

COMMUNITY CONSERVATION PLAN
for the
Quill Lakes Important Bird Area

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Executive Summary

This Community Conservation Plan for the Quill Lakes 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 have restricted ranges.

The Quill Lakes (Big Quill, Mud and Little Quill lakes) are large (up to 420 km²), saline lakes in the Aspen Parkland of east-central Saskatchewan. The lakes are self-contained in their watershed and thus have no in- or outflow to the nearby North Saskatchewan, Qu'Appelle or Assiniboine rivers. Soils in the immediate vicinity of the lakes tend to be black Chernozems of loamy texture and little or no slope. Approximately 65% of the land in the region is under cultivation. Cattle graze on a belt of Crown-owned grasslands immediately surrounding the lake.

The Quill Lakes are of enormous importance to many species of shorebirds. Some of these have single day counts that exceed 1% of the global population, making the site "globally" important. These species include the American Avocet, Hudsonian Godwit, Stilt Sandpiper, Short- and Long-billed Dowitchers, Red-necked

Phalaropes, White-rumped Sandpiper, Baird's Sandpiper, Semipalmated Sandpiper and Least Sandpiper. The nationally endangered Piping Plover breeds here in considerable numbers. Some Whooping Cranes stop here on migration. In addition, Sandhill Cranes stop here on migration in globally significant numbers. The Quill Lakes have been awarded at least nine designations for conservation purposes, four of which are international in stature.

Threats to the birds or the lake's ecosystem are envisioned in the longer term. Agriculture is the primary land use and the birds species listed here have apparently coped well with it. One future threat may be climate change or any other factor that interferes with water levels or the lakes' characteristic flood-dry cycles. 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 and site, there is considerable tourism potential including viewing and hunting. The lake's location near Highway 16 is an asset in this regard.

The objectives of this plan are to draw attention to the exceptional importance of the Quill Lakes for shorebirds, waterfowl and cranes, and to the need for water quality and quantity. Specific recommendations are to:

- Monitor water levels, the characteristic flood dynamics and water quality;
- 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; and
- Continue or increase monitoring of bird numbers and reproduction at the Quill Lakes.

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 include the Canadian Millennium Partnership Program, Canadian Adaptation and Rural Development Saskatchewan (CARDS), Saskatchewan Environment and Resource Management (SERM), and Ducks Unlimited Canada.

1. Introduction

Bird conservation is not 'just for the birds.' In a widely acknowledged and visionary treatment of the state of decline of diverse life forms on Earth, Wilson (1992) suggested that certain species will and should receive special attention. Wilson pointed out that individual species which may be large and colourful or otherwise charismatic, often are conservation favourites even though they represent a small fraction of living things. Such species, Wilson claimed, can motivate conservation at many levels, from individual to government. Since no species exists in isolation from other species or its environment, such bird-focused 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.

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. Of these, 15% of the population participated in trips specifically to view wildlife (www.ec.gc.ca/nature).

This community conservation¹ plan focuses on the Quill Lakes, in the Aspen Parkland

¹ In his book review of D. Hulme and M. Murphree, Eds. (2001. *African Wildlife and Livelihoods: The Promise and Performance of Community Conservation*. Heinemann), Child (2002) writes: "Community conservation in Africa ranges from park outreach programmes in East Africa to southern Africa's radical policies to give back to communities the rights to use and benefit from the wildlife on their land. The latter, in particular, have contributed significantly to the emerging idea that conservation should contribute to basic human needs rather than conflict with them. This radical revision of a paradigm built on 'fortress conservation' is already incorporated into key international conventions, yet its practice remains new and experimental....."

Community conservation is being driven forward by a remarkably small number of 'scholar practitioners', who are attempting to realign institutions so that

ecoregion (Sect. 2.1) of south-central Saskatchewan. The lake is considered "globally significant" in IBA program terms for: Whooping Cranes, Sandhill Cranes, Piping Plovers, Hudsonian Godwits, Stilt Sandpipers, White-rumped Sandpipers, Baird's Sandpipers and Least Sandpipers; and nationally important for American Avocets.

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

- i) explaining why the Quill Lakes are 'important' to birds,
- ii) describing the lakes' 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.

conservation benefits local communities and introduces democratic practices."

beyond a "fortress approach" (Pickett et al. 1992),
the type

2 IBA Site Information

The Quill Lakes² (IBA #SK002; 51°04'N, 107°06'W) are saline lakes located in the Aspen Parkland ecoregion in east-central Saskatchewan (Fig 1). The Quill Lakes IBA includes three lakes (Table 1), Big Quill, Little Quill, and Mud or Middle Quill lakes. They lie near the Yellowhead branch of the Trans-Canada Highway. Nearby towns are Foam Lake, Quill Lake, Wadena and Wynyard.

Table 1. Physical characteristics of Big Quill and Little Quill lakes in east-central Saskatchewan. These data were not available for Mud Lake.

Lake	Year	Km ²	Depth (m)	Shoreline km
Big Quill	1938-43 ^a	420	6.0	
	1975 ^b	307	2.6	88
Little Quill	1938-43 ^a	182	1.5	
	1975 ^b	181	4.3	86

^a Rawson and Moore 1944

^b Hammer and Haynes 1978

The boundaries of the IBA are dynamic rather than static. They vary as needed depending on a particular conservation action. Going

² Barry (1998) describes the name of the town of Quill Lake located on Hwy 5, north of Big Quill Lake, as "Village (PO 1904-) northwest of Wadena on Highway #5. Named after the Quill Lakes, all three of which (Big Quill, Middle Quill and Little Quill) are within ten miles of the town site.

The Quill Lakes are an extremely important migratory waterfowl stopover and breeding ground, and their shores tend to be cluttered with feathers or quills. For many years the Indians collected goose and whooping crane quills for trade at Touchwood Hills Post, from where they were shipped to England to be used as pens."

Fig. 1

of conservation advocated here includes not only local point manipulations but entire systems and institutions. The IBA clearly includes the three lakes and their shores, but also the lakes' watershed and to some degree the biosphere (e.g. climate change).

Of 53 lakes examined in Saskatchewan, Big Quill and Little Quill ranked very high in salinity at 52nd and 51st, respectively. Only Little Manitou Lake (near Watrous) had higher salinity. Salinities in the Quill Lakes increased over Rawson and Moore's (1944; (Table 2) study period, as was true of most Saskatchewan lakes studied. Salinity changes occur seasonally within a year dependent on water volume, water inflow/outflow and dissolution of Glauber's salt (Sect. 5.3.3) if formed during winter. Changes over many years can be influenced by droughts (Rawson and Moore 1944).

Table 2. Changes in salinity (parts per million) in Big Quill and Little Quill lakes over time. For comparison, sea water has a salinity of 40,000 ppm. and freshwater below 500.

Year	Quill Lakes	
	Big	Little
1920 ^a	16,550	10,850
1929 ^a		13,499
1938 ^a	28,477	19,368
1939 ^a	30,022	21,387
1975 ^b	53,210	56,000

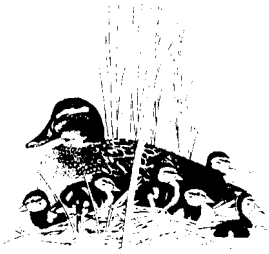
^aRawson and Moore 1944
^bHammer and Haynes 1978

The Quill Lakes lie within the Quill-Lakes-Plain landscape area, within the Aspen Parkland ecoregion. This plain is part of the first prairie steppe (500-600 m elevation) bounded eastward by an escarpment rising out of the Manitoba lowlands (200-300 m elevation). Westward, this plain is bounded by the Missouri Coteau, an escarpment leading to the second prairie steppe (800-900 m). South of the Quill Lakes is the Touchwood-Hills-Upland landscape area. The Quill Lakes and surrounding area represent a glacial lake plain that is "internally drained" and has no connection to either the Saskatchewan-Churchill or Missouri -Mississippi river drainage systems.

Dominant soils are black Chernozems,³ of loamy texture and little to no slope. Soils are rated as Class 2, having "moderate" limitations for agriculture, due to the soil's poor capacity to retain moisture. Erosion risks by water and wind are low (Fung et al. 1999).

Mean daily temperatures were -18°C and 18°C in January and July, respectively. Mean annual precipitation recorded at Wynyard was 41 cm, with most occurring in June and July (Fung et al. 1999).

³ Chernozem is a Russian word for the dark-coloured soil of grasslands.



2.1 Aspen Parkland ecoregion.

In the Quill Lakes basin, the Aspen Parkland is wedged between the boreal transition and moist mixed grassland ecoregions. In the Aspen Parkland, grasses are still important vegetation, but aspen woods are interspersed with grassland. In Saskatchewan, Aspen Parkland comprises 81,500 km², or 13% of the province.

Thorpe (in Fung et al. 1999:136) states: "This dynamic transition zone (between the southern boreal forest and the mixed prairie) has changed over the centuries. Historically records from the 19th Century show that many areas in the Aspen Parkland had less tree cover than they do now. The regime of frequent fires which prevailed before settlement favoured grassland over woodland, and kept the aspen groves smaller and shorter. Elimination of prairie fires has allowed groves to expand into the prairie, although not all the way to the hilltops and south-facing slopes, where the soil is too dry for tree growth...."

"Most woodlands in the Aspen Parkland are dominated by trembling aspen [species and genus names are omitted⁴]. Aspen stands tend to be short compared to those in the boreal

⁴ There are many naming conventions in biology each having its own group of supporters. Birds are fairly uniform in appearance and their common names well known. Therefore, the Latin genus and species names are omitted in this document for improved flow. Plants, in contrast are much more diverse, with ecological types or races common. Therefore plant ecologists and taxonomists generally use two or even three Latin names to identify their subjects to avoid confusion.

Latin is used for naming not because the Romans used these names, but because when naming conventions began Latin was a dead language and unlikely to change as 'living' languages do over time. Latin names are more commonly called "scientific names." However, using a two-name system in Latin or even reflecting evolutionary relationships through names is hardly enough to make a practice 'scientific.' The question of what makes a method scientific is a matter of some discussion (Bauer 1992).

ecoregion to the north. Many stands on the southern edge of the parkland are no taller than 10 m, while heights reach to 15 to 20 m at the northern edge. Especially toward the south, aspen stands tend to be dome-shaped, reflecting the fact that the oldest trees are in the centre, while expansion of the stand has produced shorter and younger trees toward the edges. Most aspen stems are produced by sprouting from the roots of parent trees, so a small stand may be a clone of genetically identical trees.

The ground vegetation under aspen stands is made up of species almost totally different from those in the nearby grassland. In the moister northern part of the region, the ground vegetation is often similar to boreal aspen stands, with beaked hazelnut and sarsaparilla. Southward, the ground vegetation becomes shorter but more diverse, with the most common species being snowberry, rose, saskatoon, chokecherry, and a variety of herbs.

Aspen stands on sandy soils tend to have lower shrub and herb cover than those on loamy soils. Most of these species are similar, but the prostrate shrubs, creeping juniper and bearberry, are much more abundant on sand than on loam. meadowsweet and poison-ivy appear in the shrub layer, along with the usual snowberry, rose and chokecherry, while hay sedge is often an important herb...."

"Over much of the Aspen Parkland, the grassland patches are made up of fescue prairie. This is dominated by a single species, plains rough fescue. The high productivity and persistent litter of rough fescue give taller, denser appearance compared to other grasslands. Subordinate species are mainly those of the mixed prairie to the south, especially western porcupine grass, june grass, and sedges. Of a variety of common forbs, the presence of species such as northern bedstraw and three-flowered avens distinguishes fescue prairie from drier grasslands.

Most of the fescue prairie which has not been broken is used for livestock grazing, for which it is highly productive. However, rough fescue is sensitive to overgrazing and has been eliminated from many pastures, leaving a

community similar to that in the mixed prairie. Sandy soils also reduce the dominance of rough fescue, in favour of spear grasses and sand reed grass, and shrubs such as creeping juniper and chokecherry. The largest block of dune sand in the Aspen Parkland is the Manitou Sand Hills, much of which is blanketed with low aspen woods, although grassland occurs on the more rugged dunes. In the southern part of the Aspen Parkland, where it overlaps the dark brown soil zone, mixed prairie appears on the upper slopes with fescue prairie retreating to lower slopes. At the eastern end of the region, fescue prairie becomes increasingly hard to find, and many areas are dominated by western porcupine grass or by the invasive Kentucky Blue Grass. It is not known whether fescue prairie was naturally less dominant in this area, or has been reduced by a longer period of human impacts such as livestock grazing."



Alan R. Smith

2.2 Existing large scale conservation measures

The ecosystem and the birds of the Quill Lakes 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 the Quill Lakes directly or indirectly are described below. These general measures have been complemented by many specific conservation initiatives described in Section 5.4.

2.2.1 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 *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. This act also gave the Canadian Wildlife Service the mandate to acquire and manage habitats for migratory birds, as in the case of National Wildlife Areas and Migratory Bird Sanctuaries.

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 (Saskatchewan Environment and Resource Management. 1997).

2.2.2 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 prohibits the direct killing of endangered species anywhere in Canada, and offers protection for the species and their '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 2.2.1).

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. The main objective of this proposed legislation, according to Minister Anderson, is to help prevent wildlife in Canada from becoming extinct and to provide for the recovery of species at risk. However, the proponents of stronger legislation point out 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 proposed act is to prohibit unequivocally the killing of endangered or threatened species under its jurisdiction (migratory species, aquatic species and species on federal lands). When it comes to habitat, there is ample opportunity for political intervention and this, critics claim, may lessen the effectiveness of the legislation. 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 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 will also make it easier for Canadians to donate ecologically sensitive lands and easements by reducing the capital gains arising from such donations through the EcoGifts Program.

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% stating 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%.

2.2.3 Saskatchewan's Representative Areas Network. Text in this section was provided by Nancy Cherney, Fish and Wildlife Branch, Saskatchewan Environment and Resource Management.

Saskatchewan has established a network of ecologically important land and water areas across the province, through a system called the Representative Areas Network (RAN). This system started with a base of sites totalling nearly 3 million hectares (7.4 million acres) including national and provincial parks, wildlife refuges, ecological and other reserves in the province. Working from this solid foundation, Saskatchewan's Representative Areas Network expanded by about 50 per cent in less than three years!

One of the primary goals of the RAN program is to protect biodiversity - the richness and variety of life - by selecting and designating areas representative of Saskatchewan's natural ecological diversity. An objective and consistent method for assessing this diversity was developed to guide representative area identification. Notably, an enduring features approach to define the range of diversity in Saskatchewan was selected. Enduring features, such as specific rock, soil and land form patterns, are considered to be very stable over long periods of time and are likely to contain characteristic plant and animal communities. Classifying the province into different enduring feature groupings and measuring the level of protection already afforded

to specific landscape types (and associated plant and animal communities) highlighted deficiencies in terms of protection. Landscape types with little or no protection were rated a high priority for action in the RAN.

This scientific approach for selecting representative areas was blended with the wealth of local knowledge gathered through land use planning and other community-based consultation processes. Suggestions and needs identified through these processes also help determine the kinds and levels of activity that may occur within designated sites. Regulations developed as a result govern activities in each site and are intended to reflect the diversity of goals and values that are meant to be protected.

