Migratory chronology, autumn recruitment, and population size of Eastern Population Sandhill Cranes (*Grus canadensis*) from the North Shore Region of Lake Huron, Ontario, Canada

Interim Report

INVESTIGATORS:

Everett E. Hanna
Ph.D. Candidate, Long Point Waterfowl/Western University

Dr. Michael L. Schummer
Scientist, Long Point Waterfowl

Dr. Scott A. Petrie
Executive Director, Long Point Waterfowl

March 2014

Long Point Waterfowl

BACKGROUND

Greater Sandhill Cranes (*Grus canadensis tabida*) in the Great Lakes Region of Ontario belong to the Eastern Population (EP). There are five additional populations of Sandhill Crane in North America (Fig. 1). Over the last four centuries, the species as a whole experienced declines throughout North America, including significant losses in the EP (Henika 1936, Urbanek et al. 1991, Laubhan & Gammonley 2001). The EP in particular has since reestablished much of what is thought to have been its historic range. In some areas, EP cranes are causing crop depredation to the extent that measures have been employed to alter behaviour and reduce local population size to reduce impacts on agricultural crops. For example, along the North Shore of Lake Huron, Ontario, Canada, where large concentrations of EP crane stage during spring and autumn migration, farmers can apply for scare and kill permits issued by the Canadian Wildlife Service (CWS). Similarly, regulated harvest has been introduced in Kentucky (2011) and Tennessee (2013), USA (Management Plan for the Eastern Population of Sandhill Cranes 2010). At present, information gaps exist for EP Sandhill Cranes in Ontario. Specifically, managers are lacking data which are required to inform possible management options aimed to mitigate agricultural damages. In particular, limited data describing 1) migratory chronology, 2) autumn recruitment, and 3) population size of EP Sandhill Cranes in Ontario are available. This research programme will address these information gaps in particular. Furthermore, as part of a much larger study forming the basis for a Ph.D. degree at Western University, this research will contribute to the advancement of our understanding of Sandhill Crane autumn foraging and migratory ecology in Ontario and beyond.

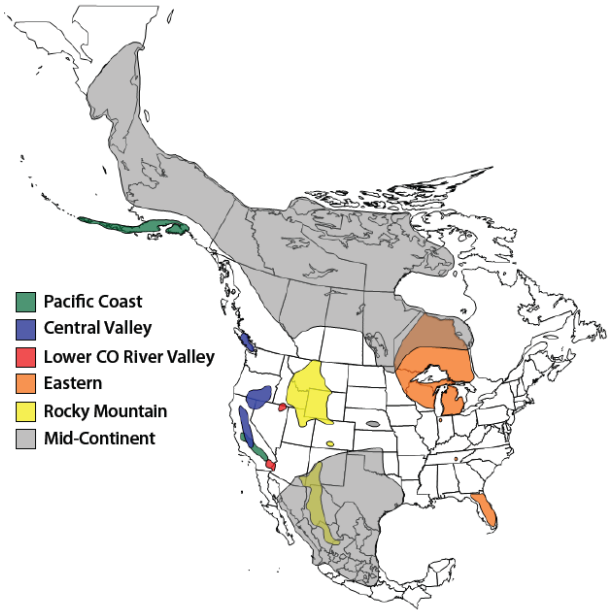

Figure 1. Map of North American Sandhill Crane populations. *From Case & Sanders 2009:* Approximate nesting, winter, and primary staging areas of the six migratory Sandhill Crane (*Grus canadensis*) populations (compiled from information in Lewis 1977, Drewien & Lewis 1987, Sharp et al. 2000, Tacha et al. 1994, and data from radio-telemetered birds provided by G. Krapu, Northern Prairie Wildlife Research Center, Jamestown, ND).

OBJECTIVES

1) Compare autumn migratory chronology of local (i.e., present at study site during breeding season) and migrant (i.e., not present at study site during breeding season) segments using a combination of GPS and field observation data.

2) Estimate autumn recruitment using field observations.

3) Collect minimum autumn population estimates using roost surveys.

