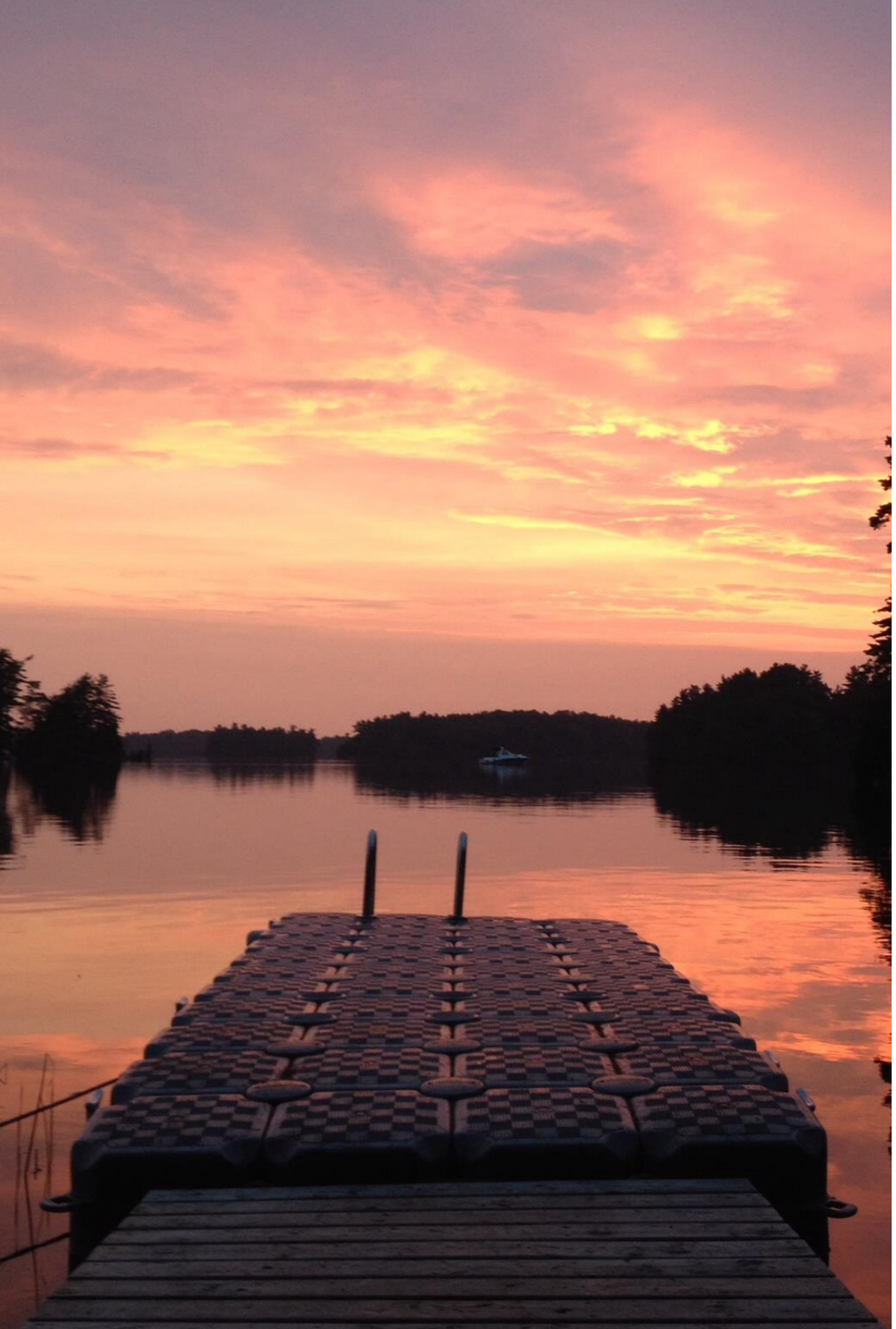
# A Long-Term Planning Framework for Frontenac County's Natural Heritage System

December 2021

Queen's University

FRONTENAC



# ACKNOWLEDGEMENTS

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# ACRONYMS

| Acronym | Description | Acronym | Description |
|---|---|---|---|
| ANSI | Areas of Natural and Scientific Interest | ECMP | *Parkland County Environmental Conservation Master Plan* (2014) |
| BCS | Biodiversity Conservation Strategy | EIA | Environmental Impact Assessment |
| CA | Conservation Authority | EIS | Environmental Impact Study |
| *CA Act* | *Conservation Authorities Act* (2006) | ES | Environmental Services |
| CCRPC | Chittenden County Regional Planning Commission | ESA | Environmentally Significant Area |
| CIP | Canadian Institute of Planners | ERCA | Area Essex Region Conservation Authority |
| CLSP | North Frontenac Crown Land Stewardship Program | *ERNHSS* | *Essex Region Natural Heritage System Strategy* |
| COFA | The Conservationists of Frontenac-Addington | FAB | Frontenac Arch Biosphere |
| CRC | Cataraqui Region Conservation | FOCA | Federation of Ontario Cottagers' Associations |
| *CVCS* | *Comox Valley Conservation Strategy* | FPIC | Free, Prior and Informed Consent |
| EMRC | Eastern Metropolitan Regional Council | NFLAA | North Frontenac Lake Association Alliance |

| | | | |
|---|---|---|---|
| GIS | Geographic Information Systems | OHI | Ontario Headwaters Institute |
| IK | Indigenous Knowledge | OMAFRA | Ministry of Agriculture, Food and Rural Affairs |
| IMA | Integrated Management Area | ONHSS | *Oxford Natural Heritage Systems Study* |
| IRDNC | Namibia's Integrated Rural Development and Nature Conservation Strategic Plan | OCCP | Okanagan Collaborative Conservation Program |
| IWM | Integrated Water Management | OP | Official Plan |
| LMU | Landscape Management Units | ORM | Oak Ridges Moraine |
| MAB | Man and the Biosphere Programme | PPS | Provincial Policy Statement (2020) |
| MECP | Ministry of the Environment, Conservation and Parks | PPCRA | *Provincial Parks and Conservation Reserves Act* (2006) |
| MNDMNRF | Ministry of Northern Development, Mines, Natural Resources and Forestry | QCA | Quinte Conservation Authority |
| MVCA | Mississippi Valley Conservation Authority | RE | Regional Ecosystem |
| NCC | Nature Conservancy of Canada | *RES* | *Regional Environmental Strategy* |
| NHS | Natural Heritage Systems | TRC | Truth and Reconciliation Commission |

| | | | |
|---|---|---|---|
| QCA | Quinte Conservation Authority | SWOC | Strength-Weaknesses-Opportunities-Challenges |
| ROP | Regional Official Plan [Halton Region] | TEK | Traditional Ecological Knowledge |
| RVCA | Rideau Valley Conservation Authority | UCPR & SDG | United Counties of Prescott and Russell, & United Counties of Stormont, Dundas and Glengarry |
| RVPMP | River Valley Parks Master Plan [Lethbridge] | UN | United Nations |
| SDGs | Sustainable Development Goals | *UNDRIP* | *United Nations Declaration on the Rights of Indigenous Peoples* |
| SMA | Special Management Areas | *UNDRIP Act* | *United Nations Declaration on the Rights of Indigenous Peoples Act* (2021) |
| SNC | South Nation Conservation | UNEP | United Nations Environment Programme |
| SOSCP | South-Okanagan Similkameen Conservation Program | UNESCO | United Nations Educational, Scientific, and Cultural Organization |

# Executive Summary

Frontenac County has a unique rural context with a vast, majestic natural heritage system throughout its four municipalities - North Frontenac; Central Frontenac; South Frontenac; and the Frontenac Islands. The way the County plans, develops, and grows over the long-term will impact the health and vitality of its natural heritage system. A regional, collaborative planning approach that uses a long-term community visioning process is necessary to protect and restore the County's natural environment for future generations.

Ten years have passed since the County last evaluated its natural heritage features in its 2012 *Natural Heritage Study.* Today, the region faces new challenges due to several driving forces, including development pressures, biodiversity loss, and the impacts of climate change. Unless addressed, these forces may jeopardize the future of the County's environmental assets. Therefore, contemporary challenges present the County with an opportunity to safeguard its natural heritage by embracing a long-term (50- to-100 years) planning framework for environmental protection that goes above and beyond the minimum requirements of conventional planning.

The following regional natural heritage planning framework provides strategic principles, objectives, and implementation tools for the County of Frontenac. The research that informed this framework was conducted using qualitative methods, including a literature review of over 100 hundred academic articles, 19 case study analyses, exploratory conversations with 12 experts in the field, policy analysis, and site observations. The natural heritage planning best practices and innovative techniques that this research revealed supported and inspired the long-term planning framework proposed in this report. Furthermore, the framework is based on the precautionary principle, a proactive and careful approach to environmental protection at the landscape scale.

The framework proposes six principles:

1. Enhance legal protection
2. Plan with Indigenous Peoples
3. Protect critical ecosystems
4. Build on opportunities for stewardship
5. Connect people to the landscape
6. Invest in models

Six recommendations and 47 action items explain how the framework's principles could be implemented in the County's next natural heritage study and over the short-, medium-, and long-term. The proposed framework aims to assist land use planning and growth management in the County by identifying ways to satisfy the region's environmental, social, and economic needs while protecting the critical natural heritage system before it is fragmented, damaged, or lost forever.

# The Team

This project was conducted for academic credit by a team of ten graduate students in the Queen's University School of Urban and Regional Planning. The team was tasked with creating a long-term natural heritage planning framework for Frontenac County in Ontario, Canada. The team worked under the supervision of Dr. John Meligrana (Director of the School of Urban and Regional Planning) and with guidance from Joe Gallivan, Director (Planning & Economic Development, County of Frontenac) and Sonya Bolton, Manager of Community Planning (Planning & Economic Development, County of Frontenac). The material in this report reflects the graduate student researchers' best judgment, taking into consideration the information available at the time of preparation. The research and recommendations herein are the work of the researchers and have not been reviewed or endorsed by the County of Frontenac.

Mike Carrier,
Project Manager

Samantha Marjanovic,
Treasurer

Mikaela Coon

Kristina Driedger

Chloe Everett

Anna Fawcett

Jocelyn Fries

Michaella Hynes

Janelle Treash

Jeff White

# 1.0 Introduction

## Vision

This report envisions a Natural Heritage System (NHS) that is rooted in the character of Frontenac and its people: diverse, strong, and resilient rural communities known for their unique, pristine natural environment and lifestyle choices. The following framework envisions a regional system where the county's environmental, cultural, and economic assets are well-connected and mutually supportive across the landscapes. The framework proposes strategic principles and action items that can help Frontenac County better align its planning practices with that vision. The framework is *ambitious*, confronting global challenges and complex ecological issues. It is *visionary*, imagining new ways to conduct natural heritage planning in a unique rural context. It is *adaptable*, emphasizing the importance of responding to changes and new information. And it is *collaborative*, bringing together various disciplines, groups of people, and institutions in pursuit of a common goal.

Figure 2. Palmerston Canonto Conservation Area, North Frontenac (Csernak, 2017).

Figure 3. South Frontenac (South Frontenac, 2021).

## Goals and Objectives

This research is guided by two main goals:

1. To investigate the best ways to protect natural heritage in Frontenac County from a regional perspective
2. To establish a comprehensive framework for implementing the best natural heritage protection practices in Frontenac County from a planning and policy perspective

The main objectives of this report are the following:

- To take a long-term perspective to natural heritage planning and management using methods and techniques that plan for a 50-to-100-year horizon;
- To provide background information and context to Frontenac County's forthcoming update to the protection strategy for its natural heritage systems (NHS);
- To explore and evaluate the key roles and responsibilities of those with an interest in Frontenac County's natural heritage system, including Provincial Ministries, Conservation Authorities, First Nations, non-profit organizations, developers, and residents;
- To evaluate current policy perspectives and how they apply to the planning and management or Frontenac County's natural heritage;
- To examine recent trends in environmental planning, risk management, and other topics related to natural heritage planning;
- To undertake case study analyses of natural heritage planning policies and approaches as undertaken by other provincial, national, and international jurisdictions;
- To consider the possible impacts of climate change on long-term natural heritage planning; and
- To consider additional factors that apply to Frontenac County's natural heritage system, such as Crown Land and the Algonquin Treaty Negotiations.

## 1.1 Why is Nature Important to Frontenac County?

### 1.1.1 Basic to the Economy

In 2015, the County developed an *Economic Development Charter for the Frontenacs,* which envisions an economy uniquely matched to the people of Frontenac: "*…welcoming, natural, healthy, clean, tranquil, entrepreneurial, and rural by choice and conviction*" (County of Frontenac, 2015). This Vision can be realized by proactively implementing initiatives related to trips and trails, local food and beverage, and recreational lifestyles. These themes overlap and are all complemented by having a strong "connected community;" having more linkages between environmental and cultural infrastructure helps balance the economy and create more opportunities for growth. The *Charter* also emphasizes the importance of seniors, family, and youth within the County's demographic base. Improving access to Frontenac's natural assets helps attract families, increase home-based employment, and improve the options for 'aging in place.' Ensuring that the beauty of the natural environment remains protected for generations to come, and expanding the opportunities for connections between the County's communities, is essential to attracting young people to the region and strengthening the County's economic vitality.

Figure 4. The Ultimate Hiking Challenge, Frontenac Provincial Park (Ontario Parks, 2021).

Figure 5. Canoe Trip, Frontenac Provincial Park (Lobo, 2017).

### 1.1.2 Essential to Health and Well-Being

Aside from the provisioning, regulating, and supporting ecosystem services (ES) that the natural environment provides, cultural ES remain an equally important component that improves human beings' physical and mental health. Cultural services, namely educational, recreational, and spiritual benefits, derive from natural and agricultural areas, both of which make up the bulk of Frontenac County's landscape.

The County's effort to promote its cultural services is most evident through its website, which highlights privately-led programs that offer recreational, educational, and spiritual-related opportunities. For example, the Blue Skies Music Festival is an annual event, established in the '70s, that provides camping, dancing, and community building in a "natural amphitheater surrounded by pristine wilderness" (Blue Skies Music Festival, n.d.). Similarly, Wintergreen Studio's BioBlitz, is an educational program where expert naturalists teach about the outdoors, such as wildlife. The County also offers spiritual benefits through programs such as the Groove Yoga Festival in Sydenham - an outdoor healing activity premised on relaxing and mindful yoga (County of Frontenac, n.d.).

Beyond organized programs, recreational, spiritual, and educational benefits also derive from personal experiences with nature, such as walking through the Rideau Trail or canoeing on Sharbot Lake. Ultimately, Frontenac's pristine environment is a much sought-after getaway for "adventure and exploration, peace and solitude, or inspiration" (Frontenac County Official Plan, p.9), shaping the County's identity, which is further solidified through its brand which "…is centered around the one thing that unites us all—a love and respect for our pristine, natural landscape" (County of Frontenac, 2016).

### 1.1.3 Intrinsic Value

The value humans place on the natural environment is an important component of ecological protection. The concept of intrinsic value reflects an understanding that nature has value in its own right, opening us up to the idea that "nature has value even if it does not directly or indirectly benefit humans" (Rea et al., 2018). This approach is viewed from an ecocentric standpoint and provides an ethical justification for environmental conservation. Opposingly, the 'instrumental value' of nature adopts an anthropocentric approach configuring economic ideas of nature's use and non-use value (Munns et al., 2015). This anthropocentric lens has informed decision making tools such as cost-benefit analysis, ES valuation, and resilience analysis (Rea et al., 2018). Although these efforts encourage sustainability and systems management, these tools often include the monetization of environmental features from an anthropocentric view of well-being. However, intrinsic and instrumental valuations of ecosystems do not need to be mutually exclusive (Rae et al., 2018). If we as a society view ourselves as a part of the environment, not isolated from it, then we will understand that environmental well-being nurtures human well-being (Caillon et al., 2017 & Rae et al., 2018).

This recognition to integrate a pluralistic valuation of nature has established the concept of *relational values*. Relational values concentrate on the interactions and responsibilities between nature and people (Chan et al., 2016). Examples of relational values include the cultural and societal conditions for maintaining a holistic human-nature interconnection, the ecological factors required to maintain life of earth, or the experience required for creating the notion of a 'good life' i.e., "aesthetic appreciation or cognitive development in nature-based contexts" (Chan et al., 2016).

The goal is to provide effective conservation efforts by considering both intrinsic and instrumental values and creating a vision of shared well-being that connects humans and nature in a joint future. A framework founded in relational values considers nature and humans as equals and fosters a decision-making framework that incorporates both ecocentric and anthropocentric concerns. Environmental management tools, techniques, and actions are best formed when accounting for the spectrum of values that constitute *relational*: economic, cultural, moral, aesthetic, social, ecological, and historical (Goh, 2019).

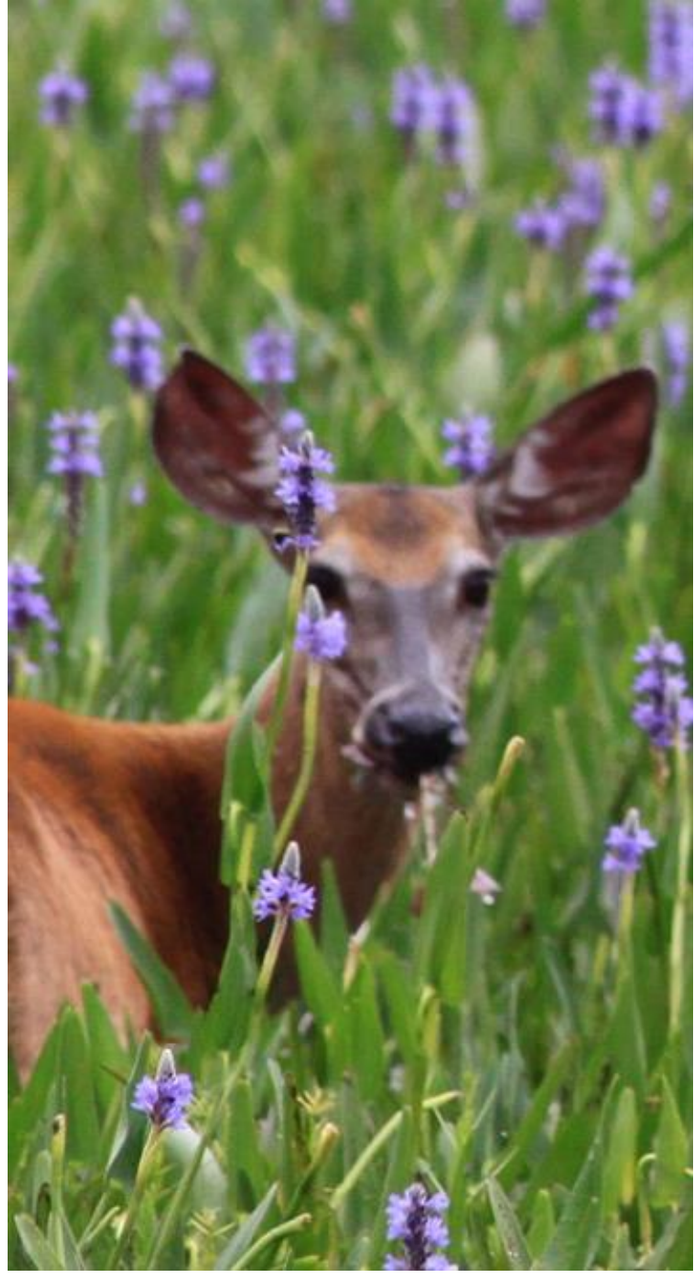


Figure 6. Deer in Nature (Lessard, 2021).

### 1.1.4 International Considerations

The purpose of this sub-section is to present select international-level policies that create a precedent for pursuing a rights-based approach to NHS planning in order to achieve more equitable and just outcomes at the local level. The following international-level agreements call for local-level initiatives to meet global challenges, especially in the current context of catastrophic climate change (FAB, 2021e). Frontenac County's planning processes and the extent to which the County protects the local NHS have the potential to meaningfully contribute to positive change far beyond its regional jurisdictional boundaries.

#### United Nations Declaration on the Rights of Indigenous Peoples

The *United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP*) was adopted in 2007, and in 2021 it achieved royal assent into Canadian federal law as the *UNDRIP Act* (2021). Justice Canada explains that the *UNDRIP Act* "has the potential to make meaningful and positive changes to how Indigenous Peoples, Communities, and businesses participate in sustainable natural resources development [...] as full partners in the natural resource and net-zero carbon economy and ensuring that Indigenous Peoples have a seat at the table for decisions that may affect their communities" (Government of Canada, 2021a). Fulsome implementation of *UNDRIP* will touch on all dimensions of settler-Indigenous relations including collective Indigenous rights to traditional lands, territories, and resources in addition to existing Treaty Rights and the right to self-determination. In terms of resource and land development, the *UNDRIP Act* calls for Indigenous communities to give Free, Prior, and Informed Consent (FPIC) throughout planning processes, a concept that surpasses the minimal legal Duty to Consult (Government of Canada, 2021b).

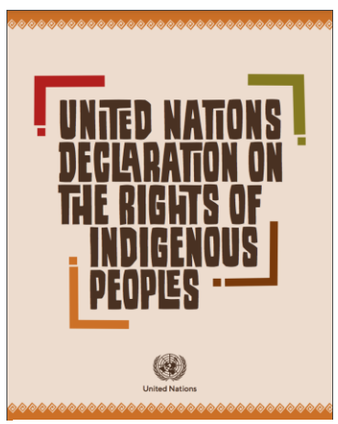


Figure 7. *UNDRIP* (United Nations, 2018).

##### *Applicability to the Project*

International and federal *UNDRIP* implementation indicates a dramatic change for Indigenous rights to land, resources, and meaningful consultation in planning processes. Frontenac County has the opportunity to make a significant step in settler-Indigenous reconciliation by engaging early and in good faith with Indigenous communities. *UNDRIP* calls settler governments, such as Frontenac County's Regional Council, to conduct land use and natural heritage planning in ways that recognize Indigenous traditional territories; respect Indigenous collective rights; and obtain FPIC regarding land, natural heritage, and resource development that may affect Indigenous communities.

### Human Right to a Clean, Healthy, and Sustainable Environment

In October 2021, the United Nations (UN) Human Rights Council formally recognized that living in a clean, healthy, and sustainable environment is a human right (UNEP, 2021). The Centre for International Environmental Law argues that recognition of this right signals a paradigm shift in rights-based climate policy that reflects the extent to which access to a healthy environment is a prerequisite for the fulfillment of other human rights (UNEP, 2021). Furthermore, the UN Environment Programme expects the recognition of the right to a healthy environment to strengthen the roles of government, legislators, courts, and citizen groups to pursue sustainability and uphold other human rights, as per the UN Secretary General's 2020 Call to Action on Human Rights (UNEP, 2021). The 2020 Calls to Action implore all levels of government, regulatory agencies, and the private sector to respect the human rights of current and future generations by taking climate action to prevent biodiversity loss and environmental destruction (United Nations, n.d.).

#### *Applicability to the Project*

Rights-based climate policy represents a paradigm shift in the foundational assumptions that underpin environmental planning. A rights-based climate policy introduces imperatives for equity and justice in both the planning processes and the outcomes. Rights-based climate policy may take the form of upholding the *UNDRIP* in planning processes, as previously discussed, or, for example, by striving to implement locally relevant aspects of the UN Sustainable Development Goals (United Nations, 2021). The human right to a clean environment and the 2020 Calls to Action on Human Rights challenge Frontenac County to ensure inter-generational equity and justice. The County has the opportunity to conduct NHS planning using a climate change lens in a

Figure 8. 47th Session of the Human Rights Council, Geneva (Geneva Environment Network, 2021).

rights-based equity framework. The UN Sustainable Development Goals may help the County orient itself towards a rights-based climate policy.

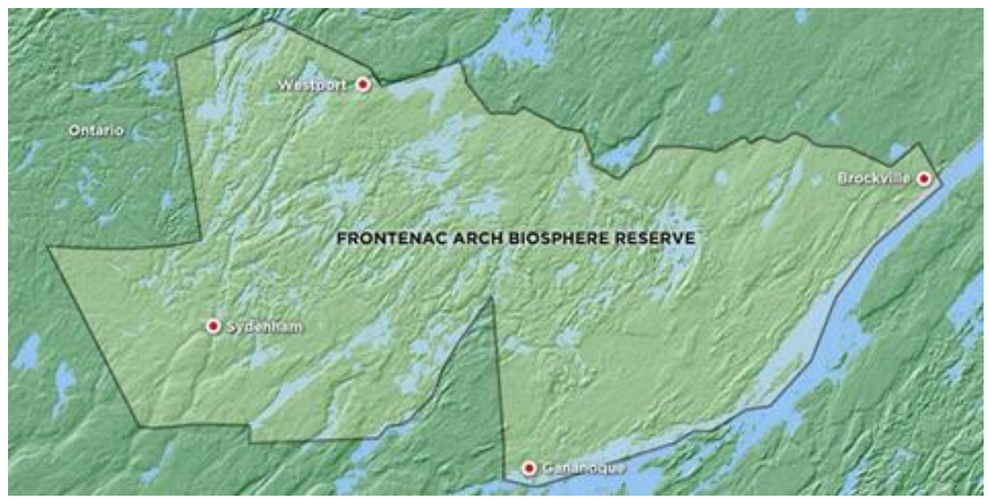
### United Nations Sustainable Development Goals

The United Nations Sustainable Develop Goals (SDGs) came into effect in January 2016 to replace the former Millennium Development Goals (which expired in 2015). The SDGs are a set of 17 goals aimed at reducing the most substantial challenges affecting our world. Globally defined and accepted by countries including Canada, the SDGs are intended to make the world a better place for everyone by 2030. From a planning perspective, the goals mark a shift towards global development that is more equitable and sustainable in the long-term. The SGDs also highlight the interconnectedness of environmental conservation with community resiliency, equity, human well-being, and economic growth (Plan International, n.d.).

#### *Applicability to the Project*

While established and signed at an international level, national-level targets will be achieved based on local adaptations and implementations of the SDGs. The SDGs can also help in guiding a vision for a more sustainable future, supported by goals and targets focused on all three aspects of sustainability – environmental, social, and economic sustainability. The SDGs are already being applied in Frontenac County. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) Frontenac Arch Biosphere (FAB) employs the goals of sustainability as outlined by the UN SDGs to avoid environmental depletion while promoting human well-being and quality of life in the long-term. The work being done by the FAB can be incorporated into studies and policies to promote sustainability and into stewardship and education campaigns to foster a greater connection with the natural environment.


Figure 9. United Nations 19 Sustainable Development Goals (Plan International, n.d.).




Map 1. A Map of the Frontenac Arch Biosphere Region (FAB, n.d.).

### The United Nations Educational, Scientific and Cultural Organization Frontenac Arch Biosphere Reserve

Biosphere reserves are internationally recognized but non-legally binding jurisdictions where local communities voluntarily engage in biodiversity conservation and sustainable interactions with the environment. Established in 2002 and expanded in 2008, the FAB Reserve spans several regions including parts of Frontenac County; it also overlaps on Algonquin-Anishnaabe and Haudenosaunee traditional territories. Therefore, the FAB represents local transboundary conservation efforts, and at the national and international levels, the Canadian Biosphere Reserves Association represents the Frontenac Arch Biosphere in Canada at UNESCO.

*Applicability to the Project*

The Biosphere's engagement with citizens, neighbouring regions, and all levels of government creates an opportunity for sustainable development, planning, and monitoring capacity-building in Frontenac County. For example, the FAB Network has extensive experience working with local, federal, and provincial parks, local Indigenous nations and individuals, Conservation Authorities (CA), land trusts, municipalities, and community environmental organizations (FAB, 2021b). The Biosphere's underlying assumption, that restoration is regarded "as a major nature-based solution" to ecological issues caused by unsustainable development, aligns with the rights-based approach to NHS planning.

Figure 10. Frontenac Arch Biosphere Network (Sustainable Eastern Ontario, 2021).

## 1.2 Nature Under Threat

The 2012 *Natural Heritage Study* provided a snapshot in time of the 2012 landscape. However, Frontenac County is changing due to several pressures that threaten the integrity of the natural environment.

### Population Growth

Population growth and development intensification in Frontenac County increases pressure on the NHS, specifically on wildlife and ecosystem services through fragmentation, habitat loss, degradation of water quality and quantity, introduction of invasive species, erosion, flooding, and runoff (Dearden & Mitchell, 2016; Ontario Nature, 2014). The majority of permanent resident population growth is anticipated to occur in South Frontenac and in the Frontenac Islands, supported by the introduction of a dual ferry service. The growth in seasonal residents is expected to be evenly divided between North, Central and South Frontenac (Watson and Associates, 2020). Frontenac County's The *Housing and Employment Projection Study* (2020) forecasts that the total population (permanent and seasonal) will increase from 54,700 in 2016 to 62,900 in 2046 (Watson and Associates, 2020). The permanent residents who comprised just under 50 percent of the total population in 2016 will increase to 53 percent by 2046 (Watson and Associates, 2020). The population growth forecast is based on the following factors (Watson and Associates, 2020):

- The growth and competitiveness of the regional export-based Greater Kingston Area economy;
- The County's attractiveness to the 55+ age group as a place for retirement/semi-retirement; and

Figure 11. Muskoka waterfront development (Discover Muskoka, 2021).

- Market demand for seasonal housing largely from the Greater Kingston Area, the Greater Golden Horseshoe area, and the Greater Ottawa Area.

It should be noted that the *Housing and Employment Projection Study* (2020) and the most recent Census (2016) was published prior to the COVID-19 Pandemic. In a climate of "remote working, affordability concerns, and pandemic-related worries about dense environments and taking mass transit", research suggests there is at least some movement away from urban centres towards rural landscapes (Price Waterhouse Coopers & Urban Land Institute, 2020). As such, these trends could influence development intensification in Frontenac County.

### Waterfront Development

Individual shoreline properties in the County are located within larger natural systems. As such, singular land uses can have a cumulative impact on the water that moves through a watershed, as well as the surrounding terrestrial and shoreline habitats (FOCA, 2016). These negative effects include intensive shoreline 'ribbon of life' modification and erosion, as well as impacts on connectivity between shorelines, wetlands, and near-shore wildlife habitats (Township of Seguin, 2018; Riverstone Environmental Solutions Inc., 2013). Furthermore, the development of shoreline sites can reduce forest cover and generate impermeable surfaces, which in turn diminishes water filtration before rainwater runs into waterbodies, thereby increasing nutrients and other contaminants in lakes and rivers (Township of Seguin, 2018; Riverstone Environmental Solutions Inc., 2013).

Figure 12. Muskoka waterfront development (Stokes, 2021).

### Invasive Species

Invasive species threaten the NHS by reducing biodiversity, causing negative adaptations in ecosystems, and changing predator-prey dynamics (Invasive Species Centre, n.d.). Invasive species degrade recreational lands, reduce outdoor experiences, pose health risks to humans (e.g. rashes, burns), and may interfere with the proper function of aquatic equipment (Invasive Species Centre, n.d.). Once established in an ecosystem, invasive species are difficult to control and expensive to manage. Examples of invasive species in Frontenac County include wild parsnip (*Pastinaca sativa)*, giant hogweed (*Heracleum mantegazzianum*), zebra mussels (*Dreissena polymorpha*), and the emerald ash borer (*Agrilus planipennis*) (FAB, n.d.).

Figure 13. Invasive species, Zebra Mussels attached to a native mussel (Sopher, 2020).

### Human Interference with Natural Cycles

Human interference with natural cycles includes trail creation, habitat fragmentation, unsafe wildlife crossings/corridors, introduction of invasive species, and introduction of domestic animals. Furthermore, human interferences may include chemical interferences such as industrial pollution, runoff from roads, aggregate extraction, agricultural operations, and domestic animal feces and litter (Dearden & Mitchell, 2016; Trent University, 2021).

Figure 14. Gravel pit in Thunder Bay, Ontario (CBC News, 2016).

### Climate Change

In Canada, climate change will likely cause an increase in prairie grasslands and the species that live in that habitat. In contrast, the amount of forested lands and the populations of forest-dwelling species will shrink as precipitation decreases. Therefore, as climate change transforms habitats and impacts biodiversity, connectivity becomes crucial for environmental resiliency (Dearden & Mitchell, 2016; Ontario Nature, 2014). In addition, climate change is increasing pressure on species as spawning, egg laying, and flowering are occurring earlier. This is resulting in a species decline due to a lack of available food sources (Dearden & Mitchell, 2016). The protection of a NHS strengthens ecological resiliency in the face of change by moderating the consequences of climate change. For example, NHSs play a crucial role in mitigating and adapting to climate change by helping to remove carbon dioxide from the atmosphere as well as helping to cool the air and prevent erosion (Green Infrastructure Ontario, 2021). In addition, NHS planning will form a key part of strategies to combat various effects of climate change such as "floods, drought, insect infestations and extreme weather events" (Ontario Nature, 2014).

Figure 15. Flooded boathouse and dock, Wolfe Island, Ontario (Ferguson, 2019).

## Pollution

As rural areas become more urbanized, demand for access to areas under development also increases. Given the remote nature of these areas, accessing these areas therefore requires a personal vehicle (Giuliano & Hanson, 2017; Peel Watershed Planning Commission, 2019). This in turn results in increased air pollutants such as nitrogen oxide, fine particulate matter, and volatile organic compounds. Additionally, increasing vehicle access to natural areas also increases runoff of hydrocarbons, heavy metals, and salts into the abutting lands and water bodies, resulting in an accumulative effect downstream (Dearden & Mitchell, 2016). Pollution places intense pressure on biodiversity and has been identified as the second greatest cause of aquatic-species endangerment in Canada. This is due to pollution's role in habitat degradation. Pollution in the environment changes the chemical composition of aquatic environments and contributes to climate change in the form of greenhouse gas emissions. Water pollutants can be described as point sources, such as sewage treatment plants and manufacturing plants, or non-point sources, such as vehicle emissions and fertilizer and pesticide runoff (Dearden & Mitchell, 2016).

Figure 16. Beach pollution, Great Lakes (NOAA, 2018).

## Loss of Habitat

Habitat change severely influences biodiversity loss, and habitat loss threatens 84 percent of Canada's endangered species. Physical changes to habitats, such as fragmentation, places immense pressure on species resulting in their decline and extinction. In southern Ontario, 68 percent of wetlands have been converted to accommodate other land uses. Furthermore, south-western Ontario's decimated Carolinian forest is the most biodiverse ecosystem in Canada, home to 40 percent of Canada's species at risk. However, 90 percent of this important habitat has been converted to forestry, industrial, agricultural, and urban land uses (Dearden & Mitchell, 2016).

Figure 17. Global study reveals habitat fragmentation (Breienhagen, 2015).

## 1.3 Overview of the 2012 *Natural Heritage Study*

The Frontenac County 2012 *Natural Heritage Study* (herein referred to as 'the *Study*', see Figure 18) was conducted to evaluate natural heritage features and systems at a regional scale to inform policies within Frontenac County's first County Official Plan. The *Study* consisted of three phases: the first two phases mapped and analysed the County's NHS, areas of biodiversity, and natural linkages, and the third phase developed policy recommendations for the protection of the identified natural features and systems. The *Study* was also completed with the expectation that it would support all three sustainability pillars – cultural/social, economic, and environmental – in addition to protecting significant natural areas. To support this expectation, a component of phase three included suggestions for conservation/ stewardship/ education tools to ensure the community was involved in the processes and that it benefited from the outcomes.

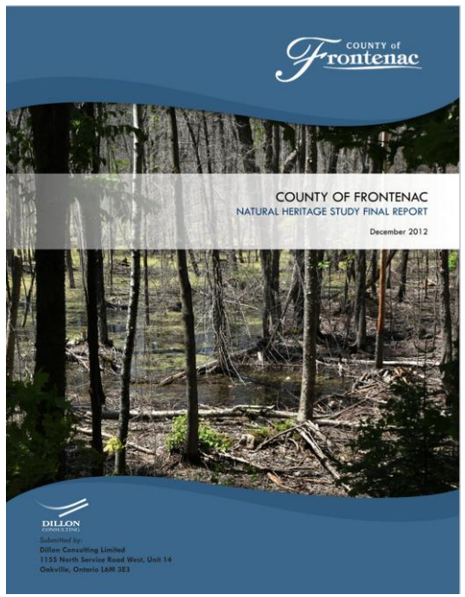
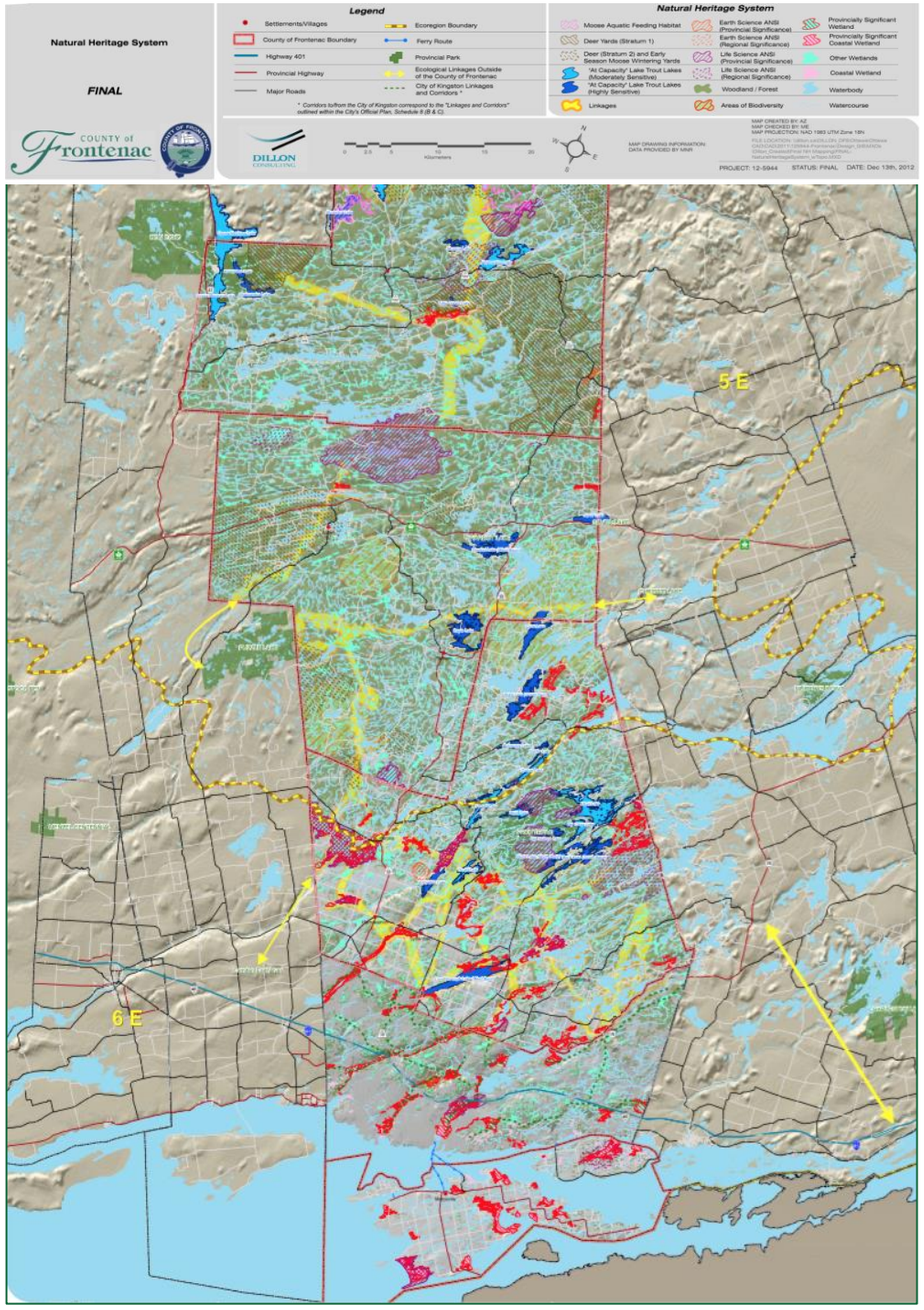


Figure 18. County of Frontenac Natural Heritage Study (Dillon Consulting, 2012).

The following is a brief analysis that reviews the *Study's* intrinsic components and that assesses its strengths and weaknesses to determine how an updated *Study* could better reflect the County's present-day conditions.

### 1.3.1 Evaluation of the *Study*

The *Study* was completed using a habitat suitability and Marxan model function in a geographic information system (GIS). The Marxan model determines appropriate and efficient areas for conservation by evaluating the ecological and economic costs (e.g. presence of roads; cost to fisheries) and producing a score for planning units that correlate with areas that conserve the most features of interest for the least cost (Dillon Consulting Limited, 2012). The product of these models was maps of the County's natural heritage and proposed conservation boundaries. There are several technical limitations with the Marxan model related to the scope of data; however, there are also some philosophical limitations that should be understood (Game & Grantham, 2008). Marxan is not designed to act as a stand-alone conservation design solution; it is part of a systematic planning process, and, therefore, its effectiveness is "dependent upon the involvement of people, the adoption of sound ecological principles, the establishment of scientifically defensible conservation goals and targets, and the development and inclusion of quality spatial datasets" (pp. 4). Marxan requires collaboration with various forms of knowledge which are essential to refining the program's input datasets and interpreting the final outcomes (i.e., the conservation area boundaries). Thus, knowledge and information gaps have the potential to significantly skew results (Watts et al., 2009). Today, Frontenac has more types of data available, a wider array of community voices, and new challenges across its territorial scale. The 2012 model inputs and outcomes should be re-evaluated with up-to-date information that incorporates the modern values, knowledge, and ecological principles that are important to the people of Frontenac.



Map 2. Frontenac County Natural Heritage System (Dillon Consulting, 2012).

The engagement process of this *Study* involved consultation with the public on two occasions to gain input into the natural heritage features that the community felt were significant, as well as to provide feedback on the resulting maps. Researchers collaborated with local agencies and CAs to gather local knowledge about their perspective areas of operation. There was no mention of planning with Indigenous Peoples. The *Study* also gathered information about how natural heritage features contribute to economic development, cultural and social improvement, etc.; however, the values of ecosystem services were not quantified to valorize the ways in which nature supports the community.