Representative area designation is flexible, supporting many resource pursuits such as trapping, hunting, and fishing. However, site management seeks to curb activities like commercial logging, road construction and mining or petroleum exploration and development, particularly within Crown land sites. The intention is to ensure long-term resource protection within representative areas by minimizing disturbance and degradation.

Crown lands administered by Saskatchewan Environment and Resource Management may be designated according to any one of a number of legislative options. Depending on features/values to be protected and the level of use to be continued within a site, choices include Ecological Reserves, Provincial Parks (several categories), Protected Areas or Wildlife Refuges.

From August, 1997 to March 31, 2000, about 500,000 hectares of Crown land were formally designated and added to the Network - 4 ecological reserves, several parkland reserves, 1 protected area, and 1 wildlife refuge.

Private lands and lands not under Environment and Resource Management's administration are also important within the network and can be managed or guided through the use of partnership agreements, memoranda of understanding or conservation easements. These types of arrangements enable the department to work closely with partners and private landowners to ensure maintenance of the long-term health of the soil, water, plants, animals, and other parts of the ecosystem. From August, 1997 to March 31, 2000, some 1.2 million hectares of private land and lands not administered by SERM were included in the Network through voluntary partnerships.

Government commitment to live up to the challenge of establishing a Representative Areas Network for the people of Saskatchewan remains strong. Public discussions for proposed representative areas are proceeding in order to bring together a mix of perspectives on the particular lands and to identify the full range of values that may need long-term protection. As these discussions conclude and site boundaries are finalized, the Network will continue to grow and offer opportunities for education, research and the enjoyment of Saskatchewan residents, today and for generations to come.

2.2.4 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" (Environment Canada 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 (Environment Canada 1995:3).

2.2.5 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 and 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 bird watchers (e.g. bird feeder watches, and other 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, though many opportunities may have been ignored thus far. How could this power be harnessed for instance by farmers in IBAs?

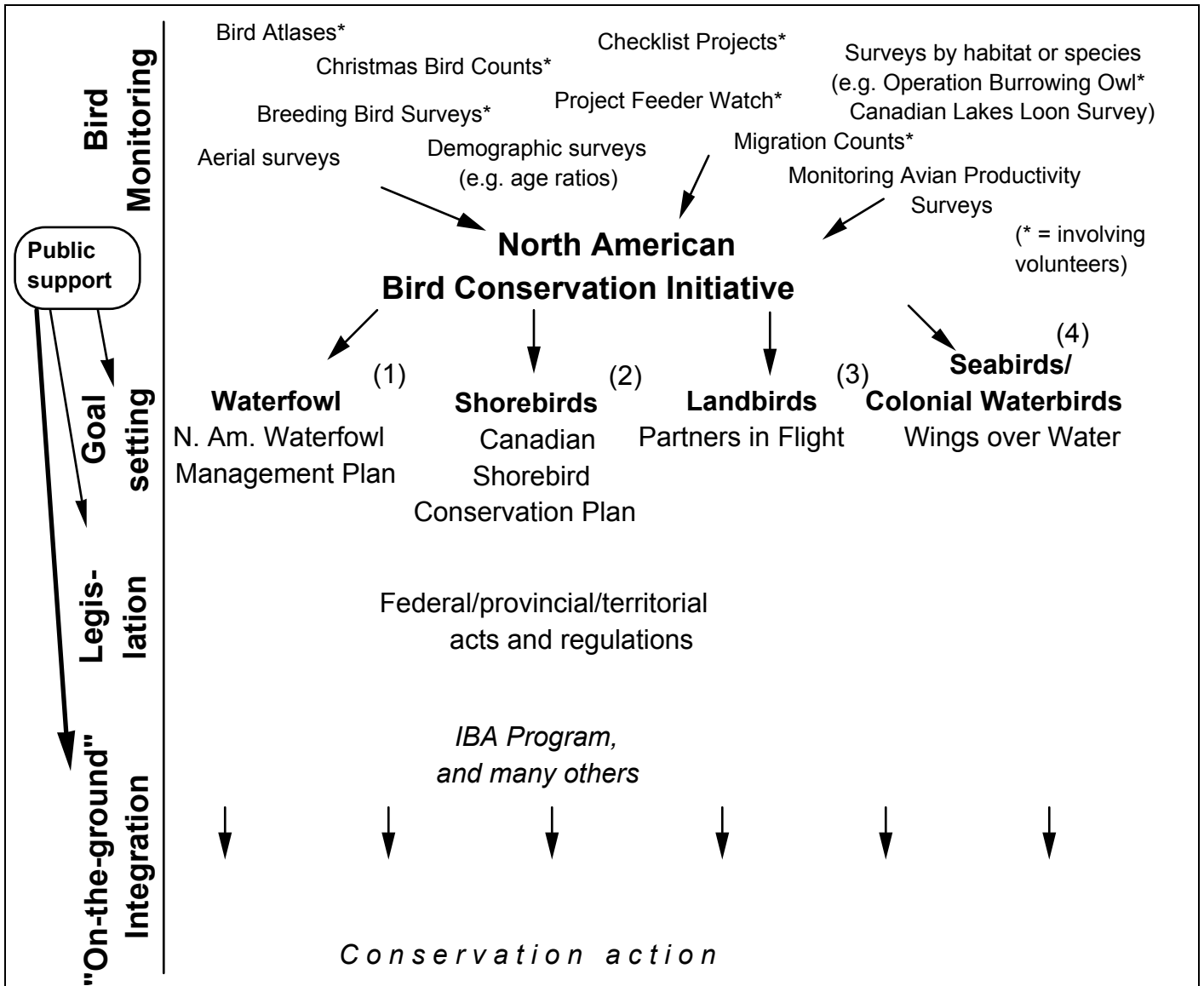


Fig. 2. A schematic diagram to show how different bird-monitoring approaches might combine with public support and regulatory instruments to form a basis for conservation action. References: (1) North American Waterfowl Management Plan Committee 1998, (2) Environment Canada 1999, (3) Canadian Landbird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

2.2.6 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.

A companion plan exists in the United States. A Mexican shorebird plan was in draft stage at the time of writing (McNight 1999).

2.2.7 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 (Environment Canada 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 bring 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 International⁵ (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). 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.

⁵In 2000, BirdLife International was active in over 100 countries with a network of 95 national NGOs with over 2.5 million members worldwide. Globally the budget for conservation was over 269 million US\$ with a staff of 4,161 people. BirdLife partners owned or managed 1,131,916 ha of natural habitat. Over 2 million children were involved in "Building a better future."

BirdLife International's Director of Network and Programs, Marco Lambertini, concludes "... we are indeed an impressive network. But there is something else beyond the figures, the budgets and the programs that makes BirdLife even more effective for conservation; it's the competence and the passion for what we do and believe in.

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) have been completed.⁶

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

In the IBA classification, the Quill Lakes are of primary importance for species that are threatened or congregate at the lake in large numbers during migration. These birds include the Whooping Crane, Sandhill Crane, American Avocet, Piping Plover, Hudsonian Godwit, Stilt Sandpiper, Dowitcher, Red-necked Phalaropes, White-rumped Sandpiper, Baird Sandpiper, Semipalmated Sandpiper and Least Sandpiper (Table 3). Peak counts for most of the species were greater than 1% of the population in this region, making the Quill Lakes globally significant in IBA terms.

The summaries of species natural histories provided below are intended as a background to conservation needs. The length of the summaries reflects primarily the extent to which information is available or compiled in the literature. Some species accounts offer detailed conservation context and this could also apply to other species in a similar-species group or 'guild" (e.g. mud zone sandpipers, Sect. 7.3). Other species of interest include Great Egret and Snowy Plover which nested in 1976 and 1986, respectively (Smith 1996).

⁶ 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 Studies in Agriculture, Law and the Environment (CSALE), College of Agriculture, University of Saskatchewan.

Table 3. Birds satisfying the IBA criteria, their significance status (Global, Continental or National) and season of main use at the Quill Lakes. Data are taken from the IBA database, and are originally derived from surveys by federal and provincial biologists and other sources.

Species	See Section	Average Numbers	Season	status
IBA birds				
Whooping Crane	4.1	1	Fall migration	Global
Sandhill Crane	4.2	12,000	Fall migration	Global
American Avocet	4.3	776	Fall migration	National
Piping Plover	4.4	284	Breeding	Global
Hudsonian Godwit	4.5	1,450	Spring migration	Global
Stilt Sandpiper	4.6	8,961/3,946	Spring/Fall migration	Global
Dowitchers	4.7	3,007	Fall migration	? ¹
Red-necked Phalarope	4.8	45,188	Spring migration	Global
White-rumped Sandpiper	4.9	8,794	Spring migration	Global
Baird's Sandpiper	4.10	1,787	Spring migration	Global
Semipalmated Sandpiper	4.11	23,637	Spring migration	Global
Least Sandpiper	4.12	3,225/759	Spring/Fall migration	Global
All shorebirds		197,155	Spring migration	
Other prominent birds				
American White Pelican		500	Breeding	
Black-bellied Plover		1,277	Spring migration	
Ferruginous Hawk		4	Breeding	
Lesser Yellowlegs		2,254	Fall migration	
Snowy Plover		1	Breeding	
Wading birds		12,000	Fall migration	
Waterfowl		100,000	Fall migration	
¹ Status is difficult to determine because Short-billed and Long-billed Dowitchers are difficult to identify in population surveys (Sect. 4.7).				

4.1 Whooping Crane.

The biology and conservation of the Whooping Crane is reviewed by Lewis (1995) and 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, and 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 nests 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. 2.2.1). 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.

In Saskatchewan, Whooping Cranes are generally seen in late April and again mid-September to mid-October. Sightings from the Quill Lakes are listed in Table 4. At Radisson Lake (IBA Appendix 3) Whooping Cranes stop with remarkable regularity.

1997	2	2
1998	2	2
2000	3	1
Total	22	28

Table 4. Sightings of Whooping Cranes at or near Quill Lakes, Saskatchewan. The sightings were adults only, there were no confirmed young seen during this time. Data from: Whooping Crane migration database maintained by Brian Johns (Appendix 1).

Confirmed		
Years	sighting	Unconfirmed
1957	3	
1975	1	
1981	1	
1983		1
1984	1	
1985		2
1987	1	
1988	2	6
1989		6
1990		2
1993	2	
1994	2	
1995	1	
1996	1	6

4.2 Sandhill Crane.

The natural history of this 3.5-4.0 kg, 1.2 m tall descendant of a Pleistocene goose ancestor (2.5 million years before present) has been described by Tacha et al. (1992). Sandhill Cranes nest in Siberia, Alaska, northern and western Canada and some northern, mid-west and western states. The cranes migrate to the southern states, Mexico and Cuba. Non-migratory populations exist in Cuba, Florida and Mississippi. Differences in body form and colour exist between the cranes of different regions, and hence this species has been divided into five subspecies.

Sandhill Cranes feed by probing for subsurface plant foods, picking seeds and other items off the soil surface, and capturing various live animals (5-10% by volume). When available, grain in fields can be a major food item.

The spectacular courtship display of Sandhill Cranes has special appeal. Of eight different courtship displays, three, the pre-copulatory bill-up, copulation and the unison call, are exhibited only by paired adults. These displays synchronize reproductive development. The others, upright wing stretch, horizontal head pump, bow, vertical leap and vertical toss, are part of the dance repertoire. Pair bonds are formed during spring migration, and normally last for life. In addition to pairs and family units that remain

intact well into March, unmated individuals also form socially stable aggregations.

Sandhill Cranes lay 1-3 eggs in nests floating on water, resting on marshy substrates or on land. Males and females share the 30-day incubation duties equally. Newly hatched young leave the nest within hours and feed on their own within a day. Family home ranges vary from 10-85 ha. Sibling aggression usually leads to only one surviving chick, the other being killed within days.

Loss of eggs and young occur from predators when parents are not nearby. Adults defend themselves from predators by lunging toward them and striking with bill or feet. Additional mortality occurs from bacterial, fungal and viral diseases, but the major factor controlling the Great Plains population is hunting.

Special cases of disease leading to mortality in some cases have arisen from fungal toxins in waste peanuts eaten by cranes. Pesticides are a problem locally.

The total population has been estimated at 652,500-715,300 individuals. Of these, 560,000 belong to the mid-continent population to which Saskatchewan Sandhill Cranes belong. The Cuban and Mississippi populations are considered endangered by the U.S. Fish and Wildlife Service, with estimates of <200 and 120-130 respectively.

Sandhill Cranes are highly selective of wintering and staging habitats. Protecting such habitats is essential for species conservation, a

protection which is urgent in some areas. For instance, approximately 80% of the mid-continent population winters in western Texas. Here, only about 20 salt lakes are used by the cranes and should be a focus for protection.

4.3 American Avocet

The American Avocet is perhaps one of the most handsome of North American birds. It is sufficiently tame to be observed without flight and is a favourite of photographers. This long-legged, 300 g shorebird has a cinnamon head and neck that becomes light grey in winter, and black wing stripes set off from a whitish-grey body. The natural history of this species was reviewed by Robinson et al. (1997).

Where suitable habitat permits, migratory populations of American Avocets breed throughout most of the Great Plains and the United States inter-mountain west. Some populations are resident year-round along the Pacific and Gulf of Mexico coasts and in central Mexico. Winter residents can be found throughout much of the southern United States and Mexico, particularly the coastal area and slightly inland. Before 1900, American Avocets bred much further north (Great Slave Lake, N.W.T.) than they do now, and also along the Atlantic Coast as far north as New Jersey. This range retraction has been attributed to over-hunting. Some range (re-)expansion has been

recorded recently, in northern Alberta (G. Beyersbergen and E. Kuyt, pers. comm.) and in Arizona. In the Luck Lake area (Appendix 3), American Avocets are reported as more common now than they were in the 1930s and 1940s (Roy 1996).

In Canada, the American Avocet occupies the prairies and parkland with the North Saskatchewan River forming the northwestern boundary. During drought years, avocets have been recorded further north, in the southern Boreal region of Saskatchewan (Smith 1996). Within this range, avocets frequent saline and flooded fields, being characteristically associated with the bare margins of water bodies. They arrive in southwest Saskatchewan in late April, lay eggs in early May, and rear young in early June (Roy 1996). American Avocets either depart early, in mid-to late July, or redistribute themselves before leaving their nesting areas. Late birds can be seen into September and even October (Roy 1996). After breeding, avocets often join small flocks and these in turn can band together to form flocks of thousands prior to migration.

Foods taken by American Avocets include aquatic invertebrates found in the water column or in sediment, but also opportunistically terrestrial invertebrates, small fish and seeds. Avocets feed mostly in water up to belly depth and, in one study, only 3% were feeding adjacent to the water line where periodic wave action left a film of water. The most common method of feeding is "scything," where a slightly open bill is pushed

while walking forward on a muddy substrate, moving the bill from side to side. American Avocets seem to avoid sandy areas, presumably to avoid wear of the bill in this filter feeding method. Other feeding methods include pecking to capture brine shrimp in the water column and snatching of brine flies.

To avoid excessive salt consumption, American Avocets have been observed moving from feeding areas to freshwater seepage ponds to drink. Movement has also been observed from water to land to defecate. About half of the time American Avocets have been observed sleeping/resting on the shore, and half the time in shallow water. Feeding can occur during day or night.

