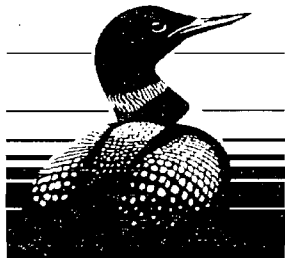


POTENTIAL WESTERN HEMISPHERE  
SHOREBIRD RESERVE NETWORK SITES  
FOR SHOREBIRDS IN CANADA:  
SECOND EDITION 1995

R.I.G. Morrison, 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

Technical Report Series No. 227  
Headquarters 1995  
Canadian Wildlife Service

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This document may be cited as:  
Morrison, R.I.G., Butler, R.W., Beyersbergen, G.W., Dickson, H.L., Bourget,  
A., Hicklin, P.W., Goossen, J.P., Ross, R.K., and Gratto-Trevor, C.L. 1995.  
Potential Western Hemisphere Shorebird Reserve Network Sites for Shorebirds in  
Canada: Second Edition 1995. Canadian Wildlife Service Technical Report  
Series No. 227, 104 pp. Canadian Wildlife Service, Headquarters, Ottawa.

Published by authority of the  
Minister of the Environment  
Canadian Wildlife Service

©Minister of Supply and Services Canada 1995  
Catalogue No. CW69-5/227E  
ISBN 0-662-23225-9  
ISSN 0831-6481

Copies may be obtained from:

Canadian Wildlife Service  
National Wildlife Research Centre  
100 Gamelin Boulevard  
Hull Quebec  
Canada  
K1A 0H3

## ABSTRACT

The Western Hemisphere Shorebird Reserve Network (WHSRN) is an international conservation initiative designed to protect the key habitats and resources used by shorebirds throughout their migration ranges. Many species of shorebirds depend on a chain of critically important sites to complete their annual migrations, and for conservation to be successful, all the links in the chain need to be preserved. This report provides an updated inventory of potential WHSRN sites in non-Arctic areas of Canada. It summarizes information currently available on locations meeting criteria for inclusion in the Western Hemisphere Shorebird Reserve Network both for a wide range of shorebird species found on migration and for the endangered Piping Plover Charadrius melodus.

## RESUME

Le Réseau de réserves pour les Oiseaux de rivage de l'Hémisphère occidental est une initiative internationale de conservation visant à protéger des habitat clés et les ressources utilisées par les oiseaux tout au long de leurs étapes migratoires. Plusieurs espèces d'oiseaux de rivage dépendent d'une chaîne de sites importants pour compléter leurs migrations annuelles. Afin que les efforts de conservation soient efficaces, tous les sites critiques appartenant à la chaîne doivent être protégés. Ce rapport constitue un inventaire des sites potentiels du réseau à ce jour, en dehors des zones arctiques canadiennes. Il fait le sommaire de l'information actuellement disponible sur les endroits qui rencontrent les critères permettant de les inclure dans le Réseau de réserves pour les Oiseaux de rivage de l'Hémisphère occidental; à la fois pour une grande variété d'espèces d'oiseaux de rivage en migration, et pour le Pluvier siffleur Charadrius melodus, un espèce menacée.

Potential Western Hemisphere Shorebird Reserve Network Sites for Shorebirds in  
Canada: Second Edition 1995

Table of Contents

Abstract	.....	i
Table of Contents	.....	ii
Introduction	.....	1
Categories of WHSRN sites	.....	4
Sources of data	.....	5
Classification of sites	.....	6
Results	.....	8
ATLANTIC CANADA	.....	12
QUEBEC	.....	22
ONTARIO	.....	29
PRAIRIE PROVINCES	.....	34
PACIFIC CANADA	.....	52
Discussion and summary	.....	57
Development of the Western Hemisphere Shorebird Reserve Network	.....	60
Estimates of populations	.....	61
Future work	.....	63
Acknowledgements	.....	65
References	.....	66
Appendices	.....	85

## List of Tables

Table 1. Numbers of potential Western Hemisphere Shorebird Reserve Network sites (grouped where appropriate, see text) in various regions of Canada. ....	10
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## List of Figures

Figure 1. Potential Western Hemisphere Shorebird Reserve Network sites in Canada. ....	11
Figure 2. Potential WHSRN sites in Atlantic Canada (see Appendix 2 for details). ....	13
Figure 3. Potential WHSRN sites in Quebec (see Appendix 3 for details). ....	23
Figure 4. Potential WHSRN sites in Ontario (see Appendix 4 for details). ....	30
Figure 5. Potential WHSRN sites in the Prairie Provinces (see Appendix 5 for details). ....	35
Figure 6. Potential WHSRN sites in Pacific Canada (see Appendix 6 for details). ....	53

## List of Appendices

Appendix 1. Definitions and abbreviations for terms, and scientific names and abbreviations for species used in this document. ....	85
Appendix 2. Potential WHSRN sites in Atlantic Canada. ....	86
Appendix 3. Potential WHSRN sites in Quebec. ....	89
Appendix 4. Potential WHSRN sites in Ontario. ....	91
Appendix 5. Potential WHSRN sites in the Prairie Provinces. ....	92
Appendix 6. Potential WHSRN sites in Pacific Canada. ....	103
Appendix 7. Western Hemisphere Shorebird Reserve Network sites designated under the Endangered Species category in Canada. ....	104



POTENTIAL WESTERN HEMISPHERE SHOREBIRD RESERVE NETWORK SITES FOR SHOREBIRDS IN  
CANADA: SECOND EDITION 1995

R.I.G. Morrison<sup>1</sup>, R.W. Butler<sup>2</sup>, G.W. Beyersbergen<sup>3</sup>, H.L. Dickson<sup>3</sup>, A. Bourget<sup>4</sup>,  
P.W. Hicklin<sup>5</sup>, J.P. Goossen<sup>2</sup>, R.K. Ross<sup>6</sup>, and C.L. Gratto-Trevor<sup>7</sup>

Introduction

This report provides an updated inventory of sites of key importance for shorebirds in non-Arctic areas of Canada, incorporating new information that has been collected since the first inventory was published in 1991 (Morrison et al. 1991). As such, it deals principally with sites where shorebirds are found in large numbers on migration, though areas of particular importance for breeding populations of the endangered Piping Plover (for scientific names of

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<sup>1</sup>CWS, National Wildlife Research Centre, 100 Gamelin Boulevard, Hull, Quebec K1A 0H3

<sup>2</sup>CWS, Pacific Wildlife Research Centre, 5421 Robertson Road, R.R. 1, Delta, B.C. V4K 3N2.

<sup>3</sup>CWS Prairie and Northern Region, Twin Atria No. 2, 4999-98 Avenue, Edmonton, Alberta T6B 2X3

<sup>4</sup>CWS Quebec Region, P.O. Box 10100, Sainte-Foy, Quebec G1V 4H5

<sup>5</sup>CWS Atlantic Region, P.O. Box 1590, Sackville, N.B. E0A 3C0

<sup>6</sup>CWS Ontario Region, 49 Camelot Drive, Nepean, Ontario K1A 0H3

<sup>7</sup>CWS, Prairie and Northern Wildlife Research Centre, 115 Perimeter Road, Saskatoon, Saskatchewan S7N 0X4

species, see Appendix 1) are also included. The criteria used to judge the importance of a site are those currently adopted by the Western Hemisphere Shorebird Reserve Network (WHSRN) (see below).

Many species of shorebirds are highly migratory, undertaking long journeys from northerly breeding areas to more southerly wintering grounds (Morrison 1984). For instance, some 27 (64%) of the 42 species of shorebirds that occur regularly in Canada (Godfrey 1986) are long-distance migrants, many wintering in areas that are located in the southern U.S.A., Mexico, Central America and South America, some as far south as Tierra del Fuego (Morrison 1984, Morrison and Ross 1989). International cooperation in preserving the key habitats that the birds use during their impressive migrations is clearly required if conservation is to be successful.

Internationally coordinated research carried out in many parts of the Americas over the past 15-20 years has provided the information base that has led to the creation and development of the Western Hemisphere Shorebird Reserve Network. This work identified many of the key areas used by the birds throughout their migration ranges, and demonstrated that some species of shorebirds concentrate to a marked degree, with major proportions of the population occurring at only a few sites both during migration and on the wintering grounds (Morrison 1983a, 1984, Senner and Howe 1984, Morrison and Myers 1987, 1989, Morrison and Ross 1989). The birds depend on a chain of critically important sites to complete their annual migrations, each site providing the resources needed by the birds to enable them to reach the next area or to survive. For conservation to be successful, all the links in the



chain need to be preserved, since removal of one vital area could disrupt the entire system.

Morrison (1983a, 1984) proposed an international system of linked reserves which would protect important sites required by the birds throughout their ranges. This led to the establishment of the Western Hemisphere Shorebird Reserve Network in 1985 (Myers et al. 1987a, 1987b) for this purpose. WHSRN has since become an active and successful conservation organisation, working to identify and protect key shorebird areas and to provide training for both biologists and managers active in the field. As of February 1995, the network comprised some 31 officially recognised sites in 7 countries, stretching from Tierra del Fuego to Alaska, protecting an estimated 10 million ha of habitat and 30 million shorebirds (Wetlands for the Americas 1994, Ian Davidson pers. comm.). The success of the organisation led to its evolving into Wetlands for the Americas in 1991, with the wider objective of promoting the conservation of wetland ecosystems throughout the Americas: WHSRN remains an active and important program within Wetlands for the Americas.

The Network is essentially voluntary and collaborative in nature and depends on the cooperation of the countries and organisations with jurisdiction over the sites concerned for its successful operation. While joining WHSRN does not involve a country in signing any treaties, there are a variety of mechanisms available for protection of potential WHSRN sites depending on who has ownership of or jurisdiction over the land concerned. For instance, sites may be protected through designation as a National

Wildlife Area, Provincial Wildlife Management Area, "Ramsar" site, other appropriate reserve, or through "stewardship" arrangements with groups or individuals, and may be managed by a federal, provincial, state or private organisation as appropriate. Even if a site is not formally dedicated as a WHSRN reserve, its recognition as meeting the WHSRN criteria may encourage conservational action to be taken should a problem arise.

#### Categories of WHSRN sites

Four categories of WHSRN sites are recognized:

Hemispheric Sites: support at least 500,000 shorebirds annually, or 30% of a species' flyway population. Hemispheric Sites are intended to include areas supporting major concentrations of shorebirds, with daily totals reaching about 50,000 birds during migration;

International Sites: support at least 100,000 shorebirds annually, or 15% of a species' flyway population;

Regional Sites: support at least 20,000 shorebirds annually, or 5% of a species' flyway population; and

Endangered Species Sites: are critical to the survival of endangered species (no minimum number of birds is required).

Canada has been an active partner in the development of WHSRN. The Bay of Fundy Western Hemisphere Shorebird Reserve became the first WHSRN reserve to be created in Canada, with the dedication of two important areas in the

upper Bay of Fundy: Shepody Bay in August 1987 (Hicklin 1988a) and the Minas Basin in August 1988 (Hicklin 1988b). The Quill Lakes in May 1994 and Last Mountain Lake in September 1994, both located in Saskatchewan, became the second and third WHSRN reserves to be dedicated in Canada.

The purpose of this report is to bring together information on important shorebird areas in Canada and to serve as a basic resource document in conservational planning and in the development of the Western Hemisphere Shorebird Reserve Network in Canada. This information and a recent assessment of the status of shorebird populations in Canada (Morrison et al. 1994c) have been brought together largely by members of the Canadian Wildlife Service Shorebird Committee, as part of a Canadian Wildlife Service national shorebird programme (Butler et al. 1995).

#### Sources of data

In addition to published data, information is drawn from Canadian Wildlife Service (CWS) survey operations, including: 1) in Atlantic Canada - the Maritimes/International Shorebird Survey (MSS/ISS) scheme, operated since 1974 (see Morrison and Campbell 1990, Morrison et al. 1994b); 2) in Quebec - CWS ground and aerial surveys (see Brousseau 1981, Maisonneuve 1982, Bourget 1988, 1989, 1990); 3) in Ontario - MSS/ISS data and CWS aerial surveys (James Bay/Hudson Bay, R.K. Ross and R.I.G. Morrison, unpubl. data); 4) in the Prairie Provinces - MSS/ISS data and CWS ground and aerial surveys (including Dickson and Smith 1988, Smith and Dickson 1989, Alexander et al. 1995,

Beyersbergen and Duncan 1995, H.L. Dickson unpubl. data); and 5) on the Pacific coast - CWS surveys (references appear in the relevant sections and Appendices below).

### Classification of sites

Two classes of potential sites have been identified:

(1) Sites for which current data clearly establish the status of the site, and for which conservation action may be considered

Such sites generally involve those where the sum of the maximum counts for all shorebird species exceeds the criteria for the WHSRN category directly without any allowance for turnover (see below), and where the criteria are met in most years. Such sites are indicated without further qualification, e.g., Hemispheric or H, Regional or R, and are enclosed by solid lines in the Figures.

Turnover refers to the fact that at any given site the population will be constantly changing as different individual birds move through the area at different times during the period of migration: because of this "turnover", more birds will use a site than is apparent from the maximum count. Estimation of the total number of shorebirds using the site (i.e., allowing for turnover) may not be straightforward, since the length of stay varies for different species in different areas (see Discussion).

(2) Sites where the status is less certain, and for which further information should be sought

Examples include sites where the maximum count totals for all shorebird species do not directly reach the minimum required, but where it is considered likely that the total number of shorebirds using the site would exceed the minimum when turnover is taken into account. Other cases of uncertainty of status for a site may occur where the criteria are only occasionally met, or have been met in the past but not in recent years. Such sites are indicated with a question mark after the category throughout the report, e.g., Regional? or R?, by being bracketed in the text (if R? only), and by dashed lines in the Figures. Where it is uncertain whether a site might qualify as a Hemispheric or International site, but clearly qualifies as a Regional site, then it may be classified as, for example, I?/R.

Endangered species sites (E) are indicated as such, in addition to any other category for which they may qualify, e.g. R/E, E, R?/E.

Some flexibility in use of the criteria has been taken to help ensure that areas for which further information is required are included, but for which immediate conservational action may not be warranted.

## Results

Fifty-four potential and/or declared WHSRN sites for shorebirds have been identified in Canada (Table 1, Figure 1). This total involves the addition of three new sites to the previous WHSRN inventory (Morrison et al. 1991), including one site in the International category on the coast of Hudson Bay in Ontario, one possible regional site in Pacific Canada, and one site in the Endangered Species category in the Atlantic Provinces; in addition, several revisions were made to site categories for areas in the Prairie Provinces and in Pacific Canada in the light of new information. Many sites involve single locations, while others consist of several geographical features grouped together (e.g., groups of lakes) (see Appendices 2-7).

Potential Hemispheric Reserves include one on the east coast (the two arms of the upper Bay of Fundy), one on the Prairies (in southern Saskatchewan), and one in southern British Columbia (Fraser River delta). Other areas of possible Hemispheric status include parts of the James Bay coast in northern Ontario and the Quoddy Region off the coast of New Brunswick; it should be noted that marine conditions at the latter site have changed considerably (see below) and few shorebirds have been found in the area in recent years. Six potential International Reserves were identified: one in northern Ontario on the coast of Hudson Bay, two in east-central Saskatchewan, and one on the Alberta/Saskatchewan border; two further possible International sites are located on the west coast of Vancouver Island and at the mouth of the Bay of Fundy. Regional Reserve sites are found across Canada at both coastal and inland locations. Endangered Species sites involve

breeding areas for Piping Plover: potential and possible Endangered Species sites include ten areas in the Prairies (six of which also qualify in other categories), one in western Ontario, one in Quebec, and four areas in the Atlantic Provinces involving a series of breeding sites. Sites at eight of these locations have been designated under the Endangered Species category (Appendix 7).

All sites qualifying for inclusion in the WHSRN system may be considered to be of international importance for shorebirds. Brief accounts of these sites are presented on a regional basis below.

Table 1. Numbers of potential Western Hemisphere Shorebird Reserve Network sites (grouped where appropriate, see text) in various regions of Canada.

