



## Interior Least Tern and Piping Plover Abundance and Productivity

One management objective in the Program Adaptive Management Plan (AMP) is to increase productivity of interior least tern (hereafter, tern) and piping plover (hereafter, plover) within the associated habitat reach (AHR) of the central Platte River. Competing hypotheses exist in the AMP as to whether or not:

- in-channel and off-channel nesting habitat are necessary for maintaining stable populations of terns and plovers within the AHR,
- increasing nesting habitat will result in an overall increase in tern and plover abundance or merely a shift in their distribution, and
- reduced flow, and thus forage availability, limits tern and plover productivity within the AHR.

As such, all nesting areas within the AHR are monitored annually to document the abundance and productivity of terns and plovers on in-channel and off-channel nesting habitats.

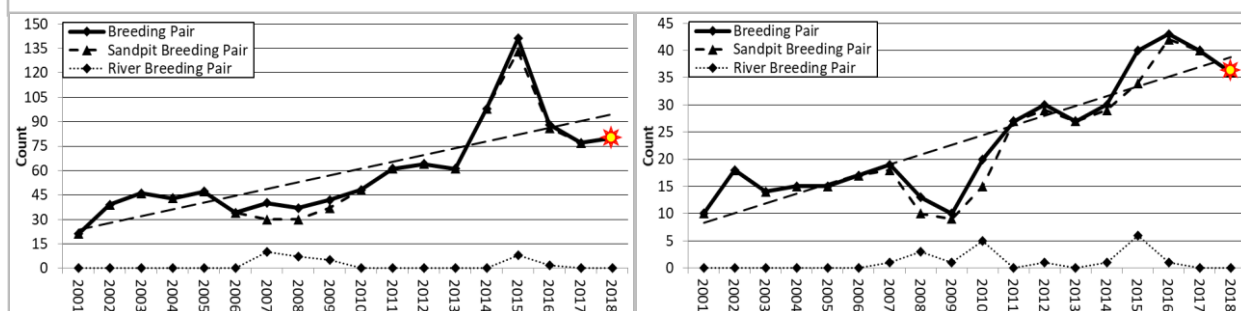
### Preliminary 2018 Monitoring Results:

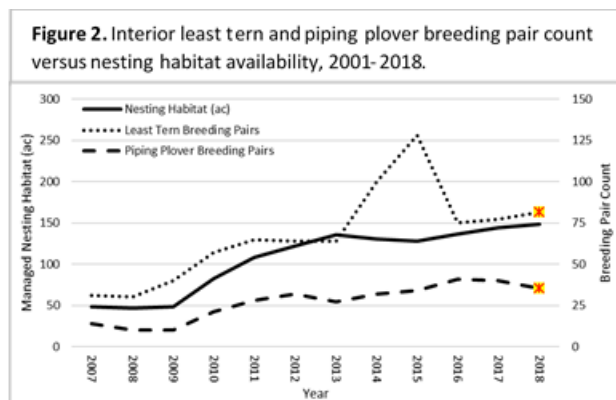
Results for 2018 indicate habitat availability and tern and plover breeding pair counts were similar to previous years. Tern nest success and chick success were high which resulted in an all-time high 1.46 tern fledglings per breeding pair. While plover abundance and nest success remained fairly high, plover chick success was low which resulted in an all-time low 0.65 plover fledglings per pair. Band resighting studies further indicate population increases within the AHR have been largely due to recruitment as 68% of tern adults and 42% of plover adults observed during 2018 were banded within the AHR prior to 2017 when banding ceased.

### Looking Backward:

Tern and plover monitoring activities conducted to date have included the implementation of monitoring techniques from within as well as from outside the nesting colony, conducting foraging habit studies, affixing telemetry equipment to adults, banding adults and chicks, and documenting productivity within the AHR. The Program has created ~72 acres of in-channel (sandbars) and >90 acres of off-channel (sandpits) nesting habitat to evaluate hypothesized relationships between habitat availability and tern and plover use and productivity within the Program Associated Habitat Area. Off-channel nesting habitat has accounted for a preponderance of the nesting activity and productivity observed within the AHR to date (Figure 1).

**Figure 1.** Habitat-specific interior least tern (left) and piping plover (right) breeding pair counts, 2001-2018.





Since Program inception, tern and plover abundance has increased in proportion to the availability of off-channel nesting habitat which is a strong indication habitat availability was limiting tern and plover populations prior to 2007 (Figure 2). During this same timeframe, tern and plover productivity has surpassed the Lutey (2002) objective in 12 of 12 years for terns and 9 of 12 years for plovers which is a strong indication the AHR is a population source rather than a sink (Figure 3).

Analyses of flow versus productivity indicate there is no relationship between flow, and thus forage fish abundance, and tern productivity and we suspect analyses of data linking forage availability and plover productivity would yield similar results.

Data collected to date have been used within a formal structured decision-making process to evaluate and adjust future management actions to achieve the Program's tern and plover objectives.

