

MUSKOKA'S BIODIVERSITY

Understanding our Past to Protect our Future

MUSKOKA WATERSHED COUNCIL

2012



**EXECUTIVE
SUMMARY**



Muskoka
WATERSHED COUNCIL

This white paper was developed by a sub-committee of the Muskoka Watershed Council, including Anna Mallin, Ken Riley, Peter Sale, and Ian Turnbull, ably assisted by Judi Brouse, and with input from several other Muskoka Watershed Council members, including, in particular, Isobel Heathcote. It was formally adopted by Muskoka Watershed Council on September 21, 2012.

This white paper should be cited as Muskoka Watershed Council, 2012, Muskoka's Biodiversity: Understanding our past to protect our future.

The full report is available at www.muskokaheritage.org/mwc.

Executive Summary

Biological diversity - or biodiversity - is a term used to describe the variety of life on Earth. It refers to the wide variety of ecosystems and living organisms: animals, plants, their habitats and their genes. It is an essential part of our environment, enabling our ecosystems to maintain productive soils, clean water, and fresh air. Biodiversity also confers ecosystem resilience, which can help our environment recover from future shocks and changes. Thus, biodiversity is critically important in advancing the mandate of the Muskoka Watershed Council to champion the health of Muskoka's watersheds, and is central to the slogan "our environment is our economy". There is growing concern about global biodiversity decline – a concern addressed in the Muskoka Summit on Biodiversity Loss, held in June 2012.

This paper is a product of a two year voyage of discovery for the members of the Biodiversity Sub-committee working under the Policy and Research Committee of the Muskoka Watershed Council. The Sub-committee was tasked with investigating Muskoka's biodiversity, identifying key issues requiring attention, and suggesting how they might be addressed. This paper reports on three diverse, yet intersecting, lines of investigation – a historical review, a series of conversations with long-term Muskoka residents, and a review of scientific knowledge with relevance to Muskoka's biodiversity.

MWC believes that the process was valuable and the recommendations/suggestions that follow are offered as guidance for future works which may be undertaken, not only by MWC, but also by others, such as universities and other volunteer organizations, to further the study of this important issue using this process of connecting with Muskokans.

The historical review of changes in Muskoka's environment revealed the impact of humans, particularly in the changes that have occurred in the past two centuries – the devastation caused by waves of early logging in removing the pine, hemlock and mixed hardwood forests; extensive land clearing for agriculture; development of transportation systems and early settlements. Changes in practice, and reductions in economic importance, of both the logging industry and agriculture, along with development of the tourism industry, have resulted in a dramatic turn-around in our environment and our biodiversity that has continued to the present day.

Conversations were held at six locations across Muskoka involving long-term residents and members of the Sub-committee. We found the information provided by those who had lived on the land revealed location-specific knowledge and perspectives about

the natural environment and biodiversity processes. For example, these residents knew about the extent to which biodiversity cycles and changes, with different species becoming rare or abundant over time; they recognized that substantial impacts had been caused by humans; and they had a deep appreciation for the capacity of nature to recover. There was a strong sense of pride in the ability of long-term residents to be effective stewards of the land. But there was widespread concern that newcomers, or less-informed individuals, were damaging the environment to the extent that it may not be able to recover to its previously enjoyed state.

The Sub-committee recommends that continued informal participatory discussions be organized, not only with long-term rural residents, but also with those involved in other parts of the Muskoka economy, those responsible for managing economic development, and those seasonal residents and others who enjoy Muskoka as a recreational destination or a place in which to retire. The future conversations should be more focused on particular topics, processes, or locations of interest. Such conversations would provide additional valuable local knowledge, would provide a basis for broader participatory activities and awareness to conserve biodiversity, and would help sustain the health of our environment (and economy).

The growing recognition of biodiversity as a scientific topic is fairly recent, and it involves many disciplines and studies that approach the subject from different perspectives. In bringing together relevant published information, differences were sometimes difficult to reconcile. Thus, for some topics, contrasting viewpoints are included in the paper.

Levels of Biodiversity

Biodiversity can be understood on three interacting levels: ecosystem, species and genetic diversity. In Muskoka, there are several ecosystem types including forests, wetlands, open lands and waterways; this variety of ecosystems is *ecosystem diversity*. *Species diversity* includes all the plants, animals and microorganisms that inhabit each of these ecosystems, as well as link organisms that move between different ecosystems, such as migratory birds, mammals, reptiles, and microorganisms. These organisms, together, carry the broad array of genes that provide for *genetic diversity*.

Maintaining healthy levels of overall biodiversity is essential if *ecosystem goods and services* are to be sustained. Ecosystem goods are items such as timber, furs, fish and 'wild' foodstuffs that we extract from the environment, while ecosystem services include the provision of high water quality, clean air and healthy soils, and the processing of our domestic, agricultural and industrial wastes. *Direct and indirect ecosystem benefits* are another pair of terms to describe ecosystem goods and services, reflecting the fact that, to a degree, ecosystem goods (and rarely some services) are accounted for in our economy, while ecosystem services are largely not costed, and are not included in our

economic balance sheet. Muskoka's GDP is dominated by a recreation and tourism sector that is strongly dependent on such indirect ecosystem benefits.

