% of the days	40		40				44	40	155
Flow exceeded for 90% of the days	130		130				80	147	217
Flow exceeded for 80% of the days	180		180				100	173	244
Flow exceeded for 70% of the days	215		215				114	199	270
Flow exceeded for 60% of the days	243		243				131	219	301
Flow exceeded for 50% of the days	278		278				155	240	347
Flow exceeded for 40% of the days	337		337				198	280	398
Flow exceeded for 30% of the days	420		420				259	362	499
Flow exceeded for 20% of the days	589		589				426	523	672
Flow exceeded for 10% of the days	1,100		1,100				954	947	1,292
Maximum	23,233		23,233				13,339	13,000	23,233
15-day Average Flows									
Flow exceeded for 100% of the days	50		50				50	55	157
Flow exceeded for 90% of the days	139		139				85	151	222
Flow exceeded for 80% of the days	191		191				105	182	250
Flow exceeded for 70% of the days	224		224				122	208	277
Flow exceeded for 60% of the days	256		256				144	228	312
Flow exceeded for 50% of the days	295		295				173	255	356
Flow exceeded for 40% of the days	355		355				225	301	425
Flow exceeded for 30% of the days	463		463				316	404	539
Flow exceeded for 20% of the days	652		652				526	562	766
Flow exceeded for 10% of the days	1,247		1,247				1,123	1,059	1,430
Maximum	12,821		12,821				7,999	7,822	12,821
30-day Average Flows									
Flow exceeded for 100% of the days	53		53				53	93	164
Flow exceeded for 90% of the days	146		146				90	157	228
Flow exceeded for 80% of the days	203		203				109	188	256
Flow exceeded for 70% of the days	236		236				132	215	286
Flow exceeded for 60% of the days	270		270				158	241	326
Flow exceeded for 50% of the days	315		315				203	276	377
Flow exceeded for 40% of the days	384		384				264	331	457
Flow exceeded for 30% of the days	506		506				368	456	579
Flow exceeded for 20% of the days	718		718				584	632	826
Flow exceeded for 10% of the days	1,328		1,328				1,066	1,048	1,500
Maximum	7,683		7,683				5,497	4,807	7,683

Table A.16-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Salt Creek near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	25		25				25	102	190
Flow exceeded for 90% of the days	153		153				94	154	247
Flow exceeded for 80% of the days	206		206				108	170	270
Flow exceeded for 70% of the days	243		243				150	210	310
Flow exceeded for 60% of the days	272		272				183	231	350
Flow exceeded for 50% of the days	322		322				212	254	404
Flow exceeded for 40% of the days	400		400				250	317	450
Flow exceeded for 30% of the days	475		475				316	451	504
Flow exceeded for 20% of the days	607		607				453	632	631
Flow exceeded for 10% of the days	1,034		1,034				1,195	1,034	987
Maximum	28,709		28,709				23,500	7,000	28,709
3-day Average Flows									
Flow exceeded for 100% of the days	44		44				44	108	200
Flow exceeded for 90% of the days	155		155				93	155	250
Flow exceeded for 80% of the days	211		211				113	170	276
Flow exceeded for 70% of the days	246		246				152	210	312
Flow exceeded for 60% of the days	276		276				194	233	353
Flow exceeded for 50% of the days	332		332				228	262	407
Flow exceeded for 40% of the days	404		404				258	334	455
Flow exceeded for 30% of the days	485		485				356	463	505
Flow exceeded for 20% of the days	655		655				555	665	663
Flow exceeded for 10% of the days	1,250		1,250				1,570	1,209	1,178
Maximum	20,433		20,433				20,433	4,137	13,184
7-day Average Flows									
Flow exceeded for 100% of the days	68		68				68	118	206
Flow exceeded for 90% of the days	162		162				95	159	254
Flow exceeded for 80% of the days	223		223				127	177	282
Flow exceeded for 70% of the days	251		251				169	218	311
Flow exceeded for 60% of the days	284		284				213	239	357
Flow exceeded for 50% of the days	339		339				250	261	414
Flow exceeded for 40% of the days	424		424				284	354	465
Flow exceeded for 30% of the days	537		537				447	557	542
Flow exceeded for 20% of the days	740		740				880	698	724
Flow exceeded for 10% of the days	1,328		1,328				2,307	1,195	1,140
Maximum	13,339		13,339				13,339	2,399	9,321
15-day Average Flows									
Flow exceeded for 100% of the days	91		91				91	143	225
Flow exceeded for 90% of the days	172		172				109	160	259
Flow exceeded for 80% of the days	236		236				132	197	279
Flow exceeded for 70% of the days	267		267				203	215	313
Flow exceeded for 60% of the days	302		302				250	240	364
Flow exceeded for 50% of the days	379		379				290	308	438
Flow exceeded for 40% of the days	495		495				579	428	500
Flow exceeded for 30% of the days	628		628				783	584	572
Flow exceeded for 20% of the days	855		855				1,683	765	774
Flow exceeded for 10% of the days	1,550		1,550				2,514	1,310	1,277
Maximum	7,051		7,051				7,051	1,909	5,869
30-day Average Flows									
Flow exceeded for 100% of the days	91		91				91	154	267
Flow exceeded for 90% of the days	171		171				106	162	272
Flow exceeded for 80% of the days	267		267				171	210	286
Flow exceeded for 70% of the days	284		284				231	228	328
Flow exceeded for 60% of the days	358		358				358	284	426
Flow exceeded for 50% of the days	449		449				413	350	476
Flow exceeded for 40% of the days	513		513				463	500	589
Flow exceeded for 30% of the days	647		647				513	752	662
Flow exceeded for 20% of the days	962		962				1,407	895	969
Flow exceeded for 10% of the days	1,407		1,407				1,463	1,001	1,391
Maximum	3,713		3,713				3,713	1,372	3,164

Table A.16-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Salt Creek near Ashland, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	48		48				48	102	151
Flow exceeded for 90% of the days	149		149				95	167	229
Flow exceeded for 80% of the days	200		200				110	200	260
Flow exceeded for 70% of the days	240		240				127	225	300
Flow exceeded for 60% of the days	279		279				154	256	362
Flow exceeded for 50% of the days	336		336				184	300	463
Flow exceeded for 40% of the days	448		448				242	368	570
Flow exceeded for 30% of the days	596		596				346	493	757
Flow exceeded for 20% of the days	872		872				556	698	1,075
Flow exceeded for 10% of the days	1,668		1,668				1,310	1,403	1,957
Maximum	51,000		51,000				39,500	51,000	49,478
3-day Average Flows									
Flow exceeded for 100% of the days	53		53				53	104	152
Flow exceeded for 90% of the days	154		154				99	170	232
Flow exceeded for 80% of the days	210		210				115	209	268
Flow exceeded for 70% of the days	249		249				137	237	312
Flow exceeded for 60% of the days	294		294				165	265	379
Flow exceeded for 50% of the days	366		366				209	317	491
Flow exceeded for 40% of the days	493		493				274	404	612
Flow exceeded for 30% of the days	655		655				455	537	803
Flow exceeded for 20% of the days	966		966				698	811	1,174
Flow exceeded for 10% of the days	1,964		1,964				1,701	1,579	2,309
Maximum	27,333		27,333				26,233	27,333	26,223
7-day Average Flows									
Flow exceeded for 100% of the days	64		64				64	105	155
Flow exceeded for 90% of the days	168		168				109	178	241
Flow exceeded for 80% of the days	224		224				129	217	280
Flow exceeded for 70% of the days	269		269				157	248	334
Flow exceeded for 60% of the days	328		328				194	299	402
Flow exceeded for 50% of the days	408		408				261	368	514
Flow exceeded for 40% of the days	532		532				346	475	666
Flow exceeded for 30% of the days	744		744				494	621	892
Flow exceeded for 20% of the days	1,121		1,121				890	932	1,392
Flow exceeded for 10% of the days	2,086		2,086				1,926	1,696	2,379
Maximum	16,349		16,349				12,921	12,611	16,349
15-day Average Flows									
Flow exceeded for 100% of the days	76		76				76	114	169
Flow exceeded for 90% of the days	191		191				124	188	249
Flow exceeded for 80% of the days	245		245				149	239	306
Flow exceeded for 70% of the days	299		299				198	281	357
Flow exceeded for 60% of the days	367		367				243	372	433
Flow exceeded for 50% of the days	468		468				293	446	588
Flow exceeded for 40% of the days	633		633				393	552	736
Flow exceeded for 30% of the days	851		851				668	736	1,053
Flow exceeded for 20% of the days	1,371		1,371				1,254	1,083	1,615
Flow exceeded for 10% of the days	2,263		2,263				1,949	2,300	2,407
Maximum	9,559		9,559				7,999	7,822	9,559
30-day Average Flows									
Flow exceeded for 100% of the days	105		105				105	132	189
Flow exceeded for 90% of the days	203		203				140	209	283
Flow exceeded for 80% of the days	277		277				181	278	328
Flow exceeded for 70% of the days	342		342				209	357	378
Flow exceeded for 60% of the days	434		434				261	461	489
Flow exceeded for 50% of the days	548		548				325	545	588
Flow exceeded for 40% of the days	736		736				583	662	864
Flow exceeded for 30% of the days	1,030		1,030				794	971	1,256
Flow exceeded for 20% of the days	1,492		1,492				1,154	1,505	1,638
Flow exceeded for 10% of the days	2,410		2,410				1,583	2,327	2,627
Maximum	6,705		6,705				5,497	4,807	6,705

Table A.16-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Salt Creek near Ashland, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	44		44				44	108	151
Flow exceeded for 90% of the days	139		139				81	157	207
Flow exceeded for 80% of the days	193		193				101	190	243
Flow exceeded for 70% of the days	222		222				117	211	278
Flow exceeded for 60% of the days	259		259				140	233	322
Flow exceeded for 50% of the days	307		307				193	265	378
Flow exceeded for 40% of the days	369		369				257	306	462
Flow exceeded for 30% of the days	482		482				398	368	588
Flow exceeded for 20% of the days	706		706				707	508	837
Flow exceeded for 10% of the days	1,411		1,411				1,845	979	1,561
Maximum	51,000		51,000				39,500	51,000	49,478
3-day Average Flows									
Flow exceeded for 100% of the days	48		48				48	109	152
Flow exceeded for 90% of the days	147		147				86	161	210
Flow exceeded for 80% of the days	200		200				106	198	249
Flow exceeded for 70% of the days	237		237				128	220	284
Flow exceeded for 60% of the days	271		271				160	246	334
Flow exceeded for 50% of the days	324		324				226	280	389
Flow exceeded for 40% of the days	396		396				310	324	493
Flow exceeded for 30% of the days	529		529				490	395	629
Flow exceeded for 20% of the days	782		782				845	532	886
Flow exceeded for 10% of the days	1,691		1,691				2,227	1,137	1,956
Maximum	41,845		41,845				26,233	27,333	41,845
7-day Average Flows									
Flow exceeded for 100% of the days	55		55				55	112	155
Flow exceeded for 90% of the days	166		166				96	174	213
Flow exceeded for 80% of the days	212		212				121	209	256
Flow exceeded for 70% of the days	251		251				149	236	301
Flow exceeded for 60% of the days	298		298				210	262	355
Flow exceeded for 50% of the days	353		353				281	308	417
Flow exceeded for 40% of the days	437		437				373	354	530
Flow exceeded for 30% of the days	597		597				631	436	692
Flow exceeded for 20% of the days	921		921				1,268	621	1,112
Flow exceeded for 10% of the days	1,953		1,953				2,511	1,104	2,055
Maximum	23,233		23,233				12,921	12,611	23,233
15-day Average Flows									
Flow exceeded for 100% of the days	74		74				74	114	169
Flow exceeded for 90% of the days	191		191				116	195	223
Flow exceeded for 80% of the days	229		229				151	223	272
Flow exceeded for 70% of the days	271		271				194	251	318
Flow exceeded for 60% of the days	319		319				245	290	381
Flow exceeded for 50% of the days	398		398				330	328	505
Flow exceeded for 40% of the days	524		524				483	403	629
Flow exceeded for 30% of the days	715		715				964	517	868
Flow exceeded for 20% of the days	1,224		1,224				1,493	699	1,358
Flow exceeded for 10% of the days	2,128		2,128				2,274	1,557	2,136
Maximum	12,821		12,821				7,999	7,822	12,821
30-day Average Flows									
Flow exceeded for 100% of the days	79		79				79	132	189
Flow exceeded for 90% of the days	208		208				155	203	234
Flow exceeded for 80% of the days	252		252				202	244	281
Flow exceeded for 70% of the days	305		305				256	271	372
Flow exceeded for 60% of the days	395		395				331	333	530
Flow exceeded for 50% of the days	522		522				543	377	602
Flow exceeded for 40% of the days	639		639				729	463	777
Flow exceeded for 30% of the days	858		858				1,039	560	1,023
Flow exceeded for 20% of the days	1,276		1,276				1,311	672	1,395
Flow exceeded for 10% of the days	1,891		1,891				2,145	1,939	1,850
Maximum	7,683		7,683				5,484	4,807	7,683

Table A.16-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

Salt Creek near Ashland, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	40		40				40	104	149
Flow exceeded for 90% of the days	128		128				65	150	197
Flow exceeded for 80% of the days	170		170				83	166	219
Flow exceeded for 70% of the days	197		197				101	185	250
Flow exceeded for 60% of the days	219		219				117	200	271
Flow exceeded for 50% of the days	251		251				142	215	302
Flow exceeded for 40% of the days	283		283				186	233	351
Flow exceeded for 30% of the days	344		344				260	265	416
Flow exceeded for 20% of the days	455		455				452	320	531
Flow exceeded for 10% of the days	795		795				982	512	884
Maximum	46,682		46,682				12,600	14,100	46,682
3-day Average Flows									
Flow exceeded for 100% of the days	44		44				44	110	153
Flow exceeded for 90% of the days	136		136				68	151	200
Flow exceeded for 80% of the days	179		179				86	173	224
Flow exceeded for 70% of the days	203		203				106	192	255
Flow exceeded for 60% of the days	229		229				127	205	276
Flow exceeded for 50% of the days	262		262				163	222	313
Flow exceeded for 40% of the days	303		303				211	246	363
Flow exceeded for 30% of the days	368		368				333	281	438
Flow exceeded for 20% of the days	495		495				562	338	566
Flow exceeded for 10% of the days	880		880				1,136	563	981
Maximum	41,845		41,845				8,613	6,897	41,845
7-day Average Flows									
Flow exceeded for 100% of the days	45		45				45	119	156
Flow exceeded for 90% of the days	149		149				71	157	205
Flow exceeded for 80% of the days	193		193				91	188	228
Flow exceeded for 70% of the days	216		216				122	203	265
Flow exceeded for 60% of the days	243		243				156	221	294
Flow exceeded for 50% of the days	278		278				205	238	332
Flow exceeded for 40% of the days	323		323				262	262	383
Flow exceeded for 30% of the days	394		394				474	305	482
Flow exceeded for 20% of the days	552		552				708	362	616
Flow exceeded for 10% of the days	956		956				1,183	542	1,057
Maximum	23,233		23,233				4,091	3,579	23,233
15-day Average Flows									
Flow exceeded for 100% of the days	50		50				50	146	157
Flow exceeded for 90% of the days	169		169				76	181	208
Flow exceeded for 80% of the days	207		207				119	205	236
Flow exceeded for 70% of the days	232		232				160	216	277
Flow exceeded for 60% of the days	267		267				202	236	307
Flow exceeded for 50% of the days	302		302				312	253	343
Flow exceeded for 40% of the days	353		353				438	279	425
Flow exceeded for 30% of the days	451		451				586	306	518
Flow exceeded for 20% of the days	606		606				731	368	701
Flow exceeded for 10% of the days	1,022		1,022				1,037	533	1,369
Maximum	12,420		12,420				2,977	2,471	12,420
30-day Average Flows									
Flow exceeded for 100% of the days	53		53				53	162	164
Flow exceeded for 90% of the days	199		199				78	202	216
Flow exceeded for 80% of the days	227		227				147	216	254
Flow exceeded for 70% of the days	257		257				263	233	288
Flow exceeded for 60% of the days	286		286				371	249	322
Flow exceeded for 50% of the days	324		324				446	266	373
Flow exceeded for 40% of the days	390		390				504	281	460
Flow exceeded for 30% of the days	495		495				595	310	559
Flow exceeded for 20% of the days	692		692				748	372	862
Flow exceeded for 10% of the days	1,045		1,045				897	556	1,591
Maximum	6,866		6,866				2,450	1,757	6,866

periods of very low flow of varying lengths. These might have occurred frequently enough to skew the flow values higher for the lower exceedance probabilities and longer averaging times. Such events were not as frequent (though some were much higher) in this seasonal period of the 1959-1974 and 1975-1998 time intervals. Also, base flows were higher for the two later time intervals. Also, there is some possible effect on flow values in the 1975-1998 time interval as a result of increases in the import of water from outside of the Salt Creek basin.