The *Study* was pivotal in gathering research necessary to make informed policy recommendations that were incorporated into the County's Official Plan (2016). In this way, the *Study* was successful in achieving this goal of ensuring that natural heritage features and systems were a major consideration in the County's planning policies. Conducting the *Study* at a regional scale ensured that environmental connections were maintained through partnerships with stakeholders.

Finally, the *Study* can be commended for suggesting performance measures, rather than indicators, for monitoring. Performance measures are considered to be more progressive and have the potential to be a more powerful tool by asking the question: "How much do we need for tomorrow?", instead of the usual, "How much do we have today?" (Dillon Consulting Limited, 2012). The former considers the long-term, and it takes into consideration the impacts of climate change, which is likely Frontenac County's most significant threat. To better support this tool, a new study should build on the research of the 2012 *Study* to ensure that all necessary natural heritage features and wildlife are taken into consideration. For instance, the first study was unable to gather quantity or quality indicators for valleylands, endangered and threatened habitats, and fish habits, which is necessary for effective long-term monitoring and feedback. Another limitation of the Marxan model is that while it can effectively determine habitat (if given sufficient input data), it cannot adequately quantify barriers to movement other than through the application of thresholds or spatial parameters (Molloy, Davis, & Van Etten, 2016). Therefore, while the *Study* was comprehensive in many regards, an updated study could adopt new approaches to overcome these challenges.

Figure 19. Bon Echo, Provincial Park (Wandering Wagars, 2016).

### 1.3.2 SWOC Analysis

A SWOC analysis was conducted to assess how an updated natural heritage study could offer improved NHS protection outcomes. SWOC is an abbreviation for strengths, weaknesses, opportunities, and challenges, and it can assist in decision-making by identifying internal and external factors.

Table 1. SWOC Analysis of the 2012 Natural Heritage Study for Frontenac County

| STRENGTHS | WEAKNESSES |
|---|---|
| • The monitoring system focuses on performance measures that look beyond what the County currently has, to focus on what is needed for the future, which is an important feature to long-term planning and climate change considerations.<br>• A strong focus was placed on protecting natural habitats and migratory corridors at a regional scale, with considerations for cross-jurisdictional boundaries.<br>• A long list of potential tools to foster conservation, stewardship, and education was suggested as a means of strengthening policies and public support/ participation.<br>• The public consultation processes were good at using local agencies to gather information and expertise about the lands they work within.<br>• The County's watersheds and features were highlighted as major significant NHS elements that required stronger conservation and where possible restoration.<br>• A review of the local planning policies was done to determine where there are differences between the County's four townships, which helps highlight which township is doing what and how they can learn from one another to implement stronger natural heritage policies. | • Habitats for species at risk were not as confidently tracked or protected as required.<br>• Limited on-site evaluations of natural features were conducted, which means that certain natural features that need to be protected could have been overlooked.<br>• The diversity of Frontenac County means that what is significant at a municipal scale might not be considered significant to protect at a regional scale and, therefore, was left out of policies. Therefore, more context and site-specific analyses of natural heritage features need to be considered.<br>• While there was a discussion of the County's interest in a sustainable future, there was little incorporation of ecosystem services.<br>• Regulatory policies and monitoring and adaptation tools could be discussed further to highlight how the NHS will be preserved in the long-term.<br>• There needs to be research and recommendations on growth boundaries and densification to reduce scattered and fragmented development. |

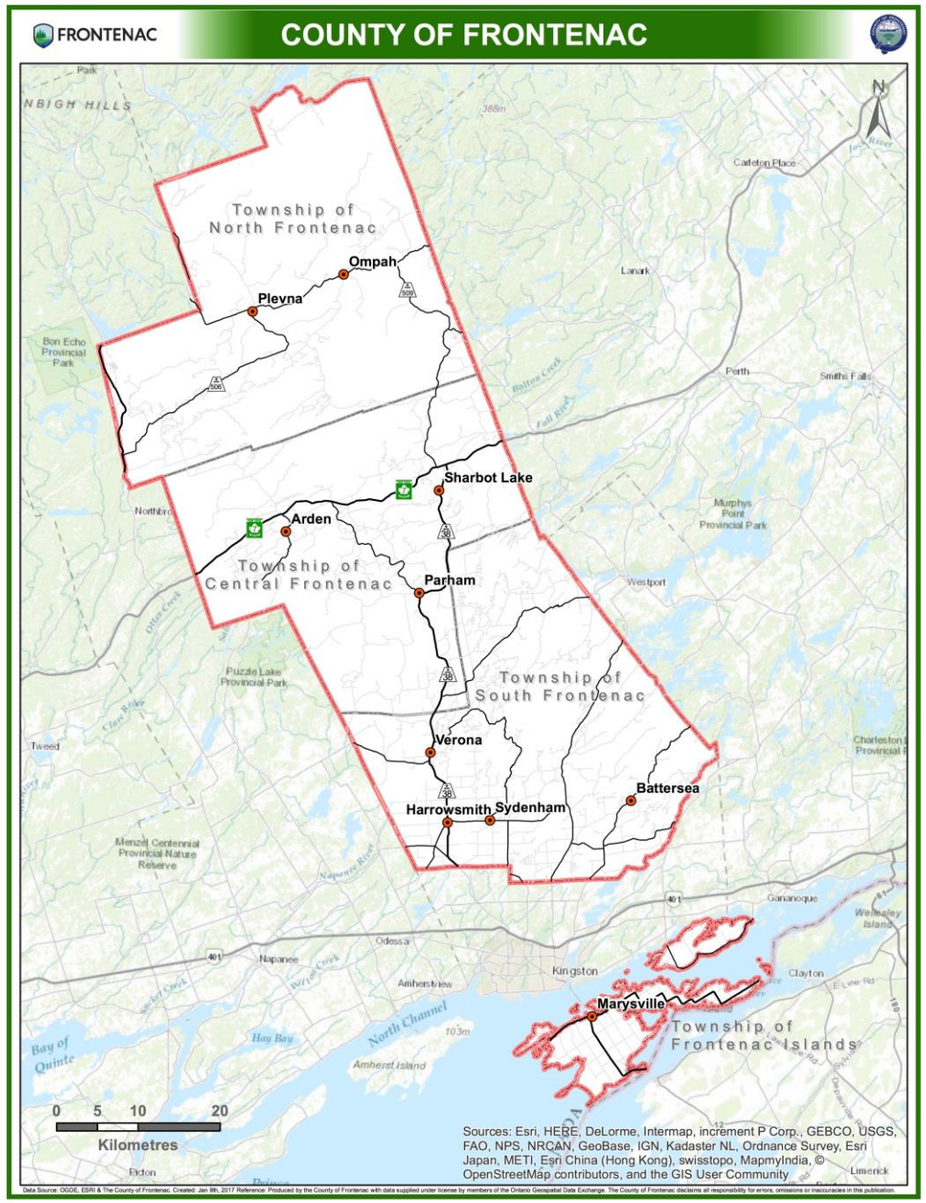
| OPPORTUNITIES | CHALLENGES |
| --- | --- |
| • Communal services in the County can help prioritize where the best locations to develop will have the least impact on the NHS.<br>• Mainstreaming of technologies such as smartphones and virtual engagement could support significantly more citizen science in mapping, ground-truthing, visioning, consultation, and monitoring.<br>• Opportunities to conduct the next study with an equity framework could allow it to have a more robust positive impact on the community and prevent the inequitable distribution of the benefits of natural heritage planning.<br>• Post-pandemic, there is an increased interest in outdoor recreation giving way for opportunities for greater public participation and stewardship.<br>• Planning with Indigenous Nations, Communities, and People can inform a greater amount of traditional local knowledge and potentially lead to new and innovative ways of land use planning. Collaboration can also promote Canada's commitment to *UNDRIP*, and Truth and Reconciliation Commission (TRC) calls to Action.<br>• There is potential to channel polices, recommendations, and best practices for natural heritage planning and management at the international scale (e.g., United Nations Decade on Ecosystem Restoration 2021-2030 will conduct research and propose best practice in order to support biodiversity). | • Climate change is more rapidly impacting the environment (e.g., flooding) and migratory patterns. Climate change modeling also presents planning challenges due to the range of possibilities.<br>• There is a significant wave of development applications that put pressure on planning staff to ensure development impacts are not significant. For example, post-pandemic has increased interests in owning homes outside of the city, predominantly on waterfronts, and the new ferry dock on Wolfe Island has the potential to lead to further development and tourism pressure.<br>• Limitations in human and financial capital challenge the County's ability to ensure compliance with policies, regulate development, and afford extensive monitoring approaches.<br>• Current or changes in the use or title of Crown Lands may not align with the County's NHS planning, having an impact on planning at a regional scale.<br>• A data gap of invasive species, endangered and threatened species, and habitats loss leads to challenges of modeling with inconclusive baseline data. |

## 1.4 Study Areas

### 1.4.1 North Frontenac

In 1998, the Township of North Frontenac was officially created, amalgamating the Township of Barrie, the Township of Clarendon and Miller, the Township of Palmerston, and Township of North and South Canonto (Township of North Frontenac, 2021). North Frontenac is home to 1,898 permanent and 7,000 seasonal residents (Statistics Canada, 2016). The low population density of 1.6 people per square kilometre is situated amongst 1,165 square kilometres of terrain located entirely on the Canadian Shield (Statistics Canada, 2016). North Frontenac lies in the middle of eastern Ontario's cottage country. Cottages and campgrounds populate the shoreline of the Township's lakes, providing picturesque vistas to both seasonal and permanent residents. The Township is also home to Bon Echo Provincial Park (shared with Addington Highlands), the North Frontenac Parklands as well as the Dark Sky Preserve observation pad (County of Frontenac, 2016).

Figure 20. North Frontenac, Community Profile (North Frontenac, n.d.).




Map 3. County of Frontenac Townships (County of Frontenac, 2015).

### 1.4.2 Central Frontenac

Central Frontenac was incorporated in 1998 through the amalgamation of the Townships of Hinchinbrooke, Kennebec, Olden, and Oso (Dawber, 2000). The Township has a population of 4,373 residents with a population density of 4.3 people per square kilometre (Statistics Canada, 2016). Central Frontenac is situated at the southernmost point of the Pre-Cambrian Shield, and its landscape depicts the transition from lush farmland to hard rock (Dawber, 2000). The Township covers 1025.20 square kilometres of undeveloped granite topography, rolling hills, meandering roads, and a multitude of lakes and other waterbodies. In addition, the landscape has generated a growing market for young farmers who are establishing organic and sustainable farms (Dawber, 2000). As a result, agriculture has become a major economic sector for the Township. Consequently, hospitality is another key sector in Central Frontenac. The Township is part of the Ontario Artisan Food and Beverage Region, which aims to assist business owners with pursuing artisanal food and beverage businesses.

Figure 21. Central Frontenac (Central Frontenac, 2018).

### 1.4.3 South Frontenac

South Frontenac was established in 1998 through the amalgamation of the former Townships of Bedford, Loughborough, Portland, and Storrington. It has a population of 18,646 people with a population density of 19.2 people per square kilometre (Statistics Canada, 2016). The Township is recognized for its natural heritage features consisting of pristine lakes, vast forested areas, conservation areas, provincial parks, and crown land. In addition, the Township hosts a vast trail network that extends to the City of Kingston. As such, South Frontenac attracts a range of visitors who come to enjoy its natural features and establish tourism as an important driver for South Frontenac's economy.

Figure 22. Arkon Lake Loop Trail, South Frontenac (AllTrails, 2021).

### 1.4.4 Frontenac Islands

Frontenac Islands encompass the following islands at the mouth of the St. Lawrence River near the outlet of Lake Ontario: Bayfield Garden, Hickory, Horseshoe, Howe, Wolfe, and Simcoe (County of Frontenac, 2016). Howe Island Township and Wolfe Island Township were amalgamated as part of the County's reorganization in 1998, resulting in the formation of the Frontenac Islands Township (County of Frontenac, 2016). While Frontenac Islands has a population of 1,760 people—the smallest in the County— the Islands are the second most densely populated with a population density of 10.1 people per square kilometre (Statistics Canada, 2016). Of the several islands that make up Frontenac Islands, Wolfe Island, Howe Island, and Simcoe Island have significant permanent resident populations and a regular or on-demand ferry service. Although several of these islands have a significant number of homes and cottages, they are largely uninhabited during the winter months when ice build-up in Lake Ontario and the St. Lawrence River impedes boat access. A major attraction on Wolfe Island is Big Sandy Bay, a public nature reserve which the Province has identified as an Environmentally Sensitive Area of Natural and Scientific Interest since it is home to several provincially significant birds, provincially rare trees, and other rare plant species (County of Frontenac, 2016).

Figure 23. Howe Island, Frontenac Islands (Maplogs, 2021).

# 2.0 Roles and Responsibilities

## 2.1 The County of Frontenac

The County of Frontenac is an upper-tier municipality governed by an eight-member council. The Council consists of the mayors from each of the four townships in the County, as well as an additional chosen member from each township's Council (County of Frontenac, 2018a). The Council is responsible for effectively delivering services to residents across the municipality and is regulated by the *Municipal Act* (2001) (see section 5.2.2). In a planning context, the Council is responsible for decision-making with respect to all regional land use planning and development matters and is also the approval authority for all lower-tier Official Plans (OP). The Council is advised by the planning department who make professional land use planning recommendations, ensuring all planning conforms to the Frontenac County OP (section 5.3) and is consistent with the Provincial Policy Statement (PPS) 2020. The Frontenac County OP holds its basis in the *Planning Act* (1990) (see section 5.2.1) and directs regional planning matters, including, but not limited to, managing growth patterns in the County, as well as Natural Heritage System (NHS) planning. Given the integral importance of the County's natural heritage, the planning department is responsible for going beyond the minimum guidelines of the PPS to protect the region's NHS for the long-term.

The County of Frontenac Planning Department also conducts local planning services for three of the four townships: North Frontenac, Central Frontenac, and Frontenac Islands (County of Frontenac, 2018b).

Figure 24. Algonquin Provincial Park, Ontario (Backroad Map Books, 2021).

## 2.2 The Townships

Planning decisions made by the Townships must conform to Frontenac County's OP, as well as the respective Township's OP. Township planning must have regard for provincial interest and be consistent with the PPS.

### 2.2.1 North Frontenac

The Township of North Frontenac is responsible for delivering services, such as by-law enforcement and land use planning, within its municipal boundaries. The North Frontenac Council is the authority for planning decisions related to OP and Zoning By-law Amendments. The Township's Committee of Adjustment/ Planning Advisory Committee is responsible for Minor Variances and Consent application decisions. The Township is also responsible for enforcing the protection of natural heritage features and areas amongst development within the Township (Township of North Frontenac, n.d.b).

With respect to Crown land, the North Frontenac Crown Land Stewardship Program (CLSP), is a partnership between the Township of North Frontenac and the Ministry of Northern Development, Mines, Natural Resources and Forestry dedicated to public awareness and maintenance in conserving natural resources. Under the partnership, the Township is responsible for the management, operation, and maintenance of the 58 kilometres of Crown roads. Township Council works with the Crown in the conservation and resource management of ecologically and recreationally valued natural features, such as Mazinaw Lake Enhanced Management Area, Bon Echo Provincial Park Additions, and Crotch Lake Conservation Reserve (Township of North Frontenac, n.d.a).

Figure 25. North Frontenac's backcountry (North Frontenac Parklands, n.d.).

### 2.2.2 Central Frontenac

The Township of Central Frontenac is responsible for delivering efficient municipal services, supporting growth and development, and conserving key natural and cultural heritage features within the Township boundaries. The

Township's planning services are provided by the County of Frontenac Planning Department. These services include providing planning recommendations to the Township Council and the Committee of Adjustment, as well as preparing planning documents, such as the Township OP and Zoning By-law (Township of Central Frontenac, 2018).

### 2.2.3 South Frontenac

The Township of South Frontenac is responsible for municipal development, service delivery, road construction, and by-law enforcement. To guide such matters, Township Council is advised/assisted by multiple committees, including the Lake Ecosystem Advisory Committee and the Committee of Adjustment/Land Division Committee. The Lake Ecosystem Advisory Committee is a committee appointed by Council to voice concerns and feedback to Council from members of the local lake associations. The Committee of Adjustment/Land Division Committee makes planning decisions regarding minor variance and disputed consent applications, with consideration to the County and Township OPs, as well as provincial planning regulations. Currently, the Township is working with the County and consultants to prepare background studies for the development of a new OP (Township of South Frontenac, n.d.).

Figure 26. South Frontenac (Frontenac Economic Development, n.d.).

Figure 27. Cottages on Wolfe Island, Frontenac Islands (VRBO, n.d.).

### 2.2.4 Frontenac Islands

The Township of Frontenac Islands is responsible for directing sustainable growth, development, and service provision in the Township. Council and community group initiatives work to promote tourism in the Township – stimulated by the area's natural heritage features and resources – to strengthen

the local economy. The Township must balance social, economic, and environmental factors in developing the local communities (Frontenac Islands, 2021b). The County Planning Department is responsible for providing planning services and recommendations to Township Council on land use planning matters related to the township area (County of Frontenac, 2018b).

## 2.3 Indigenous Peoples

Indigenous Peoples have an inherent relationship to the lands that Canadian settlers continue to colonize. Indigenous nations have special nation-to-nation relationships with the Crown in which they are sovereign nations and constitutional rightsholders (e.g., to Aboriginal title and Treaty rights as per S.35 of the *Constitution Act*, 1982) – not stakeholders. Thus, the Crown or any Crown agency has the duty to consult and accommodate Indigenous Peoples in the case that a Crown decision may affect Aboriginal or Treaty rights, as recognized by the *Constitution Act* (1982). As an extension/creation of the Crown, municipal governments should also consult local Indigenous communities in planning matters. Crown agencies can also consult and/or plan with local Indigenous communities even on matters where the duty to consult is not legislated (Government of Ontario, 2021c).

Some areas in the County of Frontenac overlap with lands that are traditional Algonquin territory. Specific areas in the Townships of North, Central and South Frontenac lie within the Algonquin Land Claim area. Thus, the County and the Algonquins of Ontario need to partner to address land use planning matters that impact the Algonquin communities in these areas, predominately with respect to water quality and utilization, environmental impact, and archeological areas of interest (County of Frontenac, 2014).

Figure 28. Salmon River (Friends of the Salmon River, n.d.).

## 2.4 Environment-Oriented Ontario Ministries

### 2.4.1 Ministry of Northern Development, Mines, Natural Resources and Forestry

The Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDMNRF) is an Ontario government ministry dedicated to protecting Ontario's biodiversity and natural resources. MNDMNRF is responsible for determining which wetlands and wetland complexes are provincially significant across Ontario. The ministry provides boundary and status information to planning authorities for evaluated wetlands. MNDMNRF is the Ontario government department responsible for identifying Areas of Natural and Scientific Interest (ANSI) across the province.

The ministry is responsible for leading the sustainable management of all of Ontario's Crown lands and forests. MNDMNRF conducts Crown land use planning under the authority of the *Public Lands Act* (1990) (see section 5.2.3). The ministry is dedicated to supporting outdoor recreational opportunities – integral to the County as outdoor recreation forms the basis of its tourism industry - and for protecting people, property, and communities from forest fires, floods, and droughts (Government of Ontario, 2021a).

The ministry partners with the County in the North Frontenac Crown Land Stewardship Program mentioned above (see section 2.2.1).

### 2.4.2 Ministry of the Environment, Conservation and Parks

The Ministry of the Environment, Conservation and Parks (MECP) is responsible for managing the quality of Ontario's natural environment – protecting air, lakes, rivers, land, and soil - through legislation, targeted programs, services, and partnerships. MECP is responsible for the protection of species at risk and their habitats. The ministry leads in the management of trout lakes and at-capacity lakes. The ministry coordinates province-wide climate change action. The ministry released a *Climate Change Action Plan* in 2007 and has since updated the plan based on environmental progress monitoring. Additionally, the ministry manages the conservation of Ontario's parks and protected areas/conservation reserves – a vital step in mitigating and adapting to climate change (Government of Ontario, 2021a).

Figure 29. Municipal Drain buffered by Wetlands made by Ducks Unlimited Canada (Conserving Canada's Wetlands, n.d.).

### 2.4.3 Ministry of Agriculture, Food and Rural Affairs

The Ministry of Agriculture, Food and Rural Affairs (OMAFRA) is responsible for ensuring the sustainability of agriculture in Ontario. The ministry works to support a productive agri-food sector to promote economic growth and opportunities in Ontario's rural communities. OMAFRA is responsible for the Rural Economic Development program that provides cost-share funding for entities in Ontario, such as a municipality, to support activities that encourage strong rural communities. The ministry has produced a provincial soil strategy to strengthen the province's agricultural sector while protecting the environment and adapting to climate change (Government of Ontario, 2021).

## 2.5 Nature Conservancy of Canada

The Nature Conservancy of Canada (NCC) is responsible for securing and managing properties with important natural features. The organization sets priorities, develops and implements strategies, and sets measures of success for species and habitat protection at all spatial scales. The organization partners with individuals, corporations, foundations, Indigenous communities, other non-profit organizations, and governments at all levels nationwide to conserve land (NCC, 2020b). The Nature Conservancy of Canada holds a public-private partnership with the Government of Canada through the Natural Areas Conservation Program and the Natural Heritage Conservation Program. This partnership currently holds six properties in the County of Frontenac – four of which are part of the Frontenac Arch (NCC, 2020a).

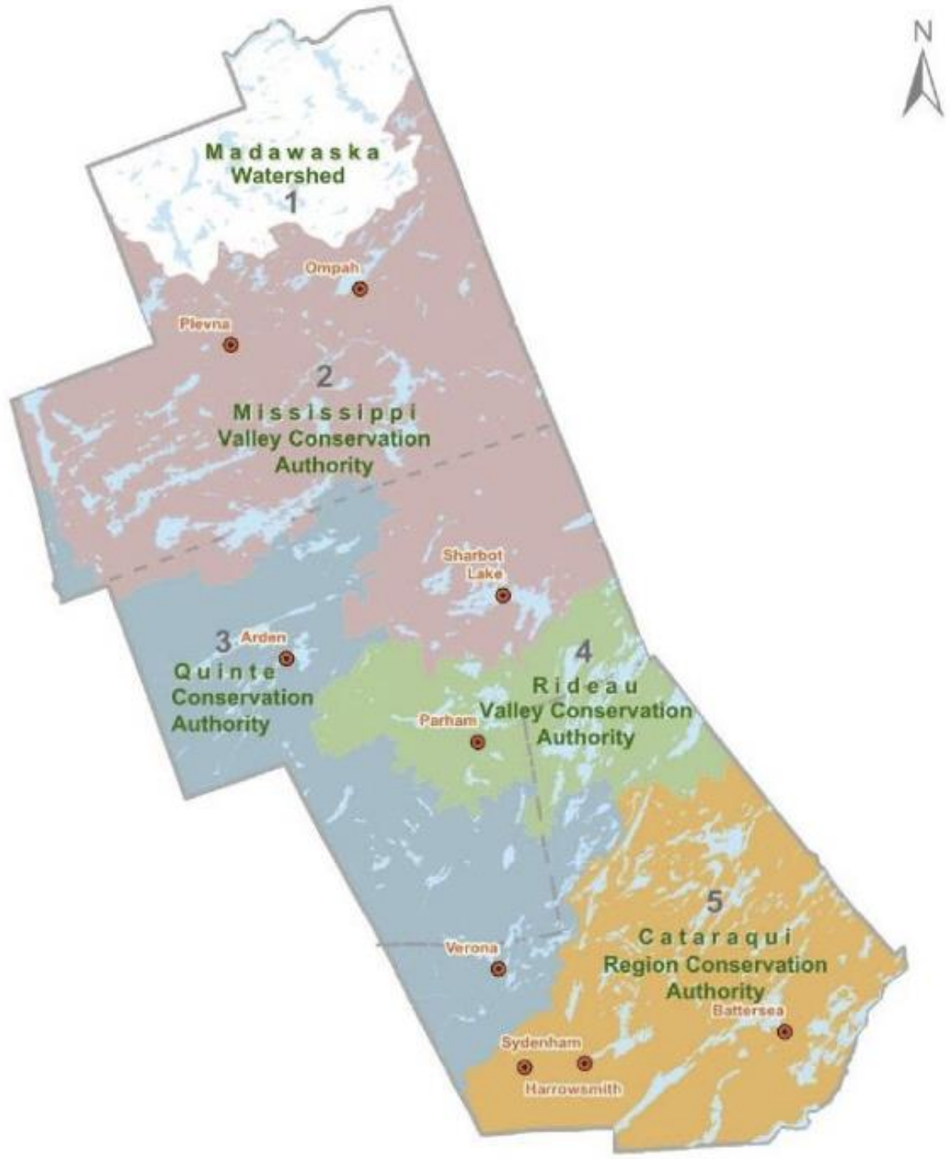
Figure 30. Frontenac County agriculture (County of Frontenac, 2017).

The Nature Conservancy of Canada also participates in conservation agreements (called conservation easements) with private landowners. Conservation easements are voluntary, legal agreements that allow the landowner to retain ownership of the land but permanently limit the use of and changes to the property to conserve its natural value (NCC, 2020a).

## 2.6 Conservation Authorities

Conservation Authorities (CA) are local watershed management agencies legislated under the *Conservation Authorities Act* (1990) (see section 5.2.8). These agencies are responsible for delivering services and programs to protect natural resources, namely water, across Ontario. CAs partner with landowners, other organizations, and all levels of government – including upper- and lower-tier municipalities (Conservation Ontario, 2021). The boundaries of Frontenac County fall within the management area of four different CAs: the Cataraqui Region Conservation Authority, the Quinte Conservation Authority, the Rideau Valley Authority, and the Mississippi Valley Conservation Authority (see Map 4).

CAs support local planning processes by reviewing planning policies, regulations, and development applications. The applicable conservation authority is required to review all waterfront development applications, applications related to areas that contain natural features, and applications for properties prone to hazards such as flooding, erosion, unstable bedrock or soil, wetlands, steep slopes, or dynamic beaches. CAs may be required to comment on applications submitted to local municipalities on behalf of the province and make recommendations to the local municipality (Conservation Ontario, 2021).




Map 4. Map of Conservation Authorities in Frontenac County (County of Frontenac, 2019).

### 2.6.1 Quinte Conservation Authority

The Quinte CA spans parts of South Frontenac, Central Frontenac, and North Frontenac and thus, is consulted in planning matters for all three townships.

### 2.6.2 Rideau Valley Conservation Authority

The Rideau Valley CA addresses conservation within South Frontenac and Central Frontenac.

### 2.6.3 Mississippi Valley Conservation Authority

The Mississippi Valley CA addresses natural resource protection and management in North Frontenac and part of Central Frontenac.

### 2.6.4 Cataraqui Region Conservation Authority

The Cataraqui Region Conservation Authority covers the majority of South Frontenac. The Cataraqui CA also supports the planning process in the Frontenac Islands as a non-regulatory body (it does not issue permits).

## 2.7 Non-Profit Corporations

### 2.7.1 Federation of Ontario Cottagers' Association

The Federation of Ontario Cottagers' Association (FOCA) is responsible for serving and representing waterfront residents (both seasonally and year-round), lake associations, waterfront property owners, and waterfront communities across Ontario, including those in Frontenac County. FOCA advocates for healthy lakes and rivers by providing education, communication, and government advocacy to the aforementioned groups (FOCA, n.d.).

### 2.7.2 North Frontenac Lake Association Alliance

The North Frontenac Lake Association Alliance (NFLAA) is a coalition of 20 cottage and lake associations in North Frontenac. The group aims to provide representation, assistance, and leadership to address common recreational, lake stewardship, and business development interests regarding development decisions. The NFLAA seeks to form partnerships with the Township of North Frontenac, the County, the Province, and Indigenous communities when addressing emerging issues (Township of North Frontenac, n.d.b).

### 2.7.3 The Conservationists of Frontenac-Addington

The Conservationists of Frontenac-Addington (COFA) is responsible for ensuring that wildlife and the environment are treated wisely in the Frontenac-Addington region. COFA maintains and enhances wildlife and fish populations for residents' benefit in addition to conserving other natural resources (Township of North Frontenac, n.d.a).

### 2.7.4 The Frontenac Arch Biosphere Reserve Network

The Frontenac Arch Biosphere (FAB) Network is responsible for fulfilling the mandates of the UNESCO Man and the Biosphere programme (MAB) within the Frontenac Arch Biosphere Region. The MAB forms the basis for sustainable use and conservation of the biosphere's resources and for strengthening people's relationship with their natural environment. The FAB Network works with local federal and provincial parks, local Indigenous nations, CAs, community land trusts, community and environmental organizations, and municipalities to improve sustainable community development by celebrating the interconnectedness of nature, livelihood, well-being, and culture. The FAB Network obtains support and higher-level representation from the Canadian Biosphere Reserves Association in the global UNESCO MAB programme (FAB, 2021b).

# 3.0 METHODS

The following chapter is an explanation of the qualitative research approach that was employed during the study period between September and December 2021. The methodology centred around a case study approach that used abductive reasoning to inform creative and intuitive recommendations. Abductive reasoning is a process whereby researchers begin with a puzzle, or rather a complex planning situation, and work to make logical inferences about best practices that may bring about desired results (Dudovskiy, 2021).

Five methods were used in this research:

- Literature review
- Policy analysis
- Case study analysis
- Exploratory conversations
- Site observations

The combination of qualitative methods triangulates the findings and presents a clear chain of evidence to support the recommendations.

Figure 31. Gould Lake Conservation Area (Harder, 2021).

Figure 32. Kennebec Wetland Complex, Frontenac County (Rodrigue, 2021).

## 3.1 Literature Review

A preliminary step in the research process was to conduct a review of academic literature related to long-term natural heritage planning on a regional scale. The review was conducted using academic databases available through the Queen's University Library and Google Scholar. Preference was given to sources published in the English language within the last 15 years. The literature review was used to justify and inform the project by providing comprehensive background information on the following seven key planning themes: long-term planning, environmental planning, regional planning, rural planning, Indigenous planning, Natural Heritage Systems (NHS), and watershed planning. Findings on the strengths and opportunities of each planning theme were used to develop criteria to analyze the case study best practices.

## 3.2 Policy Analysis

A policy analysis was conducted to review the current laws, regulations, and polices related to natural heritage that apply to Frontenac County. This review addressed legislation by federal, provincial, regional, and municipal governments. The purpose of the policy review was to gain an understanding of the existing legal and policy framework surrounding natural heritage protection and to analyze how the various laws, regulations, and policies apply to Frontenac County. By doing so, the current level of protection afforded to natural heritage in Frontenac County could be assessed and opportunities to go beyond this level of protection could be identified. The policy analysis also established an understanding of the policy tools available to Frontenac County to protect its NHS from harmful forms of development, site alteration, and other activities that could negatively impact the landscape. Additionally, the

policy analysis helped to identify key policies that could support Frontenac County when conducting a new natural heritage study.

## 3.3 Case Study Analysis

The report investigated how other jurisdictions throughout Ontario, Canada, and the world have or are conducting long-term natural heritage planning. Studies and plans related to environmental protection that have been produced within the last 10 years were selected. A total of 19 cases were analyzed based on their level of conformity with the selection criteria, which was established to scope out cases with similar characteristics to Frontenac County. The cases were analyzed against nine evaluation criteria to determine and compare strengths and weaknesses across cases in a predetermined framework. The evaluation criteria were established based on the findings from the literature review, policy analysis, and preliminary exploratory conversations with local experts.

## 3.4 Exploratory Conversations

Semi-structured conversations were conducted throughout the research process for exploratory purposes. Conversations occurred with experts in the field of NHS planning, including planners from the province, Conservation Autorities (CA), nature conservancy, and Queen's University. Roughly a dozen conversations were completed prior to November 16th, 2021. This method was not intended to justify the research but rather to guide it by providing students with the opportunity to hear from a range of voices in the fields of planning and conservation, to draw out the controversies or tensions within this interdisciplinary topic, and to inform subsequent research steps.

## 3.5 Site Observations

Site visits via a field trip occurred early in the research process to gain a better understanding of the natural heritage features in Frontenac County as well as the opportunities and challenges for NHS protection that the County faces. The purpose of the site observations was not to gather technical data; rather, the purpose was to help students gain an appreciation for the landscape and ground-truth the research topic. The field trip was led by County planners Sonya Bolton, Jennie Kapusta, and Dimitry Kurvlovich. Photographs were taken during the site visits to provide a visual representation of certain natural heritage features and unique locations throughout the County.

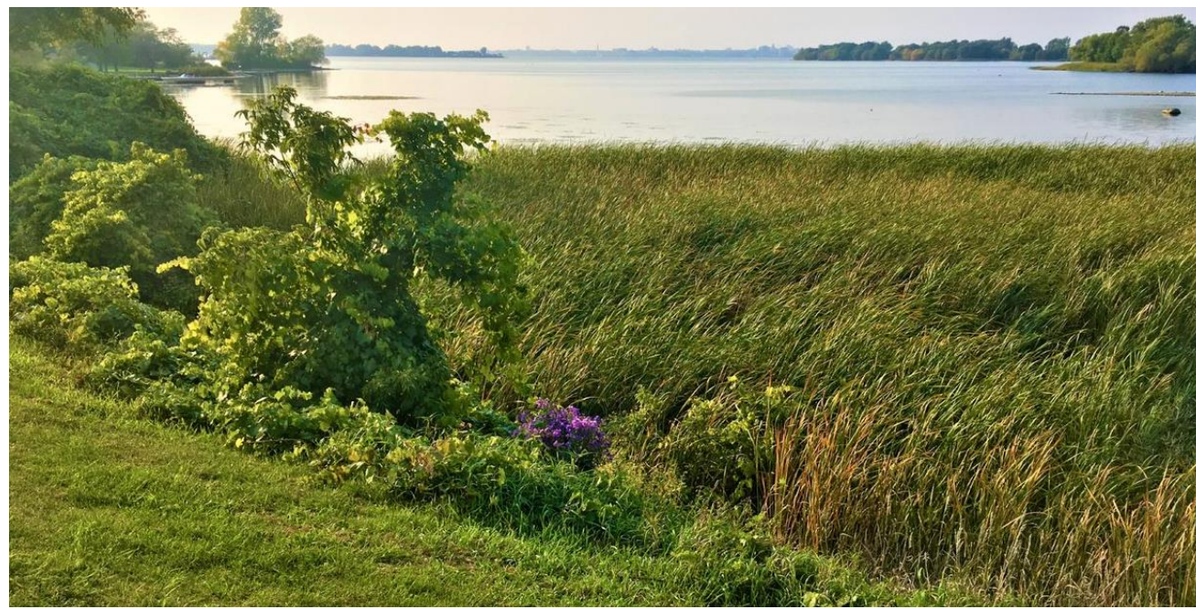


Figure 33. Photograph captured at site visit to Wolfe Island (Driedger, 2021).

# 4.0 Literature Review

The following literature review provides background information on seven planning themes: long-term planning, environmental planning, regional planning, rural planning, Indigenous planning, Natural Heritage Systems (NHS), and watershed planning. Findings were used to develop case study selection and evaluation criteria; case study analysis based on the evaluation criteria led our team to identify best practices and inform recommendations, as they relate to these planning themes.

## 4.1 Long-Term Planning

Traditionally, planning in Ontario has a short time horizon with most official plans (OP) dealing in 10- to 25-year time frames (e.g., Frontenac's OP is a 20-year plan). In contrast, long-term planning provides a framework that addresses long-term issues such as climate change, resource scarcity, greenhouse gas emissions, and population demands. Long-term environmental planning typically uses a 50-to-100-year time horizon to develop a vision that describes a community's desired future state. This visioning process identifies goals, targets, and strategies which are intended to guide land use and planning decision-making and other relevant local and regional government actions by informing future policy recommendations and implementation strategies (Roover & van Buuren, 2016). It is highly recommended that the public and stakeholders are engaged in the visioning process. By including these groups, the vision better captures the views of local citizens while improving the vision's legitimacy (Lange & Hehl-Lange, 2010). Although the visioning process is not unique to long-term planning, it is crucial that a vision is developed with

Figure 34. Kennebec Wetland monitoring (Kennebec Estuary Land Trust, 2019).

corresponding goals, targets, and strategies when trying to implement a plan over such a vast planning horizon.

Throughout the literature, numerous visioning tools are recommended to incorporate a long-term planning horizon. Findings recommend scenario planning, future state visioning, and integrated asset management when developing visions specific to long-term planning for NHSs (Hilde & Paterson, 2014; Ball, 2001; Lange & Hehl-Lange, 2010, Roovers & van Buuren, 2016).

Figure 35. Ottawa greenway, an example of green infrastructure (Martinez, 2020).

Scenario planning is a form of 'what if' analysis, which employs strategic planning, environmental impact assessment, strategic environmental assessment, Delphi studies, a method used to build reliable expert consensus, and futures studies, a systematic approach to identifying alternative futures. Scenario planning offers a process for communities to explore alternative futures, often within collaborative workshop settings, where diverse interests explore the consequences of alternative futures and ultimately and collectively select a preferred future. As climate change mitigation becomes more pressing, scenario planning is well equipped to help planners and communities understand the role that blueways and greenways can play in mitigating climate-related impacts (Barrett & Heale, 2020; Hilde & Paterson, 2014; Sardar, 2010).

Future state visioning uses a vision to describe a final desired landscape. This process must be supported by underlying information such as visible features of our physical environment and non-visual information such as habitat relationships, connectivity, or other ecosystem services. The planner then translates the vision into concrete data, which is then used to create visual representations of the future state. Equally, a vision that is the outcome of a participatory process would also have to be translated into concrete data (Lange & Hehl-Lange, 2010).

Asset planning is a form of asset management that focuses on the lifecycle of assets and invests in assets based on their life-cycle perspective. Integrated asset management is the approach applied to managing blue-green infrastructure into which public values, such as sustainability or spatial quality, are incorporated. This approach allows for asset management to focus on its own assets and on the environmental impacts of the assets simultaneously (Roovers & van Buuren, 2016).

Outside of Ontario, the cities of Calgary and North Vancouver have developed 100- year sustainability plans using a visioning process. Calgary used an asset management framework and employed a large-scale citizen visioning process that involved numerous visioning sessions focused on answering five "imagineCALGARY" questions when creating the 100- year vision (The City of Calgary, 2007). North Vancouver used a visioning process and charette guided by seven principles established by the Design Centre for Sustainability's ongoing regional project, Sustainability by Design (City of North Vancouver, 2009). Both plans provided guidance for green infrastructure (North Vancouver) and Natural Environment Systems (Calgary).

In Ontario, Markham developed a 50-to-100-year sustainability plan using a visioning process (The Town of Markham, 2011). The plan's vision was developed through online public and in-person engagement events, but it does not specify the type of visioning process used. The plan identifies water efficiency and ecosystem integrity goals.

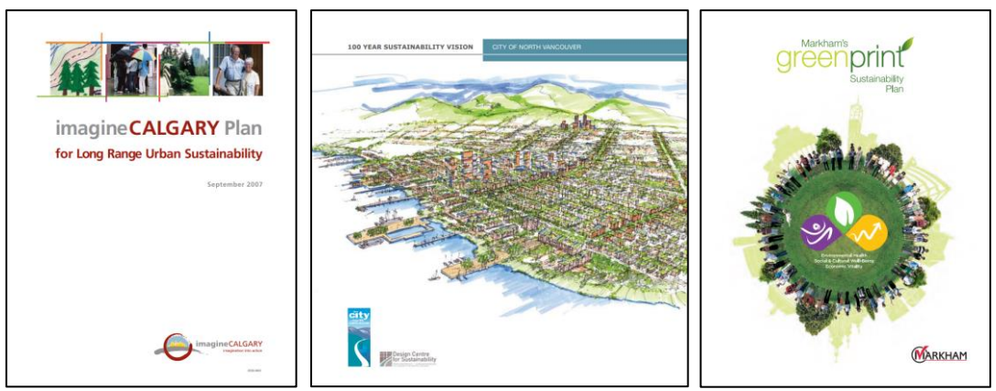



Figure 36. imagineCALGARY, North Vancouver 100-Year Vision, and Markham's 50-to-100 Year Sustainability Plan to exemplify long-term planning (The City of Calgary, 2007; City of North Vancouver, 2009; & Town of Markham, 2011).

Within Canada, only three municipalities have undertaken long-term planning with a 50- to-100 year time horizon, all of which focus on sustainable urban development rather than long-term natural heritage protection. If Frontenac County is to undertake a 50-to-100-year long-term NHS plan, they will not only be in exceptional company with Calgary, North Vancouver, and Markham, they will also pioneer long-term environmental planning in rural Canada.

### *Applicability to the Project*

Given the vastness of natural landscapes found in the County, a long-term plan is needed to protect Frontenac's NHS. To do so the County must employ a visioning process that uses participatory engagement processes to capture the views of local residents, stakeholders, and rightsholders (e.g., future state visioning); considers the roles of greenways and blueways within the County's NHS (e.g., scenario planning); and addresses any environmental impacts of blue and green infrastructure (e.g., asset planning). The visioning process used will depend on how the NHS is framed; however, a hybrid of the future state visioning, scenario planning, and asset planning could be used to address concerns regarding public engagement when considering the roles greenways and blueways play in the County, and when addressing environmental impacts on natural assets.

## 4.2 Environmental Planning

### 4.2.1 History

Canadian environmental planning can be traced to a series of eras, each with unique conceptualizations of how humans ought to act on and relate to the natural landscape. From the planning reform movement of the progressive era (1890-1920), during which the parks, City Beautiful, and Garden City

movements promised solutions to the deplorable conditions of industrial cities, to the present-day era, which Daniels (2009) defines as "planning for sustainability and the global environment," environmental planning can be seen as a necessary reaction to the ecologically disruptive impacts of our consumption habits and economic activities (p. 187). The successes of environmental planning movements and practices have therefore been dependent on the extent to which firms, governments, and industry accept responsibility for the negative externalities that they impose on the environment.

