BEAVER HILLS BIOSPHERE RESERVE

Nomination Application

A Submission to:

UNESCO

Man and the Biosphere (MAB) Program

By:

Beaver Hills Initiative

Sherwood Park, Alberta, Canada

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PREFACE

The Beaver Hills Initiative (BHI) proposes that the Beaver Hills be designated a UNESCO Biosphere Reserve in accordance with the requirements of the Man and Biosphere Programme (MAB). This submission is based on the conviction that the proposed biosphere reserve demonstrates how people and communities can live, work, and play in harmony with nature.

The Beaver Hills, a morainal landscape located in the province of Alberta in western Canada, comprises an area of almost 1,600 sq. km, extending more than 60 km in a north-south direction and just over 40 km east to west. It is a distinctive island of relatively undeveloped knob and kettle terrain surrounded by a more developed agricultural, urban, and industrialized landscape.

There are numerous protected areas within the Beaver Hills including Elk Island National Park, a protected area of international significance. Beyond these protected areas, land use changes related to anthropocentric impacts have been accompanied by a loss of biodiversity and ecological values. This has occurred despite the persistence of substantial areas of tree cover and native wetlands within a predominantly rural environment. In response, the BHI has promoted and facilitated the application of strategies to address issues associated with these cumulative land-use pressures. These pressures have originated due largely to the close proximity of the Beaver Hills to Edmonton, Canada's most rapidly growing and northernmost major city.

The Beaver Hills has a long history of providing a variety of social, economic and environmental benefits to aboriginal peoples, local residents, and nearby urban populations. As a result, this landscape is highly valued by local residents, Albertans, and other visitors, as witnessed by more than a century of efforts to conserve its distinctive landscape, ecological, and socio-economic character and qualities.

More recently, conservation efforts culminated in 2002 in the formation of the Beaver Hills Initiative (BHI), a dedicated and collaborative partnership that works to ensure the moraine is managed sustainably for current and future generations. The prevailing dynamics of landscape change if left unchecked could compromise and overwhelm conservation efforts. However, because the BHI has been successful in including all land use decision-makers in their deliberations, and because these decision-makers are committed to the shared vision and principles of the BHI, this area has been recognized as a provincial treasure. Government and non-government land managers as well as local and regional communities, aboriginal peoples, and residents realize the Beaver Hills area requires special management approaches, and they look to the BHI to find these sustainable management solutions, ideally within the context of a biosphere reserve.

The BHI has also been successful in promoting the value of the Beaver Hills because it has made a concerted effort to engage all those that live, work and play in the area. This includes representation of a cross-section of people living within and adjacent to the area, including aboriginal peoples. In the 13 years since it was founded, the BHI and its partners have carried out numerous studies, events, and projects to understand, and promote awareness of the social, economic, cultural, and environmental values provided by the Beaver Hills, as well as how to best conserve these values.

The BHI is well positioned to facilitate collaboration across agencies with jurisdiction over the proposed biosphere reserve area as well as engage active involvement of the local population. As an experienced organization, the BHI can direct research and provide guidance related to management issues both proactively and as needed episodically,

The BHI can also interact with other local, provincial, and federal jurisdictions, as well as other biosphere reserves to integrate the best information and knowledge and the most pertinent technologies to successfully manage the Beaver Hills Area. This approach ensures that the BHI can accommodate and guide change while conserving the ecological values, landscape character, and sense of place for users of the Beaver Hills.

However, the BHI recognizes that much work is still needed to ensure the proposed Beaver Hills Biosphere continues to achieve the necessary balance between the goals of conserving biological diversity, promoting sustainable economic and human development, and maintaining associated cultural and heritage values. Receiving Biosphere Reserve status is the next step in this journey and would facilitate continuing success, strengthen community engagement, and promote pride in conserving this distinctive and valued landscape

CONTENTS

LIST OF ACRONYMS

ASC	Alberta Sport Connection
AESRD	Alberta Environment and Sustainable Resource Development (*Note that this department consolidates several divisions managing various environmental aspects, including Parks, Public Lands, Fish and Wildlife and Water. Where the respective division has been directly involved, it is mentioned specifically. Where various divisions within AESRD have been involved, the broader departmental abbreviation is used*).
BHI	Beaver Hills Initiative
Blackfoot PRA	Cooking Lake-Blackfoot Provincial Recreation Area
EINP	Elk Island National Park
GOA	Government of Alberta
MLPP	Miquelon Lake Provincial Park

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PART I: SUMMARY

1. PROPOSED NAME OF THE BIOSPHERE RESERVE

Beaver Hills Biosphere

2. NAME OF THE COUNTRY

Canada

3. FULFILLMENT OF THE THREE FUNCTIONS OF BIOSPHERE RESERVES

(Article 3 of the Statutory Framework presents the three functions of conservation, development and logistic support. Explain in general terms how the area fulfills these functions.)

The people of the Beaver Hills Moraine (hereafter referred to as the Beaver Hills) have a long history of *conserving* its natural resources including its forests, productive soils and wildlife. Past conservation actions were often tied to the needs of growing communities and their *development* activities such as subsistence farming, timber harvesting, fur-trading, and homesteading. Today, area residents continue to recognize the importance of balancing conservation and development, with a variety of partners providing the *logistical support* required to sustain this important landscape.

3.1 Conservation

"Contributes to the conservation of landscapes, ecosystems, species and genetic variation."

As one of the last relatively intact pieces of Aspen Parkland and Boreal transition habitat in province of Alberta, the Beaver Hills is a distinctive ecosystem that stands out from surrounding lands for several reasons. These include its geomorphological history, the number of protected areas within its boundaries, and a long association with wildlife management that has contributed to both regional and global conservation efforts. These elements are very important to those that live, work and recreate in this area. They are also important to national, provincial and regional conservation efforts.

3.1.1 Overview of Conservation in the Beaver Hills Moraine

The Beaver Hills is a distinct geomorphological feature - a stagnant ice moraine that formed during the last glacial retreat. Earth and rock, deposited as the remnant ice blocks melted away, created a rolling landscape with distinctive "knob and kettle" or hummocky terrain. Wetlands and shallow lakes fill the many depressions in these lands. Forests still cover much of the landscape, a result of limited development and past conservation action. Today, the moraine itself is within the jurisdiction of five municipalities (Beaver, Camrose, Lamont, Leduc and Strathcona Counties) and several protected areas managed by Parks Canada and the Government of Alberta. With the varied geopolitical boundaries overlapping the moraine, it is a strong candidate for bio-regional management.

Ecologically, the moraine is a disjunct extension of the Dry Mixedwood Boreal Forest Natural Subregion, surrounded entirely by the Aspen Parkland Natural Subregion. The "edge effect" created at this larger landscape level, combined with the amount of natural habitat within the moraine, contributes to high levels of

biodiversity and a mix of species characteristic of both ecological zones. This mix includes a number of special status wildlife species and rare plants and plant communities.

The Beaver Hills have long been valued for their abundant natural resources, beginning with First Nations peoples who saw the area as shared territory, based on the diverse resources relative to the grassland plains that surround it. Resource use and conservation has been a recurring theme in this area since early European settlement, beginning with the protection of valuable timber resources within the moraine. Major fires in 1894 and 1895 and extensive logging prompted federal protection of the area (Husby and Fast, 2004). In 1899, the area was officially designated the Cooking Lake Forest Reserve - Canada's first federal forest reserve.

Protection of an elk herd threatened by agricultural expansion around the Beaver Hills in the late 1800s spurred the creation of 'Elk Island Park' in 1906. The fenced reserve was originally intended to protect elk but later provided a home for one of the last herds of plains bison purchased by federal authorities from a Montana rancher in 1906 (MacDonald, 2009). In 1913, Elk Island was declared a National Park (Elk Island National Park, EINP). Since then it has continued to play an important role in providing disease-free stock for parks across the northern hemisphere. Today, the park supports herds of plains bison (*Bison bison bison*), and wood bison (*Bison bison athabascae*), both listed as Threatened nationally and as Nearly Threatened on the IUCN Red List.

Additionally, a long term reintroduction project at EINP helped recover regional trumpeter swan (*Cygnus buccinator*) populations. Faced with near extinction in the early 1900s, this species is now considered Not at Risk federally (although still ranked as Sensitive provincially). Today, the original park population of trumpeter swans has expanded into adjacent protected areas and private lands. The Beaver Hills have also long been known as an important waterfowl production region. Ministik and Miquelon Game Bird Sanctuaries were both established in the early 1900s to protect waterfowl populations (Nyland, 1970). Beaverhill Lake, a Ramsar Wetland of International Significance valued for migratory waterfowl and shorebirds, lies just outside the moraine.

In 1930, control of the remaining Federal Forest Reserve lands was turned over to the provincial government. The two previously designated game bird sanctuaries (Ministik Game Bird Sanctuary and Miquelon Lake Bird Sanctuary) were retained in their original form, but other parts of the original Forest Reserve became Miquelon Lake Provincial Park (in 1958) and the Cooking Lake-Blackfoot Provincial Recreation Area (in 1983).

Conservation interest continued into more recent times, with the formation of a series of groups interested in the moraine's ecological integrity. The Beaver Hills Ecological Research Network (BHERN), formed in the 1990s, focused mainly on the scientific and ecological values of the moraine. With representatives from the federal and provincial governments, academia and environmental non-governmental organizations, BHERN recognized the moraine's value adjacent to a growing urban centre. Similarly, the Elk Island National Park Science Advisory Committee (SAC) was formed in 1998 to assist in the park's conservation planning and management programs. It included park staff, academics and research scientists from the University of Alberta, the Provincial Museum of Alberta (now known as the Royal Alberta Museum), the Northern Forestry Centre and the Alberta Research Council (now known as Alberta Innovates – Technology Futures). The park management plan that emerged recognized the need for regional cooperation with adjacent land managers to meet the park's objective to sustain ecological integrity. The Cooking Lake Moraine Conservation Association, also active in the 1990s, had a broader focus (Swinnerton and Otway, 2004) including

environmental stewardship, recognition of cultural heritage and outdoor recreation opportunities, the need for protection of the essential character of the area, and more broadly, the quality of life of moraine residents. Although no longer in operation, each of these organizations helped maintain the ecological profile of the moraine within the region and drew attention to the need to conserve its landscape character and sense of place that the area held for local residents. These past organizations set the stage for, the collaborative approach of the Beaver Hills Initiative (BHI). The BHI is one of several efforts to conserve the distinctive ecological, environmental, cultural and social aspects of the Beaver Hills and is the entity undertaking the nomination of the moraine as a Biosphere Reserve.

3.1.2 Conservation in the Core Areas and Buffer Zones

Currently, the focus of the BHI and the proposed biosphere reserve is mainly within the boundaries of the Beaver Hills (Figure 1). The BHI proposes that the reserve be limited to the moraine lands for several reasons. The moraine is a distinct, recognizable biophysical feature that overlaps a variety of municipal, provincial and federal jurisdictions. While the federal and provincial protected areas lie entirely within the moraine, the municipalities extend beyond it. For some municipalities, the moraine comprises only a very small proportion of the area under their jurisdiction:

- Beaver County: 8.7%;
- Camrose County: 3.4%
- Lamont County: 5.3%
- Leduc County: 4.6%
- Strathcona County: 55.2%

The moraine has a distinctive character and ecology recognized by all partners, but particularly the municipalities. The moraine has long been featured as an environmentally sensitive area in local planning, for example. This distinctiveness has helped to motivate and inspire collaboration in a way that might not be possible within the broader agricultural landscapes surrounding the moraine. Protected areas comprise 27.3% of the moraine land base and reflect a long tradition of conservation interest. The protected areas of the Beaver Hills would serve as Core Areas and Buffer Zones as defined by the UNESCO Biosphere Reserve Program and are managed primarily with a conservation focus.

3.1.2.1 Core Areas

Elk Island National Park (EINP) and Miquelon Lake Provincial Park (MLPP) are federal and provincial protected areas, respectively, with a primary focus on conservation of biodiversity and ecological function. They are considered IUCN Category II protected areas (National Park).

3.1.2.2 Buffer Zones

Ministik Game Bird Sanctuary, Miquelon Game Bird Sanctuary and the Cooking Lake-Blackfoot Provincial Recreation Area (Blackfoot PRA) are provincial protected areas that emphasize conservation, and also allow some sustainable land uses related to working landscapes (e.g., grazing leases within the Blackfoot PRA). Ministik and Miquelon Game Bird Sanctuaries are International Union for Conservation of Nature (IUCN) Category IV protected areas (Habitat/Species Management Area), and the Blackfoot PRA is an IUCN Category V landscape (Protected Landscape/Seascape).

Six smaller provincial natural areas located across the moraine (including Antler Lake Island, Edgar T. Jones, Hastings Lake Islands, North Cooking Lake, Parkland and Sherwood Park natural areas) are managed to conserve their natural resources. Although they have been recently classified as IUCN Class II sites, due to

their small size, their previous classes remain appropriate and will be used in this nomination. In addition, no formally approved conservation management plans currently exist for these areas. Specifically, North Cooking Lake Natural Area will remain classified as an IUCN VI protected area (Protected Area with Sustainable Use of Natural Resources), and the rest as IUCN IV for the intent of this proposal. Other recreational land uses are possible in all of these natural areas under specific management conditions (e.g., hunting).

Strathcona Wilderness Centre is a Strathcona County recreational facility dedicated to outdoor education and recreation experiences. The property is managed for conservation, recreation and educational use; most of the property remains a mosaic of native aspen forest and wetlands. The centre promotes awareness of environmental issues within the moraine and helps visitors of all ages establish a positive relationship with the natural world through a variety of outdoor education, recreation and school courses.

Parcels owned or managed by various conservation agencies active in the moraine (e.g., the Alberta Conservation Association, the Alberta Fish and Game Association, Ducks Unlimited Canada, Nature Conservancy of Canada, the Edmonton and Area Land Trust and the Alberta Sport Connection) are managed mainly for conservation and education objectives. Recreational use is permitted; off-road vehicle use is not. Most are relatively small (e.g., two to three ha at most) although the largest is 607 ha and the Nature Conservancy of Canada holdings average about 65 ha (pers. comm. A. Wilson).

Although generally much smaller in size than the other Buffer Zones in the moraine, these parcels play a critical role in ensuring both the retention and re-establishment of functional connectivity between the larger protected Buffer Zones and Core Areas. In addition, these sites provide an example of alternative conservation action and stewardship. Lastly, they promote a culture of conservation that can transfer to management of other lands within the Transition Areas. The various conservation non-government organization partners within the BHI have each identified the moraine as a focal location for their conservation activities, which includes purchase of particularly significant sites. The BHI has opened the possibility of conservation partnerships, allowing land purchase through pooled resources.

An example of such a partnership is the Golden Ranches project. In the spirit of cooperative effort, the BHI, Alberta Conservation Association, Ducks Unlimited Canada, Nature Conservancy of Canada, Alberta Fish and Game Association, Edmonton and Area Land Trust and Alberta Sport Connection successfully purchased the 607 ha Golden Ranches site, the largest working ranch in Strathcona County. This site now protects critical linkage area between the Blackfoot PRA and the Ministik Game Bird Sanctuary. The BHI also supports these organizations by providing information on the natural resources of the moraine to aid their planning activities.

Managers with federal, provincial and municipal protected areas and wildlife agencies promote conservation practices and sustainable development within and outside park areas through various jurisdictional tools. For example, all federal, provincial and municipal park areas adhere to area-specific management plans that stipulate conservation objectives and conditions for use (see Appendix A: List of Land Use and Management Plans). Specific management programs to achieve ecological and conservation goals are often included in these plans (e.g., invasive plant species management, fire management and range management). The Government of Alberta (GOA) manages local wildlife populations through hunting regulations and harvest limits applicable on certain provincial protected and all private lands within the moraine. In addition, the GOA (Parks and Tourism), EINP and the Strathcona Wilderness Centre promote stewardship through their visitor services programs and environmental education outreach programs (e.g., Parks in the Classroom).

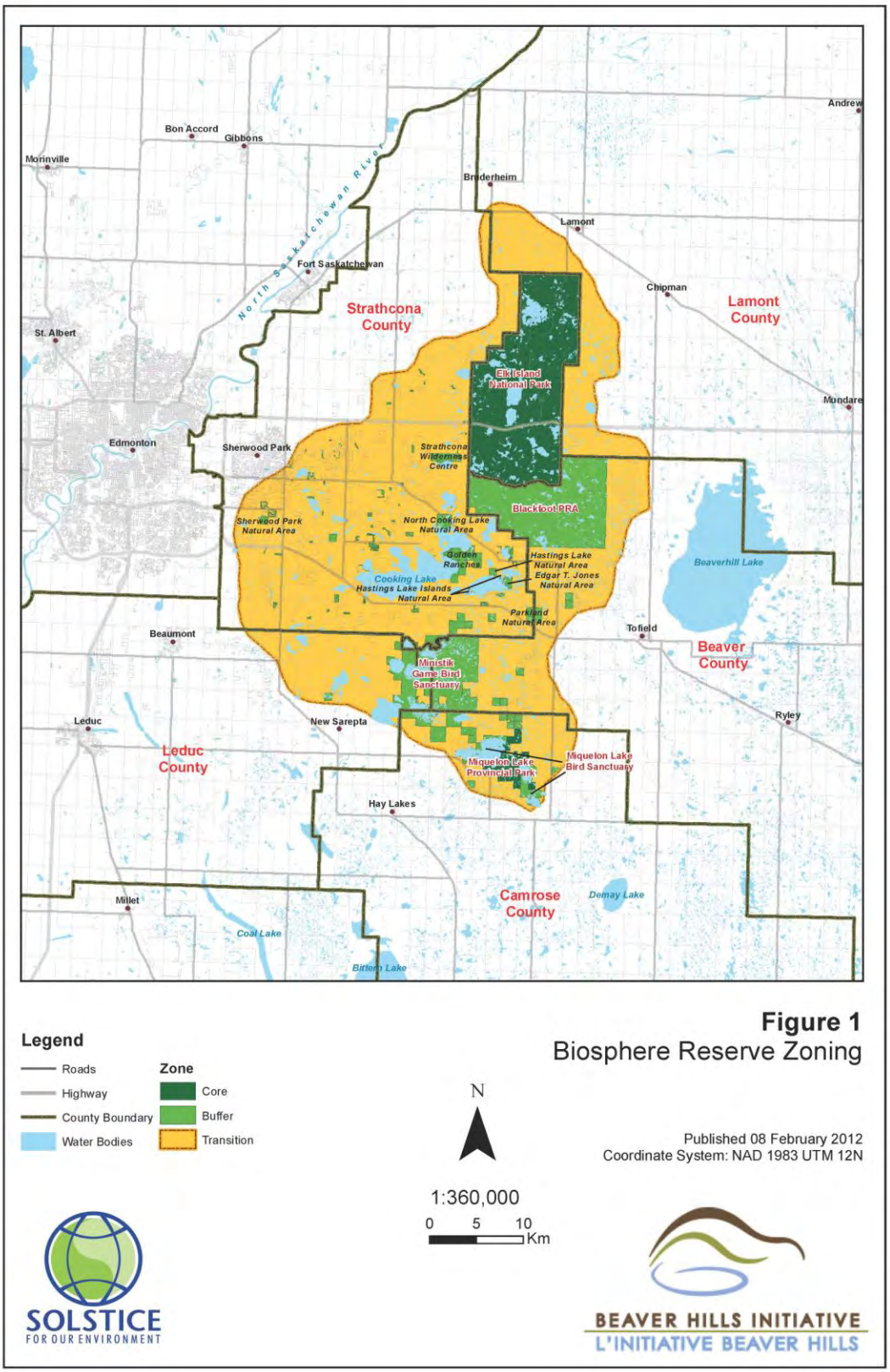


Figure 1. The proposed Beaver Hills Biosphere Core Areas, Buffer Zones and Transition Areas.

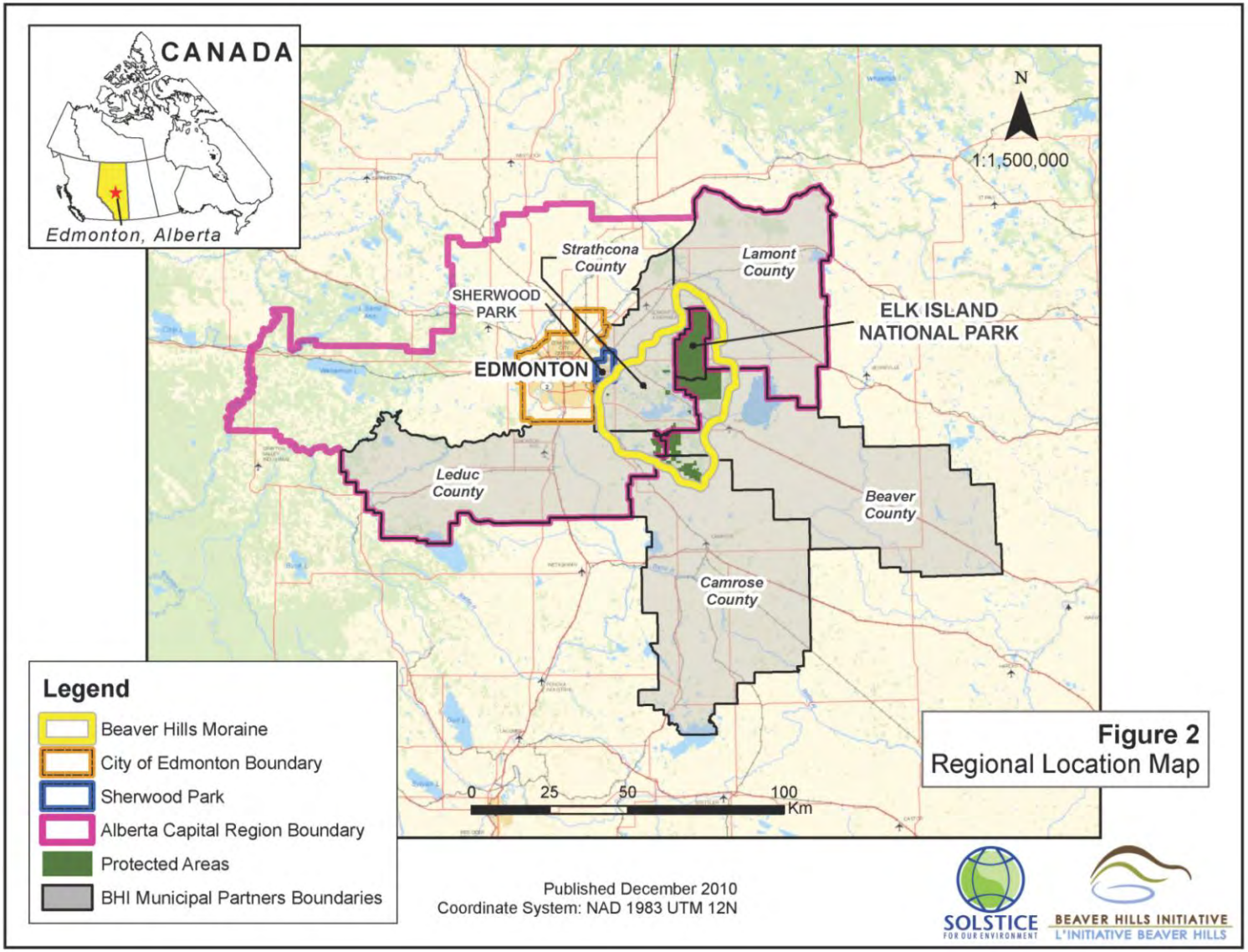


Figure 2. The Beaver Hills is located in Alberta, Canada and is managed through a collaboration of surrounding jurisdictions.

3.1.3 Conservation in the Transition Area

The Transition Area, a lived-in and working landscape, consists of privately held lands that lie within the jurisdiction of the five partner municipalities (Figure 2). Conservation activities in the Beaver Hills through direct land acquisition currently involve municipalities and environmental non-governmental organizations. Some of these municipalities hold conservation easements within the moraine lands (e.g., Strathcona County). Some, like Strathcona County have established a policy (the Legacy Lands Policy) to secure environmentally significant lands to add to the County's 'green infrastructure'. Environmental non-governmental organizations also hold conservation easements in the region and are actively working to establish more easements. In such cases, landowners become an active partner, first by proposing an easement and second by helping to identify management objectives for the parcels.

Conservation can also be achieved through land use planning and the BHI has initiated several projects to develop information and tools to assist municipal planners in identifying and managing environmental resources within the moraine. As previously noted, each of the five rural municipalities' holds only part of the moraine land base and except for Strathcona County, the moraine occupies only a small part of each municipality. Regardless, all of the municipalities have treated the moraine as a unique landscape, because of its distinct, rugged and natural character. Strathcona has specifically identified the moraine as a special policy area within it land use policies, and most of the other municipalities have also recognized it as a distinctive and valued part of their land base.

The interest in conservation of the moraine landscape provides incentive to seek and implement land management solutions to environmental concerns, and this offers opportunity to transfer applicable solutions to other areas of the municipality. Thus, although the biosphere reserve designation would be applied, at this time, only to the moraine lands, BHI activities need not necessarily be limited to the moraine. Partner municipalities have sometimes asked for studies initiated by the BHI to extend beyond the moraine, to include the whole of their municipality. For example, Strathcona County commissioned a separate study to map the environmental sensitivities of the entire county, modelled on a BHI study for the moraine, to support development of an updated Municipal Development Plan in 2005.

Adoption of innovative land management approaches has also occurred outside the moraine. An environmental mapping project to support planning in the Edmonton Capital Region extended beyond the regional boundary to include Beaver and Camrose counties. This change recognizes that the ecological values of the moraine may extend beyond the Capital Region, yet be affected by regional political jurisdictions.

3.1.4 Heritage Conservation

Conservation interests within the Beaver Hills also include cultural heritage. Archaeological investigation within EINP was a focal point of park management in the early 1990s, and data from those studies have contributed to our understanding of early Aboriginal use of this landscape. Interpretation of Aboriginal culture and experiences has been used in EINP and the new Biodiversity Trail intends to include Aboriginal history and culture in its interpretive elements. The Métis Nation of Alberta recently assumed management of a local historical site (St. Margaret's Church) that has historical and cultural significance for local Métis. It has recently begun to host celebration events such as Louis Riel Day at the site, to raise awareness of the church and its role in local cultural heritage.

Early European settler history and particularly Ukrainian culture is another important theme. The Ukrainian Cultural Heritage Village, a living history museum on the east side of EINP, recreates early Ukrainian settlement of east central Alberta through historic buildings, displays, interpretive and school programming and special events. The Village has partnered with EINP on interpretive programs and works regularly with municipal and provincial tourism agencies to promote the history of the moraine area. EINP also features a heritage Ukrainian pioneer home (designated by the Federal Heritage Buildings Review Office). The building was recently restored to protect its historical values. In addition, smaller scale cultural heritage conservation efforts, including municipal historic resources, contribute to retention of the overall landscape character and the "sense of place" of the moraine.

3.2 Development

"Fosters economic and human development which is socio-culturally and ecologically sustainable"

The Beaver Hills has a long history of human use and economic development. Today, people living in the moraine enjoy a diverse economy based on agriculture, and the industries and service-based businesses in the Edmonton Capital Region. The region supports a good quality of life with a strong social security net that respects and celebrates a cultural mosaic representing early settlers and more recent immigrants. Recognizing the ecological and cultural value of the area, many residents and agencies are now exploring how they can foster sustainable economic development, and sustain and enhance the current quality of life, ecological sustainability and ecosystem services offered by the moraine. The BHI has provided a cross-sectoral forum for discussion of sustainability concerns that has produced new synergies and expanded the capacity of individual partners. It has also created an openness to innovation that has fostered new creativity in problem-solving, resulting in new approaches, knowledge and confidence in managing the moraine's resources in a sustainable manner. Designation as a biosphere reserve will only enhance this creativity, by allowing opportunities to share experiences with biosphere reserves across the global network.

Indigenous peoples within Canada include several distinct groups: First Nations peoples whose traditional lands extended across the country, the Inuit peoples of Northern Canada and the Métis peoples resulting from unions between First Nations and European peoples early in Canada's history. Naming of those groups is a sensitive issue, due to historical relationships between these peoples and the Canadian state. In this document, we refer to Canada's indigenous peoples as Aboriginal peoples, the term legally recognized in Canada's Constitution. In the Beaver Hills area of Alberta, Aboriginal groups include First Nations bands representing plains cultures (e.g., Cree, Blackfoot) and Métis peoples, and the term Aboriginal is meant to include both groups.

3.2.1 Human History of the Moraine

The Beaver Hills has been important to various Aboriginal groups for at least the past 8,000 years (MacDonald, 2009). Although the dominant tribal groups periodically changed over time, the Beaver Hills was mostly considered a shared territory by the Cree, Assiniboine and Blackfoot that occupied central Alberta, until the arrival of European settlers after 1870. Its abundant supply of bison and other game, and its sheltering forests offered a comfortable existence relative to the prairie plains to the south. Abundant evidence of campsites and work areas suggest that the Beaver Hills was a central zone of activity. About 150 to 200 sites were identified in EINP alone in a formal archaeological survey in 1977 (MacDonald, 2009; D. Ryerson, pers. comm.).

Use of the Beaver Hills switched from subsistence to harvest and more permanent residence during the fur trade. Abundant beaver populations were heavily trapped by local Aboriginal groups and sold to the Hudson's Bay Company fort at modern day Edmonton, Alberta. This strong link to beaver is reflected in the Cree name for the moraine, a-misk wa-chi ("place rich in beaver"; MacDonald, 2009).
After the 1870s, the Canadian government's drive for settlement in Canada's western provinces began to increase the population and alter land use in the region adjacent to the Beaver Hills. Yet the moraine itself proved resistant to the settlers. The broad plains surrounding the moraine attracted many early settlers, some of whom also attempted to homestead within the more difficult terrain within the moraine (MacDonald, 2009). Although some cleared land for agricultural crop and pasture use, most settlers were discouraged by the rugged land and rocky soil conditions.

The forests of the moraine instead became valued as a timber supply for the growing city of Edmonton. Conservation in the moraine began in 1895, with establishment of the Cooking Lake Timber Reserve over much of the area (Husby and Fast, 2004). Today, the natural features and essential character of the Beaver Hills have persisted through increasingly intensive phases of human land use and development, and in the process, become important to local and regional residents, many of whom have long-term, deeply rooted ties to this landscape.

3.2.2 History of Economic Development

As noted above, historically, the economic value of the Beaver Hills has been in the extractive use of its natural resources, as a fur and timber supply, and later, for agricultural use and some oil and gas development. Agriculture remains important today, but the aesthetic value of the forests, wetlands and lakes have become increasingly important to the economy of the moraine. Tourism and recreation, rural residential living and agriculture, and indirectly, the oil and gas industry, are now the main economic drivers.

The Beaver Hills lies partly within a broader oil and gas deposit (the Joseph Lake field) and these resources were extracted during the oil boom of the 1950s (Hunt, 1950; Gow and Gow, 2005). Gas wells and collection pipelines remain distributed across the moraine, particularly in the Joseph Lake and Ministik area, but the peak production years of this field are now past. New exploration projects within the moraine are relatively few. The local oil and gas industry has shifted to processing materials drawn from more remote parts of the province. Several large petrochemical processing plants are located outside the moraine, near rail, road and pipeline transportation linkages to northern Alberta and the oil sands. Alberta's Industrial Heartland, a large regional petrochemical complex, lies north of the moraine, near Fort Saskatchewan. Other refineries are located on the eastern boundary of the City of Edmonton, west of Sherwood Park.

Today the oil and gas industry still provides an important source of employment for many local residents, but it does not rely directly on the moraine as a source of raw materials. Instead, the moraine contributes directly to the local economy through agriculture, recreation and tourism and rural residential development. The BHI has focused its attention on these latter sectors, as they lie at a critical intersection of economic, social and natural sustainability within the moraine.

Attracted perhaps by publically owned recreational facilities and protected areas, several sustainable commercial operations have become established in the moraine area and this private tourism sector appears to be growing. A variety of eco-tourism, agri-tourism, heritage foods and market gardens (organic and otherwise)

and environmental education or recreation businesses operate within the moraine lands and provide local demonstrations of sustainability and stewardship. Several bed-and-breakfast style accommodations and environmentally themed businesses have become established within the moraine and benefit from the promotion of the moraine's natural values.

A number of provincial and municipal recreational and tourism facilities play an active role in the moraine, reminding residents and visitors of the cultural and ecological resources of this landscape, and the need to consider these resources in current land management strategies and future development plans. The Ukrainian Cultural Heritage Village provides a vital tie to the historical development of east-central Alberta and context for its current socio-cultural fabric. The Strathcona Wilderness Centre, established by Strathcona County in 1981, provides year-round outdoor recreational facilities, trails, and programming for the public, businesses, schools and local interest groups. The Beaver Hills and its natural values and vulnerabilities feature prominently in programming at the centre, building awareness of the moraine and its contribution to the quality of life for residents of the region. Strathcona Wilderness Centre award-winning programs have gained provincial notice for their effective communication to a broad public, including a provincial Emerald Foundation Award for environmental education. School and visitor services programs in the region's federal and provincial protected areas fulfil a similar public awareness function that in turn benefits local businesses reliant on the moraine's natural character.

Significant provincial support for the future development and use of the region's cultural and ecological values has come from Alberta Culture and Tourism. This department has identified the Beaver Hills as a focal area for sustainable tourism and is actively working to ensure that sustainable opportunities are encouraged within broader provincial policy. This effort will be directly supported by activities within the moraine. In the summer of 2011, Alberta Culture and Tourism, with the BHI, and a consultant team worked with local residents, businesses, municipalities and non-governmental organizations to complete a feasibility study and business case for nature-based tourism in the Beaver Hills (*Alberta's Beaver Hills Region Tourism Development Opportunity Assessment*). The study, which focused on eco-tourism and agri-tourism opportunities, has spurred creation of a sustainable Tourism Working Implementation Group in the BHI. Alberta Culture and Tourism also funded an implementation pilot project in 2014-2015, a short section of the Biodiversity Trail, between the Blackfoot PRA and Strathcona Wilderness Centre.

The lessons learned from the feasibility study and the proposed implementation pilot project will help the BHI support other economic diversification initiatives as future opportunities arise. It has also helped other regional groups in their own efforts: the recreation inventory assessment, stakeholder engagement process and the business case developments in the Tourism Development Opportunity Assessment will inform future initiatives of the Capital Region Planning Group and the Provincial Land Use Framework Secretariat. As well, the study will provide important socio-economic information that will contribute to understanding the human dimensions of the changing land use patterns of the lived-in and working landscapes of the moraine. However, the growing importance of the amenity value of the Beaver Hills is dependent on the region retaining its predominantly natural and rural landscape character while taking advantage of its proximity to the urban market afforded by the City of Edmonton

3.2.3 Moving towards Sustainable Development

Recognition of the special values of the moraine, and the need for sustainable development, has resulted in current protection of 27.3% of the moraine. The unique value of the moraine's resources beyond the protected areas was highlighted for conservation in provincial and municipal policies, such as the *Cooking Lake Areas Study: Planning Report* (Alberta Environmental Planning Division, 1977), the *Strathcona County Recreation and Parks Outdoor Master Plan* (1987) and the *Strathcona County ConservAction* program (1989/1990-1993). Since the early 1990s, several non-governmental organizations promoted sustainable management of the moraine's resources: the Beaver Hills Ecological Research Network (BHERN) in the 1990s, the Cooking Lake Moraine Conservation Association (early 2000s) and the EINP Science Advisory Committee (1998-2003). The BHI itself is a more recent organizational attempt to address land management in the moraine.

Prior to emergence of the BHI, provincial and municipal governments had separately developed guidelines for sustainable development in protected and privately held lands within their jurisdictions. Coordination occurred in the form of referrals to other jurisdictions for input on decision-making, but most planning was developed by individual agencies. Still, many of these agencies recognized the need for coordinated conservation and land use planning within the moraine.

Although oil and gas and surface mineral resources are available throughout the region, development of these resources within the protected areas has either been prohibited (e.g., EINP) or restricted (e.g., Ministik Game Bird Sanctuary). For example, guidelines developed in 1979 between the Alberta Fish and Wildlife Division and the then Oil and Gas Sales Division established Core Areas within the Ministik Sanctuary where no surface development would be allowed (Alberta Forestry, Lands and Wildlife and Ducks Unlimited Canada, 1989). Riparian buffer zones and seasonal timing constraints were also established for other developable areas.

Strathcona County established the Lake Management Area in its Municipal Development Plan in 1993 to protect the wetland-rich moraine lands between EINP and the Ministik Game Bird Sanctuary (i.e., the eastern part of the county) from intensive forms of development. The county later increased the size of the policy area (now the Beaver Hills Policy Area) from 228.5 km^2 (56,462 ac) to 330.9 km^2 (81,772 ac) and implemented down-zoning (a lower density for subdivision, which limits fragmentation) in their updated 2007 Municipal Development Plan.

Similarly, Camrose County included a buffer around the MLPP in which certain forms of development (e.g., intensive or confined livestock operations) would not be permitted. The BHI has definitely encouraged cooperative land management among jurisdictions working within the moraine, mainly by providing data and innovative land management tools to facilitate development of common policy. Many areas of collaboration are yet to be explored, ideally within the context of a designated biosphere reserve.

3.2.4 Innovative Approaches to Sustainable Development

The BHI's approach to sustainable management has been recognized in several awards, including a provincial Award of Excellence for Municipal Partnerships, and selection twice as a finalist for a provincial Emerald Foundation Award for innovative environmental initiatives by a government institution. The BHI has facilitated this growing interest in sustainable land management within the moraine lands in several ways.

First, it has sponsored and shared projects that have generated information and new approaches useful for land management and planning by its partners (for examples of BHI projects, see Appendix B: Case Studies Demonstrating the Value of BHI Projects).

Second, it has created a culture of cooperation that encourages reciprocation and collaboration among its partners. Lastly and probably most importantly, the BHI and its partners benefit by sharing lessons learned during development and implementation of their sustainable development programs, such that positive experiences can be applied elsewhere and negative ones avoided. Some programs have gained the attention of provincial and regional land managers and information and tools are being considered for adoption beyond the moraine, the ultimate goal of a biosphere reserve. An example of innovative practice resulting from this approach is the BHI's Land Management Principles. Developed early in the organization's history, these principles provide a set of general management objectives for the moraine lands. All BHI partners have committed to these principles.

To provide more specific management tools for municipal partners, the BHI developed a comprehensive Geographic Information System (GIS) library and database that documents the natural resources of the moraine. This data and information formed the basis of a BHI Land Management Framework (2007) document that identified environmentally sensitive areas (e.g., surface and groundwater risk areas, biodiversity Core Areas) and Best Management Practices for use in regional planning and site-specific development reviews. The Land Management Framework was updated in 2015 and now includes web-based mapping that improves access and utility of the data. It also includes resources for landowners. The sharing of data and information has become an important function of the BHI.

All five municipal partners have adopted sustainability principles and strategies from the BHI's Land Management Principles, the Land Management Framework document or both within their land use planning and development departments. Many of the BHI partners (individually or with other BHI partners) have sponsored their own projects that support sustainable development of the moraine. A heightened awareness and understanding of the critical resources in the moraine identified in the Land Management Framework has also triggered substantial change to municipal policy in some jurisdictions. Strathcona County, when updating its Municipal Development Plan (MDP) between 2006 and 2007, significantly expanded the former Lakes Management Area (now renamed the Beaver Hills Moraine Policy Area) to include more of the moraine lands. The County used the information from the Land Management Framework to raise awareness of the sensitivity of the area to development during the MDP review process. This eventually brought community support to the plan, and a proposed expanded Policy Area and its stipulation for lower density development.

Strathcona County is now updating its Land Use Bylaws and will incorporate relevant information and Best Management Practices from the Land Management Framework, as well as recommendations from the Tourism Development Opportunity Assessment (TDOA). The TDOA, initiated by Alberta Culture and Tourism but developed with input from local residents and businesses, non-governmental organizations and other municipalities will directly incorporate ideas from the public about nature-based tourism into public policy.

Other partner municipalities have also reviewed their statutory plans and have incorporated sustainable land management principles from the Land Management Framework into their land use planning processes where relevant. All municipalities are also using the Land Management Framework and its Best Management

Practices in review of specific development proposals submitted for approvals, a practical application that does not require sanction through policy.

Additionally, the BHI worked with Alberta Innovates - Technology Futures and other partners (Miistakis Institute, Land Stewardship Centre and Agriculture and Agri-foods Canada) on a Transfer of Development Credit program designed to encourage development in areas of lower environmental sensitivity through economic incentives. The three year pilot project was completed in 2012 and included market research, identification of areas for conservation and development, stakeholder engagement, and public education and communication. The project has set the stage for implementation on a trial basis, pending policy updates to legislation permitting use of development credits.

Another example of success of the BHI's approach involves the recently completed Alberta Capital Region Growth Management Plan. Part of the moraine lies within the Edmonton metropolitan area (the Alberta Capital Region, Figure 2), an area that spans 25 municipalities (including cities, towns and counties). The Capital Region is designated as one of two priority growth management planning areas in the province of Alberta. The western part of the moraine lies within the Alberta Capital Region, within the jurisdiction of three municipalities involved in the BHI (Strathcona, Leduc and Lamont counties). The population is expected to reach 1.7 million people in the Alberta Capital Region by 2043, with an average growth rate of 1.3% per year (Capital Region Board, 2009). Strathcona County's population is anticipated to almost double in that time, from 84,415 in 2008 to 147,891 in 2043. The Province identified the need for regional management to sustain the environmental, social and economic character of the area and in 2008 delegated responsibility for preparation of a Growth Management Plan to the municipalities. Through discussion and sharing of information and tools developed by the BHI (e.g., the BHI Land Management Framework, GIS datasets and other science-based products), Strathcona County was able to ensure the moraine was identified as an Environmentally Sensitive Area in the Capital Region Growth Management Plan. Recently approved by the Government of Alberta Cabinet, this plan will provide a comprehensive vision for the future development of this region.

3.2.5 Sustainable Land Management – Additional Examples

The BHI and its partners have commissioned various programs designed to support sustainable land use and management within the Beaver Hills and within the partners' respective jurisdictions. The result of such programs, or lessons learned from their implementation, have been shared with BHI partners, regardless of the originating agency and successful innovations have been considered by others, where relevant to their own management context. Relevant examples follow below:

A fire history study for the moraine was conducted in 2006 to identify vegetated areas of higher fire risk. That information complemented an earlier study done for Strathcona County, to identify infrastructure risks due to wildfire. A later analysis was added to address specifically the fire and infrastructure risks to the Strathcona Wilderness Centre. Together, these products have informed municipal Fire Smart and Wild Fire Risk Assessment Programs designed to encourage safe building and site management practices on private lands. Strathcona Wilderness Centre secured funding in 2010 for a demonstration Fire Smart project based on the recommendations of these various studies. The project involved Strathcona County Emergency Services, the BHI, Alberta Agriculture and Rural Development, and the provincial Woodlot Extension Program and resulted in interpretive materials and demonstration works accessible to the public visiting the Wilderness Centre site.

More recently, the five municipalities asked the BHI to coordinate development of a Joint Fire Management Strategy that would address fire risk across the moraine. A drying climate and years of fire suppression have increased fire risk, which could easily spread from protected areas into human-settlement areas, or vice versa. The program will incorporate existing Fire Smart and other fire prevention programs, and will rely on participation of municipalities, protected areas managers and residents. It will also be the first provincial Joint Management Plan, drawing heavily on the expertise of government and non-government partner organizations to create a comprehensive, landscape level plan.

Strathcona County's Energy Exploration Committee has created a policy guideline for oil and gas developments (the Oil and Gas Protocol) in the County. Having been accepted by Council, it establishes the County's expectations regarding information to be included in oil and gas resource development applications and consultation within the community. It is actively promoted to the energy industry and provides means for industry to work with the County to resolve potential issues early in the development process. The County also provides a variety of resources to assist its residents in understanding the oil and gas development process, serving as a liaison to help mitigate potential conflicts.

Agriculture & Agri-food Canada (federal ministry) and Alberta Agriculture and Rural Development (provincial ministry) have promoted and encouraged adoption of environmentally sustainable agriculture practices in the moraine for several decades. Agricultural production (predominantly forage and livestock operations) is the dominant land use in the moraine. About 89% of the privately owned lands in the moraine are under agricultural use. Agricultural stewardship programs focus on biodiversity, protection of water resources, adaptation to climate change, and riparian health. Activities range from adoption of beneficial management practices such as agroforestry and rotational grazing, to soil and water conservation programming, food system planning, landscape modelling, and wetland restoration. The Blackfoot PRA has historically promoted sustainable grazing management within its pasture areas through partnerships with researchers and farmers using these community pastures, and serves as a potential model for local producers.

An agricultural land use inventory called 'Ag Capture' was completed for the BHI region in 2008 by Agriculture & Agri-food Canada. It has provided a unique data set and mapping outputs that describe the geospatial extent of agriculture and food systems that exist in the moraine through a science-based, hierarchical approach. Much of this data is foundational to an understanding of the diverse nature of agriculture and food production systems, the need for sustainable development, and the wise use of natural capital. Ag Capture data is now being used by professional planners and economic development authorities to promote local foods, agri-tourism and other agri-support or agri-value services.

Alberta Agriculture and Rural Development and various environmental non-governmental organizations, industry and other government partners have promoted agricultural conservation, diversification and agri-tourism as alternative agricultural strategies within the moraine. This includes Alberta Agriculture and Rural Development's Woodlot Extension Program. This program offers opportunities for alternative market development and potential for a range of dynamic and entrepreneurial agricultural operations within the BHI region and across the province.

The Beaver Hills Dark Sky Preserve (BHDSP), founded by the Royal Astronomical Society of Canada (RASC), Parks Canada and Alberta Parks in 2006, originally protected the nocturnal environment of EINP and

the Blackfoot PRA. Since then, the preserve has added four new sites: Strathcona Wilderness Centre, the Ukrainian Heritage Cultural Village, the Sherwood Park Ketchamoot Creek Fish and Game Association property, and MLPP. A Dark Sky Preserve consists of areas that meet a minimum standard for sky quality and natural darkness and which support dark sky principles for design and development. Within the lands managed by these agencies, the participating BHI partners, with support from the Dark Sky Preserve network and the RASC, actively promote strategies to minimize light pollution and energy use, protect nocturnal habitat and reconnect communities to the night sky. All BHDSP partners have adopted responsible lighting practices, and promote such sustainable practice on their websites and in other public awareness communications. This includes a Dark Sky event held at the protected areas forming the Dark Sky Preserve that offers children's' programs, viewing opportunities and information on sustainable lighting.

In addition, Alberta TPR offers related educational programming accessible to elementary schools in the Alberta Capital Region, educating both teachers and students on the adverse effects of artificial light on the nocturnal environment. EINP offers public opportunities to learn about the night sky through regular astronomy programming and public events. In 2014, the RASC recognized the BHI as a partner in the BHDSP for its support in coordinating activities across the moraine, and in particular, efforts to engage local citizens in Dark Sky practices. Future steps for the BHDSP include establishing partnerships with additional moraine land managers, integrating light efficient practices into land development and the eventual achievement of an International Dark Sky Reserve designation.

These goals require the municipalities, and their local residents and businesses to implement Light Efficient Community Policies, aided by the Dark Sky Preserve network and the RASC. In adopting its Light Efficient Community Policy (Alberta's first) and developing a community handbook on responsible lighting principles and practices, Strathcona County is positively influencing surrounding rural and urban regions. The City of Edmonton is presently developing a Light Efficient Community policy to reduce its energy use and eliminate unnecessary light domes, and their negative effects on the nocturnal environment. Sturgeon County, immediately north of the moraine is also pursuing Dark Sky policies, and together this expanded network will contribute to qualification for International Dark Sky Preserve status.

3.3 Logistic Support

"Support for demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development"(Indicate current or planned activities.)

The BHI is fortunate to enjoy the logistic and financial support of a wide variety of agencies and organizations that are carrying out a number of research, monitoring and educational projects, individually and collaboratively, to better manage conservation and sustainable development in the moraine as well as surrounding landscapes.

3.3.1 BHI Formation

Today, conservation efforts and more broadly, sustainable land management, have become increasingly important to those living, working in and enjoying the Beaver Hills. Located within 10 km of the City of Edmonton, and within the Edmonton Capital Region, one of Canada's fastest growing metropolitan areas (the

Calgary-Edmonton corridor; Statistics Canada, 2012), the moraine and surrounding lands have attracted increasing development interest related to urban expansion (particularly rural residential and urban growth).

Local municipalities, protected area managers and environmental non-governmental organizations have increasingly recognized the distinctiveness of the Beaver Hills landscape within the greater region and the need for strategic conservation planning. Five municipalities, Parks Canada, the Government of Alberta (Tourism, Parks and Recreation divisions) and various environmental non-governmental organizations control lands within the moraine.

In 2000, EINP and Strathcona County initiated discussions with the other land managers in the moraine, to address regional growth pressures. A proposal for petroleum exploration work on the western boundary of EINP instigated these discussions, but shared concern soon emerged about the pressures of regional growth. Growing demand for residential, commercial, recreational and industrial use of the moraine lands was prompting an individual planning response from each government agency involved in land management.

The BHI, the sponsors of this application, formed from the concerns held by these affected land managers. The group recognized that a coordinated response from the various jurisdictional interests was essential to sustain the moraine's resources. Hence in 2002, they formed the BHI to address the effect of development on the natural resources on both protected and private lands within the moraine. Today, the successful inter-jurisdictional implementation of sustainable land management strategies that include social, economic, environmental and cultural aspects of the moraine has prompted the BHI to pursue biosphere reserve status for the Beaver Hills.

To provide balanced discussion, other interests in the area were also invited to participate in the BHI, including the businesses in Alberta's Industrial Heartland, a major petrochemical complex (the largest of its kind in North America), located north of the moraine. A representative for Alberta's Industrial Heartland sat on the board during the organization's initial years (2002 to 2004); then industry participation lapsed when the BHI shifted focus to municipal planning and opportunities to support the municipal partners in management of rural residential growth. Oil and gas industry partnerships have remained interested in the BHI partnership, particularly as their industry's interest in environmental management has evolved, and have offered their support to the nomination document. The BHI identified a position for industry within its governance structure, and industry representatives have renewed their involvement and support.

The provincial department of Municipal Affairs was also involved in the initial formation of the BHI and provided assistance and expertise in regional approaches to land use planning. Municipal Affairs gradually reduced its involvement once the BHI became better established and had demonstrated its ability to work cooperatively. However, they have maintained interest in the BHI activities and have provided substantial financial support for specific projects, including a significant grant for preparation of this nomination package. The rural municipal governments are recognized within the BHI as key partners in sustainable management within the moraine, due to their jurisdictional controls over land use and land management of private lands.

Overall, the BHI now includes 35 partners representing all levels of government (federal, provincial and municipal), various environmental non-governmental organizations (including land trusts), the University of Alberta (both its North campus in Edmonton and Augustana campus in Camrose) and local oil and gas industry associations. Other economic interests in the moraine have been represented by associated

government agencies (e.g., Agriculture and Agri-food Canada, Alberta Agriculture and Rural Development, and Alberta Environment and Sustainable Resource Development (AESRD).

Membership in the BHI is fluid and various non-governmental organizations have become affiliated with the group as interests align. Agencies from the three levels of government, large environmental non-governmental organizations with land holdings in the moraine (Ducks Unlimited Canada, Nature Conservancy of Canada, Alberta Fish and Game Association, Alberta Conservation Association, Edmonton and Area Land Trust and Alberta Sport Connection), and the University of Alberta have been consistently active members.

3.3.2 BHI Organizational Capacity and Structure

Over time, the BHI has refined its organizational structure to facilitate discussion about specific issues and to promote and coordinate specific projects performed by it and its partners (Figure 3). To encourage discussion and participation from all stakeholders in the moraine, both the Board and Working Groups are open to any organization or individual with an interest in the moraine landscape. The BHI membership currently includes over 30 different organizations and some public members, and the intent is to attract new members, particularly individuals who live, work or play within the moraine. This approach has the advantage of pooling the knowledge, talents and other resources of all stakeholders, as well as ensuring the diverse interests of stakeholders are represented within the BHI. Voluntary participation has the advantage of minimizing potential power issues, which encourages openness and open discussion of proposals. Since the BHI has no authority to direct a partner agency; implementation of innovative approaches to sustainable development is promoted through discussion and peer evaluation. The approach has led to successful adoption of sustainable development policy and cooperation among diverse partners.

Any member can propose a project, or initiate discussion on shared concerns that might lead to a specific initiative, at either the Board or Working Group level. Decisions on such projects are made by consensus at the Board level. Working Groups are used to manage the BHI's own initiatives and to coordinate with work conducted by other agencies working in the area. The Board and Working Groups each track project progress through a three-year business planning cycle. Cross-disciplinary coordination is achieved through an Executive Director and Executive Committee. Strathcona County provides fiscal management on behalf of the BHI, which is not a legally incorporated organization. This structure allows the Working Groups to maximize efficiencies by linking groups with similar interests together to share resources, expertise, information, contacts, and in some cases, funding, while capitalizing on the pooled knowledge and experience at the Board level to debate proposed solutions and develop robust support.

Currently, the BHI has six standing Working Groups that are active in the current coordination areas of research, conservation, communication / education, land use planning, and municipal government:

- Research and Monitoring Working Group
- Protected Areas Working Group
- Planners Working Group
- Councillors Working Group
- Communication and Outreach Working Group
- Tourism Working Implementation Group

Other working groups have been struck to address specific initiatives. For example, the Beaver Hills Dark Sky Working Group (BHDSWG) has been formed under the auspices of the Communication and Outreach Working Group. These groups work with each other to ensure all opportunities to share resources and information is maximized.

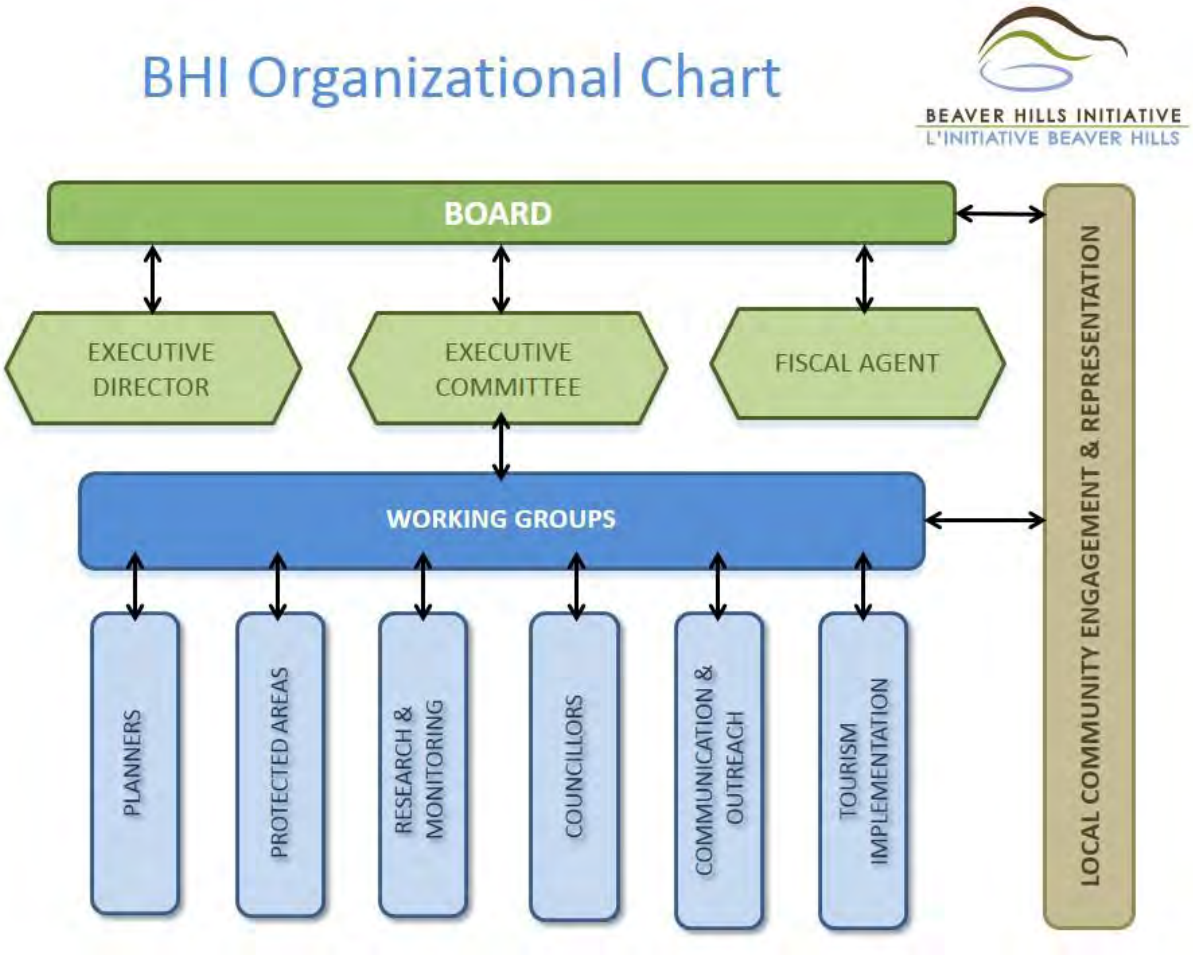


Figure 3. Beaver Hills Initiative Organizational Structure

3.3.3 BHI Initiatives

The BHI partners have committed to sustainable management of the moraine lands through voluntary action, and the BHI serves as both a sounding board for, and initiator of, cooperative management activities. Its vision and mission statements clearly identify a goal of sustainable land management through cooperation (see Appendix C: Beaver Hills Initiative, 2012-2015 Business Plan). BHI projects have ranged from research to development of management tools useful to the participating partners. The projects have become increasingly complex and reflect strong partnerships. The 2012-2015 Business Plan outlines the BHI's future priorities in terms of both sponsored projects and in the activities of specific working groups. Several new initiatives are now underway, including the public and Aboriginal engagement program (see Appendix D: Public and Aboriginal Engagement Campaign), the first monitoring review of moraine resources (State of the Beaver Hills report) and a citizen science program.

Many of the initial BHI programs sought to provide science-based planning tools; information on the ecology, conservation and stewardship of the moraine; as well as training and advice to help the municipalities develop effective land management policies. Each of the municipal partners has incorporated relevant aspects of these resources into statutory planning documents and policies to develop a more sustainable approach to land management, a major goal of the BHI members. More recent projects include coordination of the purchase and management of lands for conservation by a subgroup of the BHI partners, including land trusts and Strathcona County. This focus on collaboration among partners, to address problems through interdisciplinary solutions, has been a consistent theme for the BHI and is reflected strongly in the 2012-2015 Business Plan.

Regardless of the current focus on the moraine, some BHI projects have been adopted by municipalities and have been applied beyond the moraine. This is an option for all partners involved in the BHI, but it is not a requirement. Past examples of adoption by partner agencies of land management concepts developed by the BHI are encouraging, and the BHI will continue to foster broader application of the best management practices for sustainable land use. EINP is now actively seeking opportunities to foster sustainability projects in the lands surrounding the moraine. It has initiated discussions with these communities regarding funding of potential sustainability projects that would address site specific concerns and are consistent with the proposed biosphere reserve. Such initiatives will ensure that the lessons learned within the moraine are shared with the adjacent communities, another important function of a biosphere reserve.

Since its inception, the BHI has served as an informal coordinating agency for research, monitoring, educational and demonstration projects within the moraine. The BHI has successfully secured over $1 million in grant funding, generously provided from all levels of government and non-governmental organizations, and project-specific funds from other sources. In-kind contributions over $1.5 million have provided tremendous value, including the extensive expertise shared by BHI members. This has allowed the BHI to sponsor research of benefit to the partner agencies, and particularly its municipal partners. Through paid consultant assistance, the BHI has conducted studies to expand and update existing biophysical information and to develop planning tools to inform and assist land management.

The Land Management Framework project provided member municipalities with practical strategies to incorporate environmental sustainability within their land use development review processes. Some municipalities have adopted the management recommendations into their own policies. Others are using the information to review site-specific proposals for environmental concerns, a skill developed through additional training offered by the BHI. The BHI is currently working toward several large, joint projects, including the Transfer of Development Credit pilot project in Strathcona County with Alberta Innovates - Technology Futures, the management plan for the Golden Ranches conservation area and the Joint Fire Management Plan, in conjunction with Strathcona County and member and regional conservation agencies. Many of these projects are synergistic. For example, the Transfer of Development Credit pilot project will supplement other strategies for sustainable land management identified in the Land Management Framework. The Joint Fire Management Plan will build on the Fire History Project conducted by the BHI, as well as the cumulative experience and resources of government and public participants.

3.3.4 Research Projects in the Beaver Hills

Research activity in the moraine has been a consistent interest to academics, due in part to the extent and variety of protected landscapes in close proximity to the University of Alberta. Academic representatives who

provide knowledge about natural and social systems and liaison to a broader research network have participated in the BHI since 2002.

The University of Alberta's Animal Science Department established a research station within the Ministik Game Bird Sanctuary in the 1970s as a range management and wild ungulate research centre. Although less used in recent years, the research programs housed here helped promote the distinctive character of the moraine within the broader research community. More tangibly, the research centre developed ungulate and range management policies implemented within the moraine and in other regions.

Ministik Game Bird Sanctuary currently serves as a field site for collection of electro-magnetic radiation field levels (related to the magnetic poles) and ionization activity in the lower ionosphere. Ministik is an ideal location for this because of its undisturbed nature and isolation from electrical fields and fences (which can conduct electricity). The collection system, established in 1974, is part of a global network of monitoring sites operated by the VLF/ELF Remote Sensing of Ionospheres and Magnetospheres (VERSIM) Working Group of the International Association of Geomagnetism and Aeronomy. The network, the Antarctic-Arctic Radiation-belt (Dynamic) Deposition - VLF Atmospheric Research Konsortium (AARDDVARK, 2011), has established a series of long-range monitoring stations across the globe. The Ministik station is linked to the Scott Base in Antarctica. The UltraMSK narrow-band loggers are maintained by the University of Alberta and provide long-range tracking of changes in ionization in the lower ionosphere. The network can detect global change in energy flow (radiation) between the Earth, the Sun and space, which can improve our understanding of climate change, and help advance communications and navigation technologies.

EINP and Alberta Parks also support biological, management, recreational and cultural research. EINP has provided housing facilities and in-kind support to researchers working within the park area on a variety of research projects, including rare species recovery and habitat management. A similar informal arrangement has existed within the provincial parks of the moraine. A Memorandum of Understanding between the University of Alberta's Augustana Campus and Alberta Parks promotes research and teaching activities within the provincial protected areas in east-central Alberta, including the Beaver Hills. This has formally established a research tradition within the provincial parks in the moraine.

A new research station within MLPP, the closest of the moraine protected areas to the Augustana Campus of the University of Alberta in Camrose, a joint project of Alberta Parks and Augustana Campus will open in 2015. The research station will focus on linking the social, natural and health sciences into "Sustainability Sciences". The new station will primarily assess how environmental, social, health and agricultural domains intersect and affect each other in increasingly industrialized, urbanized and ecologically sensitive landscapes. These questions will be addressed using biological inventories and monitoring, inter-sectoral public policy analyses, public opinion assessments and policy impact assessments, focusing on rural and environmental sustainability. Such research is increasingly relevant to rural areas, as use of these landscapes is either approaching or exceeding capacity and testing the resilience of natural and social systems.

The Augustana Campus of the University of Alberta, which is located about 25 km south of MLPP, allows for ready access to the research station and supporting infrastructure (e.g., library, laboratories). Its rural context allows opportunity for social and ecological approaches to sustainability research. This research station illustrates well the potential benefits of the MOU and more generally, partnerships within the BHI. Not only will it promote active research within the moraine, but it will also raise awareness and appreciation of

sustainable land use practices within the broader community, including the university's student population and local decision-makers.

University partners have played a particularly active role in such conservation activities within the moraine, as both advisors and collaborators. Researchers have contributed to the understanding of local environmental conditions and to the development of effective land management strategies through research programs involving the protected areas and the surrounding private lands. Perhaps the best example of this is the Scientific Advisory Committee, which was established to encourage cooperative research and monitoring of the natural and cultural and historical resources within the EINP ecosystem and to link park management programs with other conservation activities in the region. Improving and formalizing communication and cooperation between EINP, researchers, scientists and the community was a key goal. The group began in 1998 and contributed to the development of the park's Ecosystem Conservation Plan in 1999. The addition of new members representing social and planning science interests expanded the capacity of the group beyond the natural and physical environment and archaeology. It also stimulated interest in trans-boundary planning and management, and facilitated the initial discussions on collaborative management between EINP and its adjacent land managers. The emergence of the BHI as a regional collaboration that included many of the original members of the SAC led to its lapse as an active organization.

Other initiatives include an innovative, multi-disciplinary approach to sustainable land development that combines economics, conservation science and land use planning. Alberta Innovates - Technology Futures worked with the BHI to develop a market-based incentive tool to help balance land conservation and development objectives (the Transfer of Development Credit, TDC project). The TDC mechanism for land conservation was provided by the Government of Alberta in the 2009 Alberta Land Stewardship Act. Such tools have been implemented successfully in many other jurisdictions; though few examples exist in Alberta or in Canada. The project drew on partners within and beyond the BHI. The Miistakis Institute of the University of Calgary and the Land Stewardship Centre of Canada shared their expertise with TDC programs while BHI members Alberta Parks and Agriculture & Agri-food Canada contributed their understanding of natural and agricultural values of the area. The project was to be tested in a trial implementation phase in Strathcona County; however, implementation is currently pending approval of key regulatory mechanisms under the Alberta *Land Stewardship Act*

The BHI and Alberta Culture and Tourism also commissioned a study (the Tourism Development Opportunity Assessment, 2012) to assess sustainable tourism potential within the moraine lands to help inform economic development initiatives for this region of the province. The BHI formed the Tourism Working Implementation Group (TWIG) to assist in the development of initiatives identified in the assessment report, which developed an implementation plan based on the specific initiatives identified in the report. Going forward, the TWIG and its member agencies will help to carry out those initiatives and facilitate growth of nature-based tourism opportunities in the moraine. Some of these initiatives are already underway, including recruitment and coordination of economic development personnel in the partner municipalities and development of a first section of the regional Biodiversity Trail.

Finally, the BHI is working with a broad constituency to build a volunteer citizen science program, with initial focus on winter mammal activity and woodpecker habitat use. With established mechanisms in place for planning conservation actions at the Beaver Hills scale, the BHI is well positioned to prioritize where direct restoration and monitoring actions would best serve the overall objectives of the biosphere reserve. (See

Appendix E: Past and Current Research and Monitoring Projects). A series of facilitated workshops helped to define an associated Stewardship Initiative and means to develop projects, recruit, train, mentor, and then recognize conservation volunteers. With the sustainability of the moraine and biosphere reserve as the mission, volunteers from the Beaver Hills area, as well as from nearby Edmonton, will see their collective purpose more clearly and become engaged in many hands-on conservation projects. By showing small-scale positive changes on the landscape, private landowner interest may grow in the biosphere reserve, which may leverage support for larger-scale planning initiatives.

3.3.5 BHI and Member Communication Programs

The BHI previously undertook public consultation to moraine residents only in conjunction with its member municipalities, to present the BHI activities in a context relevant to moraine residents and consistent with municipal application of BHI information. For example, the BHI provided information to support public consultation efforts during municipal land use planning reviews. Over the past year, a more direct public outreach program has been used to promote awareness and solicit support for the Beaver Hills Biosphere nomination. The program was broad-ranging, with presentations to community groups, schools, municipal partners, environmental and industry non-governmental organizations, and potential industrial partners and public outreach at community events across the moraine, the Edmonton region and provincial level conferences. The BHI website was updated to include more information about the nomination, and allowed viewers to indicate their support for the nomination. This program will continue over the next year, with a focus on schools and community events in particular. These presentations have often featured tangible results of BHI activities, including data products describing the natural resources of the moraine and management programs developed to help manage those resources (e.g., the Land Management Framework and the future Transfer of Development Credit pilot program) (Appendix F: Bibliography of Selected Papers).