Table A.16-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.16-14** shows irregular flow variations by time interval and exceedance probability. It has previously been noted (**Section A.16.3**) that there were several very high flow maximums that occurred in this seasonal period during the 1975-1998 time interval, which would explain the high flow values for the lower exceedance probabilities (higher flows) for this time interval. Another interesting aspect of the flow values for this time interval is that they increase with increasing averaging time. This could be an effect of the reservoir system around Lincoln as well as increases in the import of water from outside of the Salt Creek basin. As for the 1942-1958 time interval, the conditions discussed in the preceding paragraph were also seen in this seasonal period of this time interval.

A.16.5 Median Mean Daily Flow

The Median mean daily flow by calendar day is shown on **Figure A.16-6**.

Figure A.16-6 reflects the effect of climate variation and human impacts by time interval. Evidence of the possible effect of the reservoirs is that, in **Figure A.16-6**, the time series plots for both the 1942-1958 and the 1959-1974 time intervals are somewhat irregular, whereas the plot for the 1975-1998 time interval is comparatively smoother. As with the timing of the Annual Maximum mean daily flow (**Figure A.16-3**), the seasonal concentrations of higher Median mean daily flow are less well-defined than those for the Elkhorn River at Waterloo and the Platte River near Ashland (**Figure A.14-6** and **Figure A.15-6**).

A.16.6 USGS Annual Peak Flow

Data are insufficient to develop meaningful characterizations of USGS Annual Peak flow for this location.

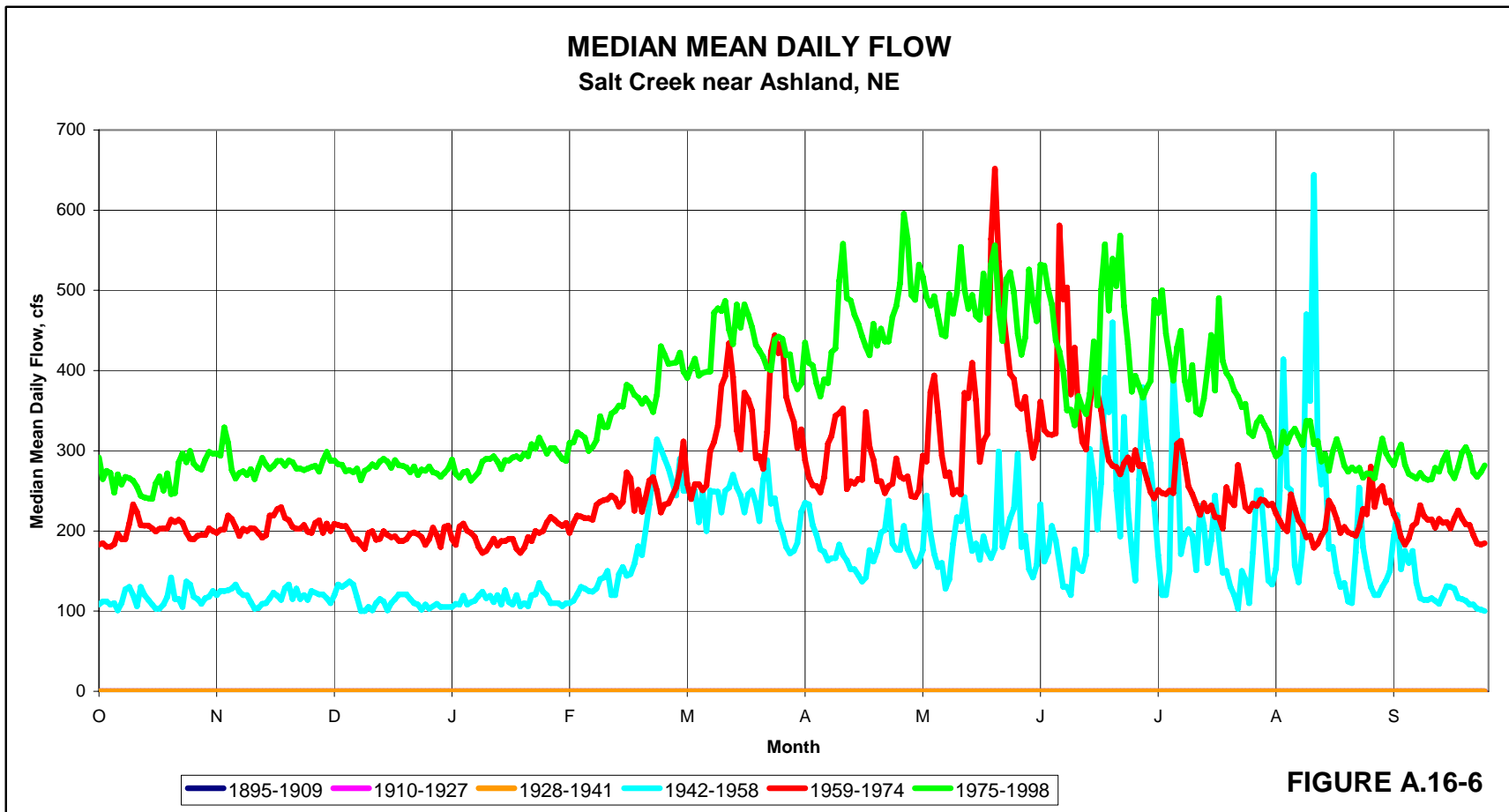


Figure A.16-6 Median Mean Daily Flow.

A.17 PLATTE RIVER AT LOUISVILLE, NEBRASKA

A.17.1 Methodology

The Platte River at Louisville has the shortest period of record of all locations considered in this report (1953 through 1998). For this location, the continuous streamflow record consisted of a single gage, as follows:

Gage	Records Used	Data Source
Platte River at Louisville, Nebraska	10/1/1953 – 12/31/1998	USGS website.

All North Platte reservoir projects except Glendo were built before the beginning of this period of record. Cherry Creek, Chatfield, and Bear Creek reservoirs in Denver and Sherman, Calamus, and Davis Creek reservoirs in the Loup River basin were built at various times before and during the period of record given above (**Table 2** of the main report). However, presumably these reservoirs are far enough upstream so as to have minimal effect on flow conditions at Louisville. Salt Creek accounts for about 8 percent of the average annual flow at Louisville based on the records evaluated for this study (**Section A.16**). The flow characterizations for the Platte River at Louisville are given in **Table A.17-1** (mean daily values), **Table A.17-2** (annual 3-, 7-, 15-, and 30-day running average values), **Table A.17-3** (seasonal 3-, 7-, 15-, and 30-day running average values), and **Table A.17-4** (flow frequencies).

A.17.2 Maximum and Minimum Mean Daily Flow and Annual Flow Volume

Table A.17-1 shows that seasonal and multi-year climatic effects appear to be the predominant influence on streamflows (climate data are shown in **Figures 3, 4, 5, and 8** of the main report). The 1942-1958 time interval (whose record actually begins on 10/1/1953, and which will be referred to as “the 1950’s time interval” elsewhere in this section) shows much lower values for all annual quantities than do the corresponding tables for the Platte River at Duncan, approximately 97 river miles upstream. This is most likely the result of the lack of data prior to 1953, which introduces a bias in favor of lower flows due to the drought conditions of the 1950’s and the absence of data from the 1940’s, when flows would likely have been relatively high by comparison. The changes in both the average and median Annual Maximum mean daily between the 1959-1974 time interval and the 1975-1978 time interval are not substantial, even though conditions during the latter time interval were considerably wetter.

Both **Figure A.17-1** (maximum flows) and **Figure A.17-2** (annual flow volume) suggest that climate is the predominant influence on streamflow at this location. All flow and volume quantities are lower in the 1950’s, and generally higher from the 1960’s through the end of the period of record except for a period of lower maximum flows and volumes in the mid-1970’s and lower volumes in the late 1980’s. These show up most clearly in the 10-year running averages, albeit with a delay due to the averaging process. Climate

records show that drought conditions occurred during the mid-1970's and late 1980's in the lower Platte River basin and other parts of the region, as discussed in **Section A.14-1**. For the higher annual maximums, there is a large difference between the Annual

Table A.17-1 Summary of Mean Daily Flow Values.

Platte River at Louisville, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	47,132		47,132				29,358	49,581	49,942
Median Annual Maximum Mean Daily Flow (cfs)	41,550		41,550				20,850	45,350	40,050
Average Annual Flow Volume (kaf)	5,023		5,023				2,733	4,524	5,929
Median Annual Flow Volume (kaf)	4,497		4,497				2,840	4,433	5,299
Average Mean Daily Flow (cfs)	6,985		6,985				4,126	6,249	8,190
Median Mean Daily Flow (cfs)	4,745		4,745				3,305	4,563	6,195
Average Number of Mean Daily Flow Measurements	360	0	360	0	0	0	325	365	365
Number of Years of Data	46 of 104	0 of 47	46 of 57	0 of 15	0 of 18	0 of 14	6 of 17	16 of 16	24 of 24
Average Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	21,644		21,644				19,716	15,351	26,242
Average Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	36,428		36,428				22,878	39,500	37,768
Average Jun1-Aug15 Maximum Mean Daily Flow (cfs)	36,023		36,023				24,183	38,759	37,159
Average Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	19,055		19,055				10,015	14,586	24,295
Median Feb 15-Mar 16 Maximum Mean Daily Flow (cfs)	15,600		15,600				10,100	12,350	19,500
Median Apr 16-Jul 15 Maximum Mean Daily Flow (cfs)	27,600		27,600				19,000	30,150	30,600
Median Jun1-Aug15 Maximum Mean Daily Flow (cfs)	27,100		27,100				20,500	35,000	26,200
Median Jul 16-Sep 30 Maximum Mean Daily Flow (cfs)	14,000		14,000				7,355	9,365	18,350
Difference ("Apr-Jul Average" - "Jul-Sep Average")	17,373		17,373				12,863	24,914	13,472
Difference ("Apr-Jul Median" - "Jul-Sep Median")	13,600		13,600				11,645	20,785	12,250
Average Occurrence of Maximum Mean Daily Flow	5/17		5/17				4/28	5/17	5/22
Median Occurrence of Maximum Mean Daily Flow	6/2		6/2				6/10	5/28	6/6
Average Annual Minimum Mean Daily Flow (cfs)	1,232		1,232				579	938	1,564
Median Annual Minimum Mean Daily Flow (cfs)	1,000		1,000				388	1,000	1,250
Average occurrences per year of the Minimum	1		1				1	1	1
Occuring between	9/9		9/9				9/14	9/21	8/31
and	9/10		9/10				9/15	9/22	9/1
Median occurrences per year of the Minimum	1		1				1	1	1
Occuring between	8/24		8/24				9/3	8/24	8/20
and	8/25		8/25				9/4	8/25	8/21

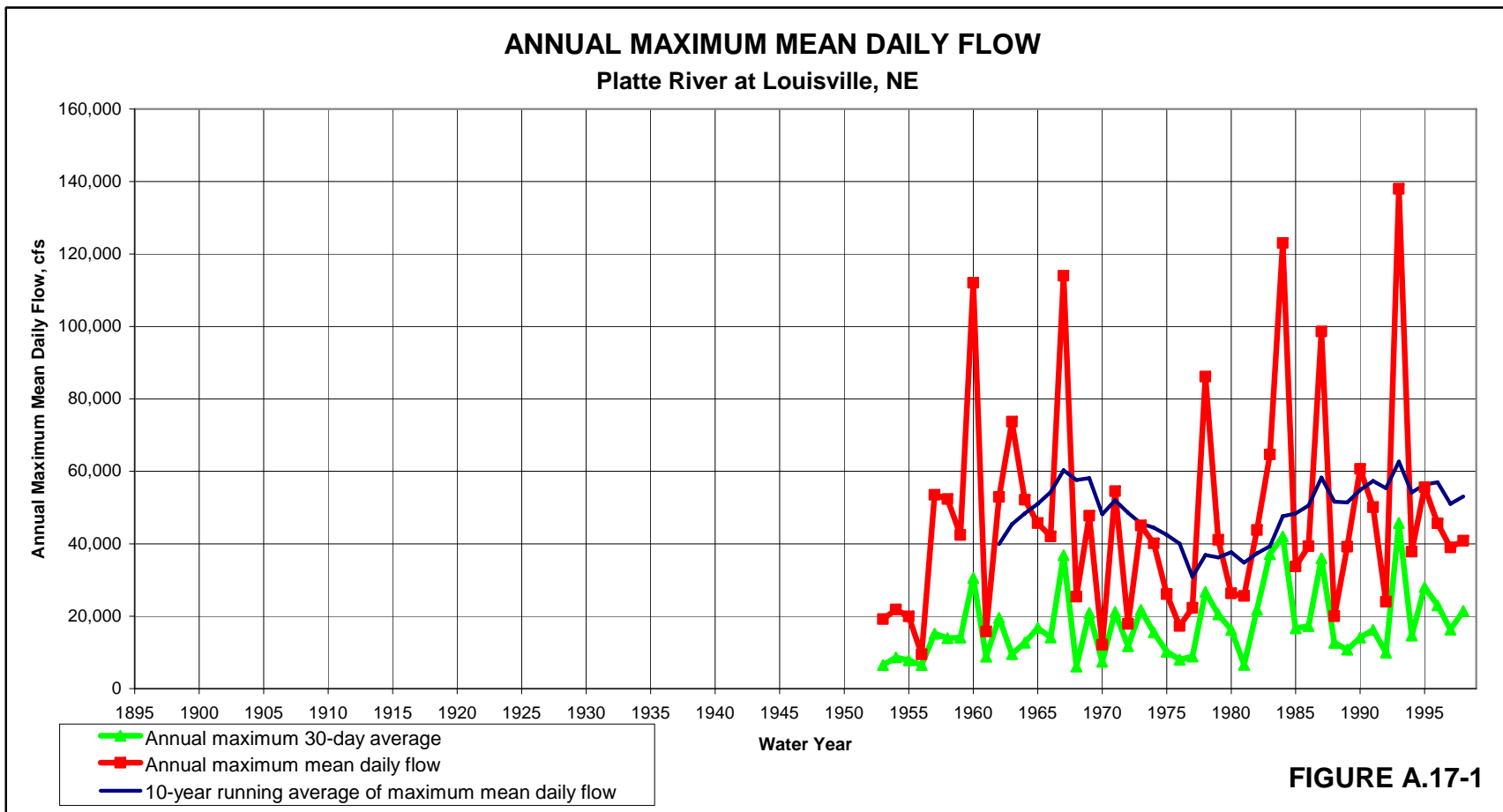


Figure A.17-1 Annual Maximum Mean Daily Flow.

