

Conservation of Piping Plovers in the U.S. Alkali Lakes Core Area

2002 Field Effort: Summary Report

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Introduction

The northern Great Plains population of Piping Plovers is declining at a rate of 5 - 13% annually (Ryan et al. 1993, Plissner and Haig 2000a, Plissner and Haig 2000b, Larson et al. 2002) due largely to inadequate reproductive success and alteration of breeding habitat. At this rate Piping Plovers could disappear from the region within 50 - 100 years (Ryan et al. 1993, Plissner and Haig 2000, Larson et al. 2002). Approximately one-half to two-thirds (300 - 400 breeding pairs) of the U.S. Great Plains population breeds annually on alkali lakes contained within the "U.S. Alkali Lakes Core Area" (Core Area), which follows the Missouri Coteau landform from central North Dakota to northeast Montana (Fig. 1; Plissner and Haig 2000a). During the mid-1980s efforts to monitor and restore plovers on these lakes and wetlands were initiated; area-wide recovery activity has been ongoing since 1991.

During the 2002 field season, 9 seasonal technicians and a Recovery Biologist worked to protect and monitor breeding pairs on private, federal, and state lands comprising the 8,000 mi² Core Area. Support for this effort was provided by the U.S. Fish & Wildlife Service (USFWS); The Nature Conservancy (TNC); Montana Fish, Wildlife, & Parks (MTFWP); and the U.S. Army Corp of Engineers (USACOE).

The goal of the recovery effort in the Core Area is to achieve an annual fledging rate of at least 1.24 – 1.44 chicks/breeding pair (baseline fledging rate = 0.89 chicks/pair). This level of recruitment, if maintained in the Core Area as well as prairie Canada, should be sufficient to halt the decline in plover numbers (Larson et al. 2002). To achieve this goal, technicians 1) conduct an annual breeding census to track the status of the population and determine pair distribution, 2) search for nests and protect them with predator exclosures to enhance reproduction, and 3) monitor reproductive success to determine if management activities have been helpful.

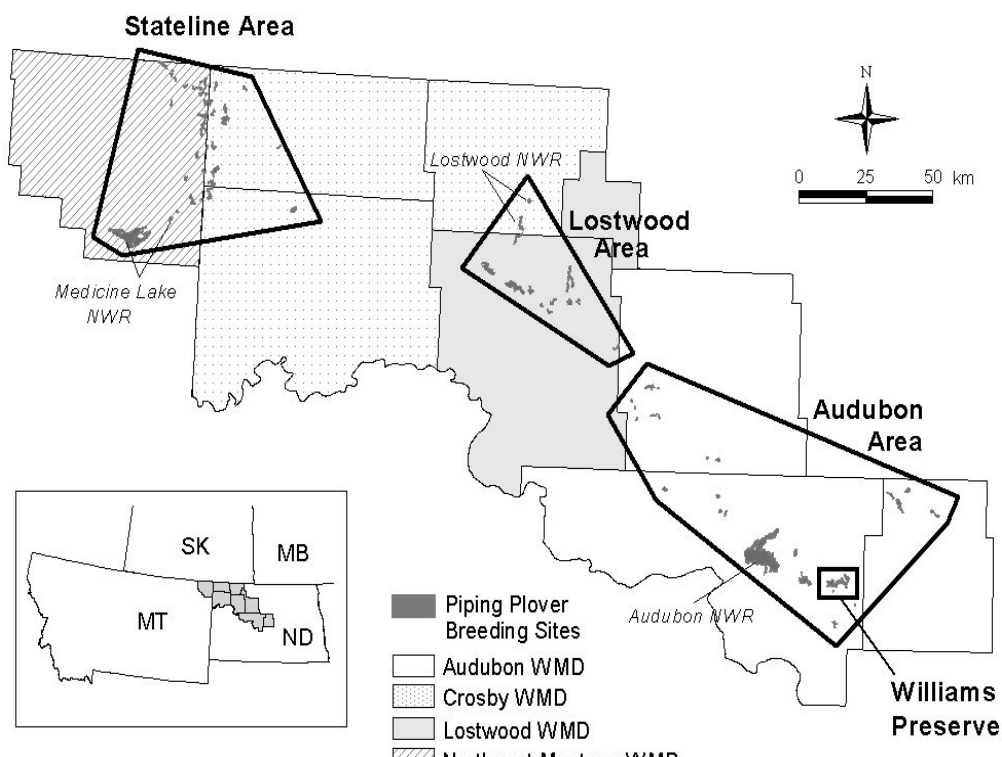


Figure 1. The U.S. Alkali Lakes Core Area of the northern Great Plains: sites surveyed for Piping Plover breeding activity 2002.

