

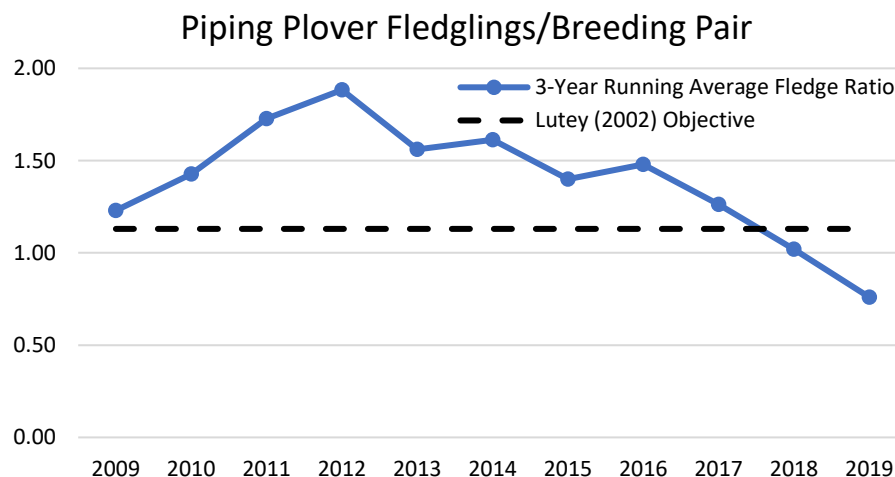
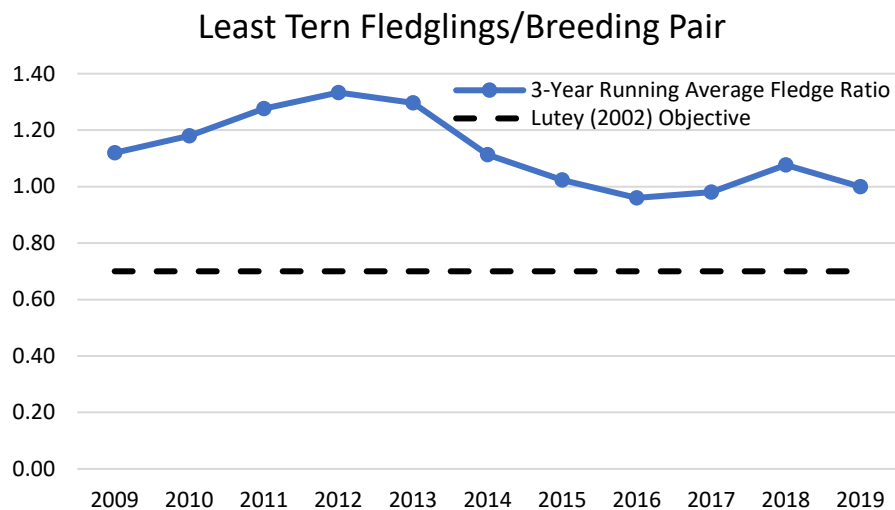


PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM ADDITIONAL PREDATOR CONTROL RESEARCH DESIGN

Definition and Purpose

The Platte River Recovery Implementation Program (Program) and Nebraska Public Power District (NPPD) manage nine off-channel sand and water sites for interior least tern (tern) and piping plover (plover) nesting. Since 2007, the Program and NPPD have implemented terrestrial predator trapping at all managed nesting sites. In 2019, the Program underwent a process to revise an adaptive management plan (AMP) to be implemented during the Program's First Increment Extension. During this process, the Program identified a Big Question and associated hypotheses related to the necessity of additional predator control at off-channel nesting sites. This decision was related to the fact that plover three-year running average fledge ratios increased as new sites were added from 2009-2012, reached an all-time high in 2012, and declined annually since the Program ceased creating new habitat in 2013 and the sites subsequently aged (Figure 1).

