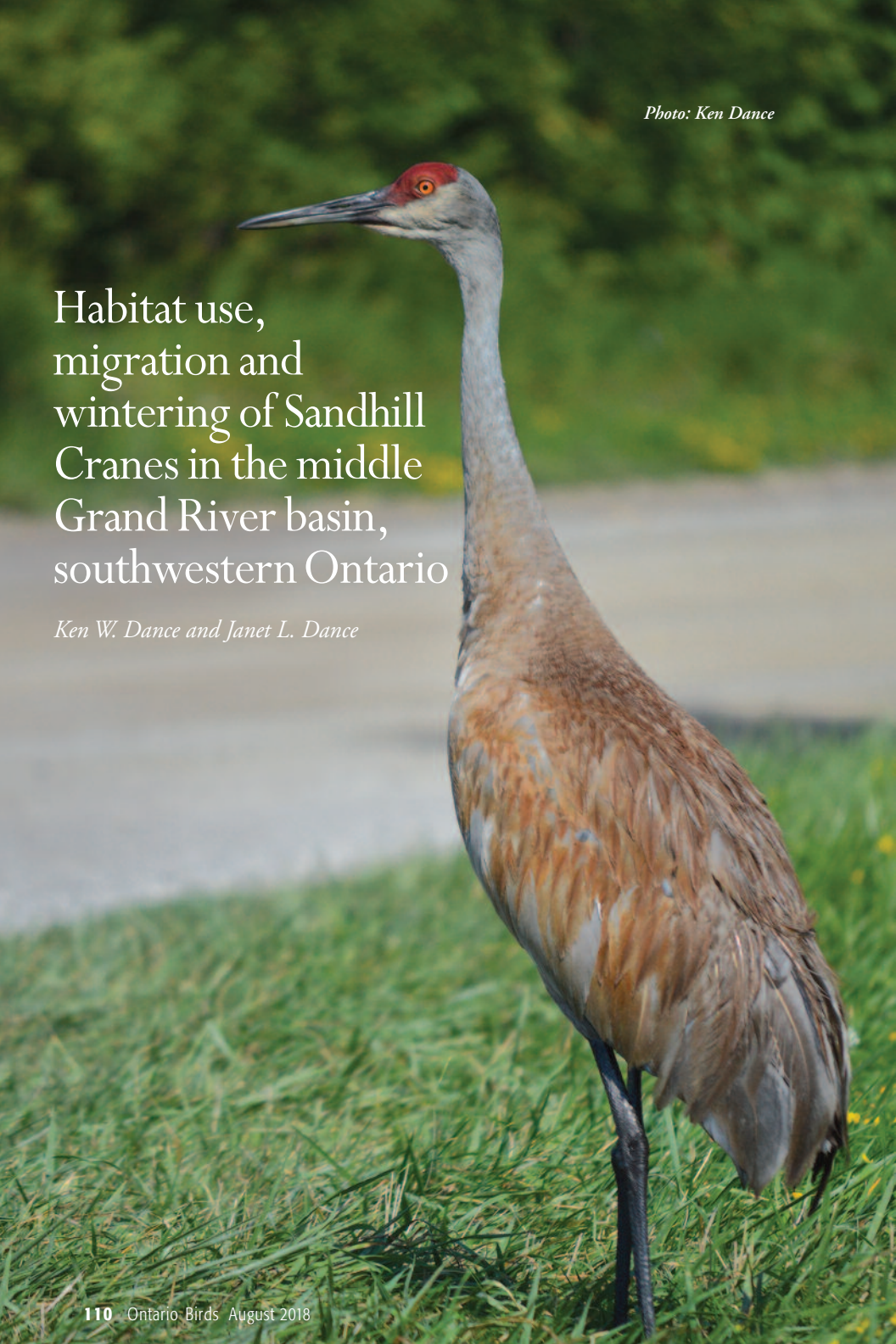

Photo: Ken Dance

Habitat use, migration and wintering of Sandhill Cranes in the middle Grand River basin, southwestern Ontario

Ken W. Dance and Janet L. Dance

Summary

1. We conducted a study of the habitat use, relative abundance and migration of Sandhill Cranes in a central portion of southwestern Ontario, from March 2014 to October 2017.
2. The most frequently used habitats were cattle pastures, harvested corn fields and wetlands. We also found that green soybean fields provided foraging habitat for Sandhill Cranes.
3. During the strong El Nino event that occurred during autumn and early winter of 2015-16, cranes used the Bannister Lake (Regional Municipality of Waterloo) roost site until the end of December 2016 — well past usual early December departure dates.
4. During the winter of 2016-17, cranes were absent from five southern Ontario counties for periods ranging from 37-80 days.
5. Sandhill Cranes over-wintered at the Horner Creek floodplain, Oxford County, which we believe is the farthest north that Sandhill Cranes have been recorded wintering in Ontario.

