



# MANITOBA MODEL FOREST: CONSERVING BIODIVERSITY THROUGH STAKEHOLDER ENGAGEMENT & USE OF SCIENCE & TECHNOLOGY

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## Summary

*Moose are an important wildlife species in eastern Manitoba. They are of significant cultural importance to Indigenous peoples, provide for recreational hunting opportunities, and are the subject of activities such as photography and eco-tourism. Moose are an important component of the overall biodiversity found in the boreal forest, including as a food source for predators such as wolves and black bear and are part of a complex food web that includes other species such as white-tailed deer and woodland caribou. Moose are the largest mammal in the boreal forest (weighing up to 600 kg) and the largest member of the deer family.*

*Manitoba Model Forest (MBMF) is currently leading an effort to reverse the decline in the moose population within its territory, which had dropped from about 2,400 moose in the year 2000, to only 800 moose by 2010. The factors responsible for the decline are numerous, complex and interrelated. Observations by trappers, wildlife managers, hunters and others indicated that the wolf population in the Manitoba Model Forest (MBMF) area had increased dramatically, particularly in the last 10 or more years, negatively impacting moose populations. Other factors are also likely responsible for moose population decline.*

*Through an interdisciplinary, multi-stakeholder approach to landscape level natural resource management, the moose population is slowly recovering, directly contributing to Canada's national and international targets for forest and biodiversity conservation and other commitments.*

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## Description of the area

MBMF encompasses approximately 1 million hectares in eastern Manitoba (Figure 1). The majority of the MBMF territory is covered by boreal forest, one of the largest forest biomes in the world. A smaller part of the area includes agricultural land, much of which was formerly forested. The MBMF area has a small population relative to its size, with approximately 15,000 people residing there.

Starting in the 1920s and 30s, the main economic driver in the area was forestry, specifically the harvesting of spruce and pine taken from local lands being cleared for agriculture for the production of newsprint. In 2009, the newsprint mill closed. Today, the economy in MBMF is focused on agriculture, tourism and the generation of hydroelectricity. Traditional activities of hunting, fishing and trapping continue to be practiced by Indigenous peoples. In addition to industrial and recreational use of the forest, MBMF also contains several provincial parks, which contribute to the province's network of protected areas.

Biodiversity is rich in MBMF with several hundred species of birds, fish, amphibians and mammals. Despite its proximity to Manitoba's capital city (120 km to Winnipeg, population of about 800,000), MBMF remains an unspoiled oasis. Larger mammals in the MBMF area include black bear (*Ursus americanus*), wolf (*Canis lupus*), moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*). Moose are a highly sought and valued by both Indigenous subsistence hunters and licenced (non-Indigenous) hunters. The MBMF is also home to the most southern range of woodland caribou (*Rangifer tarandus caribou*) in western Canada, a protected species designated as Threatened under Canada's Species at Risk Act.



Figure 1

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## About Manitoba Model Forest

Manitoba Model Forest (Inc.) was established as a non-profit, non-governmental organization (NGO) in 1992 and was one of the original Model Forests established under Canada's Model Forest Program. MBMF is managed by a large and diverse Board of Directors, reflective of the varied interests in the area. The Board includes representatives from towns, municipalities, Indigenous communities, industry, NGOs, universities and the Government of Manitoba.

The mandate of MBMF includes conducting ecological, social and economic research on all aspects of the boreal forest and using

that knowledge to develop innovative and novel approaches to natural resource management. The Model Forest also develops and administers forest education programs for students, and creates provincially-accredited natural resource curricula for schools. Finally, the MBMF works with communities to identify economic opportunities from the forest. The MBMF has also worked with other Model Forests on projects in Canada, Chile, Costa Rica, Mexico and Indonesia.

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## Key biodiversity issue being addressed

Moose require a mixture of habitats of a variety of ages, which provide both protection and food, and their habitat requirements can overlap with those of other species such as deer and caribou. Forest harvesting creates important young habitat for moose, but the resulting network of access roads and trails from forestry operations and mining exploration activities can also create challenges for wildlife management as they provide easier access by hunters into formerly remote areas (where the moose are), and can facilitate the movement of other species such as wolves and deer into moose areas.