Figure 1. Observed three-year, running average fledge ratios for interior least tern (top) and piping plover (bottom) on off-channel nesting sites along the central Platte River, 2007-2019.





The Program invested substantial resources in increasing the amount of available off-channel nesting habitat by removing vegetation from existing sandpits and constructing new off-channel sand and water nesting habitat. This habitat has attracted high numbers of breeding terns and plovers annually. However, the high concentration of nests and chicks on this permanent off-channel habitat may make them more vulnerable to predation. Predation impacts the productivity and adult survival of terns and plovers and predation management is an important strategy to aid in the recovery and conservation of these listed species. Furthermore, predator management is identified in species recovery plans for terns and plovers as a recovery and conservation action that must be considered if recovery of these species is to be achieved.

Predators are known to key in on permanent nesting sites of terns and plovers. Similar to the central Platte River, predation has been identified as a factor that limited the productivity of terns and plovers on older nesting sites on the Missouri River. Similar to the central Platte River off-channel sites, apparent nest success for these older sandbars remained high with 68% of plover nests and 70% of tern nests hatching out at least one egg; however, productivity on the older bars on the Missouri River was low due to high chick mortality. In the absence of evidence of chick losses due to weather events, the most likely cause of the recorded high chick mortality was reported to be predation.

In 2008, United States Department of Agriculture personnel erected modified pole traps on a sandbar complex on Lewis and Clark Lake and on six constructed sandbar complexes on the Gavins Point River Segment on the Missouri River. Plover chicks on these sites had significantly higher survival rates than sandbars where no avian predators were removed during this year. The three older constructed sandbars saw an increase in productivity over the 2004-2007 time period with a combined fledge ratio of 1.36 for piping plovers and 0.59 for least terns. Similarly, strobe light systems have been used to deter nocturnal predators on four sites on the Gavins Point River segment. For the four sites on the Gavins Point Segment with strobe lights, tern nest success was 69% and plover nest success was 100% while the tern success rate for sites without strobe lights on the Gavins Point River Segment was only 19% and piping plover nest success was 61%.

Program monitoring data and observations suggest avian and terrestrial predators have learned to hunt on off-channel nesting sites as they age and that current piping plover productivity levels are insufficient for maintaining a long-term population along the central Platte River (Figure 1). Program predator monitoring data indicates mammalian predators are the most prevalent predator within the nesting sites during the night while avian predators are the most prevalent predator during the day. As such, the Program will test the effectiveness nocturnal predator deterrent lights and turtle management techniques to decrease predator presence and increase tern and plover productivity on nesting sites. Turtle management will include turtle trapping and turtle exclusion fences to discourage turtle egg-laying on nesting sites to decrease nesting site attractiveness to predators. Based on research findings, ongoing predation management efforts will focus on implementing a combination of management actions in a manner that will, at a minimum, sustain current populations of the terns and plover and ideally improve productivity and increase the central Platte River populations of these species.

Implementation Criteria

Beginning in 2020, we propose to maintain current levels of terrestrial predator trapping at all off-channel nesting sites while introducing nocturnal predator deterrent lights, turtle trapping, and turtle exclusion fences to determine the efficacy of these methods for increasing productivity at off-channel nesting areas. We hypothesize these additional predator management actions will decrease terrestrial and avian nocturnal predator activities at nesting sites and lead to increased tern and plover productivity.

The study will begin with a pilot year in 2020 where turtle trapping will be deployed at Blue Hole and Dyer to understand the our ability to (1) effectively capture targeted turtle species, (2) estimate site-level turtle population size, and (3) Understand target turtle species utilization of tern and plover sites as nesting areas.

Turtle trapping will be executed with baited hoop nets 3ft x 6ft with 2 -inch mesh (memphisnet.com) at Dyer (3-4 traps) and Blue Hole (5 traps) at a density of one trap per 2500 ft of suitable nesting habitat shoreline at a site. Hoop nets were specifically chosen to target softshell turtles, as these are most frequently observed and represent the most likely turtle to deposit eggs on tern and plover nesting sites.