Introduction

Sandhill Cranes (*Antigone canadensis*) (henceforth cranes) have received little intensive study in southern Ontario, primarily because until recently they were relatively uncommon. The breeding distribution and population size of Sandhill Cranes in Ontario was addressed by Pedlar and Ross (1997) and Elder (2007) with a focus on northern and central Ontario and the Rainy River area, respectively, where breeding cranes are associated with the Mid Continent Population (Krapu *et al.* 2011). In contrast, Southern Ontario is located within the range of the Eastern Population of Sandhill Cranes, which traditionally overwintered in Georgia and Florida (Ad Hoc Eastern Population Sandhill Crane Committee 2010). Sutherland and Crins (2007) summarized changes in Ontario cranes associated with both populations between the 1980s and early 2000s, noting the increase of breeding incidence in southern Ontario over that period. Cadman *et al.* (2016) commented that the Sandhill Crane "has become a familiar sight across much of southern Ontario, whereas during the early 1980s, its breeding range was just beginning to expand southwards." Data from the Great Lakes Marsh Monitoring Program indicated that between 1995 and 2012, the annual increase in mean numbers of Sandhill Cranes per station was 7.5% (Tozer 2013). Coordinated winter surveys have indicated that the overall Eastern Population has increased from 30,000 in the 1990s (Ad Hoc Eastern Population Sandhill Crane Committee 2010) to approximately 80,000 in recent years (Wolfson *et al.* 2017). The Ontario segment of the Eastern Population during the 2009 to 2012 period was estimated to be 12,000-15,000 individuals (Hanna 2015).

Manitoulin Island cranes have been studied intensively during recent years, including their abundance, migration, productivity and habitat use (Hanna *et al.* 2014, Hanna 2015, 2017). While recent increases in breeding populations in more

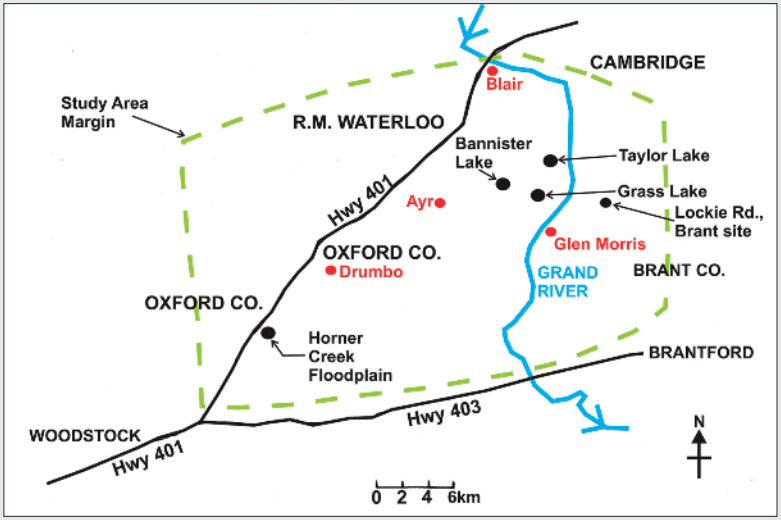

Figure 1. Primary study area, middle Grand River basin, in the Regional Municipality of Waterloo, Oxford and Brant counties.

southern portions of Ontario are well known, we are not aware of any quantitative studies of crane numbers during autumn migration staging or winter in southwestern Ontario. We are also unaware of any studies of habitat use and foods of cranes during migration in southwestern Ontario. Thus, we undertook studies of these subjects in the middle Grand River basin and to a lesser extent, elsewhere in southwestern Ontario and present the results here. The objectives of the present paper are: (1) to document habitat use and food sources of Sandhill Cranes, (2) to estimate the percentage of hatch year cranes (colts) in the autumn population, (3) to document autumn staging, migration chronology and winter presence of Sandhill Cranes in the middle Grand River basin and across southern Ontario in years with contrasting autumn-winter weather, and (4) to document return in spring to calculate the duration of absences of Sandhill Cranes from five southern Ontario counties.

Study Area and Methods

The primary study area was located within the middle Grand River basin, extending from the eastern margin of Woodstock, in the west, to east of the Grand River south of Cambridge (Figure 1). The following townships were included in the study: Blandford-Blenheim in Oxford County, North Dumfries in the Regional Municipality (R.M.) of Waterloo and the area called South Dumfries by the original land surveyors, now located in Brant County. The study area is characterized by intensive cropping, scattered livestock grazing and a human population living adjacent to patches of Sandhill Crane habitat.

Assessments of habitat use and food sources of Sandhill Cranes were made between 20 March 2014 and 31 October 2017. When possible, landowners were interviewed when encountered in the field or contacted by phone. A 60 x spotting scope and 8 x 42 binoculars were used to scan suitable habitat from roadsides. Members of Waterloo Region Nature provided some records of crane family sightings and feeding observations. Observation locations were mapped, age group was often determined and habitat (including crop cover) and any foraging behavior/food consumption was usually recorded. The percentage of colts in the population was calculated as the ratio of hatch year birds divided by the total number of hatch year plus adult birds, based on counts in the primary study area from 11 dates during the October-November 2015 staging period.

Staging numbers, migration chronology and over-wintering of Sandhill Cranes was assessed using four methods. First, evening roost counts of Sandhill Cranes were made by us at Bannister Lake (R.M. Waterloo), a known autumn roost site for cranes in the primary study area, throughout the autumn migration period in 2015 and 2016. The total number of cranes landing in the Bannister Lake wetland at dusk was recorded during each count. Second, since air temperatures were much warmer than normal and there was virtually no snow cover in early February 2016, we searched the Blandford-Blenheim Township portion of the study area for cranes on six dates from 2-28 February 2016. We also searched Blandford-Blenheim Township for wintering cranes between 1 January and 28 February 2017. Third, numbers of cranes counted in the Cambridge Sector of the Alan Wormington-Hamilton Fall Count (held on the first Sunday of November) were examined for the period 1999 to 2016. These provided an index of numbers of cranes usually present in the primary study area in early November. Fourth, we obtained eBird records for the primary study area and the larger southwestern Ontario region.