METHODS

STUDY SITE

Our study site extended from Sudbury in the northeast to Sault Ste. Marie in the northwest to Massey and Manitoulin Island in the southeast to St. Joseph's Island in the southwest along the North Shore of Lake Huron, Ontario, Canada (Fig. 2). Our entire study area was approximately 18,000 km^2. We collected data from different portions of our study area in each year of our

study (see specific methods sections below). Our research protocols primarily focused on agricultural fields and associated wetlands.

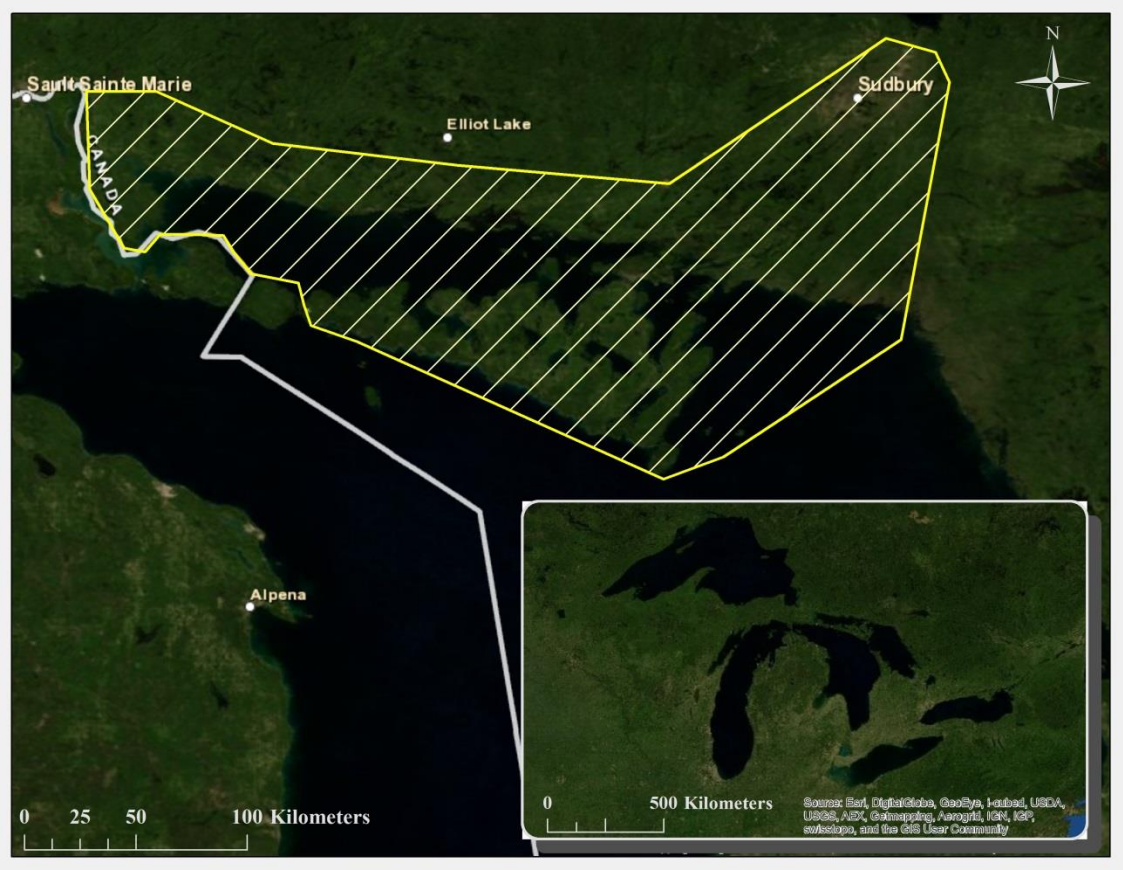

Figure 2. Map of study site. Study site (yellow polygon) extended along the North Shore of Lake Huron, Ontario, Canada from Sudbury in the northeast to Sault Ste. Marie in the northwest to Massey and Manitoulin Island in the southeast to St. Joseph's Island in the southwest. Data were collected at study site August – October 2009 – 2012.

