Water Management through the First Increment Extension of the Platte River Recovery Implementation Program

U.S. Fish and Wildlife Service
Version: May 13, 2019

For additional information contact Jeff Runge (jeff_runge@fws.gov) or Tom Econopouly (tomas_econopouly@fws.gov).

The following document outlines the initial plan of the U.S. Fish and Wildlife Service (Service) for water management during the remainder of the first increment and extension. Goals, objectives, and strategies correspond with Environmental Account (EA) Manager's responsibilities and decisions summarized in the document: "Summary of Environmental Account Manager Responsibilities" (Responsibilities Document). Service goals, objectives, and strategies for EA management are based on maximizing: 1) effectiveness, 2) yield, and 3) efficiency. Benefits to trust federal resources are maximized when EA is efficiently released during times of high effectiveness. EA Manager decisions that maximize EA yield, maximize the quantity of EA released from Lake McConaughy. Goals, objectives, and strategies for water management are listed below, and then are explained in more detail in the support information section at the end of the document.

Goals, objectives, and strategies assist the EA Manager with the prioritization of releases in the EA Annual Operating Plan (AOP). Goals, strategies, and objectives are not stand-alone priorities in AOP development; rather, they are applied situationally as the EA Manager also considers multiple factors when developing the AOP to ensure that the EA is used in the most beneficial manner. In addition to effectiveness, yield, and efficiency, EA releases are prioritized in consideration of PRRIP Adaptive Management Plan priorities; potential impacts that fall within the PRRIP's good neighbor policy; and anticipated outages for the Kingsley Dam Project or the North Platte/Keystone Dam Project.

It is important to note that this document represents the Service's initial plan for 1st increment operations. The Service intends to revisit (and if necessary revise) goals, objectives, and strategies throughout the extension.

Definitions:

1. *Effectiveness - EA effectiveness pertains to downstream benefits to federal trust resources.*
2. *Yield – Quantity of water accrued to the EA at Lake McConaughy.*
3. *Efficiency - EA efficiency represents the proportion of EA released from Lake McConaughy that either: 1) reduces shortages to Service target flows, or 2) supports a pulse, SDHF, or similar high flow release as measured at the USGS stream gage at Grand Island.*

Goal 1: Improve EA Effectiveness

Objective 1 – Reduce likelihood of Lake McConaughy reaching critically low levels (currently proposed at 355,200 af) to minimize invasive plant encroachment.

Strategy 1– Prioritize the EA carry-over into the subsequent water year if content if there is not a significant threat of the Lake filling or reaching its capacity.

Strategy 2 – Support waiver (or partial waiver) for CNPPID non-irrigation release requirements when Lake McConaughy is at risk of reaching critically low levels.

Measurable Attribute – Reduction in the likelihood of reaching 355,200 af within the first increment extension from implementation of above strategies.

Measurable Attribute – Reduced management for in-channel invasive plant control for the remainder of the first increment when compared to management during times of low reservoir content (specifically 2005 through 2009).

Objective 2 – Utilize EA releases to improve our understanding of EA effectiveness.

Strategy 1 – Coordinate with PRRIP Adaptive Management Plan Working Group, to plan and implement releases that lead to future improvements in EA effectiveness for the Interior least tern, pallid sturgeon, piping plover, whooping crane, or other species of PRRIP interest.

Strategy 2 – While implementing releases under Strategy 1, assess the effectiveness of these releases for other federal trust resources including: the Platte River fish community, sandhill cranes, waterfowl, waterbirds and other species.

Measurable Attribute - Improved understanding of EA effectiveness.

Goal 2: Maximize EA Yield

Objective 1 – Increase the likelihood of accruing EA to 100 kaf and reduce likelihood of EA being debited to 100 kaf due to the filling of Lake McConaughy or reaching effective capacity.

Strategy 1 –Implement releases that minimize carry over at the end of each irrigation season to reduce risk of resetting EA back to 100,000 af.

Strategy 2 – Place higher priority on EA releases early in the water year to reduce risk of resetting EA back to 100,000 af.

