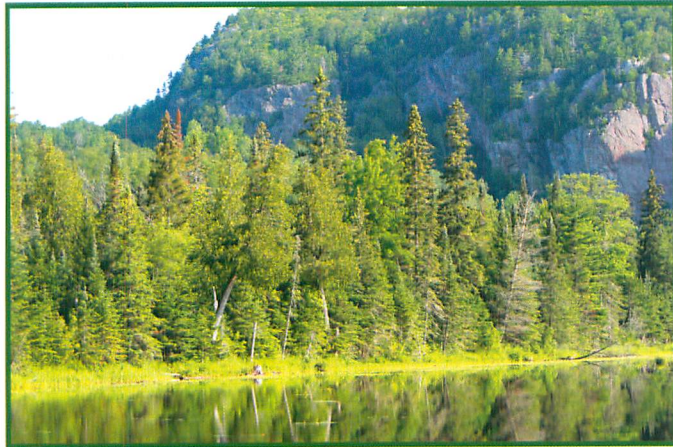


FRONTLINE

policy perspectives

Forest biodiversity: Balancing economic opportunity with ecological sustainability

Note 6



THE CHALLENGE

Sustainably managed forests provide a wide range of economic, social and environmental goods and services for the benefit of Canadians including food, fuel, wood and paper products, medicine, employment, clean air and water, and habitat. The production of some of these goods and services can have an effect on the amount and quality of forest habitat which can change the number of animal, plant and insect species living in the forest. Biological diversity, or biodiversity, is a measure of the variety of living organisms in an ecosystem. Information about the potential impacts of forest management on biodiversity is used to develop sustainable policies and practices.

The Science behind the Challenge

Diverse forests are better able to cope with the changes caused by disturbances such as forest fires, insect outbreaks, climate change, and harvesting than are forests with fewer species. If an ecosystem is able to recover after a severe disturbance, then it is considered to be resilient. Generally, forests with high biodiversity are more resilient than those with low biodiversity.

Individual species may play specific roles in the ecosystem that are defined by how they interact with the environment and with other species. While some species perform different functions, others may perform similar roles. For example, different species of bees and butterflies are pollinators. When a number of species have a similar function, like pollination, the ecosystem is considered to have 'redundancy'. This redundancy provides an ecosystem with insurance against disturbance so that if a species is lost its function may then be carried out by another species. However, if an ecosystem has little or no redundancy because of low biodiversity, then it may not be able to provide the same services as it did before the disturbance occurred.

Climate change is expected to have significant impacts on forests, particularly through increases in temperature, forest fire activity and insect infestations. These changed environmental conditions may have unexpected consequences for ecosystems. For example, while it may seem like some species are not important in an ecosystem today, they may become very important under future environmental conditions. The best way to support future ecosystem resiliency is to maintain high levels of biodiversity in current forests.

POLICY INFLUENCING SCIENCE

The International Picture

Canada ratified the United Nations Convention on Biological Diversity (CBD) in 1992. The CBD identified the decline of biodiversity as a common global concern and urged the development of scientific, technical and institutional capacities for conservation. In Canada, implementation of the CBD is guided by the Canadian Biodiversity Strategy, released in 1995, which sets out a primary goal of conserving biodiversity through improved



ecological understanding. Canada is also a member of the Montreal Process Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. Development of conservation efforts and sustainable management practices was, and continues to be, based on scientific information.

The National Picture

The Department of Natural Resources Act requires the federal Minister of Natural Resources to enhance the responsible development of Canada's natural resources, and to carry out research. With respect to forest

biodiversity, this mandate is delivered by Natural Resources Canada's Canadian Forest Service (CFS). The federal government recognizes that maintaining biodiversity is an important forest management objective. In addition to establishing protected areas, research supports the development of best management practices, which are incorporated into forest policy.