Region	WHSRN Category*								Total
	H	H?	I	I?	R	R?	E**E?		
Atlantic	1	1	-	1	4	4	4	-	15
Quebec	-	-	-	-	3	3	1	-	7
Ontario	-	1	1	-	-	2	-	1	5
Prairies	1	-	3	-	10	4	3(6)	1	22
Pacific	1	-	-	1	1	2	-	-	5
<b>Total</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>18</b>	<b>15</b>	<b>8(6)</b>	<b>2</b>	<b>54 (6)</b>

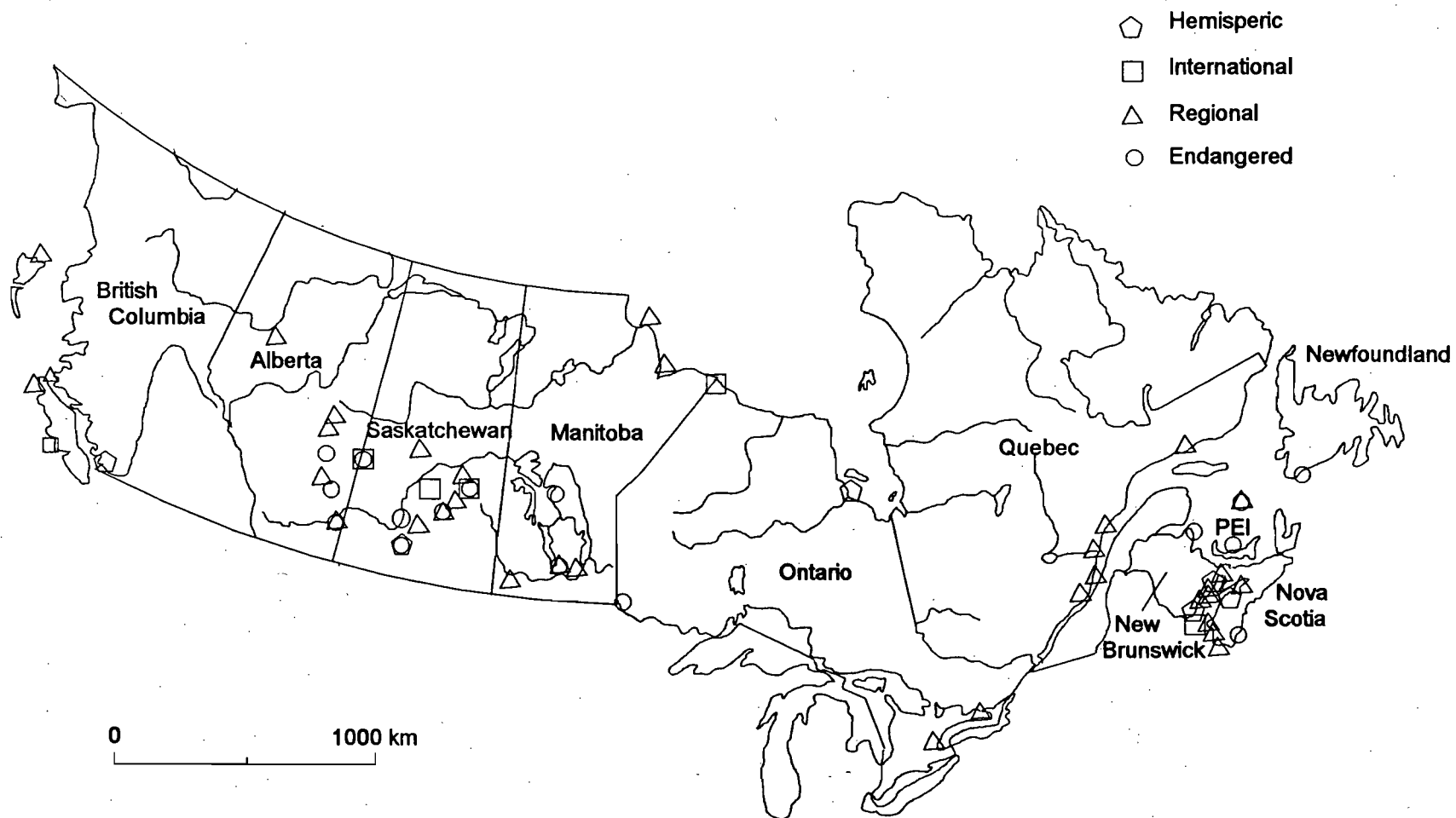
\* Site categories: H = Hemispheric, I = International, R = Regional, E = Endangered, see text for definitions

? indicates site does not qualify directly from existing count data

\*\* Figures in brackets for E category indicate sites also qualifying for inclusion in another category



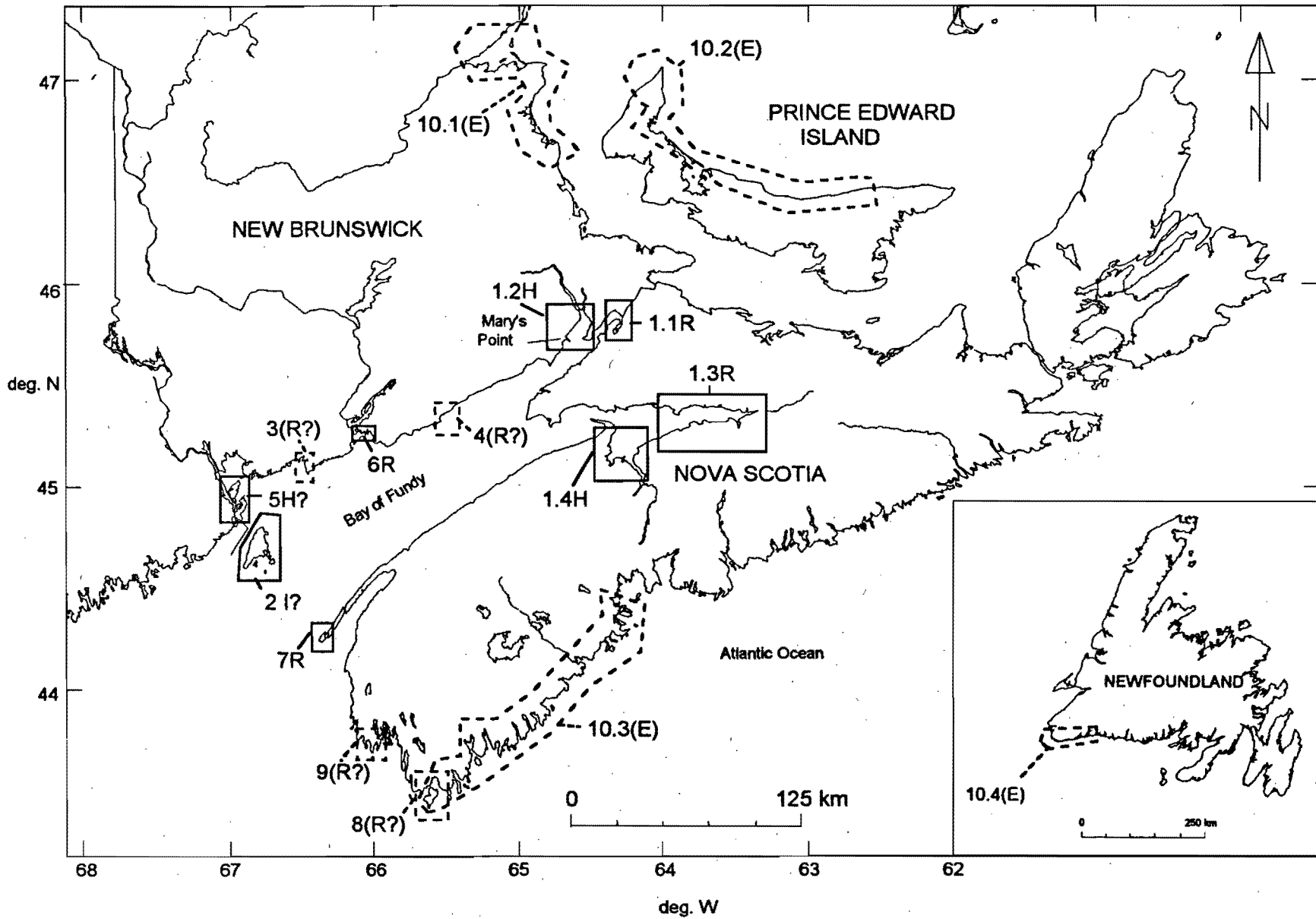
Figure 1. Potential Western Hemisphere Shorebird Reserve Network sites in Canada



## ATLANTIC CANADA

The most important areas for shorebirds on the east coast of Canada are found around the upper Bay of Fundy (Morrison and Harrington 1979, Hicklin 1987) (Figure 2, Appendix 2). The upper bay can be divided into two main areas, the north/northwest arm, comprising Chignecto Bay, Shepody Bay and Cumberland Basin, and the east/southeast arm, consisting of Minas Basin and Cobequid Bay. These areas contain over 80% of both the intertidal flats (total 35,000 ha) and the saltmarsh (total 5,000 ha) in the Bay of Fundy (Pearce and Smith 1974, Hicklin and Smith 1984a). Many species make a direct, trans-ocean flight to South America from these areas. The combination of an abundant food supply on the wide intertidal flats, and suitable beaches and other areas for roosting, provides the resources needed by the birds to accumulate the large energy reserves required for completing their flights (Morrison and Harrington 1979, Hicklin et al. 1980, Hicklin and Smith 1984b, Peer et al. 1986). Semipalmated Sandpipers are by far the most numerous species, though the area is of considerable importance to a wide range of shorebirds. The highest numbers occur in the north/northwest arm of the Bay of Fundy, especially around Shepody Bay, though large numbers are also found in Minas Basin and Cobequid Bay. These areas together form the Bay of Fundy Western Hemisphere Shorebird Reserve.

Figure 2. Potential WHSRN sites in Atlantic Canada (see Appendix 2 for details)



1. Bay of Fundy Western Hemisphere Shorebird Reserve

(Hemispheric)

- 1.1 Cumberland Basin, NB/NS (Regional)
- 1.2 Shepody Bay, NB (Hemispheric, declared 1987)
- 1.3 Cobequid Bay, NS (Regional)
- 1.4 Minas Basin, NS (Hemispheric, declared 1988)

The extensive intertidal flats and associated roosting areas surrounding Shepody Bay/Mary's Point, NB, support the highest numbers of migrant shorebirds known to occur in eastern North America. Shepody Bay is a large tidal embayment containing some 4,000 hectares of intertidal flats, which extend for up to 2 km seaward at Grande Anse and Daniel's Flats on the east and west sides of the bay, respectively. The west side is lined with a narrow band of salt marsh. The east side is rockier and includes sand-gravel beaches used by the birds for roosting. At the mouth of the bay, the Mary's Point peninsula encloses another 940+ hectares of mudflats forming the New Horton Flats, with sand and gravel beaches forming the principal roosting sites on the south side of the point.

Counts of Semipalmated Sandpipers at Mary's Point ranged between 55,000 and 350,000 during Maritimes Shorebird Surveys from 1974 to 1987. Some 800,000-1,000,000 birds were estimated to be present for one day after a period of bad weather in 1975 (Morrison 1976). In recent years, the beach at Johnson's Mills, which borders the Grande Anse mudflat across from Mary's Point, has become increasingly important as a roosting site for Semipalmated

Sandpipers. On 4 August, 1992, two separate observers (P. Hicklin, R. McManus) estimated 300,000 and 270,000 sandpipers roosting on this beach. The mudflats and beaches in Shepody Bay are also important for Semipalmated Plovers, Black-bellied Plovers, Red Knots, Short-billed Dowitchers, Least Sandpipers and White-rumped Sandpipers, and support wintering populations of Purple Sandpipers. For all species combined, the average peak number (1974-1986) seen at Mary's Point is approximately 165,000 birds (see Hicklin 1987) but the importance of Mary's Point to migrant shorebirds has declined in recent years in favour of Johnson's Mills, apparently because of disturbance by Peregrine Falcons which have bred on nearby cliffs at Mary's Point since 1989.

Mary's Point (New Horton Flats) and the Grande Anse mudflat at Johnson's Mills in Shepody Bay became the first Canadian site in the Western Hemisphere Shorebird Reserve Network on 8 August 1987 (Hicklin 1988a), forming one element of the Bay of Fundy Western Hemisphere Shorebird Reserve.

On 10 August 1988, the Minas Basin, NS, was dedicated as the second element of the Bay of Fundy Western Hemisphere Shorebird Reserve (Hicklin 1988b). Numbers at individual roost sites are generally less than in Shepody Bay. Between 1974 and 1979, counts in the Southern Bight of the Minas Basin ranged up to approximately 25,000 birds (Appendix 2), with a peak count at the most important site, Evangeline Beach, of 40,000 Semipalmated Sandpipers (Hicklin 1987). In 1978 and 1979, aerial surveys of the Minas Basin conducted in mid/late August by R. Hall and A. MacInnis of the NS Dept. of Lands and Forests produced totals of 25,180 and 16,630 birds, respectively

(Morrison and Gratto 1979, Morrison 1983b). However, as at Johnson's Mills in Shepody Bay, the numbers of Semipalmated Sandpipers roosting at Evangeline Beach have increased substantially in recent years. For example, on 30 July 1991, the numbers of roosting sandpipers on Evangeline Beach was estimated at 131,200 birds (Mawhinney et al. 1993).

The Cumberland Basin, situated in the north/northwest arm of the upper Bay of Fundy, contains some large areas of mudflats, as well as the extensive Tantramar marshes near Sackville, NB. Large numbers of Semipalmated Sandpipers (30,000 in 1978, Morrison and Gratto 1979, Hicklin 1987) feed and roost at Minudie, NS. This area should be considered part of the Bay of Fundy Western Hemisphere Shorebird Reserve.

Cobequid Bay comprises the inner part of the east/southeast arm of the Bay of Fundy, and contains extensive mud and sandflats backed by rolling terrain. Maximum counts of shorebirds at various sites in Cobequid Bay from Maritimes Shorebird Survey censuses total between 35,500 and 43,120 (Appendix 2), and numbers observed during aerial surveys conducted by R. Hall and A. MacInnis of the NS Department of Lands and Forests in 1978 and 1979 were 26,400 and 33,750, respectively (Morrison and Gratto 1979, Morrison 1983b). The area should also be considered part of the Bay of Fundy Western Hemisphere Shorebird Reserve.

2. Grand Manan area, NB (International ?)

Several reports of very large numbers of phalaropes, involving mostly Red-necked Phalaropes, in concentrations of up to 100,000 birds, have been made from the Grand Manan area, though further surveys are needed to document the phenomenon adequately, especially in view of the recent apparent decline in phalarope numbers in Passamaquoddy Bay (see Quoddy region, NB, below).

[3. Maces Bay, NB (Regional ?)

Maces Bay supports moderate numbers (approximately 5,000-14,000 birds in 1975-1977) and an interesting diversity (16 species) of shorebirds during autumn migration. The very extensive rocky intertidal zone is used by some of the largest recorded concentrations of Purple Sandpipers in the Maritime Provinces during the winter (525+ birds, Morrison unpubl. data).]

[4. Quaco Bay, NB (Regional ?)

Moderate concentrations of shorebirds have been recorded using the flats at Quaco Bay in some years (e.g., approximately 9,000 in 1974).]

[5. Quoddy region, NB (Hemispheric ?)

The narrow passages and very strong currents running through the

entrances to Passamaquoddy Bay, especially between Deer Island and Campobello Island, NB, produce upwellings and areas of high marine productivity that have attracted very large concentrations of seabirds and Red-necked Phalaropes. During the 1970s and early 1980s, numbers of phalaropes reported from the area varied between 15,000+ and 2,000,000 and were consistently in the hundreds of thousands to one million range (Appendix 2). The low number of 15,000+ in 1978 was attributed to a failure of Euphausiids that year (Vickery 1979). Since 1985, however, very few phalaropes at all have been seen in the area (Hicklin pers. obs., R.G.B. Brown pers. comm., Duncan in litt.). The reasons for this major change in numbers or distribution are not yet fully understood.]

6. Saints Rest marsh and beach, St. John, NB (Regional)

The sandy beach and mudflats at Saints Rest Beach, flanked by rocky beaches and points and backed by the marshes along the Manawagonish River, provide an interesting diversity of habitats that have regularly supported over 20,000 shorebirds during autumn migration, with a reported maximum of 111,500 in 1986 (Appendix 2).

