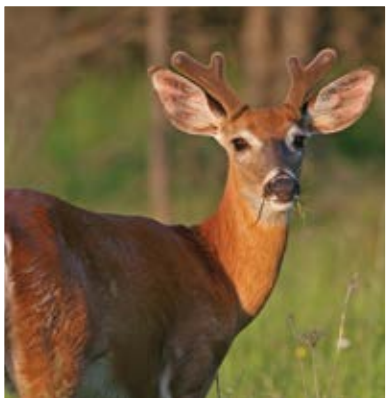
BEYOND THE FIELDS

THE VALUE OF FOREST AND FRESHWATER FOODS IN NORTHERN ONTARIO

Ontario Nature



PUBLICATION INFORMATION AND ACKNOWLEDGEMENTS

Beyond the Fields: The Value of Forest and Freshwater Foods in Northern Ontario

Published by: Ontario Nature

This report was made possible through the generous support of the Ontario Trillium Foundation, Mountain Equipment Co-op (MEC), Service Canada, and the Ivey Foundation.

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A tremendous thank you to Joseph Leblanc (True North Community Co-operative) and Charlene Rogers (Environment North), who formed the project steering committee, established the direction and tone, and offered valuable ideas to the content.

Ontario Nature gratefully acknowledges the assistance of the following people who provided invaluable information, insight and perspectives: Dr. Rob Stewart and Dr. Chander Shahi of Lakehead University, Aimee-Leah Lavoie from Mushkegowuk Environmental Research Centre (MERC), and Ian Kaufman of Lakehead University Student Union (LUSU) Sustainability Initiative. Note, however, that the views presented in this paper represent those of Ontario Nature and do not necessarily reflect those of the aforementioned individuals.

Thank you to citizens throughout northern Ontario who provided comments, criticism and expressions of support, and who contributed to the project through their interest in forest and freshwater foods, and directly to this report through the online public review in October, 2013.

Finally, thank you to all those who practise and support sustainable forest and freshwater food harvesting, and to those who continue to hold the knowledge of this land, share it and use it to nourish themselves and those around them.

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Cover photos: Mushrooms and fiddleheads, KCline, iStock; blueberries, Kristian Tornqvist; white-tailed deer, John Czenke; wild rice, Alejandro Rivera, iStock; fish fry, Kristian Tornqvist

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Forest and freshwater foods—including plants, animals and fungi—are integral parts of forest, aquatic and other ecosystems. Typically harvested without domestication, these foods include moose, deer, caribou, waterfowl, fish, berries, nuts, seeds, wild rice, fiddleheads, mushrooms, and plants used for tea and medicine.

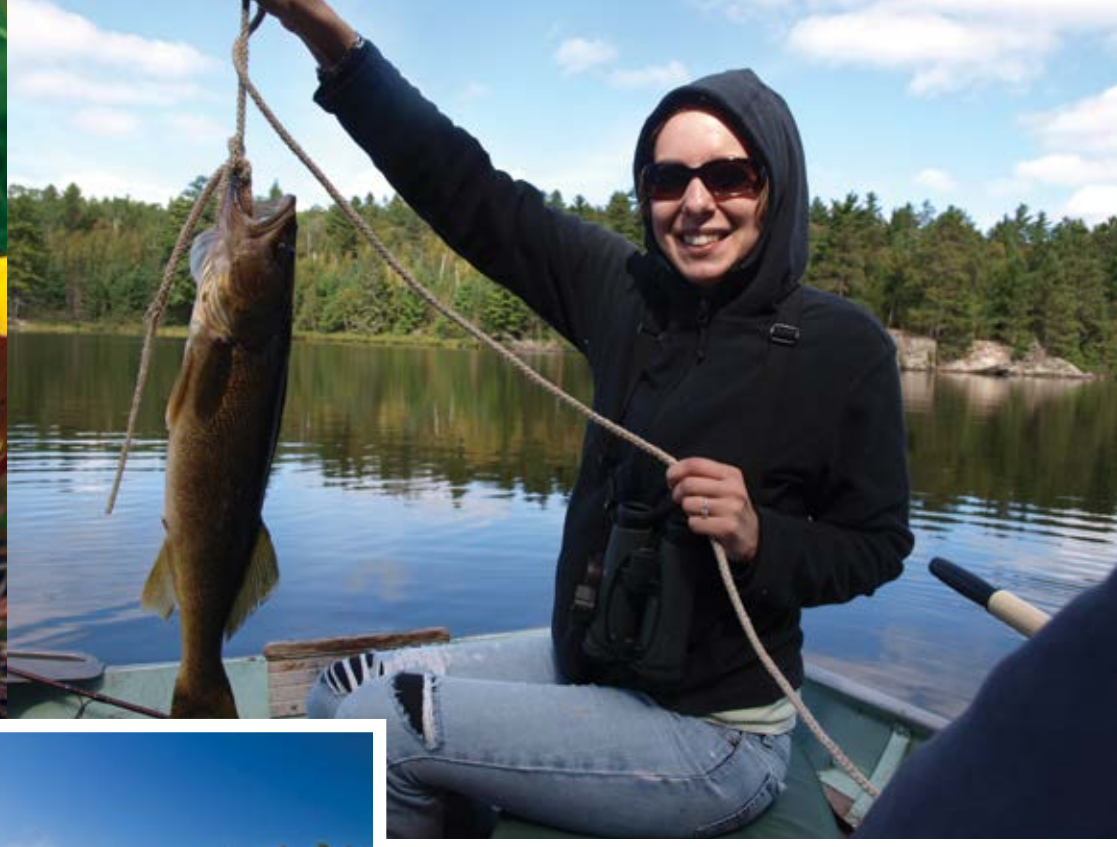
EXECUTIVE SUMMARY

Photo: Julochka, Flickr

The forests, waterways, and wetlands of northern Ontario are home to a great number and diversity of wildlife, and contain one of the largest reservoirs of fresh water in the world. These natural systems have provided physical, cultural and spiritual sustenance for humans since time immemorial. Yet, in spite of this apparent abundance, northern communities are struggling with unemployment and economic instability. They are vulnerable to the boom and bust cycles of industrial resource extraction and to external market forces over which they have no control. Understandably, many northerners are exploring options for a more resilient, sustainable way forward that will foster long-term community health, prosperity, and security.

Beyond the Fields: The Value of Forest and Freshwater Foods in Northern Ontario stems from that exploration and from the Forest and Freshwater Foods Project, a joint undertaking of Ontario Nature, the True North Community Co-operative, and Environment North. The project aims to gather and share information about forest and freshwater foods and food systems to inform land-use planning, and better protect human and ecosystem health. Forest and freshwater foods—including plants, animals and fungi—are integral parts of forest, aquatic and other ecosystems. Typically harvested without domestication, these foods include moose, deer, caribou, waterfowl, fish, berries, nuts, seeds, wild rice, fiddleheads, mushrooms, and plants used for tea and medicine.

This report is rooted in the local food movement, a growing and compelling force in northern Ontario, as it is elsewhere in the province. The past decade has seen a resurgence of local food networks across Ontario. These collaborative efforts seek to build more locally-based, self-reliant food economies in recognition of the role that healthy local food systems can play in the well-being of communities. Food security and food independence are intimately tied to people's economic realities. While it is well recognized that employment and income have a strong determining effect on people's access to food, it is much less understood that people's access to food and resilient food systems can improve their economic well-being. This reframing of perspective is



Photos: Chanterelles, Sandra Cohen-Rose and Colin Rose; walleye, Jessica, Flickr; autumn lake, Lydia Dotto

central to the arguments made here for the protection and promotion of forest and freshwater food systems and their related economic activities.

The report examines people's use of and reliance on the unique assets of the North through the lens of self-sufficiency and economic and community resilience. Looking specifically at forest and freshwater foods and food systems, it summarizes the considerable benefits that these assets confer to the economy, and to human and ecosystem health in northern Ontario. It also examines potential threats to these resources, including environmental pollutants, habitat loss and fragmentation, hunting and harvesting pressures, and climate change.

A basic premise of the report is that these foods and food systems are an unrecognized economic resource that could be leveraged to foster long-term prosperity for the region's communities in ways that maintain ecological health and integrity. Both the commercial value of forest and freshwater foods and their subsistence value to families and communities are considered in this analysis.

The food economy is not isolated from other spheres of economic life. The overarching goal of this report is to encourage a shift towards a broader, more inclusive and regionally appropriate approach to community economic development and environmental sustainability.

This report offers the following recommendations to the government of Ontario to better manage, promote and protect forest and freshwater food systems. These are intended to address policy gaps as well as weaknesses in current approaches to resource management and land-use planning.

Photo: Allan Oman

RECOMMENDATION 1: THOROUGHLY ACCOUNT FOR THE SOCIO-ECONOMIC IMPORTANCE OF FOREST AND FRESHWATER FOODS IN LAND-USE PLANNING.

Forest and freshwater foods should be valued for the multiple benefits they provide. For a land-use planning framework to be truly comprehensive, it must enable communities to live on and derive benefits from the land while ensuring that the best knowledge available is used to protect multiple values, including the needs of future generations. Planning must account for ecosystem services and establish baseline data for monitoring the health of forest and freshwater foods. It must also address local economic opportunities that occur at a much smaller scale than major industrial resource extraction such as forestry and mining.

RECOMMENDATION 2: PROVIDE ADEQUATE FINANCIAL SUPPORT FOR COMMUNITY-BASED LAND-USE PLANNING.

The primary focus of land-use planning should be the health and well-being of communities and ecosystems. This is essential for long-term sustainability. The provincial government must work with communities to ensure that adequate resources and information are available to complete *and maintain* comprehensive land-use plans. This includes resources to complete thorough environmental baseline studies, technological and scientific support to map forest and freshwater values, and training to conduct meaningful community-based land-use planning that addresses community needs and values.

RECOMMENDATION 3: FOSTER A BROADER PUBLIC UNDERSTANDING OF ABORIGINAL AND TREATY RIGHTS AND THEIR IMPLICATIONS FOR COMMUNITY AND ECONOMIC DEVELOPMENT, FREE AND INFORMED CONSENT, AND THE DUTY TO CONSULT.

Land-use planning, and related protection and development decisions, must ensure the inclusion of Aboriginal people and respect for their governance of the land and their traditional knowledge. Best practices in land-use planning must be founded on an acknowledgment of, and respect for, the Aboriginal and treaty rights of Ontario's First Nations, as enshrined in section 35 of the Canadian Constitution.

RECOMMENDATION 4: PRACTISE ADAPTIVE MANAGEMENT.

Threats to forest and freshwater foods include environmental pollutants, habitat loss and fragmentation, unsustainable hunting and harvesting pressures, and climate change. The outcomes of these combined threats are complex and unpredictable. Therefore,

Photo: Allan Oman

land managers must carefully experiment and actively probe multiple solutions guided by a precautionary approach.

RECOMMENDATION 5: SUPPORT CO-MANAGEMENT AND COLLABORATIVE EFFORTS TO MANAGE RESOURCES.

Forest and freshwater foods offer an opportunity to find common ground between human socio-economic interests and broader ecological needs. In particular, there is an opportunity to explore collaborative efforts to maintain forest and freshwater food systems. In cases where communities share the use of resources with one another and where there are potential resource scarcities, it is important to establish linkages of resource governance between communities, government agencies and others. Such linkages should involve co-management arrangements, defined as the sharing of power and responsibility in decision-making between governments and communities for resource management.

RECOMMENDATION 6: USE MULTI-SCALE PLANNING TOOLS TO PROTECT ALL VALUES.

Analysis of land-use change should be based on the following assumptions: 1) the impacts of land use occur at multiple scales; 2) understanding at local scales does not directly lead to an accurate understanding of landscape-level scales, and vice versa; and 3) all observations provide only a partial description of the whole system. Therefore, land-use planning must use tools that reflect the relationships among all scales.

RECOMMENDATION 7: TRAINING IN SUSTAINABLE HARVESTING OF FOREST AND FRESHWATER FOODS.

Increasing sustainable harvesting capacity for personal consumption and small business enterprise will strengthen local economies and local food systems. Training on sustainable foraging practices and species identification is needed to ensure that the growth of forest and freshwater food use is framed within the context of ecological responsibility. Further, the provision of business and financial guidance for small entrepreneurs will foster a more sustainable regional food system and nurture a business community that is knowledgeable about land-use planning as it pertains to forest and freshwater food values.

CONTENTS

INTRODUCTION

Photo: Mary Sanseverino, Flickr

The forests, lakes, rivers and wetlands of northern Ontario are home to millions of migratory songbirds and waterfowl, caribou herds, and healthy populations of wolf, moose, deer and bear. They hold one of the largest freshwater reservoirs in the world that teems with game fish such as lake trout, northern pike and walleye. These ecosystems have provided physical, cultural and spiritual sustenance for humans since time immemorial. Yet, in spite of this apparent abundance, northern communities are struggling with unemployment and economic instability. They have been and continue to be vulnerable to the boom and bust cycles of industrial resource extraction and external market forces over which they have no control. Understandably, many northerners are exploring options for a more resilient, sustainable way forward that will foster long-term community health, prosperity and security.

Beyond the Fields: The Value of Forest and Freshwater Foods in Northern Ontario stems from that exploration and from the Forest and Freshwater Foods Project, a joint undertaking of Ontario Nature, True North Community Co-operative, and Environment North. The project aims to gather and share information about forest and freshwater foods and food systems to inform land-use planning and better protect human and ecosystem health. The report is rooted in the local food movement, a growing and compelling force in northern Ontario, as it is elsewhere in the province.

The past decades have seen a resurgence of local food networks across Ontario.[1] These collaborative efforts seek to build more local, self-reliant food economies in recognition of the role that healthy local foods play in the well-being of communities. The strong and growing interest in the local food movement is reflected in the increasing popularity of farmers' markets, food co-operatives and food-system research. Local food initiatives tend to be closely linked to social and environmental justice questions, such as: how is

Photo: John Reaume

our food produced, by whom and at whose expense?[2] As such, localism is often seen as an effort to exert greater community control over the food system.

It is well known that food security and food independence are intimately related to people's economic realities. While it is well recognized that employment and income have a strong determining effect on people's access to food, it is much less understood that people's access to food and resilient food systems can improve their economic well-being. This reframing of perspective is central to the arguments made here for the protection and promotion of forest and freshwater food systems and their related economic activities.

Although there are many similarities between small and rural communities across Ontario, communities in northern Ontario differ in some important social and economic ways. For example, while agriculture is Ontario's mainstay for local food production, it has been neglected in favour of primary resource development in much of northern Ontario.[3] In the place of agriculture, many communities in northern Ontario rely on forests and freshwaters as important sources of local food. Further, from a demographic perspective, northern Ontario makes up roughly two-thirds of the province's total land mass, yet it contains only five cities of more than 40,000 inhabitants: Sudbury (157,900), Thunder Bay (109,100), Sault Ste. Marie (74,900), North Bay (54,000) and Timmins (43,000). Northern Ontario, with approximately 803,900 inhabitants, has a population density of less than one person per square kilometre. Thus, while the insights of this report are applicable to those who harvest forest and freshwater foods throughout Ontario, they are of special relevance in the North, given the region's lower population density and its distance from major centres of agricultural production.