The BHI has also promoted its unique land management approach to broader audiences by hosting conferences with partner agencies and providing educational tours to other local conferences and meetings. Some of these bus tours have attracted an international audience (e.g., through conference field trips for the ICLEI - Local Government for Sustainability World Congress in 2009 and the ISSRM conference in 2012). The 2010 Alberta TPR Volunteer Stewards conference was hosted within the moraine, at the request of conference organizers, and featured the various provincial natural areas and parks and BHI activities relative to those protected areas. In September 2012, the BHI hosted a partner event to celebrate its 10th anniversary and review the success of the BHI in promoting coordinated sustainable development in the region. International recognition of the BHI's contribution to such information has already been acknowledged by the OECD, which included the BHI as a case study on collective action in 2011.

The BHI is regularly invited to present about its activities at local and regional venues and it has hosted workshops to garner interest and support for specific programs. Members of the BHI have given presentations on the BHI and its approach to sustainable management at various regional, national and international conferences. This includes presentations at the annual meetings of Community Association of Alberta Planners, which is attended by provincial and municipal, elected officials and planners. Local groups such as the Edmonton Nature Club have requested presentations from the BHI, to better understand the objectives and approach to moraine conservation. Recent projects have involved public workshops attended by moraine residents and organizations not previously involved in the BHI (e.g., a citizen science stewardship effort coordinated by EINP and the AB TPR tourism study). These presentations have often featured tangible results

of BHI activities, including data products describing the natural resources of the moraine and management programs developed to help manage those resources (e.g., the Land Management Framework and the Golden Ranches land acquisition).

The BHI has also been invited to participate in regional planning initiatives, such as the development phase of the Alberta Land Use Framework and the Integrated Watershed Management Planning by the North Saskatchewan Watershed Alliance (authorized by the provincial environmental policy called Water for Life). Such opportunities allow the BHI to share its experience in collaborative land management with other similar initiatives. Lastly, the BHI has represented the joint interests of the partner agencies in review of large development projects proposed within the moraine (e.g., two proposed alignments for a new regional power line within the moraine). In these instances, the BHI has been able to identify for regulators and planners the resources of highest significance or sensitivity, areas deserving of protection from development, and best management practices that can assist in sustainable development.

Updates on BHI activities are provided to member councils on an ongoing basis to inform elected officials and local decision-makers, to provide relevant background information, and to seek input and feedback on activities and initiatives. Recent presentations have featured the Land Management Framework, the Transfer of Development Credit pilot program and the biosphere reserve application process. A broader public communication program to raise awareness of the BHI and its programs among the moraine communities has been active through this past year, within the moraine, the Edmonton region and the province. This campaign has supplemented existing communications, such as the BHI website (www.beaverhills.com) and quarterly newsletters distributed in digital and paper format.

3.3.6 Environmental Education Programs

The BHI protected areas partners use many forms of educational messaging, programming, tours and advertising to raise public awareness about sustaining the moraine's natural and cultural environments and how we, individually and collectively, can contribute to promote sustainable development. Additionally, all programming offered by BHI partners that targets school-aged children is linked to the Alberta Programs of Studies (Alberta Curriculum Guide Kindergarten to Grade 12, ages 5 to 18) and updated regularly.

Federal and provincial parks offer environmental education programming to visitors and their staff also travel to provide these programs to community groups and schools in the local area. Strathcona Wilderness Centre, a Strathcona County municipal park, offers a range of outdoor experiences to school and community groups. All of these agencies provide information on the Beaver Hills and the BHI in their displays and other printed materials.

Environmental non-governmental organizations such as Ducks Unlimited Canada, the Nature Conservancy of Canada, Alberta Conservation Association, Edmonton and Area Land Trust, North Saskatchewan Watershed Alliance and Alberta Fish and Game Association have also developed specific conservation programs for delivery within the moraine lands. Their programs promote sound stewardship principles or the use of conservation easements as alternative conservation strategies for landowners that wish to maintain ownership and conserve their property's natural values. Newsletters from these agencies often feature stories that promote awareness of the BHI and the various conservation programs active within the moraine. More recently, some of the environmental non-governmental organizations have developed a video that highlights

conservation areas recently acquired within the moraine. Other materials produced by and about the BHI, including brochures, newsletters, and news articles are featured on the BHI's website (www.beaverhills.ca).

The BHI has also helped the provincial Mindfuel initiative to develop a package of learning materials featuring the Beaver Hills as an example of a landscape pressured to support both ecological and human needs. The resulting 'Ignition Pack' provides 20 hours of instructional material appropriate for grades 4 to 9 (ages 10 to 15), and is intended to prompt discussion about sustainable development alternatives and decision-making. The project was tested with 14 teachers who used it in classes totalling 714 students in 2014-2015, and a broader release is planned for next year.

3.3.7 Future Programs

Other future plans include a proposal by Alberta Parks to coordinate training programs with Parks Canada, in order to increase effectiveness, efficiency and continuity. Alberta Parks foresees a role for the Visitor and Interpretive Services program at MLPP, its key programming office, to provide educational support to the Beaver Hills Biosphere. Likewise, EINP plans to use its facilities and interpretive programming to highlight the role of the biosphere reserve.

In the past, not-for-profit support organizations of Elk Island (Friends of Elk Island Society) and the Blackfoot PRA (Friends of Blackfoot-Cooking Lake and the Canadian Birkebeiner Association) have offered volunteers and some funding to specific research, interpretive and special events programs within the protected areas. These groups have assisted in BHI programs such as the involvement of the Friends of Elk Island Society in coordinating citizen science initiatives with focal groups (e.g., students from the Augustana campus of the University of Alberta). Similarly, local agricultural societies and not-for-profit organizations already actively promoting sustainable agricultural practices and local food systems could be recruited to specific initiatives through contacts already established by Agriculture & Agri-food Canada, Alberta Agriculture and Rural Development, local agricultural service boards and economic development authorities.

Lastly, as noted in Section 3.2, Alberta Culture and Tourism and the BHI have now completed a study within the moraine area that is designed to inform a future planning strategy for a complementary programming approach to tourism. The strategy acknowledges that the government agencies (Parks Canada, Alberta Culture and Tourism, Strathcona Wilderness Centre), environmental non-governmental organizations and commercial operations now active in the moraine area provide a spectrum of education and recreation opportunities and demonstration projects. With coordination to build on strengths and share resources, including the different recreational potentials of their properties and infrastructure, the resulting synergies could expand on the programs now offered in the area and perhaps create new sustainable opportunities. The future success of this particular initiative will depend on the creation of partnerships between existing parks, conservation properties, land owners and facility operators. The BHI is well positioned to facilitate development of these partnerships and the Protected Areas Working Group and the Tourism Working Implementation Group (TWIG) have been recruited to this purpose by Alberta Parks and Alberta Culture and Tourism.

4. CRITERIA FOR DESIGNATION AS A BIOSPHERE RESERVE

[Article 4 of the Statutory Framework presents 7 general criteria for an area to be qualified for designation as a biosphere reserve which are given in order below.]

The proposed Beaver Hills Biosphere Reserve meets the seven general criteria for designation as described in the sections below.

4.1 Ecological Mosaic

"Encompass a mosaic of ecological systems representative of major biogeographic regions, including a gradation of human interventions."

The Beaver Hills lies within the Temperate Grassland Ecosystem (UNESCO classification system, 1996), and is part of the Temperate Grassland Biome (Begon et al., 1990), and within the Canadian Prairie Ecozone (Ecological Stratification Working Group, 1995). Under the Canadian National Parks System Plan, Parks Canada considers this area part of the Southern Boreal Plains and Plateaux Natural Region of the Interior Plains (Parks Canada, 2009). Regardless of the classification system, this part of the Canadian landscape is considered a zone of transition, separating the southern prairie grasslands from the northern, moist boreal forests. It also grades from intensely human-altered landscapes to relatively untouched wilderness, and because of past development activities, it contains some of the most endangered habitats in Canada (Parks Canada, 2009). Within the moraine is a mosaic of wetlands, lakes and upland forest, characteristic of the Boreal zone, plus surrounding areas of grassland more commonly associated with the prairie parkland. The moraine presents a smaller scale example of the resulting mosaic of developed and natural lands, and of protected areas and lived-in and working landscapes found within the Alberta landscape.

Provincially, the moraine is recognized as a distinct biophysical feature, a disjunct, southern island of the Boreal Forest and, specifically, the Dry Mixedwood Natural Subregion (Natural Regions Committee, 2006). Its elevation above the surrounding plains creates the climatic conditions to support boreal vegetation. That same elevation makes this a physically identifiable landscape feature, distinct from the lower elevation, agricultural plains around it. Surrounded by the Aspen Parkland Natural Subregion, it is an ecologically distinct Transition Area, supporting high biodiversity due to the presence of plant and wildlife species of both natural subregions (Natural Regions Committee, 2006).

The distinctive landscape and ecological value of the Beaver Hills results from its 'knob and kettle' topography, extensive forest cover and abundant native wetlands. This combination of hummocky terrain, wetlands and poor (rocky) soil conditions has limited past agricultural clearing with the result that much of the Beaver Hills remains in natural upland cover (approximately 55%) or surface water (14%) (H. Sawada, pers. comm.). As mentioned elsewhere in this application, much of the naturally vegetated area has been protected as either federal or provincial parks (27.3% of the moraine, or about one third the natural habitats in the moraine). Consequently, it is not surprising that the Beaver Hills is a key area under the North American Waterfowl Management Plan (NAWMP). As part of the Prairie Pothole Region of Canada (a NAWMP ecosystem category), the moraine is considered critical to sustaining breeding, migratory waterfowl at the continental level, and due to past effects of wetland loss from development, one of the top 25 threatened waterfowl sites in North America (Ducks Unlimited Inc., 2010). As a result, the moraine has been the focus of attention of the Nature Conservancy of Canada and Ducks Unlimited Canada for many years.

Developed lands within the moraine support agricultural operations (cultivation, grazing and pasture), rural residential subdivisions and some industrial development (mainly oil and gas wells and pipelines), but they are far less densely populated than the adjacent Edmonton Capital region (see section 10). Several small villages lie within the moraine, but larger communities are beyond the moraine boundary (e.g., the cities of Edmonton and Leduc, and the towns of Tofield and Lamont). Sherwood Park partly straddles the moraine boundary (see Figure 1). The relatively low population density within the moraine has helped to sustain its ecological functions. An ecological connectivity analysis conducted by the BHI found that the moraine still maintains a good level of connectivity, particularly north and south along the chain of protected areas comprising the most naturally vegetated "spine" of the moraine (Spencer Environmental Management Services Ltd., 2007). As such, the basic components of natural habitat are in place for ongoing support of the relatively high level of regional biodiversity within the moraine (see section 4.2 below regarding biodiversity).

4.2 Role in Biological Diversity Conservation

"Be of significance for biological diversity conservation."

4.2.1 Wildlife

The diverse habitats within the moraine support a broad assemblage of wildlife species (for a complete list, see Appendix G: Wildlife Species Occurring in the Beaver Hills). Table 1 summarizes the number of species potentially occurring in the area, based on the Royal Alberta Museum's Official List of the Birds of Alberta, wildlife distributions reported within the province (Acorn, 1993; Fisher and Acorn, 1998; Pattie and Fisher, 1999; Russell and Bauer, 2000; Federation of Alberta Naturalists, 2007), published inventory reports and observations of biologists working in the area (L. Carbyn, G. Hood, D. Patriquin, pers. comm.). A comprehensive inventory of wildlife present in this area was lacking, which the BHI recently addressed through the State of the Beaver Hills reporting project.

Diversity is high relative to the rest of the province, partly because of the juxtaposition of the provincial Aspen Parkland and Dry Boreal Mixedwood Forest ecoregions at the moraine boundary. Of a total of 439 wildlife species potentially occur in the area, of which the majority (358 species) are birds. This is not unusual; bird diversity is typically much higher than that of other wildlife species in any given area. Mammals are the next most diverse group, with 58 species. Due to the colder climate of central Alberta, only five amphibians and three reptiles occur in the area. About 15 species of butterflies (Lepidoptera) that are tracked by AESRD are known to occur in the moraine area.

In terms of their residency in the region, most of these wildlife species are migratory and either pass through the region en route to breeding grounds (migrants, 49 species) or remain to breed in the moraine through the spring and summer months (breeding species, 182 species, Table 1). This is typical of the central and northern regions of Canada, where a harsh winter climate poses a barrier to year-round use, but abundant summer resources support highly diverse breeding populations. Another 102 species are year-round residents in the area (including all of the amphibian and reptile and most mammal species). Seven bird species occur only in the winter months. Lastly, 99 vagrant species (mainly birds) have been occasionally observed in the area. These observations represent accidental movements beyond typical ranges or migration pathways.

Table 1. Wildlife species potentially occurring in the Beaver Hills

Species group	Migratory species					
	Breeding	Migrant	Resident	Winter	Vagrant	Total
Amphibian	--	--	5	--	--	5
Reptiles	--	--	3	--	--	3
Birds	167	49	37	7	98	358
Mammals	--	--	57	--	1	58
Lepidoptera	15	--	--	--	--	15
Total	182	49	102	7	99	439

Both the Canadian and Alberta governments track species at risk of extinction. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) lists 20 of the moraine's species at the higher levels of risk including Endangered, Threatened, Special Concern, High Priority (HP) Candidates (for listing) or Low Priority (LP) Candidates (Table 2). Of those, 11 species are also Schedule 1 "listed species" in the Species at Risk Act (SARA), species with legal protections under the Act. One of those listed is a Schedule 3 Special Status species under SARA, a species for which management planning is federally mandated.

Nationally, species considered at risk are first assessed by the COSEWIC and assigned to various categories. Endangered species are under imminent threat of extirpation or extinction and Threatened and Special Concern species risk being elevated to higher status categories (Endangered and Threatened, respectively) in the absence of management action. COSEWIC may recommend species that require management intervention or protection be protected legally under the federal *Species at Risk Act* (*SARA*). These species are listed under Schedule 2 (nationally endangered or threatened) or Schedule 3 (nationally of special concern) of the *SARA*, until they have been reassessed for federal protection status. Schedule 1 species have been reassessed and are fully protected under the *SARA*.

Table 2. Federal (COSEWIC) and Species At Risk Act (SARA Listed) Species

COSEWIC designation	Total species	SARA designation	Total species
Endangered	6	Schedule 1 (Endangered)	6
Threatened	14	Schedule 1 (Special Concern)	9
Special Concern	15	Schedule 1 (Threatened)	9
High Priority Candidate	3	Schedule 3 (Special Concern)	0
Mid Priority Candidate	3		
Low Priority Candidate	16		
Data Deficient	1		
(Reviewed, but) Not at Risk	35		
Status in Review	2		
Total	**95**	**Total**	**24**

Provincially, 10 of the species potentially occurring in the moraine are considered to be at the highest level of risk (At Risk or May Be At Risk) and one species has been extirpated (Table 3). Another 66 species are considered Sensitive (in need of management attention to prevent further declines).

Table 3. Provincial status species, (AESRD, 2005)

Provincial status	Total species	Wildlife Act [1]	Total species
Extirpated/Extinct	1	Endangered	3
At Risk	4	Threatened	2
May be At Risk	6	Special Concern	5
Sensitive	66	Data Deficient	3
Undetermined	9	Review in progress	2
Secure	261		
Accidental/Vagrant	86		
Exotic/Alien	6		
Total	**439**	**Total**	**15**

EINP, and to some extent, the moraine, have played a critical role in sustaining these species. Notable success stories include conservation of disease-free populations of wood (*Bison bison athabascae*) and plains bison (*Bison bison bison*). These two species are considered At Risk and Extirpated/Extinct provincially, respectively, and are listed by the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Threatened. Only the wood bison is currently protected under the federal Species at Risk Act as a Schedule 1 (Threatened) species[2].

The bison populations within EINP are part of a national recovery plan designed to sustain genetically pure and disease-free populations of each sub-species to serve as a healthy source for other population restoration efforts. Excess individuals are periodically transferred to other parks and protected areas to restore or bolster populations in parts of their former range, including recent transfers to Grasslands National Park in Saskatchewan, and two releases the American Prairie Reserve in Montana. A transfer of bison to a park on the Siberian Plains of Russia helped reintroduce a large herbivore to this ecosystem, replacing the now extinct steppe bison (*Bison priscus*). A similar translocation program exists for the park's elk (wapiti, *Cervus elaphus*) population; animals have helped re-establish populations in the southern United States as well as other areas in Canada.

Recovery of a breeding population of trumpeter swan (*Cygnus buccinator*, At Risk provincially, Not At Risk federally) is an important continental achievement. The trumpeter swan recovery program at EINP has helped delist this bird nationally (now considered Not At Risk according to COSEWIC). Provincially, it remains an At Risk species. The initial small population of breeding birds reintroduced into the park has produced a larger local population that now breeds in the park and in adjacent lands (M. Peckett, pers. comm.). This population overwinters in the 'tri-state' region of the United States, where Idaho, Montana and Wyoming meet and like many migratory species, is at risk in both their overwintering and breeding areas (James, 2000). Alberta supports 30% of Canada's trumpeter swan population, in six key locations including EINP (James, 2000).

[1] Includes new species assessed by the provincial Endangered Species Conservation Committee.

[2] Nationally, species considered at risk are first assessed by the Committee on the Status of Endangered Wildlife In Canada (COSEWIC) and assigned to various status categories. Endangered species are under imminent threat of extirpation or extinction and Threatened and Special Concern species risk being elevated to higher status categories (Endangered and Threatened, respectively) in the absence of management action. COSEWIC can recommend species for additional legal protection. Especially sensitive species can be protected under the federal *Species at Risk Act* as Schedule 1 Endangered or Threatened species, with specific management requirements.

The EINP population has shown steady growth since the re-introduction of several pairs (James, 2000) and so, the reintroduction program has played an important role in conservation of this species. Since reintroduction in 1987, a number of pairs have successfully bred in the park. In 2002, 27 swans were reported in the park. The most recent aerial census in 2009 found 50 swans, including eight breeding pairs and 17 fledged cygnets.

Researchers at the University of Alberta have also contributed to management of declining wildlife species and ecosystems (e.g., a Canadian toad (*Anaxyrus hemiophrys*) and Western toad (*Anaxyrus boreas*) habitat study, and a variety of wetland biodiversity and management studies). Several ongoing collaborative studies have examined wetland form and function, in the context of development of a province-wide policy for wetland conservation. This research will help to quantify wetland loss and develop parameters for appropriate compensation, a tool now missing in existing policy.

4.2.2 Plants

The moraine is a disjunct area of the Dry Mixedwood Boreal Natural Subregion, which stretches across north-central Alberta. The moraine is a southern extension, an island totally enclosed by the Aspen Parkland Natural Subregion. It is characterized by aspen and balsam poplar forests, with scattered patches of white spruce. Wetlands are abundant, due to the hummocky terrain and include peat bogs and fens, but these are limited in distribution. A recent BHI-funded study mapped these communities at a scale useful for land use planners, filling a critical data gap for regional planning.

The Alberta Conservation Information Management System (ACIMS) tracks observations of plants and wildlife within the province. It also maintains a list of tracked, sensitive plant species and plant communities for the province. A total of 936 plant species may occur within the Beaver Hills (See Appendix H: Plant Species in the Beaver Hills). As with wildlife, the diversity is in part due to the unique biogeographical location of the moraine, a boreal zone surrounded entirely by aspen parkland. Plants representative of both natural subregions may occur within the moraine landscape.

The ACIMS holds records of 36 plants and six plant communities observed within the moraine that are considered sensitive due to low distributions of populations within the province (with ranks of S1 to S3, Tables 4 and 5). Plants or communities with a rank of S1 have fewer than five populations reported within the province, S2 rank species have between five and 20 populations and S3, between 20 and 100 populations. None of these species are listed under the federal Species at Risk Act (SARA).

The sensitive plant species include both vascular and bryophyte species. Although ACIMS also tracks lichen species, no sensitive species have been reported within the moraine. The plant communities include a bog community (Alaska birch (*Betula neoalaskana*) / common Labrador tea (*Ledum groenlandicum*)), a native grassland community (Western porcupine grass (*Stipa curtiseta*) - green needle grass (*Stipa viridula*) – sedge (*Carex* spp.), a shrubland community (Saskatoon (*Amelanchier alnifolia*) / common bearberry (*Arctostaphylos uva-ursi*) / northern rice grass (*Oryzopsis pungens*)), a wetland community (Cyperus-like sedge (*Carex pseudo-cyperus*) – water arum (*Calla palustris*) and two balsam poplar (*Populus balsamifera*) forest communities.

Alberta ranks its plant and wildlife species for conservation management on a global, national and sub - national scale of 1 to 5, following the system developed by The Nature Conservancy. G1 (Global 1) indicates

that a species of high conservation concern at the global scale due to rarity, endemism and / or threats, and a rank of G5 (Global 5) indicates a species that is widespread and abundant. A rank of N1 (National 1) or S1 (Sub-National 1) indicates high conservation concern at the national or state / provincial level, respectively. S1: <5 occurrences in province; S2: between 5 to 20 occurrences; S3: between 20 – 100 occurrences. GNA, NNA or SNA: not applicable for management at the respective scale (ACIMS, 2010). Species of rank S3 or lower are generally considered sensitive in Alberta and in need of management attention.

Table 4. Sensitive plant species potentially occurring in the moraine (ACIMS, 2010)

Scientific name	Authority	Common name	Provincial status	Global status
Aster umbellatus	Mill.	Flat-topped white aster	S2	G5
Betula neoalaskana	Sargent	Alaska birch	S1S2	G4G5
Botrychium ascendens	W.H. Wagner	Ascending grape fern	S2	G2G3
Botrychium lanceolatum	(Gmel.) Aongstr	Lance-leaved grape fern	S2	G5
Botrychium minganense	W.H. Wagner	Field grape fern; prairie moonwort	SU	
Botrychium pallidum	W.H. Wagner	Pale moonwort	S3	
Botrychium pinnatum	H. St. John	Northwestern grape fern	S1	
Botrychium simplex	E. Hitchc.	Dwarf grape fern	S2	G5
Bryum cyclophylum	Schwaegr	Bryum moss	S2	
Calla palustris	L.	Water arum	S4	G5
Campylium radicale	P. Beauv	*Campylium* moss	S2	
Carex lacustris	Willd.	Lakeshore sedge	S2	G5
Carex pseudo-cyperus	L.	Cyperus-like sedge	S2	
Carex vulpinoidea	Michx.	Fox sedge	S2	G5
Conardia compacta	C. Müll	Compact conardia moss	S2	
Desmatodon heimii	Hedw.	*Desmatodon* moss	S2	
Drepanocladus crassicostatus	Jans.	*Drepanocladus* moss	S2	
Dryopteris carthusiana	(Vill.) H.P. Fuchs	Narrow spinulose shield fern	S4	G5
Geranium carolinianum	L.	Carolina wild geranium	S1	G5
Ledum groenlandicum	Oeder	Common Labrador tea	S1S2	G5
Mycocalicium calicioides	Nadv.	*Mycocalicium calicioides*	S1	
Najas flexilis	(Willd.) Rostk. & Schmidt	Slender naiad	S2	G5
Phascum cuspidatum	Hedw.	Toothed *Phascum* moss	S2	
Physcomitrium pyriforme		Common bladder moss	S1	
Potamogeton foliosus	Raf.	Leafy pondweed	S2	G5
Potamogeton obtusifolius	Mert. & Koch	Blunt-leaved pondweed	S2	G5
Rhizomnium andrewsianum	Steere	Andrew's *Rhizomnium* moss	S1	
Ricciocarpus natans	L.	Purple-fingered riccia	S2	
Rubus x paracaulis	Bailey	Hybrid dwarf raspberry	S1	GNA
Ruppia cirrhosa	Grande	Widgeon-grass	S1	
Scoliciosporum chlorococcum	Stenh	*Scoliciosporum chlorococcum*	S2	
Trichophorum clintonii	Gray	Clinton's bulrush	S1	
Viola pallens	Banks ex Ging	Northern white violet	S2S3	
Weissia controversa	Hedw.	Green-tufted stubble moss	S2	
Wolffia columbiana	Karsten	Watermeal	S2	G5

Table 5. Sensitive plant communities potentially occurring in the moraine (ACIMS, 2010)

Plant Community		Provincial Status
Amelanchier alnifolia / Arctostaphylos uva-ursi / Oryzopsis pungens	Saskatoon / common bearberry / northern rice grass	S2S3
Carex pseudocyperus - Calla palustris	Cyperus-like sedge - water arum	S2
Populus balsamifera / Alnus tenuifolia - Cornus stolonifera / Equisetum pretense	Balsam poplar / river alder - red-osier dogwood / meadow horsetail	S3
Populus balsamifera / Viburnum opulus / Matteuccia struthiopteris	Balsam poplar / high-bush cranberry / ostrich fern	S1S2
Stipa curtiseta - S. viridula - Carex spp.	Western porcupine grass - green needle grass - sedges	S2S3
Betula neoalaskana / Ledum groenlandicum	Alaska birch / common Labrador tea	S1S2

4.3 Demonstration of Sustainable Development

"Provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale" (Describe in general terms the potential of the area to serve as a pilot site for promoting the sustainable development of its region (or "eco-region")

The BHI partner agencies, including environmental non-governmental organizations and all levels of government, have already committed to a set of principles for land management that would apply to the biosphere reserve. The principles identify the aspects of the moraine on which biosphere reserve management will focus (quality of life, biodiversity, water, appropriate land use and air quality) and the specific goal associated with each aspect (see Appendix C: Beaver Hills Initiative , 2012-2015 Business Plan, Guiding Principles for more information).

The BHI has demonstrated its commitment to the Land Management Principles and the concept of a regional approach to sustainable land management through a number of projects. Its approach has not been confined solely to the moraine either; its management approach and specific tools for land management have attracted the interest of others at the regional and provincial level. The adoption of sustainable land management approaches into planning practices and policies by the partner municipalities has been a notable success. Alberta's Land Use Framework, now being developed by the provincial Land Use Secretariat, will delegate to municipalities responsibility for implementation of regional management objectives.

The Secretariat has indicated interest in the BHI's regional management approach, and may use the BHI's Land Management Framework as an example of an effective strategy in future development of its regional plans. The Land Management Framework is of particular interest for the implementation of a Cumulative Effects Management Strategy identified in the Alberta Land Stewardship Act, a legislative component of the provincial Land Use Framework. The proposed Transfer of Development Credit program has attracted similar interest from the provincial government, because it offers a practical demonstration of a new conservation tool permitted under the Alberta Land Stewardship Act.

Several other examples of the sustainable development programs now offered within the moraine have already been mentioned in the preceding sections of this application. They too offer opportunities to demonstrate sustainable options, and include:

Stewardship and conservation activities beyond protected areas:

- Conservation easement and land purchase projects, including the Golden Ranches project have protected areas with high ecological value within the moraine.
- Environmental programs for landowners, including land stewardship strategies, offer land management alternatives to those interested in conservation and sustainable land management.
- Outreach programs offered by the Beaver Hills Dark Sky Preserve at EINP and MLPP promote awareness and the means to reducing light pollution across the moraine.
- Citizen science programs (e.g., winter tracking of mammals) have engaged University of Alberta students and volunteers from the Friends of Elk Island Society in conservation initiatives, and indirectly, in management of the moraine.

Environmentally sustainable agriculture programs (long-term programs):

- Since 2003, agricultural producers have successfully completed Environmental Farm Plans (a tool for comprehensive sustainable management of agricultural operations) and implemented over 774 projects to adopt new and improved beneficial management practices.
- Grazing management plans implemented on provincial grazing leases within the moraine, including the Blackfoot PRA, highlight sustainable practices for agricultural producers using these lands.
- A 2013 pilot project of Alberta Parks, Ducks Unlimited Canada and the Blackfoot Grazing Association reclaimed over 60 wetlands in the Blackfoot PRA to enhance biodiversity and water conservation values. The project was expanded in 2015, based on the success of the pilot project.
- In the last 10 years, over 1,800 agricultural producers have planted over 900,000 tree seedlings in various agro-forestry, shelterbelt, wildlife and eco-buffer plantings.

Environmental innovation projects:

- Demonstration projects within partner properties include the proposed Fire-Smart program at Strathcona Wilderness Centre, toxic round-ups and demonstration waste management programs offered by Strathcona County.
- Innovative projects being developed in partner municipalities have potential use as demonstration projects.

Camrose County:

- Its bio-fuels project is a sustainable wood energy heating system for the County Administration Building. Although outside the moraine, it will draw its wood supply from areas in the County, including the moraine. This project is a recipient of the 2011 Minister of Municipal Affairs Award of Municipal Excellence.
- A recently developed municipal nature park, created from a reclaimed County gravel area outside the moraine, demonstrates the County's commitment to sustainable land management planning for all lands under its jurisdiction, including the moraine.

Strathcona County:

- Conservation Easement Policy offers an opportunity for landowners to dedicate their lands through a conservation easement agreement with the County.
- Legacy Lands Policy directs the County to identify and secure environmentally significant lands within the county to build its 'green infrastructure'.
- Green Routine (Rural and Urban Recycle and Organics Collection Program) is a waste collection program that serves rural and urban residents and collects organics and waste in separate bins.
- Environmental Sustainability Framework outlines a broad approach to municipal governance issues.
- Award winning SUN (Sustainable Urban Neighbourhoods) Living and associated planning projects: Town Centre and Community Energy Project; Emerald Hills neighbourhood project; Cambrian-Strathcona Joint Planning Initiative; Municipal Sustainable Buildings Policy; Dark Sky and Light Efficient Communities Policy.
- The Sustainable Plan-It School Program, a social studies curriculum module about sustainable development planning and municipal government, delivered by municipal planning staff to Grade 6 schools (ages 12-13).
- Various sustainable planning policies [e.g., Wetland Conservation Policy, Biophysical Assessment Policy, Conceptual Scheme Plan Policy (for subdivision development)].

Leduc County:

- Riparian Setback Matrix Model is used to determine adequate Environmental Reserves around wetlands, watercourses and water bodies during the land development process.

Beaver County:

- A Municipal Sustainability Plan, now being prepared for the entire County, will address specific concerns relevant to the moraine lands.
- County-sponsored Conservation Easements with moraine residents are an important component of the County's long-range planning for the moraine, including the Municipal Sustainability Plan.
- The County has developed its own Transfer of Development Credit program to divert development away from sensitive natural areas and into designated growth areas.
- The West End Growth Plan has set development limits for the moraine lands that will help sustain natural landscape and ecological function.
- The County participated in development of Cumulative Effects Planning models for the North Saskatchewan watershed region and will incorporate its findings into their long-range planning.

Sustainable agriculture and alternative agricultural strategies:

- Woodlot management and agro-forestry programs are promoted through Agriculture & Agri-foods Canada, and Alberta Agriculture and Rural Development.
- Agri-tourism and heritage foods and market garden programs have been supported through coordinated regional promotion (e.g., Kalyna Country, which promotes a variety of such tourism opportunities in northeast Alberta through partnership with Alberta Culture and Tourism).
- Sustainable agriculture programs sponsored by Agriculture & Agri-foods Canada and Alberta Agriculture and Rural Development promote land and water stewardship, manure management and food system planning and analysis.

Academic research programs:

- Research partnerships between the University of Alberta North (Edmonton) and Augustana campuses with EINP and Alberta Parks have opened new opportunities for relevant local research. The recent Memorandum of Understanding between Alberta Parks and Augustana campus and the installation of a research station at Miquelon represent an innovative means of gathering regional monitoring and research data.
- Transfer of Development Credit pilot program developed by the BHI, Alberta Innovates - Technology Futures , Miistakis Institute (University of Calgary) Land Stewardship Centre of Canada and Agriculture & Agri-food Canada will provide a pilot model for land use management within the moraine and more broadly, across the province and Canada.
- Community outreach by university researchers links local residents into regional monitoring efforts.
- Undergraduate and graduate level research has examined social and environmental issues relevant to the moraine, including two undergraduate studies on Aboriginal history of the moraine area, a PhD study on the BHI's collaborative approach, and several undergraduate and graduate studies on the biodiversity and ecology of the moraine.

4.4 Biosphere Reserve Size

"Have an appropriate size to serve the three functions of biosphere reserves"
(This refers more particularly to (a) the surface area required to meet the long term conservation objectives of the Core Area(s) and the Buffer Zone(s) and (b) the availability of areas suitable for working with local communities in testing out and demonstrating sustainable uses of natural resources.)

The area of each of the proposed Core Areas, Buffer Zones and Transition Areas within the moraine is:

Core Areas	217.25 km^2	21,725 ha	13.6%
Buffer Zones	217.66 km^2	21,766 ha	13.7%
Transition Areas	1160.69 km^2	116,069 ha	72.7%
Total	1595.6 km^2	159,560 ha	100%

These areas were the starting point on which the BHI Land Management Principles and Land Management Framework were developed. Although some municipalities and regional planners are considering using these landscape management approaches and tools outside the moraine, which would take the biosphere reserve concepts to a broader area, the geophysical boundaries of the moraine will delineate the biosphere reserve for the time being.

4.5 Appropriate Zonation

4.5.1 Core Areas

"(a) a legally constituted Core Area or areas devoted to long term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these objectives"?(Describe the Core Area(s) briefly, indicating their legal status, their size, the main conservation objectives.)

The Core Areas proposed within the biosphere reserve (EINP and MLPP) are federal and provincial protected areas that are considered to be IUCN protected area management Category II [national park] areas. Both are relatively large areas (EINP, 19,335 ha and MLPP, 2,390 ha) and are large national and provincial parks, respectively, established to protect the ecological integrity of a representative landscape. Their respective

management plans establish strategic management objectives toward this end. EINP completed its revised management plan, which was approved by the federal Minister of the Environment in 2011. Miquelon's management plan was completed in 2002, and recent improvements to the park fulfil many of that plan's priority action items. New lands can be added to either park under their respective legislation. Additional land was recently added to Miquelon, but has not yet been officially designated under the provincial process. The map of Core Areas will be adapted once this process is finalized.

4.5.2 Buffer Zones

"(b) a Buffer Zone or Zones clearly identified and surrounding or contiguous to the Core Area or areas, where only activities compatible with the conservation objectives can take place..." (Describe briefly the Buffer Zones(s), their legal status, their size, and the activities which are ongoing and planned there.)

Two of the three largest proposed Buffer Zones of the Beaver Hills Biosphere (Ministik Game Bird Sanctuary at 7,580 ha and Miquelon Lake Bird Sanctuary at 2,220 ha) are considered to be IUCN IV (habitat/species management area) protected areas. The Blackfoot PRA (9,920 ha) is an IUCN V (protected landscape/seascape) protected area. The Provincial natural areas are small parcels that have been recently classified under the IUCN system as Class II sites, but due to their small size and the absence of formally adopted management plans, the BHI places them in their previous categories (total area, 2,046 ha). North Cooking Lake is a Class VI, and the rest are Class IV. The remaining Buffer Zone lands, the Strathcona Wilderness Centre and the environmental non-governmental organization conservation easements and properties, have not yet been classified according to the IUCN system.

Because some of these organizations secure new easements and properties on an on-going basis, the Buffer Zones will not necessarily be static. Figure 1 indicates buffer zone properties at the time of writing. Mapping will be updated periodically to reflect change over time.

Although conservation is a primary goal for all of these areas, other land uses are also allowed, provided they will not significantly alter the existing natural ecosystem. For example, grazing and non-motorized recreational use is permitted in the Blackfoot PRA, and oil and gas development has been permitted in restricted zones within the Ministik Game Bird Sanctuary. Both of these provincial protected areas have management plans that outline acceptable land management and land use practices consistent with conservation objectives. Further, AESRD commissioned a heritage appreciation development plan for all of its protected areas within the moraine (Husby and Fast, 2004) that compiled natural and human history and outlined recommendations for environmental and heritage education.

The smaller natural areas and conservation easements held by the province and environmental non-governmental organizations are primarily designated for conservation, but passive forms of recreation and environmental educational functions are also permitted. Specific management plans have not been created for each area; instead the managing environmental non-governmental organizations and municipal managers have identified general management goals for their holdings. The provincial natural areas within the moraine are monitored by a Volunteer Stewards program that is operated by Alberta Parks. Despite a less intensive management approach, these smaller parcels play an important role as linkages between the larger protected areas in the moraine, contributing to a protected "spine" that extends north-south through the moraine.

The Strathcona Wilderness Centre, Strathcona County's largest municipal park, provides another Buffer Zone. In addition to providing environmental education and outdoor recreation opportunities, it is a site for research studies and pilot projects demonstrating sustainable land use practices. The centre also serves as a demonstration site for Fire Smart Principles (development practices for reduced wildfire risk. The 0.5 km trail shows examples of Fire Smart Treatments and was developed with Strathcona County Emergency Services, who provided interpretive materials and the Strathcona County Recreation, Parks and Culture department, who completed the fire protection measures at the centre.

4.5.3 Transition Areas

"(c) an outer Transition Area where sustainable resource management practices are promoted and developed" (The Seville Strategy gave increased emphasis to the transition area since this is the area where the key issues on environment and development of a given region are to be addressed. Describe briefly the transition area(s), the types of questions to be addressed there in the near and the longer terms. The Madrid Action Plan states that the outer boundary should be defined through stakeholder consultation).

The Transition Areas of the proposed Beaver Hills Biosphere is the lived-in and working landscape of the moraine and includes the privately held lands that surround the Core Areas and Buffer Zones. These working landscapes are largely used for agricultural production.

4.5.3.1 Agricultural Sustainability

Proportionally, these private lands form the majority (73%) of the proposed biosphere reserve, and most of those lands (89%) are currently under agricultural land use (C. Vanin, pers. comm.). Some land is held by the respective municipalities and other parcels are provincially owned grazing leases. The grazing leases contain some natural habitat; however, they are managed primarily for grazing capacity for cattle production, and thus differ from those Crown lands included in the Buffer Zones. Because they are managed under a Code of Practice that emphasizes sustainable land management objectives, they offer an excellent example of a sustainable agricultural landscape intended for all Transition Area lands.

The Agriculture Profiling component of the Alberta Capital Region study now in preparation by Agriculture & Agri-food Canada reports that within the Beaver Hills (159,560 ha), a total of approximately 110,607 ha (273,200 acres) are under agricultural land use, in the following forms (C. Vanin, pers. comm.):

Agricultural use	Percentage of agricultural land base
Land in crops [annually cultivated]	52.2%
Natural grasslands or unimproved pasture	20.6%
Tame forages or improved pasture	14.9%
Woodlands, wetlands and Christmas trees	7.1%
All other lands	3.6%
Summer fallow	1.6%

Agri-environmental stewardship programs have been historically, and remain currently, significant contributors to the sustainability of the moraine. Agriculture & Agri-food Canada, and Alberta Agriculture and Rural Development have long promoted agri-environmentally sustainable practices within the moraine. For example, agricultural producers in the prairies have received and planted tree seedlings from Agriculture & Agri-food Canada's Prairie Shelterbelt Program since 1901. In the past decade, nearly 900,000 trees have been delivered

to over 1,800 agricultural producers in the moraine, for purposes of energy conservation, wildlife habitat, eco-buffers, and snow harvesting and soil conservation. Local commercial tree nurseries have also provided additional tree stock for other conservation plantings throughout the moraine.

Today, nearly half (43%) of the agricultural lands of the moraine are in some form of permanent cover, a testament to past government programs such as the Permanent Cover Program and the Greencover Program, which ran from 1989 to 1994 and 2003 to 2007 respectively (C. Vanin, pers. comm.). Nearly a dozen sites with marginal soils have been converted from annual cultivation to permanent cover within the moraine and, through land management agreements with Agriculture & Agri-food Canada, the agricultural producers will manage these lands as either sustainable grazing or forage production systems until 2015.

Agri-environmental stewardship and beneficial management practices have been enthusiastically adopted by producers within the moraine, who have often incorporated a variety of practices into their operations. According to the Ag Profiling study by Agriculture & Agri-food Canada, a custom data tabulation of data from the 2006 Census of Agriculture from Statistics Canada, 969 farms within the moraine reported use of some form of sustainable practice (C. Vanin, pers. comm.). Represented as a percentage of the reporting farms, the reported land management practices include:

Sustainable practice	Percentage of reporting farms
Manure management practices including composting	65.9
Windbreaks or shelterbelts	53.4
Rotational grazing	47.0
Agri-environmental crop rotations	31.8
Buffer zones around water bodies	17.1
Green manuring or plow-down	3.9
Winter cover crops	1.8

Note that often producers had adopted more than one practice (resulting in a total percentage greater than 100%). Additional information and statistics on adoption of beneficial management practices by agricultural producers are included in sections 12 and 14 of this application.

4.5.3.2 Sustainable Land Use and Management

Historically, the natural character of the moraine was sustained by its physical limitations that restricted agricultural development, the then dominant land use in the region. Today, regional growth and economic shifts have created new interest in the development potential of the proposed Transition Area of the moraine for rural residential, commercial and industrial uses. The rapid growth in interest was the original impetus for regional management and formation of the BHI. Accordingly, the BHI and its partners have focused their efforts on developing management tools and information for sustainable management within the proposed Transition Area. The BHI's Land Management Framework offered information and management tools to municipalities charged with land use planning and management of these lands. Each of the partner municipalities has begun to use the framework in current land use planning activities.

The Transfer of Development Credit pilot project will provide another management tool to municipalities, allowing conservation of critical lands while still offering fair market value to landowners. This project has been developed and awaits provision of additional legislative tools for implementation. Each municipality has developed its own land use planning tools, including a Natural Areas Management Plan (Strathcona County) and a Riparian Setback Matrix Model for identifying development setbacks near water bodies (Leduc County). Lessons learned through the implementation of such policies are shared within the BHI, and can be modified for use by other partner municipalities. Some of these tools and practices have been applied within the municipal lands beyond the moraine boundaries, as well as within the proposed biosphere reserve.

A new initiative the Board has identified and mapped wetlands within the moraine lands to facilitate their protection as Environmental Reserve lands. The provincial Municipal Government Act Subdivision Regulations allow municipalities to take wetland areas as Environmental Reserves when those lands are developed. This mapping project has clearly identified such lands, facilitating development proposals that acknowledge their presence. Future work on will prioritize wetlands using health indicators, such that highly functional wetlands can be readily identified and managed by municipalities. This information can also inform the pilot Transfer of Development Credit project, by highlighting lands supporting healthy, functional wetlands.

4.5.3.3 Conservation

Various other efforts by the BHI partners have focused on offering options for conservation and sustainable land management to private landowners, including environmental non-governmental organization conservation easement and landowner education programs, and the Dark Sky Preserve interpretive programs. The Golden Ranches project, and the purchase of other ecologically sensitive riparian areas and grazing lands in the heart of the moraine by a number of the partner organizations, will convert some of the Transition Area lands to Buffer Zones. These purchases will also fill in a critical link between the north and south protected areas. Beaver Hills Dark Sky Preserve programs address both astronomical and ecological light pollution. Astronomical light pollution impacts night viewing opportunities, an important aspect of human cultural and natural heritage. Ecological light pollution due to chronic or periodic night lighting can affect the foraging, reproductive, communication and predator avoidance behaviours of animals, which in turn can affect population viability (Longcore and Rich, 2004). Interpretive programs raise awareness of both concerns and provide options for better management. Municipalities such as Strathcona County have adopted those best management practices into land use policy, thereby establishing an expectation of improvement within the community.

Other organizations conduct regular monitoring and habitat assessment within the moraine that can inform future conservation efforts. For example, two key priority areas (the Ardrossan and Mundare target areas) for the North American Waterfowl Management Plan (NAWMP) overlap with the moraine. In partnership with Prairie Habitat Joint Venture (PHJV), NAWMP undertakes monitoring and assessment activities related to wetlands, biodiversity and waterfowl habitat in the target areas. This information, in turn, helps NAWMP partners, such as Ducks Unlimited Canada, in their conservation efforts within the moraine.

4.5.3.4 Nature-based Tourism

The Core Areas and Buffer Zones comprise protected areas valued regionally for their conservation activities and for outdoor recreational opportunities. Small agricultural operations (market gardens and orchards) offer other tourism opportunities, as well as at-source marketing of their products. The BHI and its protected areas and municipal partners recognize the potential to enhance such commercial recreational, eco-tourism and agri-

tourism opportunities, to provide additional economic benefits to the region. In preparation for a provincial regional land use planning process, the BHI and AESRD commissioned a Tourism Development Opportunity Assessment (2012) that examined the potential to enhance private and government tourism operations and attractions in the moraine region. The report will be included in the broader regional planning process, ensuring that context-appropriate and sustainable tourism opportunities are considered. The municipal partners have also recognized the potential in eco-tourism and agri-tourism (collectively referenced as nature-based tourism in the assessment) as an economic alternative for the region, and have begun to review their land use policies to ensure that new opportunities identified in the assessment are facilitated and existing ones, enhanced. Strathcona County and Alberta Culture and Tourism funded construction of a section of the Biodiversity Trail, another recommendation of the assessment, between Strathcona Wilderness Centre and Blackfoot PRA. The trail will eventually link the protected areas from north to south through the moraine. Additional implementation opportunities are being explored by the Tourism Working Implementation Group (TWIG).

4.5.4 Interaction between the Core Areas, Buffer Zones and Transition Areas

(d) Please provide some additional information about the interaction between the three areas.

The moraine landscape supports abundant natural landscapes, such that the three zones are ecologically connected, allowing plants and wildlife to move across almost the entire landscape. Politically, the three zones generally fall under two jurisdictional mandates. The Core Areas and Buffer Zones are owned and managed for conservation objectives by federal and provincial agencies and environmental non-government organizations. The Transition Zone is under private ownership. While land use planning within this zone falls under municipal control, land management on a day to day basis is largely left to the land owner. Accordingly, the private land owner is an important partner in conserving the moraine's resources.

Although land use and development are managed by different levels of government, coordination across agencies is legislated and functional relationships encourage some level of cooperation on land use planning and land management. For example, each municipality must consult with neighbouring jurisdictions when updating their land use policies. Similarly, the protected areas agencies will also consult with municipalities when updating their management plans, and these agencies also coordinate to share certain resources (e.g., fire management, agricultural concerns). The BHI initially formed to encourage a more coordinated land management approach, and it has generally been successful in terms of coordinating shared initiatives, developing innovative management approaches and facilitating on-going, informal dialogue regarding land use and land management concerns.

Like most large landscapes, the broader public spans a range of interests, from businesses that conduct work within the area, to recreational users and residents. Culturally, the moraine has experienced change over time, with First Nations, Métis and European settlers each contributing to the history of the area. While few aboriginal residents currently remain in the moraine, Métis and First Nations communities do have historical connections to the moraine landscape, and have an interest in maintaining or in some cases, re-establishing those links. The BHI has initiated two phases of engagement to raise awareness among these members of the public since 2012.

First, a stewardship initiative brought together the broad range of government and non-government agencies with interests in recreation, conservation and cultural values of the moraine, with a goal of leveraging the

resources and shared interests of those groups to promote stewardship within the moraine. Second, a public outreach campaign actively promoted the biosphere reserve nomination among moraine, Edmonton region and broader provincial publics, including schools, community organizations, municipal councils, industry and other public venues. In addition, the BHI initiated discussions with both key provincial organizations representing aboriginal groups with historical and current interests in the moraine lands, the Confederacy of Treaty Six First Nations and the Métis Nation of Alberta to explore potential for collaboration. Those efforts to engage with the public and with aboriginal communities have built a basis for a range of partnerships for land stewardship and cultural awareness within the moraine.

4.6 Organizational Arrangements

"Organizational arrangements should be provided for the involvement and participation of a suitable range of inter alia public authorities, local communities and private interests in the design and the carrying out of the functions of a biosphere reserve."

4.6.1 Arrangements in Place or Foreseen

(Describe involvement of public and/or private stakeholders in support of the activities of the biosphere reserve in core, buffer and transition areas (such as agreements, protocols, letters of intent, protected area(s) plans).

The Beaver Hills Biosphere will be managed by the BHI, with the support of its membership. The BHI has created an organizational structure and governance system that has sustained active participation of over 30 partner agencies (municipal, provincial and federal government, environmental non-governmental organizations, academic institutions, and industry) in cooperative regional sustainability management since 2002.

The BHI is also actively soliciting involvement from additional stakeholders, including aboriginal and other members of the public. Discussions initiated this past year with the Métis Nation of Alberta and the Treaty Six Confederacy of First Nations will continue to investigate shared interests and collaboration opportunities. Similarly, members of the public have been encouraged to become involved in the BHI and the future biosphere reserve during all public engagement efforts. The public engagement program will continue to encourage involvement of all stakeholders, and will particularly target affected stakeholders as specific initiatives are proposed (e.g. eco-tourism, sustainable agriculture, drought protection).

Letters of support for the biosphere reserve nomination have been provided by current and prospective partners, including all levels of government, non-government organizations, industry, academic institutions and First Nation and Métis organizations (Confederacy of Treaty Six First Nations and Métis Nation of Alberta (Appendix I: Letters of Support). Several members of the public have also provided letters of support, in addition to the 919 responses received during the public engagement campaign. This broad base of support suggests that the BHI partnership can support the activities of the proposed biosphere reserve, as does past success of the BHI in promoting and maintaining regional cooperation for sustainable development.

The existing governance model of the BHI will establish the model for cooperation among these public and private stakeholders in the management of the biosphere reserve. The principles, structure and governance of the BHI are laid out in the Land Management Framework (LMF, 2015) and the BHI Policies. These documents reflect the values and principles to which the BHI members have committed in their partnership, which include:

- Maintaining a voluntary, cooperative approach to sustainable development, with the goal of conserving the natural character of the Beaver Hills Moraine through shared initiatives.
- Balancing representation among the partners to ensure active participation and input from all stakeholders (three levels of government, ENGOs, community organizations, academic institutions, industry and the public). As membership expands, the BHI has rebalanced representation through a consensus based process, a consideration now under discussion relative to potential for new public and aboriginal members.
- Ensuring a deliberative and consensus-based approach to decision-making and implementation of shared initiatives, at the Working Group, Executive Committee and Board level.
- Recognizing the autonomy of partner agencies, and the critical role of municipalities and protected areas in managing the moraine, each within their own contextual constraints.
- Recognizing and facilitating the significant commitments that all partners have made to the BHI (in terms of time, resources, personnel and initiative) to further the goals of the BHI and conservation of the moraine.

Specific agreements define more specific areas of cooperation among partners in the BHI. This includes the BHI Protected Areas Cooperation Plan (Appendix J), which outlines the cooperative arrangement among federal, provincial, municipal and non-governmental organizations involved in protected areas management. A Memorandum of Understanding for Fiscal Agency has established Strathcona County's role as the fiscal agent for the BHI, with support from all BHI partners. The BHI has not yet incorporated as a formal organization, in part to encourage active participation of all partners. Although an unusual approach, the arrangement has worked well in the past, and is anticipated to maintain support for the biosphere reserve. The current 12 year partnership has largely been sustained by this emphasis on voluntary participation and consensus-based action (Patriquin, 2014).

The voluntary nature of the governance structure allows flexibility to add new members to the Board and Working Groups, or for members to choose their levels of activity based on current priorities and resources. Any member can participate in Board discussions and bring forward suggested initiatives through the Working Groups or the Board, but Board approval is required for the BHI to proceed with any initiative. Board decisions are consensus-based. A culture of respectful debate has largely minimized conflict and decisions have regularly been achieved by consensus. Regardless, a structure of representatives has been developed and periodically reviewed to accommodate changes in membership, and to ensure a balance among partner interests. Currently the structure allots representation to each of the municipal governments, federal and provincial agencies (jointly), non-government organizations, industry, academic/research sectors, community groups and the public. Governance policies are currently being revised to include public and aboriginal stakeholders and ensure their interests are also represented.

The current BHI governance structure allows all partners to participate in decision-making regarding BHI activities and encourages open communication and sharing of ideas and innovation. Working Groups comprising representatives of partner organizations or individuals design and implement BHI projects and strategies, addressing specific needs and interests of the BHI members. In some cases, networking groups have formed to manage specific projects or investigate shared emerging interests. This flexible approach allows for specific opportunities to be explored in a timely way, and for the interests of the membership to be addressed

with relevant partners. Currently, the BHI has six key Working Groups that are active in the main coordination areas of research, conservation, communication / education, land use planning, tourism and municipal government:

- Research and Monitoring Working Group
- Protected Areas Working Group
- Planners Working Group
- Councillors Working Group
- Communication and Outreach Working Group
- Tourism Working Implementation Group

The Beaver Hills Dark Sky Preserve Working Group is also currently active and working on specific initiatives. All Working Groups have formalized internal policies. The Chairs of each working group sit on an Executive Committee that helps plan and coordinate the activities and projects undertaken by the BHI. An Executive Director seconded from Strathcona County supports the day-to-day activities of the group and, with members of the Executive Committee, performs a liaison role with the public, external agencies and member organizations. In addition, the Chairs of each working group present monthly reports to the Board to ensure that all BHI members are kept informed of individual projects. This reporting mechanism ensures that any proposed new projects receive Board approval and incorporation into the annual business plan. The business planning process now evaluates and prioritizes all proposed projects to be undertaken by or with cooperation of the BHI to ensure accountability with BHI priorities and capacities.

The existing BHI funding and business planning model would also be maintained. Administrative funding is contributed by the partner municipalities, allowing consistent support for the operation of the BHI. Those operational funds have been successfully leveraged for additional grant funding for specific projects, totalling $1M since 2002. Strathcona County also contributes legal, accounting, office, staff and support for the operation of the BHI in its role as Fiscal Agent and an additional $1.5 M of in-kind support has been provided by the partner agencies involved in Working Groups and at the Board level. Proposed and approved projects, and associated funding sources, timelines and responsibilities are identified through an annual business planning process, which ensures transparency and accountability to BHI partners (Appendix C: BHI, 2012-2015 Business Plan). This business model has sustained the organization financially since 2002, and has helped provide innovative management tools and information useful to each of the partners. The role of in-kind support (personnel, administration and services) has been critical and has helped facilitate adoption of innovation by partner organizations. Going forward, the biosphere reserve may require additional funding sources, and industry partnerships are now being considered as means to supplement grants available to government and other organizational partners. A more detailed description of the BHI's governance, current organizational structure and funding structure is provided in Appendix K: BHI Governance and Policies.

4.6.2 Cultural and Social Impact Assessments

Have assessments been conducted, or similar tools and guidelines been used?

The current cultural and social context of the moraine and surrounding area was characterized for this nomination process to help identify key community stakeholders, through analysis of indigenous history, European settlement and current land use patterns. The terrain within the moraine largely prevented

development of large urban centres. The largest urban centre - the Edmonton metropolitan area - lies immediately west of the proposed biosphere reserve.

Today, the moraine is predominantly a rural community comprising agricultural and rural residential landowners and a few small villages. The terrain is more suitable for smaller agricultural operations of up to 640 – 1280 acres (258 – or 517 ha, or one to two sections of land), supporting livestock ranching; hay farming; hog, poultry and horse production; and agri-tourism operations (e.g., market gardens and greenhouses). Cereal crops are grown in the area, but soil limitations generally discourage large scale operations. Other industrial activities in the moraine are limited to oil and gas production facilities (well sites and collector pipelines). Two major petroleum refining complexes lies to the north (the Industrial Heartland) and east of the moraine (Strathcona Refinery area), and they and the urban centres are key drivers of the regional economy. Areas nearest the larger urban centres support a commuting population of professionals who live and recreate within the moraine but work in the adjacent cities, towns and industrial areas. The population shifts to more agricultural residents on the eastern and southern edges of the moraine. Finally, easy access to the various protected areas within the moraine also supports high recreational use of the area by regional residents.

The communities within and near the moraine represent a modern Canadian mosaic of long-term residents of European and aboriginal descent and more recent immigrants from within Canada and beyond. Communities throughout the Edmonton region proudly celebrate this multicultural heritage and increasingly acknowledge both original aboriginal residents and more recent European settlers. In this sense, the cultural character is changing to be more inclusive of traditional First Nations and Métis connections to these lands. That mixed heritage is reflected in facilities such as Fort Edmonton, which recreates the post-Contact fur trade era and early European settlement period and the Ukrainian Cultural Historical Village, which commemorates one of the main group of European settlers of the region.

The traditional connections of aboriginal communities to the moraine were disrupted by past government sponsored resettlement programs, which has changed the cultural understandings of aboriginal and settler populations alike. No permanent First Nation or Métis community remains in the moraine today, resulting in a loss of direct cultural association with the moraine. Historically, Cree and Blackfoot First Nations used the moraine seasonally as a hunting area and winter refuge. Cree were the most recent group to include the moraine as part of their traditional territory. Métis also lived in the moraine through the early to mid-1800s, in small communities and homesteads. Both aboriginal groups moved away from the area in the late 1880s to early 1900s, after resettlement through Treaty Six (Cree) and the scrip and settlement programs (Métis).

Today, although some First Nations people hunt or recreate in the moraine lands, most have established in communities beyond the moraine (e.g., reserves in Maskwacis and Saddle Lake). Most Métis moved to other communities, or to Métis settlements. A few Métis families remained in the moraine, but often chose to integrate into their local communities to avoid potential discrimination. Initial discussions with the Confederacy of Treaty Six First Nations, the Métis Nation of Alberta and individuals of aboriginal descent linked to the moraine suggest an openness to explore and renew understandings of traditional use and ecological knowledge of this area. As a result, Beaver Hills Biosphere may differ from others in the MAB network, in that it can play a role in re-establishing indigenous cultural connections to a landscape and building broader cultural awareness within the region.

Socially and culturally, the biosphere reserve can positively influence residents in several ways. Increased attention as a tourist destination could bring economic benefits. Sustainable management initiatives could also bring direct benefits to the quality of life for local and regional residents, as well as recognition for successful innovations. The BHI is well positioned to contribute to the social, economic, cultural and environmental health of such communities, by sharing its expertise and resources to develop local initiatives. The BHI has been engaging these civic leaders and community members in open workshops on the future of stewardship in the moraine and area. These workshops have served several purposes: to identify needs and concerns relevant to land managers and communities; to generate potential solutions to shared concerns; and to foster collaborative relations amongst these groups. Many of the communities are interested in demonstration projects, possibilities that can be explored together with partners within the BHI.

4.7 Mechanisms for Implementation

4.7.1 Mechanisms to Manage Human Use and Activities in the Buffer Zones

Does the proposed biosphere reserve have: (a)"mechanisms to manage human use and activities in the Buffer Zone or Zones"? If yes, describe. If not, describe what is planned.

The Buffer Zones are largely under the control of two provincial agencies. AESRD manages the Blackfoot PRA and the various smaller provincial natural areas within the moraine through its Tourism, Parks and Recreation Division. ESRD is also responsible for management of the Ministik Game Bird Sanctuary and Miquelon Lake Bird Sanctuary. Each agency has developed a specific management plan for their respective areas that emphasizes the conservation goals for each area and restricts non-compatible land uses.

Provincially, the Plan for Parks (2009) has incorporated public comment into a renewed management direction and vision for all provincial protected areas; its strategies apply to the Blackfoot PRA and the natural areas. Among other specific programs identified in the plan is the Alberta Parks Division Science Strategy, which supports evidence-based decision-making relating to the management of parks. The research initiatives of the BHI mesh well with this new strategic direction for provincial parks, and BHI activities are proposed in MLPP (a proposed Core Area) as well as Blackfoot PRA. More generally, land use in the Blackfoot PRA and the natural areas is also restricted to certain activities by the Provincial Parks Act and the Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act.

Management of the Ministik Game Bird Sanctuary and the Miquelon Lake Bird Sanctuary is administered by Alberta Environment and Sustainable Resource Development, through two constituent divisions. Alberta Public Lands Division has jurisdiction over land use and land management within the sanctuaries, while Alberta Fish and Wildlife Division manage wildlife and habitat resources. The Ministik Wildlife Management Plan (Alberta Fish and Wildlife Division, 1989) re-affirmed the wildlife management goals for the area, and particularly the waterfowl production values that motivated creation of the sanctuary in 1911. The plan also formalized existing cooperative management efforts between Alberta Fish and Wildlife Division and Ducks Unlimited Canada to enhance waterfowl habitat. From a land use perspective, the plan recognized past development within the sanctuary (e.g., oil and gas leases) and the role of Alberta Public Lands in land management within the sanctuary. It also restricted future development to certain areas. Today, the area remains largely undeveloped, except for hiking and snowmobile trails and a research station operated by the University of Alberta. Off-road vehicles are discouraged in the area, though snowmobiles are permitted under specific winter conditions. The management plan has not been updated and remains the main guidance

document for conservation of these lands. A specific management plan has not been developed for the Miquelon Lake Bird Sanctuary.

4.7.2 Management Plan for the Biosphere Reserve

(b) a management plan or policy for the area as a biosphere reserve"? If yes, describe. If not, state how such a plan or policy will be developed, and the timeframe. (If the proposed area coincides with one or more existing protected natural area(s), describe how the management plan of the proposed biosphere reserve will be complementary to the management plan of the protected area(s)).

The BHI developed Land Management Principles in 2007 that outline sustainable management objectives for the area, and have been adopted by all member organizations. The principles will also guide future management of the moraine as a biosphere reserve. Those principles were operationalized in the Land Management Framework (2007) which provides specific information and management tools for use by land use planners in site-specific and landscape level decision-making. Elements of the framework have been incorporated into the land use planning departments of each of the member municipalities, either as a practical resource guide or a more formal statutory policy. An updated 2015 version of the document provides web-based mapping information and other additional resources for land use planners, developers and land owners.

The management agencies of the protected areas within the BHI have also developed a Protected Areas Co-operation Plan that identifies the respective goals, strengths and contributions of each federal, provincial and municipal agency, and the environmental non-governmental organizations. This document has helped to identify areas where cooperative efforts could be undertaken to develop a regional approach to protected areas management, including collaboration on issues of common concern, educational programs and training. Alberta Parks has developed a Heritage Appreciation Development Plan that identifies interpretive and visitor experience objectives for its protected areas within the moraine. Where feasible, the plan identifies opportunities for collaboration with Parks Canada and other environmental non-governmental organization managers of protected lands within the moraine. Lastly, the BHI has developed two other support documents intended to facilitate stewardship engagement among BHI partner organizations and community organizations (See Appendix L: Stewardship Engagement Strategy) and coordinate eco-tourism development across the moraine (Tourism Development Opportunity Assessment).

Other regional and provincial plans will also influence future land management decisions within the moraine and many of those have or will consider the moraine as a special conservation zone. Parts of the moraine have already been incorporated into established regional plans. The Alberta Capital Region Board is a regional land management organization established by the Province to address growth management within the Edmonton metropolitan area. The City of Edmonton and adjacent municipalities, including three members of the BHI (Lamont, Leduc and Strathcona Counties), comprise the Board. The Board has completed a regional growth management plan (Growing Forward 2010) that identifies priority growth and conservation areas. The plan recognizes the Beaver Hills policy area within Strathcona County as one of the region's "Regional Buffer Zones" and it specifically identifies the moraine as a "Conservation Buffer".

Regional planning for the Integrated Watershed Management Plan (IWMP) for the North Saskatchewan River Basin under the province's Water for Life strategy was initiated in 2005, upon completion of the State of the Watershed Report by the North Saskatchewan Watershed Alliance (NSWA). The Beaver Hills is a significant portion of the Beaverhill sub-watershed, one of 12 sub-watersheds within the basin planning area. Mandated

by the Water for Life policy, the NSWA completed public consultation and engagement on the draft discussion document for the IWMP and the associated Water Quality Objectives Report (December 2011). As a member of the BHI, NSWA has accessed the BHI's data describing land use, land management and environmental conditions within the moraine as well as consulting with the other BHI partners on appropriate management objectives.

Lastly, regional recognition of the moraine as a special area could be established the mandate of the Alberta Land Use Framework, which is enabled under the Alberta Land Stewardship Act (ALSA, 2009). The Land Use Framework requires regional plans for sustainable land use to be developed across the province and the North Saskatchewan Regional Plan is to be completed in the next year. Although municipalities have the option to negotiate inter-jurisdictional regional plans (the Capital Region Plan is an example), the province can create additional policy under the ALSA regarding regional sustainability objectives. The plan can recognize specific areas valued by Albertans, such as the moraine, within its policy and provide management objectives geared to sustainable use and conservation of its resources. The BHI and its partners have been working with the province to develop background pieces to ensure sustainable use of the moraine is incorporated into the regional plan – the tourism initiative of Alberta Culture and Tourism is one such example. The Transfer of Development Credit pilot project currently under development through the BHI partners is also of interest, as this pilot project would test a new legislative mechanism for conservation permitted under the ALSA.

The provincial Land Use Framework Secretariat may also use the BHI as an example of a regional sustainable management approach for the pending North Saskatchewan Regional Plan. The vision, mission and guiding principles of the BHI are very consistent with the intent of the provincial Land Use Framework and the ALSA, and the BHI already provides a working example of some of the innovative approaches recommended in the Provincial Framework. The regional planning process thus offers several opportunities to influence the direction of future policy within the moraine. This opportunity will be particularly strengthened by designation as a biosphere reserve.

4.7.3 Designated Authority for the Biosphere Plan

"(c) A designated authority or mechanism to implement this policy or plan"?

Yes. The BHI has already established an organizational structure and governance system to administer regional sustainable management and planning initiatives within the proposed biosphere reserve. It does not have the authority to implement specific action within member jurisdictions; each member land manager retains autonomy and control of its own lands. This arrangement is not planned to change, because voluntary adaption has proven to be a more successful model for this area. In part, this is because the political, economic and social context varies considerably across the moraine. A voluntary adoption model, backed by commitment to the Land Management Principles, allows each land management agency to adopt Land Management policies at a time and to the degree appropriate for that agency. The BHI has been very effective in initiating collaborative projects through the Board, the working groups and between relevant partner agencies (for examples, please see Appendix C: Beaver Hills Initiative, 2012-2015 Business Plan) through voluntary cooperation, and the BHI anticipates this support to continue within the biosphere reserve.

To explain this arrangement more specifically, each of the member agencies and organizations has committed to cooperative management of the moraine landscape without delegating any specific authority to the BHI to act as a third party agency. Instead, the agreement has created a unique management role for the BHI as a

coordinator, facilitator and manager of programs involving and benefiting relevant and interested member organizations. Ultimately, however, the choice to participate in programs and implement solutions developed by the BHI remains the prerogative of the individual member organizations. As a result, the BHI Board and Working Groups are critical in achieving sustainable management of the landscape. The programs and initiatives they develop help facilitate new partnerships as well as providing new information. Perhaps more important are the lines of communication maintained among the members and between the BHI, its member organizations and the public. The members of the BHI have, for the most part, demonstrated their enthusiasm for the initiative by adopting the information generated by the BHI within their own land management practices. The converse is also true: the BHI has relied on information generated by its partners to create tools and value-added products useful within the context of the management of the moraine. Information sharing within and among the BHI partners has become an important function of the BHI.

4.7.4 Programs for Research, Monitoring, Education and Training

"(d) Programmes for research, monitoring, education and training"? If yes, describe. If not, describe what is planned.

In the past, each of the protected areas has implemented its own research and monitoring agenda, often in conjunction with student and academic researchers from the University of Alberta. Ducks Unlimited Canada has also actively conducted research and monitoring of specific project sites and broader landscape issues in the moraine area for many years. The BHI has established a Research and Monitoring Working Group to help coordinate research priorities for the region and facilitate partnerships that could achieve efficiencies in conducting such projects. The Working Group currently comprises representatives from EINP, Alberta Parks and Alberta Environment and Sustainable Resource Development, Alberta Innovates Technology Futures, Ducks Unlimited Canada, consulting companies and the University of Alberta. As a group, they have identified opportunities for collaboration and priorities for research and monitoring initiatives, which are in turn taken forward to the BHI Board for inclusion in the annual business plan update. A similar process allows each Working Group to discuss and prioritize projects related to education, training and other means to promote sustainable development. The Research and Monitoring Working Group has developed specific criteria to evaluate and prioritize its proposed research projects within the business planning process, but other Working Groups have not yet adopted a formal review process. As noted in Section 4.6.1 above, the BHI has some municipal funding available for such projects which can help leverage other grant funding. Progress and funding are tracked through each business planning cycle. Much of the past research has focused on ecological issues but "human dimensions" are now included as one of the business planning criteria. Future plans will build on past initiatives and will expand to include more social science and applied sustainable or conservation management approaches.

