Interior Least Tern and Piping Plover Predator Control Memo

It is believed avian and terrestrial predators have keyed in on off-channel nesting sites as they have aged 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, 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.

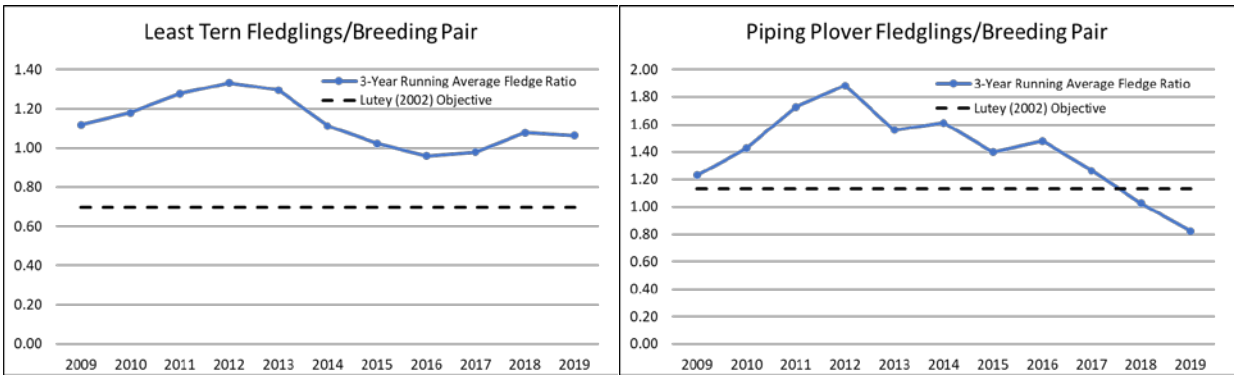

Figure 1. 3-year running average fledge ratios for interior least terns (left) and piping plovers (right) nesting on off-channel sites within the AHR, 2007-2019.

Beginning in 2020, we propose to maintain current levels of terrestrial predator trapping at all off-channel nesting sites while implementing combinations of avian trapping and nocturnal predator deterrents (strobe lights) to determine the efficacy of these methods for increasing productivity at each of the off-channel nesting areas (Table 1). The experiment will continue through 2027 at which time data will be evaluated to determine the efficacy of avian predator trapping and strobe lights at reducing predation on off-channel nesting areas.

Table 1. Experimental design for predator trapping and installation of strobe lights at off-channel nesting sites within the AHR. The design for year 1 is shown below and treatments will be rotated annually so that all sites (except Leaman) will be exposed to 4 replicates of the various combinations of avian trapping, strobe lights, and control during this study. Leaman will not be treated with avian trapping and will have strobe lights installed every other year due to the presence of a bald eagle nest near the site.

Site Name	Avian Predator Trapping	Strobe Lights
Lexington Sandpit	No	Yes
Dyer	Yes	Yes
Cottonwood Ranch	Yes	No
Blue Hole	Yes	Yes
Johnson Pit	No	No
Broadfoot South	Yes	No
Newark West	No	Yes
Newark East	No	No
Leaman	No	Yes

Power Analysis

The Program conducted a statistical power analysis to determine the duration and extent of avian predator management necessary to observe an increase in piping plover productivity (fledglings per nest) on off-channel sites in the Associated Habitat Reach. Piping plover productivity data from 2012-2019 was utilized to develop a statistical power curve based on study duration in years. Off-channel nest data from 2012-2016 (n = 170 nests) represented high productivity assumed to when avian management occurs during the beginning of the First Increment Extension. Off-channel sites (n = 9 sites) were assigned 1 of 3 treatments: 1) strobe lights, 2) avian trapping, 3) strobe lights and avian trapping. Off-channel data from 2017-2019 (n = 147) represented lower productivity assumed to occur in the absence of avian management and were not assigned any avian treatments (treatment 4 or control).

We modeled fledglings per nest with a generalized linear mixed effects model using R-package lme4 where fledglings per nest was assumed to have a Poisson distribution. Avian management treatments of strobe lights and avian trapping were included as fixed effect categorical variables and year was included as a random effect. We assumed 0.75 fledglings per nest resulted with no avian management treatment, whereas strobe lights or avian trapping would increase productivity to 1.06 fledglings per nest and 1.50 when sites had strobe lights and avian trapping present. Our power analysis result estimated adequate statistical power was achievable with a study duration of ≥9 years during the First Increment Extension (Figure 2). When accounting for year and site as random variables, we determined power would not be adequate to determine if avian management would increase productivity at off-channel sites in the Associated Habitat reach during the First Increment Extension.

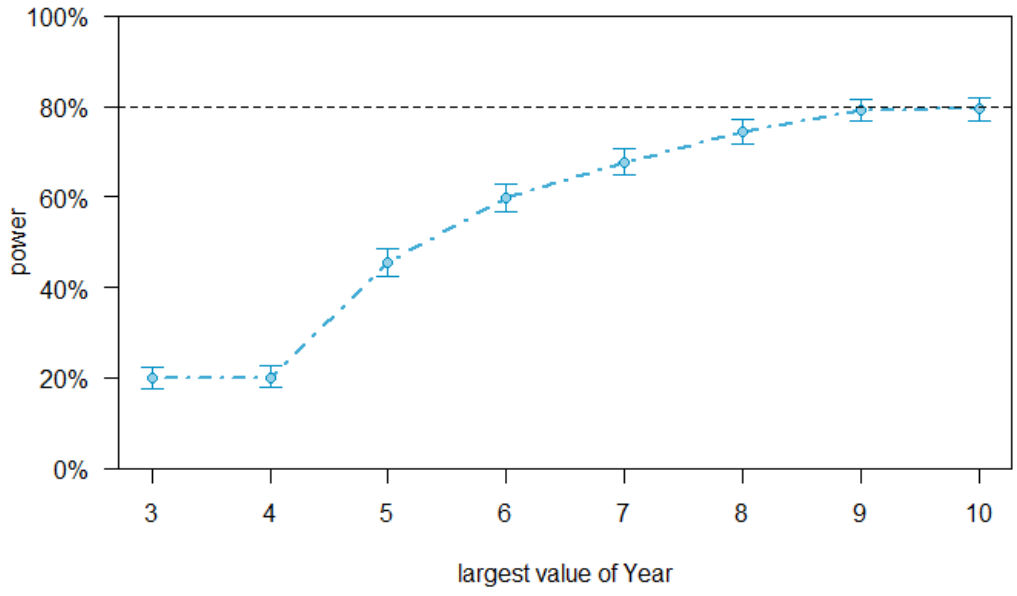

Figure 2. Power analysis results for avian management assuming 0.75 fledglings/nest for no management, 1.06 fledglings/nest for strobe lights or avian trapping, and 1.50 fledglings/nest when both strobe lights and avian trapping were applied.