Foods and food systems are an undervalued resource that could be better leveraged to foster long-term prosperity for northern communities in ways that maintain ecological health and integrity.

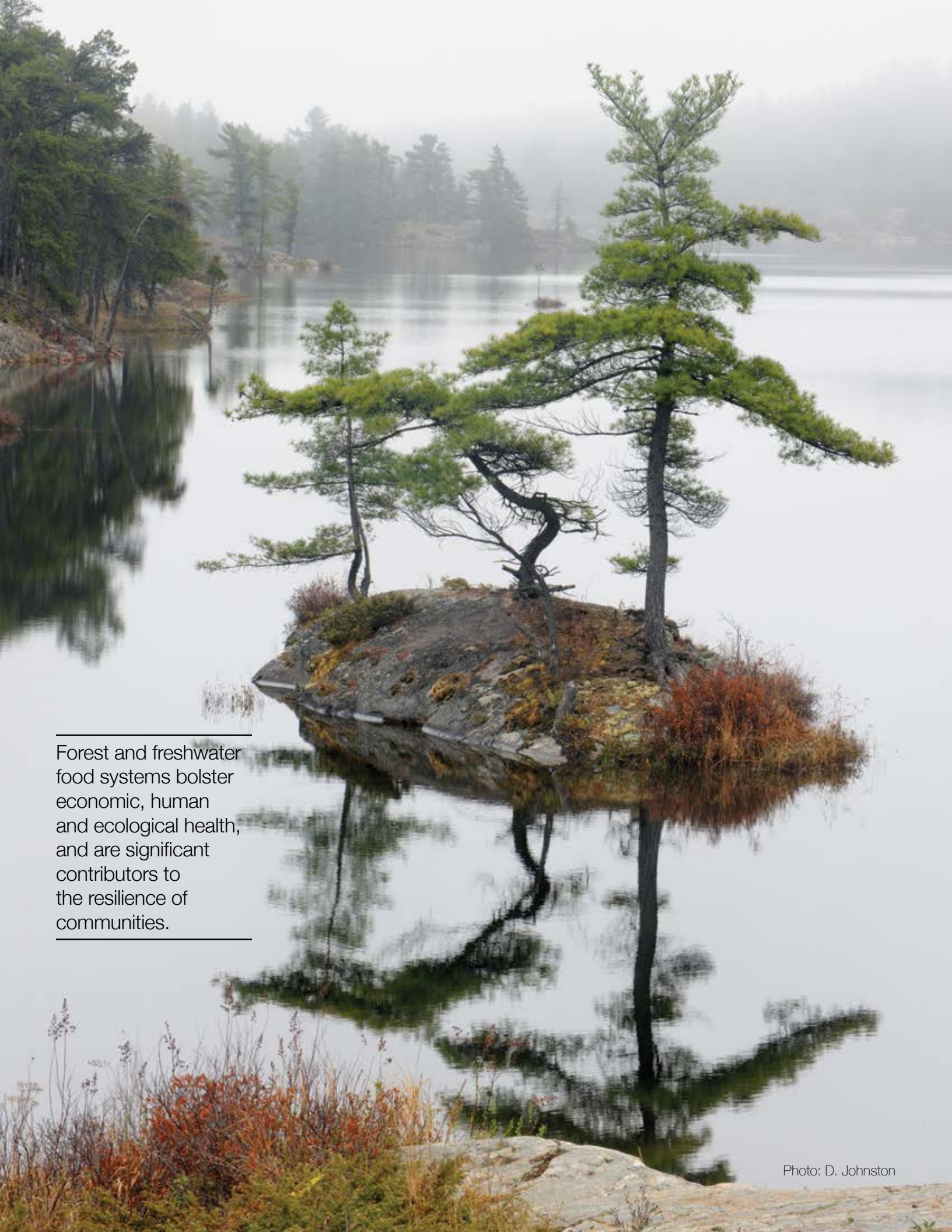
This report examines people's use of the unique assets of the North through the lens of self-sufficiency and economic and community resilience. It summarizes the considerable benefits that forest and freshwater foods confer to the economy and to human and ecosystem health in northern Ontario. A basic premise of the report is that these foods and food systems are an undervalued resource that could be better leveraged to foster long-term prosperity for northern communities in ways that maintain ecological health and integrity. Both the commercial and subsistence values of forest foods are considered in this analysis.

This report serves two purposes. First, it provides a comprehensive argument as to why forest and freshwater food systems should be valued in economic and land-use planning in northern Ontario. It is not simply about finding new ways to get new goods (in this case, forest and freshwater foods) into global markets, or attracting new industry investments to rural communities. Rather, the case is made for a shift in emphasis towards community resilience, where the role of economic development is first and foremost to foster meaningful and diverse livelihoods within a dynamic and sustainable local economy.

Second, the report provides an overview of the economic, social and ecological value that forest and freshwater foods confer. It should be noted that current knowledge about the extent of forest and freshwater food-related activities in northern Ontario is somewhat limited. However, the report draws on direct evidence about the region wherever possible, while making inferences from larger bodies of knowledge where appropriate and also identifying gaps in the available information. Despite these gaps, the report makes abundantly clear that the extent and value of forest and freshwater food-related activities are considerable, and that there are many as yet unrealized opportunities.

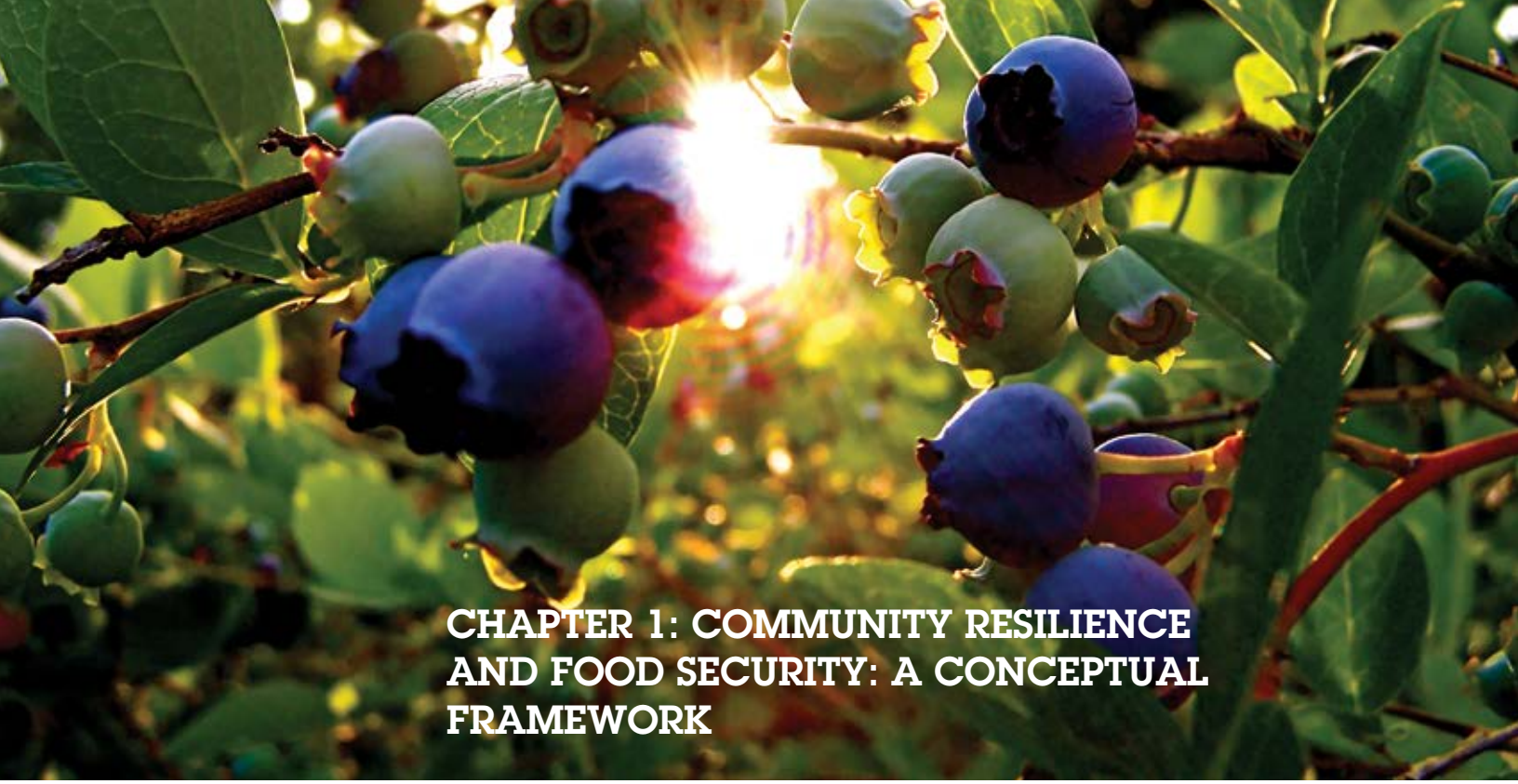
The food economy is not isolated from other spheres of economic life. The overarching goal of this report is to encourage a shift towards a broader, more inclusive and regionally appropriate approach to community economic development and environmental sustainability. Forest and freshwater food systems, an essential part of local economies, are the point of departure. Within the larger context of contemporary challenges, including widespread environmental degradation, the global financial recession and a large provincial deficit, this approach offers policy-makers, planners and community practitioners a promising new way of understanding and responding to issues such as unemployment and economic instability. By taking community resilience as the measurement of economic success, it becomes possible to appreciate a broader range of resources and economic activities as viable solutions to local economic challenges.

In summary, the central argument of this report is that forest and freshwater food systems bolster economic, human and ecological health, and are significant contributors to the resilience of communities. The report's conceptual framework is set out in Chapter 1, which explores the basic concepts of community resilience and food security. Chapter 2 provides relevant contextual information about economic development, employment and policy in northern Ontario. Chapter 3 gives a detailed account of the broad array of benefits that forest and freshwater food systems confer on northern Ontarians. Threats to these benefits are presented in Chapter 4, which looks at the impacts of environmental pollutants, habitat loss and degradation, hunting and harvesting pressures, and climate change; the chapter also reviews opportunities for addressing these threats in order to maintain and enhance forest and freshwater food benefits. The concluding chapter suggests areas for further research and offers recommendations to the government of Ontario for economic and land-use planning, adaptive management and co-management of natural resources.



Forest and freshwater food systems bolster economic, human and ecological health, and are significant contributors to the resilience of communities.

Photo: D. Johnston



CHAPTER 1: COMMUNITY RESILIENCE AND FOOD SECURITY: A CONCEPTUAL FRAMEWORK

Photos (from top): Brendan DeBrincat; wild rice, Leslie Seaton; ducks, Mike Baird; pike, Per Verdonk

Typically harvested without domestication, forest and freshwater foods include moose, deer, caribou, geese, duck, fish, berries, nuts, seeds, wild rice, fiddleheads, mushrooms, and plants used for teas and medicines. This list includes only some of the most common *human* foods found in northern forests and freshwaters, and says nothing of the infinite number of food relationships among other species.

The term "forest and freshwater food systems" refers to the network of interdependent ecosystem elements that support the existence of forest and freshwater foods. This network includes the ecological community of living beings (including humans), inorganic ecosystem elements (geology, hydrology, etc.) and broader ecosystem factors, such as climate. It is important to note that the terms "forest" and "freshwater" are not intended to exclude ecotypes such as grasslands, bogs, tundra or others that can be found in northern Ontario. Throughout the region, however, forest and/or freshwater ecosystems dominate the landscape.

COMMUNITY RESILIENCE

The term "community resilience" has been used by various thinkers and advocates to indicate a range of approaches to community wellness that may or may not include ecosystem, social, economic, political and other elements.[4] Resilience is about being able to bounce back and deal with stresses while remaining flexible and strong. This report uses a comprehensive working definition of community resilience that attempts to acknowledge all of the significant elements of a community's well-being (see Figure 1) as well as the interdependence of those elements.

Triple Bottom Line: Interconnected and Interdependent Benefits

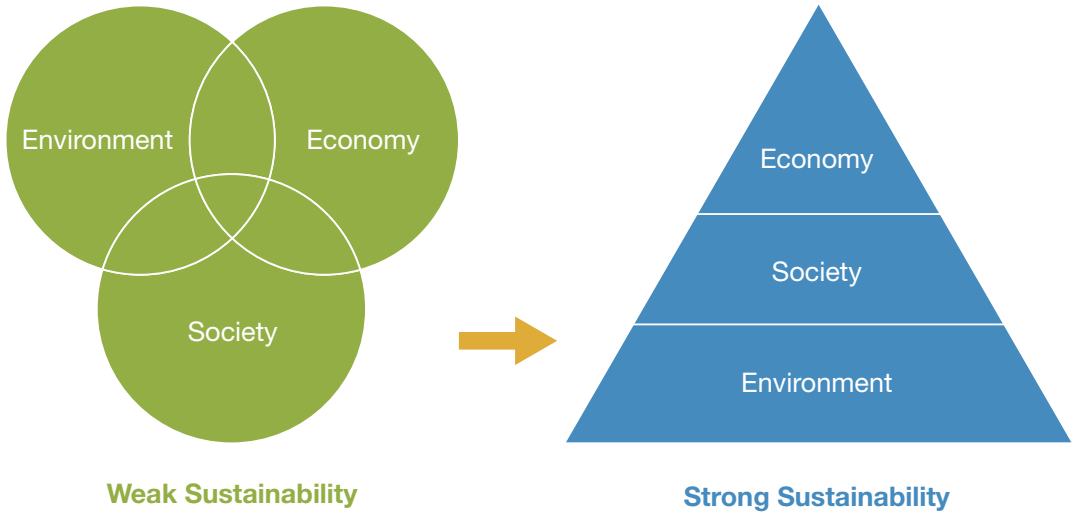


Figure 1: A comparison of the conventional "triple bottom line" concept (left) to a modified hierarchy of the same three spheres (right). The conventional triple bottom line is considered weak because it views the realms of economy, society and environment as equals; whereas the modified diagram acknowledges the foundational role that the environment plays in the human spheres of society and economy. This re-prioritization represents the perspective taken in this report.

An important aspect of community resilience is found in the field of ecology. Ecological resilience focuses on the persistence of relationships within a system in the face of stress and trauma. Resilience is a measure of how the quality, quantity and directness of relationships among different elements of the system lead to a flexibility that enables the community as a whole to re-shuffle its many parts to maintain essential systemic functions. This flexibility is based on a combination of three characteristics that are considered vital to ecological resilience: diversity, deep interconnectedness and tight feedback loops (the ability to respond quickly to change).[5]

In most forest management planning, non-timber forest values are considered secondary.