MIGRATORY CHRONOLOGY

To estimate migratory chronology for both local and migrant cranes, we used two techniques. First, we used a rocket net to capture cranes prior to the arrival of migrants during July and August 2010 (n -= 17). We outfitted a subsample of those individuals (n = 9) with solar-powered GPS tracking units (Model 30GPS, North Star Science and Technology, Virginia, USA) mounted on uPVC leg-bands (Greater Sandhill Crane, FWS #9, Darvic uPVC 1.5L, Haggie Engraving, Maryland, USA; Fig. 3). We programmed transmitters to attempt to acquire GPS

location fixes every six hours. Transmitters relayed tracking data through the Argos satellite system on a 2 – 3 day schedule.

Figure 3. GPS transmitter attached to crane. Solar-powered GPS transmitter (North Star Science and Technology, LLC.) mounted on uPVC leg-band (Haggie Engraving) deployed on Eastern Population Sandhill Crane (*Grus canadensis*). Cranes were captured using a rocket net at our study site on Manitoulin Island, Ontario, Canada during July and August 2010.

We assumed GPS-marked individuals represented an unbiased sample of local movement and migratory behaviour. We observed local departure dates and, ultimately, migratory chronology using GPS tracking data. Second, we conducted concurrent field observations during staging and migration (i.e., September and October) 2010 – 2012. Because there was disparity in the size of the local and migrant segments (i.e., ~300 and 8,000, respectively), we assumed that peak departure date as indicated by field observations was representative of migrant migratory behaviour.

AUTUMN RECRUITMENT

We made opportunistic road-based observations and counts of cranes in the field during September and October 2009 – 2012. We classified each individual observed as either hatch-year (HY) or after-hatch-year (AHY) according to obvious head plumage characteristics (Nesbitt

& Schwikert 1998). We combined all estimates per year to calculate annual autumn recruitment as follows:

Autumn Recruitment = HY / (HY+AHY) *100

POPULATION ESTIMATE

We collected minimum population estimates during 7 – 8 October 2009 and 3 – 6 October 2011 by surveying roost sites in the evening and morning. Survey methods and locations were identical in both years. We included all known major roost sites between Pumpkin Point and Massey on the mainland North Shore as well as St. Joseph and Manitoulin Islands to the south by counting cranes from strategic survey sites (n = 16; Fig. 4). Morning surveys were conducted from 0.5 hours before sunrise until 1.5 hours after sunrise. Evening surveys were conducted from 1.5 hours before sunset until 0.5 hours after sunset. We opted to use evening roost surveys where possible because flights were less protracted in the evening. In addition, observers could be certain that flights were complete before concluding surveys in the evening (i.e., onset of darkness) whereas during morning surveys observers often had to wait for long periods of time for a few remaining cranes to leave the roost for feeding sites to ensure a complete census of each roost site.