Currently, environmental planning considers 'sustainable development' an elusive target; a process which must be continually pursued, which "can only be pursued if population size and growth happen in harmony with the changing productive potential of the ecosystem" (World Commission on Environment and Development, 1987, p. 9). How to achieve that harmony has been contested over time, and among environmentalists there has long been a debate between the preservationists (who believe that natural resources should remain as untouched by human influence as possible) and conservationists (who believe that natural resources should be managed for sustained yields and used wisely for human benefit) (Hays, 1959). But this call for the 'wise use of resources,' which is echoed in the language of Ontario's Provincial Policy Statement (PPS) today, embodies environmental planning's principal objective: to balance the social and economic needs of development with environmental protection. While there is no concrete formula for achieving harmony with nature, there are three main components to environmental planning frameworks which work to support this goal. These are scientific analysis, social organizations, and political and economic support. Each are discussed below in more detail.

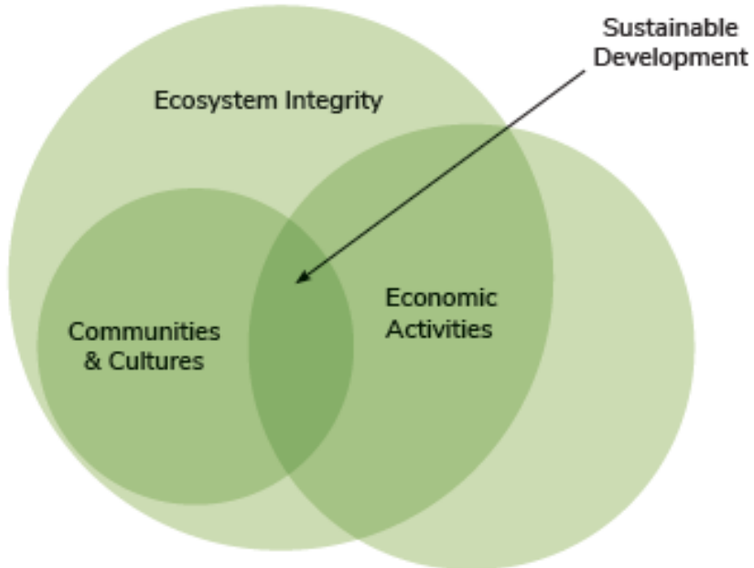



Figure 37. Sustainable development. The circles do not intersect equally. Society (communities and cultures) exists within the environment (ecosystem integrity) and is limited by its capacity. Some economic activities fall outside the overlapping circles of environment and society because they are not sustainable (Peel Watershed Planning Commission, August, 2019, p.8).

### *Applicability to the Project*

Balancing the economic needs of development with environmental protection is a pertinent challenge for Frontenac's landscape, as the majority of Frontenac's growth is forecasted in the County's rural areas (County of Frontenac, 2019). Haphazard rural growth has the potential to negatively impact natural heritage resources, and, therefore, County planners need to think holistically and systemically about what growth ought to look like in the

future. Without strategies in place to harmonize the functions of the NHS with development, the County could experience the negative impacts of piecemeal-thinking, or what is often referred to as 'death by a thousand cuts' (Brooks, 2010).

### 4.2.2 Scientific Analysis

Land use plans are produced after a long process of negotiating technical, political, and civil needs, and during this process, the consultation of maps and scientific documents is critical to understanding spatial problems and their territorial distribution (Salata et al., 2020). There are several different analysis techniques for ecosystems and landscapes that provide scientific justification for regulating land use activities. Recently, the ecosystem service (ES) approach to planning has been recognized as playing an important role in addressing sustainability through the land use planning process because it helps identify the key multifunctional areas of environmental networks. ES are "the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life" (Daily, 1997, p.2). The Millennium Ecosystem Assessment was developed in 2005 to assess the consequences of ecosystem change for human well-being and to establish the scientific basis for actions needed to enhance the conservation and sustainable use of ecosystems (Millennium Ecosystem Assessment, 2005). Increasingly, cultural ES are being integrated into ES assessments, and this allows planners to incorporate normative values into their analyses, such as food provision, carbon sequestration, cultural and natural history, and the aesthetic experience/sense of place (Schmidt et al., 2017).

Table 2. Types of ecosystem services (Millennium Ecosystem Assessment, 2005).

| Environmental Services | | |
|---|---|---|
| Provisioning | Regulation | Cultural |
| - Food<br>- Fresh Water<br>- Fuel<br>- Food and Fibre | - Climate Regulation<br>- Flood Regulation<br>- Disease Regulation<br>- Water Purification | - Aesthetic<br>- Spiritual<br>- Educational<br>- Recreational |
| Supporting<br>- Nutrient cycling<br>- Soil formation<br>- Primary production | | |

Many studies have confirmed that increased biodiversity improves ecosystem functioning, making the ecosystems more stable and more efficient due to the presence of more pathways for energy flow and nutrient recycling (MacArthur, 1955; Hooper et al., 2005; Vitousek & Hooper, 1993; Worm et al., 2006). Biodiversity, or *the variety of life*, therefore, helps sustain ES (Brooks, 2010). Advances in ecosystem ecology, landscape ecology, and remote sensing provide increasingly sophisticated maps and tools for land use planning at larger spatial scales, for instance, when designing green infrastructure, determining the costs for development, or establishing urban growth boundaries (Brooks, 2010).

*Applicability to the Project*

Frontenac County could benefit from taking a multi-criteria approach to classify and manage the County's NHS. Incorporating contemporary advancements into landscape ecology as well as cultural and recreational values into the strategy for natural heritage protection helps justify planning policies and regulations. Moreover, climate change has already begun to impact the County, and as it continues to disrupt the stability of the County's ecosystems and weather systems, Frontenac may increasingly rely on different ES to mitigate those changes (County of Frontenac, 2019). Incorporating those services into the strategy for natural heritage protection helps ensure that policies are grounded in thorough, up-to-date scientific information.

### 4.2.3 Social Organizations

Civic engagement emphasizing community involvement and collective learning has become central to environmental planning, and stakeholder engagement has become increasingly codified into planning processes (Wagenet & Pfeffer, 2007). 'Citizen science' can therefore emerge from these synergies between official and unofficial knowledge and allow local communities to be included in research, visioning, and strategy formulation (Wagenet & Pfeffer, 2007). There is significant evidence demonstrating the connection between networks of social capital and positive citizen engagement with local politics and organizations (Selman, 2001). From an environmental perspective, 'social eco-capital' can be thought of as the glue which binds community networks together through the mutually dependent relationship between environmental stewardship and care for the public good (Selman, 2001). Essentially, having the social infrastructure for mutual help, advice, and knowledge-sharing aids in the execution of local environmental initiatives. That said, local autonomy should be supported by sufficient funding and expertise: financial and organizational structure provided by larger regional authorities helps empower social organizations (Wagenet & Pfeffer, 2007). Therefore, John and Mlay's (1999) suggestion for a hybrid system involving a strong centralized regulatory infrastructure combined with a focus on "top-down support for bottom-up initiatives" is a critical step towards successful environmental planning and management (p. 361).

Figure 38. Pack of Loons in a lake in North Frontenac (Township of North Frontenac, n.d.).

Furthermore, when plans and strategies are developed in a manner of true partnership between stakeholders, this is known as 'social license,' and stakeholders should feel a sense of ownership over the resulting plan (Thomson & Boutilier, 2011). In a case study investigating the Region of Halton's NHS planning, DeLoyde (2020) found that strong negative perceptions of the NHS process from industrial stakeholders suggest that the process has not yet achieved the threshold for social license. Findings also indicate that integrating ecosystem services into NHS planning could improve transparency and

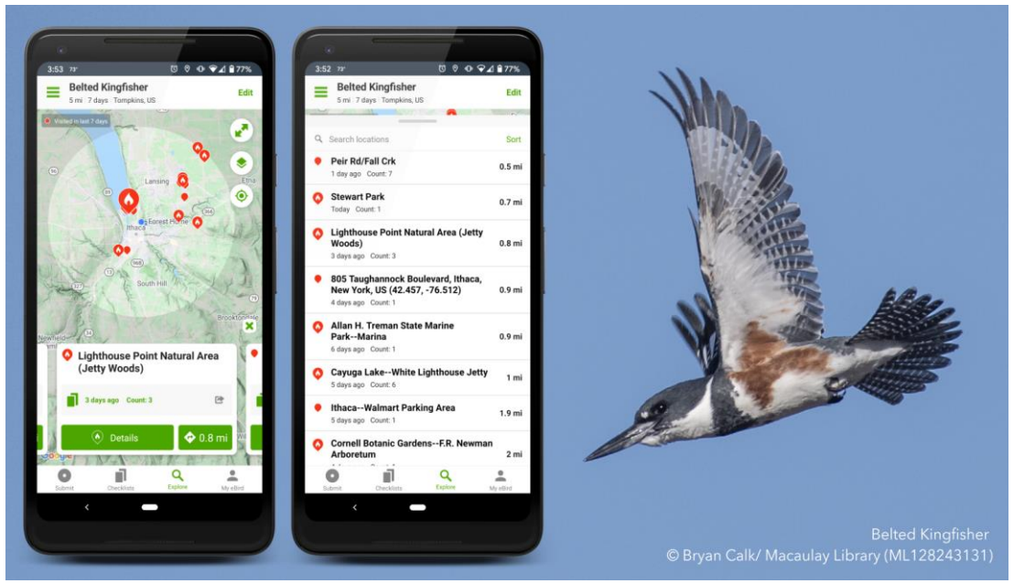



Figure 39. eBird is a website and app available for the public to input sightings of various bird species, this is an example of citizen science (TeameBird, 2021).

communication around the process; however, "stakeholders would be more likely to accept this integration if the process was framed as a response to a common goal, such as managing impacts of climate change" (p. 141). Generally, communities with common interests and common places will "cooperate with external institutions where there has been sufficient trust-building to assure them that a shared, consensual, and mutually-beneficial approach will be pursued" (Selman, 2001, p. 16). This is essential in the pursuit of local sustainability since the wealth of a sustainable society "lies in more than its outputs of goods and services" and must have regard for the "non-material forms of wealth which sustain ecological and human integrity" (p.15).

### *Applicability to the Project*

Framing the NHS planning process as a response to climate change could help create consensus among stakeholders across the County. Moreover, because a lot of the land in Frontenac is privately owned, the County relies on homeowners to act as stewards of the County's natural heritage resources. Education initiatives and public consultation can help civil society buy into the process of NHS planning. Ultimately, if there has been sufficient trust-building between planners and stakeholders, and if unified by a common vision of landscape permanence, Frontenac's NHS can be supported by the stewardship and care offered by strong social infrastructures.

### 4.2.4 Political and Economic Support

One of the biggest challenges with environmental planning is often a lack of political will rather than scientific uncertainty (Daniels, 2009). Adopting the principle of 'sustainable development' implies that we must go beyond conventional definitions of what constitutes successful policy when planning or

managing the economy (Clark et al., 1993). This can evoke normative, ethical, and moral questions "about our survival," so it can be difficult to agree on issues related to equity and futurity (Korhonen, 2007). That said, it has been widely accepted that resource conservation and balanced development are key sustainability objectives for planners and decision-makers (Clark et al., 1993). Resource conservation involves recognizing environmental limits and constraints, which prevents resource depletion and protects businesses from future risks and insecurities. Balanced development involves minimizing the waste of resources and damage to communities that occurs when areas experience uneven development pressures. Strategic planning and the progressive upgrading of environmental standards "can counter the tendency for new investment to be located away from places that have experienced industrial decline" (Clark et al., 1993, p. 13).

Figure 40. Muskoka Housing developments (McNutt, 2020).

Economically, it can be difficult to assess the effectiveness of environmental interventions in our complex global economies (Korhonen, 2007). Some scholars have suggested that economic activity should "strive toward local operation, local product life cycles, and adapt to local carrying capacity," since it is at the local and regional scales that common cultures and organizations can best cooperate (p. 54). This local economic cooperation can lead to transformational adaptation whereby individuals decide on values and actions that they believe will engender transformation in an unsustainable world (Ajibade & Adjei Adams, 2019). Some principles of good transformational adaptation are participatory visioning and decision-making, equity in power relations, experimentation and social learning, avoid risk distribution, promote stewardship and ecosystem-based management, promote sustainable degrowth (a framework that calls for re-localizing economic markets), and foster flexible, decentralized, and adaptive governance (Ajibade & Adjei Adamsb, 2019).

### *Applicability to the Project*

Frontenac County's *Strategic Plan 2019-2022* recognizes that the County's economic future is centred around smaller enterprises and 'local activity' since having a strong infrastructure for local businesses and social networks strengthens the community fabric overall (County of Frontenac, 2019). Frontenac's local economies are an opportunity for transformational adaptation; the County is well-positioned to adapt to change and implement sustainability initiatives. If planners can communicate to consumers,

developers, and politicians the true costs of their choices, they can enable them to make informed choices that promote sustainability (Daniels, 2009).

## 4.3 Regional Planning

Regional planning may broadly be defined as an integrated planning and management approach to the economic, social, and physical resources of a spatially bounded area (Johnson, 2015; Lord & Tewdwr-Jones, 2015; Purkarthofer et al., 2021). It is stressed, however, that regional planning does not nor should not have a finite and all-encompassing definition; it is a dynamically changing system (Purkarthofer et al., 2021; Harrison et al., 2021; Johnson, 2015; Lord & Tewdwr-Jones, 2015).

Regional planning, in the Ontario context, takes the general form of programs, plans, and public policies involving multiple levels of public and private agencies. The focus is on anticipating change, coordinating responses, mapping vulnerability and possibilities, and delivering political agendas of action to maintain or improve the future spatial form of an area (Harrison et al., 2021; Vodden et al., 2020; Ledda et al., 2020).

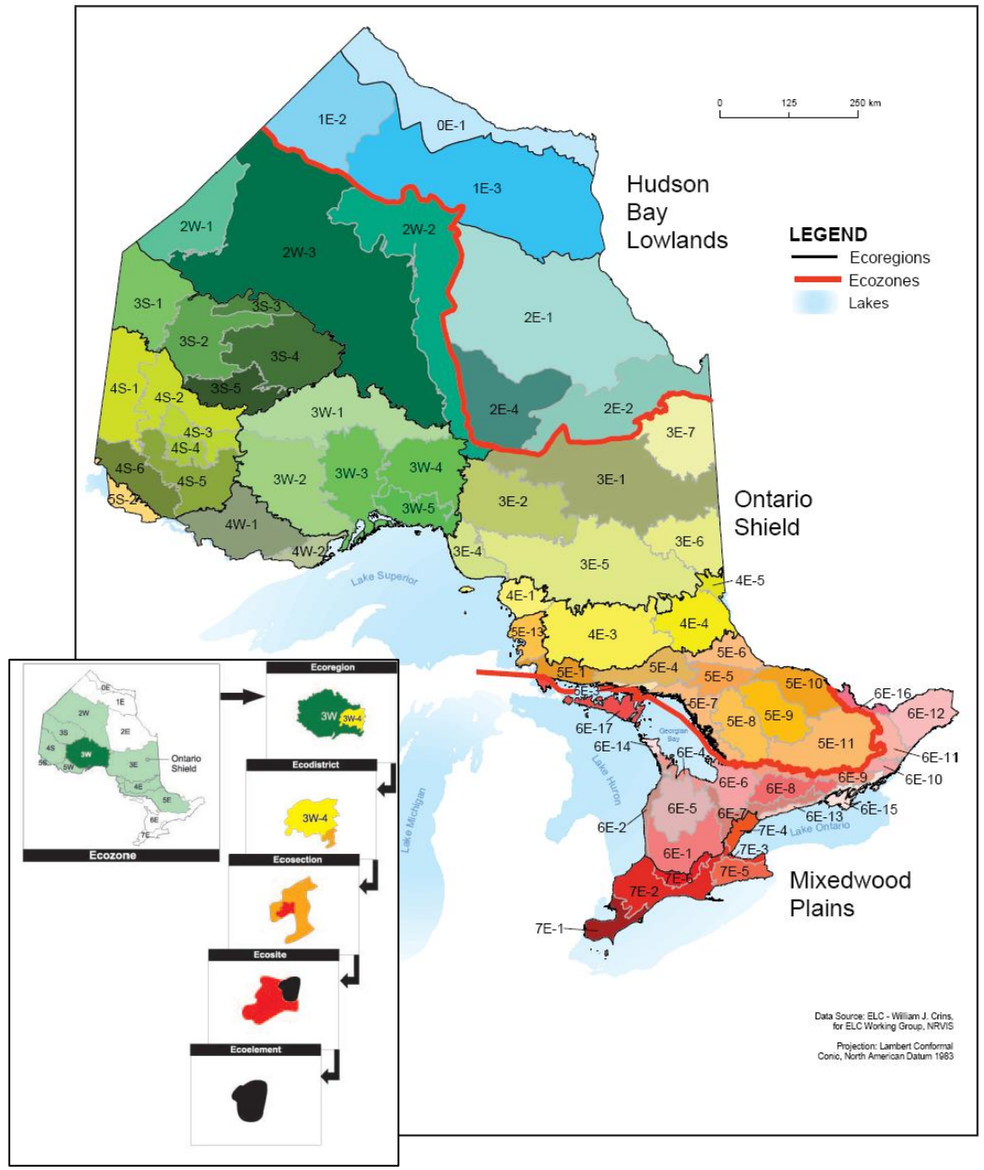
Moreover, it is posited that regional planning is not purely a matter of scale and must be understood from the following three perspectives: interests, institutions, and relations (Purkarthofe et. al., 2021; Harrison et al., 2021; Vodden et al., 2020). Interests reveal the underlying motive relating to regional planning. Institutions are defined as the relationship between formal and informal rules, norms, and discourses that shape the planning and governance processes. Relations refers to the complex interactions between the network of actors and processes involved in regional planning spanning

Figure 41. Aerial view of small community in North Frontenac (Township of North Frontenac, n.d.).

administrative scales, territorial entities, and sectoral policies (Purkarthofe et al., 2021).

If regional planning is understood through the lens of these three perspectives, it is then a reminder of the underlying complexities hindering a resilient and successful regionalist approach. Regional efforts are commonly undermined by the fragmentation of regional coordination and recommendations across myriad politically vested interests, seeing a focus on short-term over long-term decision-making combined with a pervasive absence of a consensus on future visions or goals (Johnson, 2015; Purkarthofe et al., 2021; Markey et al., 2015; Ledda et al., 2020). Furthermore, difficulties occur when implementing a bottom-up governance approach specifically in conveying local knowledge and contextual data to broader levels of decision-making (Morrison et al., 2014; Mills et al., 2014).

Regional planning can also be thought of through the lens of bioregions, eco-regions and/or watersheds (refer to section 4.6 for watersheds). Bioregions and eco-regions can be understood as large areas of water or land which contain geographically unique characteristics of natural communities and species (Miller, 1999). The main difference between the two is determined by size with bioregions typically being larger than eco-regions (Miller, 1999). These environmental regions act as a way of framing conservation priorities by providing the context to ask and answer the question "what might this natural landscape and natural patterns of movement look like?" (LandScope America, n.d.). Furthermore, eco-regions and bioregions may allow for more effective conservation efforts as their boundaries are not restricted in the way political and jurisdictional ones are (LandScope America, n.d.).




Map 5. The ecosystems of Ontario (Ministry of Natural Resources, 2009).

Furthermore, regional planning is to be understood as a visionary, creative practice that promotes citizen participation and bottom-up collaboration (Purkarthofe et. al.,2021; Schiff, 2019; Harrison et al., 2021; Markey et al., 2015; Ledda et al., 2020; Vodden et al., 2020). Adding to this emergent complexity is the inclusion of the following concepts to regional planning's lexicon: a re-focus on rural planning regions, ecosystem approaches, climate change resiliency, implementation of truth and reconciliation processes, local innovation, and learning regions (Klenk et al., 2017; Ortiz-Guerrero, 2013; Douglas, 2013; Schiff, 2019; Markey et al., 2015; Vodden et al., 2020). The future for regional planning highlights the need for adaptive, flexible and context-appropriate policies (Vodden et al., 2020; Morrison et al., 2014; Angelstam et al., 2019).).

This literature review also highlights the importance for adopting regionalist approaches in rural areas (Ortiz-Guerrero, 2013; Douglas, 2013; Schiff, 2019; Markey et al., 2015; Vodden et al., 2020). As rural systems become increasingly affected by uncertain determinants—biodiversity loss, degradation of services and infrastructure, land use-conflicts, the identification and pursuit of collective economic opportunities, and climate change— the way societies and governments manage change in a traditional way is challenged (Morrison et al., 2014; Mills et al., 2014; Ortiz-Guerrero, 2013). Adopting a regional vision of fluid, long-term, and context-appropriate policies provides a future in which regions, governments, and communities will be able to better mitigate and proactively respond to the rapidly shifting environmental, economic, and social landscapes (Vodden et al., 2020; Morrison et al., 2014; Angelstam et al., 2019).

A limitation of this literature review is evident as the articles lack any substantial discussion on the role of Indigenous governance, self-determination, or land claims in Canadian regional planning. This is a vital area of research for further investigation (Klenk et al., 2017; Schiff, 2019).

Figure 42. North Frontenac rural landscape (TripAdvisor, 2021).

### *Applicability to the Project*

Protecting NHS from a regional perspective is crucial in ensuring the County of Frontenac ability's to proactively respond to and ensure resilience against

climate change and development pressures. To successfully protect and preserve the natural environment, policies must be adaptive, flexible and focused on a long-term vision. The County should also ensure that in creating a regional vision for the next 50-to-100-years, the process is rooted in community participation, and incorporates local knowledge and interests. In addition, given that that County is situated within the Algonquin to Adirondacks Collaborative, the region may also benefit from including concepts such as bioregions and eco-regions into their policies and plans to ensure the most effective scale of conservation efforts.

Figure 43. A photo of cattle in a field on Wolfe Island captured by a team member (Driedger, 2021).

## 4.4 Rural Planning

Rural planning has historically been thought of as residual (i.e., anything that is not urban) (Gilbert, 1982; Frank & Hibbard, 2016). Modern planning emerged to remedy the negative outcomes of urbanization, including issues related to sanitation, traffic, and sprawl. Therefore, the planning profession's urban bias and neglect of rural landscapes comes as no surprise (Woods, 2012; Frank & Hibbard, 2016). This simple understanding of 'rural' belies the diversity within and across rural landscapes and generalizes "geographic differences in natural landscapes and resources, economies, population and development patterns, ethnic and cultural legacies, immigration, and regional context" (Frank & Reiss, 2014, p. 390). Furthermore, rural planning has typically been conducted by actors operating at larger scales with narrow interests whereby certain sectors or populations have dominated local decision-making (Frank & Reiss, 2014).

Rural planning, therefore, should be understood, as Caldwell et al. (2015) provides, as "the process of planning for rural areas, with a focus on rural issues and from a rural perspective" (p.12). Resultantly, rural processes must be situated to holistically understand rural values and empower local residents (Frank & Reiss, 2014). Across this literature review, a consensus emerges that *rural* is to be understood both in a materialist and idealist sense (Frank & Hibbard, 2016; Scott et al., 2019; Woods, 2009). From a materialist perspective, *rural* is delineated by low population density, certain predominant forms of economic activity/land use, and proximity to nature – 'the rural everyone knows as rural' (Frank & Reiss, 2014; Frank & Hibbard, 2016; Scott et al., 2019). In the idealist sense, *rural* is a set of associations embedded by a connection to place, customs, and way of life (Scott et al., 2019; Frank & Reiss, 2014; Frank & Hibbard, 2016).

In recent decades, rural policies and practices have moved away from viewing *rural* as isolated sites of agricultural and natural resource production (Scott et al., 2019; Frank & Reiss, 2014; Dandekar, 2001; Woods, 2012; Hibbard et al., 2015). Rural planning has begun to reflect a "matrix of place-making strategies, spatial coordination and mediation, land use regulation and development control, landscape management and design, protecting, reporting, and enhancing ecosystem services and natural capital, and community action" (Scott et al., 2019, p.5).

Additionally, the planning practice must contend with a set of new rural social geographies pertaining to processes of rural in-migration such as counter urbanisation, rural gentrification, and amenity migration (Scott et al., 2019; Woods, 2012; Dandekar et al., 2020). The literature review highlights the importance of increasing the capacity of community problem solving such as participatory processes, local stewardship, social equity, entrepreneurship, community control and recognition of the subsidiarity principle (Frank & Reiss, 2014; Dandekar et al., 2020; Hibbard et al., 2015; Morrison et al., 2014). This transition to a holistic process of rural planning encourages planning "that maintain[s] and transform[s] rural settings rather than statically trying to protect or achieve the desired landscape or cultural characteristics in isolation" (Frank & Reiss, 2014, p.391).

In Ontario, the extent to which an area is rural varies significantly across the province (Caldwell, 2018). For example, northern Ontario reflects the Canadian Shield with scattered settlements whereas southwestern Ontario is primarily composed of an agricultural base (Caldwell, 2018). There are also rural landscapes located near urban centres as well as rural areas composed of cottages and seasonal residents (Caldwell et al., 2015). The Ontario Professional Planners Institute provides strategic direction for planning in rural areas, identifying the following themes: land use planning & community design; active transportation/active communities; local food initiatives; aging communities; community engagement and volunteerism; tourism; water quality; value-added agriculture practices; natural and clean air; cultural strategies (Caldwell et al., 2015).

Figure 44. Fruition Berry Farm, South Frontenac (Major, n.d.).

*Applicability to the Project*

Frontenac County's *Strategic Plan 2019-2022* emphasis a vision of sustaining "diverse, strong, and resilient rural communities known for their unique natural environment and lifestyle choices" (County of Frontenac, 2010). Given that the region's rural identity is rooted in their natural environment, it is imperative that the protection of its NHS is a priority. Furthermore, a new NHS is crucial to maintain and transform the region's rural landscape in a way which is reflective of the County's people, perspectives, and values. In the creation of a NHS, planners should include increased opportunities for rural community capacity building through tools such as local stewardship, entrepreneurship, and participatory processes.

Figure 45. Algonquin Park in the fall (Explore Magazine, 2015).

## 4.5 Indigenous Planning

### 4.5.1 Reconciliation

A national discussion concerning historical and contemporary settler-Indigenous relations is taking shape in academic and public discourse (CIP, 2019). Canada's Truth and Reconciliation Commission (TRC) uses the term reconciliation to refer to the commitment to establish and maintain a mutually respectful relationship between Indigenous and non-Indigenous Peoples (TRC, 2015). While Canada's relationship with Indigenous Peoples has been developed by its colonial praxis, the process of reconciliation calls upon all settler Canadians to recognize this legacy and collaborate to end the deeply rooted, outdated, oppressive, settler-colonial ways of thinking (TRC, 2015). Changing the status quo requires giving up old belief systems, learning new ways of looking at the world, and ultimately replacing control with collaboration (CIP, 2019).

In 2019, the Canadian Institute of Planners (CIP) adopted its current Policy on Planning Practice and Reconciliation. The policy presents a vision for the future of Canadian planning by harmonizing key action areas from the TRC's Calls to Action, the 10 Principles of Reconciliation, and *the United Nations Declaration on the Rights of Indigenous Peoples* (*UNDRIP*) (CIP, 2019). Planners have the historical responsibility and privilege to help realize truth-telling and reconciliation throughout Canada. This process must focus on long-term relationship-building and learning as opposed to achieving a specific outcome (Swiftwolfe & Shaw, 2019). Reconciliation in planning will look different in every community, plan, and/or policy, as it is shaped by the unique needs, experiences, and priorities of the Indigenous partners involved (Ugarte, 2014). However, the challenge remains in articulating what reconciliation will

look like for on-the-ground practitioners on a daily basis. Contemporary Indigenous rights discourses present questions of self-determination, reconciliation-informed planning framework, sovereignty, and the recognition of land rights and title (Swiftwolfe & Shaw, 2019; Whyte, 2017; Whyte, 2013; TRC, 2015; & CIP, 2019).

*Applicability to the Project*

The County of Frontenac is well-positioned to advance reconciliation with Indigenous Peoples. This can be done through partnering with Indigenous rightsholders to build meaningful and reciprocal relationships, as well as encouraging the genuine participation of Indigenous Peoples in decision-making processes. Planning with Indigenous Peoples with respect to NHS planning illustrates an opportunity to learn and strengthen our connection to the land, enabling the better protection and preservation of the natural environment. Planning with Indigenous Peoples must be oriented towards Free, Prior, and Informed Consent (FPIC) beyond the Duty to Consult, as well as upholding *UNDRIP* and the recent Federal *UNDRIP Act.*

### 4.5.2 Traditional Ecological Knowledge

Traditional Ecological Knowledge (TEK), also referred to as Indigenous Knowledge (IK), may be "characterized as a source for rethinking human relationships with their environments" (Ludwig & Macnaghten, 2020, p.26). TEK refers to "systems of monitoring, recording, communicating, and learning about the relationships among humans, nonhuman plants and animals, and ecosystems that are required for any society to survive and flourish in particular ecosystems which are subject to perturbations of various kinds" (Whyte, 2017, p.157). It is a detailed, cumulative, and often dynamic knowledge of both past and present ecological systems; however, TEK is also interconnected with other aspects of Indigenous ways of being (Marin et al., 2017).

The literature review demonstrates the value of TEK and calls for its further incorporation into environmental governance. It is argued that diverse knowledge types better facilitate the management of uncertainty and promotes a framework of resilience within socio-ecological systems (Shawoo & Thorton, 2019). Furthermore, Robinson et al. (2021) assert that there is potential for ecological restoration to be a driver of self-determination while "helping to conserve cultural practices and protect the rights of Indigenous Peoples" (p.2).

The concept of TEK must be understood as a collaborative process whereby work is undertaken with Indigenous collaborators mutually, not exploitatively (Whyte, 2017). This creates a process that encourages communities to continually learn from one another by challenging the very question of 'knowledge'. This can create mutual capacity-building of different approaches to knowledge that can lead to better stewardship of the environment and natural resources (Whyte, 2013; Whyte, 2017). However, in working with multiple knowledge systems there must be critical attention to how knowledge is treated to ensure that knowledge systems are treated respectfully and equitably (Shawoo & Thorton, 2019; Robinson et al., 2021).

In Canada, research studies noted that TEK successfully supported Western scientific models towards a more effective and holistic model of conservation planning at finer geographic scales, specifically in northern and remote regions (Marin et al., 2017; Whyte, 2017; Makenzie et al., 2017). The findings of these studies showed that the incorporation of TEK provided a nuanced understanding of sub-regional and interconnected patterns and systems over

large temporal and spatial scales (Shawoo & Thorton, 2019; Makenzie et al., 2017).

The integrity of TEK is continually under threat from changes in educational practices and traditional livelihoods and the loss of rights – all directly resulting from colonial practices and subsequent loss of land tenure (Tang & Gavin, 2016; Whyte, 2013; Whyte, 2017). Indigenous Peoples' "freedom to access and protect their own traditional lands jeopardizes the persistence of TEK as cultures erode without the landscapes to support them" (Robinson et al., 2021, p.2). Moreover, with the increased recommendation of TEK as an integral part of large global restoration goals, the concern of continued discrimination and inequities of Indigenous Peoples is pressing (Robinson et al., 2021). If ecological management, rooted in Western science, aims to partner with Indigenous communities to lead TEK projects, "inter-national agreements and proactively protecting intellectual property and data sovereignty rights" must be integral to any project or policy (Robinson et al,. 2021, p.1). To this effect, the recognition and respect of Indigenous communities within restorative ecological movements must go beyond mere inclusion. As Quayle and Sonn (2019) assert, a paradigm shift must occur toward building literacy rooted in collaboration, challenging the dogmatic scientific voices within governments and institutions, and incorporating decolonizing approaches that prioritize spaces for TEK.

### *Applicability to the Project*

The incorporation of TEK into a new NHS represents an opportunity to expand the mapping and databases, strengthen decision making and ensure that Indigenous rightsholder's values and traditions are prioritized. In addition, the depth, breadth, and length of documented TEK offers a holistic approach to climate change and NHS protection that western science approaches cannot reach singularly.

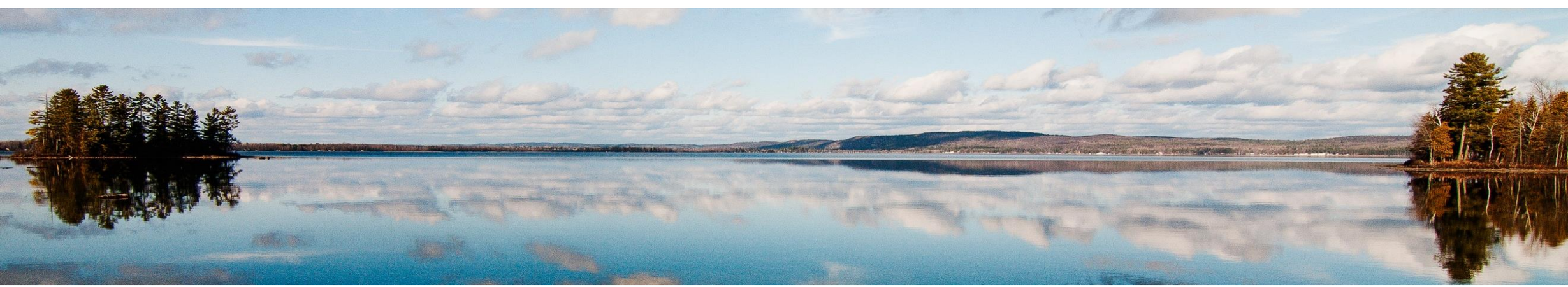


Figure 46. Elevation of Golden Lake in Madawaska Valley (Worldwide Elevation Map Finder, n.d.).

## 4.6 Natural Heritage Planning

Ontario uses Natural Heritage System (NHS) planning to protect ecological and wildlife corridors (Ontario Nature, 2014). NHS planning is a long-term, systems-approach to promoting, supporting, and enhancing ecological connectivity, ecosystem function, ecosystem integrity, genetic diversity, and energetic pathway flow (Watts et al., 2009; Ontario Nature, 2014; Credit Valley Conservation, 2015; Puric-Mladenovic & Strobl, 2021). NHS features provide services that help address issues related to land use change, flood control, water purification, climate change, and biodiversity loss, and they contribute to the overall health and safety of valuable resources (Ontario Nature, 2014).

An NHS can include valleylands, wetlands, woodlands, aquatic habitats, shoreline habitats, significant wildlife habitats, habitats of endangered and threatened species, and the buffers that these areas require to function (TRCA & Credit Valley Conservation, 2014). These features are classified into the following three categories: high functioning, supporting, and contributing (TRCA & Credit Valley Conservation, 2014). High functioning features maintain ecological function; supporting features enhance the quality and function of the high function areas; and contributing features, which are small and isolated, provide connectivity throughout the landscape. Other features in an NHS include buffer areas that mitigate impacts on an NHS's function and key areas of biodiversity, which tend to have a high concentration of natural heritage features.

Natural heritage features can be managed using a landscape ecology approach and the patch-corridor-matrix model, which attempts to model the spatial connection of patches, corridors, and core areas that make up a landscape (Haber, 1990; Opdam et al., 2002; Golley & Bellot, 1991; Grober-Dunsmore et al., 2009; Turrini & Knop, 2015). Patches vary in function. They provide habitat to species, and they contribute to water and air quality. Studies have shown that larger individual patches are, more successful because they provide larger interior habitat areas, which certain species require (Grober-Dunsmore et al., 2009; Turrini & Knop, 2015).

Corridors connect habitat patches (Grober-Dunsmore et al., 2009; Turrini & Knop, 2015). Corridors are particularly useful in fragmented landscapes were

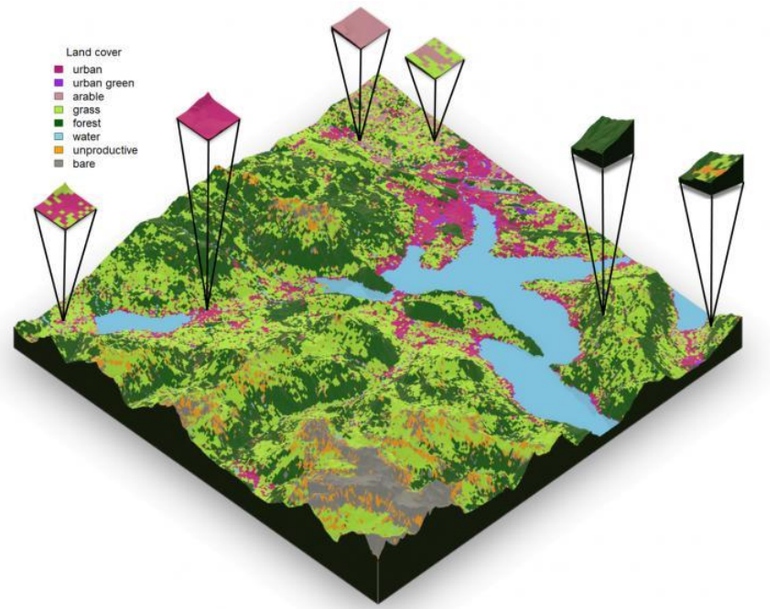



Figure 47. Landscape ecology matrix, illustrating that a healthy and complex ecosystem is made up of various patches (University of Zurich, n.d.).

species have limited mobility because corridors facilitate movement and survival; they can also provide temporary habitats (Grober-Dunsmore et al., 2009; Turrini & Knop, 2015).

The landscape matrix is a combination of patches and corridors that create a connected ecosystem. In areas with high connectivity, species are more likely to successfully navigate the landscape to undergo biological processes such as spawning and migration.

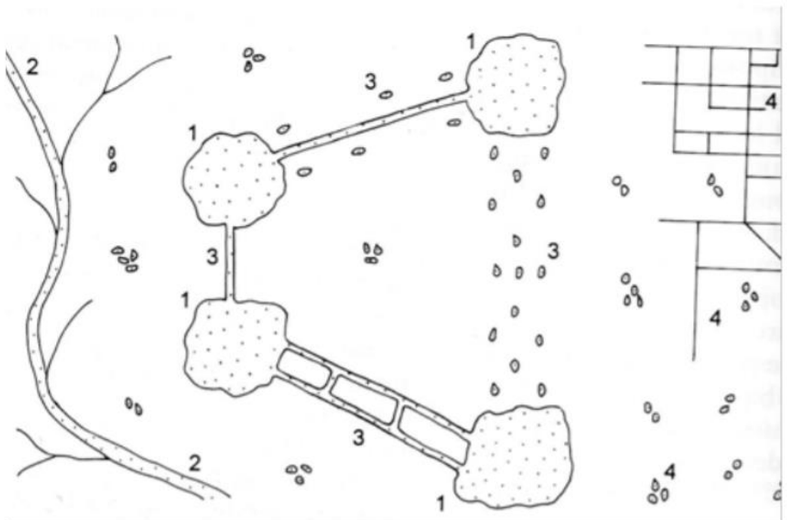



Figure 48. Landscape ecology matrix, illustration from the Parkland County Master Environmental Plan (02 + Design Inc., 2014).

*Applicability to the Project*

NHS planning is a tool used in Ontario to protect and regulate natural features. Frontenac County has significant ecosystems such as valleylands, wetlands, and woodlands that require protection.

Landscape ecology principles create and protect the diverse species that live in dynamic ecosystems. Frontenac County can apply these principles to establish a healthy matrix of patches, including different habitat types and ages. The Count can incorporate these features into an NHS model.

### 4.6.1 The Marxan Model

The Marxan model is a computer program used to create an NHS by planning and spatially prioritizing the ecological landscape (Watts et al., 2009; Daigle et al., 2020; Spang et al., 2021). Notably, the Marxan model was used in the creation of the Oak Ridges Moraine and the Greenbelt; however, many governments and organizations use it in their planning processes (Puric-Mladenovic & Strobl, 2021).

The Marxan model aims to identify a network of biological pathways and connected corridors that require prioritization and can be protected with minimal disturbance to development and human activity (Watts et al., 2009; Daigle et al., 2020; Puric-Mladenovic & Strobl, 2021; Spang et al., 2021). The algorithm considers stakeholder feedback, trade-offs, and other social and economic data that are integral in the decision-making process. The Marxan model is designed to meet targets set by the user, at the minimum cost, which can be defined in terms of land, economics, resources, culture, or cumulative impacts (Watts et al., 2009). This method is primarily used in highly urbanized and developed areas which require a firm strategy to ensure that the natural

heritage resources and elements are not further fragmented and degraded (Watts et al., 2009; Ontario Nature, 2014).

Figure 49. Habitat corridor in West German's Greenbelt (Leidorf, n.d.).

*Applicability to the Project*

The Marxan model informed the design of Frontenac County's 2012 Natural Heritage Study, which focused on creating efficient linkages throughout the landscape. Although it is used across Canada and in other regional NHS plans, it is not appropriate for the rural, contiguous landscape of Frontenac County. The County has a vast landscape that has not become fragmented; therefore, Frontenac does not have the typical challenges that the Marxan model aims to address.

## 4.7 Watershed Planning

In Ontario, watershed planning uses the watershed, subwatershed, and tributaries as the planning unit. Using the integrated watershed management (IWM) model, watershed planning targets key variables and relationships that are amendable to change and have the greatest impacts. However, the responsibility for implementing IWM is fragmented between provincial agencies. Overcoming this requires water management agencies to develop partnerships, coordinate planning and management activities, engage stakeholders, secure funding, and monitor and report progress (Worte, 2017).

Recently in Ontario, there has been a shift toward protecting headwaters due to their importance to a watershed's health and to the numerous ecological functions they support such as groundwater recharge, riparian habitats, and flood control (Ontario Headwaters Institute, 2016). Examples of headwater planning include the *Oak Ridges Moraine Conservation Plan*, *Protecting Ontario's Headwaters* and the *Evaluation, Classification and Management of Headwater Drainage Features Guidelines* (Ministry of Municipal Affairs, 2017; Ontario Headwaters Institute, 2016; TRCA & Credit Valley Conservation,

2014). The provincial *Oak Ridge Moraine Conservation Plan* orients the Oak Ridges Moraine (ORM) boundaries around the headwater areas (Ministry of Municipal Affairs, 2017). This plan uses a coalition of nine CAs to organize watershed planning and management. The aim of the plan is to protect the headwater areas that feed more than 60 watersheds surrounding the ORM from degradation and development. The plan itself designates the following four land-use types: settlement areas, countryside areas, natural linkage areas, and natural core areas. *Protecting Ontario's Headwaters* (2016) was produced by The Ontario Headwaters Institute (OHI); it recommends that headwater protection should focus on Contiguous Upland Headwater Catchments (Ontario Headwaters Institute, 2016). This OHI construct focuses on protecting first- and second-order streams that touch each other in the upstream areas of any watershed. Finally, the *Evaluation, Classification and Management of Headwater Drainage Features Guidelines* (2014) was produced by the Toronto and Region Conservation Authority to provide direction for protecting headwater drainage features that are not well-covered by existing policy and legislation (TRCA & Credit Valley Conservation, 2014).