This is a marked departure from the way our communities have been conditioned to treat resources, with narrow and rigidly defined roles in the economic system. For example, a forest is viewed by many as having one dominant function: to provide wood and paper products. From this perspective, other functions or values may be considered, but are secondary. However, if approached with more flexibility, the forest could be seen to have many equally important roles within the community: as a source of timber, food, medicine, recreation, carbon storage, oxygen production, and so on. This flexibility creates the potential for a wider variety of *relationships* among the different elements in the community. Using the forest example: when the forest is seen primarily as a source of timber, all other elements within the system must relate to it in that role. Thus, insects are seen primarily as potential pests and threats to healthy stands of timber; people have a role primarily as forestry technicians or consumers; and a wide number of other system elements (such as understory plants and small mammals) are erased from the picture altogether because they are irrelevant to the idea of "forest as timber."

If, on the other hand, a community views the forest as having multiple, equally valuable roles within the ecosystem, then all other elements within the system have a greater number of possible roles in relation to it such as the insects as food for game and fish populations; or people as recreationists, food entrepreneurs, hunters, harvesters and conservationists. When the diversity of each element's role(s) within the forest system is understood, each element stands a greater chance of being acknowledged in our considerations of how the forest is used.

FOOD SECURITY, FOOD INDEPENDENCE AND COMMUNITY RESILIENCE

Access to food and control of food systems are basic components of any resilient local economy. For this reason, food security and food independence should be linked to the goal of community resilience. Generally speaking, people are *food secure* when they have access to adequate amounts of nutritious, safe and culturally appropriate food.[6] People are more *food independent* when they have more control or influence over their ability to feed themselves.[7] Factors such as the distance food has to travel, the political stability of borders food has to cross, the price of fuel and taxes, the severity and frequency of climatic disturbances (droughts, floods, etc.), and the number of access points for food in a community all affect people's control or influence over access to food.

Photos: Coniagas mine, Cobalt, Pkdon50, Flickr; logs, Maigi, Shutterstock; abandoned storefront, Jennifer Aitkins

The notion of "going local" can address many of the vulnerabilities within food systems, particularly those that have to do with geography. When the majority of food is sourced from a distance, communities are vulnerable to disruptions beyond their control. Consider an example from Whitehorse, Yukon. In June of 2012, a series of mudslides and washouts along the Alaska Highway closed off the city from its food supply, which is trucked in. Within three days, the city's grocery shelves were bare, and food had to be flown in on a chartered Hercules aircraft.[8] Whitehorse residents experienced extreme food insecurity as a result of depending on only one access route.

Unlike southern Ontario, where industrial agriculture and hydroponics contribute greatly to local food sources, many rural and remote northern Ontario communities depend on forest and freshwater foods as a source of nutrition that is less vulnerable (although not immune) to fuel prices, political and economic turmoil, or limited access routes. Some communities are fly-in with only one food retailer, and many other communities depend on a very modest and remote highway infrastructure.

Access to food and control of food systems are basic components of any resilient local economy.

By ensuring the resilience of the ecological systems that support forest and freshwater foods, the resilience of Ontario communities can be strengthened. Policy and land-use planning are two important tools that can be used to protect and support these systems, bolstering food security and food independence (and thus social, ecological and economic justice) in northern communities.

Photos: Fish and fiddleheads, Plonq, Flickr; stew, Lynn Gardner

CHAPTER 2: SOCIO-ECONOMIC CONTEXT

Photo: Mark R., Shutterstock

One of the greatest challenges for an equitable and sustainable future is to bridge the gap between economics and ecology. Historically, the two fields developed separately, addressing distinct questions and employing different assumptions. The result has been an economic system that functions as though it exists outside the constraints of nature, and a field of natural science (ecology) that struggles to be relevant to policy-makers who, for the most part, work within the conventional economic framework.[9] Efforts to address this gap have come from ecological economists such as Hornborg,[10] Rees,[11] and Holling,[12] and environmental organizations such as the David Suzuki Foundation[13] and Pembina Institute[14] advocating for economic models that value ecosystem services such as water storage and purification, climate regulation, carbon sequestration, and the provision of wild foods.

The value of the world's various ecosystem services has been estimated conservatively at approximately $33 trillion per year.[15] According to a study commissioned by the Ontario Ministry of Natural Resources (MNR), the value of ecosystem services in southern Ontario alone is more than $84 billion per year.[16] Thus, a strong economic argument can be made for maintaining and enhancing the integrity of ecosystems.

ECONOMIC DEVELOPMENT AND POPULATION TRENDS

Since the arrival of Europeans and the establishment of European trade systems in the region, northern Ontario's economy has been based primarily on the large-scale extraction of natural resources.[17] Economic development plans for the region have, for the most part, focused on increasing this activity.[18]

In 2011, the government of Ontario released the "Growth Plan for Northern Ontario."[19] The plan refers generally to economic diversification, but this diversification is focused on 11 existing and emerging priority economic sectors. The plan does not provide clear guidance on how to balance economic priorities with social and environmental

concerns. Moreover, it does not suggest changing the economic paradigm to ensure that the economy of northern Ontario operates within the ecological constraints of the resource base. Instead, the report maintains the status quo of pursuing unlimited economic growth.

In northern Ontario, the overarching demographic trends indicate a population stasis,[20] with the notable exception of Aboriginal population numbers, which are growing comparatively fast.[21] At present, the primary engine of population growth for the province is federal immigration policy, with immigration accounting for more than 50 percent of Ontario's population growth,[22] which is concentrated mainly in large urban centres. In small, rural and remote communities, immigration is virtually non-existent, and low fertility rates combined with a lack of incentives (employment, services, etc.) for immigration leave population levels in decline, with no evidence that this pattern will reverse in the future.

These trends have important implications for the economies of northern Ontario. The "Growth Plan for Northern Ontario" is predicated, at least partly, on future population growth in the North. The document implies that this growth will occur in "economic and service hubs," defined as communities in which there is enough critical mass to support growth.[23] There are at least two problems with this "population growth" assumption.

First, there are only two "hubs" in northern Ontario that could support substantial long-term population growth: Sudbury and Thunder Bay. These two cities could, in theory, support an incentive regime to attract immigration. Some might argue that Sault Ste. Marie, North Bay and Timmins are also potential hubs that could support incentives for immigration. However, Sudbury is struggling to maintain comparatively modest population growth, and Thunder Bay has experienced population decline. The 2011 census saw Sudbury's population increase by 1.6 percent from 2006; Thunder Bay's population declined by 1.1 percent from 2006.[24] These rates, compared to the provincial average population increase of 5.7 percent over the same period, call into question any economic or community planning that is predicated on significant increases in population for northern Ontario.[25]

There are 162 municipalities in northern Ontario, 30 percent of which are economically dependent on one resource industry, such as industrial forestry or mining, and 60 percent of which have a population of less than 2,500.

Second, if one were to ignore present population trends in northern Ontario and assume that economically significant, long-term increases in population were attainable for the five urban centres identified above, the economic and service hubs proposed in the "Growth Plan for Northern Ontario" would still be unable to meet the needs of a significant portion of northern communities. This is because outlying communities are not able to benefit from proximity to larger economic centres.

There are 162 municipalities in northern Ontario, 30 percent of which are economically dependent on one resource industry, such as forestry or mining, and 60 percent of which have a population of less than 2,500.[26] Additionally, there are 32 remote communities in northern Ontario that can only be accessed by air, ice roads in the winter and occasionally by water. Even if roads were built to each of these communities, some remain at such a great distance from larger urban centres that they would still be considered remote. Many communities that have road access are several hours' drive from neighbouring communities.

Community distribution in northern Ontario

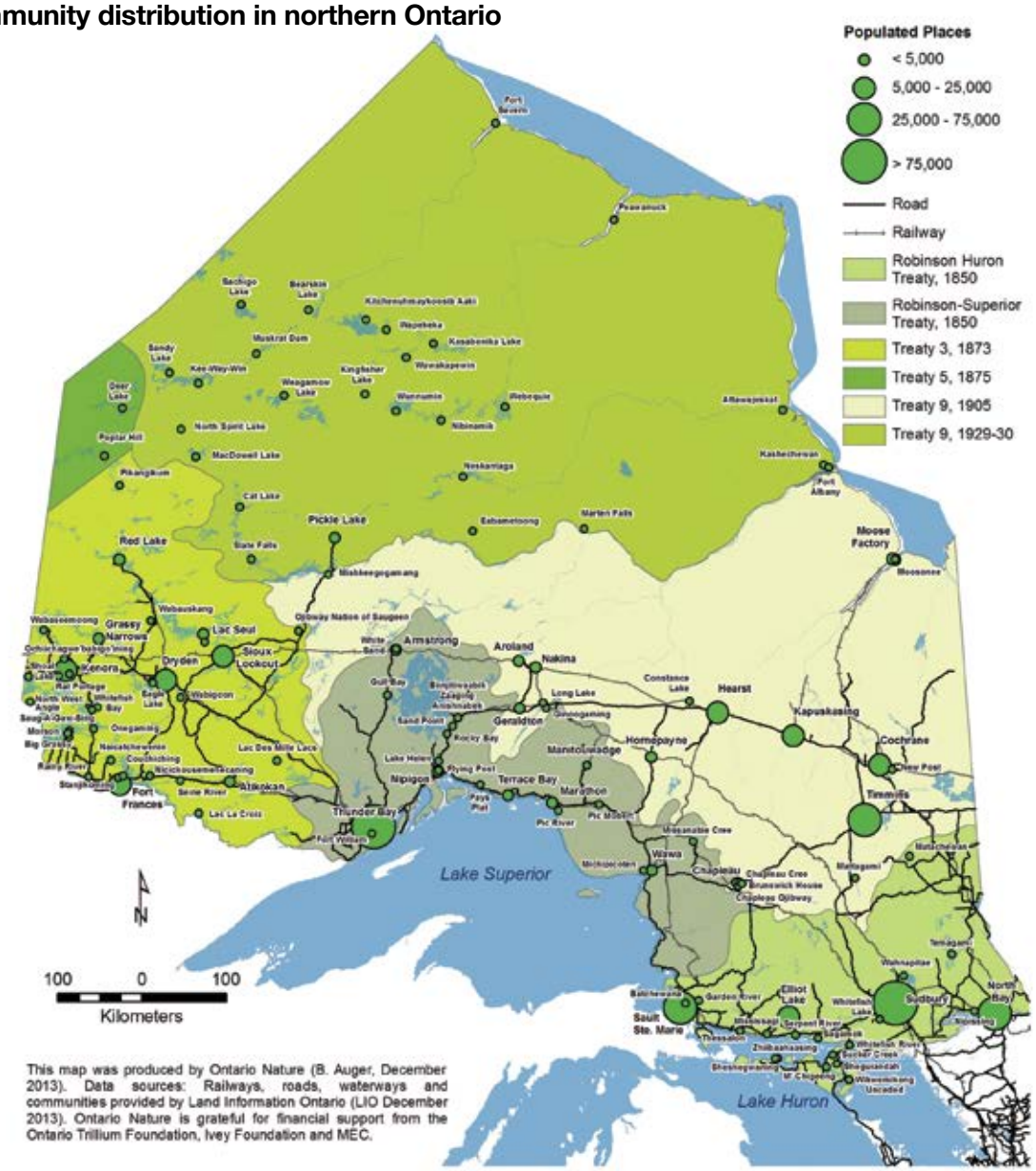


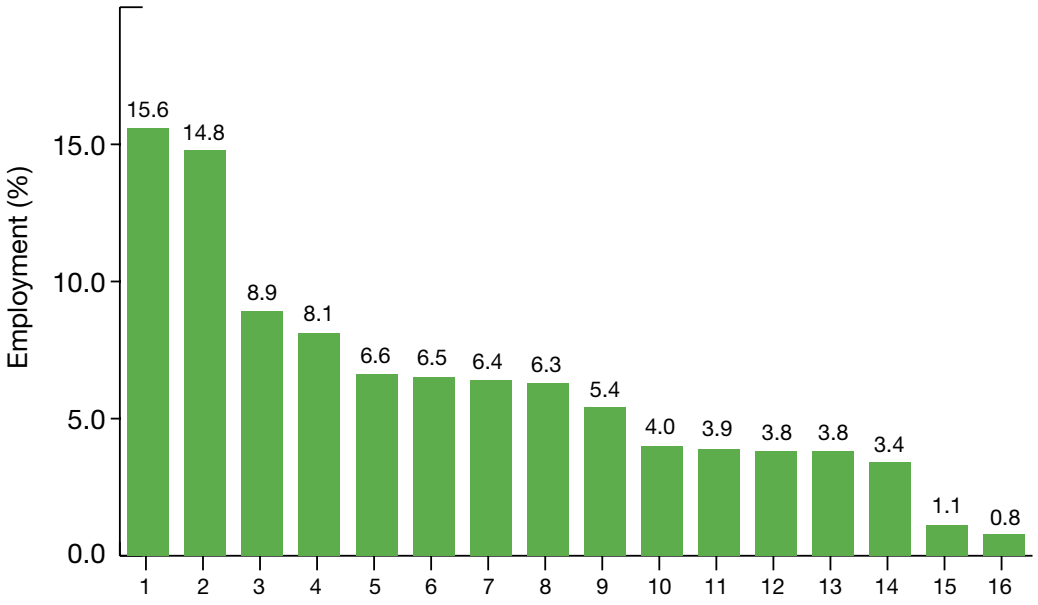
Figure 2: Community distribution in northern Ontario

Small, rural and remote communities generally lack the economic diversity to withstand fluctuations in industry prosperity and rely instead on one or a few industries. This is a resilience issue because when those industries fail, the people once employed have few alternative means to make money. This leads to an additional set of challenges, including the loss of working-age people (19-64), who seek opportunities elsewhere.[27] What is left is an aging population with a higher dependence on health care and social services, and a smaller tax base to cover those costs. The majority of northern Ontario's communities are thus not able to take advantage of the economies of scale afforded to larger urban centres. The geographic isolation of many of these communities also prevents them from outsourcing services to neighbouring communities.

EMPLOYMENT TRENDS AND ECONOMIC DIVERSITY

In northern Ontario, economic diversity and employment levels are low compared to southern Ontario. The majority of the labour force is dependent on a few major industries, and this perpetuates a state of instability and dependence rather than a state of self-sufficiency. Unemployment rates have historically been higher than in the rest of the province.[28] As of August, 2012, the unemployment rate in northern Ontario was an estimated 10.4 percent. At the same time, Aboriginal communities in the North were experiencing an unemployment rate of 16 percent.[29] Meanwhile, the provincial unemployment rate was at 7.8 percent.