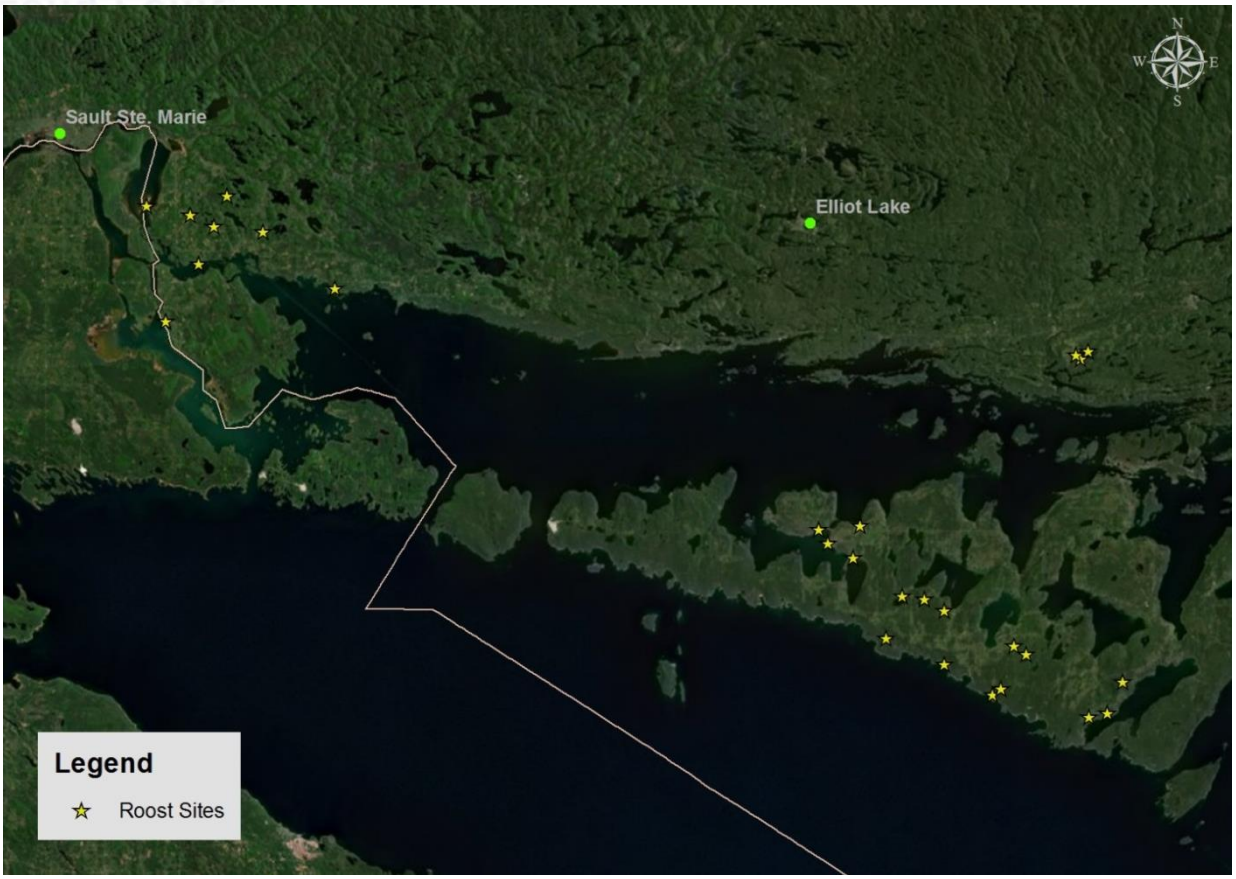

Figure 4. **Roost survey sites.** Known and probable roost site locations (*n* = 27) of Eastern Population Sandhill Crane (*Grus canadensis*) along the North Shore of Lake Huron, Ontario, Canada. Map depicts both focal and additional roost site locations.

RESULTS

MIGRATORY CHRONOLOGY

In 2010 and 2011, local cranes marked with GPS transmitters departed earlier than the peak departure for migrant cranes (Table 1). In 2012, both local and migrant cranes departed in late September. We hypothesize that departure from the study site was earlier in 2012 due to poor growing conditions for small grains and thus reduced agricultural food density at our study site. Our concurrent research involving grain depletion and crane foraging ecology aims to test this hypothesis. Results from this research will be forthcoming in the near future.

Table 1. Local and migrant autumn departure dates. Migratory departure dates of GPS-marked (local segment) Sandhill Crane (*Grus canadensis*) compared with annual peak departure dates from field observations (migrant segment) along the North Shore of Lake Huron, Ontario, Canada, during autumn 2010 – 2012. GPS data were collected via leg-mounted, solar-powered GPS PTTs deployed during July and August 2010 at Manitoulin Island, Ontario, Canada.

PTT ID	2010		2011		2012	
	Local	Migrant	Local	Migrant	Local	Migrant
63952	02-Oct-10	10-Oct-10	03-Oct-11	07-Oct-11	29-Sep-12	28-Sep-12
63957	02-Oct-10		03-Oct-11		25-Sep-12	
63961	02-Oct-10		11-Oct-11		07-Oct-12	
63962	02-Oct-10		04-Oct-11		30-Sep-12	
63969	02-Oct-10		04-Oct-11		27-Sep-12	
85515	05-Oct-10		--		--	
85516	02-Oct-10		01-Oct-11		--	
85517	01-Oct-10		01-Oct-11		--	
85518	01-Nov-10		22-Oct-11		--	
MEAN	**02-Oct-10**	**10-Oct-10**	**03-Oct-11**	**07-Oct-11**	**29-Sep-12**	**28-Sep-12**
SD	**1.16**	**--**	**3.39**	**--**	**4.56**	**--**
n	**8***	**--**	**7***	**--**	**5**	**--**