Measurable Attribute – Increase in EA yield and quantity of EA released throughout the first increment extension from implementation of above strategies.

Goal 3: Improve Efficiency of EA and PRRIP Water Projects.

Objective 1 – Maximize EA release efficiency.

Strategy 1 – Place higher priority on releases early in the calendar year to minimize conveyance losses.

Strategy 2 – Minimize instances when EA releases are in excess to Service target flows.

Measurable Attribute – Increase in EA efficiency throughout the first increment extension from implementation of above strategies 1 and 2.

Objective 2 - Coordinate water management activities with PRRIP.

Strategy 1 - Develop annual operating plan that integrates Service water management activities with PRRIP water projects.

Strategy 2 - Coordinate with EAC/RCC and PRRIP to plan and implement releases that improve EA and PRRIP water efficiency.

Measurable Attribute - Increase in EA and PRRIP water efficiency throughout the first increment extension from implementation of strategies 1 and 2.

Objective 3 - Improve information sharing with EAC/RCC and other cooperators.

Strategy 1 - Utilize information provided by the EAC/RCC to improve EA and PRRIP water efficiency.

Strategy 2 - Identify new methods and models that may improve decision making to improve EA and PRRIP water efficiency.

Measurable Attribute - Increase in EA and PRRIP water efficiency throughout the first increment extension from implementation of strategies 1 and 2.

Support Information

Goal 1: Improve EA Effectiveness

Objective 1: To support Goal 1, the EA Manager will implement strategies to improve effectiveness of EA releases by: 1) minimizing the frequency of low lake storage at Lake McConaughy (approximately 355,200 af); 2) resulting in increased volume releases from the lake; and 3) reducing rates of invasive plant encroachment in the active channel. Wide channel widths are an important habitat characteristic for several federal trust resources in the Platte River basin including the whooping crane, Interior least tern, piping plover, and sandhill crane.

Due to a severe multi-year drought, the lake level at the end of WY 2005 was one of the lowest recorded at Lake McConaughy (approximately 355,200 af). The multi-year drought resulted in reduced natural, target and instream flows and facilitated widespread invasive plant encroachment in the active river channel. This encroachment decreased channel widths and the effectiveness of EA releases. The occupation of the active channel continued until a higher Lake McConaughy reservoir content enabled the return of flow releases from 2010 through 2017. In consideration of aforementioned conditions observed from 2005 through 2010, the Service may consider strategies that maximize EA effectiveness by minimizing the frequency of low lake levels.

When the reservoir is at risk of reaching critically low levels, then the EA Manager may deviate from Objective 1, Strategy 1 by minimizing EA releases and thereby increasing the carryover at the end of the water year. Another strategy, which may be considered by the EA Manager, is to minimize the occurrence of critically low lake levels by supporting waivers for non-irrigation releases. Both strategies may improve lake levels by reducing outflows with the expectation that the increased rate of lake storage will result in a quicker return to normal lake outflows.

Objective 2: In coordination with the PRRIP EDO, the EA Manager may prioritize releases within the AOP to better understand EA effectiveness. One learning opportunity that is a Service priority answers the question: What is the timing and duration that is most effective in minimizing vegetation encroachment given limited water in the EA? To assist in answering this

question, the Service would like to implement a May-June pulse (or SDHF release) in conjunction with a summer release as the combination of releases have the potential to scour in-channel vegetation and/or inhibit vegetation seedling germination.

The Service will coordinate with PRRIP with additional learning opportunities to better understand EA effectiveness with target species. The Service may also investigate learning opportunities for non-target, federal trust resources.

Goal 2: Maximize EA Yield

Objective 1: The purpose for implementing Objective 1 strategies is to maximize water accrued to the EA and minimize the amount of EA lost when the Lake McConaughy reaches effective capacity and is reset to 100 kaf. There are generally two time periods when the lake is at risk of reaching effective capacity: 1) in May/June when snowmelt and rainfall is at its peak for the year, and 2) on October 1 when the FERC mandated maximum operating levels of the lake are reduced. Both conditions are typically triggered when snowmelt and/or rainfall is higher than predicted, so lake inflows substantially exceed outflows. During these times, there is often no ability to release EA, or even non-EA water, since downstream locations are at capacity or flood stage.

