Last Mountain Lake National Wildlife Area and Migratory Bird Sanctuary

Management Plan

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Canada

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Environment and Climate Change Canada
Public Information Centre
Place Vincent Massey building
351 St-Joseph boulevard
Gatineau Quebec K1A 0H3
Toll free: 1-800-668-6767
Email: enviroinfo@ec.gc.ca

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Environment and Climate Change Canada Protected Areas website**:**
https://www.canada.ca/en/environment-climate-change/services/wildlife-habitat.html

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About Environment and Climate Change Canada's Protected Areas and Management Plans

What are Environment and Climate Change Canada Protected Areas?

Environment and Climate Change Canada establishes marine and terrestrial National Wildlife Areas for the purposes of conservation, research and interpretation. National Wildlife Areas are established to protect migratory birds, species at risk, and other wildlife and their habitats. National Wildlife Areas are established under the authority of the *Canada Wildlife Act* and are, first and foremost, places for wildlife. Migratory Bird Sanctuaries are established under the authority of the *Migratory Birds Convention Act, 1994* and provide a refuge for migratory birds in the marine and terrestrial environment.

How has the federal government's investment from Budget 2018 helped manage and expand Environment and Climate Change Canada's National Wildlife Areas and Migratory Bird Sanctuaries?

The Nature Legacy represents a historic investment over five years of $1.3 billion dollars that will help Environment and Climate Change Canada expand its national wildlife areas and migratory bird sanctuaries, pursue its biodiversity conservation objectives and increase its capacity to manage its protected areas.

According to the budget 2018, Environment and Climate Change Canada will be conserving more areas, and have more resources to effectively manage and monitor the habitats and species found inside its protected areas.

What is the size of the Environment and Climate Change Canada Protected Areas Network?

The current Protected Areas Network consists of 55 National Wildlife Areas and 92 Migratory Bird Sanctuaries, comprising more than 14 million hectares across Canada.

What is a Management Plan?

A management plan provides the framework in which management decisions are made. It is intended to be used by Environment and Climate Change Canada staff to guide decision making, notably with respect to permitting. Management is undertaken in order to maintain the ecological integrity of the protected area and to maintain the attributes for which the protected area was established. Environment and Climate Change Canada prepares a management plan for each protected area in consultation with Indigenous Peoples, the public and other stakeholders.

A management plan specifies activities that are allowed and identifies other activities that may be undertaken under the authority of a permit. It may also describe the necessary improvements needed in the habitat, and specify where and when these improvements should be made. A management plan identifies Aboriginal rights and allowable practices specified under land claims agreements. Further, measures carried out for the conservation of wildlife must not be inconsistent with any law respecting wildlife in the province in which the protected area is situated.

What is Protected Area Management?

Management includes monitoring wildlife, maintaining and improving wildlife habitat, periodic inspections, enforcement of regulations, as well as the maintenance of facilities and infrastructure. Research is also an important activity in protected areas; hence, Environment and Climate Change Canada staff carries out or coordinates research in some sites.

The series

All of the National Wildlife Areas are to have a management plan. The management plans should be initially reviewed 5 years after the approval of the first plan, and every 10 years thereafter.

To learn more

To learn more about Environment and Climate Change Canada's protected areas, please visit our website at https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas.html or contact the Canadian Wildlife Service.

LAST MOUNTAIN LAKE NATIONAL WILDLIFE AREA AND MIGRATORY BIRD SANCTUARY

In 1887, 1,025 ha of land at the north end of Last Mountain Lake (known then as “Long Lake”) was set aside to protect the northern islands and peninsulas of the lake for the benefit of “wild fowl”. Under the *Migratory Birds Convention Act, 1917*, Last Mountain Lake Migratory Bird Sanctuary (MBS) was created in 1921 and became one of the first federally protected areas listed in North America. Then in 1987 the Last Mountain Lake National Wildlife Area (NWA) was established to consolidate the provincial and federal lands surrounding the MBS that had been acquired in the previous 20 years under the auspices of a Cooperative Wildlife Management Unit between the Government of Canada and Province of Saskatchewan.

Canada’s Prairie Ecozone is one of the most modified Ecozones in Canada, and also one of the most important habitats for migratory waterfowl, shorebirds, and grassland songbirds in North America. Over the last 100 years, the majority of natural habitat in this ecozone has been drastically altered by agriculture. Last Mountain Lake NWA and MBS are strategic protected areas within this drastically altered landscape. The shallow bays at the north end of the Lake provide one of the most important spring and fall migratory stop-over locations along the central flyway of North America, and the surrounding natural and tame grasslands are managed to provide nesting and roosting cover for migratory birds, wildlife and species at risk.

Last Mountain Lake NWA and MBS support over 300 species of birds, with peak numbers occurring during fall migration. Up to 50,000 sandhill cranes (*Grus canadensis*), 900,000 arctic geese (*Branta*, *Chen* and *Anser* sp.), several hundred thousand ducks, and smaller numbers of songbirds, shorebirds, and birds of prey may be observed at those peak times. More than 100 species of birds nest in the grasslands and wetlands during the summer, and many are unique to the prairie region. Mixed colonies of American white pelican (*Pelecanus erythrorhynchos*), double-crested cormorant (*Phalacrocorax auritus*), along with gulls and terns are common on the islands and dependent upon protection afforded by the NWA and MBS. In addition, Species At Risk like the piping plover (*Charadrius melodus*), whooping crane (*Grus americana*), ferruginous hawk (*Buteo regalis*), loggerhead shrike (*Lanius ludovicianus*), Sprague’s pipit (*Anthus spragueii*), yellow rail (*Coturnicops noveboracensis*), and barn swallow (*Hirundo rustica*) are commonly observed and critical habitat has been identified for some of them.

Habitats at Last Mountain Lake NWA and MBS include 7,300 ha of loamy to sandy upland grasslands, 2,600 ha of saline clay grasslands, and 1,000 ha of wet meadows and wetlands not including an additional 4,300 ha of managed reservoirs and streams. More than half the upland native grasslands were cultivated for crop production at one time in the past century. Nearly all those cultivated lands have been revegetated by Environment and Climate Change Canada, and grasslands are actively managed by fire, grazing, or haying to create a mosaic of habitats for wildlife. Water levels can also be manipulated to meet waterbird habitat needs in eight managed basins using a connecting system of artificial ditches and dams that draw water from inflowing creeks.

Public access for hunting and wildlife viewing is promoted while driving, cycling, and hiking are allowed on gravel roads, designated interpretive trails and boardwalks. Canoeing and kayaking are also allowed on the internal basins except during the waterbird breeding seasons (May-July). Off-road vehicles, overnight camping, barbequing, or camp fires are prohibited.

For greater certainty, nothing in this management plan shall be construed so as to abrogate or derogate from the protection provided for existing aboriginal or treaty rights of the aboriginal peoples of Canada by the recognition and affirmation of those rights in section 35 of the *Constitution Act, 1982*.

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1.0 DESCRIPTION OF THE PROTECTED AREA

Last Mountain Lake (LML) National Wildlife Area (NWA) and Migratory Bird Sanctuary (MBS) provide a continentally and nationally important habitat for migratory birds, wildlife, and species at risk. Unique attributes include:

- North America's oldest federally protected area for wildlife, signed into existence by John A. Macdonald and cabinet in 1887 before any other legal protections were afforded to wildlife.
- More than 300 bird species including the endangered piping plover (*Charadrius melodus)* and whooping crane (*Grus americana*).
- Significant concentrations of migrating water birds on spring and fall migration, with more than 900,000 geese (*Branta*, *Chen* and *Anser* sp.) and 50,000 sandhill cranes (*Grus canadensis*) each fall, in addition to ducks, shorebirds, and other migrants.
- Information centre and interpretive trails provide the only such presence for the Canadian Wildlife Service in the Canadian Prairies.
- A long history of testing and developing active habitat management interventions, resulting in well-developed grazing, haying, prescribed fire, native plant revegetation, and water management programs.

Since the setting aside of Sanctuary lands 1887 (Table 1), and official designation of the NWA lands under the Wildlife Area Regulations in 1987, a number of new legislative and policy changes have influenced site management. Migratory birds were and are the primary wildlife group of concern, but other wildlife, species at risk, and rare or unique habitats are now part of the criteria for directing management on NWAs (Figure 1).

Table 1: Protected Area Summary

Protected Area Designation	National Wildlife Area	Migratory Bird Sanctuary
Province/territory	Saskatchewan	Saskatchewan
Latitude/longitude	51°22' N / 105°12' W	51°22' N / 105°12' W
Size (ha)	10,905 ha	4,838ha
	Total area: 14,056 ha (1,687ha have dual designation)	
PA designation criteria	To maintain and enhance its wildness; An important breeding ground and migratory stopover for many species of birds, several of which are unique to the prairie region.	To be set aside as "breeding grounds for wild fowl".
PA Classification System	Category A Species or Critical Habitat Conservation	Category A Species or Critical Habitat Conservation
IUCN Classification	Category IV-Habitat/Species Management Area	Category IV-Habitat/Species Management Area
Order in Council Number	SOR/94-527	P.C. 1181 (1887) P.C 2650 (1921)
DFRP number	14104 - Parcels 01, 02,03	
Gazetted	1994	1887;1921
Additional designations	• Overlaps with Last Mountain Lake Migratory Bird Sanctuary (MBS) • Western Hemisphere Shorebird Reserve Network (WHSRN) site of hemispheric importance • Important Bird Area (IBA) • Part of Last Mountain Lake Ramsar Site • International Biological Programme site (IBP) • Environmental Monitoring and Assessment Network Site	• Overlaps with Last Mountain Lake National Wildlife Area (NWA) • Western Hemisphere Shorebird Reserve Network (WHSRN) site of hemispheric importance • Important Bird Area (IBA) • Part of Last Mountain Lake Ramsar Site • National Historic Site (NHS) • International Biological Programme site (IBP) • Environmental Monitoring and Assessment Network Site
Faunistic and floristic importance	Representative native grasslands from the mixed grass prairie ecozone, breeding habitat for piping plover (Critical Habitat) (*Charadrius melodus*), ferruginous hawk (*Buteo regalis*), barn swallow (*Hirundo rustica*), loggerhead shrike (*Lanius ludovicianus*), Sprague's pipit (*Anthus spragueii*), and yellow rail (*Coturnicops noveboracensis*); migration habitat for whooping crane *(Grus americana),* up to 50,000 sandhill cranes (Grus Canadensis), 900,000 geese (*Branta*, *Chen*, and *Anser sp.*), and several hundred thousand ducks.	Shallow productive marshes and flooded saline meadows provide breeding habitat for yellow rail, and horned grebe, along with many colonial and marsh-nesting species such as western grebe, eared grebe, red-necked grebe, pied-billed grebe, black-crowned night-heron, American bittern, willet, marbled godwit, black tern, Forster's tern, common tern, Wilson's phalarope, red-necked phalarope

Invasive species	Baby's breath (*Gypsophila paniculata*); Canada thistle (*Cirsium arvense*); Siberian pea-shrub (*Caragana arborescens*); common tansy (*Tanacetum vulgare*); crested wheatgrass (*Agropyron cristatum*); dandelion (*Taraxacum sp.*); dame's rocket (*Hesperis matronalis*); downy brome (*Bromus tectorum*), Kentucky bluegrass (*Poa pratensis*); nodding thistle (*Carduus nutans*); quack grass (*Agropyron repens*); smooth brome (*Bromus inermis)*; sow thistle (*Sonchus arvensis*); yellow sweet clover (Melilotus officinalis); yellow toadflax (*Linaria vulgaris*); common carp (*Cyprinus carpio*); Norway rat (*Rattus norvegicus*); wild boar (*Sus scrofa*).	
Species at Risk	Baird's sparrow (*Ammodramus bairdii*), barn swallow (*Hirundo rustica*), bobolink (*Dolichonyx oryzivorus*), buff-breasted sandpiper (*Tryngites subruficollis*), burrowing owl (*Athene cunicularia*), Canada warbler (*Cardellina canadensis*), chestnut-collared longspur (*Calcarius ornatus*), common nighthawk (*Chordeiles minor*), ferruginous hawk (*Buteo regalis*), horned grebe (*Podiceps auritus*), loggerhead shrike (*Lanius ludovicianus excubitorides*), olive-sided flycatcher (*Contopus cooperi*), peregrine falcon (*Falco peregrinus anatum*), piping plover (*Charadrius melodus circumcinctus*), red knot (*Calidris canutus rufa*), rusty blackbird (*Euphagus carolinus*), short-eared owl (*Asio flammeus*), Sprague's pipit (*Anthus spragueii*), whooping crane (*Grus americana)*, yellow rail (*Coturnicops noveboracensis*), bigmouth buffalo (*Ictiobus cyprinellus*), little brown myotis (*Myotis lucifugus*), monarch (*Danaus plexippus*)	
Management Agency	Environment and Climate Change Canada, Canadian Wildlife Service	
Public Access & Use	The Last Mountain Lake NWA is open for public enjoyment during daylight hours only, from sunrise to sunset. Administrative office, self-serve information kiosk and public washrooms available; walking trails, observation tower, boardwalk, narrated driving tour. Hiking, nature-watching, canoeing and kayaking (after nesting season), and weather-watching encouraged. Fishing, hunting, trapping, boating, haying and grazing under permits and public notices only. Special closures may occur for conservation purposes.	The Last Mountain Lake MBS is open for public enjoyment during daylight hours only, from sunrise to sunset. Nesting season is particularly sensitive for migratory birds, and off-trail exploration should be infrequent from May-July. No firearms allowed in the MBS. Special closures may occur for conservation purposes.

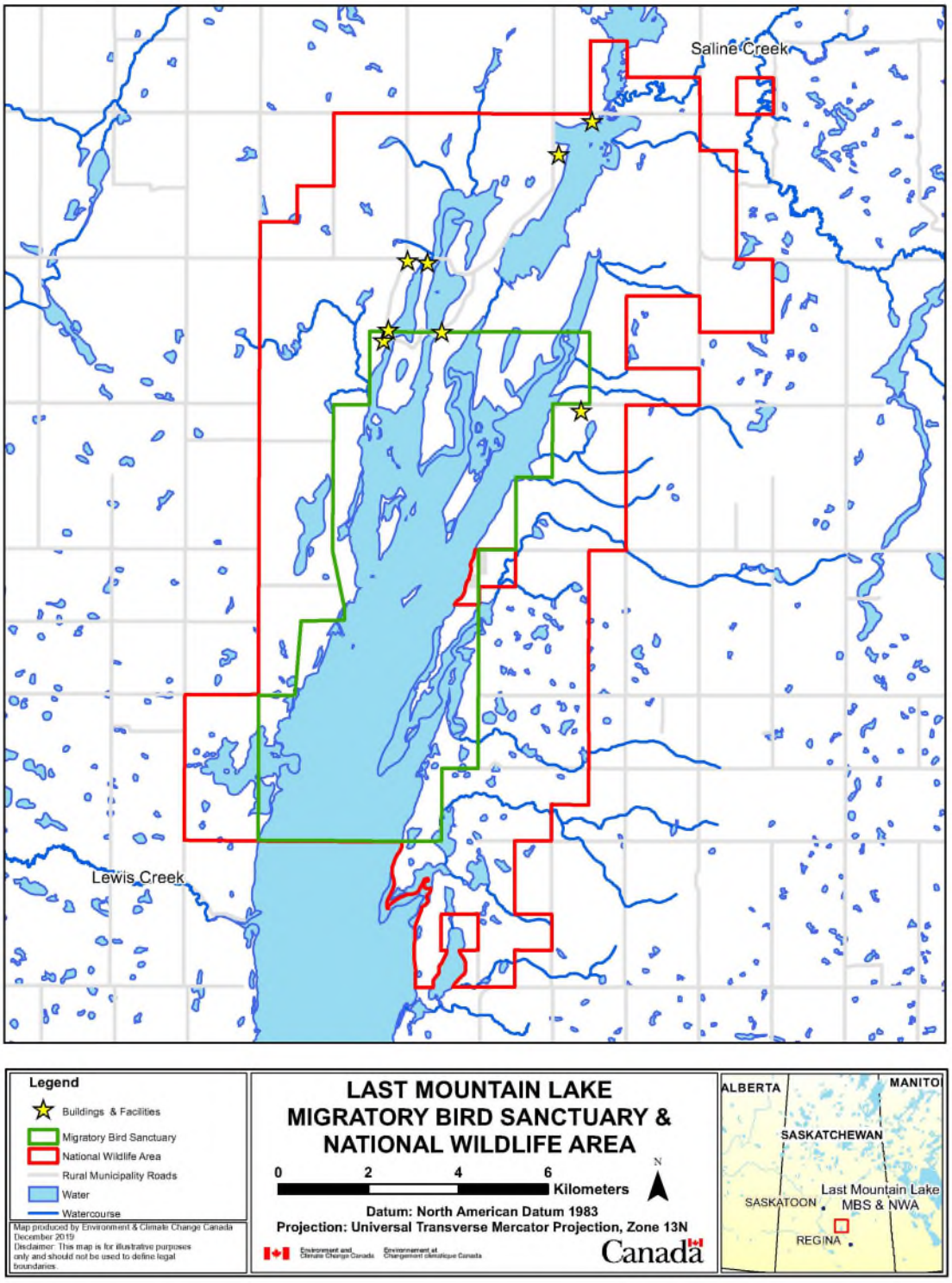

Figure 1: Location of Last Mountain Lake National Wildlife Area and Migratory Bird Sanctuary within Saskatchewan and the local network of gravel roads and waterbodies

1.1 Regional Context

The LML NWA & MBS are a parcel of 15,200 ha that encompass the northernmost end of LML, including wetlands, peninsulas, islands, shoreline, and uplands within 1 to 5 km from the lakeshore. LML NWA & MBS is located in the Moist Mixed Grassland Ecoregion of Canada's Prairie Ecozone (Wiken, 1986), about 160 km southeast of Saskatoon and 150 km north of Regina, Saskatchewan. The regional climate is cool and subhumid, with more precipitation falling as rain during the warm summer, and relatively less precipitation falling as snow during the cold winter. Normal climate for the Last Mountain Sanctuary weather station indicate mean annual precipitation is approximately 366 mm, while temperatures range from a mean July high of +26 ºC to a mean January low of –22 ºC (Environment Canada, 2011).

