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NESTING SUCCESS AND PRODUCTION OF GREATER SANDHILL CRANES DURING EXPERIMENTAL PREDATOR CONTROL AT MALHEUR NATIONAL WILDLIFE REFUGE, OREGON, 1982-83

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Abstract: Greater sandhill cranes (*Grus canadensis tabida*) nest commonly on Malheur National Wildlife Refuge, Oregon, but depredations by common ravens (*Corvus corax*) and coyotes (*Canis latrans*) contributed substantially to low recruitment during the 1970's. An experimental predator removal study was initiated in 1982 to determine if nesting success and recruitment would increase if predator populations were reduced. We monitored 120 crane nests located in 2 treatment areas (ravens and coyotes removed, and only ravens removed) and 1 control area (40 nests per area). Nesting success between the 2 predator control areas differed significantly during the 2-year study, but not between either predator control area and the area where no predators were removed. Two years of predator removal did not sufficiently reduce the number of predators in the study area to increase nest success to a level that would maintain a stable nesting population.

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Key words: *Grus canadensis tabida*, Malheur NWR, Oregon, greater sandhill crane, predator control, nesting success, common raven, *Corvus corax*, coyote, *Canis latrans*.

The Central Valley Population (CVP) of greater sandhill cranes is 1 of 5 populations of this subspecies. Because of its small size and low productivity, the CVP has been classified as a sensitive population, receiving high priority for management by the U.S. Fish and Wildlife Service in the Pacific Flyway. Most cranes of the CVP nest in southcentral and eastern Oregon and in northeastern California. Malheur National Wildlife Refuge (NWR), Harney Co., Oregon, is the most important nesting area for the CVP (Littlefield and Thompson 1979; Littlefield 1982, 1989; Stern et al. 1987).

Depredations by common ravens and coyotes on sandhill crane eggs and unfledged young at Malheur NWR were believed to have contributed substantially to the low number of chicks fledged (Littlefield and Thompson 1987). Of 674 crane nests monitored during 1966-81, 48.5% were destroyed by predators. Annual mortality of crane chicks for 11 years (1970-81) averaged 84.8% (C. D. Littlefield, unpubl. data).

Reduction of annual cattle grazing on Malheur NWR after 1973 improved nesting habitat and resulted in increased nest success (Littlefield and Paullin 1990), but the percentage of fledged chicks in the autumn population has averaged only about 6% since then (1974-81). The number of nesting crane pairs peaked at 236 in 1975 and declined to 214 in 1982 and 1983.

This paper reports on an experimental predator control study conducted at Malheur NWR in 1982 and 1983 to test the effectiveness of (1) common raven control alone for improving sandhill crane nest success, and (2) simultaneous coyote and raven control on crane nest success and recruitment. This paper summarizes results of the 2-year study.

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STUDY AREA

Malheur NWR includes more than 72,000 ha of interspersed meadows, marsh, and shrub-covered uplands, the latter dominated by sagebrush (*Artemisia* spp.). Most sandhill crane nesting occurs in emergent vegetation in depressions in the meadows (Littlefield and Ryder 1968) of the narrow Blitzen Valley. The valley is surrounded by rimrocks that provide nesting sites for common ravens.

Common ravens are abundant throughout the Malheur NWR and adjacent areas (Littlefield and Thompson 1987).

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More than 1,300 ravens have been counted at winter roost sites in the area. Coyote densities are unknown, but observations by refuge staff and others indicate that coyotes are generally abundant. Coyote predation on sandhill crane eggs was less than that by ravens or raccoons (*Procyon lotor*), but coyotes, unlike ravens, kill crane chicks (Littlefield and Lindstedt 1992).

Ravens and coyotes are common on the refuge during the period when cranes are nesting. Each year a pronounced post fledging movement of ravens onto the refuge occurs in late May and early June, when nesting of many other avian species peaks (Stiehl 1978, Littlefield and Thompson 1987). Coyotes are commonly encountered during the crane nesting period (April-June), but numbers increase in late July after meadows dry and hay mowing activities begin (C. D. Littlefield, unpubl. data).