American Avocets are adaptable in their use and defense of space. Feeding areas are defended particularly before and during laying. During incubation a small breeding area is defended. Feeding areas that are distant from breeding areas are defended only while the birds are feeding there. The usual number of four eggs is laid in one of several possible scrapes, often associated with sparse vegetation near the water's edge. Both parents incubate. Within a day of hatching the family leaves the nest and moves to a feeding area, which can involve swimming when the nest is on an island. When nests are in close proximity, inadvertent brood mixing can occur.

American Avocets exhibit a rich array of displays within and between pairs. Pairs are monogamous during breeding season, and one or

both members of the pair may abandon the brood around the time when young gain flight.

Described mortality sources include predation, injuries, botulism and exposure of young during cold storms. Data from breeding bird surveys suggest that avocet populations were stable at least from 1966-94. Soon after the Migratory Bird Treaty was enacted, shooting and trapping became a minor source of mortality. The bioaccumulation of DDT and its metabolites gradually waned after DDT was banned. A subsequent toxic effect was noted, involving bioaccumulation⁷ of selenium that was introduced to marshes as a result of irrigation practices in the western United States.

In addition to a water quality threat that is ongoing, American Avocets have suffered from wetland losses that were commonplace. In Saskatchewan, as elsewhere, wetland drainage was a common practice and was subsidized by various levels of government to result in projects of varying size. Although Sask. Water's current policy requires a permit for water diversion, "midnight ditching" is still common.

⁷ Also known as biological magnification, an "increasing concentration of relatively stable chemicals as they are passed up the food chain from initial consumers to top predators"

4.4 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 (Sect. 4.4.1) 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.

4.4.1 Piping Plover food at Quill Lakes. Whyte (1985) studied the food habits of Piping Plover at the Quill Lakes. The food, or potential food in areas occupied by plovers, seems to be different as compared to other areas. This is not automatically a cause for concern, but the plover's food chain begs detailed examination.

The following text and table was provided by Loÿs Maingon. "According to three major studies on Piping Plover food habits in the northern Great Plains cited by Haig (1992) aquatic insects are the major food item. The results of these studies are in Table 5. There appears to be a general correlation between the nesting success of Piping Plovers and the density of shore flies (Ephydridae) in prairie habitat. In these three studies, Whyte's (1985) results which indicate that brine flies are a relatively small proportion of potential food

items, are anomalous. Whyte's research and the conclusions are different in two respects: sampling method and behavioural assumptions.

Whyte sampled macro-invertebrates actively by using a sweep net, and passively by using emergence traps. Both methods collect insects that inhabit the water column, this favours the collecting of aquatic Coleoptera and Corixidae. Whyte's samples may therefore over-represent these groups. Behaviourally, Piping Plovers feed on the shoreline, where adult Ephydriidae feed. Nordstrom sampled the shoreline habitat with adhesive traps. Nordstrom's results, therefore, may reflect Piping Plover food more reliably.

Based on a meta-analysis of the distribution of insect families collected in these studies and the relative density of Piping Plover breeding pairs associated with the locations sampled in these three studies, it can be hypothesized that shore flies (Ephydriidae) are the dominant food item. There appears to be a strong correlation between shore fly density and the number of successful breeding pairs.

Ephydriidae is a large family (1700 species) of medium size flies. Ephydriids are the dominant macro-invertebrate in salt springs, alkali flats, marine environments as well as hot, oil and mineral springs. While some species are predatory the majority are detritivorous, feeding largely on cyanobacteria and micro-algae associated with algal mats and decomposing matter found therein (Foote 1995). The flies' reproductive cycle is dependent on the micro-ecology of algal mats. They can therefore form part of a food source as both larval and adult stages, but are most commonly found as adults grazing on the algal mat.

Ephydriids present an ideal food source for Piping Plovers because they are an easily caught prey of relatively high caloric return. If this hypothesis is correct, the density of Ephydriid flies, and therefore of Piping Plovers, is directly dependent on the productivity and condition of algal mats.

A decline in Ephydriid density could be associated with at least three factors:

- i) Increased UV-B decreases micro-algal populations.
- ii) Increased ambient temperatures on shore will desiccate algal mats too rapidly to maintain high Ephydriid reproductive rates.
- iii) Ephydriids may also be adversely affected by agricultural pesticides and herbicides.

Table 5. Percentages of insects eaten by Piping Plovers or recorded in Piping Plover habitat as potential food; non-insects not listed. Summary provided by Loÿs Maingon.

	Chain		
	Big Quill	of Lakes	Great Lakes
Plover pairs	16	472	16
Insect families			
Carabidae	267		
Dytiscidae	15		
Corixidae	19		
Saldidae	2		
Chironomidae	10	13	72
Ephydriidae	3	73	3
Dolichopodidae		9	5
Muscidae			3
Totals	76	95	83

4.4.2 Plover 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).

4.4.3 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 Big Quill Lake, although Piping Plovers have used all of the shoreline at different times, densities tend to be highest on west and

east shores. Ten-fold differences in densities have been recorded and these are attributed to changing water levels (Table 6). When beaches are flooded to the vegetation line, plovers cannot nest. Similarly, when waters recede too far away from the gravelly beach habitat the plovers require, food becomes scarce.

Table 6. Counts of Piping Plovers at the Quill Lakes during the years of the international census 1991 & 1996, and some other years (Skeel et al. 1996).

Year	Big Quill Lake				Little Quill Lake			
	Pairs	Young	Adult plovers	Portion surveyed	Pairs	Single plovers	Adult plovers	Portion surveyed
1909	Estimated 1 pair/mile (55 pairs?)							
1947	"Common," 24 young collected							
1978	20		145	N & S shores				
1984	57		138	76% of shores			7	?
1985		127	300	Near complete				
1986		137	136	?				
1987		74	151	?				
1988		17	107	?				
1989	9		43	?			5	?
1990			≥110	Complete	5		13	Complete
1991	54	1	151	Complete				
1993	51	1 ^a	74	E. shore only			39	Complete
1994	65	100	156	E. shore only				
1995	(220)	(480)	(>440)	(Estimated)				
1996	196		435	Complete			0	Shores flooded

^a Heavy rains apparently killed many young.

4.5 Hudsonian Godwit

Information about the Hudsonian Godwit is taken from Godfrey (1986) unless otherwise indicated. It is a large shorebird with a long slender slightly upturned bill. Its tail is mainly black and contrasts with the white upper tail coverts and white wing stripe. Its blackish tail separates it from the Willet and Greater Yellowlegs, which it may be confused with in the

fall. Its bluish-grey legs are very different from those of either species of Yellowlegs.

Hudsonian Godwits breed in a variety of northern habitats including northeastern Manitoba at Churchill. During the spring migration it crosses the prairie provinces. During fall migration, large concentrations can be found on tidal mud flats, gently sloping beaches and sandbars.

The Hudsonian Godwit lays four olive buff eggs. It nests in a hummock or low mound in wet sedge or grass tundra with widely scattered trees. Incubation period is generally about 22 days.

Morrison et al. (2001) estimate the Western Hemisphere (i.e. global) population to be at least 50,000 birds based on wintering ground surveys.

According to Smith (1996) and his citations, "The Hudsonian Godwit is an uncommon transient and very rare summer visitant in Saskatchewan. In the fall, it occurs in large numbers on several lakes in south-central Saskatchewan. Flocks in excess of 2500 birds have been recorded at Luck Lake and Little Quill Lake. During the more dispersed spring migration, flocks are smaller and more frequent on smaller wetlands. Although migration routes have not been determined, most Hudsonian Godwits migrating through Saskatchewan probably breed on the Mackenzie Delta rather than the other major breeding area near Churchill, Manitoba."

4.6 Stilt Sandpiper

The Stilt Sandpiper is a medium size sandpiper whose slender body, longish (greenish) legs and bill, white rump, and chestnut ear patch distinguish it from other medium or small sandpipers (Godfrey 1986).

'Stilts' winter in central South America, many in Argentina. Some also remain in Central America. They nest on the northern coasts of Alaska and Canada eastward to the western coast of Hudson Bay. Stilts migrate both in spring and fall in a narrow band along the eastern edge of the Great Plains. Most flocks contain less than 100

individuals but some flocks include over 10,000 birds (Skagen et al. 1999).

Stilt Sandpipers obtain their invertebrate food by collecting it off the shore or water, and by probing in soft mud. They are most commonly seen on those parts of the shore that include wet soil devoid of vegetation to water up to 8 cm deep (Skagen et al. 1999).

4.7 Dowitchers

During the Quill Lakes surveys, the dowitchers could not always be identified to species. The biology of the Long-billed Dowitcher outlined below can serve to describe the general biology of the two species.

Smith (1996:162-163) describes the occurrence of the two species in Saskatchewan.

"Because the Short-billed Dowitcher nests in inaccessible bog regions, its range in Saskatchewan, as elsewhere, is poorly known. The only confirmed breeding record for this province is of recently fledged young on the south shore of Lake Athabasca. Other records suggest, however, at least a sparse breeding population southeast through the Boreal Forest to Red Earth Lake. South of its range, it is a fairly common spring and fall transient in better vegetated wetlands. Summer records probably refer either to late spring transients or to failed breeders. The largest concentration was of 500 at Last Mountain Lake on 8 May 1985."

Regarding the Long-billed Dowitcher, Smith (1996) states: " The consensus of observers is that the low Arctic-nesting Long-

billed Dowitcher is the more abundant of the two dowitchers migrating through Saskatchewan. Observations from the region suggests that the long-billed outnumber the short-billed by a factor of 10, while a comparison of maps shows that the former is more frequently seen in this province as a whole. Considering this, we describe the Long-billed Dowitcher common and the short-billed Dowitcher fairly common as transients. Flocks of over 1500 long-bills have been identified in both spring and fall at Luck Lake."

Takekawa and Warnock (2000) and citations therein describe the biology and conservation of the Long-billed Dowitcher as follows: "The Long-billed Dowitcher is a chunky, medium-sized sandpiper distinguished by a sturdy bill that extends twice the length of its head and by a characteristic "sewing machine" motion while feeding. In flight, it exhibits a white triangular patch above its tail and white upper tail-coverts and it emits a distinctive *keek* call when flying and feeding. This dowitcher breeds in Tundra regions from northeastern Russia to northwestern Canada and migrates mainly west of the Mississippi River, spending the winter primarily along Pacific and Gulf Coasts into Mexico. It is distinguished by its late migrations compared to most other shorebirds and by its full wing molt during fall migration."

"Declining numbers of dowitchers reported in the late 1800s and early 1900s were attributed to over-hunting; this species, for example, was sold in the markets of Los Angeles in the mid-1800s as "jack snipe." Populations are now thought to be stable, with recent breeding-range expansion in Siberia; nevertheless, the Long-billed Dowitcher has been identified as vulnerable because of loss of wetlands in western states (Page and Gill 1994 [see Takekawa and Warnock 2000]). In addition, specimens from Texas and California

have been collected with elevated contaminant levels that may have adverse biological effects.

The breeding display of the Long-billed Dowitcher has been described as very demonstrative: flying with speed and agility, 2 or 3 males call loudly while pursuing a female. Following mating, the male hovers about 15 meters above the ground and sings a song that ends with a buzzy *pee-witch-er*. Surprisingly little else is known about the breeding biology of this species, however, most likely because it nests in very low densities. More is known about its migratory and wintering ecology, but few studies have been conducted where it is distinguished from the congeneric Short-billed Dowitcher (*Limnodromus griseus*).

The systematics of Long-billed and Short-billed dowitchers have been debated for more than a century. Early analyses by Rowan (1932) and Orr (1940) inspired Rollo Beck and Frank Pitelka (1986) to investigate these species in California. Pitelka (1950) studied over 2,900 individuals, many collected by Beck, in his classic monograph on geographic variation and morphological differentiation, and he identified 1 race of Long-billed Dowitcher and 3 subspecies of Short-billed Dowitcher from geographically separate regions of subarctic Alaska through e. Canada. Although these two species were later described as a superspecies (May and Short 1970), they were found to have some of the most widely divergent mitochondrial DNA patterns reported in avian congeners (Avice and Zink 1988)."

Although similar to the Short-billed Dowitcher in appearance, the Long-billed differs from that species ecologically. Short-billeds are found mainly in salt water wetlands and forage on open mud flats. Long-billeds are more often found in freshwater wetlands; when they do visit marine habitats, they are most common in small pools and in salt-marsh vegetation. Long-billeds breed primarily along coastal western and northern Alaska to eastern Siberia, while the three subspecies of Short-

billed species breed in s. Alaska and Yukon, central Canada, and the Maritime Provinces."

"Shooting and trapping. Sold in markets of Los Angeles in 1865 as "jack snipe" (Grinnell et al. 1918). Decline in numbers of dowitchers in e. North America and California in late 1800s and early 1900s because of hunting (Page and Gill 1994); enactment of Migratory Bird Treaty Act in 1918, 2 years after its passage, brought protection."

"Pesticides and other contaminants/toxics. Pesticide and other contaminant levels available for dowitcher, but interpretation of results difficult since no experimental work on effects of these toxins on either breeding or migrating and wintering individuals is available. Mean DDE residues (0.4 - 1.3 parts per million [ppm]; wet wt) found in pooled breast tissue samples ..."

"Degradation of habitat: breeding and wintering. Little breeding habitat disturbed in North America; largely unknown effect of degradation of habitats in n. Russia. Loss of wetlands in individual states west of Rocky Mtns., 30-91% (median = 37%); in Great Plain states, 35-89% (median = 48%, Page and Gill 1994); such losses likely impact migrating and wintering Long-billed Dowitcher populations. Species given a habitat vulnerability score of 7 (range 3-18, 3 = lowest, 18 = highest; Page and Gill 1994)."

"Disturbance at nest and roost sites. Trampling of nests by caribou (*Rangifer tarandus*) occasional source of nest loss in n. Alaska (NW); also likely for reindeer (*Rangifer tarandus*) in parts of n. Russia. Roost sites in w. U.S. affected by wetland habitat loss in developed areas, especially in California. Vehicle disturbance on beaches in e. U.S. implicated in declines of migrating Short-billed Dowitcher (Pfister et al. 1992)."

"Measures proposed and taken. Beneficial management includes manipulating vegetation,

controlling grazing and water depth, and reducing disturbance (Elphick 1996). In San Francisco Bay estuary, CA, management of salt-evaporation ponds for shorebirds such as Long-billed Dowitcher (see Anderson 1970) resulted in regional recommendations: (1) support managed saline ponds, seasonal ponds, and wetlands; (2) encourage construction of elements in restored tidal marsh that favor shorebirds (e.g., bare levees and islet, and shallow water areas (5 - 10 cm) and (3) minimize disturbance of roosting and foraging areas (Goals Project 1999)."

"Effectiveness of measures: the species' response. Elphick and Oring (1998) tested 6 rice straw-management treatments and found highest densities of Long-billed Dowitcher in rice fields where rice straw from the previous growing season had been partially buried by being dished or chiseled and then flooded. On San Pablo Bay, CA, use of tide gates to reduce flow resulted in decreased water levels at low tides and increased numbers of shorebirds, including this species (JYT)."

4.8 Red-necked Phalarope. The Red-necked Phalarope is smaller than a robin, whitish below and tan and grey uppers. As the name suggests, there is a rusty red neck on females in their summer plumage.

Red-necked Phalaropes nest on the Tundra and Boreal Forest edge in Canada and Alaska. There are isolated sightings of breeding pairs on northern Saskatchewan Lakes (Smith 1996), but this birds is generally only common on migration.

