Flight Times and Abundance of Three Shorebird Species Staging near Chickney Channel, James Bay, Ontario, Summer 2012

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Mixed flock of Dunlin and Semipalmated, White-rumped, and Pectoral sandpipers flying to presumed roost at Chickney Channel, July 2012. *Photo: Christian Friis*

Introduction

The Hudson Bay Lowlands are the third largest wetland complex on earth and the coastal ecosystems of south-western Hudson Bay and James Bay are a global hotspot for breeding and staging waterbirds, waterfowl, shorebirds and other migratory birds (Manning 1952, Ross *et al.* 2003, Abraham and Keddy 2005, Abraham and McKinnon 2011). For shorebirds, the Lowlands is known or believed to harbour significant proportions of the breeding populations of Hudsonian Godwit (*Limosa haemastica*) and Whimbrel (*Numenius phaeopus hudsonicus*) (Manning 1952, Morrison 1987, Skeel and Mallory 1996, Peck and James 1983, Peck 2007, Peck and Sutherland 2007, Prevett 1987, Walker *et al.* 2011). Several Arctic and sub-Arctic breeding shorebird species stage along the coast to add fat reserves and undertake partial moults (e.g., White-rumped Sandpiper (*Calidris fuscicollis*), Semipalmated Sandpiper (*C. pusilla*)) or complete moults (e.g., Dunlin (*C. alpina*)) in preparation for their migrations (Harrington *et al.* 1991, Parmelee 1992, Warnock and Gill 1996, Hicklin and Gratto-Trevor 2010, Abraham and McKinnon 2011).

Early research on shorebirds throughout the Americas in the 1970s led to the establishment of the Western Hemisphere Shorebird Reserve Network (WHSRN) program in 1985 (Morrison 1983, 1984, Myers *et al.* 1987a, b). A site must meet two criteria to be considered for WHSRN designation: demonstrated importance to shorebirds and expressed landowner agreement. Three categories of WHSRN sites are recognised based on peak counts or use by a percentage of a population of a species: Sites of Hemispheric

Importance hosting at least 500,000 shorebirds annually, or at least 30% of the biogeographic population for a species; Sites of International Importance hosting at least 100,000 shorebirds annually, or at least 10% of the biogeographic population for a species; and Sites of Regional Importance hosting at least 20,000 shorebirds annually, or at least 1% of the biogeographic population for a species (WHSRN 2009). Landowners must agree in writing to the following three conditions: to make shorebird conservation a priority at the site; to protect and manage the site for shorebirds; and to update WHSRN annually about the site's status (WHSRN 2009).

During the 1990s, the Canadian Wildlife Service (CWS) compiled an inventory of potential WHSRN sites along the coasts of both Hudson Bay and James Bay (Morrison *et al.* 1991, 1995, Ross *et al.* 2003). Despite meeting criteria demonstrating the importance to shorebirds, efforts to date have failed to secure a WHSRN designation for any of the James Bay sites, leading to a significant and recognized gap in the WHSRN program.

The western James Bay shorebird project (hereafter: the project) began when the Royal Ontario Museum (ROM) and the Ontario Ministry of Natural Resources (OMNR) partnered to survey birds at sites along the James Bay coast in 2009. Since then, CWS, Bird Studies Canada (BSC), Nature Canada and the Moose Cree First Nation have joined this partnership in various capacities to continue work on surveys of staging shorebirds. This work initially included bird surveys at sites known to support staging shorebirds, with an emphasis on Red Knot (*C. canutus rufa*) to enable identification of critical habitat, as well as species at risk surveys for Yellow Rail (*Coturnicops noveboracensis*) and Short-eared Owl (*Asio flammeus*). Additional work to collect natural heritage information by staff at the Natural Heritage Information Centre of the OMNR has been conducted in concert with more recent surveys. Currently, the project involves annual surveys of shorebirds staging at various sites along the south-western coast of James Bay.