For a number of counties/regions adjacent to Norfolk County and adjacent to the southern Great Lakes, we calculated the number of days that cranes were absent between the latest autumn — early winter dates and the earliest presumed "spring" return dates, using eBird records and our own observations.

We obtained historical data on monthly average temperatures in the primary study area from 1981-2010 from the Government of Canada (Canadian Climate Normals, Station Waterloo Wellington A), online 17 February 2016. The study period monthly average air temperatures for autumn-winter were obtained from monthly climate summaries for the same Station and source.

Results

Habitat Use/Food Sources

We observed 1644 Sandhill Cranes during 238 inventory trips to the study area on a total of 196 dates. We classified these observations into one or more of the following ten habitat or food source situations: Cattle Pastures, Green Soybean Fields, Green Corn Fields, Green Wheat Fields, Harvested Corn Fields, Harvested Soybean Fields, Harvested Wheat Fields, Hay Fields, Roadsides and Wetlands.

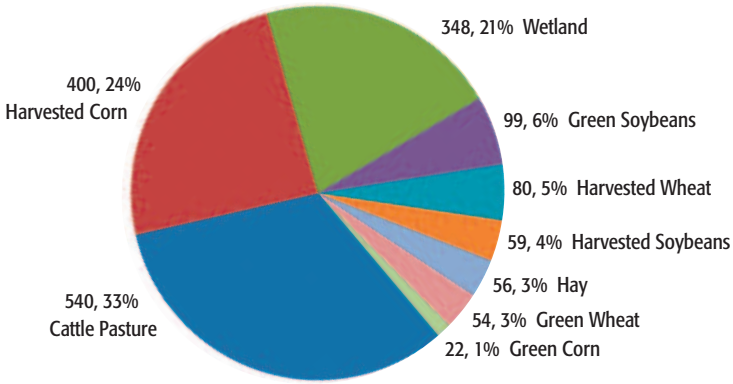

Figure 2. Number and percentage of Sandhill Cranes observed by habitat/food source type.

Use of these habitats/situations is presented below in descending order from most to least frequently used (based on number of observations, not number of individual cranes) (Figure 2).

Cattle Pastures were defined as pasture where cattle were either present with cranes or cattle were present on the pasture during most of the growing season. We recorded 101 observations in 15 separate pastures (n = 540 cranes or 33% of the total individuals). Cranes were observed gleaning from pasture vegetation and around cow pats and probing into the pasture soils. At two treed pastures it appeared that acorns or beech nuts were being consumed by cranes. Cranes and cattle are shown together in a treed pasture area (Figure 3).

Cranes were observed feeding on 38 occasions in 26 different Harvested Corn Fields (n = 400, 24%). Harvested corn fields were a major source of food for local crane families and migrants arriving in the primary study area. Groups of several dozen cranes were observed frequently in harvested corn fields and were also reported on eBird in corn fields in Bruce, Norfolk, Simcoe, Grey and Niagara counties. Cranes also fed in Green Corn Fields (n = 22, 1%). A crane colt is shown feeding on unharvested corn in early September 2015 in Figure 4. In this instance, an adult crane had peeled the husk back and plucked corn kernels from the cob. Following the adult's lead, a colt pecked at and ate kernels from the same cob.

Crane families and migrants were observed probing for invertebrates and/or seeds and roots of wetland vegetation on 65 occasions in nine different Wetlands (n = 348, 21%). Wetland types where we observed crane foraging included: bog, shrub thicket and kettle lakes with tall emergent vegetation, sedge meadow and emergent vegetation on the floodplain of a creek. Sandhill Cranes need to drink frequently (Gerber *et al.* 2014).

On 44 occasions, adult cranes were observed walking through 21 different Green Soybean Fields in early summer (n = 99, 6%) and they appeared to be foraging for invertebrates. Crane families were observed feeding on waste beans in

Figure 3. Migrating cranes foraging on Cattle Pasture on 1 November 2015. *Photo: Ken Dance*

Figure 4. Crane colt eating standing corn from ear partially husked by an adult on 4 September 2015. *Photo: Janet Dance*

Harvested Soybean Fields on 10 occasions in nine different fields (n= 59, 4%). However, once corn had been harvested, soybean fields were not often used by cranes. Cranes were also observed feeding in a harvested edible white bean field.

Cranes were observed feeding on waste grain in Harvested Wheat Fields on 26 occasions in 17 different locations (n = 80, 5%). Often Canada Geese (*Branta canadensis*) and Mallards (*Anas platyrhynchos*) were also present. They were also observed feeding on six occasions in five different Green Wheat Fields (n = 54, 3%).

Cranes were observed feeding in 11 different Hay Fields on 21 occasions (n = 56, 3%). Hay fields were used by adult cranes as invertebrate hunting sites during the summer through autumn. Families of cranes were observed feeding on the margins of tall hay. Where the vegetation appeared to be too tall and dense for the crane colts to walk through, the young birds were seen pecking at hay plants on the field margin, which included alfalfa, red clover and grasses. Crane families were observed foraging along Roadsides on two occasions. Invertebrates were probably the primary food being sought, but vegetative material was probably also being consumed.

Recruitment

The proportion of colts in the population calculated from 11 counts in autumn 2015 was 11.8%. Since this result was within the range found in many other studies, we did not determine the proportion of colts in the population in autumn 2016 nor 2017.

