

**OPPORTUNITIES FOR ECOTOURISM DEVELOPMENT
IN THE REDBERRY LAKE BIOSPHERE RESERVE, SASKATCHEWAN**

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ABSTRACT

Ecotourism can benefit both natural reserves and local communities, as it attracts and educates visitors about how to protect biodiversity and as it brings economic revenue to those natural reserves and local communities. While several interesting ecotourism projects (e.g. a hiking program) have already been proposed for the Redberry Lake Biosphere Reserve (RLBR), the ecotourism in the RLBR, Saskatchewan, still has room to develop. On one hand, current ecotourism mainly focuses on natural elements (e.g. plants and birds). Cultural elements, such as Ukrainian traditional architecture, festivals, and food have not yet been considered for ecotourism although they also have great potential with proper advertisement and operation. On the other hand, comprehensive ecotourism service information needs to be compiled and put in place and available to the public. In this project, data was collected from literature, documents/reports and interviews with local. Potential ecotourism resource material has been classified to conduct an inventory of attractions and to map out available resources. Recommendations for future ecotourism development and possible marketing methods have also been suggested. We, my adviser and I, believed this project will benefit potential visitors, the biosphere reserve staff and volunteers, as well as local communities.

INTRODUCTION

Today, tourism has become the world's largest industry and nature tourism is its fastest growing trend. However, increased tourism can do harm to sensitive natural areas by causing severe environmental degradation and threatening the integrity of ecosystems, if proper planning and management are absent. To address the wide range of social, cultural, economic, and environmental impact of tourism on natural areas, efforts to foster sustainable tourism or ecotourism were initiated (The Nature Conservancy, 2012). In order to satisfy the increasing needs of nature conservation, ecotourism should maintain the integrity of ecosystems and the local culture. Ecotourism is a relatively new concept (e.g. Fennell, 2001; Ma, 2009), which can benefit both natural reserves and local communities, as it attracts and educates visitors to conserve biodiversity, and as it brings economic revenue to the area.

Redberry Lake, Saskatchewan, is home to one of only 16 biosphere reserves in Canada. Redberry Lake Biosphere Reserve (RLBR) was officially designated by the United Nations Science, Education and Culture Organization (UNESCO) in January 2000 as having the purpose to conserve biodiversity, foster sustainable development, and build capacity through scientific research, monitoring, education, and training (RLBR, 2012a). The RLBR has rich natural and cultural resources, which are regarded as having great potential for ecotourism development. For instance, Redberry Lake, the core area of the biosphere reserve, supports about 200 birds, comprising nine endangered, threatened or rare species (Kingsmill, 2002). There are varieties of natural landscapes in RLBR, such as rolling prairie, pothole wetlands, pocket woodlands and forests, as well as different types of marshes, including saltwater and freshwater, which are unique themselves. In addition, there are diverse plant species and vegetation communities that are typical for Prairie and Boreal Plain ecozones (RLBR, 2012a). In terms of cultural resources, Hafford, the nearest town to Redberry Lake, is very rich in Ukrainian history and culture. There are churches with unique architectural style; traditional festivals, such as the Polka Festival and Summer Sizzle, which are distinctive and enable visitors to appreciate Ukrainian songs, dance and to taste traditional foods (Hafford community sustainability plan draft [HCSP], 2010).

As there are these plentiful natural, historic, and cultural resources in RLBR, ecotourism will help develop this area. Therefore, incorporating plans for this target area into larger planning efforts for the design and implementation of ecotourism is critical.

While an early ecotourism project, the Redberry Pelican Project, organized by Kingsmill in 1989, brought economic benefits and protection for wildlife (Buckley, 2003), the RLBR also

proposed some interesting projects, such as hiking and education programs. However, there is still room for further development of ecotourism in the area.

On one hand, current ecotourism mainly focuses on nature-featured elements. For instance, either fishing/hunting activities or hiking/education programs are directed at animals and plants in the RLBR. Culture-featured elements, such as Ukrainian festivals and traditional food/meals, were not considered in the current plan for ecotourism, although they also have great potential to attract more tourists and to bring economic benefits. With proper advertisement and operations, these cultural elements could be integrated to improve the ecotourism development in the RLBR.

On the other hand, comprehensive tourist service information needs to be compiled and put in place. For example, there is no virtual map or guideline for ecotourism in the whole of the RLBR. Redberry Lake and its nearing towns/villages have not developed the roots needed for ecotourism, which is a weak area for them.

Through researching and summarizing available ecotourism resources in the RLBR, our project aims to achieve the following goals: (1) a site and infrastructure analysis focused on nature-oriented, culture-oriented and sport-oriented features; (2) a strategy to develop different ecotourism activities, including possible marketing methods; (3) a plan to build better communication with local communities; and (4) a plan to promote ecological education for locals and visitors.

Theoretical Framework

At first, a literature review was conducted to provide the background for our project. We then explored current ecotourism resources in the area of the study. Ecotourism is a relatively new concept and there are over 80 definitions of this term, since it was first proposed by Ceballos-Lascurain, in the early 1980s (Fennell, 2001).

The various definitions of the term, “ecotourism,” follow three basic criteria: “(1) attractions should be predominantly nature-based; (2) visitor interactions with those attractions should be focused on learning or education; and (3) experience and product management should follow principles and practices associated with ecological, social- cultural and economic sustainability” (Weaver & Lawton, 2007). In this project, we adopted the definition proposed by the World Conservation Union (IUCN) in 1996, which describes ecotourism this way: *ecotourism* is “environmentally responsible travel and visitation to natural areas, in order to enjoy and appreciate nature (and any accompanying cultural

features, both past and present) that promote conservation, have a low visitor impact and provide for beneficially active socio-economic involvement of local people” (Ceballos-Lascurain, 1993).

As we said above, ecotourism has unique benefits which make it different from traditional tourism. Ecotourism could protect biodiversity, promote local culture, support the local economy, and build an impression of sustainability.

To achieve the goal of conservation, ecotourism needs to be carefully planned, in advance. An effective plan for ecotourism plan is critical and has several important aspects.

According to Gutierrez (2006), to develop an active plan for ecotourism, that benefits biodiversity conservation and local people, we should base it on an informed process which includes “attraction inventory”, “site and infrastructure analysis”, “market demand”, “supply and competitiveness”, “available capacity”, “socioeconomic linkages to biodiversity conservation”, and “tourism impacts”. That is to say, an effective ecotourism plan also needs to pay attention to these factors.

Limited by time, our project mainly focuses on the first two aspects – we collected literatures to build the attraction inventory; and, based on this inventory, we did site and infrastructure analysis and Strength-Weakness-Opportunity-Threaten (SWOT) analysis on its ecotourism development. In addition to these portions of the study, we will also give recommendations on the remaining aspects, identified by Gutierrez (2006), as cited above.

METHODS

a. Study area

In this project, the RLBR was set as our main study area to explore its ecotourism resources. Located on the edge of Parkland Ecoregion in Saskatchewan (RLBR, 2012a), the area is unique for its saltwater lake, while being surrounded by a mostly freshwater environment.

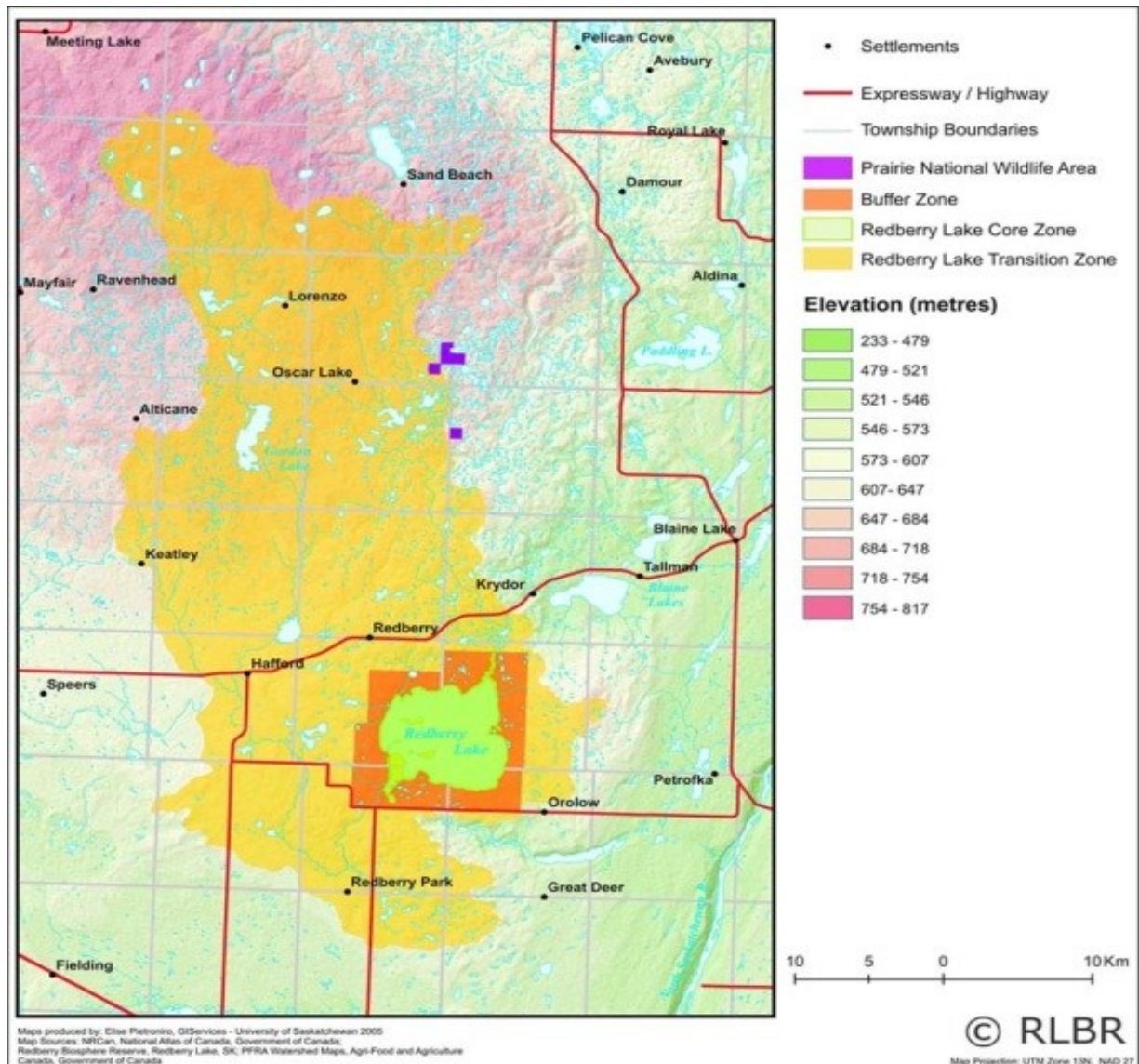


Figure 1. Map of the Redberry Lake Biosphere Reserve area (RLBR, 2012a)

Like other biosphere reserves, the RLBR also consists of three functional zones: the 'core area', surrounded by a 'buffer zone,' and a 'transition zone' (or 'area of cooperation'). The reserve's core, about 5% of the total area (Fig. 1), is Redberry Lake itself, a federal Migratory Bird Sanctuary, established by Environment Canada in 1925. It is also recognized as a Canadian Important Bird Area (IBA), along with its four islands – Gull, Pelican, Old Tern and New Tern (IBA, 2012; RLBR, 2012a).



Figure 2. The Research and Education Centre of the RLBR (Photo by X. Zhao)

The buffer zone of the RLBR, about 6% of the total area (Fig. 1), is immediately surrounding the lake, which includes Redberry Lake Regional Park and Research and Education Centre of the RLBR (Fig. 2). The third zone of the RLBR, the area of cooperation which occupies about 89% of total area (Fig.1), is made up of all other land within the closed watershed of Redberry Lake, as well as the town of Hafford. People live and work in this large, outer part (RLBR, 2012a).

The RLBR area covers 5 Rural Municipalities (RM), including the RM of Meeting Lake and the RM of Redberry, as well as small parts of the RMs of Douglas, Great Bend and Leask (Fig. 3). In addition to these RMs, there are also the RM of Blaine Lake and Mayfield, which are involved in the Agri-Environmental Group Plan project, within the RLBR.

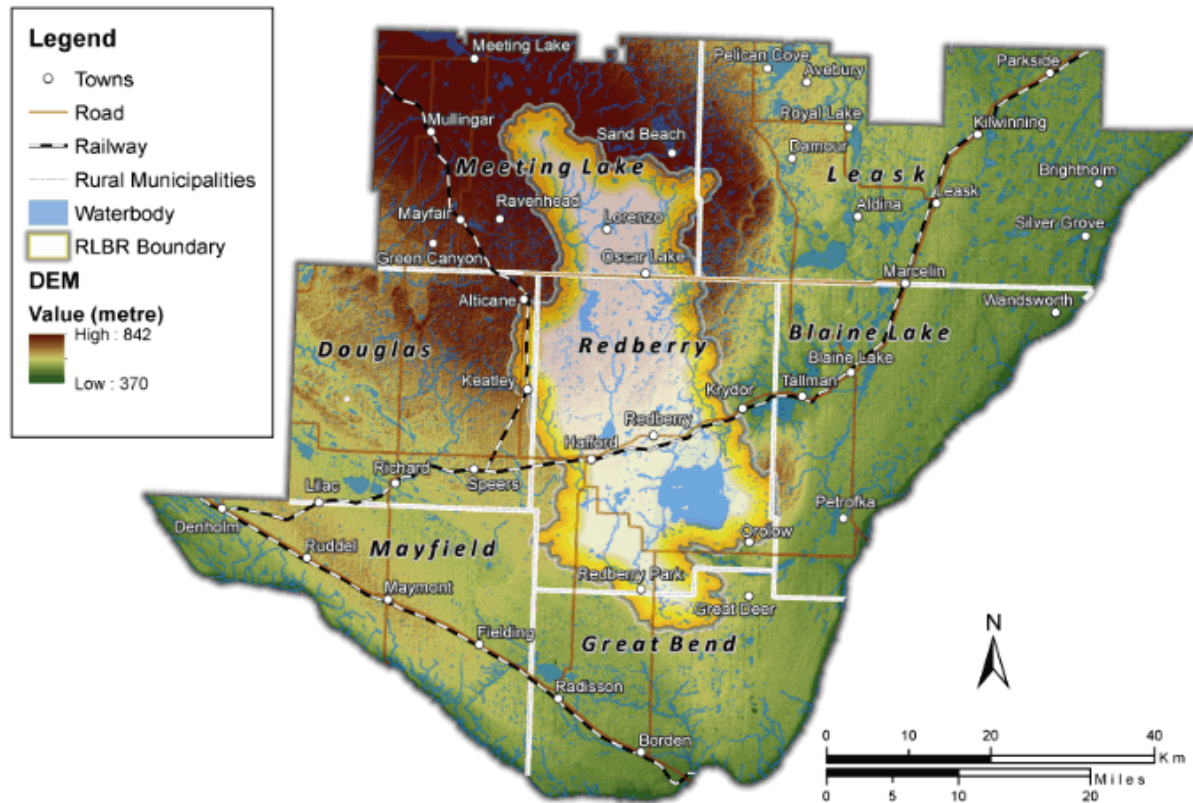


Figure 3. Rural municipalities related to the RLBR (after Kricsfalussy et al. 2012)

In this project, we plan to explore not only the RLBR's natural resources, but also its cultural resources. Therefore, we classified the whole area of the biosphere reserve as 'RLBR (natural area)' and the town of Hafford, which is full of Ukrainian characteristics.

Additionally, the development of ecotourism requires support infrastructure, such as hotels, restaurants and shops to provide tourists with service supports, and these businesses need a minimal population to maintain their operation. As a result, some demographical data analysis should be included in our project.

First, we set Redberry Lake as centre-point for our study. Then, we identified several prospective sites (towns and villages) in the RLBR and surrounding RM of Leask and the RM of Blaine Lake, such as Hafford, Borden, Radisson, Blaine Lake, Maymont, and Speers (Fig. 4).

After that, we did some research on demography, collecting the population and related information about listed towns and villages. Then we explored the infrastructure in sites which have population greater than 50 people, as we assumed that this number in most cases is the minimum population for maintaining tourist services.

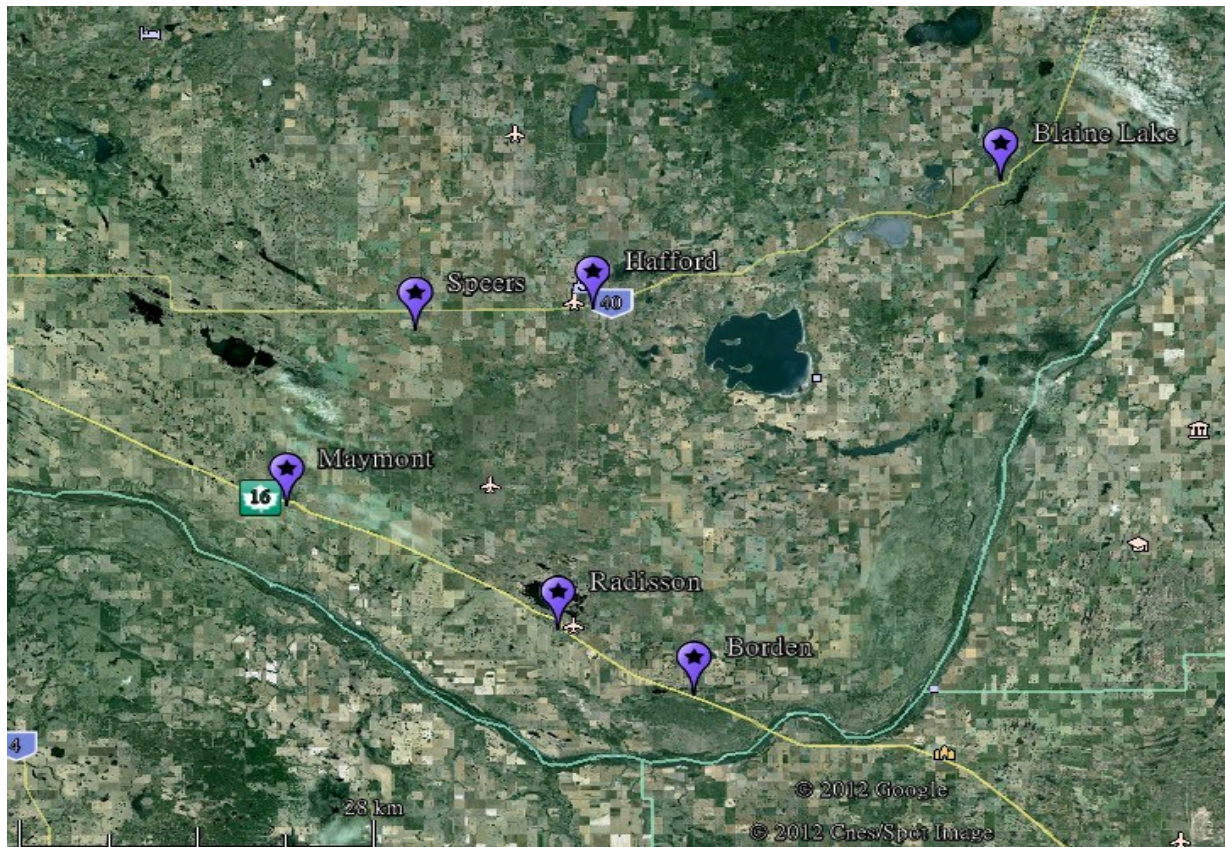


Figure 4. The selected study sites in the RLBR and vicinity.

b. Ecotourism attraction inventory

There are several steps necessary to develop an attraction inventory and virtual map for this project. First, published papers and articles, project reports, magazines and newsletters, and website resources about the RLBR were collected and reviewed to set up a checklist of potential resources (Appendix A). Based on that checklist, we prepared more detailed inventory.

