

COMMUNITY CONSERVATION PLAN
for the
Radisson Lake Important Bird Area

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Cover photo: The three Whooping Cranes were part of a group of five feeding in a barley field 5 km northwest of Radisson Lake in October 1998. When the three cranes flew to a nearby pond to drink, Brian Johns managed to take this photograph. Brian suspects that the three are subadults. The two in dance posture may be pairing, a process that can take years to complete.

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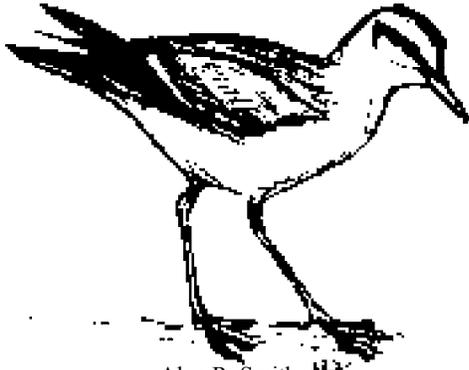
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Alan R. Smith

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Executive Summary

This Community Conservation Plan for Radisson Lake was prepared as part of Saskatchewan's Important Bird Area (IBA) Program. In this program, special areas are awarded an Important Bird Area designation for conservation purposes if the areas are used by large concentrations of birds, if birds present are at risk, or if the sites represent intact biomes and their natural bird inhabitants with restricted ranges.

Radisson Lake is a salt lake roughly 4.5 km² when full. It lies in the transition zone between mixed grassland and aspen parkland, at the foot of the Missouri Coteau in west-central Saskatchewan. The lake has no riparian connection to the North Saskatchewan River a mere 10 km to the south, nor any other outflow. Soils in the immediate vicinity of the lake tend to be black Chernozems with sandy loam texture and little or no slope. Approximately 80% of the land surrounding the lake is under cultivation.

In addition to waterfowl which congregate at Radisson Lake during migration, the lake harbors endangered species. The nationally endangered Piping Plover breeds there in small numbers, near the northern edge of the species' range. Whooping Cranes were brought back from the brink of extinction through intensive management in Canada and the United States. They stop here on migration. At Radisson Lake cranes can be seen more predictably than at other sites, in mid-September to mid-October. This forlorn-looking lake is clearly important to some high priority bird species and is thus an IBA of global status.

No major threats to the birds or the lake's ecosystem apparent at this time. Land uses are primarily for agriculture and the birds have apparently coped well with this resource use. One future threat that may be envisaged is climate change. This would likely place the lake under stress and drying of the lake bed would be detrimental to the birds. Consideration should be given to water monitoring and management if the need arises.

Given the high priority bird species at Radisson Lake, especially Whooping Cranes, there is some tourism potential during part of the year. The lake's location within a stone's throw from Highway 16 is an asset in this regard.

The objectives of this plan are to draw attention to the importance of Radisson Lake for Piping Plovers and Whooping Cranes, and to the need to monitor water quality and quantity. Specific recommendations involve:

- Monitor water quantity and quality and manage water levels when needed.
- Provide local people with information about the birds and bird requirements.
- Encourage bird watching as a tourism opportunity and coordinate this with other sites throughout Saskatchewan.
- Continue or increase monitoring of bird numbers and reproduction at Radisson Lake

The IBA Program was launched initially by BirdLife International in the UK. Today there are BirdLife Partners in over 100 countries. In Canada the national partners are the Canadian Nature Federation and Bird Studies Canada. In Saskatchewan, the conservation component of this program is being delivered by Nature Saskatchewan. Funding partners of the Community Conservation Plan for Radisson Lake include the Canadian Millennium Partnership Program, Canadian Adaptation and Rural Development Saskatchewan (CARDS), Saskatchewan Environment and Resource

Management (SERM), Ducks Unlimited Canada
and the University of Saskatchewan.

1. Introduction

Bird conservation is not 'just for the birds.' In a widely acknowledged and visionary treatment of the causes, human uses and the state of decline of diverse life forms on Earth, E.O. Wilson (1992) suggests that certain species will and should receive special attention. Wilson points out that individual species which may be large and colorful or otherwise charismatic, often are conservation favorites even though they represent a small fraction of living things. Such species, Wilson claims, can motivate conservation at many levels, from individual to government. Since no species exists in isolation from other species or its environment, such conservation efforts already in the first instance serve to protect elements of a functioning life support system. If human economic, cultural and social values are adopted in addition to species and systems concerns, the conservation efforts will come 'full circle' and have gone well beyond the birds.

Whooping Cranes (*Grus americana*) reside here on migration

1.1 Why protect birds.

Surveys of human values and economic impacts have shown that birds have attracted the attention of many people in Saskatchewan and around the World. In a 1991 survey, 83% of Canadians reported that "maintaining abundant wildlife is very or fairly important" (Filion et al. 1993). Globally, 62% of people surveyed in 1990 in 42 countries reported "strong approval" for the ecology movement (Nevitte 1996). These human values are more than wishful thinking to many people. They signal a change in values by which we rank the worth of humans and wildlife, an expansion of the 'human-animal boundary' (Cartmill 1993). These changing world views represent both a responsibility and an opportunity. It will be the conservation planner's role to help formulate a scenario in which these new opportunities and responsibilities are realized.

A survey in Saskatchewan in 1996 showed that 74% of the population was involved in indirect nature-related activities (through media, visiting zoos, purchasing art and the like), and 15% of the population participated in trips specifically to view wildlife (www.ec.gc.ca/nature).

This community conservation plan focuses on Radisson Lake, in the Aspen Parkland ecoregion of west-central Saskatchewan (Fig. 1). The lake is considered 'globally significant' in IBA program terms because endangered

Fig. 1

as do large numbers of Tundra Swans (*Cygnus buccinator*). Some of the endangered Piping Plover (*Charadrius melodus*) breed at Radisson Lake. Also, up to 20,000 waterfowl, including up to 7,000 Snow Geese (*Chen caerulescens*), stop here on migration.

It is hoped that this report may provide a significant impetus for further conservation into the future by

- i) explaining why Radisson Lake is 'important' to birds,
- ii) describing the lake's ecosystems of which the birds are a part,
- iii) reviewing appropriate literature, considering what is known but also speculating as to the potential impact of what is not known,
- iv) anticipating opportunities for people to derive a quality of life from the birds, and
- iv) listing potential stakeholders and contact people (Appendix 1) toward these ends.

Key stakeholders in addition to those organizations directly involved in the IBA program (Appendix 2) include local land owners, the Town of Radisson, the Rural Municipality of Great Bend, Ducks Unlimited Canada, Sask. Water, Saskatchewan Environment and Resource Management and Environment Canada.

2 IBA Site Information

Radisson Lake (IBA #83) is located immediately north of Highway 16, NW of the town of Radisson,¹ and 60 km from Saskatoon, *en route* to North Battleford and Edmonton (Fig. 1). Radisson Lake lies only 10 km north of the North Saskatchewan River, but does not drain into it.

This shallow (<10 m) saline lake covers 4.5 km² when full. This lake was apparently not included in the surveys by Rawson and Moore (1944) or Hammer (1978) who described the characteristics of over 50 saline lakes in Saskatchewan. Radisson Lake seems largely devoid of emergent vegetation, presumably due to its salinity. A bay east of the abandoned, old Hafford highway is flooded in spring in some years. One small tributary drains land to the west of Radisson Lake in years of high melt water runoff. During the 1930s, the entire lake was dry enough so that one could drive across it, (Corey Loessin, pers. communication). The lake receives waste water from the town of Radisson twice each year (Sect 7.2).

Radisson Lake is surrounded with salt tolerant grasses and forbs beyond the high water line. There are no trees in the immediate vicinity

¹ According to Barry (1998), the town was named after "Pierre-Esprit Radisson (1636-1710), fur trader and explorer who was instrumental in the establishment of the Hudson Bay Company." The Radisson post office was opened in 1905.

and the nearest shrubs are Buffaloberry. The beaches at the lake's northwest corner provide the best habitat for Piping Plover (Sect. 4.3.1). In some years, the flooded bay to the east is also used by plovers.

Judging from topography, Radisson Lake is probably a discharge site for deeper saline ground water aquifers. The lake lies at the foot of the Missouri Coteau (Fung et al. 1999) that marks the edge of an uplifted plain, or the second prairie step. Many saline lakes in Saskatchewan, and soils lie in a band bordering the edge of this plain.

Radisson Lake is located at the transition from the moist mixed grassland to aspen parkland ecoregions, where the dominant soils are black Chernozems,² with sandy loam texture and little or no slope. Soils are rated as with 'moderately severe' limitations for agriculture, due to the soil's poor water retention capability (Fung et al. 1999).

Mean daily maximum and minimum temperatures were -12.4 and -22.5, and 24.2 and 11.6 in January and July, respectively. Mean annual precipitation is 37 cm, with most occurring in June and July (Fung et al. 1999).

From a conservation perspective, the lake, its shores and a 1 km border around the high water mark should be considered the IBA *per se*.



2.1 Existing large-scale conservation measures

The ecosystem and the birds of Radisson Lake owe their persistence in large measure to their own ingenuity but also to past conservation values among people, and to legal protection. Large-scale Acts, policies and programs that relate to Radisson Lake directly or indirectly are described below. These general measures have been complemented by many specific conservation initiatives described in Section 5.4.

2.1.1 Federal and provincial acts. In the late 1800s and early 1900s it became increasingly clear that migratory birds were on the decline. Market hunting was identified as a cause, but the other major cause, habitat loss, was not well recognized then. Legislated migratory bird protection passed the United States Senate in 1913. In 1916, Canada and the United States signed the Migratory Birds Treaty. The

² Chernozem is a Russian word for the dark-coloured soil of grasslands.