They winter in Central America, where they frequent sea shore and the open ocean primarily.

Nests are located on the ground in the vegetation margin of freshwater ponds. Four eggs are usual, as is the case for many other shorebirds.

Phalaropes as a group are most unusual in two ways, their spin-swimming and the 'reversed' role of the sexes. In this family of shorebirds, with some variation among species, females court aggressively to attract males. After copulation and egg-laying, the male assumes all incubation and brood-rearing duties. The female may lay for yet another male in the same season, and finally may or may not raise a brood of her own. Corresponding with this role-reversal, the female is brightly coloured, while the male is drab and well camouflaged during incubation.

Phalaropes are also the only shorebirds that show sustained swimming. This allows them to stay and feed in the open ocean, where they swim in circles, always alert for an invertebrate prey animal that has been disoriented by the water current thus produced and falls easy prey. For effective swimming, phalaropes have partial lobes between their toes (Godfrey 1966).

At the Quill Lakes IBA, Red-necked Phalaropes are most common in spring. In the late 1980s, concentrations of 26,000 Red-necked Phalaropes have been recorded here on 28 May and 70,000 on 26 May at the Manitou, Freshwater, Reflex and Wells lakes IBA.

4.9 White-rumped Sandpiper

The biology of this species has been summarized by Parmalee (1992) and authors cited therein. Selected excerpts are as follows: "This small Nearctic sandpiper migrates from its principal breeding ground in the Canadian Arctic to the southern extremities of South America, one of the longest animal migrations in the Western Hemisphere. Much of its migration is made in a few, long, non-stop flights, each of which can last as long as 60 hours and transport these birds up to 4,000 kilometers, powered by extensive body fat. Such fat reserves are laid down at key migration staging area wetlands where food is especially abundant — making this bird particularly vulnerable to loss of strategic habitat. South-bound migrants fly over the Atlantic Ocean from northeastern North America to northern South America, and then gradually move southeast along the coast before turning inland in Trans-Amazonian travel of about one month. Northward migration from Patagonia is apparently similar, at least through South America; the birds then move across the Caribbean and through interior North America to Arctic breeding grounds.

As a breeder, the White-rumped Sandpiper occupies wet, hummock tundra near marshy ponds, nesting on the ground and laying four, distinctive, pale to olive green eggs, spotted with reddish brown. It performs elaborate courtship and territorial displays, and is vocal near its nest.

It usually forages in small groups, but individuals also defend feeding territories. This species associates freely with other sandpipers; its highly visible white patch behind the rump and distinct call are its best field characters."

"Sensitivity to disturbance at nest and roost sites. Incubating females normally not disturbed by simple nest checks; handling and banding of some females results in nest desertion (Parmalee et al. 1968)."

"Shooting and trapping. No longer significant in Canada and U.S. North Americans are no longer important game-related predators of white-rumps. Large numbers once shot for human consumption, e.g., L. M. Turner (in Bent, 1927) secured 82 birds with only five shotgun discharges."

"Degradation of habitat. Loss of wetland feeding and resting areas along migratory routes and in wintering areas detrimental to this and other shorebirds. For example, Castro et al. (1990) show how drying of Cheyenne Bottoms, KS, limits ability of shorebirds to fatten before spring migration to Arctic. This and other Great Plains wetlands struggle to maintain water levels as agriculture (deep well irrigation) diminishes supply. Long term solution tied to shift to more traditional forms of agriculture based on natural precipitation, stopping further depletion of aquifers. Short term solution tied to purchase of extra land reserves and more water. Preservation of wetland staging areas in Latin America equally critical. Western Hemisphere Shorebird Reserve Network (P. O. Box 1770, Manomet, MA 02345) working effectively to accomplish this."

"Management. Helmers (1992) covers this topic in detail for shorebirds in general, including White-rumps. Two major techniques identified: (1) Protect and preserve important staging areas; (2) manipulate habitats to reduce disturbance and increase food availability. "Management of coastal or interior marshes and seasonally flooded wetlands for migratory shorebirds can be easily incorporated into current waterfowl management strategies. Minor changes in the timing, depth, and duration of drawdowns or reflooding within a wetland complex can provide habitats for

shorebirds without affecting potential habitat for other species."

4.10 Baird's Sandpiper

Baird's Sandpiper is slightly larger than a Semipalmated Sandpiper but not as large as a Sanderling. Baird's Sandpiper has a streaked upper breast and unstreaked flanks. Its long wings extend well beyond the tip of the tail when folded. The plumage is quite buffy even into fall. The Baird's Sandpiper carries its long and slim body horizontally.

Baird's Sandpiper is ranked as uncommon on migration. It breeds in the high Arctic, from eastern Siberia across Alaska and Canada, to western Greenland. Baird's Sandpiper winters in South America, south of the equator. Here it occupies diverse habitats from the high Andes to sea level. This relative habitat flexibility is shown throughout the year, when Baird's Sandpiper can be found away from water in moist or even dry habitat. Dry habitat can include the elevated reaches of the coast where it pecks for food rather than probes. It is often seen in small flocks and thus is quite similar to Pectoral Sandpipers in behaviour and ecology.

On migration, the Baird's Sandpiper is also unusual because it stays well inland, flying over the open plains east of the Rocky Mountains and the Andes. Baird's Sandpiper seems to fly over Central America without stopping, and therefore

on migration is rarely seen on the coasts. The sandpiper departs from its South American wintering ground in April and early May. Similar to the Semipalmated Sandpiper and Sanderling, Baird's Sandpiper occupies its breeding areas in late May and early June.

During breeding, Baird's Sandpipers occupy more elevated and drier ground than most other sandpipers, near inland lakes but also including dry sand dune habitat. Both males and females participate in the approximately 20 day incubation of 4 eggs, and the 20 day fledgling period. As with other sandpipers, females may abandon the brood earlier than males. Adults leave their breeding ground in late July. They slow their 5 week migration on the northern Great Plains, to restore their energy. They generally are found south of the United States by mid-August, a time when the later migrating juveniles arrive.

Roy (1996) described Baird's Sandpiper as an "uncommon to fairly common transient." He has usually recorded them in small flocks of 5-30 individuals on lake shores, on mud flats and on the grassy margins of sloughs. Some early sightings were on 4 April and the average of 15 sightings was 10 May, in the "Elbow region" of Lake Diefenbaker. Numbers of individuals, according to Frank Roy's observations, remained fairly stable until the end of May.

In late summer/autumn, the first Baird's Sandpipers appeared in early July and could be seen through September and in some favourable weather years to the end of October.

4.11 Semipalmated Sandpiper.

The Semipalmated Sandpiper is small in size, its body fitting easily in a child's hand, but it is large in stature as a migrant. On its upper surface, Semipalmated Sandpipers are gray or light buffy brown with under parts nearly white, with sparse streaks on upper breast. Juveniles have a more obvious white streak over the eye. Semipalmated Sandpipers have black legs and received their name for the incomplete web between their toes. The biology of this species has been summarized by Cheri L. Gratto-Trevor (1992); unless otherwise indicated, this publication will be the source for this review.

Semipalmated Sandpipers breed in the Arctic from Alaska across Canada, and winter along the coasts of Central and South America. Those breeding in the eastern Arctic tend to migrate along the coasts, and many fly a spectacular 3,000-4,000 km non-stop journey from the Bay of Fundy or East Coast sites further north to reach northern South America. Individuals breeding in the central and western Canadian Arctic tend to migrate through the North American interior in spring, but more follow the sea route in autumn. Gratto-Trevor and Dickson (1994) have confirmed this elliptical 'interior-Spring - Atlantic-Autumn' migration using marked individuals. Semipalmated Sandpipers use stars to navigate on migration, combined with the Earth's magnetic cues.

In the Lake Diefenbaker area, Semipalmated Sandpipers can be expected from

late April to June, and again from mid-July to October. The breeding activity in Canada's North is much compressed and the sandpipers return south as soon as possible. On their northward migration, males precede females by a few days. Moving southward, females precede males, and adults precede young. Migration is actually much more compressed in time than these data suggest. The largest number of northward migrants at the three lakes in different years were from 1,000-30,000 individuals on 17, 24 and 26 May.

The small and therefore metabolically highly active Semipalmated Sandpipers seem to 'walk an energetic tightrope' on migration and during breeding. For this reason, it is recognized that human encroachment on inland shores and ocean feeding areas is one of the major threats. Because of the large concentrations of birds involved, a very localized influence could have a tremendous negative impact on the population. At each of the 'staging sites,' Semipalmated Sandpipers feed as much as they can with 85 feeding probes per min. Once adequate energy is restored, they depart again, but only during weather favourable for migration. Thus, the bird's stay can be prolonged in inclement weather.

In general, the food types most often recorded include invertebrates that live on or in the soft mud. Thus, the two main feeding strategies are pecking at prey in view, and probing into the mud to 'feel' for food. Visual pecking is particularly common in a receding tide, where animals are left behind and exposed. At Chaplin Lake, *Artemia* are likely captured by pecking in

the shallow water column. In a study of Semipalmated Sandpipers collected at Quill Lakes, Saskatchewan (Alexander et al. 1996), the food found in the esophagus or gizzard of 18 Semipalmated Sandpipers included seeds (15 individuals), fly larvae (18), water beetle larvae (6) and water fleas (1). Based on a review of many studies, the size of invertebrates taken was most often between 2-5 mm, but some were considerably larger. Feeding does not involve swimming or diving. However, newly fledged chicks swim readily and adults too can do so when necessary. This feeding habit requires a narrow range of water depths where Semipalmated Sandpipers can feed.

Although Semipalmated Sandpipers congregate in large numbers on migration and in winter, they are solitary breeders. Males defend territories 1 ha in size immediately upon arrival on the breeding grounds in late May or June. Often, but not always, these territories are reclaimed in later years.

Another illustration of the 'Semipals' energetic tightrope is egg laying. Females lay their single 4-egg clutch per year within 4-6 days after arrival. They acquire some of the energy for those eggs on migration, but also must obtain a fair portion after arrival. If food is scarce in the breeding area, breeding may be delayed up to two weeks and some females do not breed at all, presumably because they could not obtain sufficient energy.

Male and female Semipalmated Sandpipers incubate equally. Females (91% of

pairs in one study) desert the brood and the male between 0-11 days after hatching. This behaviour is presumably related to high combined energy demand on migration and for breeding. The desertion gives the female a chance to move to and switch between the best feeding areas available locally, so as to allow her to restore energy quickly to migrate southward again, this time preceding males. Males, and females when present, do not feed the young but guard, guide and brood them. The young feed on their own on small flies and fly larvae. Once the young are large enough to join feeding flocks, males depart southward well in advance of their young. Few if any young breed in their first year, and they remain in South or Central America during the first austral winter of their life.

Breeding densities are low in this species, ranging from 0.1-1.0 pairs/ha. Aerial surveys in South America yielded a total population estimate of adults and juveniles of 2 million birds. An analysis of population trends using data from the international shorebird survey between 1979-91 suggested that populations were stable during that time.

In the late 1800s, Semipalmated Sandpipers were harvested for food and considered good to eat. Numbers of birds apparently declined as a result and began to recover in response to protection through the Migratory Birds Convention Act in 1917. Current threats arise from developments reducing habitat in coastal areas and inland shores. Environmental contaminants also can pose a problem.

haylands at Fairy Hill on 25 May 1978, while the largest of the fall was 2200 on 24 July at Big Quill Lake."

4.12 Least Sandpiper

As the name suggests, the Least Sandpiper is the smallest of North American sandpipers. It can be very common on salt marshes and muddy shores of rivers and lakes. It feeds both by probing in the mud and gleaning food from the surface. It is most commonly found in the wetland zone between wet mud and 4 cm of water (Skagen et al. 1999; e.g. Sect. 7.3).

Least Sandpipers breed right across the Arctic from the Aleutian Islands of Alaska to Labrador. "Leasts" winter from the southern United States to the Amazon basin. In terms of migration distance between feeding stops, the Least Sandpiper flies a medium distance, necessitated by its small size since it cannot store large quantities of fat as an lasting energy source *en route* (Skagen et al. 1999).

Describing the Least Sandpiper's distribution in Saskatchewan, Smith (1996:155) states: "Nero found the Least Sandpiper to be a fairly common summer resident in open bogs of the Subarctic, with confirmed nesting at Little Gull, Milton and Hasbala lakes. Nesting has also been recently confirmed at Close Lake in the northern Boreal region. In the rest of the province we know it as a common transient or rare summer visitant. Although migration habitat includes sand beaches and mudflats, leasts prefer vegetated shorelines, where they are often seen in the company of the Pectoral Sandpiper. The largest spring gathering of Least Sandpipers was 10,000 in flooded

4.13 Waterfowl

The Quill Lakes area is locally important for moulting ducks, nationally important for staging ducks, nationally important for breeding geese, and locally important for staging geese (Poston et al. 1990).



(Fung et al. 1999:40) he marked the southern limit of the forest where "spruce and pine predominate" not far north east of the Quill Lakes, though the lakes themselves are not shown.

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

The Quill Lakes fall under the responsibility of the Crown. Many adjacent quarter sections of land are also Crown-owned (Fig. 3).

5.2 Historical land use.

The Quill Lakes are part of a large block of land claimed under Treaty No. 4, which was signed in 1874.

The Quill Lakes vicinity, if not the lakes themselves, was well known to fur traders around 1800. John Palliser explored the Canadian Prairies and a reconstructed route brought him past the lakes to the south. According to his map

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 where the Quill Lakes are located. These lakes lie outside of what has come to be known as Palliser's triangle; a region characterized by precipitation only 60-70% of potential evaporation and by recurring droughts.

After the loss of the bison which served as a source of meat and hides, a ranching economy emerged in prairie Canada after the Canadian Government introduced a liberal and attractive grazing lease policy in 1881. This ranching on the open range was concentrated in southwestern Saskatchewan and did not reach the parkland to any great extent (Fung et al. 1999:65).

During Sir Wilfrid 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 on essentially free land was aggressively promoted. By 1916 the human

Fig. 3

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 'summerfallowing' 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.

Day Star, Poor Man's and Fishing Lake First Nations are located south and east of the Quill Lakes. The band's primary livelihood

comes from ranching, and secondary from hunting and fishing (Fung et al. 1999).

According to Fung et al. (1999), townships south of the Quill Lakes were settled around 1911 and north around 1921. Ethnic background among settlers was Scandinavian and Finnish in areas southeast of the lakes, and German northwest.

5.3.1 Farming. Currently, more than 65% of the area is under cultivation or summerfallow (Fig. 3). Wheat, canola and flaxseed are common crops, and 50-60% of the area is under some form of conservation tillage.

5.3.2 Ranching. There are apparently no large ranches where the majority of a landowner's livelihood comes from range cattle. Less than 10% of farms categorized themselves as primarily cattle farms (Fung et al. 1999).

Extensive grazing of cattle on native rangeland does exist on community or co-op pastures in the largely crown-owned green belt around the Quill Lakes (Fig. 3).

5.3.3 Oil, gas and mineral extraction. There are apparently no gas, oil or mineral deposits in the Quill Lakes area. Potash and salt deposits, including magnesium, are recorded for the area and a large region southward (Fung et al. 1999).