The MBMF is currently leading an effort to reverse a dramatic population decline in the moose population in Game Hunting Area (GHA) 26, which makes up a significant portion of the Model Forest land base. The moose population has declined from approximately 2,400 in the year 2000, to only 800 by 2010 (Figure 2). MBMF,

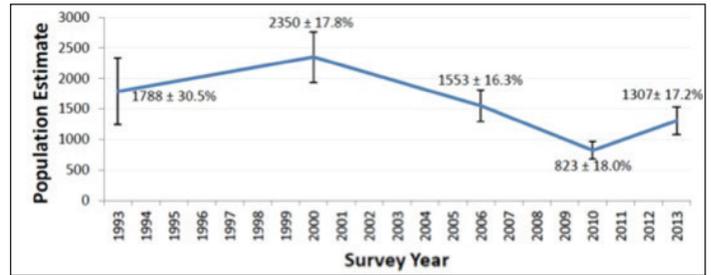


Figure 2

and in particular, the MBMF Committee for Cooperative Moose Management (CCMM), have worked closely with the Manitoba government to research and understand the causes of the decline, and to develop solutions with a range of partners.

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## Manitoba Model Forest Committee for Cooperative Moose Management (CCMM)

The CCMM was established in 1995 as a multi-stakeholder committee of the Manitoba Model Forest to promote the conservation, recovery and sustainability of eastern Manitoba moose populations. Its purpose is “to provide a forum for people with a common interest in moose conservation to share information and ideas, participate in management projects and activities, and develop cooperative recommendations to Manitoba Conservation and Water Stewardship (MCWS), for the conservation and management of moose in eastern Manitoba, including advice and recommendations on moose recovery strategies and action plans”. MCWS is the government agency responsible for managing the province’s wildlife resource.

The CCMM operates under a set of core principles designed to foster inclusive stakeholder participation, including (*inter alia*): recognizing and maintaining all traditional, cultural, social and

ecological values associated with moose; recognizing and respecting Indigenous and treaty rights and responsibilities; consideration for economic stakeholders; open and transparent communications, and; integrating western science with local and traditional ecological knowledge. Membership ranges from Indigenous communities to hunting/trapping associations, to hydro-electric companies, government representatives, conservation groups and forest industry.

The role of the CCMM in reversing the precipitous decline in the moose population in GHA 26 has been to 1) conduct research and monitoring to understand the factors responsible for the population decline, and 2) develop and facilitate the implementation solutions collaboratively with the Government of Manitoba. This is done through active participation of individuals and organizations that are members of the CCMM facilitated through the Model Forest.

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## Factors related to moose population decline

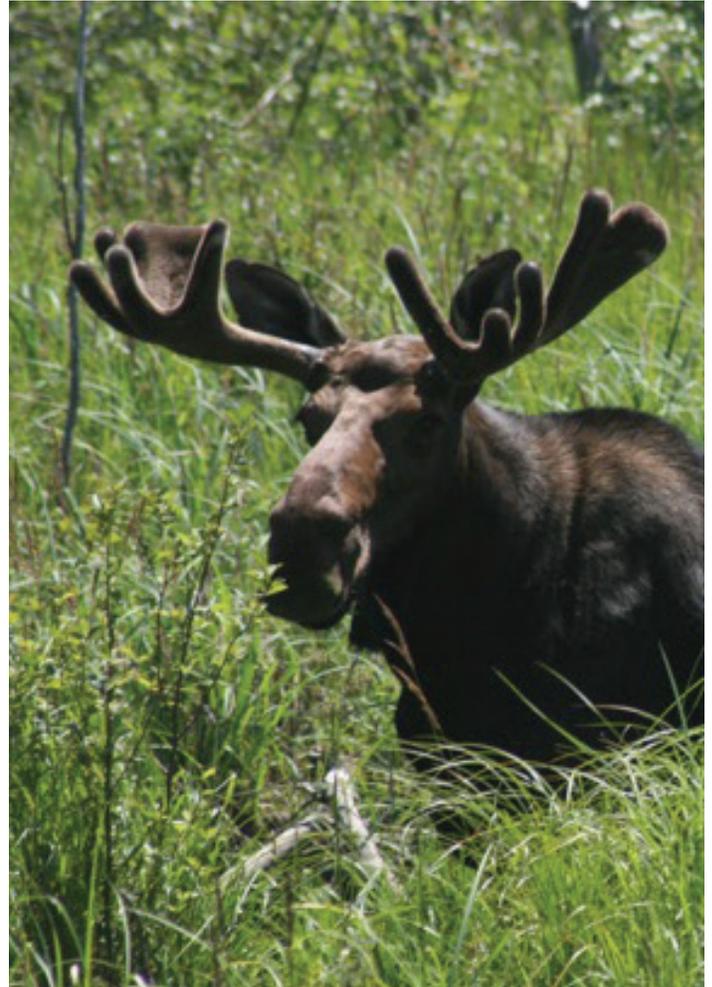
Factors such as predation, hunting, road access, and parasites and disease can have direct or indirect effects on the moose population. In addition, other factors such as habitat, climate and severe weather events can play a fundamental role in determining the capability of an area to support moose.

