Comparison of greater and lesser sandhill crane winter movements in California

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Abstract: The objective of our study was to compare winter movement patterns of sympatric greater and lesser sandhill cranes (*Grus canadensis tabida* and *G. c. canadensis*) wintering in the Sacramento-San Joaquin Delta region of California (Delta). We marked 31 greaters and 45 lessers with VHF radios and recorded their roosting and feeding locations throughout the wintering periods in 2007/08 and 2008/09. Ten of the lessers were also marked with platform terminal transmitters and tracked via the Argos Satellite System. Compared to lessers, locations of greaters were much more predictable. Greaters showed strong fidelity to wintering sites and moved between discrete wintering areas less frequently. During the second year of our study, 90% of the greaters returned to the study area, compared to 69% of the lessers. Only two greaters (7%) were located in more than one discrete wintering area, compared to 40% of the lessers. Average flight distances from night roost sites to feeding areas were lower for greaters than for lessers and consequently, winter home range sizes were smaller for greaters. These results have application for conservation of wintering cranes at a landscape scale and indicate that habitat protection and mitigation for the state-threatened greater sandhill crane must occur very close to existing use areas to be successful.

Acknowledgements

Funding for this project was provided by a grant from CALFED's Ecosystem Restoration Program. Additional funding was provided by the International Crane Foundation and Kachemak Bay Crane Watch. We thank the following landowners for permitting our access to their properties: The Nature Conservancy (TNC) and the Bureau of Land Management (BLM) for Staten Island and Cosumnes River Preserve, California Dept. of Fish and Game (CDFG) for Isenberg Crane Reserve, U.S. Fish and Wildlife Service (USFWS) for Stone Lakes and San Joaquin River National Wildlife Refuges, and Cortopassi Farms for their properties on Brack Tract and Canal Ranch. Oregon Dept. of Fish and Wildlife assisted with trapping at Ladd Marsh Wildlife Management Area.

Introduction

This study was conducted in partnership between the Department of Fisheries and Wildlife at Oregon State University in Corvallis, Oregon and the U.S. Geological Survey's Western Ecological Research Center in Dixon, California. We are presenting a preliminary analysis of the data from our study of greater and lesser sandhill crane wintering ecology in the Delta. The greater is listed as "threatened" under the California Endangered Species Act (Calif. Dept. of Fish and Game 2006), while the lesser is classified as a "Bird Species of Conservation Concern" (PRBO Conservation Science 2003). These subspecies are sympatric during winter and use only a few discrete areas within California's Central Valley agricultural landscape (which spans between Chico and Bakersfield; Fig. 1). Traditional crane wintering areas are rapidly being degraded by habitat loss from urbanization, conversion to incompatible crops (e.g., vineyards and orchards), and water development projects. Although there is much agricultural habitat in the Central Valley unused by cranes, their distribution has changed little in the past 30 years because they show strong fidelity to wintering areas (Lovvorn and Kirkpatrick 1981, Tacha et al. 1984, Ivey and Herziger 2003). The Delta is among the most important areas in the Central Valley for wintering cranes and is also under the greatest development pressure from the growing communities around it.

Study Area

Our study area included the region of the Delta north of Highway 4, west of Rio Vista and south of Freeport, including the lower Cosumnes and Mokelumne River floodplains (Fig. 2). Major crane conservation areas within our study area included Staten Island (TNC), the Cosumnes River Preserve (TNC and BLM), North and South Isenberg Crane Reserve (CDFG) and Stone Lakes National Wildlife Refuge (USFWS).

Methods

Trapping and radio-telemetry—We captured 31 greater and 45 lesser sandhill cranes using rocket nets and noose-lines. Birds were color-marked for individual identification and fitted with VHF transmitters for radio-telemetry tracking. Of the lessers, 29 were marked in the Delta, six at Ladd Marsh Wildlife Management Area near LaGrande, Oregon and ten near Homer, Alaska. These ten were also marked with platform terminal transmitters and tracked via the Argos Satellite System. We recorded their roosting and feeding locations through the wintering periods in 2007/08 and 2008/09, primarily within our study area and at other wintering locations in the Central Valley.