Staging/Migration Chronology

In 2015, our earliest record of local family groups coalescing, as a possible first indicator of autumn staging, was on 11 September on the Horner Creek floodplain, Oxford County, when we observed a group of nine cranes: two adults together, two adults with one colt and two adults with two colts. A group of 28 cranes was observed by Todd Hagedorn at Bannister Lake on 2 August 2016 (eBird 2016).

Seasonal staging of Sandhill Cranes in autumn-winter 2015-16 and 2016-17 at the Bannister Lake roost site, in the centre of the primary study area, is shown in Figure 5. In 2015, the first cranes were recorded at Bannister Lake on 30 September. A relatively consistent population of about 100 birds was maintained for two months but a peak in numbers occurred in the third week of December at just over 200 individuals. On 20 December 2015, the day of the Cambridge Christmas Bird Count (CBC), 130 cranes were counted at dusk at Bannister Lake and 175 were counted simultaneously at Taylor Lake, a kettle lake located 4.3 km to the northeast, for a combined count of 305 (G. Hentsch, pers. comm.). Numbers declined quickly during the rest of December and the last individuals were observed there on 31 December. Our field work in the primary study area was very limited in January 2016; however, from 1-3 January 2016, cranes were reported from elsewhere in the primary study area (eBird 2016). We saw three to six cranes on each of six dates in the 2-17 February 2016 period in Blandford-Blenheim Township (Table 1). Our searches in Blandford-Blenheim Township found

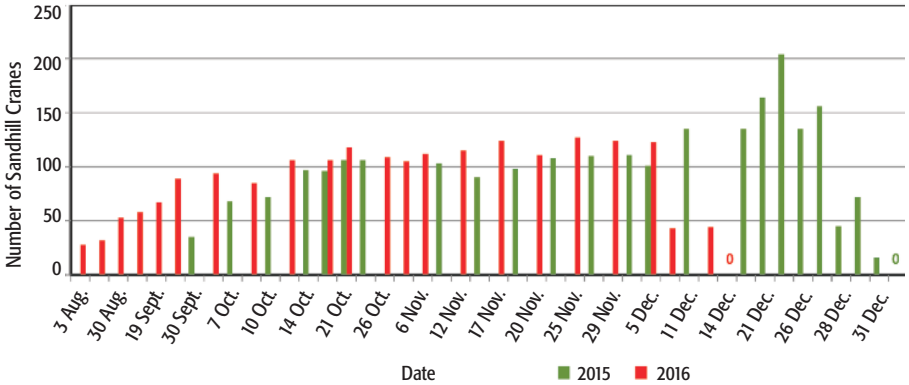

Figure 5. Maximum daily counts of staging Sandhill Cranes roosting (at dusk) at Bannister Lake (R.M. Waterloo) in autumn 2015 and 2016.

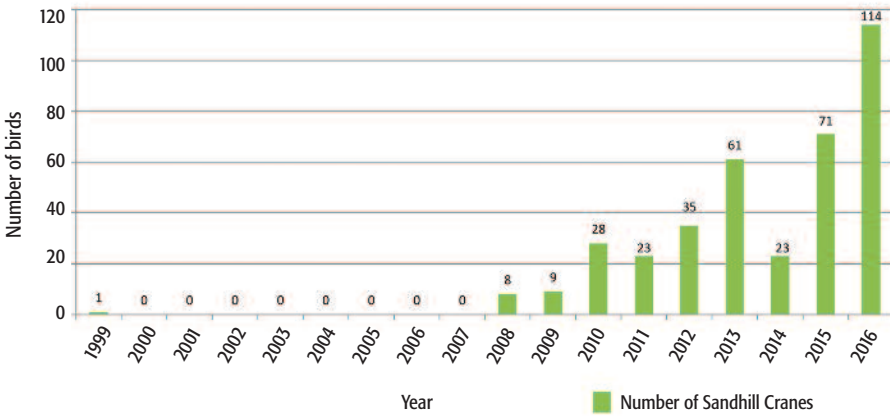

Figure 6. Number of Sandhill Cranes recorded on the first Sunday in November annually in the Cambridge Sector of the Al Wormington-Hamilton Fall Count, 1999-2016.

three cranes on 2 and 9 February and six cranes on 3, 5 and 6 February.

In 2016, the first cranes were observed at Bannister Lake in early August, but like 2015 a relatively constant population of about 100 individuals was maintained until early December. During autumn 2016, the largest numbers of cranes were present at the Bannister Lake roost on 25 November and cranes had abandoned the Bannister Lake roost by 14 December. In the Cambridge sector of the Al Wormington/Hamilton Fall, only eight cranes were recorded during the 2008 count, but over the period 2008 to 2016, the numbers increased to a high of 114 individuals in 2016, a 14-fold increase (Figure 6).

Table 1. Selected winter Sandhill Crane records from the primary study area, 2012 to 2017. Sources include authors' observations, eBird, Christmas Bird Counts and personal communication.