The 8,153-ha Raven Removal Study Area (RRSA) was located in the southern Blitzen Valley (Fig. 1). Common ravens were killed in this area. A Raven and Coyote Removal Study Area (RCRSA) located in the Double-O area on the western portion of the refuge was 7,976 ha. A Control Study Area (CSA), 7,494 ha in size, was established near the center of the Blitzen Valley where no experimental predator management occurred. The CSA was about 8 km from the RRSA, and the RCRSA was about 26 km northwest of the CSA (Fig. 1). Study sites were selected on the basis of predator populations and the number of nesting crane pairs. The RRSA had the greatest number of nesting crane pairs on the refuge, whereas the RCRSA had the highest predator densities and lowest crane nest success from 1978 to 1982 (C. D. Littlefield, unpubl. data).

METHODS

Common ravens were killed with DRC-1339 (3 chloro-p-toluidine hydrochloride), a selective toxicant that is not lethal to mammals or raptorial birds at dosages lethal to ravens (Decino et al. 1966, Larson and Dietrich 1970). In 1982, common raven control was conducted from 12 February to 10 June in the RRSA and 25 February to 14 June in the RCRSA. A total of 7,335, 1-cm³ meat baits treated with 7.5 mg/kg of DRC-1339 (Larsen and Dietrich 1970) was placed on carcasses of mule deer (*Odocoileus hemionus*), black-tailed jack rabbit (*Lepus californicus*), pronghorn (*Antilocapra americana*), and carp (*Cyprinus carpio*) between 12 February and 16 April 1982. Depending on carcass size, 5 to 50 meat baits were used daily per carcass. From 16 April to 14 June, 1,828 chicken eggs, injected with 1 ml of 10% solution of DRC-1339 in water, were placed throughout the RRSA and the RCRSA. Usually, 4 injected eggs were placed in each artificial nest. All known common raven nests

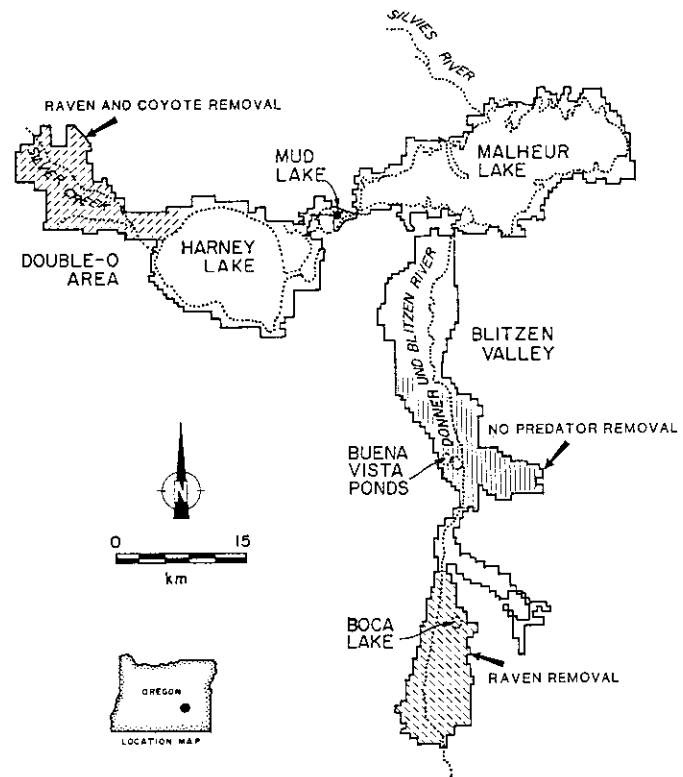


Fig. 1. Location of 3 study areas for evaluation of predator removal on sandhill crane nest success and production, Malheur National Wildlife Refuge, Oregon, 1982-83.

were examined annually by the refuge staff. In 1982 and 1983, 42 raven nests were surveyed, and activity and fates were determined. Most of the nests were on or adjacent to the 3 study areas.