Under circumstances when the reservoir is likely to fill, the Service intends to release water within to minimize the risk of a reset. Generally, this may be done by releasing the quantity of water that will result in an EA volume, by May 1 of the following water year, which is approximately 100 kaf. To do so requires an accurate forecast of the future contributions to the EA and to the total storage at the reservoir.

Strategies may need to be implemented throughout multiple WYs to minimize the likelihood of EA debiting. For example, WY 2011 was a very wet year when the EA was reset with limited opportunities to reduce shortages to target flows through EA releases. In hindsight, the Service recognized that little could be done in WY 2011 to minimize the amount of EA lost to debiting, and that the Service needed actively managing releases in WY 2010 (or earlier) to minimize loss of EA.

The Service's second strategy to minimize the likelihood of EA being debited to 100 kaf is by releasing EA early in the water year. EA releases early in the water year will reduce EA content prior to May/June when the EA is at the highest risk for resetting. Prioritizing releases early in the calendar year also provides the Service with multiple opportunities to release EA as there are times when times when circumstances prevent a release (river ice, flashy rain events, reservoir and infrastructure maintenance, etc.). While maximizing yield is important, the Service acknowledges the potential to deviate from the above strategies to support effectiveness learning under Goal 1.

Goal 3: Improve Efficiency of EA and PRRIP Water Projects

Objective 1: Releases early in the calendar year benefits EA efficiency conveyance losses for releases early in the calendar year are lower when compared to releases in the summer and fall. Additionally, EA releases early in the calendar year are less likely to exceed flow targets since the spring runoff peak may have not begun and there is less of a threat of sudden increases in streamflow due to convective storms. While maintaining high efficiency is important, there should be opportunities to deviate from the above strategy to support effectiveness learning under Goal 1.

Also to improve EA efficiency, the EA Manager should maintain releases so flows in the associated habitat reach (AHR) are just below Service target flows (i.e., maintaining freeboard). For example for a release during the spring whooping crane season, the EA Manager maintained 2,200 cfs in the AHR which allowed for a 200 cfs buffer from the 2,400 cfs flow target. This strategy provides a buffer from increased flows due to rain events that may result in total flows to be in excess of target flows. In addition, there have been instances of adjustments to measured flow, due to a rating curve shift, that resulted in EA releases overshooting the intended target. Maintaining freeboard would minimize exceedances under these circumstances. Maintaining freeboard is not needed for pulse releases, SDHF, or similar high flow releases.

Objective 2: Coordinated EA and PRRIP water management is expected to improve both EA and PRRIP water efficiency. Because of their close proximity to the associated habitat area, PRRIP

projects can quickly respond in a rapidly changing environment. Proposed PRRIP water projects may have an ability to supplement a pulse flow release and/or SDHF. PRRIP recharge projects provide a baseflow foundation for year-round flows, and may be the only flow contribution during dry summer periods. There may also be times when EA releases are in excess to target flow due to unforeseen rain events, and PRRIP water projects may be able to capture excess water and then release the water later to reduce shortages to target flows.

Objective 3: Improved information sharing with EAC/RCC has the potential to improve EA efficiency. The EA Manager is dependent on information from EAC/RCC members when developing the AOP and managing EA releases. Before making an EA release, there are calculations performed to estimate the quantity of water to be released to perform its intended purpose. The calculations estimate conveyance loss, amount of freeboard required, and gains from tributaries (e.g., South Platte). These variables depend on time of year, base flows at the time of release, local weather conditions, and other factors. To improve EA efficiency, it should be beneficial to develop tools to improve communications between the EAC/RCC membership and to reduce the uncertainty in the calculations.