Limited turtle exclusion fence (~1000 ft) will also be deployed at Blue Hole along a southeastern section of the site where of abundant turtle nesting activity have been observed in the past. The fence will consist of one, 500-foot length of wood slat and one, 500-foot length of Redbrand Woven wire 39” with steel six-foot t-posts placed every 20 feet along fence lengths (figure 2; appendix 1A). An electrified wire will be run along the top of the fence to deter avian predator perching and funnel traps will be placed at fence ends. Effectiveness to deter turtle presence/nesting will be monitored for both fence types through hoop net turtle traps placed in water, with funnel openings at the fence ends. Surveys to detect visual turtle evidence (tracks, fence breaches), as well as potential terns or plovers entrapped, entangled, or injured along the fence will occur at both of the tern and plover nesting areas. Surveys will be conducted from the waters’ edge or with kayaks. Both types of fence will also be placed at Broadfoot South along shoreline of nest site in areas with recent tern and plover nesting activity and chicks utilizing the shoreline (appendix 1B). Broadfoot South fence will demonstrate if terns and plovers avoid nesting near fencing. Fences at both sites will be monitored to determine if either fence type is a barrier for chicks or adults to access the shoreline.



Figure 2. Pictures of A) wood slat fencing prior to electrified top wire installation and B) Redbrand Woven Wire 39” with electrified top wire and insulators.

Deterrent light sets will be placed at Blue Hole and Newark West at a density of one light set per five acres of suitable nesting habitat. Sets will consist of both random lights (Foxlights Solar Night Predator Deterrent) and motion triggered (Luposwiten Solar Motion Sensor Lights) lights. Each light type will be set on 8 ft t-posts and placed less than 100 ft apart depending on terrain. A single random light will be installed on top of a t-post and 2 motion triggered lights will be installed on the other t-post. No negative impacts to tern and plover productivity were observed on the Missouri River when deterrent lights were deployed, and no negative impacts are anticipated for this study (Kruse 1993, US Army Corps of Engineers 2009). However, deterrent lights will also be monitored twice per week to during active nesting periods to monitor tern and plover behavior near sets.

In the absence of major experimental design revisions following 2020, the study will proceed at full capacity from 2021-2027 where two sites will be fenced, three sites turtle trapped, and 4-5 sites outfitted with



deterrent lights each year and treatments will be assigned at random annually. Upon conclusion of the study data will be evaluated to determine the efficacy of turtle management and deterrent lights to increase productivity on off-channel nesting areas.

Table 1. Experimental design for predator trapping and installation of deterrent lights at off-channel nesting sites within the AHR. The design for year 1 (2020) is shown below and treatments will be rotated annually so that all sites will be exposed to turtle management and deterrent lights during this study.

Site Name	Turtle Management	Deterrent Lights	Terrestrial Predator Trapping
Lexington Sandpit	No	No	Yes
Dyer	Trapping	No	Yes
Cottonwood Ranch	No	No	Yes
Blue Hole	Trapping/Fencing	Yes	Yes
Johnson Pit	No	No	Yes
Broadfoot South	Fencing	No	Yes
Newark West	No	Yes	Yes
Newark East	No	No	Yes
Leaman	No	No	Yes

Constraints

Given the year-to-year variability in productivity at each site, the primary constraint for this experimental design is the number of replicates needed to have sufficient statistical power to detect a difference in productivity rates at experimental and control sites. Based on assumptions to estimate statistical power, at least eight years of study duration would be required to achieve high statistical power and indicate a positive influence of avian predator control measures. As such, we will use statistical modeling and a weight of evidence approach to assess this hypothesis.