The BHI hopes to continue its role as a facilitator of regional research initiatives within the biosphere reserve. Research and monitoring efforts will include development of demonstration projects for sustainable agriculture and conservation management on the Golden Ranches, and potential projects through a new research station at MLPP (operated by the Augustana Campus of the University of Alberta). No specific education or training initiatives are currently identified, other than support for the Beaver Hills Bioblitz, a collaborative outreach event held with several non-governmental organizations to promote ecological awareness and biological monitoring programs. The BHI has also recently completed a "State of the Beaver Hills" report card on its biodiversity and ecological goods and services that can assist in management and facilitate tracking of management effectiveness. The most recent business planning cycle has prioritized these research initiatives.

A detailed list of the projects identified for the current business planning cycle is provided in Section 15.1.4. The business plan is currently under revision and will include development of a joint fire management plan, as well as continued support of the sustainable nature-based tourism implementation plan, stewardship engagement implementation strategy, communication and engagement strategies, and a biosphere reserve implementation strategy.

The Communication and Outreach Working Group has also identified opportunities for future collaboration and their role in communicating the work within the future Beaver Hills Biosphere Reserve. They are now developing a collaborative plan to incorporate the results of the Research and Monitoring Working Group and the land management successes of the BHI partners within the moraine into their education and leadership training programs. They also look forward to collaborating with other biosphere reserves, to identify other UNESCO Education for Sustainable Development programs that could be adopted here.

5. ENDORSEMENTS

(If a large number of Authorities are involved, please enclose the additional endorsement letters as a separate Annex).

See Appendix H for copies of letters of support.

5.1 Authorities for the Core Areas

Signed by the authority / authorities in charge of the management of the Core Area(s):

Elk Island National Park of Canada

Full name: _____

Title: _____

Date: _____

Signature: _____

Alberta Environment and Sustainable Resource Development (Miquelon Lake Provincial Park)

Full name: Bill Werry

Title: Deputy Minister

Date: May 22, 2015

Signature: 

5.2 Authorities for the Buffer Zones

Signed by the authority/authorities in charge of the management of the buffer zone(s):

Alberta Environment and Sustainable Resource Development (Ministik Game Bird Sanctuary, Miquelon Lake Bird Sanctuary, Cooking Lake-Blackfoot Provincial Recreation Area)

Full name: Bill Werry

Title: Deputy Minister

Date: May 22, 2015

Signature:

Strathcona County (Strathcona Wilderness Centre)

Full name:

Title:

Date:

Signature:

Alberta Fish and Game Association (Secured lands and conservation easements)

Full name:

Title:

Date:

Signature:

5.2 Authorities for the Buffer Zones

Signed by the authority/authorities in charge of the management of the buffer zone(s):

Alberta Environment and Sustainable Resource Development (Ministik Game Bird Sanctuary, Miquelon Lake Bird Sanctuary, Cooking Lake-Blackfoot Provincial Recreation Area)

Full name: _____

Title: _____

Date: _____

Signature: _____

Strathcona County (Strathcona Wilderness Centre)

Full name: Jean Helen Funk

Title: Supervisor, SWC

Date: May 21, 2015

Signature: Jean Funk

Alberta Fish and Game Association (Secured lands and conservation easements)

Full name: see following Sherwood Park Fish and Game Association

Title: _____

Date: _____

Signature: _____

Sherwood Park Fish and Game Association (Secured lands and conservation easements)

Full name: FRANK LEE SHPK F&G

Title: & ALBERTA FISH & GAME LIFE MEMBER

Date: MAY 22/15

Signature:

Nature Conservancy of Canada (Secured lands and conservation easements)

Full name: BOB DEMULDER -

Title: REGIONAL VICE PRESIDENT

Date: MAY 21 / 2015

Signature:

Edmonton and Area Land Trust (Secured lands and conservation easements)

Full name: GLEN THOMAN

Title: BOARD CHAIR

Date: MAY 25, 2015

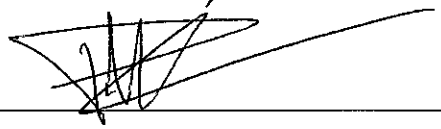
Signature:

Ducks Unlimited Canada (Secured lands and conservation easements)

Full name: TERRY McCORMICK

Title: MANAGER OF PROVINCIAL OPERATIONS

Date: MAY 25, 2015

Signature: 

5.3 National or Provincial Administration

Signed as appropriate by the National (or State or Provincial) administration responsible for the management of the core area(s) and the buffer zone(s):

Signatures as above.

5.4 Local Authorities or Spokespersons

Signed by the authority/authorities, elected local government recognized authority or spokesperson representative of the communities located in the transition area(s).

Beaver County

Full name: KEVIN SMOOK

Title: REEVE, BEAVER COUNTY

Date: MAY 25 2015

Signature:

Lamont County

Full name: Wayne C. Woldanski

Title: Reeve

Date: May 14, 2015

Signature: Wayne Woldanski

Leduc County

Full name: JOHN B. WHALEY

Title: MAYOR

Date: MAY 14 2015

Signature: John Whaley

Strathcona County

Full name: ROXANNE CARR

Title: MAYOR, STRATHCONA COUNTY

Date: MAY 13, 2015

Signature:

5.5 MAB National Committee

Signed on behalf of the MAB National Committee or focal point:

Full name: _____

Title: _____

Date: _____

Signature: _____

PART II: DESCRIPTION

6. LOCATION (Coordinates and Maps)

6.1 Geographic Coordinates

Provide the biosphere reserve's standard geographical coordinates (all projected under WGS 84):

Cardinal points:	Latitude	Longitude
Most central point:	-112.967129	53.471924
Northernmost point:	-112.912842	53.783173
Southernmost point:	-112.837782	53.201714
Westernmost point:	-113.324612	53.457099
Easternmost point:	-112.660226	53.493568

6.2 Map

Provide a map(s) on a topographic layer of the precise location and delimitation of the three zones of the biosphere reserve (Map(s) shall be provided in both paper and electronic copies). Shapefiles (also in WGS 84 projection system) used to produce the map must be attached to the electronic copy of the form. If possible, also provide a link to access this map on the internet (e.g. Google map, website…).

Please see Figure 1, which illustrates the geographic location of the zones for the Beaver Hills Biosphere.

7. AREA

	Terrestrial	Marine (if applicable)	Total
Area of Core Areas	21,725 ha	N/A	21,725 ha
Area of Buffer Zones	21,766 ha	N/A	21,766 ha
Area of Transition Areas	116,069 ha	N/A	116,069 ha
TOTAL:	159,560_ ha		159,560 ha

7.1 Rationale for Zonation

Provide a brief rationale of this zonation in terms of the respective functions of the biosphere reserve. If a different type of zonation also exists indicate how it can coexist with the requirements of the biosphere reserve zonation. (e.g., if national criteria exist for the definition of the area or zones, please provide brief information about these).

The proposed Beaver Hills Biosphere area and zonation have been developed to deliver the three functions in a complementary manner in practice, and so meet the requirements of the UNESCO Seville Strategy, Statutory Framework for the World Network of Biosphere Reserves, and Madrid Action Plan. The designation of the Core Areas and Buffer Zones was based on the two broad categories of protected areas present within the Beaver Hills (Figure 1). EINP and MLPP are managed primarily for conservation purposes, in a manner consistent with the intent of the Core Area of a biosphere reserve. The management objectives of these areas are to protect the ecological integrity and biodiversity of the protected lands and accordingly, land uses are restricted to those with minimal environmental impact. Ministik Game Bird Sanctuary, Miquelon Lake Bird Sanctuary, the Blackfoot PRA, the lands comprising the Strathcona Wilderness Centre and the other smaller natural areas within the moraine may allow a somewhat broader range of land use, but their primary intent is still focused on conservation of the natural values of the protected landscapes. These management objectives are consistent with the Buffer Zones of a biosphere reserve. Plate 1 highlights the diversity of landscapes protected within the moraine.

Many of the smaller protected areas and lands under conservation easements are not only important in their own right but collectively serve critical biodiversity protection roles by ensuring effective connectivity between the larger designated protected areas along the "protected spine of the moraine". They have consequently been considered as part of the Buffer Zones of the proposed Biosphere Reserve. This also is consistent with UNESCO's criteria for Buffer Zones. In addition, the sustainable land use practices promoted within these areas can provide examples relevant to other biosphere reserves.

Lastly, the BHI and its partners have invested funding, developed research, advised on municipal policy development, and implemented educational and communication programs to promote sustainable land management in the private lands (the Transition Area) surrounding the Core Areas and Buffer Zone (Plate 2). Municipal partners have begun to incorporate voluntarily the sustainable practices and tools compiled or developed by the BHI into land use and land management policies, a testimony to the success of their approach to cooperative land management.

Subgroups of the BHI partners have engaged in programs to develop additional biophysical and socio-economic information and management tools for use by its partners and to actively conserve particularly sensitive parts of the moraine. While the specific tools and programs they have developed provide examples that may be helpful to other biosphere reserves within the global network, the lessons gained through their experiences in regional land management may offer even more widely applicable insights into appropriate land management practices. The process by which the BHI has formed effective collaborations and a unified approach to land management with organizations that have not been traditional partners in land management, offers much to biosphere reserves globally, as well as to the moraine.

Plate 1. Protected areas within the Beaver Hills
(Clockwise from upper left, clockwise: EINP, MLPP, Blackfoot PRA, Ministik Game Bird Sanctuary).

Plate 2. Typical Transition Area landscapes.
[Clockwise from upper left: pioneer shed with log construction, typical of homesteading era; regenerating farm meadow; rural residential acreage; agricultural lands.]

8. BIOGEOGRAPHICAL REGION

The Beaver Hills lies within the Temperate Grassland Ecosystem (UNESCO classification system, 1996) and is part of the Temperate Grassland Biome (Begon et al., 1990). Under the national biogeographical system, it is part of the Canadian Prairie Ecozone (Ecological Stratification Working Group, 1995). Under the Canadian National Parks System Plan, Parks Canada considers this area part of the Southern Boreal Plains and Plateaux Natural Region of the Interior Plains (Parks Canada, 2009).

Provincially, the moraine is recognized as a distinct biophysical feature, a disjunct, southern island of the Boreal Forest and, specifically, the Dry Mixedwood Boreal Natural Subregion (Natural Regions Committee, 2006). Regardless of the classification system, this part of the Canadian landscape is considered a zone of transition, separating the southern prairie grasslands from the northern, moist boreal forests. It also grades from intensely altered landscapes to relatively untouched wilderness and because of past development activities, it contains some of the most endangered habitats in Canada (Parks Canada, 2009). The moraine presents a smaller scale example of the resulting mosaic of developed and natural lands, and of protected areas and lived-in and working landscapes.

The elevation of the moraine above the surrounding plains creates the climatic conditions to support boreal vegetation. That same elevation makes this a physically identifiable landscape feature, distinct from the lower elevation, agricultural plains around it. Surrounded by the Aspen Parkland Natural Subregion, this example of the Dry Mixedwood Boreal Subregion is an ecologically distinct transitional area, supporting high biodiversity due to the juxtaposition of the two natural subregions (Natural Regions Committee, 2006).

The distinctive landscape and ecological value of the Beaver Hills result from its “knob and kettle” topography, extensive forest cover and abundant native wetlands (Plate 3). This combination of hummocky terrain, wetlands and poor (rocky) soil conditions has limited past agricultural clearing with the result that much of the Beaver Hills remains in natural upland cover (approximately 55%) or surface water (14%) (H. Sawada, pers. comm.). As mentioned elsewhere in this application, much of the naturally vegetated area has been protected as either federal or provincial parks. Consequently, it is not surprising that the Beaver Hills is a key area under the North American Waterfowl Management Plan (NAWMP). As part of the Prairie Pothole Region of Canada, the moraine is considered critical to sustain breeding of migratory waterfowl at the continental level. Due to past wetland loss from development activities, it is also one of the top 25 threatened waterfowl sites in North America (Ducks Unlimited Inc., 2010). As a result, the Beaver Hills has been the focus of attention of the Nature Conservancy of Canada and Ducks Unlimited Canada for many years. These organizations have actively conserved lands through purchase, conservation easement arrangements and directly, working to improve habitat in cooperation with other land managers (e.g., a 2013 pilot wetland restoration project in the Blackfoot PRA involving Alberta Parks, Ducks Unlimited and the Blackfoot Grazing Association).

Developed lands within the moraine support agricultural operations (cultivated, grazing and pasture), rural residential subdivisions at varying densities, and some industrial development (mainly oil and gas wells and pipelines). Several small villages and hamlets lie within the moraine but larger communities are beyond the moraine boundary (e.g., the cities of Edmonton and Leduc and towns of Tofield and Lamont). Sherwood Park straddles the boundary; a small part of this urban centre lies within the moraine. The relatively low population density within the moraine has helped to conserve its ecological functions. Ecological connectivity analysis

found that the moraine still maintains a good level of connectivity, particularly north and south along the chain of protected areas comprising the naturally vegetated "spine" of the moraine (Spencer Environmental Management Services Ltd., 2007). As such, the basic components of natural habitat are in place for ongoing support of the relatively high level of regional biodiversity within the moraine.

Plate 3. Ecological diversity of the moraine (top row: marsh and swamp wetlands; bottom: morainal landscape)

9. LAND USE

9.1 Historical Land Use

If known, give a brief summary of past/historical land use(s), resource uses and landscape dynamics of each zone of the proposed biosphere reserve.

Griffiths (1992) identified several periods of human use in the moraine. Land use during each of these periods is summarized in the sections below:

9.1.1 Aboriginal Culture Period (13,000 BCE. to 1700 CE)

Archaeological findings suggest that the Beaver Hills was used by Aboriginal groups as early as 12,000 to 8,000 years ago (MacDonald, 2009). Land use history is punctuated by technological change. Access to new tools or resources has often led to expanded human capacity in transportation or trade and so contributed to new patterns of settlement. In the period of early ecological succession after glacial retreat, resources and travel were limited (MacDonald, 2009). Horses did not come to the plains until the mid-1800s and dogs were the main aid in transport of goods.

Use of the moraine by these early peoples was tied closely to its glacial history and subsequent ecological development. Vegetated watercourses and uplands provided vital shelter from a harsh environment. Although the identity of these early people is not certain, they are thought to have been nomadic, yet rooted in areas with adequate resources. Movements were motivated by necessity, following bison, a key food resource, and other large game or travelling to known, seasonal food sources such as berries (the "seasonal round"). Where conditions supported a long stay, groups would remain in the area, foraging within the adjacent lands as long as possible. The extensive evidence of localized camps across the moraine suggests it was a hospitable and well-supplied landscape for these early residents. Archaeological evidence of campsites and work areas is abundant - about 150 to 200 sites have been identified in EINP alone (MacDonald, 2009; D. Ryerson, pers. comm.).

After the arrival of the horse, Aboriginal peoples could range over wider areas (MacDonald, 2009). Before this, hunting and travel during the seasonal round were on foot or supported by dogs, and thus restricted to a relatively small area. Spears, and later, bow and arrow, assisted in hunting of game, particularly bison. But a limited range of travel made a keen eye on the bison essential. These early people closely followed herd movements. The grasslands then were a commons resource, shared by various herds of bison and the boreal and prairie peoples reliant on them for sustenance.

The moraine became shared territory for various tribes using both the prairie and boreal lands (MacDonald, 2009, p. 17). The moraine provided abundant bison, other game and shelter for the various Algonquin (Cree, Blackfoot and Sarcee) and Siouan (Assiniboine) speaking groups that moved between parkland and prairie environments. The Saulteux, an Algonquin-speaking group, was also active in the area. The Blackfoot and Sarcee, whose traditional areas extended into the aspen parkland, later abandoned these lands for the prairies to

the south, but Cree, Assiniboine and Blackfoot tribes considered the moraine to be a shared territory until the last decade of the 18th century, when the emergent fur trade created a new regional economy.

9.1.2 European Contact and the Fur Trade Era (1700-1870 CE)

Use of the Beaver Hills gradually shifted from subsistence to harvest and finally to more permanent residence after arrival of the first Europeans to North America and the emergence of the fur trade. The catalyst for change was the Canadian beaver (Castor canadensis). Between 1700 and 1870, beaver pelts were sought out by the early European explorers for export to lucrative European markets depleted of their own beaver supply (Newman, 1986). From forts established on Hudson Bay and through a collection system organized across the West by First Nations (Cree) trappers, eventually trade moved closer to the source. By the end of this period, beaver were heavily trapped by local Aboriginal groups for sale to the local Hudson's Bay Company (HBC) forts in the Edmonton area (Griffiths, 1992). The strong link between the moraine and beaver is reflected in the Cree name for the moraine, a-misk wa-chi ("place rich in beaver"; MacDonald, 2009).

This demand established a fur economy among the Cree, who at that time, extended across the boreal region. Trade brought new partnerships among the various Cree tribal groups and their neighbours. It also introduced new knowledge and tools, including the gun, which created a power imbalance among the tribes. Horses had also arrived with the Europeans, allowing greater mobility and hunting efficiencies (MacDonald, 2009). The combination of new economic relationships and mobility led to a shift in territories. The Blackfoot moved south onto the grasslands, aided by horses and guns, and the advantage they offered in the hunt of bison. The Cree remained focused on the boreal and parkland areas, and the beaver economy.

Realization of the possibilities offered by a trade monopoly ushered in another transition in land use of the Beaver Hills. The HBC had been granted sole control over the entire drainage system of Hudson Bay (Rupert's Land, comprising most of western and northern Canada) by Charles II of England in 1670 (Newman, 1986). The HBC's arrangements with the Cree enabled lucrative trade at the forts established at the bay, without the risk of inland travel. Secure in their monopoly, the HBC stayed the course for decades, relying on their Cree partners to build an expanded fur collection network across the West, supporting trade at its Hudson Bay forts. But in the 1750s, French Canadian traders searching for a western route to the Orient discovered the possibilities of direct trade along the northern rivers and began to compete by establishing trading routes of their own through the western wilderness (Newman, 1986). Competition sparked a race to establish a foothold along the North Saskatchewan River in the mid-1770s (MacDonald, 2009). Traders from the HBC and its competitors soon had a number of forts along the river, in and around Edmonton, the first permanent European presence near the Beaver Hills. These forts became a focal point for trading activity with First Nations trappers and later, in the 1790s, for missionary work by the Methodist, Anglican and Catholic churches.

In this changing economic context, conflict replaced the cooperative use of the landscape. Aboriginal groups (mainly Cree) established permanent camps in the Beaver Hills and surrounding areas and began to compete with other groups for control of the territory supplying furs to the European traders (Husby and Fast, 2004). The parkland zone between the North Saskatchewan and Battle rivers became a contested landscape, as northern and southern tribes adjusted to the transition away from traditional use of the moraine's resources (MacDonald, 2009). Recognition of the Battle River as a place name in the records of early explorers around 1793 (e.g., Peter Fidler) and in maps from 1803 reflect the now contentious relationship between the Woodland Cree, Assiniboine and Salteaux and the prairie Blackfoot Confederacy. The missionaries added another

transformative influence. Charged with the task of serving the spiritual and educational needs of the settled traders and their First Nations neighbours, they travelled to the Aboriginal camps, introducing other aspects of European culture.

As the fur trade began to wane through the 1850s to 1870s, some of the early fur trader families began to settle in the area around Edmonton, establishing farms and small trading centres. Métis communities of bison hunters who decided to remain near the herds, rather than travel seasonally to the hunt from the Red River area in Manitoba, established in northeast Alberta, and within the Beaver Hills. The new interest in settlement piqued other interests as well, and in 1857, the British government commissioned the Palliser Expedition, a major survey project to assess land and resource values in the West.

9.1.3 Pre-settlement Interlude (1870-1890)

In the 1850s, concern about the exclusive control held by the HBC over Rupert's Land and growing settlement of the western United States led to transfer of HBC lands to the new Dominion of Canada in 1869 (MacDonald, 2009). Palliser's Expedition in 1857 and other resource evaluations outlining the rich potential of these lands provided additional motivation for settlement. Fort Edmonton remained the key administrative centre for the region through this period and the settlement of the old fur trade families within the region helped encourage growth. The small community of Logan, west of Beaverhill Lake, was named for one such former trader at Fort Edmonton. The great herds of bison, long the central feature of the parkland life, began to decline, and the Métis hunters also retired to their small communities, mainly north of the Beaver Hills, but also one at the south end of Beaverhill Lake (MacDonald, 2009). The shift to random settlement in the frontier, and the potential for conflict over land and resources, spurred federal efforts to establish some form of territorial government.

Soon after the transfer of Rupert's Land to Canada in 1869 (effectively much of the northern and western parts of Canada), surveyors from Ottawa began mapping out parcels land for sale (MacDonald, 2009). Plans for a railway were proposed to facilitate settlement, but were contingent on land settlements with the resident First Nations peoples. Starvation and an outbreak of smallpox among First Nations groups added to the tensions with the European settlers. A division of the North West Mounted Police was established at one of the old Fort Edmonton trading forts at Fort Saskatchewan, north of the moraine, to enforce basic laws and assist in the transfer of First Nation title to lands. A similar process occurred across the province, resulting in establishment of three treaties that formalized the land transfer for groups of First Nations within broad geographical regions of the province. Treaty Six (1876) included 16 First Nations groups within central Alberta and Saskatchewan and incorporated the moraine lands (INAC, 2012). Treaty 7 covered five First Nations groups in southern Alberta and Treaty 8 comprised 24 First Nations groups in northern Alberta, British Columbia, Saskatchewan and parts of the Northwest Territories.

Treaty Six assigned the sole Aboriginal group residing within the Beaver Hills, headed by Chief Bobtail, lands along the Battle River, to the southwest of the moraine (the current Ermineskin reserve near Maskwacis). A group near Edmonton, the Papachase, had also frequently used the moraine lands and had been assigned reserve lands south of their community under that same treaty. They were later pressured to give up that reserve for compensation (scrip) or be transferred to the Enoch reserve west of Edmonton. This effectively removed legal ties of the remaining First Nations residents in the moraine, but not necessarily their physical or cultural ties.

Métis rights had not yet been settled on the Prairies and conflict over land ownership came to a head in 1885 with the Riel Rebellion in northeast Alberta and in Saskatchewan (MacDonald, 2009). Military intervention resolved this final barrier to settlement, firmly establishing the new land terms with the Métis and other First Nations. Chief Bobcat conceded to federal authority and permitted the survey for settlement of his lands to the west of the Beaverhill Lake, an outstanding obligation of Treaty Six. Some Métis peoples emigrated from Saskatchewan to the Edmonton region, to establish in the small communities within the Beaver Hills Moraine, west of Beaverhill Lake (and in existing communities such as Logan; Husby and Fast, 2004). But organized settlement of these lands was now in motion, ushering in the next phase of land use of the moraine.

9.1.4 Homesteading Period and Non-mechanized Agriculture and Recreation Period (1890-1945)

While Griffiths (1992) considered the homesteading period to begin around 1890, others have identified the first significant attempts to settle within the moraine around 1870, when the Canadian government began to promote settlement of the Western provinces by offering homesteading claims to Eastern Canadians and European immigrants (Husby and Fast, 2004; MacDonald, 2009). Although the broad plains around the moraine were gradually cleared for agricultural use by these pioneers, the rocky soils and difficult terrain of the Beaver Hills were not easily converted to cultivation. Instead, agricultural use was generally limited to the more gently sloped moraine edge (MacDonald, 2009).

The spruce and aspen forests of the moraine continued to sustain its human residents, first as a source of food to supplement the crops of early pioneers, and later, as a source of building materials. As nearby urban centres such as Edmonton began to grow, the timber resources in the moraine forests became more valuable, and in 1895, a large area was set aside as the Cooking Lake Timber Reserve (Husby and Fast, 2004). This was partly in response to large forest fires that swept across the moraine in 1889, 1892 and 1895, threatening the newly established settlements and homesteads. Other aspects of the moraine were recognized to be at risk due to settlement and were also protected as land reserves. Conservation concern for herds of wild elk (wapiti) spurred creation of the Elk Island Game Reserve in 1906 from part of the original Cooking Lake Timber Reserve lands (MacDonald, 2009). Later, between 1907 and 1912, the reserve received new residents - a herd of 700 bison from Montana purchased by the federal government to sustain one of the last herds on the prairies. The role of the Elk Island Game Reserve in conservation prompted inclusion in the federal National Park system in 1913. Ministik and Miquelon were established as Migratory Bird sanctuaries around 1920 to protect pelican colonies and other bird species. Lastly, the Blackfoot Grazing Reserve was established south of EINP as a community pasture initiative in about 1930 (it was formally established as the Blackfoot PRA in 1983), one of Alberta's first. Today's federal and provincial protected areas are remnants of these original reserves and conserved lands now comprise 423 km2 (27%) of the moraine land base.

Beyond the reserve lands, sawmills were established to supply lumber for the growing towns around the young commercial centre of Edmonton - a welcome income for the moraine homesteaders (Husby and Fast, 2004). The Department of Forestry operated a tree nursery on the north shore of Cooking Lake until the early 1930s (Husby and Fast, 2004). Timber harvest and forestry remained an important land use within the moraine until the mid-1950s.

The Government of Canada completed land surveys of the moraine area in 1907, which marked another period of transition of the moraine landscape (Husby and Fast, 2004). The key component of the federal plan for settlement of the west, rail access, arrived soon after. The completion in 1909 of the Grand Trunk Pacific Railway (GTPR), a local section of the northwestern Grand Trunk Rail line extending from Winnipeg to Prince Rupert, spurred on new growth (Husby and Fast, 2004; MacDonald, 2009). Previous and new settlers began to file claims on homesteads to obtain legal titles to the land (Husby and Fast, 2004). Small communities such as Deville and North Cooking Lake began to develop in the heart of the moraine, supporting the agricultural activities of established homesteaders (MacDonald, 2009). The new Grand Trunk Rail line and the GTPR removed one of the last barriers to settlement of the moraine: transportation. Now, the small communities were connected with larger urban centres across east central Alberta, including those in and around the moraine (Husby and Fast, 2004). The development of the GTPR was significant in the modern development of the Beaver Hills area. Taken over by Canadian National Railway in 1920, the GTPR provided a vital transportation link for the early settlers and, during its construction, an important source of work and income for moraine residents.

The final drive for settlement was one of several factors that pushed most of the Métis residents from the moraine. Many did not hold legal title to the lands on which they lived and lacking such security, could not hold off homesteading interest on the lands they occupied (Métis Settlements General Council, no date). Métis in many areas of the province were displaced by new settlers who laid claim to land under the new settlement policies. Métis leaders lobbied for recognition of their land tenure and their contributions to the early development of the province. In 1935, the Alberta Government launched an investigation of the impoverished conditions of Alberta Métis, through the Ewing Commission. In 1938, the province passed the Population Betterment Act, a response to a recommendation of the commission, which established 12 Métis settlements in central and northern Alberta to provide a permanent home for the Métis. Not all Métis wished to move to the settlements, however, and some, including a few families in the Beaver Hills, chose to remain (C. McBurney, pers. comm.).

Small industries emerged in the lands adjacent to the moraine, including coal mining (MacDonald, 2009). By 1913, three mines were active in the moraine: two were strip mines and the third was underground. Eventually, these three merged into one operation (the Tofield Coal Company). Coal remained an important industry in the moraine area until discovery of oil in the Leduc oil fields in 1947 (MacDonald, 2009).

The access provided by the GTRP also opened the lakes of the moraine to commercial recreational operations, offering opportunities for residents in Edmonton and the nearby area (Husby and Fast, 2004). A summer resort developed on North Cooking Lake, off the rail line, and was well used until a series of economic downturns forced its closure (reduced use due to World War I, dropping lake levels in the 1920s, and finally, the depression in the 1930s). The early 20th century saw the last phase of settlement and the emergence of established communities, supported by agriculture, forestry and recreation. This land use pattern has remained consistent within the moraine, and is present still, albeit in updated forms, on today's landscape.

9.1.5 Mechanized Agriculture and Recreation Period (1946-1973)

Agricultural land use slowly continued to develop within the moraine from the early 1900s (Husby and Fast, 2004). The homesteaders began to see positive results of their labour, particularly once the droughts of the 1930s passed and growing conditions improved. Communities grew and became prosperous (MacDonald,

2009). Schools, churches and recreational facilities, both commercial and government-supported, established in these communities and within the conserved lands. After World War II, the federal *Veteran's Act* attempted a last effort to populate the moraine with offers of homesteads. Few accepted the challenge of these poor agricultural lands and focused instead on the new opportunities of the emerging oil and gas industry.

Discovery of the Joseph Lake oil and gas field in the 1950s introduced this new industry to the moraine landscape, one that spurred rapid development in some areas of the moraine (Hunt, 1950; Gow and Gow, 2005). Although production from these original wells has slowed today, oil and gas wells and pipelines established at that time remain active.

Cars and motorized equipment fostered other changes in the agricultural landscape. Increased automobile ownership and access to heavy trucks meant less reliance on rail transportation (MacDonald, 2009). Farm labour could be replaced by machinery, which increased agricultural productivity. Other changes in the surrounding landscape, including the establishment of Sherwood Park in the mid-1950s and development of the first oil refinery on the east side of Edmonton, introduced new opportunities for living, working and recreating in and near the moraine (MacDonald, 2009). Increased private car ownership made group outings to EINP and Cooking Lake more accessible and recreational use of the moraine's amenities more frequent.

Recreational use of the moraine began during the early settlement of the Edmonton area in the late 1800s, and grew with the enhanced transportation links provided by the railway. Conservation efforts had set aside large areas of the moraine under federal and provincial protection. However, changing public attitudes prompted a shift in park management, which allowed recreational developments in EINP in the 1920s. By the 1940s, a policy change within the Dominion Parks Service emphasized a new role for parks as "National Playgrounds" (MacDonald, 2009). Commercial recreational and accommodation facilities, summer camps and a golf course were established in EINP, but most closed around 1968, casualties of a changing market and a shift in policy toward an environmental focus. The golf course remains in the park and receives steady use.

9.1.6 Rural Urbanization (1974 onwards)

Today, the proposed Transition Area (comprising 73% of the moraine) includes a mix of larger, traditional agricultural holdings and smaller operations, with roughly half in some form of permanent perennial forage, pasture or grassland, and half under cultivation for annual crops (C. Vanin, pers. comm.). In part, the extent of permanent cover is due to past government actions such as the Permanent Cover Program (1989-1994) and Greencover Program (2003-2007), which encouraged conversion of marginal cropland to perennial forage or grassland (C. Vanin, pers. comm.). Nearly a dozen of the moraine's producers entered into agreements with Agriculture & Agri-food Canada under those initiatives, committing to sustainable grazing or forage production systems until 2015. Agriculture and Agri-food Canada's mandate is to support and encourage

sustainable agriculture. The department actively reviews the need for programs such as this, and the possibility exists for extension of this program or the introduction of new programs and initiatives.

The moraine population is largely rural (living on traditional agricultural properties) or 'rurban' (living in rural residential subdivisions, or acreages). Few urban communities remain within the moraine and these are largely limited to small villages with only a few homes and businesses (e.g., South Cooking Lake, Uncas). In some locations, only a community hall remains of an original settlement. Small cities such as Fort Saskatchewan, Leduc or Camrose (population of <25,000, Statistics Canada, 2014) and small towns of 500 to 2,000 residents (e.g., Bruderheim, Tofield, Statistics Canada, 2014) lie within about 20 km of the moraine. Edmonton and Sherwood Park, the largest urban centres, are at the eastern edge of the moraine (Sherwood Park in fact lies partly within the moraine). The Edmonton metropolitan area (which includes Strathcona County) is Canada's second fastest growing region, with a population of in 1.3 million according to the 2014 municipal census (Statistics Canada, 2015). In contrast, the total population of the other four municipalities (Beaver, Lamont, Leduc and Camrose counties) is 30,823 (Statistics Canada, 2014), with only a small fraction of that population living in the moraine.

9.2 Reserve Users

Who are the main users of the biosphere reserve? (For each zone, and main resources used). If applicable, describe the level of involvement of indigenous people taking into account the "United Nations Declaration on the Rights of Indigenous Peoples". (http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf).

Core Areas and Buffer Zone

The Core Areas and Buffer Zones of the proposed biosphere reserve are all protected areas, with a management mandate that emphasizes conservation and recreational use. For the two Core Areas of EINP and MLPP, for example, conservation is a primary management objective, although both parks also support recreational use. Trails, campsites and interpretive centres in each park provide recreational opportunities to local users as well as tourists. EINP is also actively involved in management of species at risk, including wood and plains bison and trumpeter swans. Conservation activities related to management of these species, and other ecologically important species (e.g., beaver, elk) are another important land use within this park.

Recreation and conservation are key management objectives in the Buffer Zone protected areas as well, although camping is not permitted in any of these protected areas. Trails have been developed in the Blackfoot PRA, the two Game Bird Sanctuaries and some of the provincial Natural Areas and are used for non-motorized and motorized (Ministik Game Bird Sanctuary only) activities. The smaller provincial Natural Areas and conservation properties owned by non-governmental organizations may support wildlife viewing, nature appreciation and other passive forms of recreation, but have little infrastructure to support recreational uses.

Other non-recreational land uses are also permitted in some of the provincial protected areas. The Blackfoot PRA has community pastures used by local ranchers, and some oil and gas infrastructure that was installed under previous policy. While no new oil and gas development will now be permitted, these sites will be maintained until production warrants closure, then decommissioned and reclaimed. MLPP and Ministik Game Bird Sanctuary also have some older oil and gas well sites and pipelines that are slowly being closed and reclaimed.

Transition Area

Today, a wide range of farm types exist in the moraine, according to the 2006 Census of Agriculture (Figure 4). Under the North American Industrial Classification System (NAICS), beef, horse and pony, grain and oilseed and hay farms are the most common types of operations (C. Vanin, pers. comm.). Small- to medium-sized operations (less than 1,120 acres) are increasingly important within the moraine (Husby and Fast, 2004, C. Vanin, pers. comm.) and, in fact, these smaller operations comprise 50% of the farms in the moraine (C. Vanin, pers. comm.). These smaller operations range from confined feeding operations of cattle, hogs or poultry to market gardens. Fruit production market gardens (e.g., strawberries and saskatoon berries) have been a relatively recent development that provides agri-tourism opportunities as well as marketable produce to local farmers' markets and local residents. The Ag Capture program conducted by Agriculture & Agri-food Canada in 2008, an inventory of farm operations in the moraine, also identified a number of riding stables, and a few local meat processors, aquaculture and specialty game bird producers within the moraine (C. Vanin, pers. comm.). Organic farming is another recent innovation increasingly popular within the moraine and adjacent lands.

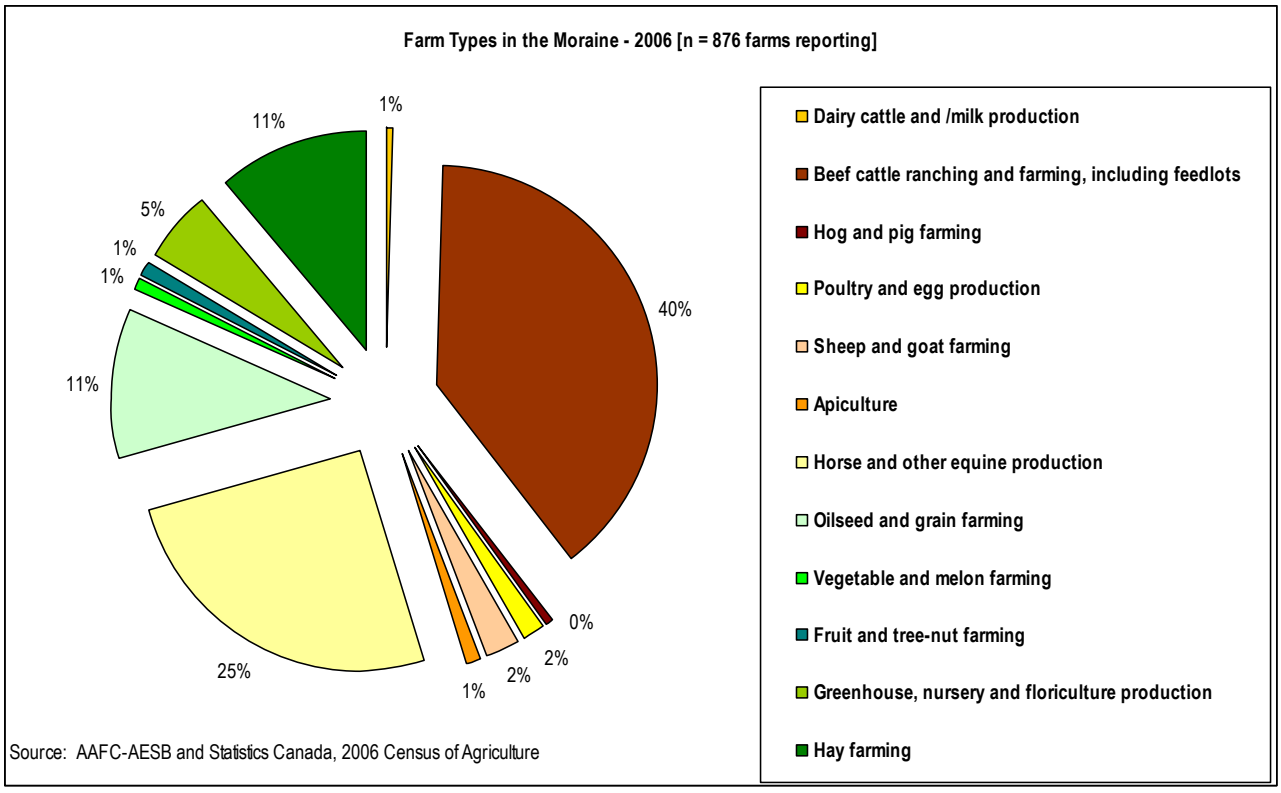


Figure 4. Farm types in the Beaver Hills (C. Vanin, pers. comm.).

Rural residential subdivisions began to develop within the Strathcona County part of the Beaver Hills in the late 1960s (D. Chemylk, pers. comm.), and became increasingly prevalent throughout all municipal jurisdictions within the moraine through the 1990s. Rapid growth in applications for subdivision of agricultural lands to create various densities of acreage properties was one of the land use pressures that prompted formation of the BHI. Most of the municipal partners in the BHI have now introduced or are considering land use policies to direct rural residential development to specific areas, adjacent to existing civic

infrastructure (water, sewer and electricity services, and recreational and other public facilities), in an attempt to reduce environmental and financial impacts and conserve good agricultural lands.
Lastly, several types of small- to medium-industrial land use exist within the Beaver Hills, including oil and gas development (pipelines and well sites), aggregate extraction and small manufacturing facilities. Although forestry is not as important as it was in the past, several small, privately owned agroforestry operations have established in the moraine and have generated over $100,000 in annual sales according to the 2006 Canadian Census of Agriculture. Early oil and gas infrastructure (e.g., wells, pipelines established in the 1950s) remains on the landscape and active, particularly near Joseph Lake, but this is now an old field. New development includes large pipelines constructed to transport petroleum products through the moraine, from Alberta's Industrial Heartland to refineries and markets in Eastern Canada and the United States (e.g., the Enbridge pipeline). Alberta's Industrial Heartland, the heavy industrial facilities that support the provincial petroleum industry, is located to the north of the Beaver Hills near Fort Saskatchewan and west of Sherwood Park. This industrial area provides an important economic base for many local residents.

The abundant lakes of the moraine have remained an attraction to local and regional residents; small commercial campsites now supplement those in the various protected areas. The terrain creates challenging golf courses, which have also been established in some locations. In addition, several bed and breakfast operations and other fixed roof accommodations market themselves based largely on their location within the natural landscape of the moraine. Their proximity to a number of important protected areas provides another draw. Together, these private and public operations promote the strong recreation and tourism potential of the area, for moraine residents as well as those in the adjacent urban areas and beyond.

9.3 Land Use Rules

What are the rules (including customary or traditional) of land use in and access to each zone of the biosphere reserve?

The proposed biosphere reserve includes a mix of public and private lands. Generally, access to public land has few restrictions, but access to private lands is granted only by the landowner. The proposed Core Area and Buffer Zones include public lands controlled by federal and provincial protected areas agencies (Parks Canada and Alberta Parks) and private lands held or managed by environmental non-governmental organizations. These private lands are held for conservation purposes, and most of the organizations permit some level of public access. The Transition Zone is mostly private land held by individual and commercial landowners who limit access to their lands. Municipal and provincial governments also own small parcels within this zone, which support servicing purposes (e.g., waste disposal areas, municipal water plants). Access is understandably limited in such areas.

Within the federal and provincial protected areas comprising Core Area and Buffer Zone lands, land use is managed under park management plans. Those plans designate specific areas for recreational, park support and other uses, with a general objective of conservation of natural features and habitats. Lands owned or managed by environmental non-governmental organizations have similar management objectives. Land use on the private lands within the Transition Zone is managed under a high-level Municipal Development Plan (MDP) and a more specific Land Use Bylaw (LUB). Each municipality develops these plans independently, based on objectives determined through consultation with area residents. That collective vision is summarized in the MDP, and the LUB outlines the specific rules guiding land development and to some extent, land

management (e.g., weed management, storm and waste water management). In many instances, the partner municipalities have incorporated policies in these documents that outline expectations for land conservation, particularly for wetland habitat and areas with significant natural features. The BHI's Land Management Framework (2015) provides a variety of Best Management Practices for land use planners and private land owners that can be adopted voluntarily, as the need or interest arises.

9.4 Gender and Resource Use

Describe women's and men's different levels of access to and control over resources. (Do men and women use the same resources differently (e.g., for subsistence, market, religious/ritual purposes), or use different resources?).

The natural resources and ecological services in the moraine are accessible to all residents of the moraine and the broader region, regardless of gender. In agricultural areas, both male and female members of the household contribute to the operation of the farm, with no division of control over specific resources. Rural and village residents have equal access to local resources (e.g., water, natural areas), limited only by rights provided under private landownership. Regional residents who recreate in the area also share open access to trails, natural areas and other park facilities, with no differentiation based on gender.

Traditional aboriginal land uses of the resources in the moraine have changed with resettlement outside the moraine area. Aboriginal residents within the moraine are few, and limited to Métis descendants. Discussions with a local First Nations elder suggest activities traditionally practiced by specific genders, such as berry picking (women), waterfowl hunting and spiritual retreats (men) shifted to new locations near reserve lands after resettlement (Matters, 2014). Some First Nations residents from reserves in the region do still hunt in the moraine area, but it is unclear whether the practice follows traditional gender roles.

10. HUMAN POPULATION OF PROPOSED BIOSPHERE RESERVE

(Approximate number of people living within the proposed biosphere reserve)

	Permanently	Seasonally
Core Areas	21 (2011 census)	300,479 (2009 visitors)
Buffer Zones	0 (2011 census)	65,000 (2008/09 visitors)
Transition Areas	12,000 (2011 census)	0 *
Total	12,021	365,479

** Note that seasonal residents may hold property within the Transition Area, but such information is not collected by municipalities or in the Canadian census.*

10.1 Local Communities

Provide a brief description of local communities living within or near the proposed biosphere reserve.

As per the 20011 Canadian Census, the Beaver Hills is occupied mainly by rural residents, either living on active farm holdings, or non-farm rural residential properties (multi-lot subdivisions or small acreages, Statistics Canada, 2014). A small part of the moraine overlaps Sherwood Park, an urban centre within Strathcona County with a higher density, residential population (about 2% of Sherwood Park's population lies within the moraine, based on past municipal census data). Five small communities (villages, summer villages and hamlets) are within the moraine (Figure 1), but otherwise, the population of permanent residents is dispersed at low density across the private lands under the jurisdiction of each municipal government. For example, Strathcona County, the municipality with the largest area of the moraine, had 26,938 rural and small village or hamlet residents, with an additional 65,465 urban residents in Sherwood Park (Strathcona County, 2012 census data). Twenty-one people reside permanently in staff housing at EINP and at MLPP. Researcher accommodations at each park may be occupied seasonally. No permanent or seasonal residents live in the Buffer Zone protected areas. Seasonal visitors to the various protected areas within the Core Area and Buffer Zone total about 300,479 and 65,000 respectively. Most use occurs in the summer months and visitors may use these areas for the day or for overnight camping trips of one day to several weeks.

Economic activities focus on agriculture and total farm gross receipts generated over $62.8 M for the moraine economy in 2006 (2006 Canadian Census for Agriculture). While 40% of farm operators work only on their farm operations, 60% do work off-farm for 40 hours or more per week (C. Vanin, pers. Comm.). These and other rural residents often commute to Edmonton and other urban centres in the metropolitan area to their places of work. Demographics of the area differ depending on proximity to Edmonton. Strathcona County is a fast growing, affluent, professional community (12.1% growth from 2006 to 20011, Statistics Canada, 2014), with an aging and well-educated population (Graham and McFarlane 2001). Leduc County is also growing in terms of income and population (3.1% growth from 2006 to 2011, Statistics Canada, 2014), but it tends to have a higher proportion of trades workers than does Strathcona County (Husby and Fast, 2004). Residents of Camrose County, Lamont County and Beaver County are primarily employed in agricultural industries and have similar educational backgrounds to Leduc County (Graham and McFarlane, 2001, Husby and Fast, 2004). Lamont and Beaver counties had a slower rate of growth over the last national census period of 2006 to 2011 (-0.8% and 0.2% respectively, Statistics Canada, 2014). Camrose county, in contrast had an 8.0% increase over this same census period (Statistics Canada, 2014). Lamont County's population decrease may be due to a faster aging population than the other four counties (Husby and Fast, 2004). Relative to the national

average of 5.9% population growth (Statistics Canada, 2012, Strathcona and Camrose are growing faster than most municipal regions in Canada.

Ethnic backgrounds of the residents of the moraine reflect that of the original settlers of the region, modified by recent phases of immigration to Canada. As a result, the cultures within the moraine are similar to the multi-cultural mosaic found across Canada. Many rural residents are descendants of early settlers to the region, who were primarily of European origin. Ukrainian immigrants were among some of the first to homestead in this region and this culture is still well-represented across the moraine. Early Scandinavian immigrants settled in and around Camrose, south of the moraine and as a result, families of Norwegian, Swedish and Finnish descent can be found in the southern part of the moraine. A variety of other ethnic backgrounds can be found within the moraine, descendants of early settlers or later 20th century immigrants to the region.

The treaty process and resettlement to reserves outside the moraine displaced early Aboriginal residents and today few First Nations peoples reside within the Beaver Hills. Their traditions and history are still actively maintained, but not necessarily through direct linkage to the moraine lands themselves. The Ermineskin Cree Nation has maintained its community identity (now centred on its reserve lands near Maskwacis about 50 km from the southern edge of the moraine) through dedicated preservation of its traditions and history (Ermineskin Cree Nation, 2011). Talented artists within the Ermineskin Cree Nation have been recognized for their work within and outside the First Nations communities, and school programs teach and help sustain native traditions and the Cree language (Ermineskin Cree Nation, 2011). The Ermineskin and other Treaty Six Nations communities have also developed active relationships with a variety of faculties at the University of Alberta's North Campus in Edmonton as well as the Augustana Campus in Camrose. Aboriginal Student Services on both campuses help the University of Alberta provide an environment that encourages full access, participation and success for Aboriginal students (ASSC, 2011). These services also facilitate awareness in the broader community of local Aboriginal history, culture, Cree language and traditional land use through invited talks and presentations by First Nations community members, and special events (P. Cegielny, pers. comm.). Some First Nations individuals have maintained connection with the moraine through eco-tourism enterprises and hunting. First Nations peoples have subsistence hunting rights and can hunt on Crown-owned lands, including some of the provincial protected areas within the moraine (e.g., the Blackfoot PRA). Métis groups are pursuing similar rights, but this matter is still under legal deliberation.

About five Métis families remain in the moraine area today; most moved to the settlements formed by the province in 1935, or followed other opportunities beyond the moraine (C. McBurney, pers. comm.). Métis community ties remain through St. Margaret's Catholic Church; many early Métis residents are buried in its cemetery. The owners, the Métis Nation of Alberta, have applied for Municipal Historic Resource designation from Strathcona County, to replace a provincial designation now transferred to participating municipalities under the Municipal Heritage Partnership Program (L. Clapp, pers. Comm.). The remaining Métis in the area have no formal organizational links to the moraine. They have instead integrated into and identify with the communities in which they live, while acknowledging their Métis heritage through other provincial associations.

EINP and Alberta Parks have worked with First Nations groups in the past to develop park programming. EINP's Park Management Plan (2005) identified as an objective the need to explain the First Nations cultural heritage associated with the moraine in a way that respects their traditions and values. In its 2011 Management Plan, the park continues to investigate ways in which First Nations can contribute to the park's

cultural programs regarding the early history of the moraine landscape. Public events hosted by the Beaver Hills Dark Sky Preserve partnership have provided valuable opportunities to integrate Cree and Blackfoot sky knowledge with astronomers and public enjoyment and education, including the development of First Nations star maps.

Plate 4. Inhabited Areas of the Moraine
[clockwise from left: St. Margaret's Catholic Church (former Provincial Historic Site, application for municipal historic resource designation through Strathcona County submitted); rural residential subdivision; agricultural pasture and old farm shed; plaque commemorating historic site of Miquelon school (1913-1952)].

10.2 Major Settlements

Name(s) of the major settlement(s) within and near the proposed biosphere reserve with reference to the map (Sec 6.2):

According to the most recent census in 2011, the nearest urban centres to the moraine include:

Urban Centre	Population
City of Edmonton	812,201
Hamlet of Sherwood Park	64,733
City of Leduc	24,279
Town of Tofield	2182
Town of Lamont	1753

10.3 Cultural Significance

Briefly describe the proposed biosphere reserve's importance in terms of past and current cultural values (religious, historical, political, social, and ethnological) and others, i with distinction between material and intangible heritage.

The Beaver Hills has been a consistent draw for human use, beginning with First Nations peoples, then early European settlers and more recent residents. Although land use has changed over time, the region has been inhabited more or less continuously for the past 8,000 years, much of that time by pre-Contact First Nations groups (MacDonald, 2009). European settlement, represented by the fur trade, began in the early 1700s, and was followed by European settlers lured by promises of agricultural land in the late 1800s (MacDonald, 2009). The area's abundant resources and natural landscapes have continued to attract others to the region since then, creating a rich and diverse cultural history. The sections below provide a brief summary of the cultural groups who have made use of the Beaver Hills, taken from Husby and Fast (2004) and MacDonald (2009).

10.3.1 Pre- Euro-Canadian Settlement

The moraine has been important to various Aboriginal groups for at least the past 8,000 years (MacDonald, 2009). Considered a shared territory by the Cree, Assiniboine and Blackfoot, the area was known for its abundant game and sheltering forests. Bordering the harsher prairie lands to the south, the area was well used by the various tribal groups. Projectile points have often been found near the large water bodies in the area, suggesting that these First Nations people used the area for subsistence hunting (Husby and Fast, 2004). Larger lakes, such as Beaverhill and Cooking Lake, appear to have been sites of large, permanent camps, whereas smaller lakes and sloughs appear to have supported smaller, temporary hunting camps.

Bison were a key food source for these early peoples and in the moraine area they were often harvested by driving small groups into "pounds" (small barricaded enclosures) where the individual animals could be easily killed (MacDonald, 2009). Bison are large animals and can provide large quantities of meat and hide, but other animals abundant in the moraine, such as elk, deer, ducks, and geese, provided alternate, seasonal foods. The archaeological record has gained much from descriptions of the hunting practices of early explorers and fur traders (see for example, descriptions in MacDonald, 2009).

In the early 1700s, the arrival of early Europeans to the area introduced the new economy of the fur trade. Beaver were an important trade item during the fur trade period and First Nation hunters turned to the moraine for harvest of beaver pelts to trade with the local Hudson's Bay Company post, Fort Edmonton (MacDonald, 2009). The nomadic lifestyle and shared ownership of the moraine began to change during the fur trade, as Aboriginal groups established permanent camps in the hills, to trap and trade with the local traders at the fort (MacDonald, 2009). The Sarcee began to move into the moraine from the prairie plains to the south at this time, and came into conflict with the resident Blackfoot groups (Husby and Fast, 2004).

10.3.2 European Contact and the Fur Trade

European contact began with the activities of the early explorers who were sent by the Hudson's Bay Company and the Northwest Company to map the terrain and resources of western Canada (Husby and Fast, 2004, MacDonald, 2009). Many of these early explorers travelled through the Beaver Hills in the 1800s, including David Thompson, Alexander Henry and Duncan McGillivray, as did Methodist, Anglican and Catholic missionaries later in that century (Husby and Fast, 2004). Many of these individuals left journals describing the Aboriginal groups, wildlife, and landscape of the area. Those writings describe a landscape of forests, shrublands and small lakes, and stories of severely cold winters. Their forts and missions, in turn, left their own cultural impressions on the landscape around the moraine.

During this early period of the 19th century, fur trading forts were established along the major northern river systems, including the North Saskatchewan River (MacDonald, 2004). Several versions of Fort Edmonton were constructed at the future site of the City of Edmonton and served as a central trading centre for local Aboriginal groups. Initially, the Cree were liaisons between the European traders headquartered in Eastern Canada and native fur trappers across the Canadian wilderness (Husby and Fast, 2004). Wanting to maintain a monopoly on the fur trade, the Cree drove other bands out of good trapping grounds using European guns, steel knives and steel arrowheads obtained by trading (Husby and Fast, 2004). The European traders encouraged the monopoly and the steady supply of furs the Cree could provide for their European markets, through their main trading forts in Eastern Canada. Over time, the Cree expanded their influence from Eastern Canada across the great plains of western Canada, including the Beaver Hills (Husby and Fast, 2004).

European demand for beaver fur during this period made the Beaver Hills an important hunting area due to its abundant beaver, and thereby an area of conflict (Husby and Fast, 2004, MacDonald, 2009). The Beaver Hills band of the Plains Cree drove out the Sarcee and Blackfoot and occupied this rich trapping ground soon after European contact (Husby and Fast, 2004). Raiding between the Beaver Hill Cree and Blackfoot was common through this period - Blackfoot Lake within the Blackfoot PRA was the location of a major battle between the two groups.

Missionaries also used the forts as a base for travel out to the surrounding First Nation communities (MacDonald, 2009). The introduction of Methodist, Anglican and Catholic faiths among these groups, and maintenance of the spiritual traditions of the traders and later settlers within the moraine lands relates directly to the efforts of these men. The historic St. Margaret's Catholic Church, a central part of the early community within the moraine, remains evidence of the impact of missionaries on First Nations and other residents of the moraine.

10.3.3 European Settlement

After the 1870s, the Canadian government looked to the western lands for potential expansion and began to encourage development and settlement (MacDonald, 2009). The Palliser Expedition that mapped the resource and settlement potential of the western lands, also passed through the moraine lands (Husby and Fast, 2004). This put the moraine "on the map" for potential settlement. The broad plains surrounding the moraine offered fewer obstacles to agricultural development and soon attracted early European and eastern Canadian settlers (MacDonald, 2009). Métis bison hunters, realizing the time of the great prairie hunts was drawing to a close, also began to settle in small communities through east central Alberta, including a small community near Cooking Lake (near St. Margaret's Catholic Church mentioned above). Although some areas within the moraine were also cleared to establish homesteads, the rugged terrain and rocky soils discouraged extensive agricultural development.

Logan, the Métis and ex-fur trader settlement founded just north of Tofield, was the earliest permanent settlement in the moraine (Husby and Fast, 2004; MacDonald, 2009). Established before 1892, it is now abandoned (only a cemetery remains). Other communities formed around the perimeter of the moraine, as immigrants from Germany, Poland, the Ukraine and Scandinavia settled in the area. The small communities grew as friends and relatives joined earlier pioneers to take up homesteads and together, they formed the base of today's multi-cultural region. New Sarepta, Josephburg and Bruderheim (German); Kingman, Hay Lakes, Ryley and Camrose (Scandinavian); and Star, Lamont, and Mundare (Ukrainian and Polish) lie within and adjacent to the moraine (MacDonald, 2009). The promise of religious freedom lured other new residents, and Mennonite, Hutterite and Moravian pioneers established some communities, such as Bruderheim. A hardy mixture of eastern Canadians, Americans and Europeans attempted to tame the moraine lands themselves, settling mainly along old trading trails extending from Edmonton, past Cooking Lake and through the heart of the moraine.

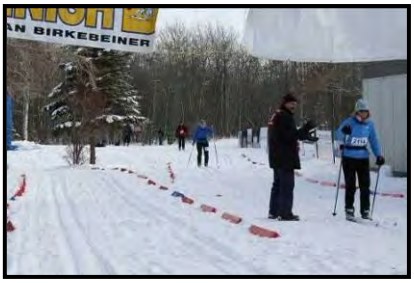
The last homesteading rush occurred after completion of federal land surveys of the moraine area in 1907 and of the Grand Trunk Railway (GTR) soon after (Husby and Fast, 2004). Creation of Alberta as a province in 1905 prompted careful consideration of future development. A shift in federal emphasis toward agriculture stimulated another phase of active recruitment and influx of homesteaders, this time from eastern Canada, Western Europe and the United States (MacDonald, 2009). With direct rail access to the new lands, these new residents readily established homesteads and settled in the small communities within the moraine (Husby and Fast, 2004). The new railway offered connections between the small communities and larger urban centres across east central Alberta and opened opportunities for movement, commerce, education and mixing of cultural groups not formerly possible. By the 1920s, times were prosperous and the local residents began to establish schools, churches and local governments within the moraine (MacDonald, 2009). The moraine lands again became a shared landscape, this time dominated by European, American and Canadian settlers, and their new agricultural economy and religious, cultural and political traditions.

10.3.4 Present Day

Although many of the early cultures have persisted within the broader region, the culture and traditions of more recent European and Scandinavian settlers have become firmly established in the moraine's communities. First Nations' use of the area continues to some degree through subsistence hunting on crown land and small eco-tourism operations. Cree descendants have remained mainly on Treaty Six Nation reserve lands at Maskwacis, southwest of the moraine. Métis descendants may still reside in the moraine, but have become part of the broader community within the greater Edmonton area, rather than a distinct community. Their cultural contributions to the character of the moraine are recognized in interpretive programs at the federal and provincial protected areas and both agencies have attempted to encourage active participation with First Nation groups.

The varied cultural backgrounds of the early settlers have been well maintained in the area, by the descendants' families and through government programs. The Ukrainian Cultural Heritage Village east of EINP provides a "living history museum", with the major theme of early Ukrainian settlement to east central Alberta before 1930. The Scandinavian heritage of settlers in the Camrose area, at the south end of the moraine, is similarly maintained through various local programs and activities, including locally organized cross-country ski events.

Recreational use of the moraine lands also continues in the many protected areas established since the early 1900s. The Canadian Birkebeiner, a cross-country ski marathon race and festival held in the Blackfoot PRA and EINP, attracts over 2,000 participants and spectators each year. This event attracts international visitors to the moraine, as do EINP, the Blackfoot PRA and MLPP.



10.4 Languages

Specify the number of spoken and written languages (including ethnic, minority and endangered languages) in the biosphere reserve. (Refer, for instance, to the UNESCO Atlas of Endangered languages (http://www.unesco.org/culture/languages-atlas/index.php)).

The moraine's human population comprises a mixture of cultural backgrounds and languages, with descendants of European-settlers, Métis and Cree indigenous groups, and new immigrants from around the world. Today the dominant spoken and written language in the area is English, one of Canada's two official languages (Statistics Canada, 2014.) French, Canada's other official language is enjoying a resurgence in the greater Edmonton area and in the moraine communities, although typically less than 2% of households speak only French and less than 10% are bilingual (Statistics Canada, 2014). In areas with strong cultural connections to original settler traditions, other European languages are still used, but often by less than 2% of the municipal population (Statistics Canada, 2014). German, Ukrainian, Scandinavian and Dutch speakers can be found in the small towns within and surrounding the proposed Biosphere Reserve.

Use of the Aboriginal languages of this area was actively suppressed through parts of the previous century and according to national census data, no current municipal residents reported use of Cree or other First Nations languages (Statistics Canada, 2014). Despite this historical change, Cree language has been maintained in First Nations communities to varying degrees, and it is now enjoying an active regeneration within those

communities with traditional connections to the moraine. As noted in Section 10.5, First Nations inhabitants of the moraine were resettled in reserves at Maskwacis and Saddle Lake, about 100 km and 180 km from the moraine, respectively, and many original Métis residents also moved away from the region after European settlement. English became the dominant language in the region, and use of Cree diminished through the 20th century even in First Nation communities, due to the influence of residential schools.

Métis residents may still speak and write in French or Cree, but neither language is commonly spoken within the moraine and Cree writing is rare. Recent efforts to restore the Cree language are gaining ground in many First Nations communities, and various initiatives exist in the region. Examples include a mapping project that has compiled Cree place names across the traditional Cree lands in Central Alberta, and Cree language instruction at schools in Maskwacis and Saddle Lake, and at the University of Alberta's North Campus. EINP had also investigated Cree names for places within the park, through an undergraduate project with the Augustana Campus of the University of Alberta. Reintroduction of Cree cultural understandings of the moraine landscape through language and Cree place names is a cultural initiative that could be further explored by the proposed biosphere reserve. Such initiatives have already been discussed with the Confederacy of Treaty Six First Nations and Métis Nation of Alberta.

11. BIOPHYSICAL CHARACTERISTICS

11.1. Topography

General description of site characteristics and topography of area: (Briefly describe the major topographic features (wetlands, marshes, mountain ranges, dunes etc.) which most typically characterize the landscape of the area).

The Beaver Hills comprises hummocky glacial till deposited by disintegrating, stagnant (non-moving) ice during the most recent glacial retreat (Husby and Fast, 2004). The relative rapid retreat of the glacial ice left rolling, hilly terrain with no defined watercourses. As a result, meltwater collected in depressions within the moraine, rather draining directly to nearby river systems. These depressions became shallow lakes or wetlands, charged first by melting glacial waters, and later sustained by rainfall and groundwater flow.

The Beaver Hills is a stagnant ice moraine, formed through the advance, and later retreat, of the Laurentide continental ice sheet (Emerson, 1977; N. Rutter, pers. comm.). At their peak, around 21,000 years ago, this ice sheet and extensions from the glaciers of the Rocky Mountains covered much of what would later become the province of Alberta (MacDonald, 2009). Around 12,000 years ago, the structure of the Beaver Hills was formed as the glaciers began to retreat. Sand, gravel and cobble debris ground from underlying bedrock during glacial expansion was deposited in mounded piles across this landscape as the ice sheets began to melt. Glacial meltwater formed Lake Edmonton, which flooded up to the newly formed Beaver Hills, still ice-bound with stagnant remnants of the retreating glaciers. Lake water was released suddenly after ice barriers blocking the lake's drainage melted, leaving a broad, flat plain, channels and basins later to become the North Saskatchewan River, Battle River and Beaverhill Lake, the major water features that surround the Beaver Hills today. The remnant ice in the hummocky terrain of the moraine was last to melt, and that meltwater fed the abundant wetlands and shallow lakes.

Between 10,000 and 12,000 years ago, the Beaver Hills began to develop their current ecological form (MacDonald, 2009). Watercourses stabilized as outflow from Lake Edmonton ceased. Vegetation established across this raw landscape, and the broader region in which the moraine lies became open aspen parkland separating the boreal forests of the north from the broad, prairie grasslands in the south. Yet the elevation of the moraine above the surrounding plains created a climate more similar to that of the northern Boreal zone. Boreal vegetation, including spruce and aspen mixedwood forest, established in the hills, a direct contrast to the aspen parkland on the surrounding plains. The result was a disjunct pocket of boreal forest located within a broader band of aspen parkland. The aspen parkland occupies much of the central part of the province and separates the northern boreal forest from southern prairies. The boreal habitats within the moraine are thus a distinctive feature on this landscape. The shelter and abundant resources of this treed, rolling landscape played an important role in the moraine's early land use history and continues to shape human activity within these lands.

This is somewhat different from the glacial history of the level terrain surrounding the Beaver Hills. Generally, the regional glacial retreat followed the path of natural drainage in central Alberta, to the northeast, causing

melt waters to be impounded in front of the glacier, producing large, but short-lived lakes (Bayrock and Hughes, 1962). These pro-glacial lakes continually found new and lower outlets, creating deeply incised channels. Glacial Lake Edmonton was one such pro-glacial lake and it formed to the west of the moraine, depositing thick lacustrine sediments. As glacial retreat continued, various outlets formed and the lake ultimately drained into the North Saskatchewan River, creating a deep valley (Bayrock and Hughes, 1962). Although smaller post-glacial meltwater channels do exist within and adjacent to the moraine, they are now dry, or support long, linear lakes (Husby and Fast, 2004).

Today, drainage generally flows off the moraine slopes toward the surrounding plains, but the overall drainage pattern is complex. Some surface water collects in a few smaller streams that flow out from the edges of the moraine. More commonly, the scattered ponds in the moraine lie within small and sometimes isolated drainage basins, and do not release waters through the hierarchy of creeks, streams and rivers as on the surrounding plains. Instead, surface waters infiltrate underlying sediments to recharge aquifers or they evaporate. For this reason, the moraine performs a critical role in regional hydrology.

The elevation of the moraine above the surrounding plains and its complex terrain contributed to the development of an ecological zone distinct from the surrounding plains. Based on the provincial ecosystem classification, the moraine is considered a disjunct pocket of the Dry Mixedwood Natural Subregion, a subunit of the northern boreal forest - different from the Aspen Parkland Natural Subregion that encircles it (Husby and Fast, 2004). Gray Luvisols formed under the forested uplands and Gleysols and Organic soils developed in the depressional areas (Natural Subregions Committee, 2006). Today, forests are predominately deciduous aspen (Populus tremuloides) or balsam poplar (Populus balsamifera) (Husby and Fast, 2004; Natural Subregions Committee, 2006), but prior to European settlement, white spruce (Picea glauca) and, to a lesser extent, balsam fir (Abies balsamea) were abundant (Husby and Fast, 2004). Forest fires were common in the area and in fact, provided motivation for first conservation efforts within the moraine, as a strategy to preserve timber building supplies (Husby and Fast, 2004). As a result, coniferous stands are now relatively rare within the moraine.

With settlement came the clearing of land for agriculture. The moraine was relatively rocky and had limitations for cultivation, but would support grazing. Clearing for cereal and forage crops replaced native forests, mainly on the west side and edges of the moraine. The rest of the moraine remains in native cover. Pure deciduous, mixed deciduous conifer and to a lesser extent, pure coniferous stands are distributed across the moraine with grasslands and dry shrublands, beaver shrublands and shallow lakes and wetlands (Husby and Fast, 2004).

11.2 Altitudinal Range

11.2.1 Highest Elevation above sea level: 724.9 metres

11.2.2 Lowest Elevation above sea level: 617.4 metres

11.2.3 For coastal/marine areas, maximum depth below mean sea level: N/A

11.3. Climate

(Briefly describe the climate of the area, you may wish to use the regional climate classification by Köppen as suggested by WMO (http://www.wmo.int/pages/themes/climate/understanding_climate.php)).

The moraine lies within the Boreal eco-climatic province (Natural Subregions Committee, 2006) and generally experiences a continental climate with short, cool summers and long, cold winters (Husby and Fast, 2004). Dry Arctic air masses regulate winter temperatures and Pacific maritime air flows bring moisture to the region, as snow in winter and rainfall in summer (Natural Subregions Committee, 2006). Because of its location within the central part of the province, the moraine tends to have a relatively moderate climate relative to other natural subregions (Natural Subregions Committee, 2006). Summers in the Beaver Hills are warmer and have higher growing degree-day accumulations than the more northern boreal forests. They are also wetter and cooler than the grasslands to the south. Average annual precipitation is 461 mm, and most precipitation falls between April and August (Natural Subregions Committee, 2006). Average temperature and other climate normals cited below were taken from the average data for the provincial natural sub-region description (Natural Subregions Committee, 2006). These data were developed from a Geographic Information System (GIS) model based on raw monthly data from Environment Canada weather monitoring stations across the province, normalized to the 1961 to 1990 period.