Considering completeness of the project, private communication is another useful method to gather information (there was no need to disguise participants' names). Therefore, visits to the study area and talking with the RLBR staff to verify and update collected information were done.

The first visit to the RLBR was conducted in mid-May (May 15, 2012). During this one-day visit, John Kindrachuk (Executive Director, RLBR), Rachel Turnquist (Technician, RLBR), Susanne Abe (Communication Coordinator, RLBR), Thomas Abe (Local Resident in Hafford), and Vanessa Currie-Foster (Adventure Leaders/owners of Clearwater Canoeing) provided considerable help with gathering information, such as which duck species could be hunted, a list of plants and birds in the RLBR, as well as a list of current sports, known for their entertainment value (e.g., canoeing), and local festivals.

Another valuable contact for this project was Lenore Swystun from Prairie Wild Consulting Co. (PWCC), Saskatoon, who helped to gather more detailed information about some particular locations. During the discussion with Ms. Swystun (June 05, 2012), several locations of potential resources were verified, and she also provided maps of surrounding villages, which were very useful for future work.

We also used the Internet resources, particularly searching for infrastructure, such as potential food and accommodation, in the study area.

All the collected data on ecotourism resources in the study area were mapped using the free “Google Earth” program. For some points (built-up sites), which could not be easily verified on “Google Earth” in Street View mode, Ms. Swystun and other local residents kindly located on maps.

In early July (July 06, 2012), a one day-field visit with Dr. Vladimir Kricsfalusy was done to verify specific sites and to conduct ground-checking. During that visit we also met with Janet and Andrew Hawrysh, at their farm. By communicating with them, we gathered some new information on elk and bison farms, tea shops, woody crafts, etc. We also visited nearby towns, such as Hafford, Borden and Blaine Lake, to explore potential ecotourism attractions, do their mapping and get some first-hand pictures.

c. Ecotourism attraction mapping

Based on above methods, we built the first draft of attraction inventory and sketched a map. When pointing sites into “Google Earth” maps, we used different approaches:

1. We investigated the locations of Ukrainian legacies (e.g. churches, heritages sites) that we list in the reference section, by consulting Saskatchewan Land Description, such as SW 25-43-10 W3 (Descent of the Holy Spirit Church in Hafford). We used the Co-ordinate Converter in Map Town (2012) to convert these locations into GPS coordinates and then pointed them in the “Google Earth” map;
2. We used the village maps provided by Ms. Swystun for marking some locations which were mentioned during private communications. Subsequently, these locations were also pointed in the “Google Earth” map;
3. For villages or towns which appear in street view mode in “Google Earth,” we patrolled the whole town under that mode, identifying specific locations, such as hotels, restaurants;

4. We also used GPS to record some points which we could not identify by the above methods.

There were a few hindrances to the data collection process. The first one was data gaps. Due to limited time, as well as the low number of existing sources of literature, we did not complete the developed attraction inventory and map, and perhaps do not cover all of the potential resources existing in the study area. For example, in terms of cultural resources, the main focus is Ukrainian Churches. But the only reference available on them is Saskatchewan's Ukrainian Legacy guide (2006). That is to say, there might be some abandoned, missing or new churches. To overcome this challenge, we communicated privately with and interviewed local residents, as efficiently as possible. The second hindrance is the quality of data, especially in terms of mapping. As described above, we used four different methods to deal with the mapping. However, the first method resulted in rather low quality data – those coordinates derived from this approach showed only approximate locations. In addition, getting the GIS resource also became a challenge. It took a long time to collect and access the RLBR GIS layer files, since they were scattered among different organizations. In addition, the lack of ecotourism businesses in the RLBR created another challenge for this project. Until now, there have been no ecotourism business providers or tour operators in Hafford. Only a canoe business run by Vanessa Currie-Fosters of North Battleford is offering some local tours in the RLBR, from time to time. This made it more difficult to attain first-hand information about business perspectives on ecotourism development, in the study area.

RESULTS

a. Demography of main towns and villages

According to the recent census (Statistics Canada, 2011), we found that in the study area includes 6 towns/villages that have a population above 50 people (Table 1).

Table 1. Demography of towns/villages in the study area

Town/Village	Blaine Lake	Radisson	Hafford	Borden	Maymont	Speers
Population	510	505	397	245	146	65

Therefore, the data collection about existing infrastructure and analysis of ecotourism attractions were conducted in these places. A brief description of two of the locations of the study which have strong cultural and historical attributes was provided as follows.

- Hafford: Ukrainian- style location

Hafford is a town in the Rural Municipality of Redberry Lake. Settlers first began to arrive in this community in 1900 and on January 13th, 1914 Hafford began its formal existence (Holota, Lommer & Oschipok, 1955). This is the nearest town to Redberry Lake. Hafford is a town which is filled with a Ukrainian atmosphere.



Figure 5. Bilingual street signs in Hafford (Photo by X. Zhao)

From its bilingual street signs (Fig. 5), one can quickly assimilate to this Canadian Ukrainian settlement. Every January 13th, residents here will celebrate Malanka, or Ukrainian New Year, using their traditional customs.

- Blaine Lake: Doukhobor-style location

Blaine Lake is a town in the Rural Municipality of Blaine Lake, Saskatchewan. It was incorporated in 1912 and gets its name from a nearby lake. The town of Blaine Lake is located in the centre of a triangle formed by Saskatoon, North Battleford and Prince Alberta (Blaine Lake, n.d.b). A Doukhobor-prayer home is one of the famous attractions here (Fig 6). Additionally, a Doukhobor Settlement and Doukhobor Caves also embody the local culture and history (Blaine Lake, n.d.a).



Figure 6. Doukhobor prayer home in Blaine Lake (Photo by X. Zhao)

Borden, Radisson and Maymont are viewed as three stars in a line formed by Highway #16. For this reason, they are readily accessible and convenient for tourists.

b. Ecotourism attraction inventory

This project aimed to produce the following deliverables: an ecotourism attraction inventory (Appendix B), an ecotourism resource interpretation (e.g. locations, values & usages) as well as a virtual map (Appendix C).

Overall, the developed ecotourism attraction inventory included natural resources (21 habitats, 28 fauna and 25 flora species), cultural resources (38 heritage sites, 4 festivals, 3 types of art, and 9 kinds of cuisine) and infrastructures (11 information signs, 4 trails, 12 parks, 18 places of commerce, 10 food venues and 11 places for accommodation).

The locations of these resources included not only Hafford, but also nearing towns and villages, such as Borden, Radisson, Blaine Lake, Maymont and others.

1. Natural resources

- *Fauna*

As mentioned before, the RLBR's unique ecosystem makes this area the suitable haven for over almost 200 birds and animals, especially for some endangered or threatened species. During our data collection process, we found that there are some conflicts in literature sources regarding species at risk in the area (SAR). Kingsmill (2002) talked about 9 species at risk, and the RLBR website also mentioned 9 species but only introduced 4 species in detail. However, according to birding list (Appendix D), there are 5 species at risk: 3 endangered species and 2 threatened species of birds (RLBR, n.d.b; Environment Canada, 2009) stay in the study area. In this project, we used the birding list mentioned above.

Endangered species of birds include the Loggerhead Shrike (*Lanius ludovicianus*), the Piping Plover (*Charadrius melodus*) and the Whooping Crane (*Grus americana*). Threatened species of birds include the Peregrine Falcon (*Falco peregrinus*) and the Sprague's Pipit (*Anthus spragueii*). Detailed information on these five species is provided in Appendix E.

The iconic species of the RLBR is the American White Pelican (*Pelecanus erythrorhynchos*). According to IBA (2012), from 1991 to 1996, the number of nesting pelicans has increased from 524 to 1060 pairs. This large number is estimated to represent about 1-2% of the world's American White Pelican population. The pelican used to be an endangered species in Canada, but it was moved from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) list in 2007, because of the recovery of the population.

Bird-watching is not the only pastime here. According to a hunting list provided by Rachel Turnquist, tourists also can hunt ducks, such as the Blue Winged Teal (*Anas discors*), the Canvasback (*Aythya valisineria*), the Gadwall (*Anas strepera*), the Green-winged teal (*Anas carolinensis*), the Lesser Scaup (*Aythya affinis*), the Mallard (*Anas platyrhynchos*), the Pintail (*Anas acuta*), the Redhead (*Aythya americana*) and the Widgeon (*Anas americana*). They can also hunt domestic Bison (*Bison bison*) and Elk (*Cervus canadensis*).

- *Flora*

According to a preliminary plant list for the RLBR (Appendix F), and the field research of Kricsfalusy (2012), there are about 250 species of vascular plants observed in the study area. From the perspective of ecotourism, we selected about 25 interesting plants for our inventory, some of them edible, and some of them with special features that people can recognize. We also provided descriptions of some interesting plants (Appendix G).

- *Habitats*

In the study area, there are different types of natural habitats: wetland, forest/woodland grassland/prairie (Fig. 7).

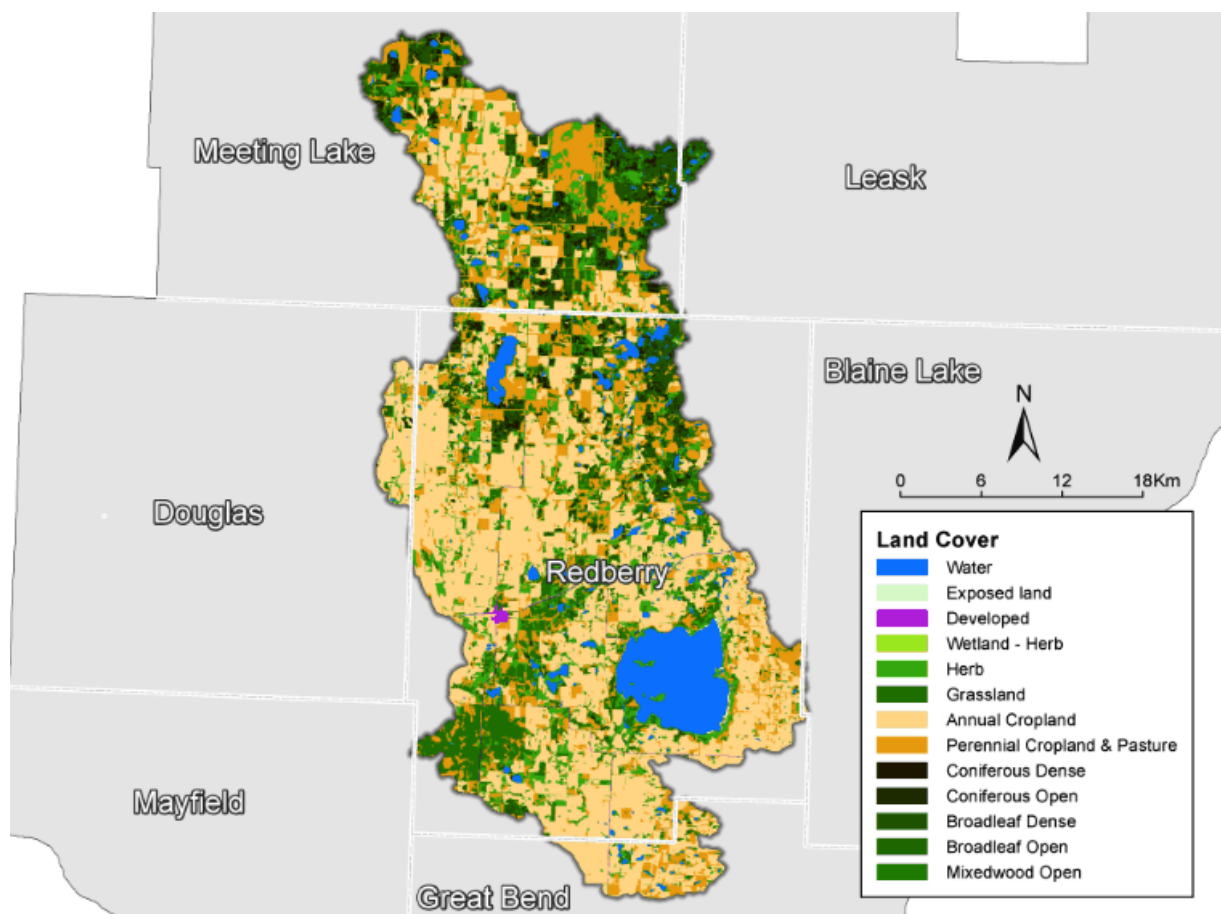


Figure 7. Main types of land cover in the RLBR (after Kricsfalusy et al. 2012)

In addition, there are several lakes, beaches and rivers that can be used as resources for ecotourism development. In terms of wetlands, one of the unique features of the RLBR is that there are four main types of wetland habitats present in the study area: marsh, swamp, fen, and rarely bog. Redberry Lake is the right place to appreciate the different types of marshes, freshwater and saltwater, located along the lakeshore.

- *Protected areas*

There are many types of protected areas in the study area, which fell under the following categories: Fish and Wildlife Development Fund Land, the Migratory Bird Sanctuary, National Wildlife Area, PFRA Community Pasture, Private Conservation Lands, Provincial Pasture, Recreation Site, Wildlife Habitat Protection and Wildlife Refuge (Fig. 8). Altogether, they form a well-developed network of Representative Areas within the RLBR.

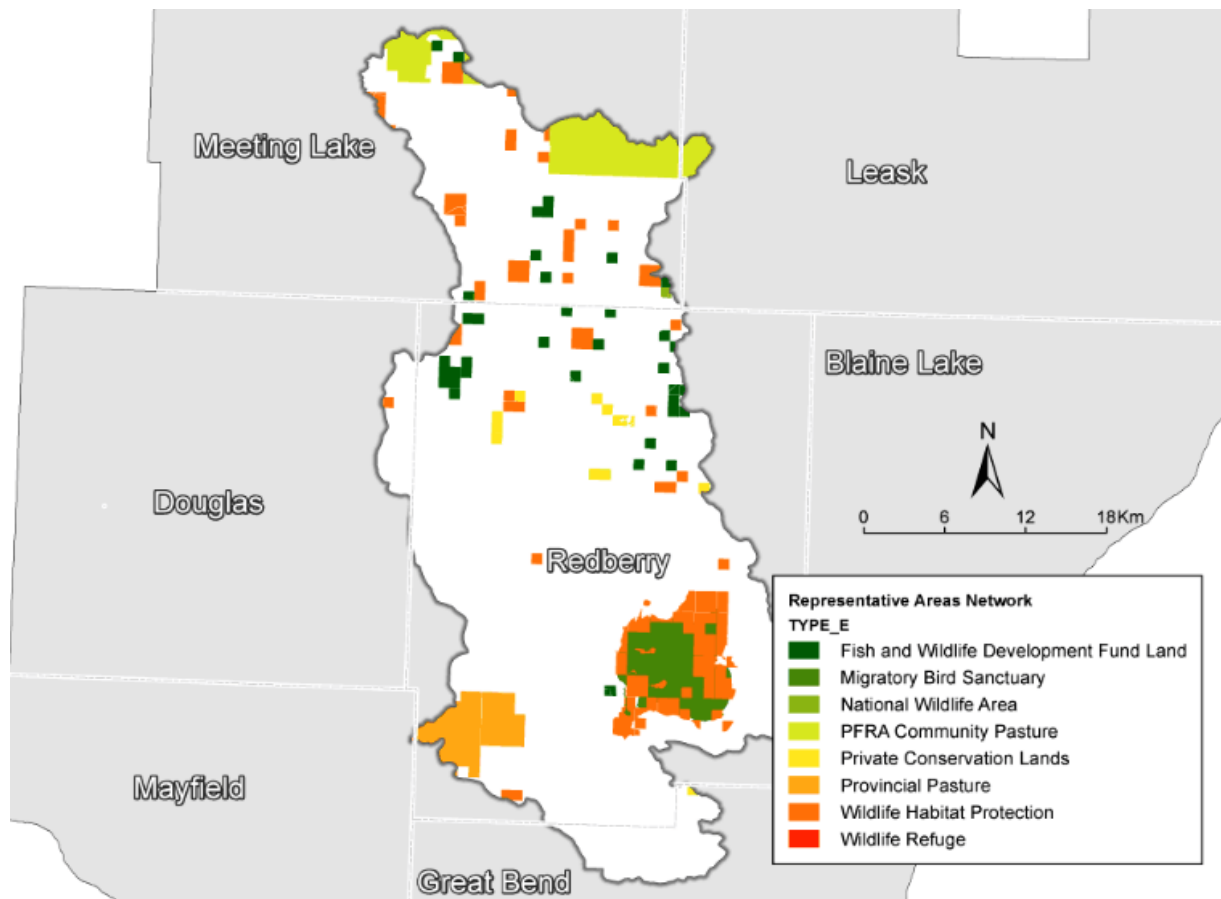


Figure 8. Network of protected areas in the RLBR (after Kricsfalusy et al. 2012)

2. Cultural resources

- *Heritage sites*

In terms of the cultural and historical legacy of the area, Ukrainian Churches (Fig. 9) are perhaps the most important part.