7. Brier Island, NS (Regional)

Brier Island is noted for the concentrations of Red Phalaropes occurring offshore, where currents flowing over a submerged ledge result in highly



productive feeding areas for seabirds and pelagic shorebirds (Brown 1980). Vickery (1979) reported that approximately 20,000 phalaropes occurred routinely during late August, though numbers are apparently variable from year to year depending on oceanographic conditions (R.G.B. Brown in litt.). It is uncertain whether the large decline in Northern Phalaropes seen in Passamaquoddy Bay (see above) has also occurred with the Red Phalaropes off Brier Island.

[8. Cape Sable, NS (Regional ?)]

Maximum counts at this site have ranged between 6,520 and 10,830 from 1977 to 1984. The area contains extensive sandflats and may support over 20,000 shorebirds during the year. Cape Sable is especially important for large shorebirds. For example, in 1994, MSS observers counted 2,043 Short-billed Dowitchers, 33 Whimbrel, 85 Willet, 72 Red Knots, 4,370 Semipalmated Plovers and 253 Black-bellied Plovers in this area.]

[9. Cook's Beach, NS (Regional ?)]

Maximum counts at this site reached approximately 8,000 during Maritimes Shorebird survey operations in 1982 and 1983 (Appendix 2), and the site may support over 20,000 shorebirds during the course of the year.]

10. Atlantic Piping Plover sites, NB, PEI, NS, Nfld (Endangered)

- 10.1 Eastern shore, New Brunswick (E?)
- 10.2 Northern shore, Prince Edward Island (E?)
- 10.3 Southern shore, Nova Scotia (E?)
- 10.4 Southwestern Shore, Nfld (E?)

134 pairs of Piping Plover are spread over the coastline of the Atlantic Provinces, with small numbers nesting on sandy beaches along the shores of both the Atlantic Ocean and Gulf of St. Lawrence (CWS unpubl. data). While it is difficult to single out individual sites for WHSRN reserve status, three sections of the coast are of particular significance to the species: the eastern shore of New Brunswick, the north coast of Prince Edward Island, and the southern shore of Nova Scotia. Small numbers also breed along the southwestern shore of Newfoundland. Six areas within these four general regions have been designated by the Western Hemisphere Shorebird Reserve Network as Endangered Species sites (Appendix 7).

Twenty one (21%) of the 63 pairs of Piping Plover that nested in New Brunswick in 1994 were found within Kouchibouguac National Park. In 1994, two other beaches supported 7-10 pairs of Piping Plovers on the northeast shore north of Miramichi Bay.

More than one half of the Piping Plovers nesting in Prince Edward Island are found within the Prince Edward Island National Park. Other breeding sites are located mainly along the north shore and support one or two pairs up to a

maximum of three pairs per beach.

The largest concentration (4 pairs) of Piping Plovers breeding in Nova Scotia in 1994 was found in the Kejimkujuk National Park Seaside Adjunct. Other sites generally consisted of small beaches with a maximum of one to three pairs per beach.

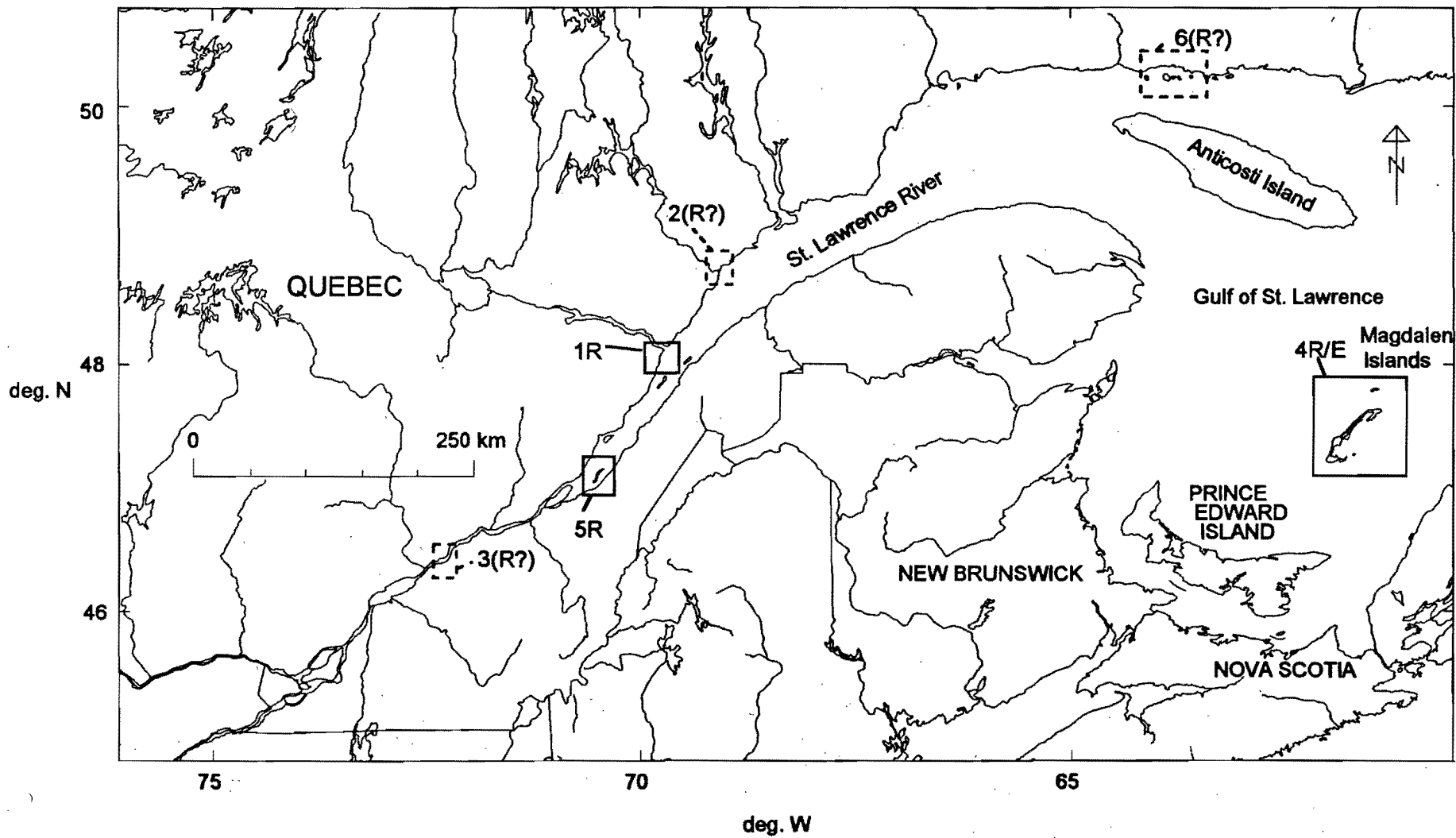
Eight pairs of Piping Plovers were reported near Burgeo and Port-aux-Basques Newfoundland, in June 1994. These were the only two nesting areas found during the 1994 census (J. Brazil, pers. comm.).

## QUEBEC

All currently listed sites within Quebec are potentially Regional Reserves, with one area also of significance as an Endangered species site (Figure 3, Appendix 3). Only two, the Magdalen Islands and the Battures aux Loups-marins, qualify directly with maximum counts of shorebirds totalling over 20,000. The other sites listed, with totals of 5,500-16,700, likely support over 20,000 shorebirds during the course of migration when turnover is taken into account. The shoreline of the St. Lawrence River clearly supports significant numbers of shorebirds during migration, with heavy use being made of intertidal areas formed at low tide in shallow parts of the offshore channel. Sites along the north shore of the lower parts of the river appeared to support significant numbers of Red Knots, Ruddy Turnstones and White-rumped Sandpipers. There are few detailed counts from potential sites in the north of the province, though parts of the east coast of James Bay and of the southern coast of Ungava Bay are undoubtedly important for shorebirds.

Development, pollution, disturbance and habitat deterioration have reduced numbers in several localities. For instance, Maizerets (near Quebec City), which was partially filled by road construction, was reported by Brousseau (1981) to have supported up to 40,000 Semipalmated Sandpipers during the peak of migration in 1973. Today, however, the remaining habitat supports only a few thousand shorebirds (A. Bouget pers. obs.). At the Magdalen Islands, the construction of the main road in 1956 and the partial closure of the outlets of the lagoon of Havre aux Basques by dikes, has affected the

Figure 3. Potential WWSRN sites in Quebec (see Appendix 3 for details).



tidal regime in this habitat and is probably responsible for the important changes in bird numbers noted since the visits by Hagar (1949, 1956).

1. Saguenay River area, Que (Regional)

1.1 Battures aux Allouettes (Regional ?)

1.2 Ile Rouge (Regional ?)

1.3 Ile Blanche (Regional ?)

At Battures aux Allouettes, an enormous area of sandy bottoms, mudflats and pebble beaches is exposed at low tide along the north shore of the St. Lawrence estuary near the mouth of the Saguenay River. The area is vast and can only be partially censused from the shore because resting areas and tidal pools used for feeding occur up to 5 kilometres offshore. The total numbers of birds using the area are thus likely to be considerably higher than those shown in Appendix 3.

Ile Rouge is a small island (4 ha) located almost in the middle of the St. Lawrence estuary opposite the mouth of the Saguenay River. Its shoreline consists of rounded pebbles and a sandbar is exposed off its eastern tip at low tide. The site is used for roosting by several species of shorebirds and gulls at high tide when the nearby feeding grounds at Battures aux Allouettes are submerged. The area was notable for the highest recorded count of Black-bellied Plovers (10,000) along the St. Lawrence River in 1981 (Appendix 3).

Ile Blanche, which is part of the Iles de l'estuaire National Wildlife Area, is a small island (4.5 ha) located a few kilometres west of Ile Rouge, and likely shares the same birds from feeding grounds on the north and south sides of the St. Lawrence estuary. Extensive flats composed of sedimentary rocks dotted with tidal pools surround the island at low tide. Shorebirds roost on the small rocky outcrops that remain exposed at high tide.

[2. Banc de Portneuf (Regional ?)

A long sandbar running parallel to the shore encloses a tidal gully containing sandy and muddy substrates used by shorebirds for feeding at low tide. A small saltmarsh with a few tidal pools occurs at the upper end of the gully. Birds roost on nearby beaches. The area supported one of the largest concentrations of White-rumped Sandpipers (6,000) recorded in the region in 1981 (Appendix 3).]

[3. Gentilly (Regional ?)

The area used by shorebirds is located at the mouth of the Gentilly River and consists of 115 ha of emergent vegetation and mud. The area is only slightly influenced by the tide and is used as a feeding ground. Up to 10,000 Semipalmated Sandpipers and 1,500 Lesser Yellowlegs have been recorded at the site.]

#### 4. Iles de la Madeleine (Regional/Endangered)

The Iles de la Madeleine (Magdalen Islands) form an archipelago situated in the middle of the Gulf of St. Lawrence. Shorebird habitats consist principally of tidal lagoons that have formed between sand dunes connecting the various islands. Shorebirds use habitats throughout the archipelago, but the most important section is at Havre-aux-Basques, where brackish marshes have formed between Ile du Cap aux Meules and Ile du Havre Aubert. The area is clearly of considerable importance for shorebirds. Hagar (1956) estimated that up to 6,000 Black-bellied Plovers, 10,000 White-rumped Sandpipers and 12,000 Semipalmated Sandpipers used the island, though these figures were higher than those reported during an earlier visit (Hagar 1949). Peep migration was reported to peak at 37,000 in 1978 (D. Lehoux pers. comm., MSS unpubl. data). Figures from later censuses (Appendix 3) are somewhat lower, but include significant numbers of a variety of species. The Iles de la Madeleine are also the only site in Quebec where a small population of Piping Plover (37 pairs and four single adults in 1987, Shaffer and Pineau 1987) is known to breed. These plovers represent about 4% of the Atlantic Piping Plover population (Haig and Oring 1988, S. Haig unpubl. data).



5. Montmagny Archipelago (Regional)

5.1 Montmagny (Regional ?)

5.2 Battures aux Loups-marins (Regional)

Sedimentation at Montmagny has resulted in the formation of an extensive soft mud flat (980 ha) and Scirpus marsh (375 ha) on both sides of the mouth of Riviere du Sud. The area is used exclusively for feeding by shorebirds at low tide, and includes part of the migratory bird refuge designed for the protection of Greater Snow Geese along the St. Lawrence. Counts of shorebirds at the site were amongst the highest recorded along the St. Lawrence in recent years (Appendix 3).

At Battures aux Loups-marins, a large (545 ha) rocky flat interspersed with muddy depressions forms around three small islands at low tide. The depressions are colonized by green algae that provide cover for small crustaceans and molluscs. Shorebirds feed around these pools at low tide and roost on exposed rock outcrops and pebble beaches at high tide. The area supports the largest recently recorded concentration of Semipalmated Sandpipers along the St. Lawrence estuary, and substantial numbers of Semiplamated Plovers and Ruddy Turnstones were counted at the site (Appendix 3).

[6. Minganie (Regional ?)

This area is part of the Mingan Archipelago National Park Reserve. Some of the islands in the western part of the archipelago support important concentrations of shorebirds. The birds feed on the large flats that are crossed with channels at low tide, and roost on certain of the islands at high tide. The area was notable for the largest concentration of Red Knots found to date along the St. Lawrence, and also supported fairly large numbers of White-rumped Sandpipers (Appendix 3).]

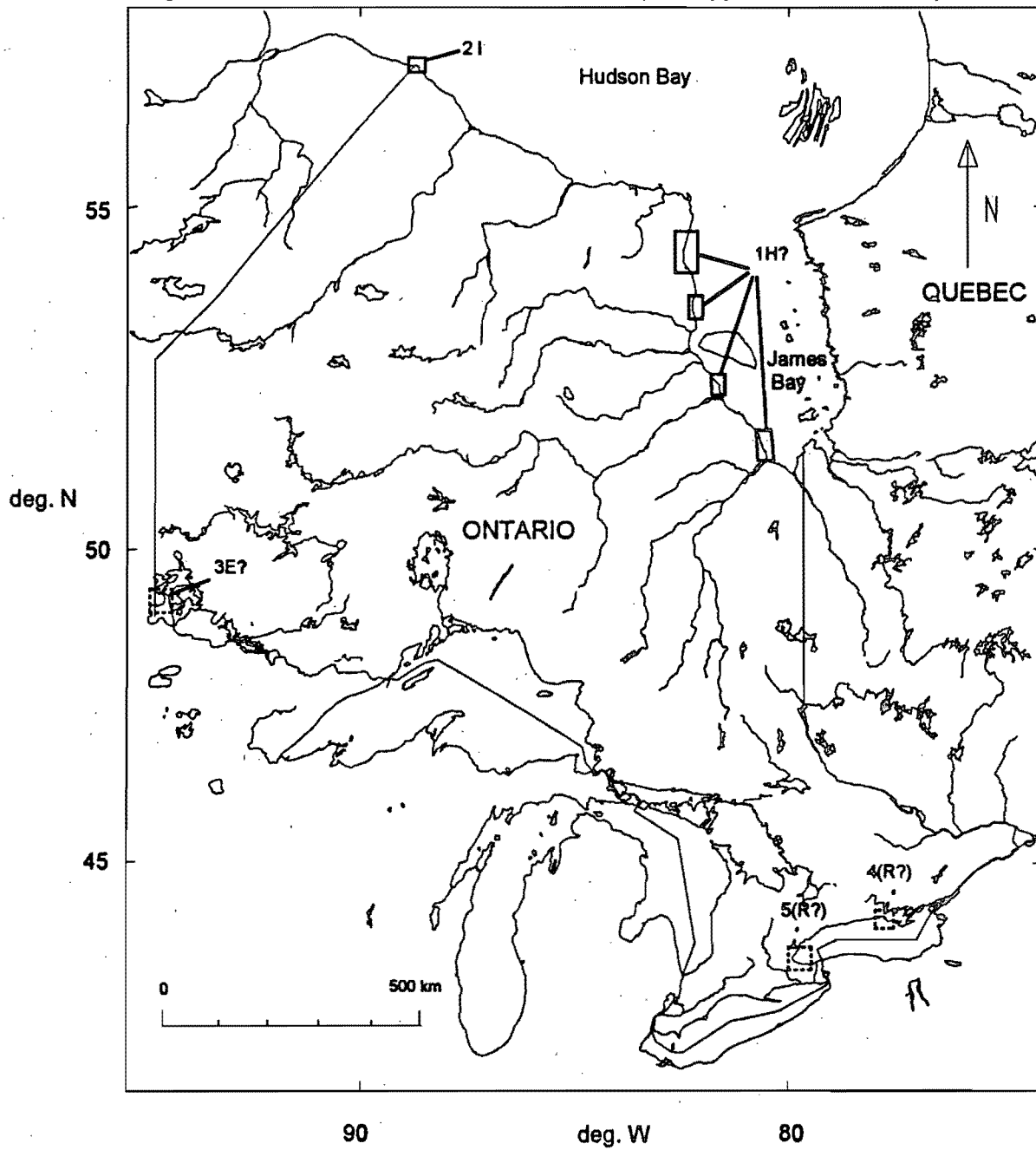
## ONTARIO

The most important habitats for shorebirds in Ontario are found along the coasts of James Bay and Hudson Bay (Figure 4, Appendix 4). Habitats in the south of the province are generally smaller in area and are located along the shores of the Great Lakes or of other lakes and rivers. Many of these are affected by fluctuating water levels and thus may vary in importance from year to year, depending on the amount and quality of habitat available. Most are affected by developments, pollution, or by increasing recreational use by humans. Few of the numerous lakes in northern and central Ontario are thought to have habitats suitable for shorebirds.