A salt extraction plant is located at the south shore of Big Quill Lake. Salt extraction became prominent at Saskatchewan lakes in the mid-1900s. A Crown Corporation called Saskatchewan Minerals was established to help foster this industry. Gradually different mining operations were sold to private companies.

The salt, sodium sulfate is used primarily in powder laundry and dishwasher detergent, but also in carpet deodorizer, modified corn starches, textile dyeing, glass making, kraft paper and mineral in livestock feed. For extraction, water is pumped into reservoirs and allowed to evaporate when the salts eventually crystallize into what is known as Glauber's salt. The remaining magnesium, chloride, water and impurities are drained back into the lake and the sodium sulfate is stockpiled for gradual purification and dehydration. The product is then shipped by rail or truck to markets in North America and the Pacific Rim.

5.3.4 Brine shrimp harvest. A brine shrimp fishery exists at Quill Lakes, operated by Wynyard Technologies. Frozen adult brine shrimp are harvested and sold as aquarium fish food.

5.3.5 Fishery. Portions of Little Quill Lake approach a depth of 5 m and this provides enough water in wet years for fish to survive and have enough oxygen over winter. In years of adequate

water depth fish were "re-stocked" to facilitate sport fishing.

Records show that in the 1920s, cisco occurred naturally in all three quill lakes. Little Quill Lake was stocked with cisco/whitefish. These lakes were examined for commercial fishing potential. However studies by Rawson and Moore (1944) showed that salinity had increased significantly in all saline lakes in Saskatchewan since 1920. As salinity increased fish reproduction declined and natural populations disappeared.

Although there was no large scale commercial fishing, some fishing sustained many of the local people, including aboriginal communities nearby. In keeping with provincial enhancement and re-stocking programs, here as elsewhere throughout the province, walleye were released into the lake for sport fishing, for instance in 1976 and 1988, and possibly more recently.

The increased salinity is largely a result of declining rainfall and declining water volume while the amount of salt remains constant. Residents point out that many temporary creeks which normally replenish Big Quill Lake run no longer. One local resident recalled that his father had maintained a regular fishery on Middle Quill up to the early 1950's, a factor which he attributed to the artesian springs contributing water to the lake.

Many if not all large saline lakes in Saskatchewan have declined in water volume (e.g. Redberry and Manitou lakes) since the beginning

of record-keeping by Rawson and Moore (1944; Sect. 2). This is not only serious for birds that use the water for resting on migration, but for the viability of the invertebrate food chains on which many other birds depend.

As salinity in the lakes increases, key organisms in the birds' food chain disappear and food chains become narrower. This has potential adverse impacts on specialist feeders. First the freshwater species and later low-salinity tolerant species disappear as salinity rises. This is a subtle but potentially enormous threat for this Quill Lakes ecosystem that bears monitoring and management where possible.

5.3.6 Tourism. The Yellowhead branch of the Trans-Canada Highway (Hwy. 16) but also Hwy. 5, have considerable traffic, with an estimated 1000 vehicles per day (Fung et al. 1999). Foam Lake, Wadena and Wynyard have museums, interpretive centres, regional parks, campgrounds and golf courses. The towns, including Quill Lake, offer accommodation and meals.

Hunters make an important contribution to the tourism industry. For example, all three communities organize "hunter appreciation suppers" in fall (e.g. <http://wsd.inet.wadena.sk.ca/wadena/>).

5.4 Conservation management achieved at the site

This section highlights activities by some organizations that are active and visible in the IBA and surrounding region (Table 7). 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.'

Table 7. Designations awarded to the Quill Lakes for conservation purposes and year when awarded.

Designation	Sect.	Big Quill	Mud	Little Quill
Game Preserve ¹	5.4.3	?		
Heritage Marsh ²	5.4.6	1981		
Important Bird Areas	3	1999	1999	1999
Int. Biol. Programme	5.4.10		1973	1973
N. Am. Waterfowl Management Plan	2.2.7	1989	1989	1989
RAMSAR ¹		1971		
Repres. Areas Network	2.2.3	1997	1997	1997
W. Hemisphere Shorebird Reserve Network	5.4.11	1974		
Wildlife Habitat Protection Act ¹	5.4.1	1988	1988	1988
Wildl. Refuge ¹			?	

¹ Fung et al. (1999)

² Ducks Unlimited Canada (no date)

5.4.1 The Wildlife Habitat Protection Act is one conservation tool protecting 3.4 million acres of public lands in Saskatchewan. This Wildlife Habitat Land ensures that the land cannot be sold by the government, but allows oil and natural gas

extraction, electrical-, radio-, and telecommunication transmission lines, livestock grazing, haying, and cultivation where the land had been cultivated prior to inclusion in the 1970s or 1980s. This designation only offers nominal protection, but the concern was that more far-reaching protection would not have passed cabinet at the time (Thornton et al. 1995).

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 the Quill Lakes.

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 Saskatchewan game preserves are administered by the Department of Environment and Resource Management. Most have been created in the 1930s and 1940s. Mud Lake is a game preserve, including the lake and land 200 m from the high 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. Game preserves are indicated by yellow signs.

5.4.4 Fisheries and water management. In addition to its general responsibilities in the area of environment and resources, Saskatchewan Environment and Resource management also undertakes specific projects and facilitates land uses through a permitting process (e.g. Sects. 5.3.4, 5.3.5).

5.4.5 Crown-owned pasture lands. Four community pastures (Wimmer, Lampart, Dafoe and Elfros) and East Quills co-op pasture are located in the immediate vicinity of the Quill Lakes. One Prairie Farm Rehabilitation Pasture is

located approximately 50 km southeast of Big Quill Lake.

There are three ways by which sustainable grazing of Crown lands is permitted; via community pastures, co-op pastures and individual leases. Community pastures are owned by the Crown, but administered either federally through the Prairie Farm Rehabilitation Administration, or provincially by the Saskatchewan Pastures Program.

The Community Pastures Program in general receives its funding partly or entirely from the patrons' grazing fees. Local staff (pasture managers assisted by range riders) manage all day-to-day affairs of the pasture, such as livestock care and handling, and facilities maintenance. Stocking rates and the timing of rotations are set jointly by an agrologist and the pasture manager. An advisory board composed of patrons helps by providing local input and may administer parts of the program such as the cattle breeding. In grazing co-ops, a group of ranchers have formed an administrative co-operative and manage all aspects of a pasture. A lease fee is paid by the group. Finally, in this continuum of management styles for crown-owned grasslands, some land is leased directly to the rancher who is expected to observe stocking rates set according to the carrying capacity of the land.

The Saskatchewan Pastures Program of Saskatchewan Agriculture and Food was established in 1922. Today there are 56 pastures comprising slightly more than 800,000 acres (3,238 km²). The program's mandate is to

provide livestock business opportunities while promoting the public objectives of integrated land use and a sustainable resource base. The goals are to provide supplementary grazing and livestock management services to enhance livestock diversification; to improve environmental and agricultural sustainability of Crown Land; and to implement new enterprise opportunities.

Many grassland communities including grassland birds are protected through Crown-ownership (see also Sect. 6.2). The benefits arise from land being kept in pasture even in the event of temporarily attractive grain prices. Also Crown-ownership allows some level of public influence in maintaining its range status and condition. An additional institutional advantage is an opportunity to adjust lease arrangements to sustain both grazing and biodiversity. Biodiversity is a 'public good' and this balance between private and public good can not be achieved as efficiently on private land. The premise is that a considerable amount of natural vegetation (see Odum in Rowe 1997) must be maintained by any nation for the ecological services (e.g. clean air, clean water) natural vegetation provides (Costanza 1997).

It should be remembered that there is apparently little legal force behind public grassland remaining public or being protected. For lands other than those protected under the Wildlife Habitat Protection Act (Sect. 5.4.1), the fate of grasslands lie in the policy arena and government policies can change without broad consultation. There is a tradeoff, laws are

monolithic and unable to track changing systems, while policy is too easily changed. The message for conservationists may be to be vigilant always and clear about our goals. Perhaps the best insurance against policy mishaps is broad stakeholder involvement in new and old initiatives (Sect. 8.1, Goal 1).

5.4.6 Quill Lake/Mount Hope Heritage Marsh.

The Quill Lake/Mount Hope marsh is one of ten designated Heritage Marshes in Saskatchewan. This designation was launched in 1981 to recognize the historical value and to preserve these important wetlands. The original participants in the program were: the former Saskatchewan Parks, Recreation and Culture, the Saskatchewan Wildlife Federation, Nature Saskatchewan, Ducks Unlimited Canada and Wildlife Habitat Canada.⁸

5.4.7 Piping Plover Survey. Coordinated surveys to count Piping Plovers are carried out every five years throughout this species' breeding

range in prairie and eastern Canada, and in 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).

The first Piping Plover recovery plan was approved in 1989 and an updated plan was in 2000. International surveys were completed in 1991, 1996 and 2001. These breeding season surveys are complemented by surveys on the plovers' wintering grounds.

5.4.8 Saskatchewan Wetland Conservation Corporation

delivers conservation projects locally at the Quill Lakes, but also has an international presence in bird conservation. "Linking communities, wetlands and migratory birds" is a partnership with Wetlands International-The Americas. Two workshops have been held with many delegates representing different sites (Demoskoff 1999). Saskatchewan Wetland Conservation Corporation also established a TransAmerica Migratory Bird Fund to facilitate research, land management and education (Demoskoff 1999).

Locally, the Saskatchewan Wetland Conservation Corporation is delivering a Prairie Shores project, which includes the Quill Lakes area. According to their web site (www.wetland.sk.ca/prairieshores) "Prairie Shores is a N. Am. Waterfowl Management Plan

⁸ Part of the Heritage Marsh program includes waterfowl feeding stations and lure crops. Crop damage in this area is significant. Landowners typically associate all water birds with waterfowl and do not see their conservation as a priority. As a direct result of a recent landowner conflict (No compensation no Hunting) the Quill lakes now has a Prevention Advisory Committee (PAC) which is made of various stakeholders. This PAC group advises SERM on how to spend the annual crop damage budget and has initiated extension projects with local landowners (C. Deschamps, pers. communication).

(Sect. 2.2.7) program which benefits breeding ducks and provides direct benefits to threatened and endangered species, shorebirds and grassland songbirds.

The Quill Lakes region of Saskatchewan is recognized as one of the most important bird areas in the World. In 1971 it was designated an International Ramsar Site. In 1994 it was dedicated as a Western Hemispheric Shorebird Network Site and in 1998 it was designated and Important Bird Area.

The Saskatchewan Wetland Conservation Corporation has undertaken a major conservation program in this area, "Prairie Shores", aimed at securing and enhancing habitat for waterfowl, shorebirds, grassland birds and colonial water birds.

Through Prairie Shores, the Corporation has acquired and improved the habitat quality of 28,000 acres of native prairie grassland and wetlands around the Quill Lakes including approximately 20 miles along the shoreline of Big Quill Lake. Crown Land transfer and land purchase have secured one of the largest habitat projects in perpetuity.

This work has been community based involving many individual landowners and lessees, five municipal grazing cooperatives, the Saskatchewan Department of Agriculture and Food, the Nature Conservancy of Canada and Ducks Unlimited Canada (Sect. 5.4.9). Habitat enhancement was undertaken by establishing rotational grazing systems, rest rotations, solar

pumping of remote watering systems, shoreline fencing for Piping Plovers and other shorebirds and by establishing a riparian management program for nearby creeks and streams (e.g. Huel 1998).

Grazing management plans for the pastures designed by Saskatchewan Wetland Conservation Corporation are implemented by the grazing coops to benefit both wildlife and producers. Within these lands surrounding the Quill Lakes the Corporation has established points and transects for monitoring populations of breeding and migrating grassland birds, shorebirds, and marsh birds, as well as the structure and condition of the vegetation. Data from these monitoring programs will be used to refine management plans if required. Saskatchewan Wetland Conservation Corporation has also conducted extensive bird inventories at other locations within the Quill Lakes' watershed. In an avian monitoring and inventory, 118 bird species were recorded on or around the Quill Lakes (McMaster et al. 1999). The project also employs transects in which bird densities can be estimated.

5.4.9 Ducks Unlimited Canada is active in the Quill Lakes region, and throughout the province. Ducks Unlimited Canada is a non-profit conservation company who's mission is to conserve wetlands and associated habitats for the benefit of North America's waterfowl, which in turn provide healthy environments for wildlife

and people. Formed in 1937, Ducks Unlimited Canada began delivering programs in Saskatchewan in 1938.

Ducks Unlimited Canada's first projects at the Quill Lakes were built in 1948. They were the Havers Wetland Project, along the southwest shore of Little Quill Lake, and the Fair Wetland Project, located on Iron Spring Creek in the Wimmer pasture on Big Quill Lake. Like most of the large wetland projects to follow, the projects consisted of constructing dams across bays of the large brackish lakes. Creeks supplied freshwater to these marshlands and ensured stabilized water levels for most years. In some instances creeks were diverted to projects to ensure the desired water levels were attained. Before Saskatchewan Water Corporation would authorize Ducks Unlimited Canada to construct and operate these wetland projects all landowners had to be invited to sign easements. Ducks Unlimited Canada currently manages the water level on Little Quill Lake, Mud Lake, and 15 other large wetlands associated with the lakes. The most recent wetland project constructed is at Windmill Point on the north Shore of Little Quill Lake. This multi-species project is managed for both waterfowl and shorebirds.

While Ducks Unlimited Canada has the capability to manage water levels on most of its large wetland projects, all projects are designed to be self-operating. Once a desired water level is reached excess water flows over water control structures or through spillways to the lakes. The three main lakes all receive most of their water from creeks that flow from the Ponass Lake in the north, from the Touchwood Hills in the south, and

Foam Lake to the east. Water flows west from Little Quill Lake through Mud Lake and then into Big Quill Lake. Mud Lake is operated approximately 0.15 m higher than Little Quill Lake so water levels must be lowered on Mud Lake before water can flow into Big Quill Lake.

All wetland projects rely primarily on spring runoff to reach their desired levels. Once water is released from a wetland project it is not possible to add water. Due to their small size relative to the large lakes, and their shallow depths (<1 m) the amount of water stored in these projects does not significantly affect water levels on Little Quill or Big Quill Lake. These projects do however have significant values for waterfowl and shorebirds. Waterfowl brood surveys have shown these projects to be valuable brood salvage and production areas with brood densities as high as 4 broods/ha. On a few projects nesting islands were constructed for waterfowl, pelicans, and cormorants. The total wetland acreage managed and enhanced by Ducks Unlimited Canada at the Quill Lakes is 48,838 acres.

Ducks Unlimited Canada also played a major role in the development of the Quill Lakes Heritage Marsh agreement (Sect. 5.4.6) in the mid 1980s. As part of the agreement, Ducks Unlimited Canada purchased and maintained land around Mud Lake and Little Quill Lake for lure crops and feeding stations. The farmland around the Quill Lakes annually experiences the highest amount of crop damage by waterfowl in the province. Lure crops are cultivated lands adjacent to the lake that are seeded to barley, swathed in mid August, and left for waterfowl to feed on. Geese and cranes utilize these sites primarily.

Feeding stations are graveled pads on the shore of the marsh where barley is spread out daily for the birds to feed on. Ducks primarily use these sites. Tens of thousands of birds feed at these sites each day in the fall.