The main source of predation on moose in GHA 26 is wolves. Local observations, Aboriginal Traditional Knowledge and aerial surveys conducted by the CCMM indicate that the wolf population has increased over at least the last decade, and the population is sufficiently high in GHA 26 to negatively impact the moose population.

As wolves feed opportunistically, the presence of alternative prey species in an area can also influence the overall predation rate on moose. The relatively new appearance of white-tailed deer in GHA 26 is likely supporting the growth of the wolf population, particularly in the southern portion. Wolves also prey opportunistically on boreal woodland caribou, which are also found in GHA 26.

The CCMM has undertaken several landscape-level research and monitoring studies to understand the population distribution of wolves, moose and deer in the area. While moose were historically distributed throughout GHA 26, based on a combination of local observation and GPS data, researchers found an almost complete absence of moose in the southern part of area from 2010 and onward. This change may be a result of the increased deer population, which in turn increased and sustained the wolf population reducing the moose population in the south. The introduction of the brainworm parasite by deer and its fatal effects on moose may also be a contributing factor.

Researchers also examined the role of corridors (roads, trails, etc.) in the interaction and distribution of wolves and moose in the northern portion of GHA 26 using a global positioning system (GPS) collar on wolves – the first time the technology was used on wolves in Manitoba. Using a combination of the GPS data from the collared wolves, aerial survey data as well as track surveys, the study was able to clearly demonstrate spatial overlap of wolves with moose in the northern portion of GHA 26, negatively impacting moose populations there.



The advances in GPS collar technology and capabilities have also allowed researchers to study, in detail, seasonal habitat use, movements, home ranges and other attributes of animal behaviour (e.g., predation) of various wildlife species, such as moose. This has provided data that would otherwise be difficult to obtain through traditional field studies. When the GPS moose location data is combined with other spatial data (e.g., land cover, roads and trails, water bodies, industrial activities such as forestry and mining), it can provide a powerful landscape scale tool to understand how moose travel, use various habitats, and respond to human activities.