Date	Number of Cranes	Source/Location/Observer
Horner Creek Floodplain, Blandford-Blenheim Township, Oxford County		
15 Dec 2012	2	Woodstock CBC, J. & K.W. Dance
19 Dec 2015	4	Woodstock CBC, J. & K.W. Dance
19 Dec 2015	53	eBird: north of Hwy 401, K. Harmer
23 Dec 2015	4	J. & K.W. Dance
2 Feb 2016	3	J. & K.W. Dance
3, 5, 6 Feb 2016	6	J. & K.W. Dance
9 Feb 2016	3	J.& K.W. Dance
17 Feb 2016	3	K.W. Dance
2, 12, 22, 26, 30 Jan; 15 Feb 2017	5	J. & K.W. Dance
11, 24 and 28 Feb 2017	7	J. & K.W. Dance
19 Feb 2017	8	J. & K.W. Dance
26 Feb 2017	9	J. & K.W. Dance
North Dumfries Township, R.M. Waterloo		
1 Jan 2016	21	near Grass Lake, J. & K.W. Dance
1 Jan 2016	3	eBird, Grass Lake, G. Berger
2 Jan 2016	16	eBird, Grass Lake, T. Hagedorn
3 Jan 2016	50	Taylor Lake, N. Watson pers. comm.
28 Feb 2016	4	Taylor Lake, N. Watson pers. comm.
29 Feb 2016	X (heard)	Taylor Lake, N. Watson pers. comm.
1, 2, 3, 5 March 2016	10 or more	Taylor Lake, N. Watson pers. comm.
8 Dec 2016	100	Taylor Lake, N. Watson pers. comm.
13 Dec 2016	50	Taylor Lake, N. Watson pers. comm.
14 Dec 2016	14	Taylor Lake, N. Watson pers. comm.
20 and 21 Feb 2017	2	Taylor Lake, N. Watson pers. comm.
22 Feb 2017	6	Taylor Lake, N. Watson pers. comm.
22 Feb 2017	4 (o)	eBird, Grass Lake, R. Beardon
South Side of Lockie Road, Brant County		
9 Dec 2011; 20, 26 Feb 2012	a few	A. Sandilands pers. comm.
20 Dec 2016	2	A. Sandilands pers. comm.
25 Feb 2017	X (heard)	A. Sandilands pers. comm.
Glen Morris, Brant County		
25 Feb 2017	1 (o)	eBird, Glen Morris, E. and/or J. Horak
25 Feb 2017	2	eBird, Deer Run Court, J. and/or G. Sims

"o" = overhead

Selected crane records from across southern Ontario from November 2015 to February 2016 and from October 2016 to the end of February 2017 are presented in Appendices 1 and 2, respectively. These indicate that in 2016 cranes were still present in Simcoe and Niagara Counties in early January. As well, eBird data document the presence of cranes in the Long Point, Norfolk County, area throughout January and February 2016 (Appendix 1).

Return Dates of Sandhill Cranes

The late February 2016 crane records for Essex County, Taylor Lake (R.M. Waterloo) (Table 1) and a solitary crane seen by us in Blandford-Blenheim on 28 February 2016, were possibly early spring migrants, not overwintering individuals. Likewise, during the 13 to 24 February 2017 period, a few cranes were reported at such scattered locations as Harrow, Kingsville and Point Pelee National Park, all in Essex County (Appendix 2). Within our primary study area, there appeared to be returning cranes at Taylor Lake continuing from 20 February 2017, at Lockie Road, Brant County, on 25 February 2017, and presumably new individuals at Horner Creek floodplain, Oxford County, increasing the consistent winter counts (five to seven birds) up to eight on 19 February and to nine on 26 February 2017 (Table 1).

Duration of Sandhill Crane Absence

Based on eBird data in the winter of 2016-17, we calculated that Sandhill Cranes were absent from five counties/regions of Ontario adjacent to the southern Great Lakes for periods ranging from 37 to 80 days (Table 2). The periods of absence generally increased from southwest to northeast among these counties.

Table 2. Duration of absences of Sandhill Cranes from certain counties/regions in southern Ontario, winter 2016-17. Sources: eBird (2016, 2017, N. Watson, pers. comm. (Waterloo) and A. Sandilands), pers. comm. (Brant).

County/Region	Date Last Seen	Location	Date First Seen	Location	Days of Absence
Simcoe	10 Dec 2016	Minesing Wetland Conservation Area	1 Mar 2017	South of Minesing Wetland	80
Waterloo	16 Dec 2016	Wilmot Line	20 Feb 2017	Taylor Lake	65
Brant	27 Dec 2016 ±	Glen Morris	27 Feb 2017	Glen Morris	59
Lambton	27 Dec 2016	Walpole Island	19 Feb 2017	Sarnia	53
Essex	7 Jan 2017	Point Pelee National Park	13 Feb 2017	Harrow	37

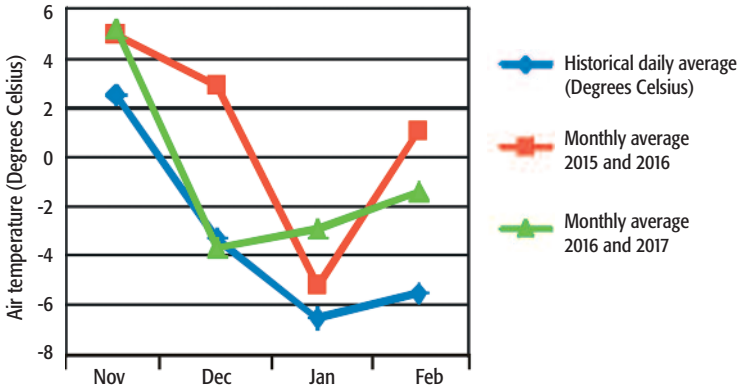

Figure 7. Average air temperatures in the primary study area from November to February 2015-2016 and 2016-2017, compared with long term averages. *Data source: Environment Canada –Station Waterloo Wellington A.*

Weather and Temperatures in 2015-2016 and 2016-17

Air temperatures were much warmer than normal during the November 2015 to early February 2016 period (Figure 7). This resulted from one of the strongest El Nino events in recorded history (Wilcox 2016). A low pressure cell from Texas that arrived in R.M. Waterloo on 28 December 2015 had 44 km/hr winds that produced a wind chill of -14°C with snow and freezing rain. However, the morning of 29 December 2015 was calm with a +1°C temperature and rain, although 5 to 7cm of snow had accumulated in drifts. Average air temperature was warmer in January 2017 than it had been in January 2016 — both being warmer than the historical average and February of both years was also warmer than normal (Figure 7).

