

2012 Fish Springs NWR Predator Report

Prepared by:

Ryan Haffele
U. S. Fish and Wildlife Service
July 25, 2012

Introduction

Predator populations can have profound effects on the population dynamics of their prey, most notably through direct consumption. A less recognized effect is behavioral changes that are caused by the presence of predators, which affect the survival and reproduction of prey species (Nelson et al. 2004). Predators have been identified as the most important cause in reproductive failure for bird species, primarily through the predation of eggs (Ricklefs 1969). Previous studies, however, have found that perceived predation pressure can also impact reproductive investment and success of avifauna. Fontaine and Martin (2006) found increased parental investment of passerines on areas where predators were experimentally removed. Another study found decreased clutch sizes (a surrogate for reproductive investment) of Collared Flycatchers (*Ficedula albicollis*) in areas with experimentally increased predation rates (Doligez and Clobert 2003). Finally, Dassow (2010) found evidence that dabbling duck hens are able to identify and avoid high predator density areas when selecting a nest site.

Mesopredators, like red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), and raccoons (*Procyon lotor*) have been found to have an extreme negative effect on ground nesting bird success, with coyotes typically having less of an impact (Sovada et al. 1995). The predator composition at Fish Springs National Wildlife Refuge (FSNWR), however, is limited due to the extreme environment surrounding the refuge. Coyotes (*Canis latrans*), ravens (*Corvus corax*), and gopher snakes (*Pituophis melanoleucus*) have been identified as the most common predators present (FSNWR Coyote Management Plan 1980), with badgers (*Taxidea taxus*), raccoons, striped skunks, kit fox (*Vulpes macrotis*), and bobcats (*Lynx rufus*) also being seen on rare occasions (FSNWR Annual Report 1966; 67; 69). Understanding predator populations on the refuge is an important consideration when developing management plans to enhance ground nesting bird success.

Monitoring predator populations and activity levels on the refuge can help determine appropriate management actions to increase nest survival. Scat deposition surveys have been found to be correlated with estimates of animal density (Knowlton 1984). Deposition surveys also have the benefit of needing only one observer and being able to collect data over time without an observer present, making it a very practical technique at FSNWR (Henke and Knowlton 1995). There are biases involved with this technique, including a possible reduction in scat deposition due to removal of scats while preparing transects, decomposition of scat, and failure to detect scat. The last bias can be reduced by walking transects twice, once in each direction (see Henke and Knowlton 1995).

FSNWR was established with the primary focus on waterfowl production (FSNWR Marsh Management Plan). Since refuge establishment, predators have had a large impact limiting waterfowl production on the refuge (See 2012 Duck Production Report). Efforts have been made to control the impact of predators on production through predator management, with

staff focusing on the removal of striped skunks, coyotes, ravens, and gopher snakes (Table 1). Coyotes were primarily removed through shooting and trapping, with the Animal Damage Control assisting with aerial shooting. Ravens were controlled through shooting, harassment, and eggs poisoned with avicide. Gopher snakes and striped skunks were removed through trapping efforts (FSNWR Animal Control Plan 1990). Despite a concern over the impacts of predation on ground nesting species at FSNWR, very little monitoring of predator populations has occurred. The objective of this study was to: 1) design a monitoring protocol to create an index of predator abundance on the refuge and 2) determine if the predator composition has changed from historical records, primarily the presence of striped skunks and raccoons.

Methods

Scat deposition transects (Andelt and Andelt 1984) were developed to determine a relative index to the predator populations, primarily coyotes, on FSNWR (Figure 1). A total of 5 1-km transects were created on roads within the refuge. Starting and ending locations were determined by selecting random points generated along roads in the refuge in ArcGIS (ESRI, Redlands, California, USA). Each road could only contain a maximum of 1 transect to ensure sampling of the entire refuge. The survey took place in late May to coincide with the nesting season. To perform the scat survey, each transect was walked twice, once from each direction, with observers identifying and removing all scat found on transects. Two weeks after clearing transects, observers walked each transect in both directions again, identifying and counting all scat located on transects. An index to predator populations was then calculated for each species in which scat was found. Indices were calculated as the number of scat deposited per day per km

$$\left(\frac{\frac{\# \text{ scat found}}{\text{km}}}{\text{day}} \right).$$

To positively identify other potential predators that may be present on the refuge, remote camera traps were set up throughout the refuge. A total of 2 cameras were deployed at a time for 11 weeks. Cameras were fastened to steel posts and checked at ~ 2 week intervals. Bait stations consisting of sardines were established in front of each camera to attract predators.