The landscape including and immediately surrounding LML NWA & MBS is an undulating plain with relatively low relief ranging between 482 to 502 meters above sea level and local slope gradients < 10 %. Running north-south through the center of the site is a channeled lowland formed on glacio-fluvial outwash and partially covered by the bed of Last Mountain Lake. Uplands bound the western and eastern sides of the NWA, where soils formed in glacio-lacustrine and moraine deposits. Shallow coulees oriented east-west drain these uplands into LML. The watershed to the north includes Dellwood, Usborne, Wolverine, Lanigan, and Saline Creeks which drain an area just over 4,000 km^2, but the outflow of those creeks is restricted to a spring snow-melt peak in April and often the creeks run dry by August. Groundwater discharge is very saline, and salt-affected soils and salt-tolerant vegetation are common.

Agricultural land use and private land ownership dominate the region, leading to frequent changes in land cover and land use driven by changes in global demand and prices for commodities. As a result, many native species and natural processes that depend upon large and stable expanses of natural land cover (i.e., migratory bison herds or wildfire) are now missing from the ecosystem. Altering the landscape also alters local drainage and may have an impact on habitat in the NWA. Prior to cultivation, surrounding upland vegetation was mixed grass and fescue prairie (Coupland, 1950; Coupland and Brayshaw, 1953). Most of that vegetation and underlying dark-brown chernozemic soil was plowed and converted to cropland over the last century. Many wetlands were also drained or filled to further increase the area of cropland (Millar, 1976; Sugden & Beyersbergen, 1984; Bartzen *et al.*, 2010).

The region is now fragmented by the grid road network that follows north-south and east-west road allowances every 1.6 to 3.2 km (McKercher and Wolfe, 1978). This road network can interfere with wildlife and water movements, as well as facilitate movement of invasive alien species, pollutants, native predators, and parasites of wildlife (Forman *et al.*, 2003). Surrounding agricultural activities include grain and oilseed annual crop production, perennial forage crop haying, and livestock grazing. Widespread use of pesticides and fertilizers and erosion of cultivated soils have affected local water and soil quality (Donald *et al.*, 2007, Papiernik *et al.*, 2005).

Despite these regional and landscape changes in land cover and land use, the upland and wetland habitats continue to attract a diversity of wildlife. At least 23 species at risk and more than 300 species of migratory birds have been observed at LML NWA & MBS. It remains a continentally significant fall migration staging area for geese (*Branta*, *Chen* and *Anser* sp.) and sandhill cranes (*Grus canadensis*).

1.2 Historical Background

Prior to European settlement, the surrounding region was occupied by the Plains Cree (Nahathaway), Assiniboine (Nakota), and Saulteaux (Anishinabe). Through most of the 1700s and 1800s, primary land uses were trapping for the fur trade or hunting and gathering for subsistence. Metis hunters also utilized bison and other game in the region. During this period, the fur trade directly or indirectly caused great depletions in the populations of some wildlife, such as beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), bison (*Bison bison*), and elk (*Cervus elaphus*).

On September 15, 1874, Treaty 4 was signed by representatives of the Crown and the Cree, Saulteaux, and Assiniboine First Nations. Treaty 4 provided the First Nations the "*right to pursue their avocations of hunting, trapping and fishing throughout the tract […] excepting such tracts as may be required or taken up from time to time for settlement, mining or other purposes, under grant or other right given by Her Majesty's said Government*" (AANDC, 2013). Treaty 4 led to the establishment of several reserves in the region, including those of the Day Star First Nation, Gordon First Nation, Kawacatoose First Nation, and Muskowekwan First Nation.

By the end of the 1800s, non-indigenous settlers began to arrive in the surrounding region, and founded many towns and villages along railways (Fung, 1999). During the late 1800s and early 1900s settlers homesteaded throughout the surrounding region. Over this

period, First Nations people battled disease and hunger on their reserves. The pass system confined them within reserve boundaries, restricted their access to wildlife and severely constrained their economic prospects (Daschuk, 2013).

From the early 1900s through to the 1970s settlers increased the area under cultivation for annual crops leading to a rapid decline in natural land cover. Wetlands in low relief landscapes were sometimes drained, or filled during droughts, to increase the area of cropland (Bartzen *et al*., 2010). Where the soil was too saline, sandy, or saturated, native grasslands and wetlands persisted, or attempts to cultivate them for crop production were short-lived. Nearly all remnant grasslands in the region have been grazed continuously by domestic livestock since the time of settlement.

The north end of LML was far removed from major canoe and overland routes where European explorers most commonly travelled through the 1700s and 1800s. As a result, few explorers ever mentioned the location in their journals. In 1879 a trained naturalist, John Macoun, camped at the north end of LML and made the following observation in his journal: "*Multitudes of pelican, geese, ducks, avocets, phalaropes, water hens, and grebe, beside innumerable snipe and plover were everywhere in the marshes at the head of the lake or along its shores, or on small islands lying to the south of the camp. This was early in July and experience tells me that not one-tenth was then seen of the bird life assembled in September and October."* (Macoun, 1883).

Surveyors for the Dominion Land Survey and railway companies made similar observations in the 1880s, which attracted great interest from hunters. Lieutenant Governor of the North-west Territories, Edgar Dewdney, was concerned about the prospects of losing this resource at a time when bison, passenger pigeons, and other wildlife were disappearing from the landscape. It was Dewdney who in March 1887 wrote to the Minister of the Interior asking that the islands and shorelines of the lake be reserved from settlement: *"The reports of the probable extension of the Long Lake Railway this summer has drawn some attention to the land in that neighborhood. I think it would be very desirable to reserve the Islands near the north end of the lake […] these islands are the favorite breeding grounds for almost all the different varieties of wildfowl we have in the North-West, from pelicans to snipe […] the shores of the islands are literally covered with eggs in the breeding season."*

Then in June 1887, Prime Minister John A. Macdonald and his cabinet signed an Order in Council to reserve 1,025 ha of land and 18 km of shoreline as a bird sanctuary (Hendry, 1987). This was the first federally protected bird sanctuary designated in North America.

During the peak of settlement between 1908 and 1918 there were multiple attempts by homesteaders to have the government allow cultivation and settlement in the Bird Sanctuary. Following passage of the Migratory Birds Convention Act in 1917, the Bird Sanctuary was designated an MBS in 1921 (Hendry, 1987), and the federal government began employing Game Guardians to enforce hunting prohibitions and regulations (Symons, 1994). Each officer had a huge territory to patrol and the MBS received very little attention. The Province of Saskatchewan gained title to the MBS after the Natural Resources Transfer Agreement of 1930, agreeing to preserve the Last Mountain Lake Bird Sanctuary. There are few records between then and 1947 due to the drought and Second World War. It is very likely that trespass grazing and haying were common and became an established practice by locals who viewed the lands as vacant. In 1947, the Province of Saskatchewan began permitting grazing and haying, which helped control the situation. A local Fish and Game Club established a camp on the shoreline of LML MBS in the early 1950s, which was later grandfathered to become the Last Mountain Regional Park.

In 1947 a Dominion Wildlife Officer, Dewey Soper, and his summer student, David Munro, observed and reported upon the crop depredation caused by migrating flocks of geese and sandhill cranes on croplands surrounding LML MBS. Munro then proposed for the first time the use of “lure crops” to be planted and swathed but not harvested as a means to defer use of surrounding lands by the cranes. Government agencies could then pay for the crop as compensation to the farmer (Munro, 1950). The Canadian Wildlife Service took back federal administration and control of the MBS in 1951, and in 1952 the first 60 acres of lure crop was seeded by the Province of Saskatchewan on adjacent crown lands cultivated for this purpose (Munro, 1961). Additional lure crops were planted in 1961, 1962 and 1963 for a total of 460 acres. Approximately 20,000 sandhill cranes were supported by these crops annually in the following decade, and the program was considered successful at that time (Stephen, 1967). Towards the end of the 1990s the program became less useful due to changes in migratory bird behavior associated with agricultural practice changes in the surrounding region and growth in crop depredation support through crop insurance. The last lure crops were planted in 2011.

The Province of Saskatchewan and the Dominion Wildlife Service collaborated in the late 1960s to lease or acquire private lands adjacent to the MBS. This LML Cooperative Wildlife Management Unit (CWMU) surrounded the MBS on the West, North, and East sides (Hatfield, 1968). In 1968 the first on-site manager was hired to monitor waterfowl populations, enforce the *Migratory Birds Convention Act*, pay for the lure crop program, purchase private lands and re-seed most of the cultivated croplands back to perennial grass cover as nesting cover for the birds, and subsequently issue permits for grazing and haying on those lands. In 1970, shelterbelts of trees and shrubs began to be planted for wildlife under Provincial jurisdiction like deer and upland game birds, as well as security barriers for cranes feeding in lure crops, and as nesting sites for songbirds and raptors (Staines & Hatfield, 1971). Starting in 1979, the practice of uncut leave-strips in hayfields to help trap snow and maintain soil moisture was phased in to all haying leases. Stocking rates and seasons in the few grazed pastures were also aligned with provincial policies at the time. In nearly all cases the grazing and haying leases were issued to the former landowners as a gesture of goodwill (Latham, 1978).

The Province of Saskatchewan collaborated with Ducks Unlimited Canada (DUC) to construct five dams/causeways in the LML CWMU between 1970 and 1971 to hold back the flow of Lanigan and Saline Creeks. A number of smaller impoundments were also constructed on coulees that emptied into the lake on the west and east sides. The five larger structures had valves, gates, or stop-logs to control water, and the intent was to have the area manager operate all dams to fill basins, divert flow among basins, and slowly drawdown the water over summer to permit emergent vegetation establishment for waterfowl habitat (Latham, 1978). Fluctuating water levels due to the regional climate, and corrosion of metal culverts and valves due to salinity led to many failures in achieving the prescribed water management targets. A water management plan designed by DUC (Boychuck, 1977) was never implemented because of these challenges. Even after some major repairs in 1985 and 1986 (Ducks Unlimited Canada, 1986), including more berms and dykes, the water management plan could not be implemented due to lack of water. Only in the 1990s did the basins fill as a result of a regional wet cycle in the climate. Following the convention of DUC, all of their projects are named and the Murfitt, Simpson, Alfred, West Shields, Davis, Lanigan Creek, and LML Projects are all embedded within LML NWA & MBS.

In the 1980s a lack of dense nesting cover for upland nesting waterfowl was identified as a regional management concern (NAWMP Committee, 1986). In response, two major management changes were made to idle all haylands in the MBS, and to institute a delayed hay

cut to July 15 for all other haylands in the LML Cooperative Wildlife Management Unit (soon to become the NWA) surrounding the MBS. The impact of this delayed hay cut and idling was initially positive for ducks and upland songbirds compared with grazed pastures or earlier hay cuts, as the two practices provided nesting habitat for a broader array of birds than standard practices alone (Dale, 1984; Dale *et al*., 1987). Undisturbed grasslands resulted in a build-up of fine fuels and increased wildfire risk, so research was undertaken to evaluate the effect of prescribed fire on grass production, forage quality, small mammals, and birds between 1982 and 1986 (Driver, 1987). Results indicated no adverse effects, thus a prescribed fire program began with a focus on the peninsulas of the MBS where no grazing or haying was occurring and where the water provided a natural fire guard (Driver, 1989).

In 1987, the National Wildlife Area was created by consolidating all Provincial and Federal lands under a single designation for federal administration and control. The event also coincided with the 100th anniversary of the Bird Sanctuary, and the signing ceremony on June 5th was attended by His Royal Highness, the Duke of Edinburgh, Prince Phillip, as well as the federal and provincial Ministers of Environment (Taylor, 1987). At this time, the MBS had increased in size and changed slightly, now covering 4,838 ha of shoreline, islands, marsh, and shallow lake. Interpretive programming, an observation tower, designated walking trails, a picnic site, signs and a gravel road loop were developed to help the public access portions of the NWA and MBS for various interpretive stops (Zellermeyer, 1977; Taylor, 1987). In the years immediately following, staff numbers grew to manage the growing number of facilities and on-site programs, and the on-site manager was joined by part-time administrative, mechanical, and technical assistants. Wildlife Habitat Canada funded a position located at LML NWA & MBS to help with prairie restoration and migratory bird monitoring.

Ecosystem management was a predominant theme in the 1990s, with programs for prescribed fire, expanded grazing, and cropland revegetation with native species aimed at conserving and restoring upland biological diversity in LML NWA & MBS (Taylor *et al.*, 1994). Prescribed fire in the 1990s was quite frequent, with an average of 4 fires covering more than 300 ha each year. The frequency and size of fires declined in the 2000s and 2010s when on-site staff numbers in the summer dropped from six to four people. A partnership with the adjacent Wreford Community Pasture in 1994 resulted in more fencing infrastructure and a rotational grazing system within the eastern half of LML NWA & MBS for mutual socio-economic and ecological benefits. Finally, the Mixed-Grass Prairie Restoration Project began pioneering work to learn how to collect, clean, store, and successfully plant up to 90 species of grasses and

broad-leaf native plants, attempting to re-create the native prairie community (Nernberg, 1995; Hammermeister, 2000). Lessons learned from this hands-on approach were passed on to other government and non-government agencies, and to many private seed producers. A native plant nursery and industrial-scale seed cleaning and storage facility were constructed in the early 2000s to increase efficiency and scale of the operation. Only 16 ha were seeded in the 1990s until seed supplies and techniques could be developed, but by 2017 more than 500 ha of former lure crops and other lands had been revegetated using a mix of locally-collected native seed and commercial supplies of native ecovars and cultivars.

As one of the oldest protected areas in Canada, there have been a number of previous management plans prepared for LML NWA & MBS (Hatfield, 1968; Staines & Hatfield, 1971; Latham, 1978; Taylor *et al.*, 1994) as well as specific plans over the years for prescribed fire, grazing, revegetation, invasive plant and weed control, and water management. Further rationale for the management actions taken in the past can be found in these plans.

1.3 Land Ownership

Treaty 4 Territory encompasses the drainage area of the Qu'Appelle River including the Last Mountain Lake National Wildlife Area and Migratory Bird Sanctuary, and surrounding lands. The treaties "are 'living,' foundational agreements based on the synthesis of two world views: the oral traditions (values and common laws) of the First Nation peoples and the written traditions (laws) of the Crown." (Office of the Treaty Commissioner, 2008).

Land ownership from the latter perspective can be summarized as follows: Surface title to LML NWA belongs to the Crown in Right of Canada, with the exception of a few parcels still in the process of transfer from the Crown in Right of Saskatchewan. Most road allowances are owned by Her Majesty in Right of Canada and are managed by the Canadian Wildlife Service. Some road allowances are owned by Her Majesty in Right of Saskatchewan, and are managed by the local Rural Municipalities of Wreford (No. 280), Big Arm (No. 251) and Last Mountain Valley (No. 250). Subsurface mineral rights are retained by Her Majesty in Right of Saskatchewan, but mineral rights have been withdrawn from sale for the original lands in the 1987 agreement with Saskatchewan.

Title to the LML MBS lands belongs to the Crown in Right of Canada. Most road allowances are owned by Her Majesty in Right of Canada and are managed by the Canadian

Wildlife Service. A few road allowances are owned by Her Majesty in Right of Saskatchewan, and are managed by the local Rural Municipalities of Wreford (No. 280), Big Arm (No. 251) and Last Mountain Valley (No. 250). Subsurface mineral rights are retained by Her Majesty in Right of Saskatchewan, but mineral rights have been withdrawn from sale for the original lands in the 1987 agreement with Saskatchewan.

Title to the major water bodies within the LML NWA & MBS belongs to the Crown in Right of Saskatchewan.

All surrounding lands are either provincial crown lands or privately held by livestock and annual crop producers. Livestock grazing and haying is allowed on LML NWA & MBS as habitat management activities through permits under the *Wildlife Area Regulations* and *Migratory Bird Sanctuary Regulations*.

A number of utility rights-of-way also occur on the land base and on legal land titles.

1.4 Facilities & Infrastructure

Two separate facilities are present on site, each comprised of a number of buildings, including a residence (Table 2). This is a relatively remote location, and Environment and Climate Change Canada – Canadian Wildlife Service (ECCC-CWS) staff are responsible for the maintenance and operation of all facilities. Signs and fences are maintained by ECCC-CWS through periodic field checks along the boundaries. The wood post and barbed wire perimeter fence around the NWA is 90 km in length, and there are many internal cross-fences for a total of 216 km. Fence condition ranges from poor to good depending on the location, surrounding use, and age of the fence. An interpretive loop road and 2-track trails along former municipal road allowances are the sole responsibility of ECCC to maintain.

The water control infrastructure built, maintained, and operated by DUC has been repaired over the 47 years since the project began. The projects are described by DUC under the names of Last Mountain Lake, Murfitt, Simpson, Alfred, Davis, Watertown and West Shields. The Last Mountain Lake project includes a number of berms, dams, gated culverts, half-pipe culverts, and channels for controlling water flow. In this project, Saline Creek is prevented from flowing through the natural confluence into Lanigan creek, and is instead directed to a shallow basin that outflows into a more easterly arm of Last Mountain Lake. There is a concrete dam

with two outer stop-log bays and a radial arm gate in the center bay which allows water from Lanigan Creek to be retained in a shallow basin above the dam.