According to the Saskatchewan's Ukrainian Legacy guide (2006), there are 14 Ukrainian Catholic Churches, 5 Ukrainian Orthodox Churches and 15 cemeteries in the Redberry Lake bloc. Among these churches, there are three heritages sites: "Assumption of the Virgin Mary"

in Blaine Lake, “Descent of the Holy Spirit” in Radisson and “Presentation of the Blessed Virgin Mary” in Welechko.



Figure 9. The Ukrainian Orthodox Church in Hafford (Photo by X. Zhao)

In addition, there are also Roman Catholic Churches, Polish Catholic Churches (Fig. 10), and an Evangelical Church (Fig. 11) in the Redberry Lake bloc.



Figure 10. The Polish Catholic Church at the RLBR (Photo by V. Kricsfalusy)



Figure 11. The Gospel Fellowship Church (Evangelical) in Hafford (Photo by X. Zhao)

- *Festivals*

As we mentioned before, the Redberry Lake area has a strong Ukrainian atmosphere, especially during its festival seasons. There are two Ukrainian festivals - Polkafest and Malanka. Polkafest is a musical festival, but is not limited to a band and dancing. Polkafest also has other components, such as a “Jam” session and a pancake brunch. During July 13-15th, 2012, Hafford held its 16th Annual Polkafest. The other festival, Malanka, is the Ukrainian folk holiday that celebrates New Year’ Eve, on January 13, in the Julian calendar. To celebrate, people participate in a lot of activities, such as going out from the house to play pranks, or to act in small plays.

In addition, the RLBR also have some local festivals, such as Summer Sizzle and Winterama. For instance, on August 18th, 2012, Hafford held its 4th annual Summer Sizzle, featuring an outdoor carnival and many interesting activities, such as artisans’ tables, beer gardens, a dunk tank, a soap box derby and fireworks (RLBR, 2012c).

- *The Arts*

If you are interested in the arts, here you will have a wonderful adventure— the “12-40 and Beyond Tour” will be your best choice. Selecting your starting point at Blaine Lake, Marcelin, Leask or Hafford, and from there begin your journey in the Arts. You will find orchards, art studios, maybe an antique museum, or traditional crafts. Talented local residents who work in these places will surprise you with their ability.

In addition to the “12-40 and Beyond Tour”, there are also other Arts to explore. For example, you could find wood carving taking place in both Speers and Hafford.

- *Local Cuisines*

We explored that good and interesting foods can be found in this area. The best place to find it is at the Farmer's Market. The other place is to find someone willing to share local home-made food.

For instance, Hafford holds a monthly Farmer's Market, in the summer (Fig. 12). This is a wonderful opportunity to taste local food. Additionally, there are Farmers' Markets in Radisson, Borden and Blaine Lake.

For home-made food, you can choose between Ukrainian, Doukhobor, French, Polish, and German food. However, because there is no Bed&Breakfast service in the study area, visitors will not find most home-made food for public sale. The only venue to sell home-made food is Pat Kohut's "Local Ukrainian Food & Sell", located in Hafford.



Figure 12. A Poster of the Hafford Farmer's Market (Photo by X. Zhao)

3. Infrastructure resources

- *Information signs*

Obelisks in the RLBR are one source of significant information. There are four obelisks, featuring Birders' Paradise, Freshwater Marsh, Riparian Habitat (Fig. 13), and Saltwater Marsh.



Figure 13. The Riparian habitat Obelisk (Photo by X. Zhao)



Figure 14. The MAB Obelisk (Photo by X. Zhao)

These obelisks offer basic information and use attractive images from nature. In Hafford, there is an important obelisk, dedicated to UNESCO the “Man and the Biosphere Programme” (MAB) (Fig. 14). This reminds visitors that Redberry Lake was selected as a member in the World Network of Biosphere Reserves in 2000. The text of obelisk also illustrates the importance of the local community in its designation.



Figure 15. Bilingual Street signs in Hafford (Photo by X. Zhao)

The street signs in Hafford are dual language – in both Ukrainian and English (Fig. 15). Once you enter the town, these signs help guests to navigate their way in this picturesque Ukrainian settlement in Canada.



Figure 16. The Millennium Point Obelisk (Photo by X. Zhao)

Located along Redberry Lake is the Millennium Point Obelisk (or Harbour Entrance Beacon), which represents the core protected area of the RLBR, as well as the entrance to the harbour (Fig. 16). Not far from the beacon, there is another sign marking the Migratory Bird Sanctuary (Fig. 17).



Figure 17. The Migratory Bird Sanctuary sign (Photo by X. Zhao)

- *Trails/Routes*

The RLBR website and some other sources (e.g. Korpan & Korpan, 2003) provide a concise information on hiking trails in the RLBR. Generally, there are four kinds of hiking routes: the Millennium Point Hiking Trail (for easy walking), the Grassland Golf Course Walking Trail (for moderate walking), the Lookout Trail (also for moderate walking) and the Crooked Bush Trail (for easy walking). For more detailed information about these trails, please visit the website of the RLBR. And we also mapped the starting points of these trails in “Google Earth” (Appendix C).

- *Town Parks*

Ted Tylucki's Arboretum (Fig. 18) is located near to the town of Hafford. His private forest park contains many planted and natural trees, and each tree has its own story (Tylucki, 2001 & 2004). This is a living museum of trees.



Figure 18. Ted Tylucki's arboretum (Photo by X. Zhao)

The Crooked Trees site (Fig. 19) is a unique natural park, located near Hafford. It is famous for its twisted trees and was nominated as a 2007 "Seven Wonders of Canada" Candidate (Seven Wonders of Canada, 2012).



Figure 19. Crooked Trees park (Photo by X. Zhao)

It may be dated to the 1940s, when a population of crooked trembling aspen (*Populus tremuloides*) was first observed (Remphrey, 2011). What has caused these trees to bend? There have been a great number of guesses, such as soil contamination, and the effect of bombardment by a meteorite. Dr. Bill Remphrey (2011) provides an interesting study with possible explanations of this phenomenon (e.g., generic mutation). When you visit this park, you can form your own conclusion.

The town of Hafford itself has two small parks, which are Kinsmen Park (Fig. 20) and Millennium Park. There are also other parks in nearby communities, such as Borden Sports & Recreation grounds.



Figure 20. Kinsmen Park in Hafford (Photo by X. Zhao)

- *Regional Parks*

Regional parks (6 sites) located within the RLBR are also included in our inventory, since they are important recreational sites not only for local people, but also for many visitors. Moreover, this network of regional parks provided a great opportunity for their developments. They are Emerald Lake Regional Park, Glenburn Regional Park, Martin's Lake Regional Park, Meeting Lake Regional Park, Valley Waldheim Regional Park and, then, Redberry Lake Regional Park, itself.

- *Places of Commerce*

Commerce is an important source of income, through tourism. For tourists, shopping also plays an important role in their experience of the area. In the RLBR, you can find a great

amount of healthy, green and organic food. For example, Saskatoon Berry Farm nearing Krydor has fresh berries to be picked; John Kindrachuk's raises organic pork; Peter Bomok's provides local food and honey; Lucia Horbay's grows organic plants; B.&M. Krsacok's and K.&C. Thachuk's farm elk; bison is farmed by the Pat Bashuk and B. Wiebe & B. Balchen; and Andrew Hawrysh's Farm is also a good destination to closely watch and learn the daily activities of the cows. If you are interested in sports, the Sail Boat Club of Saskatoon and golf courses in Borden and RLBR will fit the bill.

Also pertaining to commerce, tourist souvenirs are popular. Many types of souvenirs are available. Both Borden's Foster Shop and Radisson's 20th Century Antiques Collectables have lots of antiques; Hafford's Carol Herman is good at making Ukrainian Eastern Eggs and Wedding Bread Caraway. And if you feel tired, visit to the Tea House & Bakery Shop to taste some Chinese Tea and to feel rejuvenated.

- *Food venues*

In this section, we divided food venues into two categories: Restaurant/Pub/Bar and Café. There are four food venues in Hafford; one in Redberry Lake; three in Borden; and two in Radisson (Appendix B).

- *Places of Accommodation*

Hafford has two places of accommodation – the K-Bar Inn and the Chalice Knight's Inn. There are the Model-T Bar & Grille (The former Borden Hotel) and Sargent's Holiday Farm Ltd. in Borden. Radisson has the Radisson Hotel and Midway Motel. Blaine Lake has the Country Girls Inn Motel and in Maymont has the Maymont Hotel.

If you want to escape hotels or motels, private cabins and cottages are available in Redberry Lake Regional Park. Enjoy living near to the lake and appreciate the flight of local birds and the rising and setting of the sun, each day.

DISCUSSION

a. Resource location analysis

When we calculate the number of resources in each location, we will get the following results (Table 2). However, we do not include natural resources (e.g. plant and animal species, etc.) in this calculation, since it is impossible to identify locations accurately.

Table 2. Number of resources identified in each study sites.

Type	Location	Number	%
Natural Area	RLBR	27	23.89
Towns/ Villages/ RMs	Hafford	34	30.09
	Borden	10	8.85
	Blaine Lake	8	7.08
	Radisson	8	7.08
	Speers	5	4.42
	Maymont	4	3.54
	Krydor	2	1.77
	North Battleford	2	1.77
	Whitkow	2	1.77
	Albertown	1	0.88
	Alticane	1	0.88
	Belyk	1	0.88
	Great Bend	1	0.88
	Marcelin	1	0.88
	Mayfair	1	0.88
	Orolow	1	0.88
	Richard	1	0.88
	Sich	1	0.88
	Uhryniw	1	0.88
	Welechko	1	0.88
Total	21	113	100

Considering 113 resources that we could accurately locate, we conclude that Hafford and the RLBR's natural area are the top two resource locations in the study area, and that they have the potential to become the centre of future ecotourism development. The comparison also suggests to us that it would be wise to view Hafford as the best ecotourist destination, whose many surrounding attractions could also be visited.

b. Natural resources analysis

1. Fauna

Although historical literature reports that there are 9 threatened or endangered species in the RLBR (Kingsmill, 2002), the recent birding list provides only 5 threatened or endangered species and one iconic species. In addition, RLBR recommends 15 species for watching and Rachel Turnquist helps to identified 9 species for hunting games, as well as 2 domestic animals for hunting. These interesting animals in the RLBR are listed as follows (Table 3).

Table 3. Interesting animals in the study area.

Common Name	Scientific Name	End	Thr	Icon	Hun	RLBR (n.d.a)
American Bison (domestic)	<i>Bison bison</i>				√	
American White Pelican	<i>Pelecanus erythrorhynchos</i>			√		√
Barn Swallow	<i>Hirundo rustica</i>					√
Blue Jay	<i>Cyanocitta cristata</i>					√
Blue-winged Teal	<i>Anas discors</i>				√	
Canada Goose	<i>Branta canadensis</i>					√
Canvasback	<i>Aythya valisineria</i>				√	√
Chipmunk	<i>Tamias</i>					√
Common Loon	<i>Gavia immer</i>					√
Eastern Kingbird	<i>Tyrannus tyrannus</i>					√
Elk (domestic)	<i>Cervus canadensis</i>				√	
Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>					√
Gadwall	<i>Anas strepera</i>				√	
Green Winged Teal	<i>Anas carolinensis</i>				√	√
Lesser Scaup	<i>Aythya affinis</i>				√	
Loggerhead Shrike	<i>Lanius ludovicianus</i>		√			
Mallard	<i>Anas platyrhynchos</i>				√	
Peregrine Falcon	<i>Falco peregrinus</i>		√			
Pintail	<i>Anas acuta</i>				√	
Piping Plover	<i>Charadrius melodus</i>	√				√
Redhead	<i>Aythya americana</i>				√	
Red Squirrel	<i>Sciurus vulgaris</i>					√
Richardson's Ground Squirrel	<i>Urocitellus richardsonii</i>					√
Ruby Throated Hummingbird	<i>Archilochus colubris</i>					√
Sprague's Pipit	<i>Anthus spragueii</i>		√			
Widgeon	<i>Anas americana</i>				√	
White Tail Deer	<i>Odocoileus virginianus</i>					√
Whooping Crane	<i>Grus americana</i>	√				

The above table shows that interests of ecotourists include birding species at risk and hunting. The RLBR also recommended a list of “Common Animals”, such as deer, squirrels, chipmunks and polar geese, for tourists to watch (RLBR, n.d.a). During our field visits and conversations with local people, we found that in recent years, , visitors observed some other wild animals (e.g., moose, black bear) in the wilderness that potentially could be the objects of tourist attraction. In addition to that, there are also interesting breeds of the domestic pig (e.g. at John Kindrachuk’s Farm, located near Hafford).

2. Flora

Among about 250 vascular plant species in the RLBR, we selected 25 interesting plants (Table 4) and list the features of these species.

Table 4. Interesting vascular plants in the study area.

Common Name	Scientific Name	Orna- mental	Edible	Other importance
Balsam Poplar	<i>Populus balsamifera</i>	√		Tree
Black-fruited Choke Cherry	<i>Prunus virginiana</i>	√	√	Tree
Common Cat Tail	<i>Typha latifolia</i>	√		
Elderberry	<i>Sambucus canadensis</i>	√	√	
Hawthorn	<i>Crataegus spp.</i>		√	
High Bush Cranberry	<i>Viburnum opulus</i>	√	√	Ukrainian's national tree
Low Bush Cranberry	<i>Viburnum edule</i>	√	√	
Mountain Deathcamas	<i>Zigadenus elegans</i>	√		Poison plant
Northern Green Orchid	<i>Habenaria hyperborea</i>	√		Rare plant
Pincherry	<i>Prunus pennsylvanica</i>	√	√	Tree
Prairie Crocus	<i>Anemone patens</i>	√		Manitoba's provincial flower
Prairie Shooting Star	<i>Dodecatheon pulchellum</i>			Saline plant
Pussy Willow	<i>Salix discolor</i>	√		Cultural
Stinging Nettle	<i>Urtica dioica</i>			Herb
Scapose Hawkbeard	<i>Crepis runcinata</i>	√		
Striped coralroot	<i>Corallorhiza striata</i>	√		Rare plant
Saskatoon	<i>Amelanchier alnifolia</i>	√	√	Cultural
Trembling Aspen	<i>Populus tremuloides</i>	√		Crooked tree
Thorny Buffalo Berry	<i>Shepherdia argentea</i>		√	
Western Red Lily	<i>Lilium philadelphicum</i> <i>var. andinum</i>	√		Saskatchewan's provincial flower
White Birch	<i>Betula papyrifera</i>	√		Saskatchewan's provincial tree
Wild Black Currant	<i>Ribes americanum</i>		√	

Wild Rose	<i>Rosa acicularis</i>	√	√	Alberta's provincial flower
Cottonwood/Balsam poplar hybrid	<i>Populus deltoides</i> x <i>Populus balsamifera</i>			The biggest tree in Saskatchewan

From above table, we concluded that ornamental plants are the top at attracting tourists, followed by edible plants (for humans or birds). Meanwhile, Trembling aspen (crooked tree) and the Cottonwood/Balsam poplar hybrid (the biggest tree in the province) are famous for their uniqueness.

3. Habitats

According to Fig 7, we identified that pasture, grassland, forest/woodland, water and wetland are the most important habitats to the biosphere reserve. And we calculated the area of each habitat and the proportion of the whole RLBR area (Table 5).

Table 5. Habitat distribution in the study area.

Type of habitat	Land cover type	Area (km ²)	Proportion (%)
Cropland	Annual Cropland	3374.653237	48.51
Pasture	Perennial Cropland & Pasture	1271.282577	18.27
Grassland*	Herb	675.50326	15.16
	Grassland	379.440676	
Forest/woodland*	Coniferous Dense	123.40148	13.18
	Coniferous Open	2.005891	
	Deciduous Forest	1.862984	
	Broadleaf Dense	493.84878	
	Broadleaf Open	263.967948	
	Mixedwood Open	31.725539	
Lakes & rivers*	Water	283.494301	4.08
Towns/villages	Developed	31.576227	0.45
Exposed land	Barren	0.051744	0.18
	Exposed land	2171460.98	
Shrubland	Shrubland	6.540622	0.10
	Shrub low	0.555279	
Wetland*	Wetland	1.438573	0.07
	Wetland - Shrub	0.42395	
	Wetland - Herb	2.784091	
Total	19	6956.902606	100
* For the purpose of this project we focused only on these habitats and showed them in the RLBR ecotourism attraction inventory (Appendix B) and map (Appendix C)			

The RLBR is famous for its wetland habitat (freshwater marsh and saltwater marsh), although the proportion of wetland habitat is only 0.07% of the total area of the RLBR. In terms of size, pasture, grassland and forest/woodland are the main habitats in the RLBR. Open waters are smaller in size, but they are the major attraction for potential tourists.

4. Protected areas

According to Fig. 8, we also identified 8 protected areas as follows (Table 6).

Table 6. Protected areas' distribution in the study area.

Type of Protected Area	Area (km ²)	Proportion (%)
Wildlife Habitat Protection	72321148.97	30.70
Migratory Bird Sanctuary	52699037.61	22.37
The Prairie Farm Rehabilitation Administration (PFRA) Community Pasture	50271582.65	21.34
Provincial Pasture	29270089.54	12.42
Fish and Wildlife Development Fund Land	22603176.41	9.60
Private Conservation Lands	6955815.31	2.95
Wildlife Refuge	908385.04	0.39
National Wildlife Area	535179.84	0.23
Total	235564415.4	100

Wildlife habitats, migratory bird sanctuary and federal pastures are the top three categories of protected areas, in terms of size.

c. Cultural resources analysis

The church is one type of attractive cultural resource, in the study area. Those churches are analyzed in Table 7.

Table 7. Number of churches in the study area.