Results

Results from predator surveys were overwhelmingly dominated by coyote. Throughout a total of 5 scat survey transects, 164 specimens were found, 162 of which were coyote. The remaining two specimens belonged to both skunk and red fox. The total deposition rate for all transects was 2.34 scat/km/day. Predator activity was concentrated along the southern end of the refuge; with 117 of the 164 scats being found on transect 4 for an index of 8.35 scat/km/day. All but one of these scats was from coyotes, with the other being identified as a red fox. Transect 3 contained the second-highest abundance of scat with 25, all coyote, resulting in an index of 1.79 scat/km/day. Transect 2 contained 12 scat, all attributed to coyote. The index for transect 2 was 0.88 scat/km/day. Transects 1 and 4 had a total of 4 and 5 scats, respectively, with 1 of the scats

on transect 5 being identified as skunk scat. Indices for these transects were 0.29 and 0.43 scat/km/day, respectively. Camera traps were deployed for a total of 11 weeks, with 35 predators being captured by photo. On the camera set in Avocet unit, 9 animals were photographed, all coyote. In Gadwall unit, 1 coyote was captured on film, along with 4 common ravens. In the Handicap Blind area where a camera was placed, 3 coyotes were captured. Within lower Curlew unit, 3 coyotes were caught in the trap, along with 2 ravens. The last trap placed caught 2 coyotes, and 11 ravens.

Discussion

Based on the results found from predator surveys, coyotes have the highest population of all predators on the refuge. Common ravens were also present during the nesting season, which have been found to be efficient nest predators that can limit the productivity of other bird species (Angelstam 1986, Marzluff and Balda 1992). Nest predation has been reportedly high at FSNWR, presumably due to the large population of coyotes and ravens (See 2012 Duck Production Report). Due to the relatively inhospitable environment around FSNWR and the increased habitat diversity and abundance of water on the refuge, common prey items (i.e. lagomorphs, waterfowl, and small mammals) are likely attracted to the refuge, resulting in an increase in predators responding to an increased abundance of prey.

Historically, coyote populations peaked in the fall and winter at FSNWR (FSNWR Annual Report 1960), but indices from current surveys suggest they are abundant during the nesting season. This likely has negative effects on nesting species, as coyotes have been witnessed depredating nests (J. Bourne and E. Pero, personal observation). The primary food source for coyotes in this region is jackrabbits (Clark 1972), however, coyote populations and home range sizes have been shown to fluctuate with prey populations (Clark 1972, Mills and Knowlton 1991). When prey abundances drop below a level that is not energetically advantageous for coyotes to hunt, they will switch to an alternative prey (Bartel and Knowlton 2005). With the abundance of coyotes on the refuge during the nesting season, it is likely that ground nesting birds provide an alternative prey source, making it important to understand their population trends to ensure appropriate management actions are taken to alleviate their overall effect on nesting birds.

The identification of a skunk and red fox scat on the refuge is intriguing. Striped skunks have been found on the refuge previously, however, intensive management efforts were thought to have decreased the population to a level that would not affect nesting birds (FSNWR Coyote Management Plan 1980). If these mesopredators are present on the refuge, management actions to control the growth of their population may be needed, as they are more efficient foragers of ground nests and may reduce nesting productivity on the refuge even further (Sovada et al. 1995). Further investigation into the presence of these animals should be conducted, as observers conducting the surveys were novices at scat id. Baited camera traps placed in locations near