Discussion

Habitat Use/Food Sources

Cattle pasture was the most frequently used habitat and one-third of all the cranes observed were seen there. Most of the pastures were cropped short by grazing, which enhanced detectability and accuracy of crane counts. Although quite limited in area and distribution, active cattle pasture was frequently used by crane families. One location was used during every month of the year. In spring, cattle pasture was used as "dancing" habitat; in summer, both family groups of adults and colts and "bachelor" groups were observed foraging there. In one location, adjacent to the Bannister Lake roost site, migrating cranes were routinely observed feeding and loafing in a cattle pasture.

In our primary study area, harvested corn fields were an important source of food for staging and migrating cranes in autumn. Other authors have documented the importance of corn to staging,

migrating and wintering cranes (Sparling and Krapu 1994, Aborn 2011, Gerber *et al.* 2014). Gerber *et al.* (2014) indicate that changes in agricultural practices and distribution of food crops used by cranes can affect breeding, stopover and wintering areas. Since corn is one of the two key cash crops in southwestern Ontario, we expect it to persist in the future as a food source for autumn staging and migrating cranes.

Wetlands were important throughout the year, including breeding season and migration. We observed that crane families that were feeding in upland areas returned to adjacent wetlands to drink. We also observed that when staging cranes landed at the Bannister Lake roost, most drank almost immediately.

Our observations of crop field use are consistent with other studies (Gerber *et al.* 2014). Martin *et al.* (1961) list a number of agricultural crops as foods including corn, wheat, rice, oats, sorghum and alfalfa. Neither soybeans, nor edible white beans are listed, but these crops were not widely grown in northeastern North America when the study took place. More recent literature describes soybeans as being "not valuable nutritionally for cranes" (Kruse *et al.* 2014). Gerber *et al.* (2014) indicate that cranes of the eastern population use waste corn during fall migration, but avoid soybeans. We were somewhat surprised by the number of observations of cranes foraging in green soybean fields (ranking fourth among the ten habitats), but given the extensive areas planted to soybeans near wetlands, which are preferred nesting and rearing sites of cranes, perhaps this should have been expected. Our data show that the numbers of cranes observed on harvested soybean fields was relatively small, supporting the literature reports of avoidance of soybeans as food, and suggesting the use of soybean fields is related to invertebrate foods available there.

Our observations indicate that several individual fields located close to apparently suitable nesting habitat were visited by feeding cranes year after year regardless of whether the crop was corn, soybeans or wheat. Presumably, the cranes are those with fidelity to nesting sites, and they adapt to the changes associated with the rotation of crops from year to year.

Percentage of Colts

In 2015, the only year for which we collected information, the mean proportion of colts in the population was 11.8%, which falls within the range of values reported in the literature for Sandhill Cranes. Johnsgard (1983) cites data from six studies which had a mean recruitment value of 11.3% (range 7.2 to 15.6%), while Sandilands (2005) cites recruitment values of 10 to 13%. On Manitoulin Island over four years, the mean autumn recruitment was 14% (Hanna *et al.* 2014) and they estimated that the crane population would be stable if recruitment was >5 to 6%. The 11.8% that we calculated from autumn 2015 data indicates an increasing population.

Staging and Migration Chronology and Migration Triggers

Our repeated counts at Bannister Lake (Figure 5) provide a consistent record of the numbers of staging cranes and likely migration events. Autumn crane numbers and staging/migration duration in southwestern Ontario in general can be tracked with eBird data. Although many records are from scattered and incidental observations, in some counties observers contributed several records throughout the season for specific locations. The range of dates in these cases of repeated observations provide an indication of the duration of use of certain locales. In addition, a combination of CBCs and birders travelling and/or on vacationing during the last two weeks of December 2015 and 2016 and early January 2016 and 2017 led to many observations and reporting efforts that happened to coincide with the movements of Sandhill Cranes through southwestern Ontario. The fluctuation in numbers during December 2015-January 2016 in the primary study area and over a broader area of southwestern Ontario is evident in Figure 5 and Appendix 1, respectively.

Our data and eBird (2015, 2016) indicate that the movement of cranes through southern Ontario in 2015-2016 was much later than typical years. Hanna (2015) indicated that peak crane viewing times on the Bruce Peninsula are usually late September and early October, whereas mid to late October usually sees the peak in numbers at Long Point. Fronczak *et al.* (2017) reported on the migration of Eastern Population cranes breeding in Minnesota, Wisconsin, Michigan and the Manitoulin Island area of Ontario and found that during 2009 to 2014, the average arrival date of cranes at their winter areas farther south in the United States was 11 December. Sandhill Cranes remained in southwestern Ontario throughout December 2015 and into early January 2016.