Migratory Birds Convention Act passed Parliament in 1917. Mexico signed the Migratory Birds Treaty in 1936 (Foster 1978).

The *Migratory Birds Convention Act* and its regulations give Environment Canada the authority to protect migratory birds, and control seasons and bag limits for hunted migrants. Soon after the Act passed Parliament, the first Dominion ornithologist was hired. Bird management was under the Parks Branch until the section of the branch administering the Act became the Canadian Wildlife Service in 1947.

The province of Saskatchewan brought its legislation quickly into line with the *Wildlife Act*, as did most of the other provinces. The *Canada Wildlife Act* of 1973 fostered a partnership in conservation between the federal government, and the provinces and territories.

In addition to its traditional responsibilities in the area of fish, wildlife and parks management, the Government of Saskatchewan has recently passed the *Wildlife Act 1997* (replacing the *Wildlife Act*) to include "species at risk." The province has also created *The Conservation Easements Act 1997* (Sect. 5.4.2) and introduced the Representative Areas Network program (Anonymous 1997).

2.1.2 The proposed Species-at-Risk Act. Environment Canada Minister David Anderson introduced the newest version (Bill-C5) in January 2001, which replaces Bill-C33. Previous

versions of this Act expired when elections had been called. The new Act prevents the direct killing of endangered species anywhere in Canada, and offers protection for the species and its 'home' on federal land. On lands of other jurisdictions, protection is a matter of negotiation. Provinces were encouraged to implement their own Act. Saskatchewan did so in 1997 (Sect. 2.1.1).

The main objective of this proposed legislation, according to Minister Anderson, is to help prevent species of wildlife in Canada from becoming extinct and to provide for the recovery of species at risk. However, the proponents of stronger legislation point out that there are a series of political loopholes that reduce its effectiveness. For example, the Environment Minister and Cabinet, not biologists, will have the final say about which species are placed on the list. When the listing of a species is approved by Cabinet, species recovery plans will be prepared, but the implementation of such plans is again at the discretion of the government. Therefore, the preservation of habitat, which is usually identified in recovery plans and an integral part of any meaningful action, is not mandatory, but subject to a political decision.

The Act recognizes the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as the body to provide a public record of species recommended for listing. However, the final say as to which of the species will actually receive protection rests with the Environment Minister and Cabinet, not biologists.

The Minister recognized these shortcomings but felt that it was important to make some concessions to obtain greater buy-in by stakeholders.

Minister Anderson has accepted a proposed mechanism of compensation for landowners in the event that species protection comes into unequivocal conflict with resource use. The Government's 2000 budget contained a commitment of \$90 million over three years, and stabilized funding of \$45 million in subsequent years, for the protection of species at risk. Also, a new habitat stewardship program has already started to contribute approximately \$5 million to over 60 partnership projects. Provisions through the EcoGifts Program will also make it easier for Canadians to donate ecologically sensitive lands and easements by reducing the capital gains arising from such donations.

A recent survey by Pollara indicates that many Canadians are willing to restrict mining and logging activities, leave lands undeveloped, and even accept fewer tax cuts to protect wildlife; 45% stated that "...tax cuts are nice, but legislation to protect wildlife is more important." Of those surveyed, 66% said they "strongly supported" a law to protect endangered species, while another 28% said they "somewhat supported" such a law -- for a total support of 94%.

One of the larger conservation concerns is that already stretched resources for environmental management may be diverted away from needy ecosystem projects to boost few but high priority

endangered species. Despite its need, endangered species management more often addresses ecological symptoms rather than fundamental causes.

2.1.3 Canadian Biodiversity Strategy. The authors of the Canadian Biodiversity Strategy defined "biodiversity" as "the variety of species and ecosystems on Earth and the ecological processes of which they are part" (Anonymous 1995). Diversity is broadly defined including genetic and species diversity, diversity in ecological function (e.g. ground water recharge, plant production, soil building) and diversity among ecosystems (e.g. land-based, water-based).

The goals of the Canadian Biodiversity Strategy are to:

- conserve biodiversity and use biological resources in a sustainable manner;
- improve our understanding of ecosystems and increase our resource management capability;
- promote an understanding of the need to conserve biodiversity and use of biological resources in a sustainable manner;
- maintain or develop incentives and legislation that support the conservation of biodiversity and the sustainable use of biological resources; and
- work with other countries to conserve biodiversity, use biological resources in a sustainable manner and share equitably the benefits that arise from the

utilization of genetic resources (Anonymous 1995).

2.1.4 North American Bird Conservation Initiative. Conservation plans, including the present one, are wish lists - but not without important functions. They can coordinate the will and strategies between different people/programs. The North American Bird Conservation Initiative is a 'super plan' that attempts to unify various bird conservation initiatives that are narrower in scope (Fig 2). Different plans focus on different levels (national vs. provincial, birds vs. biodiversity, disturbance zones vs. ecosystems). When combined with local context and stakeholder participation, these plans can lead to meaningful action.

It is noteworthy that in addition to bird monitoring projects by professional biologists, an enormous amount of data is gathered by many thousands of birdwatchers (e.g. bird-feeder watches, and similar bird counts; Fig. 2). This is tangible evidence of a widespread care and personal will to conserve this charismatic component of nature (Sect. 1). This public will and power has been harnessed effectively for data gathering, and it is starting to be harnessed in a tourism-economic sense, but many opportunities may have been ignored thus far. How could this power be harnessed, for instance, by farmers in IBAs?³

³ Darryl Amey and Elaine Androsoff of Darlaine Ventures process their own grains and market these directly to families and stores in Saskatoon. The attractive component to consumers is organic and local production. The producer

2.1.5 Prairie Canada Shorebird Conservation

Plan. The goals of the Prairie Canada Shorebird Conservation Plan (Gratto-Trevor et al. 2000) are similar to those included in the Canadian Shorebird Conservation Plan. Goals are to:

- acquire sufficient information about population dynamics, population trends, migration and staging strategies, and habitat preferences of prairie Canada shorebirds to make knowledgeable management recommendations;
- sustain and enhance sufficient high quality habitat to support healthy populations in prairie Canada;
- inform the public, decision-makers, and all those involved in land management in prairie Canada about the importance of prairie Canada to shorebirds, and about shorebird species, biology, trends and management; and
- ensure that coordinated conservation efforts (regionally, nationally, and internationally) are in place to address the key conservation priorities for shorebirds in prairie Canada.

Implementation will be encouraged and guided by a management board in cooperation with government and non-governmental organizations. A technical advisory committee was struck to encourage actions based on sound ecological knowledge and to address information gaps.

can capture the income that normally goes to shipping, processing and marketing. Darryl and Elaine's farm includes some of the poorly drained and saline grasslands at Radisson Lake's eastern shore.

stage at the time of writing (McNight 1999).

A companion plan exists in the United States. A Mexican shorebird plan was in draft