Goals of the project are: to increase our ability to estimate population trends of shorebird species staging along the south-western James Bay coast; to understand movement patterns of these birds and their causes (local and flyway); and to obtain information to update the identification of important shorebird staging habitats as potential WHSRN sites based on recent research and traditional ecological knowledge. The intention of these goals is to update information on Important Bird Areas and ultimately lead to the protection of habitat for the Red Knot, which was listed as Endangered in Ontario in 2008 under the provincial Endangered Species Act, 2007, and the nomination of WHSRN site(s) for south-western James Bay. The objectives to meet these goals are to estimate variability of migration phenology and length of stay of staging shorebirds; to

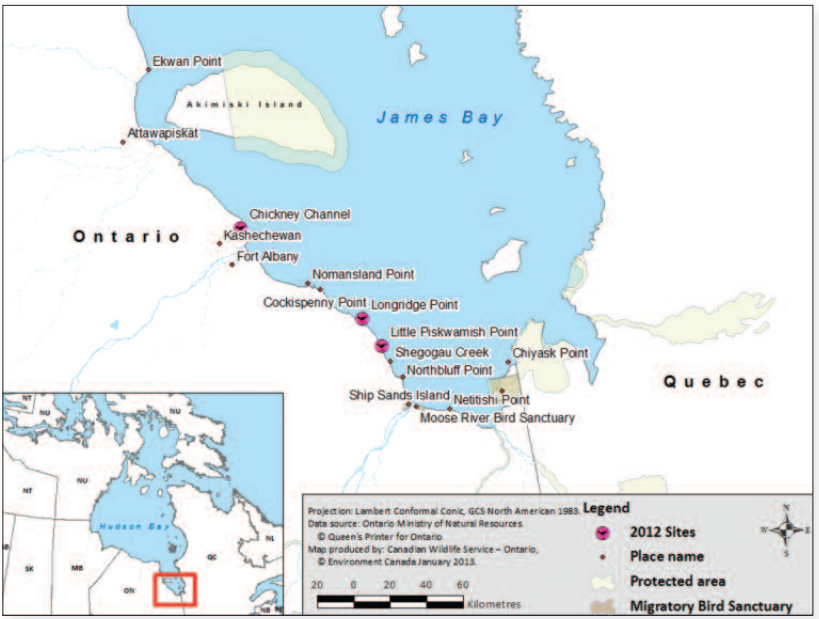

Figure 1. Field camp sites of the western James Bay Shorebird Project, 2012.

estimate annual variation in abundance of staging shorebirds; to assess habitat and food resource availability for staging shorebirds; and to determine the minimum proportion of the global Red Knot, subspecies *rufa*, population that uses the south-western James Bay coast.

Three field camps operated in 2012; Little Piskwamish Point, Longridge Point, and Chickney Channel between 15 July and 13 September (see Figure 1). From these field camps, dedicated volunteers and staff counted shorebirds on the south-western coast of James Bay during their southbound migration. The timing of these counts was driven by the tide cycle, in that birds are more easily counted when they concentrate because of the flooding (incoming) and ebbing (outgoing) tides. At low tide, birds distribute broadly, making it difficult to cover ground effectively and attain an accurate count. At Chickney Channel, birds were pushed inland during the flooding tide until they flew to a presumed roost site to the south, which was too far away to monitor efficiently. Roost sites (Figure 2) were more easily approached at other field camps. Most species — except those that tend to feed in the wet meadow or more vegetated zones (e.g., Pectoral Sandpiper (*C. melanotos*), Least Sandpiper (*C. minutilla*) and yellowlegs sp. (*Tringa* sp.)) — would cease feeding and rest until the tide began to recede.

Figure 2. Roosting and feeding shorebirds at Chickney Channel, July 2012. *Photo: Christian Friis*

Figure 3. Mixed flock of Dunlin and Semipalmated, White-rumped, and Pectoral sandpipers flying to presumed roost at Chickney Channel, July 2012. *Photo: Christian Friis*

During field surveys in July and August 2012 at Chickney Channel, surveyors noted species were more abundant during particular periods during flights to roost on flooding high tides. Species most common during these flights included Dunlin, and White-rumped and Semipalmated sandpipers (Figure 3). Here we describe the timing and composition of these flights relative to high tide at Chickney Channel for short periods in August 2012.