Global efforts to calculate the value and costs of indirect benefits, such as healthy soils that resist erosion, clean water, fresh air, and an attractive natural environment, have only just begun. Nevertheless, we must recognize that, in Muskoka, the value of these ecosystem services is as great as or greater than the direct benefits provided by the goods we use.

Resilience versus Redundancy

An ecosystem is said to be disturbed when events occur that impact it negatively – a forest fire, a flood, a clear-cut, or the arrival of a new pathogen are all examples of disturbance. Biodiversity provides various 'self-repair' mechanisms that achieve *resilience*, allowing an ecosystem to cope with disturbances or change without materially altering its capacity to provide its goods and services. The text of this background paper identifies the importance of two such mechanisms. First, genetic diversity can provide resilience through selection, adaptation, and evolution, enabling species to respond to long-term change in environmental conditions (adaptation to temperature change by lake trout in Lake Muskoka is used as an example). This resilience can be overpowered by changes which are too extensive, or too rapid. Second, species diversity can provide an ecosystem with another type of resilience, because one species can substitute for another in fulfilling specific environmental functions as conditions change in ways that favour some but not other species. Ecosystems with lower species diversity have less *redundancy* and are less resilient because of it.

Intermediate Disturbance and Biotic Resistance

Two important hypotheses that relate biodiversity, and resulting resilience, to types and patterns of disturbance are also discussed. First, the *intermediate disturbance* hypothesis can help in understanding how biodiversity in Muskoka has recovered to a level that is presently as high as, or higher than that prior to the devastation in the early days of tree felling and land clearance. Second, the *biotic resistance* hypothesis demonstrates how high levels of biodiversity operate to prevent the spread of invasive species or pathogens.

The relationships between biodiversity and the resilience of ecosystems in the face of various types of environmental change provide a solid basis for the claim that the conservation of biodiversity is important for continued ecosystem function including its

provision of environmental goods and services on which our lives and our economy depend.

Decline in Biodiversity

The risks to biodiversity in Muskoka are best understood when placed in a context of global trends. The scientific community is agreed that, globally, the world is currently experiencing a significant decline in overall biodiversity. While scientists do not agree on the exact percent of species loss, it is generally agreed that between 20% and 50% of all species on the planet risk extinction by 2100. In Muskoka-Parry Sound, there are currently 35 species identified provincially as Species at Risk.

This decline, referred to as the Holocene mass extinction event, is occurring for many reasons. Globally, human destruction and modification of natural habitat are reducing the capacity of the environment to support other species, leading to reductions in species' population sizes and to local extinction. Direct exploitation of animals and plants also contribute. Our development of industrial-scale agriculture and our rapid conversion of land into cities are also displacing many species, fragmenting populations and lowering genetic diversity. Human caused climate change and pollution are further exacerbating the difficulties faced by other species. In Muskoka, similar processes, working on a smaller scale, are impacting our local biodiversity. All of these processes lead to lower overall biodiversity and lost resilience in ecosystems.

While there is an overall trend towards lower biodiversity, the pace of that decline varies from place to place and from system to system, and the true extent of the decline is still somewhat uncertain although it is clearly substantial. In Muskoka, the generally high quality of our natural environment has buffered us from the high level of species extinction seen elsewhere in the world. However, even in Muskoka we cannot become complacent about biodiversity loss. Many of the factors that contribute to biodiversity loss are at work here in Muskoka – climate change, development, pollution, invasive species – and maintaining our high quality environment is central to continued prosperity in our recreation and tourism economy.

The document identifies four key areas that should be addressed:

1. Use of the best available science to pin down relationships between biodiversity, ecosystem function, and economic value,
2. Use of the broadest knowledge of the processes affecting our Muskoka environment, particularly including local knowledge and perspectives,
3. Use of knowledge of how and why biodiversity has changed in the past, and
4. Use of an effective broad-based collaboration among residents, seasonal residents and visitors, municipal and provincial governments, and the regulatory

agencies to increase awareness, and design and implement effective management policies and practices.

Recommendations for Further Research

It is also recommended that specific action should be taken in Muskoka to understand and address two specific concerns relevant to maintaining biodiversity and ecosystem performance in predominantly rural environments:

First, the distribution of ecosystem types in Muskoka has changed in the recent past, with an expansion of forested areas and a consequent loss of open spaces such as crop land, pastures and field hedgerows. The loss of these more open habitats may be negatively affecting many link species that depend on being able to move among open and wooded areas. *Further work to understand how open space habitat can be maintained in Muskoka is warranted.*

Second, direct economic use of biodiversity in Muskoka through forestry and agriculture has declined to only a fraction of its importance in the period 1800-1950. In contrast, recreation and tourism industries continue to expand, with an increased rate of expansion predicted in the coming decades, along with population expansion. *Further work to understand the impact of these changes on biodiversity, including value and costs to our environment and economy, is warranted.*

Conclusion

The report concludes with several explicit recommendations for ways in which a community can manage its environment to conserve biodiversity. In order to adopt such approaches, it is first necessary to come to understand that there is an urgent need to conserve biodiversity in Muskoka. We hope this report provides a foundation on which to begin the conversation needed to build awareness and consensus. We who live in Muskoka, and depend on our environment for both the quality of our lives and the strength of our economy, have much to gain by recognizing the risks we face, and treating them as a challenge to build the healthy environment we will need in our future.