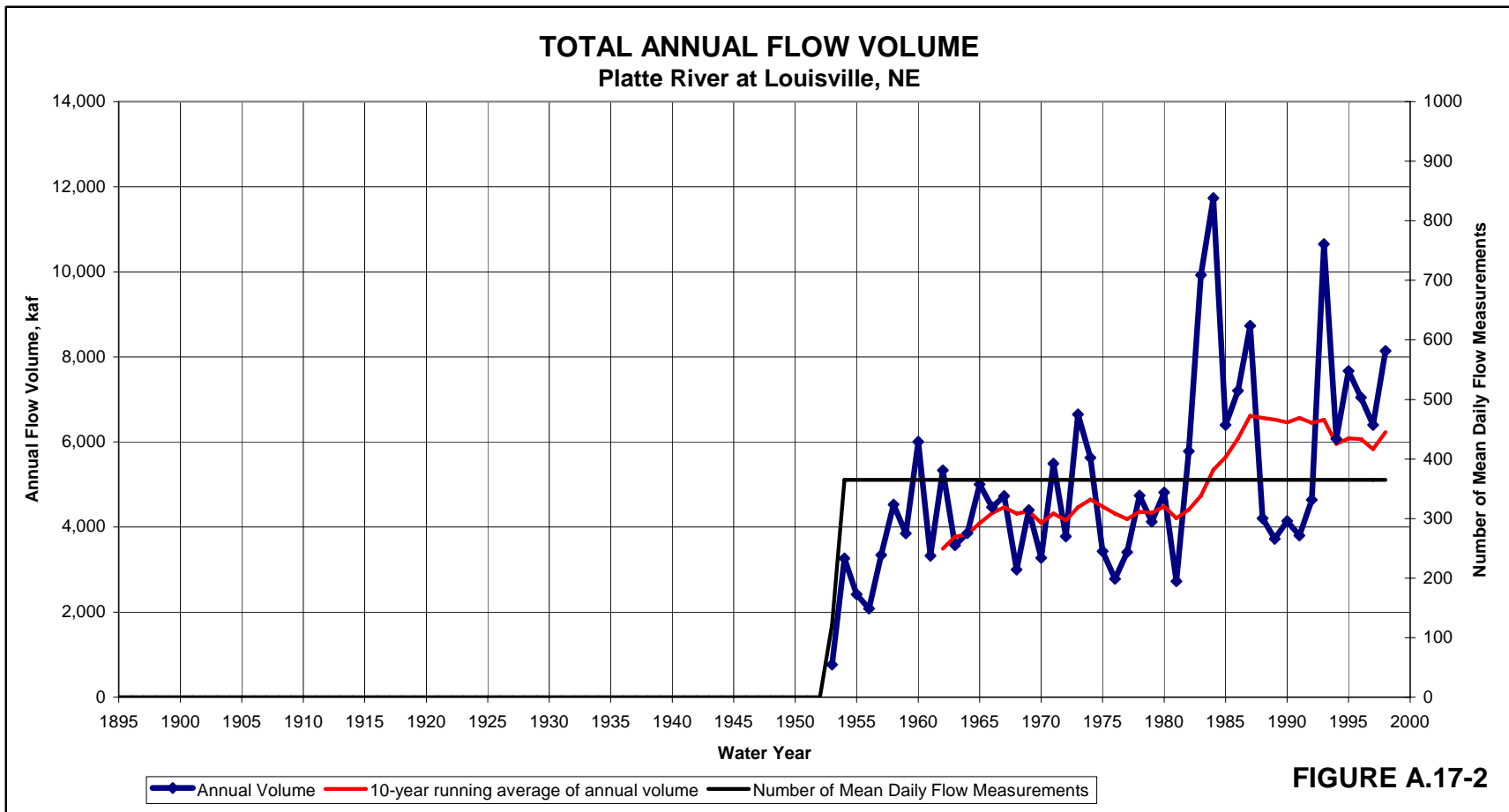


FIGURE A.17-2

Figure A.17-2 Total Annual Flow Volume.

Maximum mean daily flow and the annual maximum 30-day average flow (**Figure A.17-1**), indicating that these are short-duration runoff maximums.

Figure A.17-3 shows the magnitude and occurrence of Annual Maximum mean daily flow by calendar day, grouped by time interval. **Figure A.17-3** shows that most annual maximums are concentrated in and close to the months of March and June. March is the primary snowmelt month in the lower Platte River basin; June is the month that receives the most precipitation in these areas (NOAA, 2005 [Nebraska]). June is also the month when the most upper Platte River basin snowmelt runoff usually reaches the lower Platte River basin, to the extent that it is not intercepted by the upstream Platte River basin reservoirs.

The average seasonal maximum mean daily flows are highest in the Apr 16-Jul 15 and Jun 1-Aug 15 seasonal periods for all time intervals considered. The differences between the values for these seasonal periods are relatively small and do not substantially favor either seasonal period (**Table A.17-1**). For the median seasonal maximum mean daily flows, the highest maximums occur in the Jun 1-Aug 15 seasonal period for the 1950's and 1959-1974 time intervals, and in the Apr 16-Jul 15 seasonal period for the 1975-1998 time interval. All time intervals show substantially lower values in the July 16-September 30 seasonal period for both average and median seasonal maximum flows, relative to the Apr 16-Jul 15 and Jun 1-Aug 15 seasonal periods. The average and median Dates of Maximum Flow occur from mid-May through mid-June for all three time intervals, except that the average for the 1950's time interval occurs in late April. This earlier occurrence of the Date of Maximum Flow could be the result of drought conditions during the 1950's.

Figure A.17-4 (minimum flows) and **Table A.17-1** both show a pattern for the Annual Minimum mean daily flow that is similar to that for the annual flow volume (**Figure A.17-2**), suggesting that the climatic effects on the annual flow volume are affecting the Annual Minimum mean daily flow in a similar way. The differences between the Annual Minimum mean daily flow and the annual minimum 30-day average flow are not as great as those between the corresponding maximum flow quantities, indicating that changes in minimum flows do not occur as rapidly. The 10-year running average also demonstrates the changes in Annual Minimum mean daily flow with variations in climatic conditions, though not as clearly and with a delay due to the averaging process. The average and median Dates of Minimum Flow are in late August through late September for all time intervals considered. Minimum flows were not calculated for years with incomplete flow records.

A.17.3 3-, 7-, 15-, and 30- day Averages of Mean Daily Flows

Table A.17-2 shows that there is significant attenuation of both average and median Annual Running Average flows due to the averaging process, indicating that most maximums at this location are short-duration runoff maximums.

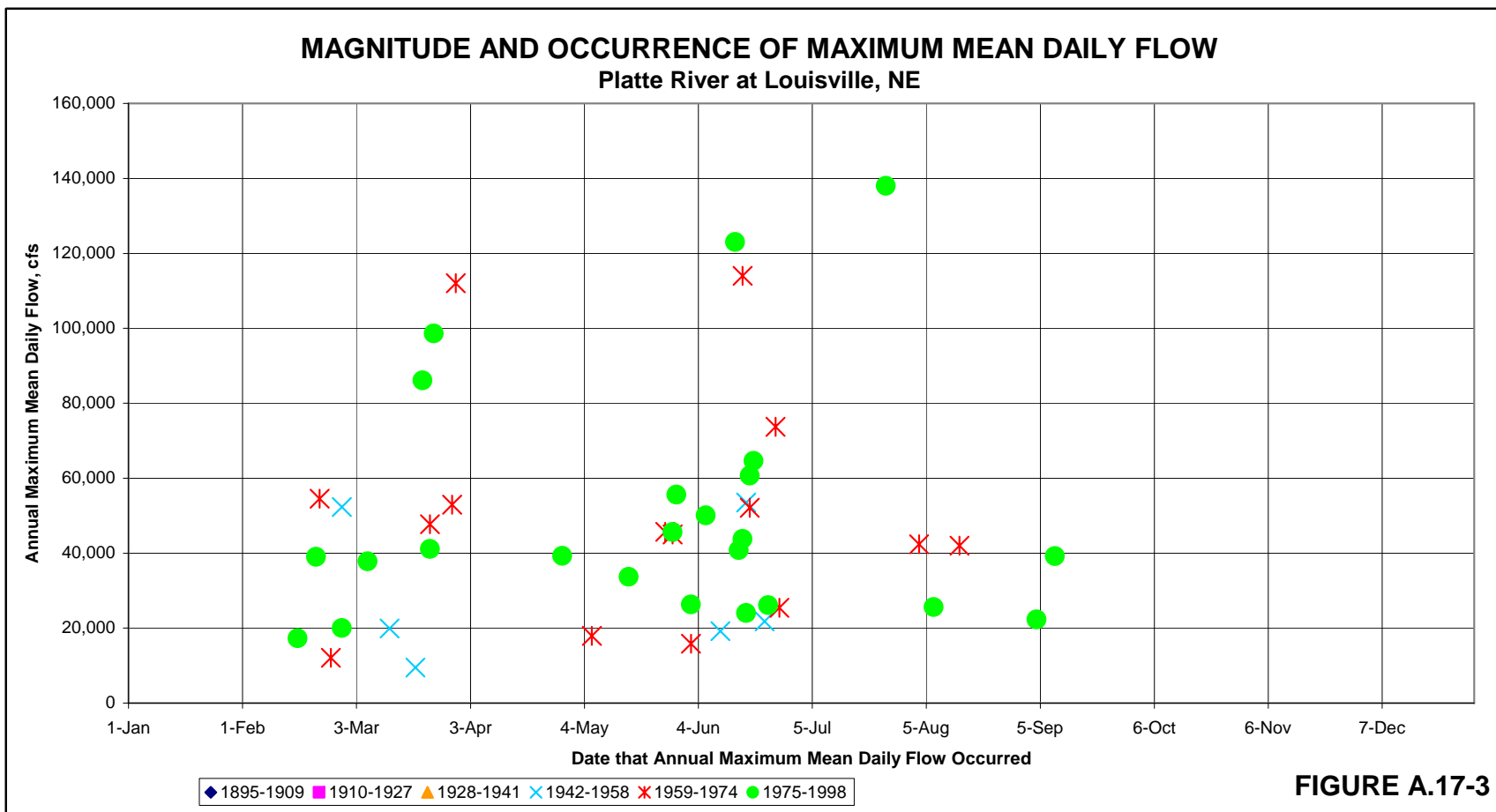


FIGURE A.17-3

Figure A.17-3 Magnitude and Occurrence of Annual Maximum Mean Daily Flow.

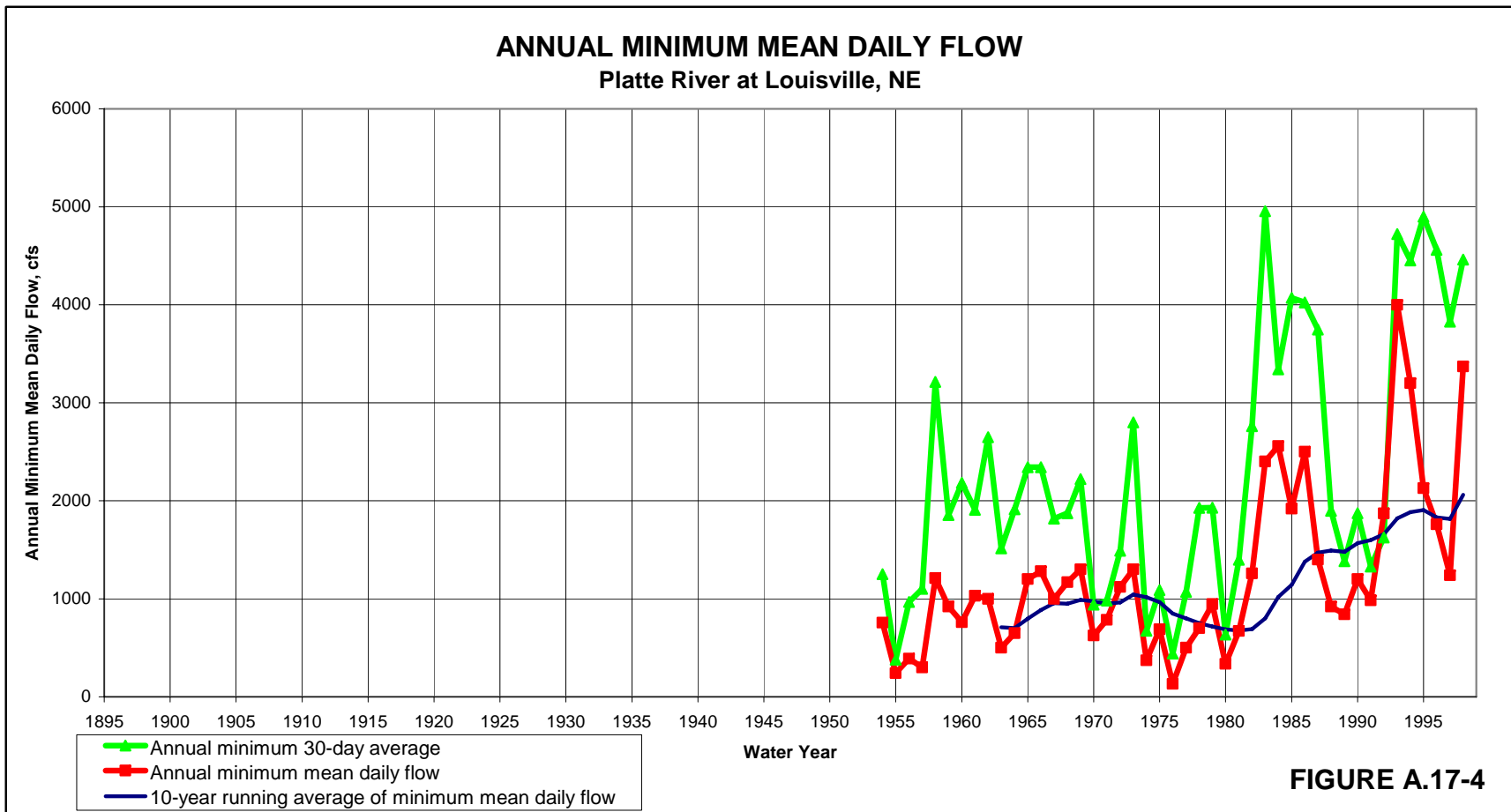


Figure A.17-4 Annual Minimum Mean Daily Flow.

Table A.17-2 Comparison of Annual Maximums for Mean Daily and Multiple Day Running Average Values.

Platte River at Louisville, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Maximum Mean Daily Flow (cfs)	47,132		47,132				29,358	49,581	49,942
Median Annual Maximum Mean Daily Flow (cfs)	41,550		41,550				20,850	45,350	40,050
Avg. Ann. Max. 3-day Avg. Flow (cfs)	39,265		39,265				24,563	40,479	42,131
Median Ann. Max. 3-day Avg. Flow (cfs)	35,233		35,233				17,617	38,433	34,833
Avg. Ann. Max. 7-day Avg. Flow (cfs)	30,471		30,471				17,191	30,647	33,674
Median Ann. Max. 7-day Avg. Flow (cfs)	25,557		25,557				14,167	26,736	27,800
Avg. Ann. Max. 15-day Avg. Flow (cfs)	22,793		22,793				12,101	22,438	25,703
Median Ann. Max. 15-day Avg. Flow (cfs)	19,096		19,096				10,038	19,013	21,599
Avg. Ann. Max. 30-day Avg. Flow (cfs)	17,541		17,541				9,761	16,723	20,031
Median Ann. Max. 30-day Avg. Flow (cfs)	15,342		15,342				8,198	14,811	16,465
Average Annual Minimum Mean Daily Flow (cfs)	1,232		1,232				579	938	1,564
Median Annual Minimum Mean Daily Flow (cfs)	1,000		1,000				388	1,000	1,250
Avg. Ann. Min. 3-day Avg. Flow (cfs)	1,339		1,339				640	1,034	1,687
Median Ann. Min. 3-day Avg. Flow (cfs)	1,155		1,155				459	1,077	1,425
Avg. Ann. Min. 7-day Avg. Flow (cfs)	1,528		1,528				766	1,199	1,906
Median Ann. Min. 7-day Avg. Flow (cfs)	1,347		1,347				713	1,316	1,785
Avg. Ann. Min. 15-day Avg. Flow (cfs)	1,894		1,894				1,047	1,543	2,305
Median Ann. Min. 15-day Avg. Flow (cfs)	1,634		1,634				929	1,653	2,224
Avg. Ann. Min. 30-day Avg. Flow (cfs)	2,285		2,285				1,382	1,844	2,767
Median Ann. Min. 30-day Avg. Flow (cfs)	1,909		1,909				1,101	1,891	2,345

Table A.17-3 Multiple Day Averages of Seasonal Maximum Mean Daily Flows.