Table 2: Facilities & Infrastructure at Last Mountain Lake National Wildlife Area and Migratory Bird Sanctuary

Type of Asset	Approximate Size*	Location	Responsibility
Summer Residence	165 m^2	Lasher yard	ECCC-CWS
Main Residence	123 m^2	Headquarters	ECCC-CWS
Main Residence Garage	54 m^2	Headquarters	ECCC-CWS
Workshop/Storage Facility	250 m^2	Headquarters	ECCC-CWS
Fuel Storage	29 m^2	Headquarters	ECCC-CWS
Equipment Storage Building	205 m^2	Headquarters	ECCC-CWS
Quad Shed	29 m^2	Headquarters	ECCC-CWS
Office Building	232 m^2	Headquarters	ECCC-CWS
Seed Cleaning Facility	240 m^2	Headquarters	ECCC-CWS
Garden Shed	12 m^2	Headquarters	ECCC-CWS
Pole Shed	320 m^2	Headquarters	ECCC-CWS
Information kiosk	16 m^2	Headquarters	ECCC-CWS
Floating dock	20 m long	On NWA	ECCC-CWS
Viewing tower	7 m tall	On NWA	ECCC-CWS
Roads	18 km	On NWA	ECCC-CWS
Wood Post & Wire Fence	216 km	On NWA	ECCC-CWS
Boundary Signs	~500	On NWA	ECCC-CWS
Entry Signs	10	On NWA	ECCC-CWS
Parking Lots	2 ha	On NWA	ECCC-CWS
Dedicated Cairns	5	On NWA	DUC & ECCC-CWS
Dams	5 major, 7 minor	On NWA	DUC
Culverts	>15	On NWA	DUC & ECCC-CWS
Earthen Dyke	8 km	On NWA	DUC

* Size in metres square or linear metres

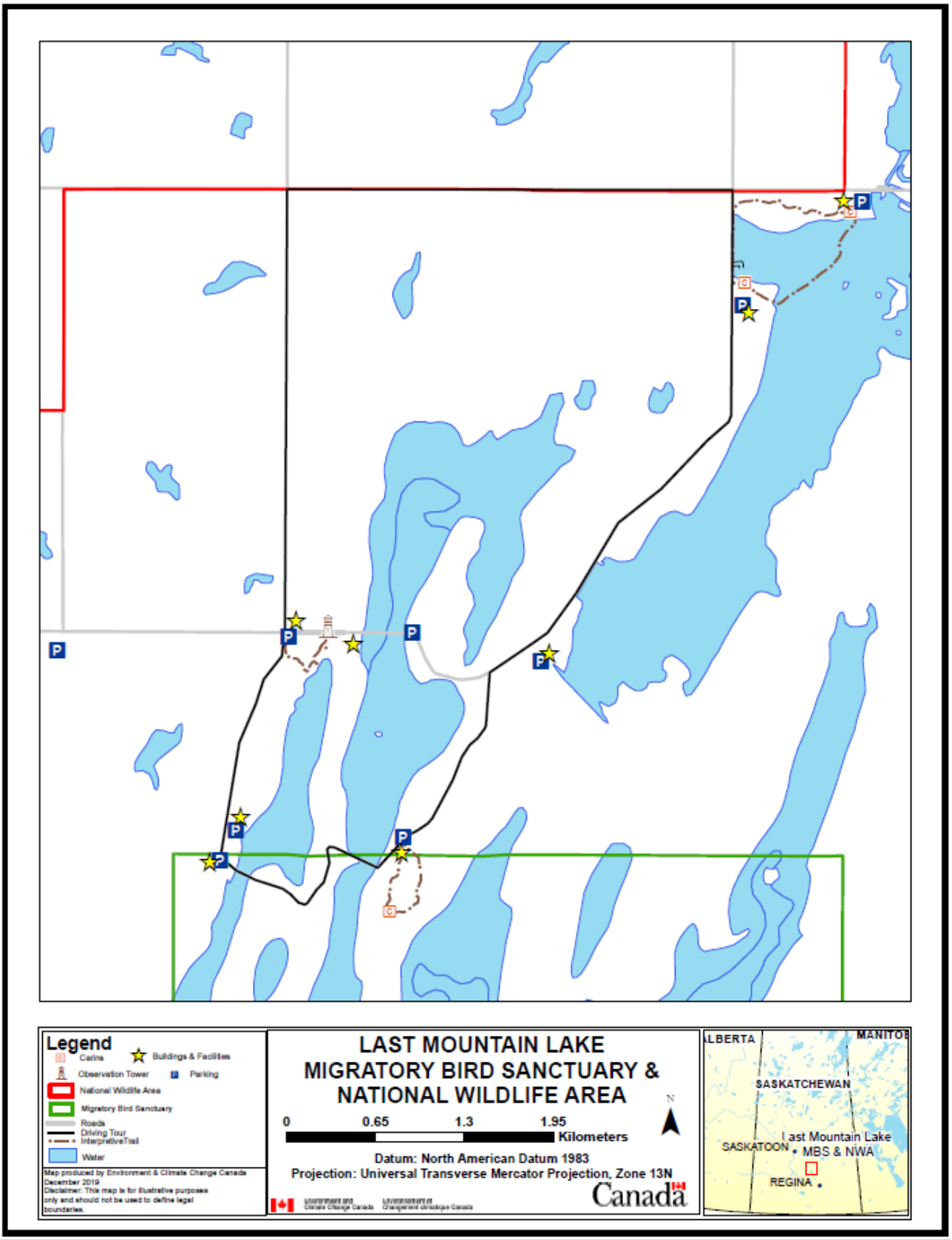

Figure 2: Interpretive facilities at the Last Mountain Lake NWA and MBS

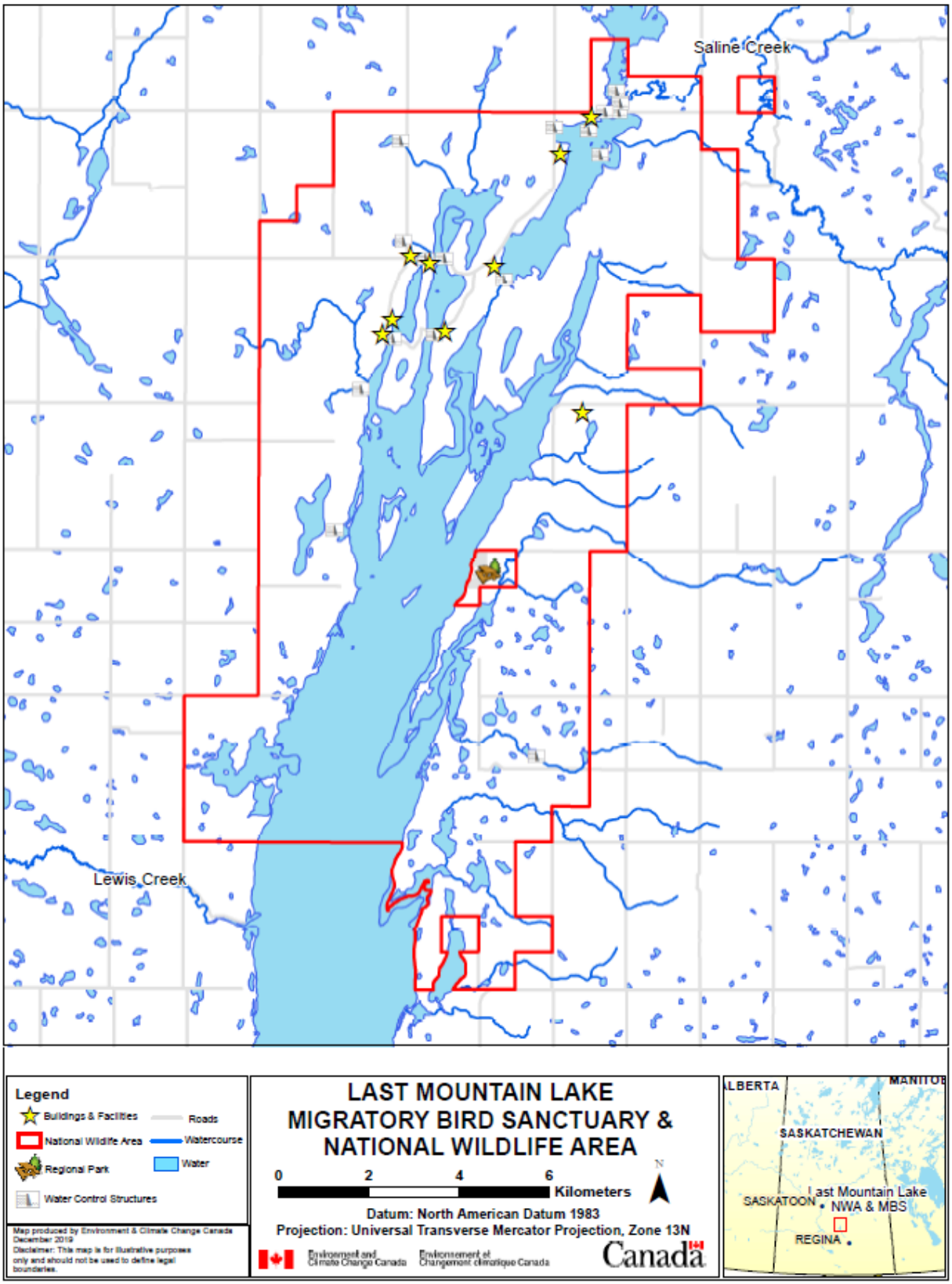

Figure 3: Facilities within the Last Mountain Lake NWA and MBS

2.0 ECOLOGICAL RESOURCES

2.1 Terrestrial and Aquatic Habitats

2.1.1 Upland ecosites

LML NWA & MBS contain elements of the Moist Mixed Grassland Ecoregion of the Prairie Ecozone (Ecological Stratification Working Group, 1995). Upland ecosites comprise approximately 7,300 ha or 67% of the land surface and consist of dark-brown soils on gravelly to silty-textured parent materials of the orthic or calcareous chernozemic suborder. Originally, the typical upland ecosites were dominated by grasslands of western porcupine grass – northern wheat grass – needle and thread (*Hesperostipa curtiseta – Elymus lanceolatus – Hesperostipa comata*) on coarse-textured sites and plains rough fescue – northern wheatgrass – western porcupine grass (*Festuca hallii – Elymus lanceolatus – Hesperostipa curtiseta*) on loamy sites (Thorpe, 2007).

Upland ecosites have been modified by deliberate and unintended human activity over the last century. Historically, just more than half (~4,000 ha) the uplands were plowed for agricultural crop production. Most of that land is now dominated by planted perennial forages of European origin, mostly smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*) and alfalfa (*Medicago sativa*), along with many other non-native weedy and invasive species. Due to active fire suppression to protect infrastructure and forage supplies, some loamy native grassland habitats now support expanding patches of trees and shrubs, including trembling aspen (*Populus tremuloides*), willow (*Salix* spp.), western snowberry (*Symphoricarpos occidentalis*), prairie rose (*Rosa arkansana*), thorny buffaloberry (*Sheperdia argentea)* and silverberry (*Elaeagnus commutata*). Exclusion of fire, grazing, or haying from portions of LML NWA & MBS has resulted in unfettered seed production and wind dispersal of several invasive alien species such as smooth brome, Kentucky bluegrass, perennial sow thistle (*Sonchus arvensis*) and yellow sweet clover (*Melilotus officinale*), which invade nearly half (~2,000 ha) of the remnant native grasslands. This leaves only 1,200 ha of upland prairie in native-dominant condition. Currently there is 545 ha in the post-planting management of the restoration process, revegetated with either native grass mixes or non-invasive tame forages.

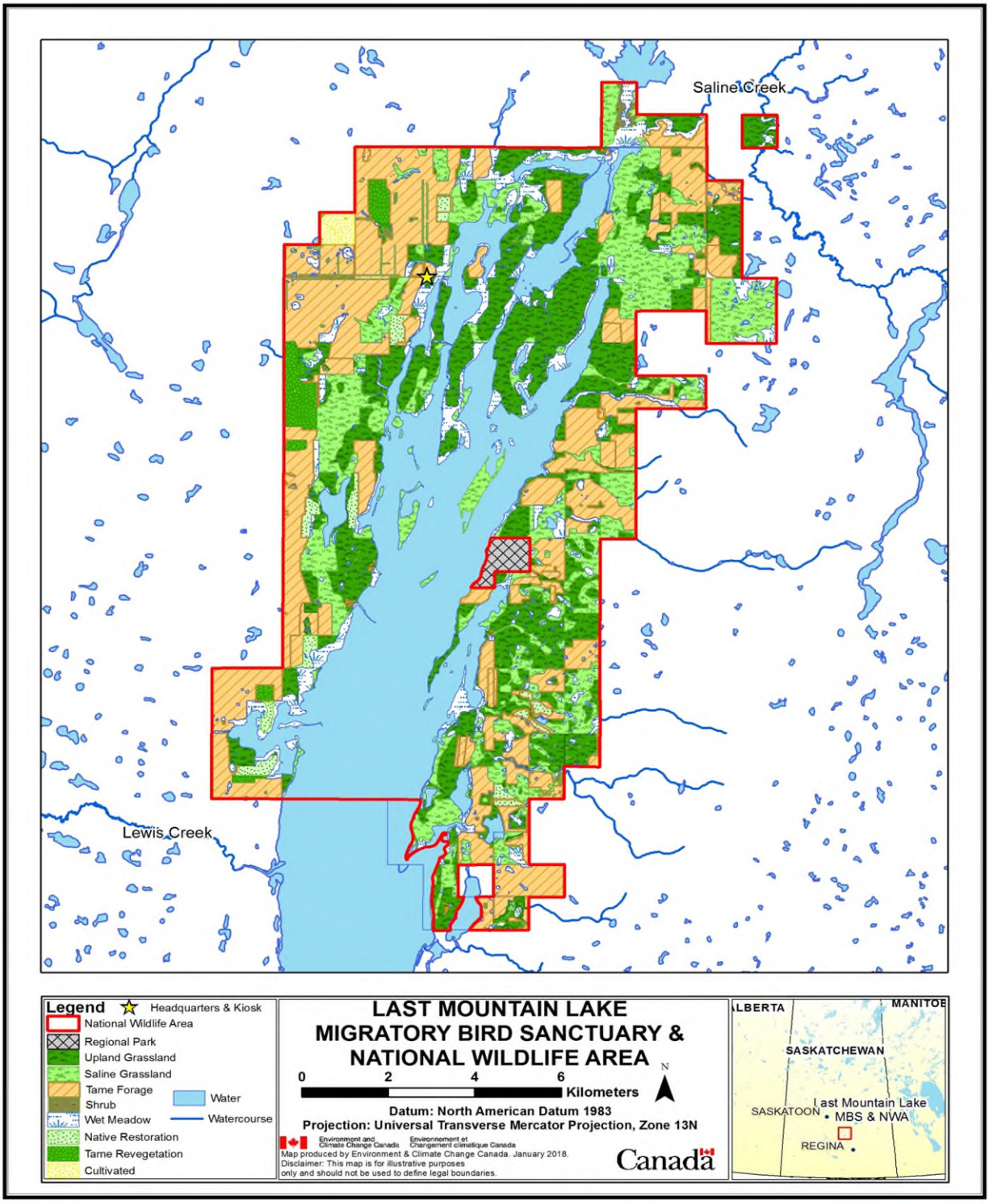

Figure 4: Vegetation cover types at Last Mountain Lake National Wildlife Area and Migratory Bird Sanctuary

A large number of artificial shelterbelts have been planted on the NWA, most of which are the non-native Siberian pea-shrub (*Caragana arborescens)*. Other planted trees include hybrid poplar (*Populus deltoides X P. balsamifera)*, Manitoba maple (*Acer negundo)*, American elm (*Ulmus americana),* white spruce (*Picea glauca)* as well as non-native common lilac (*Syringia vulgaris*), tartarian honeysuckle (*Lonicera tatarica)*, and scotch pine (*Pinus sylvestris)*. Although these long, straight rows of trees are distinctive and can be seen from many kilometers away, in total these cover less than 0.5% of LML NWA & MBS.

2.1.2 Lowland ecosites

Lowland ecosites comprise 3,600 ha or 33% of the remaining land surface, and include a gradient of saline soils that may remain dry for years down through annually inundated wetlands varying from fresh to saline chemistry. Soils consist of dark-brown gleyed chernozems and humic gleysols with a loam to silty texture (Thorpe, 2007). Wetland margins are diverse, in part because these vary from wind and wave prone sandy beaches, to freshwater fens surrounding springs, to organic and clay-rich closed basins, and saline internal drainage basins. Further, much of the plant community composition can change from year to year in response to changing water levels and flow rates (Stewart & Kantrud, 1971).

Drier saline soils are dominated by mat muhly (*Muhlenbergia richardsonis*), desert salt grass (*Distichlis spicata*), Sandberg's bluegrass (*Poa secunda*), slender wheatgrass (*Elymus lanceolatum*), and Nuttall's alkaligrass (*Puccinellia nuttaliana*), and cover just more than 2000 ha. Saline wetlands are dominated by red samphire (*Salicornia rubra*) or bulrush (*Scirpus* spp.) depending upon the water level. As salinity drops the freshwater wetlands become dominated by spike rush (*Eleocharis palustris*), cattail (*Typha latifolia*), Baltic rush (*Juncus balticus*), white top (*Scholochloa festucaceae*), northern and narrow reed grasses (*Calamagrostis inexpansa* and *neglecta*), fowl bluegrass (*Poa palustris*), three-square rush (*Scirpus pungens*), the native variety of common reed grass (*Phragmites australis var. americanus*) and various species of sedge (*Carex* spp.) (Millar, 1976). Invasive alien species like quack grass (*Eltrygia repens*) and perennial sow thistle now dominate up to a third of this vegetation type, usually closest to shorelines of the lake and smaller reservoirs where water-level fluctuations are modified by dams.

2.1.3 Aquatic habitats

Aquatic habitats covering a surface area of 4,300 ha at LML NWA & MBS include the streams, dugouts, deep marshes, and artificial reservoirs created by dams and thus experience both natural and manipulated fluctuations in water quantity and quality (Figure 3). Naturally, the lake level fluctuated by several meters and the basin functioned as an outflow into the Qu'Appelle River system when inflow rates were high, or became an internal drainage basin with no outflow when inflow rates were low and evaporation rates high. A result of these basin characteristics is relatively high pH hard water, but a eutrophic nutrient regime and rich aquatic community. In the 1950s, the Valeport dam was installed at the south end of LML with the intention of stabilizing the lake level. Lake-level stabilization reduced the extensive mudflats at the north end of the Lake that were important to shorebirds. Despite the manipulations there is high productivity of aquatic invertebrates in these wetlands, and water-milfoil (*Myriophyllum* spp.), coontail (*Ceratophyllum demersum*) and pondweed (*Potamogeton* spp.) are conspicuous submergent plants (Millar, 1976).

Lanigan and Saline creek are the major inflow streams into the area. Both creeks are ephemeral with a peak flow in mid-to-late April associated with early spring snowmelt runoff, and the creeks often run dry by mid-summer. In wet years there is sufficient flow of sufficient quality to provide excellent opportunities for populations of creek-spawning fish which migrate from various areas within Last Mountain Lake up into the small creeks at the north end.

2.2 Wildlife Species

2.2.1 Birds

Over 300 species of birds have been seen at Last Mountain Lake NWA/MBS. Major species groups of migratory birds that currently use the NWA include waterfowl, shorebirds, waterbirds, passerines, and raptors. Most significant among those groups are the large migrating flocks of Canada geese (*Branta canadenis*), lesser snow geese (*Chen caerulescens*), white-fronted geese (*Anser albifrons*), and sandhill cranes that arrive in the hundreds of thousands through the month of September. In most years one or a few whooping cranes (*Grus americana*) appear among the flocks of sandhill cranes. Many neotropical migrants also pass through along the 100 km north-south corridor created by LML. Resident flocks of sharptail grouse (*Tympanuchus phasianellus*) use the upland grasslands and may be observed in spring dancing at one of many leks on the site.