Study Area

Chickney Channel camp (52.462063°N, 81.628790°W) was the most northerly of the project's three field camps in 2012. It was located north of Chickney Channel (Albany River) roughly 30 km north of Fort Albany, 45 km directly south of Akimiski Island and about 150 km north-northwest of Moosonee (Figure 4). Extensive mudflats in the region, fuelled with nutrients from the Albany River, its tributaries and the innumerable smaller creeks, provided excellent conditions for staging shorebirds and waterfowl (Abraham and Miyasaki 1994, Morrison *et al.*1995, BSC and Nature Canada 2012). The extremely shallow gradient shoreline in the area was vegetated by dense tall willow (e.g., *Salix bebbiana, S. planifolia*) thickets, which gave way to vast supratidal graminoid meadow-marshes (e.g. *Carex paleacea, Calamagrostis inexpansa, Juncus balticus*) interspersed with low willow thickets, which graded finally to brackish and saline tidal marshes (e.g., *Puccinellia* spp., *Hippuris tetraphylla, Plantago maritima, Salicornia* sp.) dissected by myriad small ponds, drainage

channels, tidal inlets and exposed mudflats. The spruce forest (e.g., *Picea glauca, P. mariana*) began five to six kilometres inland from the high tide line. Previous aerial surveys of this region have shown large concentrations of shorebirds (e.g., Hudsonian Godwits) during autumn migration (Morrison *et al.* 1995).

Methods

At Chickney Channel, standardized daily shorebird surveys (Figure 5) were conducted between 15 July and 15 August 2012 near high tide at two count locations along

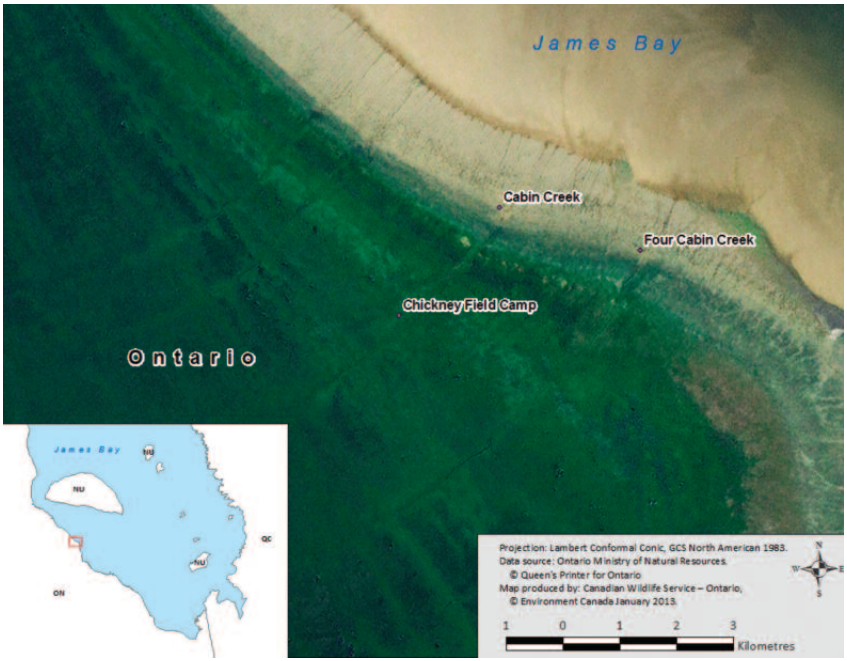

Figure 4. Chickney Channel site, showing field camp and count locations Cabin Creek and Four Cabin Creek.

the coast: Cabin Creek and Four Cabin Creek (Figure 4). The timing of shorebird movements was recorded on two days in August (14 and 15). Counts of individuals of each species were estimated for each of these intervals by two-person teams in 15-minute intervals from the beginning to the end of the roost flight. Each team consisted of an individual who estimated total numbers while the other estimated the proportion of each species in the flock. For an example of the flights, please see the following videos at http://www.youtube.com/watch?v=Vj4iyirvx7k and http://www.youtube.com/watch?v=KTP2otAr-YI.

Results

Counts from August coincided with morning and afternoon high tides. Flights during these periods typically corresponded with lower numbers than those observed during counts that coincided with evening high tides that likely comprised some degree of mass movement toward night roosts. On 14 August, Dunlin numbers dominated early in the flights, particularly within the first 30 minutes of observation (Figure 6). This is less apparent on 15 August, where Dunlin numbers are most abundant during the first 15-minute period. On both days as the flooding tide began, numbers of White-rumped Sandpipers

started to build between the 15-30 minute mark of observation, with a corresponding reduction in Dunlin numbers. White-rumped Sandpiper numbers in the flight appeared to peak immediately adjacent to high tide (Figure 6). Semipalmated Sandpiper numbers built with White-rumped Sandpiper numbers peaking about 15 minutes following high tide, at which point birds began to mix in the flooded high tide zone making it difficult to get an accurate count.