Employment by Industry in 2008



1. Heath care & social assistance
2. Trade
3. Educational services
4. Manufactuing
5. Public administration
6. Forestry, fishing, mining, oil & gas
7. Construction
8. Accommodation & food services
9. Transportation & warehousing
10. Business, building & other support services
11. Professional, scientific & technical services
12. Information, culture & recreation
13. Other services
14. Finance, insurance, real estate & leasing
15. Agriculture
16. Utilities

Figure 3: Employment by Industry for Northern Ontario (2008)
Source: Statistics Canada, Labour Force Survey (2009)

Employment patterns show disconcerting differences between northern Ontario and the rest of the province (and, indeed, Canada). Of the top six employment industries in Canada, three are part of the public sector: health care and social assistance, education, and public administration. Nationally, these three industries combined employ 31.1 percent, or roughly one-third of the labour force. Provincially, they account for only 21.4 percent, or less than one-quarter of the labour force.[30] In northern Ontario,

however, they account for 60.5 percent of the region's employment, indicating a heavy dependence on the public sector and a lack of economic diversity.

What is not obvious from these numbers is that major public-sector employers tend to be concentrated in high-density hubs. Regional health and service centres exist in places such as Thunder Bay and Sudbury, while many smaller communities are under-serviced (especially with regard to health care and social services). With employment opportunities in the public sector concentrated in the region's few urban centres, smaller communities have increased dependence on the remaining major industry employers.

Forest and freshwater foods offer an exciting alternative to this pattern of economic dependence, and could enhance self-sufficiency in the northern economy.

The primary catalyst for resource extraction (and thus economic activity) in the region is the price of commodities in the global market, something that communities in northern Ontario have no control over. When prices are good, the mills and mines open or expand, and when prices are bad, shutdowns and layoffs follow. For single-industry towns, the loss of that industry threatens the very existence of the community. Yet, because of the small size and relative isolation of many northern communities, bolstering economic diversity is extremely challenging. There is no incentive for new businesses to set up in an isolated community with limited infrastructure, so attracting new capital investment is very difficult. This puts pressure on municipal and provincial governments to ensure continued use of existing capital investments and infrastructure.

Southcott (2008) reports that northern Ontario relies more heavily on government transfers than other parts of the province.[31] This is consistent with other indicators of dependence such as high public-sector employment, higher than average unemployment, a small pool of major industry employers, and a pattern of governmental interventions that favour industrial resource extraction.[32]

REGULATORY FRAMEWORK IN ONTARIO

Forest and freshwater foods offer an exciting alternative to this pattern of economic dependence, and could enhance self-sufficiency in the northern economy. However, gaps in legislation and policy limit this opportunity.

The Ministry of Natural Resources (MNR) has shown limited interest in non-timber forest products (NTFPs) and their management (such as the review of NTFPs conducted by the Ontario Forest Research Institute in 1999). The major focus for research and management have been for non-edible plants such as Canada yew,[33] for which the provincial government is promoting the development of a commercial industry.

Existing legislation, tenure systems and strategic planning in Ontario likewise reflect a lack of attention to NTFPs, providing minimal direction for their use and conservation. As Mitchell et al. (2010) have noted, because of the diversity in this sector and the fact that NTFPs are not easily defined, they have been largely ignored in public policy by agencies that have more limited and specialized mandates.[34] Missing are regulatory incentives such as business support, training, and information and facilitation for

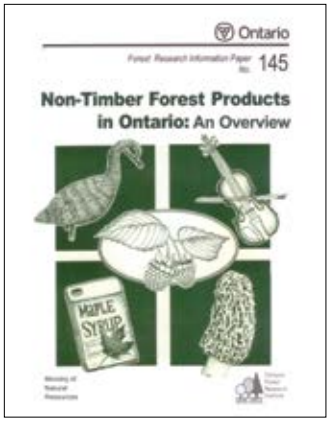
Photo: Wild rice, Dogtooth77, Flickr

collaboration within the sector and with other industries, which are critical for development.[35]

The only legislation currently in place that directly regulates the harvest of edible products in Ontario is the Wild Rice Harvesting Act, passed in 1990, which promotes a coordinated approach to wild rice harvesting and includes the requirement of a licence for harvesting rice on Crown land. The MNR issues licences and authorizes harvesters. As documented in a 2001 case study by DeLisle,[36] this licensing system does not eliminate the potential for conflict over use rights. In this particular case, conflict arose between local (including Aboriginal) harvesters, for whom the local rice harvest was a long-standing land use, and commercial harvesters, who were licensed to harvest without local input. Such conflict between traditional users and new commercial interests highlights the need for a more comprehensive regulatory framework for NTFPs in Ontario.

There are few other defined access rights that have been established for edible plants in Ontario other than wild rice. Harvesting and sale of NTFPs, including forest and freshwater foods, are regulated through an ad-hoc framework of legislation and policy. The result is a *de facto* open-access environment that leaves non-timber forest resources open to uncontrolled exploitation.

Crown land in Ontario is managed by the MNR under the Public Lands Act. The ministry has established Public Land Management Directives (commonly referred to as policies and procedures) to guide ministry staff, stakeholders and the public in the day-to-day and long-term administration, use, disposition and stewardship of Crown land, including NTFPs.[37]



The personal use of NTFPs is addressed by Ontario's Free Use Policy.[38] This policy identifies the recreational activities and specific commercial and industrial uses of public land that do not require government authorization or payment of fees. Uses that are defined as free-use privileges include transient activities such as "…non-regulated resource harvesting (berries, mushrooms, spruce boughs and other non-timber forest resources that are not regulated under the Crown Forest Sustainability Act) as well as hunting and fishing in accordance with the game and fish laws." The policy requires that these activities be undertaken in an "ecologically and socially sound" manner, but it does not further define what constitutes "ecologically and socially sound."

Under the Public Lands Act, the MNR manages the sale and disposition (including rights of use) of Crown land in Ontario. A number of provisions in the act restrict the activities of harvesters, including zoning for land use and opportunities to restrict road access to Crown land.

Rights to commercial use of NTFPs on Crown land can be accessed in a number of ways, most commonly through the issuance of a Land Use Permit or Licence of Occupation by the MNR. Policies under the Public Lands Act (e.g., Application Review and Land Disposition Process, Crown Land Rental Policy) describe the disposition and fee structure for rights to occupy or use Crown land and resources.

Photo: Nick Thompson

Ontario's Policy Framework for Sustainable Forests, along with the Crown Forest Sustainability Act, 1994, provide direction for the sustainable use of Ontario's Crown forests. Under the act, tenure for timber harvesting is defined through Sustainable Forest Licences (SFLs). Licence holders are required to develop forest management plans to ensure the sustainable use of the forest resource. These plans include recognition of non-timber forest values such as wildlife, recreation, hunting and trapping, and other Crown land uses. The main focus of the licence system and the forest management plans, however, is to manage the forests to optimize timber extraction while mitigating effects on non-timber forest values. The current forest management planning framework does not address the tenure for other uses of Crown land, nor can it resolve tensions among competing land uses.

The provincial government passed the Ontario Forest Tenure Modernization Act, 2011, to update the tenure system and create opportunities for local management of forests. This new law opens the door to improved approaches to managing for multiple forest values. Indeed, under the new system, there are examples of local communities, municipalities and First Nations working toward regional, community-based forestry models that include NTFPs as a component of promoting economic and community resilience. (See Chapter 5 of this report.)

Ontario has many examples of non-exclusive access rights to natural resources and resource exploitation. Non-exclusive use includes when there is more than one type of activity or licence holder in the same area. Sustainable Forest Licences do not provide exclusive access to licence holders, since they do not include the right to harvest forest resources other than timber. As such, there may be opportunities to grant harvesting agreements for non-timber forest products in many of the locations where timber rights have been assigned. However, the practical implications of doing so give rise to a number of challenges due to potentially incompatible land uses.

Along with the legislation discussed above, harvesting of NTFPs, including forest and freshwater foods, is also affected by laws governing the protection of the province's biodiversity. These include provincial laws such as the Provincial Parks and Conservation Reserves Act, 2006, the Wilderness Areas Act, and the Endangered Species Act, 2007, and federal laws such as the Canada National Parks Act and Species at Risk Act.

The Provincial Parks and Conservation Reserves Act, 2006 includes restrictions (for non-Aboriginal people) on harvesting of plant material and hunting in provincial parks. While hunting is not permitted in provincial parks unless "it is allowed by regulation made under the Fish and Wildlife Conservation Act, 1997. 2006, c. 12, s. 15 (1)," hunting in conservation areas is permitted. Plants cannot be removed from national parks, as per the Canada National Parks Act, or from provincial parks, as per the Provincial Parks and Conservation Reserves Act, 2006.

Photo: Quetico, Steve Wall

Existing Aboriginal and treaty rights are explicitly recognized in the Provincial Parks and Conservation Act, 2006, which states:

> Nothing in this Act shall be construed so as to abrogate or derogate from the protection provided for the existing aboriginal and treaty rights of the aboriginal peoples of Canada as recognized and affirmed in section 35 of the Constitution Act, 1982. 2006, c. 12, s. 4. (section 4).

Aboriginal harvesting in provincial and national parks is a subject of ongoing legal debate in Canada. The recognition of Aboriginal rights and title in the courts and the pursuance of Aboriginal land claims and treaties have generated growing interest in increasing the level of Aboriginal harvesting in national parks.[39] Since most of Ontario's land base is covered by treaty agreements with Aboriginal peoples, the existence of treaty rights could have an impact on both Aboriginal and non-Aboriginal rights to harvest NTFPs and other forest and freshwater foods.

Although there is some regulatory control of NTFPs through the existing provincial policy and legislation discussed above, Ontario is still lacking explicit, clear regulation regarding the sustainable harvest of most forest and freshwater foods. This creates challenges for ensuring that sustainability values are meaningfully included in higher-level land-use plans.

COUNTING THE HIDDEN VALUES

Current practices and precedents in forestry and mining support a one-dimensional approach to planning in which only single values that are relatively fixed, such as timber and minerals, are adequately accounted for. A one-dimensional planning approach is insufficient to manage and sustain the layered, overlapping and interrelated values in forest and freshwater food systems.

Photo: S. Brothers, Powerline Films

Although some food harvesting, such as commercial fisheries and commercial wild rice harvesting, is partially accounted for by conventional economic systems, the ecological systems that support these industries are undervalued, if valued at all.

Federally, the Canadian Council of Forest Ministers' Criteria and Indicators of Forest Sustainability identified the need to monitor and enhance contributions to the economy from the NTFP sector.[40] In addition, there is a need for inventories to establish sustainable harvest levels, more research to determine growth and reproduction requirements, improved application of traditional knowledge in management, clear harvesting guidelines, and fair licensing practices. Most importantly, all of this work should inform comprehensive land-use planning to achieve long-term community resilience and sustainability.

CHAPTER 3: THE VALUE OF FOREST AND FRESHWATER FOODS

Photo: Juhan Sonin

Previous chapters recommend reframing economic development so that it enhances the resilience of communities in the face of social, political and environmental challenges. This must be done, in part, by broadening the goal of economic development to include the support and protection of informal and under-represented food entrepreneurship, including food-related activities that lead to financial gain as well as food harvesting for personal consumption.

This chapter links community resilience with forest and freshwater food-related activities in northern Ontario, and presents new opportunities to leverage forest and freshwater foods for community resilience.

FOOD SECURITY AND INDEPENDENCE

Many communities in northern Ontario rely on foods that are harvested from forest and freshwater ecosystems, such as fish, moose and berries. The most obvious example of the value of these foods comes from northern Ontario's 32 remote communities, which are not accessible by road, except during the winter when ice roads are open. In many of these communities, the Northern Store (owned by the North West Company) is the only food retailer, and typically charges 50-70 percent more than what a food retailer in a city, such as Thunder Bay, would charge for food.[41] Because high food prices present food-access challenges to people in these communities, hunting, fishing and foraging offer important alternatives of significant economic value.

> In many remote communities, the Northern Store is the only food retailer, and typically charges 50-70 percent more than what a food retailer in a city would charge for food."

Region-wide statistics on the extent and scale of harvesting of forest and freshwater foods for personal consumption are incomplete. However, some information exists on the value of fish and meat for personal consumption in a number of First Nation communities. For example, a 1994 study of the Omushkego Cree of Hudson and James Bay Lowlands (Moose Factory, Moosonee, New Post, Fort Albany, Kashechewan,

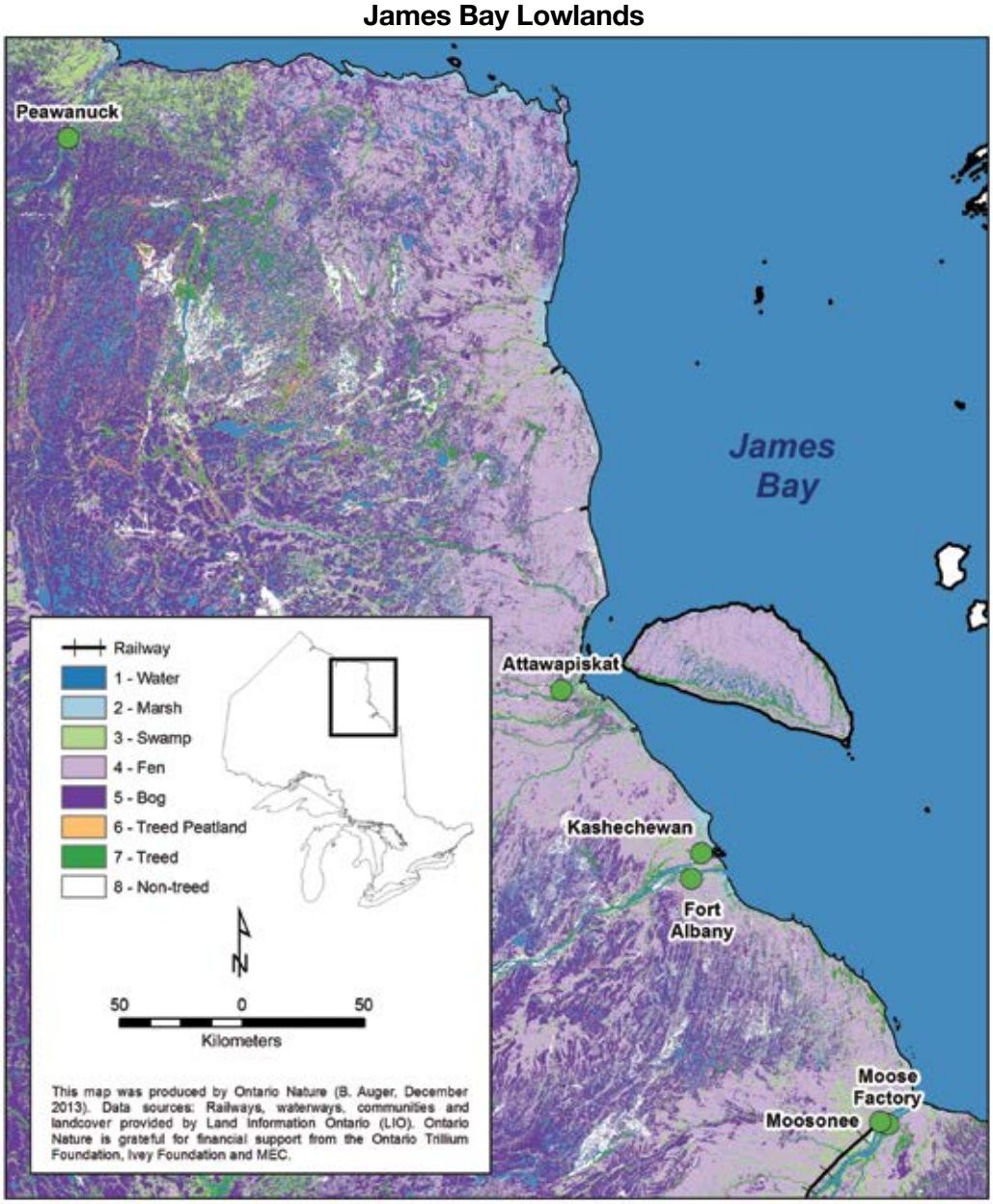


Figure 4: James Bay Lowlands

Attawapiskat, Peawanuck and Fort Severn) demonstrated that wild meats contributed a monetary value equivalent to one-third of their total cash economy ($7.8 million).[42] A 1991 study of the Ojibwa community of Webequie demonstrated that fishing activity generated a food weight of approximately half a pound of fish per person per day.[43] These findings reveal a considerable use of forest and freshwater foods by Aboriginal peoples.