## Action taken

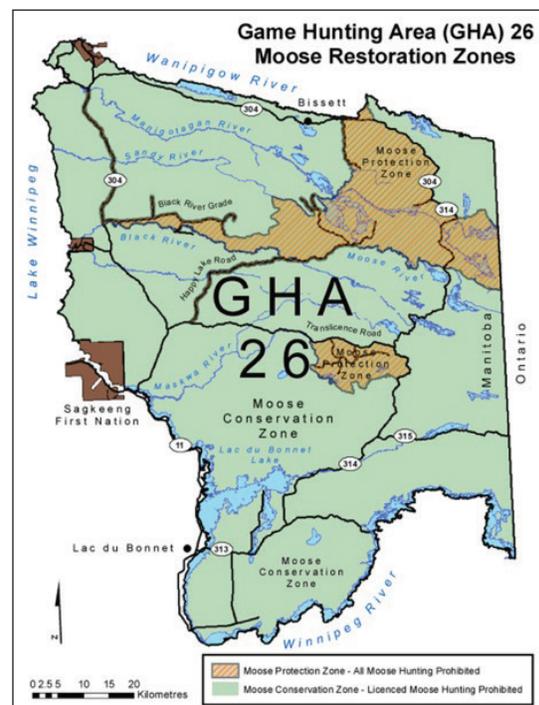
In order to halt and reverse the decline in moose, the Government of Manitoba developed an incentive program (which ran from 2010-2015) for local trappers to increase their harvest of wolves with the goal of reducing, but not eliminating, the wolf population in GHA 26. Incentives to trappers included trapping workshops, provision of equipment and financial incentives. However, based on the number of wolves trapped through the program, information from wolf aerial surveys conducted by the CCMM, track studies, and other sources, the wolf population in GHA 26 was considered as having remained high enough to have the ability to significantly impact ungulate populations (such as moose) through predation<sup>1</sup>. A continued high density of wolves in GHA 26 could prevent or slow the recovery of the moose populations or reduce them to a level low enough that moose would become extirpated from the GHA. Additional work was needed.

Complementary initiatives have been developed by the CCMM partnership and implemented by the Government of Manitoba to reduce the deer population in GHA 26, such as increasing the number of deer hunting licenses an individual may hold, as well as extending the length of the fall deer hunting season. As a result, local observers report that the deer population in GHA 26 has declined over the last few years.

In addition, the brainworm parasite is a nematode worm that is carried by deer (but does not affect the deer) that can be transferred to moose, in which it is fatal. In 2012, the CCMM and provincial government began a brainworm monitoring study in GHA 26 in an effort to document levels and distribution of infection in white-tailed deer, as well as how it might be affecting moose in the area. Indeed, high levels of infection were found in GHA 26 deer. Therefore, the deer reduction strategy was designed not only decrease the main

prey of wolves and therefore limit the wolf population, but also to diminish the transmission of brainworm to moose.

Finally, there are a significant number of access roads and trails in GHA 26, particularly forestry roads. Upon recommendation from the CCMM, and in partnership with local Indigenous communities, the province carried out road decommissioning work to restrict truck access, reduce ATV traffic and reduce hunting pressure on moose, especially during the vulnerable mating period<sup>2</sup>. In addition, perhaps one of the most visible and successful positive effects (on the moose population) of the activities of the CCMM and its partners has been the temporary moose hunting ban in GHA 26<sup>3</sup>.



- 1 On an annual basis, the proportion of wolves harvested under the trapper incentive program varied from approximately 10% to 50%. The wolf population estimate of approximately 120 individuals (range of 106 to 136) for GHA 26 represents a density of 15 to 19 wolves per 1,000 km<sup>2</sup>. This is considered to be a very high density. To put this in perspective, wildlife managers suggest that wolf densities in excess of 10 wolves per 1,000 km<sup>2</sup> have the ability to significantly impact ungulate populations through predation.
- 2 Decommissioning activities included removal of culverts and bridges, digging of trenches (i.e., ripping up sections of the road) and building of berms at strategic locations on roads, as well as placing barricades on roads at river crossings
- 3 The moose hunting closure in GHA 26 was implemented in 2 phases. In 2010, the entire area of GHA 26 was closed to licensed hunting. Hunting by rights-based hunters (Indigenous peoples) was allowed to continue throughout GHA 26 as formal government-to-government consultations occurred. Following these consultations, a conservation closure was also implemented, which prohibited hunting to rights-based hunters in certain areas, termed Moose Protection Zones. The closure to rights-based hunting of moose was initiated in January 2012. The total area of closure to moose hunting of rights-based hunters represents approximately 12% of GHA 26. These Moose Protection Zones represent areas in the GHA that still contained higher moose densities, younger regenerating forests (that provide high value habitat for moose) or areas where moose are particularly vulnerable to hunting (e.g., major roads). The remainder of GHA 26 (88% of the area, and termed Moose Conservation Zones, Figure 6) remains open to rights-based hunting for moose. Even though rights-based hunters are allowed to harvest moose in the Moose Conservation Zones, many have chosen not to, allowing the moose population to potentially recover even more quickly. This conservation ethic is to be applauded and demonstrates the value of such collaborative efforts towards the conservation of moose in the region.