Methods

From mid-May through mid-June, technicians searched potential plover beaches for breeding pairs and their nests using standard methods (Murphy et al. 1999). All lakes with past records of plover use were searched unless permission was not secured or breeding habitat was not present due to current vegetation and/or water conditions. An official survey was conducted from June 1 – June 15 as part of the annual adult census.

Once nests were located, predator exclosures were erected to reduce predation on plover eggs and chicks. Most nests were protected by wire mesh “nest cages” (5 x 10 cm mesh; 1 - 3 m diameter; 0.8 - 1 m high; topped with bird netting or wire mesh) that were placed over nests and secured to the ground. Nests located on peninsulas or otherwise concentrated together were further protected via the addition of temporary electric (Murphy et al., In Review), permanent electric (Mayer and Ryan 1991), or non-electric (Smith et al. 1993) predator fences.

After locating and protecting nests, technicians checked each breeding pair 1-2 times/week to monitor the fate of the nest or chicks. Nests were considered successful if at least one egg hatched. Plover chicks were considered fledged when they reached 18 - 20 days or were observed “hop-flying” (on 5 occasions 16-day-old juveniles were observed hop-flying or in flight). Technicians recorded status of pairs and their nests/chicks on site maps and later entered all information into a chronological database. GPS locations were obtained for each nest to facilitate future management and research initiatives.

Apart from protecting nests, other plover-related management involved increasing the quantity and quality of plover nesting beaches. Vegetation was reduced on some beaches using prescribed fire, cattle-grazing, chemical applications, and plastic tarps (on manmade islands). At Audubon National Wildlife Refuge, efforts continued to create and maintain habitat by alternately flooding and de-watering 3 impoundments.

Results and Discussion

During the census conducted in early June, plovers were observed on 59 of the 106 alkali lakes/wetlands surveyed in the Core Area (Table 1). At least 218 breeding pairs were identified from the 508 adults recorded. These totals match all-time lows since intensive population tracking began in the early 1990s (Fig. 2). Continued high water and reduced beach availability at many lakes in the eastern half of the Core Area may partially account for the low numbers. Probably more important, however, was the vast amount of favorable habitat offered by Lake Sakakawea (Missouri River Reservoir bordering the Core Area). After severe flood events 1996 and 1997, the lake has remained well below normal for the past 3 years, exposing miles of gravel beach suitable for nesting plovers. The number of breeding pairs recorded on Lake Sakakawea has dramatically increased during this time and a record 469 adults were recorded this year (USACOE). Likely many plovers shifted breeding sites from the Core Area to Lake Sakakawea to take advantage of present water conditions. Similar to the past 4 years, major concentrations of plovers in the Core Area occurred at Pelican and Peterson Lakes (n = 40 and 26 adult plovers, respectively) at the Williams Preserve, Redmond Lake Southeast (n = 24) in the Lostwood Area; Miller Lake (n = 60) in the Crosby WMD, and Schaefer Lake (n = 23) in the Audubon Complex.

Table 1. Distribution and reproductive success (fledging rates) of piping plovers in the U.S. Alkali Lakes Core Area, from central North Dakota (Williams Preserve) to northeastern Montana (Medicine Lake NWR), 2002.

