2013 Waterfowl Nesting Success on Fish Springs National Wildlife Refuge, Juab County, Utah

A Report for Utah DWR Permit # 4COLL9138

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INTRODUCTION

Population growth (λ) is the product of demographic processes such as age- or stage-specific survival rates. These demographic processes, also known as vital rates, vary in time and space and have differing levels of influence on population growth. Understanding not only which factors have the greatest effect on a population, but which factors potentially affect these vital rates can be important for effectively managing a population.

In ground-nesting birds, factors such as weather (Harvey 1971), food availability (Gloutney & Clark 1991), and nest parasitism (Lokemoen 1991) have been demonstrated to influence nest success, largely through abandonment. However, the greatest cause of nest failure in ground-nesting birds is nest depredation (Klett et al. 1988). Not only do predators cause nest failure directly by killing nesting individuals or depredating nests, but their presence can indirectly reduce nest success (Fontaine & Martin 2006). Increased predator pressure may reduce these actions as nesting individuals seek to conserve energy in the event that re-nesting is required, and as individuals attempt to reduce activity that could draw predator attention to the nest (Fontaine & Martin 2006).

Studies have since been done to assess the effects of predation on nest success. These studies have investigated several aspects of these predator-prey interactions, from the differential effects of particular predators on nest success, to the effects of nesting patch size on the likelihood of predation. However, the majority of nest success studies in the past have been conducted in the Prairie Pothole Region (PPR) of the United States and Canada, North America's most significant waterfowl breeding ground. Exploring nest predation processes in dissimilar or unique nesting habitats can help determine how general the processes are, informing management of important nesting areas outside of the PPR. For example, Fish Springs National Wildlife Refuge (FSNWR) in the West Desert of Utah includes nearly 10,000 acres of wetland habitat inundated by artesian springs. Unlike other waterfowl nesting sites, where human activity has reduced the habitat to fragmented islands in a matrix of agricultural fields, development and livestock pasture, FSNWR is a habitat island in the midst of a salt-desert ecosystem, characterized by salt-tolerant vegetation (*Sarcobatus vermiculatus*, *Spartina gracilis*, *Atriplex confertifolia*).

The PPR's matrix of agricultural land use favors a broad variety of generalist mesopredators, likely at elevated densities due to the greater and more persistent food resources associated with anthropogenic development (Fedriani et al. 2001, McKinney 2001). The location of FSNWR in the West Desert results in the surrounding area being relatively inhospitable, limiting the spectrum of mesopredator species capable of surviving here. The suite of mesopredators found at FSNWR includes primarily bobcat, coyote, raven, snakes, and rarely kit fox and badger. This creates a unique situation for waterfowl management and investigations of nest success. In other habitats that are more like the PPR, it has been noted that the variety of predators have made it almost futile to attempt to understand nest site characteristics that increase nest success; there is always some type of predator adapted to counteract any adaptation the waterfowl have developed to select safe nest sites (Jiménez et al. 2007). Perhaps, with the simplified predator base, FSNWR will provide a different picture of nest site selection. This knowledge could potentially allow managers to identify some of the safe nest site characteristics of the refuge, potentially allowing them to implement management practices that could increase nest success at FSNWR.

Each refuge within the National Wildlife Refuge System, is expected to create a refuge management plan with the purpose of managing for the conservation of the wildlife, plants and habitats found on the refuge, and to do so in a way that achieves the purposes behind the formation of the refuge and the Refuge System Mission of establishing a network of lands and waters for the management of wildlife resources for future generations. Part of creating these refuge management plans is gathering baseline information on the species

within the area, which will be vital in making management decisions in the future. An investigation of nest success and the factors affecting it on FSNWR will not only provide important information to inform future management and create a comprehensive refuge management plan, but it will do so in a way that addresses the motivations behind the formation of the refuge: the protection and support of migratory birds.

The objective of this study was to quantify duck production on the refuge and to better understand the factors that may be limiting nest survival, including predation pressure. The information gained from the study will help guide management decisions for the refuge, as well as provide insight on factors affecting nest survival and nest site selection in unique habitats other than the PPR.