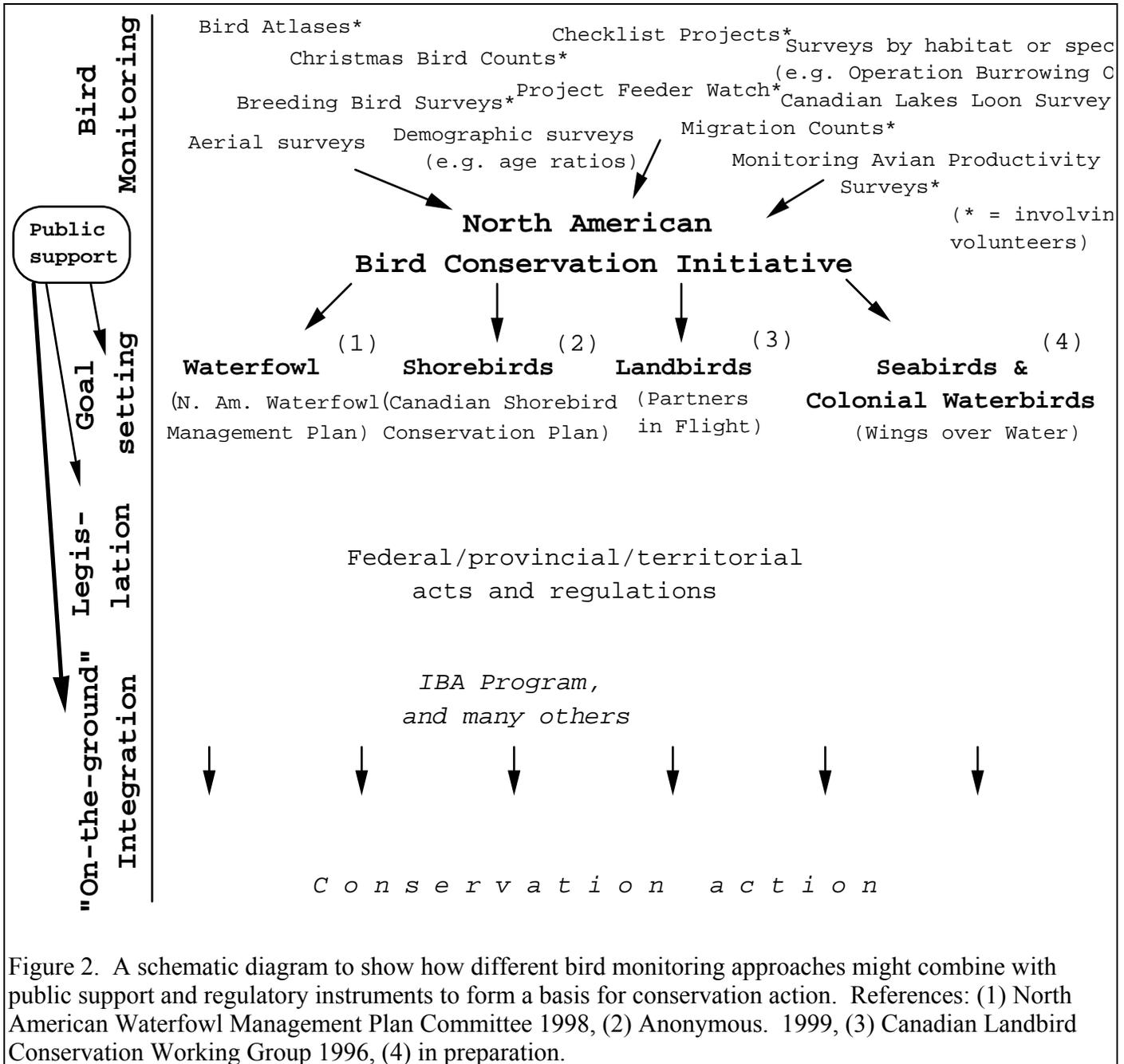


Figure 2. A schematic diagram to show how different bird monitoring approaches might combine with public support and regulatory instruments to form a basis for conservation action. References: (1) North American Waterfowl Management Plan Committee 1998, (2) Anonymous. 1999, (3) Canadian Landbird Conservation Working Group 1996, (4) in preparation.

2.1.6 North American Waterfowl Management Plan.

This plan was approved in Canada in 1986 by the Minister of Environment, and in Mexico in 1994. The plan was envisioned as an extension to the Migratory Birds Convention Act to coordinate effective management between the three signatory countries, including the United States. The plan was intended to help restore waterfowl populations to 1970s levels, to perpetuate waterfowl habitats, to employ management strategies according to subpopulations or flyway populations, and to incorporate subsistence and recreational hunting into management strategies. The prairie Canada portion of this plan came to be known as the Prairie Habitat Joint Venture (Anonymous 1986, Dickson and McKeating 1993).

In their 1993 analysis of the Prairie Habitat Joint Venture, Dickson and McKeating compliment the program for its achievements in waterfowl management, but they also conclude that more must be done to include species other than ducks. They point toward initiatives that were promising and suggest that multi-species management should be included more often than was usually the case in the early stages of habitat management.

In 1998, this plan was updated to recognize the "changing context of waterfowl conservation" (North American Waterfowl Management Plan Committee 1998). Aspects in need of adaptation include: i) more than 60

million people watch migratory birds and only 3.2 million hunt waterfowl, ii) the signatory countries are also part of other alliances that create their own obligations (e.g. the Biodiversity Convention), iii) initiatives for migratory birds other than waterfowl exist (e.g. Western Hemisphere Shorebird Reserve Network), iv) an increasingly suburban existence and increasing demands for food globally brings new challenges.

Under this waterfowl management plan, Ducks Unlimited Canada operates approximately 10,000 wetland and upland segments within the Prairie Habitat Joint Venture. Waterfowl and shorebird habitat management are seen as complementary, not exclusive. Many properties are specifically managed for both. "Cooperative partnerships are the key to better shorebird conservation in prairie Canada" (Sadler 1999).



3 The IBA Program

The IBA program is an international initiative coordinated by BirdLife International (Appendix 2), a partnership of over 100 countries seeking to identify and conserve sites important to all bird species worldwide. Through the protection of birds and habitats, it also promotes the conservation of the world's biodiversity. There are currently IBA programs in Europe, Africa, the Middle East, Asia, and the Americas. The Canadian IBA program is part of the Americas IBA program which includes the United States, Mexico, and 17 countries in Central and South America.

The Canadian BirdLife co-partners are the Canadian Nature Federation and Bird Studies Canada (Appendix 2, <http://www.ibacanada.com/html>). Bird Studies Canada is primarily responsible for site identification and designation. The Canadian Nature Federation facilitates conservation planning and implementation, working with its provincial partners.

The goals of the Canadian IBA program are to:

- identify a network of sites that conserve the natural diversity of Canadian bird species and are critical to the long-term viability of naturally occurring bird populations;
- determine the type of protection or stewardship required for each site, and

ensure the conservation of sites through partnerships of local stakeholders who participate in development and implementation of appropriate on-the-ground conservation plans; and

- establish ongoing local involvement in site protection and monitoring.

IBAs are identified by the presence of birds falling under one or more of the following internationally agreed-upon categories:

- Sites regularly holding significant numbers of an endangered, threatened, or vulnerable species;
- Sites regularly holding an endemic species, or species with restricted ranges;
- Sites regularly holding an assemblage of species largely restricted to a biome; and
- Sites where birds concentrate in significant numbers when breeding, in winter, or during migration.

3.1 IBA Saskatchewan

Nature Saskatchewan is working with the Canadian Nature Federation and Bird Studies Canada (Appendix 2) to deliver the conservation planning component of this program in Saskatchewan. IBA Saskatchewan was launched on 1 February 1999. Conservation plans for 13 sites (Appendix 3) will be completed by March 2001.⁴

⁴ The author, Joe Schmutz is internationally known for his research and conservation of prairie birds of prey, and has participated in a nationally sponsored interdisciplinary ecosystem and community-based research program. Joe was contracted by Nature Saskatchewan as IBA Community Conservation Planner. Joe has been appointed as a Research Fellow and taken up residence in the Centre for

IBA Saskatchewan has two homes, one in Nature Saskatchewan's office in Regina (Appendix 2) and one at the Centre for Studies in Agriculture, Law and the Environment (CSALE, www.ag.usask.ca/centres/csale), at the University of Saskatchewan in Saskatoon. CSALE is a newly formed strategic partnership integrating the disciplines of science, law and economics to conduct research into environmental issues related to agriculture. CSALE undertakes studies, provides education and develops policy options so as to enhance prairie and other agroecosystems.

4 IBA species information

Radisson Lake is of primary importance to species at risk (Piping Plovers, Whooping Cranes) and congregatory species (Tundra Swans, Snow Geese, geese and ducks; Table 1).

Table 1. Birds of the IBA and their season of main use at Radisson Lake, Saskatchewan. Significance status reflects whether bird numbers in the IBA exceed on percent of estimated national, continental or global population size. Some other birds prominent in the IBA are also listed. Data are taken from the IBA database, and originally derived from surveys by federal and provincial biologists and other sources.

Species	Bird Numbers	Year	% total population	Season	IBA Significance status
IBA birds					
Whooping Crane	4 adults	17 yr av.	2.2	Migration	Global
Tundra Swan	2,500		1.2	Migration	Global
Other species					
Piping Plover	3 adults	19 yr av.	<1	Breeding	
Snow Geese	7,000		<1	Fall migration	
Total waterfowl	20,000			Fall migration	

4.1 Whooping Crane.

The biology and conservation of the Whooping Crane is summarized by Lewis (1995) and again summarized here. The Whooping Crane is one of the most spectacular examples of management helping to reverse a species' decline; from 15 or 16 individuals in 1941, to 257 in 1995.

The male whooper, 15% larger than the female, stands 1.5 m tall and weighs over 7 kg. Adults are largely white with black wing tips. Young are reddish-brown and lighter coloured below.

The crane was originally named 'whooping' for its loud, single-note call given when alarmed or given as part of the 'unison' call, a call that connects the pair even when out of sight. The extra long trachea of the whooper increases volume and pitch, and is coiled in the body to accommodate this length.

During the mid-1800s, Whooping Cranes were widespread with an estimated 1300-1400 individuals, sparsely distributed with no known concentrations. They occurred throughout the northern tall-grass prairie; from central Iowa through Minnesota, Manitoba, Saskatchewan, to near Edmonton, Alberta. Scattered breeders existed in the short-grass prairie in Wyoming.

Whooping Cranes are now relegated to three small populations. There are also captive flocks held in 4 different locations to minimize

loss due to accidents. The single self-sustaining population nests in the Northwest Territories and adjacent areas in Alberta, primarily Wood Buffalo National Park. This group migrates and winters along the Gulf of Mexico, primarily on the Aransas National Wildlife Refuge. A second non-breeding population consists of only four individuals that summer in an area bridging Idaho, southwestern Montana and western Wyoming, and winter in the Rio Grande valley of New Mexico. This group was established by having Sandhill Cranes rear Whooping Crane chicks.

A non-migratory flock of 25 cranes exists in central Florida, the result of 52 cranes raised in captivity and released there. The only captive flock in Canada exists at the Calgary Zoo.

Spring migration from Aransas begins on 15 March to 15 April, with stragglers, mostly juveniles, remaining as late as 1 May. Family groups and pairs depart first, arriving on the Wood Buffalo Park nesting area in late April. Fall migration from Wood Buffalo Park begins in mid-September. The cranes spend several weeks resting and feeding in Saskatchewan, before moving more quickly through the United States.

Migrating in daytime, the cranes use thermal updrafts when these occur and fly at roughly 600 m elevation. Whoopers travel as singles, pairs or family groups, sometimes up to seven cranes per group. During migration, cranes roost in shallow waters in lakes, ponds or river bays. Wetlands used for roosting tended to be small (<0.5 ha) and within 1 km of feeding areas.

Marsh habitat is an integral part of the Whooping Crane's existence. Marshy lands make their nest inaccessible to predators, protect the birds themselves from disturbance, and support their food and method of feeding. Given the widespread draining of marshes after Europeans settled the Great Plains, it is not surprising that this bird suffered so greatly.