Location	Type of church							Total
	EC	MC	PCC	RCC	UCC	UOC	UC	
Albertown					1			1
Alticane					1			1
Belyk						1		1
Blaine Lake					1			1
Krydor					1	1		2
Hafford	1			1	1	1		4
Maymont				1			1	2

North Battleford					2			2
Orolow					1			1
Radisson					1			1
RLBR (natural area)		1	1					2
Richard						1		1
Sich					1			1
Speers					1		1	2
Uhryniw					1			1
Welechko					1			1
Whitkow					1	1		2
Total	1	1	1	2	14	5	2	26
<i>EC: Evangelical Church; MC: Mennonite Church; PCC: Polish Catholic Church; RCC: Roman Catholic Church; UCC: Ukrainian Catholic Church; UOC: Ukrainian Orthodox Church; UC: United Church.</i>								

It could be concluded that Ukrainian Churches (both Catholic and Orthodox) are the most common ones, to the study area. And Hafford has 4 churches which make it, together with other attractions, the top cultural destination for ecotourists in the area.

Festivals are also fascinating for potential ecotourists. In the study area, there are two types of festivals (Table 8) and both types are held in Hafford.

Table 8. Festivals in the study area.

Type of festival	Name	Location	Time
Ukrainian festival	Polka Festival	Hafford	July 13-15, 2012 (annually held)
	Malanka (Ukrainian New Year)	Hafford	January 13, 2012 (annually held)
Local festival	Summer Sizzle	Hafford	August 18, 2012 (annually held)
	Winterama	Hafford	January 29, 2012 (annually held)

In addition, the arts (e.g., murals, woody carver) and food (e.g., Farmer's markets and local cuisine) are also attractive cultural resources. According to the data we collected, there are two woody carvers, one is in Speers and the other is in Hafford.

For cuisine, Farmer's market is one popular event. And it is held regularly in Borden, Blaine Lake, Hafford and Radisson. However, currently, local food is not as popular as the Farmers' markets. Although our data shows that there is Ukrainian food at the markets, in addition, there are Doukhobor, French, Polish and Germanic foods available. Apart from the

Ukrainian food, which is served in one specific place, the others lack venues, where they can be served.

d. Tour resource analysis

Compiling collected information about tourist' travel routes, we found that the current routes (Table. 9) are mainly hiking/biking routes, which focus on natural resources alone. Only one route is aimed to demonstrate cultural resources.

Table 9. Current tourist routes in the study area.

Type of trail	Name	Trail length	Location
Hiking/Biking	Millennium Point Hiking Trail	3.4 km (return)	Redberry Lake BR
Hiking	Grassland Golf Course Walking Trail	2 km (loop)	Redberry Lake BR
Hiking/Biking	Lookout Trail	1.5 km (return)	Redberry Lake BR
Hiking	Crooked Bush Trail	200 meters (loop)	Hafford
Driving (Arts)	12-40 & Beyond Tour		Marcelin - Leask - Blaine Lake - Hafford

It could be recognized that the first three routes are all focused on natural resources, and only the last one has some cultural features. According to our analysis of cultural resource in the previous section, Hafford is the most suitable stop to demonstrate culture, such as in museum routes, church routes and others.

e. Ecotourism business analysis

According to Swystun and Nahirney (Prairie Wild Consulting Co. [PWCC], 2010), the RLBR area is a primarily agricultural region, whose economy focuses mostly on grain and livestock farming. The authors show that 42.2% of the workforce in the RLBR area work in "Agriculture and Resources", while the second one, "Business Services", is comprised by only 9.2% of the workforce.

And a recent RLBR review report (Whitelaw & Schmutz, 2011) mentioned that there is a trend of green development in the RLBR. The report says that the biosphere reserve is working on three new ways to foster sustainable socio-cultural and ecological human development: the Reserve seeks *(1) emerging alternatives to industrial agriculture, through sustainable uses of native prairie, (2) ways to be involved in the Land and Infrastructure*

Resiliency Assessment, and (3) ways to be involved in an ambitious project to improve regional planning.

Meanwhile, according to one study on the RLBR, that concerned “Listing Keys Things/Aspects You Would Most Like To See Changed/Improved” (PWCC, 2010), locals want to see tourist facilities built or improved, such as “better use of recreation facility combining recreation areas in common areas, better place for overnight stopover, more sporting activities,” etc.).

Clearly, there are many opportunities that rest on the development of the study area’s eco-business and ecotourism.

f. SWOT analysis

Based on above information, we apply Alberta Humphrey’s SWOT analysis (Piercy & Giles, 1989) to evaluate the strengths, weakness/limitations, opportunities of and threats to it’s the development of the RLBR area’s ecotourism (Table 10).

Table 10. SWOT analysis of ecotourism development in the study area.

	Helpful	Harmful
Internal factors	<p>Strengths</p> <p>Unique habitats; Bird’s paradise; Abundant plant and animals; The only biosphere reserve in the province; Unique Ukrainian culture; Cooperation with school in Hafford; Cooperation with the School of Environment and Sustainability at the University of Saskatchewan</p>	<p>Weaknesses</p> <p>Data gaps and low quality of some existing ecotourism resources data; Accessibility is low; Lack of signs on many gravel roads; Lack of public recognition; Absence of ecotourism businesses in the area</p>
External factors	<p>Opportunities</p> <p>Changes in land-use patterns; Cooperation with high schools in Saskatoon; Cooperation with other regional parks in Saskatchewan; Cooperation with biosphere reserves in Canada and abroad Increasing incentives of conservation of biodiversity</p>	<p>Threatens</p> <p>Ecosystem damage if improper tourist activities; Potential negative impact on Ukrainian Culture when it meets other cultures</p>

In general, the project helped to identify suitable areas to develop ecotourism:

Hafford offers cultural diversity and richness; and the RLBR offers a unique natural ecosystem. The study also identified parts that need to be improved if future ecotourism is to develop (e.g., promoting the building of tourist facilities and developing local eco-business). What's more, a number of opportunities rest on the development of the study area's ecotourism, such as cooperation with external agencies (e.g., schools in Saskatoon, regional parks in Saskatchewan and other biosphere reserves in Canada). However, regularly monitoring and assessing the future impact of ecotourism on local culture and the biodiversity are necessary, in order to avoid damage to both. All in all, our aim through doing these things is to make better use of RLBR's current strengths and improve weaknesses for its ecotourism development.

RECOMMENDATIONS

Based on the above analyses, the following suggestions are made for future ecotourism development in the RLBR:

a. Suggestions for infrastructure improvements

- More directional information/signs to the RLBR in surrounding towns/villages and along highways could be added, as well as interesting slogans that might attract potential visitors. One big problem causing low accessibility is the current lack of necessary signs to direct visitors, along the roads within the RLBR. For most drivers without GPS, it is very difficult to drive through the area. Adding more Ukrainian flags and other attributes might enhance the cultural experience of Hafford. For a newcomer to the town, the Ukrainian atmosphere is imperceptible, or else not very appealing.

Residents could be encouraged to establish and operate Bed&Breakfast facilities in Hafford, to provide ecotourists with accommodation and home-made food in order to promote local culture (e.g., Ukrainian or Polish lifestyle and cuisines). When tourists are immersed in such an atmosphere, they will appreciate the area more and then promote it to other potential tourists, by word of mouth.

b. Suggestions for ecotourism activities

- Summer-themed and Winter-themed brochures could be printed, to illustrate major ecotourism activities held in these seasons. For example, a summer-themed brochure could promote canoeing, swimming, and the “outdoor sizzles” or the Polka Festival. And the winter-themed brochure could promote skiing, snowmobiling, indoor dancing/music shows, or Malanka (Ukrainian New Year).
- Regarding the RLBR’s plentiful natural resources, Saskatoon schools could be invited to conduct outdoor teaching there, whereby students would learn and play games in nature.
- Companies in various sectors could be invited to operate teamwork training programs. These programs would aim to strengthen the cooperation of participants as a team, by having them play outdoor games.

- Cultural travel routes need to be developed. As Hafford is located in the center of the study area and it is the closest town to the RLBR's Research and Education Centre, we suggest that Hafford should be the starting point from which to develop various kinds of travel, which would promote selected cultural resources (e.g., churches and cemeteries, museums and local artists).

c. Suggestions for ecotourism marketing methods

- Website Contests, such as "My Story in the biosphere reserve" essay contests, or "the Beauty of the biosphere reserve" photo contests could attract more people interested in the RLBR to visit the area. The award could consist of tickets to a concert of local music or to a festival show.
- Communication between regional parks in the study area could be built, such as between Emerald and Meeting Lakes, at least in part to advertise the RLBR in these parks.
- Visitors could compete to write a song on the biosphere reserve. Candidates could compete via an online election. And the competition could be promoted by using a mascot typical to the area, such as by circulating pelican-inspired souvenirs, post cards, pins, posters, calendars, etc.
- Innovation and entrepreneurial culture should be promoted. Currently, residents in the study area, especially in Hafford, need to "wake up" and build the local ecotourism business. Local or outside companies should be encouraged to implement innovative strategies to increase their competitiveness, if the area is to survive.

CONCLUSIONS

To recognize opportunities to develop ecotourism in the RLBR, information about potential ecotourism resources was collected and analyzed. After a review of an ecotourism theoretical framework, we identified ecotourism attractions in the study area and included them in our inventory. Overall, 194 resources (including 74 natural resources, 54 cultural resources and 66 infrastructure resources) were collected, analysed and about 130 resources were plotted in the “Google Earth” map. The inventory and map could be used as guidelines by which to plan for future ecotourism in the area, and for visitors to the RLBR.

The RLBR's abundant natural resources provide suitable conditions for nature-oriented ecotourism. As a result, current nature-oriented ecotourism is starting to develop. For instance, there are a few hiking trails along Redberry Lake and recommendations for watching plants, birds and other animals. However, plentiful, culture-oriented ecotourist attractions are not as widely known and used. Based on collected information, we recommend improving and enhancing of nature-oriented trails as well as developing cultural trails in the study area. The latter one may start from Hafford because of its suitable location and its plentiful resources for culture-oriented ecotourism (e.g., the Folk Customs Tour, the Historical Tour and the Church Tour). Based on this project, we strongly recommend “three wonders” of the RLBR: the Ukrainian Churches and Festivals, Redberry Lake and the Crooked Tree grove.

We also did Humphrey's SWOT analysis to assess the prospects of ecotourism in the RLBR. Based on the information collected, we recommend that developers focus on three main areas: infrastructure improvements, ecotourism activities and ecotourism marketing methods.

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APPENDICES

Appendix A. A checklist of ecotourism resources in the study area.

Resource		Publication			Web		Document			Literature		Others
		RLBR (Education)	RLBR (Hiking 101)	RLBR (Hiking trails)	RLBR (website)	Google Search	Hafford Community Plan (2010)	PWCC (2010)	PWCC (2011)	SK's Ukrainian Legacy (2006)	Kingsmill (2002)	Personal communi- cation
<i>Nature</i>												
Fauna	Animals		√	√	√		√	√			√	
Flora	Plants		√	√	√			√				
Habitat	Forest/Woodland											√
	Grassland											√
	Wetland		√	√	√		√	√				
	Lake		√	√	√		√	√	√			
	Beach					√						√
	River					√						√
<i>Culture</i>												
Heritage	Cemetery/Church								√	√		
	Heritage site							√	√			
	Museum							√	√			
	School								√	√		
Festival	Ukrainian festival				√		√					
	Local festival				√		√					
Art	Murals					√						
	Wood carver											√
Cuisine	Market											√
	Local food											√

Infrastructure												
Information	Street sign						√					
	Obelisk			√	√							
	Park sign											√
	Native Prairie Stewardship sign											√
	Migratory Bird Sanctuary sign				√							√
Trail/Route	Hiking/Biking/ATV		√	√								√
Park	Arboretum											√
	Nature park					√		√	√			
	Town park								√			√
	Trailer park					√						√
	Regional park				√				√			
Commerce	Club											√
	Farm											√
	Field			√								√
	Golf course			√				√	√			√
	Store					√			√			√
Food venue	Restaurant/Pub/Bar								√			
	Café											√
Accommodation	Inn/Hotel/Motel/Lounge								√			√
	Cabin											√
	Cottage											√
Activity												

Sport	Boating/sailing/ wind surfing/canoeing			√				√				
	Hockey				√							
	Golf			√	√			√				
	Skating				√			√				
Hunting and Picking	Ducks Unlimited							√	√			
	Mushroom											
Recreation	Camping							√				
	Hiking		√	√	√							
	Horsing							√				√
	Redberry Lake Spa (proposed as a new idea)							√				√
Educating		√			√							

Appendix B. Ecotourism attraction inventory for the study area.

Resources	Description						
	Name			Location	Ecotourism function	Coordinates	
Nature			Common name	Scientific name			
Fauna	Interesting animals	RLBR's Recommend	American White Pelican	<i>Pelecanus erythrorhynchos</i>		Watching, Education	
		RLBR's Recommend	Barn Swallow	<i>Hirundo rustica</i>		Watching, Educating	
		RLBR's Recommend	Blue Jay	<i>Cyanocitta cristata</i>		Watching, Educating	
		RLBR's Recommend	Canada Goose	<i>Branta canadensis</i>		Watching, Educating	
		RLBR's Recommend	Chipmunk	<i>Tamias</i>		Watching, Educating	
		RLBR's Recommend	Common Loon	<i>Gavia immer</i>		Watching, Educating	
		RLBR's Recommend	Eastern Kingbird	<i>Tyrannus tyrannus</i>		Watching, Educating	
		RLBR's Recommend	Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>		Watching, Educating	
		RLBR's Recommend	Red Squirrel	<i>Sciurus vulgaris</i>		Watching, Educating	
		RLBR's Recommend	Richardson's Ground Squirrel	<i>Urocitellus richardsonii</i>		Watching, Educating	
		RLBR's Recommend	Ruby Throated Hummingbird	<i>Archilochus colubris</i>		Watching, Educating	
		RLBR's Recommend	White Tail Deer	<i>Odocoileus virginianus</i>		Watching, Educating	
		Endangered (Eastern), Threatened (Prairie)	Loggerhead Shrike	<i>Lanius ludovicianus</i>		Watching, Educating	
		Threatened spp.	Peregrine Falcon	<i>Falco peregrinus</i>		Watching, Educating	

		Endangered spp.	Piping Plover	<i>Charadrius melodus</i>		Watching, Educating	52°40'30.08"N; 107° 6'37.01"W
		Threatened spp.	Sprague's Pipit	<i>Anthus spragueii</i>		Watching, Educating	
		Endangered spp.	Whooping Crane	<i>Grus americana</i>		Watching, Educating	
		Duck	Blue Winged Teal	<i>Anas discors</i>		Watching, Educating, Hunting	
		Duck	Canvasback	<i>Aythya valisineria</i>		Watching, Educating, Hunting	
		Duck	Gadwall	<i>Anas strepera</i>		Watching, Educating, Hunting	
		Duck	Green Winged Teal	<i>Anas carolinensis</i>		Watching, Educating, Hunting	
		Duck	Lesser Scaup	<i>Aythya affinis</i>		Watching, Educating, Hunting	
		Duck	Mallard	<i>Anas platyrhynchos</i>		Watching, Educating, Hunting	
		Duck	Pintail	<i>Anas acuta</i>		Watching, Educating, Hunting	
		Duck	Redhead	<i>Aythya americana</i>		Watching, Educating, Hunting	
		Duck	Widgeon	<i>Anas americana</i>		Watching, Educating, Hunting	
		Hunting games	American Bison (domestic)	<i>Bison bison</i>		Watching, Educating, Hunting	
		Hunting games	Elk (domestic)	<i>Cervus canadensis</i>		Watching, Educating, Hunting	
Flora	Interesting plants	Trees	Balsam Poplar	<i>Populus balsamifera</i>		Watching, Educating, Hiking	
		Edible & Tree	Black-fruited Choke Cherry	<i>Prunus virginiana</i>		Watching, Educating, Hiking	
		Wetland bush	Common Cat Tail	<i>Typha latifolia</i>		Watching, Educating, Hiking	
		Edible	Elderberry	<i>Sambucus canadensis</i>		Watching, Educating, Hiking, Picking & Eating	

		Edible	Hawthorn	<i>Crataegus spp.</i>		Watching, Educating, Hiking, Picking & Eating	
		Edible & Ukrainian's national tree	High Bush Cranberry	<i>Viburnum opulus</i>		Watching, Educating, Hiking, Picking & Eating	
		Edible	Low Bush Cranberry	<i>Viburnum edule</i>		Watching, Educating, Hiking, Picking & Eating	
		Poison plant	Mountain Deathcamas	<i>Zigadenus elegans</i>		Watching, Educating, Hiking	52°42'45.60"N; 107°12'53.58"W
		Uncommon plant	Northern Green Orchid	<i>Habenaria hyperborea</i>		Watching, Educating, Hiking	52°42'45.60"N; 107°12'53.58"W
		Edible & Tree	Pincherry	<i>Prunus pennsylvanica</i>		Watching, Educating, Hiking, Picking & Eating	
		Manitoba's provincial flower	Prairie Crocus	<i>Anemone patens</i>		Watching, Educating, Hiking	
		Saline plant	Prairie Shooting Star	<i>Dodecatheon pulchellum</i>		Watching, Educating, Hiking	52°42'36.30"N; 107°14'16.50"W
		Cultural	Pussy Willow	<i>Salix discolor</i>		Watching, Educating, Hiking	
		Herb	Stinging Nettle	<i>Urtica dioica</i>		Watching, Educating, Hiking	
			Scapose Hawkbeard	<i>Crepis runcinata</i>		Watching, Educating, Hiking	
			Striped coralroot	<i>Corallorhiza striata</i>		Watching, Educating, Hiking	52°42'45.60"N; 107°12'53.58"W
		Edible	Saskatoon	<i>Amelanchier alnifolia</i>		Watching, Educating, Hiking, Picking & Eating	
			Tall Climbing Grass			Watching, Educating, Hiking	
		Crooked tree	Trembling Aspen	<i>Populus tremuloides</i>		Watching, Educating, Hiking	
		Edible	Thorny Buffaloberry	<i>Shepherdia argentea</i>		Watching, Educating, Hiking, Picking & Eating	
		Saskatchewan's provincial flower	Western Red Lily	<i>Lilium philadelphicumvar.and inum</i>		Watching, Educating, Hiking	
		Saskatchewan's	White Birch	<i>Betula papyrifera</i>		Watching, Educating, Hiking	

		provincial tree					
		Edible	Wild Black Currant	<i>Ribes americanum</i>		Watching, Educating, Hiking, Picking & Eating	
		Edible & Alberta's provincial flower	Wild rose	<i>Rosa acicularis</i>		Watching, Educating, Hiking, Picking & Eating	
		Largest Tree in SK (Big Tree)	Cottonwood/Balsa m poplar hybrid	<i>Populus deltoides x Populus balsamifera</i>	RM of Blaine Lake	Watching, Educating, Hiking	52°44'38.84"N; 106°43'19.83"W
Habitat	Forest/ Woodland		Aspen woodland				52°40'8.41"N; 107°13'34.09"W
			Boreal forest				52°55'42.25"N; 107°10'41.62"W
	Grassland		Fescue prairie				2 areas
	Wetland		Riparian habitat			Hiking	Around RL
			Freshwater marsh			Hiking	3 areas, around RL
			Saltwater marsh			Hiking	2 areas, around RL
	Lake		Emerald Lake			Camping, Fishing	53°10'55.37"N; 106°58'9.60"W
			Gordon Lake			Recreation	52°53'23.79"N; 107°22'1.66"W
			Lac La Peche			Camping, Fishing	52°56'43.47"N; 107° 4'17.31"W
			Martin's Lake			Camping, Fishing, Golfing	52°59'50.80"N; 107° 0'20.95"W
			Meeting Lake			Camping, Fishing, Golfing	53°11'25.27"N; 107°38'25.02"W
			Oscar Lake			Recreation	52°54'26.21"N; 107°13'11.15"W
			Radisson Lake			Bird sanctuary & Birding Platform	52°29'34.12"N; 107°24'45.88"W