Breeding birds number more than 100 species, and include large obvious colonies of American white pelican (*Pelecanus erythrorhynchos*), double-crested cormorant (*Phalacrocorax auritus*), ring-billed gull (*Larus delawarensis*) and California gull (*Larus californius*) on the islands in the lake. The marshes have many conspicuous birds like the noisy and territorial red-winged blackbird (*Agelaius phoeniceus*) and yellow-headed blackbird (*Xanthocephalus xanthocephalus*). Great blue herons (*Ardea herodias*), black-crowned night herons (*Nycticorax nycticorax*), American bittern (*Botaurus lentiginosus*), Franklin's gull (*Leucophaeus pipixcan*), and common tern (*Sterna hirundo*) nest in the marsh vegetation near open water. Virginia (*Rallus limicola*), yellow rail (*Coturnicops noveboracensis*), and sora rails (*Porzana carolina*) skulk in the shallow flooded grasslands and wetlands. Wetlands are also home to innumerable ducks (*Anas* spp., *Aythya* spp.), grebes (*Podiceps* spp., *Aechmophorus* spp.), coots (*Fulica americana*), and shorebirds (Charadriiformes).

Upland grasslands provide habitat for the conspicuous Western meadowlark (*Sturnella neglecta*), and less conspicuous Baird's sparrow (*Ammodramus bairdii*), Sprague's pipit, (*Anthus spragueii*), chestnut-collared longspur (*Calcarius ornatus*), clay-coloured sparrow (*Spizella pallida*), song sparrow (*Melospiza melodia*), bobolink (*Dolichonyx oryzivorus)* and vesper sparrow (*Pooecetes gramineus*). Ground-nesting raptors like northern harrier (*Circus cyaneus*) and short-eared owl (*Asio flammeus*) are naturally common, while tree-nesting raptors like Swainson's hawk (*Buteo swainsoni)*, red-tailed hawk (*Buteo jamaicensis*), and great horned owl (*Bubo virginianus*) became more common as planted shelterbelts have grown and aged. Ferruginous hawk (*Buteo regalis*) have always been present in low numbers, nesting in the few trees available in moist pockets of grassland, and bald eagles (*Haliaeetus leucocephalus*) have recently begun nesting in the tall cottonwoods along the banks of Last Mountain Lake.

2.2.2 Mammals

Typical prairie mammals inhabit the Last Mountain Lake NWA & MBS. Upland soil and vegetation is frequently disturbed by earthen mounds created by northern pocket gophers (*Thomomys talpoides*), while wetland and lowland vegetation is largely impacted by muskrats (*Ondatra zibethicus*) and beavers (*Castor canadensis*). Other mammal species that are abundant and significant predators of birds, eggs, and/or nestlings include red fox (*Vulpes vulpes*), coyote (*Canis latrans*), racoon (*Procyon lotor*), short-tailed weasel (*Mustela erminea*), long-tailed weasel (*Mustela frenata*), least weasel (*Mustela nivalis*), American mink (*Neovision vision*), striped skunk (*Mephitis mephitis*), richarson's ground squirrel (*Urocitellus richardsoni*),

Franklin's ground squirrel (*Spermophilus franklinii*), and thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*). Other prairie mammals that call this place home are: snowshoe hare (*Lepus americanus*), white-tailed jackrabbit (*Lepus townsendii*), silver-haired bat (*Lasionycterus noctivagans*), hoary bat (*Lasiurus cinereus*), porcupine (*Erethizon dorsatum*), and American badger (*Taxidea taxus*).

Many small mammals thrive here, including: masked shrew (*Sorex cinereus*), prairie shrew (*Sorex haydeni*), olive-backed pocket mouse (*Perognathus fasciatus*), deer mouse (*Peromyscus maniculatus*), red-backed vole (*Myodes gapperi*), meadow vole (*Microtus pennsylvanicus*), house mouse (*Mus musculus*), western jumping mouse (*Zapus princeps*), meadow jumping mouse (*Zapus hudsonius*) and northern grasshopper mouse (*Onychomys leucogaster*).

Whitetailed deer (*Odocoileus virginiana*) and mule deer (*Odocoileus hemionus*) are frequently observed resting in tree, shrub, and cattail cover and feeding in grasslands. Elk (*Cervus canadensis*) and moose (*Alces alces*) were present historically, and have recently re-colonized the area after decades of absence. Pronghorn (*Antilocapra americana*) have been in the vicinity continually, persisting in small numbers, but seem to prefer the areas north and west of the LML NWA & MBS. Occasional sightings are reported of cougars (*Puma concolor*), black bears (*Ursus americanus*) and wolves (*Canis lupus*), but they are unconfirmed and relatively uncommon. Plains bison (*Bison bison*), plains grizzly (*Ursus arctos*) and wolves remain extirpated species.

2.2.3 Reptiles and Amphibians

Four amphibians are known to use the wetland and adjacent upland habitats in Last Mountain Lake, including the wood frog (*Rana sylvatica*), boreal chorus frog (*Pseudacris maculata*), Canadian toad (*Bufo hemiophrys*), and tiger salamander (*Ambystoma tigrinum*). Three other amphibians, the plains spadefoot (*Scaphiopus bombifrons*), leopard frog (*Rana pipiens*), and western painted turtle (*Chrysemys picta belli*) are theoretically in the area, but there are no records of their presence despite surveys and many incidental observations. The only reptile known to be present is the plains garter snake (*Thamnophis radix*).

2.2.4 Fish

The large fish present in Last Mountain Lake (Atton and Merkowsky, 1983) include: northern pike (*Esox Lucius)*, walleye (*Sander vitreus*), yellow perch (*Perca flavescens*), burbot (*Lota lota)*, lake whitefish (*Coregonus clupeaformis)*, cisco (*Coregonus artedii)*, white sucker (*Catostomus commersoni*), common carp (*Cyprinus carpio*) and big-mouth buffalo (*Ictiobus cyprinellus*). Northern pike, walleye, and yellow perch are desirable game fish in the summer sport-fishing season. In the winter ice-fishing season, desirable game fish include northern pike, walleye, and yellow perch as well. There is a commercial ice-fishery in Last Mountain Lake, which targets lake whitefish. Bigmouth buffalo is a COSEWIC species of special concern, and is listed on Schedule 1 of the Species at Risk Act as a species of special concern.

Small fish in Last Mountain Lake (Atton and Merkowsky, 1983) include: Fathead minnow (*Pimephales promelas*), emerald shiner (*Notropis atherinoides*), spottail shiner (*Notropis hudsonius*), trout-perch (*Percopsis omiscomaycus*), brook stickleback (*Culea inconstans*), ninespine stickleback (*Pungitius pungitius*), Johnny darter (*Etheostoma nigrum*) and Iowa darter (*Etheostoma exile*). Other small fish are likely present but have not been identified definitively in documents available at this time.

Most fish are target prey species for piscivorous birds and mammals when at the appropriate size for consumption.

2.2.5 Invertebrates

Among invertebrates, several aquatic groups are abundant and important as food sources for wildlife or indicators of environmental change. Groups well-represented at LML NWA/MBS include zooplankton (e.g., *Copepoda*, *Daphnia*), crustaceans (e.g., *Cladocera, Hyalella, o*r *Gammarus* spp.), insect larvae (e.g., *Diptera* spp., *Ephemeroptera* spp., Odonata spp.), or adult beetles (e.g., *Dyticidae* spp., *Chrysolemidae* spp., *Corixidae* spp.) (Euliss *et al.*1999). Purely terrestrial insects include many Lepidoptera, Orthoptera, and Hymenoptera in the grasslands.

2.3 Species at Risk

A number of species at risk have been observed on the Last Mountain Lake NWA & MBS (Table 3). The International Piping Plover Census, conducted every five years since its initiation in 1991, includes LML and some smaller water bodies (Elliot-Smith *et al.*, 2009).

Critical habitat for the piping plover (*Charadrius melodus*) has been listed under the *Species at Risk Act* on the LML NWA & MBS.

Table 3: Species at Risk in in Last Mountain Lake NWA or in the Surrounding Landscape

Common and scientific names of species	Status			Presence or Potential of Presence[4]
	Canada		Saskatchewan	
	SARA[1]	COSEWIC[2]	Provincial ranking[3]	
Insects				
Monarch *(Danaus plexippus)*	Special Concern	Endangered	S2B	Confirmed
Amphibians				
Northern leopard frog (*Lithobates pipiens)*	Special Concern	Special Concern	S3	Potential
Western tiger salamander (*Ambystoma mavortium*)	Special Concern	Special Concern	S4	Confirmed
Fishes				
Big mouth buffalo *(Ictiobus cyprinellus)*	Special Concern	Special Concern	S3	Confirmed
Birds				
Baird's sparrow (Ammodramus bairdii)	Special Concern	Special Concern	S4B	Confirmed
Barn swallow *(Hirundo rustica)*	Threatened	Threatened	S5B, S5M	Confirmed
Bobolink (*Dolichonyx oryzivorus*)	Threatened	Threatened	S4B, S4M	Confirmed
Buff-breasted sandpiper (*Tryngites subruficollis*)	Special Concern	Special Concern	S4M	Confirmed
Burrowing owl (*Athene cunicularia*)	Endangered	Endangered	S2B, S2M	Potential (confirmed nearby)
Canada warbler (*Cardellina canadensis*)	Threatened	Threatened	S4B, S3M	Confirmed
Chestnut-collared longspur (*Calcarius ornatus*)	Threatened	Threatened	S3B	Confirmed
Common nighthawk (*Chordeiles minor*)	Threatened	Special Concern	S4B, S4M	Confirmed
Ferruginous hawk (*Buteo regalis)*	Threatened	Threatened	S3B	Confirmed
Horned grebe (*Podiceps auritus*)	Special Concern	Special Concern	S5B, S5M	Confirmed

Common and scientific names of species	Status			Presence or Potential of Presence[4]
	Canada		Saskatchewan	
	SARA[1]	COSEWIC[2]	Provincial ranking[3]	
Loggerhead shrike (*Lanius ludovicianus excubitorides*)	Threatened	Threatened	S2B, S2M	Confirmed
Peregrine falcon (*Falco peregrinus anatum*)	No Status	No Status	S1B, SNRM	Confirmed
Piping plover (*Charadrius melodus*)	Endangered	Endangered	S3B	Confirmed
Red knot (*Calidris canutus rufa*)	Endangered	Endangered	S2M	Confirmed
Rusty blackbird (*Euphagus carolinus*)	Special Concern	Special Concern	S3B, SUN, S3M	Confirmed
Short-eared owl (*Asio flammeus*)	Special Concern	Special Concern	S3B, S2N, S3M	Confirmed
Sprague's pipit (*Anthus spragueii*)	Threatened	Threatened	S3B, S3M	Confirmed
Western grebe (*Aechmophorus occidentalis*)	Special Concern	Special Concern	S3B, S3M	Confirmed
Whooping crane (*Grus americana*)	Endangered	Endangered	SXB, S1M	Confirmed
Yellow rail (*Coturnicops noveboracensis*)	Special Concern	Special Concern	S3B, S3M	Confirmed
Mammals				
American badger (*Taxidea taxus*)	Special Concern	Special Concern	S3	Confirmed
Northern Myotis Myotis septentrionalis	Endangered	Endangered	S3	Potential
Little brown myotis (*Myotis lucifugus*)	Endangered	Endangered	S4B, S4N	Probable

1. *Species at Risk Act*: Extinct, extirpated, endangered, threatened, special concern, not at risk (assessed and deemed not at risk of extinction) or no status (not rated)
2. Committee on the Status of Endangered Wildlife in Canada
3. Saskatchewan Conservation Data Centre (SKCDC) Provincial S-Ranks: S1 Critically Imperiled, S2 Imperiled, S3 Vulnerable, S4 Apparently Secure, S5 Secure, SU Unrankable, B Breeding Population, M Migrant Population, N Non-breeding Population, X Extirpated (http://www.biodiversity.sk.ca/ranking.htm)
4. Categories are 'confirmed', 'probable', or 'potential'

2.4 Invasive Species

Most invasive vegetation in LML NWA & MBS is comprised of three invasive alien grasses [smooth brome (*Bromus inermis*), quack grass (*Agropyron repens*), and Kentucky bluegrass (*Poa pratensis*)], an alien legume [alfalfa (*Medicago sativa*)], and several invasive alien forbs are widespread: perennial sow thistle (*Sonchus arvensis*), nodding thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), dandelion (*Taraxacum sp.*), and yellow sweet clover (*Melilotus officinalis*). Many other alien weed species are known from isolated occurrences and are actively controlled by hand-picking, spraying, mowing, or bio-controls released in the region.

Among wildlife there are few non-native species like the house sparrow (*Passer domesticus*), rock dove (*Columba livia*), grackle (*Quisculus quiscula*), European starling (*Sturnus vulgaris*), and gray partridge (*Perdix perdix*), as well as mammals such as Norway rat (*Rattus norvegicus*), wild boar (*Sus scrofa*), and newly arrived fox squirrel (*Sciurus niger*) and grey squirrel (*Sciurus caorlinensis*). There have been confirmed sighting of all of these invasive mammals in the LML NWA & MBS, but no known population has been established of any of these species. Common carp (*Cyprinus carpio*) likely have the largest impact on aquatic systems (Weber & Brown, 2009).

Some native North American species like white-tailed deer have also increased their range and become more abundant in the past several decades. Associated with the deer expansion are ticks (*Dermacentor variabilis and D. andersoni*) that were not known in the area prior to the 1980s. Since 2016, the province of Saskatchewan has recorded small numbers of *Ixodes scapularis* (Black-legged ticks), the carrier of Lyme disease; this disease has been contracted by at least 2 individuals within 100km of the LML NWA & MBS.

3.0 MANAGEMENT CHALLENGES & THREATS

The following management challenges and threats affecting LML NWA & MBS were evaluated using the IUCN threat calculator and consideration of on-going operational and policy challenges. In terms of threats, there were 19 of 40 possible IUCN threat categories where an actual or potential threat was posed to the wildlife and habitat. Of those identified only one was high impact, two were medium impact, and five were low impact while the others were negligible (Table 4). This protected area is in moderately good health.

Invasive non-native and alien species continue to be the greatest threat to the health of habitat within the Last Mountain Lake NWA & MBS. Primarily plants, these species are well-adapted to the soil and climate in this area, and have no natural predators, thus they thrive and expand annually. Fire suppression assists these invaders by allowing substantial litter layers to accumulate and maintain cooler moister soil. Returning the natural ecosystem processes of grazing and fire will assist in keeping the native habitat healthy, and carefully timed spot treatment with herbicide may assist in reducing the extent of invasive species. Biocontrols are being developed for some species to reduce the vigour of the invasive plants. Unfortunately these invaders will likely continue to expand and alter the habitat despite our best efforts. Constructed dams and water control berms are a minimal threat, as they are a source of disturbance and invasive species. Agricultural run-off and effluents are a minimal concern, primarily for their effect on the insects both aquatic and terrestrial, as those particular populations are substantial in this area, and also provide food for the many insectivorous species here; birds, small mammals, and other insects.

Table 4: Threats and their relative impact on Last Mountain Lake National Wildlife Area and Migratory Bird Sanctuary, relative to IUCN threat categories and impact scores derived from the IUCN threat calculator (IUCN 2011).

Threat	Impact	Scope	Severity	Timing
1.1 Housing and urban areas	Negligible	Negligible (<1%)	Slight (1-10%)	Moderate (<10 yrs/3 gen)
2.1 Annual and perennial non-timber crops	Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (<10 yrs/3 gen)
2.3 Livestock farming and ranching	Negligible	Large (31-70%)	Negligible (<1%)	High (continuing)
3.2 Mining and quarrying	Negligible	Negligible (<1%)	Extreme (71-100%)	Low (>10 yrs/3 gen)
4.1 Roads and railroads	Negligible	Negligible (<1%)	Moderate (11-30%)	High (continuing)
4.2 Utility and service lines	Negligible	Negligible (<1%)	Slight (1-10%)	Low (>10 yrs/3 gen)
5.1 Hunting and collecting terrestrial animals	Negligible	Negligible (<1%)	Slight (1-10%)	High (continuing)
5.2 Gathering terrestrial plants	Negligible	Negligible (<1%)	Negligible (<1%)	High (continuing)
5.4 Fishing and harvesting aquatic resources	Negligible	Negligible (<1%)	Negligible (<1%)	High (continuing)
6.1 Recreational activities	Negligible	Negligible (<1%)	Negligible (<1%)	Moderate (<10 yrs/3 gen)
7.1 Fire and fire suppression	Medium	Pervasive (71-100%)	Moderate (11-30%)	High (continuing)
7.2 Dams and water management/use	Low	Restricted (11-30%)	Moderate (11-30%)	High (continuing)
8.1 Invasive non-native/alien species	High	Pervasive (71-100%)	Serious (31-70%)	High (continuing)
8.2 Problematic native species	Low	Small (1-10%)	Serious (31-70%)	High (continuing)
9.1 Household sewage and urban waste water	Negligible	Negligible (<1%)	Negligible (<1%)	High (continuing)
9.3 Agricultural and forestry effluents	Medium-Low	Restricted (11-30%)	Serious-Slight (1-70%)	High (continuing)
9.4 Garbage and solid waste	Negligible	Negligible (<1%)	Negligible (<1%)	High (continuing)
11.2 Droughts	Low	Restricted-Small (1-30%)	Moderate-Slight (1-30%)	Moderate (<10 yrs/3 gen)
11.4 Storms and flooding	Low	Restricted-Small (1-30%)	Moderate-Slight (1-30%)	Moderate (<10 yrs/3 gen)

3.1 Alien Invasive Plant Species

Most non-native perennial vegetation in LML NWA & MBS is comprised of three invasive alien grasses (smooth brome, quack grass, and Kentucky bluegrass), an alien legume (alfalfa), and invasive alien weeds are widespread (perennial sow thistle, nodding thistle, Canada thistle, and yellow sweet clover).