Whooping Cranes are omnivores, catching their food on land or in shallow water, or by probing in soft mud. Summer food is comprised mainly of animals including dragonfly larvae, tadpoles and small fish, but also plant tubers and berries. On migration, waste grain (barley and wheat) is most commonly used. In winter, animal items including blue crabs and razor clams, are supplemented with plant matter including acorns, wolf berry fruit, plant roots and some grasses.

Male cranes are the primary defenders of the family and nesting territories, the latter ranging from 1-47 km² in size. The initial pair bond is formed slowly, over 2-3 years as birds gain sexual maturity, and seems to last as long as both birds live. If one member of the pair dies, re-mating happens much more quickly than the initial bond, in a matter of weeks. Life span in the wild has been estimated as 22-30 years, and perhaps more.

The first clutch tends to be laid at four years of age. Two eggs are most common. Mortality is highest among chicks, due to predation and weather related factors.

Wild Whooping Cranes can contract diseases such as avian tuberculosis, avian cholera, and other bacterial infections. Other causes of mortality include starvation, fire - especially when young or moulting adults are flightless, collision with powerlines and other structures on migration, and predation. Powerlines alone, have killed or injured at least 19 cranes prior to 1995, and 2 since that time including 1 in Saskatchewan.

Disturbance, including viewing, can impact the cranes, especially along the Gulf Coast where boating and other resource uses disturb the cranes. Generally, the birds become used to bird watchers very quickly if not pursued too closely. Except during migration, the cranes are wary when away from their territories and will generally fly at the sight of a human within 400-500 metres.

The first level of protection was afforded the cranes by the signing of the Migratory Bird Treaty in 1916 (Sect. 2.1.1). Wood Buffalo National Park was established in 1922. Its role was to protect Wood Bison at first, but unknowingly it protected Whooping Cranes at the same time. The Aransas National Wildlife Refuge was established in 1937 to protect Whooping Cranes.

Studies to explore the species' biology and requirements for conservation were launched in the 1940s, culminating in a monograph published in 1952. In 1967 biologists of the Canadian Wildlife Service and U.S. Fish and Wildlife Service began strategic egg-removals and captive

rearing to augment the Wood Buffalo-Aransas population, and establish the other populations. When an egg at Wood Buffalo National Park was tested and found not viable, it was replaced with an egg from another 2-egg nest. In this way the overall fledging success was likely enhanced by having more adults raise fewer young each, since sibling rivalry often leads to only one surviving young.

4.1.1 Whooping Crane sightings near Radisson Lake. Between 1980-2000, 28 sightings were made by biologists and local birders (Brian Johns, pers. communication; Table 2). Four of these were in spring (21-30 April) and 24 in fall (12 Sept. - 16 Oct.). Cranes were encountered either at the lake (n = 13), or in stubble fields or pasture up to 8 km away (n = 15).

Table 2. Whooping Crane sightings at Radisson Lake, Saskatchewan. Source: Whooping Crane migration database maintained by Brian Johns (Appendix 1).

Year	Adults	Young
1980	5	1
1982	6	1
1983	2	1
1985	5	1
1986	4	2
1987	2	1
1988	4	1
1990	2	0
1991	2	0
1992	6	0
1993	2	0
1994	4	0
1995	2	0
1996	8	1

1997	4	1
1998	7	1
2000	3	1

4.2 Tundra Swan.

The Tundra Swan, formerly Whistling Swan, is one of two native and a third feral swan in North America. Adult Tundra Swans show a yellow spot below the eye and have a concave upper border of the black bill and white head. Trumpeter Swans lack the yellow lore and have a wedge-shaped head. The feral Mute Swan holds its neck more curved than the two natives, and has an orange bill with a black base and black knob. The natural history of the Tundra Swan has been reviewed by Limpert and Earnest (1994).

The current breeding range of the Tundra Swan includes lakes, ponds and river deltas across the northern tundra, from the Aleutian Islands of Alaska to Quebec. In winter, the swans occupy disjunct areas. Swans breeding along the western coast of Alaska winter along the coast and some distance inland from Vancouver Island to central California. In addition, the swans winter inland far from the coast in British Columbia, and the Rocky Mountain states. The northern Alaskan and all of the Canadian breeders winter in a short coastal stretch including the Chesapeake Bay area, from New Jersey to South Carolina.

On the southward migration, Tundra Swans depart from the Arctic in late September in family groups (4 young are common) or small to

medium-sized flocks (possibly ≥ 100). Individuals arrive on the Great Plains in October. Once they reach Ontario or Minnesota, they depart in a non-stop flight to reach their wintering quarters about mid-November. One radio-marked individual was clocked at 82 km/h. In mid-March the swans depart again northward, to cross the northern Great Plains in April. Juvenile birds probably separate from their parents after their northward migration to the breeding grounds. Fidelity to wintering areas is high, and here the previous year's offspring may rejoin the new family and recognize their parents. The oldest neck-collared Tundra Swan was 21 years old.

While on migration, Tundra Swans use ponds, lakes and marshes for feeding and resting. They feed on seeds, stems, roots and tubers of submerged and emergent aquatic vegetation. They will frequent fields to feed on waste grain and growing winter cereal crops. Tundra Swans will also consume some animal matter, mainly mollusks.

Populations of Tundra Swans are tracked through annual mid-winter surveys. An average population estimate over three years yielded 87,000 individuals for the eastern and 64,000 for the western population. The swans have benefited from regulated hunting, and have doubled in population size during the 35 years prior to 1989. Shooting is the most common source of mortality of swans once they have fledged. There is currently a regulated hunt of roughly 4,000 Tundra Swans, and an additional take of 5,000 by native peoples.

A moderate mortality other than through shooting was attributed to ingestion of lead shot and lead fishing sinkers. The greatest threats to Tundra Swans now come from oil and gas extraction in the Arctic, and a continuing loss of wetland stopover sites.

There is one record from Stony Lake (western parkland) of a pair of Tundra Swans breeding in Saskatchewan, from 1973-80 (Smith 1996). Most swans of the eastern population migrate through Saskatchewan (see picture collage), and as many as 20,000 individuals have stopped at one lake (Smith 1996).

4.3 Piping Plover.

The ecology of this species has been summarized by Haig (1992) and forms the basis for this synopsis. The Piping Plover takes its name 'shorebird' literally. It spends virtually its entire life on the beach, at ocean shores, in bays, on inland lakes and rivers, and temporary ponds. It uses primarily the very edge of the water and a narrow upland strip. Bathing seems to be the only time when it deliberately gets wet.

Piping Plovers feed on aquatic and terrestrial invertebrates. At the water's edge, they capture those invertebrates that are vulnerable after having been whipped up by wave action, or left behind in the film of receding water. On the Great Plains, aquatic invertebrates include mostly aquatic insects in the larval stage. The plovers also run down terrestrial insects on the beach and seem not to take them in flight.

To raise their brood, Piping Plovers begin by making a depression in the sand. This inconspicuous depression is then lined with items found nearby, including pebbles and sometimes broken shells from snails or clams. The male and female appear ritualistic when they line their nest, tossing items with their bill. During egg laying and the 4-week incubation period the plovers are 'tied' to this spot, but soon after the young hatch, the family is able to move to other areas on the beach. The young fledge at three weeks of age.

Concealment and camouflage are essential features in the Piping Plover's life, especially during nesting. Nests are sometimes near larger objects such as logs or boulders, presumably selecting rough areas which large animals might avoid. Piping Plovers have many predators of eggs and young, including mammals and birds. Their reliance on shores predisposes the plovers to predation, because these water bodies are visited by many animals in an arid landscape where water bodies can be rare. Human activity also is often concentrated at shores and this can result in conflicts. Rushing storm water sometimes washes away nests, and others are flooded when water levels are drastically altered in reservoirs.

4.3.1 Status and requirements. Attempts to protect the declining Piping Plovers have been many. Plover numbers on the Great Plains continue to decline (from 3,469 in 1991 to 3,284 in 1996), although they increased in Saskatchewan from 1,172 to 1,348 over this period (Skeel et al. 1996). Along the Atlantic Coast, numbers are maintained, no doubt due to the intensive protection measures including limiting human, vehicle or other recreational travel along shores. Plovers of the Great Lakes are showing an increase in recent years (Paul Goossen, pers. communication).

In Saskatchewan, Piping Plovers are widely distributed (Smith 1996), often with only a few pairs at any one lake. Also, as habitat changes, the plovers are often forced to select different sites. Suitable Piping Plover habitat is

dependent on water level fluctuation. If water levels are low for several years in a row, vegetation invades the broad beaches and Piping Plovers do not return, apparently due to a shortage of exposed beaches. A broad beach or mud flat with nearby water is a requirement (Skeel and Duncan 1998; Sect. 7.3).

4.3.2 Local distribution. In Saskatchewan, Piping Plovers nest in the prairie and parkland region (Smith 1996). Plovers return to the region in early May. Incubation takes place in late May and June. Except for possible re-nesting after the first clutch has failed, chicks should be hatched and mobile in early July. The plovers apparently depart again in August.

At Radisson Lake, Piping Plovers have used parts of the eastern and northwest shores. Radisson Lake characteristically supported few plovers and only in some years (Table 3). Likely contributing factors are the lake's location at the northern edge of the plover's range and fluctuating water levels.

Table 3. Counts of Piping Plovers at Radisson Lake during the years of the international census 1991 & 1996, and some intervening years (Skeel et al. 1996).