The role that hunting, fishing and foraging play in less remote communities of northern Ontario is unclear, as very little research has been done. However, the MNR has estimated that more than 5,000 moose and more than 13,000 deer were harvested from northern Ontario in 2010.[44] These estimates exclude harvests by Aboriginal peoples, who are not required to acquire hunting permits, and are based solely on resident hunters who live in Ontario. The numbers suggest that forest sources of meat contribute a great deal to the food independence of northern Ontario.

There has been little attempt to quantify undomesticated plant harvests for personal consumption in northern Ontario. This lack of information is likely due, at least in part, to the fact that the harvest of most forest plants is not regulated and thus not monitored. However, anecdotal evidence suggests that berry, fiddlehead and mushroom harvesting is widely practised in the region, along with the harvesting of plants for teas and medicines.

FOREST FOOD ENTREPRENEURSHIP

Calculating the economic value of forest food entrepreneurship is a challenge, as it is difficult to monitor consumption and informal commerce. However, one relevant measure is the United Nations' estimate that Canada's "shadow economy" (i.e., goods and services that are not part of the official economy) had a value of approximately $16 billion in 2004.[45] This figure underscores the significant unrecognized value of certain types of goods and services that are outside of the formal economy.

Due to the lack of data, this report does not distinguish between formal and informal food entrepreneurship in the following summaries, and instead presents a comprehensive list of all known forest and freshwater foods and their uses in various enterprises, excluding value-added products such as jams, jellies and prepared foods.

Photos: (from top) True North Community Co-op, Thunder Bay; boreal birch syrup, Simon Brothers, Powerline Films

UNDOMESTICATED PLANT FOOD SALES

There is a growing interest in undomesticated edible plants. According to a major Ontario wild foods producer, Forbes Wild Foods, this coincides with the growing demand for organic food.[46] Forbes Wild Foods has approximately 100 items on its product list, and recently began distributing to the U.S. However, there are very few data on the actual quantity of foods and scale of commerce for most undomesticated, commonly harvested edible plants in northern Ontario.

BLUEBERRIES

In 2010, Canadian sales of lowbush blueberries in provinces other than Quebec, New Brunswick and Nova Scotia were valued at $8,355,000.[47] It is unclear what percentage of the lowbush blueberries were wild and came from northern Ontario. However, there is a thriving local market for blueberries across the region every summer, ranging from roadside vendors to farmers' markets and small grocers who buy blueberries from pickers. Prices vary but are usually between $7.50 and $15.00 per litre. There

Photo: Gabriel Amadeus

is at least one commercial-scale distributor of wild blueberries in northern Ontario.[48]

OTHER BERRIES

Other popular berries available in northern Ontario include raspberries, saskatoon berries and cranberries. They are sold at farmers' markets and elsewhere, but there is very little information about the extent and economic value of these activities.

WILD RICE

Much of northern Ontario's natural wild rice habitat has been destroyed by hydro dam development and industrial pollution.[49] However, Ontario maintains a small wild rice industry. In 2006, Canada produced more than 1 million kilograms of wild rice, 12 percent of which came from Ontario.[50] There is at least one commercial wild rice producer in northern Ontario, Manomin Canadian Wild Rice, based in Dryden.[51] In July, 2012, wild rice was priced at $4 per kilogram.

FIDDLEHEADS

The fiddlehead season lasts for three to four weeks in the spring. Generally, independent pickers harvest fiddleheads; there are no known commercial harvesters in northern Ontario. There is a small market for fiddleheads in restaurants, grocery stores and farmers' markets. At present, many major supermarkets carry frozen fiddleheads from the east coast, and small-scale pickers sell fresh fiddleheads at country markets in the spring. Fiddleheads sell for approximately $5-7.50 per kilogram, and up to $10 per kilogram in a gourmet food store.

MUSHROOMS

The wild mushroom market in northern Ontario is modest. Fine-dining restaurants and some specialty grocery stores purchase wild mushrooms in season, generally from independent harvesters. Popular varieties include morels, chanterelles and oyster mushrooms. Commercial harvesting of pine mushrooms in northern Ontario appears to be uncommon, but they can sell for as much as $13 per kilogram.

TEA

Many forest plants are used for teas including: wild rose hips, highbush cranberries, Labrador tea, wild mint, stinging nettle, raspberry and various tree barks. There are at least two commercial tea producers in northern Ontario that incorporate local forest foods.[52]

SYRUPS

There are many maple and birch syrup producers and vendors in northern Ontario. The province's maple syrup industry is estimated to be worth $10.9 million annually, with production occurring mainly in southern Ontario.[53] Towards the southern boundary of northern Ontario—including St. Joseph Island—there are maple syrup-producing regions. With climate change, these boundaries may shift.

Birch syrup is less common than maple syrup due to the significantly greater amount of tree sap needed to produce a unit of syrup. There is one known producer in northern Ontario, located near Thunder Bay. However, birch syrup industries in the Yukon and Alaska are strong, with one cup (250 ml) of birch syrup selling for $25. Thus, there may be more opportunities to increase production in northern Ontario.

HUNTING AND FISHING

According to the Ontario Federation of Anglers and Hunters, hunting is valued at $1.5 billion in Ontario and accounts for 20,000 jobs.[54] Recreational fishing contributes an additional $2.4 billion to the provincial economy.[55] Given that northern Ontario is a popular hunting and fishing destination, it is clear that the forest and freshwater food systems of northern Ontario are of significant importance to the region's economy.

Economic activity generated in 2007 from tourism in northern Ontario was responsible for more than 17,000 direct and indirect jobs across the province and contributed nearly $1 billion towards Ontario's overall Gross Domestic Product, according to FedNor statistics.[56] Hunting and fishing (the main tourism activities in northern Ontario) account for the majority of overnight visits to the region. Twenty percent of tourists to northern Ontario are Americans who come primarily to fish (528,000 American anglers), with an additional 898,000 Canadian anglers (resident anglers and tourists).[57] There are more than 190 hunting and fishing camps operating in the region. Sport anglers and those who fish for food draw from the same wild fish stocks. Thus, the value of forest and freshwater food systems goes beyond their immediate benefit as food.

Photos: (from top) True North Community Co-op, Thunder Bay; boreal birch syrup, Powerline Films; Julee Boan

Since 1996, Ontario has put licence fees, royalties and fines collected under the Fish and Wildlife Conservation Act, 1997 into a special account used exclusively for fish and

Photo: Klahowya

wildlife management. According to the MNR, the Fish and Wildlife Special Purpose Account was expected to contribute approximately $68.2 million to fish and wildlife management in 2011-2012.[58] This is an excellent example of the way in which hunting and fishing activities, which depend directly on forest and freshwater food systems, can generate economic value that can then be used to ensure the long-term sustainability of these systems.

COMMERCIAL FISHERIES

The commercial fisheries of Lake Superior and Lake Huron have been formally managed since 1955, when the government of Ontario, along with the United States, signed the Convention on Great Lakes Fisheries.[59] The principal commercial fish from Lake Superior is lake whitefish; smoked, refrigerated and vacuum-packed fillets are available in grocery stores across North America. Lake Huron's commercial fishery produces the largest volume of lake whitefish in the Great Lakes; it sells in American and Ontario markets.

Lake Superior's northern bays account for 90% of the lake herring commercially harvested in Canadian waters.

Lake Superior's northern bays also account for 90 percent of the lake herring commercially harvested in Canadian waters. Lake herring is primarily harvested for its roe, which is shipped mainly to the U.S. and Europe.[60] Lake trout, walleye and yellow perch also contribute to the commercial fisheries of Lake Superior and Lake Huron.

In 2010, Fisheries and Oceans Canada recorded more than 11,298 tonnes of fish landed in Ontario's commercial fisheries, amounting to more than $31 million in catch value. The value of the northern Ontario catch is not separated out in this total.

In addition to the Great Lakes enterprises, there are several small-scale commercial fisheries in Lake of the Woods, Lake Nipissing, Lake Nipigon, Eagle Lake, Cat Lake and Slate Falls. Commercial fishing has been in significant decline since the 1980s, largely due to the high cost of flying fish to market for sale, as well as concerns with methyl-mercury contamination.[61] The fish harvested from these small-scale fisheries tend to be sold in local stores and served in local restaurants. There are no statistics on the number of these vendors; however, there are fish vendors committed to sourcing local fish in Thunder Bay, Sudbury and Sault Ste. Marie.

HUNTER SUPPORT PROGRAMS

It is illegal to sell wild meats in Ontario—unless one has a commercial fisheries licence. The extent of informal trading of wild meats and fish is unknown. There are, however,

interesting social enterprises, known as hunter support programs, taking place in some First Nation communities. These programs support community members who harvest animals and then redistribute the meat, contributing to the overall economic well-being of the community.[62]

NUTRITION AND SOCIAL DETERMINANTS OF HEALTH

The economic benefits that forest and freshwater foods confer extend beyond consumption, employment and financial gain. They also contribute greatly to different types of community capital such as health and well-being. Forest and freshwater foods foster good health by providing nutrition that can prevent chronic diet-related illnesses.

Obesity and Type II diabetes are on the rise in all Canadian populations. Twenty-three percent of adult Canadians are obese, and an additional 36 percent are overweight.[63] Twenty-six percent of Canadian children are overweight or obese, a number that has more than doubled over the past 25 years.[64]

Aboriginal Canadians have undergone a dietary transition from traditional diets, which consist mainly of forest and freshwater foods, to western diets.[65] This change is due to a range of factors. Resettlement has estranged some communities from the traditional ecological knowledge that enabled them to live off the land.[66] Assimilative pressures, whether through economic development or cultural force (including residential schools and hospitals), have brought a shift to a cash economy and a preference for western foods practices.[67] In addition, industrial development has destroyed or contaminated many northern Ontario food webs.[68]

Photo: Sriram Bala

The Aboriginal transition to a western diet has contributed to disproportionally high rates of obesity, Type II diabetes, hypertension, coronary heart disease, peripheral vascular disease, varicose veins, diverticulosis, appendicitis, kidney stones and some forms of cancer.[69] In 2004, the World Health Organization identified Sandy Lake First Nation, a fly-in community 600 kilometres northwest of Thunder Bay, as having the third highest rates of Type II diabetes in the world.[70]

Access to health care and economic opportunities have a mutually reinforcing relationship: poor health can lead to poverty and poverty can lead to poor health.[71] In northern Ontario, factors such as geographic remoteness, low population densities, lower availability of health-care providers, over-priced foods with little nutritional value, and high unemployment rates result in a structural disadvantage for accessing health care and maintaining a level of health conducive to joining the work force or doing well in school.

In 2003, Aboriginal people living on reserves in Ontario were much more likely to be

HEALTH BENEFITS OF SPENDING TIME OUTDOORS

In a 2010 report, Dr. Frances Kuo reviewed and summarized the research from around the world examining the human health implications of being in contact with nature. Kuo characterizes the findings as remarkable in their strength, consistency and convergence. The significant social, mental and physical health benefits include:

- greater sense of community;
- more positive social interaction;
- better cognitive functioning;
- more self-discipline and impulse control;
- greater resistance to stress;
- improved immune system functioning; and
- higher levels of physical activity.

admitted into care for preventable illness and much less likely to access specialist care than people living off reserves.[72] In a 2011 Statistics Canada study, Aboriginal Canadians were found to be 2.5 times more likely to die prematurely than non-Aboriginal Canadians, due in part to socio-economic factors.[73]

Adequate nutrition is an essential element of preventive health care.[74] Forest and freshwater foods are the major source of local, affordable, healthy food in northern Ontario. These foods are accessible, in terms of both proximity and cost, making them a valuable asset for health-care autonomy in otherwise under-serviced communities. Furthermore, for many First Nation cultures, food and medicine are seen as interchangeable.[75] In places where health-care accessibility is low, the value of forest and freshwater foods as a form of preventive medicine is greatly increased.

HARVESTING AND HEALTHY LIFESTYLES

Harvesting forest and freshwater foods can bolster personal and community well-being by helping to maintain personal fitness, cultural traditions and heritages; by supporting intergenerational relationships through knowledge-sharing networks; and by fostering a greater connection to the land.[76]

In 2011, Statistics Canada reported that only 15 percent of Canadians meet the minimum exercise standard set out in Health Canada guidelines.[77] The health risks associated with a sedentary lifestyle are many, and have been linked to Nature Deficit Disorder, a term coined by Richard Louv in 2005 to denote the broad and serious health implications of living disconnected from the natural world.[78] These include heightened stress and anxiety, higher rates of clinical depression, exacerbated attention deficit disorder, higher rates of childhood obesity, and higher rates of disease.[79] Dr. Melissa Lim of the Canadian Association of Physicians for the Environment argues that time spent outdoors can be used to prevent and even treat conditions such as attention deficit disorder and asthma in children.[80]

An active lifestyle can reduce the risk of these problems in children and adults. A study conducted by Marc Berman, a research fellow at the Rothman Research Institute in Toronto, found that a 50-minute walk in a woodland park improved cognition and relieved depression in volunteers suffering from depression.[81] Summary research conducted by naturopath Alan Logan and Harvard physician Eva Selhub demonstrates that outdoor physical activity increases energy and reduces fatigue and depression.[82]

Given this strong body of research, it stands to reason that the physical activity associated with forest and freshwater food harvesting can contribute to a healthier and more active lifestyle.