Recent, repeated droughts in 2001 to 2003 and 2007 to 2009 caused significant evaporative loss of wetlands, shallow lakes and small streams in the Beaver Hills. Lack of winter snow pack, and reduced or no spring run-off failed to replenish surface-fed water bodies for nearly a decade. As a result, many lakes and water bodies have receded significantly or are completely dry. Reliance on groundwater supplies increased in some areas of the moraine during this time and has heightened awareness of the public and the agricultural community regarding source water protection. Water conservation measures, snow harvesting and other land management practices encouraging drought preparedness are increasingly promoted in all areas of the moraine. For agricultural operators who rely on forage supplies or grazing resources, the drought significantly reduced forage supplies. Aquatic wildlife, especially beavers, were significantly impacted by the series of droughts, based on beaver monitoring studies conducted by the Augustana Campus of the University of Alberta within the moraine. Drought-induced die back of aspen stands was also evident in the summer of 2010. Although precipitation levels returned to near normal or slightly above normal in 2010, soil moisture levels are still in recovery. Many years of average, to above average, precipitation will be necessary to replenish the surface water supplies of the moraine.

This drying trend is predicted to continue through the next century, not only within the moraine, but in this part of the province as well. Climate scenarios prepared for Alberta show changes in annual mean temperature of 3 ˚C to 5˚C by the 2050s and in annual precipitation of -10% to 15% (Barrow and Yu, 2005). Decreases in annual precipitation are predicted to result from reduction in summer rains in the short term, but the trend will eventually reverse in the longer term. By the 2080s, annual precipitation would increase to 15%. By the 2050s, degree days >5˚C and annual moisture index scenarios would increase between 30 to 50% and 10 to 30%, respectively, which would lengthen the growing season. The trend of reduced surface water due to less precipitation noted in this current decade is likely to continue for some time given these projections. For the moraine region, these changes represent a shift to the climatic conditions now seen in southern Alberta, dry, warm summers with longer growing days.

The BHI plans to begin a research program to examine the implications of climate change for the moraine (Climate Change Adaptation Strategy), and some of its academic partners are examining aspects of climate change in their research programs (e.g., ice phenology, wetland biodiversity). Miquelon Lakes tend to be alkaline and are similar chemically to sea ice. Dr. Christian Haas of the University of Alberta has a long-term project examining climatic effects on ice characteristics, using the largest of the three lakes as a surrogate for arctic sea ice. Another researcher at the Augustana campus of the University of Alberta (Dr. Glynnis Hood) is examining the effect of human and biotic (beaver) forms of surface water management on biodiversity in wetland systems, which could help to determine resilience of local aquatic ecosystems to changes in climate. Her research has already quantified the surprising ability of beaver-managed wetlands to sustain open water during drought (Hood and Bayley, 2009), an important finding for land managers facing a potentially drier climate. The Alberta Biodiversity Monitoring Institute, another research institute supportive of the BHI, is currently investigating climate change adaption relative to Alberta's plant and wildlife species through its Biodiversity Management & Climate Change Adaptation initiative. The project involves the prediction of potential impacts to inform planning and ultimately, incorporate climate adaptation into land management decision-making.

11.3.1 Average Temperature of the Warmest Month

15.9 °C (July or August, Natural Resource Committee, 2006)

11.3.2 Average Temperature of the Coldest Month

-16.8 °C (December or January, Natural Resource Committee, 2006)

11.3.3 Mean Annual Precipitation

461 mm, modelled for the natural sub-region (elevation range of 724.9 and 617.4 meters above sea level, Natural Resource Committee, 2006)

11.3.4 Meteorological Station Records

Is there a meteorological station in or near the proposed biosphere reserve? If so, what is its name and location and how long has it been operating?

Meteorlogical records have been recorded in the formats listed below at local sites:

a) Manually: EINP (since 1966)
b) Automatically: Fort Saskatchewan (since 1958) and EINP (since 1994)
c) Name and location of station:
Fort Saskatchewan (53˚ 43.000 N; 113˚ 11.000 W; Elevation = 620 m)

11.4. Geology, Geomorphology and Soils

(Briefly describe important formations and conditions, including bedrock geology, sediment deposits, and important soil types)

The Beaver Hills is a glacial creation. The upper Cretaceous bedrock underlying the area is covered by deep post-glacial morainal deposits and bedrock has no surface expression within the moraine. The distinct, rough

character of the terrain derives mainly from morainal deposits, but bedrock did influence the patterns of morainal deposit. These Cretaceous layers represent three marine formations:

- Edmonton formation (sandstone, mudstone, shale, ironstone and coal beds)
- Bearpaw formation (silty-shale and clay rich sandstone)
- Belly River formation (sandstone, siltstone and mudstone, Husby and Fast, 2004)

The Edmonton formation overlies the other two formations and forms a distinct scarp running from northwest to southeast, roughly from Lamont to the west side of Beaverhill Lake (Husby and Fast, 2004). This line marks the transition from rougher hummocky terrain to flatter terrain. The moraine itself sits on a slightly elevated area of bedrock, which held sections of the retreating glaciers that created the knob and kettle terrain of the moraine. The Laurentide continental ice sheet extended from the northeast across the moraine area during the Last Glacial Maximum (LGM) about 20,000 years ago. The date, distribution and extent of ice coverage was confirmed by Emerson (1977) and contributed to our understanding of the LGM in North America and in Europe, through the International Geological Correlation Program (IGCP Project 24) (N. Rutter, pers. comm.). Founded in 1972 as a joint program of the International Union of Geological Sciences (IUGS) and UNESCO, the program sought answers to theoretical and practical geological problems through international cooperation. This particular project sought to correlate deposits of the LGM between Europe and North America and resulted in several papers published in the Quaternary Glaciations in the Northern Hemisphere (Sabrava and Richmond, 1986; N. Rutter, pers. comm.).

As the Laurentide ice sheet receded, stagnant (non-moving) sections remained in the area, caught by the elevations of bedrock (Husby and Fast, 2004). Surficial sediments deposited by those glacial relicts created the terrain now characteristic of the moraine. Ground moraine (deposits of silts, sand, gravel and boulders) formed from erosion of the underlying bedrock as the glacial sheet advanced. These eroded sediments remained in place when the stagnant ice melted, producing the lower hummocky relief found in some parts of the moraine. Hummocky (disintegration) moraine, the dramatic knob and kettle form of moraine topography, formed from deposition of sediments captured within the stagnant ice. As the ice melted, those sediments, sometimes quite concentrated, settled in small to large hillocks, separated by depressions of variable size. Prairie mounds, circular landforms with a central depression are perhaps the most characteristic form of disintegration moraine. Such wetland sites are readily apparent in aerial photography of the moraine, and occur in variable density across the landscape.

This morainal landscape has persisted with little change in part due to the poor drainage of the Beaver Hills (Husby and Fast, 2004). As mentioned in Section 11.1 above, the depressions scattered across the landscape captured meltwater from the stagnant pieces of the retreating glacial sheet, and continued to collect rainwater and snow melt, resulting in development of wetlands and small lakes. Although post-glacial flows did create some small meltwater channels in the moraine, these generally did not become significant drainage channels in the post-glacial period. As a result, most surface water within the moraine is now held in small waterbodies and outflow is limited to a few low order streams along the edges of the moraine. The ability of the landscape to hold surface water, within a height of land, has created a local area of groundwater recharge that is important to the moraine and the surrounding plains.

According to the Canada Land Inventory, soils that have developed within the moraine are typically of lower agricultural capability for growing small-seeded cereal crops (Agriculture & Agri-food Canada, 2010). Forage

crops can grow in these areas, and tree farming is also possible. The lower capability is related to the hummocky terrain and poorly drained and rocky soils associated with the central part of the moraine. Gray and Dark Gray Luvisols have typically developed on uplands; Gleysols and Organic soils are dominant in wetlands (Natural Regions Committee, 2006).

11.5 Bioclimatic Zone

(Indicate the bioclimatic region in which the proposed biosphere reserve is located, refer to the table below and tick the appropriate box for each area of the biosphere reserve).

Areas	Average annual rainfall/mm	Aridity index		Core Area(s)	Buffer Zone(s)	Transition Area(s)
		Penman	(UNEP index)			
Hyper-arid	P<100	<0.05	<0.05			
Arid	100-400	0.05-0.28	0.05-0.20			
Semi-arid	400-600	0.28-0.43	0.21-0.50	√	√	√
Dry Sub-humid	600-800	0.43-0.60	0.51-0.65			
Moist Sub-humid	800-1200	0.60-0.90	>0.65			
Per-humid	P>1200	>0.90				

Aridity index resulting from the use of P/ETP: Mean annual precipitation (P)/mean annual potential evapotranspiration (ETP)

11.6 Biological Characteristics

(List main habitat types (e.g. tropical evergreen forest, savanna woodland, alpine tundra, coral reef, kelp beds) and land cover types (e.g. residential areas, agricultural land, pastoral land).

The Beaver Hills comprises a mixture of human-modified agricultural lands (cropland, forage, grazing), native aspen and aspen-white spruce mixed wood forest, grasslands, shrublands and wetlands (Figure 5). The areal extent and distribution of the agricultural areas and natural habitats discussed in the following sections are not static. Agricultural use has shifted in recent years from large traditional cropping operations to smaller, specialized farms, such as horse stables, or has been replaced with rural residential subdivisions (Young et al., 2006; C. Vanin, pers. comm.). Currently, 110,607 ha of the 159,560 ha moraine are in some form of agricultural land-use (as determined by Agriculture Canada's Ag-Profiling study of the moraine). Most lands are under annual cultivation (52% of agricultural land use area), but pasture and hay crops are also common (35.5% of agricultural land use area) (C. Vanin, pers. comm.). About 10.7% of the agricultural land base remains undisturbed, as woodlots and other undeveloped forms of land use (C. Vanin, pers. comm.).

Agriculture occurs on 89% of the working lands of the BHI region (i.e., the Transition Area), the balance (11%) represents rural residential developments as either multi-lot subdivisions or small non-farm acreages; and a small portion of Sherwood Park's urban area (C. Vanin, pers. comm.).

As a result of rural residential development over the past few decades, fragmentation of natural areas in the moraine increased and larger patches of natural habitat (greater than 300 ha) decreased by 88% between 1977 and 1996. However, Young, et al. (2006) found that overall, the moraine had gained natural habitat (by +0.61% per year) over this same period. In contrast, the lands surrounding the moraine had experienced a net

negative loss of natural habitat (-0.82% per yr.), a trend of loss observed elsewhere in the southern Boreal zone of Canada. This difference was due to the cumulative rate of agricultural, industrial and urban (and rural residential) development outside the moraine lands, development related to the growth of the Edmonton metropolitan area. The metropolitan area, including bedroom communities on the western edge of the moraine, such as Sherwood Park, has been one of Canada's fastest growing regions since the 2001 census (Statistics Canada, 2011).

Much of the gain in natural vegetation within the moraine is due to encroachment of natural vegetation (aspen forest, shrublands) into lower quality agricultural land that had been converted to acreage development. The successional development of abandoned marginal ranching and farming lands has also contributed to this gain (Figure 5). Current initiatives by municipal partners within the BHI to focus development within less sensitive areas of the moraine and to help sustain an economy based on sustainable use of the landscape are intended to further encourage this successional dynamic. The trend of afforestation is, therefore, likely to continue.

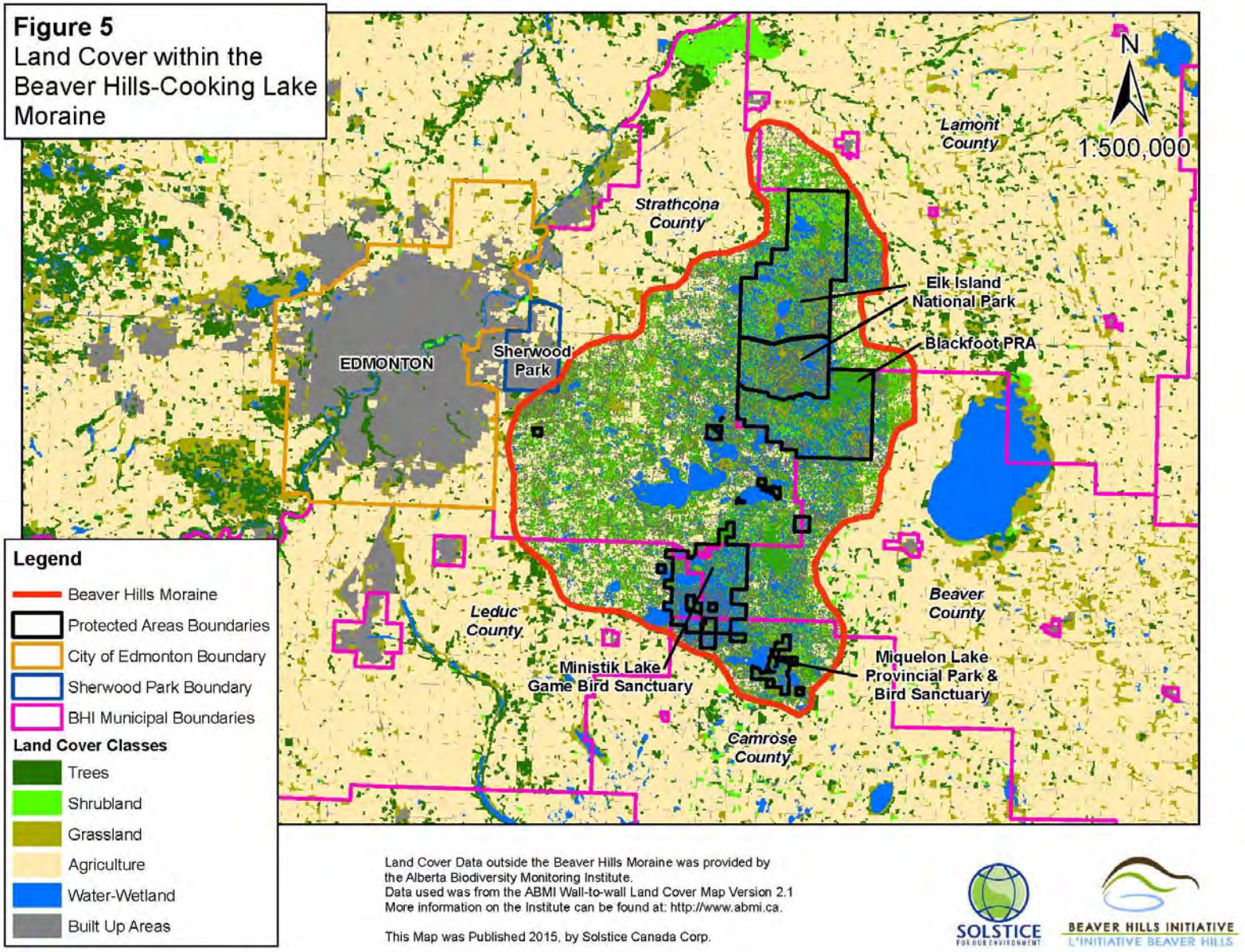


Figure 5. Land cover within the Beaver Hills.

11.6.1 Agricultural Lands

11.6.1.1 Overview

Type: Human-modified
Area: 444.7 km^2
Distribution: Regional/Local
Characteristic Species: Cereal or forage crop; Manicured species (e.g., Kentucky bluegrass)

11.6.1.2 Important Natural Processes

Human-modified areas are modified by agricultural land use and maintained by ongoing agricultural operations (e.g., cultivation, haying). Fertilizers and pesticides may be used periodically, particularly in croplands. Grazing of beef and other cattle is also common in these areas.

11.6.1.3 Main Human Impacts

These are managed landscapes, with regular agricultural activity. Wastes must be managed, including manure. Manure management practices, including composting, were implemented on 65.9% and 34.1%, respectively, of farms in the 2006 Canadian Census of Agriculture. In a few cases, wetlands have been drained to gain additional crop area. The carrying capacity of forage supplies, and proper stocking rates of livestock (especially horses) have not always been managed as effectively as sustainable grazing practices would recommend (C. Vanin, pers. comm.). In some rural residential developments, trees have been cleared, riparian areas have been altered, and wetlands have been filled in to accommodate construction and transportation routes or access.

11.6.1.4 Relevant Management Practices

Agri-environmental stewardship programs have historically been important within the moraine and they remain so currently. Agricultural producers in the prairies have received and planted tree seedlings from Agriculture & Agri-food Canada's Prairie Shelterbelt Program since 1901. Agro-forestry (planting of trees on agricultural lands) has been used for various objectives, including energy conservation, wildlife habitat enhancement, creation of eco-buffers, snow harvesting and soil conservation. Participation in this program has been and continues to be high. For example, in the past decade, nearly 900,000 trees have been delivered to over 1,800 agricultural producers in the moraine (C. Vanin, pers. comm.).

Growing concern for environmental sustainability in agriculture, as in other industries, has stimulated government agencies and environmental non-governmental organizations to develop a variety of information campaigns and incentive programs to encourage sustainable farming practices across the province. New regulatory approaches, particularly for manure management, have also been instituted. For example, confined feeding operations must now implement manure management plans under provincial regulations. Federally, Environment Canada has initiated information campaigns to raise awareness of regulatory requirements regarding management of fuels, lubricants and other hazardous materials used in farming operations. These programs have focused on safe storage and management to prevent spills and releases, and contravention of environmental legislation.

From 2002 to 2008, a joint federal-provincial program (the Canada Agricultural Policy Framework or CAPF) used the National Farm Stewardship Program to raise awareness of stewardship practices. The program provided technical support and funding to agricultural producers interested in completing Environmental Farm

Plans (EFP, a comprehensive sustainable management tool for farm operators) and adopting its recommended beneficial management practices (BMPs). In Alberta, agricultural producers that completed an EFP were eligible to receive cost-shared assistance to implement the BMPs, which addressed a variety of land management practices (e.g., surface and groundwater protection; crop residue management; riparian area management; grazing, manure, nutrient and pest management, plus overall farm management planning). The program was very successful. In total, 774 BMP projects were completed by agricultural producers within the five member municipalities of the BHI during the program. Many other agricultural producers chose to adopt and implement BMPs on a voluntary basis, participation that was not specifically tracked. The BMPs were designed to offer cost-effective solutions to agricultural management concerns, as well as to address potential negative impacts to the environment, and so although not specifically confirmed, sustained implementation was a likely outcome of the program (C. Vanin, pers. comm.).

Environmental non-governmental organizations (sometimes with government partners) were also active in the moraine (and elsewhere in the province), promoting agricultural BMPs through other programs and awareness campaigns. The Land Stewardship Society of Canada and Environment Canada have promoted Best Management Practices through public outreach programs in the moraine. The AFGA developed a farm stewardship program that recognizes operations that have implemented recommended Best Management Practices. Their program continues to identify new stewards in the moraine, which suggests the BMP programs have successfully fostered change in agricultural practices on this landscape.

The new federal agricultural policy framework called Growing Forward 2 (2013-2018) provides support to help the agricultural industry respond to market opportunities and challenges through research and innovation to address environmental stewardship, biosecurity, energy and water conservation, as well as market concerns (http://www.growingforward.alberta.ca/UCM01/ProgramAreas/EnhancedEnvironment/StewardshipPlans/GrazingandWinterFeedingManagement/index.htm). Through joint projects with the province, the program will provide support similar to the previous National Farm Stewardship Program, and it will also promote research on innovations spanning animal health and productivity to more efficient fuel and energy use. Demand and uptake for the new stewardship program has been high to date, and over-subscription during the first phase of this initiative caused significant challenges. Regardless, producers within and immediately beyond the moraine have taken advantage of the program to highlight innovative practices or develop new initiatives (e.g., Sunrise Farms in Holden, AB, about 20 km from the moraine).

In addition to these programs, market forces are prompting other changes in farming operations. Producers in the moraine are increasingly converting to organic approaches, primarily for poultry, pork and beef production and in some areas, cereal crop operations. Interest in local food has spurred diversification into market gardens, fruit orchards and agri-tourism. Sustainability BMPs are a defining characteristic of such operations and the market shift may facilitate wider adoption within the region.

11.6.2 Native Deciduous Cover

11.6.2.1 Overview

Type: Native deciduous
Area: 681.5 km2
Distribution: Regional/Local

Characteristic Species: Trembling aspen (*Populus tremuloides*); Balsam poplar (*Populus balsamifera*); Paper birch (*Betula papyrifera va. papyrifera*)
Understory: Beaked hazelnut (*Corylus cornuta*), prickly rose (*Rosa acicularis*), wild sarsaparilla (*Aralia nudicaulis*), cream coloured vetchling (*Lathyrus ochroleucus*), purple peavine (*Lathyrus venosus*) and bluejoint (*Calamagrostis canadensis*)

11.6.2.2 Important Natural Processes

Forest fire, native insects and diseases, and beaver activities have all been important natural processes controlling the deciduous forests within the moraine (Husby and Fast, 2004). As a result, the deciduous forests in the moraine represent varied stages of development, from young, regenerating stands to mature woodlands. In the morainal landscape, deciduous uplands are rarely far from water, resulting in a vigorous forest with a dense shrub understory.

Fire has historically been a significant natural process regulating forest and grassland distribution in this landscape. The early settlement history records for the area note a series of large fires within the moraine, which prompted an early interest in fire management and forest protection (as documented by Husby and Fast, 2004 and previous sections of this application). Most of the moraine has been burned in the last 100 years, and that, combined with timber harvest, contributed to a decline in the once common white spruce (Picea glauca) and the predominance of deciduous forests today (Husby and Fast, 2004). Fire suppression is now a necessity in this developed landscape; however, within EINP, fire has historically been used to manage grasslands and forests. An updated Fire Management Plan now being prepared will guide future decisions on the use of fire to sustain healthy forests and grasslands in the park.

Although insects and disease were considered detrimental influences in the past, and thus actively and severely controlled, their role in sustaining biodiversity through disturbance has become increasingly appreciated. Today, protected areas and local municipalities do not actively manage insects and other species commonly affecting local tree species (Husby and Fast, 2004). A variety of fungi (89 species) occur in the region (Dr. M. Thormann, pers. comm.); several are associated with decay of live and dead trembling aspen (Husby and Fast, 2004). In many cases, fungi have a symbiotic relationship with aspen and many other plant species, and can actually improve their health, vitality, access to water and nutrients, and defend against pathogens.

Key lepidopteran insects affecting aspen and balsam poplar include tent caterpillar (*Malacosoma disstria*), large aspen tortrix (*Choristoneura conflictana*), Bruce spanworm (*Operophtera bruceata* (Hulst)) and aspen leaf miner (*Phyllocnistis populiella*, Husby and Fast, 2004). Beetles are also important and include aspen leaf beetle (*Chrysomela crotchi* (Brown)), American aspen beetle (*Gonioctena americana* (Schaeffer)), poplar borer (*Saperda calcarata* (Say)), poplar and willow borer (*Cryptorhynchus lapathi* (Linnaeus)), aspen agrilus (*Agrilus liragus* (Barter & Brown)). Tent caterpillar can cause significant defoliation, but do not otherwise harm aspen, unless outbreaks coincide with drought, beaver flooding or other stressors (Husby and Fast, 2004). Outbreaks typically extend four to five years and re-occur on a 10-year cycle.

The beaver is an abundant keystone species that is widespread in the area and can dramatically affect forest succession and biodiversity (Husby and Fast, 2004). Beaver live in colonies of six to 12 individuals and the family unit can fell a considerable number of deciduous trees and shrubs annually to prepare winter food caches. As an example, two beavers reintroduced to new habitat felled about 2500 deciduous stems over three fall months to prepare their winter food cache (Hood, 2015b). By damming surface water flows and modifying

landscapes to entrap water, beaver create a remarkable diversity of wetland and riparian habitat. Their within-pond channelling activities and modifications of pond morphometry help retain surface waters on a consistent basis but also offer habitat for a variety of upland, semi-aquatic and aquatic species (Hood and Larson, 2014, 2015a).

Beaver also affect adjacent uplands through their tree cutting and water impounding activity, in terms of soil moisture, temperature and vegetation cover in the areas around their ponds (Husby and Fast, 2004, Hood, 2015b). They are very capable water managers and have been shown to sustain surface water on the landscape, even in times of severe drought (Hood and Bayley, 2008).

11.6.2.3 Main Human Impacts

Clearing of lands for rural subdivision development or agricultural use is probably the primary concern for all forested areas within the moraine currently, particularly with the rising demand for rural subdivisions. Growth of metropolitan Edmonton, including smaller suburban communities on the perimeter of the moraine such as Sherwood Park and Tofield, has created a market for "rurban development", small agricultural holdings, acreages and rural subdivisions that have been developed on former agricultural lands and forested areas within the moraine. Such developments have resulted in an 88% increase in forest fragmentation within the moraine over the past three decades (Young et al., 2006).

Clearing of forested lands for agriculture is relatively infrequent, although it does still occur in some areas. Grazing can also affect forest lands, because the cattle can remove lower branches on aspen and balsam popular, and limit the development of the forest understory. The impacts to forests from agriculture are not permanent, and as noted in the introduction to this section, forest cover has also been positively influenced by regional growth. In some cases, natural habitat has re-established in these "rurban" lands, but overall, habitat fragmentation in the moraine has exceeded those gains (Young et al., 2006). Wildfires do still occur occasionally, caused either by human action or lightening, and at times have become sizeable fires.

11.6.2.4 Relevant Management Practices

EINP has reintroduced prescribed fire as a management tool for the deciduous forests within the park. In other areas, wildfire protection is a significant concern of municipal fire protection managers, and educational programs such as the provincial "Fire Smart" principles are actively promoted to the public. The BHI has commissioned a fire history study to determine fire risk and Strathcona County used that information to target areas for fire suppression and preventive management.

None of the protected areas or municipalities currently has insect or disease control programs for deciduous tree species. Beavers are controlled by local municipalities and protected area managers where their activities threaten roads and other infrastructure.

Legal means for conserving the moraine have been established in the land use policies of many of the partner municipalities. Statutory planning documents (e.g., Municipal Development Plans and Land Use Bylaws) have identified special conditions and limitations on development within particularly sensitive areas of the moraine

and steps within the planning process that allow for site-specific assessment and mitigation of environmental conditions. A variety of legal options for protection of environmental resources by municipalities are provided by provincial law. A study by the Environmental Law Centre in Alberta used the moraine as a specific example of implementation of such measures (Kwasniuk, 1997). Interestingly, the document discussed the opportunities presented by biosphere reserve designation within the moraine with respect to long-term conservation of the essential character of the moraine and its associated quality of life.

11.6.3 Native Grassland Cover

11.6.3.1 Overview

Type: Native grassland
Area: 158.6 km^2
Distribution: Regional/Local
Characteristic Species: Native grasslands are typically found on drier, upland slopes and level areas (Husby and Fast, 2004). Within the moraine, these grasslands tend to occur as small patches, often within openings of deciduous forest cover, or adjacent beaver ponds, where tree cover has often been removed. Typical species include:

Kentucky bluegrass (*Poa pratensis*)
Slender wheatgrass (*Agropyron trachycaulum*)
Pasture sagewort (*Artemisia frigida*)
Northern bedstraw (*Galium boreale*)
Canada wild rye (*Elymus canadensis*)
Saskatoon (*Amelanchier alnifolia*)
Chokecherry (*Prunus virginiana*)

11.6.3.2 Important Natural Processes

Processes affecting native grasslands include beaver flooding, which can convert uplands adjacent wetlands to an emergent or aquatic habitat. Conversely, abandoned beaver ponds will succeed to meadows once water levels are no longer maintained (see example photo, left). Fire was historically also important for native grasslands, as for deciduous forests, a natural process discussed in the preceding section.

11.6.3.3 Main Human Impacts

Currently, clearing for rural subdivision development is the main human influence on native grasslands, as with deciduous forests in the moraine. Agriculture has also had negative effects in some areas, through overgrazing and subsequent alteration of species composition, and conversion of native grassland areas to tame, non-native pasture species. Accidental wildfires can burn dead organic matter from grasslands, but unless fires are excessively hot, they do not often have detrimental effect.

11.6.3.4 Relevant Management Practices

Other than wildfire management and educational programs, no active management of the native grasslands within the private lands in the moraine is currently promoted. Potential exists to conserve areas under a conservation easement and, in fact, the acquisition of the Golden Ranches property has protected a significant area of native grassland pasture.

Grasslands within EINP have been burned during prescribed burns, due to their scattered distribution within the deciduous forest cover. Grazing practices on the grasslands on public grazing leases in the Blackfoot PRA provide demonstration of sustainable range management and similar demonstration projects are planned for the recently acquired Golden Ranches property.

11.6.4 Wetlands and Lakes

11.6.4.1 Overview

Type: Wetlands/lakes
Area: 227.8 km^2
Distribution: Regional/Local
Characteristic Species: The moraine lies within the Prairie Pothole Region (a NAWMP ecosystem category), a broad zone across the southern Prairie Provinces in Canada and northern central United States (Husby and Fast, 2004). This region supports over half of the continent's waterfowl production, which has earned it the nickname "the duck factory". The moraine is a particularly good example of the Prairie Pothole Region, with abundant wetland habitat in a diverse array of forms.

Wetland communities within the moraine range from small, ephemeral ponds present only after spring melt, to moderately sized semi-permanent swamps and marshes, up to larger permanent open-water ponds or lakes. Almost all lakes in the moraine are shallow (Husby and Fast, 2004). Some can be highly saline (e.g., Miquelon Lake #1 in MLPP, Dr. G. Hood, pers. comm.). The wetlands also can be saline, a factor of soil condition (particularly true in the south part of the moraine, Dr. G. Hood, pers. comm.).

Each wetland type has characteristic species, depending on site specific conditions, water availability and depth. Generally, three types of wetlands have been recognized within the moraine and have characteristic plant communities associated with them (Husby and Fast, 2004).

11.6.4.2 Important Natural Processes

Lakes and wetlands are subject to an annual regime of flooding and drawdown, which is important for sustaining the plant community. Nutrient balance within the aquatic system also regulates plant growth, species diversity and oxygen levels. Several recent periods of drought have dramatically reduced lake and wetland levels at times, most recently in 2002 and 2008, with record droughts. Over the longer term, records dating to 1966 suggest surface water levels have been steadily declining across the moraine (Husby and Fast, 2004). Drought and human use appear to be the main causes (Husby and Fast, 2004).

11.6.4.3 Main Human Impacts

Infilling of wetlands or modification to create dugouts or impoundments from surface water flows has historically been a significant contributor to wetland loss provincially (Interim Wetland Policy, 1993). Current regulatory regimes are now focused on reducing wetland loss from direct or indirect impact (e.g., by diversion of contributing flows).

Nutrient inputs to waterbodies can increase production levels, driving systems to eutrophic condition (Bayley and Prather, 2003). Heavy application of fertilizers or improper manure storage and handling can cause nutrient release through surface water run-off, which is an important source of nutrient loading in many landscapes. Sediment release to wetlands from erosion of disturbed ground during construction or in areas of

cultivation, or release of hazardous materials (e.g. fuels) to wetlands can degrade water quality, affecting vegetation and wildlife. Wetlands in this area tend to be seasonally eutrophic, with high phosphorous levels at some points in the year (Dr. G. Hood, pers. comm.). Detailed water quality information has only been collected for Alberta lakes since the 1980s, which limits our understanding of the impacts of human settlement on waterbodies in the province (Mitchell and Prepas, 1990). Our understanding of water quality patterns for wetlands is similarly limited. A comprehensive investigation of the nutrient status of wetlands in agricultural areas of the moraine has not yet been conducted and the current status is unknown.

Swamps
Wooded wetlands with peat deposits and either a white spruce (*Picea glauca*) with red-osier dogwood (*Cornus stolonifera*) or a deciduous (alder (*Alnus* spp.), willow (*Salix* spp.), birch (*Betula* spp.) community.

Marshes
Freshwater: bluejoint (*Calamagrostis canadensis*) wet meadow, awned sedge (*Carex atherodes*) meadow, or water sedge (*Carex aquatilis*)/small bottle sedge (*Carex utriculata*) meadow communities, and other shore communities (reed grass (*Phragmites australis*), cattails (*Typha latifolia*).
Saline: salt meadow grass (*Spartina patens* (Ait.) Muhl.), foxtail barley (*Hordeum jubatum*), wire rush (*Juncus balticus*), Kentucky bluegrass (*Poa pratensis*) and graceful sedge (*Carex praegracilis*) communities.

Bogs and Fens
Bogs: wooded bogs with black spruce (*Picea mariana*), Labrador tea (*Ledum groenlandicum*), cloudberry (*Rubus chamaemorus*), bog cranberry (*Vaccinium vitu-idaea*), feather (Pleurozium schreberi) and Sphagnum moss (*Sphagnum* spp.) communities.
Fens: wooded fens with tamarack (*Larix laricina*) and spruce (*Picea* spp.) (and groundwater supply).

11.6.4.4 Relevant Management Practices

Because of the moraine's location near a growing urban area, impacts such as wetland infilling and contamination due to development within the urban fringe are an increasing concern. Key management practices include reducing wetland loss due to development through no-net-loss policies and minimizing the release of potential contaminants to wetlands through healthy riparian buffers. A recently completed BHI

project to identify and map wetlands in the moraine will allow these resources to be conserved as Environmental Reserve lands when applications for development arise. This conservation mechanism is provided under the provincial Municipal Government Act, and can be used to prevent loss during development.

Despite such mechanisms, development still sometimes requires removal of wetland habitat. Under Alberta's new Wetland Policy (2013), wetlands lost to development must be replaced or restored. The moraine lands have been a favoured site for wetland restoration and creation by environmental non-governmental organizations such as Ducks Unlimited Canada, one of the wetland restoration agencies authorized by the provinces. This is due in part to the proximity of the moraine to the Edmonton Capital Region, an area experiencing high levels of urban development and growth. Wetland compensation activity has increased within the moraine in recent years, in part because restoration has been a preferred means of compensation for wetland loss under current regulatory approval processes. As adjacent urban areas continue to grow, the moraine's wetland areas are likely to continue to benefit from such restoration efforts.

Some of these wetland restoration projects have been quite innovative. As an example, in 2013 Ducks Unlimited Canada partnered with Alberta Parks and the Blackfoot Grazing Association to restore over 60 wetlands within the Blackfoot PRA. The success of this pilot project, intended to improve biodiversity and grazing range health, led to a commitment by the partners in May 2015 to expand the project. Designation of the moraine as a Biosphere Reserve could highlight such wetland conservation work as well as the innovative efforts of partner agencies to alleviate the pressures on the moraine's water resources.

Confined feeding operations can introduce a potential threat to surface water bodies if waste is not well managed. Regulation of such operations falls under provincial jurisdiction, but siting of such facilities is partly under the control of the municipalities. Most of the municipalities whose jurisdictions overlap the moraine restrict development of such operations near sensitive waterbodies (e.g., MLPP, Cooking Lake) and have identified appropriate areas for such facilities in their land use plans. Perhaps a result of the high density of surface water within the moraine, such operations are relatively few, but protection of water quality remains a priority for both the provincial regulators and Agriculture Canada.

Federal and provincial agencies have begun to promote manure management programs on all agricultural operations, and particularly for confined feeding operations, to prevent nutrient release to adjacent waterbodies. Such releases contravene environmental legislation of both levels of government. Promotion of improved practices is an attempt to achieve compliance as an industry standard and avoid the need for enforcement. Environmental non-governmental organizations active in the moraine offer educational and stewardship programs with suggested Best Management Practices that can help minimize nutrient loading from fertilizers and animal waste management and sediment release. These measures include better management of inputs to the land, but also simpler strategies such as maintaining a healthy riparian buffer of natural vegetation along wetland boundaries. Cows and Fish (the Alberta Riparian Habitat Management Society), another environmental non-governmental organization member of the BHI, has been particularly effective in this regard across the province, through various hands-on workshops and local community groups that can provide practical advice. Originally working in southern Alberta, Cows and Fish has expanded their programs into the moraine area over the past decade and have increasingly attracted participants from within the moraine lands.

12. ECOSYSTEM SERVICES

In accordance with the Millennium Ecosystem Assessment Framework (2005), the moraine currently provides *provisioning* (e.g., food, water, fibre, fuel), *regulating* (e.g., climate regulation, water quality), *cultural* (e.g., spiritual, aesthetic, recreation, and education), and *supporting* (e.g., primary production and soil formation) ecosystem services that benefit local and regional residents. Its forests, wetlands and grasslands each play a role in sustaining the quality of life enjoyed by these residents now and ideally also by future generations. Although a formal inventory of those services has not yet been completed, baseline inventories of the moraine's resources have highlighted the important role these functional ecosystems play in sustaining both existing ecological, social and economic systems.

12.1 Ecosystem Beneficiaries

If possible, identify the ecosystem services provided by each ecosystem of the biosphere reserve and the beneficiaries of these services. (Please refer to the Millennium Ecosystem Assessment Framework and The Economics of Ecosystems and Biodiversity (TEEB) Framework (http://millenniumassessment.org/en/Framework.html and http://www.teebweb.org/publications/teeb-study-reports/foundations/)).

The moraine's forests, wetlands and native grasslands and their constituent wildlife and plant species contribute to the provisioning, regulating, cultural and supporting ecosystem services used by local and regional residents. Key examples of each type of service, and their beneficiaries are outlined below.

12.1.1 Provisioning Services

Water cycling is one of the most critical services provided by the moraine. This moraine is higher and receives more precipitation than the adjacent plains. The elevated hummocky landscape collects precipitation in abundant wetlands, which creates groundwater recharge and discharge flows through underlying gravel surficial deposits. Recharge flows supply aquifers linked to the lands adjacent to the moraine, and thus the moraine plays an important role in local and regional groundwater supply. The moraine forests have been assessed for woodlot potential, and small operations have been developed for fuel and wood fibre supply. Beneficiaries include moraine residents and agricultural and urban residents in the surrounding area.

12.1.2 Regulating Services

Natural forests and grasslands contribute to air quality and along with lakes and waterbodies, to climate regulation. About 23% of the moraine supports native deciduous forest cover and another 13% is surface water. Forests, grasslands and freshwater can take up CO_2, and thus play a role in carbon storage and climate regulation. Forests and grasslands use CO_2 during photosynthesis, which contributes to carbon storage, but the process also releases O_2, thus enhancing air quality. Wetlands have other regulatory roles in terms of water quality. Nutrients are readily used by a variety of wetland plants, and cattail (*Typha latifolia*) and other emergent species can metabolize trace metal contaminants, removing them from surface waters. Such services benefit all local and regional residents most directly, but climate regulation has the potential for much broader, global benefits.

12.1.3 Cultural Services

Protected areas within the moraine are a recreational and aesthetic resource long valued by local and regional residents, dating back to the early settler populations who established the area's first parks. Forests and wetlands on private lands within the Transition Area are driving the growing interest in rural residential

development, and the natural character of the moraine has been consistently identified as a valued aspect of the rural community in the land use planning policies of each partner municipality. Cultural heritage of the landscape is linked to the natural ecosystem, particularly for the regional First Nations communities whose traditional territories include the moraine lands.

12.1.4 Supporting Services

Although much of the moraine has lower quality soils for cereal production due to abundant wetlands and hummocky terrain, the moraine's topsoils are relatively deep and fertile. As a result, they support good hay and pasture production, as well as the primary productivity of natural ecosystems. Soil conservation has long been a priority of all member municipalities, and in particular, those with higher agricultural capability.

12.2 Indicators

Specify whether indicators of ecosystem services are used to evaluate the three functions (conservation, development and logistic) of biosphere reserves. If yes, which ones and give details.

Preliminary indicators of ecosystems that will be used to evaluate the three functions (conservation, development and logistic) have been selected and baseline data has been collected in a State of the Beaver Hills report. This project was designed to identify potential indicators that could be used to track land use patterns, change in the natural landscape and thus, impacts of land management practices in the moraine. Indicators reflecting land, water and social conditions have been identified, but explicit links to the functions of a biosphere reserve (conservation, development and logistic) have not yet been made. In part, this was because the primary role of the project was to develop a system that could assess the effectiveness of past land management actions. The indicators can also identify needs for future research, management and policy direction, including policy related to operation of the biosphere reserve. Upon designation of the biosphere reserve, these indicators will be reviewed and updated to ensure that they can be applied to evaluation of the three functions of a biosphere reserve. Examples of the indicators that could be applied to evaluate biosphere reserve function include those for land (riparian shoreline development, land use, habitat and connectivity), water (trends in lake levels), air (ambient air quality) and quality of life (numbers of community stewardship groups, employment trends, tourism and use of regional planning tools).

12.3 Biodiversity

Describe biodiversity involved in the provision of ecosystems services in the biosphere reserve (e.g. species or groups of species involved).

A broad range of biodiversity elements are important in sustaining the ecosystem services identified above. The BHI and its partners have long recognized the critical role of landscape connectivity in the genetic, species and landscape level biodiversity of the area. The present level of species biodiversity of the moraine is directly linked to its unique biogeographical context: the moraine is a disjunct island of boreal habitat surrounded by aspen parkland. Connection to northern boreal habitats and to the natural areas within the surrounding aspen parkland will help sustain genetic diversity within individual species, as well as the current mixture of boreal and parkland species.

In terms of species or groups of species important to the ecosystem services identified above, the diverse suite of forest and grassland plants and trees and wetland plants, wildlife and microbial species ensure that the provisioning, regulatory and cultural services are maintained. Microbial populations that help maintain soil

fertility are also important, but as yet, understudied in the region. Research conducted within the moraine on the role of beaver indicates the potential of the biosphere reserve to demonstrate need for better management of species central to ecosystem services. Work on beaver has shown that this keystone species can help maintain wetlands on the landscape, even in the face of significant drought (Hood & Bayley, 2008). New understandings of its role in enhancing habitat diversity for a range of aquatic and semi-aquatic organisms (Anderson, 2013; Hood & Larson, 2014, 2015) is changing perspectives on management of beaver and of wetland ecosystem services more generally, in the moraine and across the province. A province-wide public awareness and research initiative is currently exploring the potential benefits of beaver re-introduction as a water management tool, particularly in drought risk areas.

12.4 Ecosystem Assessment

Specify whether any ecosystem services assessment has been done for the proposed biosphere reserve. If yes, is this assessment used to develop the management plan?

As noted above, the recently completed initial State of the Beaver Hills report has established a baseline assessment of potential indicators that could inform future land management and land use policies within the moraine. Because this study was at a preliminary stage, its focus was mainly on the cost, quality and effectiveness of the indicators as repeatable measures of change in the land, water and social aspects of the landscape. Once indicators have been refined, the intent is to use the suite of final indicators to assess change at five year intervals. Although the study was not exclusively designed to assess ecosystem services, some indicators are applicable and will provide a basis for assessment. Additional indicators will be added over time, particularly as suitable data becomes more accessible and accurate, key limitations discovered in this current project.

13. MAIN OBJECTIVES FOR THE BIOSPHERE RESERVE'S DESIGNATION

13.1 Main Objectives

Describe the main objectives of the proposed biosphere reserve, integrating the three functions (conservation, development and logistic), presented below (sections 14 to 16), including components of biological and cultural diversity. Please specify the indirect pressures and/or organizational issues.

Although the BHI partners have had considerable success in promoting sustainable development through the three functions of a biosphere reserve, they have largely operated as a unique example within the province. Sustainable development demands an inter-disciplinary approach, and access to a breadth of experience in conservation, development and capacity. Biosphere status would help clarify to existing and potential partners, including the public, the potential offered by sustainable development, and specifically, the potential offered by land management focused on conservation, sustainable socio-economic development and logistic support (knowledge building, learning and awareness).

Thus one of the key objectives of seeking designation as a biosphere reserve is access a broader network of similar-minded organizations. The availability of a biosphere reserve, with its mandate for innovative approaches to sustainable development, within a short distance of key research institutions (North and Augustana Campuses of University of Alberta and Alberta Innovates Technology Futures) will also likely attract research interest and funding. A second objective is to build on the branding offered by biosphere reserve status to recruit additional funding and facilitate expansion of sustainable development programs currently envisioned for the moraine landscape (e.g., nature-based tourism opportunities such as eco-tourism and agri-tourism). Lastly, designation as a Biosphere Reserve will also enhance internal partnerships as the status and concerns of the Beaver Hills become more visible to all parties currently involved, and the benefits of collaboration become more apparent.

Current BHI partners, when asked to consider the benefits of participation in past BHI projects, consistently identified the synergy generated by combining resources of diverse partners. Case studies developed from this survey highlight both the benefits of past collaborative efforts, and anticipated future projects as part of the biosphere reserve (Appendix B: Case Studies Demonstrating the Value of BHI Projects). All of these partners are challenged by available financial, technical and labour resources. Building on the experience, knowledge and networks of other agencies helped complete immediate goals, but also provided invaluable cross-training. Conservation and development goals not feasible within one organization could be readily accomplished through pooled resources. Each experience has generated new knowledge and creativity that were essential to identify and facilitate other future 'next steps', whether in land use planning, environmental education, research or protected areas management. Those experiences have also helped demonstrate the potential in cross-organizational approaches, and provide tangible results that can help to overcome traditional silo-like approaches to sustainable development concerns. The current BHI partners recognize the opportunity for membership in the Canadian and global network of biosphere reserves to generate new possibilities from access to new knowledge and collaboration partners, including new positive examples of collaboration. The potential to investigate strategic international partnerships, in research, environmental education, or innovation is particularly attractive to the partners, as is the potential to apply innovations used by other reserves to address local concerns.

Members of the public who provided comments and discussed the biosphere proposal with BHI members during a recent public engagement initiative were overwhelmingly supportive. In part, this support related to the potential recognition of their moraine as a globally significant area. Respondents were also interested in the biosphere reserve's objective of sustaining the natural and cultural character of the moraine for future generations. Over 919 positive responses have been received to date and the BHI will continue to build support as the public engagement program continues over this next year. Several members of the public and many other organizations have also provided letters of support for the biosphere reserve nomination (Appendix I).

First Nations and Métis organizations and individuals contacted about the biosphere reserve nomination have also been supportive. In this case, interest lies in the potential to re-establish connections to the moraine and share cultural and ecological understandings of this landscape through the cultural objectives of the biosphere reserve. The Confederacy of Treaty Six First Nations and the Métis Nation of Alberta have both provided letters of support (Appendix I) and are interested in exploring potential collaborative opportunities. Local and regional Aboriginal residents and the Métis Nation of Alberta have also contributed to background studies on the First Nation and Métis history of the moraine, filling a gap in the historical description for this current nomination document (e.g., Belanger et al., 2013; Matters, 2014).

13.2 Sustainable Development Objectives

Describe the sustainable development objectives of the biosphere reserve. (If appropriate, please refer to Agenda 21, Rio+20 and SDG post 2015).

The Rio Declaration (1998) outlined in Agenda 21 provided a set of 27 principles that established key concepts related to sustainable development. These included recognition of human beings as central to sustainable development (Principle 1); the importance of poverty eradication (Principle 5); and the need to balance conservation of the environment for current and future generations with development (Principles 3 and 4). It also recognized the need for common but differentiated responsibilities (Principle 7). From an economic perspective, Agenda 21established the two key principles of polluter pay (Principle 16) and the precautionary approach (Principle 15). The role of the public was established in principles relating to participation in decision-making and inclusion of groups often excluded from that process (e.g., women and indigenous groups, Principles 10, 20, 21, 22). Finally, established expectations for Member states to develop the legislation to address environmental issues. Rio +20 reaffirmed the need to move forward on implementation of these principles, to achieve the goals of sustainable development.

The BHI has established a definition of sustainable development appropriate to the moraine's natural, socio-economic and political context and the objectives and means to achieve that vision. Many aspects of that vision embody the principles outlined in Agenda 21. The BHI's Land Management Principles (Appendix M) recognize the key aspects of the natural environment that require conservation action and the need to ensure opportunity for human development and economic benefit from use of those resources. The Land Management Framework (LMF) provides information and tools to help land managers balance conservation and development, to achieve sustainable development in this landscape. Both the Principles and the LMF emphasize the need to include environmental factors in land management and many of the BHI's initiatives have focused on the means for ensuring both environmental and human development needs are met.

Perhaps the chief mechanism for promoting sustainable development options has been the BHI Board. Its foundational principle of voluntary participation has helped reduce barriers to cooperation and to provide a forum for discussion on sustainable development not otherwise available in the region. Raising awareness of the need for change in management objectives and availability of sustainable alternatives is an important first step in adopting a sustainable development model. The open forum of the Board and the Working Groups has provided opportunities for the exchange of ideas, and at times, to challenge understandings of environment, development and the trade-offs implicit in sustainable development. Open discussion has been a key mechanism for promoting sustainable development among BHI partners, and the cooperative efforts required to achieve it. The BHI will retain these fundamental aspects of its organization as it moves forward as the manager of the Beaver Hills Biosphere.

To date, the main objective of the LMF has been on inclusion of sustainable practices in land use planning, since private land development is the chief threat to natural ecosystems in the transition zone. An updated LMF (2015) has added tools applicable to private landowners, to provide them with the information and options to pursue sustainable land management. This compilation of best management practices provides land use planners and municipal staff with information that can be promoted to developers, land owners and members of the public.

A Stewardship Engagement Strategy developed in 2012 aims to coordinate and assist community groups and environmental interest groups in their efforts to promote awareness of the natural, cultural and recreational value of the moraine landscape. Specific initiatives, such as a Citizen Science Monitoring Program have been implemented with local university students, professional biologists (the Alberta Chapter of The Wildlife Society) and youth programs (the Young Naturalists initiative of Nature Alberta). Efforts in public and Aboriginal engagement may generate new partnerships that can promote awareness of cultural and natural values of the moraine, and the means to sustain them.

13.3 Stakeholders

Indicate the main stakeholders involved in the management of the biosphere reserve.

The Beaver Hills is a lived-in landscape that supports a rural population of farmers, acreage owners, and village residents, recreational users from the Edmonton region and beyond, some oil and gas exploration activity, and various governmental and non-governmental organizations involved in environmental conservation, research, tourism and recreation, agriculture and community development. Although few aboriginal communities lie within in the moraine, traditional and cultural connections remain active. These communities comprise the group of stakeholders that have been recruited to support and participate in the management of the proposed Beaver Hills Biosphere.

The Beaver Hills Biosphere will be managed by the BHI and its Board members, with the cooperation of the key land management agencies (municipalities, federal and provincial protected areas and environmental non-governmental organizations). The BHI can facilitate and promote sustainable development initiatives (e.g., coordinated land use policy) and supporting programs (e.g., research, creation of management tools), but itself has no power to direct its partners to implement any specific strategy. The strength of the BHI has been, and will continue to be, in its ability to facilitate voluntary change, by providing the necessary information, technical expertise and funding and by raising awareness of new possibilities. Going forward, the BHI will expand its network to incorporate the public, including landowners and Aboriginal peoples more fully as

partners in sustainable development, in activities aiming to conserve the natural and cultural features of the moraine. The public and Aboriginal engagement campaign has helped start this dialogue and that program will continue to investigate possibilities for involvement over this next year.

13.4 Consultation Process

What consultation procedure was used for designing the biosphere reserve?

An extensive consultation process was used to establish guiding principles and attract support for the Beaver Hills Biosphere. The process began during the formation of the BHI, before a biosphere reserve was even proposed and has continued since then. At each stage, key stakeholders have been identified and invited to share their ideas and concerns, which contributed to the foundational management plans that will guide the future biosphere reserve. The process and outcomes of each phase of consultation are outlined below.

13.4.1 Initial Formation of the BHI

Consultation regarding sustainable development in the moraine began in 2000 with discussions among the government, environmental non-government organizations, industry organizations and members of the research community with interest in the moraine. Those discussions led to formation of the BHI, a Terms of Reference and within a few years, the Land Management Principles (2006) and Land Management Framework (2007). Although in many respects, the organization was modelled on a biosphere reserve, intent to pursue designation began around in 2009, after several smaller projects had established the potential offered by sustainable development programs. Since 2010, the BHI has worked with its existing partners to prepare its nomination bid, and expand the initiative to include other stakeholders, including landowners, other members of the public and Aboriginal communities.

13.4.2 Stewardship Engagement Initiative

The Stewardship Engagement Initiative in 2011-2012 was designed to raise awareness and recruit support for the biosphere reserve among local towns and villages, within and adjacent the moraine and non-governmental organizations active in the moraine. Those organizations included groups like Nature Alberta and the Land Stewardship Centre of Canada, organizations that promote appreciation of nature and best management of the environment at the provincial and national level. Their networks and public outreach capacity made them natural partners to assist in public engagement within the moraine. These discussions resulted in a Stewardship Engagement Strategy that identified specific programs that could be implemented over the short to long-term, with a goal of engaging specific groups in conservation activities related to the moraine.

13.4.3 Public Outreach Campaign

A more focused public engagement program began in 2013. This effort included a formal communication plan that aimed to share information and raise awareness among moraine residents and within the broader region about the moraine and the biosphere reserve nomination process. The program also solicited support for the nomination through a signature campaign, and targeted requests for organizational and government support letters. This latter aspect of the program re-affirmed the on-going support of the nomination, and the work of the BHI in promoting sustainable development in the moraine.

The information campaign was based on three communication strategies: a broad-based media strategy; use of the BHI website and social media as information portals; and intentional outreach through meetings, presentations, information booths at special events and school presentations. Various communication tools were developed and used to help 'tell the story' of the Beaver Hills and the UNESCO Biosphere nomination, including postcards, one-page information sheets, bookmarks, a Facebook page, a Twitter account, an updated BHI website, a banner and posters.

At total of 67 presentations and 22 traditional media stories helped promote awareness across target audiences, in addition to establishing 52 social media links (e.g., re-tweets, links to partner media sites). Several meetings with key stakeholder groups were also used to more specifically discuss the potential for collaboration. The organizations contacted had members who were primarily within the Beaver Hills (36), Edmonton region (43) and provincially (45) (Appendix D). The moraine presentations were aimed mainly at community groups, new potential partner organizations (in industry and tourism and recreation) and partner organizations whose involvement had lapsed over time. Two schools whose populations are from the moraine area were also targeted. Presentations within the Edmonton region covered a similar range of audiences, but focused more on schools (9 locations) and potential political support (e.g., through contact with provincial and federal elected officials and aboriginal organizations). The traditional and social media awareness campaign also focused on these two geographic areas.

The information provided through each strategic venue centred on four key messages:

- What makes the Beaver Hills region ecologically distinct and culturally significant?
- The work being done by the BHI in the moraine.
- What a UNESCO Biosphere is and its importance.
- Why it matters to Albertans, Canadians and world citizens that the Beaver Hills is designated UNESCO Biosphere.

Target audiences identified for each strategic venue fell into one or more types of experience with the moraine. Those themes provided a focal slogan for communications materials, "Live, Work, Play", intended to link individuals'' experiences with the moraine to the goals of sustainable development and the biosphere reserve nomination:

- "**Live**" - residents in the five municipalities within the Beaver Hills and residents of Edmonton, the closest major urban centre to the Beaver Hills Area.
- "**Work**" - workers in the nearby oil and gas industries, business leaders and owners/operators, political representatives at all three levels of government and community leaders.
- "**Play**" - recreational clubs and organizations, annual athletic events in both summer and winter sports, community events, and schools in and around the area.

Importantly, many of the meetings and presentations involved people who represented a much larger group of individuals. These representatives were asked to 'spread the word' about the initiative to their membership. Many also signed a support letter for the Beaver Hills Biosphere nomination on behalf of members.

13.4.4 Aboriginal Engagement Campaign

While some Métis residents remain in the moraine, aboriginal communities whose traditional use areas included the moraine are now located up to 200 km away from the moraine. To determine interest and potential involvement of these communities and few residents in the proposed biosphere reserve required a different approach than the broad-based public engagement campaign. Instead, and following the recommendation of Alberta Aboriginal Affairs, the BHI contacted First Nation and Métis organizations representing these communities to discuss the nomination and potential for collaboration. To build a better understanding of the traditional use of the moraine by First Nation and Métis and to seek out local residents who might contribute their understandings of the moraine and its history, the BHI initiated base research of recent historical use. Finally, to build a better understanding of traditional land use and Treaty rights, the BHI provided Aboriginal awareness training for its Board.

Based on advice from the Confederacy of Treaty Six First Nations the BHI dealt directly with the Confederacy, as opposed to engaging with individual Chiefs. Treaty Six represents 50 First Nations across Alberta, Saskatchewan and Manitoba, 18 of which are in Alberta. Ongoing communication with the Confederacy over an 18 month period resulted in the Confederacy offering a letter of support for the UNESCO Biosphere Reserve initiative. This letter was provided with both parties (the Confederacy and the BHI) committing to proceed in a different way; to set aside the western `rules of engagement` and work to start developing an understanding of indigenous relationship to the land and what that entails. That is the first step to determining what future opportunities and involvement the Confederacy and the BHI might have in furthering awareness of the cultural significance of the Beaver Hills.

From the Métis perspective, the strategy was similar. Engagement with the Métis Nation of Alberta (MNA) began in February 2014. Through connecting with the MNA, the BHI was reaching out to all Métis in the province. The MNA is very receptive to opportunities for collaboration in raising awareness of Métis culture, history and ties to the Beaver Hills; however as with many organizations, capacity for initiatives remains a challenge. The MNA has also provided a letter of support for the nomination, and is interested in exploring joint initiatives such as a traditional land use study that would document historical and present day connections of the Métis to this landscape.

As part of public engagement, school presentations have included those with high First Nations and Métis populations. Examples include the Amiskwaciy Academy and Ben Calf Robe School in Edmonton. These schools, and other cultural organizations including the Musée Heritage, have also been contacted to determine if there is willingness to work together to identify opportunities for learning, education, or other appropriate initiatives. These organizations are all open to such collaborative projects and further discussion will explore specific opportunities. With regard to the school programs more generally, the outreach program teaches students of all heritages about the Beaver Hills and the importance of this area to our communities.

The Augustana Campus of the University of Alberta has provided additional support for a research initiative intended to fill an acknowledged gap in our understanding of traditional connections of First Nations and Métis to the moraine. Two projects, the Métis History literature review (Belanger, et al., 2013) and an Aboriginal Oral History project (Matters, 2014) helped address two acknowledged gaps. These projects, completed by undergraduate students of Aboriginal and ‘settled Canadian’ heritage, accessed local museum and Métis Nation of Alberta resources and publications (including diaries and unpublished works) and Aboriginal and non-

aboriginal individuals familiar with the historical use of the area by both First Nations and Métis. Their research has helped build awareness of traditional use of the area, local Cree and Métis heritage, and parallel research initiatives in First Nations and Métis communities (e.g., the Cree place name project in Maskwacis and historical research by the Métis Nation of Alberta).

The strategic intent of this engagement process is to open doors for learning and understanding: most importantly about each other, and the needs all parties have in developing a deeper understanding of the cultural significance of the moraine to past generations and to those ahead of us. Part of this process has included cultural awareness training for the Board, at which cultural protocols, engagement steps and opportunities were reviewed and refined. These steps will pave the way to future identification of opportunities for initiatives, projects and innovative collaborations.

13.5 Stakeholder Engagement

How will stakeholder involvement in implementing and managing the biosphere reserve be fostered?

The Stewardship Engagement Strategy developed by the BHI in 2012 outlines means by which communities, non-governmental organization and the public might become help implement the future biosphere reserve. The plan noted the opportunity to coordinate the activities of organizations already working in the moraine, for example with communities and organizations working more directly with members of the public on initiatives to enhance quality of life of their communities through conservation. The BHI can help facilitate initiatives by linking organizations with similar objectives, or by providing logistic or communications support. As an example, the BHI is providing a web platform to community groups and non-governmental organizations to advertise their stewardship activities. Citizen scientists have also been recruited through BHI partners to assist in research projects now active in the moraine (e.g., the meso-carnivore study). Such support will fulfil the conservation and capacity functions of the biosphere reserve.

The public engagement and Aboriginal engagement campaigns have also promoted awareness of opportunity for future involvement as part of the BHI, either on the Board, or as part of a Working Group. Although public members of the BHI are few presently, the hope is to grow representation from both of these groups. In addition, public and Aboriginal engagement work will be on-going through this next year, to complete initiatives begun as part of the nomination awareness program, and then will continue as an on-going feature of the Biosphere Reserve. The on-going program will ensure that all local communities are informed of programs, initiatives and opportunities to become involved in both programs and management of the biosphere reserve. Representatives of organizations that actively engage volunteers in their work within the moraine, including non-governmental organizations like the Nature Conservancy of Canada and Nature Alberta, offer another means of raising awareness of the biosphere reserve, and potential to become more involved in its management or operation.

13.6 Resources

What are the expected main sources of resources (financial, material and human) to implement the objectives of the biosphere reserve and projects within it? (Please provide formal commitments and engagements.)

The BHI has established an organizational structure and business planning approach that minimizes direct operational costs by focusing its efforts on coordination, while supporting specific project implementation through leveraged grant funding and in-kind support. Each municipality contributes funding that supports

operational costs of the BHI, and can be used to leverage funding through grant sources. Strathcona County provides staff support for many administrative duties as part of its role as a Fiscal Agent for the BHI, an in-kind contribution. It also funds the Executive Director position. The Executive Director is responsible for coordination of the activities of the various Working Groups and partner organizations, including facilitation of BHI projects and managing associated funding. Communication, sharing information, news of events and local and regional initiatives across member organizations and with the public is central to this role and allows the group to respond to new collaborative and funding opportunities. Together, these resources perform the main administrative and coordination functions of the BHI.

Although the BHI serves mainly as a coordination body, helping to facilitate projects by linking financial, technical or human resources appropriate to a given initiative, from time to time projects are initiated, managed and sometimes staffed by the Working Groups. Each Working Group comprises members of relevant partner organizations, whose time is considered an in-kind contribution of their home organization to the BHI. As projects relevant to a member organization are identified, they will often contribute additional support as needed, or dedicate staff to manage and complete the project. Members of the public are also welcome on the Working Groups and can assist in project activities. Additional members from the general public have been solicited during recent engagement campaign and will continue through the on-going communication and engagement process. Generally though, BHI initiated projects have been implemented through grant and industry funding leveraged from municipal contributions. The BHI has raised $1 M in funding for its projects since 2002. In-kind contributions have totalled about $1.5 M in that same time.

14. CONSERVATION FUNCTION

14.1. Landscapes and Ecosystems

At the level of landscapes and ecosystems (including soils, water and climate):

14.1.1 Location of Ecosystems and/or Land Cover Types of the Biosphere Reserve

The higher elevation and slightly cooler conditions within the Beaver Hills have helped to create a distinct boreal ecosystem. The moraine is a disjunct island of the Dry Mixedwood Boreal Forest characteristic of northern Alberta. It is surrounded by the level to undulating plains of the Aspen Parkland ecosystem, which separates the moraine from these northern boreal forests. The moraine stands out as a distinctive feature in the region, and in the province, as a southern isolate of the boreal forest so dominant in the north.

The adjacent parkland plains were more attractive for early settlers and that landscape has been extensively modified for agricultural use and later industrial and urban development. The moraine, in contrast, is relatively intact due to development limitations of the rough terrain and soil conditions.
Part of what makes the moraine distinctive is the diversity of wetland and upland forest within the hummocky, rough terrain. Lakes and wetlands are abundant and diverse in size, form and water chemistry. The adjacent deciduous (and in some places, remnant white spruce) forests are largely intact, particularly through the "spine" of the moraine, a north-south section of more rugged terrain within which the four largest protected areas lie.

Ecological connectivity is relatively high through this intact zone, and is being enhanced by conservation activities of the BHI partners. The purchase of Golden Ranches by partner environmental non-governmental organizations and land trusts filled a key linkage area between the Blackfoot PRA and Ministik Game Bird Sanctuary. This property lies in the middle of the less developed "spine" of the moraine and its conservation will protect a key section of this north to south connective corridor. The municipal partners within the BHI have recognized the importance of the moraine to the quality of life for area residents and many have developed policies to protect the more sensitive or vulnerable parts of the moraine on private lands.

14.1.2 State and Trends of the Ecosystems and/or Land Cover Types Described Above and the Natural and Human Drivers of the Trends

The diversity in landform and habitat, landscape level connectivity and the relatively undeveloped condition in much of the moraine have helped attract and sustain a diverse and abundant assemblage of wildlife, plants and plant communities. Because of its location in a transition area between the Aspen Parkland and the northern Boreal Forests, species representative of both ecosystems can be found within the moraine. A number of special status species (wildlife and plants) use the moraine, which is indicative of the health of the moraine ecosystem. Management programs for several of these species have been established in the protected areas (most notably EINP), which have contributed to the successful recovery of several federally listed Endangered and Threatened species. Section 14.2 below describes in more detail the diversity of wildlife and plant species

found within and outside the moraine's protected areas, including the abundance of special status species within the moraine.

The moraine's forest, grassland and wetland ecosystems are currently under threat from urban expansion from the adjacent Edmonton metropolitan region. The moraine's rugged terrain and natural landscapes are highly attractive for rural residential living and the Edmonton metropolitan area has been one of Canada's fastest growing regions since 2001 (Statistics Canada, 2011). Much of that development has been in the urban fringe lands, including the moraine. Strathcona County has experienced much of that development pressure; the 2011 federal census reports that Strathcona County is now Alberta's third largest municipality (Statistics Canada, 2011). Such expansion can remove natural forest cover or result in wetland drainage or infill. It can also result in re-forestation of lands formerly used for agricultural production. Both trends have been observed in the moraine landscape, and preventing loss or disturbance of natural ecosystems due to inappropriate residential development has been a focal point of the BHI's Land Management Framework and its work with area land use planners.

Climate change is anticipated to compound effects of wetland loss due to human development. Schindler and Donahue (2006) predicted that near future climate warming will combine with the normal cyclic drought pattern on the Western Canadian prairies, with severe impact on both water quantity and quality. Programs to conserve wetlands are increasingly emphasized at the provincial and municipal level. Strathcona County has implemented its own *Wetland Policy* since 2008, a program that aims to conserve wetlands through the land use planning process. Alberta's *Wetland Policy* (2014) has imposed a stricter system to regulate loss and compensation for that loss.

Climate change and drought effects could also influence the moraine's forests, either by increasing risk of wildfire or by gradual conversion to grassland due to drying conditions. The degree of anticipated impact is less well understood, and discussion of climate adaptation is only beginning at the provincial level. As an example, a partner organization, the Alberta Biodiversity Monitoring Institute has initiated programs examining the potential effects of climate change on Alberta's biodiversity, and planning that may be required to manage such changes. Although their work extends across the province, opportunity exists to develop specific studies of the moraine's biodiversity, a topic that could be explored in the future. Again, water conservation is a central theme in those discussions. Other adaptations potentially required at the local level have been less often explored. The BHI commissioned a fire history study in 2006-2007 that characterized past trends, with intent to inform discussions for regional cooperation on fire management. The Joint Fire Management Plan will move forward with recommendations and proactive measures developed with input from government, non-government organizations and the public,

14.1.3 Protection Regimes (including customary and traditional) for the Core Area(s) and the Buffer Zone(s)

The majority of the Core Areas and Buffer Zones are managed by federal and provincial park agencies, each of which have jurisdictional control over habitat management, land use planning and enforcement. From an ecosystem protection perspective, these protected areas focus considerable attention on habitat management, including monitoring. Parks Canada compiles a State of the Park report for all National Parks as part of its 10 year management planning cycle. The report presents results of monitoring of ecological, cultural and visitation indicators, with particular focus on context specific threats such as climate change and habitat loss.

EINP completed its most recent State of the Park report in 2010, and highlighted wetland loss due to drought as a key concern. Forests, grasslands and species of concern were considered to be in fair condition, or in need of additional monitoring (Parks Canada, 2010a).

Alberta Parks has taken a broader approach under its Science Policy (2009), which allows specific issues and concerns to be studied in collaboration with researchers. Specific management solutions have been tested at MLPP and the Blackfoot PRA since the policy was developed, including wetland management. A province-wide assessment of research needs identified management priorities within specific park regions and at the provincial level (Beaverhills Consulting, 2014). Species conservation and climate change were key ecological concerns at both the provincial and regional level. Region specific concerns included management of human-wildlife conflicts and ability to identify key threats to the ecological health of parks in the East Central Region, which includes the moraine area.

The environmental non-government organizations (ENGOs) that manage conservation properties within the moraine also develop management plans and monitor responses relative to indicators of interest. Most of these groups will conduct annual or semi-annual assessments of their properties to assess change over time. The Nature Conservancy of Canada will be updating their conservation plan for the moraine area this year, for example, a process that will assess their past conservation efforts, and future opportunities for conservation through easements, outright purchase or local partnerships, including partners within the BHI.