### *Applicability to the Project*

Headwaters are crucial to the health of a watershed, and Frontenac County has vast headwater lakes that should be prioritized for protection. In Ontario, CAs have an institutional history of protecting headwaters; the CAs capacity and expertise in headwater protection is something the County can use to create a foundation for long-term NHS planning. Frontenac should partner with these institutions to gain access to the CAs' valuable knowledge in headwater protection. Additionally, Frontenac should use *Protecting Ontario's Headwaters* (2016) by the Ontario Headwaters Institute to identify priority headwater areas.

Figure 50. Landon Bay Centre (Frontenac Arch Biosphere, 2021).

# 5.0 Policy Analysis

The table below shows the federal, provincial, regional, and municipal policies that were examined as part of this project. The scope of policies covered is not exhaustive. The policies analyzed in this section were selected because they directly relate to natural heritage system (NHS) planning in Frontenac County. For each legislation, a brief summary highlights the policy's purpose and its applicability to natural heritage planning in the County.

| Jurisdiction | Policy |
|---|---|
| Federal | • *Fisheries Act* (1985)<br>• *Migratory Birds Convention Act* (1994)<br>• *Species at Risk Act* (2002) |
| Provincial | • *Planning Act* (1990)<br>• *Municipal Act* (2001)<br>• *Public Land Act* (1990)<br>• *Provincial Parks and Conservation Reserves Act* (2006)<br>• *Endangered Species Act* (2007)<br>• Provincial Policy Statement (2020)<br>• *Clean Water Act* (2006)<br>• *Conservation Authorities Act* (1946) |
| Regional | • County of Frontenac Official Plan (2016) |
| Municipal | • Township Official Plans |

## 5.1 Federal Legislation

### 5.1.1 *Fisheries Act* (1985)

The *Fisheries Act* was enacted in 1985 and amended in August 2019. The *Act* provides a regulatory framework to manage fisheries and to protect fish and their habitats, including preventing pollution. The *Fisheries Act* prohibits any work, undertaking, or activity, other than fishing, that results in the death of fish. The *Act* prohibits harmful alteration, disruption, or destruction of fish

Figure 51. Barn Swallow, an endangered songbird found in Ontario (Nightingale, 2020).

habitat. Furthermore, the Act prohibits directly and indirectly depositing deleterious substances in water frequented by fish. If any area is considered ecologically significant under the *Act*, no work, undertaking, or activity is permitted without authorization from Fisheries and Oceans Canada. These prohibitions apply to all waters in Canada that support the existence of fish, shellfish, crustaceans, or marine animals.

*Applicability to the Project*

Frontenac County's lakes and rivers provide an extensive amount of fish habitat. Under the *Fisheries Act*, no developments, site alterations, or activities in Frontenac County can harm fish or their habitat. Land uses near water must be limited to activities that will not harm fish or their habitat. To prevent deleterious substances from entering fish habitat, buildings and structures must be appropriately set back from water. Shorelines must not be altered in a manner that would harm fish or their habitat. Despite these protections, growing development pressures along shorelines significantly threaten fish and their habitat in Frontenac County.

### 5.1.2 *Migratory Birds Conservation Act* (1994)

The *Migratory Birds Convention Act* became law in 1994 with its most recent amendment in December 2017. The *Act* protects and conserves migratory birds and their nests through the *Migratory Bird Regulations*, which prohibit the disturbance or destruction of a nest, egg, or nest shelter of a migratory bird. This prohibition applies to all lands in Canada.

Figure 52. Northern Flicker, one of the many migratory birds found in Ontario (Bird Photography, n.d.).

*Applicability to the Project*

Many areas in Frontenac County, including the Frontenac Arch, are home to migrating birds. Under the *Migratory Birds Convention Act,* no developments, site alterations, or activities in Frontenac County can harm migratory birds or disturb their nests. If an active nest is present on a site, any tree or vegetation removal must occur outside the timing of bird species' breeding window. To comply with these policies, it is critical that trees are properly inspected prior to undertaking any development, site alteration, or activity to assess whether any migratory bird nests are present.

### 5.1.3 *Species at Risk* (2002)

The *Species at Risk Act* became law in 2002 and was last amended in August 2021. The *Act* prevents wildlife species in Canada from disappearing; provides for the recovery of wildlife species that are extirpated (no longer existing in the wild in Canada), endangered, or threatened as a result of human activity; and manages species of special concern to prevent them from becoming endangered or threatened. Wildlife species at risk are listed in Schedule 1 of the *Act*. The *Species at Risk Act* prohibits harming individuals of wildlife species at risk. The *Act* also prohibits the damage or destruction of their residences, such as nests or dens. These prohibitions apply to all lands (private, municipal, provincial, etc.) for aquatic species at risk and species of migratory birds at risk that are protected by the *Migratory Birds Convention Act.* For all other species at risk, these prohibitions are generally limited to federal lands.

#### *Applicability to the Project*

There are many wildlife species at risk in Frontenac County, including the Gray Ratsnake and Peregrine Falcon. Under the *Species at Risk Act*, no developments, site alterations, or activities in Frontenac County can harm aquatic species at risk or migratory birds at risk. The residences of these species are also prohibited from being damaged or destroyed on all land within Frontenac County. Since there are no federal lands in Frontenac County, wildlife species at risk other than aquatic species or migratory bird species are not protected by the *Species at Risk Act*. However, these species may be protected by other legislation, including the Province of Ontario's *Endangered Species Act.*

Figure 53. Bull Moose (Cole, 2018).

## 5.2 Provincial Legislation

### 5.2.1 *The Planning Act* (1990)

The *Planning Act* (1990) lays the foundation for land use planning in Ontario. The *Planning Act* aims to promote sustainable economic development and to provide a comprehensive policy approach to land-use planning, known today as the Provincial Policy Statement (PPS). Additionally, the *Planning Act* requires that all provincial and municipal planning decisions have regard for matters of provincial interest which are further translated into guiding policies within the

PPS. The *Planning Act* gives legal status to Official Plans (OP) (Section 16) - a municipal planning doctrine that informs land use planning through localized policies, goals and objectives. The OP does not, however, prescribe a trajectory for how far ahead such policies, goals, and objectives should plan. Thus, many OPs across Ontario, including that of Frontenac County, have assumed planning horizons that do not extend beyond 20 to 25 years. Finally, the *Planning Act* provides fair planning processes and holds municipal councils accountable for decision-making within their municipalities. The *Planning Act* applies to all municipalities in Ontario.

*Applicability to the Project*

Frontenac County must conform to the *Planning Act*. While regarding provincial interests, the County can implement strong measures to protect and conserve its NHS in a long-term planning framework using tools in the Official Plan and guidelines in the PPS.

### 5.2.2 *The Municipal Act* (2001)

The *Municipal Act*, enacted in 2001, was most recently amended in September 2021. The *Municipal Act* gives municipalities the status of a corporate entity with rights and duties. The *Act* describes the general (Part 2) and specific (Part 3) powers provided to the municipality by the Province of Ontario. General municipal powers include its authority to pass by-laws regarding municipal matters and, in two-tiered scenarios, matters following spheres of jurisdiction. Other general powers include a municipality's right to establish joint undertakings and enter into agreements with local bodies, First Nations, and the Province. Specific powers delegated to municipalities regard highways, transportation, waste management, public utilities, culture, parks, recreation and heritage, drainage and flood control, structures, parking (except on highways), animals, economic development services, health, safety and nuisance, and the natural environment. The *Municipal Act* applies to all municipalities in Ontario except for the City of Toronto.

*Applicability to the Project*

The *Municipal Act* is relevant in Frontenac County as it frames the governance structure for a two-tiered system. Frontenac County is the upper-tier municipality, whereas the Townships of South Frontenac, Central Frontenac, North Frontenac, and Frontenac Islands are lower-tier municipalities. As the upper-tier government, Frontenac County is responsible for processing amendments and approving all lower-tier OPs and applications for subdivision. Similarly, all lower-tier OPs must conform to the upper-tier Official Plan, among other regional and provincial legislative prescriptions.

### 5.2.3 *The Public Lands Act* (1990)

The *Public Lands Act* (1990) was recently amended in December 2020. The *Public Lands Act* gives the Minister of Natural Resources and Forestry authority to manage, sell, or transfer Crown land. *The Public Lands Act* covers forests, shorelands, and beds of most lakes and rivers but does not include Provincial Parks and Conservation Reserves. The latter two are governed by the *Provincial Parks and Conservation Reserves Act. The Crown Land Management Policies* came from the *Public Lands Act* to direct day-to-day and long-term management of Crown Lands by the Ministry. These policies guide administration, stewardship, land management, energy, rent fees, and Crown Land compliance. Similarly, Crown land planning describes planning processes and determines how Crown land is used through land-use specific policies and primary land use designation.

### *Applicability to the Project*

The *Public Lands Act* applies to all Crown Land, except for Provincial Parks and Conservation Reserves. Crown lands exist in three of the four townships in Frontenac County. Respectively, North Frontenac, Central Frontenac and South Frontenac have 64, 17, and one percent provincially owned land. There is no Crown land on the Frontenac Islands. County policies and township planning policies do not apply to Crown lands unless such land becomes provincially owned, in which case local planning policies would come into effect. Despite not having jurisdiction over the planning of Crown lands, the County and lower-tier municipalities are obligated to identify Crown land as a land-use designation in their OPs, which recognizes Crown lands' significance as a resource.

### 5.2.4 *Provincial Parks and Conservation Reserves Act* (2006)

The *Provincial Parks and Conservation Reserves Act* (PPCRA) (2006) was last amended in July 2021. The PPCRA gives the Minister of the Environment, Conservation, and Parks authority to administer the *Act*. The PPCRA takes a systems approach to provide permanent protection for provincial parks and conservation reserves. Under the *Act*, a designated provincial park and conservation reserve protects ecosystems representing Ontario's natural landscape and provincially significant natural and cultural heritage elements. Similarly, the PPCRA works to maintain biodiversity within designated provincial parks and conservation reserves, providing land uses for recreational opportunities and economic benefits that are compatible and sustainable. Designation of these areas also provides for scientific research and environmental monitoring. The PPCRA applies to all provincial parks and conservation reserves.

Figure 54. Blanding's Turtle, Species at Risk (Crowley, n.d.).

### *Applicability to the Project*

There are three provincial parks and two conservation reserves in Frontenac County. The provincial parks include Bon Echo Provincial Park (North Frontenac), Sharbot Lake Provincial Park (Central Frontenac), and Frontenac Provincial Park (South Frontenac). The conservation reserves in Frontenac Country are Crotch Lake and Hungry Lake, located in North Frontenac. Both conservation reserves are situated on the Algonquin Land Claim currently being negotiated by the Algonquins of Ontario, Province of Ontario, and Government of Canada. A recommendation of the Land Claim is a new provincial park named Whiteduck, which would be established using an area of Crotch Lake conservation reserve.

### 5.2.5 *Endangered Species Act* (2007)

The Province of Ontario's *Endangered Species Act* (2007) protects over 200 plant and animal species by granting automatic legal protection for the species and their habitats based on both scientific evidence and Aboriginal Traditional Knowledge (which includes but is not limited to Traditional Ecological Knowledge). The *Act* applies to species that scientific evidence and Aboriginal Traditional Knowledge indicate should be classified as "protected species" who are threatened, endangered, or extirpated (native to Ontario, no longer found living in the wild, but living elsewhere on earth). Species of special concern are protected by the federal *Species at Risk Act* rather than the *Endangered Species Act*. Importantly, S.9(1)(a) of the *Act* states that "No person shall kill, harm, harass, capture or take a living member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species." This includes killing, harming, or harassing a protected species by affecting its habitat.

#### *Applicability to the Project*

Frontenac County's Natural Heritage Study (2012) identified a significant knowledge gap regarding endangered species and their habitats. Frontenac's Study reported that the habitats for endangered species should be considered natural heritage features but that the quantity, quality, and location of these habitats in the County are unknown. In line with the *Endangered Species Act,* Frontenac County must address its knowledge gap by acquiring the necessary species and habitat data to inform its natural heritage mapping model, which in turn can support better evidence-based decisions regarding natural heritage features protection, monitoring, and use. The County should note that the *Endangered Species Act* automatically protects the habitat of protected species when development projects appear to kill, harm, or harass those species; lack of endangered species and habitats knowledge increases the risk of interruption for projects in the County. The *Act* stipulates that provincial-level plans must be created to restore and regulate the protected species and their habitats; in order to minimize this type of provincial planning intervention, the County can include protected species and the location of their habitats in the next iteration of its natural heritage study.

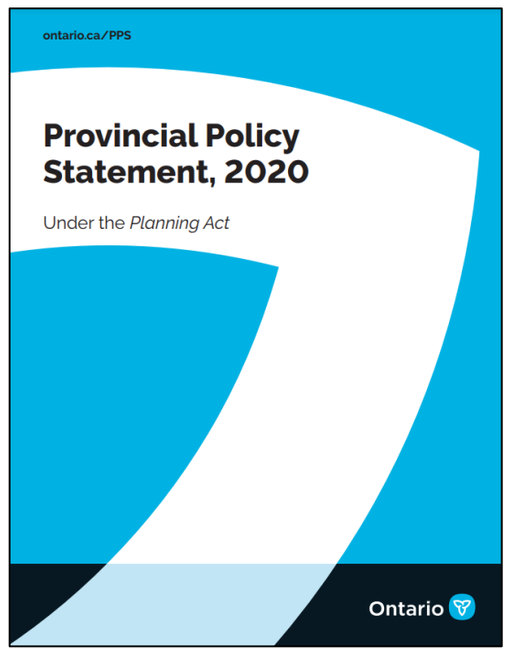


Figure 55. Provincial Policy Statement, 2020.

### 5.2.6 Provincial Policy Statement (2020)

The PPS provides an interpretive lens through which the *Planning Act* should be implemented. The purpose of the PPS is to illuminate the direction that planning in Ontario should go according to the *Planning Act*. Furthermore, the PSS outlines the Province's land use interests that upper-, lower-, and single-tier plans must protect. Frontenac's 2012 Natural Heritage Study was primarily based on the 2005 PPS with minor input from a 2012 draft version of what later became the 2014 PPS. The 2005 PPS was the foundation for the Ministry of Natural Resources' 2010 *Natural Heritage Reference Manual*, which was a key source of natural heritage planning guidance for Frontenac's 2012 Study. However, the 2020 PPS has evolved significantly since 2005; therefore, the County's approach to natural heritage planning must evolve too. The PPS

speaks to the definition of natural heritage features, areas, and systems; to protecting water quality and quantity; to ecological planning at the watershed scale and minimizing negative cross-jurisdictional cross-watershed impacts; and to land use planning regarding aggregate minerals and agricultural lands.

*Applicability to the Project*

A new natural heritage study for Frontenac County would be based on current assumptions and mandates outlined by the PPS 2020, such as assumptions about the climate crisis's role in natural heritage planning and the mandates to plan for Healthy Communities and to engage in meaningful consultation with Indigenous rightsholders. As the escalating climate crisis and development pressures exacerbate habitat and biodiversity loss, reconceiving Frontenac's natural heritage planning framework would align with the PPS 2020:

***2.0*** *Ontario's long-term prosperity, environmental health, and social well-being depend on conserving biodiversity, protecting the health of the Great Lakes, and protecting natural heritage, water, agricultural, mineral and cultural heritage and archaeological resources for their economic, environmental and social benefits.*

***2.1.1*** *Natural features and areas shall be protected for the long-term.*

***2.1.2*** *The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.*

Figure 56. Mississippi Valley Conservation Authority (LinkedIn, n.d.).

### 5.2.7 *Clean Water Act* (2006)

The *Clean Water Act* (2006) aims to protect municipal drinking water sources from pollution by creating 19 source protection regions in Ontario. The *Act* calls on municipalities and conservation authorities to collaborate on drinking water source protection at the watershed scale. This work is called source protection planning. Source protection planning includes addressing hazards to drinking water sources, preventing contamination, monitoring the drinking water system, and raising public awareness of drinking water issues. Note that the *Clean Water Act* protects specifically sources of municipal residential drinking water; this may not include non-municipal headwaters, lakes, streams, or groundwaters. The *Act* differentiates between drinking water and non-municipal waters. Note that the *Clean Water Act* is not the *Safe Drinking Water Act* (2002), which aims to regulate and protect municipal drinking water systems, treatment facilities, and infrastructures from contamination.

#### *Applicability to the Project*

Frontenac County has embarked on a new municipal communal services strategy for safe, affordable, and ecologically sustainable drinking water. The *Clean Water Act* may affect how communal services infrastructure should be implemented due to the increased responsibility for drinking water protection that municipalities may have. Municipalities will shoulder responsibilities under the *Act* while communal services infrastructure attracts development and supports greater densities. The location of future communal services will have an immense impact on where growth concentrates in Frontenac County—the development of which will impact the County's natural heritage features including drinking water quantities and quality. A natural heritage study that accounts for the impacts of communal services at the watershed scale would enable the County to collaborate with the conservations authorities to create

Figure 57. Little Cataraqui Creek Conservation Area (Visit Kingston, n.d.).

source water protection plans based on local context and scientific knowledge. A regional-level plan to protect drinking water sources in Frontenac has the potential to involve protecting natural heritage features such as headwaters (e.g., the Kennebec complex). Currently, Frontenac County's residential drinking water is protected by the following three source water protection plans administered by the following conservation authorities:

- Cataraqui Source Protection Plan (Cataraqui Region Conservation Authority)
- Mississippi-Rideau Source Protection Plan (Combined plan by the Mississippi Valley Conservation Authority and the Rideau Valley Conservation Authority)
- Quinte Source Water Protection Area (Quinte Conservation Authority)

### 5.2.8 *Conservation Authorities Act* (1946)

The *Conservation Authorities Act* (1946) creates 36 non-profit agencies in Ontario that are responsible for stewarding watersheds and protecting communities from flooding, erosion, and drought. Crucially, conservation authorities (CAs) are responsible for watershed-based drinking water source protection planning, as noted in Section 5.2.7. Since 2006, the *Act's* Development, Interference, and Alternation Regulations has empowered CAs to weigh in on development activity in or near watercourses (rivers, stream valleys, shorelines, hazardous lands, and wetlands). To achieve sustainable watershed management, development projects near natural heritage features in the watershed currently require permits and approval through the local CA (e.g., for docks, boat ramps, pools, municipal drains, bridges, and more).

*Applicability to the Project*

Through the *Conservation Authorities Act,* CAs regulate activities that impact watercourses. Collaboration with CAs as key stakeholders may be crucial for the successful re-framing and implementation of an updated long-term natural heritage plan for Frontenac County. Moreover, CAs are bound by watershed (not political) boundaries, therefore meaningful cross-jurisdictional natural heritage planning collaboration with adjacent counties may be facilitated through the CAs.

## 5.3 Regional Legislation

### 5.3.1 County of Frontenac County Official Plan (2016)

The County of Frontenac Official Plan (OP) was adopted in October 2014 to guide land use planning in the County. The OP uses a watershed perspective to protect the natural environment and manage growth in the County. This is done by mapping the County's watersheds rather than land use designations in the OP's Land Use Schedule. Communication between Townships within a watershed is encouraged when a new development proposal may impact the quality and function of the watershed.

The OP includes policies that support the protection of the County's NHS and its features, including significant wetlands, significant coastal wetlands, significant ANSIs, significant wildlife habitat, fish habitat, habitat of endangered or threatened species, significant woodlands, significant valleylands, linkages, and biodiversity areas. The locations of these natural heritage features are illustrated on maps. OP policies detail where development or site alteration is prohibited in relation to natural heritage features and when development or site alteration requires an assessment such as an Environmental Impact Study.

The County's OP also has policies that require the Townships to identify and protect natural heritage features in their lower-tier OPs.

Several key policies help mitigate potential negative impacts of new development on the County's NHS. For example, new developments are required to do a site assessment to identify the presence or absence of endangered or threatened species and their habitats. Additionally, new developments along waterbodies require a minimum setback of 30 metres from the ordinary high-water mark. This setback must remain undisturbed and naturally vegetated when possible. The removal of vegetation is required to be minimized in significant wildlife habitat. Furthermore, new lot creation is prohibited within 300 metres of lake trout lakes that are deemed to be at-capacity in terms of development.

The County's OP protects natural areas through its policies for growth management. To minimize the consumption of land and resources, the OP encourages efficient development patterns and road connections in settlement areas. For residential development in rural areas, the OP states that structures should be unobtrusive and blend in with the rural landscape. Residential plans of subdivision in rural areas are subject to additional criteria, including the presence of mature tree cover. In waterfront areas, tree cover and vegetation are encouraged to be retained along the shoreline to maintain its environmental integrity. Collectively, the policies within the OP provide a framework for the County and Townships to make land use planning decisions that support the NHS.

*Applicability to the Project*

Any development or site alteration within the region is subject to Frontenac County's OP policies. When conducting long-term planning or development review, the actions of the County and the four Townships must conform to the policies in Frontenac County's OP. It is the primary tool that Frontenac County can use to mitigate the impact of new development on natural heritage features and protect the region's NHS. A new natural heritage study can improve the identification of natural heritage features within the County's OP and inform policies to enable growth in a sustainable manner that respects and protects the NHS.

## 5.4 Municipal Legislation

### 5.4.1 Township Official Plans

The OPs for the Townships of South Frontenac, Central Frontenac, North Frontenac, and Frontenac Islands regulate municipal land use and development in each Township and further implement policies found in the County's Official Plan. All the municipal OPs recognize the importance of protecting the region's NHS. Compared to the County's OP, the Townships' OPs include more specific polices related to natural heritage features, including permitted and prohibited uses in or near natural heritage features and the widths of lands adjacent to these features (i.e. buffers) that are protected from the negative impacts of development. The locations of the natural heritage features in each Township are mapped in their respective Land Use Schedules. Furthermore, the Ops include detailed criteria for Environmental Impact Assessments that must be met for development or site alteration to be permitted in or near natural heritage features. Natural heritage policies required by the PPS and the County's OP are also included in the Townships' OPs.

The Townships implement their OP policies using their Zoning By-laws, which control the use of land through more specific, legally-enforceable

requirements. The Zoning By-laws regulate land uses, building and other structure locations, permitted building types and uses, permitted building and lot dimensions, and required building setbacks. These regulations play a key role in mitigating the negative impacts that development may have on natural heritage features. Any construction or new development that does not comply with the Zoning By-laws is not allowed without approval from the Township that administers the Zoning By-law.

Of the four Township OPs, most notable is the OP for the Township of Central Frontenac. This plan was recently approved by Frontenac County in September 2021. The plan goes beyond the minimum requirements of the PPS by implementing a 30-metre minimum setback from all wetlands (including those not provincially significant), prohibiting all development in significant wildlife habitat, and recognizing the importance of headwaters in the NHS. The plan also extensively maps the location of various natural heritage features within the Township, including provincially significant wetlands, regionally significant wetlands, areas of natural and scientific interest, at-capacity lake trout lakes, deer wintering areas, waterbodies, and watercourses. Additionally, there is a policy that allows the Council of Central Frontenac to designate locally significant wetlands, which may be granted the same protections as Provincially Significant Wetlands. These policies highlight a progression towards greater NHS protection at the municipal level.

### *Applicability to the Project*

Development and site alteration in a Township must conform to the Township's OP policies. When conducting long-term planning or development review, the Township's actions must conform to their OP. Frontenac County is the upper-tier approval authority for Township OPs and can ensure the policies within them mitigate development impacts on natural heritage features within each Township and protect the region's NHS. A new natural heritage study could help the Townships identify and protect key natural heritage features in their jurisdictions.

Figure 58. South Frontenac Museum, Harington (Christianson, 2017).

## 5.5 Policy Summary

Based on the policies discussed in this section, this report's recommendations must be compatible with the policies summarized in the table below.

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Table 2. Summary of policies and their applicability to the project

| Policy | Applicability to the Project |
|---|---|
| *Fisheries Act* (1985) | No developments, site alterations, or activities in the County can harm fish or their habitat. No deleterious substances can be directly or indirectly deposited in water frequented by fish. |
| *Migratory Birds Convention Act* (1994) | No developments, site alterations, or activities in the County can harm migratory birds or disturb their nests. |
| *Species at Risk Act* (2002) | No developments, site alterations, or activities in the County can harm at-risk aquatic species or migratory birds, and their residences cannot be damaged or destroyed. Other species at risk are protected under this Act on federal lands only. |
| *Planning Act* (1990) | NHS planning in the County must regard provincial interests and be consistent with the PPS. |
| *Municipal Act* (2001) | As an upper-tier government, Frontenac County can develop and implement NHS planning policy, which the County's lower-tier municipalities must abide by. |
| *Public Land Act* (1990) | All Crown lands in North, Central, and South Frontenac, excluding provincial parks and conservation reserves, are the sole responsibility of the province pursuant to the Act. |
| *Provincial Parks and Conservation Reserves Act* (2006) | Bon Echo Provincial Park (North Frontenac), Sharbot Lake Provincial Park (Central Frontenac), and Frontenac Provincial Park (South Frontenac) are provincial parks protected under this Act. The conservation reserves protected under the Act include Crotch Lake and Hungry Lake (both situated on the Algonquin Land Claim) in North Frontenac. |
| *Endangered Species Act* (2007) | Development cannot kill, harm, or harass endangered species or their habitats. Protection of biodiversity is imperative in line with the PPS 2020. |
| Provincial Policy Statement (2020) | NHS planning must regard the interests of the Province and be consistent with the PPS (e.g., consultation with Indigenous Peoples; protection of the NHS, including biodiversity). |
| *Clean Water Act* (2006) | NHS planning can be used to collaborate with CAs to protect drinking water sources (e.g., by protecting headwaters and identifying ecologically-sound locations for communal services). |
| *Conservation Authorities Act* (1946) | CAs participate in development review and permit approval when applications may impact the watershed; CAs may facilitate cross-jurisdictional NHS planning with adjacent municipalities. |
| County Official Plan (2016) | Frontenac County's OP uses policies to identify and protect natural heritage features and areas. in the County and includes land use policies to support their protection. All private and public works within the County must conform to the County's OP policies. |
| Township Official Plans | The Township OPs use policies to identify and protect natural heritage features and areas in their jurisdiction. All private and public works within a Township must conform to the policies in the Township OP. |

# 6.0 Case Studies

This case study analysis reviews environmental protection plans, strategies, and studies that have been produced by municipalities, Conservation Authorities (CAs), and other organizations in and beyond Ontario. The intent of the case study analysis is to explore the actions other governments or organizations are taking to protect the natural environment in their jurisdictions.

## 6.1 Selection Criteria

The following selection criteria were identified based on Frontenac County's context, as discussed in the introduction of this report:

- √ Environmental Protection Plan/Study
- √ Recent Publication (within 10 years)
- √ Similar Population Density (<100/km$^2$)
- √ Primarily Rural
- √ Diverse Geographic Features
- √ Waterfront Development
- √ Regional Scope
- √ Similar Policy and Legal Framework
- √ Located in Ontario

These criteria were used to identify cases with characteristics similar to Frontenac County. Key findings from cases with a similar context to Frontenac County may be more transferable. However, cases that differ in context compared to Frontenac County were also included, e.g., cases located outside Ontario. These cases may provide valuable insight into innovative approaches to protecting the natural environment.

The following table (Table 3) outlines how the selection criteria were used to assess and select cases. At a high level, this table also shows the degree to which each case shares contextual characteristics with Frontenac County.

Figure 59. Available Lands and Buildings, North Frontenac (Township of North Frontenac, n.d.).

Table 3. Case studies and selection criteria.

| Case Study | Environmental Protection Plan/Study | Recent Publication | Similar Population Density | Primarily Rural | Diverse Geographic Features | Waterfront Development | Regional Scope | Similar Policy and Legal Framework | Located in Ontario |
|---|---|---|---|---|---|---|---|---|---|
| City of Guelph's *Natural Heritage Action Plan* (2018) | ✓ | ✓ | | | | | | ✓ | ✓ |
| *Essex Region Natural Heritage System Strategy* (2013) | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ |
| *Grey County Natural Heritage System Study* (2017) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Halton Region's *Natural Heritage Discussion Paper* (2020) | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ |
| *Mapping of a Natural Heritage System in the County of Wellington* (2018) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| MVCA's *Mississippi River Watershed Plan* (2021) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Northumberland County's *Natural Heritage System Plan* (2020) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| *Oxford Natural Heritage Systems Study* (2016) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| United Counties of Prescott and Russell, & United Counties of Stormont, Dundas and Glengarry: *NHS Study* (2021) | ✓ | ✓ | | | ✓ | | ✓ | ✓ | ✓ |
| Trent University's *Trent Lands and Nature Areas Plan* (2020) | ✓ | ✓ | | | | ✓ | | ✓ | ✓ |
| *Keeping Nature in Our Future: A Biodiversity Conservation Strategy for the Okanagan Region* (2012) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | |
| *Chittenden County ECOS Plan* (USA) (2018) | | ✓ | | ✓ | ✓ | ✓ | ✓ | | |
| *Lethbridge River Valley Parks Master Plan* (2017) | ✓ | ✓ | | ✓ | ✓ | ✓ | | | |
| Integrated Rural Development & Nature Conservation's *Strategic Plan 2015-2025* (2015) (Namibia) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | |
| *Nature Without Borders: Vision for Comox Valley Conservation Strategy* (2013) | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| *Parkland County Environmental Conservation Master Plan* (2014) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| *Peel Watershed Regional Land Use Plan* (Yukon) (2019) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | |
| Perth's *Regional Environmental Strategy 2016-2020* (2016) (Australia) | ✓ | ✓ | | | ✓ | ✓ | ✓ | | |
| *Queensland Regional Ecosystems* ) (2019) (Australia) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |

## 6.2 Evaluation Criteria

After selecting case studies, nine criteria were used to evaluate each case and compare their strengths and weaknesses against a common framework (see Tables 4 and 5 for evaluation criteria and case comparisons). These criteria were established based on the specific needs of Frontenac County, in addition to key findings that were gathered from the literature review, policy analysis, site observations, and exploratory conversations.

Table 4. Description of the case study evaluation criteria

| Evaluation Criteria | Description | Key Aspects |
|---|---|---|
| Natural Heritage Systems Protection | It is important that Frontenac County uses a planning tool which effectively protects its diverse Natural Heritage System and natural heritage features to maintain the region's biodiversity. 'Natural Heritage Systems Protection' was evaluated based on how each case approaches and/or prioritizes NHS protection. | • Uses landscape ecology approach and/or complexes to link water and land systems<br>• Quality, quantity, connection |
| Long-Term Planning Horizon | In creating a long-term plan (50-to-100-years), it is important that Frontenac County uses a planning tool that considers how climate change, resource scarcity, and population growth may impact the County's NHS. The 'Long-Term Planning Horizon' evaluation criterion assesses case studies' planning horizon and how the case studies address long-term planning issues. | • Time horizon<br>• Use of a visioning process<br>• Consideration for long-term planning issues (e.g., climate change) |
| Engagement (and Education) | In order to fulfill a vision that is accepted by, and consistent with the priorities of, the general public and stakeholders, it is important that Frontenac County engages a variety of individuals and groups in the planning process. Preliminary and consistent education will also assist in the implementation and success of the plan. Additionally, some planning tools require collaboration with external agencies such as Conservation Authorities (CAs) or lake associations. 'Engagement (and Education)' was evaluated based on the extent of and types of engagement used, as well as how or if the public and stakeholders were educated on planning issues/processes. | • Type of engagement (e.g., partnership, collaboration, informative, etc.)<br>• Extent of public engagement (i.e., democratic and inclusive process, Non-governmental organizations, topic specialists like ecologists, biologists, wildlife specialists)<br>• Extent of stakeholder engagement<br>• Effort to educate public and stakeholders |

| | | |
|---|---|---|
| Planning with Indigenous Peoples | Planning with Indigenous Peoples is important in Frontenac County because some lands in the municipal boundary fall within traditional Algonquin territory. 'Planning with Indigenous Peoples' was evaluated based on consideration of Indigenous Peoples' input; the ways in which Indigenous knowledge is integrated into the planning principles (i.e., Two-eyed seeing; Traditional Ecological Knowledge; Aboriginal Traditional Knowledge); consideration of reconciliation through planning practice and policy; and how the Duty to Consult / Free, Prior, and Informed Consent (FPIC) is addressed. | • Goes beyond the Duty to Consult; achieves FPIC<br>• True settler-Indigenous planning collaboration/partnership<br>• Indigenous Peoples respected as rightsholders |
| Value of Ecosystem Services | Ecosystem services (ES) provide many benefits to communities. The Millennium Ecosystem Assessment identified four distinct types: regulating, provisioning, cultural and supporting. 'Value of Ecosystem Services' was evaluated based on how the case identifies the value of ES and whether it implements ways of enhancing or protecting them. | • Economic/financial values (e.g., increased insurance cost from climate change)<br>• Social/cultural values<br>• Intrinsic values/eco-centric values (e.g., Species at Risk (SAR) habitat, wildlife habitat, etc.) |
| Complimentary with Cultural and Economic Networks | Environmental networks should acknowledge the overlap with cultural and economic networks (i.e., tourism, parks, recreation) so that the patterns of human traffic can minimize the disturbances on the natural environment (i.e., preserve viewscapes and aesthetic integrity; minimize pollution), and work synergistically to achieve sustainability goals. | • Healthy and age friendly communities<br>• Equity (e.g., equitable socio-economic access to the benefits of conservation efforts and access to green spaces/ecosystem services)<br>• Economic development (e.g., cottaging/eco-tourism)<br>• Densification/intensification |
| Proposes Protective Policies /Strategies | 'Proposes Protective Policies /Strategies' was evaluated based on whether or not the case study explicitly proposes policies to protect natural heritage features and the system as a whole. Whether the case study proposes new, innovative policies or tools was also considered. This was evaluated in relation to the Provincial Policy Statement (PPS) – determining whether the case study meets the policies in the PPS; exceeds the policies in the PPS; or does not meet the policies in the PPS. | • Strong/explicit wording (e.g., in legislations such as an Official Plan (OP))<br>• Enforcement<br>• Innovative planning tools (e.g., incentives, taxes, securement strategies)<br>• Land use compatibility – within and outside the region (spectrum of protection)<br>• Cross-jurisdictional collaboration |
| Monitoring and Continuous Evaluation | 'Monitoring and Continuous Evaluation' was evaluated by assessing whether or not the case study integrates a monitoring component that allows the plan/study/strategy's progress or success to be continually evaluated. This | • Adaptive management/projections/feedback/ monitoring/evaluation techniques<br>• Baseline data<br>• Innovation (e.g., adjustment to new data, conferences/stewardship) |

| | | |
|---|---|---|
| | criterion focused on the degree to which the plan/study/strategy has the potential of being a "living document" that evolves over time. | • Engagement projections (e.g., constant feedback from the public/evolution of learning/education) |
| Model Evaluation | 'Model Evaluation' was evaluated based on whether or not the case study mentions and/or justifies the use of a conservation model or spatial prioritization framework/algorithm/mapping system. | • Explanation of a framework or model<br>• Identification and mapping of natural heritage features (other than the Marxan model)<br>• Ground truthing (e.g., with qualified professionals; citizen science)<br>• Layering of data (e.g., layering of land uses/policy/legislation, as well as data)<br>• Innovation (e.g., including private landownership knowledge) |

For each case study, evaluation criteria were individually assigned a rating of 'Excellent', 'Satisfactory", or 'Poor' (Figure 60). This rating was assigned based on how the case study addressed the aspects of the evaluation criteria described in (Table 5) provides further explanation on how ratings were assigned. The evaluation criteria ratings for each case study were then used to identify examples of best practices in NHS planning (see Chapter 7). The following table (Table 5) summarizes each case study's rating in the evaluation criteria categories. Detailed analysis of each case study is found in Appendix A.

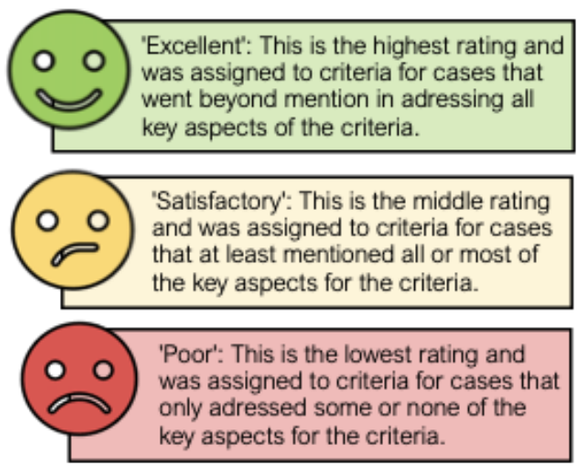



Figure 60. Three-level evaluation criteria (modified from SURP 825, Project Course Team, 2019).

Table 5. Evaluation criteria rating for each case

| Case Study | Natural Heritage Systems Protection | Long-term Planning Horizon | Engagement (and Education) | Planning with Indigenous Peoples | Value of Ecosystem Services | Complimentary with Cultural & Economic Networks | Proposes Protective Policies/ Strategies | Monitoring and Continuous Evaluation | Model Evaluation |
|---|---|---|---|---|---|---|---|---|---|
| City of Guelph's *Natural Heritage Action Plan* (2018) |  |  |  |  |  |  |  |  |  |
| *Essex Region Natural Heritage System Strategy* (2013) |  |  |  |  |  |  |  |  |  |
| *Grey County Natural Heritage System Study* (2017) |  |  |  |  |  |  |  |  |  |
| Halton Region's *Natural Heritage Discussion Paper* (2020) |  |  |  |  |  |  |  |  |  |
| MVCA's *Mississippi River Watershed Plan* (2021) |  |  |  |  |  |  |  |  |  |
| Northumberland County's *Natural Heritage System Plan* (2020) |  |  |  |  |  |  |  |  |  |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Mapping of a Natural Heritage System in the County of Wellington* (2018) |  |  |  |  |  |  |  |  |  |
| UCPR & SDG: *Natural Heritage System Study* (2021) |  |  |  |  |  |  |  |  |  |
| Trent University's *Trent Lands and Nature Areas Plan: Natural Heritage Report* (2020) |  |  |  |  |  |  |  |  |  |
| *Keeping Nature in Our Future: A Biodiversity Conservation Strategy for the South Okanagan-Similkameen* (2012) |  |  |  |  |  |  |  |  |  |
| *Chittenden County ECOS Plan* (2018) (USA) |  |  |  |  |  |  |  |  |  |
| *Lethbridge River Valley Parks Master Plan* (2017) |  |  |  |  |  |  |  |  |  |
| Integrated Rural Development & Nature Conservation's *Strategic Plan* 2015-2025 (2015) (Namibia) |  |  |  |  |  |  |  |  |  |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Nature Without Borders: Comox Valley Conservation Strategy* (2013) |  |  |  |  |  |  |  |  |  |
| *Oxford Natural Heritage System Study* (2016) |  |  |  |  |  |  |  |  |  |
| *Parkland County Environmental Conservation Master Plan* (2014) |  |  |  |  |  |  |  |  |  |
| *Peel Watershed Regional Land Use Plan* (2019) (Yukon) |  |  |  |  |  |  |  |  |  |
| Perth's *Regional Environmental Strategy 2016-2020* (2016) (Australia) |  |  |  |  |  |  |  |  |  |
| *Queensland Regional Ecosystems* (2019) (Australia) |  |  |  |  |  |  |  |  |  |

# 7.0 Best Practices

This chapter outlines the best practices that were gathered from the case studies as they relate to the evaluation criteria and discusses how the best practices can be applied specifically to Frontenac County.

## 7.1 Natural Heritage Systems Protection

Natural heritage system (NHS) protection was evaluated based on the cases' approaches to protecting the quality, quantity, and connectivity of natural areas. The following five plans, strategies, and studies exemplify the best natural heritage system protection practices that can be applied to Frontenac County in the rural context:

- *Nature Without Borders: Comox Valley Conservation Strategy* (2013)
- *Keeping Nature in Our Future: A Biodiversity Conservation Strategy for the South-Okanagan Similkameen* (2012)
- *Essex Region Natural Heritage System Strategy* (2013)
- *Peel Watershed: Regional Land Use Plan* (Yukon) (2019)
- *Parkland County Environmental Conservation Master Plan* (2014)

These reports emphasize the importance of protecting, enhancing, and creating connected matrixes in different capacities. For example, the *Comox Valley Conservation Strategy* identifies and protects priority ecological areas and recreational greenway trails. Comox classifies priority ecosystem areas as biodiversity corridors, sensitive ecosystems, or water resources; in contrast, the recreation greenway trails are paths designed for low-impact recreational uses such as walking, cycling, and other activities. Similarly, Frontenac can create a network of recreational areas that improve education, stewardship, and anthropogenic relationships with natural resources and a network of preserved natural areas that recognize the importance of ecosystem services (ES) and biodiversity. This dual-pronged approach recognizes the importance of balancing both ecocentric and anthropocentric connectivity within the NHS. Multi-use pathways already exist in Frontenac, including regional roads, regional mountain bike routes, and cross-regional trail routes. These forms of infrastructure (e.g., regional multi-use pathways, local connector pathways, boardwalks, and pedestrian bridges) support the use of natural areas while encouraging a sense of ownership, stewardship, and appreciation for the outdoors. Furthermore, tools such as trail classification systems, comprehensive and aesthetic signage, and other forms of education materials increase the opportunities for the public to learn about the value of the natural ecosystem.

Figure 61. Park Trail in Comox Valley, British Columbia (Comox Valley Regional District, n.d.).

The *Peel Watershed: Regional Land Use Plan* (Yukon) uses a legal system to enforce their protection plan. The conservation strategy was designed to focus on the official designation of conservation areas, which are subdivided into the following three categories: special management areas; wilderness areas; and wilderness areas – boreal caribou. The special management areas are given permanent protection whereas wilderness areas have interim protection; the boreal caribou area is protected under the *Species at Risk Act* (2002) to protect boreal habitat. Core natural areas throughout Frontenac could be given legal standing, and this could be achieved through ground-truthing wetlands in order for them to receive Provincially Significant Wetland (PSW) or Areas of Natural and Scientific Interest (ANSI) status, or by providing a new framework under municipal Official Plans (OP) that provides greater protection to natural features when development threatens the NHS.