Data analysis—The fixed-kernel method was selected to calculate the home range areas (95% of the utilization distribution) because it measures the intensity of use (Kernohan et al. 2001). The Home Range Tool (Rodgers et al. 2005) for ArcGIS9 (ESRI, Redlands, California) was chosen for this calculation using likelihood cross-validation (CVh) as the smoothing parameter. This parameter was selected because for a sample size ≤ 50, it generally produces home range estimates with better fit and less variability (Horne and Garton 2006). The CVh was calculated using Animal Space Use 1.1 (Horne and Garton 2007). Feeding flight distances and home range area sizes were compared between the two subspecies using one-tailed Student's T tests with unequal variances.

Results

Winter site fidelity—**Greaters showed stronger fidelity to winter sites**

Of 31 greaters marked in our study area during the first winter, 90% returned the second winter and all but one of these used the same local site, showing high wintering site fidelity. Two greaters spent the second winter in a different winter region (Sacramento Valley), while one was not located. In comparison, of 29 lessers marked in our study area, only 69% were recorded in the study area during the second winter (four were located at other Central Valley winter sites and five were not located).

Movements between winter sites—**Greaters moved between winter sites less often**

Of our marked greaters that were located the second season, 93% used only one wintering region, while 7% were recorded at two wintering sites (Sacramento Valley and Delta). In comparison, 60% of lessers used only one winter site, while 32% were recorded at two wintering sites and 8% were recorded at three wintering sites.

Results (continued)

Feeding flight distances—**Greaters flew shorter distances to feeding sites**

Flight distance for greaters was significantly smaller than for lessers (see Fig. 3) and averaged 1.91 ± 0.021 km compared to 5.06 ± 0.38 km for lessers ($P < 0.001$).

Fixed-kernel home range sizes—**Greaters exhibited much smaller home ranges**

Our estimates of home ranges for greaters were also significantly smaller than for lessers, with greater home ranges averaging 2,205 ± 309 ha, compared to an average of 25,181 ± 6,102 ha for lessers ($P < 0.001$). Fixed-kernel home ranges of a typical greater and lesser in our study are shown in Fig. 4.

Discussion

Lessers exhibited larger home ranges because they generally fly further from roost sites to forage and because they used a wider array of roost sites through the winter period. Most greaters used the same roost area throughout the winter season and showed high fidelity to their home range areas as they returned to them during the second winter season. Some marked greaters have used the same local areas in the Delta for over 10 years (G. Ivey, unpublished data), further indicating a tendency towards high fidelity in this subspecies. Because greaters are listed as threatened, any significant losses of foraging or roosting habitats should be mitigated. To increase the chances for success, mitigation should occur as close as possible to the area lost, and ideally within 5 km, as greaters are not likely to readily shift far from their traditional winter ranges and impacts at local scales are more likely to affect them. The selected mitigation areas should be where foraging habitat has been lost to conversion to incompatible crops (e.g., vineyards and turf farms).

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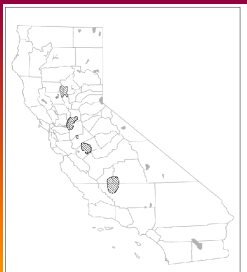

Figure 1. Sandhill Crane wintering regions in the Central Valley of California

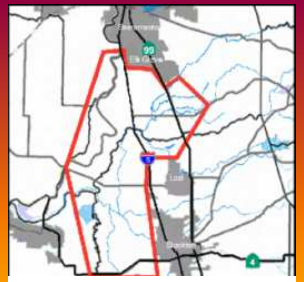

Figure 2. Sandhill Crane study area.

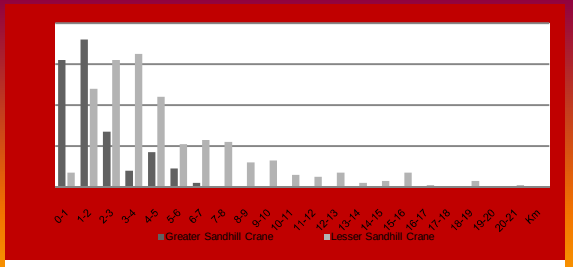

Figure 3. Frequency of daily distances traveled from roost sites to feeding sites (in km) by greater and lesser sandhill cranes.

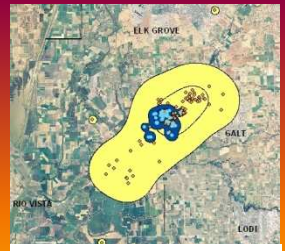

Figure 4. Examples of fixed-kernel home ranges of lesser (yellow) and greater (blue) sandhill cranes.