			Rabbit (Long) Lake			Informal Boating & Kayak	52°36'38.39"N; 107° 1'10.10"W
			Redberry Lake			Recreation	52°41'50.41"N; 107° 9'55.11"W
			Roth Lake			Recreation	52°37'29.68"N; 107°20'31.91"W
	Beach		Redberry Lake Beach			Recreation	52°42'39.00"N; 107°12'47.76"W
			Sand Beach			Recreation & Fishing	53° 3'54.94"N; 107°12'52.12"W
	River		Borden Bridge			Camping (infml), Fishing,	52°22'23.41"N; 107° 9'10.77"W
			Petrofka Bridge			Fishing (infml)	52°38'45.97"N; 106°50'42.39"W
			Redberry Lake Fishing Pond			Fishing	52°43'7.95"N; 107°12'16.85"W
Culture							
Heritage site	Cemetery/ Church		Sts. Peter and Paul (UC)		Albertown	Cemetery on site	52°52'26"N; 107° 15'17"W
Note:			St. John the Baptist (UC)		Alticane	Cemetery on site	52°57'41"N; 107°29'44"W
* Ukrainian Catholic churches (UC); * Ukrainian Orthodox churches (UO); * Roman Catholic Church (RC); * Evangelical church (EC); * Heritage site (HS)			Assumption of the Virgin Mary (UO+HS)		Belyk	Cemetery on site	52°35'25"N; 107°12'32"W
			Our Lady of Perpetual Help (UC)		Blaine Lake	Cemetery on site	52°50'16"N; 106° 52'52"W
			Sacred Heart of Jesus (UC)		Krydor	Cemetery on site	52°47'12"N; 107° 7'20"W
			Sts. Peter and Paul (UO)		Krydor	Cemetery on site	52°47'12"N; 107° 5'53"W
			St. Solange Roman Catholic Church (RC)		Hafford		52°43'36.82"N; 107°21'5.06"W
			Holy Eucharist (UC)		Hafford		52°43'34.36"N; 107°20'49.70"W

			Descent of the Holy Spirit (UO)		Hafford		52°43'33.46"N; 107°21'29.66"W
			Gospel Fellowship Church (EC)		Hafford		52°43'33.46"N; 107°21'10.02"W
			All Saints (RC)		Maymont		
			United Church		Maymont		
			All Saints (UC)		North Battleford		52°46'14.85"N; 108°17'14.25"W
			St. John the Baptist (UC)		North Battleford		52°46'18.59"N; 108°17'14.13"W
			Descent of the Holy Spirit (UC+HS)		Orolow	Cemetery on site	52°38'28"N; 107° 3'56"W
			Protection of the Blessed Virgin Mary (UC)		Radisson		lack specific location
			Mennonite Church		RLBR	Bible Camp (renting hall, swimming pool, canoing, horseback riding); Cemetery on site	52°40'6.12"N; 107° 5'41.87"W
			Polish Church (Catholic)		RLBR	Cemetery on site	
			St. Volodymyr (UO)		Richard	Cemetery on site	52°51'34"N; 107°45'37"W
			St. Michael's (UC)		Sich	Cemetery on site	52°52'53"N; 107° 5'53"W
			Pioneer Memorial United Church		Speers		52°42'28.74"N; 107°33'36.53"W
			Sts. Peter and Paul (UC)		Speers	Cemetery on Hafford: 52°43'43"N; 107°20'20"W	52°42'30.19"N; 107°33'17.65"W
			St. Nicholas (UC)		Uhryniw	Cemetery on site	52°41'32"N; 107° 2'59"W
			Presentation of the Blessed Virgin Mary (UC+HS)		Welechko	Cemetery on site	52°38'2"N; 107°18'59"W
			Holy Spirit (UO+HS)		Whitkow	Cemetery on site	52°56'27.68"N; 107°52'17.11"W

			Ascension of Our Lord (UC)		Whitkow	Cemetery on site	52°56'40.97"N; 107°52'14.99"W
			Ukrainian National Hall (going to be HS)		Hafford		52°43'38.58"N; 107°21'15.12"W
			World War I Memorial		Hafford		52°43'39.48"N; 107°21'10.68"W
			Doukhobor Prayer Home		RM of Blaine Lake	Blaine Lake	52°49'47.00"N; 106°52'49.73"W
			Doukhobor Settlement		RM of Blaine Lake	Near Petrofka Bridge	
			Doukhobor Caves		RM of Blaine Lake	Near Big Tree	52°45'17.11"N; 106°43'33.90"W
			Community Hall		Mayfair		
			Historical site of a German school		RM of Great Bend		52°31'19.37"N; 107° 3'33.95"W
			Kingdom Hall		Blaine Lake		52°49'42.54"N; 106°52'42.24"W
	Museum		Borden Museum		Borden (200 Main St.)		52°24'21.41"N; 107°14'21.99"W
			Radisson Zion Museum		Radisson		52°27'34.47"N; 107°23'49.90"W
	School		Hafford Central School		Hafford		52°43'43.21"N; 107°20'55.31"W
			Maymont Central School		Maymont		52°33'50.22"N; 107°42'16.18"W
Festival	Ukrainian festival		Polka Festival		Hafford	Annually held. July 13-15, 2012	
			Malanka		Hafford	Ukrainian new year. Jan. 14, 2012	
	Local festival		Summer Sizzle		Hafford	Aug. 18, 2012	
			Winterama		Hafford	Jan. 29, 2012	
Art	Murals		12-40 & Beyond Tour		Marcelin - Leask - Blaine Lake - Hafford	One week-end every summer	

	Wood carver		Joe Luchka's wood carver		Speers		52°42'38.49"N; 107°33'44.74"W
			Lacey Woody		Hafford		52°43'32.27"N; 107°21'16.58"W
Cuisine	Market		Borden farmer's market		Borden		
			Blaine Lake farmer's market		Blaine Lake	June-Sept Saturdays	
			Hafford farmer's market		Hafford	June 9th, July 7, Aug. 18, Spet.8, Oct. 13, 2012	
			Radission farmer's market		Radisson		
	Local food (Home-made only)		Ukrainian food	Pat Kohut's local Ukrainian food & sell	Hafford		52°43'35.03"N; 107°21'0.59"W
			Doukhobor food				
			French food				
			Polish food				
			Germanic food				
Infrastructure							
Information	Street		English and Ukrainian street signs		Hafford		
	Obelisk		Birders paradise		RLBR		
			Freshwater marsh		RLBR		52°43'0.76"N; 107°12'24.93"W
			Riparian habitat		RLBR		
			Saltwater marsh		RLBR		
			MAB Obelisk		Hafford		52°43'40.62"N; 107°21'12.24"W
			Millennium Point Obelisk (Beacon)		RLBR		52°42'45.15"N; 107°12'21.07"W
	Park sign		Entrance sign		RLBR		
			Hiking trail sign		RLBR		

	Native Prairie Stewardship sign		Native Prairie Stewardship sign		RLBR		52°50'30.36"N; 107°39'38.22"W
	Migratory Bird Sanctuary sign		Migratory Bird Sanctuary sign		RLBR		52°42'46.20"N; 107°12'22.48"W
Trail/Route	Hiking/Biking/ ATV		Millennium Point Hiking Trail		RLBR		52°42'47.84"N; 107°12'50.95"W
			Grassland Golf Course Walking Trail		RLBR		52°43'9.87"N; 107°12'36.59"W
			Lookout Trail		RLBR		52°40'3.36"N; 107°14'16.36"W
			Crooked Bush Trail		Hafford		52°52'15.53"N; 107°32'15.14"W
Park	Arboretum		Ted Tylucki's Arboretum		Hafford		52°52'8.98"NN; 107°23'33.47"W
	Nature park		Crooked Trees	Aspen grove	RLBR	Hiking, Nature visiting	52°52'14.76"N; 107°32'15.78"W
	Town park		Borden Sports & Recreation grounds		Borden	Recreation	52°24'14.46"N; 107°13'56.77"W
			Kinsmen Park		Hafford	Recreation	52°43'23.73"N; 107°21'21.43"W
			Millennium Park		Hafford	Recreation	52°43'40.69"N; 107°21'12.81"W
	Trailer park		Redberry Lake Trailer Park		RLBR		52°43'7.67"N; 107°12'41.79"W
	Regional park (near Redberry Lake BR)		Emerald Lake			Camping, Fishing	53°10'48.53"N; 106°57'38.95"W
			Glenburn			Camping, Fishing	52°34'7.26"N; 107°42'16.32"W
			Martin's Lake			Camping, Fishing, Golfing	52°59'43.90"N; 107° 0'11.27"W
			Meeting Lake			Camping, Fishing, Golfing	53°12'10.68"N; 107°42'18.84"W
			Redberry Lake		RLBR	Camping, Hiking, Sailing, Golfing	52°35'2.45"N; 107°15'3.36"W

			Valley Waldheim			Camping	52°36'58.40"N; 106°41'23.57"W
Commerce	Club		Sail Boat Club Saskatoon		RLBR		52°41'56.11"N; 107° 6'35.48"W
	Farm	Berry Farm	Saskatoon Berry Farm		RLBR	Berries picking & purchasing	52°42'49.31"N; 107° 1'42.00"W
		Bison Farm	B. Wiebe & B. Balchen 's Farm		RLBR		52°41'0.52"N; 107°21'45.20"W
		Cow Farm	Andrew's Farm	Cows	Hafford		52°36'34.32"N; 107°15'50.70"W
		Elk Farm	B.&M. Krsacok's Farm	Elk	Hafford		52°41'11.12"N; 107°22'1.87"W
		Elk Farm	Ken & Cathy Thachuk's Farm	Elk	Hafford		52°43'18.59"N; 107°18'20.68"W
		Organic Farm	Lucia Horbay's Farm		Hafford		52°41'59.03"N; 107°16'47.89"W
		Bison Farm	Pat Bashuk's Farm	Bison	Hafford		52°46'48.63"N; 107°10'21.78"W
		Pig Farm	John's Farm	Natural pork	Hafford		52°43'9.45"N; 107°33'15.51"W
		Honey Farm	Peter Bomok's Farm	Local food & honey	Speers		52°42'8.65"N; 107°33'14.54"W
	Field		Redberry Lake Sport Field		RLBR	Recreation	52°43'5.56"N; 107°12'36.67"W
	Golf course		Borden Golf Course		Borden	Nine Hole with sand greens	52°24'0.59"N; 107°14'4.94"W
			Redberry Lake Mini Golf Course		RLBR		52°42'43.55"N; 107°12'58.02"W
			Redberry Lake Golf Course		RLBR		52°43'9.48"N; 107°12'35.92"W
	Store		Foster's Store		Borden	Tourist attraction - functioning store with lots of antiques and such displayed inside.	52°24'21.47"N; 107°14'25.49"W
			20th Century Antiques		Radisson(31 7 Main		52°27'43.01"N; 107°23'44.34"W

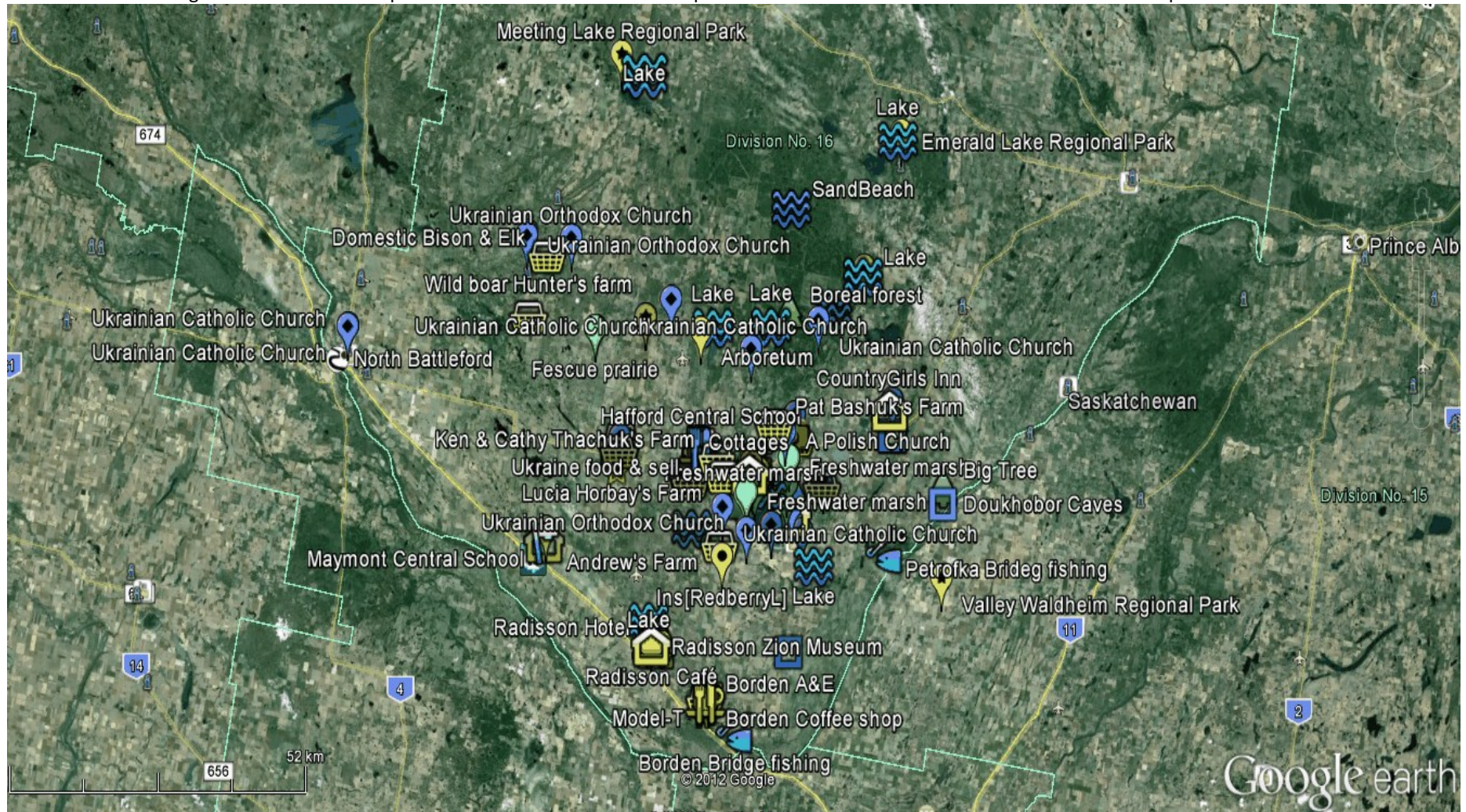
			Collectables		Street)		
			Ben Herman's Ukrainian Local art	Ukrainian eastern egg & wedding bread caraway	RLBR		
			Tea House & Bakery		Hafford		52°43'40.65"N; 107°21'30.76"W
Food venue	Restaurant/ Pub/Bar		7 Star Restaurant		Hafford		52°43'40.35"N; 107°21'10.84"W
			Silver Sword	Bar & Restaurant	Hafford		52°43'39.79"N; 107°21'12.02"W
			K Bar Inn	Bar & Rooms	Hafford		52°43'41.61"N; 107°21'10.84"W
			Red Bull		Radisson		52°27'44.89"N; 107°23'17.32"W
			Model-T Bar & Grille (The old Borden Hotel)	Bar, restaurant & Rooms	Borden		52°24'13.86"N; 107°14'27.05"W
	Café		Happy Ron's Cozy Corner Café		Hafford		52°43'38.45"N; 107°21'10.65"W
			Borden Café		Borden		52°24'12.66"N; 107°14'21.49"W
			The Borden Art & Eatery		Borden(401 Railway Avenue)		52°24'12.42"N; 107°14'21.01"W
			Radisson Café		Radisson		52°27'40.71"N; 107°23'45.11"W
			Redberry Lake Café		RLBR		52°42'42.64"N; 107°12'57.06"W
Accommodation	Inn/Hotel/Motel/Lounge		K Bar Inn	Rooms & Bar	Hafford		52°43'41.61"N; 107°21'10.84"W
			Chalice Knight's Inn		Hafford		52°43'37.61"N; 107°21'19.70"W
			Model-T Bar & Grille (The old	Rooms, bar and restaurant	Borden		52°24'13.86"N; 107°14'27.05"W

			Borden Hotel)				
			Country Girls Inn Motel		Blaine Lake		52°49'46.93"N; 106°53'13.68"W
			Maymont Hotel	Rooms & Bar	Maymont		52°33'47.75"N; 107°42'25.09"W
			Radisson Hotel	A Full service Hotel Tavern, Rooms, VLTs, Beer and Liquor Off sales, Food.	Radisson		52°27'39.88"N; 107°23'49.85"W
			Midway Motel		Radisson		52°27'31.42"N; 107°23'4.97"W
			Speers Hotel/Bar		Speers		52°42'28.40"N; 107°33'24.65"W
			Sargent's Holiday Farm Ltd		Borden		along the highway #16
	Cabin		Private Cabins		RLBR		52°39'58.61"N; 107° 5'42.71"W
	Cottage		Cottage Area		RLBR		52°42'31.25"N; 107°13'0.59"W





Appendix C. Ecotourism attraction map for the study area (click here > [attraction map.km](#) to open link to the map in Google Earth).