Collaborating with Ontario

The federal government plays a coordinating role for provincial governments in the management of their natural resources. In Ontario, direction for biodiversity conservation is provided by Ontario's Biodiversity Strategy.

The federal and Ontario governments have legislation for the protection of species at risk on their own lands. The federal Species at Risk Act (2002) and the Ontario Endangered Species Act (2007) set out requirements for identifying, classifying, and protecting species at risk of extirpation or extinction. Both levels of government must develop recovery strategies for species at risk; these strategies must include identification of the species' critical habitat needs, threats to their survival or recovery and practical recommendations for their protection. Both Acts also require that recovery strategies be based on the best available knowledge.

SCIENCE INFLUENCING POLICY

Biodiversity studies have been designed to investigate the response of forest ecosystems to disturbances. CFS researchers at the Great Lakes Forestry Centre (GLFC), in collaboration with others, are undertaking research that will help to inform sustainable forest management policy at various levels. Examples of key projects are presented here.

Biodiversity has traditionally been measured by counting the number of different species within an ecosystem, a measure known as species richness. A decline in species richness can lead to the conclusion that there has been a negative impact on biodiversity. But measuring only species richness is not very relevant to decision makers because it does not identify the reasons for the loss of biodiversity. GLFC scientist, Dr. Isabelle Aubin is using a new approach that will be more applicable to policy development. The plant trait approach involves placing species into groups according to characteristics that are important for ecosystem functions. Rather than looking at the diversity of species, the plant trait approach looks at the diversity of functions in ecosystems. This approach allows researchers to compare ecosystems that have similar functions even if they do not have the same species composition. A national network of plant trait information has been created to provide a standardized set of characteristics that can then be used to make meaningful comparisons between ecosystems within





Canada and internationally. The Traits of Plants in Canada (TOPIC) is a database that contains information on more than 700 documented species from Ontario and Quebec so far; it also serves as a network to help scientists share information.

Boreal forest ecosystems are adapted to periodic natural disturbance events such as forest fires. Forest management in Ontario is carried out in ways that attempt to mimic these patterns of natural disturbance because forests are expected to respond similarly to the disturbed conditions caused by harvesting activities. But there is a need to improve our understanding of the extent to which the conditions created by forest management are similar to those created by natural disturbances. GLFC scientists Steve Holmes and Dr. Dave Kreutzweiser are conducting studies that will determine the effectiveness of forest management guidelines based on natural disturbance emulation. Of particular interest is how forest conditions after a harvest compare to natural

disturbances in providing bird habitat and in sustaining aquatic biodiversity. This work is being conducted in collaboration with other government agencies, industry, academia, and environmental organizations.

Resilience in forest systems requires that species continue to exist in their natural habitats in the face of disturbances. However, some species are at risk because of human activities. Woodland caribou (*Rangifer tarandus caribou*) is designated as a threatened species under both the Species at Risk Act and the Endangered Species Act. The main cause of caribou population decline in Canada is habitat loss and fragmentation resulting from land use change and resource development. Caribou in Ontario are estimated to occupy only half of their former range, which historically extended south to Lake Nipissing and Manitoulin Island. Managing for woodland caribou recovery requires a thorough understanding of its habitat preferences and population dynamics. GLFC research scientist Dr. Ian Thompson is contributing to this knowledge with a study on the impacts of human activities on caribou populations. Together with government, academic, and industry collaborators, Dr. Thompson is working to identify critical habitat requirements. This information will be used to guide the recovery of woodland caribou and will contribute to the continued sustainable management of boreal forests.

CONCLUSION

Biodiversity provides Canadians with many goods and services that are essential for our well-being and that contribute to overall ecosystem health and resilience. Human activities are having an impact on the biodiversity of forest ecosystems. Research is being carried out by NRCan-CFS to gain a better understanding of the response of forest biodiversity to disturbances. Results from these studies will be used to inform policies and practices that conserve biodiversity in support of sustainable forest management.

SUGGESTED READING:

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