Performance Metrics

We will calculate daily nest and brood survival rate (DSR) to obtain incubation and brooding period survival rates (DSRⁿ) separately for each species where n is 21 days for least tern nests and broods and 28 days for piping plover nests and broods. Proportion of chicks fledged and fledglings per breeding pair and nest will also be calculated at each site within a given year.

Modeling and Output

Nest or brood fate logistic regression models will be developed, with a logit link function, using the nest survival models in package RMARK in Program R for both nest and brood survival analyses. Evaluation of nest and brood survival will occur to test for statistically significant differences between tern and plover productivity rates when turtle trapping, turtle enclosure fencing, and/or deterrent lights, are included as additional predator management compared to when they are absent. To test for statistical significance of management techniques, chi-square tests will be performed to compare the null model and models including trapping variables within the nest survival modeling framework in Program MARK. The proportion of chicks fledged and fledglings per breeding pair will also be compared using generalized linear mixed models to evaluate if statistically significant differences occur between sites with and without turtle trapping or turtle enclosure fencing as well as sites with and without deterrent lights.

Uncertainties

Efficacy of turtle trapping, turtle enclosure fencing, and deterrent lights for improving tern and plover productivity.



Criteria for Adjusting Actions

This experimental design will be implemented for the pilot year plus seven years (2020, 2021-2027) at which point productivity rates will be evaluated to determine the efficacy of turtle trapping, turtle exclosure fencing, and deterrent lights for improving productivity of terns and plovers. A 0.20 increase in nesting or brooding period survival rates and fledge ratios would be indications of an effective means of controlling predation and improving production of terns and/or plovers within the AHR.

Incidental Take Avoidance and Minimization Measures

The research activities described above will be implemented within the requirements of the existing federal permit (TE183430-2) with modifications proposed in our permit renewal that was submitted in February of 2020. Specific avoidance and minimization activities include:

- All fencing and lights will be installed prior to May 1 and removed in the fall after all birds have migrated.
- All fencing and light installations will be equipped with avian spikes or similar to prevent their use as predator perches.
- All fencing will be setback ≥ 2 feet above the waterline to minimize impacts on foraging and other behaviors near waters' edge at nesting sites.
- Least tern and piping plover colonies will be entered no more than twice weekly. No individual bird will be kept off a nest for more than 30 minutes.
- Turtle trapping will be conducted under water and will not require access to, or have any impact on terns and plovers or their nesting habitat.
- No impacts from deterrent lights to be anticipated on terns and plover; as found at sites on the Missouri River (Kruse 1993, US Army Corp of Engineers 2009) but behavioral monitoring will occur near deterrent lights during tern and plover breeding season monitoring.
- Fencing will be constructed with at least 2.5-inch wide x 4-inch tall openings to allow for terns and plovers (which are ~2 inches wide), to pass through unimpeded, thereby reducing the likelihood that the fence will act as a barrier.
- During each site survey, as part of the Tern and Plover Research and Monitoring Protocol, a 5-minute observation of tern and plover behavior near predator management activities will be conducted.
- Kayak surveys will assess turtle fence breaches, but also will survey for the presence of any adults, chicks along the fence line that may have been trapped or entangled, injured or killed.
- Report any instances to FWS immediately when it is determined access to the shoreline is being impacted or terns, plovers, or their chicks have been entangled, entrapped, injured, or killed near fence.

Literature Cited

- Kruse, C. 1993. Influence of Predation on Least Tern and Piping Plover Productivity Along the Missouri River in South Dakota. Thesis, South Dakota State University, Brookings, USA.
- US Army Corps of Engineers. 2009. Predation management plan for least tern and piping plover habitat along the Missouri River. Omaha, NE, USA.

Appendices

Appendix 1. Fence placement at Blue Hole (A) and Broadfoot South (B) during the 2020 tern and plover breeding season. Yellow lines represent wood slat fencing, orange lines represent woven wire fencing, and blue lines represent where fence types are joined. Funnel trap openings with hoop net turtle traps will be placed at fence ends on Blue Hole (white triangles).