### 1. James Bay (Hemispheric?/International)

The west coast of James Bay is very flat, and consists of extensive tidal flats and wide salt marshes which form a major migration route for many species of shorebirds (Morrison and Harrington 1979, Morrison and Gaston 1986). A variety of intertidal substrates occurs, from soft mudflats to sandflats, backed by characteristic marshes of various types, and beach ridge systems (see e.g. Martini 1981). Shorebirds concentrate in preferred areas, apparently where food resources are most abundant (Morrison 1983a). The coast is of major international importance for the Red Knot (Morrison and Harrington 1992) (aerial survey counts ranging from 7,000-15,000 from 1974-1990) and Hudsonian Godwit (10,000 observed north of the Albany River in 1974 and 11,500 along the whole coast in 1992), and supports large numbers of other

Figure 4. Potential WHSRN sites in Ontario (see Appendix 4 for details).



species (aerial survey totals up to 60,000) (Appendix 4). Areas of particular importance include parts of southern James Bay between the Moose River and Longridge Point, areas north of the Albany River, and coastal sectors in the north of the bay around the Swan River and Lakitusaki/Nowashe rivers.

## 2. Pen Islands - Hudson Bay (International)

This complex of sandy peninsulas and islands is located in subarctic tundra near the Manitoba border. Although it is a relatively small site, it is comprised of a variety of habitats, including broad mudflats, sandflats, salt marsh, tundra heath, ponds, and estuaries of several small rivers that enter Hudson Bay at the site. The area is well-known for its concentrations of wildlife, including Polar Bear, Woodland Caribou, and waterfowl. Recent surveys have revealed that large numbers of Hudsonian Godwits also stage there (Appendix 5), as do Red Knot, although their peak numbers have not been determined. Further surveys are needed to assess the full importance of this area.

## [3. Lake of the Woods (Endangered Species ?)

The sandy island complex used by Piping Plovers and known as the Lake of the Woods Sand Spit Archipelago includes the Sable Islands, Ontario, as well as Pine and Curry islands, Minnesota. Morris Point and Rocky Point, Zippel Bay and "Tern Island", also in Minnesota and located on or near the southern

shore of Lake of the Woods, are also used by Piping Plovers (Maxson and Haws 1994). In 1994, all the above U.S. and Canadian sites, except Rocky and Windy Points and Zippel Bay, supported adult Piping Plovers (minimum 18), few of which were found in Canada (Maxson and Haws 1994, L. Heyens unpubl. data). The Lake of the Woods population in Minnesota during 1994 was nearly 70% less than the population of 47-50 adults recorded in 1984 (Maxson and Haws 1994). Lake of the Woods qualifies as an Endangered Species site, if both U.S.A. and Canadian shorelines are included.]

[4. Presqu'ile Provincial Park (Regional?)

The long beach and point at this site provide sandy and muddy habitats that can be heavily used by shorebirds, especially when beds of washed up algae accumulate along the lakeshore. Numbers occurring in the park generally range into the hundreds for the more common species (McRae 1982, 1986), although large concentrations can occur when birds are forced down by poor weather. High counts include 5,950 and 7,000 Dunlin in 1983 and 1985, respectively (Appendix 4). McRae (1986) reported that as many as 20,000 shorebirds have been found during northward migration after the birds have been grounded by adverse weather, and considers (pers. comm.) that this many may use the area during the course of a year.]

[5. Western End of Lake Ontario (Regional ?)

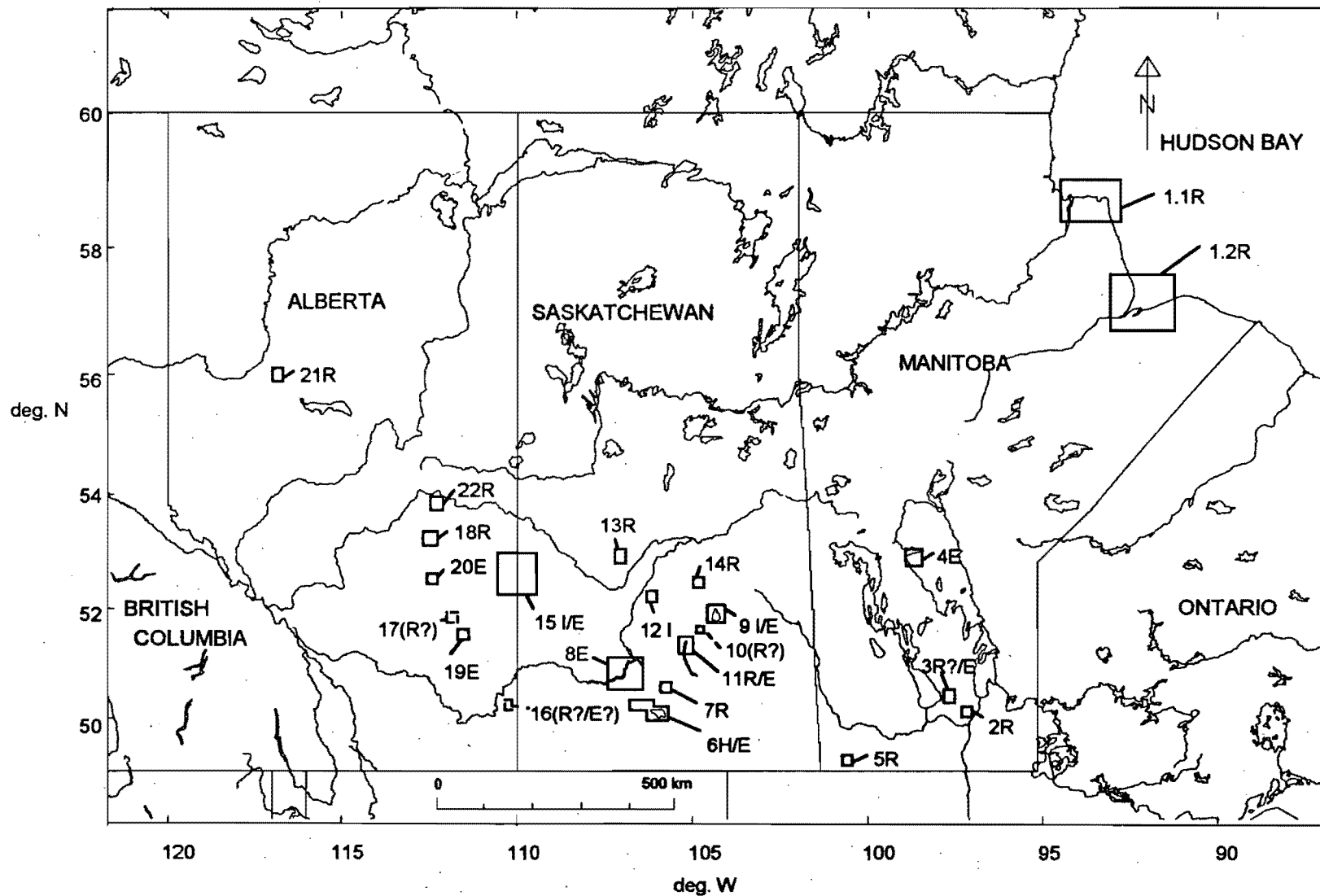
A complex of sites around Hamilton, including Dundas Marsh, the Windermere Basin, the Smithville Sewage Ponds, and sections of the lakeshore have been estimated to support over 20,000 shorebirds during the course of the year (Clarke 1988, ISS counts), though numbers at the individual sites do not reach levels to satisfy WHSRN criteria. The heavily polluted nature of parts of this area make its designation as a reserve questionable.]

## PRAIRIE PROVINCES

Staging sites used by shorebirds in the Prairie Provinces (Figure 5, Appendix 5) are fundamentally different from those in other parts of Canada. Most are situated on shallow saline or alkaline lakes where water levels and conditions can vary considerably from year to year. With habitat availability depending heavily on water levels and the amount and type of shoreline available, migrating and breeding shorebirds often use different lakes in different years or their populations fluctuate with annual habitat conditions. It is therefore more realistic to group complexes of lakes or habitats in the same geographic area into one unit when considering how potential WHSRN reserves should be identified (Appendix 5). The small saline sloughs and potholes of Prairie Canada typically all support small numbers (10-1,000) shorebirds during migration each year, and while individual concentrations are small, the overall numbers involved are undoubtedly very large.



Figure 5. Potential WHSRN sites in the Prairie Provinces (see Appendix 5 for details).



1. Hudson Bay coast of Manitoba (Regional/International?)

1.1 Churchill, Man. (Regional/International?)

1.2 Nelson River/Hayes River area, Hudson Bay, Man.  
(Regional)

Churchill is well known as a breeding area for shorebirds, but large concentrations of migrants have also been recorded along the adjacent coast of Hudson Bay. One of the most significant observations was of some 6,000 Ruddy Turnstones (Appendix 5) (Gollop 1982): this is the largest concentration of this species recorded to date in Canada, and represents some 6% of the highest number yet observed in North America (an estimated 90,000-106,000 on spring migration in Delaware Bay (Dunne et al. 1982)).

Surveys of the Hudson Bay coast between Churchill and the Manitoba/Ontario border during spring and autumn migration in 1974 produced totals of 10,750 and 16,165 shorebirds, respectively, of which 50-60% were found in the vicinity of the Hayes and Nelson rivers (R.I.G. Morrison unpubl. data). Spring totals included an estimated 3,500+ Red Knots, and Hudsonian Godwits were numerous (hundreds) in the area.

2. Oak Hammock Marsh, Winnipeg, Man. (Regional)

The Oak Hammock Marsh Wildlife Management area consists of some 3,600 hectares of managed fresh water marsh and upland habitat. When water

conditions are suitable, large numbers of a variety of shorebird species are attracted to the area. Concentrations are greatest in spring, and combined maximum count totals from different areas of the complex reached nearly 30,000 shorebirds (Appendix 5). The marsh supported significant percentages of the totals of wintering shorebirds counted on the coast of South America by Morrison and Ross (1989) for White-rumped Sandpipers, Short-billed Dowitchers, Hudsonian Godwits and yellowlegs (Appendix 5).

3. Shoal Lakes, Man. (Regional?/Endangered)

The Shoal Lakes, located northwest of Winnipeg, are comprised of three main waterbodies (North, East and West Shoal Lake), which are remnants of what was, until drained in 1912, a single lake. All are essentially catchment basins, surrounded by crown land used for grazing. The low relief and fluctuating water levels allow mudflats and shallow water areas to exist at all times. West Shoal Lake supports a small but significant number of Piping Plovers. In 1985, about 80 plovers were counted during July surveys (Haig 1987) representing an estimated 2% of the North American Northern Great Plains/Prairie population (3,467 adults - Haig and Plissner 1993). In 1990, 36 adults were found during May surveys and 64 in July (Koonz 1990). In 1994, 67 adults were present (R. Jones, unpubl. data). These lakes should be included in WHSRN under the Endangered Species category as they are the second most important site for Piping Plovers in Manitoba. The lakes also support staging shorebirds, with single day counts of approximately 3,000 and 380 in the spring and fall of 1987, respectively (Appendix 5). Additional data are

required on numbers and turnover rates.

4. Gull Bay, Lake Winnipeg, Man. (Endangered)

This area, which includes approximately 15 kilometres of sandy beach, may be the primary Piping Plover breeding site in Manitoba, with 47 adults reported in late May 1989 (Koonz 1989) and 50 adults on 10 July 1990 (Koonz 1990); the latter count represents an estimated 1% of the North American Northern Great Plains/Prairie population. The large number of plovers in July may indicate that the area is also an important staging area for Piping Plovers. Many other species of shorebirds use the Gull Bay sandspit during migration (A. Houle, pers. comm., W. Koonz pers. comm.). One of the spits has been designated as the Walter Cook Special Conservation Area.

5. Whitewater Lake, Man. (Regional)

Whitewater Lake is the catchment basin receiving water from Turtle Mountain in southwestern Manitoba. The lake covers approximately 6,070 hectares (15,000 acres) at an average depth of 76 cm (2.5 feet). Increased water run-off may result in depths averaging some 37 cm (1.2 feet) more, when the lake covers some 10,320 hectares (25,500 acres) (Ransome and Hochbaum 1972). In recent years, however, the lake has had extremely shallow water levels owing to persistent drought conditions, and it went dry in both 1988 and 1989. The potential of the lake for providing shallow water and extensive

mudflats during drought conditions makes it particularly important in the eastern Prairies. Aerial surveys in 1987 produced a maximum count of 23,070 shorebirds (Dickson and Smith 1988, Smith and Dickson 1989), and some 10,000 White-rumped Sandpipers were found during International Shorebird Surveys in 1988 (Appendix 5).

6. Old Wives Lake/Chaplin Lake/Reed Lake, Sask.

(Hemispheric/Endangered)

Chaplin Lake and Old Wives Lake are large intermittent saline lakes covering some 6,360 and 33,020 hectares, respectively (Dickson and Smith 1988). Chaplin Lake is broken into a number of sections by a series of dykes and roads built during the operation of a salt mine on its north shore. Reed Lake is a narrow, shallow lake, west of Chaplin Lake, running parallel to the Trans Canada Highway.

During aerial surveys in the spring of 1987, 64,400 shorebirds were seen on Chaplin Lake and a further 59,800 on Old Wives Lake, some 15 km to the southeast (Dickson and Smith 1988), resulting in a one-day total of 124,200 shorebirds. Ground surveys and an extrapolation of the total species composition provided an estimate of 51,700 Sanderlings. Surveys in 1993 and 1994 produced estimated totals of 106,065 and 92,882 shorebirds, including 58,760 and 56,000 Sanderlings, respectively (Beyersbergen and Duncan, 1995). Species peak numbers on Chaplin Lake in the spring of 1994 provided a total count of 110,061. The Sanderling numbers in 1987, 1993 and 1994, represent

some 46%, 52.5% and 50%, respectively, of the South American coastal wintering total recorded for this species by Morrison and Ross (1989). The lake also supported the highest recorded concentration to date of Baird's Sandpipers in Canada (29,900). Notable numbers of Piping Plovers, Semipalmated Sandpipers, Wilson and Red-necked Phalarope were also found in the area (Appendix 5). In 1984, a total of 292 Piping Plovers was counted at Old Wives Lake and Chaplin Lake (Harris et al. 1985), representing an estimated 8% of the North American Northern Great Plains/Prairie population. In 1991, 155 adults were present at both lakes (Skeel 1994). Reed Lake supports moderate though variable numbers of shorebirds and surveys in May 1993 accounted for 11,327 shorebirds (Appendix 5).

#### 7. Pelican Lake, Sask. (Regional)

Although Pelican Lake held only 1,000 shorebirds during aerial surveys in May 1987 (Dickson and Smith 1988), the lake was earlier reported to support some 75,000 shorebirds during spring migration and up to 1,000 Marbled Godwits during autumn migration in 1978 (Serr 1978). Ground suveys in May 1994 ( G.W. Beyersbergen unpubl. data) accounted for 5,745 shorebirds. A new water management plan for the lake should prove beneficial to shorebirds in future years.