Figure 62. Upper Wind River, Peel Watershed, Yukon (McGuffin, 2019).

Similar to the *Comox Valley Conservation Strategy* and the *Peel Watershed: Regional Land Use Plan*, the *Parkland County Environmental Conservation Master Plan* (*ECMP*) also prioritizes creating a diverse matrix of valued natural amenities and features. The *ECMP* uses environmentally sensitive areas as a mode of protection while following landscape ecology principles. This is based on the understanding that there are certain indispensable patterns which, if protected, will influence all components of the ecosystem. There are four area types for focused protection: large patches, connectivity, vegetated corridors, and stepping stones. Frontenac can redefine, identify, and focus protection and monitoring efforts in these area types, specifically in core areas such as wetlands, forests, and valleylands. Similarly, *A Biodiversity Conservation Strategy for the South-Okanagan Similkameen* focuses on protecting a variety of habitats in order to ensure diverse matrices of core conservation areas and connected corridors. The *Comox Valley Conservation Strategy* also implemented three main guidelines that align with a landscape ecology approach. The approach acknowledges that larger habitat areas are better than smaller areas; that habitat areas closer together are better than ones that are further apart, based on principles such as the Island Biogeography Theory; and that areas with low fragmentation are better than areas with high fragmentation. Although Frontenac is not currently degraded or fragmented, the County can employ these guiding principles for future development.

The precautionary principle is the guiding framework of *A Biodiversity Conservation Strategy for the South-Okanagan Similkameen.* Frontenac County can embed this principle in the long-term vision of the region to guide development away from causing potential unknown harm to the NHS. Frontenac can implement the precautionary principle by creating legal protections for natural features. Additionally, the *Essex Region Natural Heritage System Strategy* (*ERNHSS*) was based in a fragmented and degraded landscape; therefore, the *ERNHSS* utilized a more corridor-style strategy. Although this does not translate to Frontenac's landscape, the *ERNHSS* uses the Environment Canada restoration-focused guide that outlines how to properly create natural areas that mimic what has been lost. These restoration practices can help the County, lake associations, land trusts, and conservation areas in Frontenac address the challenges (e.g., water pollution, invasive species, and incompatible land uses) to re-establish ecosystems that have become degraded. Frontenac can apply these standards, in conjunction with the precautionary principle, to limit reckless development and thereby reduce the need for ecological restoration and rehabilitation.

Figure 63. British Colombia's Okanagan Lake behind Planet Bee Okanogan Honey Farm & Honeymoon Meadery (Isola, 2016).

## 7.2 Long-Term Planning Horizon

Long-term planning horizons enable ecosystem conservation and restoration in tandem with changes in the climate, human population, economic activity, policy landscape, and built environment. Moreover, planning with a long-term horizon creates space to address complex, evolving issues including settler-Indigenous relations (e.g., reconciliation), human rights, and intergenerational justice.

Out of the plans analyzed for this report, the following plans have the strongest approach to a long-term planning horizon:

- *Mississippi River Watershed Plan* (2021)
- Perth's *Regional Environmental Strategy 2016-2020* (2016) (Australia)
- *Chittenden County ECOS Plan* (2018) (USA)

Neither the *Mississippi River Watershed Plan* nor Perth's *Regional Environmental Strategy* use an explicitly long-term planning horizon. However, the *Mississippi River Watershed Plan* uses an overarching climate change lens and extensive community visioning process to bring a longer-term perspective to its 20-year horizon. The *Plan* combines its climate change lens with oversight by a standing Public Advisory Committee and an ongoing Indigenous Engagement Plan to ensure perpetual implementation, monitoring, evaluation, and adaptation. In contrast, Perth's *Regional Environmental Strategy* uses an explicit short-term horizon to stimulate political accountability for urgently needed environmental action.

These cases illustrate how long-term planning horizons include perspectives that will evolve as knowledge and experience evolve (e.g., climate change adaptation). Long-term plans can also include a series of immediate actions, steps, and phases. Long-term planning horizons enable communities to achieve ambitious goals through sustained focus, refined knowledge, and by observing the cumulative effects that smaller actions have over time.

The *Chittenden County ECOS Plan* combines long- and short-term planning. The *ECOS Plan* uses a 32-year horizon from 2018-2050 to plan for long-term regional climate resiliency and to identify long-term community concerns; the *Plan* also identifies short-term priority actions for leadership to take within the next five years. The Chittenden County's Long Range Planning Commission led the *ECOS Plan* and facilitated interdepartmental collaboration with the region's *Metropolitan Transportation Plan*; *Economic Development Strategy*; and *Enhanced Energy Plan* in order to produce common objectives. This indicates, a) long-range planning can be a specialized skill for a team dedicated to long-range projects, and b) long-range planning can be done holistically in the context of other plans (e.g., Official Plan (OP) reviews, strategic plans, watershed plans, etc.).

Long-term planning best practices:

- Use the planning horizon that best fits the scale of the planning issues at stake. Long-range horizons are appropriate for complex, evolving situations such as climate change, settler-Indigenous relations, green infrastructure planning, economic development and employment lands planning, and natural heritage systems (NHS) conservation.
- Orient long-range plans towards the community's goals and vision by engaging citizens in widespread, inclusive, intergenerational visioning processes. Revisit visioning processes periodically throughout the plan's "life", in line with long-range plans' ideal status as "living

documents." Periodic visioning processes support intergenerational solidarity, justice, and transmission of cultural & environmental knowledge.

- Apply the frameworks and lenses that bring the issues at stake into focus. Use a climate lens and a human rights framework throughout the long-range NHS plan to bring a long-range perspective to other shorter-term regional and municipal plans, including plans for economic growth and healthy, accessible, age-friendly communities.
- Create accountability for achieving long-term implementation by identifying priority actions that elected Councils can achieve in the shorter term (e.g., within an elected term). A long-range, community-based NHS plan—conceived in a human rights framework using a climate change lens—can create the foundation for shorter-term regional Strategic Plans, Economic Charters, OP, etc., that all work towards the community's long-range goals and intergenerational vision.
- Implement the long-range planning horizon with a detailed monitoring and evaluation program (e.g., identify indicators to monitor change in the environment as the climate change scenario evolves). Good quality monitoring enables the plan to adapt. Adaptability is a crucial component of overall community resiliency, especially in the context of climate change.

## 7.3 Education and Engagement

Community engagement and education are crucial elements of natural heritage planning as a positive relationship between heritage sites and the surrounding community promotes a high level of protection.

The following four plans, studies and strategies exemplify the best practices in engagement and education that can be applied to Frontenac County:

- *Chittenden County ECOS Plan* (2018) (USA)
- *Parkland County Environmental Conservation Master Plan* (2014)
- City of Guelph's *Natural Heritage Action Plan* (2018)
- Perth's *Regional Environmental Strategy 2016-2020* (2016) (Australia)

For example, upon developing the *Chittenden County ECOS Plan*, public priorities for the region were obtained through community-created murals, community portraits, and youth creative writing (lead by Burlington City Arts). The *ECOS Plan* was implemented in five steps –each of which contained a public review and comment period. During the fourth step of the planning process, the Chittenden County Regional Planning Commission (CCRPC) incorporated an "Equity Coordinator" to meet with representatives from community and issue-oriented groups, as well as key informants/informal leaders from marginalized ethnic and cultural groups, to ensure the *Plan* included and considered opinions/comments from underrepresented populations. Additionally, there is a Public Participation Plan in place that describes the CCRPC's traditional and innovative outreach methods for public engagement and advises residents on how to get involved.

Figure 64. Cycling Enthusiasts at a Public Meeting in Sydenham (Frontenac News, 2016).

Perth's *Regional Environmental Strategy* recognizes that various plans throughout the Region already address sustainability planning, therefore the objective of the Regional Authorities is to act as "enablers that will add value to member councils' initiatives". Some enablers include regional advocacy, education information and engagement, cross regional programs, funding, strategic consulting, technical support, research and innovation, and collaboration. Frontenac's natural heritage strategy should consider ways to leverage the strengths of existing conservation programs and volunteer networks in the Region to support local initiatives with funding, resources, and expertise.

Additional insights can be drawn from the *Parkland County Environmental Conservation Master Plan.* The *Plan* uses both a combination of centralized and decentralized engagement methods due to the rural population and an online mapping tool for individuals to use if they were unable to attend meetings. Throughout the development of the Parkland County plan, engagement was conducted in three stages for the following five stakeholder groups: technical, general public, First Nations, Parkland County committee and council, and Parkland County staff. Prior to official engagement, a study was conducted to gain initial information about the community's priorities. The first phase of engagement workshops included a presentation of the draft mapping and model documents. Participants provided feedback on the *Plan's* six main themes: species, habitats, landscape ecology, groundwater, protected areas, and development pressure. Stakeholders then determined three broad categories in which to implement in the plan: education, enforcement, and compensation.


Figure 65. Guelph's Community Plan (City of Guelph, 2021).

Figure 66. Officials from Alberta's Agriculture and Environment ministries and stewardship groups are invited to Parkland County to see four flood and drought mitigation projects (Stockford & Blair, 2019).

The City of Guelph's *Natural Heritage Action Plan* promotes creative engagement techniques and unique stewardship methods that Frontenac County should consider. Guelph prioritized engagement when developing the *Natural Heritage Action Plan* through surveys, meetings, and workshops, and the "Nature in Guelph" campaign contributed significantly to the engagement process. This campaign involved handing out nature-themed postcards at community events and allowing residents to artistically represent what nature meant to them using words and drawings. The *Plan* recognizes that fostering community support, raising awareness, and increasing community education efforts cumulatively promote a culture of conservation and stewardship that will help protect the natural heritages systems over the long-term. In order to increase stewardship, the City is exploring the idea of an urban ecology speaker series for the public in partnership with local organizations and academic institutions. Furthermore, the City is developing an online environmental guide for homeowners that includes information about trees and landscaping, water, energy, conservation and rebates, waste management, transportation, and air quality. The goal is to promote behavioural changes by effectively communicating the impacts that certain actions have on the natural environment.

## 7.4 Planning with Indigenous Peoples

Indigenous Peoples and communities have rich knowledge and an interconnected understanding of place. As such, planning with Indigenous Peoples regarding NHSs represents the opportunity to learn and deepen our connection with the land, enabling the better protection and preservation of the natural environment. This is especially relevant to Frontenac County where lands within the regional boundary constitute part of the ongoing Algonquin Land Claim between the Algonquins of Ontario and the Crown.

The following five plans, studies and strategies exemplify the best practices in planning with Indigenous Peoples that can be applied to Frontenac County:

- *Nature Without Borders: Comox Valley Conservation Strategy* (2013)
- Trent University's *Trent Lands and Nature Areas Plan* (2020)
- *Queensland Regional Ecosystems* (2019) (Australia)
- *Mississippi River Watershed Plan* (2021)
- *Peel Watershed Regional Land Use Plan* (2019) (Yukon)

The *Comox Valley Conservation Strategy* recognizes that the absence of Traditional Ecological Knowledge (TEK) in the region is a major gap in understanding how to sustain the region's natural systems and resources. The strategy also stresses the importance of establishing relationships and working together in respect for the land and people of the K'omoks First Nation. Similarly, the *Peel Watershed Regional Land Use Plan* also focuses on recognizing the cultural and environmental values of the affected First Nations through ongoing partnerships. This is evidenced by the plan's implementation and monitoring committee consisting of two members from the Yukon government and one member each from Tr'ondëk Hwëch'in, First Nation of Na-cho Nyäk Dun, Vuntut Gwitchin Government and Gwich'in Tribal Council.

Important insights can also be drawn from the *Mississippi River Watershed Plan* in their commitment to undertaking meaningful engagement with Indigenous communities. The Mississippi Valley Conservation Authority contracted the services of Cambium Indigenous Professional Services to prepare an Indigenous Engagement Plan to ensure all Indigenous Peoples and communities with an interest in the watershed are provided the full opportunity to have their knowledge, guidance, and ideas included. As part of this approach, resources are committed to working with Indigenous communities to educate the greater public on the importance of Indigenous participation and knowledge in protecting and restoring NHSs. The *Plan* also incorporates natural and cultural features valued by Indigenous Peoples as important components of the natural landscape to protect. For example, wild rice* is recognized as being vulnerable to shoreline development, rising water levels, and climate change. This grain significant and important to Indigenous Peoples, as it was a food source for thousands of years and holds cultural value.

**In Ontario, regulations falling under the Ministry of Natural Resources and Forestry prohibit the commercial harvest of wild rice without a permit.*

Figure 67. Algonquins of Pikwakanagan First Nation's Nígánizí Gamik (Council House) (Leroux, n.d.).

The *Trent Lands and Nature Areas Plan* illustrates the synergistic relationship between ecological data, TEK, cultural heritage, and sustainable land use. This plan recognizes the important contribution TEK can have in identifying numerous species that have a medicinal, resource, or spiritual use that occur and are used within an ecological region. Additionally, the plan considers sites of Indigenous use and teaching, as well as significant species, to determine opportunities for enhancement. It is important to note that sensitive data,

including identification of sacred sites or culturally sensitive sites that are protected, were not shared in detail to protect the sanctity of those sites. This was overseen by the Trent Elders and Traditional Knowledge Keepers Council.

Outside of Canada, the *Queensland Regional Ecosystems* illustrates an important "missed opportunity" to incorporate TEK. The framework's single mention of planning with Indigenous Peoples is found when a planning officer noted that the framework's mapping had been used to "stratify field survey work in protected areas, potential protected areas and with Traditional Owners on Aboriginal freehold land" (p. 43). The absence of Indigenous Knowledge (IK) in creating the mapping system is interesting, particularly since a key component to the program's baseline data is "pre-clearing" vegetation, which is defined in terms of "pre-European" contact, i.e., prior to major impacts from non-Indigenous people. In this regard, the incorporation of TEK would improve the rigour of the mapping system.

In line with best practices, Frontenac County should consider incorporating Indigenous Engagement Planning as a component of their Natural Heritage Study. It is identified that early engagement (e.g., information sessions, written communication, and meetings) lays the foundation for creating mutually respectful relationships. Best practices also highlight the benefits of hiring an Indigenous consulting firm to facilitate this engagement and create a framework for continued collaboration throughout the implementation and monitoring phases of the project. As used in the *Trent Lands and Nature Areas Plan*, the County may consider using workshops, walks and site visits to facilitate the sharing of TEK and IK, including the identification of specific Indigenous values and interests to include in the review and update of a new study. Frontenac should also incorporate TEK into baseline data for wildlife and vegetation in the County's NHS. This would benefit the County's long-term observation of landscape change and the thoroughness of its mapping model.

Lastly, it is important to note that any engagement and planning with Indigenous Peoples must reflect *United Nations Declaration on the Rights of Indigenous Peoples* (*UNDRIP*), Free, Prior and Informed Consent, and Canada's Truth and Reconciliation Commission's *Calls to Action.*


Figure 68. Truth and Reconciliation Commission (National Speakers Bureau, 2021).

## 7.5 Valuation of Ecosystem Services

Local governments in Canada and abroad increasingly recognize that assessing the monetary value of ES is a critical aspect of NHS planning.

The following three plans, strategies and studies exemplify the best practices in the valuation of ES that can be applied to Frontenac County:

- City of Guelph's *Natural Heritage Action Plan* (2018)
- Perth's *Regional Environmental Strategy 2016-2020* (2016) (Australia)
- *Chittenden County ECOS Plan* (2018) (USA)

For example, Guelph's *Natural Heritage Action Plan* states that the city would benefit from a natural asset management approach to decision-making that considers the economic value of natural ecosystems in the community. By monetizing the role that the NHS plays in key processes such as filtering water, providing clean air, regulating climate, and mitigating natural disasters, informed decisions based on measurable costs and benefits can be made regarding policy, investments, and land use planning. As part of this approach, the City of Guelph is developing a natural asset inventory (e.g., ecological goods and services that the natural heritage and water resource system provides) to facilitate the integration of green infrastructure into the City's Corporate Asset Management Plan. This integration will help to promote ecosystem restoration as essential infrastructure and help to justify further investments into Guelph's NHS.

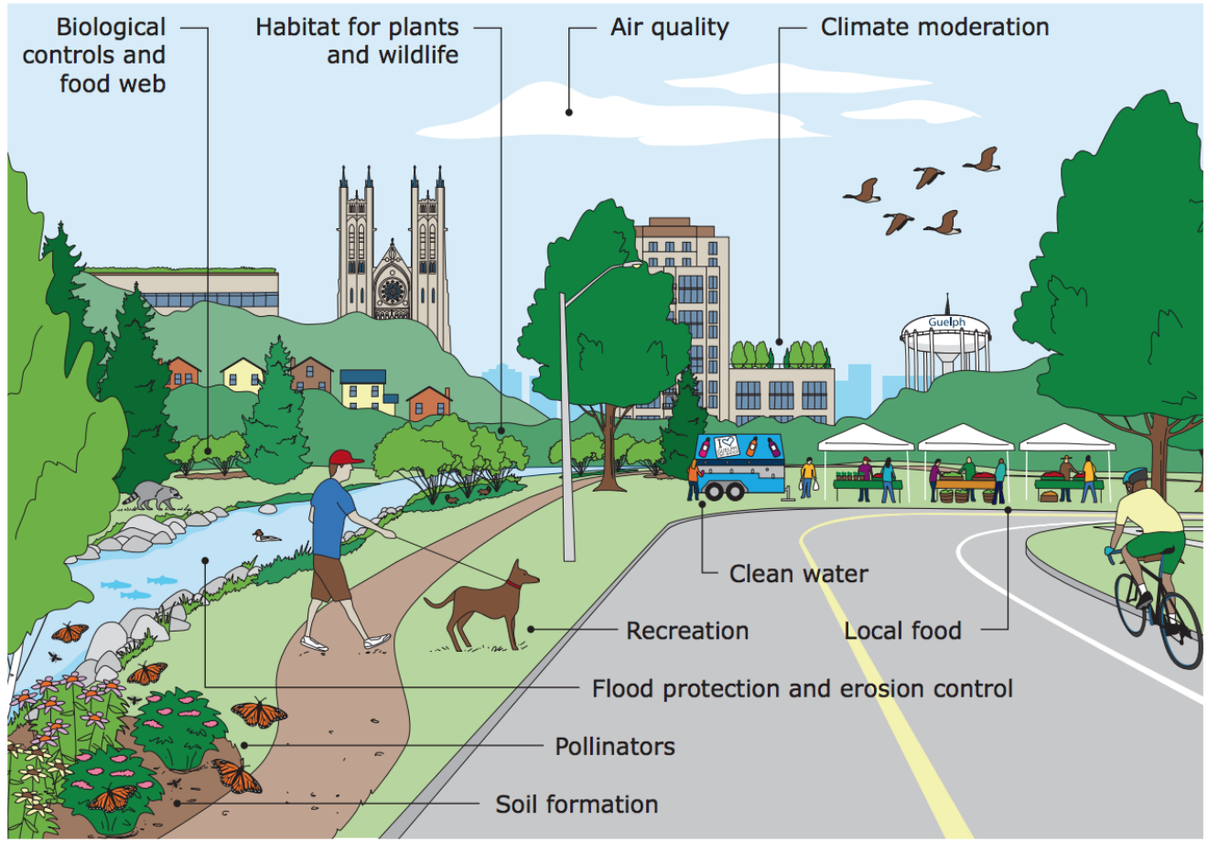



Figure 69. Guelph's illustration of ecosystem services and biodiversity (City of Guelph, 2018).

Beyond Canada, the Region of Perth in South-Western Australia is taking steps to integrate ecosystem services valuation into decision-making processes. While Perth's *Regional Environmental Strategy* does not put a monetary value on ecosystem services, it stresses that proactively enhancing protections for the natural environment can mitigate the cost of damage caused by future environmental disasters and devastation. Perth's *Regional Environmental Strategy* recognizes that a key issue in the Region is a lack of accounting of environmental impacts in cost-benefit analyses for new developments or infrastructure projects. Therefore, the *Strategy* commits to providing technical support and advocacy to member councils by developing consistent cost-benefit analysis tools for environmental assets. Insight from the *Chittenden County ECOS Plan* further touches on the cost of climate change impacts on environmental quality, natural communities, public health, the built environment, and the local economy. Together, these cases highlight that future cost mitigation is an important aspect of ES valuation.

Frontenac County contains a vast NHS, including approximately 45,000 hectares of wetlands and 227,000 hectares of woodlands (Frontenac County, 2012). These areas provide significant economic value, which is currently not accounted for in Frontenac County's Asset Management Plan (2013). For example, wetlands in Southern Ontario's Greenbelt have been estimated to provide ES worth $14,153 per hectare annually, which include water regulation, water filtration, flood control, waste treatment, wildlife habitat, and recreation opportunities (Wilson, 2008). Forests in the Greenbelt were estimated to provide ES worth $5,414 per hectare annually, which include water filtration, carbon storage, habitat for pollinators and wildlife, and recreation opportunities (Wilson, 2008). These values are likely conservative estimates due to the incomplete understanding of all the benefits provided by nature and the likely increase in ES values over time as a result of climate change (Wilson, 2008).

Figure 70. Wildfires in BC in 2018 (CBC, 2018).

When these annual per hectare estimates are applied to Frontenac County, the wetlands and woodlands provide ES that are valued at roughly $637 million per year and $1.2 billion per year respectively. While the actual values may be higher or lower in Frontenac County depending on the specific valuation method used, the immense economic value of these natural assets calls for their strategic management. To align with best practices, Frontenac County should develop a natural asset inventory to account for the annual economic value that the County's NHS provides. The annual economic values of the NHS should be based on the specific ES that it provides. By assigning economic value to the County's NHS, actionable information can be provided to decision makers and public knowledge of the importance of ES can be enhanced. The economic value of the County's NHS should be integrated into its Asset Management Plan

and be used to conduct cost-benefit analyses when making policy, investment, and land use planning decisions. This approach would allow the County to consider the cost of environmental impacts that result from new development and other economic activities. By recognizing the NHS as green infrastructure with measurable economic value in the County's Asset Management Plan, further investments in the County's NHS can be justified to maintain the ES that it delivers. This is particularly important for Frontenac County as no settlement areas have full municipal services and the rural areas rely entirely on the NHS to provide basic life supporting services, such as water supply, water filtration, waste treatment, and stormwater management.

Frontenac County should also consider future costs that it could mitigate by protecting the NHS because the increased risks of flooding and natural disasters associated with environmental degradation will not only cost the County but also cost residents as insurance rates rise accordingly. Accurate ES valuation is crucial for Frontenac County because losing them due to lack of NHS protection will have significant economic impacts that may threaten health, food production, climate stability, and provision of basic necessities such as a clean and reliable water supply. NHS conservation and sustainable management can maximize the economic benefits of ES and help avoid costly restoration efforts that become necessary when the environment has been degraded and the ES have diminished.

Figure 71. Autumn trees through Frontenac County North (Ontario Yours to Discover, 2021).

## 7.6 Complementarity with Cultural and Economic Networks

As Frontenac County responds to new opportunities for growth, and as global trends in biodiversity loss, habitat fragmentation, and climate change amplify the urgency to take proactive measures to protect our natural heritage at a landscape scale, environmental planning cannot be regarded as separate from other regional strategies, programs, and projects. A holistic approach to regional growth is therefore required to reach future goals of sustainable development, such as the conservation of resources and balanced development. Moreover, as the people of Frontenac look to the County to have their voices and values reflected in local services and programs, environmental planning should act as an effective and trustworthy channel for community planning, citizen science, and personal actions/engagement.

The following four plans, strategies and studies exemplify the best practices in complimentary applications with cultural and economic networks that can be applied to Frontenac County:

- *Nature Without Borders: Vision for Comox Valley Conservation Strategy* (2013)
- *Peel Watershed Regional Land Use Plan* (2019) (Yukon)
- *Queensland Regional Ecosystems* (2019) (Australia)
- Integrated Rural Development and Nature Conservation's *Strategic Plan* 2015-2025 (2015) (Namibia)

In British Columbia, the *Comox Valley Conservation Strategy's* recreation greenway trails provide a strong backbone for a region-wide network for

Figure 72. Cycling in Frontenac (Bonetta, 2017).

walkers, cyclists and other users which links the communities together, provides access to natural areas, and opens up additional opportunities for expansion and connections. The Comox Valley Land Trust Board considers conservation and stewardship activities along the trails, the trails' aesthetic character, and historic values when choosing the Priority Greenway Trails. Having economic and cultural values embedded into the NHS's mapping of green infrastructure would assist Frontenac in leveraging the productive potential of greenway networks.

Figure 73. Canyon on Hart River, Peel Watershed (Peepre, 2017).

Historically, the Peel Watershed Region in the Yukon has supported the traditional subsistence economy (or land-based economy) of First Nations Peoples, which is based on hunting, trapping, gathering, and fishing activities, for household use or barter (Region of Peel, 2019). A wage-based (or market-based) economy is an economic system in which goods and services are produced and exchanged for money. When both traditional subsistence harvesting and wage-based activities can co-exist in the same system, this is known as a mixed economy. The 2019 *Peel Watershed Regional Land Use Plan* uses a mixed economy framework to recognize the importance of cultural activities to the community residents while ensuring that these communities can participate in the opportunities of the wage economy. This is accomplished by ensuring that traditional economies are protected within conservation areas and by focusing wage-based economic development within Integrated Management Areas (a land-use category, known as the 'working landscape,' that permits mineral, oil, and gas disposition processes or other industrial activities or land uses.). The *Plan* emphasizes that the ecosystem is fundamental to sustaining the Region's societies and economies through appropriate sustainable economic activities. These indefinitely sustainable economic activities include activities that do not degrade the land, undermine communities, or deplete resources.

In Australia, the state of Queensland's Regional Ecosystem maps are certified legal documents under the implementation of the *Vegetation Management Act 1999.* They are intended to be used by various stakeholders in industry and government, and, therefore, have considerably impacted land management and development options. Because these maps provide a compatible, national-level approach to natural resource classification, a rigorous map modification process has been developed to respond to mapping contestations. Some mapping decisions have been disputed in court, which has involved some

challenges in explaining and debating ecological concepts in the legal arena. Overall, however, the programs have been widely accepted by government and stakeholders because of "…the scientific reputation, transparent documentation of processes and the delivery of user-friendly and accessible map products" (Neldner et al., 2019, pp. 26). Since the mapping is so consistent, credible, and easy to use, it effectively compliments other economic and cultural initiatives in the region. For instance, the maps support decision-makers in the development approval process by determining what degree of land clearing is acceptable while helping efforts to protect key natural assets for tourism and ES industries. Specifically, wetland habitat mapping and fuel characterization mapping are important base ecosystem layers that display assets for land managers, thereby helping them to determine sustainable development options and ways to generate alternative incomes from natural ecosystems. Additionally, the maps can be used to assess mining proposals and to indicate the productive potential of the land for farming, grazing, and beekeeping activities. The maps can also identify bushfire-prone areas and can, therefore, be used by fire and emergency services to develop fire management guidelines and plans in the face of natural disasters caused by climate change.

In Namibia, the Integrated Rural Development and Nature Conservation's *Strategic Plan* (IRDNC) community-based conservation framework has had a transformative impact on Namibian culture and economy. The nation has developed economic potential through local governance; cultural human-wildlife/habitat relations have transformed positively; and the framework's capacity-building programming in rural communities has made rural lifestyles more economically viable, if not sustainable. Integration of communal conservancy areas and improved rangeland conditions for livestock management present opportunities for greater economic value. The IRDNC aims to expand economic opportunities in terms of developing water management, forestry, fisheries, wildlife corridors, infrastructure planning, and community land tenure systems. Essentially the plan calls for integrating economies based on resources from nature using a strong local governance framework. The IRDNC *Strategic Plan* calls for increasing the governance roles for rural women and girls which has the potential to be culturally meaningful. Regarding communal conservancies, they are implemented by local leaders in local contexts where unemployment, demographic change, business opportunities, changing aspirations, changing average education levels, and urbanization are crucial factors in the design and

Figure 74. Frontenac dark sky preserve (Fernleigh Lodge, 2017).

management of the conservancy. Cultural and economic networks create and support the sustainable community-based conservation model. Communities involved with communal conservancies report through surveys to the IRDNC that they associate local cultural pride with conservation effort and success.

Frontenac County's regional brand embodies rural pride, community, and adventure. Whereas other Regions in Ontario may incorporate urban design or community design into land use planning processes, Frontenac should incorporate rural design into the development approval process. Frontenac's NHS currently uses provincial standards and procedures to identify natural features of interest which do not include aesthetic features, such as night skies or *viewscapes*. Official recognition of these features would help to maintain rural character and would work synergistically with recreational networks, since visitors contribute to the Region' economic vitality when they seek out these aesthetic experiences. Similar to Comox Valley's approach, Frontenac could adopt a network of greenway trails within the NHS framework. This green infrastructure could help to ensure equitable access to nature, encourage adventure, and support community connections, which are key priorities identified in the County's *Economic Charter*.

Additionally, in line with the successes of the *Queensland Regional Ecosystem* mapping system, Frontenac County could invest in the development of sophisticated, publicly available mapping layers that display important recreational and cultural features in the region. Having a reliable and multifaceted mapping system that can be used by other departments helps to reinforce the credibility and compatibility of the region's landscape classification system. For instance, landscape mapping layers could be used to determine the productive potential of rural land for agriculture and agri-businesses, which helps provide local jobs and support tourism. As another example, having a searchable database for community features would help Frontenac fill in the gaps between high-level regional mapping and site-specific local mapping. This could be developed in cooperation with the Lake Management Plans developed by lake associations. The County endorses Lake Management Plans under section 7.1.4.13 of its OP, but it could better support these associations with additional financial resources and organizational capacity. Capacity-building programming was integral to Namibia's IRDNC's community-based conservation framework, and it would likewise help Frontenac to strengthen the rural economic and cultural networks. Stronger advocacy and resources for community organizations would also inform decision-makers in the development approval process as they balance environmental, economic, and cultural values.

Frontenac County should cohere its economic initiatives with long-term environmental protection initiatives that could involve, for example, infrastructure management. Communal servicing presents planners with increased opportunities for developing higher density housing options, which aligns with the County's goals to provide more robust and diverse housing options for aging populations, as well as mitigate haphazard rural development that may have negative impacts on the NHS. Having the long-term ES and settlement vision accurately reflected to the municipalities should help to inform their risk assessments and strategic development decisions, so that County-wide growth can occur synergistically and holistically towards a desired future.

## 7.7 Proposes Protective Policies/ Strategies

Frontenac County's NHS would benefit from innovative policies that stringently work to maintain, restore, and improve natural features and areas for the long -term. Upon reviewing policies selected for case study analysis, best practices in policy are categorized into two broad groups: 1) conservation planning tools, and 2) novel programs and strategies that revolve around stewardship.

The following six plans and studies exemplify the best practices in protective policies and strategies that can be applied to Frontenac County:

- *Essex Region Natural Heritage System Strategy* (2013)
- Halton Region's *Natural Heritage Discussion Paper* (2020)
- *Grey County Natural Heritage System Study* (2019)
- *Nature Without Borders: Vision for Comox Valley Conservation Strategy* (2013)
- United Counties of Prescott and Russell (UCPR), & United Counties of Stormont, Dundas and Glengarry (SDG): *Natural Heritage System Study* (2021)
- *Chittenden County ECOS Plan* (2018) (USA)

The *Comox Valley Conservation Strategy* stipulates that local governments are responsible for incorporating connectivity conservation into their policies and

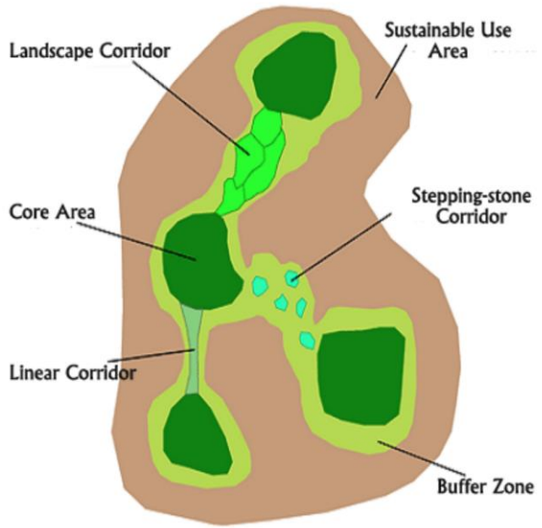



Figure 75. Comox Valley land use components that make up a natural areas network (Fyfe, 2013).

bylaws (e.g, through *conservation zoning)* and for ensuring that human activities do not prevent or threaten the functional linkages between natural areas in the landscape. Conservation zones could include core areas, buffer areas, corridors, and sustainable use areas to allow and restrict land uses that support connectivity. Frontenac County's current OP states that the County "encourages municipalities to establish and maintain linkages by incorporating them into their Official Plans," however the policies make no mention of sustainable use areas or other ecologically compatible land uses that could help support linkages (County of Frontenac, 2014, pp. 72). Since unprotected areas

influence the protected ones, a more nuanced strategy for linkages would improve the County's NHS.

As per the *Natural Heritage Reference Manual,* the *Essex Region Natural Heritage Study Strategy* (ERNHSS) recommends a less commonly-used tool – a dual designation approach that allows two different land uses to co-exist. For example, the land use designations Prime Agriculture and Natural Heritage can coexist through a dual designation policy, which has the same effect as a natural heritage overlay policy. Under the dual designation, some restrictions apply to agricultural uses where natural heritage designation is concerned (Natural Heritage Reference Manual, 2010). This approach recognizes existing land uses while identifying components of the NHS that warrant protection. Frontenac County recognizes prime agriculture as a "core economic basis for the rural economy"; thus, the dual designation approach is not only consistent with the OP's objective but also conforms to Policy 2.1.9 of the PPS, which states that the natural heritage policies outlined in Section 2.1 should not prevent agricultural land uses from continuing (Provincial Policy Statement, 2020). Policies that encourage partnerships between Conservation Authorities (CAs) and farmland owners supplement the approach by achieving natural heritage objectives through stewardship and sustainable farming practices (i.e., regenerative farming).

Similarly, the *Grey County Natural Heritage Study* recommends local municipalities place Holding provisions on designated natural core areas. Such a tool would only allow for a range of permitted uses that are sustainable and compatible with the land. The Holding provision may not be lifted unless an Environmental Impact Study (EIS) meets the standards specified by the County and the relevant CA. In the same vein, Conditional zoning, if available, is preferable because it requires two EIS, whereas Holding zones require one (to lift the provision). Thus, an EIS would be needed to lift the Conditional zoning and another one would evaluate the proposed development's effect on known natural heritage features. Frontenac County explicitly states its support for zoning bylaws that protect the natural features identified through the natural heritage study.

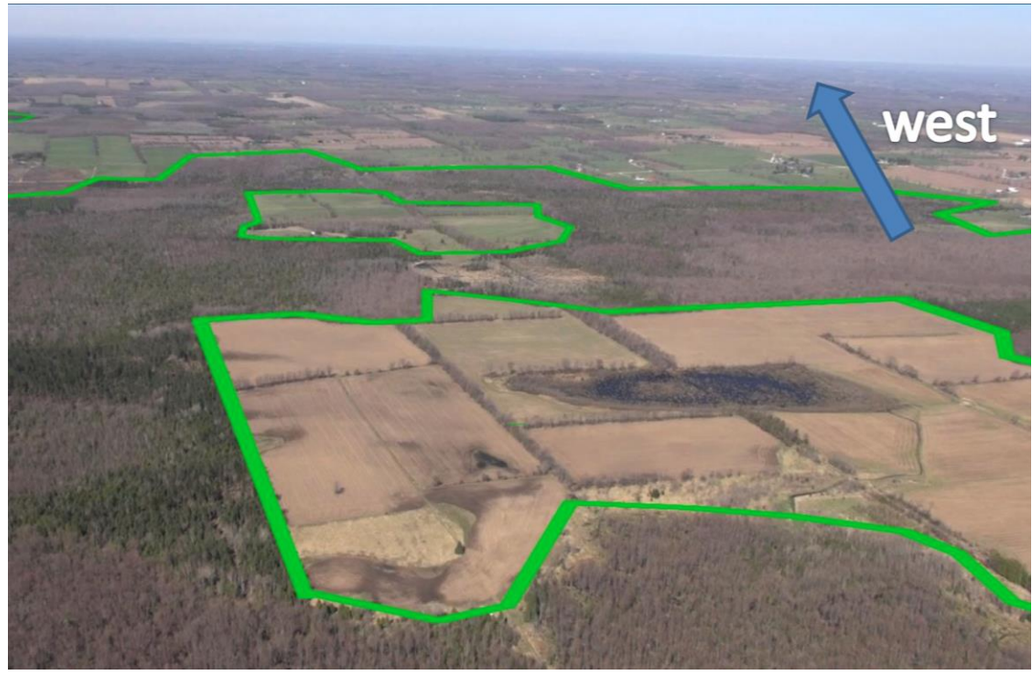


Figure 76. Grey County places "Holding" provisions on its natural features (Grey County, 2015).

Halton Region's *Natural Heritage Discussion Paper* proposes that policies be heavily grounded in the precautionary principle – an instrument that adopts a conservative approach when protecting the land where the effects of development are obscure (Natural Heritage Discussion Paper, 2020).

Recognizing the vulnerability of lake trout species in the face of development, the County's OP forbids new lot creation within 300 metres of the at-capacity lake trout lakes; however, should the precautionary principle be implemented, even as a temporary measure, the sensitive nature of lake trout and their historically unstable population could be guarded against further population dissipation.

Moreover, Section 2.1.8 of the PPS (2020) states that development proposed adjacent to designated natural heritage features (those outlined in Section 2.1.4, 2.1.5, and 2.1.6) must demonstrate no negative impact on the integrity of the features and their ecological functions. An EIS is a widely supported evaluation tool in Ontario, including Frontenac, that assesses the potentially harmful effects of a proposed development on a natural heritage feature or area. Section 7.4.1.10 of the County's Official Plan (2014) recognizes that the EIS is the most important tool in determining the effect of a development on or adjacent to natural heritage features. On the same basis, essential EIS guidelines supplement the implementation of the EIS. Both Halton and Guelph have notable examples of guidelines that include explicit details about the process of developing and conducting an EIS.

Multiple case studies note policies that support conservation programs which promote stewardship and restoration efforts, including land easements. The UCPR & SDG *Natural Heritage System Study* and *Essex Region NHS Strategy* suggest that OP policies, where possible, incentivize stewardship and restoration efforts for public and private landowners through agreements and partnerships. Similarly, land easements by the municipality or CAs are encouraged through Guelph's, Halton's, and Essex's natural heritage studies. Frontenac County should strongly consider adopting a securement strategy such as Halton Region's *Greenland's Securement Program* (2007), supported by the region's OP, which has an objective to "secure ownership or permanent stewardship of lands that will contribute to the overall quality of the Region's natural environment" (Regional Official Plan, 118(7)).

## 7.8 Monitoring and Continuous Evaluation ("Living Plan")

Plans, studies, and strategies that exemplify best practices in monitoring and continuous evaluation include:

- *Chittenden County ECOS Plan* (2018) (USA)
- City of Guelph's *Natural Heritage Action Plan* (2018)
- Halton Region's *Natural Heritage Discussion Paper* (2020)
- *Keeping Nature in Our Future: A Biodiversity Conservation Strategy for the South Okanagan-Similkameen* (2012)
- *Peel Watershed Regional Land Use Plan* (2019) (Yukon)
- Perth's *Regional Environmental Strategy 2016-2020* (2016) (Australia)
- *Queensland Regional Ecosystems* (2019) (Australia)

A strong plan, study, or strategy in this category has a monitoring component that allows for continuous evaluation and adaptation. Creating a 'living document' means building specific features into the document that encourage the evolution of information, initiatives, policies, etc. over time. This feature is especially important when designing a plan, study, or strategy that focuses on a long-term planning horizon of 50-to-100-years. For example, Perth's *Regional Environmental Strategy* highlights the benefits of establishing regular progress reviews, updates, or conferences, so local councils can monitor, evaluate, and report on their progress; Halton Region's *Natural Heritage Discussion Paper* is another good example of this concept.

Continuous evaluation of plans and strategies is a recommended approach to addressing changes and discrepancies, refining policies and initiatives, and protecting the NHS. For example, *Queensland Regional Ecosystems* includes a state-wide technical reference panel involving Herbarium bioregional coordinators and technical experts from other government departments to oversee standards in the state-wide framework. Regarding Frontenac County, having a regulated, standardized review process would hold stakeholders responsible while allowing the 'living document' to change and adapt.

Several case studies recommend that review processes should occur approximately every year to eight years, which should be determined upon the publication of the document. The timeline of this process depends on several factors including indicators such as data collection timelines. The Okanagan Region's *Biodiversity Conservation Strategy* refers to these as success indicators, which enable evaluation of strategic directions of policies, collaborative tools, stewardship initiatives, land use planning tools, etc. While budget constraints can affect the quantity and quality of indicators and the turnover of information, Frontenac County's next natural heritage study could incorporate approaches from any number of these case studies. Chittenden County in particular established 90 indicators to measure the progress of goals determined in their *ECOS Plan*. The number of indicators, however, is less important than ensuring that indicators are capturing all aspects of the study that need to be reviewed to guide and prioritize actions.

Several case studies recommend engaging communities through stewardship campaigns and citizen science. Community participation can help to leverage local knowledge and increase Frontenac County's capacity to engage in monitoring and evaluation programs. For example, the Okanagan Region's *Biodiversity Conservation Strategy* recommends sharing progress using innovative and engaging ways, such as community celebrations, field trips, awards for biodiversity champions, and high-profile media events. Strategies like these are accessible to Frontenac County and have already been incorporated in the County in the past, for example, by collaborating with post-secondary institutions. Online engagement and education programs are also recommended, given the vastness of Frontenac County and the virtual realities of younger audiences. Additionally, the City of Guelph is pursuing collaboration with neighbouring municipalities and partner agencies, such as their local conservation authority. This too is an important consideration for Frontenac County given the regional scope of the next natural heritage study and the benefits of cross-boundary collaborations, especially for monitoring and evaluation.