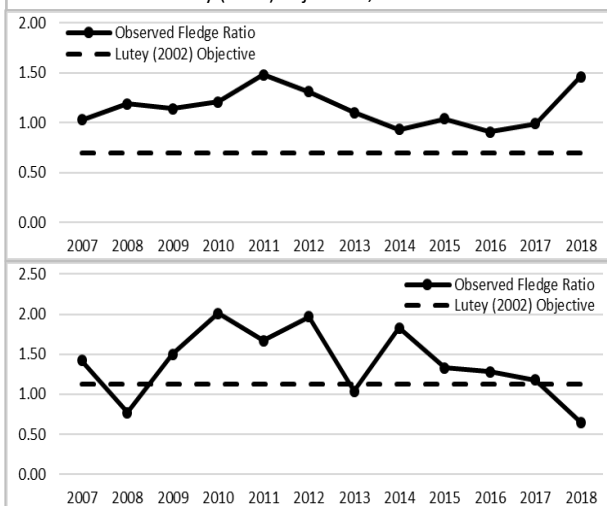
### Looking Forward:

In 2016, the Governance Committee decided to forego any further in-channel island construction activities in lieu of creating an additional 60 acres of bare-sand off-channel and water (OCSW) nesting habitat and maintaining 10 acres of moving complex approach (MCA) nesting islands in the channel. MCA habitat consists of sandbars that have been disked to clear vegetation but not elevated, smoothed or topped with clean sand to provide suitable nesting substrate. The Governance Committee further recommended the Fish and Wildlife Service not make target flow releases specifically for improving productivity of terns and plovers within the AHR.

The Program is working to identify alternatives for development of the additional 60 acres of OCSW habitat and is currently assessing the feasibility of mechanically-constructing OCSW habitat on excess cropland acres included in the Clark Island purchase. In addition, a 7-acre MCA nesting island near Chapman has been cleared and is being maintained and an additional MCA site has been identified for future island clearing activities. During the Program's First Increment Extension we plan to continue to monitor tern and plover habitat availability, abundance and productivity as the Program increases off-channel nesting habitat by 60 acres.

Although there is no relationship between flow and tern productivity, it is also logical to conclude that some minimum amount of river flow is necessary to maintain an adequate forage base over the long term. This could be a focus area for target flow and/or Extension flow management planning discussions.

**Figure 3. Interior least tern (top) and piping plover (bottom) fledge ratio versus the Lutey (2002) objectives, 2001-2018.**





## Interior Least Tern and Piping Plover Inside-Outside Monitoring Comparison

One management objective in the Program’s Adaptive Management Plan (AMP) is to increase productivity of interior least tern (hereafter, tern) and piping plover (hereafter, plover) within the associated habitat reach (AHR) of the central Platte River. As such, all nesting areas within the AHR are monitored annually to document the abundance and productivity of terns and plovers on in-channel and off-channel nesting habitats. A key uncertainty, however, is how trends in abundance and productivity within the AHR compare to estimates throughout the species range and how survey techniques influence results of estimates like trends in breeding pairs, chick survival, and overall productivity as measured by fledglings per breeding pair.

### Where We Have Been:

Program tern and plover monitoring activities conducted to date have included the implementation of monitoring techniques from within as well as from outside the nesting colony, conducting foraging habit studies, affixing telemetry equipment to adults, banding adults and chicks, and documenting productivity within the AHR. During 4 years of this monitoring and research effort, the Program also monitored all off-channel sites from outside the nesting colony which allows for comparisons in abundance and productivity estimates across survey techniques to be made.

### Results:

We found intensive inside monitoring efforts resulted in more nests and early-development chicks being detected. Excluding these nests and chicks from survival analyses could result in optimistic estimates of nest and chick survival. In addition, detecting more nests would also result in more breeding pairs being detected from within the colony. While fledgling counts between methods were similar for piping plovers, more least tern fledglings and higher fledge ratios were observed from outside the nesting colony (Figure 1).

The best method and intensity of survey effort to employ appears to be dependent on the objectives of the study and availability of resources. Intensive inside monitoring efforts seem to provide the most precise estimates of abundance and survival; however, if resources are limited, intensive outside monitoring efforts result in reasonable estimates of abundance and productivity measures.

### Where We Are Going:

Beginning in 2016, the Program opted to forgo spending the additional few hundred thousand dollars annually on intensive inside monitoring and research efforts so only intensive outside monitoring efforts will be implemented going forward.

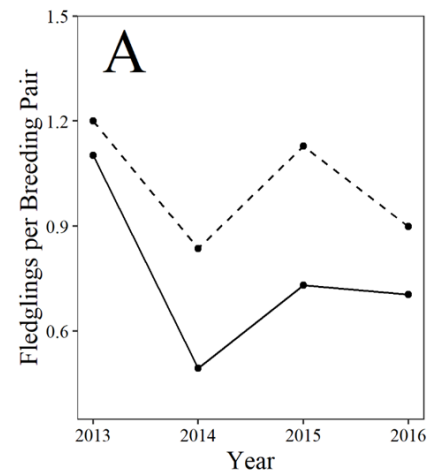


Figure 1. Comparison of inside (solid line) and outside (dashed line) monitoring techniques for least terns.