8. Lake Diefenbaker, Sask. (Endangered)

The shorelines of the artificial Lake Diefenbaker support significant numbers of the Northern Great Plains/Prairie population of Piping Plovers (Appendix 5). In 1984, 223 Piping Plovers were recorded at Lake Diefenbaker (Harris et al. 1985) and 276 adults counted there in 1991 (Skeel 1994). The latter number represents about 8% of the Northern Great Plains/Prairie population and about 5% of the total North American breeding population (Haig and Plissner 1993). The water level of this freshwater, artificial lake is controlled by the Qu'appelle and Gardiner dams, and is largely dependent on snowmelt in the Rocky Mountains to the west. The lake may thus be full of water even during drought years on the Prairies. Specific management is required to ensure water levels are not raised on the lake during the nesting season to such an extent that Piping Plover nests and/or young are destroyed. Environment Canada and Saskatchewan Environment and Resource Management have held discussions with the agency operating Lake Diefenbaker to encourage water level management which will benefit Piping Plover habitats.

9. Quill Lakes, Sask. (International/Endangered)

The Quill Lakes were designated as an International WHSRN site on May 27, 1994 and were also listed, October 1993, in the WHSRN Piping Plover Registry. They were designated as a Ramsar site in 1982 and consist of a complex of three lakes. Big Quill Lake is roughly pear-shaped, measuring about 27 km long and 18 km at its widest point; to the east lie Middle Quill Lake, which

is about 6 km long and 3 km wide, and Little Quill Lake, some 24 km long by 11 km in width. Salinity levels are variable, differing both between lakes and varying with the water level in the lake.

Both Big Quill and Little Quill lakes have shallow shorelines of muddy or sandy alkaline flats. Middle Quill Lake tends to be deeper, but in drought years also provides excellent mudflats and shallow water for staging and breeding shorebirds. The north and east shores of Big Quill Lake are very shallow. Renaud et al. (1979) reported that the shoreline retreated 1-5 km between 1909, when Ferry (1910) visited the area, and 1978, resulting in the exposure of extensive, sparsely vegetated alkaline flats. These areas are important breeding sites for Piping Plovers (Renaud et al. 1979), and large numbers of shorebirds may occur during migration. Similar conditions occur on the west side of Big Quill Lake and on Middle Quill Lake. The south shore of Big Quill Lake and north shore of Little Quill Lake have fewer beaches or alkaline flats suitable for large concentrations of staging shorebirds. Adjacent marshy wetlands are also extremely important for migrating shorebirds, especially at night when they use such habitats for roosting.

International Shorebird Survey operations in 1988 resulted in a total of 155,000 shorebirds being counted on Big Quill Lake, including an estimated 23,500 Sanderling (Appendix 5). Surveys on Middle and Little Quill lakes in 1989, 1990 and 1992 accounted for one day peaks of 59,900, 101,900 and 33,900 shorebirds, respectively (Alexander et al. 1995). Surveys of all three lakes in spring 1993 provided a one day peak count of 197,155 shorebirds. Significant numbers of several other species were also recorded, including



Hudsonian Godwit, Red Knot, Stilt Sandpiper, White-rumped Sandpiper, Semipalmated Sandpiper, Least Sandpiper, Long-billed Dowitcher, Red-necked Phalarope, yellowlegs and Piping Plover. Thirteen Piping Plovers were counted at Little Quill Lake in 1991 (Skeel 1994). There were 14 and 21 Piping Plovers observed on Middle and Little Quill Lakes in 1992 and 1993, respectively (Alexander et al. 1995). Big Quill Lake is one of the most important breeding sites in North America for Piping Plovers, with 298 adults accounted for in 1984 (Harris and Lamont 1985), 218 birds in 1993 (WHSRN data, Appendix 7), and 303 in 1994 (W. Harris and Saskatchewan Wetland Conservation Corporation, unpubl. data). The last count represents an estimated 9% of the North American Northern Great Plains/Prairie population. The Quill Lakes have been designated as a Western Hemisphere Shorebird Reserve Network Endangered Species site (Appendix 7).

Turnover rates were calculated for a variety of shorebird species at the Quill Lakes in both spring and fall (Alexander et al. 1995). Length of stay was about 4 days in the spring compared to averages of between 8 and 16 days in the fall. The peak shorebird numbers indicated here do not take these turnover rates into account, so that actual numbers of shorebirds using the Quill Lakes would be higher. A significant proportion of the Semipalmated Sandpipers migrating through the Quill Lakes in spring stage at the Bay of Fundy during fall migration (Gratto-Trevor and Dickson 1994).

[10. Kutawagon Lakes, Sask. (Regional ?)

The Kutawagon Lakes, a chain-like series of small, shallow, saline lakes,

lie to the southwest of the Quill Lakes, and supported over 12,000 shorebirds during CWS aerial surveys of the area in spring 1988 (Appendix 5).]

11. Last Mountain Lake (north end), Sask. (Regional/Endangered)

Southwest of Kutawagon Lakes lies the northern end of Last Mountain Lake, Canada's first Migratory Bird Sanctuary, a designated Ramsar site and, as of September 16, 1994, a Regional WHSRN site. The shallow lakeshore and adjacent basins provide a variety of habitats, both natural and managed, including mudflats and marshland. Shorebird surveys have produced counts of around 5,000 birds, with occasional large concentrations of Red Knots and Ruddy Turnstones (Appendix 5). Lahrman (1972) reported over 2,500 Red Knots near Last Mountain Lake on 21 May 1972 in a burned-over stubble field, with a similar number of Ruddy Turnstones. Forty-three Piping Plovers were reported on Last Mountain Lake in 1984 (Harris et al. 1985), 10 of which were in the protected areas at the north end of the lake.

12. Burke/Porter/Buffer lakes area, Sask. (International)

12.1 Burke Lake/Porter Lake, Sask. (International)

12.2 Buffer Lake, Sask. (Regional ?)

Several reports of substantial numbers (up to approximately 2,000) of Hudsonian Godwits at Porter Lake (Appendix 5) indicate this area could be considered as an International Reserve for the population of this species

wintering on the Pacific coast of South America. A single day count of approximately 11,000 staging shorebirds was recorded at Buffer Lake in 1987 (Appendix 5).

13. Blaine Lakes, Sask. (Regional)

Blaine Lakes, located 70 km north of Saskatoon, are a group of shallow, intermittent saline water bodies. Maximum survey counts of almost 30,000 shorebirds during spring migration in 1989 indicate that the lakes qualify for Regional Reserve status (Appendix 5).

14. Lac Lenore/Basin Lake, Sask. (Regional)

14.1 Lac Lenore, Sask. (Regional)

14.2 Middle Lake/Basin Lake, Sask. (Regional ?)

Lac Lenore supported over 20,000 shorebirds during spring surveys within the boundaries of the Lenore Lake Migratory Bird Sanctuary in 1989, while Middle and Basin lakes, which are also Migratory Bird Sanctuaries, supported in the order of 13,000 staging shorebirds (Appendix 5).

15. Alberta/Saskatchewan border region (International/Endangered)

- 15.1 Cipher Lake, Alta (Regional ?)
- 15.2 Gillespie Lake area, Alta (Regional ?)
- 15.3 Gooseberry Lake, Alta (Regional ?)
- 15.4 Killarney Lake/Leane Lake, Alta (Regional/Endangered)
- 15.5 Killsquaw Lake, Sask (Regional ?)
- 15.6 Landis Lake, Sask (Regional)
- 15.7 Manito/Wells Lakes, Sask  
(Regional/Endangered (Manito L.))
- 15.8 "Metiskow Lake", Alta (Regional ?)
- 15.9 Muddy Lake, Sask (Regional ?)
- 15.10 Opuntia Lake, Sask (Regional ?)
- 15.11 Reflex Lakes, Alta (International/Endangered)
- 15.12 Sounding Lakes, Alta (Regional/Endangered)

A complex of some 12 major lakes and numerous small wetlands clustered on the Alberta/Saskatchewan border supports highly significant numbers of shorebirds. Maximum counts of shorebirds recorded at the lakes listed above total some 150,000, indicating the area is likely of International Reserve status (Appendix 5). Individually, one lake qualifies for International status, four for Regional status and the remaining seven for possible Regional (?) status. Since Piping Plovers have been reported for all sites listed under the Alberta/Saskatchewan border region (Harris et al. 1985, Wershler and Wallis 1987, Wershler 1989, unpubl. results, Renaud et al. 1979, Smith 1987, M. Heckbert, unpubl. data) except Wells Lake (Harris et al. 1985) and since

evidence of breeding has been found at most of the sites listed, the region may also be considered an Endangered Species site.

The Reflex Lakes, straddling the Alberta/Saskatchewan border, supported a maximum of 35,950 shorebirds during CWS ground surveys in spring 1989. This total included some 20,000 Sanderlings, which represent approximately 20% of the South American Pacific coast wintering population recorded by Morrison and Ross (1989). The western-most Reflex lake had the second highest count of Piping Plovers in Alberta in 1986, with at least 46 adults reported by Wershler and Wallis (1987), representing an estimated 1% of the North American Northern Great Plains/Prairie population. A few kilometres to the east lie the Manito/Wells lakes, where maximum numbers in spring 1989 reached 36,850 shorebirds, most of which (34,250) were Red-necked Phalaropes (Appendix 5). Piping Plovers are also found at Manito Lake where 111 adults were counted in 1991 (Skeel 1994). The Sounding Lakes, Alta, had the highest recorded maximum count (55,800) amongst the remaining areas, and was important for yellowlegs. The two remaining areas supporting over 20,000 shorebirds were Killarney Lake/Leane Lake, Alta, (27,500) and Landis Lake, Sask, (24,800); at both lakes, the majority of the birds recorded were Red-necked Phalaropes (20,000 and 11,900, respectively). In 1994, 48 adult Piping Plovers were counted at Killarney Lake (Heckbert 1994) - a record for this location.

The remaining seven lakes supported a maximum count total of 67,700 birds, with individual totals ranging from 5,800 to 17,700 (Appendix 5). The lake with the highest total, "Metiskow Lake", Alta, (17,703), supported the second highest concentration of Baird's Sandpipers recorded on the surveys.

Gillespie Lake, Alta, (16,850) supported notable numbers of Stilt Sandpipers (10,000) and Gooseberry Lake, Alta, significant numbers of Red-necked Phalaropes (10,000) (Appendix 5).

Other lakes that could be included in this complex are Corin, Cactus, Teo and Gull lakes, Saskatchewan, and Grassy Island Lake, Alberta.

16. Chappice Lake, Alta. (Regional ?/Endangered?)

A maximum count of 11,000, including 4,500 Sanderling, indicate this site should be considered as a possible Regional reserve. Piping Plovers breed at the lake; a maximum count of 17 adults was recorded in 1986 (Wershler and Wallis 1987).

[17. Sullivan Lake, Alta. (Regional ?)]

This large lake in central Alberta possesses extensive areas of mudflats and/or extremely shallow water. Over 14,000 shorebirds were recorded on the lake during ground surveys in 1989, and the area would presumably qualify as a Regional Reserve when turnover is taken into account.]

18. Beaverhill Lake, Alta. (Regional)

Beaverhill Lake, some 65 km east of Edmonton, is a large, shallow lake measuring about 16 km by 12 km; it functions as the collection basin for the run-off from the higher Beaver Hills lying to the west (Decker 1982, Smith and Weseloh 1982). Lake levels have varied considerably during the present century, reaching a low in the 1950s. The shoreline is rather variable, with narrow sandy beaches in the south, muddy shorelines with deeply indented reed-choked bays and rocky points in the north, willow and poplar shrubs along the east and south, and open rough pastures and gently sloping fields along the west and north shores (Decker 1982). Grazing maintains the adjacent open grassland areas, and changing water levels are important in the long term control of the amount of flats and vegetation around the margin of the lake.

Beaverhill Lake regularly supports substantial numbers of a variety of shorebirds and qualifies for Regional reserve status. The maximum count reported from the area was 23,442 during spring surveys in 1989 (Appendix 5). Notable concentrations of individual species have included up to 10,000 Red-necked Phalaropes in 1986 (International Shorebird Surveys) and 10,000+ Pectoral Sandpipers, 1,100 White-rumped Sandpipers and 1,500 Buff-breasted Sandpipers in 1978 (Decker 1982), as well as 10,000 dowitchers in 1991 (Beaverhill Bird Observatory 1991). Counts of up to several hundred Red Knots, Ruddy Turnstones and Black-bellied Plovers have also been made at the lake (Appendix 5).

19. Hanna area, Alta. (Endangered)

19.1 Chain Lakes, Alta. (Endangered)

19.2 Dowling Lake, Alta. (Endangered)

19.3 Handhills Lake, Alta. (Endangered)

19.4 Little Fish Lake, Alta. (Endangered)

19.5 Spiers Lake, Alta. (Endangered)

At least 133 Piping Plovers were recorded for this area in 1994 (J.P. Goossen, unpubl. data) representing an estimated 4% of the North American Northern Great Plains/Prairie population. Piping Plovers breed at all of the above sites (Wershler and Wallis 1987, Goossen 1990, 1991, 1993). Little Fish Lake, which has been designated as a Western Hemisphere Shorebird Reserve Network Endangered Species site (Appendix 7), has supported some of the highest numbers of Piping Plovers recorded in Alberta, with 49 observed in 1989 (Wershler 1989) and 48 in 1990 (Hofman 1990); 24 pairs bred in the area in 1991 and 8-12 pairs in 1992 (WHSRN data, Appendix 7). In 1994, 52 adults were recorded for Handhills Lake (J. P. Goossen, unpubl. data). This lake appears to be the most productive site in Alberta. For example in 1994, 2.4 young per pair were produced in a portion of the lake (Cantelon et al. in prep.). At one of the Chain Lakes, 23 adults were counted in 1984 (J.P. Goossen, unpubl. data), while seven adults were found at Spiers Lake in 1984 (Shandruk and Fortin 1991) and 58 adults at Dowling Lake in 1994 (J.P. Goossen, unpubl. data).

Over 1,000 shorebirds were seen on the lakes during aerial survey in May



1987 (Smith and Dickson 1989).

20. Rockeling Bay/"Rider Lake", Alta. (Endangered)

In 1990, 39 adult Piping Plovers were found at these sites (Goossen 1991), representing an estimated 1% of the North American Northern Great Plains/Prairie population. Thirty-four young were found during surveys in 1989 and 1990 (Goossen 1990, 1991).

21. Kimiwan Lake, Alta. (Regional)

Kimiwan Lake is the most northerly of the potential WHSRN reserve sites currently identified on the Prairies, and is located about 135 km northeast of Grand Prairie. Two counts of over 20,000 shorebirds were recorded during CWS surveys in 1988, with significant numbers of dowitchers, mostly Long-billed Dowitchers (12,000), and Pectoral Sandpipers (7,000) (Appendix 5).

22. Whitford Lake, Alta. (Regional)

Whitford Lake, located approximately 75 km northeast of Edmonton, is the most recent addition to potential Prairie WHSRN sites. Over 20,000 shorebirds were seen on the lake in May 1991 (E. Ewaschuk pers. comm.).