The management decision to reseed cropland to tame forage grasses and legumes from the 1960s through the 1980s and to then allow much of that vegetation to go ungrazed for years has been the greatest source of seed for the spread of invasive species observed at LML NWA/MBS. These plants are invading natural areas and reducing plant community diversity, altering vegetation structure for nesting birds, and altering forage supplies and grazing patterns for both livestock and larger wildlife. Eradication is not a feasible option, and management strategies need to specifically address this problem to maintain, enhance, or restore wildlife habitat values.

The unmanaged, or idle, dense nesting cover was a recommended management approach for upland nesting ducks at that time (Arnold *et al*., 2007). Habitat and landscape requirements for waterfowl are not always suitable for other bird species, particularly endemic grassland songbirds, many of which are now species at risk. Perennial cover is still important to grassland songbirds (McMaster & Davis, 2001), but responses to the structure of that cover and the surrounding landscape is what differs between songbirds and ducks (McMaster *et al*., 2005). Some songbird species depend upon grazed native grasslands with shorter cover, and may avoid shrubby or wetland margin habitats (Koper & Schmiegelow, 2006; 2007; Skinner & Clark, 2008).

Restoration and enhancement of this habitat for a broader range of migratory birds requires changes in haying practices to avoid seed transmission of invasive species, expansion of grazing on idle grasslands and areas that have become difficult to manage with haying, spot application of herbicides for isolated weed populations, and interseeding tame pastures with competitive native grasses and forbs to help increase biological diversity.

3.2 Agricultural Effluents

The surrounding watershed at the north end of LML drains nearly 4,000 km^2 of cultivated farmland and grazed ranchlands, as well as sewage lagoons from the towns of Lanigan and

Nokomis. Drainage works continue to be constructed in the larger watershed and facilitate rapid movement of effluent off the fields and into the Lanigan or Saline Creek drainages. Runoff from that drainage contains fertilizers and pesticides, which can cause nutrient loading of wetlands along creeks, but also contamination with residual herbicides, fungicides, and insecticides (Donald *et al.*, 2007). The net effect of these upstream activities is restricted to the wetlands along Lanigan and Saline Creeks, but the severity in the long-term is uncertain.

It is not possible to manage this problem at the scale of the Last Mountain Lake NWA & MBS and instead requires regulatory and land use changes in the surrounding watershed. Monitoring the potential effects on aquatic vegetation, invertebrates, and wildlife productivity would be ideal areas for long-term research (Sugden & Beyersbergen, 1984). Carefully regulating use of the shoreline at LML NWA & MBS is another means of mitigating the effects, by ensuring high biological activity without addition of deleterious substances.

3.3 Fire and Fire Suppression

Wildfires would have frequently occurred in spring (March-May) and again through late summer and fall (August-November) when grassland fuels are mostly dry and cured but not covered by snow. Peninsulas and islands in the north end of the lake are more isolated by water bodies, and likely burned less frequently. Given estimates from the region (Wright and Bailey, 1980), most mainland uplands would have burned every 5 to 25 years while islands and some peninsulas may have remained unburned for 35 to 100 years at a time. Bison were attracted to the green regrowth on recently burned over areas, and the interaction of fire and grazing may have had significant ecological consequences altering structure of the grassland vegetation (Fuhlendorf & Engle, 2001).

Fire is an essential ecosystem process in the moist mixed-grass prairie. Today there are barriers in the surrounding landscape that restrict the spread of wildfires including roads, fences, the modern cattle industry and extensive cultivation and fire suppression. Both the area and frequency of prescribed fires are limited by personnel, weather and location of natural fuel breaks. Fire suppression is a regional phenomenon, and has allowed many woody species to proliferate and invasive alien species to spread (Romo, 2003). In LML NWA & MBS woody plant growth is naturally limited by soils with high salinity and osmotic stress, or soils on sandy gravels too rapidly drained to support shrubs. Away from the lakeshore on surrounding uplands with loamy non-saline soils, woody vegetation growth is enhanced. When combined with long-

term suppression of fire, haying, or grazing, woody vegetation encroachment is a disruption in the natural ecological patterns expected for LML NWA & MBS, reducing grassland vegetation and wildlife dependent upon grassland habitats. Left unmanaged these areas experience a build-up of fine fuels that greatly increases the risk of wildfire spread and severity.

Active management will be necessary to expand the area managed by fire each year, and to carefully judge the appropriate frequency of fire in the long-term to sustain wildlife habitat values for native species and Species at Risk.

3.4 Dams and water management

Off-site control of water flowing into and out of Last Mountain Lake NWA & MBA occurs both upstream on Lanigan Creek, and at the southern outlet of Last Mountain Lake at Valeport (near Craven, SK). These structures were intended to manage water levels and flow rates to benefit of agricultural land users in the Qu'Appelle valley downstream of Last Mountain Lake, recreational users along the shoreline at the southern end of Last Mountain Lake, and livestock producers in need of water during droughts along Lanigan Creek upstream. Five major water control structures occur in LML NWA & MBS. These structures were intended to hold water during droughts to provide waterfowl habitat (Boychuck, 1977), and to permit flooding and draw-downs that create mudflats for shorebird staging habitat (Colwell & Oring, 1988). In this region, natural closed basin wetlands fill early in the year with spring runoff from snow-melt and lose water from evaporation or seepage thereafter, but droughts can leave basins dry for years and wet years can lead to spill-over between basins (Stewart & Kantrud, 1971).

In reality, the regional drought and flood cycle overwhelm all of these structures and reduce their utility. In dry years there is no inflow to fill the basins, and in floods the structures become damaged, raise water tables and soil salinity in surrounding gravelly-sandy uplands, and interfere with fish passage and intermittent spawning events. Much time, money and disturbance are involved maintaining integrity and operability of the structures. All structures must be redeveloped every 30-35 years, which requires repeated access by heavy equipment to excavate, fill, and install works in a protected natural area. The activities necessary to maintain or redevelop the water control structures fall under 6-7 prohibited activities described in Section 3 of the *Wildlife Area Regulations*, and redevelopment would be subject to new, more stringent environmental regulation. Ultimately these structures are being considered for

decommissioning or reconstruction in cooperation with Ducks Unlimited Canada to address these various problems.

3.5 Annual and Perennial Crop Production

Haying occurs for positive reasons in some areas: to create a shorter structure more suitable to grassland nesting birds, to keep grasslands productive by removing litter that would otherwise shade out plant growth, and to reduce fuel loads and risk of wildfire. Haying also has negative consequences by encouraging homogeneous vegetation structural patterns. Negative side effects of haying and use of heavy equipment (tractor and baler, front-end loader and truck/hay trailer) can result in rutting, ponding, fuel spills, and waste material (baling twine, tires). Haying may still continue in the short-term until fencing and water development can be completed to support grazing, and/or resources are made available to expand prescribed fires.

Annual cropping occurs as part of revegetation activities at LML NWA & MBS and involves frequent soil disturbance, herbicide and fertilizer application, and conflicts with wildlife management. Ironically many of the croplands were created by Environment and Climate Change Canada to supply lure crops for waterfowl and reduce nearby crop depredation on private lands, but that is no longer an effective management tool. In the long-term, annual crop production will be phased out as revegetation progresses.

3.6 Problematic Native Species

Muskrats regularly undermine roads and water control structures, leading to costs in staff time and contracts to repair the infrastructure. Pocket gopher populations are high in fields of brome and alfalfa as a result of the succulent roots supplied by that vegetation. Gopher mounds complicate the passage of machinery for haying or weed control and increase costs of operations, or in extreme cases result in fields remaining idle and unmanaged. Conversion of hay fields to grazed pastures would address the problem with pocket gophers and equipment, and removal or repair of water control structures would help alleviate issues with muskrats. Occasionally sick, starving, or injured wildlife such as birds, coyotes, skunks, white-tailed and mule deer, come in close contact with built facilities, workplaces, and sites where the public are invited. Risks of human attacks or disease transmission exist, as do public-relation risks of seeing wildlife in this state without an interpretive context explaining the phenomena may be completely natural. Methods to humanely deal with problem wildlife and explain to the public

require involvement of staff with experience, and access to experts in wildlife health, occupational health and safety, public safety, and communications.

3.7 Droughts, Storms and Flooding

Natural droughts occur on a cyclic basis in this ecosystem. These droughts limit both forage and water supply, and reduce the utility of fire and grazing during severe droughts. It is during droughts when widespread grazing and fire would naturally be most common (Romo, 2003). In modern times, health and safety considerations lead to the opposite pattern. Livestock are removed before they run out of food and water and fire bans are instituted to protect adjacent private property and avoid overwhelming local volunteer fire departments. Active responses to drought include more vigilance in fire prevention, and ensuring livestock have access to a reliable water supply or can be removed quickly if the water source is compromised.

Natural floods also occur on a cyclical basis. Flooding leads to widespread damage of infrastructure (roads and dams), complicates access, and delays some other activities like revegetation and indirectly results in greater weed infestations. Staff and visitors are dependent upon the road network for access. In this low relief landscape, roads may cross several kilometers of low ground and it is prohibitively expensive to engineer those crossings to withstand a 1/100 year flood event like those experienced multiple years in a row between 2007 and 2013. Less infrastructure would alleviate the costs of on-going repairs, but would interfere with public enjoyment of the area, and active management of invasive species, grazing, fire, haying, etc. Long-term plans for reducing staff and public access in the lowest areas of the landscape will be prudent.

3.8 Other Management Challenges

Many activities do not pose ecological threats but still become major management challenges because of the time and resources required to address them by staff. Local people from adjacent farms or cottage developments along the lake often bring forward complaints about weeds, smoke from fire, smells and noise from livestock, flooding and damage to roads or reduced access for fishing and bird watching. Often reactive measures are taken in response to the immediate complaints and contrary to longer-term rationalized plans. More interaction with local municipalities to coordinate and share resources for weed control, fire protection, and road maintenance would help alleviate some challenges.

At the same time ECCC-CWS depends upon local farmers to cut hay and ranchers to bring cattle to LML NWA & MBS for the mutual benefit of managing the grassland vegetation for wildlife and generating economic benefits for the permit-holders. Changes in agricultural practices and markets has made it increasingly difficult to find locals willing to cut hay on some fields, while the smaller cow-calf operations on mixed farms have disappeared and the local community pastures are being divested by Agriculture and Agri-Food Canada. In the near future there may not be local permittees available and interested in cutting enough hay and grazing enough cattle to achieve our desired wildlife habitat goals. In future we may become more dependent upon a fire management program, livestock owner from farther away, or large corporate livestock owners, to effectively manage the vegetation.

Tourists and visitors that have good experiences at LML NWA & MBS help to spread positive messages and social support for the site and the protected area program generally. Staff on-site offer road directions, information and interpretive services to those visitors and help contribute to the positive experience. A few tourists and visitors are responsible for dumping garbage or vandalizing facilities that take time and money to repair or clean up. Some visitors may also harass or cause incidental take of migratory birds in the course of boating, fishing, roadway collisions, and visiting shorelines of islands used by colonial nesting birds. Other visitors become stranded when their vehicle is stuck off-road, on muddy roads, or has run out of fuel, and on-site staff become engaged in roadside assistance with government vehicles and equipment. Less commonly there are visitors suffering dehydration or minor injuries that require first aid assistance. Maintaining emergency first aid readiness and roadside assistance, along with the network of trails, boundary and information signs to help orient visitors and protect people and resources are a necessary and significant investment of time and money.

Increased tourism and visitation is a challenge given the geographic location and amenities offered at LML NWA & MBS. The site is not an overnight destination for tourists owing to the lack of accommodations at the site. The nearby regional park offers camping, but camp sites are almost fully occupied by 300 to 400 seasonal users in the local community. The nearest destination hotel at Manitou Springs is 50 km away, and is where most international or Canadian out-of-province visitors will stay. The local tourism authority estimates 150,000 visitors pass through the Watrous and Manitou Beach area each year, and only 500 to 1,000 of those people come to LML NWA & MBS.

Without nearby overnight accommodations, use will be primarily limited to day trips, which tourism market assessments indicate are most commonly taken by Canadians within a one hour drive on paved roads (Lang Research Inc., 2008a; 2008b). LML NWA & MBS is accessible only by 15 to 25 km of gravel roads before reaching the boundary. The potable water is only available during regular office hours on weekdays. Based on observations by staff, most day-trip visitors are arriving on weekends or local visitors are using the site in the evenings and early mornings for fishing. Communities in the 11 surrounding municipalities and within a one hour drive only support 12,000 people (Statistics Canada, 2011). One has to travel 164 km or approximately two hours to include the cities of Saskatoon and Regina and more than 500,000 people. At present, 90% of self-identifying visitors are from Saskatchewan, and most are from Regina and Saskatoon.

For public use to increase significantly there need to be entrepreneurial and creative efforts made to market the possible activities and experiences, and some strategic investments in amenities to support best visitors when and where they are most likely to visit.

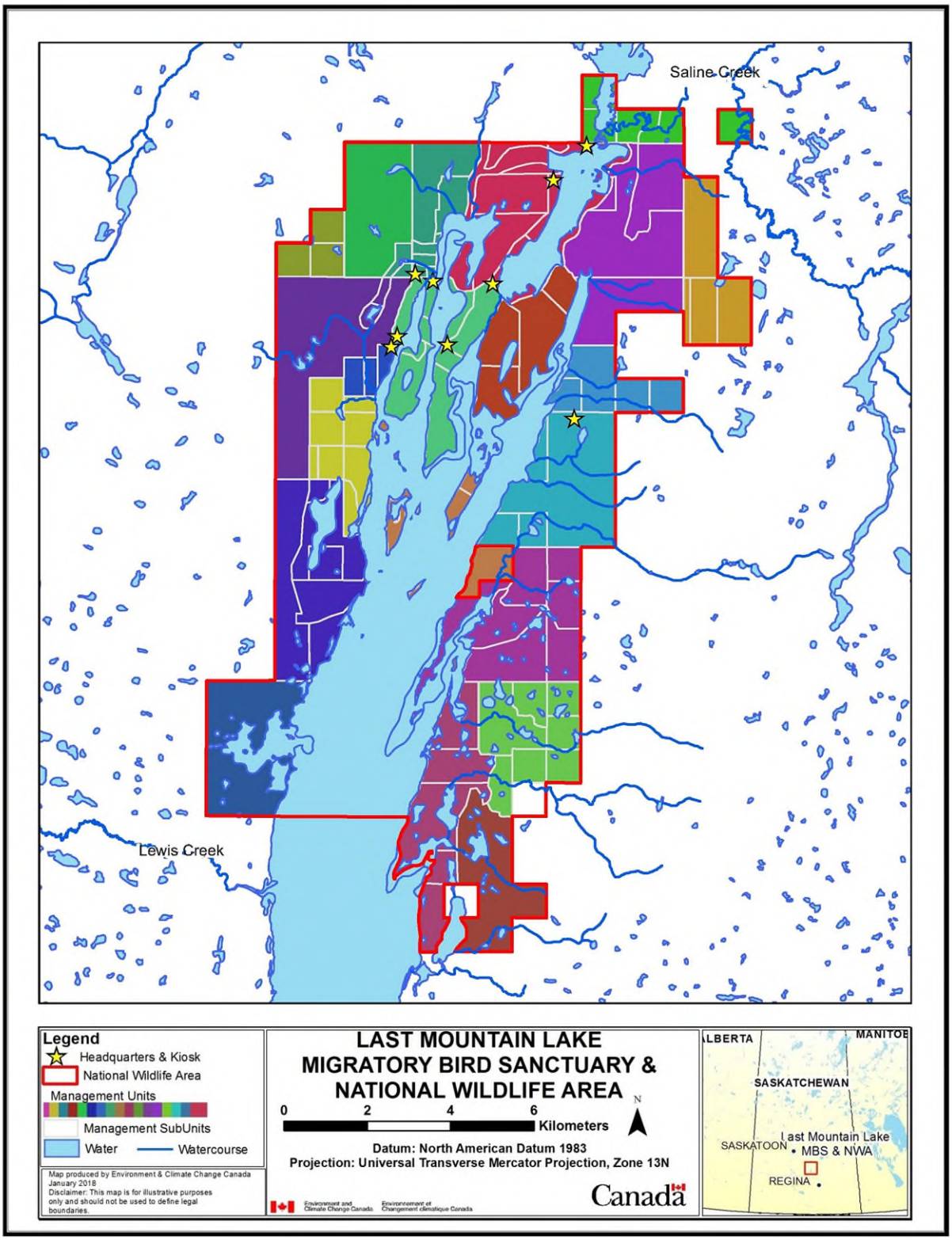

Figure 5: Existing management units within the Last Mountain Lake NWA

4.0 GOALS & OBJECTIVES

4.1 Vision

The vision for Last Mountain Lake NWA and MBS is conservation: the NWA/MBS is a continentally-significant staging area for migratory water birds, and nationally-significant habitat supporting a concentrated diversity and abundance of water birds and upland grassland birds.

4.2 Goals & Objectives

GOAL 1: Restore and enhance upland grassland vegetation at Last Mountain Lake NWA and MBS for migratory bird nesting cover.

Objectives:

(a) Convert the remaining annual croplands to perennial grassland vegetation (by 2022).

(b) Reduce the distribution and abundance of alien invasive plants and noxious weeds (on-going).

(c) Increase the structural and compositional heterogeneity of grasslands with natural disturbance tools (on-going).

(d) Reduce the distribution and abundance of upland woody vegetation with natural disturbance tools (on-going).

GOAL 2: Restore and enhance riparian and wetland habitats at Last Mountain Lake NWA and MBS for aquatic species at risk, and migratory bird staging and nesting habitat.

Objectives:

(a) Restore or maintain open mud-flat habitats for fall-staging water birds (on-going).

(b) Restore fish passage between Lanigan Creek and Last Mountain Lake (by 2021).

(c) Restore up to 255 ha of riparian vegetation along the shores of Lanigan Creek exposed by restoration of fish passage in (b) above (by 2021).

(d) Beaver and muskrat dam building or burrowing activities that interfere with water control structures will not increase over time (on-going).

GOAL 3: Enhance and streamline management activities at Last Mountain Lake NWA and MBS with surrounding lands.

Objectives:

(a) Cooperate with surrounding rural municipalities and adjacent neighbours for integrated weed and fire risk reduction on adjacent road allowances and lands (by 2023).

(b) Cooperate with surrounding resort communities, Last Mountain Regional Park, and the Province of Saskatchewan to reduce recreational boating and fishing conflicts with wildlife conservation at the north end of Last Mountain Lake (by 2024).