Coyotes were removed from the RCRSA between 2 December 1981 and August 1982 by aerial gunning from a helicopter and by trapping. Removal in 1982 was most intense in the spring and only minor control took place after May. In the RCRSA, Animal Damage Control (ADC) personnel and private trappers removed 214 coyotes during the 2-year period. Of 147 coyotes killed in 1982, only 8 were taken during summer. However, coyotes were seen regularly on all study areas during summer. In 1983, 67 coyotes and 1 red fox (*Vulpes vulpes*) were removed. Red foxes were previously unrecorded from Malheur NWR. Nearly all coyotes were killed before summer. One or 2 coyotes were seen daily in August, but their numbers were fewer than in August 1982 (C. D. Littlefield, unpubl. data).

From 25 February through 21 May 1983, 3,685 chicken eggs treated with DRC-1339 were placed in the RRSA and the RCRSA. Dosages were the same as in 1982. Coyotes were removed from the RCRSA by trapping and aerial

gunning from November 1982 through 31 July 1983. Only 1 helicopter flight was made in 1983 compared to 3 in 1982.

Searches for greater sandhill crane nests were conducted from 13 April through 27 May 1982 and 15 April through 20 May 1983. Searches were continued until 60 active crane nests (20 per study area) were found. Most nests were located during ground searches, but some were spotted from fixed-winged aircraft and helicopter. Egg incubation stage was estimated by the flotation method described by Westerskov (1950). Nests were reexamined after the estimated hatching date and nest success determined (success = at least 1 hatched egg). Predators were identified by examining the nest and egg remains (Sooter 1946, Einarson 1956).

To assess crane productivity, ratios based on counts of adult and young sandhill cranes (age class based on plumage) were attempted from ground surveys conducted from 21 to 25 September 1982 and from 22 to 28 September 1983. Annual production was calculated as:

$$\frac{\text{No. of young}}{\text{No. of young} + \text{No. of breeding adults}} \times 100\%$$

Young were counted on refuge grain fields where they concentrated during feeding in September, before most migrant cranes had arrived. Grain fields were present in or near all 3 study areas, so production per study area was usually possible to determine, particularly in the RRSA and the RCRSA.

RESULTS AND DISCUSSION

Common Raven and Coyote Removal

Although the number of common ravens killed during the study was not determined, populations were greatly reduced, especially on predator removal areas. At Malheur NWR traditional raven nests are generally occupied year after year. By May 1983 none of 20 known traditional raven nests near the predator removal areas was active. Near the CSA, 4 of 8 traditional raven nesting sites were used in 1982 and 3 were active in 1983, indicating that some ravens from that area were killed by treated baits set out in 1 of the predator removal areas.

Nest Success and Predation-1982

A total of 60 (20 per study area) greater sandhill crane nests was examined in 1982 (Table 1). Thirteen (65%) of 20 nests in the RRSA were successful. Coyotes destroyed 2 nests, ravens destroyed 1, and the others were lost to undetermined predators. Of the 20 nests examined in the

Table 1. Success of greater sandhill crane nests after predator removal, Malheur National Wildlife Refuge, Oregon, 1982-83 ($n = 20$ nests examined in each study area per year).

Study area	1982		1983	
	No.	%	No.	%
Raven Removal (RRSA)	13	65	9	45
Raven and Coyote Removal (RCRSA)	12	60	16	80
Control (CSA)	14	70	13	65

RCRSA, 12 (60%) were successful. Destruction of 8 nests was attributed to common ravens (3), raccoons (2), coyote (1), and undetermined predators (2).