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## Positive impacts of CCMM actions – Signs of recovery of the moose population

It is evident from the discussions in the previous sections that multiple research, monitoring and management actions have been underway for many years to understand the moose population in GHA 26, to determine the causes of the recent decline in the moose population and to not only halt that declining trend, but to reverse it. Credit must be given to the wide diversity of partners of the CCMM, who have worked tirelessly to ensure a sustainable moose population in GHA 26 and beyond. These collective efforts appear to be paying off. Following a 65% decline in moose population between the years 2000 and 2010, and after the initiation of diverse management actions, the moose population has grown to just over

1300 individuals by 2013, representing an increase of 60% from its population low in 2010.

In addition, improvements in other population indices (ratio of calves to cows, bulls to cows) also demonstrate that the moose population is beginning to recover. It will be important to see if these positive trends continue. An aerial survey for moose in GHA 26 was conducted in February 2016 in order to determine a new population estimate. The results are currently being tabulated. The CCMM and its partners are confident that the trend will continue to be positive.

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## Next steps

The Model Forest, through the CCMM, is currently developing a status report on the moose population in GHA 26 and a summary of all the research and monitoring work the committee has undertaken over the last 10-15 years. This status report will also contain an extensive list of recommendations for ensuring a healthy moose population in GHA 26. The report and associated recommendations will be submitted to the Government of Manitoba for its consideration, including recommendations on how to re-open the GHA to moose hunting, as well as setting a moose population objective. A key to the long-term success of the

approaches developed by the CCMM will be the continued and on-going monitoring of wildlife attributes currently being studied, the ability to be adaptive in management approaches (i.e., the ability to respond and adapt to new threats or opportunities) and the continued functioning of the Committee.

The success of collaborative, multi-stakeholder approaches such as those undertaken by the CCMM through the Model Forest can serve as a template for other organizations, not just related to wildlife management, but across a wide variety of issues related to the management of forested landscapes.

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## Policy relevance: Helping to mainstream Canada's biodiversity commitments

Over the past 20 years, some management recommendations by the CCMM have required the Government of Manitoba to alter provincial legislation, for example, in a specific geographic area where the CCMM was undertaking a landscape-scale experiment and where road access needed to be closed to the public. In other instances, local communities altered their behaviours to take biodiversity considerations into account, such as the voluntary decision of rights-based hunters (Indigenous peoples) to halt moose hunting in certain areas of GHA 26 to allow for quicker species recovery.

The efforts of the Model Forest's CCMM not only contribute to the conservation and recovery of biodiversity at a local and regional level, but also help Canada deliver on its national and international commitments, including the Convention on Biological Diversity. Under the current (2011-2020) strategic plan for the Convention, a number of Aichi biodiversity targets have been developed. The work of the CCMM is helping to fulfill at least 4 of the Aichi targets and correlating nationally determined Canadian biodiversity targets. These include:

**Target 1** *By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.*

Through its collaborative relationships, the Model Forest greatly elevates the understanding of all partners and stakeholders in the complexities of natural resource management, including biodiversity. Not only does the CCMM facilitate learning, but provides a mechanism for all stakeholders to participate in developing solutions to conserve biodiversity. While moose is a key wildlife species of consideration by the committee, the CCMM also takes a wider or landscape level view by incorporating the needs of other species such as boreal woodland caribou, which is a Threatened species under Canada's Species at Risk Act.

**Target 4** *By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.*

The CCMM is in the process of developing recommendations for the management of moose and other wildlife species in eastern Manitoba. These recommendations will then form the

basis for a moose recovery strategy that will be implemented by the province. An important component of this strategy will be the development of mechanisms to ensure that consumptive uses (e.g., hunting) are managed in a such a way as to ensure the long-term sustainability of the moose population, while recognizing and accommodating for the constitutionally-protected rights of Indigenous peoples to subsistence hunting. To achieve this goal, it will be necessary to ensure that all interested stakeholders are involved in identifying and implementing solutions.