(c) Cooperate with Federal and Provincial wildlife enforcement personnel for compliance promotion with respect to Wildlife Area Regulations and Migratory Bird Sanctuary Regulations (on-going).

GOAL 4: Engage Canadians with wildlife and nature interpretation activities at Last Mountain Lake NWA and MBS.

Objectives:

(a) Increase visitor numbers to the site and satisfaction with their experience (by 2022).

(b) Cooperate with local businesses and tourism authorities to market and permit appropriate experiential learning and recreational activities (by 2022).

(b) Cooperate with surrounding resort communities, particularly Last Mountain Regional Park, to increase opportunities for residents to enjoy nature in and around Last Mountain Lake NWA/MBS (by 2022).

(c) Improve infrastructure and information services without increasing long-term maintenance requirements (by 2020).

4.3 Evaluation

Annual monitoring will be performed within the limits imposed by the availability of financial and human resources. The management plan will be reviewed 5 years after its initial approval and reviewed and updated every 10 years thereafter. Evaluation of this management plan will take the form of an annual review of monitoring data obtained from the monitoring and research projects outlined below. Monitoring will be used to establish priorities for action and to allocate resources.

5.0 MANAGEMENT APPROACHES

This section and Table 4 contain a description of all the possible approaches that could be used in the management of LML NWA & MBS, and many happen at a scale that is possible to visualize (Figure 4). However, management actions will be determined during the annual work planning process and will be implemented as human and financial resources allow.

Table 5: Management Approaches for Last Mountain Lake NWA/MBS

Management Challenges & Threats	Goals & Objectives	Management Approaches (actions, including level of priority)[1]
3.1 Alien invasive plant invasions	**Goal 1: Restore and enhance upland grassland vegetation at Last Mountain Lake NWA and MBS for migratory bird nesting cover.** Objectives: (a) Convert the remaining annual croplands to perennial grassland vegetation (by 2022). (b) Reduce the distribution and abundance of alien invasive plants and noxious weeds (on-going). (c) Increase the structural and compositional heterogeneity of grasslands with natural disturbance tools (on-going).	Implementation of natural disturbance processes such as grazing (by livestock) and fire (prescribed) will be used to create healthy grassland more resilient to invasion by weeds (Priority 1). Weed control including chemical and/or mechanical treatment options will be implemented (Priority 1). Seeding and mowing or haying will be used to re-establish healthy native plant population. (Priority 1). Monitoring will be carried out to improve early detection of invasives (Priority 3).
	Goal 3: Enhance and streamline management activities at Last Mountain Lake NWA and MBS with surrounding lands. Objectives: (a) Cooperate with surrounding rural municipalities and adjacent neighbours for integrated weed and fire risk reduction on adjacent road allowances and lands (by 2023)	Multi-agency Management through collaboration with local communities will be attempted to address invasive weeds on neighbouring and surrounding lands (Priority 3).

Management Challenges & Threats	Goals & Objectives	Management Approaches (actions, including level of priority)[1]
3.2 Agricultural effluents	**Goal 2: Restore and enhance riparian and wetland habitats at Last Mountain Lake NWA and MBS for aquatic species at risk, and migratory bird staging and nesting habitat.** Objectives: (b) Restore fish passage between Lanigan Creek and Last Mountain Lake (by 2021) (c) Restore up to 255 ha of riparian vegetation along the shores of Lanigan Creek exposed by restoration of fish passage in (b) above (by 2021)	Decommission water control structure (concrete dam and earthen berm) to restore natural stream flow (Priority 1). Revegetate previously inundated land to restore native species and enhance habitat (Priority 1). Multi-agency Management through collaboration with local communities will be attempted to address invasive weeds on neighbouring and surrounding lands (Priority 3). Enhance water quality protection through proper zoning, physical structures and public information programs (Priority 3).
3.3 Fire and fire suppression	**Goal 1: Restore and enhance upland grassland vegetation at Last Mountain Lake NWA and MBS for migratory bird nesting cover.** Objectives: (c) Increase the structural and compositional heterogeneity of grasslands with natural disturbance tools (on-going). (d) Reduce the distribution and abundance of upland woody vegetation with natural disturbance tool (on-going)	Livestock grazing will be used as a natural disturbance process in order to create healthy and resilient grassland (Priority 1). Prescribed fire will be used as a natural disturbance to restore and maintain planted native grassland (Priority 2). In the locations where grazing and prescribed fire are not

Management Challenges & Threats	Goals & Objectives	Management Approaches (actions, including level of priority)[1]
	Goal 3: Enhance and streamline management activities at Last Mountain Lake NWA and MBS with surrounding lands. Objectives: (a) Cooperate with surrounding rural municipalities and adjacent neighbours for integrated weed and fire risk reduction on adjacent road allowances and lands (by 2023)	possible, seeding and haying/mowing will be used to increase biodiversity and promote native species (Priority 1). Monitoring activities will be conducted to adapt management activities to evaluate effectiveness of weed control methods (Priority 3). Multi-agency Management through collaboration with local communities will be attempted to address invasive weeds on neighbouring and surrounding lands (Priority 3).
3.4 Dams and water management	**Goal 2: Restore and enhance riparian and wetland habitats at Last Mountain Lake NWA and MBS for aquatic species at risk, and migratory bird staging and nesting habitat.** Objectives: (a) Restore or maintain open mud-flat habitats for fall-staging water birds (on-going) (b) Restore fish passage between Lanigan Creek and Last Mountain Lake (by 2021) (c) Restore up to 255 ha of riparian vegetation along the shores of Lanigan Creek exposed by restoration of fish passage in (b) above (by 2021) (d) Beaver and muskrat dam building or burrowing activities that interfere with water control structures will not increase over time (on-going)	Decommission water control structure (concrete dam and earthen berm) to restore natural stream flow (Priority 1). Implementation of natural disturbance processes such as grazing (by livestock) and fire (prescribed) will be used to create healthy grassland more resilient to invasion by weeds (Priority 1). Conduct research on possible mitigation measures (Priority 2). In the locations where grazing and prescribed fire are not possible, seeding and haying/mowing will be used to increase biodiversity and promote native species (Priority 1).

Management Challenges & Threats	Goals & Objectives	Management Approaches (actions, including level of priority)[1]
		Monitor activities to adapt management activities and evaluate effectiveness of water control methods (Priority 3)
3.5 Annual crop production	**Goal 1: Restore and enhance upland grassland vegetation at Last Mountain Lake NWA and MBS for migratory bird nesting cover.** Objectives: (a) Convert the remaining annual croplands to perennial grassland vegetation (by 2022). (b) Reduce the distribution and abundance of alien invasive plants and noxious weeds (on-going).	Revegetate previously cultivated land to restore native species and enhance habitat (Priority 1). Monitor activities to adapt management activities and evaluate effectiveness of weed control methods (Priority 3).
3.6 Problematic native species	**Goal 2: Restore and enhance riparian and wetland habitats at Last Mountain Lake NWA and MBS for aquatic species at risk, and migratory bird staging and nesting habitat.** Objectives: (d) Beaver and muskrat dam building or burrowing activities that interfere with water control structures will not increase over time (on-going)	Wildlife management by human removal will be permitted for population control (Priority 3)

Management Challenges & Threats	Goals & Objectives	Management Approaches (actions, including level of priority)[1]
3.7 Drought, storms, and flooding	**Goal 2: Restore and enhance riparian and wetland habitats at Last Mountain Lake NWA and MBS for aquatic species at risk, and migratory bird staging and nesting habitat.** Objectives: (b) Restore fish passage between Lanigan Creek and Last Mountain Lake (c) Restore up to 255 ha of riparian vegetation along the shores of Lanigan Creek exposed by restoration of fish passage in (b) above (d) Beaver and muskrat dam building or burrowing activities that interfere with water control structures will not increase over time (on-going)	Decommission water control structure (dam) to restore natural stream flow (Priority 1).
	Goal 3: Enhance and streamline management activities at Last Mountain Lake NWA and MBS with surrounding lands. Objectives: (b) Cooperate with surrounding resort communities, Last Mountain Regional Park, and the Province of Saskatchewan to reduce recreational boating and fishing conflicts with wildlife conservation at the north end of Last Mountain Lake (by 2024)	Multi-agency Management through collaboration with local communities will be attempted to address invasive weeds on neighbouring and surrounding lands (Priority 3).
3.8 Engaging and managing the public	**Goal 3: Enhance and streamline management activities at Last Mountain Lake NWA and MBS with surrounding lands.**	

Management Challenges & Threats	Goals & Objectives	Management Approaches (actions, including level of priority)[1]
	Objectives: (b) Cooperate with surrounding rural municipalities and adjacent neighbours for integrated weed and fire risk reduction on adjacent road allowances and lands (c) Cooperate with surrounding resort communities, Last Mountain Regional Park, and the Province of Saskatchewan to reduce recreational boating and fishing conflicts with wildlife conservation at the north end of Last Mountain Lake (on-going)	
	Goal 4: Engage Canadians with wildlife and nature interpretation activities at Last Mountain Lake NWA and MBS. Objectives: (a) Increase visitor numbers to the site and satisfaction with their experience (by 2022). (b) Cooperate with local businesses and tourism authorities to market and permit appropriate experiential learning and recreational activities (by 2022). (c) Cooperate with surrounding resort communities, particularly Last Mountain Regional Park, to increase opportunities for residents to enjoy nature in and around Last Mountain Lake NWA/MBS (by 2022).	Infrastructures and programs will be enhanced to increase public information and outreach (Priority 1)

1. Level of Priority: 1 (from 0 to 3 years); 2 (from 4 to 6 years); 3 (from 7 to 10 years)

5.1 Habitat Management

5.1.1 Upland Habitat Management

Primarily, grazing and fire will be used to create diversity in the structure and composition of the plant community at LML NWA & MBS, thereby improving the wildlife habitat. Greater variety in the structure and composition of perennial upland cover is known to support a greater diversity of species relative to a monoculture or uniform harvest system (Askins *et al.,* 2007; Rotenberry & Wiens, 1980). For example, waterfowl nest density and success appears to increase on landscapes with many small wetlands and a patch-work of idled and managed perennial hay and annual cropland (Arnold *et al.,* 2007). Some species, like northern pintail, may benefit from haying or otherwise managing perennial cover (McMaster *et al.,* 2005). Thus, new management interventions could be used to achieve the goal of improving wildlife habitat.

5.1.2. Revegetation of previously cultivated land

Site preparation and weed control are essential for successful revegetation, and efforts to date at LML NWA & MBS demonstrate the importance of these efforts. A field seeded in fall 1994 and spring 1995 had only received tillage and herbicide treatment in the 1994 growing season prior to seeding. This site preparation was insufficient to eradicate the soil seedbank of some perennial alien invasive species that dominated the site prior to 1994, and the result was widespread reinvasion of these species. Conversely, a lure crop that had been annually cultivated since 1966 was seeded in 2009 with a mixture of 70 native plant species. This long fallow period reduced the number of perennial weeds present in the soil seedbank, such that the community remains very diverse ten years later.

Site preparation involves two steps:

1. Remove alien (in some cases agronomic) and invasive plants from the site, and exhaust the seedbank of perennial alien invasive seeds and noxious annual weed seeds Methods to accomplish this include intensive grazing and periodic mowing, as well as tillage (summer-fallow) and use of herbicide to kill undesired plants (chemical-fallow). In the case of annually cultivated lands, this step has already been achieved through tillage. This step should take at least 3 years.

2. Prepare the soil for planting. Roller-packing after tillage can create a firm seedbed on which seeding equipment operates optimally can travel. In the case of annually

cultivated lands, roller packing may be the only step required prior to seeding (Nernberg 1995, Morgan *et al*, 1995). Where the soil is already firm and compacted, harrowing the soil lightly before planting can create a shallow loose soil layer, and packing after planting can firm up the seedbed and improve the seed-to-soil contact that is absolutely necessary for germination.

Seed mixes will be appropriately designed to the soil (saline clay, sandy, or loamy dark-brown soils), and incorporate information on the seed lots (purity, germinability), optimum seeding or planting methods, competitive abilities, and finally availability of the species. All purchased seed lots are analyzed for purity and viability by a certified seed analyst in a certified seed testing lab. Seeds of grasses and small, smooth forb seeds are best planted with mechanical drills to place the seed beneath the soil surface. Many irregularly-shaped forb seeds are best broadcast onto the surface and then packed or harrowed for optimum germination and establishment. Some species have very fluffy seed that does not pass through seeding equipment (i.e. prairie crocus [*Pulsatilla patens*] or three-flowered avens [*Geum triflorum*]). In some cases, certain species have poor germination or low survival rates for seedlings (i.e. plains rough fescue or western snowberry) such that greenhouse-produced plugs are recommended for planting by hand or with mechanical tree planters. Some rhizomatous grasses can quickly spread and dominate a site if included at high rates in the seed mix, so western wheatgrass (*Pascopyrum smithii*) and northern wheatgrass (*Elymus lanceolatus*) will be included at low proportions to increase diversity of the resulting vegetation.

Sourcing of seed for native prairie restoration is complex. Ultimately, many native species are not commercially available in large quantities needed for restoration, and will arrive in the site via wind or animal dispersal. The genetics of native plant populations are often highly adapted to local conditions – particularly climate and soil type. While achieving a well-established plant community that closely mimics the native grassland nearby is our primary goal, retaining the unique genetic characteristics of the plant populations in this area is a strong secondary goal. Thus our priorities for sourcing seed of native plant species are:

1. Wild-harvested on the Last Mountain Lake NWA.
2. Wild-harvested within the ecoregion (preferably within 500km east-west, and 200km north-south)
3. F1 seed produced in a nursery or cultivated setting
4. Ecovars™ from commercial sources
5. Cultivars from commercial sources

Wild-harvested seed or F1 seed from nursery populations includes commercially unavailable species like western porcupine grass (*Hesperostipa spartea*), nuttall's alkalaigrass (*Puccinellia nuttaliana*), plains rough fescue (*Festuca hallii*), northern reed grass (*Calamagrostis inexpansa*) and narrow reed grass (*Calamagrostis neglecta*), hooker's oat grass (*Helictochloa hookeri*), sedges (*Carex* spp.), sages (*Artemisia* spp.), northern bedstraw (*Galium boreale*), and common chickweed (*Cerastium arvense*). There are only a few native species readily available commercially, primarily: purple prairie clover (*Dalea purpureum*), western wheatgrass (*Pascopyrum smithii*), northern wheatgrass (*Elymus laneolatum*), slender wheatgrass (*Elymus trachycaulus*), Canada wild rye (*Elymus canadensis*) blue grama grass (*Bouteloua gracilis*) and june grass (*Koeleria macrantha*)

There is a strong likelihood of rhizomatous invasion of a new restoration site from adjacent populations of invasive alien grasses like smooth brome and Kentucky bluegrass. To diminish the effect of this, a densely seeded strip of a competitive but non-invasive grass like western wheatgrass (native) or intermediate wheatgrass (*Thinopyrum intermedium*; non-native) will be planted around the periphery of the restoration field.

Seeding in stages may be an effective strategy to deal with the annual and perennial weeds that inevitably appear from the seedbank and compete with the native species planted. One creative strategy involves first seeding a grass mix and allowing both the planted seedlings and volunteer weeds to establish, then applying a broadleaf herbicide in the first growing season to remove perennial invasive forbs. After the residual from that herbicide has disappeared, a mix of native forbs can be seeded into the site. By avoiding seeding all species at once, it leaves open the opportunity to use a broadleaf herbicide to control weeds without also losing the expensive and difficult to source native forbs. Once a competitive grass stand is established the native forbs will establish in bare spots and inter-spaces and increase the diversity of species and structures in the stand.

Post-planting management will begin after seeding, and continue until the restoration is deemed successful and mature. Typically each new restoration is mowed in mid-summer and then late summer for the 2 growing seasons following planting. Spot herbicide application is used as needed on perennial alien invasive plants. Broadcast herbicide application is only used when an even cover of perennial broadleaf weeds has germinated. Once the planted vegetation is thriving and invasive plants are minimal, the restoration will be worked into the overall management of the site, and grazing and prescribed fire will be applied as appropriate. Success

of the restoration can be measured with the Restoration Assessment guide developed at LML NWA (Hecker and Neufeld, 2006) as well as standard range health assessments.

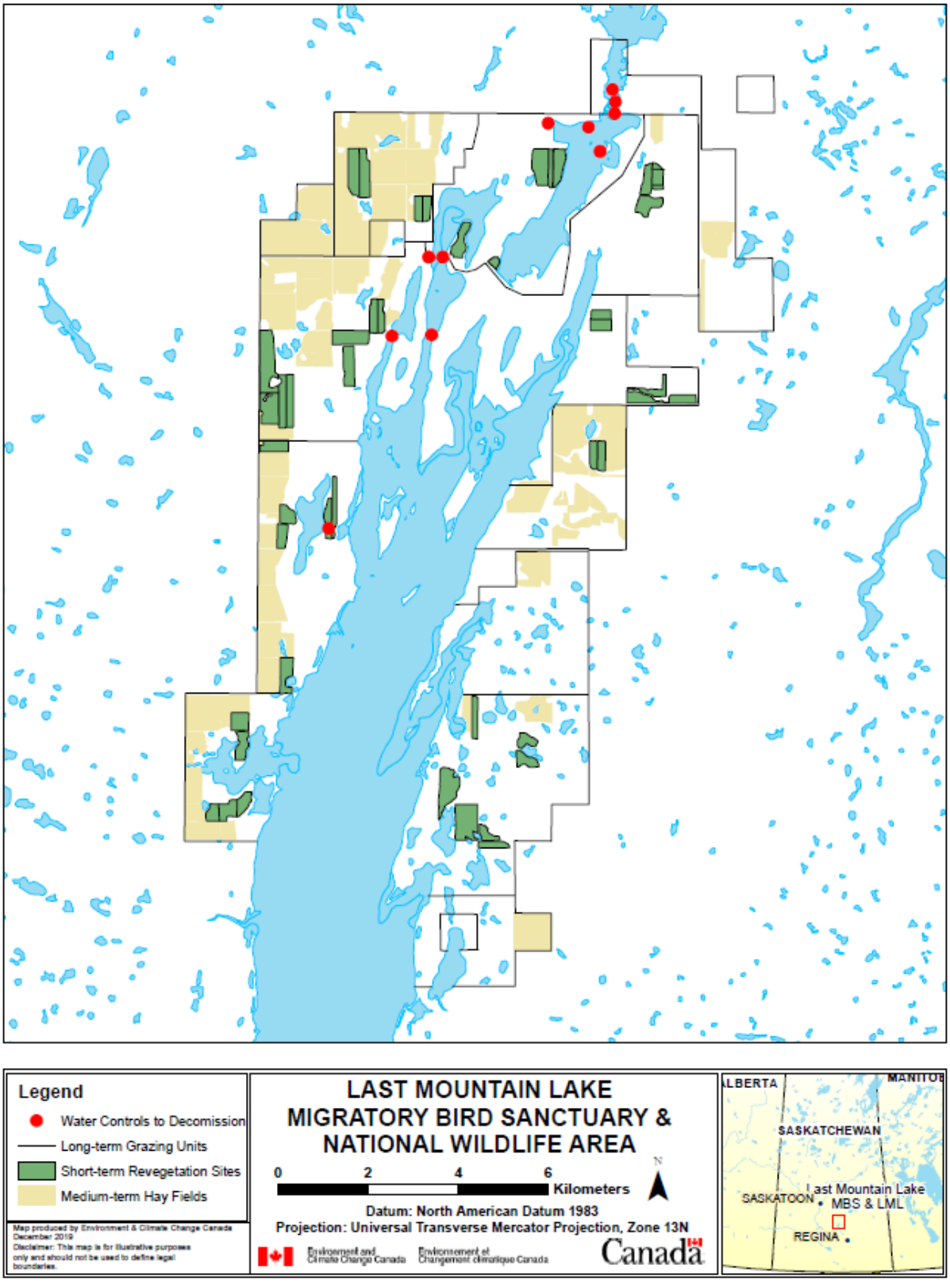

Figure 6: Distribution of proposed management actions at Last Mountain Lake National Wildlife Area and Migratory Bird Sanctuary.