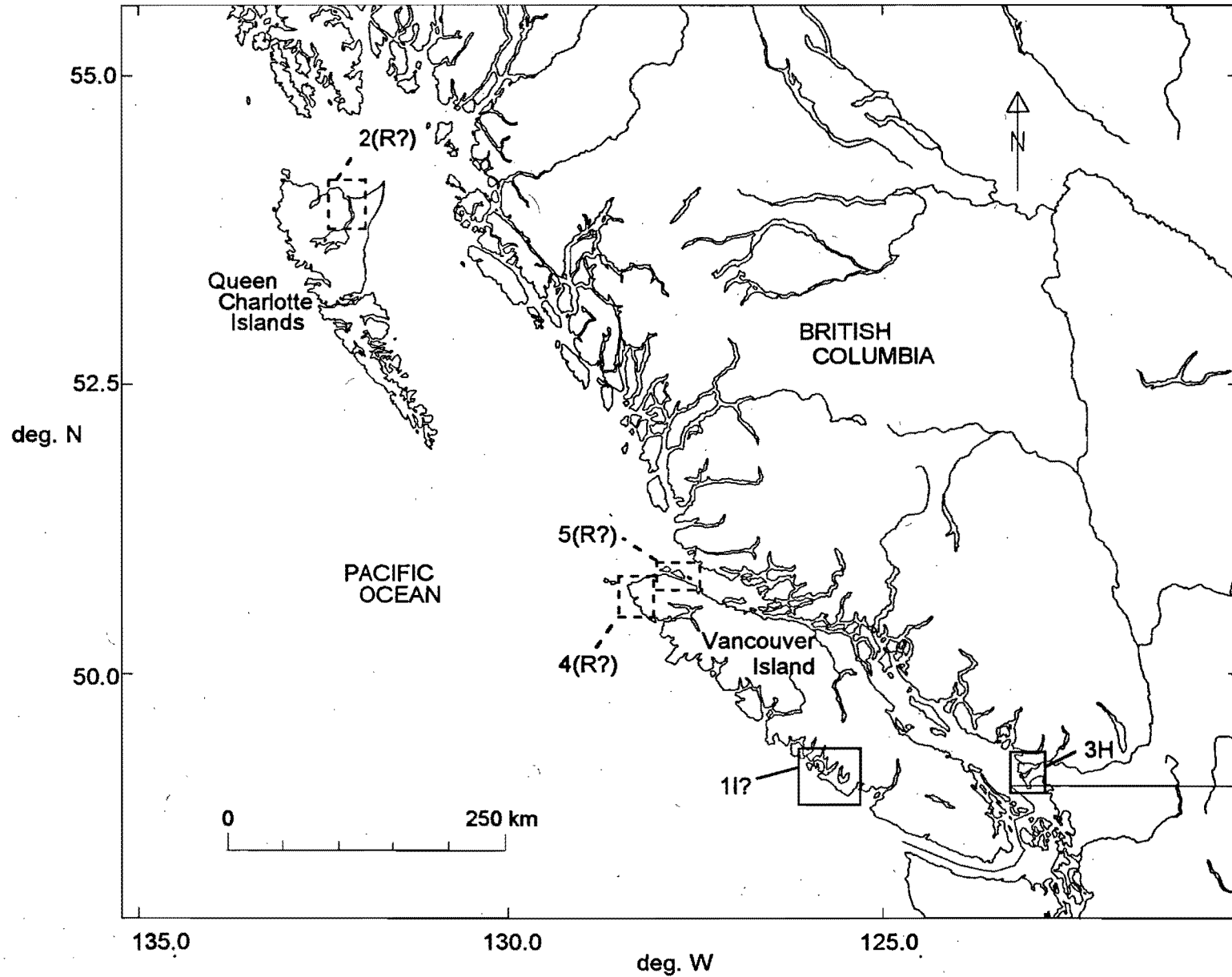
## PACIFIC CANADA

Potential WHSRN sites in Pacific Canada are shown in Figure 6 (see Appendix 6 for details). Distances between the major staging areas used by calidridine shorebirds on the Fraser River delta in southern British Columbia (Butler and Kaiser 1988) and the Stikine River, Alaska, and the Gulf of Alaska (Senner et al. 1981) are some 800 and 1,200 km, respectively. There is no known site that supports comparable numbers of shorebirds along the mainly mountainous coast between these staging areas, and the Fraser River is clearly an important refuelling stop for birds on migration. Studies on Western Sandpipers fitted with miniature radio transmitters in spring indicated an average stopover of about 3 days (Iverson et al. 1995). Thus, the total number of birds using the area is much higher than peak counts alone would indicate because of the rapid immigration and emigration of migrants.

### 1. Tofino Flats/Chesterman Beach, Vancouver Island, BC (International ?)

Chesterman Beach is located just to the south of the Tofino Flats on the west coast of Vancouver Island. Peak counts of Western Sandpipers recorded at these sites (16,000 in May 1988 and 23,000 in August 1989 at Tofino (Butler et al. 1992a) and an average autumn peak of 35,000 at Chesterman Beach (Butler and Kaiser 1988), are amongst the highest recorded on the west coast of Canada and account for a significant proportion of the west coast total (Appendix 6). Assuming that the 3-day stopover period found elsewhere in B.C. for Western Sandpipers also applies at Tofino, the population using the area would exceed

Figure 6. Potential WHSRN sites in Pacific Canada (see Appendix 6 for details).



200,000 (RWB, unpubl. data) and thus qualify as in International site.

[2. Delkatla Slough, Queen Charlotte Islands, BC (Regional ?)

Delkatla Slough, near the northern end of the Queen Charlotte Islands, provides the only known significant shorebird habitat between southern British Columbia and Alaska. Peak counts of Western Sandpipers are quite low and the frequency of use is unknown. A high turnover rate would imply the site supports enough birds to qualify as a regional reserve (Appendix 6). Delkatla Slough holds the most southerly breeding population of Least Sandpipers in British Columbia. This species pioneered Delkatla in the early 1980s, reached a peak of about 90 pairs in 1988 and declined to 60-70 pairs by 1993 (J.M. Cooper, pers. comm.). In 1994, dykes holding out the sea were breached to allow the marsh to return to its former state. The effect on shorebirds is not known, although numbers of breeding Least Sandpipers at Delkatla will likely decline.]

3. Fraser River delta, BC (Hemispheric)

The Fraser River delta is the largest estuary on the Pacific coast of Canada, containing some 20,000 hectares of mudflats and sandflats and 1,500 hectares of marsh (Butler et al. 1987). The delta forms a vital link in the chain of bird habitats extending from breeding grounds in the eastern USSR, Alaska and northern Canada to wintering grounds in the southern USA and

Central and South America (Butler and Campbell 1987). It is important both as a staging site for Western Sandpipers and as a wintering area for Dunlins and Black-bellied Plovers. Daily counts indicated that as many as 500,000 to 1 million Western Sandpipers used the delta on a single day during the peak of their migration in April 1992 (Butler 1994) and in 1994 (RWB, unpubl. data). Spring and autumn maximum counts of Dunlin reached 126,000 and 97,000, respectively, in 1989 (Butler and Cannings 1989), and winter populations were estimated from weekly censuses to be between 25,000-35,000 individuals (Butler 1994). The actual number of individual shorebirds could be many times larger than the peak counts indicate, considering that the stopover of individual Western Sandpipers is only about 3 days in spring (Iverson et al. 1995). Least Sandpipers use the delta in substantial numbers (Butler and Kaiser 1995). The peak recorded counts are a maximum of 4,000 in May and 3,000 in July (Campbell et al. 1990). Between 800 and 1800 Black-bellied Plovers use the delta in winter and about 180 non-breeding individuals remain in summer (Butler 1994). The Fraser River delta lies along the northern edge of the Puget Sound lowlands. This region holds the highest densities of Dunlins in North America (Root 1988). Moreover, the Fraser River delta supports the highest winter densities of Dunlins and Black-bellied Plovers in Canada.

[4. Hansen's Lagoon, BC (Regional ?)]

Hansen's Lagoon is situated in Cape Scott Provincial Park near the northern tip of Vancouver Island and supports small numbers of Western Sandpipers (Appendix 6).]

[5. Queen Charlotte Sound, BC (Regional ?)

Queen Charlotte Strait separates northern Vancouver Island from the mainland. In July 1991, over 20,000 Red-necked Phalaropes were estimated to be using Goletas Channel and the waters in the vicinity of Pine Island and the Buckle Group (M.F. Lemon, pers. comm.).]

## Discussion and Summary

The three sites identified as potential Hemispheric Reserves in Canada vary considerably in nature and in the species of shorebirds for which they are important. All include extensive mudflats or marshes with high biological productivity.

In the Maritime Provinces, the two upper arms of the Bay of Fundy form the focal point for the migration of Semipalmated Sandpipers on the east coast of North America (Morrison and Harrington 1979), and are also important for a wide range of other species (Hicklin 1987). The exceptionally large tidal ranges have led to the development of very extensive intertidal mud and sand flats, which support abundant invertebrate populations used by the birds for food. Suitable roosting sites occur on adjacent beaches. Shepody Bay and Minas Basin were dedicated as elements of the Bay of Fundy Western Hemisphere Shorebird Reserve in 1987 and 1988, respectively (Hicklin 1988a, 1988b).

A second possible Hemispheric reserve on the east coast involves a marine site in Passamaquoddy Bay near the mouth of the Bay of Fundy, where the turbulent tidal currents produce areas of heavy upwelling. Between 500,000 and 2,000,000 Red-necked Phalaropes were reported to use the area during autumn migration in the 1970s and early 1980s. In recent years, however, very few phalaropes have been found in the area. Preliminary investigations (R.G.B. Brown unpubl.) have indicated that the Euphausiid shrimps which formed the main food of the phalaropes no longer occur near the water surface, but the factors which have resulted in this change are not clearly understood.

This situation does, however, emphasize the need for ongoing monitoring of sites to detect shifts in distribution of birds and/or their prey, and the necessity for flexibility in adjusting and updating the status of reserves in response to such changes.

Flat topography and moderate tidal ranges have produced extensive intertidal flats and associated marshes on the west coast of James Bay, Ontario. These habitats form a natural migration corridor bordered by the waters of the bay to the east and the vast inland muskeg to the west. The area is particularly important for Red Knots and Hudsonian Godwits, and may qualify as a Hemispheric Reserve based on the percentages of these populations using the area. The coast also supports a wide range of other species, including Semipalmated Sandpiper, yellowlegs, White-rumped Sandpiper and Dunlin. Similar habitats occur along the southwest coast of Hudson Bay, with the Pen Islands near the Manitoba border again being of particular importance to Red Knots and Hudsonian Godwits; important shorebird habitats continue north to Churchill, Manitoba.

Shorebird sites on the Prairies are mostly found on large shallow saline or alkaline lakes, where water levels vary considerably from year to year. When intermediate water levels occur, extensive mudflats may develop and attract large concentrations of shorebirds. Prairies sites are important in both spring and fall, but especially so in spring when many species migrate northwards through the interior of the continent (Morrison 1984). Little information is available on the long-term variability in habitat conditions and shorebird use at a given site from year to year, but such variability will



be an important factor in designing an effective reserve system for interior sites. Prairies sites are important for Sanderling, Red-necked Phalarope, Baird's Sandpiper, Semipalmated Sandpiper, Red Knot, Ruddy Turnstone, Stilt Sandpiper, dowitchers, Hudsonian Godwit, Black-bellied Plover, Pectoral Sandpiper and Piping Plover. The importance of Quill Lakes and Last Mountain Lake in Saskatchewan was recognised when both areas were designated as WHSRN sites in 1994, becoming the second and third WHSRN reserves to be created in Canada.

In the lower Fraser River delta, large intertidal areas with abundant invertebrate food resources support large populations of migrant and wintering shorebirds (Butler and Campbell 1987). About 35,000 Dunlins and 2,000 Black-bellied Plovers remain throughout the winter. Western Sandpipers banded in Panama have been seen near Tofino (Butler et al. 1992a) and on the Fraser River delta. Flag- and colour-marked Western Sandpipers banded in the Fraser River delta have been found in Kansas (Senner and Martinez 1982), suggesting a cross-continent route. Semipalmated Sandpipers banded in Saskatchewan have been seen in the Fraser River Delta (Gratto-Trevor and Dickson 1994).

The rocky coastlines of British Columbia are used by Wandering Tattlers, Rock Sandpipers, Surfbirds and Black Turnstones on migration. The latter three species stay in winter. The highest densities of Black Turnstones in North America spend the winter on the west coast of Canada (Root 1988). A large portion of the world population of Black Oystercatchers also breeds along the coast of British Columbia. Total populations of these species are not known but it is likely that some sites on the British Columbia coast would

qualify as WHSRN sites under the present criteria involving population percentages. The south and west coasts of Vancouver Island are especially worth examining in this regard for turnstones. There are reports of thousands of Red Phalaropes and Red-necked Phalaropes along the British Columbia coast, especially near Victoria, Cleland Island and in Queen Charlotte Strait (Campbell et al. 1990, M.F. Lemon pers. comm.). These sites need to be examined to see if they are used regularly by shorebirds.

#### Development of the Western Hemisphere Shorebird Reserve Network

Since its establishment as a conservational organisation in 1985, the Western Hemisphere Shorebird Reserve Network has designated some 31 reserves in 7 countries throughout the western hemisphere, including Canada, U.S.A., Mexico, Suriname, Brasil, Argentina and Peru. The majority of sites designated to date have been Hemispheric or International, and have covered some 10 million acres of wetland and provided protection for an estimated 30 million shorebirds (Wetlands for the Americas 1994, Ian Davidson pers. comm.). The success of WHSRN itself led to its evolving into Wetlands for the Americas to enable the organisation to undertake more effective work in promoting the conservation of wetland ecosystems throughout the Americas, especially in South America. WHSRN has remained a strong program within Wetlands for the Americas and has provided the impetus for continuing work designed to develop and expand the network. The present report provides an updated inventory of potential WHSRN sites in Canada, and is intended as a resource document for use in planning the future development of the network within Canada. Other

distributional studies conducted outside Canada and supported by the Canadian Wildlife Service are also designed to provide data for WHSRN to designate sites used by shared populations. These include "Atlas" project to map wintering distribution of Nearctic shorebirds in Mexico (Morrison et al. 1992, 1993, 1994a) and Panama (Butler et al. 1992b, Morrison et al. 1995).

WHSRN has recently designated a number of sites in Canada under the Endangered Species category, all of which have been created to protect habitats used by the Piping Plover (see Appendix 7). Canada has about 36% of the western hemisphere population of Piping Plovers (Haig and Plissner 1993) and the Canadian sites form part of a developing network of sites that will help protect key breeding areas on the east coast and central parts of both Canada and the U.S.A.

#### Estimates of populations

The criteria used to assign sites to the various reserve categories are based on: (1) the number of birds which the site supports during the course of the year or, (2) the percentage of a species flyway population using the site. The only unequivocal case in assigning a site to a category will occur where the sum of the maximum (single day) counts of the different species using the area, or single count of one species using the area, exceeds the minimum figure. Examples include counts of Semipalmated Sandpipers in the upper Bay of Fundy and on the wintering grounds in Suriname, as well as counts of Western Sandpipers on the Fraser River Delta, all of which have exceeded

the 500,000 criterion for a Hemispheric Reserve (Hicklin 1987, Morrison and Ross 1989, Butler 1994). The total number of birds using a site will clearly be higher than the maximum single day count, since turnover will occur during migration. Few studies, however, have yet been made on the rate of turnover at different sites, and on the relationship between the peak number observed and the total estimated to be using the site. Studies on Semipalmated Sandpipers in the Bay of Fundy and on Western Sandpipers on the west coast have produced very different estimates of these parameters. Hicklin (1987 and unpublished results) has estimated that the length of stay of Semipalmated Sandpipers in the Bay of Fundy is approximately 10-15 days, and that the ratio between the total using the site and the peak count varied between about 1.25 and 2.00. On the west coast, Butler et al. (1987) estimated from studies of marked individuals that the average length of stay of Western Sandpipers was 1-3 days, an estimate recently confirmed by radio-tagging studies Iverson et al. 1995), and that the ratio between the population estimate for the site and the average peak number was about 27 (Butler and Kaiser 1988). Butler and Kaiser (1995) estimated that the average length of stay for individually marked Least Sandpipers was 4-6 days. Such large differences suggest that turnover rates vary between species, sites, and times of the season. On the Prairies, site-specific turnover rates were calculated for a variety of shorebird species migrating through the Quill Lakes: on average, length of stay was longer in the fall (8-16 days) than in the spring (4 days) (Alexander et al. 1995). Site-specific estimates of turnover rates are clearly needed when calculating numbers using a particular area. Estimation of turnover rates, however, presents considerable logistical problems on large estuaries used by major concentrations of birds and on many prairie lakes (Skagen and

Knopf 1994).

Knowledge of population sizes of different species of shorebirds is generally rather poorly developed, so that using percentage criteria to identify WHSRN sites is not usually straightforward. Preliminary estimates for population sizes of 40 species of shorebirds found in Canada indicated that about half fell in the range 10,000-100,000, with the largest populations numbering several millions and the smallest ones ranging from a few tens or hundreds of individuals to several thousand (Morrison et al. 1994a). Detailed estimates are available for only several species, and compilations of numbers from wintering ground surveys (e.g., Morrison and Ross 1989) may offer the best current estimates for use in identifying potential WHSRN sites. Further information on other world populations is provided by Rose and Scott (1994).