Saskatchewan Environment and Resource Management is responsible for operating both types of crop damage prevention from mid August to late September at which time public access to these areas is restricted. A crop damage Prevention Advisory Committee has been established for the Quill Lakes and is made up of representatives from the rural municipalities, Crop Insurance, and Ducks Unlimited Canada. This group advises Saskatchewan Environment and Resource Management on how best to allocate resources to prevent crop damage in the area.

In 1989, the Quill Lakes were chosen to be the First Step Project in Saskatchewan for the implementation of the North American Waterfowl Management Plan. An office was opened in Wadena and staff hired to deliver the first of many programs that would be aimed at improving upland nesting cover, securing small wetlands from drainage, and encouraging sustainable land use practices that provided soil and water conservation benefits. Ducks Unlimited Canada is the main delivery agency for the plan in Saskatchewan and in 1990 assumed responsibility for the office in Wadena. Since then, Ducks Unlimited Canada has protected over 4,000 acres of uplands around the Quill Lakes. This includes purchasing or leasing existing native grasslands, aspen woodland, small wetlands, and seeding cultivated lands back to tame and native grasses. Extension programs promote winter cereals,

forage and pasture management, and the use of flushing bars to protect wildlife from injury during hay cutting. Sustainable farming practices are encouraged such as rotational grazing at Elfros Community Pasture, Wimmer pasture and Lampard pasture, fencing around gravel beaches on Big Quill Lake to prevent trampling of piping plover nests, and forage establishment. In addition to these programs Ducks Unlimited Canada is also focusing on conservation easements, restoration of wetlands, and policy initiatives to further protect wildlife habitat.

Ducks Unlimited Canada has also been involved in public education in the area by leading local school field trips to the lakes, and wetland tours at the annual Wadena Shorebirds and Friends Festival. Ducks Unlimited Canada has also hired a contractor to deliver education programs to the local elementary and high schools. Ducks Unlimited Canada has also been involved in ecotourism by supporting the Land of the Living Sky Tourism Region, and providing technical support for the development of the Quill Lakes Interpretive Area / Wadena Wildlife Wetlands, and by working with Saskatchewan Wetland Conservation Corporation (Sect. 5.4.8) to establish the Quill Lakes as an anchor site for the Saskatchewan Bird Trail (Sect. 6.3.1). Ducks Unlimited Canada volunteers in Wadena and in Wynyard organize annual fundraising banquets and Greenwing Children's programs. Since 1948 Ducks Unlimited Canada has spent over 2.5 million dollars developing, enhancing, and conserving wetland and upland habitat at the Quill Lakes.

At a provincial level, Ducks Unlimited Canada's activities were based on securing and enhancing permanent wetland habitat for breeding, moulting and staging waterfowl from the 1950s until the mid 1980s. From the mid 1980s to the present, strategies focused on encouraging land use practices which benefit waterfowl and other wildlife by improving habitat through the provision of upland nesting cover, securement of small wetlands, and by encouraging sustainable land use practices that provide soil and water conservation benefits.

Extension program options include winter cereals promotion and development, forage production and management, grazing management, and the provision of "flushing bars" to protect nesting birds from injury during hay cutting. Modified agriculture options include the conversion of cropland to forages and managed grazing. Intensive programs are implemented in areas with the highest capabilities for waterfowl production and include purchase and lease of existing native habitat, hay land, pasture, and cultivated land, which is then converted to nesting cover. Conservation easements and the restoration, enhancement and creation of wetlands are other options included as intensive programs. Policy initiatives that promote sustainable land use and provide wildlife benefits are also being pursued by Ducks Unlimited Canada.

5.4.10 International Biological Programme (IBP). The International Biological Programme was launched in 1967 as a cooperative, inter-institutional, interdisciplinary study with participation in the United States and Canada. Sites of high biological importance were selected for "total ecosystem study" with a conservation orientation. Attempts were made to include sites in all major representative ecosystems.

In Saskatchewan, a component of this project was based at the University of Saskatchewan. Primary support came from the National Research Council through the Canadian Committee for the International Biological Programme (e.g. Maher 1974)⁹.

5.4.11 Western Hemisphere Shorebird Reserve Network. According to the web site (www.manomet.org/WHSRN) this network is comprised of a voluntary, non-regulatory coalition of over 160 private and public organizations in seven countries working together to study and conserve shorebirds throughout their habitats throughout the Americas. This listing provides the Quill Lakes with international recognition as a major site for shorebirds.

⁹ For example, grassland studies known as the Matador project, were concentrated in the area north of the South Saskatchewan River near Beechy, where the Matador Land and Cattle Company held traditional grazing leases through the ranching heydays of the late 1800s and early 1900s (Sect. 5.2). In 1921, the Matador Ranch still leased 120,00 acres (Fung et al. 1999).

5.4.12 Saskatchewan Wildlife Federation.

There are a few parcels of Wildlife lands near the Quill Lakes, but none apparently include the lakes' shores (see atlas, Saskatchewan Wildlife Federation 1995).

The Saskatchewan Wildlife Federation is a nonprofit, non-government, charitable organization of over 25,000 members (www.swf.sk.ca/). The Federation passed a resolution in 1969 to channel 30% from hunting, fishing and trapping license fees into a Fish and Wildlife Development Fund created for this purpose. Through this fund, 175,000 acres of wildlife habitat have been purchased. In addition the federation owns 50,000 of wildlife habitat and has secured another 400,000 through stewardship efforts. Finally, an additional 9,000 acres have been purchased through cost sharing with Saskatchewan Environment and Resource Management. These land purchases are ongoing with additional funds from a habitat Trust Fund administered by the Saskatchewan Wildlife Federation. This Fund receives moneys from various programs including a hide collection program, raffles, and other fundraising and donations.

5.4.13 Some additional projects in-brief. While some Saskatchewan lakes became the centre for detailed water quality and other studies (e.g.

Redberry Lake), the Quill Lakes saw research activities largely concentrated on birds. Many waterfowl were banded at the Quill Lakes and other Saskatchewan Lakes by biologists of the Canadian Wildlife Service and U.S. Fish and Wildlife Service.

Some of this work, for instance, showed that Semi-palmated Sandpipers (Sect. 4.11) exhibit an elliptical migration. Semipals breeding in the western Canadian Arctic migrate through the Great Plains in both spring and fall. Those breeding in the central or eastern Arctic may migrate north through these plains but tend to use the Atlantic Coast to return to northern South America (Gratto-Trevor and Dickson 1994).

Additional projects include:

- Local bird inventories have been completed by the Saskatchewan Wetland Conservation Corporation and Ducks Unlimited Canada.
- American White Pelicans and Double-crested Cormorant colonies have been monitored for several years (Roney and Longmuir 1991).
- Shorebird diets have been monitored (Alexander et al. 1996, Whyte 1985)
- Potential construction of a hog barn is being monitored locally.
- Monitoring of botulism outbreaks (e.g. Wobeser et al. 1998).

- Monitoring of pesticides in wetlands (e.g. Donald 1999).
- Ducks Unlimited Canada and Prairie Conservation Action Plan education coordinators visit schools and generally promote an understanding of wildlife.

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 Cooperation and partnerships.

Much attention has been paid to the Quill Lakes (Sect 5.4). The research, management and community development partnerships represent a great opportunity to monitor the ecosystem into the future and to find broadly-based and thus better-than-average solutions for current and future challenges. This cooperation should be encouraged. It might be useful to look for mechanisms by which all interested groups in the region, communicate their interests, accomplishments and failures on a regular basis.

A requisite element for conservation is local involvement (e.g. Wynyard Tourism Association). Every attempt should be made to respond to local issues (e.g. crop damage by waterfowl, tourism development) and to represent the aspirations of the local people. However, while local involvement is critically important, 'community' and 'stakeholder' should be broadly defined where appropriate. The stakeholders and

the community involve the local community first, but because natural systems are inextricably connected, these obligations extend eventually to all Canadians and in some small sense to all citizens on Earth. In many respects, Canada has a tradition of collective goals with both local and regional input in decision making (Raad and Kenworthy 1998). Furthermore, Canada as a nation participates in international agreements (Sects. 2.2.1, 2.2.4, 2.2.5, 2.2.7). In a world of increasing "globalization," local control and balance may become both more urgent and more difficult.¹⁰

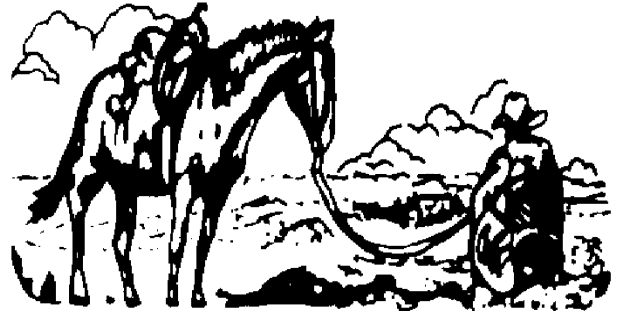
There is a need to monitor certain representative sites regularly and over the long term. The Quill Lakes are such a site, as are Old Wives Lake and Redberry Lake¹¹ IBAs. Such long-term monitoring is invaluable,¹² and temptations to shift emphasis and sites should be resisted.

¹⁰ In an article on pest invasions entitled "The dilemma of free trade," Driesche and Driesche (2001:15) state: "Laws prohibiting the entry of a given type of product on grounds of prevention of invasions have at times been attacked as protectionist measures in disguise. Under current world treaties on trade, such practices are subject to challenge by the country whose products are excluded..."

"Efforts to limit trade to prevent pest invasion and protect local biodiversity will increasingly have to be defended in World Trade Organization dispute panels against opposing interests whose economic concerns would be hurt by such restrictions. How will the still-uncertain ecological and economic costs of potential invasions be judged against the easily quantifiable economic costs if permission to import a specific good is denied? What is missing is a broad body of knowledge of the social and economic consequences of non-native species invasions."

¹¹ Sadly, Redberry Lake - an IBA and one of Canada's two newest UNESCO Biosphere Reserves is struggling to "keep its doors open."

¹² Winston Churchill is quoted for saying "The farther you look back, the farther you can plan into the future."



6.2 Range management.

Much of the land around the Quill Lakes is used for grazing. This represents an opportunity as shorelines can be healthy under proper range management. Moreover, grazing can be beneficial to keep invasive species and woody vegetation in check.

Prairie conservationists are increasingly coming to accept that prairie ecosystem conservation and ranching have much in common (Schmutz 1994, Page 1997, van Tighem 2000). The kinds of benefits realized depend on the grazing management strategies employed and the degree to which landscapes are intact.

From a biodiversity conservation prospective, a distinction deserves to be made between range and pastures. While 'fields' and 'pastures' can be terms used to denote fenced blocks of extensive rangeland, pastures when interspersed in cropland are ecologically different. Range, according to Jim Romo (pers.

communication) are those areas of the Earth that have not been cultivated because of climatic, soil or topographic limitations, but are a source of forage for wildlife and livestock, as well as water, minerals and esthetics. Range implies an expansive area where natural space-related ecological functions are able to operate. To conserve big space and the ecological functions in it, Rowe (1997) called for the protection of 'ecoscapes,' where habitat and ecological processes can function normally. Predation is an ecological process, as are dispersal, soil formation, water purification and so on. Wroe et al. (1981) define range management " ..as the art and science of planning and directing range use to obtain sustained maximum animal production, consistent with the perpetuation of natural resources."

Pastures tend to be smaller patches of grassland interspersed in cropland (e.g. Fig. 3). Weed control can be a particular challenge here, because of the proximity of weed seed on the borders of cultivated lands. Especially if pastures are "improved" through re-seeding with Eurasian grass varieties, they support fewer species of birds (Wilson and Belcher 1989) and need periodic re-grassing to sustain cattle. The term "improved" has its roots in farming and not ranching, and represents a value inappropriate in rangeland management. In recent years, the agricultural community has slowed its use of Eurasian grasses in favour of maintaining native range or using North American varieties in re-seeding. Locally

adapted native grass varieties have some distinct advantages in the long term (Christian and Wilson 1999)

Examining the relationship between cattle grazing and biodiversity, Groskorth (1998) has shown that plant biodiversity in the mixed grasslands of Saskatchewan peaked in the 'fair' to 'good' range categories (Fig. 4). This conclusion was corroborated by Bai et al. (1998) who examined sites in the mixed, moist mixed and Aspen Parkland ecoregions.

Grassland ecosystems have evolved under the influence of grazers, from the large and once numerous bison to mice (voles) and grasshoppers. For this reason, the link between grazing, biodiversity and ecosystem stability is not surprising. While the goals of range management are to maintain good-to-excellent range condition - to the right of the biodiversity peak - most pastures and range in practice include nearly the full spectrum of conditions. Despite attempts to achieve even grazing pressure, cattle will overuse some areas (near water, salt blocks or gates) and under-use others. This within-pasture-diversity in range condition is also fortuitous, because some species prefer slightly overgrazed sites (Horned Larks, Richardson's ground squirrels, grasshoppers), and others underutilized sites (mice and voles, Baird's Sparrow). The result is a complex and interdependent prairie ecosystem where human use is an integral part.

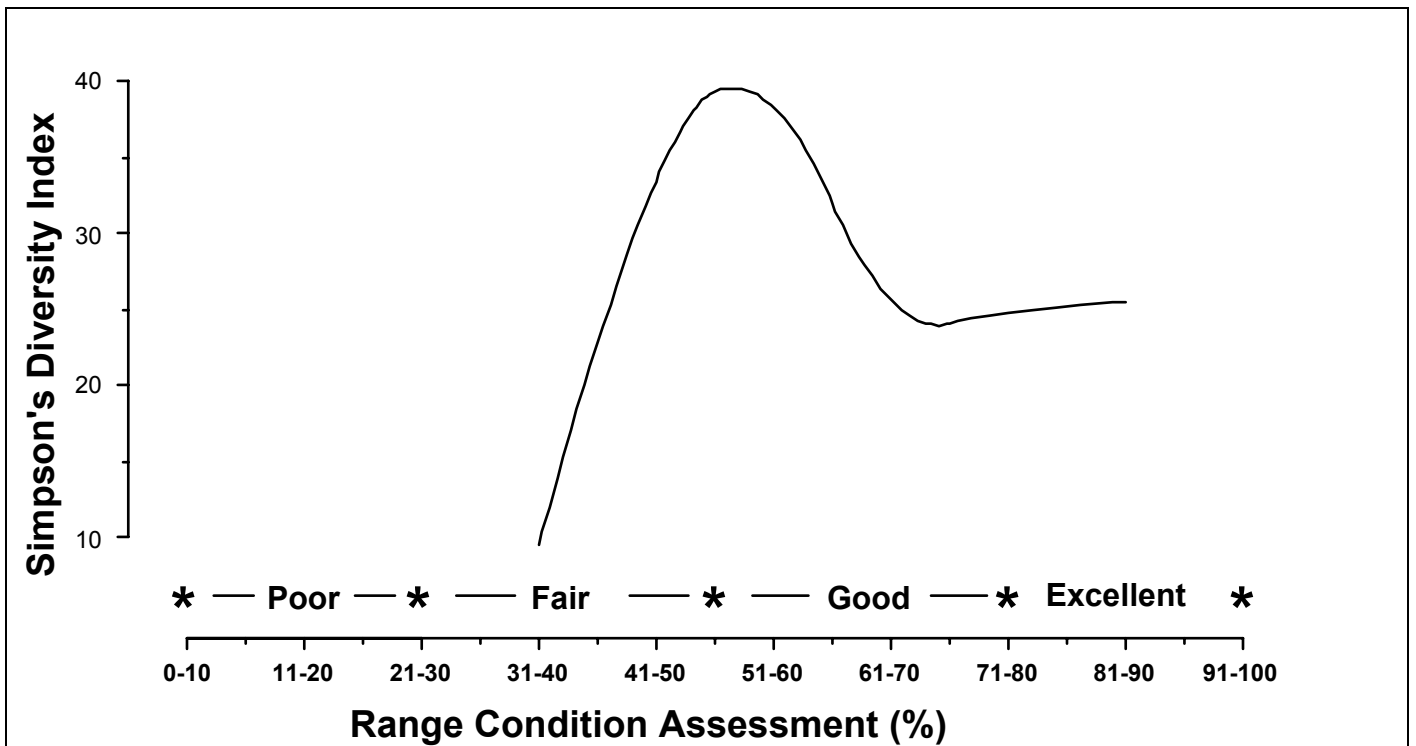


Figure 4. Species diversity estimates from study plots in the Saskatchewan mixed grass ecoregion are compared with a standard method in which range condition is assessed (Groskorth 1998). Although the two methods measure communities differently, the data show a generally accepted trend of peak diversity under fair to good range condition.