Legend: Flora Fauna Habitat Forest Lake Fishing Church Museum Heritage site School Art Commerce Sport field Golf course Sign Park Trailer park Obelisk Trail Trail path Accommodation Food Memorable place



Appendix D. List of bird species recorded in the study area.

<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  <p>Redberry Lake Biosphere Reserve Association Inc. Box 221 Hafford, SK S0J 1A0 Ph: (306) 549-4060 Fax: (306) 543-4061 mail: info@redberrylake.ca URL: www.redberrylake.ca</p> </div> <div style="text-align: center;">  </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 30%; text-align: center;">Where Summer Take Wing</div> <div style="width: 30%; text-align: center;">Where Summer Take Wing</div> </div>		
<input type="checkbox"/> Common Loon <input type="checkbox"/> Pied-billed Grebe <input type="checkbox"/> Horned Grebe <input type="checkbox"/> Red-necked Grebe <input type="checkbox"/> Eared Grebe <input type="checkbox"/> Western Grebe <input type="checkbox"/> American White Pelican <input type="checkbox"/> Double-crested Cormorant <input type="checkbox"/> Great Blue Heron <input type="checkbox"/> Black-crowned Night Heron <input type="checkbox"/> American Bittern <input type="checkbox"/> Tundra Swan <input type="checkbox"/> Canada Goose <input type="checkbox"/> Greater White-fronted Goose <input type="checkbox"/> Snow Goose <input type="checkbox"/> Ross's Goose <input type="checkbox"/> Mallard <input type="checkbox"/> American Black Duck <input type="checkbox"/> Gadwall <input type="checkbox"/> Northern Pintail <input type="checkbox"/> Green-winged Teal <input type="checkbox"/> Blue-winged Teal <input type="checkbox"/> Cinnamon Teal <input type="checkbox"/> Northern shoveler <input type="checkbox"/> American Wigeon <input type="checkbox"/> Eurasian Wigeon <input type="checkbox"/> Redhead <input type="checkbox"/> Ring-necked Duck <input type="checkbox"/> Canvasback <input type="checkbox"/> Lesser Scaup	<input type="checkbox"/> Lesser Yellowlegs <input type="checkbox"/> Solitary Sandpiper <input type="checkbox"/> Willet <input type="checkbox"/> Spotted Sandpiper <input type="checkbox"/> Ruddy Turnstone <input type="checkbox"/> Wilson's Phalarope <input type="checkbox"/> Red-necked Phalarope <input type="checkbox"/> Common Snipe <input type="checkbox"/> Long-billed Dowitcher <input type="checkbox"/> Red Knot <input type="checkbox"/> Sanderling <input type="checkbox"/> Semi-palmated Sandpiper <input type="checkbox"/> Least Sandpiper <input type="checkbox"/> White-rumped Sandpiper <input type="checkbox"/> Baird's Sandpiper <input type="checkbox"/> Pectoral Sandpiper <input type="checkbox"/> Stilt Sandpiper <input type="checkbox"/> Herring Gull <input type="checkbox"/> California Gull <input type="checkbox"/> Ring-billed Gull <input type="checkbox"/> Franklin's Gull <input type="checkbox"/> Bonaparte's Gull <input type="checkbox"/> Forster's Tern <input type="checkbox"/> Common Tern <input type="checkbox"/> Black Tern <input type="checkbox"/> Rock Dove <input type="checkbox"/> Mourning Dove <input type="checkbox"/> Black-billed Cuckoo <input type="checkbox"/> Great Horned Owl <input type="checkbox"/> Snowy Owl <input type="checkbox"/> Common Nighthawk <input type="checkbox"/> Ruby-throated	<input type="checkbox"/> Loggerhead Shrike <input type="checkbox"/> Northern Shrike <input type="checkbox"/> European Starling <input type="checkbox"/> Red-eyed Vireo <input type="checkbox"/> Warbling Vireo <input type="checkbox"/> Black & White Warbler <input type="checkbox"/> Tennessee Warbler <input type="checkbox"/> Nashville Warbler <input type="checkbox"/> Yellow Warbler <input type="checkbox"/> Yellow-rumped Warbler <input type="checkbox"/> Blackpoll Warbler <input type="checkbox"/> Palm Warbler <input type="checkbox"/> Orange-crowned Warbler <input type="checkbox"/> Northern Waterthrush <input type="checkbox"/> Mourning Warbler <input type="checkbox"/> Cape May Warbler <input type="checkbox"/> Common Yellowthroat <input type="checkbox"/> Ovenbird <input type="checkbox"/> American Redstart <input type="checkbox"/> House Sparrow <input type="checkbox"/> Western Meadowlark <input type="checkbox"/> Yellow-headed Blackbird <input type="checkbox"/> Red-winged Blackbird <input type="checkbox"/> Northern Oriole <input type="checkbox"/> Brewer's Blackbird <input type="checkbox"/> Common Grackle <input type="checkbox"/> Brown-headed Cowbird <input type="checkbox"/> Western Tanager <input type="checkbox"/> Scarlet Tanager <input type="checkbox"/> Rose-breasted Grosbeak <input type="checkbox"/> Purple Finch <input type="checkbox"/> Pine Grosbeak

- ☐ Common Goldeneye
- ☐ Bufflehead
- ☐ White-winged Scoter
- ☐ Harlequin Duck A N
- ☐ Ruddy Duck
- ☐ Hooded Merganser
- ☐ Common Merganser
- ☐ Red-breasted Merganser
- ☐ Turkey Vulture
- ☐ Sharp-shinned Hawk
- ☐ Cooper's Hawk
- ☐ Red-tailed Hawk
- ☐ Swainson's Hawk
- ☐ Rough-leg Hawk
- ☐ Bald Eagle
- ☐ Northern Harrier
- ☐ American Kestrel
- ☐ Merlin
- ☒ Peregrine Falcon
- ☐ Ruffed Grouse
- ☐ Sharp-tailed Grouse
- ☐ Gray Partridge
- ☐ Whooping Crane
- ☐ Sandhill Crane
- ☐ Sora
- ☐ American Coot
- ☐ American Avocet
- ☐ Semipalmated Plover
- ☒ Piping Plover *
- ☐ Killdeer
- ☐ Lesser Golden Plover
- ☐ Black-bellied Plover
- ☐ Hudsonian Godwit
- ☐ Marbled Godwit
- ☐ Whimbrel
- ☐ Long-billed Curlew
- ☐ Upland Sandpiper
- ☐ Greater Yellowlegs

- Hummingbird
- ☐ Belted Kingfisher
- ☐ Northern Flicker
- ☐ Yellow-bellied Sapsucker
- ☐ Hairy Woodpecker
- ☐ Downy Woodpecker
- ☐ Eastern Kingbird
- ☐ Western Kingbird
- ☐ Great-crested Flycatcher
- ☐ Eastern Phoebe
- ☐ Alder Flycatcher
- ☐ Least Flycatcher
- ☐ Western Wood Peewee
- ☐ Horned Lark
- ☐ Tree Swallow
- ☐ Bank Swallow
- ☐ Northern Rough-winged Swallow
- ☐ Barn Swallow
- ☐ Cliff Swallow
- ☐ Purple Martin ? b
- ☐ Blue Jay U W
- ☐ Black-billed Magpie
- ☐ Common Raven
- ☐ American Crow
- ☐ Black-capped Chickadee
- ☐ Red-breasted Nuthatch
- ☐ House Wren
- ☐ Marsh Wren
- ☐ Grey Catbird
- ☐ Brown Thrasher
- ☐ American Robin
- ☐ Swainson's Thrush
- ☐ Veery
- ☐ Mountain Bluebird
- ☒ Sprague's Pipit
- ☐ Bohemian Waxwing
- ☐ Cedar Waxwing

- ☐ Common Redpoll
- ☐ Pine Siskin
- ☐ American Goldfinch
- ☐ Rufous-sided Towhee
- ☐ Savannah Sparrow
- ☐ Grasshopper Sparrow
- ☐ Baird's Sparrow
- ☐ LeConte's Sparrow
- ☐ Sharp-tailed Sparrow
- ☐ Vesper Sparrow
- ☐ Lark Sparrow
- ☐ American Tree Sparrow
- ☐ Chipping Sparrow
- ☐ Clay-coloured Sparrow
- ☐ Harris' Sparrow
- ☐ White-crowned Sparrow
- ☐ White-throated Sparrow
- ☐ Lincoln's Sparrow
- ☐ Song Sparrow
- ☐ Lapland Longspur
- ☐ Snow Bunting


Appendix E. Description of selected fauna species in the study area

Endangered species:

Piping Plover

Charadrius melodus circumcinctus

ENDANGERED



Length: 15 - 19 cm (6-7 inches)

© G. W. Beyersbergen

Piping plovers are small shorebirds with a single neck-band, an orange bill with a black tip and orange legs that differentiate them from similar looking killdeer that have two neck-bands (see photo). Plovers are found on sparsely vegetated sand or gravel beaches and alkali mud flats where they nest and raise their young.

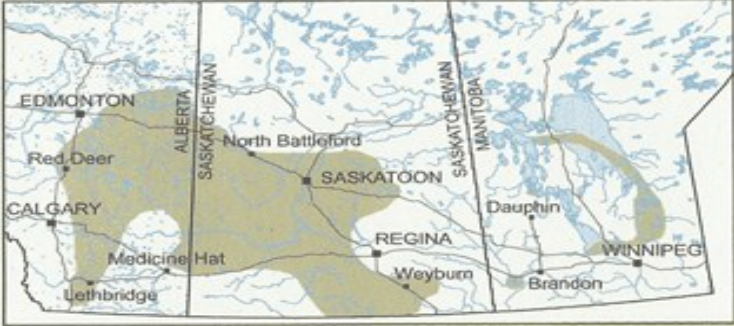
Did you know?

- Females may desert the brood, leaving males to look after the chicks alone.
- Keeping pets, cattle and vehicles (including ATVs) off nesting beaches increases survival of plovers.

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© Environment Canada, Photo: J. Paul Gosselin

birds



(Environment Canada, 2009).

Whooping Crane

Grus americana

ENDANGERED

Measuring an impressive 1.5 metres (5 feet) in height, whooping cranes are the tallest birds in North America. These majestic birds are snow white with black-tipped wings and a red and black head. They nest in shallow wetlands in the northeast corner of Wood Buffalo National Park.


Did you know?

- They perform an elaborate dancing ritual where they ruffle their feathers and perform leaps and bows in an attempt to seduce a mate. They usually mate for life and can live to their mid-twenties.
- They face hardships during migration such as loss of wetlands, collisions with powerlines and the occasional accidental shooting.

13


© Environment Canada, Photo: Geoff Holroyd

birds



Height: 1.5 m (5 feet)

Arrows indicate migratory pathway.



Threatened species:

Loggerhead Shrike Eastern & Prairie populations

Lanius ludovicianus migrans & *Lanius ludovicianus excubitorides*

ENDANGERED (EASTERN) THREATENED (PRAIRIE)

Loggerhead shrikes are slightly smaller than a robin with a distinctive black mask across their eyes and forehead. They occupy open grassland areas, but require scattered trees or shrubs nearby for nesting and perches. Loggerhead shrikes migrate south in winter, and are replaced on the Canadian Prairie by the similar but slightly larger Northern shrike.



Length: 23 cm (9 inches)

© Hank Kilaan

Did you know?

- These masked hunters use their sharply hooked beak to kill insects or mice and will often impale their prey on thorns or other sharp objects for future use.
- Shrikes often use roadside power lines and fences as hunting perches.
- The prairie and eastern populations are so similar in appearance that identification is usually based on geographic location.



birds

Peregrine Falcon

Falco peregrinus anatum

THREATENED

Peregrine falcons are dark coloured crow-sized birds of prey with long pointed wings that enable rapid flight. They are larger than merlins and have more distinctive sideburns than the Prairie falcon. These sleek raptors usually nest on cliff ledges and buildings and hunt birds, often near wetlands.



Length: 41 - 51 cm
(16 - 20 inches)

© Environment Canada, Photo: Geoff Halcyon

Did you know?

- They are the fastest of all raptors and can dive at speeds of over 300 km/hr.
- Once gone from the Prairies, they have returned to Alberta and Manitoba where they nest primarily in cities and industrial facilities thanks to an intensive reintroduction program.
- A ban on the pesticide DDT, which caused their egg-shells to become thin and break, was critical in recovering populations.



birds

20 Sprague's Pipit

Anthus spragueii

THREATENED

Sprague's pipits are secretive sparrow-like birds more often heard than seen. The males sing a twittering "Cheeeeer, Cheeer, Cheeer, Cheeer" while circling at a height of up to 150 m (500 feet) in the air. Then, they drop rapidly to the ground and hide in the grass.



Length: 16 - 17 cm (6 - 7 inches)

© Bob Gress, 2002

Did you know?

- They nest on the ground in native grasslands and feed insects to their young.
- They prefer range in good to excellent condition and are rare in cultivated lands or introduced forage.

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Appendix F. List of vascular plant species recorded in the study area.

Total	ID #	Common Name	Scientific Name	Date	Family	Locale	Observer
1	1	Alfalfa	<i>Medicago sativa</i> L.	15/06/1995	Leguminosae	Redberry Lake	Michael Finley
2	2	Alpine rush	<i>Juncus alpinus</i> Vill.	15/08/2000	Juncaceae	Redberry Lake	Michael Finley
3	3	Alumroot	<i>Heuchera richardsonii</i> R. Br.	10/05/1995	Saxifragaceae	Redberry Lake	Michael Finley
4	4	American dragonhead	<i>Dracocephalum parviflorum</i> Nutt.	21/06/1998	Labiatae	Redberry Lake	Michael Finley
5	5	American hedysarum	<i>Hedysarum americanum</i> (Michx.) Britt.	15/06/2001	Leguminosae	Redberry Lake	Michael Finley
6	6	American speedwell	<i>Veronica americana</i> (Raf.) Schwein	15/06/1995	Scrophulariaceae	Redberry Lake	Michael Finley
7	7	American vetch (wild vetch)	<i>Vicia americana</i> Muhl.	07/06/1994	Leguminosae	Redberry Lake	Unknown
8	8	Arroe-leaved colt's-foot	<i>Petasites sagittatus</i> (Pursh) A. Gray	19/07/1995	Compositae	Redberry Lake	Michael Finley
9	9	Arum-leaved arrowhead	<i>Sagittaria cuneata</i>	17/07/1994	Alismaceae	Redberry Lake	Michael Finley
10	10	Ascending purple milk vetch	<i>Astragalus striatus</i> Nutt.	22/05/1994	Leguminosae	Redberry Lake	Unknown
11	11	Aspen	<i>Populus tremuloides</i> Michx.	15/08/2000	Salicaceae	Redberry Lake	Michael Finley
12	21	Balsam groundsel	<i>Senecio paperculus</i> Michx.	19/06/1999	Compositae	Redberry Lake	Michael Finley
13	22	Balsam poplar	<i>Populus balsamifera</i> L.	15/08/2000	Salicaceae	Redberry Lake	Michael Finley
14	23	Baltic rush	<i>Juncus balticus</i> Willd.	20/07/2000	Juncaceae	Redberry Lake	Michael Finley
15	24	Bastard toadflax	<i>Comandra umbellata</i> (L.) Nutt.	07/06/1995	Santalaceae	Redberry Lake	Michael Finley
16	25	Beaked willow	<i>Salix bebbiana</i> Sarg.	15/08/2000	Chenopodiaceae	Redberry Lake	Michael Finley
17	26	Bearberry	<i>Arctostaphylos uva-ursi</i> (L.) Spreng	10/08/2000	Ericaceae	Redberry Lake	Michael Finley
18	27	Begamot (bee balm, horse mint)	<i>Monarda fistulosa</i> L.	17/07/1995	Labiatae	Redberry Lake	Unknown
19	28	Biennial wormwood	<i>Artemisia biennis</i> Willd.	15/08/2000	Compositae	Redberry Lake	Michael Finley
20	29	Black medic	<i>Medicago lupulina</i> L.	17/07/1993	Leguminosae	Redberry Lake	Michael Finley
21	30	Black-fruited choke cherry	<i>Prunus virginiana</i> L. Var. <i>melocarpa</i> (A. Nels.) Sarg.	15/08/2000	Rosaceae	Redberry Lake	Michael Finley
22	31	Blue lettuce	<i>Lactuca pulchella</i>	17/07/1995	Compositae	Redberry Lake	Michael Finley
23	32	Bluebur	<i>Lappula echinata</i> Gilib.	10/06/1995	Boraginaceae	Redberry Lake	Michael Finley
24	33	Blue-eyed grass	<i>Sisyrinchium montanum</i> Greene	22/05/1994	Iridaceae	Redberry Lake	Unknown
25	34	Blunt-leaved sandwort	<i>Arenaria lateriflora</i> L.	02/06/1994	Caryophyllaceae	Redberry Lake	Michael Finley
26	35	Buffaloberry	<i>Shepherdia argentea</i> Nutt.	01/08/2000	Elaeagnaceae	Redberry Lake	Michael Finley
27	36	Bunchberry	<i>Cornus canadensis</i> L.	10/06/1997	Cornaceae	Redberry Lake	Michael Finley
28	45	Canada anemone	<i>Anemone Canadensis</i> L.	17/06/1995	Ranunculaceae	Redberry Lake	Michael Finley
29	46	Canada buffaloberry	<i>Shepherdia canadensis</i> L.	01/08/2000	Elaeagnaceae	Redberry Lake	Michael Finley
30	47	Canada fleabane	<i>Erigeron canadensis</i> L.	21/07/1994	Compositae	Redberry Lake	Michael Finley
31	48	Canada hawkweed	<i>Hieracium umbellatum</i> L.	03/08/1995	Compositae	Redberry Lake	Michael Finley
32	49	Canada milk-vetch	<i>Astragalus canadensis</i> L.	10/06/1995	Leguminosae	Redberry Lake	Michael Finley
33	50	Canada thistle	<i>Cirsium arvense</i> (L.) Scop.	08/07/1994	Compositae	Redberry Lake	Michael Finley
34	51	Caragana	<i>Caragana arborescens</i> Lam.	22/08/2000	Leguminosae	Redberry Lake	Michael Finley
35	52	Celery-leaved buttercup	<i>Ranunculus sceleratus</i> L.	15/06/1995	Ranunculaceae	Redberry Lake	Michael Finley
36	53	Common broomweed	<i>Gutierrezia sarothrae</i> (Pursh) Britt. & Rusby	20/08/2000	Compositae	Redberry Lake	Michael Finley
37	54	Common bugseed	<i>Cosperium hyssopifolium</i> L.	02/10/2000	Chenopodiaceae	Redberry Lake	Michael Finley
38	55	Common groundsel	<i>Senecio vulgaris</i> L.	19/06/1993	Compositae	Redberry Lake	Michael Finley
39	56	Common peppergrass	<i>Lepidium densiflorum</i> Schrad.	15/08/1994	Cruciferae	Redberry Lake	Michael Finley
40	57	Common plantain	<i>Plantago major</i> L.	Unknown	Plantaginaceae	Saskatchewan	Michael Finley
41	58	Common water-plantain	<i>Alisma plantago-aquatica</i> L.	01/08/2000	Alismaceae	Redberry Lake	Michael Finley
42	59	Cow parsnip	<i>Heracleum lanatum</i> Michx.	15/06/2001	Umbelliferae	Redberry Lake	Michael Finley
43	60	Cream coloured vetchling	<i>Lathyrus ochroleucus</i> Hook	04/06/1994	Leguminosae	Redberry Lake	Michael Finley
44	61	Crocus anemone	<i>Anemone patens</i> L.	04/05/1995	Ranunculaceae	Redberry Lake	Unknown
45	62	Cut-leaved anemone	<i>Anemone multiflora</i> Poir.	11/06/1994	Ranunculaceae	Redberry Lake	Michael Finley
46	75	Dandelion	<i>Taraxacum officinale</i> Weber	17/05/1993	Compositae	Redberry Lake	Michael Finley
47	76	Dewberry	<i>Rubus pubescens</i> Raf.	07/06/1994	Rosaceae	Redberry Lake	Unknown
48	77	Dog Mustard	<i>Erucastum gallicum</i> (Willd.) O. E. Schulz	03/07/1994	Cruciferae	Redberry Lake	Michael Finley
49	78	Doorweed	<i>Polygonum aviculare</i> L.	15/08/2000	Polygonaceae	Redberry Lake	Michael Finley
50	79	Dotted blazingstar	<i>Liatris punctata</i> Hook.	19/07/1996	Compositae	Redberry Lake	Michael Finley