Discussion

The relationship between movement to roost and the incoming tide possibly relates to each species preferred feeding habitat at specific sites. Previous research has shown that species selectively use particular habitat (i.e., are spaced apart) within foraging sites, based primarily on water depth, and prey size and density (Baker and Baker 1973, Myers 1984, Senner *et al.* 1989, Davis and Smith 2001, Eldridge *et al.* 2009). The three species that we focussed on at Chickney Channel (Dunlin, and White-rumped and Semipalmated sandpipers) appeared to follow these choices and were segregated by their feeding habits, the advancing tide and general body size. Dunlin tend to feed farther out on the mudflats during low tide, particularly in shallow water (0-5cm deep; Brennan *et al.* 1985), thus being affected earlier, or among the first species affected, by the flooding tide. White-rumped Sandpipers tend to be closer to the vegetated area of the intertidal zone, and thus appear to move once water reaches this area (pers. obs.). Semipalmated Sandpipers appear to be the least (and last) affected by the flooding tides, preferring to forage along the edges of marshes and other water bodies

Figure 5. Counting Semipalmated and White-rumped sandpipers at Chickney Channel, July 2012.
Photo: Christian Friis

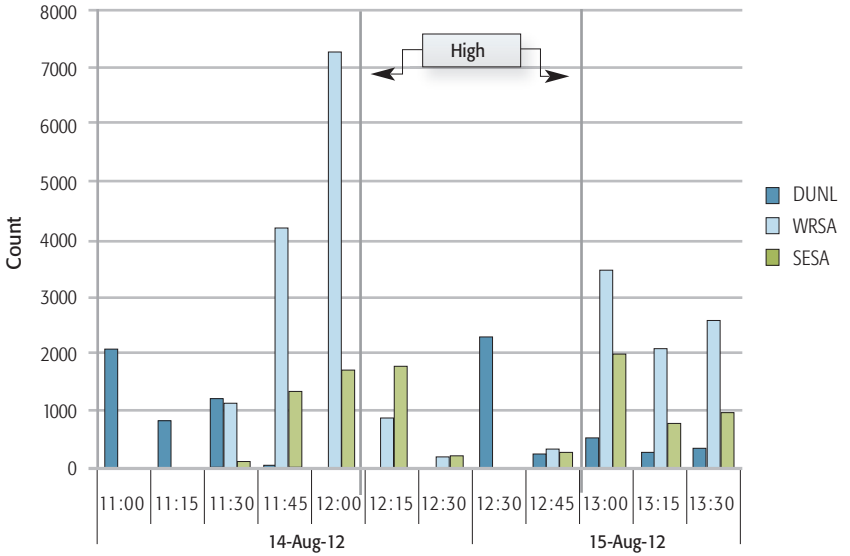

Figure 6. Numbers of each species at 15-minute intervals during high-tide flight to roost at Chickney Channel, 14-15 August 2012.

(Lewis 1983, Morrison 1984, Young 1989) and tends to feed continuously during high tide (pers. obs.).

Our results showed that Semipalmated Sandpipers were least affected by the flooding tide, and may only move to roost when water levels are at their highest level, effectively removing foraging habitat, or in the evening when feeding opportunities are more limited. Indeed, Semipalmated Sandpipers are known to be the least specific in their feeding habits (Hicklin and Gratto-Trevor 2010), and at Chickney Channel, they were observed foraging in the grassy intertidal zone, moving only when water covered the area, and later in the day. Dunlin, on the other hand, have been shown to roost during high tide, while Western Sandpiper (*C. mauri*), like Semipalmated Sandpiper, tend to forage continuously (Senner *et al.* 1989). This corroborates our observations from Chickney Channel of Semipalmated Sandpipers feeding continuously at high tide, while roost flights of Dunlin occurred before high tide.

These differences in foraging behaviour are certainly related to specific differences in diet (Hamer *et al.* 2006). Unfortunately, invertebrate samples taken at Chickney Channel have not been analysed, and specific diets for each species at Chickney Channel are unknown. Anecdotally, molluscs and dipterans were most abundant in the intertidal zone, along with oligochaetes to a lesser extent. It is difficult to determine whether each species was selectively foraging for one invertebrate group, but it is likely, due to the constraint of their bill size and length. For example, Senner

et al. (1989) found that Dunlin foraged more often on the mollusc *Macoma balthica,* while Western Sandpipers, like Semipalmated Sandpipers, had a more diverse diet. Similarly, Morrison (1984) noted the varying diet of Semipalmated Sandpipers at sites along the James Bay coast, as well as an apparent segregation of birds based on habitat and food resources. Once access to the preferred food source is flooded, the birds move to roost or to less flooded areas.