The highest nesting success in 1982 was in the CSA (70%). Destruction of 3 nests was attributed to ravens, and another 3 nests were destroyed by undetermined predators. Water management in the untreated area was different than in the other 2 study areas in 1982. By mid-April water was abundant in most of the crane nesting habitat of that area and remained relatively deep throughout the spring and early summer. Coyote activity in that area likely was reduced because of the deep water.

Average nest success in 1982 ($n = 60$) was 65%, ranging from 60% to 70%, but was not significantly different among the 3 study areas ($\chi^2 = 0.44$, $P > 0.05$). Common ravens destroyed 7 clutches, coyotes 3, raccoons 2, and unknown predators 9. Nesting success, however, was higher in all study areas when compared to the 16-year (1966-81) average (C. D. Littlefield, unpubl. data): 43.9% for RRSA ($n = 460$ nests), 50.0% for RCRSA ($n = 34$), and 45.9% for CSA ($n = 137$).

Unfortunately, irrigation was delayed on a portion of the crane nesting habitat until mid-May in the RRSA. Delayed irrigation facilitated hunting of marsh and meadow habitat by coyotes while crane nesting was in progress. In addition to the 2 nests known to have been destroyed by coyotes, we believe the 4 nests attributed to unknown predators likely were destroyed by coyotes.

Nest Success and Predation-1983

Sixty crane nests (20 per study area) also were examined in 1983 (Table 1). Success was only 45% in the RRSA for the 20 nests examined, but 3 nests were lost to flooding and 1 was abandoned. Ample water was available after mid-April, but breached dikes prevented water stabilization in some areas; the Blitzen River overflowed in late May, flooding 3 monitored nests. Fortunately most clutches already had hatched when the flooding occurred. No nest losses were

attributed to ravens, but raccoons destroyed 3, coyote 1, and undetermined predators 3.

In the RCRSA, 80% of the 20 nests examined were successful. One clutch was lost to a common raven, 1 to a coyote, 1 to a raccoon, and 1 was abandoned.

Sandhill cranes achieved 65% nest success (13/20) in the CSA. Most nest sites had water by mid-April, and cranes initiated nesting shortly after their territories received water. Most nesting was completed before high water from local streams inundated much of the area. Common ravens destroyed 2 nests, coyotes 2, raccoon 1, undetermined predator 1, and 1 was abandoned.

Nest success was significantly different among the 3 areas in 1983 ($\chi^2 = 9.13$, $P \leq 0.05$). The RCRSA had significantly higher nest success than the RRSA ($\chi^2 = 7.30$, $P \leq 0.01$). Success was not significantly different between the RRSA and the CSA ($\chi^2 = 0.92$, $P < 0.05$) or between the RCRSA and the CSA ($\chi^2 = 2.30$, $P < 0.05$). In all 3 areas combined, raccoons destroyed 5 nests, coyotes 4, ravens 3, and undetermined predators 4. Three nests were flooded, 2 were abandoned, and 1 contained infertile or addled eggs.

Nesting Summary, 1982-83

Nest success in the RRSA averaged 55%. In this area only 1 nest was destroyed by ravens in 2 years. Undetermined predators destroyed 7 nests, raccoons 3, and coyotes 3.

In the RCRSA nest success averaged 70%. Four clutches were lost to ravens, 3 to raccoons, 2 to coyotes, and 2 to unknown predators. Nest success in the CSA averaged 68%. Common ravens destroyed 5, coyotes 3, unknown predators 3, raccoons 1, and 1 was abandoned. For 120 nests monitored during the 2-year study, overall nest success averaged 64%.

Differences in nest success among the 3 study areas were not statistically significant during the 2-year study ($\chi^2 = 2.25$, $df=5$, $P > 0.05$). However, where both common ravens and coyotes were removed, nest success during the second year was 80%. This was the highest success rate since the 1940's, when predators were routinely killed throughout Malheur NWR.