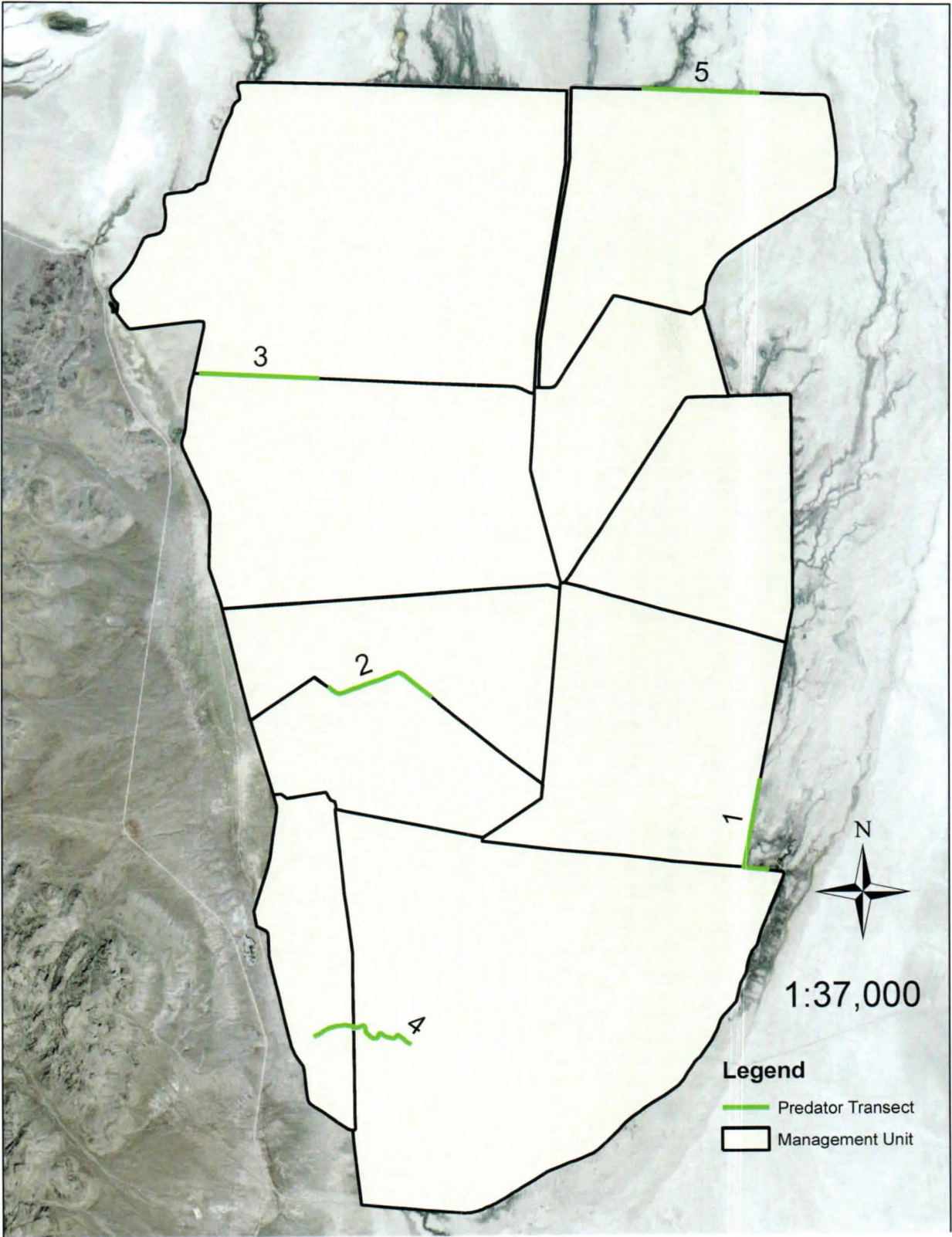
where these scat were found did not capture skunk or red fox to give confirmation of the scat identification.

The data collected this year provides a baseline for predator population monitoring. Future monitoring should be conducted along the same transects to establish trends in populations. These trends can also be analyzed to determine how predator activity on the refuge changes over time. Additionally, surveys should be conducted during the same time period (i.e. nesting season) as seasonal changes in food items may cause bias in scat deposition due to differential digestibility of prey items (Andelt and Andelt 1984). Direct population estimates can be estimated from data collected on transects if scat is collected and sent in for DNA analysis to determine how many different predators deposited scat on the transect (Foran et al. 1997). This technique, however, incurs more cost than simply comparing the indices from each year. Different techniques will need to be used to obtain an index of raven populations, as scat deposition surveys are designed primarily for mammalian predators (Gese 2004). Initiation of point-count surveys or call surveys may be an inexpensive efficient way to determine population trends in ravens on the refuge (Ralph et al. 1993, Luginbuhl et al. 2001).