51	80	Drummond's cockle	<i>Silene drummondii</i> (Hook.)	15/07/2001	Caryophyllaceae	Redberry Lake	Michael Finley
52	81	Drummond's rock cress	<i>Arabis drummondii</i> A. Gray	02/08/1999	Cruciferae	Redberry Lake	Michael Finley
53	82	Dwarf birch	<i>Betula pumila</i> L.	15/08/2000	Betulaceae	Redberry Lake	Michael Finley
54	92	Early blue violet (hooked violet)	<i>Viola adunca</i> J.E. Smith	07/05/1994	Violaceae	Redberry Lake	Unknown
55	93	Early cinquefoil	<i>Potentilla concinna</i> Richardson	25/05/1999	Rosaceae	Redberry Lake	Michael Finley
56	94	Early coralroot	<i>Corallorhiza trifida</i> Chat.	10/06/1999	Orchidaceae	Redberry Lake	Michael Finley
57	95	Erigeron glabellus Nutt.	<i>Erigeron glabellus</i> Nutt.	04/06/1994	Compositae	Redberry Lake	Michael Finley
58	105	Fairy Bells	<i>Disporum trachycarpum</i> (S. Wats.) B.&H.	01/07/1993	Lilaceae	Redberry Lake	Unknown
59	106	False dandelion	<i>Agoseris glauca</i> (pursh) Raf.	01/08/1999	Compositae	Redberry Lake	Michael Finley
60	107	Fern. Beautiful sunflower	<i>Hellanthus laetiflorus</i> pers. Var. <i>subrhomboides</i>	10/08/2000	Compositae	Redberry Lake	Michael Finley
61	108	Few-flowered aster	<i>Aster pauciflorus</i> Nutt.	07/08/1997	Compositae	Redberry Lake	Michael Finley
62	109	Field chickweed	<i>Cerastium arvense</i> L.	22/05/1994	Caryophyllaceae	Redberry Lake	Michael Finley
63	110	Field dock	<i>Rumex fennicus</i> (Murb.) Murb.	20/07/1999	Polygonaceae	Redberry Lake	Michael Finley
64	111	Fireweed	<i>Epilobium angustifolium</i> L.	10/08/2000	Onagraceae	Redberry Lake	Unknown
65	112	Flixweed	<i>Decurainia sophia</i> (L.) Webb.	11/06/1994	Cruciferae	Redberry Lake	Michael Finley
66	113	Flodman's thistle	<i>Cirsium flodmanii</i> (Rydb.) Arthur	19/07/1996	Compositae	Redberry Lake	Michael Finley
67	114	Fringed loosestrife	<i>Lysimacha ciliata</i> L.	01/07/1995	Primulaceae	Redberry Lake	Unknown
68	124	Gaillardia	<i>Gaillardia aristata</i> Pursh.	24/06/1995	Compositae	Redberry Lake	Michael Finley
69	125	Giant-hyssop	<i>Agastache foeniculum</i> (Pursh) Ktze.	20/08/1994	Labiatae	Redberry Lake	Michael Finley
70	126	Golden Bean	<i>Thermopsis rhombifolia</i> (Nutt.) Richardson	09/05/1998	Leguminosae	Redberry Lake	Michael Finley
71	127	Golden bean	<i>Thermopsis rhombifolia</i> (Nutt.) Rich.	22/05/1994	Rosaceae	Redberry Lake	Michael Finley
72	128	Golden corydalis	<i>Corydalis aurea</i> Willd.	22/05/1994	Fumariaceae	Redberry Lake	Unknown
73	129	Golden dock	<i>Rumex maritima</i> L.	10/07/1997	Polygonaceae	Redberry Lake	Michael Finley
74	130	Graceful goldenrod	<i>Solidago canadensis</i> L.	17/07/1993	Compositae	Redberry Lake	Michael Finley
75	131	Green-flowered bog orchid	<i>Habenaria hyperborea</i> (L.) R. Br.	10/06/1999	Orchidaceae	Redberry Lake	Michael Finley
76	132	Gumweed	<i>Grindelia squarrosa</i> (Pursh) Dunal	12/07/1998	Compositae	Redberry Lake	Michael Finley
77	142	Hairy golden-aster	<i>Chrysopsis villosa</i> (Pursh) Nutt.	21/07/1994	Compositae	Redberry Lake	Michael Finley
78	143	Harebell	<i>Campanula rotundifolia</i> L.	02/07/1994	Campanulaceae	Redberry Lake	Michael Finley
79	144	Heart-leaved alexander	<i>Zizia aptera</i> (Gray) Fern.	04/06/1995	Umbelliferae	Redberry Lake	Michael Finley
80	145	Hedge nettle (marsh or clown's wound wort)	<i>Stachys palustris</i> L.	15/07/1994	Labiatae	Redberry Lake	Unknown
81	146	Hemp-Nettle	<i>Galeopsis tetrahit</i> L.	01/08/2000	Labiatae	Redberry Lake	Michael Finley
82	147	Hirsute fleabane	<i>Erigeron lonchophyllus</i> Hook.	10/08/2000	Compositae	Redberry Lake	Michael Finley
83	148	Hirsute fleabane	<i>Erigeron lonchophyllus</i> Hook.	10/08/2000	Rosaceae	Redberry Lake	Michael Finley
84	149	Hoary sagebrush	<i>Artemisia cana</i> pursh.	21/07/2000	Compositae	Redberry Lake	Michael Finley
85	150	Hoary willow	<i>Salix candida</i> Fluegee	15/08/2000	Salicaceae	Redberry Lake	Michael Finley
86	160	Immaculate yellow lily	<i>Forma immaculata</i>	01/07/1995	Lilaceae	Redberry Lake	Michael Finley
87	170	Kalm's lobelia	<i>Lobelia kalmii</i> L.	10/07/1994	Lobeliaceae	Redberry Lake	Michael Finley
88	171	Kochia	<i>Kochia scoparia</i> (L.) Schrad.	09/08/2000	Chenopodiaceae	Redberry Lake	Michael Finley
89	181	Lamb's-quarters	<i>Chenopodium album</i> L.	07/09/1998	Chenopodiaceae	Redberry Lake	Michael Finley
90	182	Late yellow locoweed	<i>Oxytropis campestris</i> (L.) DC	07/07/1996	Leguminosae	Redberry Lake	Unknown
91	183	Lesser duckweed	<i>Lemna minor</i> L.	15/08/2000	Lemnaceae	Redberry Lake	Michael Finley
92	184	Lilac-flowered beardtongue	<i>Penstemon gracilis</i> Nutt.	15/07/1994	Scrophulariaceae	Redberry Lake	Michael Finley
93	185	Lindley's aster	<i>Aster ciliolatus</i> Lindl.	06/08/1994	Compositae	Redberry Lake	Michael Finley
94	186	Linear-leaved wormwood	<i>Artemisia dracunculus</i> L.	19/08/2000	Compositae	Redberry Lake	Michael Finley
95	187	Lobed prickly lettuce	<i>Lactuca serriola</i> L.	15/08/2000	Compositae	Redberry Lake	Michael Finley
96	188	long-fruited anemone	<i>Anemone cylindrica</i> A. Gray.	21/07/1998	Ranunculaceae	Redberry Lake	Michael Finley
97	189	Long-leaved stitchwort or chickweed	<i>Stellaria longifolia</i> Muhl.	01/07/1993	Caryophyllaceae	Redberry Lake	Michael Finley
98	190	Long-stalked stitchwort	<i>Stellaria longipes</i> Goldie	07/06/1996	Caryophyllaceae	Redberry Lake	Michael Finley

99	191	loose-flowered milk vetch	<i>Astragalus tenellus</i> Pursh	01/07/1993	Leguminosae	Redberry Lake	Michael Finley
100	192	Low bush-cranberry	<i>Viburnum edule</i> (Michx.) Raf.	22/08/2000	Caprifoliaceae	Redberry Lake	Michael Finley
101	193	Low goldenrod	<i>Solidago missouriensis</i> Nutt.	06/07/1995	Compositae	Redberry Lake	Michael Finley
102	194	Low townsendia	<i>Townsendia exscapa</i> (Rich.) Porter	25/05/1996	Compositae	Redberry Lake	Michael Finley
103	204	Macoun's buttercup	<i>Ranunculus macounii</i> Britt.	15/07/1995	Ranunculaceae	Redberry Lake	Michael Finley
104	205	Macoun's fringed gentian	<i>Gentiana macounii</i> Holm	25/08/1996	Gentianaceae	Redberry Lake	Unknown
105	206	Manitoba maple	<i>Acer negundo</i> L.	10/08/2000	Aceraceae	Redberry Lake	Michael Finley
106	207	Many-flowered aster	<i>Aster cricoides</i> L.	05/08/1994	Compositae	Redberry Lake	Michael Finley
107	208	Maple-leaved goosefoot	<i>Chenopodium hybridum</i> L.	07/06/2001	Chenopodiaceae	Redberry Lake	Michael Finley
108	209	Mare's-tail	<i>Hippus vulgaris</i> L.	10/08/2000	Haloragaceae	Redberry Lake	Michael Finley
109	210	Marsh felwort	<i>Lomatogonium rotatum</i> (L.) Fries.	25/08/1996	Gentianaceae	Redberry Lake	Unknown
110	211	Marsh Ragwort	<i>Senecio congestus</i> (R. Br.) DC.	10/06/1995	Compositae	Redberry Lake	Michael Finley
111	212	Marsh skullcap	<i>Scutellaria galericulata</i>	03/07/1996	Labiatae	Redberry Lake	Unknown
112	213	Marsh willowherb	<i>Epilobium palustre</i> L.	15/08/2000	Onagraceae	Redberry Lake	Michael Finley
113	214	Marsh-marigold	<i>Caltha palustris</i> L.	26/05/1995	Ranunculaceae	Redberry Lake	Unknown
114	215	Meadow blazingstar	<i>Liatris ligulistylis</i> (A. Nels.) K. Shum.	19/07/1996	Compositae	Redberry Lake	Michael Finley
115	216	Mealy primrose	<i>Primula incana</i> M.E. Jones	11/06/1994	Primulaceae	Redberry Lake	Michael Finley
116	217	Missouri milk-vetch	<i>Astragalus missouriensis</i> Nutt.	25/05/1996	Leguminosae	Redberry Lake	Michael Finley
117	218	Modoc bog orchid, slender bog orchid	<i>Habenaria stricta/saccata</i> ; <i>Limnorchis saccata/stricta</i>	15/08/2000	Orchidaceae	Redberry Lake	Michael Finley
118	219	Moss phlox	<i>Phlox hoodi</i> Richards	12/05/1996	Polemoniaceae	Redberry Lake	Michael Finley
119	220	Mountain Goldenrod	<i>Solidago spathulata</i> DC	21/07/1994	Compositae	Redberry Lake	Michael Finley
120	230	Narrow-leaved collomia	<i>Collomia linearis</i> Nutt.	01/07/1994	Polemoniaceae	Redberry Lake	Michael Finley
121	231	Narrow-leaved hawk's-beard	<i>Crepis tectorum</i> L.	01/07/1993	Compositae	Redberry Lake	Michael Finley
122	232	Narrow-leaved meadowsweet	<i>Spirea alba</i> DuRoi	10/07/1993	Rosaceae	Redberry Lake	Michael Finley
123	233	nodding beggarticks	<i>Bidens cernua</i> L.	26/08/1998	Compositae	Redberry Lake	Michael Finley
124	234	Norther grass-of-parnassus	<i>Parnassia palustris</i> L.	17/07/1995	Saxifragaceae	Redberry Lake	Michael Finley
125	235	Northern bedstraw	<i>Galium boreale</i> L.	11/06/1994	Rubiaceae	Redberry Lake	Michael Finley
126	236	Northern black current	<i>Ribes hudsonianum</i> Rich.	15/08/2000	Grossulariaceae	Redberry Lake	Michael Finley
127	237	Northern gentian	<i>Gentianella amarella</i> (L.) Borner	08/07/1999	Gentianaceae	Redberry Lake	Michael Finley
128	238	Northern gooseberry	<i>Ribes oxycanthoides</i> L.	15/08/2000	Grossulariaceae	Redberry Lake	Michael Finley
129	239	Northern willow	<i>Epilobium ciliatum</i> Raf.	12/08/1998	Onagraceae	Redberry Lake	Michael Finley
130	240	Northern bog violet	<i>Viola cucullata</i> Ait.	20/05/1995	Violaceae	Redberry Lake	Unknown
131	250	Orache	<i>Atriplex patula</i> L. var. <i>hastata</i> (L.) Gray	07/09/1998	Chenopodiaceae	Redberry Lake	Michael Finley
132	251	Owl's-clover	<i>Orthocarpus luteus</i> Nutt.	19/07/1996	Scrophulariaceae	Redberry Lake	Michael Finley
133	261	Pale persicaria	<i>Polygonum lapathifolium</i> L.	09/07/1994	Polygonaceae	Redberry Lake	Michael Finley
134	262	Pasture sage	<i>Artemisia frigida</i> Willd.	03/07/1994	Compositae	Redberry Lake	Michael Finley
135	263	pennycress	<i>Thlaspi arvense</i> L.	03/07/1994	Cruciferae	Redberry Lake	Michael Finley
136	264	Perennial sow-thistle	<i>Sonchus arvensis</i> L.	01/08/1993	Compositae	Redberry Lake	Michael Finley
137	265	Philadelphia fleabane	<i>Erigeron philadelphicus</i> L.	24/06/1995	Compositae	Redberry Lake	Michael Finley
138	266	Pineappleweed	<i>Matricaria discolor</i> DC.	15/07/2001	Compositae	Redberry Lake	Michael Finley
139	267	Pink bee plant (spider plant)	<i>Cleome serrulata</i> Pursh.	Unknown	Capparidaceae	Redberry Lake	Unknown
140	268	Pink wintergreen	<i>Pyrola asarifolia</i> Michx.	11/06/1994	Pyrolaceae	Redberry Lake	Unknown
141	269	Plains cinquefoil	<i>Potentilla bignoniifolia</i> Dougl.	10/07/1996	Rosaceae	Redberry Lake	Michael Finley
142	270	Plains cottonwood	<i>Populus sargentii</i> Dide	15/08/2000	Salicaceae	Redberry Lake	Michael Finley
143	271	Plains wormwood	<i>Artemisia campestris</i> L.	03/07/1994	Compositae	Redberry Lake	Michael Finley
144	272	Poison-ivy	<i>Rhus radicans</i> L. var. <i>rydbergii</i> (Small) Rehder	10/08/2000	Anacardiaceae	Redberry Lake	Michael Finley
145	273	Prairie cinquefoil	<i>Potentilla pensylvanica</i> L.	22/06/1999	Rosaceae	Redberry Lake	Michael Finley
146	274	Prairie groundsel	<i>Senecio canus</i> Hook.	21/07/1994	Compositae	Redberry Lake	Michael Finley
147	275	Prairie onion	<i>Alium textile</i> Nels. & Macbr.	01/06/1996	Lilacea	Redberry Lake	Michael Finley
148	276	Prairie sage	<i>Artemisia ludoviciana</i> Nutt.	10/07/1994	Compositae	Redberry Lake	Michael Finley
149	277	Prickly rose	<i>Rosa acicularis</i> Lindl.	15/06/1996	Rosaceae	Redberry Lake	Michael Finley