Year	Pairs	Single plovers	Total plovers	Survey
1986		1	1	Partial
1990			0	Complete
1991	2	1	5	Complete
1992			0	Complete
1996			0	Complete

4.4 Waterfowl.

The four pillars of waterfowl management and conservation are: habitat protection and enhancement, facilitating reproduction, minimizing losses to disease, and regulating harvest. The Radisson Lake area is ranked nationally important for migrating ducks, and regionally important for migrating geese, by Poston et al. (1990). Because of the relatively level landscape, wetlands are shallow and it is not a major area for breeding waterfowl.

5 Human Context

It is unlikely that birds can be protected in isolation from human practices and values. The following human context is intended as a background against which future conservation opportunities and threats can be evaluated.

5.1 Land ownership

Radisson Lake is large enough to extend across several parcels of land and falls under the responsibility of the Crown (Fig. 3). Six different landowners hold title to the lands bordering on Radisson Lake.

5.2 Historical land use.

Radisson Lake is part of a large block of land claimed under Treaty No. 6, which was signed in 1876. Prior to that time, the North Saskatchewan River was a prominent fur trade route. Cree and Nakota (Assiniboine) trappers delivered their catch by canoe traveling to Hudson's Bay Company posts on Hudson Bay. The first European to travel this route, and to

come at least close to Radisson Lake, was Anthony Henday in 1754-1755. Henday was the second European to see the northern prairies, after Henry Kelsey who traversed eastern Saskatchewan. A private trading post existed along the North Saskatchewan River in 1778, known as Pigeon's House, 30 km W of Radisson Lake (Fung et al. 1999).

John Palliser criss-crossed the Radisson Lake region repeatedly in 1857-1860. One reconstructed route would have taken Palliser past or very close to Radisson Lake. He noted the river bend and recorded the region north of the river as the 'elbow.' Notes on his map also describe the sandy region near Radisson Lake.

Palliser was not optimistic about the potential of the southern Canadian prairies for agriculture. His endorsement was slightly better for the parkland and parkland edge. The northern edge of what has come to be known as Palliser's Triangle is approximately 50 km south of Radisson Lake. Palliser's Triangle is a region characterized by precipitation being only 60-70% of potential evaporation and by recurring droughts. John Macoun's exploration in 1879-1881 was much more optimistic of the region's potential for agriculture and led to the railway's routing through the heart of the Palliser Triangle (Fung et al. 1999).

The Radisson Lake area was not part of the emerging ranching area located further south. Ranching became prevalent there after the Canadian Government introduced a liberal and

attractive grazing lease policy in 1881. The government was

Fig. 3

determined to find another economic activity for Palliser's Triangle after the loss of the 'keystone' bison.

During Sir Wilfried Laurier's second term in office, in the rush to unify Canada right across to the West Coast, he spared no cost to settle the prairies and to achieve an economic integration to solidify Canada's stronghold on the region. In this haste, there was little regard for environmental or sustainability concerns, even if these had been recognized at the time (Potyondi 1995).

The Saskatchewan Department of Agriculture was formed in 1905 and data were gathered. Mixed farming was hailed as the path to success. The Dominion Lands Act was created in 1908, encouraging farming by allocating 160 acres per homestead. Settlement and essentially free land was aggressively promoted, such that by 1916 the human population in southwest Saskatchewan had nearly quadrupled in 10 years.

It soon became apparent that Palliser's doubts about the capability of the prairies to support European-style farming were warranted. Severe water limitation was soon recognized and 'summer fallowing' was hailed as the technique of choice, growing crops only twice in three, or once in two years. This practice conserved moisture but predisposed the soil to erosion by wind and water. The moisture holding capacity of the soil was further weakened by halving in 50 years the soil's organic matter that had been accumulated over 10,000 years.

Although it took only a matter of decades for land on the prairies to be claimed privately or by the Crown, human adaptations and land uses on the prairies continue to change. This is relevant for conservation. During settlement, sustainability was not perceived as a need. When a new (economic) force came to bear, or when sustainability challenges had to be faced, practices were merely amended reacting to what was in existence (e.g. Potyondi 1999). It is urgent to make sustainability a consideration now for our own sake and for the birds.

5.3 Current land use.

The township including Radisson Lake was settled around 1911. In a 1996 census, the major ethnic groups represented were British (~25%), followed by German and Scandinavian (~15%). This roughly approximates the provincial average, except for Scandinavian representation which is slightly higher at Radisson Lake.

5.3.1 Farming. Cultivated acreage apparently increased sharply in Saskatchewan in two periods; after settlement and again in the 1950s to 1970s. The latter increase was in response to agricultural policies, the Canadian Wheat Board's quota system (Thornton et al. 1993), and the profitable farming of the 1970s. Currently, approximately 60% of land in the R.M. is in crops, 20% in summer- or "chemical" fallow, and 20% in pasture (Fig. 3).

Wheat is the primary crop grown and together with other grains comprises roughly 60% of crops. Oilseeds and forages are the other major crops. Crop yields tend to be reasonably high in the region where soils are of good quality for agriculture. Immediately adjacent to Radisson Lake, soils are poor due to prevailing sandy conditions. However, soil capability for agriculture is much greater south and west. About 75% of the farms are under sole proprietorship, as opposed to farm corporations. This percentage is among the highest in the province.

5.3.2 Ranching. There are apparently no large ranches where the majority of a landowner's livelihood comes from range cattle. However, about 45% of farms also have beef cattle, but less than 20% of farms categorized themselves as cattle farms primarily (Fung et al. 1999).

5.3.3 Oil and gas extraction. There are apparently no gas, oil or mineral deposits in the immediate area of Radisson Lake. Only potash and salt deposits are recorded for the area and a region northward (Fung et al. 1999).

5.3.4 Tourism.⁵ Both the town of Radisson and Radisson Lake are close to Hwy. 16, the

⁵"Tourism in Saskatchewan generates \$1.14 billion annually for the provincial economy, employs 42,000 Saskatchewan people, and is the province's fourth largest economic sector. By 2010, it is expected to employ 65,000 workers and to

Yellowhead branch of the Trans-Canada Highway. Estimated traffic is 1,000 vehicles per day. There are no tourist attractions, campgrounds or parks near Radisson Lake. Accommodations are available in the hotel. A camping ground is available in summer.

5.4 Conservation management achieved at the site

This section highlights activities by some organizations that are active and visible in the watershed. This list does not give due credit to the day-to-day choices people make in their own lives that advance - or discourage - conservation one step at a time. One is reminded by the sage advice of unknown origin '...to heed only the important things in life, but to know that all things important are small.'

5.4.1 Saskatchewan game preserves are administered by the Department of Environment and Resource Management. Most have been created in the 1930s and 1940s. Radisson Lake is a game preserve, including the lake and land 200 m from the water's edge (Nieman and Isbister 1973). This prevents hunting around the lake under the "Wildlife management zones and special areas boundaries regulations" pursuant to the Wildlife Act 1997. Game preserves are indicated by yellow signs.

generate revenues of \$2 billion annually. " (Saskatoon Sun, 4 June 2000, p. 17).

5.4.2 Conservation Easements Act. This Act represents a useful tool for habitat conservation and could play a role in protecting the vicinity of Radisson Lake.

The Saskatchewan Environment and Resource Management web site states: "A conservation easement is a voluntary legal agreement between a landowner and a qualified conservation agency. Under this agreement, the landowner continues to own and manage the land with benefits to both the landowner and the environment. As a landowner, you can take steps to preserve your property's conservation values, retain use of the land, and at the same time receive income tax benefits.

A conservation agency of your choice can assist you in preparing an agreement. A conservation easement can be granted for a specified time, or in perpetuity.

Granting a conservation easement means you are preserving the environment value of your land for the future. If the easement is granted in perpetuity, the natural values of the property will be protected indefinitely, no matter who owns the land in the future. The donation of a conservation easement is viewed by Revenue Canada as a charitable gift. The value of the gift is the difference between the land's value with the conservation easement and the best land-use value without the easement. This taxable benefit may be observed at the time of donation or extended over five years.

If the land is sold, the conservation easement will be transferred with the property, and terms of the easement will remain. These arrangements may also ease the financial burden of intergenerational land transfer. In some instances, conservation agencies may be willing to purchase an easement on privately-owned lands."

5.4.3 Piping Plover Surveys. Coordinated surveys to count Piping Plovers are carried out every 5 years across North America, including prairie Canada, eastern Canada and the United States. This survey is one of the actions suggested in the revised Canadian Piping Plover recovery plan endorsed by the recovery team struck by RENEW (Committee for the Recovery of Nationally Endangered Wildlife in Canada, Environment Canada, Sect. 2.1.2).

The first plan was approved in 1989 and an updated plan was approved in 2000. Preparations are now underway to organize the next breeding season survey in 2001. A similar survey is undertaken on the plovers' wintering grounds.

5.4.4 Ducks Unlimited Canada has three management projects within 15 km of Radisson Lake. Also, Radisson Lake itself is a project which began in 1978. A cross-dike was constructed at the narrows on the west side to manage the water level. Eleven islands were constructed to provide secure nesting habitat. In subsequent years, the control structure washed out on the cross-dike, and in 1999 the ends of the dike were cut off from the shore. This effectively limits dike access to mammalian predators, creating a long narrow island for nesting waterfowl.

Ducks Unlimited Canada's upland projects in the area are either land leases, or purchases in

partnership with the Saskatchewan Habitat Development Fund. The general strategy is to seed uplands that are near wetlands with grasses to serve as nesting cover for waterfowl.