Fledging rate ^b	No. Sites ^a Occupied	Breeding Pairs (Adults) monitored	No. Pairs monitored	
TNC - Williams Preserve	7	47 (100)	45	1.73
Audubon Area				
Audubon NWR	0	0 (0)	0	-
Audubon WMD	11	39 (82)	32	
1.78				
Lostwood Area				
Lostwood NWR	3	5 (13)	4	2.20
Lostwood WMD	10	36 (85)	34	
1.79				
Stateline Area				
Crosby WMD	10	42 (120)	49	
0.88				
Medicine Lake NWR	1	6 (13)	5	
0.00				
Northeast Montana WMD	17	43 (95)	37	0.81

Total	59	218 (508)	206
1.36			

^aSite = individual wetland basin as identified by the National Wetland Inventory

^bMean number of 18 to 20-day-old chicks/pair.

Figure 2. Breeding pairs and total adults counted during annual piping plover censuses (1st two weeks of June), U.S. Alkali Lakes Core Area, 1990-2002. Breeding pair data from 1993-1997 are incomplete as breeding pairs were not distinguished and only total adults were tallied in some areas. Census efforts for both pairs and adults were incomplete from 1990-1992.

Of 218 pairs identified during the adult census, technicians were able to monitor the reproductive fates of 206 (Table 1), and provide nest protection for 182. Pairs not monitored either abandoned territories after census work or were visited/sighted too few times to gather accurate reproductive information. Unprotected pairs either hatched their nests before technicians could erect exclosures, were physically inaccessible (e.g. located on a gravel bar in the middle of alkali muck), or occurred on land where we did not have permission to put out exclosures.

Overall Mayfield nest success (66%; Table 2) for 2002 was comparable to that observed in recent years. Nests with predator exclosures were nearly 3 times more likely to be successful than those without (Table 2, Mayfield nest success). Nest success generally increased from west to east in the study area (low of 53% Mayfield in Montana to high of 85% Mayfield at Audubon Complex). All stations from the Lostwood Area east reported Mayfield nest success

estimates 0.73. Extreme fluctuations in water levels (from completely dry to full to dry again) and ill-timed severe weather may have caused the low success observed in the western part of the study area, where plovers typically reproduce very well. Four percent of monitored nests were abandoned with a full clutch; normal abandonment rate in the area is about 2%.

Table 2. Nest success and fledging rates of piping plovers achieved under various management treatments, U. S. Alkali Lakes Core Area, 2002.

	No Protection	Wire Nest cage only	Only	Fence	Cage/Fence combination	Total
Apparent	0.63 (8) ^a	0.74 (158)	1.00 (10)	0.90 (20)		
95% C.I.	0.29 – 0.96	0.67 – 0.81	NA	0.77 (196)	0.71 -	
				0.77 – 1.00		
Mayfield	0.23 (8)	0.63 (158)	1.00 (10)	0.87 (20)		
95% C.I.	0.04 – 1.00	0.55 – 0.73	NA	0.66 (196)	0.59 –	
				0.71 – 1.00		
Fledging rate (206)	0.74 (27)	1.29 (150)	1.70 (10)	2.63 (19)	1.36	
95% C.I.	0.23 – 1.25	1.06 - 1.51	0.80 - 2.60	2.09 - 3.17	1.16 -	
					1.55	

^aSample size (Number of nests for nest success; number of pairs for fledging rate)

Plovers in the Core Area fledged 280 chicks or 1.36 chicks/pair (Table 1,2). This exceeds the rate needed to stabilize the population decline and is comparable to the highest productivity ever recorded in the Core Area (Fig. 3). In fact, 7 more chicks were produced in the Core Area this year than were produced in 2001 when 59 more pairs nested. The lowest fledging rate was observed in the Medicine Lake Complex (0.71 chicks/pair for refuge and WMD combined), which is not surprising given the uncharacteristically low nest success in that area. Productivity in the Crosby WMD was relatively poor (0.88 fledglings/pair) as it has been since 1999, but all stations east of Crosby recorded fledging rates 1.73 chicks/pair. As expected, fledging rates for pairs protected by predator exclosures were better than for pairs that were not protected (Table 2), although some of these differences were not statistically significant. Use of fences in combination with wire nest cages resulted in a higher fledging rate than use of cages alone.