SITE DESCRIPTION

FSNWR is located in Juab County of Utah, at the southern end of the Great Salt Lake Desert. It is roughly two hours southwest of Dugway Proving Grounds. The refuge is composed of 17,992 acres, and includes 10,000 acres of spring-fed wetlands. Five main artesian springs at the base of the Fish Springs Range provide water to the refuge, along with several lesser upwellings. Although the springs vary in temperature and salinity, they are all brackish and warm. The dry areas of the refuge are dominated by a salt-desert shrub community, with *Distichlis spicata* and *Sporobolus airoides* as common grasses and *Sarcobatus vermiculatus* and *Atriplex canescens* as common shrubs. Wet areas of the refuge support several different types of rushes and other wetland dependent species. Common vegetation in these areas include *Distichlis spicata*, *Juncus balticus*, *Schoenoplectus acutus*, cattail species (*Typha domingensis* and *T. latifolia*), and *Phragmites australis* (USFWS 2004).

On average, the hottest month is July, with January being the coolest month on the refuge. April is the average wettest month (NOAA). On average the refuge receives 8 inches of precipitation, with the majority falling in the spring and fall. Temperatures can range from 109° F during the summer to -19° F in winter, but the springs never freeze over completely (USFWS 2004). Frost-free days generally extend from late April until mid-October (NOAA).

METHODS

Nest Location: Due to a wet spring, ATV nest dragging was deemed not to be a viable option for nest location, so a grid survey method was used instead. Within GIS, a 90-acre grid overlay was created using the Refuge boundary as its limits. From within this grid overlay, 18 grids were randomly selected to be searched for waterfowl. Only girds with habitat deemed suitable for waterfowl were included. Grid searches were conducted between May 20th and June 11th.

Any nests located were recorded using a Garmin GPS (UTM NAD 83). Flagging tape was placed ~10-m north of the nest to assist in relocating the nest. Date, time and clutch size were recorded. Notes were made of habitat type and dominant species cover in which the nest was located. All incidental nests found outside the standard grid search methods (and randomly selected grid boundaries) were recorded and monitored in addition to those located during the initial grid searches.

Nest Monitoring: Once located, the initial nest status was recorded (e.g. active/inactive, eggs present/absent) and hen presence/absence was also recorded. Nests were then revisited at least once a week to observe nest status. Whenever possible, within 2-days of locating the nest, a Moultrie Cameras (D-555i) with infrared capabilities was placed to record the nest and any potential predation attempt. The camera was placed within < 3-m and was aimed directly at the nest. While this limited the field of view, it increased the likelihood of documenting an actual predation event upon a nest. The cameras were checked and the SD cards were removed in conjunction with scheduled nest revisits. All pictures were reviewed and any predator species observed on the camera were recorded, regardless of an actual predation event occurring.

Small Mammal Trapping: Due to time/staff limitations, no small mammal trapping occurred this season.

RESULTS

A total of 12 waterfowl nests were located. Of the 12 waterfowl nests located, 2 were found using the grid search methodology and the remaining 10 were incidental finds while out performing other duties on the Refuge (Table 1). Four of the located nests were found in the northeastern portion of the Refuge (Ibis, Egret and Gadwall Units) while the remaining 8 were located in the southern units (Mallard, Avocet, and Curlew); see Figure 1.

Table 1. Waterfowl nest locations by unit and search type.

Nest ID	Common Name	Species Name	Mgmt Unit Located	Search Method
CAGO01	Canada Goose	*Branta canadensis*	Ibis Unit	Incidental
CITE01	Cinnamon Teal	*Anas cyanoptera*	Curlew Unit	Incidental
UNKN01	Unknown	*Unknown*	Mallard Unit	Incidental
UNKN02	Unknown	*Unknown*	Mallard Unit	Incidental
MALL01	Mallard	*Anas platyrhynchos*	Mallard Unit	Incidental
MALL02	Mallard	*Anas platyrhynchos*	Mallard Unit	Incidental
GADW01	Gadwall	*Anas strpera*	Mallard Unit	Incidental
GADW02	Gadwall	*Anas strpera*	Avocet Unit	Incidental
GADW03	Gadwall	*Anas strpera*	Avocet Unit	Grid Search
GADW04	Gadwall	*Anas strpera*	Gadwall Unit	Grid Search
GADW05	Gadwall	*Anas strpera*	Egret Unit	Incidental
GADW06	Gadwall	*Anas strpera*	Egret Unit	Incidental