Our observations show differences in timing of flights, species composition and overall abundance estimates. In order to understand better the use of James Bay by staging shorebirds, future surveys at a variety of sites could collect similar data over a longer period and at different times during the season to better capture changes in abundance and flight times. Information about the invertebrate composition of various tidal zones would also be valuable to help determine how diet and foraging site selection may influence flight timing. A broad understanding of the habitat use of all shorebirds along the James Bay coast would be beneficial for conservation and management of this significant area.

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Literature Cited

Abraham K.F. and **C.J. Keddy**. 2005. The Hudson Bay Lowland: a unique wetland legacy. Pp 118-148 *in* The World's Largest Wetlands: Their Ecology and Conservation. P. A. Kelly and L. H. Fraser (Eds.). Cambridge University Press, Cambridge.

Abraham, K.F. and **W.G. Miyasaki**. 1994. A spring survey of staging geese on Hudson Bay and James Bay coasts of Ontario. Ontario Ministry of Natural Resources unpublished report.

Abraham, K.F. and **L.M. McKinnon**. 2011. Hudson Plains Ecozone+ evidence for key findings summary. Canadian Biodiversity: Ecosystem Status and Trends 2010, Evidence for Key Findings Summary Report No.2. Canadian Councils of Resource Ministers. Ottawa, ON. vi + 102p. http://www.biodiv-canada.ca/default.asp?lang=En&n=137E 1147-1

Baker, M.C. and **A.E. Baker**. 1973. Niche relationships among six species of shorebirds on their wintering and breeding ranges. Ecological Monographs 43:193–212.

Bird Studies Canada and **Nature Canada**. 2012. Important Bird Areas of Canada Database. Port Rowan, Ontario: Bird Studies Canada. To access the Canadian IBA directory: http://www.ibacanada.com. Accessed December 2012.

Brennan, L.A., **J.B. Buchanan**, **S.G. Herman** and **T.M. Johnson**. 1985.Interhabitat movements of wintering Dunlins in western Washington. Murrelet 66:11-16.

Davis, C.A. and **L.M. Smith**. 2001. Foraging strategies and niche dynamics of coexisting shorebirds at stopover sites in the southern Great Plains. Auk 118:484–495.

Eldridge, J.L., **G.L. Krapu** and **D.H. Johnson**. 2009. Feeding Ecology of Arctic-Nesting Sandpipers During Spring Migration Through the Prairie Pothole Region. Journal of Wildlife Management 73(2):248-252

Hamer, G.L., **E.J. Heske**, **J.D. Brawn** and **P.W. Brown**. 2006. Migrant shorebird predation on benthic invertebrates along the Illinois River, Illinois. Wilson Journal of Ornithology 118:152-163.

Harrington, B.A., **F.J. Leeuwenberg**, **S. Lara Resende**, **R. McNeil**, **B.T. Thomas**, **J.S. Grear** and **E.F. Martinez**. 1991. Migration and mass change of White-rumped Sandpipers in North and South America. Wilson Bulletin 103:621-636.

Hicklin, P. and **C.L. Gratto-Trevor.** 2010. Semipalmated Sandpiper (*Calidris pusilla*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/006doi:10.2173/bna.6

Lewis, M.J. 1983. Feeding ecology of northern shorebirds. Master's Thesis. University of Calgary, Calgary, AB.

Manning, T.H. 1952. Birds of the west James Bay and Hudson Bay coasts. National Museum of Canada Bulletin 125. Ottawa.

Morrison, R.I.G. 1983. A hemispheric perspective on the distribution of some shorebirds in North and South America. Pp. 84-94 *in* First western hemisphere waterfowl and waterbird symposium, H. Boyd (Ed.). Canadian Wildlife Service, Ottawa.

Morrison, R.I.G. 1984. Migration systems of some New World shorebirds. Pp. 125-202 *in* Behavior of marine animals. Vol. 6 (Burger, J. and B. L. Olla, Eds.) Plenum Press, New York.

