GREATER SANDHILL CRANE PRODUCTIVITY ON PRIVATELY OWNED WETLANDS IN EASTERN OREGON

CARROLL D. LITTLEFIELD, Malheur Field Station, HC 72 Box 260, Princeton, Oregon 97721 (current address HCR 4 Box 212, Muleshoe, Texas 79347)

Except at Malheur National Wildlife Refuge, in Harney County, data on the nesting and recruitment of the Greater Sandhill Crane (*Grus canadensis tabida*) in eastern Oregon have not been documented. The objective of this paper is to assess the reproductive performance on privately owned wetlands of the Central Valley population, classified as sensitive by the state of Oregon.

STUDY AREA AND METHODS

The study area consisted of six sites, from Three-mile Ranch on the south to Bear Valley on the north. The three sites in Harney County are within the Great Basin, where wetlands are created by drainage from nearby mountain ranges. Adjoining these wetlands are shrub-covered expanses dominated by Big Sagebrush (*Artemisia tridentata*). The sites in Grant County are in the Blue Mountains, where wetlands are usually adjacent to coniferous forest, primarily of Ponderosa Pine (*Pinus ponderosa*). Elevations vary from about 1240 m on the Silvies River floodplain to about 1620 m at Crane Prairie.

Among the Great Basin sites, Three-mile Ranch is located about 44 km south of Frenchglen or about 45 km north of the Oregon–Nevada border. Water is provided by Three-mile Creek, which drains westward off Steens Mountain onto about 50 ha of meadows. The Home Creek Ranch site is 35 km south-southwest of Frenchglen and consists of about 150 ha of wet meadows, with water from Home Creek, which also drains west off Steens Mountain. Farther north, the Silvies River floodplain is southeast of Burns. The Silvies River and several smaller creeks disperse water over about 24,300 ha between Burns and Malheur National Wildlife Refuge, creating a mosaic of meadow-marsh wetlands and shrub-covered uplands. Among the three Blue Mountain sites, Crane Prairie is a 200-ha meadow surrounded by coniferous forests and situated 40 km southeast of Prairie City; water is provided by Crane Creek. Bear Valley, 28 km south-southwest of John Day, contains an extensive meadow complex surrounded by sagebrush and pine-forested uplands. Water is provided by the Silvies River, which enters the valley in the northwest, and Bear Creek, which enters from the east. Silvies Valley, 42 km south of John Day, is bisected by the Silvies River and consists of several thousand hectares of wet meadows and willows (*Salix* spp.), with uplands covered with sagebrush, Basin Wildrye (*Elymus cinereus*), and Ponderosa Pine.

I located nests in 1976 by ground searching between 18 April and 25 May, whereas in 1986 I found nests primarily between 15 April and 6 June. A nest in Crane Prairie, however, was not discovered until 18 June. After a nest was located, I recorded vegetation height and type, water depth, land-management regime, and egg-incubation stage (Westerskov 1950). Con-

cealment was based on criteria described by Littlefield (1995a). After the expected hatching dates, I revisited sites and assessed fates. In late July and early August I revisited the sites again and counted fledged young.

RESULTS

In 1976, I surveyed two of the study sites, finding 80 pairs (68 on the Silvies River floodplain; 12 in Silvies Valley). In 1986 I surveyed five of the six sites, finding 112 pairs (from one at Crane Prairie to 70 on the Silvies River floodplain). Most territories were on meadows mowed in summer and grazed by cattle in winter. One exception was Crane Prairie, which cattle cannot reach in winter because of deep snow. The sites differed in nesting chronology so I discuss them separately, from south to north.

Three-mile Ranch. I found a nest on 13 May 1986 on a winter-grazed meadow of spikerush (*Eleocharis* sp.) in 23.6 cm of water. Flotation indicated the clutch was laid about 18 April. The surrounding vegetation had been heavily grazed by cattle and concealment was poor, but both eggs hatched. Of the four pairs having breeding territories on the ranch, all were still present on 5 August and one had a single fledgling, but I could not determine which pair had reproduced successfully. A reservoir provided a favorable and persistent roosting site through the brooding period.

Home Creek Ranch. This site generally receives spring and summer water sufficient for nesting cranes. I found the nests of six of the seven resident pairs on 13 and 15 May 1986. Four clutches contained two eggs, two a single egg each, for a mean clutch size of 1.67. The nests were surrounded predominantly by spikerush, but one was in Reed Canarygrass (*Phalaris arundinacea*). Mean vegetation height was 24.7 cm (standard deviation 12.99), ranging from 0 to 37 cm. Mean water depth was 9.2 cm (SD 5.12), ranging from 0 (moist ground) to 13.9 cm. All were on mowed and winter-grazed meadows, with four fairly well concealed and two poorly concealed. New vegetative growth provided some concealment, but little cover would have been available when clutches were laid between mid-April and early May. Five clutches hatched, but the egg of a single-egg clutch had a dead embryo. Apparently no young fledged, however; five pairs and a single adult were at the site on 5 August.