Platte River at Louisville, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
3-day average of mean daily flows									
Avg. Ann. Max. 3-day Avg. Flow (cfs)	39,265		39,265				24,563	40,479	42,131
Median Ann. Max. 3-day Avg. Flow (cfs)	35,233		35,233				17,617	38,433	34,833
Avg. Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	19,427		19,427				16,615	14,184	23,508
Avg. Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	30,227		30,227				19,388	31,827	31,871
Avg. Jun1-Aug15 Max 3-day Avg. Flow (cfs)	29,444		29,444				20,699	29,901	31,326
Avg. Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	15,105		15,105				8,144	10,875	19,665
Median Feb 15-Mar 16 Max 3-day Avg. Flow (cfs)	13,900		13,900				9,860	11,433	18,667
Median Apr 16-Jul 15 Max 3-day Avg. Flow (cfs)	23,183		23,183				16,083	25,933	25,983
Median Jun1-Aug15 Max 3-day Avg. Flow (cfs)	22,383		22,383				17,617	29,333	22,367
Median Jul 16-Sep 30 Max 3-day Avg. Flow (cfs)	10,238		10,238				5,667	7,582	15,883
Platte River at Louisville, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
7-day average of mean daily flows									
Avg. Ann. Max. 7-day Avg. Flow (cfs)	30,471		30,471				17,191	30,647	33,674
Median Ann. Max. 7-day Avg. Flow (cfs)	25,557		25,557				14,167	26,736	27,800
Avg. Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	15,584		15,584				11,924	11,841	18,842
Avg. Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	23,461		23,461				14,010	23,364	25,888
Avg. Jun1-Aug15 Max 7-day Avg. Flow (cfs)	22,227		22,227				15,098	21,489	24,501
Avg. Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	11,159		11,159				6,060	7,969	14,561
Median Feb 15-Mar 16 Max 7-day Avg. Flow (cfs)	11,829		11,829				9,603	10,257	17,264
Median Apr 16-Jul 15 Max 7-day Avg. Flow (cfs)	19,493		19,493				11,154	20,440	21,993
Median Jun1-Aug15 Max 7-day Avg. Flow (cfs)	16,611		16,611				13,864	19,434	18,157
Median Jul 16-Sep 30 Max 7-day Avg. Flow (cfs)	8,119		8,119				4,109	6,186	12,737
Platte River at Louisville, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
15-day average of mean daily flows									
Avg. Ann. Max. 15-day Avg. Flow (cfs)	22,793		22,793				12,101	22,438	25,703
Median Ann. Max. 15-day Avg. Flow (cfs)	19,096		19,096				10,038	19,013	21,599
Avg. Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	12,274		12,274				8,881	10,045	14,466
Avg. Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	18,157		18,157				9,859	17,978	20,352
Avg. Jun1-Aug15 Max 15-day Avg. Flow (cfs)	16,896		16,896				11,105	16,018	18,929
Avg. Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	8,305		8,305				5,168	6,251	10,459
Median Feb 15-Mar 16 Max 15-day Avg. Flow (cfs)	10,093		10,093				8,729	8,874	13,164
Median Apr 16-Jul 15 Max 15-day Avg. Flow (cfs)	14,867		14,867				8,581	13,720	18,438
Median Jun1-Aug15 Max 15-day Avg. Flow (cfs)	14,443		14,443				9,448	12,200	15,412
Median Jul 16-Sep 30 Max 15-day Avg. Flow (cfs)	6,690		6,690				3,217	5,121	9,095
Platte River at Louisville, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
30-day average of mean daily flows									
Avg. Ann. Max. 30-day Avg. Flow (cfs)	17,541		17,541				9,761	16,723	20,031
Median Ann. Max. 30-day Avg. Flow (cfs)	15,342		15,342				8,198	14,811	16,465
Avg. Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	9,804		9,804				6,642	8,527	11,315
Avg. Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	14,253		14,253				7,854	13,730	16,201
Avg. Jun1-Aug15 Max 30-day Avg. Flow (cfs)	12,951		12,951				8,812	11,720	14,807
Avg. Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	6,329		6,329				4,193	4,887	7,825
Median Feb 15-Mar 16 Max 30-day Avg. Flow (cfs)	8,517		8,517				6,312	7,422	10,392
Median Apr 16-Jul 15 Max 30-day Avg. Flow (cfs)	12,191		12,191				6,915	12,220	14,903
Median Jun1-Aug15 Max 30-day Avg. Flow (cfs)	10,935		10,935				7,475	8,661	12,181
Median Jul 16-Sep 30 Max 30-day Avg. Flow (cfs)	5,330		5,330				2,792	4,167	6,969

Table A.17-2 shows the average and median maximum 3-day, 7-day, 15-day, and 30-day average flows over all time intervals. The averages were calculated for the annual maximum flow and the seasonal maximum flows for the seasonal periods defined in the introduction to this Appendix. **Table A.17-3** shows that the characterizations are generally consistent with known long-term climatological conditions by time interval. The one exception is the 1950's time interval, for which both the average and the median maximum flow values for the Jun 1-Aug 15 seasonal periods are higher than those for the Apr 16-Jul 15 seasonal period. A review of the data shows that there was one flow maximum, in June 1984 (**Figure A.17-1** and **Figure A.17-3**) whose value appears to be high enough to have possibly raised both the averages and the medians for the Jun 1-Aug 15 seasonal period.

For all averaging times and all seasonal periods, the averages are greater than the medians. This indicates that the average values were skewed higher by infrequent extreme runoff events.

A.17.4 Flow Frequency

A.17.4.1 Flow Averaging

The information on flow frequencies given in **Table A.17-4** and **Figure A.17-5** generally supports the conclusions previously reached (**Table A.17-1**, **Figure A.17-1**, and **Figure A.17-2**), suggesting the predominant effect of climate on flows in the Platte River at Louisville. For percentage of years, the flow ranges between 1,001-2,000 cfs and 8,001-10,000 cfs all show 100 percent frequency for the 1950's time interval, which included a period of drought. For the 1959-1974 time interval, the upper limit of 100 percent flow frequency increased to the 12,001-15,000-cfs flow range. For the 1975-1998 time interval, a percentage frequency of 100 percent occurred for all flow ranges in and greater than the 3,001-4,000-cfs flow range.

For percentage of days, the flow ranges with the highest percentage frequency are the 1,001-2,000-cfs to the 4,001-5,000-cfs flow ranges for the 1950's time interval. For the 1959-1974 time interval, the flow range with the highest percentage frequency is the 3,001-4,000-cfs range; for the 1975-1998 time interval, it is the 6,001-8,000-cfs flow range. Percentage frequencies are near or greater than 10 percent from the 1,001-2,000-cfs to the 4,001-5,000-cfs flow range for the 1950's time interval; from the 2,001-3,000-cfs to the 6,001-8,000-cfs flow range for the 1959-1974 time interval; and from the 3,001-4,000-cfs to the 8,001-10,000-cfs flow range, and also for the Greater Than 15,000-cfs flow range, for the 1975-1998 time interval.

A.17.4.2 Maximum Mean Flow Exceedance

Table A.17-5 through **Table A.17-9** show the exceedance values and probabilities for maximum flow for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day,

Table A.17-4 Flow Frequency Distributions.

Platte River at Louisville, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	2	0	2	0	0	0	0	0	4
201 to 500	17	0	17	0	0	0	50	13	13
501 to 750	28	0	28	0	0	0	50	25	25
751 to 1,000	50	0	50	0	0	0	67	56	42
1,001 to 2,000	85	0	85	0	0	0	100	100	71
2,001 to 3,000	93	0	93	0	0	0	100	100	88
3,001 to 4,000	100	0	100	0	0	0	100	100	100
4,001 to 5,000	100	0	100	0	0	0	100	100	100
5,001 to 6,000	100	0	100	0	0	0	100	100	100
6,001 to 8,000	100	0	100	0	0	0	100	100	100
8,001 to 10,000	100	0	100	0	0	0	100	100	100
10,001 to 12,000	96	0	96	0	0	0	83	94	100
12,001 to 15,000	98	0	98	0	0	0	83	100	100
Greater than 15,000	96	0	96	0	0	0	83	94	100
Percentages = (# of years/w flow data in the specified flow range during the interval)/(# of years/w flow data during the interval)									
Flow Frequency in Percentage of Days in Specified Flow Ranges									
Platte River at Louisville, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
201 to 500	0.5	0.0	0.5	0.0	0.0	0.0	2.1	0.2	0.3
501 to 750	0.6	0.0	0.6	0.0	0.0	0.0	2.1	0.4	0.5
751 to 1,000	0.9	0.0	0.9	0.0	0.0	0.0	2.5	1.0	0.6
1,001 to 2,000	8.2	0.0	8.2	0.0	0.0	0.0	16.4	8.6	6.1
2,001 to 3,000	11.5	0.0	11.5	0.0	0.0	0.0	19.6	13.4	8.5
3,001 to 4,000	14.2	0.0	14.2	0.0	0.0	0.0	17.9	18.4	10.6
4,001 to 5,000	12.0	0.0	12.0	0.0	0.0	0.0	13.2	14.7	10.0
5,001 to 6,000	9.7	0.0	9.7	0.0	0.0	0.0	9.1	10.2	9.4
6,001 to 8,000	15.9	0.0	15.9	0.0	0.0	0.0	8.5	13.3	19.4
8,001 to 10,000	9.3	0.0	9.3	0.0	0.0	0.0	3.5	6.7	12.4
10,001 to 12,000	5.7	0.0	5.7	0.0	0.0	0.0	2.0	4.5	7.2
12,001 to 15,000	3.9	0.0	3.9	0.0	0.0	0.0	1.4	3.4	4.8
Greater than 15,000	7.4	0.0	7.4	0.0	0.0	0.0	1.8	5.3	10.1
Percentages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of days/w flow data during the interval)									
Average Number of Days per Year in Specified Flow Ranges									
Platte River at Louisville, NE		Time Interval							
Flow Range (cfs)	Period of record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
0 to 200	0	0	0	0	0	0	0	0	0
201 to 500	2	0	2	0	0	0	7	1	1
501 to 750	2	0	2	0	0	0	7	1	2
751 to 1,000	3	0	3	0	0	0	8	4	2
1,001 to 2,000	29	0	29	0	0	0	53	31	22
2,001 to 3,000	41	0	41	0	0	0	64	49	31
3,001 to 4,000	51	0	51	0	0	0	58	67	39
4,001 to 5,000	43	0	43	0	0	0	43	54	37
5,001 to 6,000	35	0	35	0	0	0	30	37	34
6,001 to 8,000	57	0	57	0	0	0	28	48	71
8,001 to 10,000	34	0	34	0	0	0	12	25	45
10,001 to 12,000	20	0	20	0	0	0	6	16	26
12,001 to 15,000	14	0	14	0	0	0	5	13	18
Greater than 15,000	27	0	27	0	0	0	6	19	37
Averages = (sum the # of days/w flow data in the specified flow range during the interval)/(sum the # of years/w flow data during the interval)									
Note: Frequency distributions may be biased towards higher flows in early intervals because winter flow measurements were limited. All computations are for the <u>entire indicated time interval</u> (as opposed to individual years within the interval).									

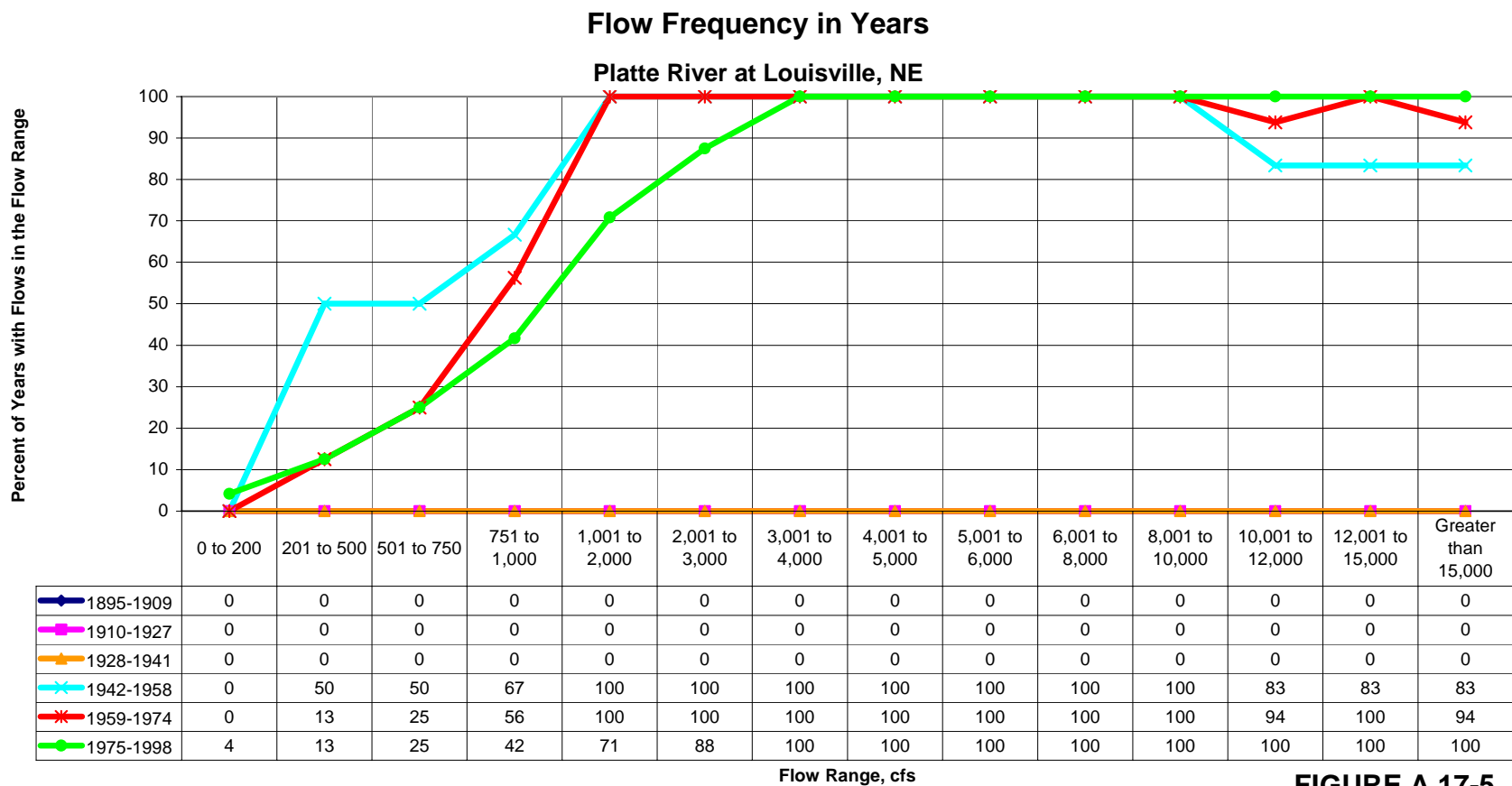


FIGURE A.17-5

Figure A.17-5 Flow Frequency in Years

Table A.17-5 Maximum Flow Exceedance Values, Annual Data.