5.4.5 Monitoring. In addition to the routine field visits by wildlife personnel, Radisson Lake has been included in monitoring of Piping Plovers (Sect 5.4.3) and Whooping Cranes. For Piping Plover, recorded counts date back to 1986 (Sect. 4.4.2) and for Whooping Cranes to 1980 (Sect. 4.1.1). In addition, Radisson Lake has been visited by birders numerous time and some of these results will be recorded in the upcoming book entitled "The birds of Saskatoon."

6 Opportunities

Since birds and people do not exist in isolation of one another, the aim of this conservation plan may be well served by pointing out those circumstances which can help the combined cause of conservation and quality of life for people.

6.1 Water quality and quantity.

When actions are contemplated to address water quality and/or quantity issues at Radisson Lake (Sects. 7.1, 7.2), this should be done with the interests of people and birds in mind. By combining these two motivators, more often than not this represents an opportunity for creative solutions and not a hindrance. This sentiment was expressed also in a soil, water and wetlands Task Force Report (no date) in their highlight no. 1: "The multi-use process of using resources is advocated to ensure a cooperative, problem-solving approach between agricultural and other interest groups." At the very least, more funding tends to be available when two or more factors are addressed.

Water quantity issues are a broad scale, ecosystem issue, and much more difficult to address than a pollution point source. However, difficulty should not be an immediate roadblock. When the issue is addressed, people with diverse

expertise should be consulted for creative solutions.

One option for waste water recovery may be through the use of bio-ponds. According to Brown et al. (1998:106), "One simple and ancient alternative to sewage treatment plants is waste stabilization ponds, a series of holding areas where sewage is retained for 10 days to a few weeks. Bacteria and algae convert the effluent to a stable form as it passes from pond to pond. Stabilization ponds require more land than conventional treatment plants do, but they are much cheaper, simpler to build and maintain, and best of all from the recycling perspective - more effective at producing safe irrigation water."

During such treatment, the ponds could provide waterfowl habitat in addition to what Radisson Lake now has. Also, the restored water could partly offset potentially declining water levels.

6.2 Tourism.

Judging from discussions with local people, there is modest if any effort to attract tourists to Radisson and Radisson Lake (Sect. 5.3.4). Bird watchers from Saskatoon know Radisson Lake to be a key birding spot and many make day trips to the area. Day-trip nature events are recognized as having high volume in Saskatchewan, but the economic benefit to local communities is small (Western Management Consultants et al. 2000). Many 'birders' bring their bag lunch, but perhaps local businesses have failed to capitalize on that opportunity. Radisson Lake has the advantage of being located adjacent to a major Saskatchewan highway. Furthermore,

Radisson Lake could be a stopping point en route to the Redberry Lake IBA (Appendix 3), and this opportunity could be part of a strategy for attracting visitors to both areas.

Whooping Cranes are special in many ways and many people would go to considerable extent to see one - this would be the sighting of a lifetime for some! Radisson Lake is a site where Whooping Cranes can be most predictably seen in Saskatchewan, in comparison to any site used by cranes on migration. Local people could capitalize on this opportunity and offer guided trips. A bird hotline (306-955-5595 for Whooping Cranes near Saskatoon) could serve to let people know about the presence of the cranes and where to contact a guide. Similarly the Saskatchewan Bird Trails initiative (Sect. 6.3) could be organized such that visitors at all of the priority bird sites in Saskatchewan could be made aware of opportunities at other sites.

According to Fung et al. (1999:269-270), "Tourism is already the world's number one industry in terms of overall contribution to the international economy. It continues to grow in importance. Tourism is the fastest-growing industry in Saskatchewan. It is an economic generator with travelers spending an estimated \$1.1 billion in the province in 1997."

Despite the promotional enthusiasm bordering on hype, there are pitfalls in the industry, especially in situations when start-up costs are high and economic losses possible. Tourism clearly needs to be managed to match the aspirations of the local community, and the necessary infrastructure needs to be in place.

6.3 Bird Trails

Saskatchewan IBAs, such as Chaplin-Old Wives lakes and the Quill Lakes, may soon become a major 'anchor point' in Saskatchewan's budding bird trail network. Bird trails have been established in many parts of the world. In these trails, birds are the theme used to attract visitors and to realize tourism opportunities. Bird watchers have become the largest of nature-loving groups. Bird watchers, or birders, look for birds to identify as a primary hobby, ornithologists study birds professionally, and naturalists appreciate birds and other living things as members of larger living communities in their environments. The Bird Trail initiative is part of Saskatchewan's Ecotourism strategy, complemented by an Agritourism strategy (Pam Wight and Associates 1998).

In Saskatchewan, 648,000 people aged 15 or older participated in nature-related activities in 1996, for a total of 41 million person-days and an expenditure of \$388 million. Wildlife viewing on nature-related trips was reported by 15.1% of Saskatchewan residents (Filion et al. 1991).

6.4 Conservation easements.

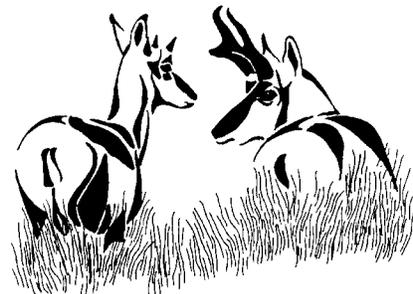
Conservation easements adjacent to the lakes could be used to encourage land management that is in favour of birds. In this way both benefits and costs are shared by society collectively. Easements could also extend to

lands west of Radisson Lake where drainage feeds into the lake (Fig. 3). While the erosion potential in this flat landscape may be low, a transfer of agrochemicals from fields to lake are a possibility and a threat (e.g. Donald et al. 1999).

Whooping Cranes seem to use certain fields northwest of Radisson Lake with great regularity (Corey Loessin, pers. communication). Given this high priority bird and high priority area, efforts might be made to maintain current land uses in these areas also.

6.5 Conservation education.

The comparatively high predictability of Whooping Cranes at Radisson Lake during the school year and its proximity to Saskatoon provides an educational opportunity. Education should focus not only on the cranes themselves but place the exemplary and hitherto successful species conservation effort in a larger biodiversity and cultural perspective. What everyday actions of the average Canadian impact directly or indirectly on Whooping Cranes? Whose responsibility is it to ensure the cranes' survival and how can this be achieved?



7 Threats

7.1 Water quantity.

Redberry Lake, located 25 km northeast of Radisson Lake (Appendix 3), has seen a 2 m decline in water level over the past 3 decades (Schmutz 1999). Given the shallow nature of Radisson Lake, relatively small changes in water level could affect the size of the lake significantly. During the 1930s, the entire lake was dry enough so that one could drive across it (Corey Loessin, pers. communication).

In view of potential climate change and subsequent increased evapotranspiration, there may be even more stress on aquatic systems in Saskatchewan than we currently experience. According to Charlson et al. (1992), predictions about the future outcome of the green house effects and its impact on climate, ecosystems and biodiversity are fraught with uncertainty. Experts seem to agree that a warming trend is taking place now, but disagree over its causes and thus what to do about it. In a recent article entitled "Get off the global warming bandwagon," William M. Gray a Colorado professor of atmospheric science states that "This small warming is likely a result of the

natural alterations in global ocean currents which are driven by ocean salinity variations.

Ocean circulation variations are as yet little understood. Humankind has little or nothing to do with the recent temperature changes. We are not that influential."

Other experts state that "Much remains to be learned about the climate-forcing mechanisms that operated over the last millennium, but current research clearly implicates anthropogenic [human-caused] greenhouse gases in the remarkable temperature changes of the last century. Given that the atmospheric carbon dioxide concentration is now higher than at any time in (at least) the last 420,000 years, that it will almost certainly double within the next century, and that a considerable amount of heat has already been sequestered in the upper ocean during this century, the climatic and environmental changes of the last millennium may be trivial compared with those in the near future" (Bradley 2000).

7.2 Water quality.

Radisson Lake is saline. This in itself is not a problem, since salt lakes can be very productive at low or moderate salt concentrations. However, when much of the water evaporates, the salt is left behind, and this can lead to great changes in salt content. In the prairie ecosystem located in the rain shadow of the Rocky Mountains, precipitation is low, the water cycle's cleansing action is reduced, and natural and human-induced impurities are flushed slowly from the surface waters. Therefore, water quality for birds and people needs to be particularly carefully managed (Coote and Gregorich 2000).

Radisson Lake receives the town's waste water piped in from treatment ponds twice a year.

This waste water disposal was the method of choice in rural Saskatchewan. Under increasing water stress and concern over quality, many communities have moved toward more effective methods of waste water management.

Water quality is affected by characteristics that are biological (bacteria, amoebae, microbes), chemical (phosphorous, nitrates, trace minerals, compounds), physical (sediment, temperature, pH) and esthetic (appearance, aroma, taste; Stonehouse et al. 1997). There are ample reasons to expect that issues of water quality affect both wildlife and people. In a presentation made at a conference in Regina on 17 May 2000, Hans Petersen reported that of the southern Saskatchewan drinking water sources examined, 95% failed health guidelines in one or more aspect (Canadian Broadcasting Corporation newscast, 18 May 2000).

According to an informal query, the people of Radisson enjoy good quality drinking water. This water comes from two wells located near town. Drinking water quality is notoriously difficult to measure and a full spectrum analysis is usually prohibitively expensive. As a result, water quality tests address the general characteristic of total dissolved solids, with few specific analyses. According to the Safe Drinking Water Foundation, (www.safewater.org) "the Department of Health

only tests for coliforms and nitrates, and then make their assessment on whether the water is safe or not! They don't test for bacteria, they don't test for parasites, they don't test for viruses, and they don't test for pesticides! The

Safe Drinking Water Foundation does not think this is sufficient."