The 14 December 2016 departure of cranes from Bannister Lake was a more typical departure date than in 2015-2016. The difference between the two autumn migration seasons we studied was likely a result of difference in daily air temperature. Clearly the air temperatures during winter 2015-2016 were consistently higher than the historical climate normal. For example, the December 2015 monthly average was 6.2°C higher than normal and the February 2016 average was 6.6°C higher than the long term average. Since daily high temperatures were frequently greater than 0°C, any snow that fell either melted or was washed away by rain. The combination of warm overnight lows and food being available due to lack of snow cover enabled the cranes to stay at the Blandford-Blenheim Township site from mid-November 2015 through to the end of February 2016. Sandhill Cranes were also observed foraging in corn fields elsewhere in southwestern Ontario throughout December 2015 and on occasional days in January and February 2016 (eBird 2016, this study), suggesting that snow and ice had not prevented access to food. In contrast, December 2016 was 0.4°C colder than the long term average, and this may explain why cranes left R.M. Waterloo earlier than in 2015. However, the subsequent monthly average temperatures were warmer than normal in three of the four study months.

Sandhill Cranes likely moved south ahead of the first significant cold snap when the overnight air temperature on 3 January 2016 was -14° C, with a wind chill of -22° C in the area of Cambridge, Ontario. An Arctic cold front was in place on 4 January 2016 and on 5 January 2016, and the only place in Ontario that cranes were reported on eBird was at and near Long Point. Johnsgard (1983) reported that Sandhill Cranes flew nearly 600 km in the autumn at an average speed of over 60km/hr. If cranes had to quickly depart Bruce County or R.M. Waterloo to reach the milder Lake Erie-influenced, extensive marsh and cropland mosaic of the Long Point area, the cranes need only fly for one-half day or less. Likewise, the cranes seen in Oxford County during February 2016 and 2017 need only have flown less than two hours to reach Long Point, if severe conditions suddenly drove them south.

We found small numbers of cranes in Blandford-Blenheim Township through December 2016, January 2017 and continuing to 28 February 2017. Although this period was not influenced by the strong El Nino event, snow accumulation was not great and there were frequent melts which resulted in availability of open water, access to residual corn and to wetland vegetation and soils along streams and on the Horner Creek floodplain during the entire winter of 2016-17. Average air temperature was even warmer in January 2017 than it had been in January 2016 (the El Nino-influenced year) and both Januarys and Februarys were warmer than the historical average (Figure 7). Kayo Roy (pers. comm.) and others carefully monitored cranes in Niagara Region in January 2017; cranes were found consistently up to 6 January 2017, but on eight visits following that date, the cranes were absent.

Triggers for autumn migration appear to include declines in food availability as well as temperatures. Lack of food may result from food depletion by crane foraging and other bird foraging throughout the autumn migration and staging period, and/or by hampered access to food caused by snow and/or ice cover. Hanna (2015) reported that when barley grain density on Manitoulin Island declined below 50kg/ha, the majority of cranes migrated south, supporting the hypothesis that autumn migration might be triggered by declining food resources. Cold temperatures lead to formation of ice on pools (Sandilands 2005) thus preventing access to water for drinking. Our field notes from counts at the Bannister Lake roost indicated ice cover briefly on 23 November 2015, but there was no ice between 26 November and 27 December 2015. In contrast, ice formed by 25 November 2016, with half of Bannister Lake being frozen on that date. Air temperatures increased to +9° C on 29 November 2016, so that during the 5 December 2016 visit to Bannister Lake, there was no ice cover but by 10 December 2016, the lake was completely frozen. On 12 December 2016, cranes were observed walking on the frozen lake and by 14 December 2016, when the lake remained frozen, no cranes were seen at Bannister Lake. Counts on 10, 12 and 14 December 2016 yielded the lowest numbers of roosting cranes since the end of August 2016 (43, 44, and 0, respectively).

Cranes Overwintering in Southern Ontario

Our study has confirmed overwintering of small numbers of cranes at the Horner Creek floodplain in Oxford County in the winter of 2016-17 and probably 2015-16. The warm weather and lack of continuous snow cover in autumn and early winter of both 2015-16 and 2016-17 resulted in cranes remaining inland in many counties into December–early January 2015-16 and 2016-17. Sandhill Cranes have stayed in southern Ontario during a number of recent winters (i.e., the wintering flock at Long Point) (Ad Hoc Eastern Population Sandhill Crane Committee 2010). The average number of cranes reported to eBird (2017) near Long Point from four counts during the 4 January to 19 February 2017 period was 163. To our knowledge, however, cranes wintering in Oxford County have not been reported previously. As noted above, milder than normal air temperatures and a lack of snow cover provided suitable conditions for small groups of over-wintering cranes in Oxford County during February 2016 and 2017 and for the larger numbers of cranes that stayed at Long Point during these winters. This is consistent with the trend in the United States, where there are a number of recent examples of cranes of the Eastern Population wintering at locations farther north than traditional sites (e.g., Jasper-Pulaski Fish and Wildlife Area, Indiana) (Hanna *et al.* 2014) and Tennessee and Kentucky (Gerber *et al.* 2014). The Jasper-Pulaski site is a traditional mid migration staging area for cranes but is more than 1,200 km north of traditional eastern population wintering areas located in Georgia and Florida.

Return Dates of Sandhill Cranes

The lack of snow cover and warm weather during February 2017 appears to have prompted cranes to return to southwestern Ontario locales from mid to late February to 1 March. It is possible that some of the birds from the Long Point wintering population might have dispersed at the end of February 2016, accounting for the late February crane sightings. However, since Red-winged Blackbirds (*Agelaius phoeniceus*) and Common Grackles (*Quiscalus quiscula*) were seen at many locales across southwestern Ontario during the last few days of February 2016 (eBird 2016) and record high temperatures occurred on 28 February 2016, these early birds might also have flown north from the U.S. Similarly, the mid-late February 2017 sightings may have been returning migrants rather than over-wintering birds.