Platte River at Louisville, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years	9,450		9,450					9,450	12,100	17,300
Maximum exceeded in 90% of the years	18,550		18,550					14,325	16,850	22,810
Maximum exceeded in 80% of the years	22,300		22,300					19,200	25,400	25,900
Maximum exceeded in 70% of the years	26,200		26,200					19,550	41,050	32,960
Maximum exceeded in 60% of the years	39,200		39,200					19,900	42,400	39,040
Maximum exceeded in 50% of the years	41,550		41,550					20,850	45,350	40,050
Maximum exceeded in 40% of the years	45,600		45,600					21,800	47,700	43,260
Maximum exceeded in 30% of the years	52,200		52,200					37,050	52,500	50,650
Maximum exceeded in 20% of the years	55,600		55,600					52,300	54,500	62,260
Maximum exceeded in 10% of the years	92,350		92,350					52,900	92,850	94,850
Maximum	138,000		138,000					53,500	114,000	138,000
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	8,577		8,577					8,577	10,923	15,700
Maximum exceeded in 90% of the years	16,283		16,283					12,672	14,467	19,240
Maximum exceeded in 80% of the years	19,100		19,100					16,767	19,333	22,000
Maximum exceeded in 70% of the years	23,183		23,183					17,050	30,767	26,143
Maximum exceeded in 60% of the years	31,600		31,600					17,333	35,467	31,880
Maximum exceeded in 50% of the years	35,233		35,233					17,617	38,433	34,833
Maximum exceeded in 40% of the years	38,600		38,600					17,900	41,033	37,533
Maximum exceeded in 30% of the years	41,467		41,467					29,517	42,417	41,593
Maximum exceeded in 20% of the years	49,133		49,133					41,133	49,133	55,733
Maximum exceeded in 10% of the years	80,400		80,400					43,400	68,667	82,640
Maximum	112,200		112,200					45,667	102,267	112,200
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	7,390		7,390					7,390	9,861	12,823
Maximum exceeded in 90% of the years	12,829		12,829					9,809	11,689	14,175
Maximum exceeded in 80% of the years	14,614		14,614					12,229	14,614	19,174
Maximum exceeded in 70% of the years	19,071		19,071					12,531	20,440	21,350
Maximum exceeded in 60% of the years	23,486		23,486					12,834	23,486	25,026
Maximum exceeded in 50% of the years	25,557		25,557					14,167	26,736	27,800
Maximum exceeded in 40% of the years	28,457		28,457					15,500	28,386	31,391
Maximum exceeded in 30% of the years	32,100		32,100					19,562	32,721	35,113
Maximum exceeded in 20% of the years	38,029		38,029					23,624	38,029	43,749
Maximum exceeded in 10% of the years	61,614		61,614					27,598	58,729	61,649
Maximum	84,243		84,243					31,571	75,343	84,243
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	7,145		7,145					7,145	8,369	9,227
Maximum exceeded in 90% of the years	9,440		9,440					7,952	9,252	11,314
Maximum exceeded in 80% of the years	11,009		11,009					8,759	12,947	14,429
Maximum exceeded in 70% of the years	13,830		13,830					9,349	13,720	18,371
Maximum exceeded in 60% of the years	16,723		16,723					9,940	16,723	19,109
Maximum exceeded in 50% of the years	19,096		19,096					10,038	19,013	21,599
Maximum exceeded in 40% of the years	20,607		20,607					10,137	20,537	25,950
Maximum exceeded in 30% of the years	26,773		26,773					13,174	25,673	27,538
Maximum exceeded in 20% of the years	28,620		28,620					16,211	28,620	36,385
Maximum exceeded in 10% of the years	44,203		44,203					18,313	40,370	44,258
Maximum	58,967		58,967					20,415	55,747	58,967
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years	6,103		6,103					6,490	6,103	6,587
Maximum exceeded in 90% of the years	7,628		7,628					6,515	8,130	9,190
Maximum exceeded in 80% of the years	8,875		8,875					6,540	9,563	10,554
Maximum exceeded in 70% of the years	11,272		11,272					7,177	12,220	13,933
Maximum exceeded in 60% of the years	14,059		14,059					7,815	14,059	16,243
Maximum exceeded in 50% of the years	15,342		15,342					8,198	14,811	16,465
Maximum exceeded in 40% of the years	16,616		16,616					8,580	16,794	19,885
Maximum exceeded in 30% of the years	20,715		20,715					11,275	20,214	21,904
Maximum exceeded in 20% of the years	21,784		21,784					13,969	21,147	27,237
Maximum exceeded in 10% of the years	33,258		33,258					14,569	26,172	36,757
Maximum	45,783		45,783					15,170	36,815	45,783

Table A.17-6 Maximum Flow Exceedance Values, Feb 15 –Mar 16 Seasonal Period.

Platte River at Louisville, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	7,710		7,710				8,050	7,710	8,200
Maximum exceeded in 90% of the years	8,338		8,338				8,122	8,165	11,200
Maximum exceeded in 80% of the years	10,820		10,820				8,194	9,270	11,500
Maximum exceeded in 70% of the years	11,520		11,520				8,604	10,450	14,980
Maximum exceeded in 60% of the years	13,200		13,200				9,352	12,000	17,480
Maximum exceeded in 50% of the years	15,600		15,600				10,100	12,350	19,500
Maximum exceeded in 40% of the years	18,400		18,400				14,020	13,600	25,800
Maximum exceeded in 30% of the years	21,120		21,120				17,940	14,750	30,120
Maximum exceeded in 20% of the years	30,140		30,140				26,380	17,000	35,320
Maximum exceeded in 10% of the years	38,520		38,520				39,340	20,050	38,640
Maximum	116,000		116,000				52,300	54,500	116,000
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	7,397		7,397				7,397	7,427	8,000
Maximum exceeded in 90% of the years	7,950		7,950				7,605	7,673	10,433
Maximum exceeded in 80% of the years	9,889		9,889				7,813	8,460	11,233
Maximum exceeded in 70% of the years	10,945		10,945				8,305	9,262	13,547
Maximum exceeded in 60% of the years	12,227		12,227				9,083	10,923	16,147
Maximum exceeded in 50% of the years	13,900		13,900				9,860	11,433	18,667
Maximum exceeded in 40% of the years	17,233		17,233				12,623	12,600	23,393
Maximum exceeded in 30% of the years	19,793		19,793				15,385	14,000	27,860
Maximum exceeded in 20% of the years	27,953		27,953				21,640	15,767	31,320
Maximum exceeded in 10% of the years	33,800		33,800				31,387	18,950	34,100
Maximum	99,667		99,667				41,133	49,133	99,667
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	6,169		6,169				6,169	6,676	7,914
Maximum exceeded in 90% of the years	7,250		7,250				6,657	6,826	9,779
Maximum exceeded in 80% of the years	9,133		9,133				7,146	7,157	10,561
Maximum exceeded in 70% of the years	10,035		10,035				7,833	8,632	11,269
Maximum exceeded in 60% of the years	10,742		10,742				8,718	9,559	13,631
Maximum exceeded in 50% of the years	11,829		11,829				9,603	10,257	17,264
Maximum exceeded in 40% of the years	14,220		14,220				10,895	11,214	17,977
Maximum exceeded in 30% of the years	17,754		17,754				12,188	11,733	20,254
Maximum exceeded in 20% of the years	20,580		20,580				14,992	12,700	24,291
Maximum exceeded in 10% of the years	25,671		25,671				19,308	17,136	26,744
Maximum	68,100		68,100				23,624	32,986	68,100
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	4,954		4,954				4,954	5,695	7,573
Maximum exceeded in 90% of the years	6,783		6,783				5,780	6,342	7,712
Maximum exceeded in 80% of the years	7,613		7,613				6,607	6,687	8,017
Maximum exceeded in 70% of the years	8,112		8,112				7,362	6,944	10,063
Maximum exceeded in 60% of the years	9,310		9,310				8,046	8,242	11,020
Maximum exceeded in 50% of the years	10,093		10,093				8,729	8,874	13,164
Maximum exceeded in 40% of the years	11,093		11,093				8,951	9,670	14,669
Maximum exceeded in 30% of the years	14,049		14,049				9,174	10,192	16,808
Maximum exceeded in 20% of the years	16,799		16,799				10,311	10,920	19,387
Maximum exceeded in 10% of the years	20,275		20,275				12,363	15,520	20,905
Maximum	39,520		39,520				14,416	23,760	39,520
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	4,471		4,471				4,672	4,471	6,552
Maximum exceeded in 90% of the years	5,747		5,747				4,958	5,495	6,774
Maximum exceeded in 80% of the years	6,504		6,504				5,244	5,792	7,226
Maximum exceeded in 70% of the years	6,847		6,847				5,572	5,917	7,999
Maximum exceeded in 60% of the years	7,526		7,526				5,942	6,882	9,629
Maximum exceeded in 50% of the years	8,517		8,517				6,312	7,422	10,392
Maximum exceeded in 40% of the years	9,544		9,544				6,688	7,958	11,947
Maximum exceeded in 30% of the years	11,218		11,218				7,064	8,784	12,513
Maximum exceeded in 20% of the years	12,594		12,594				7,719	8,933	14,543
Maximum exceeded in 10% of the years	15,741		15,741				8,654	13,249	17,420
Maximum	22,760		22,760				9,589	20,663	22,760

Table A.17-7 Maximum Flow Exceedance Values, Apr 16 –Jul 15 Seasonal Period.

Platte River at Louisville, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Maximum exceeded in 100% of the years		7,070		7,070				7,070	11,100	7,820
Maximum exceeded in 90% of the years		13,550		13,550				11,985	16,850	12,980
Maximum exceeded in 80% of the years		18,300		18,300				16,900	24,800	20,820
Maximum exceeded in 70% of the years		23,200		23,200				17,850	25,100	23,990
Maximum exceeded in 60% of the years		25,400		25,400				18,800	27,700	26,480
Maximum exceeded in 50% of the years		27,600		27,600				19,000	30,150	30,600
Maximum exceeded in 40% of the years		38,400		38,400				19,200	38,400	39,860
Maximum exceeded in 30% of the years		44,400		44,400				20,500	45,350	43,980
Maximum exceeded in 20% of the years		52,100		52,100				21,800	52,100	52,300
Maximum exceeded in 10% of the years		62,650		62,650				37,650	64,500	63,430
Maximum		123,000		123,000				53,500	114,000	123,000
3-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		6,563		6,563				6,563	10,700	7,167
Maximum exceeded in 90% of the years		11,917		11,917				10,298	14,467	11,687
Maximum exceeded in 80% of the years		15,800		15,800				14,033	16,367	16,702
Maximum exceeded in 70% of the years		17,600		17,600				14,433	18,600	19,307
Maximum exceeded in 60% of the years		19,467		19,467				14,833	22,067	23,000
Maximum exceeded in 50% of the years		23,183		23,183				16,083	25,933	25,983
Maximum exceeded in 40% of the years		31,100		31,100				17,333	32,600	32,700
Maximum exceeded in 30% of the years		37,767		37,767				17,617	38,433	37,730
Maximum exceeded in 20% of the years		41,300		41,300				17,900	41,033	42,473
Maximum exceeded in 10% of the years		51,417		51,417				31,783	44,667	56,183
Maximum		102,267		102,267				45,667	102,267	100,000
7-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		4,744		4,744				4,744	9,861	6,479
Maximum exceeded in 90% of the years		9,899		9,899				7,341	10,624	9,763
Maximum exceeded in 80% of the years		11,039		11,039				9,937	13,174	12,435
Maximum exceeded in 70% of the years		13,826		13,826				10,008	14,450	15,304
Maximum exceeded in 60% of the years		15,414		15,414				10,079	15,001	19,146
Maximum exceeded in 50% of the years		19,493		19,493				11,154	20,440	21,993
Maximum exceeded in 40% of the years		23,029		23,029				12,229	23,029	24,846
Maximum exceeded in 30% of the years		28,279		28,279				13,864	27,414	30,661
Maximum exceeded in 20% of the years		31,600		31,600				15,500	28,386	35,623
Maximum exceeded in 10% of the years		39,150		39,150				23,536	32,415	45,317
Maximum		82,671		82,671				31,571	73,686	82,671
15-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		4,250		4,250				4,250	7,303	5,192
Maximum exceeded in 90% of the years		7,511		7,511				5,719	8,507	7,763
Maximum exceeded in 80% of the years		8,645		8,645				7,188	9,654	10,736
Maximum exceeded in 70% of the years		10,683		10,683				7,796	11,342	13,109
Maximum exceeded in 60% of the years		12,947		12,947				8,404	12,947	15,201
Maximum exceeded in 50% of the years		14,867		14,867				8,581	13,720	18,438
Maximum exceeded in 40% of the years		19,200		19,200				8,759	19,379	19,637
Maximum exceeded in 30% of the years		20,476		20,476				9,448	20,352	23,119
Maximum exceeded in 20% of the years		24,327		24,327				10,137	22,867	27,892
Maximum exceeded in 10% of the years		29,057		29,057				15,276	25,957	32,407
Maximum		56,933		56,933				20,415	55,747	56,933
30-day Average Flows		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Maximum exceeded in 100% of the years		4,059		4,059				4,059	5,472	4,258
Maximum exceeded in 90% of the years		5,530		5,530				4,772	6,371	6,347
Maximum exceeded in 80% of the years		7,290		7,290				5,485	8,309	8,403
Maximum exceeded in 70% of the years		8,699		8,699				6,013	8,823	10,772
Maximum exceeded in 60% of the years		10,167		10,167				6,540	10,166	12,179
Maximum exceeded in 50% of the years		12,191		12,191				6,915	12,220	14,903
Maximum exceeded in 40% of the years		15,170		15,170				7,290	14,059	16,245
Maximum exceeded in 30% of the years		16,510		16,510				7,935	16,712	17,099
Maximum exceeded in 20% of the years		17,443		17,443				8,580	17,406	22,262
Maximum exceeded in 10% of the years		23,471		23,471				11,875	19,598	26,806
Maximum		41,983		41,983				15,170	36,815	41,983

Table A.17-8 Maximum Flow Exceedance Values, Jun 1 –Aug 15 Seasonal Period.

Platte River at Louisville, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	6,610		6,610				7,000	7,140	6,610
Maximum exceeded in 90% of the years	11,200		11,200				11,950	12,050	11,330
Maximum exceeded in 80% of the years	14,400		14,400				16,900	15,800	13,680
Maximum exceeded in 70% of the years	20,500		20,500				18,050	26,550	23,100
Maximum exceeded in 60% of the years	25,500		25,500				19,200	30,800	25,520
Maximum exceeded in 50% of the years	27,100		27,100				20,500	35,000	26,200
Maximum exceeded in 40% of the years	31,600		31,600				21,800	39,700	27,900
Maximum exceeded in 30% of the years	42,000		42,000				24,250	42,200	42,070
Maximum exceeded in 20% of the years	50,100		50,100				26,700	52,100	46,320
Maximum exceeded in 10% of the years	62,650		62,650				40,100	64,500	63,430
Maximum	138,000		138,000				53,500	114,000	138,000
3-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	5,570		5,570				6,563	6,953	5,570
Maximum exceeded in 90% of the years	9,867		9,867				10,298	10,633	9,638
Maximum exceeded in 80% of the years	10,967		10,967				14,033	13,133	10,927
Maximum exceeded in 70% of the years	16,668		16,668				15,683	17,850	16,509
Maximum exceeded in 60% of the years	19,467		19,467				17,333	22,067	20,060
Maximum exceeded in 50% of the years	22,383		22,383				17,617	27,333	22,367
Maximum exceeded in 40% of the years	26,833		26,833				17,900	28,333	24,300
Maximum exceeded in 30% of the years	34,867		34,867				20,300	31,833	37,663
Maximum exceeded in 20% of the years	40,967		40,967				22,700	41,033	39,547
Maximum exceeded in 10% of the years	51,417		51,417				34,183	44,667	56,183
Maximum	112,200		112,200				45,667	102,267	112,200
7-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	4,080		4,080				4,401	6,109	4,080
Maximum exceeded in 90% of the years	7,655		7,655				7,169	8,555	7,506
Maximum exceeded in 80% of the years	9,433		9,433				9,937	10,203	9,245
Maximum exceeded in 70% of the years	11,636		11,636				11,083	12,109	12,558
Maximum exceeded in 60% of the years	14,286		14,286				12,229	14,286	16,123
Maximum exceeded in 50% of the years	16,611		16,611				13,864	19,434	18,157
Maximum exceeded in 40% of the years	21,486		21,486				15,500	22,971	21,203
Maximum exceeded in 30% of the years	25,721		25,721				16,225	24,479	27,159
Maximum exceeded in 20% of the years	28,457		28,457				16,950	26,657	32,480
Maximum exceeded in 10% of the years	35,221		35,221				24,261	30,379	43,813
Maximum	84,243		84,243				31,571	73,686	84,243
15-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	3,214		3,214				3,920	4,943	3,214
Maximum exceeded in 90% of the years	5,938		5,938				5,554	7,204	5,888
Maximum exceeded in 80% of the years	7,303		7,303				7,188	7,401	7,498
Maximum exceeded in 70% of the years	8,509		8,509				7,973	8,372	9,108
Maximum exceeded in 60% of the years	10,137		10,137				8,759	8,978	14,037
Maximum exceeded in 50% of the years	14,443		14,443				9,448	12,200	15,412
Maximum exceeded in 40% of the years	16,151		16,151				10,137	16,151	16,418
Maximum exceeded in 30% of the years	19,628		19,628				13,174	19,773	20,149
Maximum exceeded in 20% of the years	22,591		22,591				16,211	20,780	24,595
Maximum exceeded in 10% of the years	28,187		28,187				18,313	23,597	39,533
Maximum	58,967		58,967				20,415	55,747	58,967
30-day Average Flows	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Maximum exceeded in 100% of the years	2,877		2,877				3,300	4,850	2,877
Maximum exceeded in 90% of the years	5,358		5,358				4,393	5,437	5,336
Maximum exceeded in 80% of the years	5,485		5,485				5,485	5,472	5,639
Maximum exceeded in 70% of the years	6,251		6,251				6,013	5,895	7,146
Maximum exceeded in 60% of the years	8,410		8,410				6,540	8,010	10,474
Maximum exceeded in 50% of the years	10,935		10,935				7,475	8,661	12,181
Maximum exceeded in 40% of the years	13,141		13,141				8,410	12,707	13,394
Maximum exceeded in 30% of the years	14,307		14,307				11,189	14,904	14,670
Maximum exceeded in 20% of the years	16,467		16,467				13,969	16,467	19,747
Maximum exceeded in 10% of the years	23,159		23,159				14,569	16,702	33,442
Maximum	45,783		45,783				15,170	36,815	45,783

Table A.17-9 Maximum Flow Exceedance Values, Jul 16 –Sep 30 Seasonal Period.