Silvies River Floodplain. Most of the nests I studied were here, where 68 and 70 pairs had breeding territories in 1976 and 1986, respectively. In 1976, 31 of 35 nests (88.6%) were in mowed and grazed wetlands, two in unmowed grazed meadows, and one each in sites idle and mowed only. Twenty-two of 27 nests (81.5%) at which I recorded concealment were poorly concealed, four were fairly well concealed, and only one was well concealed. Mean vegetation height was 29 cm (SD 17.98), ranging from 0 to 65 cm. All clutches had two eggs. Irrigated meadows supported 25 of the nests (71.4%), whereas six were in Broad-fruited Burreed (*Sparganium eurycarpum*) and three were in Hardstem Bulrush (*Scirpus acutus*); one nest was on a small unvegetated island. Twenty-six nests (74.3%) hatched at least one egg. Two clutches were infertile, and one chick died while pipping. Predation accounted for the loss of seven clutches (20%), with Common Ravens (*Corvus corax*) taking four, Coyotes (*Canis latrans*) two; one was

perhaps lost to a gull. From the 68 pairs on the floodplain in 1976, 12 young fledged, for a recruitment rate of 8.1%.

In 1986 I assessed 12 nests, of which nine were in mowed and winter-grazed wetlands, two in idle meadows, and one in an unmowed grazed meadow. Nine were poorly concealed, two fairly well concealed, and one well concealed. Mean vegetation height was 16.3 cm (SD 14.94), ranging from 0 to 50 cm; mean water depth was 5.6 cm (SD 5.89), ranging from 0 to 16.6 cm. Mean clutch size was 1.97. Eight nests were in meadows, two in burreed, one in Hardstem Bulrush, and one in flooded Black Greasewood (*Sarcobatus vermiculatus*). Five clutches hatched (41.7%) and seven (58.3%) were lost to predators—four to coyotes and three to ravens. From 70 pairs on the floodplain in 1986 only nine young fledged, for a recruitment rate of 6%. Most clutches were laid from late April through early May in both years.

Silvies Valley. I found three nests on 5 May 1976. Eggs were laid in late April. All nests were in flooded meadows at the valley's northern end and were in mowed and winter-grazed habitat, poorly concealed. Mean height of surrounding vegetation was 18.3 cm (SD 2.89), range 15 to 20 cm; water depth was 15 cm at all three nests. Each clutch had two eggs and all hatched successfully. From the total 12 pairs in the valley, three young fledged, for a recruitment rate of 20%.

Crane Prairie. There was only one pair here, and I found its nest in a small beaver pond at the southwestern edge of the prairie on 18 June 1986. In a small stand of Beaked Sedge (*Carex rostrata*) and poorly concealed, the clutch had hatched before discovery. Vegetation height and water depth were not measured. The pair was still on the prairie on 14 August, but no young was present.

Bear Valley. I assessed five nests on the Holliday Ranch in northwestern Bear Valley in May 1986. Most clutches were laid in early May. Nest sites were in mowed and winter-grazed meadows, except for one on a moist saltgrass (*Distichlis stricta*) flat. Four were poorly concealed, one fairly well. Mean vegetation height was 25 cm (SD 7.07), range 20–35 cm. Mean water depth was 8.5 cm (SD 7.56), range 0–16.1 cm. All nests contained two eggs, of which three clutches (60%) hatched successfully, while two were destroyed by coyotes. From the 22 pairs nesting in Bear Valley in 1986, five young fledged for a recruitment rate of 10.2%.

DISCUSSION

Nesting success on these privately owned wetlands was relatively high (69.8%) and would have approached 75% had not three clutches (4.8%) been infertile or addled. Of clutches lost to predators, coyotes destroyed slightly more (12.7%) than Common Ravens (11.1%); the only other loss of eggs to predation was attributed to an unknown bird, probably a gull. Recruitment, however, for the 80 pairs breeding on the Silvies River floodplain and in Silvies Valley in 1976 was 8.6%, and for the 112 pairs breeding on the five 1986 study sites was 6.8%, both rates below that considered necessary for population stability (Miller et al. 1972). Recruitment at Malheur National Wildlife Refuge in 1976 and 1986 was 9.1% and

12.1%, respectively. The high rate at Malheur in 1986 was attributed to an intensive predator-management program, initiated the previous winter. Though there were no significant differences in the cranes' nesting success between private landholdings and Malheur in 1976 ($\chi^2 = 1.66$, 1 df, $P > 0.05$) and 1986 ($\chi^2 = 0.63$, 1 df, $P > 0.05$), or recruitment rate in 1976 ($\chi^2 = 0.27$, 1 df, $P > 0.05$), recruitment was significantly higher at Malheur in 1986 ($\chi^2 = 4.42$, 1 df, $P < 0.05$), when predators were managed.