CULTURAL BENEFITS

Food harvesting requires specific knowledge of the ecology and geography of the land. Northern Ontario cultures are rooted in this knowledge and heritage, whether it be the traditional ecological knowledge of First Nation communities[83] or the history of the fur trade in northern Ontario.[84]

The idea that indigenous peoples' identities are tied to the land is well established.[85] At the 2012 Nishnawbe Aski Nation food symposium, being on the land and using food from the land were identified as integral to communities' cultural identities. In some communities, learning cultural heritage through the land is seen as therapy for troubled youth.[86] In the Opaskwayak community in Saskatchewan, the link between living off the land and cultural identity has been expressed not only as a value in and of itself, but as an essential element of the proper management of their wetland ecosystems.[87] Similar sentiments are shared by hunters and anglers in general. As historian and author Jean Manore has written, for hunters these activities "remain fundamental to their identity and way of life."[88]

What is less clearly established, however, is how forest and freshwater foods have been integrated into local identities in settler communities. Further research is needed.

Time spent outdoors can be used to prevent and even treat conditions such as attention deficit disorder and asthma in children.

Photos: (from top) Ivan Pope; Julee Boan

ECOLOGICAL CONSIDERATIONS

The presence or absence of various plants and animals in the food web can be indicative of ecosystem health,[89] due to the fact that forest and freshwater foods are part of ecosystem-wide food webs and their bounty is consumed not only by humans but by other animals as well.

It is well known that human activities such as mining, forestry and urbanization can alter the composition of food webs at the micro level through the removal or addition of lower trophic levels (links in the food chain)[90] or through the introduction of contaminants into the food chain.[91] At the macro level, invasive species, habitat fragmentation and habitat loss due to human activity can dramatically alter food web dynamics and the health of the larger ecosystem.[92]

More research into the values and uses of forest and freshwater foods is needed to inform community

Photo: Lake Superior, Noah Cole

development and sustainable resource management in northern Ontario. For example, a recent study of moose hunting in a northern Ontario First Nation community indicated that MNR moose harvest reports have underestimated the total harvest quantity by approximately 40 percent in some Wildlife Management Units.[93] This significant underestimation is due to the fact that the provincial management scheme does not include First Nation harvests, since First Nations' right to hunt on traditional territory falls outside provincial jurisdiction. With rapid changes and advances in resource extraction technologies and methods, it is increasingly important to find comprehensive ways to monitor and address the impacts of our actions on the ecosystem.

One of the benefits of harvesting forest and freshwater foods is that it gets people out on the land, relating to the land in more ways, and increasing the direct connections between humans and ecological systems. Protecting and promoting our engagement in forest and freshwater food systems improves our capacity to observe, understand and manage the consequences of our activities.

However, there is a tension between promoting the use of forest and freshwater foods and the risk of dramatically altering ecosystems. Studies have shown that game and fish populations affected by human activities, such as hunting and fishing, produce demonstrable changes throughout the food webs of which they are a part.[94] Thus, it is crucial that the promotion of forest and freshwater foods not compromise the maintenance of ecological integrity and the long-term viability of these food sources.

REDUCING AGRICULTURAL POLLUTANTS

Consumption of forest and freshwater foods reduces the reliance on foods grown with intensive inputs. Industrial agriculture contributes to water, air and soil contamination through the use of pesticides and chemical fertilizers that can move through food webs and bioaccumulate and inundate aquatic food chains with excessive nutrients (eutrophication), causing a wide range of environmental problems.[95] For example, agricultural pollutants, along with urban runoff, have contributed to algal blooms and oxygen depletion in Lake Erie.[96]

Forest and freshwater foods grow without the need for pesticides. However, approximately 70,000 hectares of managed forests in northern Ontario are sprayed with pesticides every year.[97] This application is to support tree growth for timber harvesting. Although the application does not specifically target forest and freshwater foods, forestry herbicides are present in forest and freshwater food systems.

Even so, synthetic chemical inputs into forest management in northern Ontario are, generally speaking, less than inputs from conventional industrial farming, where herbicides, pesticides and fertilizers are applied regularly. Herbicide applications to replanted forests are typically done only once in a 50- to 80-year cycle, and pesticides

are applied only if a serious insect infestation is imminent.

The environmental impact of farmed fish includes contamination and degradation of waterways, whereas wild fish do not have this negative impact.[98]

REDUCING GREENHOUSE GAS EMISSIONS

Forest and freshwater foods offer potential reductions in greenhouse gas (GHG) emissions associated with the global food system, such as those that result from industrial agriculture and food transportation.[99] Many northern Ontario communities are so remote that shipping food is a source of high GHG emissions. According to the David Suzuki Foundation, aviation is the most GHG-intensive form of freight transportation. Thus, relying less on food that has travelled great distances and more on locally harvested forest and freshwater foods offers reductions in GHG emissions.[100]

ECOSYSTEM SERVICES

The sustainable management of forest and freshwater foods and the ecosystems that support them should ensure that ecosystem services, including food, water purification and carbon storage, are preserved. These benefits represent significant cost savings when one considers the amount of money that would be required to replace even a portion of these ecological services.

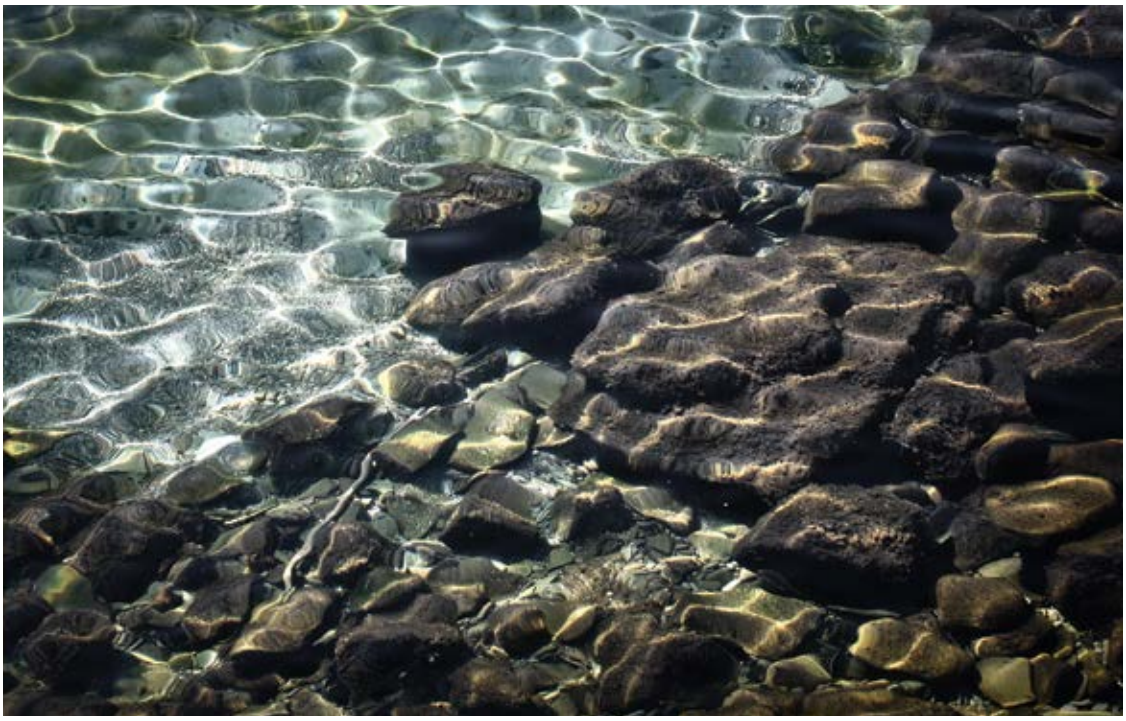


Photo: Gene Wilburn

CHAPTER 4: HUMAN IMPACTS ON FOREST AND FRESHWATER FOODS

Photo: David Astley

Ontario's northern forests have experienced a relatively short history of industrial exploitation, particularly in the boreal region.[101] In recent years, however, forestry, mining and hydro development have been expanding their reach. These activities, along with the infrastructure required to support them, have the effect of fragmenting and altering forest and freshwater habitats and changing food web interactions at multiple scales. They also bring new sources of pollutants, which make their way into forest food systems and work their way up the food chain, negatively impacting the health of humans and other animals.

Continuing industrialization of the northern landscape will undoubtedly create new threats to forest and freshwater food systems. Among the current threats are increasing levels of environmental pollutants, habitat loss and fragmentation, increasing harvesting pressure, and climate change.

A 2012 United Nations report noted that the debate on food security has revolved largely around availability, access, utilization and stability, and has barely touched on the resource base and ecosystem services that sustain the food system.[102] In Canada, the issue has begun to be addressed by Food Secure Canada (FSC) and Nishnawbe Aski Nation (NAN). FSC has published a report called "Resetting the Table: A People's Food Policy for Canada" that addresses the importance of ecological systems to food security and agriculture.[103] In Ontario, NAN has implemented a food strategy that acknowledges ecosystem health and forest and freshwater food system resilience as essential elements of a sustainable food system.[104]

Continuing industrialization of the northern landscape will undoubtedly create new threats to forest and freshwater food systems. Among the current threats are increasing levels of environmental pollutants, habitat loss and fragmentation, increasing harvesting pressure, and climate change.

ENVIRONMENTAL POLLUTANTS

The term "pollutant" refers to a contaminant whose concentration in the environment is high enough to result in harmful effects.[105] Pollutants that

contaminate Ontario's forests include heavy metals, persistent organic pollutants (POPs) and synthetic herbicides. Some of the main sources of industrial pollutants in northern Ontario are mining, hydroelectric power facilities, and pulp and paper production. Airborne deposition of pollutants is also a significant source of some types of pollutants, such as POPs.

Research suggests that indigenous populations, in particular, have a higher risk of exposure to certain pollutants because of their diet: the more likely someone is to consume fish or wild game as a main staple of their diet, the more likely is their exposure to higher concentrations of certain contaminants, such as mercury and lead. This raises concerns about the health impacts of some wild foods, and requires new approaches to managing these risks in northern communities.

Photos: (from top) Joey Rosier; Bert Van Dijik

PERSISTENT ORGANIC POLLUTANTS

Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment and persist for long periods of time in the environment. POPs can bioaccumulate and pass from one species to the next through the food chain. In Canada, the pulp and paper industry was once responsible for 50 percent of all the waste released into waters, and accounted for approximately 5.6 percent of the common air contaminants from known industrial sources.[106] While pulp and paper technology and emission standards have improved, some of the POPs from the industry can still be found in the environment today.

POPs are mainly used in industrial applications, and some have been used as insecticides. They are also by-products of incineration or other industrial processes. Many are now banned or subject to strict controls. However, because they do not break down easily through chemical or microbial processes, POPs that were released into the air and water long ago continue to circulate. These chemicals have a variety of toxic effects, including disruption of hormone and immune systems of mammals.[107]

Exposure to POPs occurs mainly through diet, particularly through the consumption of breast milk, fish, fatty meats and dairy items. Among the most heavily exposed people are those who regularly eat sport fish.[108] The risk of exposure increases with the consumption of top predator species (e.g., lake trout, walleye and salmon) and with the consumption of older, larger fish and longer-lived species (e.g., lake sturgeon).[109]

In general, the likelihood of exposure is higher with the consumption of Great Lakes fish as opposed to fish from smaller northern lakes. Nonetheless, northern communities that rely heavily on fish as part of their local diet should be aware of the risks. The *Guide*

to Eating Ontario Sport Fish, published annually, gives detailed recommendations for reducing exposure to contaminants in sport fish.

Concerns about build-up of POPs in game meat have been somewhat dispelled by studies that show POPs at very low levels in lean land animals (herbivores) such as moose.[110] However, a 1997 study by the Arctic Monitoring and Assessment Programme, "Arctic Pollution Issues: A State of the Arctic Environment Report," found that caribou in Canada's Northwest Territories had as much as ten times the levels of PCBs as the lichen on which they grazed; PCB levels in the wolves that fed on the caribou were as much as 60 times higher than PCB levels in the lichen.[111]

There is less concern about exposure to POPs from consumption of plant material because plants are at the bottom of the food chain.

HEAVY METALS

Heavy metals are found widely in the environment, and normal background concentrations are generally harmless to most living organisms. Some emissions come from natural sources (e.g., forest fires), but human activities such as burning fossil fuels, metal refining, mining operations (including acid mine drainage) and wastewater discharge also release toxic metals into the environment.[112]

Photo: Elliot Lake, Wes Reimer

Deposition from the air is the main source for most of the heavy metal contamination in the environment. At a local scale, higher concentrations of metals in wildlife occur close to point sources (e.g., power plants, mines, smelters and refineries). At a larger scale, similar levels of metals in wildlife occur across the landscape because such a high proportion of emitted metals are spread broadly as emissions into the global atmosphere. Because plants are at the bottom of the food chain, there is generally less concern about the accumulation of metals in plant-based forest foods. However, there may be site-specific concerns about plants located near industrial facilities. For example, in the Northwest Territories small amounts of arsenic have been found in berries growing at or very close to mine sites.[113]

From a human health perspective, the three metals of most concern are cadmium, mercury and lead.

CADMIUM

In Canada, the highest concentrations of cadmium have been reported in the vicinity of lead–zinc smelters. Elevated cadmium levels also occur as a result of the disposal

Photo: Pranav, Flickr

of sewage sludge, combustion of fossil fuels, and weathering of galvanized metals.[114] High cadmium levels in the human body can lead to kidney and bone damage; there is also some evidence that cadmium may cause cancer.[115]

Data from a 2001 study on contaminants in game meat, sponsored by the Assembly of First Nations/Chiefs of Ontario/Health Canada, indicated that organ meats tend to have a higher concentration of cadmium.[116] Furthermore, since toxins accumulate with age, older animals tend to have higher concentrations in their meat and organs. In 1985, the Ontario Ministry of Natural Resources first issued an advisory to hunters to avoid consuming moose livers and kidneys as they had been found to have high concentrations of cadmium. This was later extended to deer, and remains in effect today,[117] with obvious implications for populations who hunt and consume moose and deer on a regular basis.

MERCURY

Mercury occurs naturally in soil and rocks and is also a by-product of industrial processes, incineration, and metal smelting.[118] Mercury exists in different forms, some of which (such as methyl mercury) are very toxic. Mercury can be released from flooded soils and vegetation in hydroelectric water reservoirs, where bacteria use the organic carbon in soils to produce methyl mercury from natural concentrations of inorganic mercury. In Ontario, the communities of Grassy Narrows and White Dog First Nations near Dryden suffered mercury poisoning as a result of the discharge of mercury-containing pulp and paper effluent into the Wabigoon River from 1962-1970.[119] The effects of that mercury poisoning are still seen in the community today.

Mercury's primary health effects are neurological, but high exposure can also permanently damage the brain and kidneys, and cause birth defects in humans and wildlife. Children are particularly susceptible to its toxic effects. The consumption of mercury-contaminated fish from the Pacific Ocean near Minimata, Japan, resulted in 50 deaths and 200 cases of illness characterized by nervous system failure, vision loss, and brain damage.[120]

Methyl mercury biomagnifies in food webs, and the highest concentrations occur in large, longer-lived animals and in species at the top of the food chain. The main source of human poisoning is through the consumption of mercury-contaminated fish. Consumption of other wildlife is also a source of mercury in humans.[121]

The Mushkegowuk Environmental Research Centre has been sampling fish in the Albany and Attawapiskat Rivers in northeastern Ontario and finding higher than normal levels of methyl mercury.[122] Ontario's Ministry of the Environment has changed its fish consumption advisory for a stretch of the Attawapiskat river near the Victor diamond mine to four meals a month, from the previous eight. Although a causal link has not been established, one possibility for the increase in mercury levels is the mobilization of mercury from dewatering processes at the Victor mine.