14.1.4 Indicators or Data used to Assess the Efficiency of the Strategy

Parks Canada uses relatively broad indicators to assess response to management actions, including condition of forest, wetland and grassland ecosystems. Alberta Parks does not yet have a comprehensive monitoring system in place and thus, has selected no indicators. The various ENGOs have each selected indicators relevant to their management activities (where indicators are used). Invasive species are a commonly used indicator, since they, like all landowners must manage these species under municipal and provincial policies. The BHI's State of the Beaver Hills reporting project is intended to monitor various parameters related to land, water and social management activities within Core Areas, Buffer Zones and Transition Areas. The preliminary assessment of potential indicators is currently under review and final indicators will be selected by June 2015.

14.2 Species and Ecosystem Diversity

At the level of species and ecosystem diversity:

14.2.1 Main Groups of Species or Species of Particular Interest for the Conservation Objectives, Especially Those That are Endemic to this Biosphere Reserve and a Brief Description of the Communities in Which they Occur

The abundance of game, wildlife and edible plants within the moraine has been an important factor in human use of this landscape, beginning with the earliest Aboriginal use (dating back 8,000 years) through the early settlement of the region (MacDonald, 2009). The diversity of forest and upland habitats, with small openings of native grassland, provided optimal habitat for bison, deer, elk and moose, as well as diverse and abundant waterfowl. It also provided suitable habitat conditions for a range of edible berries and nuts used by Aboriginals and early settlers. Habitat conditions have been modified by human activity over time, yet extensive forest and wetland cover remains, and supports a variety of plant and wildlife species linked to these

and other ecosystem services. The main groups of species of interest from a conservation perspective are reviewed below.

Wildlife: Diverse habitats within the Beaver Hills support a broad variety of wildlife species (for a complete list, please see Appendix G: Wildlife Species Occurring in the Beaver Hills). A comprehensive inventory of wildlife within the moraine has not been conducted, but past studies on specific sites within the area provide indications of wildlife use. Table 6 summarizes the number of species potentially occurring in the area, based on distributions reported within the province (Acorn, 1993; Fisher and Acorn, 1998; Pattie and Fisher, 1999; Russell and Bauer, 2000; Federation of Alberta Naturalists, 2007), the Royal Alberta Museum's Official List of the Birds of Alberta and of the Edmonton area (compiled from naturalist reports, published studies and bird counts), and observations of biologists working in protected and privately held lands in the moraine (Dr. L. Carbyn, Dr. G. Hood, Dr. D. Patriquin, pers. comm.). Of a total of 439 wildlife species, the majority (358 species) are birds. This is not unusual; bird diversity is typically much higher than that of other wildlife species in any given area. Mammals are the next most diverse group, with 58 species. Due to the cold climate of central Alberta, only five amphibians, three reptiles and 15 butterflies (Lepidoptera) occur in the area.

In terms of their residency in the region, most of these wildlife species are migratory and either pass through the region (migrants, 49 species) or remain to breed in the moraine through the spring and summer months (182 species, Table 6). This is typical of the central and northern regions of Canada, where winter climate poses a barrier to year-round use, but abundant summer resources support highly diverse breeding populations. Another 102 species are year-round residents in the area (including all of the amphibian and reptile and most mammal species). Seven bird species occur only in the winter months. Lastly, 99 vagrant species (mainly birds) have been occasionally observed in the area. These observations represent accidental movements beyond typical ranges or migration pathways.

Table 6. Wildlife species potentially occurring in the Beaver Hills

Species group	Migratory species					
	Breeding	Migrant	Resident	Winter	Vagrant	Total
Amphibian	--	--	5	--	--	5
Reptiles	--	--	3	--	--	3
Birds	167	49	37	7	98	358
Mammals	--	--	57	--	1	58
Lepidoptera	15	--	--	--	--	15
Total	182	49	102	7	99	439

Both the Canadian and Alberta governments track species at risk of extinction. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) lists 20 of the moraine's species at the higher levels of risk including Endangered, Threatened, Special Concern, High Priority Candidates for listing or Low Priority Candidates (see Table 7, Appendix G). Of those, 11 species are also Schedule 1 "listed species" in the *Species at Risk Act* (SARA), species with legal protections under the Act. One of those listed is a Schedule 3 Special Status species under SARA, a species for which management planning is federally mandated. The IUCN Red List had identified only bison (*Bison bison*) as a species at risk globally, with a status of Near Threatened. The IUCN does not differentiate between the two sub-species recognized in Canada including wood (*Bison bison athabascae*) and plains bison (*Bison bison bison*).

Table 7. Federal (COSEWIC) and Species at Risk (Listed) species

COSEWIC designation [a]	Total species	SARA designation [b]	Total species
Endangered	6	Schedule 1 (Endangered)	6
Threatened	14	Schedule 1 (Special Concern)	9
Special Concern	15	Schedule 1 (Threatened)	9
High Priority Candidate for listing	3	Schedule 3 (Special Concern)	1
Mid-priority Candidate for listing	3		
Low Priority Candidate for listing	16		
Data Deficient	1		
(Reviewed, but) Not at Risk	35		
Status in Review	2		
Total	95	Total	24

[a] *Nationally, species considered at risk are first assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and assigned to various status categories. Endangered species are under imminent threat of extirpation or extinction and Threatened and Special Concern species risk being elevated to higher status categories (Endangered and Threatened, respectively) in the absence of management action.*

[b] *COSEWIC may recommend species that require management intervention or protection. These are identified as Schedule 2 or Schedule 3 species under the federal Species at Risk Act (SARA), until they have been reassessed for federal protection status. Schedule 1 species have been reassessed and are protected under the SARA.*

Provincially, 10 of the species potentially occurring in the moraine are considered at the highest level of risk (At Risk or May Be At Risk) and one species has been Extirpated (Table 8). Another 66 species are considered Sensitive (in need of management attention to prevent further declines).

Table 8. Provincial status species, AESRD, 2005)

Provincial Status	Total Species	Wildlife Act[3]	Total Species
Extirpated/Extinct	1	Endangered	3
At Risk	4	Threatened	2
May Be At Risk	6	Special Concern	5
Sensitive	66	Data Deficient	3
Undetermined	9	In Process	2
Secure	261		
Accidental/Vagrant	86		
Exotic/Alien	6		
Total	439	Total	15

[3] Includes species assessed by the provincial Endangered Species Conservation Committee as Data Deficient and In Progress reviews.

EINP, and to some extent, the Beaver Hills, has played a critical role in sustaining these declining species. Notable success stories include the wood bison (*Bison bison athabascae*, At Risk provincially and Threatened federally) and plains bison (*Bison bison bison*, Extirpated/Extinct provincially and Threatened federally), which are species of forest and grassland habitats respectively. The bison populations within EINP are part of a national recovery plan designed to sustain genetically pure and disease-free populations of each species to serve as a healthy source for other population restoration efforts. Excess individuals are periodically transferred to other parks and protected areas to restore or bolster populations in parts of their former range, including recent transfers to Grasslands National Park in Saskatchewan and Montana. A transfer of bison to Russia helped support a broader restoration program intended to reintroduce a key herbivore to this grassland ecosystem.

Trumpeter swan (*Cygnus buccinator*, At Risk provincially and Not At Risk federally) now successfully breeds in small wetlands and lakes within the moraine, due to a recovery program at EINP. The trumpeter swan recovery program at EINP has helped delist this bird nationally (now considered Not At Risk according to COSEWIC). Provincially, it remains an At Risk species. The initial small population of breeding birds reintroduced into the park has produced a larger local population that now breeds in the park and in adjacent lands (M. Peckett, pers. comm.).

Alberta Parks and AESRD have also contributed to the inventory and management of special status species within the region and in their protected areas. Piping plovers (*Charadrius melodus circumcinctus*), a federally Endangered species, have been reported in the alkaline wetlands in MLPP, an observation that will be confirmed through a proposed inventory. Colonial nesting birds, including an American white pelican (*Pelecanus erythrorhynchos*) colony at Joseph Lake and a great blue heron (*Ardea herodias)* colony at Hastings Lake, south of the Blackfoot PRA, are monitored and managed by AESRD and Alberta Parks. Specific studies have also been conducted from time to time, using resources of BHI partner organizations. For example, Alberta Parks and the Augustana campus of the University of Alberta investigated population trends at the Hastings Lake heron colony, as part of an undergraduate directed study. A PhD student jointly supervised by researchers from Alberta Innovates Technology Futures and the Augustana campus is assessing meso-carnivore populations within the moraine, to determine species abundance as well as population genetics of one particular species, fisher (*Martes pennanti*). This study also involves biologists from Alberta Parks, AESRD and an environmental non-government organization (Alberta Conservation Association).

Researchers at the University of Alberta's North and Augustana campuses have also contributed to management of declining wildlife species and ecosystems within the moraine (e.g., a habitat study for Canadian toad (*Anaxyrus hemiophrys*) and western toad (*Anaxyrus boreas*), and a variety of wetland biodiversity and management studies). Several ongoing collaborative studies are currently examining wetland form and function, in the context of development of a province-wide policy for wetland conservation. This research will help to quantify wetland loss and develop parameters for appropriate compensation, a tool now missing in existing policy.

Plants: The Alberta Conservation Information Management System (ACIMS) tracks observations of plants and wildlife within the province. They also track sensitive plant species and plant communities. A total of 936 plant species may occur within the Beaver Hills (Appendix H: Plant Species in the Moraine). The diversity is due, in part, to the juxtaposition of the moraine, a boreal ecoregion, within the Aspen Parkland ecoregion. Plants representative of both ecoregions may occur within the moraine landscape. The ACIMS holds records of 36 plants and six plant communities observed within the moraine that are considered sensitive due to low distribution of populations within the province (with ranks of S1 to S3, Table 9 and 10). Plants or communities with a rank of S1 have fewer than five populations reported within the province, S2 rank species have between five and 20 populations and S3, between 20 and 100 populations.

None of these species are listed under the federal Species at Risk Act (SARA). The sensitive plant species include both vascular and bryophyte species. Although ACIMS also tracks lichen species, no sensitive species have been reported within the moraine. The plant communities include a bog community (Alaska birch / common Labrador tea), a native grassland community (Western porcupine grass - green needle grass – sedge), a shrubland community (Saskatoon / common bearberry / northern rice grass), a wetland community (Cyperus-like sedge – water arum), and two balsam poplar forest communities. The Dry Mixedwood Boreal Ecoregion of which the moraine is part is characterized by aspen and balsam poplar forests, with scattered patches of white spruce. Peat bogs and fens also occur in the moraine, but are limited in distribution. A proposed study to map these communities is being considered by the BHI Research and Monitoring Working Group for the upcoming business planning cycle.

Table 9. Sensitive plant communities potentially occurring in the Beaver Hills (ACIMS 2010)

Plant community		Provincial status [4]
Amelanchier alnifolia / Arctostaphylos uva-ursi / Oryzopsis pungens	Saskatoon / common bearberry / northern rice grass	S2S3
Carex pseudocyperus - Calla palustris	Cyperus-like sedge - water arum	S2
Populus balsamifera / Alnus tenuifolia - Cornus stolonifera / Equisetum pratense	Balsam poplar / river alder - red-osier dogwood / meadow horsetail	S3
Populus balsamifera / Viburnum opulus / Matteuccia struthiopteris	Balsam poplar / high-bush cranberry / ostrich fern	S1S2
Stipa curtiseta - S. viridula - Carex spp.	Western porcupine grass - green needle grass - sedges	S2S3
Betula neoalaskana / Ledum groenlandicum	Alaska birch / common Labrador tea	S1S2

[4] *Alberta ranks its plant communities for conservation management on a global, national and sub -national scale of 1 to 5, following the system developed by The Nature Conservancy. G1 (Global 1) indicates that a community is of high conservation concern at the global scale due to rarity, endemism and / or threats, and a rank of G5 (Global 5) indicates a community that is widespread and abundant. A rank of N1 (National 1) or S1 (Sub-National 1) indicates high conservation concern at the national or state / provincial level, respectively. S1: <5 occurrences in province; S2: between 5 to 20 occurrences; S3: between 20 to 100 occurrences. GNA, NNA or SNA: not applicable for management at the respective scale (ACIMS, 2010). Communities with a rank of S3 or lower are generally considered to be sensitive to disturbance in the province, and in need of management attention.*

Table 10. Sensitive Plant Species Potentially Occurring in the Beaver Hills (ACIMS, 2010) [5]

Scientific name	Authority	Common name	Provincial status (Srank)	Global status (Grank)
Aster umbellatus	Mill.	Flat-topped white aster	S2	G5
Betula neoalaskana	Sargent	Alaska birch	S1S2	G4G5
Botrychium ascendens	W.H. Wagner	Ascending grape fern	S2	G2G3
Botrychium lanceolatum	(Gmel.) Aongstr	Lance-leaved grape fern	S2	G5
Botrychium minganense	W.H. Wagner	Field grape fern; prairie moonwort	SU	
Botrychium pallidum	W.H. Wagner	Pale moonwort	S3	
Botrychium pinnatum	H. St. John	Northwestern grape fern	S1	
Botrychium simplex	E. Hitchc.	Dwarf grape fern	S2	G5
Bryum cyclophylum	Schwaegr	Bryum moss	S2	
Calla palustris	L.	Water arum	S4	G5
Campylium radicale	P. Beauv	Campylium moss	S2	
Carex lacustris	Willd.	Lakeshore sedge	S2	G5
Carex pseudo-cyperus	L.	Cyperus-like sedge	S2	
Carex vulpinoidea	Michx.	Fox sedge	S2	G5
Conardia compacta	C. Müll	Compact conardia moss	S2	
Desmatodon heimii	Hedw.	Desmatodon moss	S2	
Drepanocladus crassicostatus	Jans.	Drepanocladus moss	S2	
Dryopteris carthusiana	(Vill.) H.P. Fuchs	Narrow spinulose shield fern	S4	G5
Geranium carolinianum	L.	Carolina wild geranium	S1	G5
Ledum groenlandicum	Oeder	Common Labrador tea	S1S2	G5
Mycocalicium calicioides	Nadv.	Mycocalicium calicioides	S1	
Najas flexilis	(Willd.) Rostk. & Schmidt	Slender naiad	S2	G5
Phascum cuspidatum	Hedw.	Toothed phascum moss	S2	
Physcomitrium pyriforme		Common bladder moss	S1	
Potamogeton foliosus	Raf.	Leafy pondweed	S2	G5
Potamogeton obtusifolius	Mert. & Koch	Blunt-leaved pondweed	S2	G5

[5] *Alberta ranks its plant and wildlife species for conservation management on a global, national and sub -national scale of 1 to 5, following the system developed by The Nature Conservancy. G1 (Global 1) indicates that a species of high conservation concern at the global scale due to rarity, endemism and / or threats, and a rank of G5 (Global 5) indicates a species that is widespread and abundant. A rank of N1 (National 1) or S1 (Sub-National 1) indicates high conservation concern at the national or state / provincial level, respectively. S1: <5 occurrences in province; S2: between 5 to 20 occurrences; S3: between 20 to 100 occurrences. GNA, NNA or SNA: not applicable for management at the respective scale (ACIMS, 2010). Species of rank S3 or lower are generally considered sensitive in Alberta and in need of management attention.*

Scientific name	Authority	Common name	Provincial status (Srank)	Global status (Grank)
Rhizomnium andrewsianum	Steere	Andrew's rhizomnium moss	S1	
Ricciocarpus natans	L.	Puple-fingered riccia	S2	
Rubus x paracaulis	Bailey	Hybrid dwarf raspberry	S1	GNA
Ruppia cirrhosa	Grande	Widgeon-grass	S1	
Scoliciosporum chlorococcum	Stenh	Scoliciosporum chlorococcum	S2	
Trichophorum clintonii	Gray	Clinton's bulrush	S1	
Viola pallens	Banks ex Ging	Northern white violet	S2S3	
Weissia controversa	Hedw.	Green-tufted stubble moss	S2	
Wolffia columbiana	Karsten	Watermeal	S2	G5

14.2.2 Pressures on Key Species

What are the threats (example unsustainable management of forest), their immediate causes (drivers of change like forest change or habitat change), their underlying causes (example overgrazing, fire, pollution), and the main driving forces (example: economic, political, social, external, etc.) and the area(s) concerned?

For many of Alberta's species at risk, habitat loss is a primary threat. This is certainly the case for many of the wildlife and plant species in the moraine area. Plains and wood bison, trumpeter swan and elk populations managed in EINP are an exception in that their populations were driven to very low levels by overhunting early in the 20th century. The captive bison herds within EINP are at risk of mortality due to diseases like brucellosis, and are regularly monitored to ensure herd health. Wild ungulates such as white-tailed and mule deer are susceptible to chronic wasting disease (CWD), and transfer to managed herds of elk is possible and actively monitored at EINP. Potential for transfer of CWD to bison and moose is not well understood, and disease monitoring extends to these species as well.

Habitat loss began with clearing of natural forests and grasslands for agricultural use, although the moraine largely avoided habitat loss due to land conversion due to rough terrain and poor soil suitability for agriculture. Later, urban expansion and industrial development (e.g., for oil and gas exploration) led to additional habitat loss in this area. Now, as the population expands in the Edmonton Capital region, rural residential development and to some extent industrial activity, have become the primary threats to species within the moraine.

14.2.3 Measures and Indicators Currently Used to Assess Species Groups and the Pressures on Them

Who undertakes this work, or will do so in the future?

AESRD has jurisdiction for management of all plant and wildlife species populations in the province and currently tracks both plant and wildlife species through various means. The Alberta Conservation Information Management System (ACIMS) and the Fisheries and Wildlife Information Management System (FWMIS) manage and distribute to government biologists and the public records of all species observations within the province. Observations come from government census surveys designed to monitor populations of hunted

species (e.g., ungulate, waterfowl, game birds, shorebirds) and species at risk, as well as reports provided by other professional biologists working in industry sectors (e.g., consulting, resource development industries) or reputable amateur biologists. Within the moraine, these two databases, and the surveys on which they are based are the chief means of tracking species populations over time.

Within the federal and provincial parks, surveys are regularly done to monitor species of management concern and species at risk. This includes the bison and elk management programs in EINP, which monitor population numbers and herd health. Trumpeter swan populations are surveyed annually in the park as well. Other key species are monitored in both EINP and the provincial parks (e.g., waterfowl, shorebirds, and beaver). Currently, a PhD research program is assessing population size and genetic diversity of mid-sized (meso) carnivores (e.g., marten, weasels, coyote) to evaluate genetic biodiversity within these populations, and effectiveness of landscape connectivity with northern boreal forests. Alberta Parks has also periodically used wildlife cameras to track wildlife activity in areas of specific interest. Such programs are generally of short duration and may not continue through the long-term.

In the future, citizen science programs run by local conservation organizations could be used to monitor specific sites for wildlife activity, supplementing efforts of provincial biologists. Two winter survey programs have been developed to date (wildlife tracking and woodpecker activity). The wildlife tracking program has been piloted as part of courses at the University of Alberta's Augustana Campus for the past two years, and will likely be continued as a regular activity in future years.

14.2.4 Actions Currently Undertaken to Reduce Pressures

The BHI's Land Management Framework (LMF) has offered land use planners information and best management practices that can help developers and land use planners to conserve critical habitats within the moraine. All five municipalities within the moraine have used the LMF to improve their land use policies, and to evaluate specific development proposals, to identify areas best suited for development, or conservation. Federal and provincial agencies can also use this information for habitat management in their own protected areas as well. Provincially, the new Wetland Policy (2014) has formalized restrictions on wetland disturbance and removal and Strathcona County has developed a similar policy for application within its own lands. These measures can help reduce habitat loss pressures more generally, and particularly for wetland habitats.

Management of wildlife disease and small populations within the moraine is handled by Parks Canada (for EINP) and AESRD for provincial protected areas and across all private land. AESRD tracks diseases like chronic wasting disease through awareness campaigns aimed at hunters, which asks hunters to submit animals for testing or report unusual symptoms observed in the field. The department can initiate control programs, should problems appear to worsen and it works closely with EINP to compare incidence reporting.

14.2.5 Actions the BHI Intends to Take to Reduce Pressures

The BHI's Research and Monitoring Working Group includes biologists from AESRD and representatives from EINP and environmental non-governmental organizations, in addition to research scientists from various institutions. Their primary role is to facilitate research or management projects to address specific needs of partner agencies, and to coordinate with others actively pursuing such work in the moraine. They are also responsible for the State of the Beaver Hills Report, which will be updated every five years. Currently the

Working Group is focused on completion of this monitoring report, and once it is complete they will be well positioned to bring forward concerns to the relevant agencies, should concerns be identified. Other projects still under discussion include climate resiliency and fire management strategies.

14.3. Genetic Diversity

At the level of genetic diversity:

The concern for connectivity between the moraine and the adjacent Aspen Parkland and boreal forest ecosystems is linked in part to awareness of the role of landscape level connections in supporting genetic diversity. The species diversity in the moraine is due to its location and unique climatic and geomorphological features. The moraine is a boreal ecosystem due to higher elevation, which influences climate, and its morainal soils, which affect primary productivity. Its location in the midst of the Aspen Parkland, and relatively short distance to boreal ecosystems north of the North Saskatchewan River allows movement of boreal and parkland species to and from this 'disjunct island'. Yet like all islands, a loss of connection can limit genetic diversity and ultimately, resilience of the now isolated population. Partner agencies within the BHI have established programs to conserve genetic biodiversity in terms of species at risk, and commercial growers are now also working to promote heritage stock adapted to local growing conditions. Such efforts attempt to preserve genetic diversity at the local level, within the moraine, and in some cases, enhance genetic diversity in other populations through re-introduction programs.

14.3.1 Species or Varieties of Importance

(e.g. for conservation, medicine, food production, agro-biodiversity, cultural practices etc).

As noted in section 13.2 above, the protected areas within the moraine have played a key role in the recovery of bison and trumpeter swan populations. Both of these species have been federally listed and nationally, their populations were in significant decline. Trumpeter swans are now delisted, due in part to the success of the EINP program. Swans have successfully bred in the park (and now also outside of it), and the program has gradually increased the local population to contribute to a continental recovery strategy.

The bison program at the park has maintained a disease-free herd with healthy population growth, providing an all-important genetic source for reintroduction programs across North America. The park's herds of plains and wood bison have sufficient numbers to sustain their genetic health, but the growing population can exceed the carrying capacity of the park. EINP manages overall herd size by offering surplus animals to programs in other parks in Canada (e.g., Grasslands National Park received a small herd in 2005) and in the United States. Bison from EINP have been used to re-establish a population in a private park on the Siberian Plains in Russia, as well as in Montana, USA.

EINP also supports a growing, disease-free herd of elk. From time to time, elk are released to the Blackfoot PRA (and can disperse through the moraine from there), which helps to sustain genetic diversity within the moraine populations. Although elk are not currently at risk in Canada, they have been extirpated from their former range in some areas of the United States. Excess elk from EINP have also been used in reintroduction programs in American states (e.g., Tennessee).

Although not as well documented, berry picking (chokecherry, saskatoon) has long been a popular activity for local residents and visitors to the area. While fruit cannot be picked in most protected areas, it is allowed on

private lands, with landowner permission, and at special 'U-pick' market gardens. Recently, saskatoons and other berry shrubs have been gained popularity as a commercial crop and small "orchards" have become established in the moraine, marketing fresh berries and secondary products (e.g., wine, juice, syrup). Certain organic farms in the moraine have specialized in heritage varieties and help to sustain genetic lines of these and other agricultural crop species (particularly vegetables).

14.3.2 Ecological, Economic or Social Pressures that may Threaten Species

There are no known ecological, economic or social pressures or changes that could affect species important for conservation at this time, other than those identified in the previous sections. Cultural use of berries and other locally grown crop species is not currently threatened, and in fact commercial market gardens have helped improve access to these species. Agro-biodiversity is not well-understood currently, and the status of the heritage varieties actively promoted by local suppliers does not appear to be at risk. Like many areas, pesticide impacts on pollinators such as bees could influence local crop production. Again though, current status of bee populations is not well studied, and trends have not yet been determined.

14.3.3 Species Indicators that are used, or will be used, to Assess Population Status and Associated Use

No indicators have been identified as yet to monitor genetic biodiversity at the broader species level. On-going efforts to manage the bison, elk and swan populations can also be used to assess indicators of genetic health (e.g., susceptibility to disease). A PhD project that is assessing the genetic diversity of mid-sized (meso) carnivores in the moraine will provide indication of the level of landscape connectivity and potential for immigration of new individuals and genetic stock. This program is not anticipated to continue as a long-term effort, however new initiatives can be explored through the BHI partners based on biodiversity indicators monitored through the State of the Beaver Hills reporting system.

14.3.4 Measures used to Conserve Genetic Diversity and Practices associated with their Conservation

The bison, elk and swan programs at EINP are at their heart an effort to sustain genetic diversity within these species. These programs are long-term and are anticipated to continue in the future. No other long-term measures to conserve genetic diversity and practices associated with the conservation of specific species are contemplated at this time. Land use planning policy changes that emphasize landscape level connectivity will play an important role in maintaining the genetic diversity of many species within and beyond the moraine.

15. DEVELOPMENT FUNCTION

15.1. Potential for fostering economic and human development which is socio-culturally and ecologically sustainable.

The BHI has already demonstrated the moraine's potential to serve as a pilot site for promotion of sustainable development. The BHI's ability to encourage voluntary adoption of sustainable management practices, and collaborative development of innovative management tools have captured the interest of provincial and other municipal governments interested in regional management approaches to sustainable development. Studies promoting innovative economic alternatives for the region that will help sustain the socio-cultural and environmental character of the moraine offer further promise. The sections below will provide relevant examples highlighting both past achievements and future potential as a demonstration area.

15.1.1 Describe how and why the area has potential to serve as a site of excellence/model region for promoting sustainable development. *(Describe how the area has potential to serve as a pilot site for promoting the sustainable development of its region or "eco-region)*

Provincially and locally, there is clear recognition that land uses that provide strong economic, social and environmental benefits are important to regional health. Further, there is growing awareness that existing industries are often highly dependent upon one or a variety of natural and anthropogenic features. The need for economic alternatives (such as sustainable forms of recreation and tourism and innovative approaches to traditional industries such as agriculture and energy production) has also been recognized as essential for sustainability. Successes within the moraine on these fronts have helped demonstrate the potential for regional sustainable development, both locally and provincially.

Municipalities play a key role in promoting economic alternatives, through their jurisdictional control over land use planning, and active local role in economic development, whether through traditional activities such as agriculture or industry, or newly emerging areas such as recreation and nature-based tourism (including eco- or agri-tourism). Further, each municipality controls these aspects of the community independently from each other, and to some extent, from the province. Although each must adhere to regional or provincial requirements and program directions, they have considerable latitude to pursue locally relevant initiatives. They have played an important role in the BHI's work on sustainable development, both as willing and active partners and advisors, for this reason.

The availability of the BHI's successful examples of sustainable regional development is timely. Alberta recently instituted a provincial requirement for regional planning (the provincial Land Use Framework, regulated under the *Alberta Land Stewardship Act*), a planning process with similar vision and objectives to that of the BHI. The success of the BHI in promoting cooperative land management through its Land Management Framework and other initiatives captured provincial attention as a potential model for regional plans to be completed across the province. The BHI provided input and ideas regarding sustainable economic alternatives for the upcoming regional land use plan to be developed for the North Saskatchewan River Region. Two of those economic alternatives are highlighted below as examples of the demonstration potential of the moraine, and the role of the BHI in coordinating and facilitating such efforts.

15.1.1.1 Sustainable Recreation and Tourism

The Beaver Hills has two key advantages with respect to sustainable recreation and tourism: its proximity to major urban centres and its landscape character, rich in ecological and cultural values. Being within easy driving distance of metropolitan Edmonton provides access to a potential market of almost one million residents as well as facilities to support regional and international visitors. The existing protected areas and the naturally vegetated linkages between them (within both protected areas and private lands) have sustained a biodiverse and appealing landscape that offers opportunities for both active and passive forms of recreation. The moraine has a number of tourism assets on which to build and enhance its performance as a sustainable nature-based and cultural tourism destination. Several of these assets have critical acclaim and currently stimulate nature-based tourism to the region, including EINP, and the provincial protected areas, including the Ministik Game Bird Sanctuary, Blackfoot PRA and MLPP. The Ukrainian Cultural Heritage Village is one of the best developed cultural assets; it offers an interactive, living history museum experience. Regional programs such as the Kalyna County Eco-museum help promote these and other recreation and tourism opportunities to a broader public.

Nearby are other significant natural areas that are ecologically linked to the Beaver Hills. Beaverhill Lake, a designated Ramsar site (Wetland of International Significance), lies to the east and the North Saskatchewan River is within five km to the northwest. Beaverhill Lake attracts visitors from across the province each spring for the "Snow Goose Chase", a bird-watching event that celebrates the return of flocks of thousands of geese and other migratory bird species to the lake and adjacent wetlands. Beaverhill Lake lies outside of the moraine and, for this reason it has not been included in the biosphere proposal at this time. Expansion of the biosphere reserve to include the lake could be considered in the future, but is not currently proposed. The North Saskatchewan River is a popular destination for fishing, canoeing and other boating activities. These water-based activities are complemented by hiking and cycling within the urban park systems of Edmonton, Fort Saskatchewan and Devon. The River Valley Alliance, an initiative of the several municipal governments bordering the river within the metropolitan Edmonton region, plans to protect much of the river valley, ideally as a provincial park, and develop a regional trail system that will further enhance this nature-based recreational area. The North Saskatchewan Watershed Alliance has also nominated the river, from Banff National Park to the Saskatchewan border, for designation as a Canadian Heritage River. Finally, the Beaver Hills Biosphere would complement the City of Edmonton's involvement in ICLEI and the sustainable development direction reflected in its current municipal policy (see letter of support from Grant Pearsell, Director of Sustainable Development in Edmonton's Urban Planning and Environment Department, Appendix I).

These private, provincial and federal natural areas form a strong ecological network within the Alberta's Capital Region. Both area residents and Albertans treasure the distinctive qualities and extensive natural areas of the Beaver Hills, as a part of that broader network. The moraine also forms a key component of the Capital Region's proposed recreational base for local, national and international visitors.

Current tourism operators within the five municipalities overlapping the moraine play host to an increasing number of local and international visitors. While promoting the diverse sustainability of the region, the BHI has

identified an opportunity to enhance the region's tourism product. The recently completed Tourism Development Opportunities Assessment study by Alberta Culture and Tourism and the BHI has helped to identify opportunities for growth in sustainable tourism and outlined specific initiatives to facilitate growth within the region. More specifically, the report highlighted specific types of tourism opportunities: sustainable nature-based tourism, ecotourism, adventure tourism, wildlife tourism, heritage and cultural tourism and agri-tourism. The report also specifically identified the moraine as a Nature-based Tourism Asset, which will be recognized and supported with development criteria in the forthcoming North Saskatchewan Regional Land Use Plan now being developed by the province.

Capitalizing on these opportunities will require a coordinated effort by economic development agencies in the partner municipalities as well as communications, recreation and planning departments. The coordination team is also actively seeking opportunities to promote existing amenities such as the Beaver Hills Dark Sky Preserve and cultural and historical sites identified within the tourism study. The Tourism Working Implementation Group (TWIG), a Working Group within the BHI will work with these groups to implement the recommendations identified in the study. It is anticipated that part of this process will involve the development of criteria and best practice guidelines for sustainable tourism that will be specifically applicable to the Beaver Hills and the surrounding area. In addition, the BHI Planners Working Group has been enlisted to help draft sample land use bylaws and other appropriate policies that would facilitate development of nature-based tourism initiatives in their respective jurisdictions. The breadth of experience in the TWIG, which includes tourism professionals from Alberta Culture and Tourism, brings a wealth of examples for such policies on which to draw, and provides a tangible example of the benefits of collaboration.

15.1.1.2 Agricultural Innovation

Agricultural operations in the moraine have become increasingly innovative, reacting to the emerging interest in local foods, agri-tourism and new market trends and opportunities. The recent interest in local and regional food systems has fostered farm-direct marketing efforts. Local farmers markets and U-pick farms have also become popular with urban residents who are seeking fresh, seasonal and healthier local products. Traditional and organic market gardens now offer fresh produce and value-added products such as syrups, wines and preserves. Meat operations have developed on-site processing facilities for meats and dairy products, which are marketed throughout the province. Producers within the Beaver Hills are promoted by the publication "Visit Edmonton's Countryside," produced annually by the Edmonton Regional Tourism Group.

In the Edmonton metropolitan area, community-supported agriculture and cooperatives provide a direct connection between producers and urban consumers for farm fresh foods. These "Good Food Box" businesses deliver fresh products to coop members on a weekly or biweekly basis, through a set contract period. The regular income helps provide economic security for the producer and the collaborative marketing approach of the coop provides access to a broader audience, with less individual effort. From local restaurants and their chefs to Good Food Box programs, the market opportunities for local foods are on the rise.

Smaller to medium-sized operations are ideal for this local food market and the growing diversity in these operations is indicative of the dynamic and entrepreneurial climate. According to the 2006 Canadian Census of

Agriculture, organic farming was reported on 8.2% of farms within the moraine. The census also reported 24 greenhouses, 33 nurseries, 17 fruit and berry farms, 17 apiculture sites, and eight vegetable farms. The 2008 Ag Capture survey, a geo-spatial agricultural land use inventory completed by Agriculture & Agri-food Canada in the moraine, found other agri-service operations not reported in the census. These included nine agri-tourism operations, 48 riding arenas or stables, six local meat processors, two aquaculture (trout) farms and five producers of specialty game birds.

Government support for these new, or niche, agricultural products is an important factor in the current diversity of operations. The Leduc Food Processing Development Centre offers assistance with market development and research, agri-value investment, food science technologies and sensory evaluation programs. Local food marketing initiatives are also important for the Alberta Capital Region Board and the City of Edmonton; both are currently investigating policy options to link local agricultural producers, distributors, the food service industry and regional consumers. Strathcona County is developing an Agriculture Master Plan that will lay out policy support for their traditional and innovative farms. Agri-tourism is promoted by a variety of regional economic development agencies, including the Edmonton Regional Tourism Group that annually produces a promotional brochure ("Visit Edmonton's Countryside"). "Kalyna Country" is another organization that promotes tourism over a broad area northeast of Edmonton.

15.1.1.3 BHI Role

The BHI's strategy for fostering economic and human development that is socio-culturally and ecologically sustainable focuses on two objectives:

- generating income from tourism for conservation
- developing innovative tourism and agricultural initiatives through consultation and coordination among all BHI partners and local farmers, residents and tourists (expanded partnerships)

From the outset, the BHI has adopted many of the management principles of IUCN Protected Ares Management Category V [Protected Landscapes/Seascapes] as an approach to balance broad scale conservation with the provision of appropriate recreation and tourism opportunities that enhance the social and economic well-being of the area (Phillips, 2002). Through consultations with protected area service staff, conservation organizations, farmers, communities and tourists, BHI has created a network of interested partners to develop and test strategies for the use of eco-based and agri-tourism as a source of funding for conservation. Entrance fees, tourism concessions and tourist donation funds are examples of revenue-generating strategies that are proving successful. As a critical complement to these initiatives, the BHI also works to ensure that the funds are well-managed and support conservation priorities in the moraine. Section 15.2 provides additional discussion of the means to involve local communities in the development of sustainable nature-based tourism (both eco- and agri-tourism) within the moraine.

In many areas, tourism is a major activity that occurs without much forethought or preparation, resulting in unintended impacts to wildlife and natural communities. To ensure that the benefits of tourism outweigh the costs, careful planning and management of tourism impacts are required. While many municipalities and protected areas have management plans addressing land use, these plans often do not include measures that ensure tourism takes place in a sustainable manner. Using its Land Management Framework and the Tourism Development Opportunity Assessment, the BHI has worked with its partners to improve tourism management plans for national and provincial park systems and municipal counties within the region. Using resources and

information compiled and maintained by the group, the BHI can assist its partners in producing management plans that consider location and construction of buildings, land use zoning, and interpretation and guidelines for visitation. The TDOA has also identified specific opportunities that can enhance the recreational and tourism opportunities currently offered by the protected areas. These resources include GIS datasets describing natural resource sensitivities within the moraine. These data can be used to analyze potential effects of proposed development or management scenarios, before implementation of a selected approach. Finally, the BHI can develop additional tools and resources for managers, operators and local organizations to measure tourism impacts in the region, and offer technical assistance through workshops and training courses.

15.1.2 How do you assess changes and successes (which objectives and by which indicator)?

The BHI has developed two means to help assess change and success in sustainable development. First, the recent update of the Land Management Framework (2015) included an assessment of the successful adoption of sustainable development approaches by member municipalities. The findings offered insights on the role of local municipal context in adoption of best management practices and the time required for changes to be incorporated into policy, let alone realized on the landscape. The LMF will be periodically reviewed to assess its role in promoting best management practices for sustainable land use planning and to identify new trends and challenges regarding land development.

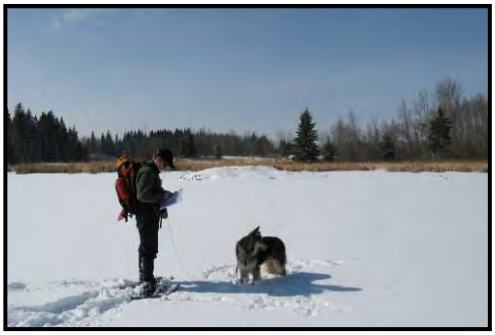
Second, the new State of the Beaver Hills Report will track indicators of social and economic change, as well as ecological parameters at five year intervals. Indicators such as economic benefits across the region and development of sustainable operations such as eco-tourism businesses can be tracked over time, to gauge the success of the BHI's sustainable development programs, including the two tourism examples outlined above.

15.2. Tourism

If tourism is a major activity:

15.2.1 Describe the type(s) of tourism and the touristic facilities available. Summarize the main touristic attractions in the proposed biosphere reserve and their location(s).

Tourism is a major activity within the moraine, an economic factor recently recognized in a listing of significant tourism and recreation areas within Alberta. This listing, compiled for use in developing future regional plans as part of the Alberta Land Use Framework, helped demonstrate the importance of the Beaver Hills as a tourism and recreation resource. The federal and provincial protected areas are key attractions, and Strathcona Wilderness Centre and the Ukrainian Cultural Heritage Village are other popular sites for local, regional and other visitors. Proximity to these facilities is often highlighted in municipal economic development websites and information.



The recreational facilities within the moraine and the rural setting in which they are located are likely to become of increasing value to residents of the adjacent growing urban areas. Growth of urbanization from these population centres creates a detachment from the rural and agricultural heritage for local residents. Areas such as the Beaver Hills are becoming increasingly important as unique settings for active and passive recreational pursuits that contrast with the urban environments and everyday lives of an increasingly urbanized population. Such settings include not only the natural areas, with native vegetation and wildlife, but also the agricultural working landscapes familiar to former residents (see Swinnerton, 1982; Swinnerton and Hinch, 1994).

These recreational facilities also support various regional and international sports events that draw visitors from across the world, and associated economic benefits and profile. The Canadian Birkebeiner Cross-Country Ski Festival takes place annually within the proposed biosphere reserve, in parts of EINP, the Ukrainian Cultural Heritage Village and the Blackfoot PRA. The Canadian Birkebeiner is one of three ski races in the world that celebrate the Norwegian Birkebeiner legend of a 55 km ski escape of an infant king from hostile forces, carried by Birkebeiner warriors. A family-friendly event, it attracts approximately 2,000 skiers annually, plus friends, family and other spectators and numerous volunteers. The races range in distance from 2.5 km to 55 km and attract local and international athletes from recreational to elite abilities. An international award for attendance of all three Birkebeiner races in one year draws in skiers from around the world, making it a premier ski event.

15.2.1.1 Core Area - Elk Island National Park

EINP caters to a wide variety of individuals, including urban and rural dwellers, children and adults, experienced outdoor enthusiasts and those who are unfamiliar with the outdoors, as well as domestic and foreign visitors. Several activities are available to cater to the interests of the various visitors including wildlife viewing (especially bison), bird watching, photography (landscape, wildlife, etc.), sightseeing, orienteering, camping, hiking, cross-country skiing, snowshoeing, picnicking, canoeing, sailing, kayaking, and golfing. EINP is managed primarily as a conservation area to preserve the ecological integrity of its natural features. It also offers various outdoor recreational and interpretive experiences to local and non-resident visitors. Tourist facilities within the park include:

- Two campgrounds (plus group camping areas) with washrooms and free hot and cold showers (78 sites for tents and RVs, plus primitive tent camping sites are also available)
- Visitor information centre and indoor theatre with displays and presentations (including guest speakers) on the resources within protected areas in the moraine, as well as the surrounding area
- Recreational facilities including a soccer field, horseshoe pits, a playground and a nine-hole golf course with a clubhouse that offers light meals
- Picnic tables and shelters in several locations throughout the park
- Fire boxes and firewood
- A range of environmental education programming, including environmental education programs for students, wildlife-watching programs and junior naturalist programs
- An extensive network of trails for walking, bike-riding, skiing and snowshoeing (trails range in length from 2.5 km to 16.5 km)
- A paved, low-speed parkway for motorized touring by visitors, with pull-offs designed to accommodate tour buses

15.2.1.2 Core Area - Miquelon Lake Provincial Park (MLPP)

MLPP offers a large campground with serviced and un-serviced sites, day use areas and seven group areas as well as a network of backcountry trails. Both summer and winter camping opportunities are provided and the trails are tracked for cross-country skiing in winter. The lake offers a sandy beach and good water quality for swimming, a relatively rare recreational opportunity within short driving distance of Edmonton. MLPP is managed for conservation and outdoor recreation objectives. The park offers a variety of front-country recreational facilities for local and non-resident visitors, plus the backcountry trails. Its tourism facilities include:

- Campground: 276 sites, 159 with power (recently upgraded, including new washrooms and showers), one loop is open for winter camping
- Seven group camp sites with shelters, three of which include washroom buildings and power pedestals.
- Four paved sites for disabled persons
- Park Centre with Information Kiosk, rentable multi-purpose room and gift store (wheelchair accessible).
- Staffed entrance booth utilizing the new online camping registration system (accessed through the www.Reserve.AlbertaParks.ca website)
- 22 km of backcountry hiking trails, 10 km of front-country paved trails
- Interpretive and environmental education programming, including discovery pack lend outs for visitors
- New amphitheatre that offers various summer interpretive programs
- Day-use shelter, picnic areas and beach facilities (free outdoor showers)
- Activities available: hiking, bird watching, swimming, volleyball, horseshoe pits, canoeing (hand launch area), cross-country skiing, snow shoeing, baseball diamond, playgrounds and adjacent private golf course

15.2.1.3 Buffer Zone Facilities – Ministik Game Bird Sanctuary

Ministik Game Bird Sanctuary is primarily managed as a waterfowl production area, though some recreational facilities have been developed within it to allow use by local residents and other visitors. The area is well-used for recreation by local and regional residents. Snowmobiling enthusiasts promote the trails in Ministik on their websites and provide updates on trails and trail closures (e.g., the Tri-County Snowmobile Club, http://www.tri-county.ab.ca/). Note that snowmobiling is only permitted under specific management guidelines, to protect the environment. Other permitted uses include wildlife viewing, hiking, hunting of non-migratory species, limited haying, star viewing, and cross-country skiing. There is some gas and oil activity; but overall this use has been restricted to specific areas.

Facilities in Ministik include:

- Several public access points, with parking, signs and gates
- Hiking trails, including a section of the Waskahegan walking trail, a regional trail system
- Snowmobile and ATV trails (on all-weather roads, designated staging areas and other designated trails)

15.2.1.4 Buffer Zone Facilities - Blackfoot PRA

The Blackfoot PRA contains forests, pastures and wetlands in rugged morainal (knob and kettle) terrain within its 9,920 ha area. The Blackfoot PRA is a day-use park with no front country and some backcountry camping facilities, but with multiple permitted land uses, including cattle grazing, wildlife management, natural gas extraction and outdoor recreation. Summer recreational activities include hiking, bird watching, mountain biking, canoeing, kayaking and horseback riding. Winter recreational opportunities include horseback riding, cross-country skiing, hiking, bird watching, snowshoeing, dog sledding and snowmobiling. Snowshoeing, dog sledding, horseback riding, hunting, snowmobiling are permitted in certain pasture areas only. Active wildlife management programs in the area have created a wide range of habitats that support numerous wildlife species; as a result, there are excellent wildlife viewing opportunities along the area's trail systems and pastures. Game and waterfowl hunting occurs in PRA during regular hunting seasons and Aboriginal hunting may occur in the area year-round.

Facilities within the Blackfoot PRA include:

- Six backcountry shelters with firewood, firewood boxes and stoves in shelters (free firewood is provided at these shelters)
- Two backcountry group-use shelters for overnight camping (educational or youth groups only)
- An interpretive information centre that is open from the third weekend in May to the first weekend in September. It is run by volunteer hosts and supported by the Friends of Blackfoot Society
- Facilities are open daily from 7 a.m. until 11 p.m.
- 170 km of trails with approximately 41 named trails maintained largely by volunteers:
- Dogs on leash are welcome on all trails in the recreation area
- Separate, designated trails for horses, dog sledding and bicycles
- In winter, 100 km of the trails are groomed for cross-country ski use and another 60 km are non-groomed
- Four day-use sites within the park offer a range of facilities: picnic shelters, fire pits and stoves, tables, washrooms, canoe launch, hiking, biking and equestrian staging areas accessing the extensive trail system
- Recent upgrading provided new fire stoves in shelters and new picnic tables and benches
- A range of environmental education programming is available, including curriculum-based field studies for school groups
- Special events hosted annually within the Blackfoot PRA include the Canadian Birkebeiner Ski Festival in February (with the Ukrainian Heritage Cultural Village and EINP), an Ultra-marathon in May and the Five Peaks Adventure Marathon in September

15.2.1.5 Buffer Zone Facilities - Strathcona Wilderness Centre

The Strathcona Wilderness Centre is located in the center of the moraine, in a characteristic area of rolling hills, abundant wetlands and extensive aspen forest. The Centre offers leadership training and instructor certification programs to lead environmental education and outdoor programs for camps, schools and the community. A special, year-round program for youth in grades 7 to 12 (age 13 to 18) offers a progression of skill development for day camps and outdoor trips. Training includes standard to advanced first aid skills, school program instruction and specific instructor certifications in cross-country skiing and canoeing.
Facilities within the Strathcona Wilderness Centre include:

- Day lodge and equipment rental shop offering cross-country ski and snowshoe rentals and lessons, open daily 9 a.m. to 4:30 p.m.
- Main lodge with meeting and classroom facilities, plus administrative offices
- 12 km of ski trails, 3 km of interpretive trail and a spruce bog boardwalk available for year-round use
- Camping and picnic spots

15.2.1.6 Transition Area Facilities - Ukrainian Cultural Heritage Village

The Ukrainian Cultural Heritage Village (UCHV) is an award-winning, open-air living history museum that depicts the cultural history of east central Alberta. It tells the story of Ukrainian immigrants who settled in this region from 1892 to 1930. Established in 1971 and owned and operated by the Province of Alberta since 1975, this museum welcomes nearly 50,000 visitors annually to "travel back in time" to experience the region's rural and agricultural history. Over thirty historic structures have been relocated to the museum, restored and furnished to a pre-1930 period, and then staffed by dynamic interpreters who bring history to life. The landscaping program and heritage gardens provide insight into the natural landscape of the region at the turn of the 20th century. The UCHV offers a range of year-round programs and hands-on, experiential learning activities that complement school curriculums and make learning fun for children of all ages.

15.2.2 How many visitors come to the proposed biosphere reserve each year? (Distinguish between single-day visitors and overnight guests, visitors only visiting the proposed biosphere reserve or only passing on the way to another place). Is there an upward or downward trend, or a particular target?

Visitation statistics have been tracked in several of the key protected areas (mainly those with gate fees and campground areas) and at recreational facilities such as Strathcona Wilderness Centre and the Ukrainian Cultural Heritage Village.

EINP tracks daily and overnight visitors of through its gate entry system. EINP has received an average of 196,594 visitors annually since 1999 (Table 11). Current statistics are not yet available, but over the past decade in particular, visitation has generally grown. From 1999 to 2004, the park experienced a decline in visitors; however, since 2004, the number of visitors has increased. This trend was expected to continue based on estimates in the park's 2010 management plan. Earlier declines were attributed to the elimination of some facilities and restrictions on certain recreational activities within the park as management focus shifted to ecological integrity (EINP, 2010).

An increased emphasis on interpretive programming and visitor services for this and other national parks, and promotion of new opportunities such as bird watching, cross-country skiing and night-sky viewing (in conjunction with the Beaver Hills Dark Sky Preserve) helped to increase visitation (EINP, 2010). The EINP (2010) State of the Park Report notes that visitation has increased by about 15% over the past five years, which is higher than the 4.5% increase reported for the Alberta Central Tourism Destination Region over that same period. Continued improvement is anticipated with implementation of road sign upgrading and pre-trip information services, such as more frequent and accurate website updates. The park has also offered environmental education and training and over the past seven years; the park has averaged 2,500 student visits per year.

The new EINP management plan (2011) assigns specific attention to enhancement of visitor experiences to attract a broader spectrum of visitors to the park and to create greater awareness of its resources and recreation

opportunities. The Inviting Participation initiative plans to engage visitors and park neighbours more directly in the management of the park with increased opportunities for involvement in volunteer experiences, promotion of the park as a living classroom for educational institutions in the region and direct advisory roles in park management and planning activities (EINP, 2011b).

Table 11. Visitor use - Elk Island National Park

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Visitors	171,447	180,946	182,736	186,855	198,231	202,196	206,240	210,364	220,758	225,940	244,800

MLPP tracks use of the main campground, day use areas and group areas. Table 12 shows trends in use over the past decade (2000 to 2009). In 2006, the campground was closed for a major renovation to its facilities. The park has been consistently used over the summer months, with between 36,985 to 59,515 campers in the main campground and a trend toward increasing use in 2008 and 2009. Day use has not been tracked since the major renovation; however, prior to 2006, use seemed to be declining. With the addition of new beach facilities as part of the renovation, including showers, washrooms, a playground and picnic areas, day use may have increased. The beach and the camping experience appear to be key attractions, reflected in the usage trends for the day use and campground sites.

Miquelon also has seven group camping areas that can be booked by individuals or formal groups and clubs. The renovation in 2006 also improved the facilities at these sites. Use has increased steadily since 2006. In fact, the 2009 data shows use has exceeded the pre-renovation trend in both booked nights and individual campers.

Data for the Blackfoot PRA is somewhat incomplete for the past decade, but recent use has averaged about 65,000 day visitors annually, based on 2008/09 data. Blackfoot PRA is a day use area, and so this represents recreational visits for hiking, skiing, horseback riding and other summer and winter activities. These statistics do not include special events such as the Canadian Birkebeiner Cross-Country Ski Festival. This special event, hosted by the Blackfoot PRA (and EINP and the Ukrainian Cultural Heritage Village), every second weekend in February is organized by 600 local volunteers and attracts thousands of international, regional and local visitors, including skiers and their families. Use of the Ministik Game Bird Sanctuary and the provincial natural areas is not tracked. Anecdotally, use appears to include mainly local residents. Visitation statistics would be expected to be lower than the other protected areas in the moraine.

Table 12. Visitor use - Miquelon Lake Provincial Park (Use tracked from April to October only)

	Camping		Day Use		Group Camping	
Year	Occupied Campsite Nights	Campers	Day Use Party Visits	Day Use Visitors	Group Unit Nights	Individual Group Camper Nights
2000	13,684	44,211	27,425	79,713	1,725	5,488
2001	15,131	48,917	23,990	71,981,	2,081	6,604
2002	13,585	43,614	11,180	33,528	1,824	5,728
2003	14,701	47,613	150,501	444,191	2,016	6,403
2004	11,904	38,081	16,150	48,221	1,726	5,503
2005	13,921	45,099	120,401	362,581	1,512	4,838
2006	C	C	C	C	C	C
2007	11,295	36,985	Day use data not available since construction in 2006.		332	1,062
2008	16,340	53,691			1,633	5,220
2009	18,111	59,515			2,510	8,015
2010	16,856	50,565			2,349	ND
2011	15,639	51,328			ND	ND
2012	17,615	57,560			2,562	8,162
2013	17,551	57,001			2,836	9,359
2014	17,841	57,785			2,375	7,838

The Ukrainian Cultural Heritage Village attracts over 50,000 visitors each year. Visits include school programs and general admission by members of the public (Table 13).

Table 13. Ukrainian Cultural Heritage Village visitor statistics 2007 to 2014

Program	2007	2008	2009	2010	2011	2012	2013	2014
School Programs	12,644	12,545	11,732	14,060	12,384	12,400	12,456	12,738
General Admission	33,534	31,732	31,706	34,213	27,038	29,036		
TOTALS	46,178	44,277	43,438	48,273	39,422	41,436	44,412	45,316

So, in total, the Beaver Hills receives about 370,000 visitors a year or 5.6% of the Edmonton and Area Tourism (6.5 million visitors a year) or 1.1% of Alberta's tourism (33 million visitors a year, Table 14).

Table 14. Beaver Hills Tourist Attraction Visits by Destination

Destination	Tourist Visits (year)
Elk Island National Park	220,000 (2013)
Miquelon Provincial Park	24,000 (2013)
Strathcona Wilderness Centre	75,882 (2014)
Ukrainian Village	45,316 (2013/2014)
Edmonton and Area Tourism Region	6.49 million (2012)
Alberta	33.09 million (2012)

Source: Knowles 2014, Cole 2014, Funk 2014, Makowsky 2014, Alberta Government 2014

15.2.3 How are tourism activities currently managed?

Tourism activities are managed by the respective protected area and attraction managers, which in this case include Parks Canada (EINP), Alberta Parks (all provincial parks and natural areas), Alberta Culture and Tourism (the Ukrainian Cultural Heritage Village), Alberta Public Lands (Ministik and Miquelon Game Bird Sanctuaries) and Strathcona County (Strathcona Wilderness Centre). For the federal and provincial parks, visitor experience is addressed as one component of a site-specific park management plan. For EINP, the park management plan is updated every 10 years, under a legislated mandate. It was last updated in 2010. Monitoring results from a State of the Park Report are used to identify and address specific concerns relative to visitor impacts on the park's ecosystem and cultural resources. The management plans of the respective provincial parks and game bird sanctuaries are not updated as frequently and have no mandated renewal timeframe. These plans also include management objectives to minimize impacts of visitor use and other permitted land uses (e.g., grazing in the Blackfoot PRA). Issue specific management plans have also been developed for specific parks on an as-needed basis.

The Ukrainian Cultural Heritage Village is managed for visitor experience more than conservation objectives. Alberta Culture and Tourism develops a site specific management plan and annual operational plans that address visitor impacts and the quality of visitor experience.

15.2.4 Indicate possible positive and/or negative impacts of tourism at present or foreseen and how they will be assessed (linked to section 14)?

Tourism visitation at EINP, the provincial protected areas and Strathcona Wilderness Centre has had positive impacts on social, economic, and environmental levels. The parks attract tourists, which leads to increased revenues for businesses in the area (e.g., the golf course at EINP) and the parks themselves. Socially, the parks provide a place to interact with other members of society, often in a healthy way (i.e. cross-country skiing, hiking, etc.). Moreover, sustainability measures are supported by many of the parks, which aid in increasing biodiversity in the area and provide corridors for wildlife. Environmental issues and solutions are often discussed or revealed to a visitor when they are in the parks (e.g., through talks and other programming, interpretive centres and adult education programs); this aids in transferring knowledge and increasing interest in environmental issues.

No significant negative impacts due to tourism have been noted in the Core Areas to date, but minor issues have arisen from time to time. Such issues include illegal use or trespass at the boundaries of protected areas, improper recreational use (e.g., off-road driving incidents that can damage vegetation) and vandalism within the park. Vandalism ranges from minor issues (damage to signage and picnics sites) to more severe, localized issues (e.g., tampering with fences). In 2009, as a representative example of frequency, EINP park staff recorded 20 vandalism incidents. Potential exists for future negative impacts if visitation to the Core Areas exceeded the capacity of the park ecosystems or if development of additional tourism infrastructure began to fragment habitats or otherwise impact the ecosystem. Such impacts are unlikely in EINP, because the *Canada National Parks Act* has restrictions for new recreational activities within the park. Management guidelines within provincial protected areas legislation also ensure that MLPP would be similarly unaffected.

Other protected areas within the Buffer Zone that allow a broader range of land use experience other management concerns with regard to tourism. For example, oil and gas development in some of the Buffer Zone parks provides access to areas not intended for recreational use. Recreational use has been steadily increasing over the past 20 years, coincident with population and development growth within and adjacent to the moraine. On the provincial natural area sites, use is less regulated and activities range from passive, nature-based use (hiking, bird and nature watching, and berry picking) to all-terrain vehicle (ATV) and snowmobile use, and hunting (illegal activities in some natural areas). Illegal entry of motorized recreational vehicles (ATVs and snowmobiles) has periodically been an issue in some areas, due to disturbance to vegetation, watercourses and other users. Management of this improper recreational use is an ongoing concern. With declining water levels, off-road vehicle travel along dry shore beds has had an additional impact. Small areas of fire damage created by random use outside of designated areas has caused vegetation damage, and removal or cutting of vegetation (for fuel) in some areas as well.

The introduction of invasive species and loss of native species is a potential concern for any of the protected areas, but this has not historically been a significant problem. For the parks within the Core Areas, potential exposure to invasive species is limited to the boundary areas adjacent to other forms of land use. Protected areas within the Buffer Zone that allow horse use and motorized recreational vehicles may experience higher risk of introduction, but again, significant issues have not been reported to date. Stewardship programs that promote responsible use of protected areas, and programs designed to rehabilitate and restore damaged sites have helped manage potential problems.

15.2.5 How will these impacts be managed, and by whom?

Each of these parks and tourism attractions are managed by respective federal, provincial or municipal government agencies that are mandated through legislation and policy to manage both visitor experience and environmental conditions. This is particularly true for EINP, since the *Canada National Parks Act* requires management for ecological integrity, as well as facilitating visitor use of national protected areas. The Ukrainian Cultural Heritage Village differs from the other sites described above, in that it is managed mainly as a cultural heritage facility. Although the site has a natural character that is important to the facility, conservation may not necessarily be a primary goal. The mandate for the Strathcona Wilderness Centre, a

municipal park, is more similar to that of the provincial parks, in that conservation and visitor experience are dual objectives. Regardless, each managing agency is responsible for addressing impacts of tourism activities within their respective properties, according to their management mandate. The BHI's Protected Areas Cooperation Plan (Appendix J) has also outlined areas for potential collaboration, which could include cooperative management of pervasive impacts such as invasive species. The future Joint Fire Management Plan will address wildfire risk, and regional cooperation measures to manage that risk.

Municipalities and Alberta Tourism actively promote all of the various tourism facilities in the moraine area, with a goal of enhancing economic advantages and regional profile. In some parts of the moraine, the municipality has assisted with new tourism initiatives (e.g., development and promotion of two regional tourism initiatives: the construction of the Biodiversity Trail in Strathcona County and development of the Boomtown Trail initiative in Camrose County). The BHI's Planners Working Group has also discussed the potential need for changes to land use planning to promote eco-tourism.

15.3. Agricultural (including grazing) and Other Traditional and Customary Activities

15.3.1 Describe the type of agricultural (including grazing) and other activities, area concerned and people involved (including men and women).

As summarized in Section 9.2, a wide range of farm types exist in the moraine, according to the 2006 Census of Agriculture. The most common operations include beef, horse and pony, grain and oilseed and hay farms (C. Vanin, pers. comm.). Smaller to medium-sized operations (less than 1,120 acres) are increasingly important within the moraine (Husby and Fast, 2004, C. Vanin, pers. comm.) and, in fact, small operations comprise 50% of the farms in the moraine (C. Vanin, pers. comm.). These smaller operations range from confined feeding operations of cattle, hogs or poultry to market gardens. Fruit production market gardens (e.g., strawberries and saskatoon berries) have been a relatively recent development that provides agri-tourism opportunities as well as marketable produce to local farmers markets and local residents. The Ag Capture program conducted by Agriculture & Agri-food Canada in 2008, an inventory of farm operations in the moraine, also identified a number of riding stables, and a few local meat processors, aquaculture and specialty game bird producers within the moraine (C. Vanin, pers. comm.). Organic farming is another recent innovation increasingly popular within the moraine and adjacent lands.

15.3.2 Indicate the possible positive and/or negative impacts of these activities on biosphere reserve objectives (section 14).

Agricultural operations are an important part of the economy of the moraine, as well as the rural communities in each member municipality. In this sense, these small agricultural operations are helping to maintain the character and traditions of this landscape. Unsustainable land management could, however, impact the ecological health of the moraine's aquatic and terrestrial environments. Overuse of fertilizers or pesticides can affect soil and water quality and have unintended consequences on plant and wildlife communities. Both the federal and provincial agriculture agencies and non-governmental organizations promote sustainable practices that help mitigate such uses. Organic farming has increased within the moraine in recent years, and these farmers will often promote their sustainable practices at local farmers markets, schools and university campuses such as the Augustana Campus of the University of Alberta. Their efforts have helped build awareness of alternatives and the importance of local farming to the small communities within the moraine. As

a result good farming and agricultural practices have become recognized as fundamental to both the socio-economic well-being of the Beaver Hills and its residents, and the continued management of its natural environment.

15.3.3 Which indicators are, or will be used to assess the state and its trends?

The Canadian census regularly tracks agricultural and other economic indicators at a municipal basis. Such data will allow assessment of change over time, as the biosphere reserve initiates various sustainable development strategies. The State of the Beaver Hills report will also provide some indication of trends relative to agri-tourism.

15.3.4 What actions are currently undertaken, and which measures will be applied to strengthen positive impacts or reduce negative impacts on the biosphere reserve objectives?

Initiatives such as the Tourism Development Opportunity Assessment jointly sponsored by Alberta Parks and the BHI have helped identify agro-agriculture opportunities, and to suggest means to encourage their development as economic alternatives in the moraine. The BHI began working with land use planners in the area to discuss changes that would be required to implement enabling land use policies. This work is currently on-going. Other government agencies and organizations have programs that promote sustainable use and farm management practices or to identify alternatives to diversify their operations in a sustainable way. An example of such diversification programs is the Woodlot Program supported by Alberta Agriculture and Rural Development (AARD), which helps interested farmers to develop a sustainable wood fibre operation on wooded lands. Other examples include the Environmental Farm Plan, another AARD program that promotes sustainable practices through development of farm management plans and certification. Finally, partner non-government organizations sponsor information and awareness programs to farmers and other rural residents to help promote better management of water, soils, wildlife habitat (e.g., the Land Stewardship Centre of Canada's *Green Acreages Guide*).

15.4 Other Types of Activities

Positively or negatively contributing to local sustainable development, including impact/influence of the biosphere reserve outside its boundaries.

15.4.1 Describe the type of activities, area concerned and people involved (including men and women).

Other types of activities in the moraine area include rural residential, commercial and oil and gas development activities. Most of this occurs in the Transition Zone, but in some cases, land uses other than conservation or recreation have been permitted within Core Areas and Buffer Zone parks. There are no gender restrictions on these activities and men and women enjoy equal opportunity to engage in such activities. These other activities are briefly summarized in the sections below:

15.4.1.1 Core Area

Although both EINP and MLPP are protected areas and are managed for conservation of ecological values, commercial recreational facilities are also allowed. A private golf course operates within EINP and another lies at the boundary of MLPP. Conservation remains the primary focus in both parks and the majority of the land base in these areas remains in undeveloped, native habitats. Limited oil and gas development has also

occurred in both parks, including a pipeline through EINP and several oil well sites within MLPP. Generally, however, such development has been discouraged and old infrastructure is gradually being removed.

15.4.1.2 Buffer Zones

The main management objective for the Blackfoot PRA is conservation but several other land uses are also permitted. Public grazing reserves within the Blackfoot PRA offer local farmers and ranchers access to sustainably managed forage supplies and livestock breeding services. Conservation has long been a management objective of both the natural area within the Blackfoot PRA, and grazing areas, and the Blackfoot Grazing Association has often helped Alberta Parks develop and test innovative range management practices. As an example, the pilot wetland restoration project initiated in 2013 by Alberta Parks, Ducks Unlimited Canada and the Blackfoot Grazing Association successfully met range and biodiversity enhancement goals. This led to plans for expansion of the program in 2015. Oil and natural gas extraction is permitted either where associated with a pre-existing commitment or where surface disturbance can be limited to an existing disturbance footprint. There are currently about 13 active well sites within the Blackfoot PRA. Most of the park remains naturally vegetated, except for several parcels with improved pasture.

Ministik Game Bird Sanctuary is also managed primarily for wildlife conservation in general and waterfowl production in particular. A University of Alberta research station has also been established in the sanctuary and was used for wildlife and range management studies. The future of the station is currently under review. Oil and gas development is permitted, provided wildlife conservation and research activities are not compromised. A few quarter sections (each quarter is 160 acres or 65 ha) remain as private holdings in the middle of the sanctuary, but have only primitive (ATV) access. The other small provincial natural areas within the moraine, while committed to their primary purpose of conservation, also allow multiple uses. These can include off-road vehicle use and oil and gas development on sites.

15.4.1.3 Transition Area

The Transition Area of the proposed Beaver Hills Biosphere comprises lands held mainly in private ownership (some government parcels are also included here). Land use and management are primarily under the jurisdiction of the five respective municipal governments through Municipal Development Plans (MDP) and Land Use Bylaws (LUB, Figures 6 and 7). New provincial legislation (the Alberta Land Stewardship Act) has established a level of regional planning that will identify additional environmental, social and economic goals in the next few years. The municipalities will be required to incorporate these goals into their own planning. The province has otherwise delegated to the municipalities a broad scope for land use and land management. Good governance, provision of services necessary or desirable for the community, and development and maintenance of safe and viable communities are the three main responsibilities for municipalities under the provincial Municipal Government Act. This means that these five municipalities in the moraine have the authority to regulate the environmental character of their lands, as well as the social and economic conditions.

Membership in the BHI has enabled elected officials and county staff to become more aware of the range of values and ecological services derived from the moraine's natural systems and the environment more generally. Further, information about these natural systems, best land use practices and legislative tools compiled within the BHI's Land Management Framework provides a scientifically sound and robust framework for informed decision-making regarding land use within the moraine. This crucial tool has helped to coordinate land use policy across the moraine, to ensure that key ecological values are conserved and sustained. Other BHI partner initiatives will help foster understanding of sustainable development concerns, and develop potential solutions.

Most notably, the Miquelon Lake Environmental Research Station will support research on the social, natural and health sciences (Sustainability Sciences), and will focus specifically on sustainability issues in rural areas such as the Beaver Hills.
Although the main land use within the Transition Areas of the moraine is agricultural, rural residential subdivisions have developed in all five counties. Rural subdivisions are distributed across the Transition Area in small pockets, often supporting abundant forest cover and wetland habitat. Densities vary, and in some counties, land use planners are increasingly encouraging such development nearby larger urban centres, where utilities and water servicing can be provided from the existing municipal system. Small pockets of commercial zoning also exist in each municipality's area of the moraine, mainly located in or near small villages and towns. These operations include small industrial shops, gas stations or retail businesses. The western part of the moraine lies closer to the rural-urban fringe of metropolitan Edmonton and exhibits many of its land-use characteristics, including a dense urban footprint (particularly near Sherwood Park).

Industrial uses are also distributed in small clusters across the moraine. Oil and gas development (well sites and pipelines) has occurred across the Transition Area. No large processing facilities are located within the Transition Area of the moraine. Oil wells are particularly abundant along the southwest edge of the moraine, near Joseph Lake. Elsewhere, natural gas extraction wells are more common. Aggregate extraction has also been developed in small parcels, though this activity is not widespread across the moraine.

Alberta's Industrial Heartland, a concentrated industrial zone for petrochemical processing and refinement, lies to the north of the moraine, near Fort Saskatchewan. It does not directly affect the moraine and air quality monitoring suggests that indirect emissions impacts are not currently an issue. Provincially and municipally, this area has been designated as a growth node for industrial development; several new petroleum upgrader developments are currently proposed for this area. The BHI has initiated a study of air quality effects within the moraine and works with the Fort Air Partnership, a member non-governmental organization regarding air quality issues. The Fort Air Partnership is one of eight "Clean Air Strategic Alliance" airshed zones in the province of Alberta working to promote air quality initiatives, conduct monitoring and prepare reporting regarding air quality in the airshed. The Alberta Capital Airshed, the airshed for the Edmonton region, will address air quality issues within the Edmonton metropolitan area. A supporter of the Beaver Hills Biosphere and the BHI, it has helped establish a new community-based air quality monitoring station in a small community in the moraine (Ardrossan).