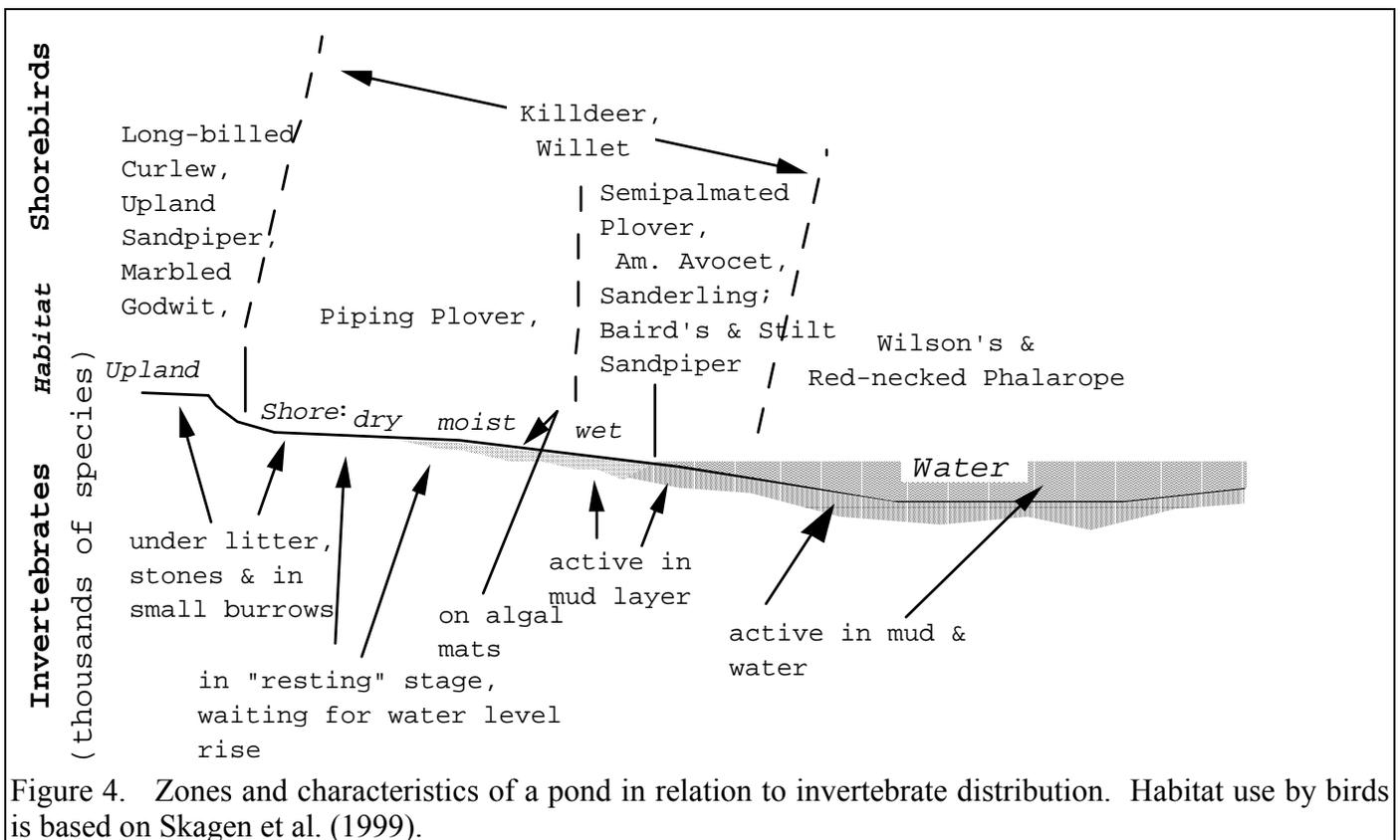
7.3 Wetland dynamics

It is not clear why Piping Plovers are so low in number at Radisson Lake (Sect. 4.3.2). Are wetland characteristics insufficient to sustain the plovers?

While a local freshwater or saline lake is often discounted as 'just a slough,' the biodiversity and ecosystem dynamics that operate there are complex. Figure 4 offers a glimpse into some of this complexity from the point of view of feeding lifestyles of shorebirds including Piping Plovers -- greatly simplified at that. If factors that operate here are disrupted, this can be a threat.

Different species of shorebirds occupy rather specific habitats along a shore or on a lake. Management strategies should be cognizant of different feeding styles and different small-scale habitats used at different times. Biodiversity relies on habitat diversity. Different feeding strategies by shorebirds include:

- gleaning, to peck, scrape or pry out insects in view on or near the surface of ground or water (e.g. Long-billed Curlew, Piping Plover or Sanderling).
- probing, using bill in soft mud to feel for and grab live insects or resting cocoons (e.g. Sanderling, sandpipers, Am. Avocet).



- scything, pushing bill through soft mud sweeping side to side in search of insects (e.g. Am. Avocet⁶)
- spin-swimming, phalaropes swim in tight circles and disorient insects in the water column making them easier to catch.

For insects to survive in their resting stage, a flood has to recur before their 'time is up' (even resting takes small amounts of energy and this can be depleted over years). Thus, blocking the regular occurrence of flooding and drying eliminates in a pond's seasonal cycle will impact insects. Prolonged droughts may be expected under climate change. Water impoundments in the drainage basin could have the same threat.

Insect resting stages die if they are exposed to the extreme drying of the sun. Agricultural cultivation of wetlands in their dry period exposes insects to the sun, as does trampling by cattle. A trampled shore alters the soft mud layer and potentially reduces availability of insects to birds.

⁶ A subtle connection between feeding strategy and habitat is illustrated here. Avocets tend to avoid sandy beaches, presumably because the bill would suffer too much wear during scything in this abrasive substrate and not retain its pincer-like feeding function.

7.4 Predation.

Predation is clearly a natural process, but it's balancing factors can be out of synchrony when ecosystems change or through human actions. Radisson Lake does not have persistent islands attractive to gulls for nesting, nor are there many trees or shrubs that would attract crows, magpies or hawks in the immediate vicinity. These predators do consume plover eggs and young. This open landscape at the lake should be maintained. Management strategies should be specific not to attract predators to the vicinity; trees and shrubs (planted shelterbelts) attract crows, magpies and raptors, and islands in the lake may attract gulls.

7.5 Accidents.

The proximity of Radisson Lake to a major highway and rail-line (Fig. 1) may pose a small risk from chemical spills. Striking a powerline is a considerable threat to Whooping Cranes.

7.6 Disturbance.

Human disturbance can reduce an animal's feeding time, or prevent it from breeding, or

interfere with an animal's occupancy of cover which it ordinarily occupies to escape from predators or the elements. Bird watching is a benefit in the greater scheme, but when visitor numbers are high, it should be managed to avoid it becoming a threat.

8 Conservation Goals and Objectives

'A conservation plan does not conservation make.' This conservation plan is no different. It is a stepping stone in the continuum from conservation goals to conservation action (Fig. 2). A purpose of this plan is to serve as a tool, by providing a description of ecosystem elements which are presumably critical for conserving the IBA birds, the IBA sites, the landscape and the people's quality of life. The plan also outlines some specific goals and actions.

8.1 Management goals

Goal 1. In view of the importance of the site for Whooping Cranes and in view of potential changes in water level under climate change, water quantity should be monitored and opportunities for retaining water explored.

Goal 2. Human disturbance of Whooping Cranes and Piping Plovers should be prevented.

Goal 3. Consideration should be given to features in the surrounding landscape which Whooping Cranes need (e.g. food and undisturbed feeding).

Goal 4. Find ways to support local land owners use strategically placed permanent plant cover to discourage erosion from fields reaching the lake.

Goal 5. Discourage the erection of high power transmission lines or other tower structures in the vicinity of Radisson Lake.

8.2 Infrastructure goals

Goal 6. In the event of management of water at Radisson Lake, as many stakeholders as possible should be involved.

Goal 7. Encourage the inclusion of Radisson Lake in the 'bird trails' system, and any other tourism opportunity that ensures both a quality experience for visitors without any loss to the birds themselves.

8.3 Educational goals

Goal 8. Provide schools with appropriate resource materials including field trip guides to highlight the special nature of Radisson Lake, particularly with regard to Whooping Cranes.

Goal 9. Encourage where possible the sharing of information with local people to highlight the

treasure they have 'at their door,' the opportunities and also the threats to conservation.

8.4 Research and information needs

Goal 10. Continue to monitor crane and plover numbers at Radisson Lake.⁷

Goal 11. Examine water quality in the lake and the invertebrate communities that sustain plovers to provide a benchmark for future monitoring and possibly to anticipate changes related to water dynamics (e.g. global warming).

9 Evaluating Success

This IBA program is a new conservation program in Canada. In its current form, it was designed with a ten-year vision, to 2008. The participants of the Important Bird Area program in Saskatchewan and nationally will support this conservation process. These participants and local stakeholders should be ever vigilant for opportunities to support the local initiatives where possible. Most importantly, however, a local 'champion' should be identified for each area and perhaps for special goals. It is hoped that these champions will accept some ownership for this

⁷ Piping Plover population surveys are planned for the summer of 2001, the third in a series of 5-year intervals. A companion count is currently underway on the plovers' wintering grounds.

initiative and keep the ball rolling, and never cease to be vigilant for threats and for opportunities for conservation support.

10 Acknowledgments

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Saskatchewan has provided office space and other services.