The criticisms that have been raised by some against beef 'producers' have been directed mostly at the feedlot segment of the long production chain from cow-calf operator to consumer. Feeding grain to cattle is highly inefficient and costly from an environmental point of view. The feedlot 'finishing' process could be much shorter than in prevailing practice. The grassland conservation opportunity arising from a well-managed traditional ranch is potentially enormous.

6.3 Tourism. Bird watchers know the Quill Lakes to be key birding spots. Some local birders may make day trips to the area, and because of its international stature, the Quill Lakes draw some birders from far and wide.

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.

The towns of Foam Lake, Wadena and Wynyard are making a co-operative effort to increase tourism in the region by improving nature viewing opportunities and coordinating marketing efforts. The construction of a short range FM tower is planned, through which visitors to the area will be informed of the local treasure and opportunities to view it.

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

6.3.1 Bird Trails. Saskatchewan IBAs, such as Chaplin-Old Wives 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 them 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

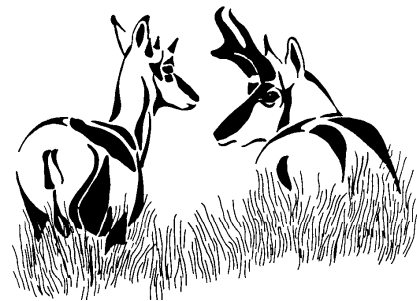
Ecotourism strategy, complemented by an Agritourism strategy (Pam Wight and Associates 1998).

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 Hunting and outfitting.

In 1999, 19,154 Saskatchewan residents purchased game bird licenses, compared to 7,964 non-residents.

Rural economies benefit from hunting through the added revenues arising from meals, accommodation and travel. In addition, hunters purchase outfitters' services and pay selected local people for cleaning and freezing of game prior to transport.



7 Threats

7.1 Threats to Shorebirds away from the Quill Lakes.

If the primary factor limiting a population of shorebirds operates outside of the IBA, then local monitoring will reflect a decline but local conservation action will not lead to the hoped for recovery. Many species of shorebirds, including Piping Plovers, are facing population declines in North America. Sixteen species of shorebirds are on the decline, 1 is increasing, 15 remain unchanged and 15 have inadequate information to judge (Harrington 1999). In Canada, two thirds of the species of shorebirds show a downward trend (Dickson 1999). Threats that have been identified at a continental level include non-consumptive uses of shores by people leading to disturbances and energy losses by shorebirds, shore developments, shrimp farming, and coastal impoundment (Harrington 1999).

According to Sallaberry (1999), increasing tourism opportunities are encroaching on important shorebird staging areas in Chile, where this industry is unregulated. In another example, 90% of the coastal salt marsh acreage in the United States has been drained for mosquito management using ditches. In actuality, only about 5% of the drained area actually supported

many mosquitoes. Changes are now in place to focus mosquito management more precisely. This represents an example of how knowledge of a species' ecology can save time and effort, and also reduce harm to the environment, through cooperation and conservation (Harrington 1999).

Gonzales and Vega (1999) have outlined how runoff from chemical agriculture, the depletion of shorebird food from shrimp farming, lead shot used in hunting, and wildlife depletion through local consumption have impacted shorebirds along the coast of Sinaloa, Mexico. Sinaloa in particular and Mexico in general provide critical habitat to some short- and long-distance shorebird migrants. It has been estimated that one third of the shorebirds that winter in the Pacific coastal region of North America occur in two bays in Sinaloa. Here, industrial farming and aqua-culture have increased rapidly after the North American Free Trade Treaty was signed.

These big-picture scenarios illustrate threats potentially faced by the plovers and other shorebirds when they are away from the Quill Lakes. These threats are largely if not entirely out of local control.

7.2 Water levels.

Measurements indicate that the salinity of the Quill Lakes has been increasing over decades (Table 2). Such an increase is often associated with an overall decline in water levels.

A decline in water volume leads to an increase in salinity, since salts remain on the lake when virtually pure water evaporates. Increases in salinity present a considerable threat to the aquatic community and thus to birds participating in the lakes' food chain (e.g. Sect. 5.3.5). Rawson and Moore's (1944) data indicate, for example, that few species of fishes could tolerate salinity exceeding 10,000 ppm. and none more than 20,000 ppm. In their study, fewer and fewer species of small aquatic animals, including water flea, rotifers and relatives, were found in lakes as salinity increased and exceeded 20,000 ppm.

In the absence of periodic flooding, plants also may encroach on shorelines, thus altering the habitat to the detriment of shorebirds. Furthermore, without a periodic and life-stimulating saturation of the soil by flood water, invertebrates may remain dormant in their resting stage, or may die altogether in time (Sect. 7.3). Climate change (Charlson et al. 1992) is a concern because the chaotic (vs. deterministic) nature of climatic systems (Gleick 1987) largely precludes meaningful planning in advance. Also, if increased temperatures are an outcome, increased temperatures will lead to even greater evaporation in already water-stressed ecosystems.

Long-term data from Redberry Lake and Chaplin/Old Wives lakes, presented in their respective IBA conservation plans, raise concern. Redberry Lake water levels have been declining steadily over the last decades, and there is no evidence of a leveling trend. Impacts on the lake's fishery and threats are documented. It is likely

that Redberry Lake has a ground water connection, as is likely for many saline lakes. The declining water levels may be a sign of depletion of ground water reservoirs.

Chaplin and Old Wives lakes derive much of their water from within the Wood River watershed. Flow records in Notukeu Creek were available from Sask. Water. These records indicate that since 1914 there were periods of increased and reduced flow, but no declining trend in water levels over all.

Saline lakes in Saskatchewan, including the Quill Lakes, are enormously important for the shorebirds at a continental level. Many individuals and organizations in Saskatchewan have data or opinions on ground water supply in this province. It may be fruitful to bring interested people together to share data on trends.

7.3 Water dynamics.

In addition to water levels, water dynamics as in the characteristic flood-dry cycles, are needed for shorebirds (e.g. Sect. 4.9 - Degradation of Habitat). The Quill Lakes have undoubtedly experienced such cycles in the past. While flooding too high and receding too low impacts Piping Plovers negatively in the short term, these cycles renew the mudflat ecosystem and represent an opportunity for feeding/staging shorebirds.

Several species of shorebirds are adapted to probing for their food in exposed mud or the mud below shallow water. Figure 5 offers a

glimpse into some of this complexity from the point of view of feeding lifestyles of shorebirds -- greatly simplified at that. If any one of the many factors that operate here is 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).

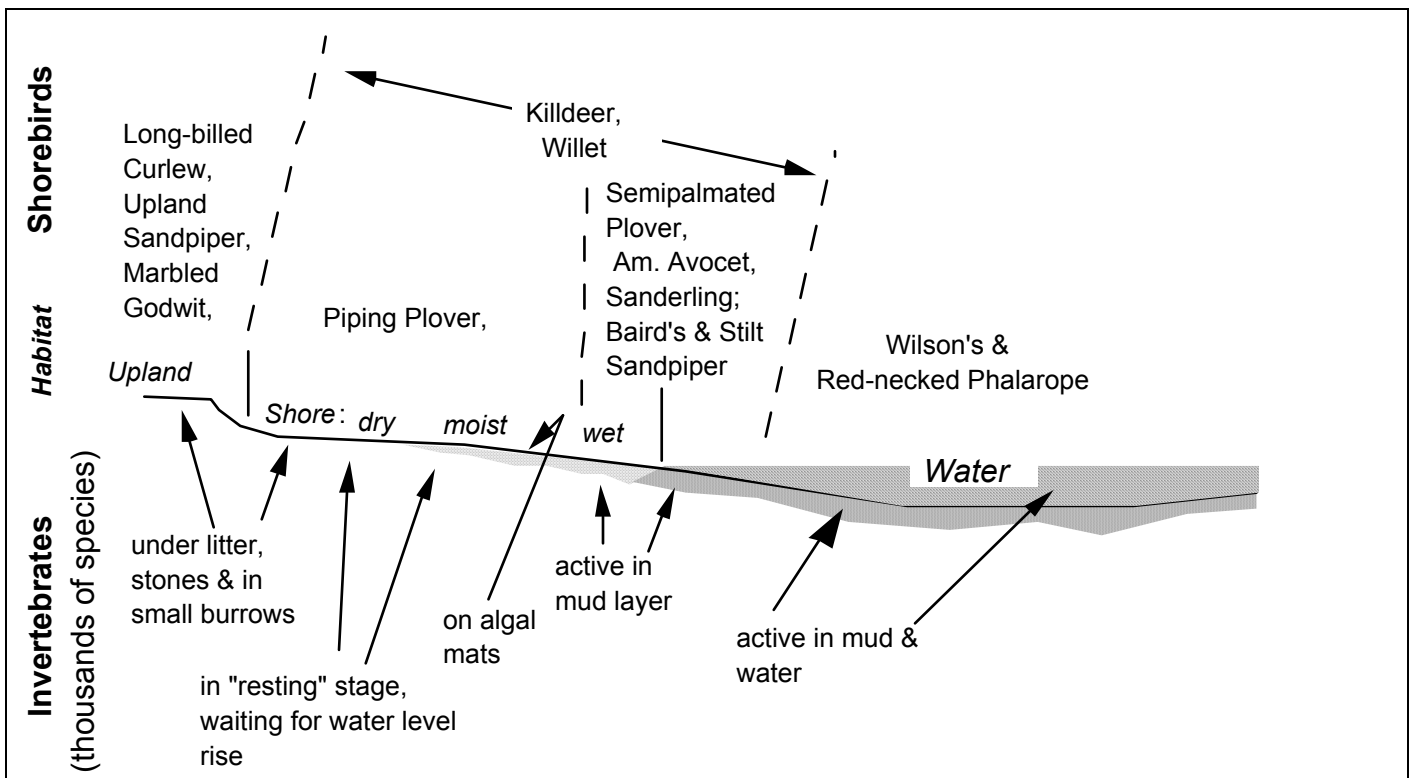


Figure 5. Different zones and characteristics of a pond affect how and where invertebrates species live, and the degree to which these are available to different shorebirds with different feeding strategies. Habitat use by birds is based on Skagen et al. (1999).

- 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. Avocet¹³)
- spin-swimming, to swim in tight circles and disorient insects in the water column making them easier to catch (e.g. phalaropes).

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 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.

In their resting stages insect 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.

7.4 Water quality.

The Quill Lakes are saline (Sect. 2), as are a substantial portion of the world's lakes. Salinity in itself is not a problem, since salt lakes can be very productive at low or moderate salt concentrations. 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 very carefully managed (Coote and Gregorich 2000).

In addition to salt and silt, chemicals carried in water can threaten water quality and impact food chains. In southern Saskatchewan, 44% of the land is treated with pesticides annually. In a study in southern Saskatchewan, Donald et al. (1999) found that in early July the average number of types of pesticides detected in wetlands ranged from 1.8 in areas with less than 21 mm of rain during the previous 15 days, to 3.2 in areas with more rainfall. The high rainfall areas resulted in greater erosion. As many as 60% of the wetlands had at least one pesticide in amounts that exceeded Canadian guidelines for

¹³ 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.

the protection of aquatic life. Lindane and triallate exceeded these guidelines most often (Donald et al. 1999).

Tests for the presence of pesticides and pollutants in water are costly. Even when funds are available for studies of pesticide exposure through drinking water, the task is difficult at best. Environment and water quality experts in Canada and around the World are given the virtually impossible task of deciding whether a given chemical or practice is safe or not safe. The public demands answers in a simplistic science-based yes-or-no evidence style. This approach is hopelessly mismatched to the complex natural system in which the chemical finds itself. A yes-or-no conclusion is impossible because once a synthetic pesticide leaves the sprayer nozzle, it becomes virtually impossible to track. Furthermore, when a given concentration of a pesticide is studied for impact on a certain life stage (e.g. adult but not embryo) of a plant or animal in the controlled microcosm of a laboratory, this does not automatically reveal its impact on different life stages in nature, its impact under the simultaneous exposure of two or more pesticides, or the impact of multiple exposures (Donald et al. 1999).

7.4.1 Intensive livestock operations. In an effort to capture ever decreasing economic margins, agriculture in Saskatchewan has been increasing in scale. First, grain farms increased and then livestock operations in the form of feedlots for cattle, and hog "barns" as they are called. In a

link to its homepage (<http://www.agr.gov.sk.ca/>), Saskatchewan Agriculture, Food and Rural Revitalization states:

"Saskatchewan, with its low cost feed grains, large land base, advanced production skills, and research & development capabilities, presents great pork production opportunities! The Department provides leadership, information and services to promote the pork industry expansion in the province. The following topics contain valuable documents related to production and regulation for companies to be globally competitive, environmentally sound and socially responsive."

Plans are underway to erect a hog "barn" in the R.M. of Lakeside. Questioning the apparently limitless expansion of this agricultural industry for environmental reasons, and to avoid deterioration of water quality in the Quill Lakes area, a local group has raised opposition. This group, the "Quill Lakes Watch Group," called a meeting on 26 March 2002. Below is a brief presented at this meeting by Lillian Thorlacius:

"The Quill Lakes and surrounding area "belongs" to us all and to all future generations. It is a part of our past. It has given to us: it needs our protection before the point of no return is reached.

Within the memory of our people, changes are recorded as the climate continues to interact with the soils, the vegetation, our creek systems and ground water. Throughout time the Quill Lakes area has been shaped by the prevailing forces of nature. As man became an active and constant part of the environment, he also has added his force and it is the increasing strength and speed of that dollar-sign-force that should alert everyone.

And now just a brief glance at our past. Recorded in history are accounts of early travelers to this area: Henry Youle Hind in 1858; John Macoun and the Fleming expedition in 1872; and Chief Yellow Quill and his small

band of Saulteaux who knew this area as home; and then the homesteaders came.

An early pioneer, Joe Stefansson, communicated with the Indians who spoke of fish which had been in the lakes - but at the turn of the century, no fish. There had been a dry period. However, by 1909, fish were being netted. (There is a picture in 'Reflections by the Quills' showing Joe with a sleigh box full of fish for sale.)