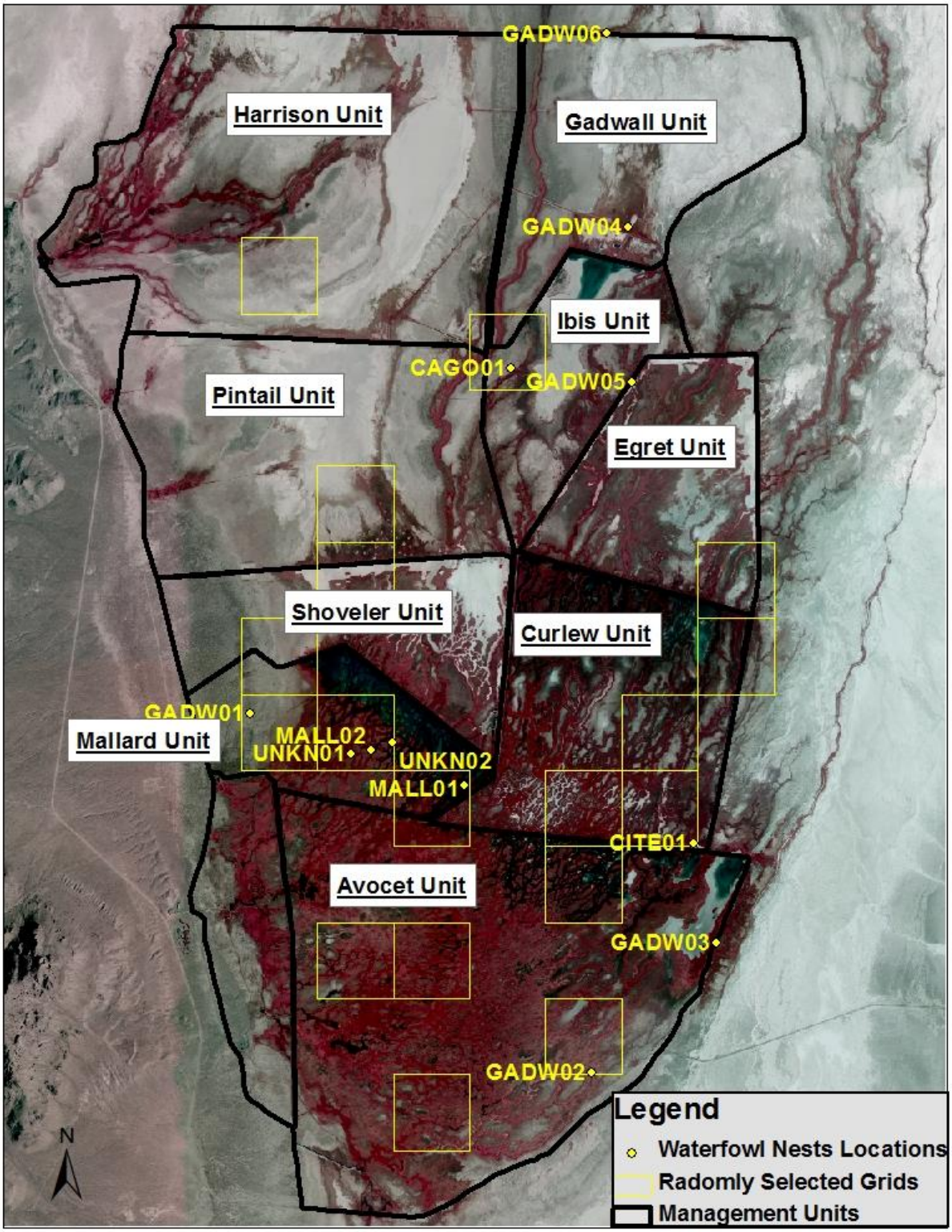

Figure 1. Waterfowl nest locations on Fish Springs NWR, spring 2013.

A nest was deemed 'successful' if it had at least one successful live hatchling (Table 2). Of the 12 waterfowl nests located for this study, 7 of them were successful, resulting in a Mayfield daily survival rate of .977. Overall nest success was estimated at 44.13% using the Mayfield method. These values were up slightly from last year's daily survival rate of .969 and overall estimated nest success of 33.61%.