LEAD

Lead is a neurotoxin that affects both humans and wildlife and has particularly adverse effects in children. Specifically, exposure to lead may hinder the intellectual development of infants and children.[123]

One of the earliest documented cases of toxic metal contamination in wildlife populations was the effect of lead shot on waterfowl. Prior to 1991, North American duck hunters released an estimated 3,000 tonnes of lead per year. Ducks, geese and other waterbirds pick up these lead pellets while feeding. Species that feed on waterfowl, such as bald eagles, are also exposed to high concentrations of lead and suffer the effects of lead poisoning.[124]

Research has shown that regular consumption of game meat harvested with lead ammunition and contaminated with lead residues may cause relatively substantial increases in blood lead levels compared to background levels, particularly in children.[125] One study focusing on Cree adults in northern Ontario found that the mean blood lead concentration of adult males was approximately three times higher (6.3 µg/dL, compared to 2.1 µg/dL) than in a control group from the industrialized city of Hamilton, Ontario.[126]

As of September 1, 1999, the possession or use of lead shot for hunting most migratory game birds (waterfowl) was banned in Ontario. However, lead shot remains legal for grouse, woodcock and some other upland species,[127] and lead ammunition continues to be used commonly for hunting large game in Ontario. The provincial government has a role to play in educating hunters and developing a more stringent regulatory framework for the use of lead ammunition in Ontario.

HERBICIDES

It is estimated that herbicides are applied to approximately 70,000 hectares of forest in Ontario annually, or about one-third of the area harvested each year.[128] People in northern communities are increasingly voicing concerns about the health effects of herbicide exposure from forestry applications, and requesting environmental assessments of their use.

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One of the most commonly used herbicides in the forest industry in northern Ontario is glyphosate, which is also known under the trade names “Roundup” and “Vision.” Glyphosate is a non-selective herbicide that is used to kill broad-leaved plants, grasses and sedges, and assists in controlling competing vegetation so that conifers can re-establish on a logged site. Questions have been raised about the direct and indirect effects of this herbicide on wildlife, including potential contamination of game meat.

In 2002, the U.S. Forest Service funded studies by the California Department of Pesticide Regulation to assess the potential exposure of plant gatherers and users to forestry herbicides, in response to concerns expressed by tribal people in that state.[129] The study found that, in general, residues of glyphosate were significantly higher in many plant parts than other herbicides that were tested.

Low levels of glyphosate remained detectable in bracken fern roots at 67 weeks post-application. The important question is whether or not such residues pose any harm to wildlife or humans consuming the ferns.

The Canadian government asserts that there are "no credible scientific data supporting the contention that glyphosate residues may contaminate wild game tissues, particularly at levels that may be toxicologically significant to humans. Field studies conducted in different forestry scenarios confirm that glyphosate residues are not accumulated in the flesh of game animals (e.g., moose, deer, hare) or other wildlife species taken from within or near glyphosate-treated areas."[130]

This is supported by a U.S. Environmental Protection Agency (EPA) study[131] that found approximately 30-36 percent of glyphosate is absorbed through the gastrointestinal tract in laboratory animals. Less than 1 percent of the absorbed dose remained in the carcass, and what remained was found primarily in the bone. When glyphosate was first registered in 1993, the EPA stated that "based on current data, EPA has determined that the effects of glyphosate on birds, mammals, fish and invertebrates are minimal."

It has been shown, however, that glyphosate treatments to forests can affect moose distribution by substantially reducing the quantities of winter food available on sprayed areas. Moose eat fewer plants on treated areas, most likely because they go in search of areas where there is a higher density of food plants.[132] While the long-term impacts on the overall moose population are less clear, it has been shown that heavy spraying in an area can dramatically change the availability of moose to hunters in the treatment area, at least in the short-term.[133]

In addition to concerns about game, some indigenous people who rely heavily on forest and freshwater foods have expressed concerns that chemical spraying makes wild foods such as berries less healthy, and that some people are therefore more reluctant to eat them.[134] As well, spraying has been shown to reduce the amount of berries available for several years following treatment.[135]

In Canada, much of the available research and government regulatory investigations suggest that glyphosate is not known to cause cancer, act as a developmental/reproductive toxin or as an endocrine disruptor.

However, there are epidemiological studies that suggest possible links between exposure to glyphosate and some kinds of cancer, most commonly non-Hodgkin's lymphoma.[136] Furthermore, a Canadian epidemiological study, the Ontario Farm Family Health Study, found an association between exposure to glyphosate-based herbicides and miscarriages and pre-term deliveries.[137]

An extensive literature review by the Pesticide Action Network suggests many other possible adverse health effects from continued exposure to glyphosate.[138]

There are also concerns that "adjuvants" such as surfactants (chemicals added to glyphosate products to improve the effectiveness of chemical application) may be more toxic than the active ingredient. Some surfactants are known to be toxic to animals, ecosystems and humans, and can increase the diffusion of other environmental contaminants.[139] However, since adjuvants are protected under law as trade secrets, little information is available and their full health effects have not been established.[140]

While the scientific debate over whether or not herbicides pose a serious risk to human and wildlife health is ongoing, the issue of perceived risk is real. If people fear contamination from herbicides and avoid consuming forest foods as a result of that risk (perceived or otherwise), then this represents an indirect threat to the accessibility of a secure forest and freshwater food supply.

Photo: Garth Lenz

HABITAT LOSS AND FRAGMENTATION

Habitat loss and habitat fragmentation are two types of changes to forest landscapes that result from human activity. Habitat loss, considered to be the leading cause of species extinction,[141] is generally associated with habitat fragmentation. While the two are related, they can have different implications for species that depend on forest landscapes.

Habitat loss occurs when an area is altered or degraded to an extent that it no longer functions as habitat for a species—that is, it no longer provides adequate food, shelter

and the space needed for a species to safely mate, rear young, migrate, and so on. This loss can result in the extirpation of species (meaning they are no longer found in a part of their former range) or extinction (meaning the species disappears altogether).

Habitat fragmentation can be described as the division of large habitat blocks into smaller areas which may or may not be large enough to provide good quality habitat for a species. In northern Ontario, it is often the result of the development of linear corridors, including highways, logging roads, transmission lines and associated access corridors.[142] Effects of fragmentation include increased road mortality, changes in predator-prey relationships, the introduction of invasive species, and over-hunting and over-fishing as a result of increased access. Logging not only leads to fragmentation but it also alters the landscape on a large scale through changes to the proportion of tree species at different ages that make up a forest, forest composition and age-class structure. These large-scale changes can result in habitat loss and degradation for certain boreal species.[143]

EFFECTS ON MOOSE, DEER AND CARIBOU

Declining woodland caribou populations and local extirpation of caribou in parts of Ontario provide an example of the effects of industrialization and development on vulnerable forest species.

Habitat loss or degradation through fragmentation has been shown to alter species interactions, predation rate and foraging behaviour, as well as affect the breeding and dispersal success of various species, such as caribou.[144] Forest fragmentation also contributes to the spread of parasites (e.g., meningeal worm, which fatally affects caribou and moose but not deer) and disease by facilitating the co-occurrence of deer and caribou in the same areas.[145] As well, fragmentation has negative effects on caribou populations through increased mortality from predation and decreased calf survival.

Photo: Bruce MacQueen

The impact of roads on moose populations varies. Linear corridors may create or remove habitat for moose depending on the habitat types being traversed and degree of distribution of individuals in the area.[146] Moose have sometimes been found to avoid habitat in the vicinity of roads because of human activity, which is most evident in hunted populations.[147] In the case of deer, however, a 2012 study in eastern Ontario suggested that there may be a positive correlation between paved roads and white-tailed deer abundance, although the reasons for this are not clear.[148]

EFFECTS ON FISH

Infrastructure development such as dam construction in river catchments is destroying or modifying inland fishery habitats. More than 50 percent of the world's large rivers have been fragmented by dams on their main channel and 59 percent by dams on their tributaries.[149]

Many aquatic species have specific habitat requirements for successful reproduction and are thus sensitive to habitat fragmentation. For example, brook trout's habitat requirements include forest cover along the water's edge, clean, low-nutrient water quality, and a water-flow speed sufficient to maintain flow rates and cold water temperatures; brook trout are sensitive to any habitat changes. Physical barriers such as hydro dams, irrigation systems and reservoirs can also impact aquatic habitat connectivity and undermine the viability of fish populations.

Photo: Don Schuetze

Roads, a key factor in habitat fragmentation on land, also put pressure on inland fish stocks by increasing access for anglers and thus potentially increasing fishing rates. For example, the popularity of walleye with resident and non-resident sport anglers has resulted in extensive overexploitation of the species in some areas of the province. Resource managers in northern Ontario have long observed the rapid decline in angling quality following the construction of access roads into previously unexploited or lightly exploited walleye lakes.[150]

As industrial activity moves farther into northern forests, there will be increasing pressure on fish populations. New road corridors will mean that northern communities that rely on forest species as a significant part of their diet will be competing with non-resident anglers and hunters for fish and game.[151] Increased harvesting pressures will make it necessary to develop management strategies to ensure a secure forest food supply for primary users such as First Nations and other local residents.

HUNTING AND HARVESTING PRESSURES

Many remote northern communities, and in particular Aboriginal communities, rely on hunting and fishing as an important food source. In larger urban areas where other food sources are available, wild game is a supplement to the local diet, and hunting represents a recreational activity more often than a subsistence need. Fundamentally, however, both types of harvest must be carried out in a way that maintains the sustainability of animal and fish populations.

Some jurisdictions have developed priority rules for subsistence harvests. For example, Alaska state law directs the Board of Game and Board of Fisheries to provide a reasonable opportunity for subsistence uses first, before providing for other uses.[152] Currently, Ontario makes no such distinction, though it should be considered as part of an improved regulatory framework to enhance northern food security.

The main factors that determine moose abundance are food, weather, hunting, predation, disease and parasites. Ontario's 1988 "Timber Management Guidelines for the Provision of Moose Habitat" note that moose populations declined in Ontario by approximately 35 percent between the mid-1960s and the 1980s. The reasons for the decline were debated, but there is general agreement that hunting was a major factor.[153] Another northern Ontario study from the 1980s found that the vulnerability of

Increased harvesting pressures will make it necessary to develop management strategies to ensure a secure forest food supply for primary users such as First Nations and other local residents.

moose to hunting appeared to be directly related to the amount of access for hunters, and inversely related to the amount of cover for moose.[154] Since the 1980s, efforts to regulate hunting levels and patterns in Ontario have begun to stabilize moose populations, though density varies substantially in different areas of the province.

In the Kenora region, moose populations have declined by 90 percent since the 1990s.[155] The decline is attributed to many factors, including habitat changes (fire sites have now regenerated to conifer stands, resulting in fewer food sources), increased numbers of white-tailed deer that bring fatal brainworm to moose, increased predation, and a tick outbreak that renders moose more susceptible to freezing in winter as a result of hair loss.

In Ontario, moose are managed under the Cervid Ecological Framework and Moose Management Policy to achieve specific population objectives for each Wildlife Management Unit. To achieve the population objective, restrictions have been put in place to limit the number of moose that can be harvested each year. The current allowable harvest for each management unit ranges between 5 and 15 percent, although these numbers have come under criticism from the Environmental Commissioner of Ontario as being based on inadequate monitoring.[156]

Moose, large as they are, are quite difficult to census because they are generally solitary animals and they inhabit such rugged terrain. Moose harvest quotas are established based on the difference between the estimated population in a given Wildlife Management Unit and that required to reach the desired population goal.[157] Harvest estimates are determined by voluntary hunter postcard returns, which are in the 50 to 60 percent range in some management units.[158] Accurate harvest numbers are further hindered by the fact that the Aboriginal moose harvest is estimated rather than confirmed by the MNR. A 2011 study in northern Ontario shows that the MNR's calculations may underestimate total harvests by up to 40 percent.[159] This could have significant implications for future moose populations, wildlife managers and hunters.

Photo: Russ Osborne

Instability in the moose population means decreased food security for northern and indigenous communities that rely on moose as a significant source of their diets. (One adult moose can feed a family for almost a year.) In Ontario, the continuing uncertainty about the moose population highlights the need for a better understanding of the effects of hunting pressures and landscape changes. It also speaks to the importance of examining the issue of recreational versus subsistence hunting of moose, and making transparent decisions about the regulatory framework for moose hunting in Ontario.

In many indigenous societies, there are important connections between the knowledge generated about ecological conditions and the "rules-in-use" governing resource harvesting practices.[160] These rules-in-use have developed to prevent the "tragedy of the commons."[161] Where resources are recognized as important, limited, predictable and exploitable, and are under the control of the resource harvesters, those who depend on the resource can institute ways of managing that resource.[162]

Many indigenous societies have developed alternative management practices governing fish and wildlife harvest. The rules and norms, developed by indigenous peoples who have lived through resource scarcity, provide a particularly useful perspective on how to deal with uncertainty.[163] For example, the Chisasibi Cree of the Canadian eastern subarctic have rules about how much fish is to be harvested in different seasons, the size of fish that can be harvested, as well as what kinds of nets can be used.[164]

Photo: Morels, David Allen

UNREGULATED HARVEST OF FOOD PLANTS

Important food plants for northern Ontario communities include berries, mushrooms, wild rice, nuts and seeds. From a regulatory standpoint, the sustainability of these plants, like any resource, could be compromised by unrestricted harvest. Much of the non-timber forest products sector in Ontario is poorly monitored and largely unregulated.[165] As a result, some species are vulnerable to exploitation and possible extinction due to overharvesting. For example, wild American ginseng has been over-harvested from forests to the point of being endangered in Ontario.[166]

Lack of regulation can also lead to conflicts over the use and harvest of wild foods. While there are few examples of significant conflicts over forest foods to date, the 1979 Mud Lake wild rice controversy in Ardoch, Ontario, illustrates the potential for conflict over commercial interests if inclusive planning that includes consideration of traditional local food security is not undertaken. However, any considerations of plant harvesting regulation in Ontario must include a discussion about the difference between commercial harvesting and personal consumption, so that regulatory processes do not interfere unduly with individuals' and families' ability to harvest for themselves.

CLIMATE CHANGE

Climate change is currently affecting all four dimensions of food security: food availability, food accessibility, food utilization and food systems stability. Its impacts will be both short term, resulting from more frequent and more intense extreme weather events, and long term, caused by changing temperatures and precipitation patterns.[167]

Higher temperatures will challenge production systems. Many plants are sensitive to high temperatures during critical stages of growth and might not be able to adapt quickly enough to changing climate regimes.[168] Fish populations will be affected as water temperatures, acidity, lake levels and currents change, with potentially severe impacts on natural aquatic ecosystems.[169] There will be impacts on the abundance of game species along with their habitats, food sources and established predator-prey relationships. Pests and diseases affecting plants, animals and humans may change in unpredictable ways.