Strategy 2 focuses on improving the Service's understanding of factors affecting conveyance losses and exceedances of flow targets through the application of new methods and/or models. Conveyance losses and risk for exceeding flow targets vary depending on time of year, base flows at the time of release, local weather conditions, and other factors. To better support Goal 3, Objective 1, the Service will conduct evaluations to better understand spatial and/or temporal factors that affect conveyance losses with the intent of improving EA efficiency. Also in support of Goal 3, Objective 1, the Service should conduct evaluations to better define buffers that optimize EA efficiency while minimizing excesses to Service target flows. Routine coordination with the EAC/RCC will ensure information applied in the above assessments is current and relevant. Coordination with non-EAC/RCC water and research institutions will ensure models and methods applied in assessments are current and relevant.

Competing Objectives and the Need for Optimization

The above EA objectives are intended to improve EA yield, efficiency, and/or effectiveness. Several objectives would be classified as competing objectives because proposed strategies, designed to achieve one EA objective, may result in suboptimal conditions for another objective. In these circumstances, there is not a single strategy (or combination of strategies) that will maximize both objectives. When competing objectives exist, an improved understanding of the interrelated effects of multiple strategies on competing objectives is needed to find an optimal solution that best satisfies both objectives. Subsequent paragraphs describe competing objectives in this document and the need for optimization.

Issue 1. Reservoir Content Optimization - Goal 1, Objective 1 (minimize occurrence of low lake storage) and Goal 2, Objective 1 (maximization of EA yield via reset) represent competing objectives. Currently, the EA Manager uses best professional judgement on whether to maximize water releases during the current water year or conserve water for the upcoming water year. EA manager's decisions are based on current water year's hydrologic conditions and climate predictions. It would be useful to develop tools, which utilize climate and hydrologic forecasts, to improve decision making.

There are also trade-offs involved with supporting actions that improve lake content or actions that increase reservoir releases. For example, waivers for non-irrigation release requirements result in the loss of releases that support federal trust resources. In previous WYs, the Service has agreed to partial waivers to increase lake storage but allow a smaller quantity of water to be released to benefit downstream resources. An example of a partial waiver is when non-irrigation releases are waived from October through January, but non-irrigation release requirements are met from February through April. An understanding of tradeoffs will lead to the development of rule based triggers for when to support a full waiver or partial waiver.

Issue 2. Maximizing Effectiveness through Storage versus Releases - Goal 1, Objective 1 (minimize occurrence of low lake storage) and Goal 2, Objective 1 (maximize EA yield via reset) also represent competing objectives when it pertains to EA effectiveness. It is implied that EA effectiveness increases as the Service maximizes EA yield. Specifically, higher EA release

quantities roughly equates to greater EA effectiveness. However, maximization of EA releases could have a negative effect on EA effectiveness if releases contribute to critically low lake storage, and low lake storage exacerbates invasive vegetation encroachment described in Goal 1, Objective 1.

An understanding of tradeoffs between maximizing EA releases and minimizing low lake levels will lead to the development of operational rules that optimize EA effectiveness under varying hydrologic conditions and reservoir content. This issue is very similar to Issue 1 with subtle differences. Issue 1 focuses on optimization of water in Lake McConaughy through water management using objectives based on reservoir content. Issue 2 focuses on optimization of EA effectiveness. Currently, proxies are applied as objectives for EA effectiveness (EA release quantity, EA efficiency and low reservoir content). The Service and the PRRIP are evaluating the effects of EA releases on downstream resources, and results from this evaluation will inform EA effectiveness.

Issue 3. Balancing Efficiency and Effectiveness - Goal 1 (EA effectiveness) and Goal 3 (EA efficiency) also contain competing objectives as there may be time periods when EA releases cannot be maximized for both efficiency and effectiveness. For example, the EA Manager currently prioritizes EA releases early in the calendar year to minimize loss due to resetting, conveyance losses and exceedances of flow targets. However, we may find that these releases while efficient are not highly effective. Thus, a comprehensive understanding of tradeoffs between EA effectiveness and EA efficiency could identify EA releases that optimize species benefits coupled with EA and PRRIP water use. The effectiveness and efficiency of EA releases may also vary spatially or temporally, and this variability should be considered in the optimization process.