Regarding natural heritage planning and management, monitoring should include well-established ecological indicators (as mentioned in the Okanagan Region's *Biodiversity Conservation Strategy*) to monitor the plan's progress. Innovative practices for conducting environmental monitoring, require solid baseline data. For example, *Queensland Regional Ecosystems* identifies a biodiversity systems modernisation program, which is a database that automatically updates information, such as terminology variations. This framework builds on having a strong monitoring program, which provides information about the effectiveness of management practices and impacts to biodiversity. Additionally, building on a strong volunteer base not only leverages social capital but also perpetuates sustainable education and practices across the region. Halton Region's *Natural Heritage Discussion Paper* recommends consulting stakeholders to update and improve information and maps. For Frontenac County this would include collaborating with CAs, the Frontenac Biosphere Arch Network, lake associations, and more, who already engage in knowledge-sharing and may have monitoring systems in place.

Frontenac County already employs cumulative effects indicators. The *Peel Watershed Regional Land Use Plan*, however, shows that defining various landscape management units throughout the region can create an inventory of human-caused surface disturbances, which can provide a clearer representation of the potential impacts of future development. Data collection should be obtained from diverse sources, as mentioned in the City of Guelph's *Natural Heritage Action Plan* which intends to collect data from weather, river and stream flow, water quality, groundwater, and ecological monitoring stations, many of which are updated in real time. Guelph has also included the innovative idea of requiring post-construction monitoring for new developments to help evaluate the effectiveness of mitigation measures, thereby enabling adaptive management. Frontenac County could benefit from these practices by considering them in its next natural heritage study, especially regarding environmental impact assessment.

## 7.9 Model Evaluation

The following quotation from the *Queensland Regional Ecosystems* case study captures the importance of mapping in regional natural heritage planning:

> "Never underestimate the power of a map. Policies and laws to manage and conserve biodiversity depend on simple words and tools to represent complex ecological concepts. The 'regional ecosystem' unit, and the maps created to show these, are superlative examples. … Vague assertions were replaced with visually tangible lines, colours, numbers and statistics which transformed the conversation with decision-makers and the wider community forever. Regional ecosystem mapping has given us an enduring tool that has (thankfully) improved with age." (Neldner et al., 2019, pp. 40)

The following plans, strategies, and studies exemplify the best practices in non-Marxan mapping models that can be applied to Frontenac County:

- *Queensland Regional Ecosystems* (2019) (Australia)
- *Nature Without Borders: Comox Valley Conservation Strategy* (2013)
- *Parkland County Environmental Conservation Master Plan* (2014)
- *Essex Region Natural Heritage System Study* (2013)
- *Peel Watershed Regional Land Use Plan* (2019) (Yukon)

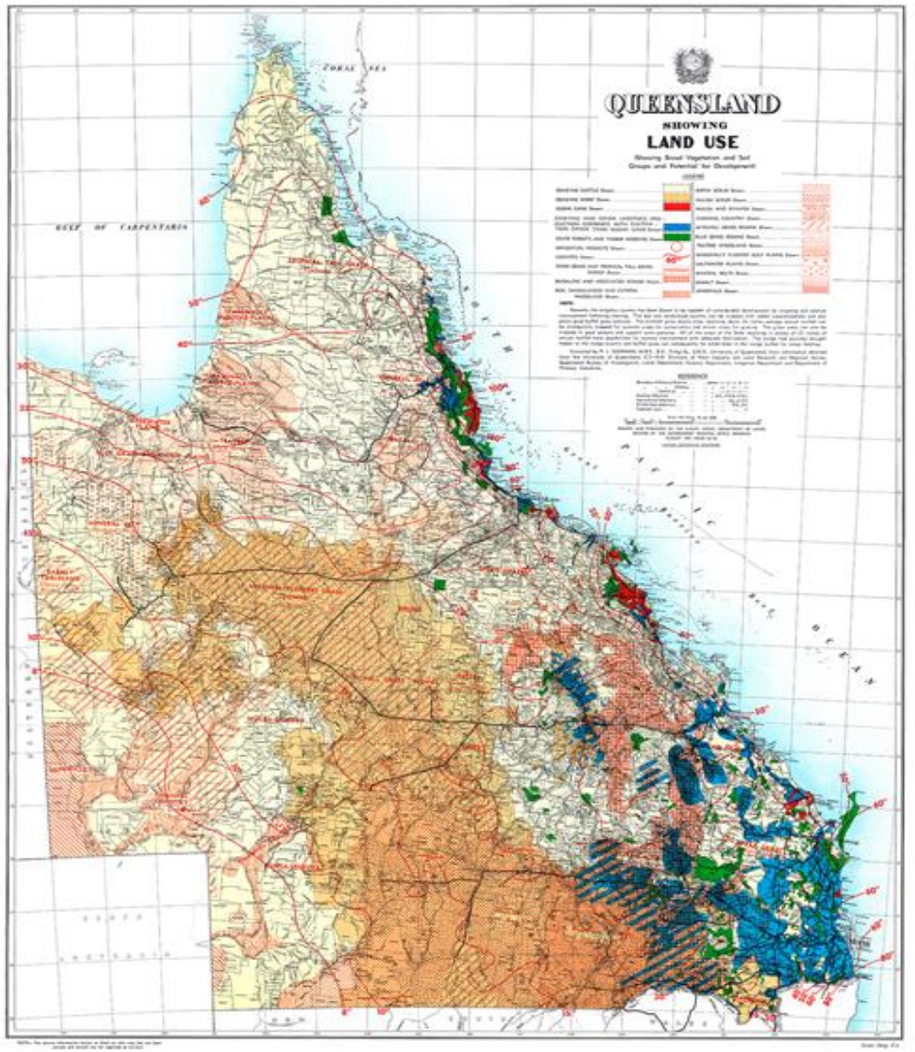
The *Queensland Regional Ecosystems* is a world-class mapping product that draws on vegetation mapping and surveys in Queensland, Australia, that have been compiled since 1946. In 1995, Australia's Environmental Protection Agency adopted the regional ecosystem framework as the biodiversity framework for the state of Queensland, and the Queensland Herbarium Regional Ecosystem Survey and Mapping (QHRESM) program was developed by the Queensland Herbarium to produce a "consistent, seamless, versatile, best-practice and legally-defensible 1:100,000 scale regional ecosystem coverage of the state of Queensland" (Nelder, Butler & Guymer, 2019, pp. 9). It is legally defensible under the *Queensland Vegetation Management Act 1999*, which regulates the clearing of vegetation in a manner that prevents biodiversity loss, maintains ecological processes, and allows for sustainable land uses (State of Queensland, 2019). The legislation and mapping system operate together by linking a spatial mapping framework and information system with implementation and regulation.

All maps are prone to some degree of error whether through misinterpretation of patterns on imagery or human error in the transcription process. However, because the RE maps are important regulatory tools that affect landowners' ability to manage their vegetation and natural resources, the RE maps are

heavily scrutinized, and in-house assessments indicate that the accuracy of the QHRESM program is likely greater than 90 percent.

The vegetation mapping program continues to improve through widespread use and ongoing ecological site data collection. For Frontenac County, a region with a vast NHS, it may be difficult to identify the appropriate conservation tools needed for different areas. Achieving mapping data accuracy across the region could increase the quality of conservation efforts and better direct the necessary actions to protect the NHS in the long-term. Complete data accuracy may not be possible, but Queensland's leadership in this field demonstrates the accuracy level possible when a region invests time and resources into its mapping program over the long-term. Moreover, delivering the regional ecosystem framework through a single agency has ensured mapping coordination and consistency across the State's 1.73 million square kilometres of land.

Similarly, the *Nature Without Borders: Vision for Comox Valley Conservation Strategy* (CVCS) recognizes that a significant challenge in developing a regional strategy is that the local governments in the Valley do not use a common mapping system (tools, methods, and protocols); therefore, the accuracy of the compiled maps is affected by variations in the original format of the information. The CVCS has capitalized on the opportunity to improve the Valley's data-sharing mechanisms by developing several mapping tools which can be used to identify the priority conservation areas. The Conservation Database was created by the Comox Valley Land Trust to act as a searchable Community Conservation Features Database containing conservation reports and land use plans. These features map out "conservation significance" and document the environmental and cultural values, as well as specific




Map 6. Queensland's Mapping of Broad Vegetation and Soil Groups, as well as Potential for Development (Queensland Government, n.d.).

conservation recommendations made by the authors of the respective plans. A Regional Conservation Atlas acts as a comprehensive library of digital map layers intended to support existing online map applications by providing high-level conservation and land use information to anyone with internet access. Further, the Regional Priorities Map acts as a guide for regional planners and decision-makers; however, it is merely used for illustrating the minimum requirements for protecting the natural areas network over the long-term. Frontenac County could develop similar initiatives to ensure the County and four Townships use consistent and accurate mapping systems.

Consistent with the theme of data accuracy, a major phase of producing Parkland County's mapping is field reconnaissance, which involves ground-truthing for accuracy. This includes looking at aerial photos, driving public access roads, and flying over the County. The *Parkland County Environmental Conservation Master Plan* employs field reconnaissance, as well as data analysis, stakeholder engagement, and public consultation to create map overlays for Environmentally Significant Areas (ESA). These overlays are then overlapped using GIS to effectively map each ESA identified in the County.

Figure 77. Example of Field Reconnaissance (Raedeke Associates Inc., 2006).

The *Essex Region Natural Heritage System Strategy* (ESRHSS) also uses layers and overlapping to map significant and other natural heritage features. The ESRHSS includes a map with all the layers for each municipality in the region. Frontenac County could use layered, overlapping mapping to ensure that all significant elements of the NHS are mapped from a variety of perspectives. The approach of creating maps with overlays for each municipality is an approach that could benefit Frontenac County as it magnifies each municipality's NHS rather than using a 'big-picture' concept that could miss the region's biodiversity.

The *Peel Watershed Regional Land Use Plan* approaches mapping by identifying landscape management units (LMUs). These LMUs identify and organize spatial units around distinct areas of land with similar ecological properties, similar planning issues, and management intent. The mapping of LMUs considers significant wildlife and fish habitat, heritage, social, and cultural resources, economic development, and other special considerations. The significant wildlife and fish habitat accounts for caribou, Dall sheep, moose, marten, grizzly bears, peregrine falcon, birds,

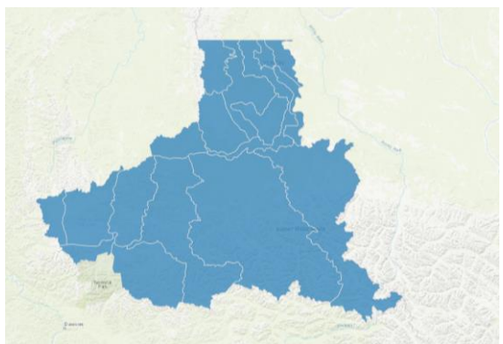


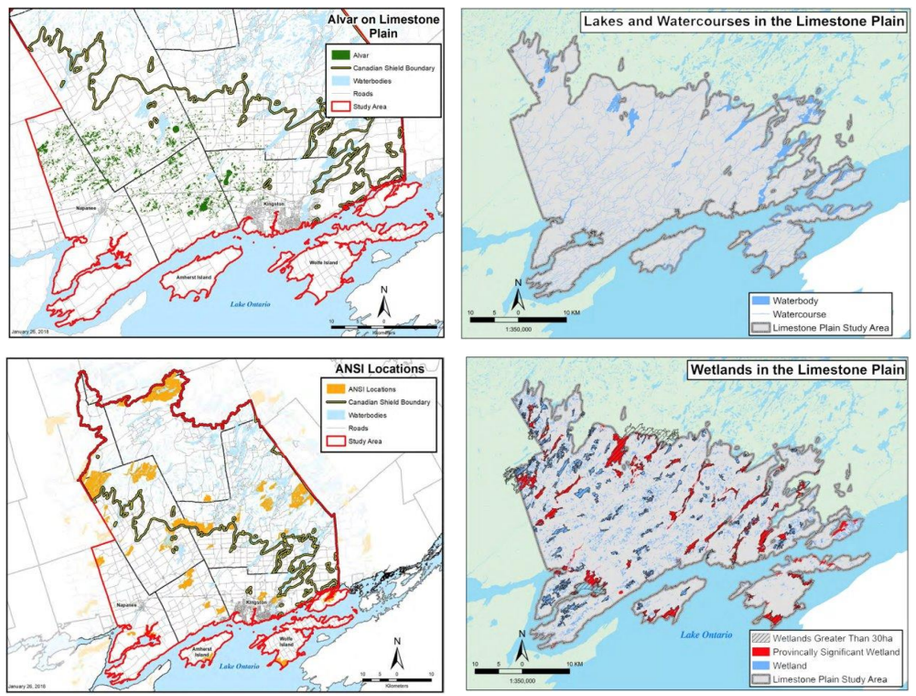
Figure 78. Peel Region Watershed LMU Layer on GIS (Yukon Metadata, 2021).

wetlands, lakes, riparian areas, vegetation, and permafrost. Heritage, social, and cultural resources account for additional territories, travel routes, heritage resources, and paleontological resources. Economic development accounts for traditional economies, transportation and access, big game outfitting and trapping, recreation and tourism, forestry, gas and oil extraction, and mineral extraction. Special consideration accounts for the vicinity of the Dempster Highway corridor, major river corridors, core habitat locations/species at-risk habitats, administrative boundaries between traditional territories, and natural hazards. All these aspects are mapped and used to define the 16 LMUs throughout the region. Frontenac County could use a similar framework to identify areas that require conservation actions or policies.

Other notable mapping practices are seen in the following cases:

- UCPR & SDG *Natural Heritage Study* (2021)
- *Mapping of a Natural Heritage System in the County of Wellington* (2018)
- *Grey County Natural Heritage System Study* (2017)
- Halton Region's *Natural Heritage Discussion Paper* (2020)
- *Keeping Nature in Our Future: A Biodiversity Conservation Strategy for the South Okanagan-Similkameen* (2012)
- *Oxford Natural Heritage System Study* (2016)

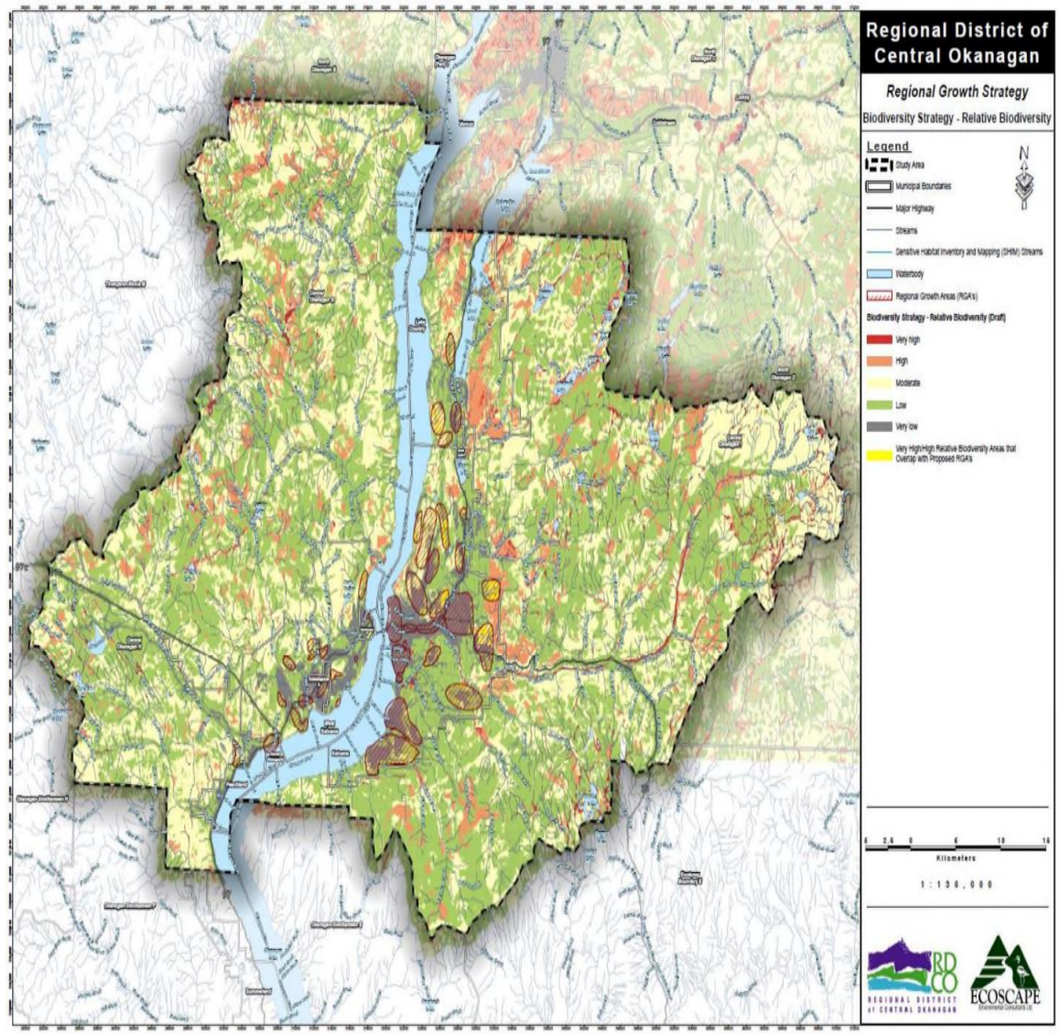
These cases employ a combination of methods and/or models in the creation of their maps. The UCPR & SDG *Natural Heritage Study* and the *Mapping of a Natural Heritage System in the County of Wellington* use the Marxan model or similar framework for their NHS mapping. Both plans then use a least-cost corridor/path model to identify least-cost paths between identified cores where migration is easiest. 'High cost' is assigned to paths where factors reduced the viability of linkages. For the UCPR & SDG's study, additional maps with landscape features that impact wildlife movement are layered over the cost map with an associated multiplier that would increase or decrease costs. This approach is less applicable to Frontenac County's predominately contiguous natural landscape but could be used in areas with high development pressures to prevent the impairment of wildlife migration. A highlight of the UCPR & SDG's approach is that mapping is cross-jurisdictional, an important consideration in NHS planning as natural systems do not follow regulatory/political boundaries.




Map 7. Examples of overlays for the Limestone Plain from the Natural Heritage Plan for the Conservancy of Kingston, Frontenac, Lennox, and Addington (North-South Environmental, 2018).

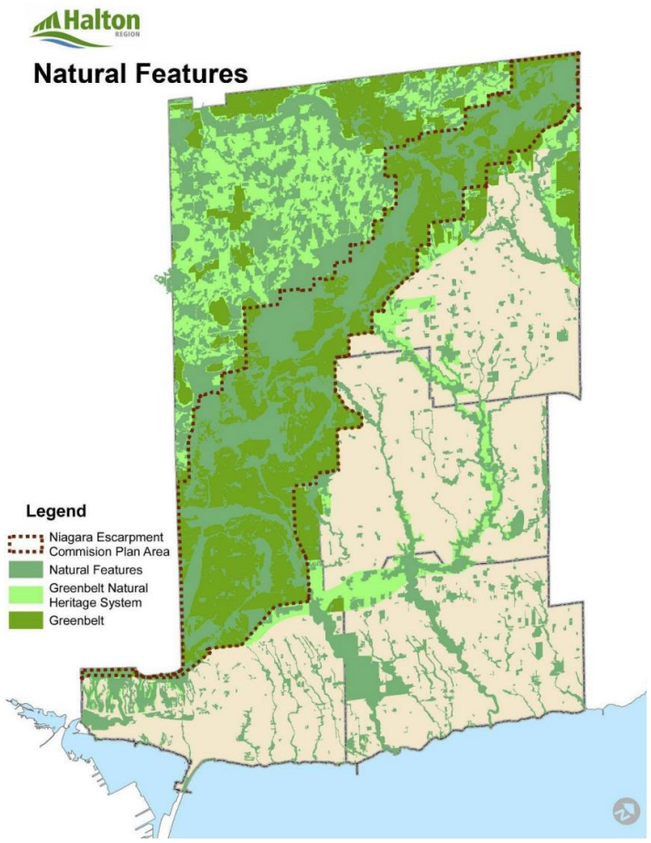
The *Grey County Natural Heritage Study* employs a model similar to Marxan in the development of its NHS map. Large interior forests are the fundamental identification for Core Areas. The *Study* defines these interior habitats as areas 100 metres from the edge whereas 'deep' interior habitats are those with a 200 metres distance, or more, from the edge. Large interior habitats are then clustered to form the 'Mega-patches,' which inform the boundary line of Core Areas. Linkages are established based on areas with the most amount of natural cover and that are the shortest distance between Core Areas. Frontenac County can benefit from such an approach, considering it has an abundance of forestry which provide deep interior habitats. A prioritization model could also be applied to wetlands, as these features are known to have the greatest values in terms of providing ES, and Frontenac County has abundant wetlands. Finally, Halton Region's *Natural Heritage Discussion Paper*, the *Biodiversity Conservation Strategy for the Okanagan Region*, and the *Oxford Natural Heritage Study* use a variety of methods in mapping worth brief discussion. The *Oxford Natural Heritage Study* measures and assesses woodlands and natural areas on a landscape-scale using ortho-imagery (air photos) and Geographic Information Systems (GIS). Nine scientific criteria are used to determine which patches are "ecologically important" on the County-scale. Information on Oxford's watercourses are compiled from earlier studies with additional sampling to fill gaps. The watercourses are categorized into three system types and mapped.

The *Biodiversity Conservation Strategy for the Okanagan Region* uses biodiversity conservation analysis and baseline data to inform four types of mapping: wildlife habitat connectivity; relative biodiversity; land management classes; and conservation opportunity maps. It should be noted that field studies and community consultation were not included in the creation of these maps.




Map 8. Okanagan Regional Growth Strategy - Biodiversity Strategy (Okanagan Collaborative Conservation Program, 2014).

The Halton Region combines a systems approach, minimum standards, enhanced ecological integrity, and the concept of centres of biodiversity. In total, approximately 52.8 percent of Halton Region's NHS is proposed to be protected based on their mapping approaches. Frontenac County should consider using a variety of mapping models/methods as its NHS is quite large and diverse.




Map 9. Halton Region Natural Features (Halton Region, 2009).

Figure 79. Population Forecasts, Frontenac County (Watson and Associates, 2020).

# 8.0 The Framework

The precautionary principle and the long-term planning theme guide the following recommendations in a direction that encompasses the complexities of Natural Heritage System (NHS) planning; together these themes support a future of ecosystem preservation and community resiliency.

**Precautionary principle |** The precautionary principle is based on a humble respect for the complexities of ecosystems; it rests on the assumption that synergies between overlapping ecosystems can never be fully understood by scientific data, and therefore the full effects of human activities on ecosystems can never be predicted with absolute certainty. Thus, lack of full scientific certainty shall not be deemed a reason to delay measures to prevent environmental deterioration. The precautionary principle, as a framework for ecological decision making, has four central components: "taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents/developers of an activity; exploring a wide range of innovative alternatives to possibly harmful actions; and increasing public participation in decision making" (Kriebel et al., 2001).

**Long-term planning |** Long-term planning enables communities to work toward ambitious, collective goals. Planning horizons of 50-to-100-years should be based on meaningful community visioning processes that foster intergenerational solidarity and knowledge-sharing. Long-term horizons make complex challenges more approachable by creating living plans that evolve as the community adapts to change. Thus, long-term planning supports both community resiliency and shorter-term accountability for steps taken to achieve the collective vision, and the long-term planning lens brings meaningful perspective to shorter-term community objectives.

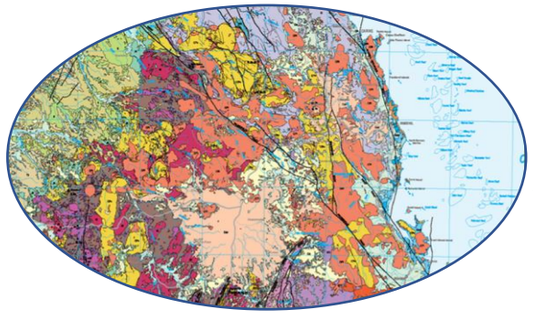
Figure 80. Crotch Lake, North Frontenac (Maurer, n.d.).

1. Enhance Legal Protection


2. Plan with Indigenous Peoples

3. Protect Critical Ecosystems

RECOMMENDATIONS



6. Invest in Models

5. Connect People to the Landscape

4. Build on Opportunities for Stewardship

Figure 81. Bon Echo Provincial Park (Lam, 2018).

Table 6. Each action item for the associated recommendations is classified as foundational or complementary.

| | |
|---|---|
| **Priority**—The recommended order to complete actions, indicates whether an action is intended for the future natural heritage study | |
| 1 | **Foundational**—Items intended for the natural heritage study to establish a vision for long-term natural heritage protection |
| 2 | **Complementary**—Items that work with the natural heritage study to supplement the foundational items or support the natural heritage system for the long term |

## Recommendation 1. Enhance legal protection

Frontenac County's NHS requires better legal protection. The County should adopt stronger policies to legally and proactively protect its rich natural environment for the long-term in the face of development pressure; doing so will also preserve Frontenac's rural cultural identity. Section 2.1 of the 2020 Provincial Policy Statement (PPS) provides the legal basis for long-term, precautionary natural heritage planning; furthermore, the PPS does not restrict governing bodies from going above and beyond its prescribed minimum standards. NHS studies and environmental plans were analyzed to identify policies used elsewhere to protect NHSs and features. The following objectives and action items suggest how Frontenac County could improve its existing policies or consider implementing new ones that are not already explored in its Official Plan (OP). The recommendation has four measurable objectives supplemented by action items that will assist Frontenac County to achieve them.

Figure 82. Frontenac County Council (Frontenac County Twitter, 2019).

**Recommendation 1.1 Update Frontenac County's Official Plan policies -** Adopt innovative and/or novel planning tools such as conservation zoning or Holding/Conditional provisions for natural heritage features and areas in the NHS.

1.1.A Implement a dual designation approach to allow for the coexistence of important land uses and the natural heritage systems (e.g. land uses that dually designate an area for Prime Agriculture and its role in the NHS).

1.1.B Identify and encourage, through policy, sustainable land uses such as naturalized gardens or native species landscaping; small-scale, regenerative food production; and bioswales or other sustainable stormwater facilities.

1.1.C Apply the precautionary principle and long-term planning lens to policies that affect-capacity lake trout lakes and headwater areas.

**Recommendation 1.2 Assign economic value to natural heritage components**

1.2.A Develop a natural asset inventory based on the annual economic value of ES provided by natural heritage components.

1.2.B Integrate Green Infrastructure (natural heritage, water resource system, and ecological goods and services) into the County's Asset Management Plan and strategically manage these natural assets.

**Recommendation 1.3 Legitimize "regionally or locally significant" features and areas in the NHS**

1.3.A Regionally or locally significant natural heritage features should be identified through a collaborative process that engages residents, municipal partners, Indigenous Peoples, and other interest groups.

1.3.B Develop policies that protect regionally or locally significant (environmental, economic, social, or cultural value) natural heritage features within the broader NHS.

**Recommendation 1.4 Satisfy the need for new processes, guidelines, and supporting documents related to policies to protect the NHS**

1.4.A Update the Environmental Impact Study (EIS) guidelines. Conduct a scoping activity at a pre-submission consultation meeting and develop a Terms of Reference to identify the studies, surveys, screenings, or other work that needs to be completed.

1.4.B Support the current OP policies surrounding conservation easements by developing a securement strategy and corresponding guidelines and outline legal precedence of the conveyed land, should conflicts arise.

1.4.C Establish Rural Design Guidelines that can be referenced in the development approval process. Design should center around natural heritage, for instance, by providing a glossary for aesthetic features such as night skies or views capes (cottages on lakes).

1.4.D Develop a values-based set of sustainability standards that can be used in the pre-consultation planning stage to communicate to developers the Region's expectations of sustainable development (E.g., a Regionally-relevant version of the United Nations Sustainable Development Guidelines).

1.4.E Create a region-wide at-capacity lake trout lake assessment strategy with supporting guidelines. Included in the process should be consultation with the proponent, County, local township, respective Conservation Authority (CA) and other relevant stakeholders.

Table 7. Priority for Recommendation 1 action items

| Objectives | Action Item | Priority |
|---|---|---|
| 1.1 Update Frontenac County's Official Plan policies | 1.1.A. Adopt innovative and/or novel planning tools. | 1 |
| | 1.1.B. Implement a dual designation approach. | 1 |
| | 1.1.C. Identify and encourage, through policy, sustainable land uses. | 2 |
| | 1.1.D. Apply the precautionary principle and long-term planning lens. | 2 |
| 1.2 Assign economic value to natural heritage components | 1.2.A. Develop a natural asset inventory. | 2 |
| | 1.2.B. Incorporate Green Infrastructure in the County's Asset Management Plan. | 1 |
| 1.3 Legitimize "regionally or locally significant" features and areas in the NHS | 1.3.A. Identify regionally or locally significant natural heritage features. | 1 |
| | 1.3.B. Develop policies that protect regionally or locally significant natural heritage features. | 1 |
| 1.4 Satisfy the need for new processes, guidelines, and supporting documents related to policies to protect the NHS | 1.4.A. Update the Environmental Impact Study guidelines. | 1 |
| | 1.4.B. Develop a securement strategy and corresponding guidelines. | 2 |
| | 1.4.C. Establish Rural Design Guidelines that can be referenced in the development approval process. | 2 |
| | 1.4.D. Develop a values-based set of sustainability standards to be used in the pre-consultation planning stage. | 1 |
| | 1.4.E. Create a region-wide at-capacity lake trout lake assessment strategy with supporting guidelines. | 2 |

## Recommendation 2. Plan with Indigenous Peoples

This principle stresses the importance of partnering with Indigenous rightsholders to create meaningful, reciprocal, and long-term relationships, as well as facilitating the genuine participation of Indigenous Peoples in decision-making processes. Indigenous Peoples and communities have a rich knowledge and interconnected understanding of place. Thus, planning with Indigenous Peoples with regard to natural heritage systems represents the opportunity to learn and deepen connection with the land, enabling the better protection and preservation of the natural environment. Planning with Indigenous Peoples must be oriented towards Free, Prior and Informed Consent (FPIC), beyond the Duty to Consult, and oriented towards upholding the *United Nations Declaration on the Rights of Indigenous Peoples* (*UNDRIP*) and the recent federal *UNDRIP Act.*


Figure 83. Algonquins of Pikwakanagan First Nation Health Centre (Algonquins of Pikwakanagan, 2018).

### Recommendation 2.1 Establish a firm commitment to undertake meaningful engagement

2.1.A Adopt an Indigenous Engagement Plan to ensure all Indigenous rightsholders with an interest in the County's NHS have the full opportunity to share input and have their knowledge included in the study.

2.1.B Hire an Indigenous consulting firm to help guide a framework focused on creating spaces to learn, share, and foster respectful, reciprocal relationships.

### Recommendation 2.2 Facilitate opportunities for knowledge-sharing

2.2.A Consider the use of workshops, walks, and site visits to facilitate the sharing of Traditional Ecological Knowledge (TEK) and Indigenous Knowledge (IK), including the identification of specific Indigenous values, interests, and priorities for inclusion in a new study.

2.2.B Consider the incorporation of TEK into baseline data for wildlife and vegetation as well as the study's mapping model.

2.2.C Work with Indigenous communities to learn about and educate the public on the interconnectedness of Indigenous rightsholders, the land, and their important role in protecting it.

Table 8. Priority for Recommendation 2 action items

| Objectives | Action Item | Priority |
|---|---|---|
| 2.1 Establish a firm commitment to undertake meaningful engagement | 2.1.A. Adopt an Indigenous Engagement Plan. | 1 |
| | 2.1.B. Hire an Indigenous consulting firm. | 1 |
| 2.2 Facilitate opportunities for knowledge-sharing | 2.2.A. Consider the use of workshops, walks, and site visits to facilitate the sharing of TEK and IK. | 2 |
| | 2.2.B. Consider the incorporation of TEK into baseline data for wildlife and vegetation as well as the study's mapping model. | 2 |
| | 2.2.C. Work with Indigenous communities to learn about and educate the public on the interconnectedness of Indigenous rightsholders, the land, and their important role in protecting it. | 1 |

## Recommendation 3. Protect critical ecosystems

Conservation of the healthy ecosystems in Frontenac County is crucial to maintaining the abundant natural resources and habitat availability for non-human species and people's enjoyment. A landscape ecology approach must be adopted to acknowledge that a mosaic of patches provides resiliency to the ecosystem. Rather than giving precedence to connectivity and corridors (which is inappropriate in the context of Frontenac County due to the abundance of natural features), prioritize and redefine core areas of wetlands, valleylands, and woodlands. In order to enforce protection of these areas, establish reliable monitoring to uphold ecological integrity and observe indicators of ecosystem health, such as biodiversity, species richness, and abundance, over time. Protect critical ecosystems by identifying areas that demand reclamation in order to restore ecosystem health. Preservation of Frontenac's natural heritage features will balance continual improvements and ecosystem monitoring while ensuring that no irreparable damage is caused.

Figure 84. Algonquin Provincial Park (Ye, n.d.).

### Recommendation 3.1 Adopt a landscape ecology approach

3.1.A Adopt a landscape ecology approach to prioritize core areas rather than linkages due to the already connected landscape of Frontenac County.

### Recommendation 3.2 Redefine "core areas"

3.2.A Redefine and broaden the requirements of a patch to be considered a "core area" in order to capture larger swaths of land that can be officially protected.

### Recommendation 3.3 Ensure consistent and ongoing monitoring

3.3.A Establish the natural heritage plan as a "living document" that adapts across a long-term planning horizon by conducting consistent and reliable monitoring of core areas to observe indicators of ecosystem health.

3.3.B Collaborate with stakeholders, agencies, citizens, and Indigenous rightsholders to establish strong baseline data and maps which can be used in the monitoring process

### Recommendation 3.4 Identify areas for reclamation

3.4.A Identify areas that are in need of reclamation and restorative practices or that may, in the foreseeable future, become vulnerable to invasive species and ecological collapse.

Table 9. Priority for Recommendation 3 action items

| Objectives | Action Item | Priority |
|---|---|---|
| **3.1** Adopt a landscape ecology approach | **3.1.A.** Adopt a landscape ecology approach to prioritize core areas. | 2 |
| **3.2** Redefine "core areas" | **3.2.A.** Redefine and broaden the requirements of a patch to be considered a "core area". | 1 |
| **3.3** Ensure consistent and ongoing monitoring | **3.3.A.** Establish the natural heritage plan as a "living document" that adapts across a long-term planning horizon. | 2 |
| | **3.3.B.** Collaborate with stakeholders, agencies, citizens, and Indigenous rightsholders to establish strong baseline data. | 1 |
| **3.4** Identify areas for reclamation | **3.4.A.** Identify areas that need reclamation and restorative practices. | 2 |

## Recommendation 4. Build on opportunities for stewardship

This principle highlights objectives and action items to strengthen Frontenac County's current engagement and stewardship opportunities regarding NHS planning and management. Engagement with stakeholders should be imbedded throughout the natural heritage study to form a collaborative vision and strategy for the long-term resiliency of Frontenac County's natural and cultural identity. Incorporate a variety of stewardship programs into the strategy to strengthen the capacity of policy implementation and monitoring using citizen science. Both engagement and stewardship programs should explore innovative opportunities that are accessible to a broad range of groups to allow for mutually beneficial knowledge-sharing and an increase in NHS protection.


Figure 85. Frontenac Stewardship Foundation Environmental Forum, Queen's Biological Station (Frontenac Stewardship Foundation, 2017).

### Recommendation 4.1 Create programming opportunities

4.1.A Build on current monitoring and engagement programs by leveraging groups already conducting education and stewardship work to overcome capacity limitations (e.g., work with the Frontenac Arch Biosphere Network and CAs to build on the education and stewardship programming already underway).

4.1.B Introduce policies that encourage partnerships between CAs, lake associations, community land trusts, community organizations, and academic institutions to create internship and volunteer positions for students in biology, geography, environmental sciences, etc.

### Recommendation 4.2 Implement effective engagement

4.2.A. Use a variety of engagement tactics to allow community members to participate in NHS planning processes. In addition to interviews, open houses, surveys etc. the community can incorporate creative methods such as community murals, portraits, youth creative writing, which can be led by groups such as the Kingston Arts Council and the Kingston School of Art.

4.2.B. Use a combination of centralized and decentralized methods of engagement, which are important for a rural community, including online options such as framework training, educational packages, and maps for those who cannot participate in in-person meetings.

4.2.C. Introduce an "Equity Coordinator" position to meet with representatives from various community groups and community leaders of marginalized groups to ensure the NHS planning processes consider underrepresented people's views.

### Recommendation 4.3 Facilitate knowledge-sharing

4.3.A Incorporate innovative stewardship programs built on social and cultural values that integrate citizen science into the monitoring process to strengthen monitoring capacity and foster community support for policies based on data collected through the stewardship programming.

4.3.B Implement ongoing education, cross-regional programs, strategic counselling, and technical support and research, to support a positive relationship between residents and policies implemented to protect the natural heritage system.

4.3.C Partner with academic institutions such as Queen's University, St. Lawrence College, and Elbow Lake Environmental Education Centre to help facilitate community engagement and education.

4.3.D Explore the idea of an ecology speaker series, or an annual conference event, for the public in partnership with local organizations and academic institutions. These events could discuss the region's most pressing environmental and planning issues and keep the public up to date on the latest initiatives in the County.

### Recommendation 4.4 Partner with private landowners

4.4.A Distinct strategies or incentives should be available for private landowners with different land tenures to implement the relevant conservation practices or applicable policies.

4.4.B Develop a "Homeowner's Guide" to provide homeowners with tools to incorporate nature-inclusive design components such as green roofs, green walls, pollinator gardens, vegetable gardens, pocket forests, medicine gardens, bird feeders/ houses, etc.

- Homeowner's Guide could include an online environmental guide that includes information about environmental stewardship, trees, landscaping, water, energy, conservation, rebates, waste management, transportation, and air quality. The goal of this program would be to create behavioral changes based on communicating the impacts that certain actions have on the natural heritage system.

4.4.C Collaborate with Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) funding opportunities to educate and financially assist local farmers who undertake sustainable and/or regenerative farming practices.

Table 10. Priority for Recommendation 4 action items

| Objectives | Action Item | Priority |
|---|---|---|
| 4.1 Create programming opportunities | 4.1.A. Leverage groups already conducting education and stewardship work to overcome capacity limitations. | 2 |
| | 4.1.B. Encourage partnerships to create internship and volunteer positions. | 2 |
| 4.2 Implement effective engagement | 4.2.A. Use a variety of engagement tactics to allow community members to participate in NHS planning processes. | 1 |
| | 4.2.B. Use a combination of centralized and decentralized methods of engagement. | 1 |
| | 4.2.C. Introduce an "Equity Coordinator" position. | 1 |
| 4.3 Facilitate knowledge-sharing | 4.3.A. Incorporate innovative stewardship programs built on social and cultural values. | 1 |
| | 4.3.B. Implement ongoing education, cross-regional programs, strategic counselling, and technical support and research. | 2 |
| | 4.3.C. Partner with academic institutions to lead educational events. | 1 |
| | 4.3.D. Explore the idea of an ecology speaker series for the public. | 2 |
| 4.4 Partner with private landowners | 4.4.A. Distinct strategies or incentives should be available for private landowners. | 2 |
| | 4.4.B. Develop an online "Environmental Handbook for Homeowners". | 2 |
| | 4.4.C. Collaborate with OMAFRA to assist local farmers who undertake sustainable and/or regenerative farming. | 2 |

## Recommendation 5. Connect people to the landscape

Frontenac County should formalize a set of *relational values,* which incorporate both intrinsic and instrumental values, and create a vision of shared well-being that connects humans and nature in a joint future. Incorporating anthropocentric features into the evaluation of the NHS would legitimize diverse forms of knowledge and enrich the overall rigour of the mapping networks. Moreover, creating more linkages between recreational trails and the NHS opens up opportunities for community connection, exploration, and adventure.

Figure 86. K&P Trail (Ontario Trails, n.d.).

### Recommendation 5.1 Incorporate place-making values

5.1.A Go above and beyond what the *Natural Heritage Reference Manual* classifies as a "natural feature" to include features that have aesthetic or "place-making" importance. For example, scenic views ("viewscapes") along cottages and lakes, or night skies. This also helps protect recreational landscapes, which is important to the region's economic vitality because tourists come to Frontenac for its aesthetic outdoor experiences.

5.1.B Consider the relationship between nature and mental health when classifying features of local significance. Having nice places to live and access to nature that is well-thought-out improves our mental and physical health, and this should be incorporated into the next strategy for natural heritage protection. Moreover, protecting outdoor areas that are used for festivals and gatherings helps integrate cultural significance into NHS planning.

### Recommendation 5.2 Establish a regional vision

5.2.A Create a concise Vision in the form of a regional charter that states a balance between NHS preservation and recreation by unifying the cultural, historical, and natural identities from the four Townships and Indigenous communities.

5.2.B The Vision could be accessible on the "Regional Priorities" webpage, merging with the ideas of the County's *Economic Charter* and the *Regional Brand.*

### Recommendation 5.3 Explore green infrastructure opportunities

5.3.A Develop a green infrastructure Master Plan for Frontenac County to map out the existing greenway recreational trails, to identify opportunities for effective linkages, and to establish a system that can create additional connections between the surrounding communities.

- Examples of existing recreational networks in the County include regional multi-use pathways, local connector pathways, boardwalks, mountain-biking paths, and pedestrian bridges.
- Explore how different pervious and sustainable surfaces can be used in greenways so that they may be located adjacent to sensitive ecosystems, habitat areas, and forestry and agriculture lands.
- Classify the ecosystem services (ES) associated with green infrastructure, such as life-supporting services including filtering and supplying water, treating waste, and managing stormwater.
- Integrate a climate change lens into the classification of green infrastructure services so that mechanisms can be established to respond to the risks of flooding or other natural disasters that are associated with environmental degradation and climate change.