Impacts of Predators

Technicians observed a variety of potential adult, chick, and egg predators during visits to plover breeding sites. On the Lostwood WMD, fresh tracks implicated a raccoon and a badger in the destruction of 2 nests before they could be caged. Also at Lostwood WMD, a calf became entangled in a cage and destroyed 2 eggs at the nest. A week later the incident was repeated and a third egg was destroyed. The adult finally abandoned the nest only a few days before the expected hatch date. On the Northeast Montana WMD, one nest was destroyed by

a coyote or badger (suspected) that dug under a nest cage. At least 26 nests in the Core Area suffered the loss of 1-3 eggs during incubation, but the adults continued incubating the remaining eggs for at least one visit after the losses were noted. Twenty-three of these nests eventually hatched. It is unclear whether small mammals, snakes, birds, or weather are to blame for the attrition of clutches.

Figure 3. Fledging rate (number of 18 to 20-day-old chicks per breeding pair) for Core Area Piping Plovers 1994-2002. Dashed region indicates rates necessary to stabilize the decline of the northern Great Plains population. Squares indicate years when most nests were left unprotected. Circles indicate years when about 90% of monitored nests were protected from predators.

As in the past few years, the number of large gulls (*Larus delawarensis*, *L. californicus*) increased at plover beaches as the nesting season progressed. In addition to several observations of 10+ gulls loafing on plover beaches, 3 direct attacks were also observed. At Krueger Lake in the Audubon WMD, a gull dove at a plover chick and knocked it down with its feet. The chick was bleeding from its back and wing, but was able to hide in the vegetation as adult plovers mobbed the gull. A few days later the chick was observed feeding normally with the rest of its brood. At White Lake in the Lostwood WMD, a gull was observed repeatedly swooping down at an uncaged plover nest. Adult plovers and avocets harassed the gull, and the nest was eventually caged the same day. However, only 1 chick fledged from 2 nests in the area. At Redmond Lake East, also in the Lostwood WMD, a gull attacked an avocet chick that was within 100 m of 4 piping plover nests/broods. The avocet chick survived, as did most of the

plover chicks that hatched on that lake. Surprisingly, gull colonies at Round/Westby Lake in the Stateline Area and Pelican Lake on the Williams Preserve were much reduced in size due to unknown causes.

Impacts of Weather

An unusually cold spring punctuated by a snowstorm on May 8 probably caused a delay in breeding activity across the Core Area. Mean nest initiation (May 23) was almost a week later than average for the past 7 years (May 18). On June 8, a severe thunderstorm with heavy rain and winds \sim 70 MPH blew over 8 nest cages and destroyed 10 nests at the Williams Preserve and Roberts Lake (Audubon WMD). Coincidentally, 8 other nests at the Williams Preserve lost 1-3 eggs during this same period, but each of these was eventually successful (i.e. remaining eggs hatched). A severe thunderstorm hit the Stateline Area on June 30 and caused the destruction and/or abandonment of several nests in that area. This event combined with another series of storms in early June filled many basins in the Stateline Area that were completely dry early in the season. By late July, however, most shallow basins in this area were dry again.

Related Projects

Aside from the recovery efforts of field technicians, we are currently engaged in a study to explore the relationship between landscape attributes and piping plover reproductive success.

Our initial modeling efforts explain only 13% of the variation observed in fledging rate. Significant variables in these models include (in order of importance) nest protection status (+), distance to nearest shrub or perch (+), year effect, and basin size (-). We are also partitioning reproductive success data by predator exclosure type to tease apart relative importance of mammalian vs. avian predation during the egg and chick stages. Mammalian and avian predators appear to be of equal importance during the egg stage, but birds account for the majority of reproductive loss incurred after hatching. Danielle Le Fer, a Ph.D. candidate at Virginia Polytechnic Institute, is using some of the Core Area lakes in her efforts to understand the relationship between food availability and chick growth, survival, and fledging age. Initial results from her work indicate that food availability at alkali lake sites is almost an order of magnitude greater than at river or reservoir sites. However, chick growth curves at alkali lakes were not different than at river/reservoir sites. This is unexpected, but may change with the collection of more data.

Acknowledgments

Most plovers in the Alkali Lakes Core Area breed on land in private ownership. As they have for several years, dozens of landowners across North Dakota and Montana once again graciously agreed to allow technicians frequent access to their properties. State Lands departments likewise fully cooperated in permitting access and management activities on their lands.

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