It is estimated that Canada has more than a million lakes, covering 7.6 percent of the country's area. Many of these lakes, especially in the north, are particularly sensitive to climate change.[170] Indeed, climate change is already altering boreal ecosystems. A study of boreal lakes in northwestern Ontario from the 1970s to the 1990s found an increase of air temperature (+1.6°C), a general decline in precipitation (~60 percent of highest years), an increase in evaporation (~50 percent) and an increase in annual solar radiation.[171] Increases in air and water temperatures, reductions in snow and ice cover, and changes in precipitation patterns and quantities are affecting the hydrological cycle and are altering the flow of water and water chemistry.

Some of the possible threats to freshwater species from climate change include:

- nutrient enrichment;
- hydrological modifications;
- habitat degradation and loss;
- pollution;
- spread of invasive species; and
- increasing levels of ultraviolet radiation. [172]

Photo: Walleye, Peter Nicodeemus

Fish are cold-blooded, and changes to water temperature affect their distribution, growth, reproduction and survival. Lake warming will favour cool- and warm-water species (walleye, smallmouth bass) and lead to changes in the fish communities of many lakes across Ontario. Overall, fish productivity may rise in some lakes due to an increase in growth rates and food supply. However, populations of coldwater species such as lake and brook trout may decline substantially. For example, forecasts suggest that the province's lake trout habitat will be reduced by almost one-third by the year 2100.[173]

While productivity may increase in some lakes (though at the expense of coldwater species), the availability of fish for human consumption may be negatively influenced by climate change. As lake and stream temperatures change, contaminant transfer in the food chain is projected to increase and could reach toxic levels in lake-bottom waters.[174] Furthermore, changes in rain and snowfall patterns will affect the deposition of new pollutants, and may increase aquatic organisms' exposure to these pollutants,

leading to higher contaminant loads in the food chain through biomagnification.[175]

Warmer lake temperatures will increase the frequency of harmful algal blooms. Blooms of cyanobacteria are of particular concern in freshwater systems because many cyanobacteria have the potential to produce toxins, some of which can cause acute lethal poisoning in humans and other animals.[176]

Warmer temperatures will result in range expansion for white-tailed deer, already overabundant in southern parts of the province.

Climate change will also affect the populations and distribution of game species across Ontario.[177] For example, warmer temperatures will result in range expansion for white-tailed deer, already overabundant in southern parts of the province. Conversely, climate change is expected to lead to higher mortality rates of moose in northern Ontario from hypothermia, as freezing rain events increase. Other effects on moose may include range contraction from heat stress, lower calf production from nutritional stress, and higher occurrences of winter tick infestations leading to mortality. The impact on woodland caribou is expected to include greater disturbances to their habitat based on a greater number of forest fires and higher fire intensities in many parts of the North.

The effects of climate change highlight larger questions about what direction northern Ontario's development agenda should take. Fish and game populations will have to be managed carefully, particularly in terms of the current harvest and quota systems, in order to ensure the sustainability of these important food resources.

Photo: Christian Autotte

CHAPTER 5: MOVING FORWARD

Photo: Christian Autotte

Northern Ontario is host to globally invaluable ecological systems including the Hudson Bay Lowlands, the world's third-largest intact wetland ecosystem. Embedded in these ecosystems are human communities that rely on them not only for their livelihoods, but also for their sense of identity, community and well-being. A re-evaluation of how such social indicators are, or could be, included in economic development and land-use planning is needed.

The current land-use planning framework falls short in protecting forest and freshwater foods, and adequately incorporating them into socio-economic analyses. It prioritizes large-scale resource extraction over other socio-economic interests.

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Remote areas of northern Ontario are the homelands of people who are highly dependent for their livelihoods on ecosystem services through forest resource use, small-scale fisheries, and subsistence economies of hunting and gathering. In many such regions, these activities are part of mixed economies of subsistence harvesting and small-scale cash markets. For communities that have experienced boom and bust cycles associated with economies reliant on commodity markets, forest and freshwater foods are an important complement to cash employment and are a direct source of food.

Land-use planning should set the ground rules to account for the full range of values, and seek to optimize co-operation and reduce conflict among users. Expanding the definition of socio-economic benefits beyond employment in natural resource extraction industries would serve to reposition other values as worthy of society's attention, support and conservation.

This chapter suggests some ways in which those concerned with creating more resilient communities in northern Ontario can move forward with the information and perspectives provided in this report. These should not be viewed as a set of conclusions,

because this work is ongoing. Instead they are preliminary recommendations for action and meaningful participation.

RESEARCH

Research is needed to address significant knowledge gaps regarding the extent and value of forest and freshwater foods and related activities. Priority research needs in northern Ontario are as follows:

- Assess population numbers and trends of forest and freshwater food species.
- Comprehensively describe and valuate the ecosystem services provided by forest and freshwater ecosystems.[178]
- Assess the extent and economic worth of forest and freshwater food harvesting by individuals and communities.
- Assess the cultural and social benefits of forest and freshwater foods and related activities.
- Undertake a jurisdictional scan of successful policy and management approaches for ensuring the sustainable and equitable use of undomesticated plants and animals.

POLICY AND LEGISLATION

Previous chapters identified various gaps in Ontario's regulatory landscape. In addressing these gaps, three pieces of legislation—the Local Food Act, 2013; the Far North Act, 2010; and the Ontario Forest Tenure Modernization Act, 2011—are of particular relevance.

THE LOCAL FOOD ACT, 2013

In November 2013, the province of Ontario passed the Local Food Act, 2013. The purposes of the act are:

- to foster successful and resilient local food economies and systems throughout Ontario;
- to increase awareness of local food in Ontario, including the diversity of local food; and
- to encourage the development of new markets for local food.

The act defines local food as "food produced or harvested in Ontario, including forest and freshwater foods," and enables the Minister of Agriculture to set local food goals.

THE FAR NORTH ACT, 2010

The Far North Act, 2010 applies only to the area north of the 51st parallel, which accounts for more than two-thirds of northern Ontario's land and is home to approximately 40,000 people and two globally significant ecosystems (Hudson Bay Lowlands and the boreal forest). The act has been subject to considerable contention: considered

"groundbreaking" on one end of the spectrum and "neo-colonialist" on the other.

The purpose of the act is "to provide for community based land use planning in the Far North." This is premised on a joint planning process between First Nations and the provincial government, support for environmental, social and economic objectives, and the recognition and affirmation of existing Aboriginal and treaty rights.

The act calls for the establishment of more than 225,000 square kilometres of contiguous, protected lands,[179] which account for approximately 50 percent of Ontario's land mass north of the 51st parallel. It also stipulates that no development permits are to be issued until First Nations within the region have devised and agreed to land-use plans for their traditional territories (although the Minister of Natural Resources may veto this abstention). The temporary halt in development and the support for community-based land-use plans signal the government's recognition of: 1) the right of First Nations communities to have more control over decisions that affect their traditional territories; 2) the need to better include First Nations in regional planning; 3) the cultural and ecological value of the region; and 4) the very real impacts of industrial development on communities and their ecosystems.

The final say over land use under this legislation, however, does not rest with communities. The Minister of Natural Resources may veto land-use plans or allow development to move forward before a land-use plan is completed, if the minister feels that doing so is in the best public interest. This has been a primary source of criticism of the act.

Furthermore, the act has been criticized for not adequately addressing jurisdictional conflicts between First Nations and the province. For example, there is ongoing contention over the meaning of "the duty to consult," referenced in the purpose section of the act (section 1(c)).

Despite its flaws, the Far North Act provides an opportunity for communities north of the 51st parallel to take strong steps towards asserting control over local resources. Some communities have chosen to engage in the process, with others have chosen to disengage on political or ethical grounds.

ONTARIO FOREST TENURE MODERNIZATION ACT, 2011

In recognition of Ontario's outdated forest tenure system, the government passed the Ontario Forest Tenure Modernization Act, 2011. Under the act, opportunities for local forest management are enabled, which should result in forest management plans that better accommodate multiple forest values. Indeed, there are promising examples of local communities, municipalities and First Nations working toward regional community-based forestry models that include non-timber forest products as a component, promoting economic and community resilience.

Under the act, there are two new tenure models: the Enhanced Sustainable Forest Licence (ESFL) and the Local Forest Management Corporation. An example of the first model is the Northeast Superior initiative, led by the Northeast Superior Regional Chief's forum, which represents six First Nations in the region and several interested

municipalities. The parties are working toward developing an ESFL that would have non-timber forest products management as part of a regional conservation economy.

Local Forest Management Corporations, the second model, are required to have local community and Aboriginal members on their boards making strategic decisions. If communities are interested in edible wild plant production and management, they have the opportunity to establish management regimes that account for these. For example, in the Nagagami, White River, Big Pic, Black River and Pic River Ojibway Forests, one of the first pilot LFMCs (the Nawiinginokiima Forest Management Corporation) is currently being implemented.

RECOMMENDATIONS

This report makes the following recommendations to the government of Ontario to better manage, promote and protect forest and freshwater foods.

RECOMMENDATION 1: THOROUGHLY ACCOUNT FOR THE SOCIO-ECONOMIC IMPORTANCE OF FOREST AND FRESHWATER FOODS IN LAND-USE PLANNING.

Forest and freshwater foods should be valued for the multiple benefits they provide. For a land-use planning framework to be truly comprehensive, it must enable communities to live on and derive benefits from the land, while ensuring that the best knowledge available is used to protect multiple values, including the needs of future generations. Planning must account for ecosystem services and establish baseline data for monitoring the health of forest and freshwater foods. It must also address local economic opportunities that occur at a much smaller scale than that of major industrial resource extraction such as forestry and mining.

RECOMMENDATION 2: PROVIDE ADEQUATE FINANCIAL SUPPORT FOR COMMUNITY-BASED LAND-USE PLANNING.

The primary focus of land-use planning should be the health and well-being of communities and ecosystems. This is essential for long-term sustainability. The provincial government must work with communities to ensure that adequate resources and information are available to complete and maintain comprehensive land-use plans. This includes resources to complete thorough environmental baseline studies, technological and scientific support to map forest and freshwater values, and training to conduct meaningful community-based land-use planning that addresses community needs and values.

RECOMMENDATION 3: FOSTER A BROADER PUBLIC UNDERSTANDING OF ABORIGINAL AND TREATY RIGHTS AND THEIR IMPLICATIONS FOR COMMUNITY AND ECONOMIC DEVELOPMENT, FREE AND INFORMED CONSENT, AND THE DUTY TO CONSULT.

Land-use planning, and related protection and development decisions, must ensure the inclusion of Aboriginal people and respect for their governance of the land and

their traditional knowledge. Best practices in land-use planning must be founded on an acknowledgment of, and respect for, the Aboriginal and treaty rights of Ontario's First Nations, as enshrined in section 35 of the Canadian Constitution.

Particular consideration should be given to treaty agreements that protect Aboriginal cultures, governance, and practices including hunting, fishing and harvesting. Where land-use decisions will impact Aboriginal and treaty rights, First Nations' free, prior and informed consent, through government-to-government consultation, is of primary importance. The *duty to consult* falls with provincial and federal governments only; consultation with private/corporate interests and non-governmental sectors does not fulfill the legal duty to consult.

RECOMMENDATION 4: PRACTISE ADAPTIVE MANAGEMENT.

Threats to forest and freshwater foods include environmental pollutants, habitat loss and fragmentation, unsustainable hunting and harvesting pressures, and climate change. The outcomes of these combined threats are complex and unpredictable. Therefore, land managers must carefully experiment and actively probe multiple solutions guided by a precautionary approach.

Given the high rate of socio-ecological change in the North, those involved in co-management must increasingly scan the environment to detect change, understand it in ways that are meaningful to decision-making, and ultimately enact robust policy responses that protect beneficial social-ecological systems.[180] Adaptive management is key.[181]

RECOMMENDATION 5: SUPPORT CO-MANAGEMENT AND COLLABORATIVE EFFORTS TO MANAGE RESOURCES.

Forest and freshwater foods offer an opportunity to find common ground between human socio-economic interests and broader ecological needs. In particular, there is an opportunity to explore collaborative efforts to maintain forest and freshwater food systems. In cases where communities share the use of resources with one another and where there are potential resource scarcities, it is important to establish linkages of resource governance between communities, government agencies and others. These should involve co-management arrangements, defined as the sharing of power and responsibility in decision-making between governments and communities for resource management.[182] Co-management functions could include monitoring, impact assessment, research, habitat protection, policy-making and enforcement.

RECOMMENDATION 6: USE MULTI-SCALE PLANNING TOOLS TO PROTECT ALL VALUES.

Scale is used by scientists to measure and study objects and processes. For example, fish spawning sites are important at local scales, while climate change is impacting fish habitat globally.[183] Although the importance of dealing explicitly with scale issues in land-use models is generally recognized, most existing models take only a single

scale of analysis into account. Multi-dimensional tools need to be developed and used to link macro-scale information with the micro-scale.

In recognition of the need for such tools, analysis of land-use change should be based on the following assumptions: 1) the impacts of land use occur at multiple scales; 2) understanding at local scales does not directly lead to an accurate understanding of landscape-level scales, and vice versa; and 3) all observations provide only a partial description of the whole system. Therefore, land-use planning must use tools that reflect the relationships among all scales.

RECOMMENDATION 7: TRAINING IN SUSTAINABLE HARVESTING OF FOREST AND FRESHWATER FOODS.

Increasing sustainable harvesting capacity for personal consumption and small business enterprise will strengthen local economies and local food systems. Training on sustainable foraging practices and species identification is needed to ensure that the growth of forest and freshwater food use is framed within the context of ecological responsibility. Further, the provision of business and financial guidance for small entrepreneurs will foster a more sustainable regional food system and nurture a business community that is knowledgeable about land-use planning as it pertains to forest and freshwater food values.

CONCLUDING REMARKS

Forest and freshwater foods are undervalued resources that can and should play a significant and multi-faceted role in fostering more resilient and healthy communities. They provide ecosystem services and are an important part of larger ecological functions. They also provide the foundation for various food enterprises.

Heightening the profile of forest and freshwater foods, and ultimately pursuing community resilience, will require reframing the goals of economic development away from growth for the sake of growth. In northern Ontario, population trends and historic precedents suggest that conventional growth will not lead to community resilience. Remaining accountable to ecological and social resilience standards does not undermine economic viability. It simply shifts the focus towards community self-sufficiency and away from one-size-fits-all approaches to development. By calling for research and land-use planning that thoroughly account for the value of forest and freshwater foods to the people of northern Ontario, this report is ultimately calling for a fundamental shift in our understanding of how communities sustain themselves in a rapidly changing world.

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