Morrison, R.I.G. 1987. Hudsonian Godwit, p. 527 *in* Cadman, M. D., P. F. J. Eagles and F. M. Helleiner, Eds. Atlas of the breeding birds of Ontario. Univ. of Waterloo Press, Waterloo, Ontario.

Morrison, R.I.G., **R.W. Butler**, **H.L. Dickson, A. Bourget**, **P.W. Hicklin** and **J.P. Goossen**. 1991. Potential Western Hemisphere Shorebird Reserve Network sites for migrant shorebirds in Canada. CWS Tech. Rep. Series No. 144, 98 pp. Canadian Wildlife Service, Headquarters, Ottawa.

Morrison, R.I.G., **R.W. Butler**, **G.W. Beyersbergen**, **H.L. Dickson**, **A. Bourget**, **P.W. Hicklin**, **J.P. Goossen**, **R.K. Ross** and **C.L. Gratto-Trevor**. 1995. Potential W. Hemisphere shorebird reserve network sites for shorebirds in Canada: 2nd Edition 1995. CWS Tech. Rep. Series No. 227, 104 pp. Canadian Wildlife Service, Headquarters, Ottawa.

Myers, J.P. 1984. Spacing behaviour of non-breeding shorebirds. *In* Behavior of marine animals. Vol. 6 (Burger, J. and B. L. Olla, Eds.) Plenum Press, New York.

Myers, J.P., **P.D. McLain**, **R.I.G. Morrison**, **P.Z. Antas**, **P. Canevari, B.A. Harrington**, **T.E. Lovejoy**, **V. Plulido**, **M. Sallaberry** and **S.E. Senner**. 1987a. The Western Hemisphere Shorebird Reserve Network. Wader Study Group Bulletin 49:122-124.

Myers, J.P., **R.I.G. Morrison**, **P.Z. Antas**, **B.A. Harrington**, **T.E. Lovejoy**, **M. Sallaberry, S.E. Senner** and **A. Tarak**. 1987b. Conservation strategy for migratory species. American Scientist 75:12-26.

Parmelee, D.F. 1992. White-rumped Sandpiper (*Calidris fuscicollis)*, The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/029

Peck, G.K. and **R.D. James**. 1983. Breeding birds of Ontario: nidiology and distribution, Vol.1. Non-passerines. Life Sciences Miscellaneous Publication, Royal Ontario Museum, Toronto, Ontario.

Peck, M.K. 2007. Hudsonian Godwit, pp. 232-233 *in* Cadman, M.D., D.A. Sutherland, G.G. Peck, D. Lepage and A.R. Couturier, Eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706pp.

Peck, M.K. and **D.A. Sutherland.** 2007. Whimbrel, pp. 230-231 *in* Cadman, M.D., D.A. Sutherland, G.G. Peck, D. Lepage, and A.R. Couturier, Eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706pp.

Prevett, J.P. 1987. Whimbrel, p. 526 *in* Cadman, M. D., P. F. J. Eagles and F. M. Helleiner, Eds. Atlas of the breeding birds of Ontario. University of Waterloo Press, Waterloo, Ontario.

Ross, K., **K. Abraham**, **R. Clay**, **B. Collins**, **J. Iron**, **R. James**, **D. McLachlin** and **R. Weeber.** 2003. Ontario Shorebird Conservation Plan. Environment Canada, Canadian Wildlife Service, Toronto, 48pp.

Skeel, M.A. and **E.P. Mallory**. 1996. Whimbrel (*Numenius phaeopus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/219

Senner, D.C., **D.W. Norton** and **G.C. West**. 1989. Feeding ecology of Western Sandpipers, *Calidris mauri*, and Dunlins, *C. alpina*, during spring migration at Hartney Bay, Alaska. Canadian Field-Naturalist 103:372–379.

Walker, B.M., **N.R. Senner**, **C.S. Elphick** and **J.Klima**. 2011. Hudsonian Godwit (*Limosa haemastica*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/629

Warnock, N.D. and **R.E. Gill**. 1996. Dunlin (*Calidris alpina*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/203.

Western Hemisphere Reserve Network. 2009. http://www.whsrn.org/selection-criteria, accessed January 2013.

Young, A. D. 1989. Spacing behavior of visual and tactile feeding shorebirds in mixed species groups. Canadian Journal of Zoology. 67:2026-2028.

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