#### Future work

The future development of WHSRN will require information both from new areas, to identify and document use of previously unknown areas, and from currently known sites, to monitor conditions at the site and to provide information on population trends. Further work to identify and document use of important staging areas in South America are needed, and wintering ground surveys should be completed for Central America and the Caribbean. Long-term survey schemes, such as the International Shorebird Survey and Maritimes Shorebird Survey have provided the most reliable data available for monitoring

shorebird populations, and have demonstrated declines in a number of species (Howe et al. 1989, Morrison et al. 1994b, 1994c). WHSRN reserves can play a useful role in future investigations of shorebird population trends by providing a network of sites at which shorebird numbers can be monitored. Continued monitoring of sites may also identify major changes in distribution, such as those which have occurred with phalaropes on the Atlantic coast. Long-term studies of between-year variability of use of sites, especially those on the Prairies, and on turnover rates are clearly needed. Little is currently known about whether some sites may only be used by shorebirds on an occasional basis but nevertheless play a critical role in the long term survival of the population. An assessment of Canadian Wildlife Service priorities for shorebird research and conservation has been provided by Butler et al. (1995).

The locations of key breeding areas in the Arctic requires further investigation, though information is hard to obtain over the enormous areas involved and where the birds are more dispersed than on wintering or migration areas. Criteria are needed for the identification of such areas for inclusion in the WHSRN, to enable completion of conservational protection of the key sites used by the birds throughout their ranges.

## Acknowledgements

It is a pleasure to acknowledge the assistance of Ian Davidson, Western Hemisphere Shorebird Reserve Network Program Manager, Wetlands for the Americas, in Ottawa, in providing information, and especially for securing the funding that has enabled the joint publication of this report.

We thank the many participants in the Maritimes, Prairie and International Shorebird Survey schemes for their contribution in obtaining much of the data that have enabled the development of the WHSRN concept and the production of the list of sites in this paper. We especially thank David Christie and Mary Majka for their ongoing contributions and interest in the well-being of Canada's first Hemispheric Reserve at Mary's Point, NB. Stewart Holohan, Cleve Wershler and Robert Jones have provided much input regarding sites on the Prairies. We also thank Barbara Campbell, CWS Ontario Region, for her many contributions and long involvement with the project. Thanks to Stuart Alexander for his extra effort in the field at the Quill Lakes and for compilation of the final population figures. We thank Christine Eberl, CWS-NWRC, for assistance in revising the maps.

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Appendix 1. Definitions and abbreviations for terms, and scientific names and abbreviations for species used in this document.

WHSRN site categories

H = Hemispheric

I = International

R = Regional

E = Endangered Species

? indicates site does not qualify directly from count data, but may qualify when turnover is taken into account

Species abbreviations

AMAV	American Avocet	<u>Recurvirostra americana</u>
BASA	Baird's Sandpiper	<u>Calidris bairdii</u>
BBPL	Black-bellied Plover	<u>Pluvialis squatarola</u>
BBSA	Buff-breasted Sandpiper	<u>Tryngites subruficollis</u>
DOWI	dowitchers	<u>Limnodromus spp.</u>
DUNL	Dunlin	<u>Calidris alpina</u>
HUGO	Hudsonian Godwit	<u>Limosa haemastica</u>
LBDO	Long-billed Dowitcher	<u>Limnodromus scolopaceus</u>
LESA	Least Sandpiper	<u>Calidris minutilla</u>
LEYE	Lesser Yellowlegs	<u>Tringa flavipes</u>
MAGO	Marbled Godwit	<u>Limosa fedoa</u>
PESA	Pectoral Sandpiper	<u>Calidris melanotos</u>
PIPL	Piping Plover	<u>Charadrius melodus</u>
PUSA	Purple Sandpiper	<u>Calidris maritima</u>
REKN	Red Knot	<u>Calidris canutus</u>
REPH	Red Phalarope	<u>Phalaropus fulicaria</u>
RDNP	Red-necked Phalarope	<u>Phalaropus lobatus</u>
RUTU	Ruddy Turnstone	<u>Arenaria interpres</u>
SAND	Sanderling	<u>Calidris alba</u>
SBDO	Short-billed Dowitcher	<u>Limnodromus griseus</u>
SEPL	Semipalmated Plover	<u>Charadrius semipalmatus</u>
SESA	Semipalmated Sandpiper	<u>Calidris pusilla</u>
SLSA	Stilt Sandpiper	<u>Calidris himantopus</u>
WESA	Western Sandpiper	<u>Calidris mauri</u>
WHIM	Whimbrel	<u>Numenius phaeopus</u>
WIPH	Wilson's Phalarope	<u>Phalaropus tricolor</u>
WRSA	White-rumped Sandpiper	<u>Calidris fuscicollis</u>
YELL	yellowlegs	<u>Tringa spp.</u>
peeps	refers to small sandpipers and plovers	
-	Greater Snow Goose	<u>Anser caerulescens</u>

Other abbreviations

CWS Canadian Wildlife Service

ISS International Shorebird Survey

MSS Maritimes Shorebird Survey

WHSRN Western Hemisphere Shorebird Reserve Network

Appendix 2. Potential WHSRN sites in Atlantic Canada

<u>Location</u>	<u>Type</u>	<u>Shorebird numbers</u>	<u>References, comments</u>
1. Upper Bay of Fundy, NB/NS	H	1.1 - 2.2 million	Mawhinney et al. (1993)
1.1 Cumberland Basin, NB/NS	R	SESA 30,000 (1978)	Minudie, NS (MSS)
1.2 Shepody Bay, NB	H	* SESA max. counts: 80,000-300,000 (1974-1986)	Mary's Point, NB MSS
		350,000 (1977)	(Hicklin 1987)
		- 20,000 peeps (1978)	Daniel's Flats, NB MSS
		- SESA max. counts 30,000-72,000 (1975-79)	Grande Anse, NB MSS
		-300,000 (1992)	Hicklin (pers. obs.)
			Shepody Bay dedicated as part of Bay of Fundy Western Hemisphere Shorebird Reserve August 1987
1.3 Cobequid Bay, NS	R	- max. count 10,087 (1982)	Black Rock, NS MSS
		- max. count 6,908 (1978)	Moose Brook, NS MSS
		- max. counts 7,444-15,099 (1976-1979)	Noel Bay, NS MSS
		- max. 11,030 (1976)	Noel Shore, NS MSS

Appendix 2 (continued).

1.4 Minas Basin, NS	H	- max. counts: 16,000-25,000 (1974-1978)  40,000 - max. count 25,156 (1975) - max. count 27,703 (1976)  - max. 13,645 (1979)  -max. 131,200	Evangeline Beach, NS MSS  Hicklin (1987) Grande Pre, NS MSS  Kingsport to Oak Island, NS MSS  Oak Island East, NS MSS Mawhinney et al. (1993)
2. Grand Manan area, NB	I?	* max. count 100,000 phalaropes (1979) * 100,000 phalaropes (1980) - 15,000 phalaropes (1978 MSS)	Kent Island (MSS) off Gannet Rock (MSS) Castalia Marsh (MSS)
3. Maces Bay, NB	R?	max. counts: 8,395 (1975); 13,797 (1976); 5,361 (1977)  PUSA 525+ (1974)	(MSS)  (CWS aerial survey)
4. Quaco Bay, NB	R?	max. count 8,740 (1974)	(MSS)
5. Quoddy Region, NB	H?	RDNP min./max. 35,000- 770,000 (1981-82); up to 1 million (1980); at least 2 million (1977); only 15,000+ (1978); c. 100,000 (1971)	Mercier & Gaskin (1985), Vickery (1978, 1979, 1981), Finch (1972); Recent surveys indicate that large numbers of phalaropes no longer use this area
6. Saints Rest marsh and beach, St. John, NB.	R(I?)	max. 111,543 (1986); SESA 20,000 (1976); peeps 23,000 (1985)	(MSS)

Appendix 2 (continued).

7. Brier Island, NS	R	REPH 20,000	Vickery (1979); phalarope numbers may have declined in recent years
8. Cape Sable, NS	R?	max. counts (1977-1984): 6,520-10,830	MSS
9. Cook's Beach, NS	R?	max. counts: 8,620 (1983); 7,899 (1982)	MSS
10. Atlantic Piping Plover Sites, NB, PEI, NS, Nfld	E?	134 pr.	CWS unpubl. (1994)
10.1 Eastern New Brunswick		see Appendix 7	
10.2 Northern Prince Edward Island		see Appendix 7	
10.3 Southern Nova Scotia		see Appendix 7	
10.4 Southwest Newfoundland		see Appendix 7	

Appendix 3. Potential WHSRN sites in Quebec.

Location	Type	Shorebird numbers	References, comments
1. Saguenay River Area	R		
1.1 Battures aux Allouettes	R?	- max. 5,500 (1988), 8,632 (1989): SESA 4,000 DUNL 2,000 BBPL 600 REKN 1,600 SAND 2800 RUTU 200	CWS surveys, Bourget (1988, 1989, 1990, 1991)
1.2 Ile Rouge	R?	- max. 13,401 (1981) BBPL 10,000 SESA 2,500 RUTU 980	(Maisonneuve 1982)
1.3 Ile Blanche	R?	- max. 7,020 (1989)	CWS
2. Banc de Portneuf	R?	- max. 14,770 (1990) SESA 8,600 SAND 4,000 BBPL 2,500 SEPL 300 WRSA 6,000 RUTU 1000 (1991) REKN 1200 (1991)	(Maisonneuve 1982) (Bourget 1992) (CWS, WHSRN)
3. Gentilly	R?	- max. 12,705 (1977) - max. 10,425 (1979) SESA 10,000 LEYE 1,500 LESA 1,000	(Brousseau 1981)

Appendix 3 (continued).

4. Iles-de-la-Madeleine	R/E	- max. 11,000 (1987)	MSS
		BBPL 3,000	
		SBDO 650	
		SEPL 2,500	
		REKN 200	
		SESA 3,000	
		RUTU 600	
		HUGO 150	
		WRSA 1,000	
		LESA 600	
		- max. peeps 37000 (1978)	
		SBDO 4,000	Mousseau et al. (1976)
		REKN 504	
		SESA 9,000	
		HUGO 200	
		WRSA 6,000	
		BBPL 6,000	Hagar (1956)
		WRSA 10,000	
		SESA 12,000	
		BBPL 2,000	Hagar (1949)
		WRSA 880	
		SESA 2,400	
		SBDO 900+	
		PIPL 74	Shaffer and Pineau (1987)
5. Montmagny Archipelago	R		
5.1 Montmagny	R	- max. 16,700 (1989)	CWS
		SESA 16,700	
		- max. 15,848 (1980)	Brousseau 1981
5.2 Battures aux Loups-marins	R	- max. 30,600 (1989)	CWS, Brousseau (1981)
		-max. 13,876 (1980)	
		SESA 30,600	
		RUTU 250	
		SEPL 770	
6. Minganie	R?	- max. 7,200 (1988)	CWS
		REKN 1,150	
		HUGO 130	
		WRSA 1,500	
		LESA 750	
		LEYE 300	



Appendix 4. Potential WHSRN sites in Ontario

<u>Location</u>	<u>Type</u>	<u>Shorebird numbers</u>	<u>References, comments</u>
1. James Bay (west coast)	H/I	aerial survey totals: 60,403 (1974); 39,876 (1976/77);  HUGO 10,000 (1974) 11,500 (1992)  REKN c. 7,000 (1976), 15,000 (1990)	>30% Atlantic coast South American wintering population (32,700)  10-20% South American wintering population (76,392)  (Morrison unpubl. data; Morrison and Harrington (1979); Morrison and Ross (1989, unpubl. data); Ross (1992 unpubl. data)
2. Pen Islands (Hudson Bay)	I	HUGO: 8800 (1992)  REKN: 2000 (1992)	Ross (1992 unpubl. data); ca. 25% Atlantic coast South American population
3. Lake of the Woods	E	PIPL: 4 ads. in Ontario (1990) 47-50 adults (1984) 15 adults (1994)	Heyens (1990)  Maxson and Haws (1994) Maxson and Haws (1994)
4. Presqu'ile Provincial Park, Lake Ontario	R?	max. spring: 7,566 (1985) incl. DUNL 7,000; 5,953 (1983) incl. DUNL 3,500, SESA 250; max. autumn: 2,126 (1984) incl. SESA 1,500, SAND 250; 1,329 (1978)  up to 20,000 during northward migration	MSS/ISS data     McRae 1986
5. Western end of Lake Ontario	R?	max. spring 5,264; max. autumn 3,830	turnover estd. c.>20,000 (Clarke 1988)

Appendix 5. Potential WHSRN sites in the Prairie Provinces.

<u>Location</u>	<u>Type</u>	<u>Shorebird numbers</u>	<u>References, comments</u>
1. Hudson Bay Coast, Man.	R/I?		
1.1 Churchill area, Hudson Bay coast	R/I?	RUTU 6,000 (5/6/82) = 6% highest North American count, or 25.5% South American coastal wintering population (23,499); 2,000+ (17/6/83)	Gollop (1982, 1983) Dunne et al. (1982) Morrison and Ross (1989)
		- important nesting area for many species, including HUGO	Hagar (1966), Skeel (1976, 1983)
1.2 Nelson River/Hayes River area, Hudson Bay coast	R	- 50-60% of Churchill to Man./Ont. border aerial survey totals 10,573 (spring) and 16,165 (autumn) in area of Hayes/Nelson rivers; includes 3,500+ REKN, many hundreds HUGO	CWS surveys

Appendix 5 (continued).

2. Oak Hammock Marsh, Man.	R	<p>* max. 16,759 (north cell block, spring 1981), plus 12,578 (south and centre cell blocks, spring 1983)            * WRSA 7,000 = 9.6% censused coastal wintering population (72,996) in South America            * SBDO 5,000+ = 10.2% of coastal South American wintering population (48,859)            * HUGO 600+ = 4.7% South American Pacific coast wintering population (12,813); 200+ (15/5/76, 14/5/77, 14/5/78)            * YELL 5,400 (29/7/76) = 5.9% South American coastal wintering population (91,047)            - PESA 2,000 (29/7/76)            - WIPH 1,000 (22/5/78)            - DUNL 2,200+            - RUTU 200 (26/5/75, 22/5/76)</p>	<p>S. Holohan, ISS data             ISS 1981            Morrison and Ross (1989)             ISS 1983            Morrison and Ross (1989)             ISS 1983            Morrison and Ross (1989)             Gardner (1981)            Morrison and Ross (1989)             Gardner (1981)            Gardner (1981)            ISS 1983            Gardner (1981)</p>
3. Shoal Lakes, Man.	R?/E	<p>- PIPL c. 80 (1985) = 2% Northern Great Plains/Prairie population (3,467); 64 (1990); 67 adults (1994)            - single day counts all shorebirds: 2,989 spring 1987; 376 fall 1987</p>	<p>Haig 1987, (Haig and Plissner 1993), Koonz (1990); Jones unpubl. data             Dickson unpubl. data</p>
4. Gull Bay, Lake Winnipeg, Man.	E	<p>- PIPL 47 ad (1989), 50 (1990) = 1% Northern Great Plains/Prairie population</p>	<p>Koonz (1989, 1990)</p>
5. Whitewater Lake, Man.	R	<p>* WRSA 10,000 (1988) = 13.7% censused coastal wintering population (72,996) in South America            * max. 23,068 (spring 1987, one day count)</p>	<p>ISS            Morrison &amp; Ross (1989)            Dickson &amp; Smith (1988)            Smith &amp; Dickson (1989)</p>

Appendix 5  
(continued).

6. Old Wives H/E  
Lake/Chaplin  
Lake/Reed Lake,  
Sask.

6.1 Old Wives  
Lake/Chaplin Lake

\* SAND estimated 51,654 (spring 1987), 58,760 (spring 1993), 56,000 (spring 1994)= 46.2%, 52.6% and 50.1% South American coastal wintering population (111,815)  
- one day count 124,165 (Old Wives Lake 64,392, Chaplin Lake 59,773) (spring 1987); 106,065 (Old Wives Lake 32,706, Chaplin Lake 73,359) (spring 1993); 92,882 (Old Wives Lake 37,755, Chaplin Lake 55,127) (spring 1994)  
- PIPL 292 = 8.0% Northern Great Plains/Prairie population (3,467)  
- BASA estimated 29,862 (spring 1987)  
- SESA estimated 30,404 (spring 1987), 28,796 (spring 1994)  
  
- WIPH 7,100 (Chaplin Lake) (20/6/84), 6,192 (Chaplin Lake) (25/7/94)  
- AMAV 2,685 (Chaplin Lake) (29/8/94)  
- RDNP 7,755 (Chaplin Lake) (23/5/94)

aerial and ground surveys, Dickson & Smith (1988), Morrison & Ross (1989) Beyersbergen & Duncan (1995)

Harris et al. (1985) Skeel 1994

CWS aerial and ground surveys, Dickson & Smith (1988)

Beyersbergen & Duncan (1995)  
Harris et al. (1985)  
Beyersbergen & Duncan (1995)

Appendix 5  
(continued).