** Outlier individual removed from mean departure calculation.*

Marked cranes followed similar autumn migratory routes and used traditional key stopover sites during all three years of tracking (Fig. 5). Tracking data were shared with a collaborative research project being conducted by the University of Minnesota at St. Paul and the United States Fish and Wildlife Service aimed primarily to describe large-scale migration patterns of the Eastern Population (Fronczak and Andersen 2012).

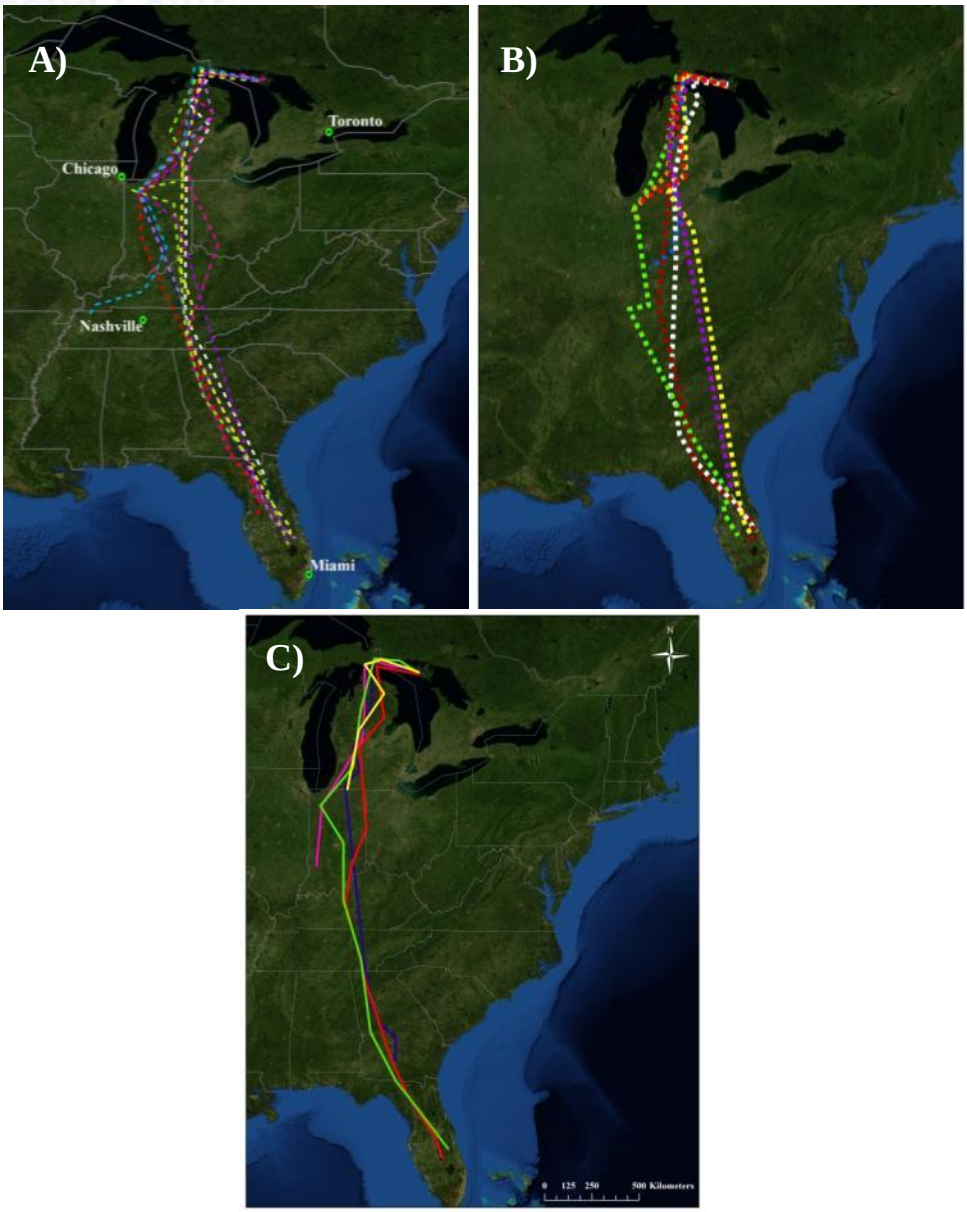

Figure 5. Autumn migratory routes. Migratory routes from GPS-marked Sandhill Crane (*Grus canadensis*) departing Manitoulin Island, Ontario, Canada along the North Shore of Lake Huron during autumn A) 2010, B) 2011, and C) 2012 (n = 9, 8, and 5, respectively). Data were collected using leg-mounted solar-powered GPS units deployed during July and August 2010.

In 2011, some GPS-marked cranes (n = 3) wintered at Jasper-Pulaski Fish and Wildlife Area in northwest Indiana, USA (Fig. 6). Jasper-Pulaski is >1,200 km north of traditional EP wintering areas in southern Georgia and throughout Florida, USA.

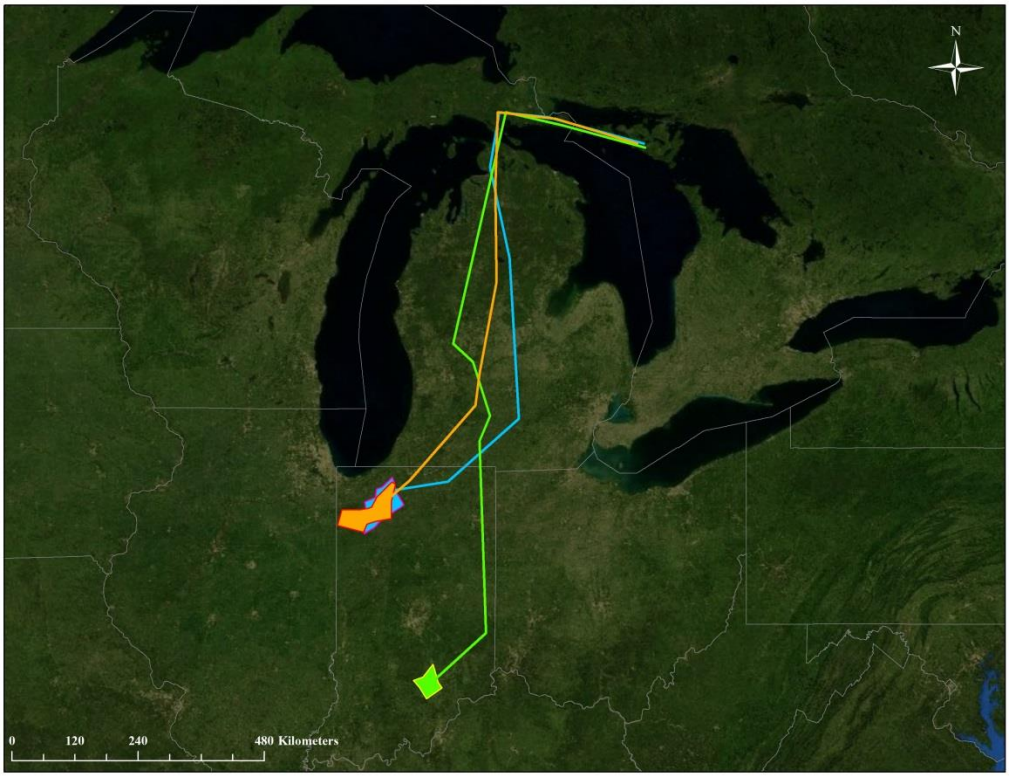

Figure 6. Select wintering ranges from 2011/12. Autumn migratory routes and wintering ranges from GPS-marked Sandhill Crane (*Grus canadensis*) departing Manitoulin Island, Ontario, Canada along the North Shore of Lake Huron in 2011/12. Data were collected using leg-mounted solar-powered GPS units deployed during July and August 2010.