Productivity

Data on productivity were inconclusive because crane pairs with chicks from outside the study area moved onto the grain field before brood counts were conducted in both 1982 and 1983. Therefore, the actual number produced in the study area was not determined. However, of the 25 chicks

produced on or adjacent to the refuge in 1982, only 2 were fledged from the 93 crane pairs in the RRSA and 1 from the 27 pairs in the RCRSA. In 1983, 39 young were fledged, including 4 from the RRSA and 5 from the RCRSA. Of the young cranes hatched on Malheur NWR in 1982 and 1983, 90.1% and 84.8%, respectively, died before fledging, primarily from predation.

The length of this study was to be 3 years, but funding was not provided for the final year. Malheur NWR encompasses a large area where predators are abundant. Under such circumstances predator removal may have to take place for more than 2 years before there is a significant increase in sandhill crane nest success or recruitment.

LITERATURE CITED

- DECINO, T. J., D. J. CUNNINGHAM, and E. W. SHAFER. 1966. Toxicity of DRC-1339 to starlings. *J. Wildl. Manage.* 30:249-253.
- EINARSON, A. S. 1956. Determination of some predator species by field signs. *Oregon State Univ. Monogr. Stud. Zool.* 10. 34pp.
- LARSON, K. H., and J. H. DIETRICH. 1970. Reduction of a raven population on lambing grounds with DRC-1339. *J. Wildl. Manage.* 34:200-204.
- LITTLEFIELD, C. D. 1982. The status and distribution of greater sandhill cranes in California, 1981. *California Dep. Fish Game, Wildl. Branch, Admin. Dep.* 82-1:1-27.
- _____. 1989. Status of greater sandhill crane breeding populations in California, 1988. Unpubl. Rep., Wildl. Manage. Div., California Dep. Fish Game, Sacramento. 40pp.
- _____, and S. M. LINDSTEDT. 1992. Survival of juvenile greater sandhill cranes at Malheur National Wildlife Refuge, Oregon. Pages 21-31 in D. A. Wood, ed. Proc. 1988 North Am. crane workshop. Florida Game Fresh Water Fish Comm. Nongame Wildl. Program Tech. Rep. 12.
- _____, and D. G. PAULLIN. 1990. Effects of land management on nesting success of sandhill cranes in Oregon. *Wildl. Soc. Bull.* 18:63-65.
- _____, and R. A. RYDER. 1968. Breeding biology of the greater sandhill crane on Malheur National Wildlife Refuge, Oregon. *Trans. North Am. Wildl. Nat. Resour. Conf.* 33:444-454.
- _____, and S. P. THOMPSON. 1979. Distribution and status of the Central Valley Population of greater sandhill cranes. Pages 113-120 in J. C. Lewis, ed. Proc. 1978 crane workshop. Colorado State Univ. Printing Serv., Fort Collins.
- _____, and _____. 1987. Greater sandhill cranes and common ravens on Malheur National Wildlife Refuge, Oregon: their history and relationship. Pages 156-165 in J.C. Lewis, ed. Proc. 1985 crane workshop. Platte River Whooping Crane Maintenance Trust, Grand Island, Nebr.
- SOOTER, C. A. 1946. Habits of coyotes in destroying nests and eggs of waterfowl. *J. Wildl. Manage.* 10:33-38.
- STERN, M. A., C. D. LITTLEFIELD, and G. PAMPUSH. 1987. The status and distribution of greater sandhill cranes in Oregon,

1986. Unpubl. Rep., Nat. Conserv., Portland, Oreg. 28pp.

STIEHL, R. E. 1978. Aspects of the ecology of the common raven in Harney Basin, Oregon. Ph.D. Thesis, Portland State Univ.,

Portland, Oreg. 178pp.

WESTERSKOV, K. 1950. Methods for determining the age of game bird eggs. *J. Wildl. Manage.* 14:56-67.