6.2 Reed Lake

one day count 6,603  
(24/5/87)  
- max. count 5,960  
(20/5/85)  
- one day count  
11,327 (26/5/93)

CWS aerial survey, Dickson &  
Smith (1988), Smith & Dickson  
(1989)  
Gollop (1985)  
Beyersbergen & Duncan  
(1995)

7. Pelican Lake,  
Sask.

R

\* max. 75,000+ (20-21/5/78)  
- MAGO 1,000 (13/8/78)  
- SLSA 5,082 (24/5/94)

Serr (1978, 1979)

Beyersbergen unpubl. data

8. Lake  
Diefenbaker, Sask.

E

\* PIPL 276 (1991) = 8.0%  
Northern Great  
Plains/Prairie population  
(3,467); 223 (1984); 97  
(1988); 94 (1989)  
- SBDO 437 (9/07/84)(1985)

Skeel 1994, Haig and Plissner  
1993, Harris et al. (1985)  
Harris (1985a, 1988)  
Harris and Lamont (1989)

Appendix 5 (continued).

9. Quill Lakes, Sask.	H/E	<p>* SAND 23,498 (Big Quill Lake, 28/5/88), 15,640 (Quill Lakes, spring 1993) = 24.1% and 15.9% South American Pacific coast wintering population (98,165);</p> <p>- HUGO 2,202 (Little Quill Lake, 1987), 2,073 (Little Quill Lake, 1989), 2,934 ( Little Quill, fall 1991) = 17.2%, 16.1% &amp; 22.9%, respectively, South American Pacific coast wintering population (12,813);</p> <p>- max. count 155,008 (Big Quill Lake) (1988) (no counts for Middle and Little Quill lakes in 1988)</p> <p>- max. count 59,913 (Middle and Little Quill lakes) (1989),</p> <p>- max. count 98,959 (Middle and Little Lakes : spring 1990)</p> <p>- max. count 129,922 (Big, Middle and Little Quill Lakes : fall 1993)</p> <p>- MAGO 1,200 (Big Quill Lake) (6/7/85)</p> <p>- PIPL (Big Quill Lake) .138 (1984), 298 (1985), 218 (1993), 303 (1994) = 9.0% Northern Great Plains/Prairie population (3,467); Little Quill Lake 39 (1993)</p> <p>-REKN 1,123 (Little and Middle Quill lakes)(26/5/89); 400 (Big Quill Lake) (6/7/85); 8,967 (Big, Middle and Little Quill Lakes : spring 1993)</p> <p>-SLSA 8,125 (Little and Middle Quill Lakes) (22/7/89); 13,600 (Big Quill Lake) (13/7/85);</p>	<p>ISS</p> <p>Alexander et al (1995)</p> <p>Morrison and Ross (1989) CWS ground surveys</p> <p>Harris (1985b)</p> <p>Harris et al. (1985) Harris &amp; Lamont (1985) WHSRN (1993, see Appendix 7) W. Harris and Saskatchewan Wetland Conservation Corporation unpubl. data (1994) CWS ground surveys Harris (1985b)</p> <p>CWS ground surveys Harris (1985b) Alexander et al (1995)</p>
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Appendix 5  
(continued).

		13,484 (Middle & Little Quill Lakes : spring 1990); 14,932 (Big, Middle & Little Quill Lakes : spring 1993).	
		- YELL 9,000 (Big Quill Lake) (6/7/85)= 9.9% South American coastal wintering population	Harris (1985b) Morrison & Ross (1989)
		- LEYE 2,254 (Middle & Little Quill Lakes : fall 1989)	Alexander et al. (1995)
		- SESA 23,637 ( Big, Middle & Little Quill Lakes : spring 1993)	
		- WRSA 11,985 (Middle & Little Quill Lakes : spring 1990); 17,126 (Middle & Little Quill Lakes : spring 1990)	
		- RDNP 29,483 (Big Quill Lake) (1988); 45,188 (Middle & Little Quill Lakes : spring 1990); 43,488 (Big, Middle & Little Quill Lakes : spring 1993).	ISS Alexander et al. (1995)
		- LESA 11,560 (Big Quill Lake) (1988); 7,150 (Big, Middle & Little Quill Lakes : spring 1993)	ISS
		- DOWI 9,216 (1988)	ISS, CWS ground surveys - banding data suggest that 80%+ are LBDO
10. Kutawagon Lakes, Sask.	R?	- one day count 12,228 (spring 1988); one day count 5,654 (spring 1987) - LESA 1,000 (22/5/82)	CWS aerial survey Dickson & Smith (1988) Smith & Dickson (1989) Wedgewood (1982)
11. Last Mountain Lake, Sask.	R/E	- REKN 2,500 (21/5/72) - RUTU 2,500 (21/5/72) = c. 10% South American coastal wintering population (23,499) - one day count 5,078 (spring 1987) - one day count 4,283 (spring 1988)	Lahrman (1972) Lahrman (1972) Morrison and Ross (1989)  CWS aerial survey Dickson & Smith (1988) Smith & Dickson (1989)

Appendix 5  
(continued).

		- max. 5,637 (1984 spring and fall)	CWS aerial survey
		- MAGO 1,000 (31/8/65)	Colwell et al. (1988)
		- PIPL 10 (43 entire lake)	Hatch (1966)
			Harris et al. (1985)
12. Burke/Porter /Buffer Lakes area, Sask.	R/I?		
12.1 Burke Lake/Porter Lake, Sask.	R/I?	* HUGO 1,978 (1979)	O'Neil (1979)
		= 15.4% South American Pacific coast wintering population (12,813); 847 (21/7/71); 1,150 (9/7/73)	Morrison & Ross (1989)
			Gollop (1971)
			Harris (1974)
12.2 Buffer Lake, Sask.	R?	- one day count 10,672 (spring 1987)	CWS aerial surveys
			Dickson & Smith (1988)
			Smith & Dickson (1989)
13. Blaine Lakes, Sask.	R	- max. 29,861 (1989)	CWS ground surveys
		- SAND 10,000 (18/5/89) = 10.2% South American Pacific coast wintering population (111,815)	CWS ground surveys
			Morrison & Ross (1989)
14. Lac Lenore/ Basin Lake, Sask.	R		
14.1 Lac Lenore, Sask.	R	* max. 25,000 (1989)	CWS ground surveys
		- RUTU 312 (24/5/72)	Houston (1972)
14.2 Middle Lake/Basin Lake, Sask.	R?	- one day count 5,830 (25/5/88)	CWS ground surveys
		- one day count 10,282 (30/5/88)	CWS aerial surveys
		- max. count 12,623 (1989)	CWS ground surveys



Appendix 5.  
(continued).

15. Alberta/ Saskatchewan Border Region	I/E		
15.1 Cipher Lake, Alberta	R?	- one day count 5,000 (15/7/87) - max. count 10,021 (1989)	CWS ground surveys
15.2 Gillespie Lake area, Alberta	R?	- max. count 16,854 (spring 1988) - SLSA 10,000 (21/5/88)	CWS ground surveys
15.3 Gooseberry Lake, Alberta	R?	- max. count 10,765 (1987) - max. count 13,503 (1988) - max. count 14,719 (1989) - RDNP 10,000 (autumn 1987); 7,500 (spring 1987) - SAND 2,500 (1989)	CWS ground and aerial surveys
15.4 Killarney Lake/ Leane Lake, Alberta	R	* RDNP 20,000 (25/5/89) * one day count 27,542 (1989) - one day count 17,170 (16/5/84) - PIPL 48 (1994)	CWS ground surveys Wershler (1987)  (Heckbert 1994)
15.5 KILLSQUAW Lake, Sask.	R?	-one day count 7,259 (spring 1987)	CWS aerial surveys Smith & Dickson (1989)
15.6 Landis Lake, Sask.	R	* one day count 24,790 (22/5/89) - RDNP 11,890 (22/5/89)	CWS ground surveys
15.7 Manito/Wells Lakes, Sask.	R/E	* one day count 28,702 (spring 1987) * one day count 36,847 (spring 1989) * RDNP 26,530 (spring 1987) * RDNP 34,245 (20/5/89) - PIPL (Manito Lake) 27 (1984), 111 (1991)	Harris et al. (1985) Skeel 1994 (E = Manito Lake only)

Appendix 5  
(continued).

15.8 "Metiskow Lake", Alberta	R?	<ul style="list-style-type: none"> <li>- max. count 17,703 (1988)</li> <li>- BASA 10,000 (21/5/88)</li> <li>- max. count 13,487 (1989)</li> </ul>	
15.9 Muddy Lake, Sask.	R?	<ul style="list-style-type: none"> <li>- one day count 10,654 (spring 1987)</li> </ul>	
15.10 Opuntia Lake, Sask.	R?	<ul style="list-style-type: none"> <li>- one day count 5,791 (spring 1988)</li> </ul>	
15.11 Reflex Lakes, Alberta	I/E	<ul style="list-style-type: none"> <li>- max. count 35,948 (1989)</li> <li>* SAND 20,000 (27/5/89) = 20.4% South American Pacific coast wintering population (98,165); 3,100 (26/5/85) = 3.2% South American Pacific coast wintering population 4,000 (1/6/88) = 4.1% South American Pacific coast wintering population</li> <li>- RDNP 10,000 (1989)</li> <li>- PIPL 26 (4/5/85), 46 (17/5/86); 20 (1989); 34 (1990)</li> </ul>	<p>CWS ground surveys Wershler (1987), Wershler and Wallis (1987), Goossen (1990, 1991): PIPL on westernmost Reflex Lakes only</p>
15.12 Sounding Lakes, Alberta	R/E	<ul style="list-style-type: none"> <li>max. count 55,803 (1987)</li> <li>- LEYE 11,480 (autumn 1987)</li> <li>- YELL 13,532 (spring 1987) = 14.9% South American coastal wintering population (91,047)</li> <li>- SAND 3,000 (27/5/83) - AMAV 900 (autumn 1987)</li> <li>- PIPL 27 (1986)</li> </ul>	<p>CWS aerial and ground surveys Morrison &amp; Ross (1989)</p> <p>Wershler (1987)</p> <p>Wershler and Wallis (1987)</p>

Appendix 5  
(continued).

16. Chappice Lake, Alta.	R?/E?	- max. count 10,992 (1988) - SAND 4,500 (spring 1988) = 4.6% South American Pacific coast wintering population (98,165) - PIPL 17 (1986)	CWS aerial and ground surveys Morrison & Ross (1989)  Wershler and Wallis (1987)
17. Sullivan Lake, Alta.	R?	- max. count 14,130 (1989)	CWS ground surveys
18. Beaverhill Lake, Alta.	R	* max. count 23,442 (1989) - max. 13,096 (1986) - RDNP 7,000 (9/9/89); 10,000 (1986) - PESA 10,000 (1978), 1,000 (12/5/84) - BBSA 1,500 (1978), 700 (25/5/83 and 28/5/84)  - REKN 300 (25/5/83), 200 (1978) - RUTU 200 (25/5/83) - WRSA 1,100 (1978) - BBPL 300 (1978) - DOWI 10,000 (09/91)	(CWS/Beaverhill Bird Observatory (BBO) ground surveys ISS Decker (1982) Gollop (1984) Decker (1982) Cuthiel (1983) Gollop (1984) Cuthiel (1983) Decker (1982) Cuthiel (1983) Decker (1982) Decker (1982) (BBO ground surveys)
19. Hanna area, Alta.	E	PIPL 133 = 4.0% Northern Great Plains/Prairie population - one day count all shorebirds 1,021 (May 1987)	J.P. Goossen (unpubl.data) see Appendix 7  Smith and Dickson (1989)
20. Rockeling Bay/"Rider Lake", Alta.	E	PIPL 39 (1990) = 1% Northern Great Plains/Prairie population	Goossen (1991)

Appendix 5  
(continued).

21. Kimiwan Lake, Alta.	R	* max. count 27,067 (1988) * one day count 21,212 (19/5/88) - DOWI 12,000 (spring 1988) - PESA 7,000 (spring 1988)	CWS aerial and ground surveys  probably LBDO
22. Whitford Lake, Alta.	R	- one day count >20,000 (May 1991)	E. Ewaschuk pers. comm.

Appendix 6. Potential WHSRN sites in Pacific Canada

Location	Type	Shorebird numbers	References, comments
1. Tofino Flats /Chesterman Beach, Vancouver Island, BC	R/I?	WESA: Tofino Flats - max. 16,400 May 1988, max. 22,600 August 1989; assuming 3-day turnover, max. spring est. 45,000, max. autumn est. 164,100, annual total = 209,700; Chesterman Beach - avg. autumn max. 35,000 (estd. 38% BC coast total (91,650)	Butler unpubl., Butler and Kaiser (1988), Butler et al. (1992a), Butler et al. (1987)
2. Delkatla Slough, Queen Charlotte Islands, BC	R?	WESA avg. peak = 3,000 (estd. 3% BC coast total)	Butler and Kaiser (1988)
3. Fraser River Delta, BC	H	WESA; max. spring = 1,000,000 max. autumn = 100,000	Campbell et al. (1990); Butler (1994) populations may be much greater because of rapid migration/turnover (see Butler et al. 1987, Iverson et al. 1995)
		DUNL 25,000 - 35,000 October to March, fall peak 109,250 (1979);	Butler (1994)
4. Hansen's Lagoon, BC	R?	WESA max. 1,650 (estd. 2% BC coast total)	(Butler and Kaiser 1988)
5. Queen Charlotte Strait, BC	R?	RDNP max. >20,000	M.F. Lemon, pers. comm.

Appendix 7. Western Hemisphere Shorebird Reserve Network sites designated under the Endangered Species category in Canada (as of March 1995). For further information, see text and Appendices. Based on information supplied by the Western Hemisphere Shorebird Reserve Network (I. Davidson pers. comm.).

Area	Agency/ Landowner	Region and Site; numbers of PIPL	Conservation Action
Kouchibouguac National Park: North and South Kouchibouguac Dunes, North and South Richibucto Dunes, Gulf coast of New Brunswick	Canadian Parks Service	Atlantic 10.1; 12-18 pr annually	Some areas closed to public, signage, twine fencing, education and interpretation, predator exclosures when threats, monitoring and surveillance
Plover Ground, Pokemouche Beach South, Inkerman, NB	Private	Atlantic 10.1; 6 pr (1990), 3 pr (1991), 2 pr (1993)	Owner controls access to site, working with naturalists club and CWS in signing property and instituting guardian program
Prince Edward Island National Park: Cavendish Sandspit, Rustico Island beaches, Covehead beaches, Blooming Point	Canadian Parks Service	Atlantic 10.2; 20-26 pr annually	Areas closed to public, signage, fencing, surveillance, monitoring, public education, predator exclosures, research on energetics
Kejimikujik National Park, St. Catherines River beach, Port Mouton, Queens County, NS	Canadian Parks Service	Atlantic 10.3; 30 pr (1976), 20 pr (1985)	Area closed to public, public education program, predator exclosures, predator live trapping, research on productivity and predators, monitoring
Summerville Beach Provincial Park, Queens County, NS	Nova Scotia Natural Resources	Atlantic 10.3; 3 pr (1991), 2 pr (1992)	Beach monitoring, informational and regulatory signage, part of NS PIPL monitoring program, beach closures, fencing regulations
Big Barasway Burgeo, Newfoundland	Crown Land, Govt of NF and Labrador	Atlantic 10.4; 5-8 pr/yr	Designated as reserve to protect PIPL, signage, volunteer guardian program
Quill Lakes, Saskatchewan	Sask Wetland Conservn Corp	Prairies 9; 39 birds (Little Quill, 1993), 218 birds (Big Quill, 1993)	Two wells drilled to create habitat and increase chick survival, cattle fencing, monitoring, education
Little Fish Lake, Alberta	Private and Provincial Park	Prairies 19.4; 24 pr (1991); 8-12 pr (1992)	Shoreline fencing for cattle, provision of dugouts for livestock, signage, public contacts, monitoring