Duration of Crane Absences from Certain Counties

The absences we calculated for five counties in southwestern Ontario, where over-wintering has not been reported, ranged from just over a month to almost three months. Fronczak *et al.* (2017) determined that certain Eastern Population cranes remained on winter areas in the U.S. an average of 67 days during their 2009-2014 study.

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Appendix 1. Selected Sandhill Crane records across southern Ontario, November 2015 to February 2016. Sources include authors' observations, eBird, Christmas Bird Counts and personal communications.

Date	Location	Number of Cranes	Observer
21 Nov 2015	Bruce Rd. 10, Bruce	500	S. Evans
27 Nov 2015	A Line Rd., Grey	850	A. Nicholson
3 Dec 2015	Hendrie Valley, Halton	65	C. Street
16 Dec 2015	Long Point, Norfolk	109	M. Conboy
20 Dec 2015	Road 5, Bruce	290	A. Nicholson
23 Dec 2015	N. Walpole Island, Lambton	45	W. Renaud
24 Dec. 2015	Hwy. 21, Bruce	460	A. Nicholson
27 Dec 2015	Amherstburg, Essex	25	J. Telford
27 Dec 2015	Port Stanley, Elgin	102	L. Foerster
28 Dec 2015	Long Point, Norfolk	80	M. Conboy
28 Dec 2015	Road 12, Wellington	140	B. & E. Woodman
31 Dec 2015	Sandusk Rd., Haldimand	3	S. Lamond
1 Jan 2016	Minesing Wetland CA, Simcoe	12	D. Deemert
2 Jan 2016	Ridge Rd., Niagara	9	L. Peters-MacDonald
3 Jan 2016	Guelph, Wellington	16	M. Dorriesfield
4 Jan 2016	McKenney Rd., Niagara	9	L. Peters-MacDonald
8 Jan 2016	McKenney Rd., Niagara	10	K. Roy, pers. comm.
23 Jan 2016	Port Burwell, Elgin	X	A. Allensen
31 Jan 2016	Long Point, Norfolk	160	M. Conboy
3 Feb 2016	Long Point, Norfolk	70	R. Ridout
9 Feb 2016	Leamington, Essex	3	J. Bensette
13 Feb 2016	Long Point, Old Cut, Norfolk	2	M. Conboy

Appendix 2. Selected Sandhill Crane records across southern Ontario, October 2016 to February 2017. Sources include authors' observations, eBird, Christmas Bird Counts and personal communications.

Date	Location	Number of Cranes	Observer
1 Oct 2016	Learmont Rd., Manitoulin	1549	D. Brisebois
27 Oct 2016	Ferndale Flats, Bruce	59	M. Butler
5 Nov 2016	Elisnore Rd., Bruce	112	B. & A.M. Taylor
6 Nov 2016	Port Bolster, York	11 (o)	M. Dorriesfield
8 Nov 2016	A Line Rd., Grey	120	A. Nicholson
10 Nov 2016	E. Luther, Dufferin	300	D. MacNeal
13 Nov 2016	Port Burwell, Norfolk	476	R. Skevington
13 Nov 2016	Strongville Rd., Simcoe	300	K. Vogan
14 Nov 2016	Walpole Is., Lambton	95	B. Mann
22 Nov 2016	Strongville Rd., Simcoe	1050	J. & K.W. Dance
10 Dec 2016	City of Hamilton, Hamilton	62 (o)	J. Lees
11 Dec 2016	Oakland Swamp, Brant	120 (o)	N. Dunning pers. comm.
12 Dec 2016	Walpole Is., Lambton	60	B. Mann
12 Dec 2016	London, Middlesex	29 (o)	L. Foerster
14 Dec 2016	Mississauga, Peel	50 (o)	M. & J. Medelko
27 Dec 2016	Walpole Is., Lambton	1	James Burk
30 Dec 2016	Ramsey Rd., Haldimand	21	E. Giles
31 Dec 2016	Harrow, Essex	11	D. Moore
4 Jan 2017	Hwy. 59, Norfolk	400	A. Goulden
6 Jan 2017	Port Burwell, Elgin	46 (o)	A. Allensen
6 Jan 2017	McKenney/Crowland, Niagara	17	K. Roy, pers. comm., (cranes absent during 8 visits after 6 Jan 2017)
7 Jan 2017	Pt. Pelee, Essex	9 (o)	J. Mlynarek
8 Jan 2017	Long Point, Norfolk	93	S. MacKenzie
29 Jan 2017	Long Point, Norfolk	25	G. Segler
13 Feb 2017	Harrow, Essex	1	D. Moore
19 Feb 2017	Long Point, Norfolk	77	J. & K.W. Dance
19 Feb 2017	Sarnia, Lambton	1	D. Nethercott
19 Feb 2017	Rondeau PP, Chatham-Kent	2	J. Burk
21 Feb 2017	Kingsville, Essex	X	J. Hatt
22 Feb 2017	Rondeau PP, Chatham-Kent	2	S. Charbonneau
24 Feb 2017	Pt. Pelee, Essex	1 (o)	J. Brown
27 Feb 2017	Hillman Marsh, Essex	1	P. Chettleburgh
27 Feb 2017	Conc. 5W, Hamilton	2	R. Poort
28 Feb 2017	Puslinch Lake, Wellington	68 (o)	C. Combdon

"o" = overhead