By 1914 the waters were rising at an alarming rate, which caused the Dominion government to send out surveyors and others to conduct a study. It is also recorded in history that the R.M. of Big Quill received a letter from the Lakeside R.M. requesting the opinion of the council as to the advisability of a meeting of the reeves of the municipalities bordering Quill Lakes, to define a course of action to get the water lowered. - Bless the memory of those pioneers who knew, "We are all in it together".

The Quill Lakes have been places for recreation:
A surge in the 1920s, - On the east shore Big Quill pavilion, boats and celebrations.
Then the dry '30s - the depression marked a decline.

The 1940s & 1950s. - A cabin grouping existed on the south shore of Big Quill.
Now a mineral industry exists there. Now netting for shrimp takes place. That's the area where in the '20s a 100 yd. Net could catch 40 fish in one night, perch, jackfish, mullets.

The foregoing capsule of information may be new to anyone here who belongs to the younger generation and a review to others. But most of all, it should focus us All in the cycles that have existed in NATURE - the rises - the ebbing - and the low.

To speak of the past is not to live in the past, but to acknowledge that it is a part of us.

But man has added a force - an increasingly powerful force to the setting. And when concerns are put forth, there are those who say "What good are the lakes or the area for anyway?" The answer is, "Take time and you will see." Then there are those who say that

what another R.M. chooses to do (regarding the mega hog operations), is "none of our business".

But it IS the people's business. It is not to be divided by manmade lines. The "R.M. divisions," still of early settlement size - small jurisdictions formed at a time when a culvert was a major issue - are now dealing with mega industries and their dollar power which move in with their psychology.

With pleasant sounding names such as "Big Sky, Heartland" and "Sunnyland", like those of children's playgrounds.

And psychology in action. Quote: "Before building a new hog facility, (someone) spends about three years courting the community." Another quote, (again referring to the mega hog industry) "We haven't been hearing things because things have been percolating behind the scenes a little bit more".

To all we say, "We are not made of putty. We are not puppets!"

The power of the mega hog industry now in motion brings other concerns to light for us all to look at.

Concern about the lagoon systems all around draining into the unique lakes - where are the standards? Are there tertiary systems? What about monitoring?

Concern about excessive clearing of land and trees.

Concern about chemicals and other pollutants from the farms.

Concern about chemicals and other pollutants from the towns.

Where to? Where does it all stop?

What about our quality and quantity of water?

Industries need an inordinate amount of water. For a long time the local poultry industry - now Lilydale has affected quality and quantity of water in some local wells. (It is not common knowledge as to how much water that industry uses). Can the mega industries be they poultry, pigs, cattle etc., guarantee that we will always have a sustainable amount of good water? Of course not!

We of the Quill Lakes Watch Group look beyond our noses at all polluting forces. Of course none of us want the sickening odour

coming our way from concentrated animal wastes, but our concern is not sidelined by stink or in improvements to that aspect. Our interest does not end at the border of our property or at municipal borders. We are concerned about the TOTAL issue.

Can we not learn from others? We know North Carolina and nearby states with their mega hog factories have, in some places, reached a point of no return with regards to drinking water and other aspects of the environment. We read that they are looking north to our spaces (the hog industry is vertically integrated). *WE ARE CONCERNED!*

It seems that our Government departments dealing with the economic development, with agriculture and food, with environment and with tourism have conflicts in ideology here at the Quill Lakes.

So let us serve notice that this is not wasteland. Yes, we have "open spaces" here at the lakes and elsewhere, (and today we speak specifically of Saskatchewan). Spaces are necessary in the whole scheme of things -- Spaces are beautiful.

- The Quill Lakes and surrounding areas
- have been left to us,
- are now in our care.
- it is our duty to protect
- It is our duty to question activities.

Times change, ways change, new ideas, progress is made. One thing is certain — INDUSTRY cannot grow at the expense of the ENVIRONMENT or we are all losers."

The Saskatchewan Environmental Society has shared information and worked with other organization to encourage a less environmentally destructive approach to expansion in the hog production industry (e.g. January/February 1998 and July/August 2000 newsletters. The water-based nature of manure handling and the enormous scales in most operations poses great threats to Saskatchewan's water resources.

Environmental engineers suggest that any project over a certain size must be required to treat its waste in a closed system so that it is neutralized before release. At least one hog operation in Alberta has set an example that is apparently economically viable. Pure Lean Hogs Inc. does not dilute its manure in water but uses wood chips as bedding which are composted as solid manure in sealed channels before it is returned to the soil. These hogs are also offered more space than is the norm in the industry and raised without growth hormones and a minimum of pharmaceuticals in the feed. Pure Lean Hogs Inc.'s operation was described in a presentation made on 6-7 April 2002 at a conference in Humboldt, SK., entitled "Community development - more than economics."

7.5 A Complex of large and small wetlands.

The 22 species of shorebirds that migrate across the prairies to their northern nesting grounds concentrate in spectacular numbers at 18 sites across the prairies. However, countless small wetlands also support many shorebirds. Combined, these modest spots may be of critical importance.

While the spectacular staging sites are critical for many migratory species, conservation should not stop there. Management strategies should complement the natural history of the species. For instance, long-distance migrating shorebirds stop and fatten at specific staging areas

and then fly non-stop 2,000-3,000 km relying on the fat gained (Harrington 1999). Others move in a broad front and make frequent stops to re-fuel. This broad-front and frequent-stops type of migration appears to be more prevalent on the Great Plains than along the east or west coastal migration routes (Skagen and Knopf 1994). Also, the species that exhibit this pattern tend to be smaller in size as they cannot store as much fat as larger-bodied shorebirds or fly as far without replenishing reserves, abundant small wetlands may be critical to their survival. Thus, many small wetlands are also important where these satisfy the requirements of some species.

7.6 Disturbance/disruption.

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.

Disturbance or other forms of disruption can represent one side of a coin, with opportunities opposite. Bird watching is a benefit in the greater scheme, but when visitor numbers are high, it must be managed to avoid it becoming a threat. The notion of what constitutes a threat will vary among people. There is considerable concern among Saskatchewan bird watchers and rural residents alike that this impact poses too great a risk for them to endorse tourism options.

Hunting related tourism in Saskatchewan has now shown its considerable adverse costs, some of it is perhaps beyond repair. Selected newspaper articles include:

"Ottawa spends nearly \$60-million killing elk,"
National Post, Friday 7 Sept. 2001, p. A4

"Hunt farm proposal (in Alberta) leaves
opponents fuming," Western Producer, 19
July 2001, p. 17.

"CJD death in Saskatchewan not linked to
animal illness," Western Producer 7 March
2002.

One root problem associated with commercialized hunting is a currently improper alignment of private gain from a traditionally public resource; inadequate time and evolution of the requisite checks and balances to allow the needed monitoring and management of private economic gains from public wildlife. The market hunting prior to the Migratory Bird Treaty (Sect. 2.2.1) represents an example of how mis-aligned private gain and public good lead to the needless elimination of some species. The loss of other species was narrowly avoided by the treaty which appropriately limited private use of wildlife. Under a system of regulated recreational hunting apparently no species have gone extinct from hunting in the many decades since the inception of the act. Furthermore, wildlife management has been so successful that some hunted species may be at an all-time high even in densely populated regions of the continent (white-tailed deer for example; Pletscher and Schwartz 2000).

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 way of life. The plan also outlines some specific goals and actions.

8.1 Management goals

Goal 1. Encourage continued stewardship and the participation of the many organizations (Sect. 5.4) toward conservation of the Quill Lakes and their ecosystem.

Goal 2. Encourage the coordination of monitoring, to maximize its effectiveness in the long-term.

Action 1. Attempt to synchronize monitoring if it is not carried out each year so that efforts coincide as much as possible, as for instance with the international Piping Plover survey (e.g. Sect. 5.4.7).

Goal 3. Manage tourism opportunities to facilitate a quality experience by visitors, without harm to birds and the ecosystem (Sect. 7.6, Appendix 4)

8.2 Infrastructure goals

Goal 4. Encourage on-site and regular meetings (annually) for information exchange among participating organizations and local people.

Goal 5. Encourage the 'bird trails' system (Sect. 6.3.1), and link other sites to the Quill Lakes to enhance tourism opportunities overall.

8.3 Educational goals

Goal 6. Provide schools with appropriate resource materials to highlight the special nature of the Quill Lakes, particularly with regard to staging by long-distance migrants (Sect. 5.4.9).

Goal 7. Encourage where possible the sharing of information with local people to highlight the treasure they have 'at their door' and also the threats to conservation.

8.4 Research and information needs

Goal 8. Monitor bird use at the lakes and assess any potential impact on birds mediated through food chain effects (Sect. 7.3) or diseases.

Goal 9. Monitor regularly water quality and invertebrate communities such that trends can be detected. Check salinity in Big and Little Quill lakes, comparing these with historic values (Table 2) and evaluate implications.

Goal 10. Evaluate long-term trends in water levels and salinity across all major saline lakes in Saskatchewan with a view to search for conservation strategies where appropriate.

9 Evaluating Success

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

Local champion: Charles Deschamps (Appendix 1)

10 Acknowledgments

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The IBA Advisory Committee members helped select IBA sites for conservation planning: Gregg Brewster, Stephen Davis, Frank Roy, Margaret Skeel, Alan R. Smith and Earl Wiltse. Attila Chanady, Chuck Deschamps, Robert Foster and Margaret Skeel provided input that greatly improved this plan.

Despite some formidable environmental and sustainability challenges of our time, a positive note is that birds are still using the Quill Lakes in large numbers. This is no accident, but a credit to local people and institutions for whose good judgment the birds are able to reside at the

lake today. We are grateful to the persons listed here who have agreed to continue to participate in this conservation planning in their professional or private capacity (see Appendix 1).

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Information from the Canadian IBA Database was provided by the Canadian BirdLife International co-partners, Bird Studies Canada and the Canadian Nature Federation. Data sources include surveys organized by NGO's and unpublished data sets kindly provided by provincial and federal department biologists. 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 Quill Lakes IBA. By letting their name appear here, these individuals have made no commitment beyond agreeing to be contacted when their participation is requested.

Fred Beek, Fish & Wildlife Branch, 3211 Albert Street, Regina, SK, S4S 5W6; 306-787-3019
fbeek@serm.gov.sk.ca

Interests: Fred Beek is the Team Leader for Saskatchewan Environment & Resource Management's RAN program (Sect 2.2.3).

Charles Deschamps, Ducks Unlimited Canada, Wadena, Saskatchewan, S0A 4J0; 306-338-3677
c_deschamps@ducks.ca

Interests: Chuck is Field Office Biologist and familiar with the birds, the broader natural history and ecotourism initiatives in the region.

Blair Foster, Box 730, Wadena, SK, S0A 4J0

Interests: Blair is interested in fostering tourism opportunities in the region.

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

Interests: Paul is the Chairperson for the Piping Plover Recovery Team (Sect. 5.4.7).

Wayne Harris, Sask. Env. and Resource Manage., 350 Cheadle Street W., Swift Current, SK, S9H 4G3; 778-8218
WHarris@serm.gov.sk.ca

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

Tom Harrison, Sask. Wetland Conservation Corp., Rm 202 - 2050 Cornwall Street, Regina, SK, S4P 2K5; 306-787-0726

Interests: Tom is directing many of SWCC's riparian management projects (Sect. 5.4.8).

Wally Hoen, Saskatchewan Agriculture & Food, Wynyard, SK, S4A 4T0

Interests: Wally is an agrologist involved in administering Crown-owned grazing lands near the Quill Lakes.

Kerri Holderness, Wynyard, SK, S4A 4T0

Interests: Kerri offers nature tours and guides hunters in the Quill Lakes area.

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.

Ken Kessler, Chaplin Tourism, P.O. Box 30, Chaplin, SK, S0H 0V0; 306-395-2556
chaplintourism@sk.sympatico.ca

Interests: Ken is the Ecotourism Coordinator for Saskatchewan's Birding Trails.

Jack Maluga, Box 1348, Wynyard, SK, S0A 4T0; 306-554-3791
wyncap@sasktel.net

Interests: Jack is a member of the newly formed Quill Lakes Watch Group, a group with a perspective for history and sustainability in local community development.

Nolan Matthies, Sask. Wetland Conservation Corp., Rm 202 - 2050 Cornwall Street, Regina, SK, S4P 2K5; 306-787-0726
nmatthies@wetland.sk.ca

Interests: Nolan is a committed birder who works for SWCC. He has been active in facilitating bird related tourism initiatives.

Roger Moskaluke, Wynyard Tourism Association, Box 734, Wynyard, SK, S0A 4T0

Interests: Roger is interested in facilitating tourism opportunities in the 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.

Shelly Thoen-Chaykoski, Box 57, Foam Lake,
SK, S0A 1A0

Interests: Shelly is interested in facilitating
tourism opportunities in the region.

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 a Species at Risk Specialist and
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 its affiliated provincial, territorial and local naturalists organizations to reach 100,000 Canadians. The strength of CNF's grassroots naturalists' network allows it 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.

CNF's 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 is recognized nation-wide as a leading and respected non-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.naturesask.com)

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.

Nature Saskatchewan conducts or facilitates research through support for monitoring

projects 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.

Appendix 4. Codes of conduct for nature viewing and hunting

As **wildlife viewers**, our goal is to watch animals behaving in natural ways in their natural habitats. We respect the needs of wild animals for space, natural vegetation, and ecological community. We recognize our responsibility to know the consequences of wildlife viewing .

We follow these guiding principles:

We will view or photograph from a distance that respects the needs of the wildlife, using proper equipment such as binoculars, spotting scopes and telephoto lenses. Before approaching wildlife we will first learn the spatial needs of each species and to recognize their alarm signals.

We will avoid noises or actions that might stress wildlife or cause animals to waste energy in unnecessary flight.

We will be patient, remembering that we are guests in wildlife habitat.

We will not trample or damage vegetation, both for the sake of the wildlife it supports, and for its intrinsic values.

We will not approach animals that are breeding, nesting, brooding or raising young, because parents and young are especially vulnerable at these times. We will learn the places and times to avoid these situations. We will not approach young or baby animals.

We will not feed wildlife, recognizing that feeding usually leads to problems such as unnatural food dependency, habituation to humans, disease or even death.

We will keep pets on a leash around any wildlife, and avoid bringing pets into sensitive wildlife habitat.

We will respect the rules and regulations of protected areas. Trails, roads, closure areas and

other management features are designed for safety and welfare of visitors, natural vegetation and wildlife.

We will be respectful of others including property owners, and other wildlife watchers.

We will give back to nature for the gifts of wildlife viewing we receive, through conservation work for wildlife and native vegetation and through helping others learn the ethics of wildlife viewing.

A hunter's code of conduct. Drafted by private conservation organizations (the main proponent was the Izaak Walton League) and wildlife management agencies. Hunters are considered a backbone of wildlife conservation, but they must also safeguard the future of their sport by behaving responsibly.

- Respect the environment and wildlife
- Respect property and show consideration for non-hunters
- Hunt safely at all times
- Know and obey the law
- Support wildlife and habitat conservation
- Pass on an ethical hunting tradition
- Strive to improve outdoor skills and understanding of wildlife
- Hunt only with ethical hunters

Ethical hunting is the true measure of the hunt.