### Recommendation 5.4 Develop a holistic approach to growth

5.4.A Integrate wastewater management with natural heritage planning, particularly through topical economic initiatives such as communal servicing.

- Consider the principle that *quality-oriented inward settlement development enhances landscape quality* when designing and developing settlements. Inward settlement may utilize higher housing densities, which may not be properly serviced by private septic systems. Therefore, the location of future communal services will have an immense long-term impact on where growth concentrates in Frontenac County, and this factor should be integrated with natural heritage planning.
- Develop a long-term visioning exercise where community residents can imagine what the future of their settlements will look like in 100 years. This can incorporate several cultural values, such as aging-in-place.

Table 11. Priority for Recommendation 5 action items

| Objectives | Action Item | Priority |
|---|---|---|
| 5.1 Incorporate place-making values | 5.1.A. Go above and beyond what the *Natural Heritage Reference Manual* classifies as "natural features" to include features that have aesthetic or "place-making" importance. | 1 |
| | 5.1.B. Consider the relationship between nature and mental health when classifying features of local significance. | 1 |
| 5.2 Establish a regional vision | 5.2.A. Create a concise Vision in the form of a regional environmental or sustainability charter. | 2 |
| 5.3 Explore green infrastructure opportunities | 5.3.A. Develop a green infrastructure Master Plan for Frontenac County. | 2 |
| | 5.3.B. Explore how different pervious and sustainable surfaces can be used in greenways. | 2 |
| | 5.3.C. Classify the ES associated with green infrastructure. | 1 |
| | 5.3.D. Integrate a climate change lens into the classification of green infrastructure services. | 1 |
| 5.4 Develop a holistic approach to growth | 5.4.A. Integrate wastewater management with natural heritage planning. | 1 |
| | 5.4.B. Develop a long-term visioning exercise where community residents can imagine what the future of their settlements will look like in 100 years. | 2 |

## Recommendation 6. Invest in models

This principle pertains to key objectives and supporting actions for maximizing the potential in modelling Frontenac County's NHS in order to identify key areas and features and characterize them as a whole system. Mapping as a modeling tool allows for complex natural systems to be represented in planning and policy with tangible lines, colours, numbers, and statistics, which go beyond vague or simple words. Maps serve as a communicative tool that can facilitate understanding of the NHS for those who may not be knowledgeable in natural heritage planning.

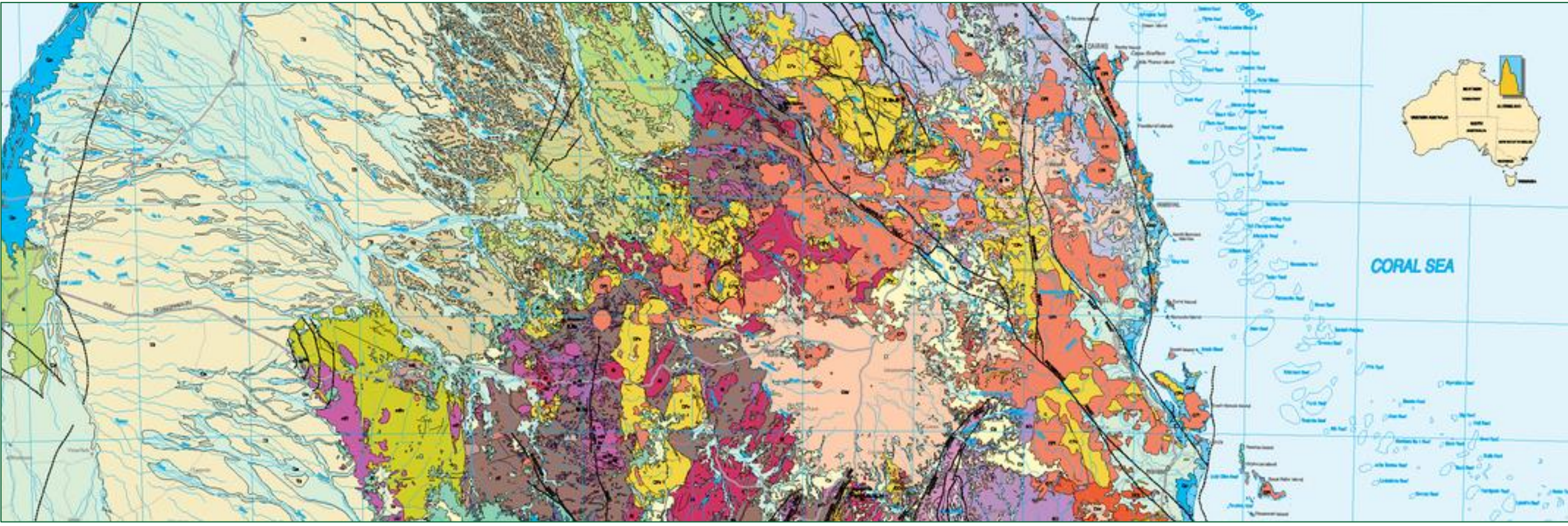



Figure 87. Geology of North Queensland, Australia (James Cook University, 2020).

### Recommendation 6.1 Produce accessible, inclusive, accurate maps

6.1.A Create map layers and use overlap mapping: numerous map layers will collectively define high priority areas and direct Frontenac to areas that need protection.

- Incorporate all NHS features and impacting factors, including, but not limited to, ecological data, TEK, social and cultural assets, Land Use regulations, stakeholder and public opinion/feedback/views, Indigenous rightsholders' traditional territories, Aboriginal land claims, etc.
- Develop a digital engagement platform that allows participants to share their knowledge, locations of interest, concerns, and priorities using a map-based interface. This community-based map can be used as a layer in the final mapping model. Pins are added to the project area map and categorized based on topics/observation types, such as favorite places, ideas for improvement, areas of concern, Significant Locations for Commemoration, Interpretation, and Indigenous Knowledge, etc.
- Consider opportunities for creative map layers such as an artisanal crafts trail; beekeeping and pollinator landscapes; hunting/trapping trails; age-friendly trails (accessibility); TEK (i.e. medicine gardens, areas of cultural importance); landscapes prone to natural disasters (flooding or forest fires), etc.

6.6.B Reinforce the maps with legislation to ensure areas of greatest ecological value/environmental significance are protected for the long-term.

6.6.C Develop a region-wide mapping tool to be used by Townships, governmental bodies, or other organizations that are planning, conserving, or developing across the region. Frontenac County should also consider broadening the map beyond the County boundary to be used by neighbouring municipalities to ensure NHS views are aligned and that healthy natural systems within the County are not impeded by the actions of external jurisdictions.

### Recommendation 6.2 Address baseline data gaps

6.2.A Attain data accuracy with ground-truthing and field reconnaissance, which can be done through field surveys, ecological site data, aerial photos, driving public access roads, etc.

- Establish partnerships (i.e., with CAs, lake associations, community organizations, biologists, ecologists, etc.) to overcome the potential for mismatch between regional maps and on-the-ground realities.

6.2.B Address gaps in science-based environmental information within the region by undertaking the following: rigorous data collection to integrate vegetation, terrain (surficial geology), and soil features; improved water resource mapping including streams and wetlands, aquifers, groundwater areas, and headwaters; identification of species at risk habitats; a detailed environmental inventory, particularly in the Settlement Areas (all aquatic and terrestrial ecosystems, plant communities and critical habitats, existing and potential biodiversity corridors and recreational trails).

6.2.C Develop a searchable database for community features that have local significance.

Table 12. Priority for Recommendation 6 action items

| Objectives | Action Item | Priority |
|---|---|---|
| 6.1 Produce accessible, inclusive, accurate maps | 6.1.A. Create map layers and use overlap mapping. | 1 |
| | 6.1.B. Reinforce the maps with legislation. | 1 |
| | 6.1.C. Develop a region-wide mapping tool. | 2 |
| 6.2 Address baseline data gaps | 6.2.A. Attain data accuracy with ground-truthing and field reconnaissance. | 2 |
| | 6.2.B. Address gaps in science-based environmental information within the region. | 1 |
| | 6.2.C. Develop a searchable database for community features that have local significance. | 2 |

# 9.0 Project Limitations

This project was created during one academic semester; therefore, due to the time and scope of this project, our ability to design and conduct primary research was limited. We were unable to make in-depth contact with multiple stakeholders, such as local citizens, lake associations, local property owners, and the lower-tier municipalities. We were also limited to holding singular, one-hour conversations with the experts and stakeholders who we were able to contact; therefore, the project team determined that the conversations would be exploratory in nature rather than for data collection and analysis purposes. Significantly, we did not consult or hold exploratory conversations with any Indigenous rightsholders or community leaders. This is a shortcoming of this project and of settler planning in Ontario more generally. This project insists that planning with Indigenous Peoples should be a cornerstone of Natural Heritage Systems (NHS) and long-term planning, and we acknowledge the crucial role and responsibility that Indigenous communities have in sustaining and protecting the NHS. By attempting to contact Indigenous communities by email, we realized that settler planners must conceive of better ways to build relationships with Indigenous rightsholders who should and must be consulted and accommodated.

## 9.1 Stakeholder Engagement

### 9.1.1 Lake Associations

We did not engage with lake associations located throughout Frontenac County. North Frontenac has a coalition of 20 lake associations, called the *North Frontenac Lake Association Alliance*, which aims to provide assistance and

Figure 88. Crotch Lake, North Frontenac (Maurer, n.d.).

leadership to homeowners in the Township. South Frontenac is home to 16 lake associations, which have a similar goal of supporting and guiding property owners. Lake associations play an integral role in communicating with individual property owners about government policy and educating the community. Similarly, many websites for South Frontenac lake associations have useful information for cottagers such as fire safety, septic system maintenance, guidebooks, and hunting and fishing guides. Lake associations in Frontenac County would serve as a point of contact for property owners, and their insight into lakefront community perspectives in NHS planning is essential.

Due to the sheer volume of lake associations in Frontenac and the time limitations, it was not feasible to conduct exploratory conversations with these

organizations. However, given more time and resources, conversations with each lake association, during the NHS planning process, would be a valuable way to grasp the local knowledge that these organizations could potentially contribute to the next NHS study. Not only do lake associations have direct contact with citizens but they also already run stewardship programs.

### 9.1.2 Local Property Owners

Like engaging with lake associations, obtaining local landowner knowledge is essential to building a sufficient model to protect Frontenac's NHS. As the literature review and case study analysis in this report has explored, incorporating local knowledge from stakeholders and citizens strengthens the framework and implementation strategy of the plan due to the community's increased invested interest. Given more time, we would have interviewed landowners from across the County to hear how the changing environment has impacted their properties and lifestyles. Local citizens can share cultural and historical information and community priorities that can be incorporated as layers into Frontenac's NHS mapping and long-term plan.

### 9.1.3 Municipality Engagement

We did not engage directly with the four Townships (North Frontenac, Central Frontenac, South Frontenac, and Frontenac Islands). However, their input, concerns, and perspectives regarding the future and long-term vision of Frontenac County's NHS is essential. Thorough, ongoing community engagement and collaborative data collection should be conducted to incorporate municipal insights and perspectives into the NHS plan.

### 9.1.4 Breadth and Depth of Conversations

Exploratory conversations were not conducted for data collection and analysis purposes. The conversations allowed the student researchers to gain background information on the roles and perspectives of various agencies that interact with Frontenac County and the County's NHS. These stakeholders included land trust associations, the Natural Conservancy of Canada, Ministry of Housing Affairs, Conservation Authorities, field experts, and more. These conversations did not extend past two hours and did not include any follow-up interviews; as a result, the depth of these conversations was informative and valuable, but ultimately limited. Ongoing relationship-building with stakeholders, experts, and collaborators in NHS planning, protection, and management could provide the opportunity for follow-up conversations to inquire into issues at a greater depth.

## 9.2 Engagement with Indigenous Rightsholders

Engagement with Indigenous rightsholders and communities is not only crucial to long-term NHS planning but also to all forms of planning. We acknowledge that Indigenous Peoples' voices are missing from our exploratory conversations and report. Our reliance on email as the primary form of communication during the research process was insufficient. In the spirit of Free, Prior, & Informed Consent, and the federal *UNDRIP Act*, future NHS planning in the County should engage with Indigenous communities in whose traditional territories the County exists, such as the Alderville First Nations, Kenhteke Kanyen'Keha:Ka (Mohawks of the Bay of Quinte), and Algonquins of Pikwàkanagàn. Initiating and building mutually beneficial relationships with Indigenous communities to incorporate, understand, and respect Indigenous perspectives, cultures, and knowledge requires a long-term planning commitment.

Figure 89. The Project Team. (Fries, 2021).

# 10.0 Conclusion

Frontenac County is fortunate to have a vast, intact, and priceless natural heritage system. The County has a responsibility to take preventative measures to protect its natural heritage for future generations. This requires the County to invest in establishing strong baseline data and maps through pluralistic stakeholder engagement and relationship-building with Indigenous rightsholders. Our framework establishes six recommendations and 47 action items that can help the County achieve that goal. To implement this framework, Frontenac needs to create a long-term vision and strategy for natural heritage protection when it conducts its next Natural Heritage Study. Frontenac is already engaging in innovative initiatives, such as communal servicing; having a visionary NHS plan would add to that momentum and establish Frontenac as a regional leader in natural heritage conservation. By implementing the precautionary principle at a landscape scale, Frontenac can ensure the continuity of its natural heritage from now into the next century.

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# APPENDIX A: CASE STUDY ANALYSIS

## Contents

### Case Study 1: City of Guelph's *Natural Heritage Action Plan* (2018)

The *Natural Heritage Action Plan* (the "*Plan*") was prepared by the City of Guelph and published in September of 2018. The plan builds on the City's *Natural Heritage Strategy* (2010) and Official Plan (OP) Amendment 42, which introduced award-winning Natural Heritage System (NHS) policies. These policies include increased protection for woodlands and wildlife habitat, a recognition of the importance of pollinators and meadows, and a focus on watershed planning to support science-based decision-making. The purpose of the *Plan* is to provide an implementation framework to support Guelph's OP policies for NHS and watershed planning.

| Evaluation Criteria | Ranking | Rationale |
|---|---|---|
| **Natural Heritage Systems Protection** |  | • The *Plan* aims to implement a systems approach that ensures the long-term ecological function and biodiversity of the NHS is managed with recognition of linkages between and among natural heritage features, surface water features, and groundwater features.<br>• Since Guelph is one of the largest communities in Canada that depends on groundwater as its source of drinking water, protecting the quantity and quality of water using a watershed-based planning approach is critical for supporting the City's growth.<br>• The *Plan* recognizes the importance of improving the quality of natural heritage features through the identification of restoration areas that can enhance the NHS. |
| **Long-Term Planning** |  | • The *Plan* uses a long-term planning approach and recognizes that healthy, diverse, and resilient ecosystems can help reduce vulnerability to climate change and other ecosystem stressors, such as invasive species, encroachment, habitat loss, population growth, resource use, and pollution.<br>• The *Plan* sets a clear mission, which is supported by many well-defined objectives and guiding principles to help ensure the plan is implemented over the long term.<br>• The *Plan* highlights that the long-term protection of the NHS from development is a key component of climate change mitigation and will require ongoing monitoring and adaptive management.<br>• The *Plan* does not set a long-term time horizon and the latest target date for the action items is 2028. |
| **Engagement (and Education)** |  | • Engagement was a top priority for Guelph when developing the *Natural Heritage Action Plan*, which states that the "community is the City's most valuable player."<br>• Community surveys, action plan workshops, follow-up surveys, meetings with external agencies, and other initiatives were used to gather input and shape the development of the plan.<br>• The 'Nature in Guelph' campaign involved handing out nature-themed postcards at community events and giving residents the opportunity to artistically represent what nature means to them using words and drawings.<br>▪ This campaign was used to raise the profile of the action plan and reach a wider audience.<br>• The *Plan* recognizes that fostering community support, raising awareness, and increasing efforts to focus on education, outreach, and stewardship opportunities will promote a culture of conservation and stewardship that will help protect the NHS in the long term.<br>▪ Restoration and enhancement efforts provide opportunities to further connect community members with nature through participation in stewardship activities.<br>• The City is establishing an adopt-a-space program to formalize and facilitate community and neighbourhood-based engagement and stewardship of natural spaces.<br>• The City is exploring the development of an urban ecology speaker series for the public in partnership with local organizations and academic institutions.<br>• The City is developing an online environmental guide for homeowners which includes information about environmental stewardship, trees and landscaping, water, energy, conservation and rebates, waste management, transportation, and air quality.<br>▪ The goal is to promote behavioural changes based on communicating the impacts certain actions have on the natural environment.<br>• The City is developing an eco-awards program to showcase local environmental projects and leadership. |

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| **Planning with Indigenous People** |  | • The *Plan* does not refer to planning or partnering with Indigenous People. |
| **Values of Ecosystem Services** |  | • A key focus of the plan is the valuation of ecosystem services.<br>• The *Plan* excels at conveying the importance of ecosystem services and how biodiversity is needed to sustain the health of the environment, economy, and people of Guelph.<br>• The *Plan* recognizes the need for a natural asset management approach to decision-making, which considers the economic value that natural ecosystems provide the community and can assist in justifying investments in NHS protection by monetizing the role that the NHS play in regulating the climate, providing clean air, and buffering the community from natural disasters such as flooding.<br>• The *Plan* speaks to developing a natural asset inventory, inclusive of the natural heritage and water resource systems as well as the ecological goods and services they provide, to facilitate the integration of green infrastructure into the City's *Corporate Asset Management Plan*.<br>• A natural asset inventory that includes the City's ecosystems will promote ecosystem restoration as essential infrastructure work.<br>• A city-wide ecological monitoring and data management framework will form the basis for the valuation and inventory work. |
| **Complimentary with Cultural and Economic Networks** |  | • The *Plan* emphasizes how protecting the NHS is needed to support a healthy community as the city grows and becomes more compact and adapts to climate change.<br>• It also recognizes that protecting the NHS will help support economic viability and provide a high quality of life for the community.<br>• The *Plan* discusses how managing growth and densification must be done in a manner that respects the value of the NHS. |
| **Proposes Protective Policies/Strategies** |  | • The *Plan* proposes many innovative strategies and planning tools.<br>• The City created the '*2019 EnviroGuide*', which is an online environmental handbook for owners that includes information about environmental stewardship, trees and landscaping, water and energy conservation, waste management, transportation, and air quality to encourage environmentally friendly behavioural change.<br>• The *Plan* speaks to the identification of habitats for species that are determined to be locally significant to help support and sustain local biodiversity over the long term.<br>▪ OP policies support protecting and restoring smaller natural areas which support habitats for locally significant species.<br>▪ OP provides policy direction for updating the locally significant species list through a process that is science-based, repeatable, transparent, and engages of a range of partners.<br>• To compliment the City's *Guidelines for Preparing Environmental Impact Studies* (2017), the City is developing guidelines for the preparation of Environmental Implementation Reports, which are used to inform the detailed design of development proposals such as subdivisions and vacant land condominiums.<br>• The City is preparing a series of design guidelines to provide issue-specific tools, such as road ecology guidelines, bird strike guidelines, wildlife friendly construction guidelines, trail compatibility and mitigation guidelines, offsetting guidelines, and soil health and management guidelines.<br>• The City will prepare green development standards to assist in evaluating the environmental sustainability of development proposals and capital projects through the application of sustainability metrics.<br>▪ The City intends to utilize conservation land securements to achieve the permanent protection of natural areas in perpetuity.<br>• Partnerships built through securement exercises can help support the development of management plans for things such as nature reserves, interpretive areas, and the incorporation of trails into these spaces where they are compatible and will not have a negative impact on sensitive areas.<br>• A *Status of the Natural Heritage System Report* will be produced by the City to measure the effectiveness of its natural heritage policies. |
| **Monitoring and Continuous Evaluation** |  | • As part of the *Plan*, a city-wide monitoring program will be developed to provide baseline data for subwatershed studies, assess the effectiveness of OP policies, understand the cumulative impacts of development, support science-based decision-making, and apply adaptive management techniques.<br>▪ Data will be obtained from weather, river and stream flow, water quality, groundwater and ecological monitoring stations, many of which are updated at real time.<br>▪ Program will monitor a suite of biodiversity and ecosystem indicators at three spatial scales: species, community, and landscape.<br>▪ Requiring post-construction monitoring for new developments can help evaluate the effectiveness of mitigation measures and enable adaptive management. |

| | | |
|---|---|---|
| | | ▪ Through the program, the City will pursue opportunities for collaboration with neighbouring municipalities and partner agencies, such as the Grand River Conservation Authority.<br>▪ The City intends to develop a citizen science component to the environmental monitoring program to leverage local knowledge and engagement; therefore, the City encourages community participation in voluntary data collection. |
| **Model Evaluation** |  | • The *Plan* does not include any detailed mapping of the natural heritage features within Guelph or discuss the models used to develop the NHS.<br>▪ Note that this background work had been done prior to the development of the action plan, which is intended to implement new strategies and share knowledge about the NHS with the community.<br>▪ Using simplified NHS mapping (i.e., show the whole system rather than a complex assortment of natural heritage features) helps to make the information more accessible to the public. |

## Case Study 2: Essex Region Natural Heritage System Strategy (2008)

Essex County has lost land due to agricultural clearing which has fragmented the County's natural heritage landscape. Being located in the Carolinian Forest Zone, the region has the potential to host abundant biodiversity; however, the County's fragmented NHS lacks the capacity to support the same level of biodiversity that a completer and more contiguous NHS could support. In 2008, the County of Essex and Essex Region Conservation Authority (ERCA) collaborated to devise the *Essex Region Natural Heritage System Strategy* (*ERNHSS*) ('the *Strategy*'), in part to prevent further deterioration of the landscape, and in part to respond to the 2005 Provincial Policy Statement's (PPS) call for diverse and connected natural heritage systems throughout Ontario. The *Strategy* uses scientific data to delineate natural heritage feature boundaries and focuses on areas considered high priority restoration areas. These restoration efforts build on guidelines that come out of a strategy directed towards rehabilitating areas of concern in the Great Lakes. This strategy is further informed by the development of the 2002 *Biodiversity Conservation Strategy* - the predecessor and influence for the restoration-foci ERNHSS. The strategy was completed with the intent to map core features, promote stewardship and securement of land, and maximize ecological benefits in areas where restoration would take place.

| Evaluation Criteria | Ranking | Rationale |
|---|---|---|
| **Natural Heritage Systems Protection** |  | • The *ERNHSS* uses a systems-approach and focusses on connecting core areas and corridors, as well as restoring the Region's highly fragmented natural landscape.<br>• The *Strategy* identifies and prioritizes land that warrants restoration efforts. These areas of improvement are considered to have the ability to contribute to increasing the quality and quantity of natural heritage features.<br>• The County has a BCS (2002), that builds on the guiding principles in *"How Much Habitat is Enough? - A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern* – a restoration-focused guide for degraded areas. From this, five principles with goals are identified to help develop the *Strategy* with the intent that it be used to ensure the long-term health of the Region's NHS.<br>• The *Strategy* borrows restoration guidelines for forest, riparian, and wetland habitats from the framework's guidelines when identifying features that should be included in the delineation process.<br>▪ Guidelines from other restoration-based strategies and plans are used to inform habitat categories including tallgrass prairie, savannah, alvar, and fish habitats. |
| **Long-Term Planning** |  | • The *ERNHSS* focuses on protecting the County's NHS in the long-term; however, the *ERNHSS* does not quantitatively define "long-term."<br>• The *Strategy* recognises that long-term planning can be achieved through local policies supported by the PPS. Where natural features are not strongly supported by the PPS, the Official Plan (OP) should implement policy that protects these natural features, mandating tools such as the Environmental Impact Assessment (EIA), subwatershed plans, property managements plans, and Zoning By-Laws. Subwatershed plans and property management plans would help to maintain ecological integrity for the long-term in scenarios where natural heritage features or areas are in public ownership.<br>• No visioning process informs the *Strategy*, rather, the *Strategy* was developed using guiding principles and goals. The *Strategy* states that fulfilling these principles and goals will ensure the long-term protection and health of the Region's NHS (refer to Section 2.3.1 Guiding Principles of the Strategy). |
| **Engagement (and Education)** |  | • The *ERNHSS* mentions neither public or stakeholder engagement nor education initiatives. |
| **Planning with Indigenous People** |  | • The *ERNHSS* did not plan with Indigenous People. |

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| **Values of Ecosystem Services** |  | • The *ERNHSS* recognizes the cultural services (recreational and educational opportunities) that a connected and diverse NHS provides, but it does not provide further detail. |
| **Complimentary with Cultural and Economic Networks** |  | • The *ERNHSS* does not mention healthy or age friendly communities, equity, economic development, or densification. |
| **Proposes Protective Policies/Strategies** |  | • The *ERNHSS* recommends implementing policies that support conservation easements, grants, and stewardship agreements to enhance natural features, especially those that have high restoration priorities.<br>• The *Strategy* recommends policies to encourage public participation in stewardship and conservation programs.<br>• The *Strategy* suggests developing policies requiring EIAs for development applications on lands adjacent to natural heritage features, as per PPS guidelines.<br>• As per the *Natural Heritage Reference Manual*, the *ERNHSS* recommends adopting a dual designation approach. This allows for high priority restoration areas to co-exist with agricultural use designations, but agricultural uses may be restricted where natural heritage features occur.<br>• The *ERNHSS* proposes a *Planning Act* application for high priority restoration areas.<br>▪ Should a proponent propose to develop lands identified as high priority restoration, the program requires the proponents to identify how they have done so, consistent with *ERNHSS* and the PPS (Section 2.1.2.) - a requirement for buffering could work to fulfill the intent of both. Nottawasaga Valley Conservation Authority (NVCA) currently has this program in place. |
| **Monitoring and Continuous Evaluation** |  | • Mitigation measures are an important way to minimize the impacts of development on natural heritage features. The *Strategy* points to the *Natural Heritage Reference Manual,* published by the Ministry of Natural Resources and Forestry (MNRF, 2010) as a guideline for mitigation measures that proponents can adopt in their applications.<br>• Monitoring is an important guiding principle for the *ERNHSS*. It suggests that all planning jurisdictions and the ERCA take part in monitoring through participation in a region wide database that monitors the status and implementation of natural heritage areas, including those identified as having high restoration priority. Additionally, the database should document conservation and stewardship activities.<br>▪ The *Strategy* does not indicate if/when the document should be revisited/ updated (i.e., every five or ten years). |

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| **Model Evaluation** |  | • Geographic Information Systems mapping and analysis was employed to develop the NHS boundary. Geoprocessing of the following layers include:<br>  • Aerial photography and watercourse data; Provincially Significant Wetlands (PSW), Areas of Natural or Scientific Interest (ANSI), Environmentally Significant Areas (ESA), and other natural features (forests, Valleylands, meadows, grasslands, tallgrass, prairie alvars, and shrub thickets); Normalized Difference Vegetation Index data; Physiography data (Ontario Geological Survey); Public Land Ownership; and Priority areas provided by Nature Conservancy of Canada.<br>• Layers were developed for forest cover, riparian, wetlands, built-up areas, and other natural features not included within the forest cover and wetlands layer, and maps including each layer were made for all the jurisdictions in the Region.<br>• The existing natural features were further prioritized for their significance and include PSW, terrestrial areas (forests, woodlands, meadows, etc.) not captured through other features, ANSI, ESA, Significant Valleyland, Significant Woodland, Interior Forest, Vegetation, Physiography, Flood Land, Public Land, and Nature Conservancy of Canada Land.<br>• The ERNHSS would benefit from ground-truthing exercises to fill in inconsistencies between overlapping layers. For example, a forest cover identified through aerial photography that overlaps with the PSW layer is categorized as a swamp forest, however ground truthing would supplement this assumption by confirming the vegetation type.<br>• The ERNHSS included a riparian analysis which uses the watercourse dataset (from aerial photography) and included both natural watercourses and open municipal drains.<br>• Natural features were weighted equally which could be problematic considering there is greater value in some features over others (wetlands are known to have the greatest ecological value compared to other ecosystems).<br>• Not included in the Strategy is the mapping of locations of Species at Risk and/or Significant Wildlife Habitat due to lack of available data. |

## Case Study 3: Grey County Natural Heritage System Study (2017)

The *Grey County Natural Heritage System Study* (2017) (the "*Study*") merges scientific data, public opinion, and provincial planning legislation (i.e., Provincial Policy Statement, 2015) to identify natural features that warrant protection. The Region is home to many diverse ecosystems including Ecoregion 6E, and the Niagara Escarpment traverses the northern part of the County. In addition, the following four Conservation Authorities (CAs) work in the County: Grey Suable, Saugeen Valley, Nottawasaga Valley, and Grand River CAs, each of which has jurisdiction over its respective watershed. Moreover, of the 44.6 percent natural heritage cover, 39.1 percent is forestry, and a total of 39.2 percent is considered significant (Significant Wetlands, Significant Woodlands, Significant Valleylands etc.). The Region's diverse ecosystems speak to the need for an effective and comprehensive study that protects its natural heritage features.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage System Protection** |  | • The *Study* adopts a systems-approach and uses existing natural heritage data to identify key areas and linkages; however, the study does not address these features in depth (e.g., no ground-truthing). |
| **Long-Term Protection** |  | • The *Study* does not explicitly mention long-term planning. |
| **Engagement (and Education)** |  | • All four CAs were involved throughout the project.<br>• At the beginning of the project, Grey County created a webpage to keep the public and stakeholders informed throughout the project.<br>• Invitations to two Open House sessions were sent by mail (one Open House in the north of the County and one in the south) to promote public participation. No details were provided regarding what participation techniques were employed at the Open House.<br>• A Technical Advisory Committee was established to provide general support to the consulting team throughout the project. |
| **Planning with Indigenous People** |  | • The *Study* acknowledges that the County is located in the traditional territories of over seven Indigenous Nations (aside from whether a First Nation reserve is located within the County); however, consultation with those communities was not conducted. |
| **Values of Ecosystem Services** |  | • Valuation of ecosystem services does not go beyond recognition of the benefits derived from those services. Ecosystem services benefit both the environment (maintenance of biodiversity, support for natural functions and wildlife) and human health (recreational opportunities, mental and spiritual significance, clean air, clean drinking water, controlled climate, and more). |
| **Complimentary with Cultural and Economic Networks** |  | • There is minimal attribution to this criterion. As noted above, the *Study* recognizes that a well-connected and quality-driven NHS ensures recreational opportunities and cultural, spiritual, and mental health benefits, The *Study* acknowledges that natural heritage features provide protection for economic opportunities in rural areas, especially for agricultural areas intended for extraction of aggregate resources. The *Study* does not mention planning concepts such as healthy and age friendly communities or equitable socio-economic access to the opportunities/benefits provided by an intact NHS. |

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| **Proposes Protective Policies/ Strategies** |  | • A new Environmental Objective was established to reflect the County's support for the protection of natural heritage features. The Environmental Objective included objectives for restoration, protection, preservation, conservation, maintenance, and enhancement of such natural heritage features.<br>• Proposed changes to the Natural Environment Policies to better define the purpose of the NHS and its attributes.<br>• Policy should inform a 120-metre adjacent Lands zone around each Core Area in which development is not permitted.<br>• Policy of a 30-metre buffer zone around all natural heritage features in the NHS.<br>• An Environmental Impact Study (EIS) is recognized as an effective evaluation tool for inspecting the potential impact of development on natural heritage features. It is recommended that, when a development is proposed, an EIS scoping activity between the proponent, County, municipality, and respective CA should take place during the pre-submission consultation meeting. A Terms of Reference should be produced that identifies the studies, surveys, screenings, or other work that must be completed related to the proposed project's anticipated impacts on natural heritage features.<br>• In cases where development is proposed within Adjacent Land zones or buffer zones, an EIA should show that there would be no environmental impact on natural heritage features should the development occur.<br>• Note that the EIA guidelines lack depth in directing proponents through the Region's policies.<br>• The *Study* recommends that local municipalities place a Holding provision on Core Area Zones:<br>▪ The Holding provision can only be lifted if an Environmental Impact Statement (EIS) meets the standards of the municipality and respective CA.<br>▪ Conditional zoning is preferred over Holding provisions, as the former would require a second EIS to be completed prior to the commencement of development, whereas an EIA is not required once another Holding provision has been lifted, and so the impact of proposed development on known natural heritage features would not be assessed.<br>• The implementation of lot severances so that land can be conveyed to public or non-profits organizations for the purpose of natural heritage-conservation is also encouraged. |
| **Monitoring and Continuous Evaluation** |  | • The *Study* does not implement strategies or tools for monitoring natural heritage features.<br>• Note that the broad scale of the *Study* makes the mapped features vulnerable to inaccuracy. In this case, local municipalities are encouraged to change map boundaries, in consultation with the County and CAs, by conducting site visits, EIAs, or other ground-truthing activities to inform boundary lines. |
| **Model Evaluation** |  | • No specific model is mentioned. A systems-approach was used to inform links and cores. Existing Geographic Information Systems (GIS) data defined significant features. Significant features include:<br>• Wetlands ≥2ha (wetlands <2ha not included in study); Provincially Significant Wetlands (PSW); Significant Woodlands; Significant Valleylands (mapped as 200 metres wide corridor, 100 metres from the watercourse centreline); Provincially Significant Life Science; Areas of Natural or Scientific Interest (ANSI); Deer Yard (Stratum 1) and Deer Wintering Area; and (provided by MNRF) Aquatic features (watercourses and waterbodies) (provided by MNRF).<br>• Meadows are not protected in the NHS. The shifting nature of meadows makes them difficult to scale and map; however, they are known for their habitat provisioning for a number of Species at Risk species such as Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*).<br>• The *Study* applied site reconnaissance (road survey and aerial flight) to supplement the data obtained through GIS layers but does not incorporate ground-truthing strategies.<br>• Large interior forests are viewed as fundamental in the identification of Core Areas. The study defined these interior habitats as areas 100 metres from the edge, whereas 'deep' interior habitats are those within a distance of 200 metres or more from the edge. Large interior habitats are then clustered to form 'mega-patches' which inform the boundary lines of Core Areas.<br>• Linkages are established as 200 metres corridors and focus on the shortest areas between Core Areas. They consist of areas with the most amount of natural cover (terrestrial, aquatic, and deep interior habitat). A criterion of 200 meters is considered, in theory, a wide enough corridor that can also act as an interior forest habitat. |

## Case Study 4: Halton Region's Natural Heritage Discussion Paper: Regional Official Plan Review (2020)

A *Natural Heritage Discussion Paper: Regional Official Plan Review* (the *"Discussion Paper")* was prepared by Halton Region and published in June of 2020. The review was undertaken to update the *Regional Official Plan* (ROP) in accordance with Provincial requirements established in Section 26 of the *Planning Act*. The last review was completed in 2009 and informed the implementation of policies from the *Growth Plan for the Greater Golden Horseshoe (2006)* and the *Greenbelt Plan (2005)*. This review, therefore, incorporated an analysis of the effectiveness of existing policies and implementation conformity since 2009. Through the *Discussion Paper*, updates were also made to terminology and policies to reflect evolving demographics, land uses, and policy changes in the Region. Given that natural heritage is central to Halton's *ROP*, the review provided specific attention to ensuring the strengthening of natural heritage and water resources' long-term validity, among other considerations.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *Discussion Paper* highlighted the advancements of Halton Region's Natural Heritage System (NHS), explaining the transition from a features-approach to a systems-approach that ensures more effective long-term protection of natural heritage linkages and areas.<br>• Each *ROP* has recognized the importance of constant evaluation and improvement to the quality of the NHS and in turn has led to the strengthening of its preservation.<br>• The goal of the NHS is to provide a framework for restoring habitats and increasing forest cover through strategies and tools that incorporate community education and awareness, as well as restoration and stewardship practices.<br>▪ The Region understands that although increased urbanization and climate change will occur, the precautionary principle (erring on the conservative side of protecting natural heritage components) is recommended in visioning practices and policy decision-making. |
| **Long-Term Planning** |  | • The goal of the NHS is to increase the certainty that the biological diversity and economical functions of the NHS will be preserved and enhanced for future generations in Halton.<br>• Phase 1 of the *Discussion Paper* focuses on the visioning process to delineate five key themes for the *ROP* to address through policy the research and implementation.<br>▪ The Report does not provide a planning horizon, but it focuses on long-term planning as a key component of climate change adaptation and mitigation. |
| **Engagement (and Education)** |  | • Consultation and input from the community was mentioned, but details about the type and extent were not documented in the *Discussion Paper*.<br>• The *ROPR* is considered a basis for future consultation with municipalities, Conservation Authorities, and the public to inform the next phase of the review process. |
| **Planning with Indigenous People** |  | • Halton's *Discussion Paper* does not reference or involve Indigenous rightsholders and communities as key partners in the planning process. |
| **Values of Ecosystem Services** |  | • Ecosystem services were not explicitly mentioned in the *Discussion Paper*.<br>• A section of the *Discussion Paper* pertaining to climate change raises awareness for reducing the Region's carbon footprint through preserving ecosystem services that regulate climate, water, air, etc. A discussion on the long-term benefits of reducing the impacts of flooding and other risks was also incorporated to support protection.<br>• The *Discussion Paper* also hints at provisions and supporting services regarding surface and drinking water, making a case that preservation is necessary to protect long-term water services.<br>• The *Discussion Paper* does not reference cultural services, including recreation and mental well-being. |

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| **Complimentary with Cultural and Economic Networks** |  | • Two concepts that underlined the vision of the NHS were sustainable development and landscape permanence.<br>• The *Discussion Paper* recognizes that, although the Region will urbanize and change, development and economic growth should be done sustainability while the Region should preserve certain into perpetuity.<br>• The *Discussion Paper* recognizes that an integrated growth strategy is necessary for a sustainable future.<br>• The *Discussion Paper* does not refer to how Halton's NHS supports cultural and/or social well-being. |
| **Proposes Protective Policies/Strategies** |  | • The *Discussion Paper* evaluated the effectiveness of current policies and strategies while incorporating changes made to Provincial plans (*Growth plan for Greater Golden Horseshoe* and the *Greenbelt Plan*) since 2009. However, the Region focuses on local (rather than regional) initiatives and strategies for better NHS protection.<br>• The *Discussion Paper* suggests protecting the NHS beyond the requirements of Provincial plans and encourages the Province to review and update mapping in response to municipal requests.<br>• The *Discussion Paper* speaks to building on its research in the next phase of the project to strengthen policies and strategies and to improve best practices for sustainable environmental conservation.<br>• Protective NHS policies are currently grounded in the precautionary principle with options to explicitly establish this principle in new policy proposed for the next *ROP*. One principal measure for achieving no environmental impacts includes buffers and vegetation protection zones, which the *Discussion Paper* proposes strengthening beyond the requirements of Provincial plans. |
| **Monitoring and Continuous Evaluation** |  | • Continuous evaluation of strategies is proposed to address changes and discrepancies with the goal of refining policies and practices that better reflect how the NHS was mapped.<br>• Undertaking mapping refinements is considered essential to incorporating community engagement and input as well as providing transparent mapping that accurately reflects localized, current data.<br>• A component of the *Discussion Paper* included updating base layer data to improve projections, adaptative management, and monitoring.<br>• Consultation with municipalities and Conservation Authorities as well as increased education in community stewardship practices are recommended for future conservation efforts.<br>• Evaluating a monitoring system/model was beyond the scope of the *Discussion Paper.* |
| **Model Evaluation** |  | • The *Discussion Paper* focused on the approaches and concepts used for mapping the NHS within Halton Region.<br>• A systems-approach, adopted in 2009, extends beyond the former features-approach to include the protection of non-features such as linkages and enhancement areas.<br>• Current mapping includes three NHS options that were developed to roughly reflect a system-approach in addition to minimum standards and enhanced ecological integrity, which increases the probability that biodiversity and ecological function will be protected.<br>• The concept of 'centres of biodiversity' was also incorporated to recognize the impact of fragmentation on natural communities and to map and preserve large areas of contiguous natural areas.<br>  ▪ Approximately 52.8 percent of Halton Region's NHS is proposed to be protected based on their mapping. |

## Case Study 5: Mapping of a Natural Heritage System in the County of Wellington (2018)

In September of 2018, the Grand River Conservation Authority published the report titled *Mapping of a Natural Heritage System in the County of Wellington ("*the *Report").* The purpose of the *Report* is to identify a Natural Heritage System (NHS) for Wellington County in a manner that reflects the diversity of natural heritage resources in the County landscape and respects the balance between natural systems, farming, and other land uses. The *Report* aimed to develop an NHS that would do the following:

- Maintain and/or improve local and regional biodiversity;
- Recognize local-scale linkage between and among natural heritage features and areas;
- Provide a strategic direction for land and water restoration, stewardship activities, conservation land acquisition and securement, priorities for inventory programs, and amendments to the County's Official Plan;
- Inform resource-management decision-making; and
- Support sustainable economic opportunities and recreational use.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *Report* highlights how human land uses can fragment natural areas and negatively impact the health of native species and communities. It recognizes the importance of quality, quantity, and connectivity to the protection of natural heritage and aims to maintain or enhance these characteristics of the NHS.<br>• The *Report* emphasizes that corridors and linkages can be used to form an interconnected web of natural habitat, which can help to best maintain the ecological integrity of natural heritage.<br>• It is noted that corridors are important to ensure genetic diversity within populations, to allow seasonal migration of animals, and to allow animals to move throughout their home range from feeding areas to cover areas.<br>• The *Report* notes that corridors may benefit some species while harming others depending on corridor width and the amount of edge habitat.<br>• The project area was extended one kilometre beyond Wellington County's municipal boundary to help facilitate connectivity with surrounding jurisdictions. |
| **Long-Term Planning** |  | • The *Report* does not go into detail regarding long-term planning issues, such as climate change. |
| **Engagement (and Education)** |  | • A Steering Committee was formed to oversee the project, which consisted of Wellington County staff and representatives from the six Conservation Authorities (CAs) whose jurisdictions overlap with county borders. Their role was to provide expertise to help inform decision-making and to facilitate access to relevant data and resources from their respective jurisdictions.<br>• Planners, Geographic Information Systems analysts, and landscape ecologists from neighbouring municipalities and CAs were involved in the project and provided guidance.<br>• Wellington County held an Open House to present draft maps of the NHS, receive comments, answer questions, and share stewardship opportunities with landowners.<br>• Wellington County engaged the public through a dedicated page on the County website with key project information, an online interactive mapping tool to view the proposed NHS, and social media.<br>• Wellington County and the Grand River Conservation Authority presented the proposed NHS to key stakeholders, such as the Wellington Federation of Agriculture.<br>• Mapping stewardship components as part of the NHS helps to encourage stewardship among landowners. |