Year	Coyote	Raven	Gopher Snake	Striped Skunk
1961	1	-	-	-
1964	9	-	-	-
1970	-	-	-	30
1971	9	-	-	-
1974	15	-	-	8
1976	30	-	-	-
1977	15	-	-	10
1979	18	-	-	-
1980	10	-	-	-
1981	6	-	-	-
1982	-	1	7	-
1986	4	-	-	-
1988	-	-	63	-
1991	4	5	-	-
1992	9	5	-	-
1993	11	5	23	-

Table 1. Number of predators removed, by species, through lethal control methods since refuge establishment at Fish Springs National Wildlife Refuge, Juab County, Utah.

Figure 1. Map of scat deposition transects surveyed in 2012 at Fish Springs National Wildlife Refuge, Juab County, Utah.



Literature Cited

- Andelt, W. F. and S. H. Andelt. 1984. Diet bias in scat-deposition rate surveys of coyote density. Wildlife Society Bulletin 12: 74-77.
- Angelstam, P. 1986. Predation on ground-nesting birds' nests in relation to predator densities and habitat edge. Oikos 47: 365-373.
- Bartel, R. A. and F. F. Knowlton. 2005. Functional feeding responses of coyotes, *Canis latrans*, to fluctuating prey abundance in Curlew Valley, Utah, 1977-1993. Canadian Journal of Zoology 83: 569-578.
- Clark, F. W. 1972. Influence of jackrabbit density on coyote population change. Journal of Wildlife Management 36: 343-356.
- Dassow, J. A. 2010. Upland-nesting ducks in the Parklands of Saskatchewan: The effects of predator reduction on nest success and reproductive investment. Thesis. Southern Illinois University Carbondale, Carbondale, IL, USA.
- Dolige, B. and J. Clobert. 2003. Clutch size reduction as a response to increased nest predation rate in collared flycatcher. Ecology 84:2582-2588.
- Fontaine, J. J., and T. E. Martin. 2006. Parent birds assess nest predation risk and adjust their reproductive strategies. Ecology Letters 9:428-434.
- Foran, D. R., K. R. Crooks, and S. C. Minta. Species identification from scat: an unambiguous genetic method. Wildlife Society Bulletin 25: 835-839.
- Gese, E. M. 2004. Survey and census techniques for canids. USDA National Wildlife Research Center – Staff Publications. Paper 337.
- Henke, S. E., and F. F. Knowlton. 1995. Techniques for estimating coyote abundance. Symposium Proceedings – Coyotes in the Southwest: A Compendium of Our Knowledge. Paper 28.
- Knowlton, F. F. 1984. Feasibility of assessing coyote abundance on small areas. Final Report, Work Unit 909:01, USFWS, Denver Wildlife Research Center, Denver, CO, USA.
- Luginbuhl, J. M., J. M. Marzluff, J. E. Bradley, M. G. Raphael, and D. E. Varland. 2001. Corvid survey techniques and the relationship between corvid relative abundance and nest predation. Journal of Field Ornithology 72: 556-572.
- Marzluff, J. M. and R. P. Balda 1992. The Pinyon Jay. T & A D, Poyser, London.
- Mills, L. S. and F. F. Knowlton. 1991. Coyote space use in relation to prey abundance. Canadian Journal of Zoology 69: 1516-1521.
-

- Nelson, E. H., C. E. Matthews, and J. A. Rosenheim. 2004. Predators reduce prey population growth by inducing changes in prey behavior. *Ecology* 85: 1853-1858.
- Ralph, C. J., G. R. Guepel, P. Pyle, T. E. Martin, and D. F. Desante. 1993. Handbook of field methods for monitoring landbirds. USDA Forest Service General Technical Report PSW-GTR-144.
- Ricklefs, R. E. 1969. An analysis of nesting mortality in birds. *Smithsonian Contribution in Zoology* 9:1-48.
- Sovada, M. A., A. B. Sargeant, and J. W. Grier. 1995. Differential effects of coyotes and red foxes on duck nest success. *Journal of Wildlife Management* 59:1-9.