Under Target 4, Canada has developed the following target: "By 2020, biodiversity considerations are integrated into municipal planning and activities of major municipalities across Canada". The moose recovery and sustainably strategy that is being developed for GHA 26 is one mechanism to fulfill Canada's obligation.

**Target 18** *By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.*

A key mandate of the CCMM is to provide a venue where stakeholders can learn more about the management of natural resources (including biodiversity) and thus, build their capacity to participate in decision-making related to their conservation and sustainable use. Key players in the CCMM include local Indigenous and non-Indigenous communities, and the CCMM forum gives all these stakeholders (and others) an opportunity to influence decision-making by being a part of the process that creates solutions. The specific inclusion of Indigenous peoples on the CCMM also provides an added benefit of providing Aboriginal Traditional Knowledge.

Under Target 18, Canada has developed the following target: "By 2020, biodiversity is integrated into the elementary and secondary school curricula". The CCMM has developed a provincially-approved high school curriculum supplement focused on moose. This curriculum supplement includes information on moose biology and management, as well as traditional knowledge from Indigenous Elders who

participated in Traditional Knowledge interviews. The MBMF has also developed other biodiversity and natural resource curriculum supplements on a wide range of topics including boreal woodland caribou, forest ecosystems and glaciation. These documents are available on the MBMF website ([www.manitobamodelforest.net](http://www.manitobamodelforest.net)).

**Target 19** *By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.*

The CCMM actively promotes and uses the newest science and technology to understand the ecology of the boreal forest, including biodiversity, such as the first use of real-time GPS collar technology on wolves and moose in Manitoba. This valuable spatial data has been used to conduct habitat use analysis, as well as to understand the geographic spatial overlap of multiple wildlife species. The results of these analysis is promoted by partners through presentations at regional and provincial meetings, workshops and national and international conferences, including those of the International Model Forest Network. Some of this work has also been published in peer-reviewed journals.

Under Target 19, Canada has developed the following target: “By 2020, more Canadians get out into nature and participate in biodiversity conservation activities”. The CCMM, and Model Forest more broadly, facilitates this by encouraging active participation of many diverse stakeholders in developing and

implementing conservation solutions for moose. The CCMM also hosts field excursions in which members of the committee and other guests see firsthand some of the solutions being implemented on the ground (for example, road decommissioning activities). The MBMF has also developed two successful outdoor education programs that provide opportunity for educators and high school students to learn about the boreal ecosystem and the conservation and management of forests, wildlife, water and mineral resources, among other programs.

In addition to the Aichi and domestic targets, MBMF’s work also contributes to two of the targets under Sustainable Development Goal 15:

**15.5** *Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction threatened species*

**Target 15.9** *By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts*

Based on population modeling by the CCMM, the moose population in GHA 26 would have been extirpated without immediate and significant management actions. The CCMM, through its diverse partner base, has helped to prevent the loss of a valuable boreal forest species. This was done through local (regional) planning, using participatory processes of the CCMM. As such, the activities of the CCMM directly support both targets under the Sustainable Development Goal 15.

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## Conclusion

While biodiversity values already form part of the provincial government’s resource management planning and decision-making process, the Model Forests’ CCMM provided a valuable mechanism to facilitate stakeholder input into that process, including input pertaining to biodiversity. By using science and technology as part of their research and monitoring initiatives, the CCMM is helping to understand the complex interactions within the boreal forest, with an ultimate objective of maintaining sustainable wildlife populations, including moose.

The long-term existence (more than 20 years) of the CCMM has allowed for the development of trust and effective working

relationships amongst government, industry, community and NGO partners. This in turn has allowed for open and candid approaches to solving resource management issues.

The structure and functioning of the CCMM has allowed for a regional approach to conserving biodiversity, which helps support biodiversity conservation at a national level. The success of the committee has drawn the attention of stakeholders in other parts of the province, resulting in the relatively recent establishment of a similar moose committee in western Manitoba, further supporting the MBMF’s goal to serve as a model for others.