5.1.3 Alien Invasive Plant and Weed Control

Control of new invasive alien species or weeds identified as noxious under the *Saskatchewan Weed Control Act*, will employ chemical formulations and application timing prescribed by licensed pesticide applicators. Control will be done up to 10 meters inside the NWA boundaries to promote compliance with the act above. All application methods will involve hand-held or ATV-mounted equipment to minimize disturbance to surrounding vegetation. Selective spot-spray applications of broad-leaf herbicides with limited residual effects will be used to target patches of the major problem species, like Canada thistle or absinthe (*Artemisia absinthium*). In all cases, no follow-up revegetation actions should be necessary, only monitoring the success of actions, and re-application where first efforts were insufficient.

Early detection and prevention are strategies intended to reduce the time and cost that would otherwise be spent dealing with a problem after-the-fact. Early detection focuses on monitoring all areas where invasions are most likely to occur (i.e. 50 km of roadside edges and 100 km of lakeshores) and areas most sensitive to invasions (i.e. pristine native vegetation). Frequency of monitoring must be high enough to balance the generation time of the most prolific alien invasive species with the relative expected frequency of invasion (i.e. roadside edges most likely invasion sites should be monitored each year, while patches of pristine native vegetation are least likely to be invaded and should be monitored every 5 years). Thus, a list of the actual and potential invasive alien species must be created for the area, and taxonomic expertise in identifying those species is also needed.

Widespread awareness of the problems and how to identify the species among staff and visitors can go a long way towards extending the detection network and preventing invasions all together. Additional efforts to prevent invasions include cleaning vehicles and equipment that frequently go off-road. Seeds of most problem species can be quickly dispersed across the landscape on or in livestock and vehicles. This is why haying equipment or livestock trailers used by permittees should never be allowed directly on native prairie vegetation, and quarantine periods are ideal for livestock before they are released on native prairie vegetation.

Rapid response and eradication are strategies intended to react to the results of detection monitoring. The appropriate chemical herbicides, application equipment, and mechanical tools are available for all potential invasive alien species, and easily moved to any location in the NWA & MBS. The intent of this rapid response to small invasions (one plant to a

few patches of a plant) is to eradicate the problem while it is small, and allow surrounding native vegetation the opportunity to recolonize the treated area. Herbicide or mechanically treated areas are monitored annually for five years after treatment to evaluate the effectiveness of invasive alien species eradication and native species recolonization. Supplemental treatment and potential revegetation may be required in some instances.

Application of natural disturbance regimes like grazing and fire may be sufficient weed treatment in native vegetation where an invasive alien species exists as distinct small patches or as a medium-low density component of the vegetation.

In all cases, regular monitoring and evaluation is needed to judge whether the management activities are having an effect, and whether the activities need to be continued or changed.

An integrated pest management strategy is needed for invasive alien species that already cover a large extent of the area, and are dominant in some locations. An eradication program in this case is not feasible, and long-term measures are required to manage the invasive alien species at population densities and occupancy rates that are least damaging to native biodiversity and the grassland community. Integrated pest management allows for a combination of chemical, mechanical, biological and cultural methods that collectively suppress one or more pest problems. Our integrated pest management strategy will be designed in the next 5 years, and will be informed by weed management principals, protocols, and input from Agriculture and Agri-food Canada (AAFC), and the Canadian Food Inspection Agency (CFIA), along with best management practices for weed management in the Saskatchewan Prairies.

5.1.4 Livestock grazing

Grazing by domestic livestock diversifies the structure of perennial cover at LML NWA & MBS and can limit weeds and woody plant invasions. Thus, grazing is an essential process to maintain the health of native prairie community on LML NWA & MBS and provide more heterogeneity in nesting cover for a greater diversity of birds. Grazing has occurred on the LML NWA and MBS for decades, but is not yet used to manage vegetation over the entire site. Two components of implementing livestock grazing include design of the grazing regime most appropriate for the ecosystem, and then constructing or arranging the infrastructure needed to support that grazing regime. Grazing regimes are described by timing, duration, frequency, and stocking density. Grazing rotations involve the movement of animals from one pasture to another, deferment involves delaying grazing in a pasture until most plants have completed seed production or nesting is completed, and rest involves not grazing a pasture for at least one year (Heitschmidt & Stuth, 1991).

Grazing will represent a range of May 1 to December 31 timing for European-breed cattle, with locations receiving a variable annual frequency and stocking rate, over the whole extent of LML NWA & MBS. For each of saline, sandy and loamy range sites the average annual utilization target will be maximum 50% of median annual forage production. Variation in annual frequency and stocking rate will be manipulated by drought and prescribed fire influences on foraging behaviour over a large extent, rather than cross-fencing and actively moving animals among pasture units of small extent. A specific grazing management strategy must be designed in cooperation with grazing patrons who own the livestock and understand some of the husbandry details like optimum bull: cow ratios, nutritional needs, etc. Ideally, researchers would also be involved to help design a system that provides independent replicates necessary for statistical analyses of monitored grazing impacts.

Drought contingencies are built into the grazing and burning regime recommendations above, and no further accommodation should be required. With conservative livestock utilization targets, forage limitations should not be a factor, although actual utilization is expected to be greater when production is lower during drought. With pasture units of large extent that include access to the lakeshore for water, water limitations should not be a factor, although actual utilization is expected to be spread over a greater extent when production is lower during drought. With a 5 year window for achieving the burn prescription, up to a maximum of 50% of loamy uplands and 20% of sandy and saline peninsulas and islands would be burned-over at

any given time, and should not impose forage or cover limitations for livestock or wildlife that would require modification of the burn plan. Worst-case scenario would be a fuel limitation imposed by increased utilization and extent of livestock grazing that would limit the extent and severity of fire. Continued monitoring of climate, hydrology, primary production, and fuel curing ratios will help evaluate the impact of drought and it's interaction with grazing and burning prescriptions.

Grazing management will require continued use of fences, but the design of those fences (new or re-built) will be wildlife-friendly to facilitate crossing and reduce entanglements.

5.1.5. Prescribed Fire

Fire would have been a common natural disturbance in the region surrounding the north end of LML in both the spring and fall, but islands and peninsulas protected by water would have burned less frequently than surrounding uplands. Prescribed fire regimes will represent a range of spring (March-May) and fall (August-November) timing, with locations receiving a variable frequency, over the whole extent of the NWA & MBS. Fire prescriptions will aim for a fixed area burned over a 5 year period, such that the average fire return interval on the upland grasslands is 10 years; this return interval is consistent with natural fire regimes in this region (Wright & Bailey, 1982). To minimize short-term negative effects on migratory birds, prescribed fire will be restricted to early April before the nesting season begins, or September and October after the nesting season has ended. Good conditions will be taken advantage of to achieve the 5 year area objective in any one or more windows of opportunity.

Prescribed fire units will focus on restoring remnant native grasslands, and maintaining planted native grasslands, in association with livestock grazing. Boundaries of units will include constructed features like trails and ditches, or natural fire guards provided by water bodies, and mowed fire-guards that follow logical landscape edges. These boundary features either offer discontinuities in fuels, ease of equipment access, or are otherwise effective lines for ignition of backfires that will travel slowly. Prescribed fires will not occur where wind speeds exceed 25 km hr^{-1}, to reduce the risk of long-distance ember transport from woody fuels or the risk of fires jumping fire guards (Cheney & Sullivan, 2008). Individual units will be designed to safely manage each fire with existing numbers of appropriately trained staff. Finally, prescribed fires will not occur during periods of fire bans dictated by surrounding municipal or provincial governments. Ideally, researchers would also be involved to help design a system that provides

independent replicates necessary for statistical analyses of monitored fire impacts and their interaction with grazing.

Other procedures, including occupational health and safety training requirements, pre-fire checklists, incident command system, post-fire mop-up, and cooperation with surrounding land owners and municipal fire departments, will be outlined in individual prescribed fire plans.

5.1.6. Haying and Diversification of Tame Grasslands

Much of the previously cultivated cropland purchased to create LML NWA was intentionally seeded to smooth brome and alfalfa as an inexpensive, permanent cover planting in the years 1968-1973 (see Tame forage; Figure 4). Additionally, these fields have been invaded by quack grass (*Agropyron repens*), Kentucky bluegrass (*Poa pratensis*), and sweet clover (*Melilotus officinalis*). There also exist linear shelterbelts of woody vegetation, much of it comprised of the non-native Siberian pea-shrub. To eradicate tame forage and shelterbelts and then revegetate would be very energy-intensive, use large quantities of non-specific herbicide and be expensive with a high risk of failure. A less expensive, lower-risk alternative is managing this vegetation to maximize benefits to biodiversity, migratory birds, and species at risk. Many wildlife species select vegetation based on structure, rather than the native or alien identity of the plants. This structure can be modified through disturbances like grazing, prescribed fire, haying, mowing, or mechanical clearing, and the addition of native species to increase biodiversity within that particular field.

In some locations where protection of infrastructure is key, grazing and firing may not be possible. In those locations haying, mowing, and mechanical clearing may be the optimum vegetation management tool. Many invasive alien plant species gain a competitive advantage by shading-out native species, and disturbances that open the canopy to solar radiation and increase soil temperature may have a positive impact on native plants. In addition, grassland vegetation left unmanaged can lead to fuel build-ups and higher risks of wildfire or invasive weed establishment.

Many native plant species are re-invading stands of tame forage, the most obvious are: coneflower (*Ratibida columnifera*), goldenrods (*Solidago sp.*), asters (*Aster sp.*), golden bean (*Thermopsis rhombifolia*), American wild vetch (*Vicia americana*), pasture sage (*Artemisia frigida*), and western wheatgrass (*Pascopyrum smithii*). Inter-seeding the tame forage fields with a variety of native species could be done deliberately, improving plant diversity and providing

more complex structure for the birds and animals that use the grasslands. These native grasses and forbs could be sown with a drill after prescribed fire or mowing, or broadcast following grazing or haying when bare soil is most likely to be exposed. Seeding would be done at appropriate times: in early spring, in late summer timed with rain, or in late fall for a dormant-season planting.

There is a tremendous opportunity for applied research on the management of tame haylands and shelterbelts for biodiversity and wildlife benefits. Partners could include universities, Parks Canada, PFRA, Saskatchewan Agriculture and Food, Saskatchewan Watershed Authority, Saskatchewan Provincial Parks, Ducks Unlimited Canada, and the Nature Conservancy of Canada. This opportunity should be promoted, and we are actively exploring options that accommodate the interests and capacity of all partner organizations.

5.2 Water and Wetland Habitat Management

Water levels and water quality of Last Mountain Lake proper are outside the control of management approaches that could be taken in LML NWA & MBS. What management within LML NWA & MBS can control is water flows through existing structures (culverts, dams, impoundments), the restoration of natural flow regimes by removing structures, the creation of new water sources (dugouts, wells, wetland creation), and protection of water quality in streams and wetlands by controlling access along shorelines and within watersheds. These activities will be consistent with the *Federal Policy on Wetland Conservation* (Environment Canada, 1991), and are not likely to result in significant adverse environmental effects under the *Canadian Environmental Assessment Act, 2012*. Regulatory matters regarding the removal of water from the canal system are under the control of the Saskatchewan Water Security Agency, which issues licenses to Ducks Unlimited Canada for this purpose.

5.2.1. Water Control Structure Decommissioning and Restoration

The large water control dam with concrete-reinforced walls and radial-arm gate will be removed from Lanigan Creek by 2020. We are actively planning for repair or - more likely - decommissioning of other water control structures such as screw valves and metal gates on culverts in berms spanning the northern bays of LML. Decommissioning will require heavy equipment use and mitigations in line with regulatory guidance.

When the dam on Lanigan Creek is removed, restoration of natural stream flows is assumed. Sedimentation and erosion is a possibility due to exposure of sediment in the unvegetated upstream basin. Active revegetation of the remaining berm, newly contoured uplands, and the exposed basin will follow methods described for uplands. Unique riparian restoration methods along 4-5 km of stream bank shorelines will include mid-summer seeding and a patchy mixture of plugs of emergent wetland species such as Baltic rush (*Juncus balticus*), three-square rush (*Scirpus americanus*), hay sedge (*Carex atherodes*) and prairie bulrush (*Scirpus paludosus*). Seed mixes for broadcast along the 200 ha of former reservoir basin and newly exposed stream channel will include Northern and narrow reed grass (*Calamagrostis inexpansa/neglecta*), slender wheatgrass (*Elymus trachycaulus*), and nuttall's alkaligrass (*Puccinellia nuttalliana*). Some forbs such as povertyweed (*Iva axillaris*) and red samphire (*Salicornia rubra*) may be seeded or planted as plugs. All of these species tolerate fluctuating water levels and salinity and are thus safe investments until the new full supply level of the stream channels are understood.

Smaller impoundments on draws and shallow coulees will likely be left in place to supply strategic surface water sources to help manage grazing of upland vegetation. Where no draws or shallow coulee impoundments exist in large landscapes, wells may be drilled and water troughs installed as a reliable water source for grazers.

5.2.2. Water Quality & Wetland Habitat Protection

A combination of zoning, physical structures, and public information programs will be used to protect water quality for wildlife.

Zoning bays of the north end of Last Mountain Lake for low horsepower motors and low speeds can help reduce boat traffic overall, which will reduce disturbance of wildlife. The environmental benefits of lower speeds include reduced noise for wildlife, reduced incidents of fuel spills into standing water in the shallow bays, reduced wave action and protection of shoreline emergent vegetation, and reduced by-catch of water birds by people fishing. There is also a public safety issue in that the northern bays can be very shallow when the lake draws down, such that grounding or capsizing a boat (or damaging/removing the propeller) is a possibility and a risk that can be avoided. Those bays that regularly draw down to a water depth of <1 meter should be restricted to non-motorized kayak and canoe traffic only. We will work with the Water Security Agency in Saskatchewan to accomplish this.

Agricultural machinery and sprayers working on revegetation projects will stay at least 30 meters away from the water's edge, as required to protect water quality. Those locations cannot be definitively mapped, as shorelines fluctuate substantially with water level fluctuations in this flat landscape. Livestock will in most cases continue to have free access to the shoreline as a water source, and their impacts by pugging, hummocking, selectively removing vegetation can have long-term benefits creating roosting sites for migratory water birds and stimulating dense regrowth of some vegetation. Varying the seasonal access and rest-rotations of livestock will be essential to ensure impacts are varied through time and space and do not become a chronic effect in a single location where water quality problems are likely to increase, rather than be dispersed along the shoreline.

Public access points to the shoreline are limited by road access. As agreed with the province when the LML NWA was created, boat launches at the cottage communities nearby (Last Mountain Regional Park and Etter's Beach, in particular) will be the only developed access to the lake in this area. LML NWA & MBS will not build or develop a boat-launch; given large fluctuations in lake levels and the position of the shoreline it is only prudent. If the public begins to use or create unauthorized boat launches, we will use a number of escalating actions to curb the activity, including: "no boat launch" pictograms and signs, increased vigilance and enforcement activity, and barriers to vehicles at the high-water mark. Ice fishing access on the Huggins Beach road will continue unless the privilege is abused and causes habitat damage. Active revegetation sites near and on the shoreline may be fenced to prevent damage by people and livestock.

Signage with maps, clear symbols about appropriate and permitted use around water, and interpretive information providing the rationale for the restrictions will be essential to gain public support and compliance.

5.3 Wildlife Management

Sport hunting is permitted on the LML NWA & MBS with specific restrictions (see 6.2), as expected to be stated in the 2020 *Canadian Wildlife Area Regulation* and as referenced in the Saskatchewan provincial hunting synopsis, as well as by hunting permits issued by federal (migratory bird permit) and provincial (upland bird and big game) authorities. All federal and provincial wildlife hunting regulations apply to Last Mountain Lake NWA & MBS. Note that no firearms are allowed on the MBS. Special closures may occur for conservation purposes.

Occasional removal of beavers or muskrats will be permitted where those animals are responsible for plugging water control structures, or back-flooding municipal roadways. Humane removal methods of the animal, lodges, and any dams, as well as instituting follow-up prevention methods will follow the direction of a Provincial conservation officer and any applicable Provincial legislation.

Wild boar (*Sus scrofa*) are invasive mammals in Saskatchewan, technically classified as 'exotic wildlife' under provincial legislation. Wild boar have been detected in the vicinity of the Last Mountain Lake National Wildlife Area, including one sighting of two individuals on the NWA in 2009 (confirmed as transient). Because of their love of water sources which help them stay cool in the summer, there is a possibility that these mammals could take up residence within the LML NWA & MBS. Wild boar are omnivores, and will eat the eggs of ground-nesting birds, as well as digging and rooting extensively in search of insects and roots; altering habitat and opening areas to invasion by weeds. They compete with wildlife and can destroy sensitive natural habitats. Staff will be advised how to recognise signs of wild boar activity. Any wild boar sightings reported on the LML NWA will be followed up immediately, and confirmed presence will trigger rapid, coordinated removal of these invasive exotic animals.