AUTUMN RECRUITMENT

Mean autumn recruitment estimates did not vary significantly between years (Table 2). Mean autumn recruitment consistently remained above levels indicative of a stable population (i.e., >5-6%, which is suggestive of population growth and expansion, but caution should be used when interpreting recruitment data alone (Drewien et al. 1995). We suspect that the EP will continue to recolonize its historical range further east in Canada (according to unreliable historical accounts; Management Plan for the Eastern Population of Sandhill Cranes 2010) as the population continues to increase in size.

Table 2. Annual autumn recruitment estimates. Annual estimates of autumn recruitment in Eastern Population Sandhill Crane (*Grus canadensis*) along the North Shore of Lake Huron, Ontario, Canada. Recruitment is presented as percent juveniles during autumn.

Year	n*	Recruitment (%)	SE
2009	16 (4,025)	12.3	1.66
2010	18 (4,636)	15.3	0.74
2011	26 (6,463)	19.2	1.69
2012	48 (22,076)	12.3	0.83

*number of surveys (total number of cranes observed).

POPULATION ESTIMATE

We counted 8,895 and 5,216 cranes in 2009 and 2011, respectively, in the North Shore Region of Ontario (Fig. 7). Our estimate was 41% lower in 2011 as compared to 2009. The difference between the 2009 and 2011 population estimates may be the result of two severe weather systems that struck the North American Atlantic Seaboard in late September 2011 (Hurricane Ophelia and Philippe). Hurricane Ophelia and Philippe brought high winds (category 4 = 210 – 250 km/h and category 1 = 119 – 153 km/h, respectively) and heavy rainfall (>100 and >50 mm, respectively) across much of eastern North America. Anecdotal field observations suggested that most cranes departed for southern staging areas in Michigan, USA (especially on the mainland North Shore; compare 3,687 and 612 from 2009 and 2011, respectively) prior to or soon after these two hurricanes passed through the region (e.g., six of eight GPS-marked cranes departed October 1 – 4 in 2011).

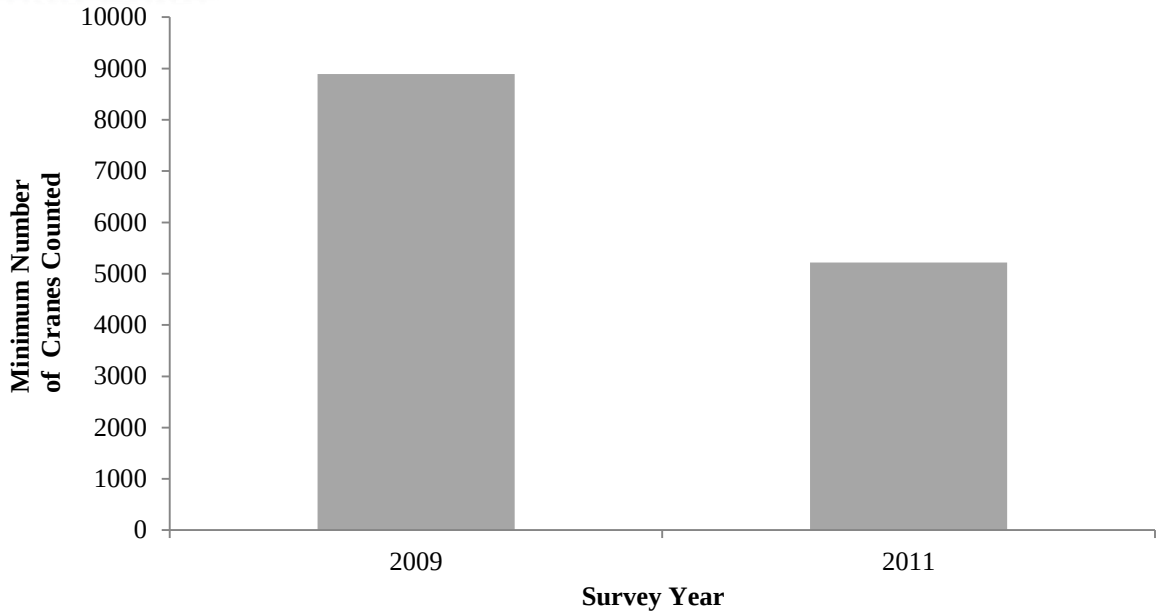

Figure 7. Minimum autumn population estimates for Eastern Population Sandhill Crane (*Grus canadensis*) collected along the North Shore of Lake Huron, Ontario, Canada in 2009 and 2011. Data were collected by enumerating cranes flying to and from roost sites in evening and morning, respectively.