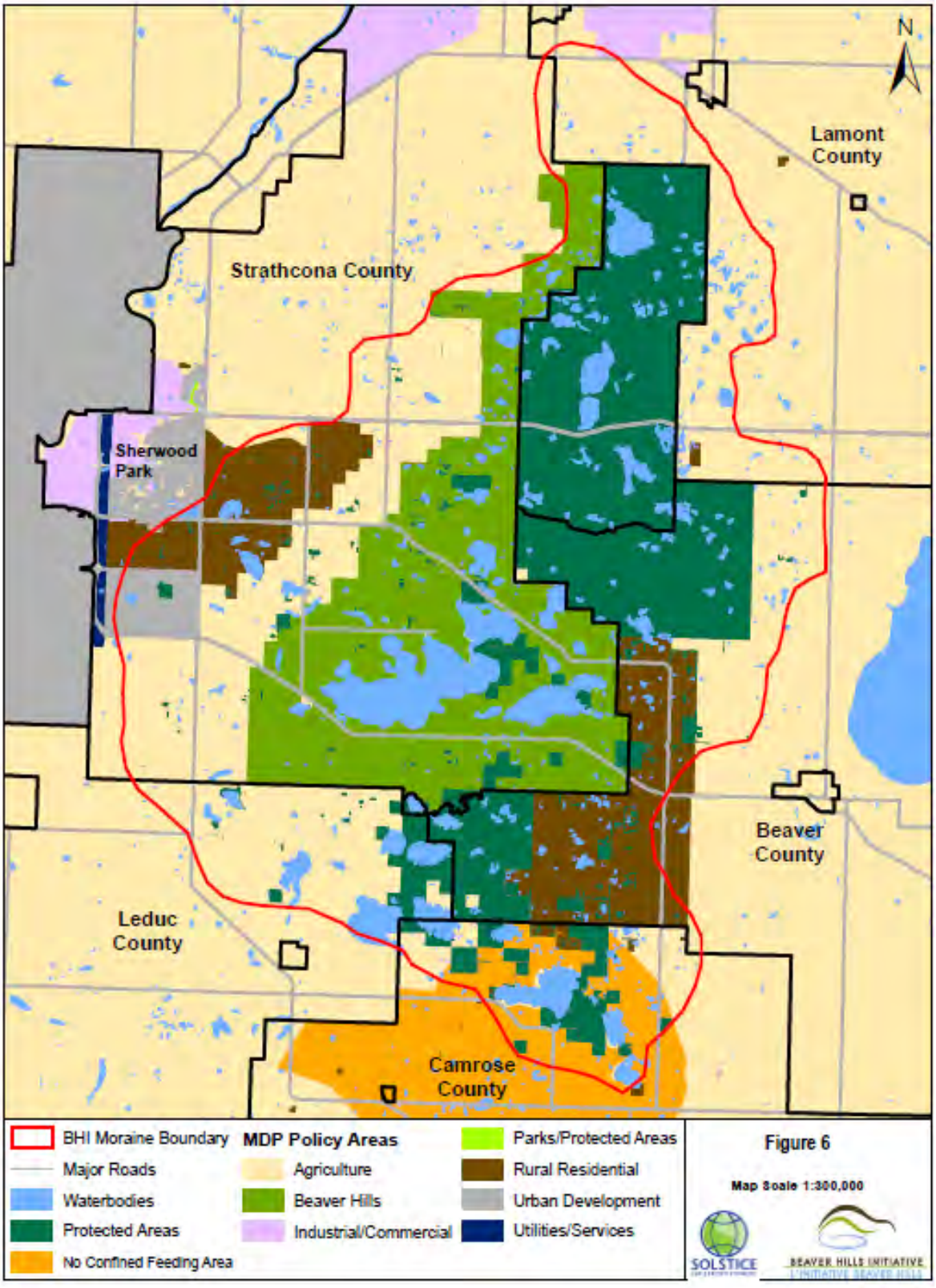


Figure 6. Municipal Development Plan Policy Areas in the Beaver Hills

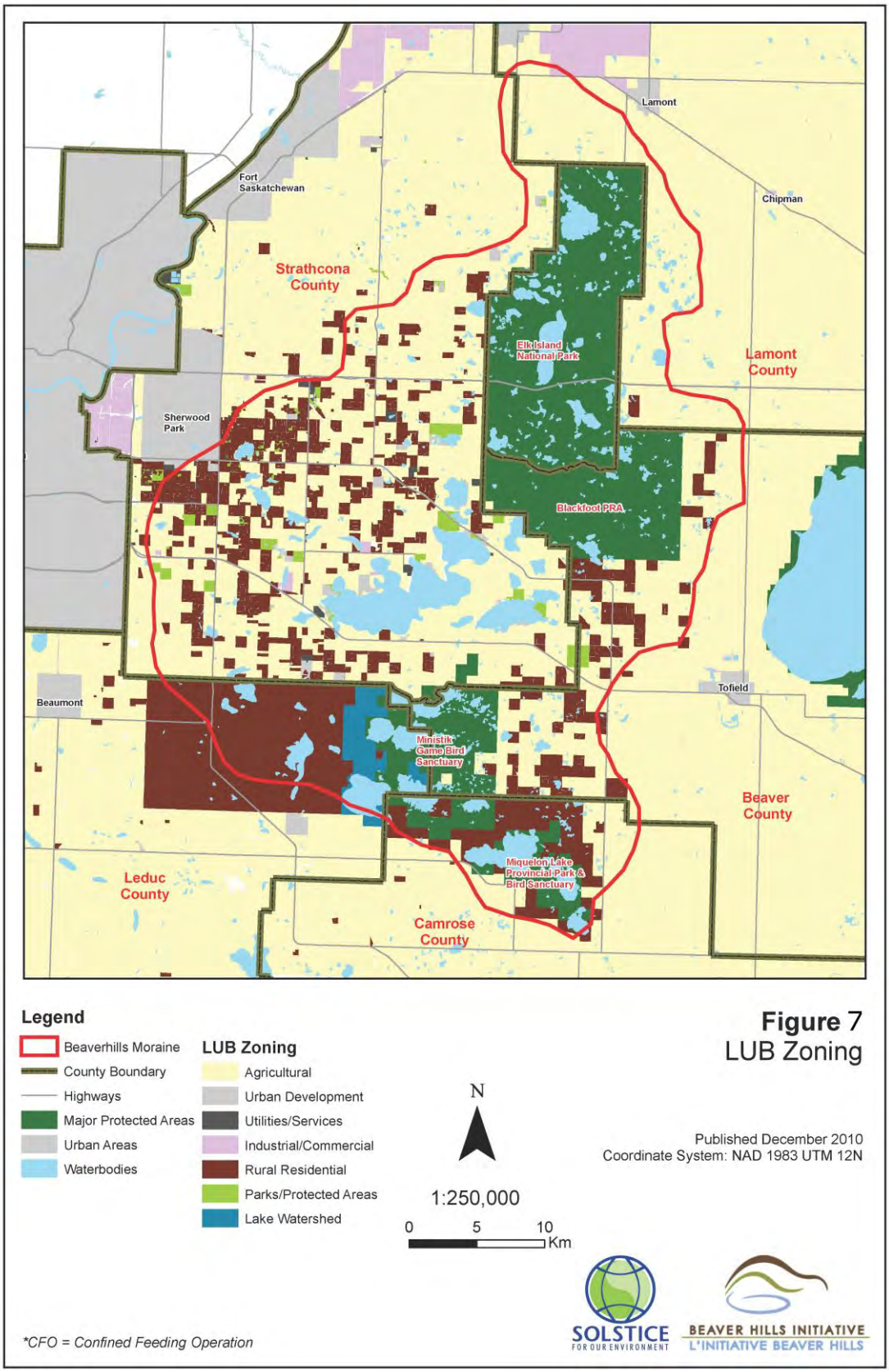


Figure 7. Land Use Bylaw Zones in the Beaver Hills

15.4.2 Indicate the possible positive and/or negative impacts of these activities on biosphere reserve objectives (section 14). Have some results already been achieved?

The initial concerns that brought EINP and Alberta Parks together in discussion with the adjacent municipalities was the rate of urban development expanding into the Beaver Hills from Edmonton and other urban centres in the surrounding region. The Edmonton Capital Region was identified in the 2001 federal census as one of the fastest growing areas in Canada (Statistics Canada, 2002). The 2011 census reports that the Edmonton metropolitan area is the second fastest growing urban area in Canada (Statistics Canada, 2011). Oil and gas development (e.g., pipelines, seismic exploration and drilling programs) had also begun to move closer to the boundaries of these protected areas. The fragmentation of the forest and wetland habitats within the moraine threatened to isolate each of the protected areas from each other and from natural habitat in the broader Edmonton region, with obvious implications for genetic and species biodiversity.

Oil and gas development is still permitted in provincial protected areas, but will be gradually phased out as well sites are shut down and reclaimed. Pipelines can technically be constructed in federal or provincial parks, although proponents are encouraged to avoid such routes if possible. When such activities are permitted, they must not conflict with conservation or recreation objectives and must utilize already disturbed areas as much as possible. Few dispositions for such activities have been granted within the protected areas in the past and reclamation of older facilities has emphasized naturalization (e.g., native species, restoration of natural ecological processes).

Weedy and invasive species can be an issue across the moraine. Each municipality enforces weed management on private lands and they have attempted to coordinate weed control activities in the past, to limit the spread of restricted and noxious weeds. The BHI has proposed a Regional Invasive Species Management Plan with its municipal, provincial and federal land manager partners to address this concern for all lands within the moraine.

Water withdrawals for residential or industrial use and wetland draining for agricultural purposes in the Transition Zone could affect groundwater and possibly surface water supply across the moraine. This is a particular concern given the past droughts and potential for increased drought in this area with climatic change. The Edmonton region has recently suffered two 1:100 year drought years in 2002 and 2009, reinforcing potential impacts to water supply. Beaver control in adjacent lands can sometimes have adverse effects on surface water supplies in these areas. Research undertaken by various groups at the University of Alberta North and Augustana campuses has been investigating the ecological and hydrological impacts of wetland loss, a significant issue in Alberta, as well as beaver management on regional surface water supply and biodiversity.

Lastly, oil and gas development can introduce additional access and habitat fragmentation, as well as potential subsurface effects. Approvals for such development are not within the control of the BHI partners; however, municipalities can influence the decision process. Strathcona County has developed a policy guideline for oil and gas developments in the County. The Oil and Gas Protocol outlines municipal expectations of industry to provide information and consult with the public. Strathcona County also provides resources to assist its residents in understanding the development process. All of these initiatives are intended to reduce conflicts during development and show the potential for collaboration with industry, particularly industry working

within the moraine. Through their involvement in the BHI, industry partners have become more aware of ecological best management practices, and they have also contributed funding to specific initiatives to investigate development impacts on the moraine.

The Transition Area is the more intensively used part of the moraine and further, management of the privately held lands can only be influenced indirectly through policy, enforcement or education. Development pressure, primarily for rural residential land use, has become a concern due to the growth of the City of Edmonton and the broader metropolitan region. Now all five counties have noted an increase in applications for residential development on agricultural lands. This has several additional impacts beyond the loss or fragmentation of habitat and viable farmland. Often municipal infrastructure costs will increase to provide emergency medical, public works and recreational support to these developments. Water use and wastewater treatment can become a potential environmental concern, particularly with low density developments. The BHI has been active in promoting the need to recognize the full range of values and benefits to be derived from the natural features of the moraine when considering areas for potential acreage development.

For these reasons, the partner municipalities have come to see the BHI as an important resource in adapting to these development pressures. The Planners Working Group provides an opportunity for discussion and brainstorming regarding potential management solutions; it also reinforces the broad scope of the issue across the moraine. The BHI has also developed alternative management tools to address the specific local land management concerns, including the Land Management Framework and a proposed Transfer of Development Credit pilot project. This latter project would trade development "credits" from areas of high sensitivity to those of lower sensitivity, as determined from baseline information compiled during the Land Management Framework Project.

Municipalities can control new development relatively easily through the land use approval process. Day-to-day land management is less readily addressed, yet can be just as important. Issues such as improper wastewater disposal, indiscriminate land clearing, and infilling or draining of wetlands are harder to detect and in these cases, the traditional approach to environmental protection has relied on enforcement from provincial or federal authorities. Instead, the BHI and its partner organizations are working to promote sustainable land management approaches and increase public awareness of proper practice. Using environmental educational material and stewardship programs developed by partner organizations such as the Land Stewardship Centre of Canada, Ducks Unlimited Canada, the Nature Conservancy of Canada, Alberta Conservation Association, Alberta Fish and Game Association, Edmonton and Area Land Trust, Alberta Sport Connection and Alberta Land Trust Association, the BHI has helped to facilitate a coordinated and multi-faceted public information campaign for area residents. Municipalities have adopted some of these sustainability practices and actively promote them to their residents. While the challenge is not yet overcome, these efforts will certainly help to provide viable options for better management to area residents.

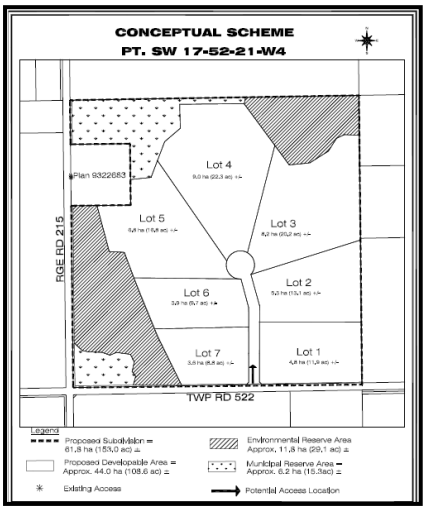
15.4.3 What indicators are, or will be used to assess the state and its trends?

The BHI's State of the Beaver Hills monitoring system includes indicators of the rate of development within the moraine and particularly within the Transition Zone. Developed shoreline as well as extent of change in developed landscapes will both be tracked. The State of the Beaver Hills report will provide valuable feedback to the BHI's municipal partners in particular, regarding effectiveness of policy in directing growth to appropriate areas and supporting alternative land development opportunities. It will also provide an important

baseline to track trends in both the environmental and social-economic sectors, and to evaluate change for the ten year review now required of all biosphere reserves.

15.4.4 What actions are currently undertaken, and which measures will be applied to strengthen positive impacts or reducing negative ones on the biosphere reserve objectives?

The BHI has developed a Land Management Framework document that outlines areas in which the municipalities could exert more control over environmental conditions, if they chose. Ideally, all five municipalities would create comparable land management policies within the moraine lands, such that environmental resources have similar conservation across the moraine. In practice, each municipality faces different development pressures and a uniform policy is not feasible. Many of the municipalities have, however, incorporated selected management tools and information from the framework into their MDP and LUB documents.



The Planners Working Group of the BHI has provided a useful sounding board to discuss land management issues and to identify information and tools that the BHI could help generate for the municipalities to assist in developing and implementing sustainable land management strategies. The BHI has also conducted workshops and given presentations regarding various land management strategies for the various municipalities, to facilitate discussion of alternatives to manage moraine resources and growth pressures in the Transition Area lands.

For some counties within the Transition Zone, conservation has been incorporated into policy. Some municipalities have identified additional restrictions in their land use planning policies to protect surface water (e.g., confined feeding operations restrictions, watershed protection zones) or wildlife habitat (waterfowl or ungulates). Certain municipalities have also identified buffer zones around the federal and provincial protected areas within their jurisdiction (e.g., Ministik) within which development may be limited. Strathcona County has an explicit policy that requires new subdivision developments to provide the full allotment of land for municipal purposes required under the Municipal Government Act, including municipal, environmental and conservation reserves, rather than accepting cash in-lieu (also allowed under the Act).

15.5. Benefits of Economic Activities to Local People

15.5.1 For the activities described above, what income or benefits do local communities (including men and women) derive directly from the site proposed as a biosphere reserve and how?

One of the basic tenets of sustainable nature-based tourism (eco-tourism and agri-tourism in this case) is to engage local communities (including both men and women) so they benefit from conservation, economic development and education. Rural communities are often rich with local knowledge and residents have a strong appreciation of their natural and cultural heritage. While nearby inhabitants are those most directly affected by the establishment of parks and protected areas, they also stand to profit the most by conservation action. By bringing residents (male and female) into the business of nature-based tourism, not only can local people meet their economic needs, but they can also maintain and enhance the "sense of place" that is critical for sustaining long-term conservation.

Parks Canada and various BHI partners have worked with Aboriginal groups over the past decade to develop and expand eco-tourism, an effort that continues today. Because the nearest Aboriginal communities are located about 100 to 200 km away from the protected areas in the moraine and their community members are often focused on other local priorities, partnerships have proven a challenge in the past. However, Parks Canada, Alberta Parks and Strathcona Wilderness Centre have all partnered with First Nations businesses to provide eco-tourism services within their protected areas from time to time. This introduces an important aspect of the cultural heritage of the Beaver Hills into visitor programming, but this is highly dependent on the sustainability of the individual business enterprise. Regardless, integration of Aboriginal culture into park programs has been identified as an objective in EINP's 2011 Park Management Plan, and an Aboriginal Liaison Officer has been identified for the region. The BHI and these protected areas agencies will work with the Confederacy of Treaty Six First Nations and the Métis Nation of Alberta to gauge interest and capacity in such cultural tourism opportunities. Efforts understandably depend on the interests and capacity of the local First Nations and Métis communities, but an opening is available to discuss the potential to develop such opportunities.

The BHI, with support from Strathcona County, works closely with agricultural producers and other local groups to help establish businesses in the community, provide tourism training and marketing assistance, and develop compatible economic activities such as farmer's markets, U-picks, farm gate sales and tour guiding. This focus on people reflects the BHI's commitment to work across landscapes, incorporating a concern for human populations as well as for the natural world we inhabit.

The Tourism Development Opportunity Assessment initiated by Alberta Culture and Tourism in September 2010 that evaluated the sustainable tourism development potential of the moraine. This project will inform future regional planning to be undertaken as part of the provincial Land Use Management Framework. It also served to identify areas of potential growth that can be encouraged through local programs. Some of the study's recommendations are already being implemented through the Tourism Working Implementation Group of the BHI, including coordination among economic development Offices in the partner municipalities on the identified opportunities.

The BHI also recognizes the more general economic benefits gained from ecological goods and services. Ultimately, the BHI's Transfer of Development Credit (TDC) pilot program aims to conserve the benefits gained from lands with healthy ecosystems, trading off development in areas that may have a less critical ecological role. Similarly, the BHI's Land Management Framework provides tools and guidance that could help municipalities to conserve and protect the natural systems from which their residents derive benefit. The Alberta Land Stewardship Act, which now permits TDC schemes in the province, has also enabled creation of Agricultural Easements, another new tool for provincial land managers. The BHI and Agriculture & Agri-foods Canada are assisting the Alberta Land Trust Association to develop criteria for Agriculture Easements. This conservation tool will help to conserve valuable agricultural lands and the economic benefits derived from them.

Despite these emerging alternatives, energy development is probably the most significant economic activity within and around the moraine. Oil and gas reserves underlie the moraine and are a valuable asset. Alberta's Industrial Heartland to the north of the moraine is also a critical part of the provincial economy and its requirements for electrical energy will increase as this area grows. Economic development of energy resources has been identified by the province as one of several priority land uses that must be managed through the

Alberta Land Use Framework, along with sustainable use and development of other natural resources. The North Saskatchewan Regional Plan is now in development and the BHI is participating as a local stakeholder. In part, this is in recognition of the successes the BHI has achieved in regional planning within the moraine. Stakeholder status also recognizes the unique character of the moraine and the need for sensitive development. Careful development of industrial land uses within the moraine seems quite possible in the current provincial climate.

15.5.2 What indicators are used to measure such income or other benefits?
The State of the Beaver Hills includes economic indicators relative to income based on census data from Statistics Canada. Unfortunately, the data is collected at the county level only, and information specific to the parts of each municipality within the moraine is not available. Income derived from employment can, however be tracked for the five counties whose lands overlap the moraine, and linked to specific industry sectors. This will help the BHI to track changes in employment characteristics over time, as sustainable options for alternative economic development are developed.

15.6 Spiritual and Cultural Values and Customary Practices

(Provide an overview of values and practices, including cultural diversity).

15.6.1 Describe any cultural and spiritual values and customary practices including languages, rituals, and traditional livelihoods. Are any of these endangered or declining?
The early European settlers often established in small communities where their cultural traditions might be sustained through community. For the most part, this led to retention of many of the customs from their original homelands, including religion, dance, music, food and to some degree, language. Although most moraine residents would be considered contemporary, with the customs of the broader blended-Canadian culture, often they have retained some traditional connection to their ancestral roots. German, Scandinavian and other European languages are still used in many of these small communities, although fluent users are now relatively rare (< 2% of most moraine municipalities, Statistics Canada, 2012b).

Ethnic churches representative of the original settler culture can be found in most towns near the moraine (e.g., Ukrainian Catholic and Lutheran churches). Other cultural traditions have been retained in the form of music, food and dance and examples can be found in each of these communities as well (e.g., traditional Scandinavian or Ukrainian festivals and events, local farmers markets products).

Cree and Métis culture, language and spiritual traditions declined across Alberta through the latter part of the 20th century due to both government programs and local prejudices. Although Cree culture, primarily dance, artwork and music was retained by communities relocated to reserves, language, stories and other aspects of this culture were not transferred to youth in many communities. Similarly, prejudice led many Métis to abandon open practice of their cultural traditions. In both cases, Cree and Métis communities are beginning to restore their cultural traditions and language, but neither culture nor language are as widely practiced within the moraine as in the past.

15.6.2 Indicate activities aimed at identifying, safeguarding, promoting and/or revitalising such values and practices.

Cultural traditions associated with early European settlers have largely been retained in those moraine communities with numerous descendants and are sustained through local community events such as the annual Lutefisk dinner in Kingman, just east of the moraine within Camrose County. The annual Birkebeiner Festival also resonates with those of Scandinavian descent. Traditional foods, such as Ukrainian, German and Scandinavian dishes are sold in local farmers markets and through local churches, and are featured in community dinners. Traditional dance and song have also been retained in communities with a dominant settler culture (e.g., Ukrainian dance and music), particularly where churches representative of the ethnic background remained in the community.

The Ukrainian Cultural Heritage Village in the north part of the moraine plays a key role in retaining and raising awareness of this culture to local residents as well as area visitors. Intangible cultural heritage elements are important complements to the cultural components of the landscape character of the Beaver Hills and as such enhance the sense of place for both residents and visitors. An important function of the guidelines provided in the Tourism Development Opportunity Assessment is to ensure that the integrity and authenticity of these sites and events are retained while providing sustainable quality visitor experiences

First Nations and Métis language and culture have recently enjoyed resurgence across the province, through dedicated effort of individuals within many communities, and support of elders and broader political organizations like the Confederacy of Treaty Six First Nations and the Métis Nation of Alberta. Examples of renewed aboriginal culture within the moraine are few, but growing. St Margaret's Church, a historic church within the moraine that served a largely Métis congregation through the late 1880s and early 1900s, was recently transferred to Métis management. The Métis Nation of Alberta has hosted past events at the church celebrating Métis culture, which have been actively promoted to and supported by Métis and others within the moraine. This includes a Riel Day walk, which commemorates the life of Métis leader Louis Riel. Cree elders and teachers in Maskwacis, about 100 km west of the moraine and Saddle Lake (150-200 km north) have developed Cree language programs that are helping to renew both the language and cultural traditions within these communities. Elders are also active in programs designed to transfer cultural traditions and understandings to youth and people at risk in these First Nation communities. As yet, none of these programs have attempted to restore cultural connections within the moraine itself.

Although few other aboriginal cultural activities have been conducted within the moraine, opportunities do exist, and can be explored within the context of a biosphere reserve. The Confederacy of Treaty Six First Nations and the Métis Nation of Alberta have already indicated interest in such discussions. The Augustana Campus of the University of Alberta has a relatively high proportion of aboriginal students due to its proximity to Maskwacis. It has purposefully developed a strong relationship with Maskwacis elders and others within the community through an Aboriginal Liaison Office and Committee of campus staff and aboriginal students. Events such as a circle dance have been held at the campus, as well as traditional spiritual blessings and cultural events sanctioned by elders, to build an informed, open and culturally aware campus community, inclusive of its First Nation neighbours. As partner organization within the BHI, the Augustana Campus can provide both opportunities and lessons regarding aboriginal involvement for others in the moraine. The BHI hopes to pursue options relevant to local Cree and Métis, beginning with the dialogue now established with the Confederacy of Treaty Six First Nations and the Métis Nation of Alberta.

15.6.3 How should cultural values be integrated in the development process: elements of identity, traditional knowledge, social organizations, etc.?

The BHI's Stewardship Engagement Strategy and the Tourism Development Opportunity Assessment identified opportunities to work with cultural organizations to promote awareness about the diverse settler cultures within the region. Both noted the gap in awareness of aboriginal culture in the moraine, and the significant opportunity to incorporate both settler and aboriginal culture into community programs and tourism attractions. This diverse background forms the existing cultural mosaic of the moraine, but aboriginal traditions and history have had a particularly limited role in portrayals of the moraine's history. A more integrated and accurate picture could contribute to the description of the biosphere reserve, with benefits to local residents as well as a moraine 'brand'. Better integration of all cultures represented within a geographic area would help promote understanding and tolerance.

15.6.4 Specify whether any indicators are used to evaluate these activities. If yes, which ones and give details. *(Examples of indicators: presence and number of formal and non-formal education programmes that transmit these values and practices, number of revitalisation programmes in place, number of speakers of an endangered or minority language).*

Specific indicators have not yet been identified for cultural features, but will be discussed as public and aboriginal engagement strategies continue this year.

16. LOGISTIC SUPPORT FUNCTION

16.1. Research and Monitoring

16.1.1 Existing and Planned Research

In the past, each of the protected areas in the Beaver Hills has implemented its own research and monitoring agenda, often in conjunction with researchers from the University of Alberta. Such partnerships were instrumental in promoting a bioregional perspective to maintain the long-term ecological health of each park and its socio-economic relevance to the surrounding communities. Ducks Unlimited Canada has also actively conducted research and monitoring of specific project sites and broader landscape issues in the moraine area for many years. The BHI has built on past partnerships, to develop a research network that can share resources and address land management concerns relevant to the partner agencies. This network of research partners can easily address questions related to biosphere reserve management and in fact are excited by the opportunities afforded by the designation.

The BHI has established a Research and Monitoring Working Group (RMWG), comprising representatives from agencies currently active in research or monitoring within the moraine. Current partners include EINP, the University of Alberta, Agriculture & Agri-food Canada, Alberta Parks, Alberta Agriculture and Rural Development, Strathcona County, Alberta Innovates - Technology Futures, Ducks Unlimited Canada, and the Nature Conservancy of Canada. Other organizations involved in research within the moraine are invited to participate as the BHI becomes aware of their activities and interests. As a group, the members have identified various opportunities for collaboration and priorities for research and monitoring initiatives (see Appendix C: BHI 2012-2015 Business Plan). The RMWG also tracks other research activities proposed or in progress within the moraine and will facilitate support or provide resources, as feasible.

The BHI recognized early the importance of research and monitoring in supporting its goal of sustainable development within the moraine, and has incorporated means to support such programs into its business model. Specifically, the BHI uses its base funding to leverage grants for specific research and monitoring projects of interest to member organizations (currently totalling $1M support). To facilitate priority-setting for BHI funded projects, the RMWG designed a framework to evaluate projects that the BHI can support or pursue itself. Projects identified for funding are tracked through each business planning cycle. The BHI has also established linkages to other monitoring programs and research initiatives within the province, including the Alberta Biodiversity Monitoring Institute, which is a framework for monitoring of cumulative effects through a network of sites located across the province (including five sites in the moraine). Such links provide important opportunities to share information and resources, and contribute to broader research networks. These linkages are particularly relevant to the potential contribution that the proposed Beaver Hills Biosphere can make to the global network because of the strong focus on climate change and the implications for biodiversity and ecological goods and services.

The RMWG is currently coordinating two monitoring projects supported solely by grant funds secured by the BHI. The RMWG identified the need for monitoring within the moraine to assess current land management activities and support the future biosphere reserve. The State of the Beaver Hills project has established the

basis for this ongoing monitoring program. The 'State of' report will be updated every five years to assess the impact of sustainable development strategies promoted by the BHI and implemented by partner organizations, based on ecological, social/stewardship and economic indicators. In a separate initiative, Alberta Innovates - Technology Futures and EINP developed collaborative citizen science inventory methodologies that can be used by protected areas and other partners to monitor diversity and abundance of select species in the moraine. These citizen science projects are also intended to foster stewardship of the moraine for visitors and residents. The winter tracking module has already been tested in a pilot project at MLPP, with students from Augustana Campus of the University of Alberta. The project will continue in subsequent years, providing monitoring data on mammal activity in the park and potentially being expanded to include other protected areas.

The BHI has also provided support and resources (e.g. financial, in-kind, or awareness) for other projects initiated by partner agencies and researchers. One example is a meso-carnivore inventory project conducted by a PhD student from the University of Victoria, which is examining the genetic diversity of mid-sized (meso) carnivore populations within the moraine, focussing specifically on a species re-introduced in the 1980s (fisher, *Martes pennanti*). The project draws on technical resources and funding provided by several BHI partners involved in the RMWG (Alberta Innovates - Technology Futures, AESRD and the University of Alberta) and another provincial conservation organization (Alberta Conservation Association). Citizen scientists recruited from the Friends of Elk Island Society and students from the University of Alberta's Augustana Campus have also assisted in baseline studies and fieldwork for the project. Relationships established within the RMWG were instrumental in bringing together the necessary financial, technical and labour resources for this project and its results are sparking great public interest in the ecological health of the moraine.

Looking ahead, the BHI hopes to continue its role as a facilitator of regional research initiatives within the future biosphere reserve. Currently partner non-governmental organizations are focused on the Golden Ranches conservation area, where potential demonstration and outreach projects will be implemented for environmentally sustainable agriculture and land and water conservation management. A new research station at MLPP, operated by the University of Alberta, Augustana Campus will focus on rural sustainability, another exciting development initiated by BHI partner agencies and with enormous potential for the future biosphere reserve.

The Miquelon Lake Environmental Research Station (MLERS), due to open in the summer of 2015, will focus on the social, natural and health sciences (Sustainability Sciences). Its research will assess how environmental, social, health and agricultural domains interact and affect each other in landscapes increasingly stressed by industry and urbanization, such as the Beaver Hills. The MLERS was funded with contributions from provincial and municipal governments, private donations from local landowners and businesses and the BHI. It will provide laboratory, office and accommodation space in MLPP, and serve as a base for regional research initiatives. The research station will support research that examines (1) the impact of changing social, agricultural and industrial pressures on environmental qualities of the moraine, (2) the effects and interactions of the ecosystem services of the moraine on social, health, agricultural and industrial activities and profiles of the region, and (3) how citizens, communities and economic actors view the relationships between environmental, economic and social imperatives. The research supported by the MLERS will contribute to public policies, programming and interventions in conservation, energy, community development, tourism, infrastructure and social sectors, within and beyond the moraine. It will also promote sustainable land use practices within the broader community, student populations and land managers from all sectors (private and public). A variety of specific research projects are on-going within the moraine, and their results can help

support sustainable development within the proposed biosphere reserve. Those projects are summarized in Appendix E.

16.1.2. Summarize past research and monitoring activities related to biosphere reserve management (please refer to variables in Annex I).

The moraine has long been of interest to researchers and past research initiatives have built an extensive body of knowledge describing the ecological, cultural and recreational resources of the moraine. A significant amount of that past work resulted from previous collaborative efforts formed to address management concerns in the moraine's protected areas. For example, the Science Advisory Committee (SAC) for EINP, formed in 1998, brought together park staff, with academics and scientists from the University of Alberta, the Provincial Museum of Alberta (now the Royal Alberta Museum), the Alberta Research Council (now Alberta Innovates - Technology Futures) and the Northern Forest Research Centre. Their work helped stimulate research interest in the moraine, and demonstrate the benefits of such collaborative relationships to all partners. In many ways, the SAC helped set the stage for the broader collaboration later created by the BHI, and the foundation for the proposed Beaver Hills Biosphere.

A summary of projects addressing the abiotic, biotic and socio-cultural aspects of the moraine is provided in Appendix E. Past research has spanned decades, and provided a base understanding of the moraine's aquatic and terrestrial ecosystems, as well as its cultural resources. For example, an archaeological study within EINP demonstrated the long history of First Nations use of the moraine, extending over 12,000 to 8,000 years (MacDonald, 2009). About 150 to 200 sites have been identified in EINP alone through research conducted through the 1980s. Studies of range health, wildlife disease and the use of prescribed fire as a park management tool generated from research within the moraine have contributed much to our understanding of natural ecological processes in boreal and parkland ecosystems. Work on recreational use of the moraine's protected areas has helped researchers and park managers understand visitor experience and the impact of park management on the quality of that experience. This base research has helped advance management of natural, cultural and recreational resources locally, and internationally. It also provides a solid basis of understanding for future management of the area as a biosphere reserve.

These studies have built a reputation of the moraine as a demonstration or surrogate site that can be linked to broader research agendas. It has also built a foundation for more applied studies. Both can serve to attract researchers to the proposed biosphere reserve, to address concerns of local or broader interest and further its reputation as a research hub. For example, limnological studies within the moraine that identified its unique water quality conditions led to awareness of the suitability of some of its larger waterbodies as surrogate systems to study phenomena seen in more remote sites. The saline conditions in Miquelon Lake and other nearby wetlands are comparable to conditions in human-made systems (e.g., tailing ponds associated with Alberta's oil sands) and Canada's Arctic (e.g., sea ice systems). These waterbodies have been used as background reference sites to predict future scenarios for wetland remediation in Alberta's oil sands and sea ice effects associated with climate change. Range health and prescribed fire studies have helped inform management of grasslands in the moraine's protected areas within the moraine and in other comparable systems. New initiatives such as the Golden Ranches demonstration projects and research to be supported by the Augustana Miquelon Lake Research Station can build on this foundational research, to address concerns related to the biosphere reserve and society more broadly.

16.1.3 Indicate what research infrastructure is available in the proposed biosphere reserve and what role the biosphere reserve will play in supporting such infrastructure.

As noted above, EINP has had a long-standing relationship with the University of Alberta and other research institutions in the region, supported in part by the facilities and infrastructure provided by the park. Similar arrangements have operated within provincial protected areas in the moraine. The BHI has helped build synergies between land managers in the moraine and the local research community, which has enhanced coordination of the resources of the respective organizations and their research interests. A particularly committed example is the Memorandum of Understanding (MOU) established between Alberta Parks and the Augustana Faculty of the University of Alberta in Camrose. (See case studies in Appendix B). The MOU has helped advance research objectives of both institutions through the sharing of facilities, equipment and other logistic support. The new research facility for MLPP is a more tangible example of their collaborative efforts.

The new Augustana Miquelon Lake Research Station will be supported more directly through the Alberta Parks Division Science Strategy, which identified support for regional research facilities. The strategy aims to maximize research quality and volume by leveraging the contributions possible through collaborative efforts, such as the BHI. The facility would be linked to and promoted by the Alberta Centre for Sustainable Rural Communities, a new research initiative of the Augustana Faculty and the Faculty of Agricultural, Life and Environmental Sciences of the University of Alberta. Like other research infrastructure in the moraine, responsibility for maintenance and operations will remain with the respective owners and operators. The biosphere reserve will provide support mainly by promoting the research opportunities and facilities available and fostering linkages among prospective collaborators.

Early in its existence, the BHI compiled a variety of GIS datasets describing the soils, surface water basins, groundwater recharge and discharge areas, vegetation, and rare and special status species records for the moraine. Data arising from research conducted by BHI partners are also shared through the BHI. Notable examples include a survey of agricultural land use within the moraine by Agriculture and Agri-foods Canada and data-sharing of provincial LiDAR elevation data for the moraine with BHI partners. Any data developed by the BHI, such as a fire history project, a vegetation mapping exercise and modelling of ecologically sensitive zones within the moraine are shared with partner organizations, and will be used to support the State of the Beaver Hills monitoring project.

Specific infrastructure available through partner organizations within the biosphere reserve includes the following:

- EINP has offered accommodations, equipment and logistical support for research activities within the park for many years, a service intended to continue after creation of the proposed biosphere reserve. EINP has a meteorological station, an air quality monitoring station and, through a volunteer stewardship group (the Friends of Elk Island Society), a research vehicle. A wet deposition precipitation sampler (for acid rain and snow) was added to the meteorological station in 2010 and is part of a provincial network of nine monitoring stations operated by AESRD used to detect ecosystem change due to human land use.
- EINP maintains a library of all monitoring and research studies conducted in the park, geographic information system (GIS) data describing its biophysical resources and historical and current aerial

photography. Digital and paper records of beaver, ungulate, breeding bird and vegetation monitoring, plus annual bison health records are also available through EINP.

- Alberta Parks allows researchers to stay in its protected areas, in on-site staff housing or park campgrounds while conducting research. It has also offered equipment, vehicles and data to researchers. Data is particularly valuable, since AESRD maintains two provincial GIS databases of observations of rare, sensitive and management concern plant and wildlife species, and historical and current aerial photography.
- The University of Alberta manages a research facility in the Ministik Game Bird Sanctuary, which is currently inactive, but may be re-opened pending strategic review of research priorities of the sponsoring department.
- The Augustana Miquelon Lake Research Station will provide laboratories, computing and archival facilities, small-scale accommodations for researchers and the resources necessary for environmental monitoring, impact assessment and public policy support.

Two university campuses lie within a short distance: the University of Alberta's North Campus in Edmonton and its Augustana Campus in Camrose. Alberta Innovates Technology Futures has research facilities in Edmonton and Vegreville (about 50 km east of the moraine). All of these institutions have supported research within the moraine and several of their researchers use the moraine as a focal part of their research program. Environment Canada, the Canadian Wildlife Service and the Canadian Forest Service also have offices in Edmonton and federal scientists from those agencies have been involved in various research initiatives within the moraine, including management studies for species at risk within EINP and the provincial protected areas. Many of these organizations have also established permanent monitoring sites within the moraine (Appendix E).

Letters of support (Appendix I) from researchers and senior administrators at both campuses of the University of Alberta attest to both the existing role of the Beaver Hills in promoting research and the potential to expand that role if the area becomes a Biosphere Reserve.

Lastly, the Beaverhill Bird Observatory lies within 10 km of the southeast side of the moraine, just east of the moraine near Tofield. The observatory is located at Beaverhills Lake, a focal point for local bird naturalists. The lake was designated as a Wetland of International Importance under the Ramsar Convention in 1987 and became a Regional Reserve in the Western Hemisphere Shorebird Reserve Network in 1996 (Beaverhill Bird Observatory, 2010). In 1997, the lake was identified as an Important Bird Area of Global Significance. It has also been legally protected under provincial legislation as a provincial natural area. The Beaverhill Bird Observatory (BBO) was established in 1984 to monitor bird migrations and populations at the lake. Their summer bird counts and summer and fall bird banding program (using the Canadian Migration Monitoring Network protocol) help to track Neotropical migrant bird populations and train biologists in bird banding and handling techniques. A bird banding laboratory, built in 1986, is operated by summer students and volunteers who band and count birds within in the natural area on an annual basis. The programs and training offered by the BBO have helped support research within the broader region, a mandate the future biosphere reserve can help to advance through its coordination efforts.

16.2. Education for Sustainable Development and Public Awareness

16.2.1Describe existing and planned activities, indicating the target group(s) and numbers of people involved (as "teachers" and "students") and the area concerned.

Environmental education is a key function of the proposed biosphere reserve and an initiative already pursued by the managers of the various protected areas within the moraine. The BHI's environmental education partners seek to create new patterns of behaviour of individuals, groups and society as a whole, to support the sustainable development of the Beaver Hills landscape. These partners believe that there is a critical linkage between sustainable development and education. They are dedicated to the use of experiential approaches to education, which involve learning rather than teaching, to individuals and groups, delivered through schools, universities and visitor programs of the BHI partner organizations and affiliates.

The educational program partners of the BHI members are striving to work collaboratively to incorporate the results of the Research and Monitoring Working Group into educational and leadership training programs. The Sustainable Plan-It program initiated by Strathcona County planners, for example, brings sustainable land use planning into the classroom as part of the social sciences curriculum for Grade 6 students. Planners help students to understand how municipal planning works, by working through sustainable development scenarios within a course delivery module. To date, the program has been delivered to 12 schools within the region. The environmental educational partners are working to share such successes within the BHI and across the biosphere reserve network. In particular, the group looks forward in the future, to two way dialogue with other UNESCO Education for Sustainable Development (ESD) programs.

16.2.1.1 Environmental Education and Public Awareness Activities

BHI partners each use their own organization's terminology to describe "environmental education and public awareness". However, it is also recognized that when referring to programming, interpretation, special events, outreach education programs, environmental education, and school group programming, partners are all talking about educating the public and creating awareness to foster support and potentially effect change in behaviour.

Partners use many forms of educational messaging, programming, tours and advertising to raise public awareness about sustaining the natural and cultural environments and how we, individually and collectively, can contribute to promote sustainable development. Additionally, all programming offered by BHI partners that targets school-aged children is linked to the Alberta Programs of Studies (Alberta Curriculum Guide Kindergarten to Grade 12, ages 5 to 18) and updated regularly.

All of the agencies involved in delivering environmental education programs conduct regular assessments of the content, delivery, and impact of these programs. In the assessments, these agencies consider the background of the audience, agency needs, and management issues. Some agencies support the provision of background information (e.g., Alberta Parks' Cooking Lake Moraine Heritage Appreciation Development Plan) and creative input (e.g., regional consultation for MLPP Interpretive Centre). Some research agencies (e.g., University of Alberta – Augustana Campus) have assisted educational partners by conducting research on learning outcomes, effectiveness, and integration with other resource assessments.

The federal and provincial parks, historic sites and other protected areas within the moraine have well-established environmental educational programs for visitors (and local residents), as do the municipalities (through county departments or municipal parks such as the Strathcona Wilderness Centre) and environmental non-governmental organization groups operating within the moraine landscape. Long-standing arrangements between the University of Alberta and these protected areas have provided opportunities for field trips associated with a variety of natural and social sciences degree programs. The formation of the BHI presented an opportunity to coordinate these individual programs and overall messaging, and to pool expertise and resources. This collaborative approach to environmental education and communications with visitors and area residents has now been formalized through the BHI Communications and Outreach Working Group. Future plans include a coordinated approach among the BHI members to produce environmental education, public awareness and communication materials, and to identify and promote the recreational, historical, cultural and other opportunities in the area to target markets. The public and aboriginal engagement campaign described in Section 13.4 and 13.5 and Appendix D has been a central focus over the past year. Other activity has focused on incorporating and promoting the Land Management Principles developed by the BHI within the programming offered by each member organization. Examples of other collaborative efforts are offered below, for each lead agency.

In a recent initiative, the BHI worked with Mindfuel, a provincial not-for-profit organization dedicated to enhancement of science education, to develop a teaching module based on the Beaver Hills. The resulting 'Ignition Pack' provides 20 hours of instructional material for students from grades 4 to 9 (ages 10 to 15), describing the moraine, its natural resources and its resource management challenges. Mindfuel selected the Beaver Hills as a topic area to highlight a successful local initiative, and to provide demonstrated alternatives for sustainable management and decision-making. The project was tested with 14 teachers and 714 students across the province in 2014-2015, and will be offered for broader release next school year.

16.2.1.2 Beaver Hills Dark Sky Preserve

In 2006, the BHI partners successfully designated EINP and the Blackfoot PRA as a Dark Sky Preserve through the Royal Astronomical Society of Canada. Subsequently, the Beaver Hills Dark Sky Preserve (BHDSP) has been expanded to include Strathcona Wilderness Centre, the Ukrainian Cultural Heritage Village, the Sherwood Park Fish and Game Ketchamoot Creek Recreation and Conservation Area and in 2011, MLPP. The designation has brought the BHI partners an opportunity to reach an audience of local residents and the regional public through a new forum, and to raise awareness about the importance of protecting nocturnal habitat for flora and fauna, as well as maintaining the cultural heritage of a dark night sky. The efforts of the BHI in this regard were recognized by the Royal Astronomical Society in 2014, by including the BHI as a partner in the BHDSP, a right typically restricted to land management agencies. Based on public support for the Dark Sky principles, Strathcona County approved Alberta's first ever, municipal Light Efficient

Community policy in July 2010, followed by the community handbook and video in 2011. Preserve partners are implementing lighting practices to model the community light efficient options.

EINP, Alberta Parks and the Strathcona Wilderness Centre have incorporated astronomy programming in their sites, often led by the Royal Astronomical Society of Canada. Star Parties and Festivals have attracted thousands of visitors to the BHDSP, increasing public awareness and environmental stewardship from surrounding urban centres. Presentations have included both astronomy and conservation information and activities, with a strong emphasis on cultural connections and the preservation of local celestial stories and knowledge. A brochure has been developed to educate people on the purpose of Dark Sky Preserves, the importance of night sky preservation and actions individuals can take. This brochure and communication materials from the Royal Astronomical Society of Canada are available at member sites. Four exhibits have been installed in EINP to help visitors understand how connection with the night sky affects them and how they can help protect starry nights for future generations. Work is on-going across the region now to broaden the number of municipalities involved in Dark Sky initiatives, with hope of obtaining International Dark Sky Preserve status.

16.2.1.3 Elk Island National Park (EINP)

EINP has long offered interpretive programs for visitors to the park in the summer and throughout the school season, as part of its curriculum-based environmental education programming and school outreach programs within adjacent communities. Equipment and displays in the park theatre were recently updated to support a broader variety of programs for park visitors and local residents, including interpretive programs, special events, guest speaker presentations and environmental education programs. Visitor service programs within the park have expanded in the past five years to include evening programs in the theatre, guided hikes, roving interpretation, an interpretive display table, Junior Naturalist programs, puppet shows, crafts, storytelling and scavenger hunts. Drawing on the information developed by the BHI and the themes within the BHI Land Management Principles, EINP has now incorporated information about the importance of the Beaver Hills ecosystem within its environmental education programs for park visitors and in outreach programs for local children and school groups (e.g., the Junior Naturalist program). Interpretive programs and park information (brochures and exhibits) discuss the importance of the moraine ecosystem, including ecological connections between native habitat areas in the moraine, and beyond, to the ecological integrity of the park.

School outreach programs have relied mainly on opportunistic invitations from local schools. On-site, curriculum-based environmental education programs are offered in the spring (May and June) and fall (September and October) months to school children. Although not formally marketed, these programs have become very popular. Currently, school requests exceed staff capacity and over 1,400 students are turned away each year. Annual participation has averaged 2,512 students over the past seven years (Table 15). Variation in participation has been due mainly to staffing limitations.

In-park interpretive programs include those for school-aged children and a variety of events and programs designed for all members of the public. During the summer months (July through August), park interpretive staff provide public and Junior Naturalist programs for visitors from the campground and local residents. In 2007, promotion of the interpretive programs for visitors improved with additional in-park advertising and the roving interpreters program. More evening programs were added to the public programming schedule. In the past three years, four to five evening programs have been offered each week, in the park theatre. Attendance

has steadily increased since changes were implemented (Table 15). The trend may have stabilized now, due to capacity limitations of the theatre used for evening programs.

Table 15. Student and In-park interpretive program participation – EINP

Year	Junior Naturalists	Evening Programs	Student Programs	TOTALS
2002	199	253	3,388*	**3,840**
2003	263	604	2,237*	**3,104**
2004	232	258	2,531*	**3,021**
2005	1,541	956	1,709*	**4,206**
2006	955	867	3,037*	**2,159**
2007	--	2,200	3,037*	**5,237**
2008	--	2,300	2,550	**4,850**
2009	--	3,400	2,133	**5,533**
2011		6,803	2,873	**9,676**
2012		9,236	1,206	**10,442**
2013		9,782	1,481	**11,263**
2014		11,689	1,150	**12,839**

* Estimated attendance

New programs currently under development will further expand the range of educational programs. In May 2011, EINP and 40 other Parks Canada sites piloted the "Parks Canada Xplorers" program, a new environmental education program for families visiting the park. Participants were provided with a booklet that contains fun, engaging activities that promote park messages, park exploration and participation of all family members. Upon completion of all activities, each participant received a certificate and souvenir from the park. EINP also launched the "Explora" project in May 2011. This new GPS-based self-guided tour provides educational information about the natural and cultural significance of the park, in multiple media formats, through the visitor's mobile device (PDA or cellular phone). Other educational experiences include new Learn-to-Camp programs for recent immigrants as well as the annual Canadian Citizenship ceremonies.

In addition to programming, the BHI and EINP created a large wall-mounted exhibit for the Elk Island Golf Course Clubhouse (within the park) that reaches a target market of local area residents. The main message of the "Who's Your Neighbour" exhibit is the importance of the Beaver Hills ecosystem not only to the park, but to local residents. The exhibit emphasizes the contributing role of the moraine environment to a quality of life that provides clean air, land and water to all and links ecosystem sustainability to aspects of the moraine valued by residents. Maintaining the existing quality of life within the moraine is central to the vision of the BHI and reflects a valued aspect of moraine life often identified by local residents to municipal and other government land managers. Several trails around Astotin Lake also feature educational exhibits with place-specific information on park ecosystems and wildlife to visitors.

16.2.1.4 Miquelon Lake Provincial Park and Blackfoot PRA

In 2003, MLPP revitalized its visitor services program. As part of this revitalization strategy the Heritage Appreciation Development Plan for Parks and Protected Areas within the Beaverhills was developed. This extensive document was created to support and direct the planning and delivery of visitor services for MLPP

and other provincial protected areas within the Beaver Hills, including the Blackfoot PRA. Since then, MLPP's visitor services program has grown and now offers a broad range of environmental education programs to schools in the metropolitan Edmonton area, interpretive programs for visitors to the park and programs at Blackfoot PRA. The Miquelon campground and day-use area bring a substantial number of visitors to the park, particularly in summer, and present a different interpretive programming opportunity than does Blackfoot PRA. The Blackfoot area offers a backcountry experience. Due to its accessibility and close proximity to a large population (Sherwood Park and Edmonton), it receives extensive use by school groups and organizations such as Inside Education, Scouts Canada, Girl Guides, Junior Forest Wardens and the Strathcona Wilderness Centre for outdoor recreation and environmental education programming.

From September to June, visitor services staff deliver outreach programs (linked to school curricula) to students from Kindergarten to Grade 6 (ages 5 to 12). Programs are offered at MLPP, the Blackfoot PRA and in school classrooms. Program themes focus on the natural and cultural history of the Beaver Hills region and encourage appreciation and a sense of caring for the landscape and its values. In 2010, 1,242 school children attended programs at Miquelon; another 1,057 came to the Blackfoot PRA. Each program incorporates the main theme of the Beaver Hills Heritage Appreciation Development Plan – "Caring for the diversity of life in the Beaver Hills".

During the peak season, July through August, visitor services staff are dedicated to a variety of in-park interpretive programs and events that help audiences understand the role and importance of the Beaver Hills - Cooking Lake Moraine ecosystem and its natural and cultural diversity. Programs range from informal experiences to more structured activities such as guided walks, point duties at interpretive locations and theatrical amphitheatre programs. Self-guided interpretive experiences include the rental of Discovery Packs and interpretive trails. The Discovery Packs are backpacks that provide families with all the equipment needed to explore the park for the day. Packs are packages under various interpretive themes: Pond Study, Bug Safari, Follow That Track, Bird Watching, Art in the Park and Astronomy. Over 218 families borrowed Family Discovery Packs in July and August 2010. The Great Miquelon Trail Contest is a self-guided hike where visitors hike the trails seeking information on the formation, role and importance of the Beaver Hills ecosystem. This contest was developed through a partnership with Ducks Unlimited Canada.

In 2005, MLPP underwent a major infrastructure upgrade. As a result, a new amphitheatre and visitor centre (with a classroom equipped for video conferencing) was built, and the parks trail system was expanded. In addition, a Storyline and Exhibit Concept Plan for the visitor centre was completed. The plan is focused on creating exhibits and experiences that are interactive, hands-on and encourage exploration of the park and the greater Beaver Hills. Implementation of the plan will occur once funding is secured.

In 2010, a new initiative called *Learning the Language, Learning the Land* was implemented at Miquelon. The program addresses barriers that may prevent new Canadians from enjoying parks including; transportation, inexperience, wildlife fears and discomfort around people in uniforms. The program successfully introduced new Canadians from many countries to a camping experience at MLPP. This project involved partnerships and funding support from several organizations: Government of Alberta, Edmonton Adult Learning Association, Mountain Equipment Coop (Edmonton) Urban Sustainability Grant, Edmonton

Mennonite Centre for Newcomers, the City of Edmonton, the Federation of Alberta Naturalists and Grant MacEwan University.

The Blackfoot PRA is a day-use area allowing multiple land uses, including agriculture (grazing), wildlife management, natural gas extraction and outdoor recreation. A heritage interpretive centre was developed in the Blackfoot PRA in 2002. Operated by the Friends of Blackfoot Society, it offers exhibits that focus on its historic forestry theme, celebrating the Blackfoot PRA as Alberta's first Forest Reserve. The Friends have received the Alberta Volunteer Steward Award in recognition of their services. The Fire Lookout Detailed Interpretive Plan, recently completed by Alberta Parks Division and the Society, is focused on a unique interpretive experience centred on an authentic fire tower that was erected on-site in 2011. Implementation of the interpretive plan will follow, pending fundraising.

Since 2003, personal contacts made through the Visitor Services Program have consistently risen, due mainly to growth in environmental education outreach programs and information provision (Table 16). Delivery staff includes one permanent visitor services supervisor and, depending on yearly budgets, one to two seasonal interpreters and one seasonal information officer.

Table 16. MLPP and Blackfoot PRA – Visitor Services Program, Individual Participants

Program	Environmental Education and Outreach	Interpretation	Information	TOTALS
2003	NA	3,658	2,613	**6,271**
2004	183	3,104	5,429	**8,716**
2005	2,688	2,770	4,500	**9,958**
2006	9,124	655/UC	UC	**9,779**
2007	9,110	1,400/UC	1,440/UC	**11,950**
2008	7,047	3,806	3,705	**14,558**
2009	5,720	3,555	10,779	**20,054**
2010	2,299	3,499	10,223	**16,063**
2011	2513	6104	11466	**20,083**
2012	2026	2828	2945	**7,799**
2013	3876	9316	8141	**21,333**
2014	2646	3475	9745	**15,866**

* UC refers to years where the park was closed or partially closed and under construction.

16.2.1.5 Strathcona Wilderness Centre

The Strathcona Wilderness Centre, Strathcona County's largest municipal park, enables around 60,000 people annually to get directly involved in outdoor experiences (Table 17). With offerings of outdoor and environmental education programs, day camps, school and community group programs and day and overnight visitors, the centre provides a range of outdoor experiences (Table 17). School programs and day use activities are key program offerings. As an example, in 2014, visitors included 40,407 students participating in curriculum-based school educational programs for children from Kindergarten to Grade 12; 27,167 visitors using the trails for cross-country skiing and snowshoeing programs and experiences; and 7,950 visitors

participating in programs and retreats in the facilities and campsites. Volunteers are an important part of the programming at the centre and 358 volunteer days were contributed to the centre over 2014.

Programs for children include outdoor-focused day camps, outdoor skills programs, and equipment rentals to enable children and their families to hike, cross-country ski and snowshoe in the park. The centre offers leadership training and certification programs for teens and adults to safely lead outdoor programs. The centre's environmental education program has established a broad reputation for excellence. It was recognized with a Canadian Award of Excellence in Environmental Education from the Canadian Network for Environmental Education and Communication (EECOM) in 2005. It has also received a provincial Emerald Award Foundation award for environmental education excellence in 2006.

Table 17. Strathcona Wilderness Centre – visitor services program, individual participants

Program	2008	2009	2010	2011	2012	2013	2014
Families and day campers	913	805	1101	954	831	833	1125
Schools and community groups	27,885	27,029	29,383	28,096	26,466	33,104	40,407
Day visitors	24,625	23,600	23,260	24,752	28,398	29,610	27,167
Overnight visitors	6,855	6,867	6360	6522	6538	6538	6825
Volunteer days	306	365	363	363	416	425	358
TOTALS	60,584	58,666	60,467	60,687	62,649	70,510	75,882

16.2.1.6 Ukrainian Cultural Heritage Village

The Ukrainian Cultural Heritage Village (UCHV) is an award-winning, open-air living history museum that depicts the history of east central Alberta. It tells the story of Ukrainian immigrants who settled in this region from 1892 to 1930. Established in 1971 and owned and operated by the Province of Alberta since 1975, this museum welcomes nearly 50,000 visitors annually to "travel back in time" to experience the region's rural and agricultural history (Table 18). Over thirty historic structures have been relocated to the museum, restored and furnished to a pre-1930 period, and then staffed by dynamic interpreters who bring history to life. The landscaping program and heritage gardens provide insight into the natural landscape of the region at the turn of the 20th century. The UCHV offers a range of year-round programs and hands-on, experiential learning activities that complement school curriculums and make learning fun for children of all ages.

Table 18. Ukrainian Cultural Heritage Village Visitor Statistics 2007 to 2011

Program	**2007**	**2008**	**2009**	**2010**	**2011**	**2011-12**	**2012-13**	**2013-14**
School Programs	12,644	12,545	11,732	14,060	12,384			
General Admission	33,534	31,732	31,706	34,213	27,038			
TOTALS	46,178	44,277	43,438	48,273	39,422	41,436	44,412	45,316

16.2.1.7 Partner Environmental Non-governmental Organizations

Ducks Unlimited Canada and the Nature Conservancy of Canada identified the Beaver Hills as a focal area for their conservation programs early in the BHI's history (about 2004). As a result, their activities are now well-established within the moraine. Their programs to promote conservation with local landowners have contributed to the area of Buffer Zone within the proposed biosphere reserve. Moreover, the environmental awareness associated with the easement program has fostered a sense of stewardship among many local residents. The Alberta Fish and Game Association (AFGA) and the Alberta Conservation Association (ACA) have generated similar awareness through their landowner programs (e.g., the AFGA Parkland Stewardship Program and Landowner Recognition Program, and the ACA Amphibian Monitoring and Landowner Habitat Programs) and management of properties purchased for conservation purposes.

In 2009, several of the environmental non-governmental organizations, with the BHI, Strathcona County and the Edmonton and Area Land Trust, undertook the Golden Ranches project, a strategy developed with the current owners to purchase their 1,500 acre property for conservation purposes. The first 136.5 acres of the 607 acre property were purchased with funds raised by the partnership and will serve as a demonstration area for "the art and science of conservation and environmental stewardship" (Nature Conservancy of Canada press release, October 8, 2010). The remaining parts of the parcel have largely been purchased by the partnership, through donations provided from a variety of donors, including a $900,000 contribution from industry. Ongoing fundraising efforts will be leveraged to sustain the funding to manage the property over the long-term. The success of this acquisition project provides an example of the potential for creative partnerships and financing applicable to other conservation efforts.

16.2.1.8 Beaver Hills Initiative (BHI)

The BHI itself has taken an active role in promoting its collaborative approach to conservation planning to a broader regional and national audience. Board members have made presentations to professional organizations (e.g., the Alberta Parks and Recreation Annual Conference, and conferences for the Alberta Association of the Canadian Institute of Planners, the Community Planning Association of Alberta, the Canadian Institute of Forestry and the Canadian Land Trust Alliance Conference), as well as hosting conferences in conjunction with other partners (the Alberta Lake Management Society conference in November 2009 and the Alberta Parks Volunteer Conference in 2010). The various project areas within the moraine have been featured in bus tours hosted annually by members of the BHI for local elected officials and municipal and other government administrators. Lastly, the BHI has established local credibility in collaborative management approaches as an invited participant to broader land use planning initiatives such as the development process for the provincial Land Use Framework.

Locally, the BHI has made many presentations to its partner municipal councils to generate support for BHI programs and raise environmental awareness. It has also supported its municipal partners in providing background information on the environmental resources and sensitivities within the moraine during their public consultation for updating of municipal development plans and other land use planning tools. The Mindfuel project to produce school instructional materials mentioned previously in this section is another example of the collaborative efforts used to raise awareness of the moraine, sustainable development and potential management solutions. Through the BHI Communications and Outreach Working Group, efforts to raise awareness of the various programs and initiatives of the BHI members and the BHI itself will be coordinated and standardized to promote consistent messaging, benefiting all BHI members.

16.2.2. What facilities and financial resources are (or will be) available for these activities?

The Core Areas and Buffer Zones of the proposed biosphere reserve offer a variety of facilities currently used to support on-site environmental education programs and public awareness activities. These include the following infrastructure.

16.2.2.1 Overnight or Roofed Accommodations

The Strathcona Wilderness Centre is a 222.6 ha municipal park with a lodge containing meeting rooms, dining area and bunk-bed accommodations for 41 people, and instructional areas. It also offers four group campsites. This facility is used regularly for educational purposes, corporate awareness activities, and public educational events.

16.2.2.2 Interpretation Theatres

Both EINP and MLPP have theatre-style facilities specifically designed and equipped for multi-media presentations.

EINP's Astotin Lake Theatre can accommodate up to 93 people. This indoor theatre is used for interpretive programs for campground and other park visitors throughout the summer, for environmental education programs during the spring and fall months, and for special events (such as Winter Light celebrations) in the winter. It serves as a focal point for visitors to interact with interpretive staff and obtain park information. The walls sport new murals of the distinctive ecosystems within the park and tactile displays. The theatre is a distribution and collection point for Parks Canada Xplorer's Guide, the new EINP Explora GPS based tour, and "Pack Elk Island on Your Back" a fun-filled educational day pack of activities.

MLPP has a new outdoor amphitheatre for 200 people in the park campground. This is used to stage interpretive programs, guest speakers and other entertainment for campground visitors through the summer months.

16.2.2.3 Visitor Information Centres

The information centre at Strathcona Wilderness Centre features seasonal displays and orients visitors to the site. Annual events include a Children's Tree Conference for grade four students, and seasonal "Get Active Outdoors" events featuring interpretive and outdoor activities for the family. The Strathcona Wilderness Centre has also been selected as the Fire Smart demonstration site for Strathcona County and it is also altering lighting practices to meet the Dark Sky Preserve guidelines. The Centre is an accredited camp of the Alberta Camping Association and has twice received the Cross Country Alberta Cross Country Ski Area of the Year

Award in recognition of the focus on providing equipment rentals, instruction, trails and events that enable visitors to experience the moraine safely in winter.
MLPP has a park centre with an information kiosk and gift store offering free information, park "discovery packs" available under loan, and books and products relevant to the local environment for purchase. The park centre also provides a multi-purpose room, fully equipped for video-conferencing, which can accommodate about 50 people. The room can be rented by local groups or used for programming offered by the park (including school group programs offered during the school year). During the summer months, the park centre is a hub for interpretive activities, as it provides a convenient muster point with easy access to several hiking trails used for interpretive programs for adults and children.

The Blackfoot PRA's heritage information centre is open during the summer months and operated by a volunteer stewardship group, the Friends of the Blackfoot Society, and volunteer campground hosts. Displays, brochures and exhibits, developed by Alberta Parks and other regional protected areas and businesses, provide information on the local environment, history and recreational opportunities to visitors.

The visitor centre at EINP is located just north off of TransCanada Yellowhead Highway at the south entrance to park. The centre is open seasonally providing orientation and information about Elk Island and the surrounding region. Educational displays, murals, children's play area and video presentations are available to visitors to the centre.

The Ukrainian Cultural Heritage Village's Visitor Centre features museum artefacts, exhibits and visitor orientation materials. The centre is located at the entrance to the living museum. The Red Barn facility provides educational and social gathering space for 250 people. Educational and event areas are located in buildings throughout this living museum.

16.2.2.4 Other Visitor Related Educational Facilities

The Blackfoot PRA has staging areas and backcountry shelters that offer convenient points for outdoor recreational and naturalist activities for local clubs. They are well used in all seasons. These areas also serve as access points for a range of environmental education programs for students and field studies for school programs.

Ministik Game Bird Sanctuary is managed for wildlife conservation (in particular, for waterfowl production) and provides limited facilities for environmental education for the public. No formal environmental programming is offered by Alberta Environment and Sustainable Resource Development, the government management agency of this protected area. However, interpretive signage promoting the value of the area to local wildlife has been posted near staging areas, and the trails within the sanctuary are used by local community and naturalist groups for interpretive hikes and outdoor recreational activities.

The Strathcona Wilderness Centre has 12 km of trails for hiking, cross-country skiing and snowshoeing with an array of educational exhibits. Educational programs and events are also held regularly along trails and at trailheads. Canoeing programs offered by the centre are held at the nearby Blackfoot PRA.

The Elk Island Golf Course Clubhouse is a privately operated golf course within the park. It provides BHI messaging and promotional information to their patrons, under agreement with the golf course operator.

EINP also has about 100 km of backcountry and paved trails that provide access to a range of representative habitats. They are well used for interpretive programs, including student tours, Junior Naturalist programs and interpretive walks for the public. Many of these trails also have viewscapes with educational exhibits or points of interest information panels.

16.2.2.5 Educational Research Stations

A research station at Ministik Game Bird Sanctuary operated by the University of Alberta was used for wildlife and range management research until recently and served as a demonstration and field trip area for university students. The future of the station is currently under review; however the facilities remain available for research or other educational use.

A new research station in MLPP will be operated by the Augustana Faculty of the University of Alberta and Alberta Parks (the Augustana Miquelon Lake Research Station). This centre will promote collaboration among economic, social and environmental researchers and educators, examining the interactions between human activities and natural systems. To support on-site research, the new facility would provide lab, office and meeting space, internet connection and overnight accommodation for researchers.

16.2.2.6 Specialist Training

Acquisition of professional skills by managers, university students, decision-makers etc. (Describe specialist training activities: for example research projects for students; professional training and workshops for scientists; professional training and workshops for resource managers and planners; extension services to local people; training for staff in protected area management)

Each of the partner organizations participating in the BHI and who would assist in the future management of the proposed biosphere reserve, provide professional development opportunities for their staff, including support for conference attendance or presentations, in-service or external courses and post-secondary education. EINP is part of an exchange program for resource management professionals with the Australian park system and several of its staff have participated in exchange postings in the past. EINP and Alberta Parks also require their personnel to maintain certification in law enforcement, fire management, first aid and other safety skills, and encourage their staff to pursue professional development specific to their areas of expertise (e.g., biological management, interpretation and environmental education). All protected areas staff have access to other parks within the federal and provincial system and are occasionally called to assist in specific management assignments in other parks (particularly fire management). Through training and interaction with other parks, resource staff are able to continuously enhance their skills and knowledge. For example, MLPP interpretive staff train with provincial counterparts each year in preparation for the summer visitor season.

The municipal partners encourage professional development through support for conference attendance or specific continuing education courses in their areas of specialty. This includes joint training for fire safety personnel, in coordination with protected area personnel. Joint training and coordination helps to develop regional wildfire protection strategies and coordinate equipment, personnel and services in preparation for potential incidents. Municipal staff have also obtained sustainable community development certification through post-secondary institutions such as Simon Fraser University.

The Strathcona Wilderness Centre offers leadership training and instructor certification programs to lead environmental education and outdoor programs for camps, schools and the community. The year-round program offers a special program for youth in Grades 7 to 12 (age 13 to 18) that offers a progression of skill development for day-camps and outdoor trips. Training includes standard to advanced first aid skills, school program instruction and specific instructor certifications in cross-country skiing and canoeing.

EINP has hosted field trips for University of Alberta students to observe specific conservation management activities, including the annual bison handling program. Once each year, all bison within the park are brought to a central handling and disease testing facility. Students have the opportunity to observe the handling process and learn about the broader principles of ungulate and disease management within this protected area. Volunteers from the moraine and Edmonton area often participate in this program, providing them hands-on experience in the park's operation.