Platte River at Louisville, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Maximum exceeded in 100% of the years	2,390		2,390				4,120	2,750	2,390
Maximum exceeded in 90% of the years	4,095		4,095				4,140	4,020	6,037
Maximum exceeded in 80% of the years	4,900		4,900				4,160	4,650	8,132
Maximum exceeded in 70% of the years	7,300		7,300				4,385	5,320	14,070
Maximum exceeded in 60% of the years	10,100		10,100				4,610	6,360	17,180
Maximum exceeded in 50% of the years	14,000		14,000				7,355	9,365	18,350
Maximum exceeded in 40% of the years	17,500		17,500				10,100	11,200	21,400
Maximum exceeded in 30% of the years	20,650		20,650				10,250	14,500	25,420
Maximum exceeded in 20% of the years	26,700		26,700				10,400	17,700	31,760
Maximum exceeded in 10% of the years	39,550		39,550				18,550	40,950	39,170
Maximum	138,000		138,000				26,700	42,400	138,000
3-day Average Flows									
Maximum exceeded in 100% of the years	2,220		2,220				3,533	2,483	2,220
Maximum exceeded in 90% of the years	3,738		3,738				3,607	3,835	5,047
Maximum exceeded in 80% of the years	4,230		4,230				3,680	4,073	6,863
Maximum exceeded in 70% of the years	5,780		5,780				3,783	4,642	9,189
Maximum exceeded in 60% of the years	7,620		7,620				3,887	5,117	14,236
Maximum exceeded in 50% of the years	10,238		10,238				5,667	7,582	15,883
Maximum exceeded in 40% of the years	15,233		15,233				7,447	9,940	17,560
Maximum exceeded in 30% of the years	17,100		17,100				7,533	12,352	20,453
Maximum exceeded in 20% of the years	21,833		21,833				7,620	15,933	24,647
Maximum exceeded in 10% of the years	27,717		27,717				15,160	23,917	28,103
Maximum	112,200		112,200				22,700	31,800	112,200
7-day Average Flows									
Maximum exceeded in 100% of the years	1,740		1,740				2,560	2,259	1,740
Maximum exceeded in 90% of the years	2,853		2,853				2,684	3,432	3,649
Maximum exceeded in 80% of the years	3,656		3,656				2,807	3,656	5,720
Maximum exceeded in 70% of the years	4,798		4,798				2,833	4,145	6,538
Maximum exceeded in 60% of the years	6,274		6,274				2,859	4,707	10,040
Maximum exceeded in 50% of the years	8,119		8,119				4,109	6,186	12,737
Maximum exceeded in 40% of the years	12,111		12,111				5,360	8,094	13,751
Maximum exceeded in 30% of the years	13,702		13,702				5,593	10,128	14,276
Maximum exceeded in 20% of the years	15,086		15,086				5,826	12,864	16,371
Maximum exceeded in 10% of the years	17,116		17,116				11,388	15,559	21,859
Maximum	84,243		84,243				16,950	17,024	84,243
15-day Average Flows									
Maximum exceeded in 100% of the years	1,533		1,533				1,869	2,027	1,533
Maximum exceeded in 90% of the years	2,346		2,346				1,950	3,037	2,586
Maximum exceeded in 80% of the years	3,113		3,113				2,031	3,309	3,979
Maximum exceeded in 70% of the years	3,993		3,993				2,236	3,710	6,233
Maximum exceeded in 60% of the years	4,461		4,461				2,442	4,021	8,033
Maximum exceeded in 50% of the years	6,690		6,690				3,217	5,121	9,095
Maximum exceeded in 40% of the years	8,964		8,964				3,991	6,285	9,871
Maximum exceeded in 30% of the years	9,764		9,764				4,226	8,308	10,614
Maximum exceeded in 20% of the years	10,684		10,684				4,461	9,560	11,022
Maximum exceeded in 10% of the years	12,969		12,969				10,336	10,652	16,008
Maximum	58,967		58,967				16,211	13,153	58,967
30-day Average Flows									
Maximum exceeded in 100% of the years	1,011		1,011				1,252	1,834	1,011
Maximum exceeded in 90% of the years	1,983		1,983				1,456	2,271	2,033
Maximum exceeded in 80% of the years	2,356		2,356				1,660	2,572	3,243
Maximum exceeded in 70% of the years	3,333		3,333				1,968	3,338	5,083
Maximum exceeded in 60% of the years	3,864		3,864				2,275	3,864	6,292
Maximum exceeded in 50% of the years	5,330		5,330				2,792	4,167	6,969
Maximum exceeded in 40% of the years	6,336		6,336				3,308	5,022	7,687
Maximum exceeded in 30% of the years	7,433		7,433				3,538	5,659	8,381
Maximum exceeded in 20% of the years	8,456		8,456				3,767	6,657	9,211
Maximum exceeded in 10% of the years	10,876		10,876				8,330	7,982	12,003
Maximum	37,047		37,047				12,893	11,409	37,047

15-day, and 30-day average maximum flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.17-5 shows the exceedance probabilities and values for annual data. **Table A.17-5** shows that the flow characterizations for annual data are generally consistent with known long-term climatological conditions during the respective time intervals.

Table A.17-6 shows the exceedance probabilities and values for the maximum flow during the Feb 15-Mar 16 seasonal period. **Table A.17-6** shows that the maximum flow values for this seasonal period are generally consistent with known climatological conditions. The exception to this is the 1950's time interval, in which the flow values exceed those for the 1959-1974 time interval for the lower exceedance probabilities over the averaging times from mean daily through 7-day. This is likely the result of inflows from Salt Creek (**Section A.16.4.3**, **Table A.16-6**). For the 15-day and 30-day averaging times, the effects of these inflows become "averaged out", and the characterizations revert to being dominated by long-term conditions over the greater Platte River Basin.

Table A.17-7 shows the exceedance probabilities and values for the maximum flow during the Apr 16-Jul 15 seasonal period. **Table A.17-7** shows that the flows for this seasonal period are generally consistent with known climatological conditions.

Table A.17-8 shows the exceedance probabilities and values for the maximum flow during the Jun 1-Aug 15 seasonal period. **Table A.17-8** shows that the flows for this seasonal period are generally consistent with known climatological conditions.

Table A.17-9 shows the exceedance probabilities and values for the maximum flow during the Jul 16-Sep 30 seasonal period. **Table A.17-9** shows that the flows for this seasonal period are generally consistent with known climatological conditions.

A.17.4.3 Mean Flow Exceedance

Table A.17-10 through **Table A.17-14** show probabilities and exceedance values considering all flows for annual data and seasonal periods Feb 15-Mar 16, Apr 16-Jul 15, Jun 1-Aug 15, and Jul 16-Sep 30, for 1-day (mean daily flow), 3-day, 7-day, 15-day, and 30-day average flows. The seasonal periods considered were those defined in the introduction to this Appendix.

Table A.17-10 shows the exceedance probabilities and values of flows for annual data. **Table A.17-10** shows that, when all flows are considered, the flow characterizations for annual data are generally consistent with known long-term climatological conditions.

Table A.17-11 shows that the exceedance probabilities and values of flows for the Feb 15-Mar 16 seasonal period. **Table A.17-11** shows that, when all flows are considered, the flows for this seasonal period are generally consistent with known long-term climatological conditions.

Table A.17-10 Exceedance Values Considering All Flows, Annual Data.

Platte River at Louisville, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	131		131				240	373	131
Flow exceeded for 90% of the days	2,000		2,000				1,266	2,000	2,340
Flow exceeded for 80% of the days	2,890		2,890				1,810	2,820	3,410
Flow exceeded for 70% of the days	3,580		3,580				2,350	3,330	4,330
Flow exceeded for 60% of the days	4,340		4,340				2,860	3,900	5,390
Flow exceeded for 50% of the days	5,200		5,200				3,430	4,550	6,390
Flow exceeded for 40% of the days	6,260		6,260				3,950	5,320	7,400
Flow exceeded for 30% of the days	7,480		7,480				4,680	6,400	8,700
Flow exceeded for 20% of the days	9,280		9,280				5,640	8,000	10,500
Flow exceeded for 10% of the days	13,000		13,000				7,612	11,500	15,100
Maximum	138,000		138,000				53,500	114,000	138,000
3-day Average Flows									
Flow exceeded for 100% of the days	144		144				253	390	144
Flow exceeded for 90% of the days	2,033		2,033				1,293	2,063	2,390
Flow exceeded for 80% of the days	2,930		2,930				1,836	2,867	3,467
Flow exceeded for 70% of the days	3,613		3,613				2,413	3,349	4,360
Flow exceeded for 60% of the days	4,373		4,373				2,895	3,927	5,437
Flow exceeded for 50% of the days	5,237		5,237				3,473	4,587	6,427
Flow exceeded for 40% of the days	6,300		6,300				3,986	5,348	7,413
Flow exceeded for 30% of the days	7,500		7,500				4,669	6,432	8,768
Flow exceeded for 20% of the days	9,393		9,393				5,674	8,014	10,537
Flow exceeded for 10% of the days	13,000		13,000				7,567	11,569	15,233
Maximum	112,200		112,200				45,667	102,267	112,200
7-day Average Flows									
Flow exceeded for 100% of the days	159		159				287	401	159
Flow exceeded for 90% of the days	2,120		2,120				1,370	2,150	2,480
Flow exceeded for 80% of the days	2,994		2,994				1,926	2,918	3,514
Flow exceeded for 70% of the days	3,660		3,660				2,464	3,391	4,448
Flow exceeded for 60% of the days	4,436		4,436				2,936	3,967	5,529
Flow exceeded for 50% of the days	5,314		5,314				3,504	4,650	6,509
Flow exceeded for 40% of the days	6,367		6,367				4,049	5,361	7,502
Flow exceeded for 30% of the days	7,609		7,609				4,689	6,493	8,844
Flow exceeded for 20% of the days	9,521		9,521				5,676	8,272	10,608
Flow exceeded for 10% of the days	13,114		13,114				7,946	11,583	15,354
Maximum	84,243		84,243				31,571	75,343	84,243
15-day Average Flows									
Flow exceeded for 100% of the days	219		219				334	471	219
Flow exceeded for 90% of the days	2,248		2,248				1,472	2,328	2,594
Flow exceeded for 80% of the days	3,086		3,086				2,029	3,027	3,641
Flow exceeded for 70% of the days	3,755		3,755				2,504	3,472	4,637
Flow exceeded for 60% of the days	4,548		4,548				3,031	4,052	5,723
Flow exceeded for 50% of the days	5,463		5,463				3,529	4,733	6,619
Flow exceeded for 40% of the days	6,510		6,510				4,001	5,496	7,563
Flow exceeded for 30% of the days	7,734		7,734				4,790	6,661	8,985
Flow exceeded for 20% of the days	9,591		9,591				5,839	8,492	10,631
Flow exceeded for 10% of the days	13,317		13,317				8,128	11,678	15,700
Maximum	58,967		58,967				20,415	55,747	58,967
30-day Average Flows									
Flow exceeded for 100% of the days	379		379				379	673	439
Flow exceeded for 90% of the days	2,403		2,403				1,565	2,606	2,676
Flow exceeded for 80% of the days	3,232		3,232				2,113	3,185	3,811
Flow exceeded for 70% of the days	3,871		3,871				2,620	3,614	4,923
Flow exceeded for 60% of the days	4,739		4,739				3,115	4,179	5,926
Flow exceeded for 50% of the days	5,644		5,644				3,488	4,908	6,752
Flow exceeded for 40% of the days	6,637		6,637				4,155	5,604	7,611
Flow exceeded for 30% of the days	7,774		7,774				4,893	6,722	9,043
Flow exceeded for 20% of the days	9,668		9,668				6,024	8,680	10,837
Flow exceeded for 10% of the days	13,345		13,345				7,695	11,926	15,284
Maximum	45,783		45,783				15,170	36,815	45,783

Table A.17-11 Exceedance Values Considering All Flows, Feb 15-Mar 16 Seasonal Period.

Platte River at Louisville, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days		1,540		1,540				1,540	2,480	2,100
Flow exceeded for 90% of the days		4,118		4,118				3,104	4,218	5,000
Flow exceeded for 80% of the days		5,200		5,200				3,614	5,000	6,000
Flow exceeded for 70% of the days		6,060		6,060				3,820	5,700	7,000
Flow exceeded for 60% of the days		6,906		6,906				4,724	6,366	8,000
Flow exceeded for 50% of the days		7,800		7,800				5,835	6,980	9,010
Flow exceeded for 40% of the days		9,000		9,000				6,536	7,710	10,600
Flow exceeded for 30% of the days		10,500		10,500				7,340	9,221	12,300
Flow exceeded for 20% of the days		12,800		12,800				8,050	11,000	15,000
Flow exceeded for 10% of the days		17,000		17,000				9,740	14,310	19,000
Maximum		116,000		116,000				52,300	54,500	116,000
3-day Average Flows										
Flow exceeded for 100% of the days		1,707		1,707				1,707	2,647	2,400
Flow exceeded for 90% of the days		4,250		4,250				3,172	4,263	5,149
Flow exceeded for 80% of the days		5,365		5,365				3,660	5,100	6,000
Flow exceeded for 70% of the days		6,187		6,187				3,799	5,737	7,084
Flow exceeded for 60% of the days		6,967		6,967				4,920	6,472	8,003
Flow exceeded for 50% of the days		7,777		7,777				5,817	6,967	9,267
Flow exceeded for 40% of the days		9,117		9,117				6,738	7,779	10,647
Flow exceeded for 30% of the days		10,520		10,520				7,302	9,333	12,567
Flow exceeded for 20% of the days		13,067		13,067				7,914	10,667	15,253
Flow exceeded for 10% of the days		17,107		17,107				9,660	14,400	18,733
Maximum		99,667		99,667				41,133	49,133	99,667
7-day Average Flows										
Flow exceeded for 100% of the days		2,194		2,194				2,194	2,869	3,371
Flow exceeded for 90% of the days		4,451		4,451				3,434	4,374	5,459
Flow exceeded for 80% of the days		5,552		5,552				3,664	5,207	6,339
Flow exceeded for 70% of the days		6,381		6,381				4,248	6,006	7,304
Flow exceeded for 60% of the days		7,151		7,151				5,312	6,606	8,286
Flow exceeded for 50% of the days		7,916		7,916				5,954	7,138	9,257
Flow exceeded for 40% of the days		9,143		9,143				6,530	7,959	10,686
Flow exceeded for 30% of the days		10,547		10,547				7,181	9,223	13,086
Flow exceeded for 20% of the days		13,286		13,286				8,099	10,429	15,600
Flow exceeded for 10% of the days		17,174		17,174				11,579	14,868	18,007
Maximum		68,100		68,100				23,624	32,986	68,100
15-day Average Flows										
Flow exceeded for 100% of the days		3,247		3,247				3,339	3,247	3,593
Flow exceeded for 90% of the days		4,908		4,908				4,244	4,679	5,874
Flow exceeded for 80% of the days		5,867		5,867				4,783	5,367	6,959
Flow exceeded for 70% of the days		6,733		6,733				4,932	6,091	7,440
Flow exceeded for 60% of the days		7,424		7,424				5,319	6,900	8,299
Flow exceeded for 50% of the days		8,117		8,117				6,349	7,557	9,671
Flow exceeded for 40% of the days		9,217		9,217				6,778	8,135	11,293
Flow exceeded for 30% of the days		10,855		10,855				7,509	8,769	13,426
Flow exceeded for 20% of the days		13,785		13,785				8,776	10,379	15,448
Flow exceeded for 10% of the days		16,918		16,918				13,061	14,663	18,242
Maximum		39,520		39,520				14,416	23,760	39,520
30-day Average Flows										
Flow exceeded for 100% of the days		4,471		4,471				4,672	4,471	6,552
Flow exceeded for 90% of the days		5,747		5,747				4,958	5,495	6,774
Flow exceeded for 80% of the days		6,504		6,504				5,244	5,792	7,226
Flow exceeded for 70% of the days		6,847		6,847				5,572	5,917	7,999
Flow exceeded for 60% of the days		7,526		7,526				5,942	6,882	9,629
Flow exceeded for 50% of the days		8,517		8,517				6,312	7,422	10,392
Flow exceeded for 40% of the days		9,544		9,544				6,688	7,958	11,947
Flow exceeded for 30% of the days		11,218		11,218				7,064	8,784	12,513
Flow exceeded for 20% of the days		12,594		12,594				7,719	8,933	14,543
Flow exceeded for 10% of the days		15,741		15,741				8,654	13,249	17,420
Maximum		22,760		22,760				9,589	20,663	22,760

Table A.17-12 Exceedance Values Considering All Flows, Apr 16-Jul 15 Seasonal Period.