The IBA Advisory Committee members helped select IBA sites for conservation planning: Gregg Brewster, Stephen Davis, Frank Roy, Margaret Skeel and Alan R. Smith.

This specific plan also owes its existence to the local people who have cared and employed good judgment for which the birds are able to reside at the lake today. We are also grateful to the persons listed here who have agreed to participate in this conservation planning in their professional or private capacity (see Appendix 1).

This report has been greatly improved by the following people by providing input over the telephone, by attending meetings and by carefully reviewing versions of the manuscript: Nancy Cherney, Robert Foster, Brian Johns, Marc Johnson, Stuart Houston, Conrad Olson and Margaret Skeel.

Darrel Cerkowniak, Sask. Land Resource Centre, Univ. of Sask., and Bill Sawchyn, Sask. Environment and Resource Management produced the maps used in this report. Jeff Keith, Saskatchewan Conservation Data Centre, provided data on locations of threatened species.

Information from the Canadian IBA Database was provided by the Canadian BirdLife International co-partners, Bird Studies Canada and the Canadian Nature Federation. Updated information can be obtained by contacting Bird Studies Canada (see Appendix 2).

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Appendix 1. Names, affiliation and general interests of individuals in connection with the Radisson Lake IBA. By letting their name appear here, these individuals have made no commitment beyond agreeing to be contacted when their participation is requested.

Darryl Amey & Elaine Androsoff, Box 53, Radisson, SK, S0K 3L0; 306-827-4610

Interests: Darryl & Elaine have a strong interest in agricultural and environmental sustainability.

Bill Chappell, Ducks Unlimited Canada, Box 1180, North Battleford, SK, S9A 0J8; 306-445-2575 w_chappell@ducks.ca

Interests: Bill has been working for DU Canada for 15 years in west-central Saskatchewan including the Radisson Lake area.

Nancy Cherney, Sask. Environment & Resource Manage., 3211 Albert Street, Regina, SK, S4S 5W6; nancy.cherney.erm@govmail.gov.sk.ca

Interests: Nancy is a primary participant in directing SERM's Representative Areas Network.

Paul Gossen, Canadian Wildlife Service, 4999-98 Avenue, Edmonton, AB, T5B 2X3

Interests: Paul is the Chairperson for the Piping Plover Recovery Team (Sect. 5.4.3).

Wayne Harris, Sask. Environment & Resource Manage., 350 Cheadle Street W., Swift Current, SK, S9H 4G3; 778-8218 wayne.harris.erm@govmail.gov.sk.ca

Interests: Wayne is the Provincial Biologist for the grassland ecoregion and a naturalist with broad knowledge of species and ecosystems.

Stuart & Mary Houston, 863 University Drive, Saskatoon, SK, S7N 0J8; 306-244-0742 houstons@duke.usask.ca

Interests: Stuart & Mary have banded birds in the Radisson Lake area for many years. Stuart is also a co-author of The Birds of Saskatoon, which includes Radisson Lake.

Brian Johns, Canadian Wildlife Service, 115 Perimeter Road, Saskatoon, SK, S7N 0X4; 306-975-4109 brian.johns@ec.gc.ca

Interests: Brian is a Wildlife Biologist and the Canadian co-chair of the Whooping Crane recovery team.

Corey Loessin, Radisson, SK, S0K 3L0;

Interests: Corey operates the family farm near Radisson and is the coordinator for the Certificates in Agriculture Programme at the University of Saskatchewan's Extension Division.

Brian Tex Rothenberger, Radisson.

Interest: Brian is familiar with local birds and has guided waterfowl hunters in the area.

Jim Schmidt, Saskatchewan Agriculture and Food, 509 Pioneer Avenue, North Battleford, SK, S9A 1E9; 306-446-7449 jschmidt@agr.gov.sk.ca

Interests: Jim is the Regional Manager of the Lands Branch for SK Ag. & Food's North-West Region.

Margaret Skeel, Nature Saskatchewan, 1860 Lorne Street, Regina, SK, S4P 2L7; 306-780-9273 Fax 306-780-9263 mskeel@unibase.com

Interests: Margaret is the Program Coordinator for Nature Saskatchewan. In this role and with her strong interest in conservation, she helps deliver IBA-Saskatchewan.

Ken Tanchak, Box 150, Borden, SK, S0K 0N0; 306-997-2101

Interests: Ken is the Administrator for the R.M. of Great Bend, that includes Radisson Lake.

Kim Waterhouse, Town Office, Radisson, SK, S0K 3L0; 306-827-2218

Interests: Kim is the town Administrator for Radisson.

Earl Wiltse, Sask. Environment & Resource Manage., 3211 Albert Street, Regina, SK, S4S

5W6; 306-787-2889 or 2464 earl.wiltse.erm
@govmail.gov.sk.ca

Interests: Earl is SERM's Species at Risk
Specialist. He also serves on the IBA
advisory Board.

Appendix 2: Information on the lead organizations of the IBA Program

BirdLife International (Wellbrook Court, Girton Road, Cambridge, CB3 0NA, UK; birdlife@ECNET.ec)

A pioneer in its field, BirdLife International is the first non-government organization dedicated to promoting world-wide interest in and concern for the conservation of all birds and the special contribution they make to global biodiversity. BirdLife operates as a partnership of non-governmental conservation organizations, grouped together within geographic regions (e.g. Europe, Africa, Americas) for the purpose of planning and implementing regional programs. These organizations provide a link to on-the-ground conservation projects that involve local people with local expertise and knowledge. There are currently 20 countries involved in the Americas program throughout North, Central and South America. For further information about the Americas BirdLife Program, check the following web site:

<<http://www.birdlife1.org.ec/ingles.html>>. The **Canadian Important Bird Areas Program** has been undertaken by a partnership of two lead agencies. The Canadian Nature Federation (CNF) and Bird Studies Canada (BSC) are the Canadian BirdLife International partners. **The Canadian Nature Federation** (1 Nicholas Street, Ottawa, ON, K1N 7B7; <http://www.cnf.ca>)

The CNF is a national conservation organization with a mission to be Canada's voice for the protection of nature, its diversity, and the processes that sustain it. The CNF represents the naturalist community and works closely with our provincial, territorial and local affiliated naturalists organizations to directly reach 100,000 Canadians. The strength of our grassroots naturalists' network allows us to work effectively and knowledgeably on national conservation issues that affect a diversity of ecosystems and human populations in Canada. The CNF also works in partnership with other environmental organizations, government and industry, wherever possible.

Our approach is open and cooperative while remaining firm in our goal of developing ecologically-sound solutions to conservation problems. CNF's web site is "<http://www.cnf.ca>".

Bird Studies Canada (P.O. Box 160, Port Rowan, ON, N0E 1M0; <http://www.bsc-eoc.org>)

The mission of BSC is to advance the understanding, appreciation and conservation of wild birds and their habitats, in Canada and elsewhere, through studies that engage the skills, enthusiasm and support of its members, volunteers, staff and the interested public. BSC believes that thousands of volunteers working together, with the guidance of a small group of professionals, can accomplish much more than could the two groups working independently. Current programs collectively involve over 10,000 volunteer participants from across Canada.

BSC recognized nation-wide as a leading and respected not-for-profit conservation organization dedicated to the study and understanding of wild birds and their habitats. BSC's web site is "<http://www.bsc-eoc.org/>"

Nature Saskatchewan (1860 Lorne Street, Regina, SK, S4P 2L7; www.unibase.com/~naturesk)

Nature Saskatchewan is one of the largest conservation organizations in Saskatchewan whose vision is "Humanity in harmony with nature." Nature Saskatchewan was founded in 1949 and has been a reasoned and respected voice in conservation. Nature Saskatchewan's major accomplishments are in the areas of education, conservation, research and publication.

Nature Saskatchewan's educational programs include delivery of the *Living by Water Project* in Saskatchewan and Manitoba, BirdQuest and PlantQuest workshops for youth and adults, a scholarship for graduate studies at universities, and support of nature camps for youth. In the conservation area, Nature Saskatchewan owns and maintains six nature sanctuaries, negotiates and refers conservation easements, and fosters conservation through working with governments and industry.

Research conducted or facilitated by

Nature Saskatchewan is through support for monitoring at high priority sites and for threatened species. Nature Saskatchewan is conducting inventories of flora and fauna at its nature sanctuaries. The organization co-manages the Saskatchewan Conservation Data Centre and operates a landowner stewardship program *Operation Burrowing Owl*. Nature Saskatchewan quarterly publishes an internationally known journal *Blue Jay*, releases special publications on an irregular basis (22 to date), and publishes a quarterly newsletter *Nature Views*.

Appendix 3. At the inaugural **IBA-Saskatchewan** workshop (Saskatoon, 22 October 1997), 123 candidate areas were nominated by several dozen naturalists. On 10 January 2001, the data compilation and assessment by outside reviewers was completed, yielding 53 IBAs approved by Bird Studies Canada.

The number of approved IBAs may yet grow as more information becomes available, particularly in the north. However, current IBA priorities involve conservation planning and implementation of suggested actions. The 13 sites shown below have conservation plans completed or in various stages of completion. Two sites focus on grasslands (Govenlock, Nashlyn and Battle Creek IBA, and Colgate IBA), one on a marsh-lake-upland complex (Cumberland Marshes IBA), and the remainder on water bodies. For lake IBAs the adjacent upland is usually equally if not more important in the ecology of IBA birds. In some cases the IBA has been expanded to include the entire watershed (Redberry Lake, and Chaplin, Old Wives and Reed lakes) or portions of watersheds.