Many of the protected areas in the moraine have provided opportunities for experiential learning. EINP has provided professional practicum placements for students in the BA Recreation and Leisure Studies program at the University of Alberta. MLPP and EINP have also served as one-semester practicum placements for University of Alberta Environmental Science students. Scientists from Alberta Innovates – Technology Futures conducting research in the Beaver Hills have included multiple practicum students from the Augustana campus of the University of Alberta in their field work, providing opportunities to collect, process and present ecological data. Lastly, EINP participates in the federal Student Work Experience Program (FSWEP) and Young Canada Works program, which provide work experience opportunities for students and young adults within the park.

The Beaver Hills as a whole has been used for field trips and case studies focusing on integrated land management at a landscape level. The Blackfoot PRA has been used for field trips to the grazing areas within this park, under arrangements with Alberta Parks, for practical experience in range management. University of Alberta students in Parks Planning, Management and Maintenance have used Elk Island as a case study for park management planning. Other protected areas within the Beaver Hills have also been used as case study areas for a variety of University of Alberta courses to study recreation users and conservation management issues. The experience extends beyond universities to include the public. Alberta Parks also sponsors workshops for parks volunteers and hunters within the Blackfoot PRA.

The BHI has become an active promoter of innovative conservation and land management practices for its members and the broader public through workshops sponsored for its partners; field tours offered to local conferences and professional, municipal and provincial organizations; and presentations to other conferences. Board members have been invited to participate in other regional boards, including the Edmonton and Area Land Trust, as well as government planning initiatives such as the provincial Land Use Framework and regional watershed management initiatives under the provincial Water for Life policy. Conference topics have covered a broad range of topics: land use planning, protected areas management, parks volunteers, weed management, wastewater management and sustainable planning. As a practical example of sustainability outside protected areas, the Golden Ranches offers the opportunity to present demonstration projects on

environmentally sustainable agricultural management. Potential audiences could include agricultural field staff, land use planners, biological conservation researchers and non-governmental organization.

16.3 Contribution to the World Network of Biosphere Reserves

16.3.1 How will the proposed biosphere reserve contribute to the World Network of Biosphere Reserves, its Regional and Thematic Networks?

The BHI has been guided by other regional biosphere reserves throughout its development and particularly through the nomination process, a dialogue that has allowed an understanding of current initiatives and opportunities to develop. Redberry Lake and Waterton Lakes Biosphere Reserves provided the BHI with guidance and advice gained from the development of their reserves, and the BHI sought advice from all 16 Canadian biosphere reserves on aboriginal engagement over this past year. BHI members with direct experience in other biosphere reserves such as Southwest Nova, Fundy, Riding Mountain, Niagara Escarpment, and Frontenac Arch in Canada, and in Britain (e.g., North Devon, Dyfi, Galloway and Southern Ayrshire), have also contributed their knowledge and experience to BHI activities. BHI representatives also participated in the EuroMAB conference at the Frontenac Arch Biosphere Reserve in 2013. Collectively, these discussions and networking opportunities have provided a sense of the work other biosphere reserves have initiated, and the opportunities for the Beaver Hills Biosphere to contribute to the World Network of Biosphere Reserves and its Regional and Thematic Networks. The BHI has considered those opportunities and its own experience with international and national networks to identify how the Beaver Hills Biosphere might best contribute to the larger network and current management priorities of UNESCO programs.

The BHI is well positioned to communicate the lessons learned from their land management experiences to a broader regional, national or global audience, including other biosphere reserves within the global network. The BHI has already participated in international research programs, such as the VLF/ELF Remote Sensing of Ionospheres and Magnetospheres (VERSIM) Working Group of the International Association of Geomagnetism and Aeronomy. The Augustana Miquelon Lake research station has the potential to research and communicate issues of sustainability directly relevant to other biosphere reserves, perhaps through partnerships with other reserves. Lastly, incorporation of UNESCO Education and Sustainable Development (ESD) programs into the educational outreach programs of the protected areas in the moraine offers another opportunity to collaborate within the moraine and beyond its borders. Following designation, a goal for future educational initiatives will be to incorporate elements of UNESCO ESD programs currently proven effective in other parts of the globe, (e.g., " ESD: Linking Learning and Happiness" Document) and to collaborate with other biosphere reserves with the global community that share similar issues. Several schools in Alberta, including two high schools within the City of Edmonton, participate in the UNESCO Associated Schools Project Network. The opportunity to involve these schools in the work of the BHI, or in the biosphere reserve network more broadly, will be explored through the BHI's Communication and Outreach Working Group.

In addition, two members of the BHI are long-time members of the World Commission on Protected Areas (WCPA), the world's premier network of protected area expertise. More specifically they are members of Protected Landscapes/Seascapes Specialist Group and the Tourism and Protected Areas Specialist Group. The WCPA is administered by IUCN's Global Programme on Protected Areas and has over 1,700 members, spanning 140 countries. WCPA works by helping governments and others plan protected areas and integrate

them into all sectors by providing strategic advice to policy makers, by strengthening capacity and investment, and by developing a network of protected area stakeholders. Access to the WCPA and these specific Specialist Groups will assist the BHI in implementing its sustainable development strategy, as well as providing another network with which to share lessons learned from the biosphere reserve. The BHI has already been featured as a case study in an IUCN/WCPA publication illustrating the linkage between nature, culture and community (Mitchell et al. 2005).

EINP and Alberta Parks are already involved in various protected areas management groups and exchange programs that facilitate information and knowledge transfer to a larger community of protected areas professionals. Agriculture and Agri-foods Canada and Alberta Agriculture and Rural Development are similarly involved in regional, national and in some cases, international organizations that promote innovative and sustainable agricultural practices and agri-foods initiatives. The diversity of experience and knowledge of innovative approaches held not only within their own organizations, but in the broader region, would be invaluable to the broader network of biosphere reserves. The openness of these organizations, indicated by the participation in a broader community of professionals, suggests that they would also gain much from the experiences of other reserves, contributing to a meaningful exchange of ideas.

The BHI itself is already actively communicating with a variety of professional organizations and decision-makers at the local, regional and national level, through its conference activities and participation in local conservation and planning initiatives. Its partner organizations have much to offer in terms of their own experiences and specialties. The municipal partners have had the unique experience of developing policies through voluntary action and cooperation. The Strathcona Wilderness Centre can contribute their award-winning experience in developing and leading outdoor and environmental education programs and leadership development programs. Inclusion in the broader network of biosphere reserves will provide another opportunity to exchange ideas, lessons and resources with similar organizations. The BHI has been used as a specific example of collaborative approaches to conservation and landscape management in international publications (e.g., the IUCN, Mitchell, et al., 2005) and at international conferences (see Swinnerton, 2003).

The BHI celebrated its 10th anniversary in 2012, and the Board hosted a presentation to showcase the achievements, lessons and experience of this collaborative initiative. This event targeted the partners and communities in and around the moraine and would be readily transferable to a broader audience. The BHI has also hosted tours of the moraine for visiting conferences such as the International Symposium on Society and Resource Management (ISSRM), events that allowed the group to showcase the Core Area, Buffer Zone and Transition Area and discuss the multi-jurisdictional challenges within the moraine. Such events have built up experience in hosting and sharing lessons learned to diverse audiences, experience directly applicable to the World Network of Biosphere Reserves.

From a national perspective, the BHI is well-positioned to collaborate with other Canadian Biosphere Reserves. Parks Canada currently has 9 protected areas that are part of the Canadian biosphere reserve network, and is well-integrated into the MAB biosphere program. EINP participates in regional and national training and planning initiatives, and has used those meetings to develop relationships with other land managers involved in the Canadian biosphere reserve network. EINP personnel are also occasionally involved in activities and programs in other parks, including those participating in the biosphere reserve program. Such activities provide another opportunity to establish relationships and perhaps, collaborate on larger initiatives. For example, the BHI requested advice from all 16 Canadian Biosphere Reserves when designing its aboriginal

engagement strategy. More locally, the BHI has established contacts within the Waterton and Redberry Lakes biosphere reserves, while researching feasibility of pursuing biosphere reserve status.

Internationally, the BHI has drawn on the experiences of various biosphere reserves in Britain to assist in development of its public engagement program and more broadly, in preparing its nomination package. Dr. Guy Swinnerton of the BHI has visited many of the biosphere reserves in Britain over the past five years, and has drawn on contacts within specific reserves to request advice on their experience with the nomination process and subsequent operation of their reserves. Those reserves include several that recently achieved or updated their reserve status (e.g., Brighton and Lewes Downs, Dyfi, North Devon, and Galloway and Southern Ayrshire). Potential for future collaboration has also been explored during those visits and discussions. More immediately though, the BHI benefited greatly from review of successful applications of other biosphere reserves within Canada and internationally (e.g., for Bras d'Or Lake in Canada and Dyfi and Brighton and Lewes Downs in Britain).

Although formal collaboration opportunities have not yet been established, based on our experience with these reserves and the broader network in Canada and globally, we are confident that the Beaver Hills Biosphere can contribute much to the World Network.

16.3.2 What are the expected benefits of international cooperation for the biosphere reserve?

Collaboration with existing biosphere reserves in thematic networks at the regional or international levels (indicate ongoing and planned activities). (Networks of sites which have a common geographic theme such as islands and archipelagos, mountains, or grassland systems, or a common topic of interest such as eco-tourism, ethnobiology etc.)

Within the Canadian Biosphere Reserve Network, Redberry Lake and Riding Mountain Biosphere Reserves occupy similar landscapes, with similar land use issues. The Waterton reserve in southern Alberta operates within a comparable land management context, despite differences in ecological systems. The BHI has been in contact with each of these reserves while researching the biosphere reserve process and will continue to nurture those relationships, collaborating where feasible. As noted above, no specific activities have been identified yet; however, potential exists to pursue common objectives through previously established contacts.

The moraine's location adjacent to an expanding urban area offers much opportunity to examine the effects of human activity and a changing climate on the economic, social and environmental landscape. This landscape has already recently experienced significant droughts that have affected both natural systems and human residents, and this trend of drier climate is anticipated to continue. The new Miquelon Lake Environmental Research Station will help realize the potential for researchers and educators to work collaboratively on identification and improvements to problems resulting from the interactions between human activities (whether rural and urban, economic, or social) and the natural environment.

16.4 Internal and External Communication Channels and Media used by the Biosphere Reserve

16.4.1 Is there a biosphere reserve website?

Yes. The BHI has established a website that has been used to publicize the biosphere nomination and will be used to promote and coordinate biosphere reserve activities in the future as well. The URL is http://www.beaverhills.ca/.

16.4.2 Is there an electronic newsletter? If yes, how often will it be published?

Yes. The BHI previously published a printed quarterly newsletter and is designing an electronic newsletter. An electronic newsletter for the Biosphere Reserve is in development and it is anticipated to be published 2 to 4 times per year.

16.4.3 Does (will) the biosphere reserve belong to a social network (Facebook, Twitter, etc.)?

A Facebook page has been developed for the Beaver Hills Biosphere (https://www.facebook.com/BHIBiosphere). A Twitter account has also been created (@BHIBiosphere https://twitter.com/bhibiosphere).

17. GOVERNANCE, BIOSPHERE RESERVE MANAGEMENT AND COORDINATION

[Describe the following characteristics in the prospective that the site is being designated.]

17.1 Management and Coordination Structure

17.1.1 What is the legal status of the biosphere reserve?

The BHI will assume responsibility for the management and coordination of the Beaver Hills Biosphere. The BHI is not an incorporated organization under provincial or national legislation and instead has established itself as a voluntary partnership. This organizational structure was a deliberate choice, designed to overcome potential perceptions of external management of the existing jurisdictional interests (see Figure 8 below). The arrangement has managed to reduce potential conflict, since the respective land management agencies retained autonomy, and the flexibility to accommodate differences in environmental, social and economic context. This lesson was recently reinforced by a review of land use policy changes fostered by a key management document of the BHI, its Land Management Framework.

The BHI has established a governance structure that addresses decision-making, accountability and fiscal management (Appendix K), and governing policies for the different levels of its organization (i.e., Board, Working Groups, and Fiscal Agent). This governance approach has served the BHI well, and is anticipated to transition readily to management of the biosphere reserve, since it has helped sustain cooperation among it's over 30 member organizations since 2002.

Jurisdiction	Jurisdictional Interests
Canada	Parks Canada (EINP), agriculture, fish and fish habitat, environmentally hazardous materials
Province of Alberta	Provincial protected areas, agriculture, surface water, wildlife, municipal affairs (liaison and support)
Municipal Governments:	Land use and private land management
Beaver County	
Camrose County	
Lamont County	
Leduc County	
Strathcona County	

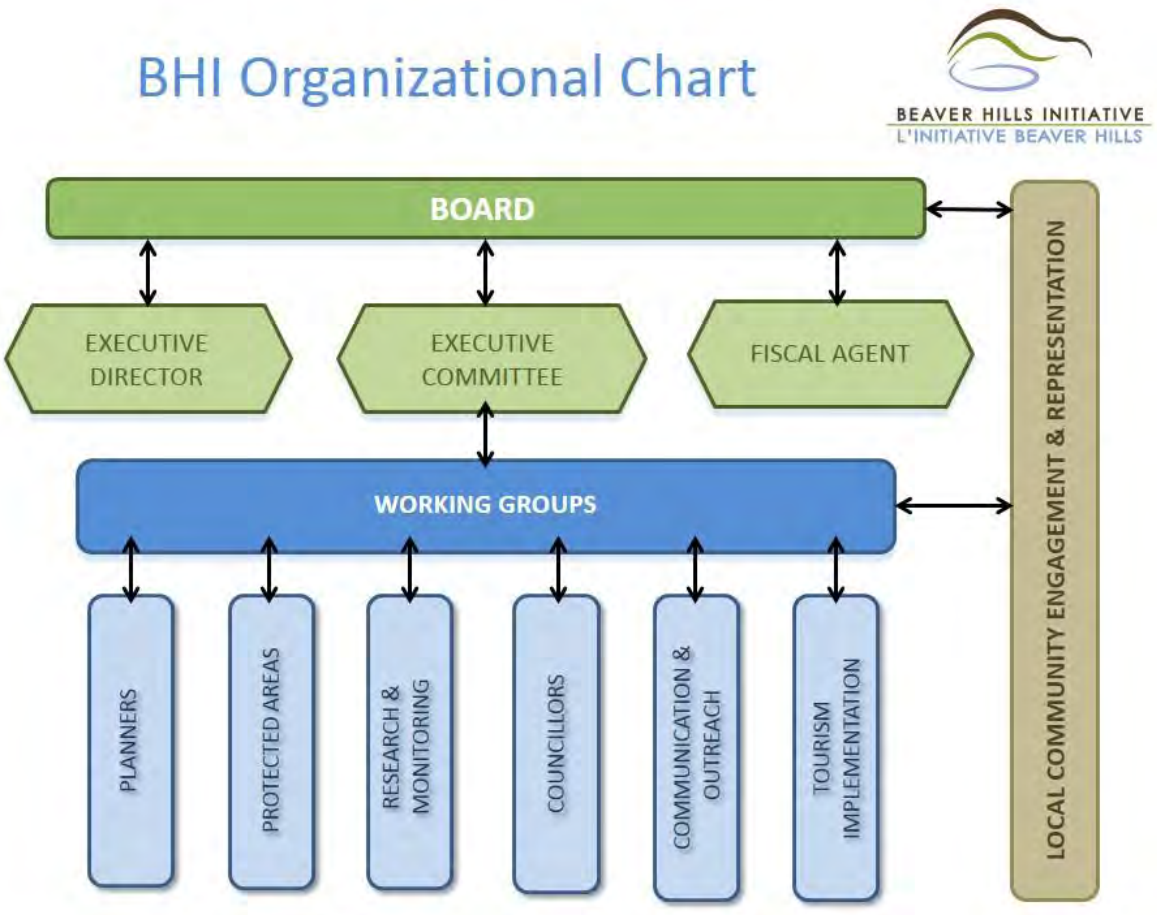


Figure 8. Organizational Structure of the BHI

17.1.2 What is the legal status of the core area(s) and the buffer zone(s)?

The Beaver Hills is a contiguous unit and the Core Area and Buffer Zone protected areas would be contained within a discrete geographic area. The legal status of the protected areas within each area is summarized below. All lands are owned by the respective federal or provincial government and managed by government agencies under respective federal and provincial legislation. The respective management plans and legislation are provided in Appendix A and N).

17.1.2.1 Core Areas

Elk Island National Park:
Established in 1913. Current area is 19,335 ha.
Managed under the Canada National Parks Act and the Elk Island National Park of Canada Management Plan (2011). This plan is renewed every ten years.

Miquelon Lake Provincial Park:
Established on Sept. 28, 1965 with 179 ha. Additional lands were added in 1973 and in 2006. Current area is 835.7 ha). All lands are held under a Provincial Order in Council (OC 603/88), which established the provincial park. Managed under the Alberta Parks Act and Regulations and the Miquelon Lake Provincial Park Management Plan (2002).

17.1.2.2 Buffer Zones

Blackfoot PRA:
Legally established with a provincial Order in Council in 1997 (OC 390/97), but has operated as a protected area since 1983. Current area is 9,920 ha.
Managed under the Alberta Parks Act and Regulations and the Cooking Lake – Blackfoot Grazing, Wildlife and Provincial Recreation Area Management Plan (1997).

Ministik Game Bird Sanctuary:
Designated as the first bird sanctuary in Alberta by the Government of Canada in 1911. Became a permanent sanctuary under the federal Migratory Birds Convention Act in 1920. Management of the sanctuary was transferred to the Government of Alberta in 1930 and protection was secured under sanctuary regulations of the provincial Wildlife Act. In addition, the sanctuary was designated as a provincial Habitat Conservation Area under the Wildlife Amendment Act in 1996. Currently, management is shared between the Public Lands Division and Fish and Wildlife Division of the Alberta Environment and Sustainable Resource Development Department. Current area is 7,580 ha.

In 1938, Ducks Unlimited Canada obtained a License of Occupation (LOC#745) to manage waterfowl habitat on 4,363 ha within the north part of the sanctuary, a habitat management relationship that has been sustained since that time. (Wildlife Management Plan - Ministik Lake Game Bird Sanctuary, by Alberta Forestry, Lands and Wildlife – Fish and Wildlife Division and Ducks Unlimited, 1989).

Two management plans address wildlife management objectives in the sanctuary: Wildlife Management Plan – Ministik Lake Game Bird Sanctuary (Alberta Forestry, Lands and Wildlife and Ducks Unlimited, 1989) and Ministik Lake Game Bird Sanctuary Wildlife Management Plan. Implementation Strategy (Alberta Environmental Protection, 1998)

Miquelon Lake Bird Sanctuary:
Miquelon Lake Bird Sanctuary was established in 1911, with Ministik Game Bird Sanctuary, as Alberta's first wildlife sanctuaries (IBA, 2010). Like Ministik, it became a permanent sanctuary under the federal Migratory Birds Convention Act in 1920, but later, management was transferred to the Province of Alberta. It is managed under the provincial Wildlife Act, under joint jurisdiction by Alberta Public Lands Division and the Fish and Wildlife Division, both within the Alberta SRD Department. Current area is 2,220 ha.

Natural Areas:
Established through a provincial Order in Council. Their dates of legal establishment (with relevant Order in Council) are:
Antler Lake Island NA – June 3, 1987 (OC378/87)
Edgar T. Jones NA – July 26, 1995 (OC5194/95)
Hastings Lake Islands NA – July 26, 1995 (OC519/95)
North Cooking Lake NA – March 15, 1971 (OC454/71-6)
Parkland NA – March 6, 1985 (OC146/85-4)
Sherwood Park NA –March 15, 1971 (OC 416/98-54)
Managed under the Alberta Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act. Their combined area is currently 622 ha.

Hasting Lake NA, a 62 ha parcel on the north shore of Hasting Lake was designated under a Protective Notation (PNT) in 1974, rather than an Order in Council. This designation offers protection from development, but does not provide the more explicit prohibitions stipulated by an Order in Council.

Strathcona Wilderness Centre:
The Strathcona Wilderness Centre was established by Strathcona County in 1981. Its total area is 220 ha. The centre is managed and protected under the Strathcona County Parks Bylaw.

Environmental Non-governmental Organization Natural Areas
Established through outright purchase (fee simple) or Conservation Easements (an agreement with private landowners that limits land use that is listed on title) by the environmental non-governmental organizations active in the moraine (Ducks Unlimited Canada (DUC), Nature Conservancy Canada (NCC), Alberta Conservation Association (ACA), Alberta Fish and Game Association (AFGA). Alberta Sport Connection (ASC), Edmonton Area Land Trust (EALT)). These sites are numerous within the moraine (currently 11 parcels and two easements with DUC; 10 parcels and one easement with NCC; three parcels and one easement with ACA and one parcel each with AFGA, ASC and EALT) and distributed in strategic acquisition areas to enhance connectivity across the landscape. Their dates of establishment range from the early 1980s to present and new sites are added on an opportunistic basis, at an increasing frequency as awareness of the moraine conservation potential grows. Their current area totals 2,296 ha.

17.1.3 Which administrative authorities have competence for each zone of the biosphere reserve (core area(s), buffer zone(s), transition area(s))?

17.1.3.1 Core Areas
EINP and MLPP are federal and provincial protected areas with a focus on conservation of biodiversity and ecological function.

17.1.3.2 Buffer Zones
Ministik Game Bird Sanctuary, Miquelon Bird Sanctuary and the Cooking Lake-Blackfoot Wildlife and Provincial Recreation Area (Blackfoot PRA) are provincial protected areas. Strathcona Wilderness Centre is a municipally owned recreational property operated by Strathcona County. Several smaller provincial natural areas are distributed across the moraine (e.g., Hastings Lake Islands Natural Area, Edgar T. Jones Natural Area) are also under provincial control. Other natural area parcels owned or managed by various conservation agencies [e.g., the Alberta Conservation Association (ACA), the Alberta Fish and Game Association (AFGA), Ducks Unlimited Canada (DUC), Nature Conservancy of Canada (NCC) the Edmonton and Area Land Trust (EALT) and Alberta Sport Connection (ASC)]. Although other land uses may be permitted, all are managed primarily for conservation.

17.1.3.3 Transition Areas
The Transition Area is managed through statutory municipal planning documents (Municipal Development Plans, Land Use Bylaws). Policies currently in force in the five counties follow below:

Beaver County	Municipal Development Plan (amended 2010), Land Use Bylaw (2004)
Camrose County	Municipal Development Plan (2004), Land Use Bylaw (2008)

Lamont County	Municipal Development Plan (2007), Land Use Bylaw (2007)
Leduc County	Municipal Development Plan (2004), Land Use Bylaw (2008)
Strathcona County	Municipal Development Plan (2007), Land Use Bylaw (2001)

Tenure of agricultural lands in the BHI region is reported in the Canadian Census of Agriculture (2006) as:
Privately-owned - 64.1%
Leased from government - 2.8%
Rented from others - 27.7%
Crop share or other arrangements - 5.4%
Private lands are managed by individual landowners, but regulations for development and land management are established and managed by the individual municipalities. Small parcels used for municipal services are also held by municipal government.

17.1.4. Clarify the respective competence of each of these authorities. Make a distinction between each zone if necessary and mention any decentralized authority.

The Core Area and Buffer Zone lands are managed by government agencies or non-governmental organizations that have a mandate to conserve the natural resources within their lands. Parks Canada has expertise in ecological management and in visitor management, as does AESRD, and both the federal and provincial agencies are delegated a conservation mandate under their respective legislation and management plans. Each of the non-governmental organizations also has conservation expertise and their organizational mandates all include conservation objectives. Although the capacity and depth may vary amongst them, through the BHI's Protected Areas Cooperation Plan and other informal arrangements, they share expertise amongst themselves and within the BHI. Specific legislation and legal authority for the respective areas is outlined below.

17.1.4.1 Core Areas

Organization Name: Parks Canada (EINP) Legal Authority: *Canada National Parks Act, Federal Migratory Birds Convention Act*

Organization Name: AESRD Legal Authority: *Alberta Parks Act and Regulations, Alberta Wildlife Act*

The two Core Areas are Crown-owned lands: EINP is a federal land managed by Parks Canada, MLPP is provincial land managed by AESRD (Parks). The respective areas of each Core Area and the percentage those lands represent in the moraine follow in Table 19 below.

Table 19. Areal extent of protected areas proposed as Core Areas

Buffer Zone	Owner or manager	Land area (km^2)	Percentage of moraine (1595.6 km^2)
Elk Island National Park (EINP)	Parks Canada	193.35	12.1%
Miquelon Lake Provincial Park	Alberta Environment and Sustainable Resource Development	23.9	1.5%

17.1.4.2 Buffer Zones

Organization Name: AESRD
Legal Authority:
Alberta Parks Act and Regulations
Alberta Wildlife Act
Alberta Wildlife Amendment Act
Alberta Public Lands Act
Alberta Land Stewardship Act
Alberta Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act

Organization Name: Strathcona County (Strathcona Wilderness Centre)
Legal Authority: Alberta Municipal Government Act
Strathcona County Parks Bylaw

The ownership, area and proportion of the moraine represented by the Buffer Zone lands follow in the table below. The various environmental non-governmental organizations own lands under fee simple arrangements and also manage conservation easements across the moraine. Lands owned outright are managed under organizational conservation objectives. Conservation easements are regulated under provincial law (Municipal Government Act, Alberta Land Stewardship Act). Conservation easements are held on title and restrict the types of land management to purposes compatible with organizational conservation objectives. Table 20 below summarize lands and conservation easements held by provincial agencies and the various environmental non-governmental organizations.

Table 20. Areal extent of protected areas proposed as Buffer Zones

Buffer Zones	Owner or manager	Land area (km^2)	Conservation easement (km^2)	Percentage of moraine (1595.6 km^2)
Blackfoot PRA	Alberta Environment and Sustainable Resource Development	99.2	0	6.20
Ministik Game Bird Sanctuary	Alberta Environment and Sustainable Resource Development	75.8	0	4.75
Miquelon Lake Bird Sanctuary	Alberta Environment and Sustainable Resource Development	22.2	0	1.40
Provincial Natural Areas	Alberta Environment and Sustainable Resource Development	6.66	0	0.41
Strathcona Wilderness Centre	Strathcona County	2.20	0	0.14
Ducks Unlimited Canada (DUC)	DUC	9.26	1.263	0.65
Nature Conservancy of Canada (NCC)	NCC (with DUC as co-owner in some instances)	3.99	0.262	0.27
Alberta Conservation Association (ACA)	ACA (with co-ownership through other environmental non-governmental organizations in some cases)	1.52	1.62	0.20
Alberta Sport Connection (ASC)	ASC	0.08		0.005
Edmonton and Area Land Trust (EALT)	EALT	2.83		0.53
Sherwood Park Fish and Game Association)	Sherwood Park Fish and Game Association	2.27		0.14
Alberta Fish and Game Association (AFGA)	AFGA	0.73		0.05
Total		226.82	3.145	14.76

17.1.4.3 Transition Area

The Transition Zone lands within the proposed biosphere reserve are largely held under private ownership. Municipalities may own small parcels for civic operations and services; they also hold various municipal reserves and environmental reserve lands, small parcels given over to the municipality at the time of subdivision development. In addition, some municipalities actively promote establishment of conservation easement agreements with their residents, which set portions of privately held lands aside for conservation land uses only through a change on the land title. Strathcona County is a recognized leader in this effort, and has established 105 easements with landowners, totalling 1,275.9 ha (3152.6 ac). The municipalities manage both development and land use under various statutory and policy documents, a power delegated by the province. The areas controlled by the various municipal governments within the moraine, and the proportion of the moraine represented by that jurisdiction are listed in Table 21 below.

Table 21. Areal extent of municipal lands within the Transition Area

Municipality	Total area in moraine (km^2)	Area in moraine excluding protected areas (km^2)	Percentage in the moraine (1595.6 km^2), excluding protected areas
Beaver County	315.7	177.0	11.1%
Camrose County	122.5	61.3	3.8%
Lamont County	136.1	136.1	8.5%
Leduc County	125.3	107.7	6.8%
Strathcona County	702.2	692.0	43.2%
Total Area	1,401.8	1164.4	73.4%

17.1.5 Main Land Tenure (Ownership) for Each Zone

Ownership and responsibility for the areas comprising the core and buffer areas are shown in Tables 19 and 20. Outside of these areas, the moraine lands are largely privately held, a situation unlikely to change in the foreseeable future. Some protected areas comprising the Core Area and Buffer Zones may acquire additional lands (such as the recent acquisition of a few small land parcels around MLPP); however, neither the federal or provincial government has immediate plans to create additional protected areas within the moraine. The environmental non-governmental organizations within the BHI and some municipalities have developed land conservation programs for the moraine area, which will continue.

These programs actively pursue land acquisition and conservation easements (conditions for land use placed on land titles). Each of the municipalities has the ability to acquire conservation lands through the subdivision process, as either Municipal Reserve or Environmental Reserve lands, an option implemented to varying degrees by the partner municipalities. Strathcona County has also developed a Legacy Lands policy that facilitates the purchase of significant natural areas as opportunities arise, to help maintain the County's green

infrastructure. This has been used recently to expand the Strathcona Wilderness Centre, enhancing its operation as well as conserving key lands within the municipality,

17.1.6 Is there a single manager/coordinator of the biosphere reserve or are several people in charge of managing it? If one manager/coordinator, who designates and employs him/her (national authorities, environmental administrative agency, local authorities)?

The BHI will manage the biosphere reserve in terms of promoting sustainable development initiatives, but any site-specific changes, whether through policy or conservation action, will be enacted by the appropriate land management organization (e.g., Parks Canada, AESRD, municipal governments, or non-governmental organizations) through their own decision making processes. The BHI has established a role as a facilitator of partnerships and developer of tools for conservation and sustainable development, and will continue in that fashion. The BHI's business planning cycle provides a means to coordinate the activities of management agencies, environmental non-governmental organizations and universities in the region. It also allows these agencies to capitalize on opportunities for innovation, policy development, expansion of knowledge, and land acquisition.

Any operational aspects of the biosphere reserve would be managed by the BHI's Executive Director and Strathcona County as the BHI's Fiscal Agent. Direction to the Executive Director and Fiscal Agent regarding management priorities would come from the BHI Board, comprising representatives from municipal, provincial and federal governments, environmental non-governmental organizations, academic institutions and members of the public (Appendix K).

By combining information, expertise, and financial and other resources, the BHI partners have been able to develop sophisticated approaches to conservation and sustainability concerns that would be beyond the capacity of individual agencies. The depth and transferability of these projects to other regions have gained attention beyond the moraine boundaries, which in turn presents an opportunity to influence policy development at a broader level. For example, through projects such as the Transfer of Development Credit (TDC) pilot program, the BHI is helping to expand the current "toolbox" of conservation approaches for private lands not only within the moraine, but across the province. The TDC program is based on the recently proclaimed Alberta Land Stewardship Act, which sanctions market-based incentive programs as mechanisms of conservation. However, such programs have only recently been applied in the province and experience in their use is limited. The TDC pilot program will provide valuable feedback to provincial land managers and regulators, as well as another means of land conservation for the municipalities within the moraine. Where similar legislative powers allow land managers opportunity to implement sustainable development approaches, the BHI will facilitate activities of interested agencies, but cannot direct organizations to comply under the BHI's voluntary participation governance structure.

17.1.7 Are there consultative advisory or decision-making bodies (e.g., scientific council, general assembly of inhabitants of the reserve) for each zone or for the whole biosphere reserve? If yes, describe their composition, role and competence, and the frequency of their meetings.

The BHI has established itself as a regional advisory body that can assist its partners in responding to sustainable development concerns, or in coordinating initiatives that address the interests of several organizations. In this sense it brings together the considerable resources and expertise across the membership,

access they previously did not have. Working from a consensus-based model, any proposal is fully debated, with input from members of Working Groups and at the Board level before decisions are made. This helps ensure that the background factors contributing to decisions are understood by all, as well as ensuring that partners can contribute their knowledge and perhaps resources to a proposed activity.

The BHI Board will be responsible for the management direction of the biosphere reserve, and proposals for new initiatives can arise from the general membership or through various Working Groups, maximizing use of this pool of expertise. Any member can bring forward a proposal for an initiative at the Board or Working Group level. The Working Groups comprise representatives from various member organizations (including members of the public) who have interest in specific management areas. Often proposals will be presented at this level, to allow for discussion and coordination of interested parties, before presentation to the Board. The Chair of each Working Group sits on the Executive Committee and can bring new proposals forward for Board consideration through that venue for additional discussion and coordination with other Working Groups. In this sense, proposals enjoy robust debate and full opportunity for coordination of resources and knowledge before being presented at the Board level. This also facilitates approval of projects, since proposals receive a thorough review prior to Board presentation. The Board, Executive Committee and most Working Groups meet on a monthly schedule, which allows frequent opportunity to bring ideas forward, and to track progress.

The Board includes all members of the BHI, and thus incorporates the full range of competencies represented by the membership. The Working Groups generally include practitioners familiar with local concerns and policy or management needs. For example, the Planners Working Group comprises land use planners from municipal and federal governments, as well as academics with research interests in the area. The governance structure allows each Working Group the authority to investigate and develop innovative tools or build knowledge useful at the practitioner level, which helps ensure relevance and ideally, maximize future adoption of those tools and information.

17.1.8 Has a coordination structure been established specifically for the biosphere reserve?

If yes, describe in detail its functioning, composition and the relative proportion of each group in this structure, its role and competence. Is this coordination structure autonomous or is it under the authority of local or central government, or of the manager/coordinator of the biosphere reserve?

The coordination structure that the BHI has already established is intended to be used to manage the Beaver Hills Biosphere. Management will be guided by the principles, structure and governance of the BHI laid out in the Land Management Framework (LMF2015) and the BHI Board (and Working Group) Policies (Appendix K). These documents reflect the values and principles to which the BHI members have committed in their partnership model, which include:

- Maintaining a voluntary, cooperative approach to sustainable development, with the goal of conserving the natural character of the Beaver Hills through shared initiatives.
- Balancing representation among the partner organizations to ensure active participation and input from all stakeholders (three levels of government, ENGOs, academic institutions and industry). As membership expands, the BHI has rebalanced representation through a consensus based process, a consideration now under discussion relative to potential for new public and aboriginal members.

- Ensuring a deliberative and consensus-based approach to decision-making and implementation of shared initiatives, at the Working Group, Executive Committee and Board level.
- Recognizing the autonomy of partner agencies, and the critical role of municipalities and protected areas in managing the moraine, each within their own contextual constraints.
- Recognizing and facilitating the significant commitments that all partners have made to the BHI (in terms of time, resources, personnel and imitative) to further the goals of the BHI and conservation of the moraine.

Based on these principles, and in particular, the voluntary and adaptive nature of this organization, the BHI has adopted a delegated approach to leadership and accountability, such that the organizational level best able to implement an initiative can assume the lead role as needed. It has also adopted a 'decentralized' approach to governance and operations that encourages initiative to arise from any level of the organization. New proposals are debated within appropriate Working Groups and the Executive Committee, with final ratification by the BHI Board and financial agency by Strathcona County. New members are welcome to join Working Groups as appropriate and any member can participate in Board discussion. As a result, the BHI membership can be fluid and is thus very adaptable to changing context, but the decision-making and accountability processes remain consistent.

The Board Policies outline roles and responsibilities of the Chair and Board, Working Groups, Executive Director and fiscal agent, as well as recommended composition of each group. The BHI organizational structure describes the functional relationships and decision-making authorities of the respective levels of organization. Consensus-based decision-making is the goal at all levels of the organization and is often successful due to the respectful debate encouraged within those groups. Failing consensus, a majority vote is required.

Board: The Board is the governing board of the BHI. The key duty of the Board is to represent the members in determining and demanding organizational performance. The Board maintains a forum for discussion and formal liaison between the BHI and its members, and develops governing policies that define the organizational mandate, governance process and the Board/Executive Director Relationship. While the Board is open to all members, representation (and voting, if required) is currently shared among municipalities, federal government agencies, provincial government agencies, ENGOs, industry organizations, academic institutions and public members. Other sectors, including a more diverse representation from the public and aboriginal groups can be added to this structure to ensure that all interests can participate in decision-making.

Board Chair: The role of the Chair is to ensure the integrity of the Board's process and to represent the Board to external partners and audiences. The Chair is the only Board member authorized to speak for the Board, except when he/she temporarily delegates this authority to another person. Confirmation of delegated spokesperson authority is made jointly by the Chair and the Executive Director. The Chair (and a Vice-chair) is selected from representatives on the Board, by the Board. Currently the Chair is represented by a member of the public.

Executive Director: The Executive Director (ED) is responsible for implementing all staffing actions, operational requirements, work plan activities and fulfilling reporting requirements to the Board, including financial planning and reporting. The ED is appointed by and accountable to the Board. Performance is assessed in two areas: organizational achievement of BHI mandate and policies, and organizational operation.

The ED is a non-voting member of the Board and Executive Committee and an ex-officio member of all Working Groups.

Fiscal Agent (Strathcona County): The BHI does not currently hold legal status as a not-for-profit society/corporation, which has helped to minimize perceptions of a new external influence on land management. A Fiscal Agent (Strathcona County) has been established by agreement among the partners, which executes the legal responsibilities of the organization. The Fiscal Agent is responsible and liable for legal requirements and responsibilities, human resources, protection from risk (insurance), and fiduciary trust. Fiscal agency has been established through a memorandum of understanding with the Board of the BHI.

Executive Committee: The Executive Committee is a Board Working Group that serves as a coordinating body to ensure consistency of purpose, shared use of resources, communications, and timely direction on specific projects. The Executive Committee assists the ED and Chair to set agendas and priorities for the Board's consideration, including information for preparing the Annual Work Plan/Business Plan and Budget. Members include all Working Group Chairs, the Board Chair and Executive Director, as well as project leads on invitation by the Executive Director.

Working Groups: Working Groups (WG) are established under the Board, but work independently from the Board, reporting to the Executive Director and the Executive Team (through their Working Group Chair). Six standing WGs address issues related to land use planning, communication and outreach, municipal politician involvement, protected areas coordination, research and monitoring and nature-based tourism. Other WGs are formed as needed to address emerging issues and are responsible for coordinating data collection, information-sharing and development of innovative management approaches related to that issue, as well as building awareness, understanding and support for the activities of the BHI. Membership comprises personnel from partner organizations, or the public, whose time represents an in-kind contribution to the BHI (i.e., these are not paid staff). Any additional resources required by the WGs are approved through annual business planning cycles, and by the ED and Board. Because WGs draw from all partner agencies and the public, they are the practical facilitators of inter-agency cooperation and collaboration to advance the goals and principles of the BHI.

17.1.9 How is the management/coordination adapted to the local situation?

As explained in Section 17.1.6 above, all members of the BHI can participate in Board and Working Group discussions. Because the Working Groups in particular comprise practitioners, both concerns and solutions can be discussed and evaluated in terms of local context. Further, because implementation of any policy, tool or information generated by the BHI is at the discretion of the respective land management agencies, they can adopt the pieces most relevant to their respective context. Indeed, an update to the BHI's Land Management Framework found that member agencies were using much of the information and best management practices provided in the framework, but only to the extent relevant to their situation. This example is explained more fully in the section below.

17.1.10 Is there a procedure for evaluating and monitoring the effectiveness of the management?

The BHI engages in an annual business planning exercise that identifies project priorities and evaluates progress on prioritized plans and programs (Appendix C). The BHI's Business Plan also includes criteria

defining effective management in terms of the BHI's activities. The effect of policy change and adoption of new tools or information generated through BHI activities has been monitored separately, since the impact of those activities will manifest over the longer-term. Two key management tools are used for this process, the Land Management Framework (LMF) and the State of the Beaver Hills report, which outline management approaches and monitor management effectiveness respectively.

The original LMF (2007) was a guidance document that outlines land use policy and land management tools to encourage sustainable development in the Transition Zone. It was recently updated in 2015, an exercise that included an assessment of the application of the management approaches by member municipalities. While each had adopted relevant aspects of the document into their policies, the review highlighted the influence of differences in context among these municipalities on 'useful' tools. For that reason, periodic updates of the LMF will be done, and will include a review of adopted elements to help ensure that innovations are relevant or to assist municipalities in adoption.

The first State of the Beaver Hills report was recently completed in 2015 and will serve as the baseline for future monitoring of indicators of environmental, social and economic advances across the moraine. Indicators can also be modified to highlight ecological services, depending on available data sources. This initial report evaluated available data sources in terms of their quality, repeatability over time and cost-effectiveness. Additional data sources can be added as they become available, if they meet these criteria. The indicators represent the BHI's Land Management Principles (Land, Water, Air and Quality of Life), and will measure change in aspects such as natural cover, water quantity, and economic benefits.

Both the LMF and the State of the Beaver Hills report will allow the BHI to evaluate the effectiveness of the tools, knowledge and adaptive policies promoted by the BHI, relative to the definition of sustainable development identified in its Land Management Principles.

17.2 Conflicts Within the Biosphere Reserve

17.2.1 Describe any important conflicts regarding the access or the use of natural resources in the area considered (and precise period if accurate). If the biosphere reserve has contributed to preventing or resolving some of these conflicts, explain what has been resolved or prevented, and how this was achieved for each zone.

Achieving a balance among competing land use and land management options is the most important conflict within the moraine, and other parts of the province. Past development activities have affected natural habitats, and the rate and extent of loss are of increasing concern in the moraine and beyond it. The proximity of the moraine to the Edmonton Capital Region and the rate of urban growth in this area were key motivators for the formation of the BHI in 2002. Although a regional approach to management is understood to be the best approach, successfully building a collaborative environment in which such conflicts might be openly discussed and consensus gained on key objectives for land management has proven difficult. The success of the BHI in not only sustaining a voluntary collaboration for 13 years, but establishing consensus on the Land Management Principles as objectives for land management has caught the attention of various organizations. The BHI has been awarded the Alberta Minister's Award for Municipal Excellence (2005), twice been a finalist for an Alberta Emerald Award (for environmental achievement) and was featured as a case study by the Organization for Economic Cooperation and Development (OECD) in 2011. In each case, the successful collaboration and

open dialogue about land development and the trade-offs required for sustainable development have been recognized, as has the application to protected areas as well as private lands (i.e., all zones of the proposed biosphere reserve).

The success of the BHI in promoting sustainable development amongst its municipal partners has garnered additional attention from provincial organizations responsible for implementing the provincial Land Use Framework and regional planning. In this case, collaboration has resulted in change to municipal land use policy and development approaches within the Transition Zone. Further, it has built interest and confidence in the value of collaboration to solve future development concerns among all land management agencies.

An emerging concern in Canada is the issue of aboriginal treaty rights and awareness of the need for greater involvement for First Nations and Métis in land management. The initial discussions the BHI has had with aboriginal organizations, as well as aboriginal awareness training pursued by the Board have helped open discussion regarding collaborative approaches to sustaining cultural connections to moraine lands. As an example, the BHI and the Métis Nation of Alberta (MNA) have discussed the potential to develop a traditional land use study within the moraine to help the MNA better respond to consultation requests from energy and other development interests.

17.2.2 If there are any conflicts in competence among the different administrative authorities in the management of the biosphere reserve, describe these.

The five municipalities differ in the amount of development pressure they currently experience and thus, the types of support resources they have on staff. Strathcona County has experienced the most development in the past and has a relatively large land use planning and environmental planning department, as well as agricultural, engineering, recreational and public works services. Other municipalities are still mostly agricultural communities with fewer rural residential, commercial or industrial applications in the moraine lands. They will often have agricultural, engineering and public works staff, but only one land use planner or contracted services. None have dedicated environmental planners or biologists. Past development also influences taxation revenues and there are differences between Strathcona County and the other municipalities due to past development interest.

The federal and provincial park agencies, in contrast, have more expertise in environmental and visitor management, as well as public works personnel. They may experience more variation in funding, depending on government program priorities at the time. As an example, ecological integrity funding available through Parks Canada around 2002-2006 helped support various BHI programs, including a Fire History Study and development of the original Land Management Framework. Parks Canada also was able to contribute to a GIS staff person at half time for the BHI (a position shared with Strathcona County). Recent budget cuts have limited the contributions EINP has been able to provide, but staff are still active in the initiative and provide in-kind support. Provincial departments have contributed in-kind and financial support, including several large grants facilitated by Alberta Municipal Affairs.

Finally, the non-governmental organizations have various levels of funding, based on their organizations' fundraising efforts and conservation objectives. Many of the non-governmental organizations that are active in the moraine have identified this landscape as a priority area for their land securement programs. Accordingly,

sufficient funds have been dedicated to their existing properties and the securement properties. Often their staff will include fund-raising, public engagement and environmental staff.

17.2.3 Explain the means used to resolve these conflicts, and their effectiveness.

The collaborative environment of the BHI has done much to facilitate sharing of available resources among member organizations. One of the benefits acknowledged by the partners, and highlighted in the recent assessment of the Land Management Framework was the ability to access expertise and other resources from other partners participating in Working Groups or on the Board. Further, data, information and experience resulting from BHI projects are made available to all partner organizations. Data-sharing was also acknowledged as a significant benefit of participating in the BHI, since most of the partners would not be able to fund such studies on their own (for examples, please see the case studies in Appendix B.

The Land Management Principles, to which all BHI partners have committed, and the BHI governance structure and policies also provide means to resolve conflict. Firstly, the Principles establish the common goals for sustainable management of the moraine, and a vision guiding decision-making and land management objectives. Second, the BHI governance structure deliberately avoids power imbalances that could result in conflict. Participation is voluntary, the BHI has no authority to enforce land management decisions, and the BHI as an organization is to promote cooperative approaches to land management. Lastly, although voting is rarely necessary and consensus decisions can usually be reached by the Board, voting privileges were established so as to avoid power imbalances, or perceived imbalances. The longevity of the BHI partners within this collaboration suggests this approach has been largely successful.

The increased opportunity for open dialogue about regional sustainability concerns, and potential solutions has resulted in increased trust in the collaboration process overall and the ability to achieve balance among environmental, social and economic objectives. The support and commitment to continue with this process are reflected in the effort taken by the BHI and its partners in developing their nomination for biosphere reserve designation.

17.3 Representation, Participation and Consultation of Local Communities

17.3.1 At what stages in the existence of a biosphere reserve have local people been involved: design of the biosphere reserve, drawing up of the management/cooperation plan, implementation of the plan, day to day management of the biosphere reserve? Give some specific examples.

As discussed previously, the BHI was initiated by government agencies in response to threats of potential impact of rapid development on the resources and character of the moraine. Although the response was driven in part by concerns expressed by the public for better environmental protection, the public was not directly involved in the initial formation of the BHI or its management objectives (the Land Management Principles). Subsequent consultations with the residents of member municipalities during consultation for land use planning processes confirmed public support for the BHI and its objectives. The BHI has long-recognized that more direct public engagement was necessary, but wanted to ensure that municipalities were comfortable with the sustainability objectives and benefits of the BHI before engaging fully with local residents.

A public engagement program proceeded in two phases over the past five years. Local communities, community and non-governmental organizations, government agency representatives helped to develop the

Tourism Development Opportunity Assessment through 2011 and design the stewardship engagement strategy through a series of workshops in 2012. That latter effort resulted in the Stewardship Engagement Strategy, which will guide help link organizations with similar interests in stewardship activities across the moraine. The Bioblitz event held on World Snow Day (January 2014 and 2015) at Strathcona Wilderness Centre is a good example of such coordination. This event is a collaborative effort of the Alberta Chapter of The Wildlife Society, Nature Alberta's Young Naturalists program, the Strathcona Wilderness Centre and the BHI. It promotes awareness of the moraine and nature, professional biologists' roles in managing natural resources and outdoor recreation in a family friendly environment. The event has succeeded in drawing in large crowds in its first two years, by drawing on the resources, volunteers and knowledge of the respective organizations. The event also promotes the objectives of each member organization, at a scale that would not be possible individually (see case study in Appendix B). The event was an early example of the potential in the Stewardship Engagement Strategy, adding support to the BHI's engagement efforts.

Over this past year, the BHI has implemented a dedicated public engagement campaign that aimed to raise awareness of, and build support for, the biosphere reserve nomination (Appendix D). Several local residents also took the time to prepare a letter of support (Appendix I). The program targeted traditional media outlets; special events in the moraine, the Edmonton region and provincially; regional and moraine schools, community and environmental organization and community administrators and councillors, with over 151 presentations, meetings, media releases and interviews and several more scheduled this summer. The program was also supported by an updated BHI web-site and a social media campaign with a growing number of followers and supporters. Supporters were asked to respond through the website or by signing supporter postcards. So far, the program has generated 919 positive responses from local, region, provincial and international locations, as well as over 70 letters of support from various organizations and individuals (Appendix I). It has also sparked interest in school programming about the moraine and biosphere reserves more generally. Communication has been two-way during this process and presentations often sparked much discussion with attendees. Communication will continue to be open as the public engagement campaign moves forward. Feedback from the public will be welcome and can contribute to future management initiatives. Members of the public have also been invited to participate in the BHI, on its Working Groups or as a member of the Board.

Lastly, an aboriginal engagement program has been implemented over the past two years, seeking to raise awareness of the biosphere reserve nomination, the BHI and the willingness to involve First Nations and Métis in these activities. A more formal, high-level process has sought support and potential collaborators from the Confederacy of Treaty Six First Nations and the Métis Nation of Alberta (MNA). Both of these organizations have provided letters of support for the nomination and have indicated their support to investigate areas of potential collaboration. The MNA is particularly interested in completing a traditional land use study of the moraine, while the Confederacy would like to discuss possible opportunities more fully and to explore means of respecting treaty obligations, particularly land stewardship, with the BHI. Local aboriginal residents and an elder from Maskwacis have also worked with aboriginal and non-aboriginal students from the Augustana Campus of the University of Alberta to complete two projects documenting aboriginal history within the moraine. Funding for additional work has been pursued, but not yet secured. These projects have helped fill a critical gap in the published history of the moraine, which does not capture aboriginal perspectives well. They have also initiated connections between aboriginal communities that could be involved in future activities, or management of the biosphere reserve. Lastly, this work helped raise awareness within the BHI of the differences in settler and aboriginal experiences in the moraine, and the absence of aboriginal perspectives in the current historical narrative.

These differences in perspective were further explored during aboriginal awareness training sessions for the BHI Board members. Facilitated by a First Nations resident from the Camrose area, attendees learned about aboriginal culture and traditions as well as aboriginal understandings of treaty obligations and rights. Finally, attendees learned more about cultural expectations and norms, and respectful means of communicating and working with aboriginal peoples.

17.3.2 Describe how the local people (including women and indigenous communities) have been, and/or are represented in the planning and management of the biosphere reserve (e.g., assembly of representatives, consultative groups).

The BHI was initiated in 2002 by government and non-governmental organizations in reaction to development pressures experienced within the various jurisdictions; those same concerns were shared by members of the public. Residents of Strathcona County, for example, reported protection of the environment as an important objective during Community Consultation 2002, an extensive consultation program conducted to inform the County's Strategic Plan. The BHI began its work by focusing on coordination among its partner organizations. As noted above, during its early development, it did not engage directly in public consultation activities. It did, however, support public consultation undertaken by its partners, including the municipalities, on their invitation. This included public consultation in support of EINP's management plan, for example and various land use policy updates. Public consultation was also included in some BHI projects, such as the Tourism Development Opportunity Assessment study (2011).

Response to the science-based information provided by the BHI at such meetings (e.g., consultation for the Strathcona, Beaver and Leduc Municipal Development Plan and Land Use Bylaw review processes) was overwhelmingly supportive of the need for environmental conservation and sustainability of the moraine's resources. The public in attendance were also very supportive of the activities of the BHI in promoting a regional approach for sustainable management. All levels of government have been under increasing scrutiny with regard to sustainable management practices, and the responses from such meetings justified their commitment to the BHI and to regional planning for the moraine. The response of the public is consistent with concerns expressed across the province to a recent phase of rapid development, which was the impetus for the Alberta Land Management Framework and the recently proclaimed Alberta Land Stewardship Act, both of which speak to the issue of sustainable development.

After the BHI established the Land Management Principles, and its partners confirmed their commitment to them and the BHI as an organization to further sustainable management within the region, the BHI developed its current governance and organizational structure. The Communication and Outreach Working Group was created to address the need for a strategy for public outreach, to involve the public directly in conservation and sustainability initiatives within the moraine. This working group worked with a communications consultant to implement the recent public engagement campaign. These materials will form a key component of an on-going outreach program to the public through the member government agencies and environmental non-governmental organizations as well as professional and industrial organizations accessible through the BHI partners. Awareness-raising efforts among both local and regional publics are therefore planned to be on-going.

Throughout the public engagement campaign, the BHI is actively encouraging members of the public and aboriginal communities to participate in the BHI, and the Board has just completed a review of its Board

policies and governance structure to ensure public participation. Currently only two public members are part of the Board (its Chair and a long-term Board and Working Group member), but the revised policies clarify that public members can be included and participate in management of the future biosphere reserve.

17.3.3 Describe the specific situation of young people in the proposed biosphere reserve (e.g., potential impacts of the biosphere reserve on youth, consideration of their interests and needs, incentives to encourage them to participate actively in the governance system of the biosphere reserve).

Like many parts of rural Canada, youth are moving away from the family farm to pursue higher education and occupations that will offer more financial security. In some cases, these decisions are a reaction to the economic challenges facing small farmers, and a movement away from risk and interests, rather than a true choice. As a result, many local small family farmers face important decisions about their futures, particularly as parents near retirement. In some communities within the moraine, retirement strategies include leasing of lands to larger intensive operators, a decision with potential implications for the ecological, social and economic health of the moraine. Small numbers of young entrepreneurs have taken over the family farm, converting it to organic operations and actively promoting the benefits of sustainable agriculture within the broader community. A few have developed innovative business models (e.g., farm food cooperatives) that could be featured as demonstration projects within the biosphere reserve. Such projects have not yet been pursued, but would be a natural fit within the biosphere reserve. Added support to these entrepreneurs could have personal as well as much broader impact, particularly if community support and pride in the accomplishments of these small farmers is enhanced through such projects.

On the other end of the land use spectrum, urban youth are increasingly isolated from natural experiences, a trend recently termed 'nature deficit disorder'. BHI partner programs like the citizen science monitoring programs have been piloted at the Augustana Campus of the University of Alberta, and have succeeded in sparking interest in the natural world, the moraine's protected areas and the proposed biosphere reserve in participants and often their friends and family. The Bioblitz Event at Strathcona Wilderness Centre is a stewardship engagement event that aims to raise awareness of moraine and Edmonton area residents about the moraine's natural features as well as various opportunities to become involved in environmental management initiatives. The Winter Tracking citizen science participants assist as volunteers at this event, and have opportunities to meet professional biologists and learn more about biological career options. Nature Alberta also promotes the event through its Young Naturalists program, which draws in children and their parents. Activities such as wildlife identification, outdoor survival skills and a bird identification scavenger hunt help build better understanding of the natural world, in children and adults. Environmental education programs offered through BHI partners in the moraine's protected areas and in local schools have similar objectives. Promotion of such programs is part of the BHI's Stewardship Engagement Strategy, which aims to promote not only awareness but active stewardship of the moraine, through the biosphere reserve's programs or in individual's personal lives.

17.3.4 What form does this representation take (e.g., companies, associations, environmental associations, trade unions)?

As described in Section 17.3.2 above, the BHI includes organizations representing the range of sectors that live, work and play in the moraine. These include federal, provincial and municipal governments, non-governmental organizations involved in environmental education and conservation, industry, academic

institutions and the public. Through the work of the public and aboriginal engagement initiatives, the BHI hopes to attract more public and aboriginal representatives to the Board and Working Groups.

Through outreach activities by the BHI and its partners, the interests and concerns of local and regional residents can also be heard, and incorporated into biosphere activities. Currently, local communities and youth are most directly involved in the BHI's programs and activities through programs and activities like those mentioned above, or indirectly through partner organizations like the University of Alberta, the protected areas and non-governmental organizations like Nature Alberta and the Nature Conservancy of Canada (see case studies in Appendix B). School programs also help engage youth, through programs developed in cooperation with local schools.

17.3.5 Are there procedures for integrating the representative body of local communities (e.g., financial, election of representatives, traditional authorities)?

Under the current organizational structure, the BHI can entertain concerns or project proposals raised by any member, regardless of affiliation, whether at the Board or Working Group level. This includes municipal councillors, who sometimes receive direct comments from their constituents regarding BHI activities. Although this feedback could also occur through federal or provincial representatives, municipal councillors tend to have a more immediate link to their residents. Involvement of municipal politicians helps to ensure that local residents have opportunities to voice concerns, regardless of their membership within the BHI. The BHI's open structure allows those concerns to be brought forward to the BHI and for collaborative solutions to be developed, drawing from the expertise and knowledge of its members. While the hope is that more members of the public and aboriginal communities will become involved in the BHI and management of the biosphere reserve, participation of municipal officials also ensures that input from local residents is considered in developing and implementing BHI initiatives.

17.3.6 How long-lived are consultation mechanisms (permanent assembly, consultation on specific projects)? Make a complete description of this consultation. What are the roles of involved stakeholders compared to the role of the biosphere reserve?

The BHI's governance structure provides several levels of consultation and discussion on any decision to be implemented. As described in previous sections, any member can participate in the discussion of proposals at the Board or Working Group level. They can also bring forward proposals or concerns regarding existing initiatives of the BHI. Because the BHI's processes and organizational structure will be used to manage the biosphere reserve as well, these mechanisms will apply to its programs and initiatives as well. Most decisions are reached through consensus, following open discussion amongst all members of the Board. Thus any stakeholder who wishes to participate in the BHI can voice their concerns in this open forum, or in the case of area residents, pass their concerns on through their elected officials. While the voting structure of the BHI limits voting to specific sectors of representatives, to ensure that real or perceived power imbalances do not form, voting is rarely necessary. Such discussion based processes will form the central basis of the BHI's decision-making, and so all stakeholders who wish to participate can contribute to the decisions regarding the management of the biosphere reserve, including new projects and initiatives.

When land use policy or parks management plans are being developed, the respective municipal or protected area's laws require public consultation as part of the development process. Because the BHI does not hold

authority to direct policy change in any member organization, these consultation processes would remain as permanent consultation mechanisms for any policy changes within the three biosphere reserve zones.

17.3.7 What consultation mechanisms have been used, and who has been involved? Are they for specific purposes or long-term? What impacts have they had on decision-making processes (decisional, consultative or merely to inform the population)?

As noted above, the BHI's consultation process for any Board level initiative encourages full debate among all BHI members. With municipal and protected areas policies that may include sustainable development elements proposed to support the biosphere reserve, public input can often influence policy direction. As examples, the BHI's environmental databases have been used to help develop land use policies in Strathcona County (for its updated Municipal Development Plan), in the Miquelon Lake area of Camrose County and in Beaver County's part of the moraine. The respective land use planning departments offered proposals for future development scenarios and in each instance, extensive periods of public consultation provided comments that were considered in the final design (see case studies in Appendix B). In the instance of the Miquelon Area Growth Management Plan and the Beaver County West End policy, a citizen advisory committee was established to review and suggest adjustments to the original policy, and the municipal council approved the policy only after the committee had provided their recommended changes. While the actual form of public consultation mechanisms and duration are at the discretion of the respective land management agency, in practice, involvement of affected publics has been more effective in designing robust policies.

Specific assessments and plans for coordinated action initiated by the BHI have often included public consultation or engagement. Examples include the Tourism Development Opportunity Assessment, the Stewardship Engagement Strategy, which involved local public, businesses, communities and governments in developing the respective plans. The Joint Fire Management Plan now underway will rely heavily on the cooperation and assistance of local residents, businesses and communities.

17.3.8 Do women participate in community organizations and decision-making processes? Are their interests and needs given equal consideration? What incentives or programmes are in place to encourage their representation and participation (e.g.: was (were) a "gender impact assessment(s)" carried out)?
A gender impact assessment was not completed for this nomination, but our experience with local community groups and municipal governments provides insight into potential gender issues. Women are represented in most local community organizations and are involved in decision-making processes. Although they may not always be represented in equal numbers, no formal barriers prevent their participation. In several instances, local community organizations have been chaired by women (e.g., the Deville-Cooking Lake Historical Society, a collaborator on the Métis history project mentioned above), which helps ensure that female perspectives are represented. Males still tend to be over-represented in municipal politics (and other levels). Federal and provincial parties have sponsored programs to encourage female participation in that level of government, and it may also have influenced participation at the local level. Several member councils include female councillors and Strathcona County has elected three female mayors in successive terms since the early 2000s. Within the BHI, genders are roughly equally represented and the Executive Director and three of five standing Working Group chairs are female.

17.4. Management Policy

17.4.1 Is there a management/cooperation plan/policy for the biosphere reserve as a whole?

The BHI's Land Management Principles (2006) and Framework (2015) will serve as the basis for management of the biosphere reserve. All member organizations have adopted the Principles and agreed to apply them in their respective operations. The Protected Areas have established a cooperation agreement that outlines more specific terms of collaboration, including expectations regarding sharing of resources and information.

The Land Management Principles, to which all member land management agencies have agreed, provide a strong basis for future sustainable management initiatives within the moraine, managed and coordinated by the BHI. In adopting these principles, these member agencies have agreed to undertake management action that will support the quality of life valued now by moraine residents, and specifically action relevant to clean air, clean water, biodiversity and quality of life.

The BHI has already developed a variety of tools and initiatives that its member agencies have either adopted or supported. The Land Management Framework figures prominently among these programs. The Land Management Framework (2007 and updated version of 2015) provides information and options for better management of the natural resources within the moraine, which many municipalities have incorporated into their planning processes and policies.

The protected areas within the moraine have developed a cooperation plan that identifies opportunities for collaboration and sharing of resources. The information compiled by the BHI will also be useful when updating the management plan of EINP and the various provincial protected areas. Such information sharing has already occurred during the recent review of EINP's management plan. Federal regulations require an updated management plan be prepared every ten years. EINP has worked closely with the BHI to ensure that opportunities for trans-boundary management and cooperation have been incorporated into the new plan. A similar process would be expected for the provincial protected areas when their management plans are renewed.

17.4.2 Which actors are involved in preparing the management/cooperation plan? How are they involved?

All founding members of the BHI were involved in developing the Land Management Principles (2006), and Framework (2007), as well as the BHI governance system and policies. These groups include all five municipalities overlapping the moraine, various related federal and provincial agencies (Alberta Municipal Affairs, federal and provincial parks agencies and agricultural agencies), non-governmental organizations, and academic and industry representatives. The Planners Working Group was more directly involved in the 2015 LMF update, but ultimately, all Board members also reviewed and provided comment on the resulting products. All members also participate in review of annual business planning goals, timelines and accountability for any project proposed by the BHI. The deliberative structure embedded in the BHI's governance structure helps ensure that any interested actor can initiate or participate in such discussions, and ultimately in decision-making. All representatives to the BHI can (and are expected to) bring forward concerns or comments from their organizational perspective. This includes municipal elected officials, who provide an important link between their constituents in the moraine and the BHI.

17.4.3 Do local authorities formally adopt the management/cooperation plan? Are local authorities making reference to it in other policies and/or plans? If so, please provide details.

Yes, each member organization, including all land management agencies, has adopted the management plans (Land Management Principles and Framework). All protected areas agencies have also adopted the Protected Areas Cooperation Plan.

17.4.4 What is the duration of the management/cooperation plan? How often is it revised or renegotiated?

The Land Management Principles have been periodically reviewed, and were updated once in the past 13 years. The Land Management Framework was first prepared in 2007 and updated in 2015. Regular updates have been recommended, but at no set interval. This will allow flexibility to adapt to relevant changes (e.g., changes or advances in legislation, policy or science).

17.4.5 Describe the contents of the management/cooperation plan. Does it consist of detailed measures or detailed guidelines? Give some examples of measures or guidelines advocated by the plan? (Enclose a copy).

The Land Management Principles have been attached in Appendix M. The Land Management Framework (LMF) is a large document and is best accessed through the BHI website at (http://www.beaverhills.ca/media/resources/BHI_LMF_DRAFTMay2015.pdf). The LMF provides a review of relevant environmental legislation at the federal and provincial level, and an analysis of legislative opportunities for municipalities to apply environmental policies applicable to local context. It also includes environmental data describing surface and groundwater contamination risks, sensitive and ecologically connected habitats, refined agricultural soil capability/suitability mapping and a predictive map with suggested land use zones that acknowledge these environmental concerns. Separate chapters summarize best management practices for land use planners for policy development and review of individual applications, and for local land owners. Lastly, it has an implementation plan identifies means by which the BHI could promote adoption of relevant aspects of the LMF and awareness about the LMF as a resource among the public. The plan itself is intended to be applied by land managers and owners alike on a voluntary basis. In past evaluation, each of the five municipalities overlapping the moraine has adopted relevant aspects of the LMF, and the BHI is optimistic that the updated LMF will enjoy similar response.

17.4.6 Indicate how this management/cooperation addresses the objectives of the proposed biosphere reserve (as described in section 13.1).

The Land Management Principles have established the aspects of the moraine that the BHI and its members would like to conserve (air, water, land, and quality of life). These principles effectively define what sustainable development might serve to protect within the moraine. The Land Management Framework has operationalized those principles, breaking them down into the constituent ecological, policy and management elements that municipalities or land owners could manage, within the scope of their normal operations. Past adoption of these policy recommendations and the use of its science-based information have resulted in more inclusive decision-making at the municipal level, as evidenced by the Strathcona County MDP, Miquelon

Growth Management Plan and Beaver County West End policy examples mentioned in the LMF. Other applied projects designed to develop innovative management tools and approaches like the Tourism Development Opportunity Assessment and Transfer of Development Credits project have helped demonstrate the economic, social and environmental potential of sustainable development. Ultimately, the Beaver Hills Biosphere aims to conserve the moraine through such sustainable development measures, which will require involvement of as many stakeholders as possible in sustainable land management. These past successes suggest that the proposed reserve can meet these goals.

17.4.7 Is the plan binding? Is it based on a consensus?

The Land Management Framework (LMF) is not binding and instead relies on voluntary adoption. However, it, and the Land Management Principles that formed the basis for the framework have been adopted by all of the BHI partners, including the federal, provincial and municipal government and non-governmental organizations that manage lands within the moraine. Adoption carries with it a commitment to implement the framework, as appropriate to the specific context applicable to each organization. Some elements of the framework are linked to existing legislative requirements for environmental management, reinforcing their applicability within the context of the moraine. The plan itself and the underlying Principles were developed based on consensus and discussion at the Board and Planners Working Group levels.

Based on a recent update of the framework, voluntary adoption has been essential to the successful incorporation of the LMF's recommendations within land use policy across the moraine. Voluntary adoption allowed member organizations the flexibility to adapt its recommendations to their site-specific context, and allowed them to implement change when they were most prepared, in terms of resources and public acceptance. Such incorporation of best management practices into land use policy converts the LMF into statutory policy, in a manner appropriate to the respective municipality.

17.4.8 Which authorities are in charge of the implementation of the plan, especially in the buffer zone(s) and the transition area(s)? Please provide evidence of the role of these authorities.

Management of the moraine lands is currently distributed among federal, provincial and municipal governments, a situation that will not change with the creation of the Beaver Hills Biosphere. The reasons for this are several: (1) The federal and provincial protected areas are owned by the respective governments and have well established legislative frameworks and management planning processes; (2) Municipal lands have similarly well-established statutory and non-statutory processes to manage the lands within their respective jurisdictions, according to their site-specific social, environmental and economic context; and (3) environmental non-governmental organization and land trusts operating within the moraine have established mutually beneficial relationships and agreements across all levels of government to facilitate conservation activities.

The management activities of these agencies can, however, be better coordinated to foster regional sustainable development. As mentioned previously in this application, the BHI has established a facilitation role among the various partner agencies, with an aim to promote coordinated approaches to management of the moraine and its social, economic and environmental resources. The BHI has already established the means for such a management approach though several policies, which have in turn been accepted by the relevant BHI partner agencies. These include the Land Management Principles (Appendix M) which all member municipalities and protected areas management agencies have accepted as objectives for regional management of the moraine.

The Land Management Framework document developed by the BHI provides the information and suggested means to manage the municipal areas of the moraine according to those principles. Aspects of the framework have been incorporated into the planning documents of each of the member municipalities, either as a practical resource guide for land use planning, or more formally, as statutory or non-statutory policy.