Platte River at Louisville, NE		Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows										
Flow exceeded for 100% of the days	705		705					1,320	895	705
Flow exceeded for 90% of the days	2,869		2,869					2,280	2,985	3,033
Flow exceeded for 80% of the days	3,880		3,880					3,000	3,790	4,580
Flow exceeded for 70% of the days	4,937		4,937					3,590	4,625	5,860
Flow exceeded for 60% of the days	5,926		5,926					4,020	5,500	6,960
Flow exceeded for 50% of the days	7,000		7,000					4,675	6,485	8,150
Flow exceeded for 40% of the days	8,250		8,250					5,296	7,560	9,578
Flow exceeded for 30% of the days	10,200		10,200					6,186	9,215	12,000
Flow exceeded for 20% of the days	13,200		13,200					7,380	11,800	16,000
Flow exceeded for 10% of the days	19,810		19,810					10,010	16,400	23,000
Maximum	123,000		123,000					53,500	114,000	123,000
3-day Average Flows										
Flow exceeded for 100% of the days	921		921					1,460	973	921
Flow exceeded for 90% of the days	2,953		2,953					2,326	3,076	3,117
Flow exceeded for 80% of the days	3,960		3,960					3,196	3,916	4,633
Flow exceeded for 70% of the days	5,028		5,028					3,711	4,772	5,920
Flow exceeded for 60% of the days	6,033		6,033					4,089	5,594	7,060
Flow exceeded for 50% of the days	7,072		7,072					4,678	6,572	8,190
Flow exceeded for 40% of the days	8,397		8,397					5,310	7,661	9,880
Flow exceeded for 30% of the days	10,465		10,465					6,160	9,594	12,350
Flow exceeded for 20% of the days	13,449		13,449					7,289	12,267	16,263
Flow exceeded for 10% of the days	19,800		19,800					10,238	15,800	22,983
Maximum	102,267		102,267					45,667	102,267	100,000
7-day Average Flows										
Flow exceeded for 100% of the days	1,072		1,072					1,670	1,107	1,072
Flow exceeded for 90% of the days	3,120		3,120					2,519	3,200	3,280
Flow exceeded for 80% of the days	4,100		4,100					3,338	4,138	4,765
Flow exceeded for 70% of the days	5,162		5,162					3,853	4,927	6,023
Flow exceeded for 60% of the days	6,179		6,179					4,194	5,745	7,243
Flow exceeded for 50% of the days	7,408		7,408					4,710	6,836	8,391
Flow exceeded for 40% of the days	8,851		8,851					5,674	8,426	10,241
Flow exceeded for 30% of the days	10,786		10,786					6,432	10,117	12,651
Flow exceeded for 20% of the days	13,705		13,705					7,947	12,283	16,387
Flow exceeded for 10% of the days	19,659		19,659					10,246	16,680	22,930
Maximum	82,671		82,671					31,571	73,686	82,671
15-day Average Flows										
Flow exceeded for 100% of the days	1,467		1,467					2,009	1,467	1,527
Flow exceeded for 90% of the days	3,387		3,387					2,883	3,620	3,560
Flow exceeded for 80% of the days	4,482		4,482					3,473	4,500	5,160
Flow exceeded for 70% of the days	5,534		5,534					3,884	5,199	6,316
Flow exceeded for 60% of the days	6,533		6,533					4,241	6,186	7,467
Flow exceeded for 50% of the days	7,755		7,755					5,522	7,374	8,821
Flow exceeded for 40% of the days	9,296		9,296					6,091	8,851	10,909
Flow exceeded for 30% of the days	11,360		11,360					6,859	10,832	13,393
Flow exceeded for 20% of the days	14,486		14,486					8,028	12,989	16,787
Flow exceeded for 10% of the days	19,135		19,135					9,819	16,716	21,573
Maximum	56,933		56,933					20,415	55,747	56,933
30-day Average Flows										
Flow exceeded for 100% of the days	2,258		2,258					2,489	2,757	2,258
Flow exceeded for 90% of the days	3,822		3,822					3,045	4,199	4,018
Flow exceeded for 80% of the days	5,020		5,020					3,354	4,996	5,692
Flow exceeded for 70% of the days	5,849		5,849					3,880	5,453	6,717
Flow exceeded for 60% of the days	6,830		6,830					5,129	6,322	7,741
Flow exceeded for 50% of the days	8,208		8,208					5,972	8,097	9,604
Flow exceeded for 40% of the days	9,972		9,972					6,233	9,755	11,320
Flow exceeded for 30% of the days	12,124		12,124					6,822	11,843	13,575
Flow exceeded for 20% of the days	14,855		14,855					7,285	13,805	16,178
Flow exceeded for 10% of the days	18,644		18,644					9,055	16,528	20,774
Maximum	41,983		41,983					15,170	36,815	41,983

Table A.17-13 Exceedance Values Considering All Flows, Jun 1-Aug 15 Seasonal Period.

Platte River at Louisville, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Mean Daily Flows									
Flow exceeded for 100% of the days	316		316				355	373	316
Flow exceeded for 90% of the days	1,510		1,510				1,065	1,570	1,583
Flow exceeded for 80% of the days	2,200		2,200				1,640	2,170	2,516
Flow exceeded for 70% of the days	2,990		2,990				2,220	2,765	3,549
Flow exceeded for 60% of the days	3,770		3,770				2,860	3,360	4,674
Flow exceeded for 50% of the days	4,865		4,865				3,480	4,090	5,890
Flow exceeded for 40% of the days	6,200		6,200				4,200	5,300	7,180
Flow exceeded for 30% of the days	7,740		7,740				5,340	6,985	9,151
Flow exceeded for 20% of the days	10,600		10,600				6,860	9,290	12,400
Flow exceeded for 10% of the days	17,750		17,750				11,200	14,450	20,670
Maximum	138,000		138,000				53,500	114,000	138,000
3-day Average Flows									
Flow exceeded for 100% of the days	348		348				459	390	348
Flow exceeded for 90% of the days	1,557		1,557				1,087	1,594	1,613
Flow exceeded for 80% of the days	2,257		2,257				1,642	2,235	2,613
Flow exceeded for 70% of the days	3,039		3,039				2,260	2,806	3,627
Flow exceeded for 60% of the days	3,820		3,820				2,954	3,428	4,800
Flow exceeded for 50% of the days	4,960		4,960				3,533	4,205	6,035
Flow exceeded for 40% of the days	6,299		6,299				4,229	5,489	7,230
Flow exceeded for 30% of the days	7,881		7,881				5,277	7,082	9,293
Flow exceeded for 20% of the days	10,933		10,933				6,845	9,566	12,773
Flow exceeded for 10% of the days	17,500		17,500				12,276	14,727	20,517
Maximum	112,200		112,200				45,667	102,267	112,200
7-day Average Flows									
Flow exceeded for 100% of the days	394		394				492	401	394
Flow exceeded for 90% of the days	1,641		1,641				1,047	1,696	1,704
Flow exceeded for 80% of the days	2,383		2,383				1,699	2,323	2,731
Flow exceeded for 70% of the days	3,106		3,106				2,403	2,977	3,670
Flow exceeded for 60% of the days	3,933		3,933				2,968	3,559	4,824
Flow exceeded for 50% of the days	5,105		5,105				3,580	4,457	6,126
Flow exceeded for 40% of the days	6,477		6,477				4,213	5,763	7,435
Flow exceeded for 30% of the days	8,306		8,306				5,694	7,531	9,703
Flow exceeded for 20% of the days	11,501		11,501				7,805	10,105	13,361
Flow exceeded for 10% of the days	17,206		17,206				12,895	14,472	19,879
Maximum	84,243		84,243				31,571	73,686	84,243
15-day Average Flows									
Flow exceeded for 100% of the days	471		471				621	471	477
Flow exceeded for 90% of the days	1,829		1,829				1,113	1,793	2,056
Flow exceeded for 80% of the days	2,517		2,517				1,980	2,435	2,747
Flow exceeded for 70% of the days	3,249		3,249				2,478	3,106	3,879
Flow exceeded for 60% of the days	4,300		4,300				2,970	4,030	5,060
Flow exceeded for 50% of the days	5,463		5,463				3,613	4,892	6,239
Flow exceeded for 40% of the days	6,876		6,876				4,506	6,618	7,714
Flow exceeded for 30% of the days	8,552		8,552				6,219	7,882	10,204
Flow exceeded for 20% of the days	11,641		11,641				8,495	10,076	13,635
Flow exceeded for 10% of the days	16,726		16,726				12,217	14,213	19,543
Maximum	58,967		58,967				20,415	55,747	58,967
30-day Average Flows									
Flow exceeded for 100% of the days	635		635				1,041	673	635
Flow exceeded for 90% of the days	2,190		2,190				1,554	2,119	2,369
Flow exceeded for 80% of the days	2,878		2,878				2,276	2,822	3,187
Flow exceeded for 70% of the days	3,821		3,821				2,833	3,854	4,382
Flow exceeded for 60% of the days	4,927		4,927				3,194	4,830	5,389
Flow exceeded for 50% of the days	5,574		5,574				3,989	5,414	6,681
Flow exceeded for 40% of the days	6,896		6,896				4,960	6,069	8,370
Flow exceeded for 30% of the days	8,726		8,726				5,933	7,858	10,515
Flow exceeded for 20% of the days	11,634		11,634				7,291	9,393	12,446
Flow exceeded for 10% of the days	14,781		14,781				12,081	13,275	19,079
Maximum	45,783		45,783				15,170	36,815	45,783

Table A.17-14 Exceedance Values Considering All Flows, Jul 16-Sep 30 Seasonal Period.

Platte River at Louisville, NE	Period of Record	1895- 1941	1942- 1998	1895- 1909	1910- 1927	1928- 1941	1942- 1958	1959- 1974	1975- 1998
Mean Daily Flows									
Flow exceeded for 100% of the days	131		131				240	373	131
Flow exceeded for 90% of the days	1,131		1,131				600	1,230	1,260
Flow exceeded for 80% of the days	1,550		1,550				1,012	1,580	1,714
Flow exceeded for 70% of the days	1,900		1,900				1,313	1,860	2,460
Flow exceeded for 60% of the days	2,480		2,480				1,580	2,290	3,420
Flow exceeded for 50% of the days	3,090		3,090				1,750	2,700	4,170
Flow exceeded for 40% of the days	3,700		3,700				2,172	3,100	5,082
Flow exceeded for 30% of the days	4,557		4,557				2,650	3,460	6,290
Flow exceeded for 20% of the days	6,240		6,240				3,254	4,038	7,666
Flow exceeded for 10% of the days	8,710		8,710				4,922	6,000	10,200
Maximum	138,000		138,000				26,700	42,400	138,000
3-day Average Flows									
Flow exceeded for 100% of the days	144		144				253	390	144
Flow exceeded for 90% of the days	1,150		1,150				581	1,276	1,277
Flow exceeded for 80% of the days	1,563		1,563				1,021	1,590	1,722
Flow exceeded for 70% of the days	1,893		1,893				1,325	1,883	2,511
Flow exceeded for 60% of the days	2,512		2,512				1,610	2,280	3,472
Flow exceeded for 50% of the days	3,133		3,133				1,767	2,727	4,170
Flow exceeded for 40% of the days	3,738		3,738				2,171	3,156	5,137
Flow exceeded for 30% of the days	4,630		4,630				2,630	3,474	6,347
Flow exceeded for 20% of the days	6,308		6,308				3,245	3,967	7,791
Flow exceeded for 10% of the days	8,800		8,800				4,717	5,968	10,140
Maximum	112,200		112,200				22,700	31,800	112,200
7-day Average Flows									
Flow exceeded for 100% of the days	159		159				287	401	159
Flow exceeded for 90% of the days	1,144		1,144				640	1,351	1,319
Flow exceeded for 80% of the days	1,590		1,590				1,029	1,636	1,740
Flow exceeded for 70% of the days	1,927		1,927				1,361	1,903	2,658
Flow exceeded for 60% of the days	2,573		2,573				1,614	2,290	3,491
Flow exceeded for 50% of the days	3,116		3,116				1,813	2,771	4,274
Flow exceeded for 40% of the days	3,741		3,741				2,209	3,133	5,177
Flow exceeded for 30% of the days	4,706		4,706				2,696	3,481	6,386
Flow exceeded for 20% of the days	6,274		6,274				3,189	3,911	8,033
Flow exceeded for 10% of the days	8,996		8,996				4,813	5,943	9,863
Maximum	84,243		84,243				16,950	17,024	84,243
15-day Average Flows									
Flow exceeded for 100% of the days	219		219				334	471	219
Flow exceeded for 90% of the days	1,208		1,208				631	1,356	1,375
Flow exceeded for 80% of the days	1,677		1,677				1,066	1,755	1,822
Flow exceeded for 70% of the days	2,018		2,018				1,344	2,001	2,672
Flow exceeded for 60% of the days	2,543		2,543				1,650	2,329	3,515
Flow exceeded for 50% of the days	3,118		3,118				1,935	2,689	4,442
Flow exceeded for 40% of the days	3,780		3,780				2,164	3,045	5,376
Flow exceeded for 30% of the days	4,816		4,816				2,826	3,415	6,711
Flow exceeded for 20% of the days	6,560		6,560				3,524	3,981	8,322
Flow exceeded for 10% of the days	8,964		8,964				3,944	5,838	9,648
Maximum	58,967		58,967				16,211	13,153	58,967
30-day Average Flows									
Flow exceeded for 100% of the days	379		379				379	767	439
Flow exceeded for 90% of the days	1,304		1,304				621	1,351	1,414
Flow exceeded for 80% of the days	1,783		1,783				1,161	1,844	1,995
Flow exceeded for 70% of the days	2,143		2,143				1,553	2,118	2,485
Flow exceeded for 60% of the days	2,554		2,554				1,677	2,346	3,818
Flow exceeded for 50% of the days	3,193		3,193				2,024	2,669	4,922
Flow exceeded for 40% of the days	3,891		3,891				2,318	3,070	5,847
Flow exceeded for 30% of the days	5,085		5,085				2,914	3,500	6,864
Flow exceeded for 20% of the days	6,586		6,586				3,306	4,016	7,683
Flow exceeded for 10% of the days	8,016		8,016				3,813	5,719	9,047
Maximum	37,047		37,047				12,893	11,409	37,047

Table A.17-12 shows the exceedance probabilities and values of flows for the Apr 16-Jul 15 seasonal period. **Table A.17-12** shows that, when all flows are considered, the flows for this seasonal period are generally consistent with known long-term climatological conditions.