Previous studies of Sandhill Crane productivity in Oregon have been confined primarily to Malheur National Wildlife Refuge in the southeast (Littlefield 1995b) and Sycan Marsh, Lake County, in the south-central part of the state (Stern et al. 1987). Other than a few general notes and comments for a few pairs (e. g., Walker 1917, Gullion 1947, Roest 1957), little information on cranes nesting elsewhere, particularly on privately owned lands, has been documented. Seventy-three percent of the 692 pairs found in Oregon in 1986 were on privately owned wetlands (Littlefield et al. 1994). With such a large percentage of the population nesting on private lands, the species' welfare in Oregon may depend largely on reproductive success on these wetlands. Even though local landowners and government trappers frequently attempt to control coyotes, other factors such as early draining of marshes and hay-mowing in July can result in high chick mortality, from either starvation or injury by mowing equipment. Coyotes also frequently hunt on recently mowed meadows (Littlefield and Cornely 1997). In addition, most meadows are grazed by cattle in winter, reducing or eliminating residual nest-concealing cover, as most pairs initiate nesting before the onset of new spring growth.

The objective of this study was to assess the reproductive performance of pairs of the Greater Sandhill Crane nesting and brooding under these agricultural practices and habitat conditions. Though nesting success was relatively high, survival of young was low, particularly in the Great Basin. Low recruitment was especially evident on the Silvies River floodplain, where the majority of breeding pairs studied was located. For pairs breeding in Blue Mountain valleys (except at Crane Prairie), recruitment rates were sufficient for stability or perhaps even an increase.

ACKNOWLEDGMENTS

The study was funded by the U.S. Fish and Wildlife Service (Division of Ecological Services) in 1976 and the Nature Conservancy in conjunction with the Oregon Department of Fish and Wildlife, Bureau of Land Management, and the U.S. Fish and Wildlife Service in 1986. I particularly thank Chris Carey (Oregon Department of Fish and Wildlife), Guy Sheeter (Bureau of Land Management), and Mark Stern (Nature Conservancy), as well as the several ranch owners and managers who allowed access to their property during the study. I also thank Gary Ivey, Tim Manolis, and Ron Schlorff for their editorial comments and suggestions, which greatly improved the manuscript.

LITERATURE CITED

Gullion, G. W. 1947. Additional notes on cranes in the Cascade Mountains of Oregon. Condor 42:128.

Littlefield, C. D. 1995a. Greater Sandhill Crane nesting and production in northeastern California, 1988. W. Birds 26:34–38.

Littlefield, C. D. 1995b. Demographics of a declining flock of Greater Sandhill Cranes in Oregon. Wilson Bull. 104:667–674.

Littlefield, C. D., and Cornely, J. E. 1997. Nesting success and production of Greater Sandhill Cranes during experimental predator control at Malheur National Wildlife Refuge, Oregon, 1982–83. Proc. N. Am. Crane Workshop 7:62–66.

Littlefield, C. D., Stern, M. A., and Schlorff, R. W. 1994. Summer distribution, status, and trends of Greater Sandhill Crane populations in Oregon and California. Northwest. Nat. 75:1–10.

Miller, R. S., Hochbaum, G. S., and Botkin, D. B. 1972. A simulation model for the management of Sandhill Cranes. Yale Univ. School Forestry Env. Studies Bull. 80.

Roest, A. I. 1957. Observations on birds of central Oregon. Condor 59:141–142.

Stern, M. A., Pampush, G. J., and Del Carlo, R. E. 1987. Nesting ecology and productivity of Greater Sandhill Cranes at Sycan Marsh, Oregon, in Proc. 1985 Crane Workshop (J. C. Lewis, ed.), pp. 249–256. Platte R. Whooping Crane Maintenance Trust, Grand Island, NE.

Walker, A. 1917. Some birds of central Oregon. Condor 19:131–140.

Westerskov, K. 1950. Methods for determining the age of some game bird eggs. J. Wildlife Mgmt. 14:56–67.

Accepted 18 October 1999