Because we collected weekly population estimates for five consecutive weeks in 2009, we were able to compare our population estimate from 2011 to weekly data from 2009 to improve our understanding of EP crane migratory chronology. The 2011 estimate was similar to the post-peak departure survey week from 2009 (nearly 10 days later; 5,109 and 5,216 from 2009 and 2011, respectively). The similarity between these two numbers may suggest that survey timing contributed to the difference between years.

It is difficult to predict the exact timing of peak migration with any certainty and subsequently commence survey efforts to capture consistent data because of the remote and distributed nature of cranes at our study site. Furthermore, annual variation in food availability and climatic factors apparently increase the volatility of crane migratory behaviour. To this end, we recommend standardizing the timing of any subsequent efforts well ahead of peak migration (i.e., the second or third week in September) to provide for meaningful comparison of annual population estimate survey data between years.

ACKNOWLEDGMENTS

Collection of the data summarized in this report was made possible by financial and/or logistical support from the following individuals and organizations: Canadian Wildlife Service, Ontario Federation of Anglers and Hunters, Wildlife Habitat Canada, TD Friends of the Environment Foundation, United States Fish and Wildlife Service Webless Migratory Game Bird Fund, Ontario Ministry of Natural Resources, St. Joseph Island Hunters and Anglers Association, Manitoulin Nature Club, Massey Naturalist Club, instructors from Sault College, Ontario Ministry of Food, Agriculture, and Rural Affairs, and countless individual volunteers from the North Shore Region.

LITERATURE CITED

Case, D. J., and S. J. Sanders. 2009. Priority information needs for Sandhill Cranes: A funding strategy. Association of Fish and Wildlife Agencies' Migratory Shore and Upland Game Bird Support Task Force.

Drewien, R. C., W. M. Brown, and W. L. Kendall. 1995. Recruitment in Rocky Mountain Greater Sandhill Cranes and comparison with other crane populations. The Journal of Wildlife Management 59:339-356.

Fronczak, D. L., and D. E. Andersen. 2012. The use of satellite telemetry to evaluate migration chronology and breeding, migratory, and wintering distribution of Eastern Population of Sandhill Cranes. Pp. 52 - 58 *in* Webless Migratory Game Bird Program Project Abstracts – 2010-11, T. Cooper, U.S. Fish and Wildlife Service (http://www.fws.gov/migratorybirds/Newreportspublications/research/WMGBMR/WMGB%20Program%20Abstract%20Report,%202010-11.pdf)

Henika, F. S. 1936. Sandhill cranes in Wisconsin and other Lake States. Proceedings of the North American Wildlife Conference. 1:644-646.

Laubhan, M. K., and J. H. Gammonley. 2001. Agricultural producers' perceptions of Sandhill Cranes in the San Luis Valley of Colorado. Wildlife Society Bulletin 29:639-645.

Nesbitt, A. and S. T. Schwikert. 1998. Maturation and variation of head characteristics in Sandhill Cranes. The Wilson Bulletin 110:285-288.

Urbanek, R. P., J. L. McMilen, and T. A. Bookhout. 1991. Rocket-netting Greater Sandhill Cranes on their breeding grounds at Seney National Wildlife Refuge. *In* Proceedings 1987 International Crane Workshop. J. T. Harris (ed.). International Crane Foundation, Baraboo, Wisconsin, pp. 241-245.

Van Horn, K., T. White, W. Akins, T. Cooper, S. Kelly, R. Urbanek, D. Holm, D. Sherman, D. Aborn, J. Suckow, K. Cleveland, and R. Brook. 2010. Management plan for the Eastern Population of Sandhill Cranes. Prepared by the Ad Hoc Eastern Population Sandhill Crane Committee.