Table A.17-13 shows the exceedance probabilities and values of flows for the Jun1-Aug 15 seasonal period. **Table A.17-13** shows that, when all flows are considered, the flows for this seasonal period are generally consistent with known long-term climatological conditions.

Table A.17-14 shows the exceedance probabilities and values of flows for the Jul 16-Sep 30 seasonal period. **Table A.17-14** shows that, when all flows are considered, the flows for this seasonal period are generally consistent with known long-term climatological conditions.

A.17.5 Median Mean Daily Flow

The Median mean daily flow by calendar day is shown on **Figure A.17-6**. **Figure A.17-6** reflects the general effects of climate variation by time interval. There is some possible moderating effect on flows by inflow from Salt Creek (**Section A.17-1**). The time series plots for both the 1950's and the 1959-1974 time intervals are somewhat irregular, whereas the plot for the 1975-1998 time interval is comparatively smoother. Also, as for the Platte River at Ashland (see **Figure A.15-6**), median mean daily flows tend to be highest in March and June, and generally higher in March through June than the rest of the year. This tendency is less evident at Louisville than at Ashland, however, possibly because of the influence of inflows from Salt Creek.

A.17.6 USGS Annual Peak Flow

The flow characterizations for the USGS Annual Peak Flow are shown in **Figure A.17-7** and **Figure A.17-8** and in **Table A.17-15** and **Table A.17-16**. Because the available data for this location are quite sparse, only limited characterizations of the USGS Annual Peak flow are possible.

Figure A.17-7 shows the Annual Maximum mean daily flow, the USGS Annual Peak Flow, and the 10-year running average of the USGS Annual Peak Flow. **Figure A.17-7** shows that the peaks are lowest in the mid-1970's, and highly variable otherwise, with one exceptionally high peak flow event in 1993. This is generally consistent with the known climatological conditions over this short period of record.

Figure A.17-8 shows the date of occurrences of the USGS Annual Peak Flow over the Period of Record. **Figure A.17-8** shows that, for this short period of record, the timing characterizations for USGS Annual Peak flow are very similar to those for Annual Maximum mean daily flow (**Figure A.17-3**).

Table A.17-15 compares the average and median values of the USGS Annual Peak Flow by time interval. **Table A.17-15** shows that the values for both average and median flows are generally consistent with known climatological conditions during this short period of record. For all time intervals considered, the averages are greater than the medians. This indicates that lower flows were the rule, and that the average values were skewed higher by infrequent extreme runoff events.

Table A.17-16 shows the exceedance probabilities and values for the USGS Annual Peak Flow. It is analogous to **Table A.17-5** for Annual Maximum mean daily flows. **Table A.17-16** shows that, for the limited data available, the USGS Annual Peak Flows are generally consistent with known climatological conditions during this short period of record.

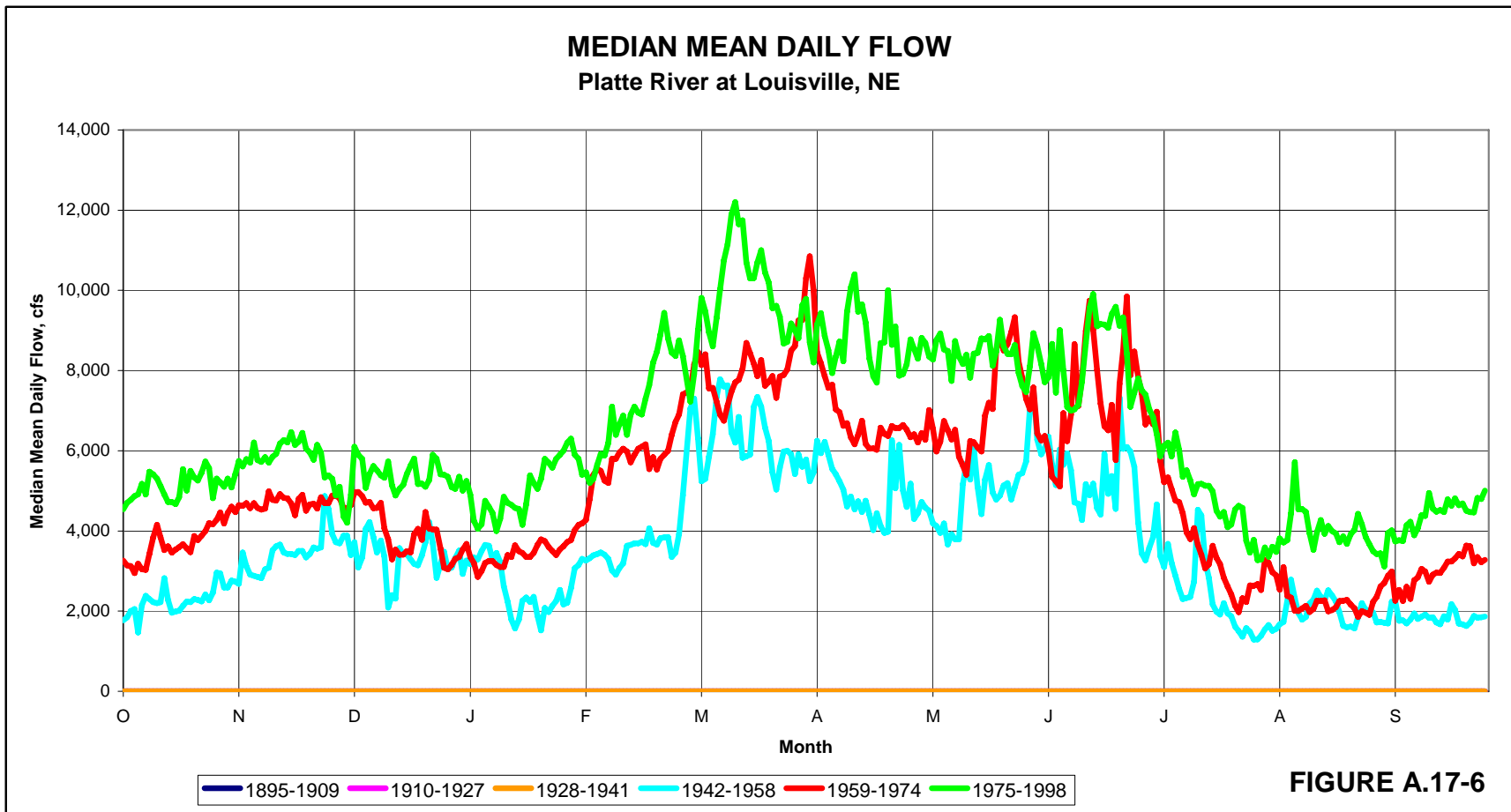


Figure A.17-6 Median Mean Daily Flow.

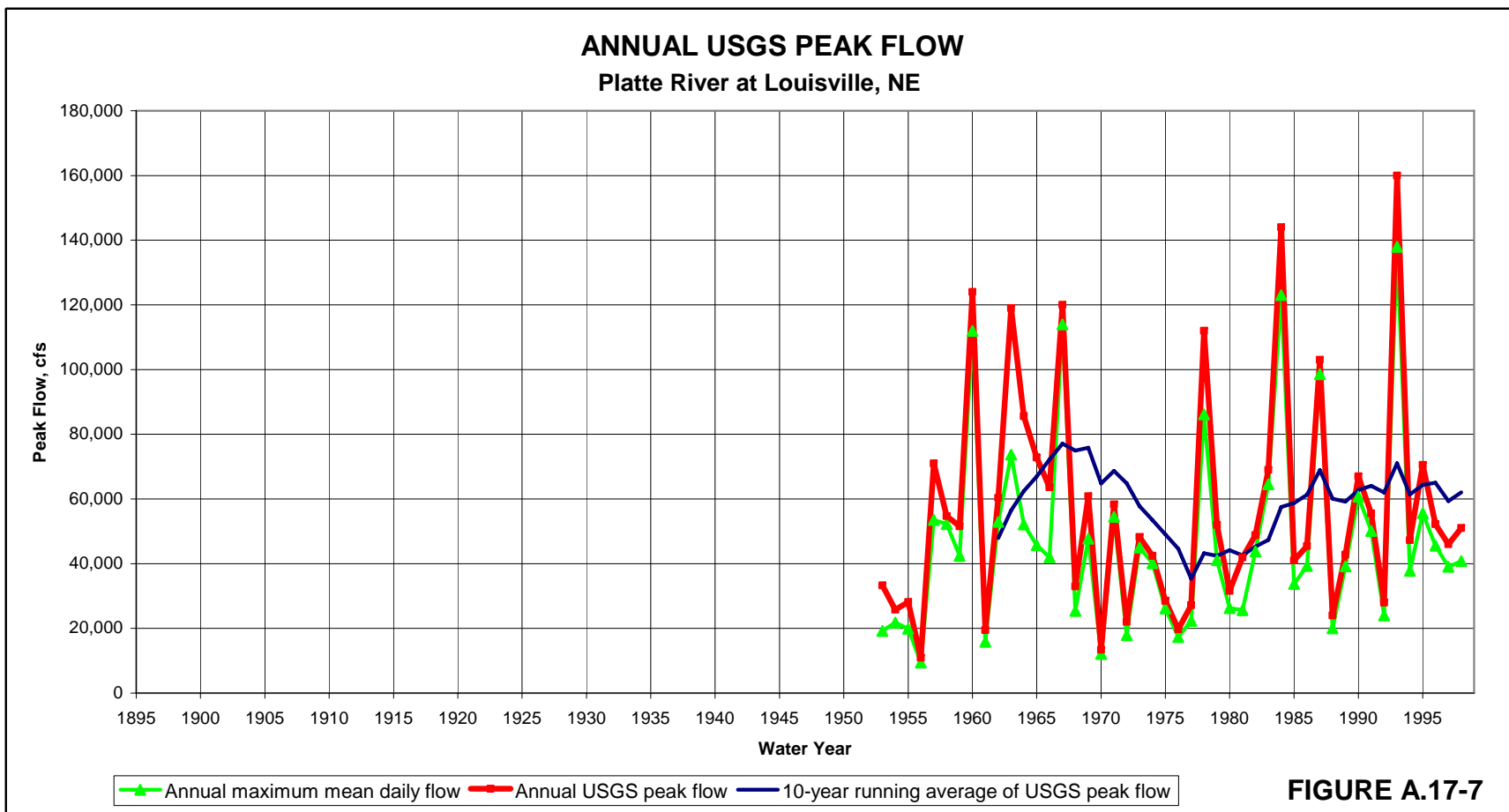


Figure A.17-7 Annual USGS Peak Flow.

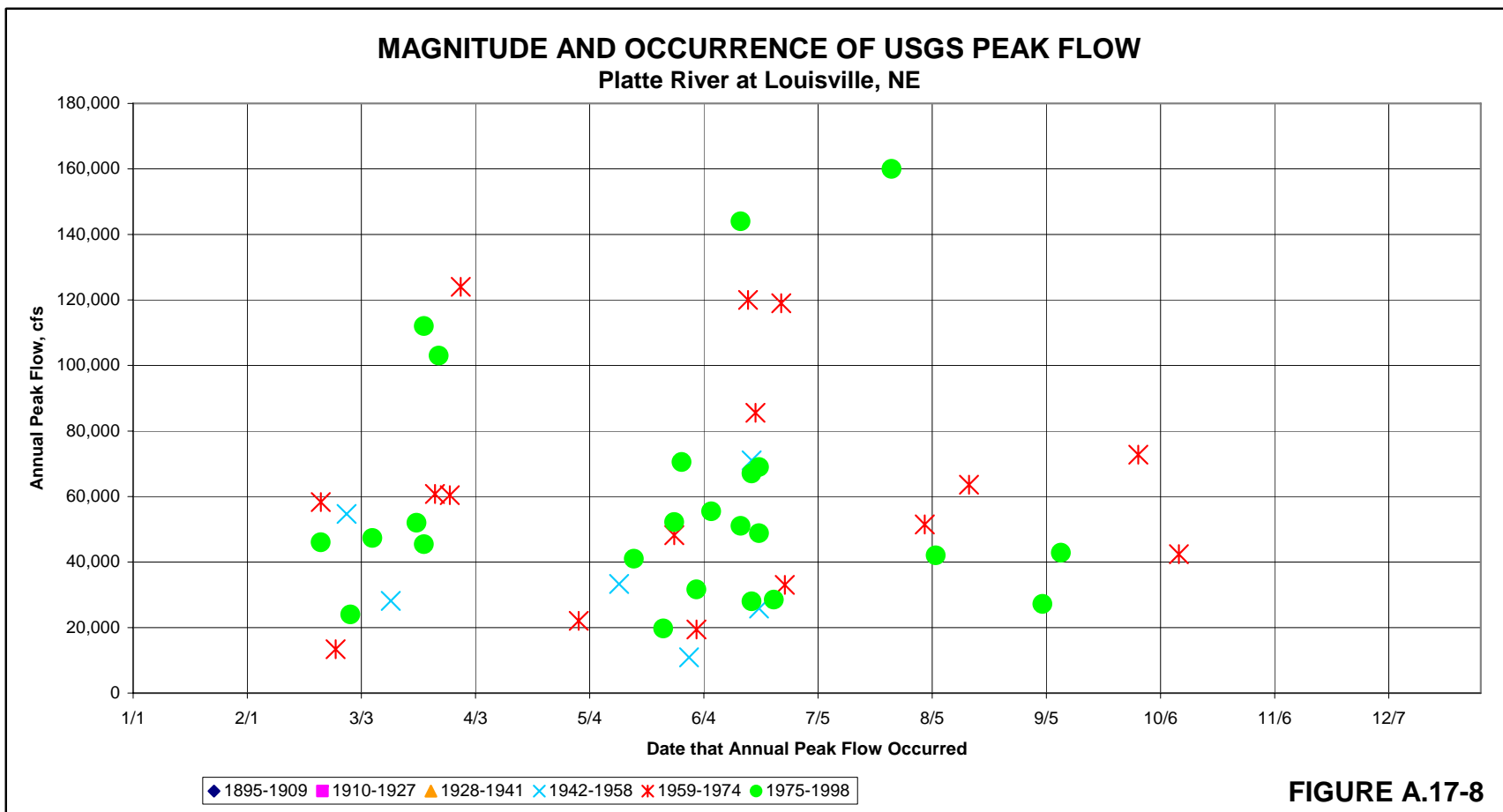


Figure A.17-8 Magnitude and Occurrence of Annual USGS peak flow.

Table A.17-15 Summary of USGS Peak Flows.

Platte River at Louisville, NE	Time Interval								
	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Average Annual Peak Flow (cfs)	57,102		57,102				37,300	62,150	58,688
Median Annual Peak Flow (cfs)	49,900		49,900				30,700	59,350	48,050
Average Occurrence of Peak Flow	5/25		5/25				5/4	6/3	5/25
Median Occurrence of Peak Flow	6/2		6/2				5/31	6/16	6/6

Table A.17-16 USGS Peak Flow Exceedance Values.

Platte River at Louisville, NE	Period of Record	1895-1941	1942-1998	1895-1909	1910-1927	1928-1941	1942-1958	1959-1974	1975-1998
Annual Peak Flows									
Peak exceeded in 100% of the years	10,900		10,900				10,900	13,400	19,700
Peak exceeded in 90% of the years	23,000		23,000				18,350	20,700	27,440
Peak exceeded in 80% of the years	28,100		28,100				25,800	33,000	30,360
Peak exceeded in 70% of the years	37,150		37,150				26,950	45,300	41,900
Peak exceeded in 60% of the years	45,400		45,400				28,100	51,500	45,520
Peak exceeded in 50% of the years	49,900		49,900				30,700	59,350	48,050
Peak exceeded in 40% of the years	54,700		54,700				33,300	60,800	51,800
Peak exceeded in 30% of the years	62,200		62,200				44,000	68,200	56,650
Peak exceeded in 20% of the years	71,000		71,000				54,700	85,600	69,600
Peak exceeded in 10% of the years	115,500		115,500				62,850	119,500	109,300
Peak Flow	160,000		160,000				71,000	124,000	160,000

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