Of the 5 nests that were not successful, 3 were abandoned for unknown reasons. Two of the three abandoned nests were apparently abandoned prior to us locating the nests. Both of these nests were both unknown species and were both located in Mallard Unit. Mallard unit was undergoing a drawdown during this time, it is not known how or if this may have impacted the decision to abandon the nests. The final nest that was abandoned was the cinnamon teal nest. It was abandoned 3 days after the second nest visit and does not appear to have been a direct result of our visiting the nest.

Table 2. Waterfowl nest success by species for the 2013 nesting season.

SPECIES	# Nests	# Predated	# Successful	# Abandoned
GADW	6	1	5	0
MALL	2	1	1	0
CITE	1	0	0	1
CAGO	1	0	1	0
UNKN	2	0	0	2
Total # WF Nests	12	2	7	3
Nest Success Rate	58.33%			

Both nests that exhibited undocumented predation (no camera was present or working properly), one showed signs of suspected badger predation and the other appears to have been predated by a coyote. The suspected badger predation presented with the sides of the shells bitten out and the shells placed in a neat pile < 1-m to the side of the actual nest. However, in neither case was definitive predator identification was not possible. Both nests were in locations that did not support print identification.

Upon reviewing all camera documentation of waterfowl nesting events, a total of 4 predator species were observed on film for a total of 5 documented events. Of those 5 events, only 1 attempted predation event was documented, in the remaining 4 events no predation attempt was made. Predators species caught on camera included 2 raptors (*species unknown*), 1 coyote (*Canis latrans*), and 2 gopher snakes (*Pituophis catenifer*). In one event, a gopher snake was documented attempting to predate a gadwall nest. While the snake was documented on the nest for 20 minutes while attempting to swallow multiple eggs, the snake was too small to be able to completely ingest any of the eggs. After approximately 20 minutes the snake moved on and the nest was left intact. This predation attempt was in addition to the two undocumented nest predations making for a total of three known predation events on 12 nests (25.00%).

For dominant nest cover, 58.33% of the nests were located within Baltic rush (*Juncus balticus*). Of the remaining 5 nests, 3 were located within Onley's bulrush (*Scirpus americanus*) and one was in the open on a small 'island' and one was located in an upland shrub area under a black greasewood bush (*Sarcobatus vermiculatus*); see Table 3.

Table 3. Nest site selection by dominant vegetation cover.

Nest ID	Common Name	Species Name	Mgmt Unit Located	Dom. Veg. Cover
CAGO01	Canada Goose	*Branta canadensis*	Ibis Unit	None
CITE01	Cinnamon Teal	*Anas cyanoptera*	Curlew Unit	Baltic Rush
UNKN01	Unknown	*Unknown*	Mallard Unit	Olney's Bulrush
UNKN02	Unknown	*Unknown*	Mallard Unit	Olney's Bulrush
MALL01	Mallard	*Anas platyrhynchos*	Mallard Unit	Olney's Bulrush
MALL02	Mallard	*Anas platyrhynchos*	Mallard Unit	Baltic Rush
GADW01	Gadwall	*Anas strpera*	Mallard Unit	Black Greasewood
GADW02	Gadwall	*Anas strpera*	Avocet Unit	Baltic Rush
GADW03	Gadwall	*Anas strpera*	Avocet Unit	Baltic Rush
GADW04	Gadwall	*Anas strpera*	Gadwall Unit	Baltic Rush
GADW05	Gadwall	*Anas strpera*	Egret Unit	Baltic Rush
GADW06	Gadwall	*Anas strpera*	Egret Unit	Baltic Rush

All nest location data has been submitted in a COR form to the Utah Division of Wildlife Resources in compliance with permit 4COLL9138.

Discussion

Duck production appears to still be at an all-time low at FSNWR with only 13 waterfowl nests (up from 8 in 2012) located throughout the Refuge. Similar to last year, this year showed the highest Mayfield nest success rate on record at FSNWR. However, this may be due to the lower number of nests compared to historical nesting rates. Fewer nests spread farther apart make it more difficult for predators to locate nests.

Caution should be used when interpreting the results of this study. The small sample size of nests located for this study may not be an adequate number to provide a valid representation of nest success Refuge wide. Additionally, the small number of nests also makes it difficult to compare overall waterfowl production with past years even though the raw numbers give the appearance of a slight increase since the last study (1989-1993). Even if the increase in waterfowl production is a true indication of the current waterfowl production taking place on FSNWR, waterfowl nest abundance does not indicate a significant breeding population when compared to other areas such as the PPR.

Literature Cited

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