150	278	Purple prairie clover	<i>Petalostemon purpureum</i> (Vent.) Rydb.	01/07/1995	Leguminosae	Redberry Lake	Unknown
151	279	Purple rock cress	<i>Arabis divaricarpa</i> A. Nels.	01/06/1996	Cruciferae	Redberry Lake	Michael Finley
152	280	Pussy willow	<i>Salix discolor</i> Muhl.	15/08/2000	Chenopodiaceae	Redberry Lake	Michael Finley
153	281	Pygmy flower	<i>Androsace septentrionalis</i> L.	04/06/1994	Primulaceae	Redberry Lake	Unknown
154	291	rayless aster	<i>Aster brachyactis</i> Blake	25/08/1998	Compositae	Redberry Lake	Michael Finley
155	292	red goosefoot	<i>Chenopodium glaucum</i> L.	07/09/1998	Chenopodiaceae	Redberry Lake	Michael Finley
156	293	Red-osier dogwood	<i>Cornus alba</i> L.	03/08/2000	Cornaceae	Redberry Lake	Michael Finley
157	294	Red-root pigweed	<i>Amaranthis retroflexus</i> L.	12/08/1994	Amaranthaceae	Redberry Lake	Michael Finley
158	295	River birch	<i>Betula occidentalis</i> Hook.	15/08/2000	Betulaceae	Redberry Lake	Michael Finley
159	296	Rough cinquefoil	<i>Potentilla norvegica</i> L.	15/06/2001	Rosaceae	Redberry Lake	Michael Finley
160	297	Rough Fleabane	<i>Erigeron asper</i> Nutt.	07/06/1996	Compositae	Redberry Lake	Michael Finley
161	298	Round-leaved hawthorn	<i>Crataegus rotundifolia</i> Moench	01/08/2000	Rosaceae	Redberry Lake	Michael Finley
162	299	Rush aster	<i>Aster junciformis</i> L.	11/08/1994	Compositae	Redberry Lake	Michael Finley
163	300	Russian pigweed	<i>Axyris amaranthoides</i> L.	07/09/1998	Chenopodiaceae	Redberry Lake	Michael Finley
164	301	Russian-thistle	<i>Salsola kali</i> L.	02/10/2000	Chenopodiaceae	Redberry Lake	Michael Finley
165	311	Sago pondweed	<i>Potamogeton pectinatus</i> L.	20/08/2000	Zosteraceae	Redberry Lake	Michael Finley
166	312	saline goosefoot	<i>Chenopodium rubrum</i> L.	07/09/1998	Chenopodiaceae	Redberry Lake	Michael Finley
167	313	Saline shooting star	<i>Dodecatheon pulchellum</i> (Raf.) Merr.	04/06/1994	Primulaceae	Redberry Lake	Unknown
168	314	Salt-marsh sand spurry	<i>Spergularia marina</i> (L.) Griseb.	09/08/2000	Caryophyllaceae	Redberry Lake	Michael Finley
169	315	samphire	<i>Salicornia rubra</i> A. Nels.	07/09/1998	Chenopodiaceae	Redberry Lake	Michael Finley
170	316	Sand bladderpod	<i>Lesquerella ludoviciana</i> (Nutt.) Wats.	04/07/1994	Cruciferae	Redberry Lake	Unknown
171	317	Sandbar willow	<i>Salix interior</i> Rowlee	15/08/2000	Salicaceae	Redberry Lake	Michael Finley
172	318	Saskatoon	<i>Amelanchier alnifolia</i> L.	10/08/2000	Rosaceae	Redberry Lake	Michael Finley
173	319	Scapose hawk's-beard	<i>Crepis runcinata</i> (James) T.&G.	15/07/1999	Compositae	Redberry Lake	Michael Finley
174	320	Scarlet mallow	<i>Malvastrum coccineum</i> (Pursh) Gray	10/07/1993	Malvaceae	Redberry Lake	Michael Finley
175	321	Sea-milkwort	<i>Glaux maritima</i> L.	11/06/1994	Primulaceae	Redberry Lake	Michael Finley
176	322	Seaside arrow-grass	<i>Triglochin maritima</i> L.	01/08/2000	Juncaginaceae	Redberry Lake	Michael Finley
177	323	Sea-side buttercup	<i>Ranunculus cymbalaria</i> Pursh	03/06/1995	Ranunculaceae	Redberry Lake	Unknown
178	324	Seneca snakeroot	<i>Polygala senega</i> L.	15/06/1996	Polygonaceae	Redberry Lake	Michael Finley
179	325	Shepard's purse	<i>Capsella bursa-pastoris</i> (L.) Medic.	07/06/1994	Cruciferae	Redberry Lake	Unknown
180	326	Shrubby cinquefoil	<i>Potentilla fruticosa</i> L. ssp. <i>Floribunda</i> (Nutt.) Elk.	01/08/2000	Rosaceae	Redberry Lake	Michael Finley
181	327	Siberian elm	<i>Ulmus pumila</i> L.	09/08/2000	Ulmaceae	Redberry Lake	Michael Finley
182	328	Silverberry	<i>Elaeagnus commutata</i> Bernh.	01/08/2000	Elaeagnaceae	Redberry Lake	Michael Finley
183	329	Silverweed	<i>Potentilla anserina</i> L.	07/06/1996	Rosaceae	Redberry Lake	Michael Finley
184	330	Skeletonweed	<i>Lygodesmia juncea</i> (Pursh) D. Don	03/08/1996	Compositae	Redberry Lake	Michael Finley
185	331	Small yellow lady's-slipper	<i>Cypripedium calceolus</i> L. var. <i>parviflorum</i> (Salisb.) Ferr.	10/06/1999	Orchiaceae	Redberry Lake	Michael Finley
186	332	Small-flowered prairie rocket	<i>Erysimum inconspicuum</i> (S. Wats.) MacM.	24/06/1994	Cruciferae	Redberry Lake	Michael Finley
187	333	small-leaved everlasting	<i>Antennaria parvifolia</i> Nutt.	03/06/1995	Compositae	Redberry Lake	Michael Finley
188	334	Smooth blue aster	<i>Aster laevis</i> L.	01/08/1994	Compositae	Redberry Lake	Michael Finley
189	335	Smooth blue beardtounge	<i>Penstemon nitidus</i> Dougl.	17/07/1995	Scrophulariaceae	Redberry Lake	Michael Finley
190	336	Smooth catchfly	<i>Silene cserei</i> Baumgarten	22/07/1998	Caryophyllaceae	Redberry Lake	Michael Finley
191	337	Smooth wild strawberry	<i>Frageria virginiana</i> Dene.	20/05/1995	Rosaceae	Redberry Lake	Unknown
192	338	Snake-root	<i>Sanicula marilandica</i> L.	10/08/1996	Umbelliferae	Redberry Lake	Michael Finley
193	339	Spiked water-milfoil	<i>Myriophyllum spicatum</i> L.	10/08/2000	Haloragaceae	Redberry Lake	Michael Finley
194	340	Spiny ironplant	<i>Haplopappus spinulosus</i> (pursh) DC.	19/07/1998	Compositae	Redberry Lake	Michael Finley
195	341	star-flowered Solomon's seal	<i>Smilacina stellata</i> (L.) Desf.	22/05/1994	Lilaceae	Redberry Lake	Michael Finley
196	342	Sticky asphodel	<i>Tofieldia glutinosa</i> (Michx.)	01/07/1996	Lilaceae	Redberry Lake	Unknown
197	343	Stiff goldenrod	<i>Solidago rigida</i> L. var. <i>humilis</i> Porter	15/08/2000	Compositae	Redberry Lake	Michael Finley
198	344	Stinging nettle	<i>Urtica dioica</i> L.	15/07/1998	Urticaceae	Redberry Lake	Michael Finley
199	345	Striate knotweed	<i>Polygonum achoreum</i> Blake	15/08/2000	Polygonaceae	Redberry Lake	Michael Finley
200	346	Striped coralroot	<i>Corallorhiza striata</i> Lindl.	10/06/1999	Orchiaceae	Redberry Lake	Michael Finley

201	347	Swamp persicaria	<i>Polygonum amphibium</i> L.	20/08/2000	Polygonaceae	Redberry Lake	Michael Finley
202	348	Swamp red current	<i>Ribes triste</i> Pall.	15/08/2000	Grossulariaceae	Redberry Lake	Michael Finley
203	349	Sweet-scented bedstraw	<i>Galium triflorum</i> Michx.	01/07/1993	Rubiaceae	Redberry Lake	Unknown
204	359	Toad rush	<i>Juncus bufonius</i> L.	20/08/2000	Juncaceae	Redberry Lake	Michael Finley
205	360	Tubrous-rooted sunflower	<i>Helianthus nuttalli</i> T. & G.	09/08/1998	Compositae	Redberry Lake	Michael Finley
206	361	Tufted fleabane	<i>Erigeron caepitosus</i>	15/06/1999	Compositae	Redberry Lake	Michael Finley
207	362	Twayblade	<i>Liparis loeselii</i> (L.) Rich.	15/08/2000	Orchidaceae	Redberry Lake	Unknown
208	363	twinflower	<i>Linnaea borealis</i> L.	01/07/1995	Caprifoliaceae	Redberry Lake	Michael Finley
209	364	Twining honeysuckle	<i>Lonicera glaucescens</i> Rydb.	11/07/1994	Caprifoliaceae	Redberry Lake	Michael Finley
210	365	Two leaves solomon's-seal	<i>Mianthemum canadense</i> Deff.	15/06/1996	Lilaceae	Redberry Lake	Michael Finley
211	366	Two-grooved milk vetch	<i>Astragalus bisilcatus</i> (Hook.) Gray	11/06/1994	Leguminosae	Redberry Lake	Michael Finley
212	376	Veiny meadow rue	<i>Thalictrum venulosum</i> Trel.	04/06/1994	Ranunculaceae	Redberry Lake	Unknown
213	377	Vine-leaved colt's-foot	<i>Petasites vitifolius</i> Greene	19/07/1996	Compositae	Redberry Lake	Michael Finley
214	387	Water-hemlock	<i>Cicuta maculata</i> L.	17/07/1996	Umbelliferae	Redberry Lake	Michael Finley
215	388	Wavy-leaved thistle	<i>Cirsium undulatum</i> (Nutt.) Spreng	19/07/1996	Compositae	Redberry Lake	Michael Finley
216	389	Western Canada violet	<i>Viola canadensis</i> L.	20/05/1995	Violaceae	Redberry Lake	Unknown
217	390	Western ditch-grass, widgeon-grass	<i>Ruppia occidentalis</i> S. Wats.	20/08/2000	Zosteraceae	Redberry Lake	Michael Finley
218	391	Western dock	<i>Rumex occidentalis</i> S. Wats.	20/07/1999	Polygonaceae	Redberry Lake	Michael Finley
219	392	western sea-blite	<i>Suaeda depressa</i> (Pursh) S. Wats.	07/09/1998	Chenopodiaceae	Redberry Lake	Michael Finley
220	393	Western snowberry	<i>Symphoricarpos occidentalis</i> Hook.	01/07/1995	Caprifoliaceae	Redberry Lake	Michael Finley
221	394	Western water-horehound	<i>Lycopus asper</i> Greene	15/07/1998	Labiatae	Redberry Lake	Michael Finley
222	395	Western wood lily	<i>Lilium philadelphicum</i> L. var. <i>andinum</i> (Nutt.) Ker	01/07/1995	Lilaceae	Redberry Lake	Michael Finley
223	396	White baneberry	<i>Actaea rubra</i> (Ait.) Willd.	20/08/2000	Rosaceae	Redberry Lake	Michael Finley
224	397	White birch	<i>Betula papyrifera</i> Marsh.	15/08/2000	Betulaceae	Redberry Lake	Michael Finley
225	398	White cockle	<i>Lychnis alba</i> Mill.	10/07/1996	Caryophyllaceae	Redberry Lake	Michael Finley
226	399	White sweet-clover	<i>Melilotus alba</i> Medic.	21/06/1998	Leguminosae	Redberry Lake	Michael Finley
227	400	Wild black current	<i>Ribes americanum</i> Mill.	15/08/2000	Grossulariaceae	Redberry Lake	Michael Finley
228	401	Wild blue flax	<i>Linum lewisii</i> Pursh	03/06/1998	Linaceae	Redberry Lake	Michael Finley
229	402	Wild buckwheat	<i>Polygonum convolvulus</i>	Unknown	Polygonaceae	Redberry Lake	Michael Finley
230	403	Wild cucumber	<i>Echinocystis lobata</i> (Michx.) T. & G.	10/08/2000	Cucurbitaceae	Redberry Lake	Michael Finley
231	404	Wild licorice	<i>Glycyrrhiza lepidota</i> (Nutt.) Pursh	20/08/1999	Leguminosae	Redberry Lake	Michael Finley
232	405	Wild mint	<i>Mentha arvensis</i> L.	19/07/1996	Labiatae	Redberry Lake	Unknown
233	406	Wild mustard	<i>Brassica kaber</i> L.	03/07/1994	Cruciferae	Redberry Lake	Michael Finley
234	407	Wild raspberry	<i>Rubus idaeus</i> L.	15/08/2000	Rosaceae	Redberry Lake	Michael Finley
235	408	Wild sarsaparilla	<i>Aralia nudicaulis</i> L.	07/06/1994	Araliaceae	Redberry Lake	Michael Finley
236	409	Willow aster	<i>Aster hesperus</i> A. Grey	21/07/1994	Compositae	Redberry Lake	Michael Finley
237	410	Wolly burdock	<i>Arctium tomentosum</i> P. Mill.	15/07/2000	Compositae	Redberry Lake	Michael Finley
238	411	Wood's rose	<i>Rosa woodsii</i> Lindl.	15/06/1996	Rosaceae	Redberry Lake	Michael Finley
239	421	Yarrow	<i>Achillea millefolium</i> L.	11/06/1994	Compositae	Redberry Lake	Michael Finley
240	422	Yellow avens	<i>Geum aleppicum</i> Jacq.	01/07/1995	Rosaceae	Redberry Lake	Michael Finley
241	423	Yellow goat's-beard	<i>Tragopogon dubius</i> Scop.	17/06/1995	Compositae	Redberry Lake	Michael Finley
242	424	Yellow marsh cress	<i>Rorippa islandica</i> (Oeder) Borbas	10/07/1997	Cruciferae	Redberry Lake	Michael Finley
243	425	Yellow sweet-clover	<i>Melilotus officinalis</i> (L.) Pall.	01/07/1993	Leguminosae	Redberry Lake	Unknown
244	426	Yellow umbrellaplant	<i>Eriogonum flavum</i> Nutt.	10/08/2000	Polygonaceae	Redberry Lake	Michael Finley
245	427	yellow whitto-grass	<i>Draba nemorosa</i> L.	17/05/1998	Cruciferae	Redberry Lake	Michael Finley
246	428	Yellow willow	<i>Salix lutea</i> Nutt.	15/08/2000	Chenopodiaceae	Redberry Lake	Michael Finley

Appendix G . Description of selected flora species in the study area.

Hawthorn (*Crataegus* spp.)

Although it has large thorns (1-2 inches), the Hawthorn's red berry looks like a mini-apple (Fig. AG1). The berries provide food for the Loggerhead Shrike, an endangered species (RLBR, 2012b).



Figure AG1. Hawthorn (RLBR, 2012b).

Thorny Buffaloberry (*Shepherdia argentea*)

This large thorny shrub or small tree is also called Silver Buffaloberry because of its silver leaves. The fruit is bright red/orange and it makes a pretty contrast to the silver leaves.



Figure AG2. Buffaloberry (Photo by V. Kricsfalusy).

It is edible and was historically used by the First Nations to include with meat, when making pemmican (RLBR, 2012b). Redberry Lake also gets its name from this plant. Its tart fruit can also be used to make a good jelly (Wasowski, 2001).

Pincherry (*Prunus pennsylvanica*)

This plant has very remarkable appearance. It is a small tree with broad clusters of white flowers and tiny, bright red cherries. Typically, it grows on hillsides with aspen, or bracken, and its growth will increase after a fire (Wasowski, 2001). Also, it is edible for birds.



Figure AG3. Pincherry (photo <http://www.google.ca/imgres?q=prunus+pennsylvanica>).

Prairie Crocus (*Anemone patens*)

As Manitoba's provincial flower, it has graygreen stems that are covered with silky hairs. Its single large flower looks like a crocus or tulip. Every flower point has five to seven petals (Fig. AG4). This species grows the best in places where there is little grass biomass, such as in gravelly prairie and moraine hill habitats (Kirt, 1995).



Figure AG4. Prairie Crocus – Manitoba’s provincial flower (photo by V. Kricsfalusy).

Western Red Lily (*Lilium philadelphicum* var. *andinum*)

As the Saskatchewan provincial flower, this species is native to the central and southern



Figure AG5. Red Lily – Saskatchewan’s provincial flower (photo by V. Kricsfalusy).

parts of the province. The plant alternates between its lower leaves and whorl upper leaves (Fig. AG5). However, because of its outstanding looks, the Western Red Lily has become

rarer and rarer, due to over-picking as well as a loss of habitat (Wasowski, 2001).

Wild rose (*Rosa acicularis*)

The Wild rose is Alberta's provincial flower. It has a cluster of flowers, and the flowers



Figure AG6. Wild rose – Alberta's provincial flower (photo by V. Kricsfalusy).

change from deep pink (when open) and then fade to white (Fig. AG6). The fruit of the Wild Rose provides food for many kinds of wildlife, such as deer, pheasants, and small mammals (Kirt, 1995).

Cottonwood/balsam poplar hybrid (*Populus deltoides* x *Populus balsamifera*)

Another interesting plant is located south of Blaine Lake on Hwy #12 (n.d.b). It is a very old hybrid tree, 5 meters in circumference, and is the largest tree in Saskatchewan (also called Big Tree) (Blaine Lake, n.d.a) (Fig. AG7).



Figure AG7. The largest tree in Saskatchewan (Tarasoff, 2007).