The Cooperation Plan created by the members of the Protected Areas Working Group (PAWG, comprising federal and provincial protected areas agencies and environmental non-governmental organizations with conservation properties within the moraine) (Appendix J) confirms members' intent to collaborate on management programs, public education programs and training. This plan advocates for a bioregional and total landscape approach to conservation whereby safeguarding the ecological integrity and connectivity between the main protected areas is complemented by the need to sustain the ecological health and sustainability of the lived-in and working landscape of the Beaver Hills. PAWG promotes the concept that protected areas, healthy ecosystems and associated cultural values are essential components of sustainable tourism and recreation, and important contributors to the economy and quality of life of local residents and visitors to the Beaver Hills.

Alberta Parks has already acted on the BHI Protected Areas Cooperation Plan. Alberta's Heritage Appreciation Development Plan identifies opportunities to collaborate on visitor experience programs with Parks Canada, the Strathcona Wilderness Centre and environmental non-governmental organizations working in the moraine on visitor experience programs. EINP, Alberta Parks and Strathcona Wilderness Centre are also developing an environmental education plan intended:

- to outline means of sharing expertise, information, contacts and resources
- to support and enhance environmental programming efforts of each partner agency
- to grow and develop skills and expertise through opportunities offered by other external agencies, including the various UNESCO educational programs.

Ultimately, this group aims to develop a Regional Centre of Expertise and the environmental educational cooperation plan would lay the foundation for this goal. Lastly, the BHI has developed governance policies and other organizational plans (Appendix C: Beaver Hills Initiative, 2012-2015 Business Plan) that outline the group's functional processes.

The various tools and information developed by the BHI are available to all members and their use will further promote the Land Management Principles within the moraine and in the broader provincial and regional planning context. Several examples of these products have been discussed in this application, including the Transfer of Development Credit pilot program, the BHI's GIS datasets depicting natural and social resources and communication and education programs currently under development. These tools have gained the interest of the Province of Alberta, which recently released its Alberta Land Use Framework and accompanying legislation (the Alberta Land Stewardship Act) to promote regional planning within the province. The Land Use Framework Secretariat has indicated its interest in the approach the BHI has developed for regional sustainable management for the impending development of a North Saskatchewan Regional Land Use Plan under this legislation. Other land use managers in the broader region have also incorporated policies developed by the BHI partners. This includes the Capital Region Board, a provincially legislated planning organization comprising the various municipalities (cities, towns and counties) within metropolitan Edmonton, including Strathcona, Leduc and Lamont counties. BHI data helped ensure that the Moraine Policy Area identified in

Strathcona County's Municipal Development Plan was incorporated in the Capital Region's regional land use plan as a "Conservation Buffer" within the region's network of "Regional Buffer Areas".

Lastly, the organizational structure and governance system established by the BHI (Appendix K) provides for ongoing cooperation on management concerns. The BHI has no authority to direct specific action within any member jurisdiction, a fundamental governance principle of the group. Each member land management agency retains autonomy and control of its own lands, and the BHI will instead provide science-based support to inform those management agencies regarding sustainable management options. The BHI also provides a sounding board to address regional concerns that could affect the essential character or quality of life within the moraine. The Board and working group structure allows specific issues to be raised and discussed at the group or expertise level (as appropriate). Potential solutions can be proposed, debated and perhaps implemented either by the BHI, or its partners with support from the BHI. Established lines of communication among the partner agencies and with the public helps ensure that both concerns and opportunities for pro-active response can be identified by the group. This approach has been very effective to date and has resulted in several successful collaborative projects and initiatives among the partner agencies. It also promises to provide the adaptability necessary to accommodate future change. Through its past successes, the BHI has established for itself a unique management role in the region as a coordinator, facilitator and manager of programs and research and an extensive and growing network of supporting agencies beyond the moraine that will allow it to address current and future sustainability concerns for its members.

17.4.9 Which factors impede or help its implementation (e.g.: reluctance of local people, conflicts between different levels of decision-making).

Perhaps the biggest impediment to implementation of the Land Management Framework (LMF) has been the site-specific differences within the respective members' lands. The recent update of the LMF helped highlight the role of subtle social, economic and political differences in universal application of the LMF's key recommendations amongst the municipalities, for example. The current differences in development pressure in particular have affected awareness of the need to consider future development scenarios, or the potential impacts uncontrolled growth may have. The typical challenges of institutional inertia and resistance to change can also play a role in delaying adoption of innovative approaches, even after potential problems have been recognized. The expectation of voluntary adoption of the LMF has had the unexpected benefit of allowing municipalities the time to consider how sustainable development approaches might best be applied in their specific context. The forum for discussion of new approaches and emerging problems offered by the BHI Board has also helped raise awareness of both the need for change, and potential options.

While response to the public engagement campaign has been largely positive, resulting in considerable support in the forms of response 'postcards' and letters of support, some residents have expressed concern about the implications of biosphere status. Such local residents were uncertain about the potential limitations that could be imposed by the biosphere reserve, which appeared based in a misunderstanding of the biosphere reserve's goals. Past experience has shown that reinforcement of the principles of voluntary participation and the main objectives of conserving air, water, land and quality of life will reduce such fears, and perhaps foster support. Consistent messaging in the on-going public engagement program will help clarify the implications and benefits of the biosphere reserve, as will communication about the initiatives, programs and benefits generated by the activities within the biosphere reserve. The benefits arising from open cooperation among the various partners has often been highlighted in presentations about the BHI and the proposed biosphere reserve, and has often

generated considerable interest from government and other organizations. Going forward, local presentations and activities will highlight that benefits relevant to residents and other members of the public interested in the moraine, to highlight the direct and indirect improvements to their communities or the quality of life in the moraine.

17.4.10 Is the biosphere reserve integrated in regional/national strategies? Vice versa, how are the local/municipal plans integrated in the planning of the biosphere reserve?

As noted previously, the BHI's successes in encouraging cooperation and sustainable development have captured the attention of the provincial agencies involved in developing regional plans under the Land Use Framework. At a minimum, the BHI's data and information on key resources (environmental, tourism or other land uses) are likely to be included in the upcoming North Saskatchewan Regional Plan.

Local and municipal plans were considered in developing the Land Management Framework, particularly areas where conflicting land use zoning could arise between neighbouring municipalities.

17.4.11 Funding and Annual Budget

The BHI has secured an annual operational budget of $135,000 per year from all five municipalities. This includes the salary of the Executive Director, which is supported by Strathcona County. It does not include the additional administrative support contributed by Strathcona County to meet its Fiscal Agent responsibilities, which represents an additional operating supplement. The operational fund allows for meetings, office space and expenses, printing, advertising, equipment lease, training, BHI promotion, workshops, a travel and presentation fund, and a modest project fund that can be used to secure additional grant funding. It allows for annual activities, such as a workshop to introduce newly elected municipal councillors to the Board (municipal elections are held every four years, province-wide). These full-day workshops are facilitated by a consultant for each affected working group as needed.

Because funding provides for a full-time Executive Director, this allows for opportunities to pursue additional grant funding on an ongoing basis. To date, the BHI has secured over $1 million in grant funds and over $0.5 million in administration funds, plus over $1.5 million of in-kind time. A significant component of in-kind time comes from the members of the BHI Board and working groups, whose collective expertise includes agriculture, business planning, communication, ecology, land use planning, tourism and protected areas management, and GIS technologies. The potential of a higher profile to the area offered by biosphere reserve designation could attract additional resources from industrial and commercial sectors, as well as from the public.

17.5 Conclusions

17.5.1 In your opinion, what will ensure that both the functioning of the biosphere reserve and the structures in place will be satisfactory? Explain why and how, especially regarding the fulfilment of the three functions of biosphere reserves (conservation, development, logistic) and the participation of local communities.

The Beaver Hills landscape has retained its natural character in part because of the difficulties in taming it for human use. The rugged morainal landscape of irregular terrain and abundant wetlands has defied the pattern of extensive development for agricultural, transportation and industrial use so common elsewhere in the southern Canadian prairies. Instead, such activities were directed to the adjacent, level plains. Over time this context created an island of native forest, wetland and grassland valued for its recreational potential and natural character. People have not been excluded from the moraine. Through their interactions with its natural features, those who have chosen to reside, work and recreate in the Beaver Hills have created a distinct place with a distinctive natural and cultural identity. These residents have developed a sense of connection to this particular landscape and its specific natural and cultural character. Maintenance of that character has been a consistent theme in the discussions about land management among land managers, residents and the broader public. It has also been a motivator for a variety of conservation initiatives, the most recent of which is the BHI. Drawing on these attitudes toward the moraine, the BHI identified the following objectives for sustainable development of the moraine:

- Conservation of the currently enjoyed quality of life
- Conservation of water and lands
- Co-existence and balance of multiple human uses within the natural landscape

The work done to date by the BHI has been founded on these objectives, a mandate that would continue with designation as a biosphere reserve. The projects and initiatives already undertaken by the BHI have provided tangible benefits to the moraine and its residents:

- Incorporation of sustainable practices into municipal land use and land management policies (e.g., Dark Sky Reserve concepts adopted in the Strathcona County Dark Sky Policy, the Land Management Framework recommendations in Strathcona and Beaver County land use policies)
- Coordination and sharing of information among all land managers with interests in the moraine (e.g., the various BHI working groups and sub-working groups, the Protected Areas Cooperation Agreement, and the Environmental Education cooperative initiative of EINP, Alberta Parks and Strathcona Wilderness Centre).
- Development of science-based information for current land management decisions and for later monitoring of management effectiveness through projects sponsored by the BHI or its partners).
- Creation of innovative approaches and tools for land management within the moraine and transferable to other regions, including other biosphere reserves (e.g., Extensive GIS dataset library, Transfer of Development Credit Project, Land Management Framework).

Biosphere reserves are intended to recognize and showcase innovative approaches to sustainable development that achieve some means of balancing conservation with sustainable use of resources. The BHI has sought and

identified ways to determine priorities for conservation, and democratic means to manage those priorities, such that the natural and cultural resources contributing to the essential character of the moraine remain available to future residents. This mandate existed before seeking designation as a biosphere reserve, and will continue regardless of the outcome of the nomination process. The current four-year Business Plan of the BHI (Appendix C: Beaver Hills Initiative, 2012-2015 Business Plan) identifies both ongoing and future projects consistent with that overall vision. Projects are prioritized by a ranking process that requires input from all of the BHI working groups, and final approval by the BHI Board.

Accordingly, the business plan reflects an agreement among the membership of collective needs and priorities for current management issues within the moraine. The annual review process undertaken by the BHI Board ensures accountability to these goals as well as adaptability to new challenges and opportunities in both the short term and the long-term. It is the combination of vision, organization, accountability and transparency embodied in the BHI approach to collaborative land management and sustainable development that will ensure the success of the future biosphere reserve. Further, it reflects the collective determination of the BHI, its members and local residents (either as active participants, or as constituents of member organizations) to ensure that the BHI maintains the qualities that make it their preferred location to live, work and play.

18. SPECIAL DESIGNATIONS

[Special designations recognize the importance of particular sites in carrying out the functions important in a biosphere reserve, such as conservation, monitoring, experimental research, and environmental education. These designations can help strengthen these functions where they exist or provide opportunities for developing them. Special designations may apply to an entire proposed biosphere reserve or to a site included within. They are therefore complementary and reinforcing of the designation as a biosphere reserve. Check each designation that applies to the proposed biosphere reserve and indicate its name]

Name: Beaver Hills Biosphere

( ) UNESCO World Heritage Site

( ) RAMSAR Wetland Convention Site

( ) Other international/regional conservation conventions/directives (specify)

(√) Long term monitoring site (specify)

Long-term monitoring programs have been in place at many of the protected areas within the moraine (EINP, Blackfoot PRA, MLPP, and Ministik Game Bird Sanctuary). An electromagnetic monitoring site in Ministik was established as part of an international network of sites (the Antarctic-Arctic Radiation-belt (Dynamic) Deposition - VLF Atmospheric Research Consortium).

Agriculture & Agri-food Canada must monitor Permanent Cover Program and Greencover sites within the BHI region to 2015 and 2017 respectively. Approximately 12 sites exist within the moraine currently.

( ) Long Term Ecological Research (LTER site)

( ) Other (specify)

19. SUPPORTING DOCUMENTS *(to be submitted with nomination form)*

(1) Location and zonation map with coordinates
[Provide the biosphere reserve's standard geographical coordinates (all projected under WGS 84).

See Figure 1

(2) Vegetation map or land cover map
[A vegetation map or land cover map showing the principal habitats and land cover types of the proposed biosphere reserve should be provided, if available].

See Figure 5

(3) List of legal documents (if possible with English, French or Spanish synthesis of its contents and a translation of its most relevant provisions)
[List the principal legal documents authorizing the establishment and governing use and management of the proposed biosphere reserve and any administrative area(s) they contain. Provide a copy of these documents.

See Appendix N (List of Legal Documents)

(4) List of land use and management/cooperation plans
[List existing land use and management/cooperation plans (with dates and reference numbers) for the administrative area(s) included within the proposed biosphere reserve. Provide a copy of these documents. It is recommended to produce English, French or Spanish synthesis of its contents and a translation of its most relevant provisions]

See Appendix A. (List of Land Use and Management Plans), Appendix J (BHI Protected Areas Cooperation Plan) and Appendix M (BHI Land Management Principles).

(5) Species list (to be annexed)
[Provide a list of important species occurring within the proposed biosphere reserve, including common names, wherever possible.]

See Appendix G (Wildlife Species Occurring in the Beaver Hills) and Appendix H (Plant Species of the Beaver Hills).

(6) List of main bibliographic references (to be annexed)
[Provide a list of the main publications and articles of relevance to the proposed biosphere reserve over the past 5-10 years].

See Appendix F (Bibliography of Selected Papers)

(7) Original Endorsement letters according to paragraph 5.

See Appendix I (Letters of Support)

(8) Further supporting documents.

Appendix B (Case Studies Demonstrating the Value of BHI Projects
Appendix C (Beaver Hills Initiative, 2012-2015 Business Plan)
Appendix D (Public and Aboriginal Engagement Campaign)
Appendix K (BHI Governance and Policies
Appendix L (Stewardship Engagement Strategy)

20. ADDRESSES

20.1 Contact Address of the Proposed Biosphere Reserve

[Government agency, organization, or other entity (entities) to serve as the main contact on the MABnet to whom all correspondence within the World Network of Biosphere Reserves should be addressed.]

Name:	Brenda Wispinski, Executive Director, Beaver Hills Initiative
Street or P.O. Box:	2001 Sherwood Drive
City with postal code:	Sherwood Park, AB. T8A 3W7
Country:	Canada
Telephone:	(780) 464-8280
Telefax (or telex):	(780) 464-8116
E-mail:	wispinsk@strathcona.ab.ca
Website:	www.beaverhills.ab.ca

20.2 Administering Entities of the Core Areas

Name:	Elk Island National Park, Dr. Stephen Flemming
Street or P.O. Box:	Site 4, RR #1
City with postal code:	Fort Saskatchewan, AB T8L 2N7
Country:	Canada
Telephone:	780-922-2950
Telefax (or telex):	780-922-2983
E-mail:	stephen.flemming@pc.gc.ca
Website:	www.pc.gc.ca/eng/pn-np/ab/elkisland/index.aspx

Name:	Alberta Environment and Sustainable Resource Development (Parks Division), Terry Krause, Regional Planner
Street or P.O. Box:	700 Millennium Centre
City with postal code:	Red Deer, AB T4N 1V1
Country:	Canada
Telephone:	403-340-7683
Telefax (or telex):	403-754-6243
E-mail:	terry.krause@gov.ab.ca
Website:	http://www.albertaparks.ca/

20.3. Administering Entities of the Buffer Zones

Name:	Alberta Environment and Sustainable Resource Development (Parks Division), Terry Krause, Regional Planner
Street or P.O. Box:	700 Millennium Centre
City with postal code:	Red Deer, AB T4N 1V1
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Telefax (or telex):	403-754-6243
E-mail:	terry.krause@gov.ab.ca
Website:	http://www.albertaparks.ca/

Name:	Alberta Environment and Sustainable Resource Development (Public Lands Division), Wayne Holland, Regional Approvals Manager, Lower Athabasca Region
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City with postal code:	Sherwood Park, AB T8A 4H5
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Telephone:	(780) 464-7955
Telefax (or telex):	(780) 449-0718
E-mail:	wayne.holland@gov.ab.ca
Website:	http://www.environment.alberta.ca/

Name:	Alberta Fish and Game Association, Gary Chalmers
Street or P.O. Box:	6924-104 Street
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Country:	Canada
Telephone:	780-990-6336
Telefax (or telex):	780-438-6872
E-mail:	office@afga.org
Website:	http://www.afga.org/

Name:	Alberta Sport Connection, Manda Wilde
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Country:	Canada
Telephone:	780-415-0266
Telefax (or telex):	780-427-5140
E-mail:	manda.wilde@gov.ab.ca

Name:	Ducks Unlimited, Milana Simikian
Street or P.O. Box:	1-5550-45 Street
City with postal code:	Red Deer, AB T4N 1L1
Country:	Canada
Telephone:	403-342-1314
Telefax (or telex):	403-346-1211
E-mail:	m_simikian@ducks.ca
Website:	http://yourland.ducks.ca/contact/index.html

Name:	Edmonton and Area Land Trust, Pam Wight, Executive Director
Street or P.O. Box:	9910-103 Street
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Country:	Canada
Telephone:	780-483-7578
Telefax (or telex):	780-483-7627
E-mail:	pamwight@ealt.ca
Website:	http://ealt.ca/

Name:	Nature Conservancy of Canada
Street or P.O. Box:	P.O. Box 22592, Southbrook, P. O.
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Telephone:	780-619-9315
Telefax (or telex):	403-515-6987
E-mail:	jaimee.dupont@natureconservancy.ca
Website:	www.natureconservancy.ca/ab

Name:	Sherwood Park Fish and Game Association, Gary Chalmers, Executive Director
Street or P.O. Box:	Box 3098
City with postal code:	Sherwood Park, AB T8H 2T1
Country:	Canada
Telephone:	780-990-6336
Telefax (or telex):	N/A
E-mail:	info@spfgra.org
Website:	http://www.spfga.org/

Name:	Strathcona County – Strathcona Wilderness Centre, Jean Funk, Supervisor
Street or P.O. Box:	2001 Sherwood Drive
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Telefax (or telex):	(780) 922-6415
E-mail:	Jean.Funk@strathcona.ab.ca
Web site:	www.strathcona.ca/wildernesscentre

20.4. Administering Entities of the Transition Areas

Name:	Beaver County, Bob Beck, Chief Administrative Officer
Street or P.O. Box:	5120 – 50 Street
City with postal code:	Ryley, Alberta T0B 4A0
Country:	Canada
Telephone:	780-663-3730
E-mail:	bbeck@beaver.ab.ca
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Name:	Lamont County, Allan Harvey
Street or P.O. Box:	5303 – 50 Avenue
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Telephone:	780-895-2233 (ext. 213)
E-mail:	allan.h@lamontcounty.ca
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Name:	Leduc County, Brian Bowls County Manager
Street or P.O. Box:	1101 – 5 Street
City with postal code:	Nisku, Alberta T9E 2X3
Country:	Canada
Telephone:	780-955-6400
E-mail:	brian@leduc-county.com
Web site:	http://www.leduc-county.com/index.php

Name:	Strathcona County, Rob Coon, Chief Commissioner
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E-mail:	rob.coon@strathcona.ca
Web site:	http://www.strathcona.ca/

ANNEX I - MABNET DIRECTORY OF BIOSPHERE RESERVES BIOSPHERE RESERVE DESCRIPTION

Administrative Details

Country: Canada

Name of BR: Beaver Hills Biosphere

Year designated: *(to be completed by MAB Secretariat)*

Administrative authorities: (17.1.3): **Beaver Hills Initiative**

Name Contact: (20.1): Brenda Wispinski, Executive Director

Contact address: (Including phone number, postal and email addresses) (20.1)

2001 Sherwood Drive, Sherwood Park, Alberta, Canada T8A 3W7

Phone: (001) 780-464-8280

Email: wispinsk@strathcona.ab.ca

Related links: (web sites)

Social networks: (16.4.3)

Description

General description: (Site characteristics in 11.1; human population in 10)

Approximately 25 lines

A hummocky morainal landscape created during the last glacial retreat, the rolling hills, wetlands and aspen forests of the Beaver Hills have been important to local inhabitants since the early days of Aboriginal occupancy over 8,000 years ago. The rolling terrain prevented extensive development in the past, so that much of the moraine remains naturally vegetated. Surface water is captured in small lakes and abundant wetlands, which in turn recharges groundwater, an important ecological function for the Beaver Hills and the surrounding agricultural lands. The variety of habitat available contributes to high levels of biodiversity, including several special status wildlife species, plants and plant communities. Active management by protected areas in the moraine has recovered some of those species to more secure population levels, a conservation success story for the region.

Abundant wildlife and more sheltered conditions made the Beaver Hills an important place for early First Nations inhabitants. The area was shared territory for Cree, Assiniboine and Blackfoot tribes and archeological evidence suggest extensive use by these nomadic groups. Permanent settlement came with European contact, first with the fur trade, then later agricultural settlers. Historically, agriculture (cereal and forage crops and grazing), forestry and recreation or conservation were primary land uses. Today, agriculture and recreation remain important, although agriculture has diversified to take advantage of new markets, including organic and local food trends. About 26.6 % of the moraine is protected for conservation purposes. The moraine has attracted increasing development attention for rural residential subdivisions, a potential threat to its natural character that motivated local land managers to pursue sustainable land management initiatives through a collaborative approach.

Today, the moraine is managed by federal and provincial governments (protected areas) and municipal governments (private lands). Two of the larger protected areas, Elk Island National Park and Miquelon Lake Provincial Park, are proposed Core Areas. Buffer Zones include Ministik Game Bird Sanctuary, Miquelon Lake Bird Sanctuary, Cooking Lake–Blackfoot Provincial Recreation Area, Strathcona Wilderness Centre and several smaller provincial natural areas and other natural area parcels owned or managed by environmental non-governmental organizations. Lastly, the Transition Area comprises lands under private ownership and managed by the five municipal governments whose jurisdiction lies within the moraine (Beaver, Camrose, Lamont, Leduc and Strathcona counties).

Major ecosystem type: **(14.1)** Dry Mixedwood Boreal Forest Natural Sub-region

Major habitats & land cover types (11.6): Human-modified, native deciduous, native grassland, wetlands or lakes

Bioclimatic zone: (11.5) Semi-arid

Location (latitude & longitude) (6.1): The central point of the Beaver Hills Moraine is located at -112.967129 latitude and 53.471924 longitude (decimal degrees).

Total Area (ha): (7) 159,560 ha

Core area(s): (7) 21,725 ha

Buffer zone(s): **(7)** 21,766 ha

Transition area(s): (7) 116,069 ha

Different existing zonation: (7.4)

The two protected areas proposed as Core Areas are managed primarily for conservation purposes. The protected areas proposed as Buffer Zones allow a broader range of land uses, but their primary management objective remains conservation. The distribution of these areas serves to link the two Core Areas (located at north and south end of the moraine) and to provide local examples of sustainability. The Transition Area is privately held and managed through municipal governments, that have adopted tools and information developed by the Beaver Hills Initiative to encourage sustainable development.

Altitudinal range (metres above sea level): (11.2) Highest: 724.9 m Lowest: 617.4 m

Zonation map(s): (6.2)

Main objectives of the biosphere reserve - Brief description (13.1)

Approximately 5 lines

The Beaver Hills Biosphere will enhance existing synergies among government, non-government, academic, industry and public sectors by facilitating sharing of knowledge, creativity, and innovation held within the global reserve network. The biosphere reserve will promote sustainable development of this special area by conserving natural and cultural heritage, creating sustainable economic alternatives, and fostering collaborative and inclusive approaches to land management and sustainability concerns.

Research - Brief description (16.1.1)

Approximately 5 lines

The federal and provincial protected areas have long established research programs, often in partnerships with other government agencies (including municipal agencies), the University of Alberta and other research institutions. One to two graduate student research projects have been undertaken in the area per year, on average, which will be enhanced by addition of a new research station and formalized cooperation agreements. Current research priorities include base and applied 'sustainability' concerns relevant at local and broader scale, examined through natural and social science perspectives.

Monitoring - Brief description (16.1.1)

Approximately 5 lines

The State of the Beaver Hills reporting system begun this year will provide a 5 year review of natural, economic, cultural and social aspects of the biosphere reserve. Such information will measure the effectiveness of policy and management initiatives intended to promote sustainable development in the biosphere reserve. Other permanent monitoring programs and infrastructure have been established by partner organizations and monitor a variety of environmental factors, some as part of global networks and initiatives.

Specific Variables (Fill in the table below and tick the relevant parameters.)

Abiotic		Biodiversity	
Abiotic factors	√	Afforestation/Reforestation	√
Acidic deposition/Atmospheric factors		Algae	√
Air quality	√	Alien and/or invasive species	√
Air temperature	√	Amphibians	√
Climate, climatology	√	Arid and semi-arid systems	√
Contaminants	√	Autoecology	√
Drought	√	Beach/soft bottom systems	√
Erosion	√	Benthos	√
Geology		Biodiversity aspects	√
Geomorphology		Biogeography	√
Geophysics		Biology	√
Glaciology	√	Biotechnology	√
Global change	√	Birds	√
Groundwater	√	Boreal forest systems	√
Habitat issues	√	Breeding	√
Heavy metals	√	Coastal/marine systems	
Hydrology	√	Community studies	√
Indicators	√	Conservation	√
Meteorology	√	Coral reefs	
Modelling	√	Degraded areas	√
Monitoring/methodologies	√	Desertification	
Nutrients	√	Dune systems	
Physical oceanography		Ecology	√
Pollution, pollutants	√	Ecosystem assessment	√
Siltation/sedimentation	√	Ecosystem functioning/structure	√
Soil	√	Ecosystem services	√
Speleology		Ecotones	√
Topography	√	Endemic species	√
Toxicology	√	Ethology	√
UV radiation	√	Evapotranspiration	√
		Evolutionary studies/Palaeoecology	√
		Fauna	√
		Fires/fire ecology	√
		Fishes	√
		Flora	√
		Forest systems	√
		Freshwater systems	√
		Fungi	√
		Genetic resources	√
		Genetically modified organisms	√
		Home gardens	√
		Indicators	√
		Invertebrates	√
		Island systems/studies	
		Lagoon systems	
		Lichens	√
		Mammals	√
		Mangrove systems	

		Mediterranean type systems	
		Microorganisms	√
		Migrating populations	√
		Modelling	√
		Monitoring/methodologies	√
		Mountain and highland systems	
		Natural and other resources	√
		Natural medicinal products	√
		Perturbations and resilience	√
		Pests/Diseases	√
		Phenology	√
		Phytosociology/Succession	√
		Plankton	√
		Plants	√
		Polar systems	√
		Pollination	√
		Population genetics/dynamics	√
		Productivity	√
		Rare/Endangered species	√
		Reptiles	√
		Restoration/Rehabilitation	√
		Species (re) introduction	√
		Species inventorying	√
		Sub-tropical and temperate rainforest systems	
		Taxonomy	√
		Temperate forest systems	
		Temperate grassland systems	√
		Tropical dry forest systems	
		Tropical grassland and savannah systems	
		Tropical humid forest systems	
		Tundra systems	
		Vegetation studies	√
		Volcanic/Geothermal systems	
		Wetland systems	√
		Wildlife	√

Socio-economic		Integrated monitoring	
Agriculture/Other production systems	√	Biogeochemical studies	√
Agroforestry	√	Carrying capacity	√
Anthropological studies		Climate change	√
Aquaculture		Conflict analysis/resolution	√
Archaeology	√	Ecosystem approach	√
Bio-prospecting		Education and public awareness	√
Capacity building	√	Environmental changes	√
Cottage (home-based) industry	√	Geographic Information System (GIS)	√
Cultural aspects	√	Impact and risk studies	√
Demography	√	Indicators	√
Economic studies	√	Indicators of environmental quality	√
Economically important species	√	Infrastructure development	√
Energy production systems	√	Institutional and legal aspects	√
Ethnology/traditional practices/knowledge	√	Integrated studies	√
Firewood cutting	√	Interdisciplinary studies	√
Fishery		Land tenure	
Forestry	√	Land use/Land cover	√
Human health	√	Landscape inventorying/monitoring	√
Human migration		Management issues	√
Hunting	√	Mapping	√
Indicators	√	Modelling	√
Indicators of sustainability	√	Monitoring/methodologies	√
Indigenous people's issues	√	Planning and zoning measures	√
Industry	√	Policy issues	√
Livelihood measures	√	Remote sensing	√
Livestock and related impacts	√	Rural systems	√
Local participation	√	Sustainable development/use	√
Micro-credits		Transboundary issues/measures	
Mining		Urban systems	√
Modelling	√	Watershed studies/monitoring	√
Monitoring/methodologies	√		
Natural hazards	√		
Non-timber forest products	√		
Pastoralism	√		
People-Nature relations	√		
Poverty			
Quality economies/marketing	√		
Recreation	√		
Resource use	√		
Role of women			
Sacred sites			
Small business initiatives	√		
Social/Socio-economic aspects	√		
Stakeholders' interests	√		
Tourism	√		
Transports			

ANNEX II - Promotion and Communication Materials

Provide some promotional material regarding the proposed site, notably high quality photos, and/or short videos on the site so as to allow the Secretariat to prepare appropriate files for press events. To this end, a selection of photographs in high resolution (300 dpi), with photo credits and captions and video footage (rushes), without any comments or sub-titles, of professional quality – DV CAM or BETA only, will be needed.

In addition, return a signed copy of the following Agreement on Non-Exclusive Rights. A maximum of ten (10) minutes on each biosphere reserve will then be assembled in the audiovisual section of UNESCO and the final product, called a B-roll, will be sent to the press.

ANNEX II – Promotion and Communication Materials

DSCN 1233: Horses being saddled-up at the Waskehegan Staging Area, Cooking Lake-Blackfoot Provincial Recreation Area in the Beaver Hills.

DSCN 1310: Plains Bison (*Bison bison bison*). Elk Island National Park in the Beaver Hills has a herd of approximately 470 Plains Bison that wander freely within Canada's only completely fenced National Park.

IMG 0909: Saint Marguerite (St. Margaret) Roman Catholic Church located near the north shore of Hastings Lake in the Beaver Hills was originally built in 1912. The Metis Nation of Alberta was granted title to the property in 2000.

IMG 1677: Bird watching at one of the many wetlands within the Cooking Lake-Blackfoot Provincial Recreation Area in the Beaver Hills.

IMG 6555: Kayaking and canoeing are popular water-based recreation activities on Astotin Lake within Elk Island National Park in the Beaver Hills.

IMG 4163: Part of the Hastings Lake Islands Natural Area. This Natural Area is one of six Provincially designated Natural Areas within the Beaver Hills.

IMG 1097: One of the wetlands that occur throughout the undulating knob and kettle topography of the Boreal Forest -Dry-Mixed Natural Sub-Region of the Beaver Hills.

IMG 8424: American White Pelicans (*Pelecanus erythrorhynchos*) are seen on many of the lakes within the Beaver Hills.

IMG1292: Beef cattle ranching is one of the most common types of agricultural operation within the "transition area" of the Beaver Hills Biosphere.

IMG 9593: A farmstead within the lived-in and working landscape of the Beaver Hills. Such sites often show a sequence of dwellings that illustrate the historical evolution of the farm setting.

IMG 7983: The City of Edmonton skyline as seen from the western edged of the Beaver Hills. The eastern outskirts of the City are approximately 10 km from the Beaver Hills.

IMG 3339: A Barred Owl (*Strix varia*) is the focus of attention of children and adults attending the Beaver Hills Bioblitz" World Snow Day event at the Strathcona Wilderness Centre in the Beaver Hills.

IMG 3332: People engaging in winter outdoor activities as part of the "Beaver Hills Bioblitz" World Snow Day event at the Strathcona Wilderness Centre in the Beaver Hills. The Strathcona Wilderness Centre is the largest municipal park in the County of Strathcona and provides opportunities for environmental education and a variety of outdoor recreation activities throughout the year.

IMG 8040: Plains Bison (*Bison bison bison*) in corals at Elk Island National Parks. Parks Canada has sent Plains Bison from Elk Island National Park to other protected areas and sanctuaries in Canada and the United States.

IMG 9494: Outdoor recreation activities at Miquelon Lake Provincial Park in the Beaver Hills.

IMG 1657: A Fly agaric mushroom (*Amanita muscaria var. guessowii*) in the Boreal Forest of the Cooking Lake-Blackfoot Provincial Recreation Area in the Beaver Hills.

IMG 3380: A beaver (*Castor canadensis*) lodge at a time of low water in Elk Island National Park in the Beaver Hills.

IMG 6496: Lake-side residential development in the village of Hastings Lake that is located on the southern shore of Hastings Lake in the Beaver Hills.

IMG 1184: A view towards the forested northern edge of the Beaver Hills which illustrates the higher elevation of the moraine in relation to the surrounding Parkland Natural Region.

EALT 1 - October 7, 2013: Grade 6 students of Holy Spirit Catholic School walking through the tall native grasses at Golden Ranches, for a field trip to install song bird nest boxes on the Edmonton and Area Land Trust - conserved lands.

EALT 2 - July 18, 2014: Song bird nest boxes, installed by the Grade 6 students of Holy Spirit Catholic School, being used by a colony of Tree Swallows, at the Edmonton and Area Land Trust - conserved lands at Golden Ranches.

EALT 3 - July 3, 2013: Deer fawn safely hiding from predators in the tall grasses of Golden Ranches, on an area conserved by Edmonton and Area Land Trust.

EALT 4 - June 22, 2013: Polyphemus Moth at Golden Ranches.

IMG 0619: The agricultural landscape in the southern part of the Beaver Hills.

IMG 1278: A view across the central portion of the Beaver Hills showing the preponderance of forested cover in this part of the moraine. Approximately 55% of the Beaver Hills remains as natural upland cover.

IMG 3408: The juxtaposition of country residential development and farming operations is symptomatic of the anthropogenic and-use pattern within the Beaver Hills.

DSCN 0022: Beaver Hills Dark Sky Preserve banner. The Beaver Hills Dark Sky Preserve was officially declared on September 3, 2006.

IMG 3680: Plains Bison (*Bison bison bison*) in Elk Island national park in the Beaver Hills.

IMG 6864: Typical forested cover complex and native wetlands within the Beaver Hills.

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Name and Address : Edmonton and Area Land Trust, 9910-103 Street, Edmonton, AB T5K 2V7
Date : July 17, 2015

Signature : Stephanie Weizenbach

Outreach Coordinator, EALT

(sign, return to UNESCO two copies of the Agreement and retain the original for yourself)

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Name and Address: GUY SWINNERTON : 662 DARTMOUTH POINT
Date: EDMONTON, ALBERTA, CANADA T6M 2V7

July 23, 2015 Signature: Guy Swinnerton

(sign, return to UNESCO two copies of the Agreement and retain the original for yourself)

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Name and Address:

Date :

Signature :

(sign, return to UNESCO two copies of the Agreement and retain the original for yourself)

Mailing address: 7 Place Fontenoy, 75352 Paris 07 SP, Direct Telephone: 00331 – 45681687
Direct Fax: 00331 – 45685655; e-mail: photobank@unesco.org

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ACKNOWLEDGMENTS

Fittingly, this application was compiled through a collaborative effort. The many member organizations of the Beaver Hills Initiative (BHI) and their representatives on the BHI Board and Working Groups contributed ideas, information and other resources to the application. Jim Birtch provided advice and guidance during the initial stages of developing the proposal. Drs. George Francis and Fred Roots provided advice, comments and suggestions to improve the document for review by the UNESCO MAB Programme. The Protected Areas Working Group members were a source of endless support, wise counsel and keen editorial eyes. Lori Clapp, Strathcona County, volunteered many hours for a comprehensive editorial review in the final stages of preparation, for which we were extremely grateful. These efforts provided ample material and support for Dee Patriquin, Solstice Canada Corp. and Petra Rowell, who compiled the application document on behalf of the BHI.

PHOTOGRAPHY CREDITS

Alberta Environment: Page 84 (bog and fen)

Alberta Tourism Parks and Recreation: Page 120 (interpreter with children); Page 123 (school program kids)

Elk Island National Park: Page 54 (Woodland Cree); Page 60 (canoe, Astotin Lake), Page 66 (bison); Page 89 (trumpeter swan and warden); Page 134 (cross-country skiing)

Jean Funk: Page 135 (woodland trail)

Global News: Page 60 (grain combine)

Dr. Glynnis Hood: Page 49, Plate 1 (upper left, EINP); Page 80 (beavers)

Ollie Machon: Page 68 (historic farming activity, railcar by granary)

Cecilia Goncalves Neath: Page 49, Plate 1 (lower right, Blackfoot PRA); Page 53, Plate 3 (bottom, aerial of wetland); Page 79 (aspen trees); Page 83 (marsh)

Dee Patriquin: Title page ; Page 53, Plate 3 (upper right and left, wetlands); Page 69 (Birkebeiner ski race); Page 82 (beaver channeled wetland); Page 90 (flowers); Page 99 (snowshoer; hare in hand); Page 104 (wood frog measurement)

Spencer Environmental: Page 83 (swamp)

St. Nicholas Mandolin Ensemble: Page 58 (horse and plough)

Strathcona County: Page 138 (conceptual scheme)

Dr. Guy Swinnerton: Cover page photos. Preface photos. Page 49, Plate 1 (upper right, Miquelon Lake Provincial Park; lower left, Ministik Game Bird Sanctuary); Page 51, Plate 2 (all); Page 65, Plate 4 (all); Page 70 (aerial of moraine); Page 77 (agricultural field); Page 86 (Astotin Lake conifers); Page 89 (bison in meadow); Page 94 (local food poster); Page 97 (Miquelon beach, camping); Page 99 (Ministik sign); Page 121 (Dark Sky Preserve); Page 126 (stewardship sign); Page 127 (bus tour group); Page 130 (bison paddock tour); Page 136 (cattle pasture)

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BEAVER HILLS INITIATIVE
L'INITIATIVE BEAVER HILLS

Louise Filiatrault, Secretary General
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Dear Ms. Filiatrault

Re: Follow-Up Regarding the Beaver Hills Biosphere Nomination

On behalf of the Beaver Hills Initiative (BHI) I would like to take this opportunity to wish you a Happy New Year and to once again thank the Canadian Man and the Biosphere (MAB) Committee and the Canadian Commission for UNESCO (CCUNESCO) for supporting the Beaver Hills Biosphere Reserve nomination and submitting the nomination application September 30th, 2015.

In response to UNESCO's request for additional information as conveyed in CCUNESCO's letter dated December 2, 2015 please find included with this cover letter the following information:

1. The original signature from the Canadian MAB Committee on the nomination form page 63, point 5.5, provided by Canadian MAB Committee Mr. Stan Boychuck. (Point 1_Letter of December 2, 2015) – *secured by MAB Canada, separately from this request*

2. Explanation of Rationale and Criteria for Determining the Boundaries of the Transition Area, the Core and Buffer Areas (Point 2_Letter of December 2, 2015) – Attachment 1

3. An Update on Building Collaborative Relationships with Indigenous Partners (Point 3_Letter of December 2, 2015) – Attachment 2

Should further information be required by the International Advisory Committee for Biosphere Reserves (IACBR), please do not hesitate to contact me or the BHI Executive Director, Brenda Wispinski (contact information below).

With the cautious optimism of the Beaver Hills becoming a Biosphere Reserve, the BHI is looking forward to further collaboration with the Canada MAB Committee and CCUNESCO and hearing a positive outcome supporting designation from the deliberations of the Bureau of the International Coordinating Council of the Man and Biosphere (MAB) Programme in Lima, Peru this March.

Thank you very much.

Sincerely,

Glen Lawrence
Chair, Beaver Hills Initiative

Brenda Wispinski
Executive Director, Beaver Hills Initiative

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Shannyn Ellett, Chair Planners Working Group, Strathcona County
Kiley Marchuk, Chair Communications & Outreach Working Group, Strathcona County
Candace Vanin, Chair GIS Working Group, Agriculture and Agri-Food Canada
Leslie Laing, Chair Tourism Working Implementation Group

Attachment 1. Clarification of Proposed Biosphere Zoning

Beaver Hills Biosphere Reserve Nomination

Explanation of rationale and criteria for determining the boundaries of the Transition Area, the Core and Buffer Areas

Rationale and criteria used for determining the boundary of the proposed Beaver Hills Biosphere Reserve and the outer boundary of the Transition Area.

The Beaver Hills Initiative (BHI) from its inception in 2002 has been primarily interested in the area generally known as the Beaver Hills-Cooking Lake moraine (herein after referred to as the Beaver Hills). Determination of a specific boundary for this area became necessary as the work of the BHI progressed and particularly when the submission of a biosphere reserve nomination was being contemplated.

Fortunately, the Beaver Hills is a distinctive geomorphological feature that encompasses 1572 km^2, although the precise delineation of its boundary is less immediately obvious. Recourse to the document *Natural Regions and Subregions of Alberta* prepared by the Province of Alberta's Natural Regions Committee (2006) provides a scientifically rigorous and widely adopted rationale for determining the boundary using biophysical and climatic criteria. That document recognizes the Beaver Hills as a disjunct southern island of Alberta's Dry Mixedwood Boreal Natural Subregion surrounded by the Central Parkland Natural Subregion. An accompanying map in that report illustrates the geographical extent and boundaries of the Beaver Hills.

Consideration in the early stages of preparing the biosphere reserve nomination was also given to the possibility of defining the boundary on the basis of geopolitical boundaries, namely local government jurisdictions. Reference to Figure 2 (page 13) in the nomination document shows that the Beaver Hills accounts for varying areal proportions of five counties: Strathcona, Lamont, Beaver, Camrose, and Leduc. However, with the exception of Strathcona County where the Beaver Hills covers over half of the County (55.2 percent), this distinctive landscape accounts for only a very small proportion of the remaining four counties (Lamont 5.3 percent, Beaver 8.7 percent, Camrose 3.4 percent, and Leduc 4.6 percent). Moreover, the landscape of these counties, outside of the Beaver Hills falls exclusively within Alberta's Central Parkland Natural Subregion. Consequently, using jurisdictional boundaries was considered as being inappropriate for determining the boundary of the proposed biosphere reserve since the Beaver Hills region itself is the main focus of attention of the BHI and the primary basis for submitting a nomination.

The topography of the Beaver Hills is a distinctive regional feature which is easily identifiable within the landscape of central Alberta. Comprising the typical hummocky "knob and kettle" terrain topography resulting from its glacial depositional origins, the elevation of the moraine has resulted in cooler and wetter climatic conditions to those prevailing on the surrounding plains. As a result, the Beaver Hills exhibits extensive areas of boreal forest cover and abundant native wetlands. Over half of the Beaver Hills remains under natural cover. This landscape

character is in marked contrast to the extensively modified anthropogenic landscape of the surrounding agricultural environments of the parkland (see Figure 5, page 95 in the nomination document that shows the land cover within the Beaver Hills and the surrounding area). Moreover, this distinctive landscape of the Beaver Hills is not only immediately evident to the visitor but it also contributes to the sense of place that is appreciated by local residents. As noted in the nomination documentation, the moraine topography of the Beaver Hills has also had an important influence on the historical human geography of the region and its current socio-economic profile.

The BHI therefore decided that the outer boundary of the proposed Beaver Hills Biosphere Reserve, that is also the outer boundary of the transition area, should coincide with the provincially recognized boundary of the disjunct southern island of Alberta's Dry Mixedwood Boreal Forest as determined by Alberta's Natural Regions Committee (2006).

Rationale and criteria for determining the Core, Buffer and Transition Areas

The zonation applied to the Beaver Hills is discussed under the following sections of the nomination document: Section 3.1.2 (pp. 10-14), Section 4.5 (pp. 42-44), and Section 7 (pp. 64-67). The proposed zoning for the Beaver Hills is shown in Figure 1 (p.12).

The BHI adopted a four stage process in determining the location and extent of the three zones conventionally used within biosphere reserves. Initially, careful consideration was given to the description of the role and function of the three zones provided within the biosphere reserve nomination form and other relevant UNESCO MAB documents. Second, the relationship between protected area categories and biosphere reserve zoning as outlined in Bridgewater, P., Phillips, A., Green, M., & Amos, B. (1996). *Biosphere Reserves and the IUCN System of Protected Area Management Categories.* Canberra: Australian Conservation Agency, IUCN, and UNESCO, was reviewed. Third, the manner in which the three zones had been applied within Canada's existing biosphere reserves was examined. The final stage was the determination of the three zones for the proposed Beaver Hills biosphere reserve.

<u>Core Areas</u>: The Core Areas proposed within the biosphere reserve (Elk Island National Park [EINP] and Miquelon Lake Provincial Park [MLPP]) are federal and provincial protected areas that are considered to be IUCN protected area management Category II [national park] areas. Both are relatively large areas (EINP, 19,335 ha and MLPP, 2,390 ha) and are large national and provincial parks, respectively, established to protect the ecological integrity of a representative landscape. The area and boundaries of these two legislatively protected areas are confirmed by the relevant park acts. The two core areas account for 13.6 percent of the proposed biosphere reserve.

<u>Buffer Areas</u>: Two of the three largest proposed Buffer Zones of the Beaver Hills Biosphere (Ministik Game Bird Sanctuary at 7,580 ha and Miquelon Lake Bird Sanctuary at 2,220 ha) are considered to be IUCN IV (habitat/species management area) protected areas. The Blackfoot Provincial Recreation Area [PFRA] (9,920 ha) is an IUCN V (protected landscape/seascape)

protected area. The Provincial natural areas are small parcels that have been recently classified under the IUCN system as Class II sites, but due to their small size and the absence of formally adopted management plans, the BHI places them in their previous categories (total area, 2,046 ha). North Cooking Lake is a Class VI, and the rest are Class IV. The remaining Buffer Zone lands, the Strathcona Wilderness Centre and the environmental non-governmental organization conservation easements and properties, have not yet been classified according to the IUCN system. Although conservation is a primary goal for all of these areas, other land uses such as outdoor recreation and environmental education are also allowed, provided they will not significantly alter the existing natural ecosystem. Although some of these buffer areas are contiguous to the two core areas, the majority of them contribute to ensuring and enhancing the ecological connectivity along the protected "spine" that extends north-south through the moraine.
These Buffer Areas in total account for 13.7 percent of the proposed biosphere reserve.

The BHI is aware that ideally, Buffer Zones are identified as surrounding or contiguous to the Core Areas. Reference to Figure 1: illustrating the proposed biosphere reserve zoning for the Beaver Hills (page 12) shows that although the Blackfoot PRA provides a contiguous buffer along the whole length of the southern edge of EINP and part of the eastern edge, the remainder of EINP is not protected by a specified buffer zone. Similarly, only part of the boundary of the other core area, MLPP, has a recognized buffer that is provided by the Miquelon Lake Bird Sanctuary. Consequently, further explanation and clarification of how the intended buffer role and function is being met in the case of both EINP and MLPP is necessary.

The concept of a "Buffer Zone" and its application in the Alberta context is problematic, particularly when it is applied in the situation of seemingly extending the conservation role of protected areas into adjacent areas of either the public or private land base. The prevailing view in Alberta is that "Buffer Zones" used in connection with designated protected areas denotes the limiting if not sterilizing the potential development and economic opportunities of such areas. Consequently, pursuing the conventional approach of identifying "Buffer Zones" on the private land base could well have jeopardized support at the local and provincial level for the Beaver Hills nomination. The BHI realized that it would therefore be strategically advantageous to identify and use alternative mechanisms for meeting the intended function and conservation role of Buffer Zones around the two core areas.

Elk Island National Park: Elk Island National Park is Canada's only national park that is completely surrounded by a perimeter fence. With the exception of the Buffer Zones noted previously, the lands surrounding EINP are predominantly in private ownership. Strathcona County in its 2007 Municipal Development Plan established the "Beaver Hills Moraine Policy Area" as a means of protecting the distinctive features of the Beaver Hills under its local government jurisdiction. (See Figure 6: Municipal Development Plan Policy Areas in the Beaver Hills, p. 144 in the nomination document). The formal definition of this Policy Area is as follows: "an area that accommodates agriculture, residences tied to agriculture and low impact recreational uses. The primary intent of the Beaver Hills Moraine Policy Areas is to preserve the Beaver Hills Moraine ecosystem and landscape." This Policy Area extends along the full length

of the western edge of Elk Island National Park as well as a substantial proportion of the County to the west and south-west of the National Park, and is supported by the identification of "High Priority Environment Management Areas" immediately adjacent to the National Park boundary. In addition, the *Land Management Framework: A Guide to Achieving Sustainable Development in the Beaver Hills Moraine* (see Appendices to the nomination) and which was formally approved by the BHI Board in November 2015, provides further science-based justification and guidance for Strathcona County to turn-down applications for proposed land-use changes that might compromise the Park's ecological integrity.

The northern and most of the eastern boundary of EINP are located in Lamont County. The County's Municipal Development Plan has zoned the area adjacent to the National Park for agriculture (Figure 6), although a substantial proportion of the area is forest and shrub-land (Figure 5, p. 93). Because of the undulating terrain and steep slopes, agriculture adjacent to the EINP is predominantly in the form of grazing and some forage crops. As a result, this area retains much of its value as wildlife habitat and extends the conservation function of EINP beyond the Park boundary. Although some of the area has the potential for country residential development, the County of Lamont has used the Land Management Framework developed by the Beaver Hills Initiative as a scientifically based and reliable information source to justify the turning down of any development applications. (See the *Land Management Framework: A Guide to Achieving Sustainable Development in the Beaver Hills Moraine).* The BHI is confident that this position is likely to continue.

Miquelon Lake Provincial Park: Miquelon Lake Provincial Park is the other Core Area and is located at the southern end of the Beaver Hills. The western side of the Provincial Park is effectively buffered by one of the Miquelon Lakes and another of the Miquelon Lakes buffers a portion of the south-eastern edge of the Park. Other portions of the Park are buffered by being contiguous to the formally recognized "Buffer" provided by the Miquelon Lake Bird Sanctuary. Most of the reminder of the boundary of MLPP lies adjacent to agricultural land and which is predominantly used for grazing. This part of the Beaver Hills falls within the jurisdiction of Camrose County. The County's Miquelon Lake Area Structure Plan, which relies heavily on information contained in the initial Beaver Hills Land Management Framework, recommends that the area be used for grazing with additional provisions for watershed protection. As a result, a considerable proportion of the area surrounding the Park is under natural cover and native wetlands and is likely to remain in this condition.

On the basis of the information provided above, the BHI feels strongly that the intended role and function of Buffer Zones exists in the areas surrounding the two Core Areas, even though these are not formally identified as such. These areas other than in "name" provide an important supporting conservation role to the two Core Areas

Transition Area: The outer boundary of the Transition Area has already been discussed in the context of defining the boundary of the proposed Beaver Hills Biosphere Reserve. Excluding the areas determined to be Core or Buffer areas, the Transition Area accounts for 72.7 percent of the proposed biosphere region. The Transition Area is the lived-in and working landscape of the

Beaver Hills and is largely under private ownership. Agriculture is the predominant form of activity and land-use planning within the Transition Area is the responsibility of the respective local governments of the five counties. As noted previously, the *Land Management Framework: A Guide to Achieving Sustainable Development in the Beaver Hills Moraine* is an important tool that is used extensively by all these authorities as a reference guide to assist in land-use planning decisions and the adoption of sustainable land-management practices. The underlying principles contained in the *Land Management Framework* are being increasingly being embedded within the respective Municipal Development Plans of the five counties. In addition, these same principles are recognized in identifying the Beaver Hills as an environmentally sensitive area in the Capital Region Growth Management Plans and Provincially as a Nature Based Tourism Asset within the Land Use Framework being undertaken by the Alberta Government.

Attachment 2. Update on Indigenous Engagement

Beaver Hills Biosphere Reserve Nomination

An Update on Building Collaborative Relationships with Indigenous Partners

In our biosphere nomination submitted in 2015, the Beaver Hills Initiative (BHI) described plans to investigate shared interests and collaboration opportunities with the Métis Nation of Alberta and the Treaty Six Confederacy of First Nations (Treaty Six Confederacy), and other indigenous community members historically associated with the Beaver Hills. We understand that clarification will be helpful to the International Advisory Committee for Biosphere Reserves in their review of the nomination document this January, 2016, and are pleased to have an opportunity to provide an update. Subsequent to the submission of the nomination document, the BHI and our partner organizations have maintained dialogue with both indigenous partner organizations, which have refined our initial plans, and we and partner organizations have generated other possibilities. Refinement has included adaptation to the unique circumstances related to indigenous peoples associated with the Beaver Hills moraine, and the recent broader policy changes recognizing indigenous peoples across Canada. To ensure clear understanding of the present circumstances, we have prefaced our update with an explanation of the local context of indigenous communities historically associated with the Beaver Hills, and the broader implications of changes in government relationships with indigenous communities.

Local Indigenous Connections to the Beaver Hills Moraine

The *Annex II MAB Strategy 2015-2025* proposes to use biosphere reserves as a means to explore and demonstrate solutions to global sustainability challenges, including loss of cultural diversity. Often this challenge involves actively retaining existing connections and cultural understandings of lands currently and traditionally used by indigenous cultures. Alberta's history relative to its First Nations and Métis residents poses a different challenge. In this case, indigenous groups were resettled from traditional territories onto designated reserve and settlement lands (respectively) over a century ago. Past discriminatory actions, including efforts to discourage cultural practices and limit access to traditional lands have also instilled a level of distrust of government. These factors are a significant barrier for those seeking engagement with Alberta's indigenous communities.

Federally, the Canadian government has taken steps over the past decade to improve relations with indigenous communities, a relationship degraded by past discriminatory policies. More significant progress has recently been made with release of the Truth and Reconciliation Commission findings and adoption of all of the Commission's recommendations by the federal government. Such changes include efforts to raise cultural awareness, empower indigenous communities to maintain their distinct culture, and provide educational and other institutional supports. Provincially, Alberta's newly elected government has expressed a commitment to similar actions, and included a commitment to implement the UN's Declaration on the Rights of Indigenous Peoples. These higher level commitments are expected to enhance opportunities for indigenous communities to develop their own capacity, through enhanced educational, economic and institutional mechanisms. They will undoubtedly help to rebuild trust by encouraging more integration of indigenous and Canadian communities sharing of associated benefits and respect for indigenous culture. .

Such support is expected also to help those indigenous communities and organizations in Alberta that have been actively working to re-establish cultural traditions and linkages to traditionally used lands, efforts that have been a challenge for several reasons. Alberta's First Nations peoples were resettled to reserve lands under terms of treaties that set the stage for European settlement, and private land

ownership. Over time, restrictions on travel outside reserve lands and active discrimination against indigenous peoples and their cultural practices reduced traditional land use (e.g., trapping, hunting, berry harvest) within communities, and on traditional territories. Today, traditional land use practices occur mainly on reserve lands or in nearby federal or provincial parks (where permitted), and cultural understandings are held by relatively few elder community members. Current efforts to restore traditional culture are supported by existing federal and provincial legislation that recognizes traditional land use and requires consultation where development may impact such activities. Consultation is a challenge for the communities though, because of the volume of industry requests of the relatively small number of people actively practicing traditional activities and the lack of documentation of traditional land use. Many indigenous communities (First Nation and Métis) are actively cataloguing traditional land use knowledge, to respond to industry requests and to pass on to their youth these traditional practices and cultural understandings of their environment.

Other challenges affect such efforts, including capacity and trust. Many of these communities also face significant social and economic issues, and they are forced to prioritize limited human and financial resources on concerns of highest urgency. Although partnerships with external parties could be helpful for cultural initiatives in particular, mutual distrust due to past discriminatory practices by governments and other organizations is a significant barrier.

Discussion of potential involvement of indigenous groups in the proposed Beaver Hills Biosphere Reserve began in this context, and progress has been slower than with other communities within and near the Beaver Hills, because of these issues. In the case of the Beaver Hills, the First Nations and most Métis peoples that formerly used the Beaver Hills resettled to new communities some distance away. Although some people return to practice traditional activities in its parks (where permitted), the local indigenous communities no longer use the Beaver Hills extensively and have not been directly involved in management of its resources or development. The trust and familiarity that allowed the Beaver Hills Initiative to form and begin collaborative projects did not exist with those indigenous communities traditionally linked to the Beaver Hills moraine. Discussions with the Treaty Six Confederacy and the Métis Nation of Alberta have started a dialogue with a broader association of regional indigenous communities, including those whose traditional lands include the Beaver Hills. The progress to date has been measured in gaining interest in the biosphere reserve, and trust in the potential to promote indigenous understandings and cultural linkages to this landscape. The letters of support from these two organizations provided in the 2015 Beaver Hills Initiative Biosphere Reserve nomination represent considerable effort, by all parties to reconcile past differences, rebuild trust and begin to explore new collaborative possibilities.

Future Engagement Plans

Both the Treaty Six Confederacy and the Métis Nation of Alberta are broader regional organizations, whose interests include promoting cultural awareness and conserving the traditional, cultural and ecological knowledge of their respective communities. These goals are consistent with the objectives of Annex II MAB Strategy (2015-2025) relative to retention of cultural diversity, and particularly relevant to Alberta, given the past history of settlement, and relations with indigenous communities. We had suggested in our nomination document some potential avenues to engage with these organizations, and others, including the following:

- Continue the Aboriginal Engagement Strategy that led to discussions with the Treaty Six Confederacy and Metis Nation of Alberta (documented on pages 48 to 49 of the nomination document).
- Solicit active involvement in the Beaver Hills Initiative and biosphere reserve management from additional stakeholders, including indigenous communities (page 49).
- Revise board governance policies to include public and indigenous stakeholders, with recognition of public and indigenous participants as distinct constituencies (Page 50).
- Support engagement initiatives of partner organizations (e.g., Parks Canada, Alberta Parks and Augustana Campus of University of Alberta) where possible (page 82), focusing particularly on activities that can promote cultural awareness, with participation of indigenous partners (page 110).

These initiatives have been sustained over the past year, and have been incorporated into current business planning activities. Although progress has been relatively slow, considering the constraints mentioned above, we consider these steps as successful, and acknowledge that full involvement will require time and suitable windows of opportunity.

The BHI has continued to discuss potential collaboration opportunities with both the Treaty Six Confederacy and the Métis Nation of Alberta since submission of the nomination document. Discussions have ebbed and flowed while exploring potential opportunities, but mutual interest in collaboration remains apparent. For example, although the designated liaison for the BHI within the Treaty 6 Confederacy was replaced last year, which created a lag in discussions, the new liaison is fully committed to exploration of collaborative initiatives. A specific opportunity for development of interpretive programming at a local historical park developed over this past year, and appears to be a promising shared project (see below). By maintaining open dialogue with both organizations, future opportunities can be explored as they arise, and with consideration of the capacity of both the BHI and its member organizations to successfully implement initiatives. We are confident that sustained dialogue will help build trust in the BHI, and the proposed biosphere reserve as a reliable partner in promoting the cultural interests of indigenous peoples.

The BHI has identified several specific initiatives for engagement with indigenous partners and local communities in the newly updated 2016-2019 business plan completed after submission of the nomination document. The following items, once adopted by the Board represent priorities for the Beaver Hills Initiative over the next four years:

- Following an initial presentation by the BHI to a meeting with the City of Edmonton, the Treaty Six Confederacy and Fort Edmonton Historical Park (in Edmonton) in June 2015, continue to discuss proposals for new interpretive programming that would incorporate the historical use of the Beaver Hills by First Nations peoples. This meets Fort Edmonton's mandate to include more specific programming about local indigenous communities and their connection to the greater Edmonton area, as well as meeting objectives of the BHI and the Treaty Six Confederacy. This

on-going dialogue with Treaty Six Confederacy will help ensure that relevant indigenous information is included in educational and/or interpretive programming undertaken within the Beaver Hills by the BHI and its partners.

- Continue to work with the Treaty Six Confederacy and Métis Nation of Alberta, or local communities to identify opportunities to incorporate traditional ecological knowledge and practices into biosphere reserve operation, including the tangible and intangible cultural significance of the biodiversity and landscape character of the Beaver Hills. (Protected Areas and Research and Monitoring Working Groups)
- Identify and hire an indigenous community member to assist in developing educational programs for cultural awareness and traditional land uses of the Beaver Hills (and similar areas) at an existing municipal environmental education facility in the Beaver Hills (Councillor's Working Group)
- Support Parks Canada (Elk Island National Park) in their efforts to implement the new Aboriginal Open Doors Program, a relationship-building program intended to facilitate access of indigenous peoples to traditional lands within Canadian parks, and to encourage practice of traditional activities and transfer of traditional knowledge. First Nations and Metis communities historically associated with park areas can enter into a Memorandum of Understanding (MOU) with Parks Canada to allow community members free access to the park. Elk Island National Park is currently developing such a MOU with the Enoch First Nation, an initiative that expands on support offered to regional indigenous communities by the park since 1907, as described in Appendix A.
- Work with other BHI partners that have successfully developed working relationships with local indigenous communities, to identify potential partnering opportunities with locally relevant, shared benefits. For example, the Aboriginal Engagement Committee of the Augustana campus of the University of Alberta has developed several joint initiatives with local community elders and organizations to encourage cultural practices on campus, benefiting both indigenous and other students. Such successful models could provide a template on which to incorporate cultural awareness, traditional land use and transfer of cultural knowledge within the proposed biosphere reserve, through activities of other BHI partners (e.g., provincial and municipal parks).

Other opportunities exist, but have not been prioritized in the 2016-2019 business plan due to current capacity within the BHI. These include additional education outreach programs to promote awareness of the biosphere reserve and its objectives in local schools, including those serving Aboriginal youth. Such programs will be re-evaluated and prioritized in subsequent business planning updates, to adapt to emerging opportunities, emerging partnerships and available resources.

Appendix A. Elk Island National Park Aboriginal Relationship-building Activities

Aboriginal Relationship Building at Elk Island National Park

Parks Canada Agency Context

There is a growing drive in Canada to develop a renewed, more equitable relationship between Aboriginal and non-Aboriginal peoples in Canada. Parks Canada is well placed to advance a reconciliation agenda, including collaborations within our parks and sites that demonstrate reconciliation in meaningful and tangible ways. As an agency responsible for a significant amount of federal Crown land, Parks Canada operates on traditionally used lands and waters of First Nations, Inuit, and Métis, including lands and waters covered by treaties and areas subject to land claim agreements. Parks Canada has established relationships with over 300 Aboriginal communities throughout Canada.

Most places that the Agency administers involve cooperative working relationships with local Aboriginal communities. These relationships support Aboriginal peoples in maintaining their traditional knowledge and provide opportunities for Aboriginal peoples to share their culture and history with Canadians and international visitors.

Fostering the partnerships and connections Aboriginal peoples have with traditionally-used lands demands three things from Parks Canada:

- **Facilitating access for Aboriginal peoples** to Parks Canada heritage places
- **Encouraging traditional activities and the use and transfer of traditional knowledge** in heritage places.
- **Fostering strong relationships** to ensure traditional knowledge is incorporated in heritage place planning, management, and operations.

Parks Canada's Aboriginal Open Doors Program – Facilitating Access

Parks Canada has recently implemented a program called the Aboriginal Open Doors Program, whereby First Nations or Métis communities historically associated with a national park or national historic site can sign an MOU with the park and thereafter receive free annual passes to the park for distribution to community members. This program is new and Elk Island has not hitherto been administering it. The work of identifying these communities and developing these MOUs is beginning in early 2016.

Elk Island National Park and Relationships with Regional First Nations and Métis

Parks Canada is a founder member of the BHI and Elk Island National Park is one of two core areas within the proposed Beaver Hills Biosphere Reserve. As a result, relationship building with indigenous communities at the Park constitutes an important and critical component of the BHI's overall commitment to improve and expand the engagement with indigenous peoples within the proposed biosphere reserve.

Elk Island National Park's bison program has given the park a unique opportunity to support First Nations and Métis communities and people in Alberta and Saskatchewan since 1907. Activities have included the provision of live bison to First Nations and Métis communities for starting domestic herds; provision of bison parts (primarily skulls) for cultural and spiritual activities; employment opportunities resulting from interpretive and educational programs and contracted performances and exhibits; and most recently, concerted relationship building efforts.

Plains Bison program:

From 1967 until 2007, Elk Island offered opportunities for First Nations and Métis communities to be provided up to six live bison calves on a one-time basis for cultural and domestic purposes. Over 400 live bison were provided through this program during this time to 33 bands and communities, mostly in Alberta but including several in Saskatchewan. This program is currently under review as the park is reviewing and updating its bison management program and protocols.

Bison skulls are also sought after for ceremonial purposes. Park staff set these aside when they are found in the park and have provided them on application from communities or from elders and spiritual leaders with the support and endorsement of their communities. On occasion the spiritual leader receiving a skull has offered park staff a pipe ceremony and gifts in commemoration.

In addition to providing live bison to begin domestic herds, park staff have provided training workshops and advice in bison management and handling to community members working with bison. These training sessions have taken place in the communities themselves and at the park.

Educational and interpretive programming:

Elk Island has contracted interpretive programming activities and performances from First Nations and Métis individuals and performers nearly every summer for the past five years. Park interpreters have been contracted from First Nations or Métis backgrounds to provide educational programming for park visitors during the summer. The park also possesses several teepees, which have been erected on occasion to support this programming.

Current relationship building activities at Elk Island National Park:

The park is in the early stages of developing an Aboriginal engagement strategy, intended to promote opportunities for working with and providing benefit to Aboriginal communities in a more proactive way. In the fall of 2014, presentations were made at Province of Alberta community workshops to representatives of First Nations and Métis communities, to inform them of opportunities at Parks Canada and Elk Island National Park, and some contacts were made with the park following these workshops. The park was recently approached by the Elders Society of the Enoch Cree Nation, located on the western boundary of Edmonton, for opportunities that might benefit the elders and other members of the community. Elders came to the park on a field trip and toured a potential cultural camp location, the park's bison handling facilities and visitor areas. Enoch Cree Nation has a historical link to the Beaver Hills. Their earliest known band leader, Chief Lapotac, was linked to the Asino Wachi Cree and Amisk Wuchee people who gathered in the Beaver Hills where Elk Island National Park is located.

Time and again when Parks Canada approaches Aboriginal communities, community members tell staff that one of their most urgent needs is the need for cultural transmission to youth and for the survival of the skills that traditionally linked people to the land and its resources. This was also true of the Enoch elders. Elk Island National Park has identified a backcountry area that would be suitable and is looking for ways to facilitate this as a cultural camp location that would allow First Nations and Métis communities to reconnect with the park. This has been a successful approach in other parks and, although it is early in the relationship as yet at Elk Island, the elders from Enoch felt the area was more than appropriate. Work has been identified to enhance it, including provision of a kitchen shelter and cultural space (for sweatlodge frames). Elders will be coming to the park to be present at the upcoming handling of bison in late January. In February, the park superintendent and external relations manager are going to Enoch to attend a meeting of chief and council and to give a presentation on the park to the Elders' Society.

The presence of bison in the park adds significant cultural meaning and depth to a park visit for the First Nations and Métis people whose heritage included the hunting of bison. We are exploring ways that the relationship with bison can be strengthened and rebuilt, and updating the previous policy of providing live bison to communities for domestic and cultural purposes.

Conclusion and next steps

Much work remains to be done. The First Nations and Métis heritage of the region is rich and complex. The park will be continuing its efforts to meet with communities and identify opportunities to work towards goals of mutual interest. Opportunities of interest to both parties at the moment, and has been demonstrated both at Elk Island and elsewhere in the agency, include facilitating youth cultural camps in the park; further Aboriginal interpretation and education opportunities; and economic opportunities including contracts for educational and interpretive programming; employment; and providing space in the park's visitor centre for crafts for sale to visitors.

Strengthening relationships with Aboriginal partners is a critical element of Parks Canada's work and unique opportunities exist at Elk Island National Park to make meaningful contributions to this mandate. Strong relationships are essential to delivering Parks Canada's mandate and contribute to the process of reconciliation between the government of Canada, Aboriginal peoples, and other Canadians. Recent commitments of Canada's new federal administration make it clear that this activity will not only continue, but will be expanded and will assume greater profile within Parks Canada's workplan.