Removal of cross-fences that present barriers to wildlife movement, or threats of entanglement, harm, or death will be removed where possible. Grazing management will require continued use of fences, but the design of those fences should be wildlife-friendly to facilitate crossing and reduce entanglements. Ultimately the 216 km of current fencing at LML NWA & MBS could be reduced substantially, which would then benefit wildlife in the long-term.

No other active wildlife population management is anticipated for the next 5 years.

5.4. Multi-Agency Regional Land Management

It is essential for LML NWA & MBS to continue and cooperative relationships with surrounding Rural Municipalities, Towns, the Last Mountain Regional Park, and enforcement personnel from federal and provincial governments.

Where cooperative management is desired, formal memoranda of understanding may be needed to provide a clear purpose, structure to meetings and committees, rules regarding decisions and dispute resolution to ensure clarity and continuity, roles and responsibilities of parties, and the loan or sharing of any equipment or chemicals. In other cases, joint training in

wildfire suppression methods, pesticide applicator certification, and weed identification would help to make more efficient and safe use of resources for those activities. Annual attendance at Rural Municipality council meetings to report upon the activities on-going at LML NWA & MBS is also a chance to share information, address questions, and achieve more trust and understanding between neighbours.

For compliance promotion public meetings, and door-knocking campaigns are necessary to exchange information between the residents of nearby resort communities and the regional park with personnel from Canadian Wildlife Service and federal and provincial enforcement officers. Such events permit opportunities for creative solutions from all parties to address conflicts between recreational activities and wildlife conservation. Any signage on shorelines or floating buoys will have to be jointly agreed upon with the Province of Saskatchewan, as the waterbodies are their jurisdiction.

An increase in interpretive programming, visitor infrastructure and information services aimed at engaging more Canadians with nature will also assist in relationship building with neighbours and partners.

5.5 Monitoring

Effective and efficient monitoring requires careful planning and a coordinated approach. Monitoring will also be carried out in a manner that contributes to meeting species at risk recovery strategy and action plan objectives. As stated previously, all monitoring activities will occur within limits imposed by the financial and human resources available. The following monitoring activities will be conducted at Last Mountain Lake NWA/MBS:

1. Rangeland and riparian (lentic) health assessments and habitat suitability for grassland songbirds, shorebirds, and prairie ducks, particularly Sprague's pipit, piping plover, and northern pintail, where lands and shorelines are burned or grazed by livestock, including before and after measurements with associated control and impact sites (Goal 1.a-d & 2.a). Presence, abundance and species diversity of migratory birds will be monitored with autonomous recording units.
2. Restoration and revegetation success where dams have been decommissioned, cultivated lands re-seeded, and haylands have been overseeded (Goal 1.a-c and 2.b-c).

3. Invasive alien and noxious weed reductions following control methods employed, using cover, area or density measures appropriate to the target weed, in the year controls were applied and the year following (Goal 1.b and 3.a.).
4. Woody vegetation reductions in response to fire treatments, using height and density measures, including before and after measurements with associated control and impact sites (Goal 1.d).
5. Aquatic habitat quality for waterbirds and aquatic species (Goal 2.a-d.).
6. Adherence of permittee(s) and resource users to regulations, permit conditions, and compliance promotion activities (Goal 3.b-c).
7. Visitor numbers and satisfaction with experiences (Goal 4.a-c).

Results of the above monitoring activities will be considered in annual and ongoing management planning for Last Mountain Lake NWA/MBS. Changes to monitoring activities may be made following the five-year review of the management plan and management goals.

5.6 Research

Research activities will be considered for permitting when the results obtained through research have the potential for the following:

1. Addressing one or more of the management goals/objectives (see approaches for specifics);
2. Will not interfere with the conservation of wildlife; and
3. Will not likely cause significant adverse environmental effects.

To obtain a permit to conduct research in Last Mountain Lake NWA/MBS and to receive instructions concerning guidelines for a research proposal, please contact:

Kerry Hecker
Last Mountain Lake NWA/MBS Manager
Environment and Climate Change Canada, Canadian Wildlife Service
Prairie Region
Box 280, Simpson, Saskatchewan, S0G 4M0
kerry.hecker@ec.gc.ca
(306) 836-2022

5.7 Public Information & Outreach

Environment and Climate Change Canada has identified LML NWA & MBS as one of the NWAs that will benefit from funding through the Connecting Canadians to Nature initiative. This initiative is meant to aid in fostering an appreciation for nature in all Canadians with the goal of building a "community of stewards". One of the goals of the Connecting Canadians to Nature initiative is to increase public access to some National Wildlife Areas. Visitation will be managed to ensure that any activities do not interfere with the conservation of wildlife.

The Connecting Canadians to Nature initiative led to a feasibility study and overarching plan for the onsite investments. Based on that Interpretive Plan, investments will be made to support a variety of low-impact public activities to enhance visitor experience. Funding will support:

1. Integrated infrastructure development, including:
    a. Interpretive Pavilion
    b. Picnic Shelter
    c. Wildlife Observation tower
    d. Washroom facilities

2. Develop interpretive programme with new and specialized staff.

3. Increase the outreach to potential visitors, mostly located in urban centers and nearby Regional Parks. The specific audience we want to appeal to are:
    a. People who are not here and won’t come here – through virtual experiences.
    b. Select visitors who are seeking for a high-quality, memorable interaction with nature.

Increase in number of visitors may lead to decrease of quality habitat for the migratory birds and wildlife that live at LML NWA & MBS. Therefore, new activities and infrastructures will be planned in a way to limit impact for wildlife and habitat, while providing the most satisfying experience to visitors.

The objectives of any education and outreach program are for people to come away with a positive experience resulting from a promoted activity that ultimately contributes to the conservation of wildlife or support thereof. Attracting people to a site that is 164 km from the nearest major city or airport will require significant investment in advertising the attractions and

appropriately informing people how to safely get to the destination. On site we will need both information services to make the activities possible, but also attention to public safety in a relatively remote location. Partnerships with urban-based organizations and local business may lead to commercial activities and events that can be permitted on-site for various audiences. Finally, with relatively small numbers of current visitors and on-site staff any increases in visitation and interpretation will need to be planned carefully and phased in.

6.0 AUTHORIZATIONS AND PROHIBITIONS

In the interest of wildlife and their environment, human activities are minimised and controlled in NWAs through the implementation of the *Wildlife Area Regulations*. These regulations set out activities that are prohibited (subsection 3(1)) in the wildlife area and provide mechanisms for the Minister of the Environment to authorize certain activities to take place in NWAs that are otherwise considered prohibited. The regulations also provide the authority for the Minister to prohibit entry into NWAs.

Activities within a NWA are authorized where notices have been posted at the entrance to or along the boundaries of the NWA or when notices have been published in local newspapers. All activities in a NWA are prohibited unless a notice has been posted or published authorizing the activity to take place. However, in addition to notices, certain activities may be authorized by obtaining a permit from the Minister of Environment.

6.1 Prohibition of Entry

Under the *Wildlife Area Regulations*, the Minister may publish a notice in a local newspaper or post notices at the entrance of any wildlife area or on the boundary of any part thereof prohibiting entry to any wildlife area or part thereof. These notices can be posted when the Minister is of the opinion that entry is a public health and safety concern or when entry may disturb wildlife and their habitat.

For LML NWA & MBS, entry is not prohibited. Authorized activities and those activities that will be considered for permitting are described below.

6.2 Authorized Activities

For Last Mountain Lake NWA, notices authorizing the following activities will be available through the provincial hunting and trapping synopsis, via local newspapers, and posted on information signs located along the area boundary.

Authorized Activities without special restrictions:

1. Wildlife Viewing
2. Hiking
3. Swimming
4. Non-commercial berry picking
5. Non-motorized boat launching and boat landing
6. Non-motorized boating
7. Cross country skiing, snowshoeing and skating

Authorized Activities with special restrictions:

1. Operating a vehicle, other than a snowmobile or an all terrain vehicle, on designated roads and trails and in designated parking areas.

2. Sport hunting — including with dogs off-leash when hunting migratory game birds or upland game birds — without a commercial guide, from half an hour before sunrise to half an hour after sunset, if the hunting is carried out;

    (a) in accordance with any applicable federal permit and any authorization required by the laws of Saskatchewan for sport hunting in that province; and
    (b) without the use of toxic shot

3. Non commercial sport fishing in designated areas under and in accordance with any applicable federal permit and any authorization required by the laws of Saskatchewan for sport fishing in that province during the period beginning on May 5 in one year and ending on March 31 in the following year.

Note: If there is a discrepancy between the information presented in this document and the notice, the notice prevails as it is the legal instrument authorising the activity.

6.3 Authorizations

Permits and notices authorizing an activity may be issued only if the Minister is of the opinion that the activity is scientific research relating to wildlife or habitat conservation, or the activity benefits wildlife and their habitats or will contribute to wildlife conservation, or the activity is not inconsistent with the purpose for which the NWA was established and is consistent with the most recent management plan.

The Minister may also add terms and conditions to permits in order to minimize the impact of an activity on wildlife and wildlife habitat.

All requests for permits or authorizations must be made in writing to the following address:

Last Mountain Lake NWA manager c/o
Environment and Climate Change Canada
Canadian Wildlife Service - Prairie Region
Box 280,
Simpson, Saskatchewan, S0G 4M0

For further information, please consult the Policy when Considering Permitting or Authorizing Prohibited Activities in Protected Areas Designated under the *Canada Wildlife Act, 1985* and *Migratory Bird Convention Act, 1994*. This ECCC policy document is available on the Protected Areas website at https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas.html.

6.4 Exceptions

The following activities will be exempt from the requirements for permitting and authorizations under the Canada Wildlife Act and Wildlife Area Regulations:

- Activities related to public safety, health or national security, that are authorized by or under another Act of Parliament or activities that are authorized under the *Health of Animals Act* and the *Plant Protection Act* to protect the health of animals and plants;
- Activities related to routine maintenance of NWAs, to the implementation of management plans, and enforcement activities conducted by an officer or employee of Environment and Climate Change Canada.

6.5 Other Federal and Provincial Authorizations

Depending on the type of activity, other federal or provincial permits or authorizations may be required to undertake an activity in this NWA.

Contact your regional federal and provincial permitting office for more information.

Last Mountain Lake NWA manager c/o
Environment and Climate Change Canada
Canadian Wildlife Service - Prairie Region
Box 280,
Simpson, Saskatchewan, S0G 4M0

And/or

Province of Saskatchewan,
Ministry of Environment
3211 Albert Street,
Regina, Saskatchewan, S4S 5W6.

7.0 HEALTH & SAFETY

Both Phase 1 and Phase 2 environmental site assessments have been completed for LML NWA & MBS (Hemmera Envirochem Inc., 2005; Dillon Consulting Ltd., 2009). The phase 1 study identified thirteen areas of potential environmental concern, 5 of which occur in the headquarters area, 1 at the Lasher residence, and 2 adjacent to the former regional park dump site. Four other abandoned farmyards that were decommissioned in the late 1960s or early 1970s were also included in the areas of concern. The areas of concern around the headquarters are fairly standard ones related to a small landfill, septic field, and fuel storage tanks similar to most farm yards in the Canadian Prairies.

The phase 2 environmental site assessment involved testing groundwater and soil for petroleum hydrocarbons, polycyclic aromatic hydrocarbons, volatile organic compounds, heavy metals, pesticides, and coliforms. Results were either below thresholds for relevant health and safety guidelines, with the exception of high mineral concentrations in drinking water. Those concentrations were no different from regional water quality in other wells. The conclusion was that investigated areas of environmental concern were not a priority for action, and no follow-up remedial measures have been taken.

In the case of environmental emergencies, contact will be made with the Canadian Environmental Emergencies Notification System at the following contacts:

Saskatchewan Ministry of Environment (Spill control)
Telephone: 1-800-667-7525

Saskatchewan Ministry of Environment (Forest Fire)
Telephone: 1-800-667-9660

Saskatchewan Ministry of Environment (Poachers)
Telephone: 1-800-667-7561

All reasonable efforts will be made to protect the health and safety of the public including adequately informing visitors of any known or anticipated hazards or risks. Further, Canadian Wildlife Service staff will take all reasonable and necessary precautions to protect their own health and ensure safety of their co-workers. However, visitors (including researchers and contractors) must make all reasonable efforts to inform themselves of risks and hazards and must be prepared and self-sufficient. Natural areas contain some inherent dangers and proper precautions must be taken by visitors, recognizing that Canadian Wildlife Service staff neither regularly patrol nor offer services for visitor safety in NWAs.

Incidents or emergencies can be reported to:

Last Mountain Lake NWA manager c/o
Environment and Climate Change Canada
Canadian Wildlife Service - Prairie Region
Box 280,
Simpson, Saskatchewan, S0G 4M0

8.0 ENFORCEMENT

The management of NWAs is based on three acts and the regulations thereunder:

- *Migratory Birds Convention Act, 1994,* and *Migratory Birds Regulations;*
- *Canada Wildlife Act* and *Wildlife Area Regulations*;
- *Species at Risk Act*.

To promote compliance with the *Canada Wildlife Act* and *Wildlife Area Regulations*, Environment and Climate Change Canada's Canadian Wildlife Service posts signs along the NWA boundaries and at main access points that identify which activities are authorized within each NWA and any conditions on those activities.

Environment and Climate Change Canada's Wildlife Enforcement Division (ECCC–WED) is responsible for enforcement of federal and provincial wildlife laws, and will perform on-site inspections and investigations, patrol the NWA to promote compliance, and prevent prohibited uses within the NWA.

ECCC–WED officers monitor compliance with the *Canada Wildlife Act*, *Wildlife Area Regulations*, *Migratory Birds Convention Act, 1994*, *Species at Risk Act*, *Fisheries Act* and the provincial *Wildlife Act, 1989* on an ongoing basis and will initiate investigations when required. ECCC–WED officers will respond to violations and take appropriate enforcement actions. Environment and Climate Change Canada enforcement officers in Saskatoon are provided a list of permits which have been issued for agricultural or research activities each year. This list helps them plan their work with responses to complaints or regular inspections of properties. Canadian Wildlife Service staff provides details from site inspections that may require investigation.

No cooperative agreements for enforcement and surveillance have been developed with other competent authorities, such as other government departments and agencies (Royal Canadian Mounted Police, National Defence, etc.), provinces and territories, or any local or municipal authorities.

9.0 PLAN IMPLEMENTATION

The management plan will be implemented over a 10-year period. Annual work plans will be developed in accordance with priorities and budgets and the details of management plan implementation will be developed through Environment and Climate Change Canada's annual work planning process and will be implemented as human and financial resources allow. An adaptive management approach will be favoured for the implementation of the management plan. The implementation of the plan will be evaluated five years after its publication, on the basis of the actions identified in Table 5.

The framework by which Last Mountain Lake NWA/MBS is managed is clearly delineated by the *Canada Wildlife Act*. Close liaison between government agencies and non-government wildlife organisations is essential for effective long-term management of the NWA and its surrounding environment. Topics of mutual interest to the federal and provincial governments include management of game and nongame wildlife, species at risk, recreation, and production of special publications relevant to the NWA/MBS.

Table 6: Implementation Strategy Timeline

Activity	2020	2021	2022	2023	2024	2025	2026
Inspect and maintain fence lines to contain livestock and to detect new invasive species, issue permits for grazing and control invasive weeds.	x	x	x	x	x	x	x
Process permits annually for haying to manage upland vegetation for weeds, fuel loads, and wildlife habitat.	x	x	x	x	x	x	x
Revegetate cultivated lands for wildlife habitat, ensure adequate biodiversity.	x	x	x	x			
Implement all infrastructure development and interpretive programming arising from the Connecting Canadians to Nature initiative to engage Canadians with nature	x	x	x	x	x	x	x
Decommission the Lanigan Creek dam and begin revegetation and restoration.	x	x					
Implement prescribed fires on 25% of the property	x	x	x	x	x	x	x
Research the effectiveness of restoration and mitigations	x		x		x		x
Implement a monitoring program for management approaches to evaluate their effectiveness		x	x	x	x	x	x
Create and support multi-agency land management partnerships for wildfire control and weed management		x	x	x	x	x	x
Remove unnecessary cross-fences that interfere with grazing management and wildlife movement and safety				x	x	x	x

9.1 Management Authorities & Mandates

Environment and Climate Change Canada - Canadian Wildlife Service: Biological inventories and surveys, habitat and land use management, permits and licensing, public information and outreach, site maintenance (e.g., fences), boundary and information signs.

Environment and Climate Change Canada - Wildlife Enforcement Division: enforcement of Migratory Birds Convention Act and Sanctuary Regulations, Wildlife Area Regulations, and Species at Risk Act.

Province of Saskatchewan: permits and licenses for game hunting, trapping, fishing, and disturbance to the beds of creeks and lakes below the high water mark.

Ducks Unlimited Canada: Murfitt, Alfred, Simpson, Watertown, Davis, Shields, and Last Mountain Lake Projects and associated wetlands – water level manipulation, construction and maintenance of water control structures (dykes and ditches).

9.2 Management Plan Review

Management plans will be reviewed 5 years after initial acceptance and every 10 years after that. Although the Environment and Climate Change Canada is solely responsible for management of LML NWA & MBS, public consultation with DUC, the Province of Saskatchewan, neighbouring First Nations, special interest groups, and concerned individuals will be held, where possible, on topics related to conservation of habitat and wildlife on LML NWA & MBS. Submissions for plan revision will be invited at that time.

10.0 COLLABORATORS

Formal collaboration on matters of management authorities and mandates will continue with the Wildlife Enforcement Division, Province of Saskatchewan, and Ducks Unlimited Canada.

Collaboration with local agencies and sector organizations to contribute to the protection and conservation of wildlife species and their habitats in the NWA will be favoured. For instance, collaborations could be developed or pursued with universities and research centres to fill scientific knowledge gaps, with the province to implement species at risk recovery measures, particularly for species under provincial jurisdiction, with non-governmental organizations and municipal authorities to increase public awareness of the objectives of the NWA & MBS. The main organizations likely to collaborate or to have a stake in the management of LML NWA & MBS include:

- Saskatchewan Ministry of the Environment
- Nature Saskatchewan
- Saskatchewan Wildlife Federation (provincial and local)
- Ducks Unlimited Canada

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