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| **Planning with Indigenous People** |  | • The *Report* does not reference the Indigenous Peoples and communities within whose traditional territories Wellington County can be found today. The Report did not collaborate and/or partnership with Indigenous rightsholders.<br>• While the *Report* mentions that economic, social, and cultural values were considered when developing the NHS, it is crucial to engage with Indigenous Peoples' values, interests, Traditional Ecological Knowledge; obtaining Free, Prior, and Informed Consent is imperative in planning processes. |
| **Value of Ecosystem Services** |  | • The *Report* discusses the value of ecosystem services and provides examples of the benefits the NHS can provide, but it does not go into detail. |
| **Complimentary with Cultural and Economic Networks** |  | • The *Report* mentions how protecting the NHS can be complimentary with cultural and economic networks but does not go into further detail. |
| **Proposes Protective Policies/Strategies** |  | • The *Report* does not propose any new policies that can be implemented within Wellington County's OP to protect the NHS. |
| **Monitoring and Continuous Evaluation** |  | • The *Report* does not discuss how monitoring and adaptive management could be used to update the NHS over time or to improve the identification of natural heritage features. |
| **Model Evaluation** |  | • The *Report* identifies an NHS that captures natural features, areas, and linkages using an approach that considers both broad-scale and local-scale ecological functions.<br>• The *Report* recognizes that the identification of regionally significant natural features and areas in Wellington County should not be constrained by provincial guidance and policies, such as the Provincial Policy Statement and *Growth Plan for the Greater Golden Horseshoe*.<br>• Natural heritage features were identified using six selection criteria and the best available existing spatial data of natural features and areas from CAs and the Province.<br>▪ The six selection criteria were size, representation, rarity, habitat quality, matrix influence, and hydrological importance.<br>▪ These six criteria and their thresholds were determined based on empirical evidence, guidelines produced by government or non-government science agencies, and the expertise of CAs and Municipal staff.<br>• The *Report* identified natural heritage features that were determined to be regionally or locally significant to Wellington County.<br>• Stewardship components were mapped using the identified natural heritage features as building blocks.<br>▪ Stewardship components consisted of enhancement linkages and enhancement woodlots.<br>▪ Enhancement linkages are potential connections between natural heritage features, whereas enhancement woodlots are smaller woodlands that can improve the broad-scale ecological and hydrological functions of the NHS if enhanced.<br>• Enhancement linkages were mapped using a combination of least-cost path analysis and Euclidian distance calculations to identify the path of least resistance between unconnected natural heritage features.<br>▪ The "cost" in the least-cost path analysis referred to factors that reduce the viability of linkages, such as roads or land use types that limit the distribution and migration of flora and fauna.<br>▪ Data related to land cover characteristics was used to determine the relative "cost" of various land cover types.<br>▪ For example, streams with adjacent natural cover were assigned the lowest cost, whereas high-impact roads (all freeways and any roads with speed limits ≥90km/hr and ≥four lanes) were assigned the highest cost.<br>▪ This approach helped to establish stronger linkages that are more likely to benefit plants and wildlife in the County. |

## Case Study 6: Mississippi River Watershed Plan (2021)

Eastern Ontario's Mississippi River watershed spans from the Addington Highlands in the west, across parts of North and Central Frontenac, toward Ottawa in the east. The watershed transverses forests, lakes, rivers, and wetlands on both Canadian Shield and Limestone Plains agricultural, crown, and private lands. The watershed is in the traditional territories of the Mississauga and Chippewas of the Williams Treaties First Nations and the Omàmìwininì Algonquins of Ontario. Eleven municipalities with 42,000 permanent residents and six times as many seasonal residents rely on the watershed's ecosystem services (ES) and Natural Heritage System (NHS) (Statistics Canada, 2016). Through an Integrated Watershed Management approach, the Mississippi Valley Conservation Authority's (MVCA) *Mississippi River Watershed Plan* (the "*Plan*") applies a climate change lens to its planning and management framework organized into broad themes, strategic goals, and specific objectives. The *Plan* was designed to be a living document with a holistic, evolving understanding of how social, economic, and environmental factors impact the watershed's ecosystem services and NHS.

| Evaluation Criteria | Rating | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *Plan* identifies 'Natural Systems"' as a key theme requiring explicit goals and objectives (i.e., actions) "to improve the application and coordination of regularly tools for the protection of wetlands, woodlands, and natural systems" (MVCA, 2021, p.vi). The Plan explicitly uses a systems-approach and aims to protect those systems using planning tools. As the primary watershed manager, the MVCA especially aims to "quantify, value, and protect wetlands as hydrologic and natural assets" (MVCA, 2021 p. iv). The *Plan* was preceded by a Natural Systems background study called "Backgrounder Three: Natural Systems" (MVCA, 2021 p.3).<br>• The *Plan* recognizes that natural heritage features and systems in the watershed may be in varying condition and requiring a flexible approach in order to improve their quality; the *Plan's* goal is to "maintain, enhance, or restore natural features and systems for all users" (MVCA, 2021, p. vi).<br>• The *Plan* aims to quantify ES, natural heritage assets, and NHS functions. It will also implement a Land Conservation Strategy to further support ES and the NHS.<br>• The *Plan's* objective is to "reduce habitat fragmentation and protect, restore, and enhance natural cover to improve connectivity, quality, biodiversity, and ecological function" (MVCA, 2021, p.45); this speaks to its intent to address protection, quality, quantity, and connection issues in the NHS. It further acknowledges natural system connectivity as a crucial support for biodiversity. The plan will achieve NHS interconnectivity and will prevent fragmentation through a cross-jurisdictional, collaborative Land Conservation Strategy, an initiative to map the NHS in the Ecoregion 6E area, and a Natural Heritage Strategy to increase wetland and forest cover to >30 percent each. |
| **Long-Term Planning** |  | • The *Plan* was designed to have a 20-year time horizon, on-going evaluation and updates, and periodic reviews. Its objectives include working with the Crown, land trusts, and municipalities to protect natural assets and systems.<br>• By using an overarching climate change lens and creating a standing committee to engage in monitoring and evaluation, the *Plan* implies that it is founded on a vision that extends beyond 20 years. The *Plan* signals that the MVCA is serious about long-term NHS protection and restoration by aiming to implement extensive education and outreach to support a culture of environmental stewardship in the community in the face of climate change stresses and changing land use regulations.<br>• The *Plan* calls for a three-year pilot of a Stewardship Program to "promote participation in land conservation incentive programs such as the Rideau Valley Conservation Authority Tree planting Program, Conservation Land Tax Incentive Program, the Managed Forest Tax Incentive Program, and the Alternative Land Use Services program" (MVCA, 2021, p.55). |
| **Engagement (and Education)** |  | • MVCA created a Watershed Plan Public Advisory Committee with "10 representatives from a number of sectors including agriculture, environment, forestry, hydro power, lake associations, land development, tourism as well as the general public" (MVCA, 2021, p.4).<br>• The *Plan* reflects engagement with "stakeholders including federal, provincial and municipal government, environmental organizations, the sectors and communities represented by the PAC, and the general public" (MVCA, 2021, p.4)<br>• Implementation of the *Plan* creates opportunities for collaboration as well as roles for the public, stakeholders, and rightsholders involved in its creation, especially municipalities with land use planning and Zoning By-Law powers. |

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| **Planning with Indigenous People** |  | • The *Plan* attests that it undertook meaningful engagement with Indigenous communities from the outset of the planning process by creating a distinct (and now permanent) Indigenous Engagement Plan, professionally designed by Cambium Indigenous Professional Services.<br>• The MVCA describes its approach to working with Indigenous communities as long-term, respectful relationship-building.<br>• The MVCA engaged in knowledge-sharing with, and learning from, Indigenous communities during the planning stages; MVCA will continue the Indigenous Engagement Program process since the *Plan* will be a living document. |
| **Values of Ecosystem Services** |  | • The *Plan* identifies the valuation of ES as a potential key strategy to inform decision-making, guide growth and development, and encourage stewardship; however, ecosystem valuation is a relatively new field. The MVCA acknowledges that the organization will have much to learn about ES valuation.<br>• The MCVA plans to collaborate with academic institutions such as universities that may undertake ES valuation research, especially related to climate change in an interdisciplinary framework. Interdisciplinary collaboration to create a realistic ES valuation model may include, for example, environmental engineering, economics, environmental studies, and/or planning.<br>• The MVCA plans to establish a 'natural capital accounting system' to assess the value of wetlands' water storage services; wetlands and riparian buffers' nutrient assimilation services; and forests' carbon sequestration services. |
| **Complimentary with Cultural and Economic Networks** |  | • The *Plan* uses an Integrated Watershed Management approach to consider social, economic, community, and environmental interests.<br>• "Backgrounder Two: People and Property", a previous NHS background study by the MVCA, provides foundational information about the demographic context, cultural history, and economic factors that impact the NHS.<br>• The *Plan* acknowledges historically significant places of importance to Indigenous rightsholders.<br>• The *Plan* addresses, at length, the "human landscape," properties, growth, development, education, and outreach. |
| **Proposes Protective Policies/Strategies** |  | • Through its *Watershed Plan*, the MVCA will:<br>▪ "Work with MNRF to identify crown holdings within the watershed that are flagged for potential sale and develop strategies to ensure the protection of crown natural assets" (MVCA, 2021, p.50).<br>▪ Promote and support land trust initiatives to acquire areas for conservation.<br>▪ "Actively pursue ownership, either by MVCA, the municipality, or other appropriate body, of suitable corridor holdings" (MVCA, 2021, p.50).<br>▪ Promote low impact development measures through stewardship programming and collaboration with municipalities at policy and planning levels.<br>▪ Create an asset management system to better prioritize and manage natural heritage assets. |
| **Monitoring and Continuous Evaluation** |  | • The *Plan* extended the role of the Public Advisory Committee into the monitoring, evaluating, and perpetual adaptation of the living plan.<br>• The Indigenous Engagement Plan will continue to ensure that ongoing collaboration and relationship-building informs the *Plan* as it adapts to its evolving context.<br>• Grassroots collaborators including North Frontenac Lake Association Alliance and the Lake Networking Group will assist MVCA with monitoring stewardship initiatives, ongoing scientific research, and developing lake plans.<br>• The *Plan's* climate change lens includes monitoring, modelling, impact analysis, and needs assessment of social, economic, and environment factors that impact the NHS. |
| **Model Evaluation** |  | • The *Plan* calls for natural heritage asset mapping and a land conservation study, but the *Plan* does not attempt to map or model the watershed's NHS. |

## Case Study 7: Northumberland County Natural Heritage System Plan (2020)

Northumberland County, Ontario is an upper-tier municipality bordered by Lake Ontario to the south and the 401 corridor and Rice Lake to the north. The County spans approximately 1,905 square kilometres and consists of seven lower-tier municipalities with a total population of 85,598 (Statistics Canada, 2016). The County is primarily rural with a significant area of agricultural lands. Northumberland County adopted the *Northumberland County Natural Heritage System Plan* (the "*Plan*") in 2020 to protect, maintain, and improve the County's Natural Heritage System (NHS) for future generations.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *Plan* emphasizes the need for resilient biodiversity, well-defined resources and features, and connectivity of natural areas and features. The County also states the importance of linkages at a County and site-specific scale.<br>• The *Plan* also outlines enhancement areas to increase and restore the quantity and quality of the NHS as well as deficiencies that should be rectified to address diversity and connectivity concerns.<br>• Considered the *Growth Plan for the Greater Golden Horseshoe* and *Oak Ridges Moraine Conservation Plan* in the development and identification of the County's *NHS.* |
| **Long-term Planning Horizon** |  | • The *Plan* states the importance of identifying and protecting the NHS as the best way to ensure the long-term viability of the natural environment, as well as protecting the NHS for generations to come. However, the *Plan* does not define a planning horizon.<br>• The *Plan* only briefly mentions climate change, however, does not provide in-depth discussion or detail. |
| **Engagement (and Education)** |  | • Three points of engagement were conducted to ensure the public and stakeholders were encouraged to participate and provide feedback throughout the development of the *Plan.*<br>• Two out of three points of engagement were conducted through public information sessions. As a third point of engagement, an interactive mapping viewer was developed "that illustrated each of the County's NHS options, Provincial NHS, and air photo imagery so that landowners could see what the NHS could look like on their individual properties" (p.3). |
| **Planning with Indigenous People** |  | • The Indigenous People and communities within County were not referenced in the *Plan* or involved as key partners in its development. |
| **Value of Ecosystem Services** |  | • The *Plan* does not discuss the economic, cultural, social, and/or intrinsic, values of the NHS. |
| **Complimentary with Cultural and Economic Networks** |  | • The NHS is not proposed to extend into settlement areas.<br>• The NHS mapping overlay would 'sit on top' of other designations, including the Agricultural Area designation which applies to prime agricultural land.<br>• The *Plan* does not provide in-depth discussion regarding cultural and economic networks. |

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| **Proposes Protective Policies /Strategies** |  | • Policies that are proposed are intended to meet the requirements set out in the Provincial Policy Statement (PPS).<br>▪ The *Plan* describes how NHS protection policies will be implemented into the County's Official Plan. |
| **Monitoring and Continuous Evaluation ("Living plan")** |  | • The *Plan* does not discuss monitoring or evaluation. |
| **Model Evaluation** |  | • Components of the NHS were identified by the *Growth Plan NHS*, the Ontario Royal Mounted Police, and the remainder by the County.<br>• The *Plan* provides a set of criteria for the identification of NHS components.<br>• Datasets used for mapping are provided in the Plan.<br>• NHS approach to mapping is provided in the Plan.<br>• NHS approach to preserve and enhance the functional connections amongst features and areas to sustain the movement of plants and animals (similar to the Marxan model).<br>• Comprehensive approach that evaluates the contribution of all land cover and habitats to the ecological function and biodiversity of landscapes. |

## Case Study 8: Oxford Natural Heritage Systems Study: A Study to Identify Natural Heritage Systems in Oxford County (2016)

The *Oxford Natural Heritage Systems Study (ONHSS)* was prepared by Upper Thames River Conservation Authority and published in 2016. The *ONHSS* evaluates the existing ecologically important terrestrial resources of the County using scientific methods and geographic information systems (GIS) modeling. The purpose of the *ONHSS* is to address the need for information on the state of the County's natural heritage system (NHS). The study provides a landscape level assessment of natural heritage features and functions. It builds on the 2006 *Oxford Natural Heritage Study.*

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *ONHSS* intends to establish a local approach to identifying the terrestrial NHS (fish habitats and other aquatic habitat features were not identified in the *ONHSS*), as required by the natural heritage policies of the Provincial Policy Statement (PPS).<br>• The *ONHSS* incorporates information available in 2010 from the Ministry of Natural Resources and Forestry to identify the Natural Heritage Features and Areas that they are responsible for identifying.<br>• The *Study* includes the identification of Significant Woodlands and Valleylands, in accordance with the *Natural Heritage Reference Manual* published by the MNRF in 2010, and sets outs a recommended approach for identifying significant wildlife habitat.<br>• It should be noted that the *ONHSS* states that it does not determine if there are enough natural heritage features, whether they are in the right places, or of the right type.<br>• The *ONHSS* focusses on meeting the requirements as set out in the PPS. |
| **Long Term Planning** |  | • The *ONHSS* includes a general acknowledgment, adherent to the policies of the PPS, that natural features and areas shall be protected for the long term. It does not, however, extend this to consider the specifics of long-term planning such as climate change.<br>• The *ONHSS* states that it does not determine whether the existing NHS is sustainable over the long term. |
| **Engagement (and Education)** |  | • The *ONHSS* states that "this project did not include a process to engage stakeholders on implementation options, recognizing that extensive consultation on implementation options was undertaken as part of the 2006 ONHS and that the majority of the implementation options developed as part of that study are still relevant today" (p.82).<br>• The study, however, states that future stakeholder consultation will be conducted as a component of the various processes required to implement the *ONHSS's* recommendations such as updates to Official Plan policies and the Woodland Conservation By-Law. |
| **Planning with Indigenous People** |  | • The *OHNSS* does not mention or refer to planning with Indigenous people. |
| **Valued of Ecosystem Services** |  | The *OHNSS* does not apply a monetary value to the County's ecosystems, and it does not discuss the cultural, social, and/or intrinsic values of the NHS. |

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| **Complimentary with Cultural and Economic Networks** |  | • The *ONHSS* focusses on the NHS of the Oxford County landscape; however, it does mention that implementation will also require consideration of cultural, economic, public health, and safety factors.<br>• The *OHNSS* does connect the importance of the County's NHS to opportunities of eco-tourism and hunting/fishing. |
| **Proposes Protective Policies/ Strategies** |  | • The *OHNSS* recommends that local municipalities develop strategies for the overall identification, ownership and management of (locally) significant and non-significant natural heritage areas within their urban growth centres. The *Study* does not provide guidelines for site-specific tools for municipalities to implement.<br>• The *ONHSS* recommends that an Environmental Impact Study guideline be developed to ensure the comprehensive implementation of the *Study* through the land use planning and development process.<br>• It is also recommended that the County use the *OHNSS* as the scientific basis for identifying natural heritage features within the County Official Plan. It is noted that the decision to apply these designations and/or overlay constraints is contingent on the Official Plan update process. |
| **Monitoring and Continuous Evaluation** |  | • The *OHNSS* provides that monitoring data through establishing benchmarks and evaluating change over time is important, and that regular reporting is crucial. The *ONHSS* outlines the four following 'monitoring' recommendations:<br>▪ It is recommended that the County lobby that provincial government to continue to support the Provincial Water Quality Monitoring Network and Provincial Groundwater Monitoring Network Programs;<br>▪ It is recommended that the Conversation Authorities (CAs) provide a coordinated comprehensive report on monitoring for the Country area on a regular basis;<br>▪ It is recommended that the County work with the CAs to enhance the existing monitoring programs by adding new sites as appropriate and improving consistency of monitoring techniques between the CAs; and<br>It is recommended that the County request that the CAs identify their specific monitoring services as a budget item and that the County continue to support the monitoring programs of the CAs. |
| **Model Evaluation** |  | • The *ONHSS* examined the state of the terrestrial (land) and aquatic (water) resources of the County using various mapping methods.<br>• The woodlands and natural areas were measured and assessed on a landscape level using ortho-imagery (air photos) and a Geographical Information System (GIS).<br>• Nine scientifically based criteria were developed to determine which patches were significant on the County scale. Maps were produced depicting which patches met at least one criterion. Any patch that met at least one of the criteria is considered "ecologically important" in Oxford County.<br>• The following chart includes the criteria used for this study. Information on Oxford's watercourses (fish, habitat, benthic organisms) were compiled from earlier studies. Additional sampling was carried out at 140 sites to fill gaps. The watercourses were categorized into three system types and mapped. Quality/chemistry data was from the past 40 years was taken from 12 sites. Data was compiled into six key parameters then plotted and discussed. The six parameters include: total phosphorus, nitrate, suspended solids (clarity), chloride, copper, and bacteria. |

## Case Study 9: The United Counties of Prescott and Russell and the United Counties of Stormont, Dundas, and Glengarry's *Natural Heritage System Study* (2021)

The United Counties of Prescott and Russell (UCPR) is an upper-tier municipality in eastern Ontario spanning over 3309. 87 $km^2$ and a total population of 113, 429. Likewise, the United Counties of Stormont, Dundas, and Glengarry (SDG) is an upper-tier municipality with 2,004.47 $km^2$ and a population of 89, 333. The Counties have come together in conjunction with the South Nation Conservation (SNC) to devise the *Natural Heritage System Study (*the *"Study")* for both United Counties. The 2021 *Study* is unique in that it employs an uncommon model in Ontario to delineate its Natural Heritage System (NHS) – the Least Cost Corridor approach. The *Study* incorporates input from stakeholders and the public to further refine the Region's natural heritage boundaries, which features linkages that aim to connect natural features that extend beyond its jurisdiction. In addition, the *Study* has a strong focus on regional connectivity so that flora and fauna may continue to move across the landscape despite development pressure.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *Study* takes a systems-approach and seeks to create a landscape that is connected through linkages of natural core areas.<br>• It focuses on implementing policy that will encourage public land acquisition and stewardship.<br>• Stewardship is characterized by restoring critical areas, such as tree planting along watercourses, seeking not only to enhance these features but also to magnify the intrinsic connection between terrestrial and aquatic environments.<br>• Four guiding principles informed the methodology and design of the NHS, drawing from knowledge in landscape ecology and conservation biology. These principles are the following:<br>▪ Prioritize large natural cores and wide corridors over fragmented cores and narrow corridors;<br>▪ Ensure corridors have continuous natural cover and connect cores using multiple corridors (the latter suggests it will aid in long-term functioning of the NHS);<br>▪ Include publicly owned lands because they warrant greater protection; and<br>▪ Recognize agricultural lands as natural features of the NHS. |
| **Long Term Planning Horizon** |  | • The *Study* has a strong focus on ensuring its NHS is healthy and resilient for the long-term in the face of climate change.<br>• It does not define a horizon (i.e., 50-to-100 years). |
| **Engagement (and Education)** |  | • The *Study* is a good example of interregional collaboration, where UCPR and the United Counties of SDG partnered with the South Nation CA to complete the study.<br>• Ecologists, land use planners, and forestry staff from the municipalities and Conservation Authorities (CAs) were all involved in the delineation of the NHS boundary and design.<br>• The map was fine-tuned through input from stakeholders and the public to better delineate boundaries according to scientific and cultural significance. |
| **Planning with Indigenous People** |  | • The *Study* does not plan with Indigenous Peoples. |
| **Values of Ecosystem Services** |  | • The *Study* details the regulating, provisioning, and cultural services offered by a healthy NHS benefits humans and the economy.<br>• The *Study* recognizes that ecosystem services, when maintained, can increase cost-savings by reducing infrastructure that would need to be built if the NHS could not freely provide such services.<br>• The *Study* states that agricultural land provides important ecosystem services. |
| **Complimentary with Cultural and** |  | • The *Study* has a good focus on complementarity between the natural and built environment to allow for economic growth. Where a corridor is best placed near development lands, its passage is narrowed to allow for the provisioning of a built landscape; however, built-land is avoided wherever possible.<br>• Healthy, age-friendly communities and densification are not discussed. |

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| **Economic Networks** | | |
| **Propose Protective Policies/Strategies** |  | • Both UCPR and SDG have policies in their Official Plan (OP) that promote land donations, conservation easements, parkland acquisitions, and biodiversity offsetting.<br>• The *Study* recommends policy surrounding incentivised stewardship and restoration programs<br>• Stringent policy is recommended for the Environmental Impact Study (EIS).<br>• Policies should include opportunities for improvement of natural areas that could later be included in the NHS map through site-specific studies.<br>• The *Study* also recommends a policy that advocates for 'no net loss' for Regional Cores.<br>• The *Study* makes recommendations for more streamlined development application policies as a result of high amounts of applications that seek single lot severance in the 120-metre adjacent lands. In consultation with qualified professionals from the CAs an EIS can be scoped or waived if:<br>▪ A severance is separate from a significant feature by a barrier (road, fence, or exiting development); and<br>▪ A small-scale development is more than 30 meters from a natural heritage feature; however, a site visit should confirm no additional feature or species at risk are present and where the EIA the Conservation Authority may include mitigation measures in the severance review comments.<br>• The *Study* recommends a pre-screening process to help the proponents and the municipality or CA to review applications and assess the EIS requirement upfront. This ensure that Natural Heritage Policies in the OP are addressed, and applicants do not pay fees for an assessment if it is not required.<br>• The *Study* is updating their EIS guidelines and conditions.<br>• The *Study* recommends updates in the OPs to better define terminology (such as adjacent lands, buffers, and setbacks, and their purposes) to avoid confusion amongst developers and consultants.<br>• Where setbacks are large, public ownership is encouraged to protect these areas from being cleared or disturbed. Policy can allow for transfer for setback lands to the municipality.<br>• Agricultural land is recognized as an opportunity for restoration and warrants natural cover retention. Initiatives can be supported through policies that call for cooperation with landowners to facilitate securement strategies. |
| **Monitoring and Continuous Evaluation** |  | • The *Study* does not include a monitoring or evaluation component. |
| **Model Evaluation** |  | • The *Study* employs the Least Cost Corridor approach. It begins by identifying regional cores. Then it uses Least Cost Corridor analysis to connect data on wildlife movement costs with connection points. The cost component stems from how difficult it is for a species to move across a landscape.<br>▪ A high cost is in those landscapes where animal migration is most difficult. This is assigned to urban/ highway, pits and quarries, and arterial roads.<br>▪ Lowest cost is assigned to those areas where migration is the easiest, such natural landscape, plantations, inlands water, and agriculture.<br>▪ Additional maps with landscape features that impact wildlife movement were layered over the cost map, and each one had a multiplier that would increase or decrease costs.<br>• The map was refined through feedback from ecologists, forestry staff, planners, and the public.<br>• The *Study* distinguishes between Regional Cores and Local Cores. Regional Cores are identified as those areas which are large and mostly natural cover, are socially and regionally significant, and are often public owned lands (Loch Garry Marsh in SDG and Larose Forest in UCPR). While Local Cores, including wetlands, are considered "building blocks for the Regional Cores" (p. 7), woodland areas that are significant do appear on the OP schedules.<br>• The significant features were layered on a map; areas within 20 metres were grouped together to create a complex. The complexes with the biggest areas and smallest amount of fragmentation were selected to be the Local Cores; Local Cores within 50 metres were complexed to form Regional Cores.<br>• The *Study* identifies "boundary linkage points" (p. 9) where the Region's corridor would connect to a core or corridor in a neighboring jurisdiction. This creates a well-connected NHS that goes beyond its own political boundaries. It employs Geographic Information Systems data from surrounding Canadian municipalities and New York State, aerial imagery, and local knowledge to identify these linkage points. |

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| | | • Corridors are defined by natural heritage features, rural, agricultural, or other support lands and were delineated through Regional Cores, the boundary linkage points from neighboring regions, and identify least cost paths.<br>• Using the model, the lowest cost path is generated between two selected cores, or another tool can be used which generates a map of pixels that indicate the lowest cumulative cost which would help identify alternative routes should the other map generate a path that captured incompatible lands. Corridors were created by buffering the path with a width of one or two kilometers; however, where a corridor travels through a built-up area, its width is further narrowed. |

## Case Study 10: Trent University's Trent Lands and Nature Areas Plan: Natural Heritage Report (2021)

The *Trent University Lands and Nature Areas Plan (TLNAP)* is intended to assist the University in achieving its vision of a regenerative and inspiring campus community, thoughtfully integrating the natural and built environments with vibrant spaces to learn, innovate, be active, and live. The *TLNAP* (2021) builds upon the recommendations of the *Stewardship Plan for Trent University Nature Areas* (2002), the *Endowment Lands Plan* (2006), the *Trent Lands Plan* (2013), and the *Cleantech Commons Master Plan* (2017). The 2021 Plan uses a systems-based approach, updating and integrating these various plans into one guiding framework. This natural heritage report is a technical companion to the *TLNAP* presenting the natural heritage surveys, analyses undertaken, and the preliminary recommendations used to inform the *TLNAP*, including the *Nature Area Stewardship Plan.*

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • Trent Nature Areas are areas recognized for their natural heritage values and functions, as well as education, research, and recreational opportunities. These areas were first recognized in 1989 and are protected from development.<br>▪ Use and management (stewardship) of these lands are advised by the Nature Areas Stewardship Advisory Committee.<br>▪ Approximately 50 percent of the Symon's Campus land area.<br>• The systems-based approach follows three principles:<br>▪ Robust, Connected System - recommends the consideration of connections and interactions with lands beyond the Campus in recognition of the function and interactions in the broader landscape;<br>▪ Net Benefit - recommends that land use planning should strive to achieve a net benefit to the Trent system as a whole. This may include modifications to existing conditions to support the long-term objectives of maintaining or improving habitat and biodiversity within the system; and<br>▪ Regenerative - recommends that the campus strive for regenerative practice through both natural systems and the integration of ecologically supportive actions. This may include nature-based design, micro-features (e.g., pocket forests), native-based landscaping, etc. |
| **Long-Term Planning** |  | • This report is a supplementary document to the *TLNAP* and intended to help achieve the TLNAP's campus vision.<br>• This report does not specify a time horizon. |
| **Engagement (and Education)** |  | • The report used data collected through citizen science data basis such as iNaturalist. |
| **Planning with Indigenous People** |  | • Trent hosted two Indigenous Traditional Knowledge walks and visits (October 2018 and July 2019) and an Indigenous Traditional Knowledge workshop (December 2018) to encourage invited participants to share their knowledge and perspectives, including the identification of specific Indigenous interests and values for consideration and inclusion into the review and update of the *TLNAP*.<br>• Knowledge shared through these workshops has been used to inform the characterization of the parcels, identification of species of known significance and use to the Indigenous communities and include:<br>▪ Indigenous ways of knowing;<br>▪ Cultural and ecological priorities; and<br>▪ Protection and integration of Indigenous knowledge into land use planning and design. |

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| | | • Known places of Indigenous use and teaching, significant species, and enhancement opportunities were identified. Species identified through Indigenous Traditional Knowledge walks, visits and workshops have been flagged in species lists to record their occurrence and value to local First Nations |
| **Values of Ecosystem Services** |  | • Three primary measures are identified in the *TLNAP* for ecosystem services:<br>▪ A high value in special services (e.g., air quality or sustainable recreation);<br>▪ High production of economically valuable products; and<br>▪ Important appreciation, education, cultural or historical value. |
| **Complimentary with Cultural and Economic Networks** |  | • *TLNAP identifies* potential sites appropriate to support Trent University's functions as an educational institution, however, does not provide in depth detail. |
| **Propose Protective Policies/Strategies** |  | • The use of a systems-based approach to inform site-selection processes, site-specific planning and design, and identification and prioritization of opportunities for restoration and enhancement is recommended.<br>• Proposes that land use planning be guided by a mitigation hierarchy and sequential approach to:<br>▪ Avoid impacts where possible/feasible;<br>▪ Seek opportunities to minimize impacts where they cannot be avoided. In addressing remaining impacts, consideration is then given to;<br>▪ Restoring / rehabilitating to offset impacts or address impacts caused; and<br>▪ Consider replication or compensation for impacts. |
| **Monitoring and Continuous Evaluation** |  | • *TLNAP* uses a variety of databases to produce baseline data for future monitoring.<br>• Monitoring and evaluation frameworks were not included in this report. |
| **Model Evaluation** |  | • *TLNAP* identifies areas of preliminary constraints.<br>▪ High Constraint Features - high constraint features are unsuitable for development and include: Provincially Significant Wetlands, Significant Woodlands, Significant Wildlife Habitat, Habitat of Threatened and Endangered Species and Significant Valleylands. High constraint features are protected in accordance with applicable plans and policies (i.e., Provincial Policy Statement, *Growth Plan for the Greater Golden Horseshoe* and Municipal Plans).<br>▪ Moderate Constraint Features - areas of moderate constraint include those features that do not meet significance criteria but may be a constraint to development features and support functions that warrant specific environmental consideration in a systems-based approach to management of natural heritage on the Symons Campus. Moderately constrained features may be a constraint to development or may provide some opportunity for development. Management requirements for the feature(s) will be determined in consultation with the appropriate regulatory agencies (e.g., Otonabee Region Conservation. Authority, City of Peterborough). Potential outcomes include the following:<br>▪ Conservation includes retention in-situ or compensation (i.e., via replication) in an alternative location that provides an equal or net benefit to the system.<br>▪ Mitigation – replication or replacement of features on the landscape that provide a primarily contributory role or function(s) in the context of the broader system, may be considered through alternative measures.<br>▪ No Management Required – where a feature does not add critical functions to the natural heritage features, its removal from the landscape may be determined as meeting the 'no negative impact' test. |

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| | | ▪ Low and No Constraints – Anthropogenic areas (e.g., agricultural fields) or feature types that do not meet criteria for significance and do not otherwise have regulatory or policy protection (e.g., meadows, thickets) are identified as having 'low or no known constraints.'<br>• Overlays used to characterize Trent Assessment Parcels include:<br>▪ Ecological land classification – 37 Classes;<br>▪ Botanical inventory;<br>▪ Calling amphibian surveys;<br>▪ Wildlife habitat assessment;<br>▪ Breeding bird surveys;<br>▪ Nocturnal Owl Surveys; and<br>▪ Bat Acoustic surveys and habitat assessment. |

## Case Study 11: Keeping Nature in Our Future: A Biodiversity Conservation Strategy for the South-Okanagan Similkameen (2012)

*Keeping Nature in Our Future: A Biodiversity Conservation Strategy for the South-Okanagan Similkameen* ("the *Strategy")* is a series of reports published between 2012 and 2014, produced by the South Okanagan Similkameen Conservation Program (SOSCP) and the Okanagan Collaborative Conservation Program (OCCP). This *Strategy* is a holistic approach, providing a 'big picture' view of the region. Ultimately, the *Strategy* provides a platform for sharing information, intended to function as a guide for the Region and Municipal Governments. The geographic region covered includes South Okanagan-Similkameen, Central Okanagan, and North Okanagan Regional District and their Municipal Governments. At a regional scale, the Okanagan valley consists of a north-south corridor, facilitating wildlife movement between the United States Columbia Basin and the grasslands of the Central Interior Plateau of British Columbia.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *Strategy's* guiding principles are focused on protecting large and small areas of habitat, connecting habitat areas, and protecting key habitat characteristics. The *Strategy* is also focused on protecting a matrix of lands outside of core conservation areas and corridors, as well as maintaining diversity of ecosystems and species. Lastly, the *Strategy* states the importance of implementing the precautionary principle in decision-making and practice.<br>• The *Strategy* excludes waterbodies such as lakes from its mapping analysis. It is inferred that this decision was made due to the existing Okanagan Sustainable Water Strategy as well as the strong presence of the Okanagan Basin Water Board in the Region. |
| **Long-Term Planning** |  | • The vision for the *Strategy* is rooted in the long-term protection of the natural environment yet provides no concrete timeline.<br>• The *Strategy* was informed and visioned by a steering committee including conservation programs, local government planners, provincial and federal government ministries, Indigenous participants, and non-profit organizations. |
| **Engagement (and Education)** |  | • The *Strategy* was developed through a collaborative process, guided by committees that included local, federal, and provincial governments, Indigenous collaborators, and non-profit organizations.<br>• It does not provide information on the tools used or discussion papers created for the engagement process. |
| **Planning with Indigenous People** |  | • The study area of this *Strategy* covers the traditional territories of both the Sylix and Splatsin First Nations. The *Strategy* did engage some First Nation representatives who participated in the preparation of the *Strategy*.<br>• The *Strategy* recognizes that the Duty to Consult is an important component of good governance, sound policy development and decision-making. It also highlights the importance of integrating conservation efforts with Traditional Ecological Knowledge. |
| **Values of Ecosystem Services** |  | • The *Strategy* prioritizes linking biodiversity with a value-based system: crucial to the Okanagan region's economy, essential to health and prosperity, and that nature is more than what matters to people (intrinsic value).<br>• The *Strategy* does not apply a monetary value to the Region's ecosystems. |
| **Complimentary with Cultural and Economic Networks** |  | • The *Strategy* broadly discusses how conservation efforts are complimentary to cultural and economic networks in the Region yet provides no in-depth discussion. |

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| **Proposes Protective Policies/Strategies** |  | • Various planning tools, policy suggestions and community initiatives are proposed. Listed below are some strategic directions and opportunities for action:<br>▪ Conservation covenants and easements;<br>▪ Conservation lands zoning which restricts the location and type of development that can occur within 100 meters of reservoir lakes;<br>▪ Use of the Green Bylaws toolkit 'Conserving Sensitive Ecosystems and Green Infrastructure';<br>▪ Establishing local levy-based conservation funds;<br>▪ Security deposits on development (act as an incentive for landowner/developer to carry out construction activities properly and to complete any restoration commitment);<br>▪ Provide educational materials to landowners about third party certifications programs that encourage stewardship of private land such as salmon safe, eco-gifts environmental farm plan, Audbon certification for gold course and BC sustainable winegrowing program;<br>▪ Zoning for cluster development;<br>▪ Encouraging voluntary placement of conservation covenants, dedication of land or voluntary changes in zoning to protect sensitive ecosystems; in exchange for incentive such as increased density of balance of subject property, an amenity bonus for another property, trading land, offering grants in aid;<br>▪ Exempting eligible riparian property from property taxes if a property is subject to a conservation covenant registered under Section 219 of the *Land Title Act*;<br>▪ Reducing fees for applications that meet certain environmental criteria;<br>▪ Proposing policies which link to other plans to balance economic growth with long range ecological health; and<br>▪ Recommendations for information and data sharing within and outside of the region.<br>• The *Strategy* is limited in its ability to implement any of the planning tools or proposed policies given its status as a framework produced by Conservation Programs. The *Strategy* functions as a 'road map' for future coordinated efforts to manage biodiversity in the Region. |
| **Monitoring and Continuous Evaluation** |  | • The *Strategy* provides a strong framework of an implementation plan which proposes key elements and next steps for effective strategy implementation.<br>• The *Strategy* suggests engaging stakeholders and decision-makers including Indigenous People through disseminating the biodiversity strategy, local government maps, and targeted outreach and discussion.<br>• It is also suggested that a governance structure for strategy implementation is used.<br>▪ It is proposed that the following bodies be included in the governance structure: implementation committee; technical working groups; secretariat/staff person; technical advisors, as needed. The strategy provides an overview of tasks for this governance structure to complete.<br>• The *Strategy* also stresses the importance of an action plan with roles, responsibilities, and a timeline.<br>• It is also suggested that a measurement, reporting and evaluation plan with a performance measurement framework is included. There are two types of performance measure indicators which should be included:<br>▪ Success indicators should evaluate the strategic directions offered in this *Strategy*. Given budget and resource shortages, the framework should be simple and focus on a few well-chosen indicators that can be assessed using reasonably accessible sources of information.<br>▪ Ecological indicators should monitor progress in meeting regional targets for ecosystems, habitats, and species conservation e.g. habitat type, species at risk, ecosystem. These indicators should build on previous efforts. For example: The *Okanagan Sub-Regional Growth Strategy Baseline Report* (2008) identifies a series of 'Performance Indicators', including three related to 'Natural Spaces', as follows:<br>▪ BNS-1 annual and cumulate area of parkland and protected areas (measured annually);<br>▪ BNS -2 percentage of sensitive ecosystems protected or stewarded by general habitat type (measured five years) ; and<br>▪ BNS-3 percentage of riparian areas protected (measured five years).<br>• Reporting should be completed on an annual or biannual and be carried out in tandem with other reporting processes. The *Strategy* recommends using innovative and engaging ways to share progress such as community celebrations, field trips, awards for biodiversity champions in various categories, and high-profile media events. The performance measurement framework will provide information on the scale to which recommendations are being implemented thus facilitating on-going strategy refinement. It |

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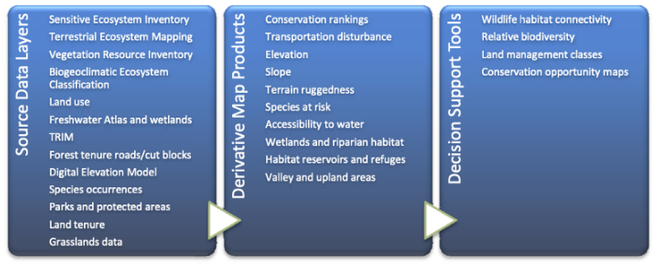
| | | is also recommended that implementing bodies commission periodic evaluation periods (every 3 years) to assess overall success. The evaluation framework should be based on overarching criteria such as impact, efficiency, effectiveness, engagement, and sustainability of measures.<br>• The strategy recommends coordinating implementation across the Okanagan region and other relevant regional and inter-regional management initiative such as the Washington State Wildlife Habitat Connectivity Trans boundary project and the Okanagan Basin Water Board. |
| **Model Evaluation** |  | • The analysis work was conducted in ESRI's ArcMap. The figure below illustrates an overview of the biodiversity conservation analysis. It should be noted field studies and community consultation were not included in the creation of these maps. In addition, biodiversity analysis focuses on terrestrial habitats. As a result, large lakes (which have high biodiversity values) have been excluded from the analysis.<br>• The *Strategy* provides mapping and information for the 14 municipalities and rural areas in the Regional District Okanagan Similkameen.<br>• Ranking sites help define high priorities for conservation of sensitive ecosystems but do not define how much conservation is required. Conservation rankings were based on the Provincial Conservation Framework, and local sensitive ecosystem priorities: very high, high, moderate, and low or not data.<br>  <br>*Figure 1: Biodiversity Conservation Analysis Overview (p. 25)*<br>• Identifying biodiversity hot spots mapping refines the conservation ranking through the incorporation of additional specifies and habitats including conservation rankings, size of natural areas, presence of regionally important habitat features, potential riparian habitats, habitat patch size, distance from roads, and species at risk information.<br>• A Geographic Information Systems based analysis was used to model habitat connectivity within the study area. It gave scores to demonstrate the current state of connectivity from low to high, identify barriers and pinch points to wildlife passage. The mapping identifies areas for maintaining existing connectivity and addressing protection of smaller, local, natural corridors and natural patches. The GIS model gave these scores based on the following information: moderate elevation, moderate slopes/flatter areas, terrain with less variation or ruggedness, more accessibility to water, and less development (avoidant of urban areas primarily and agriculture lands secondarily).<br>• The relative biodiversity rankings produce a regional perspective and is combined with information on current land management and ownership to help identify opportunities to implement conservation measures.<br>• The region is classified by four land management categories.<br>• Class 1 includes conservation land with the highest degree of protection including Migratory bird sanctuaries, Wildlife management areas, Provincial parks and protected areas, Ecological reserves, Federal Crown conservation lands, Crown lands designated for environmental protection/conservation, Private conservation lands, Canadian Wildlife Service National Wildlife Areas.<br>• Class 2 is dedicated open space which are lands currently protected as greenspace due to their land use designation including: Regional parks, Municipal parks, Crown recreation and research lands (fish and wildlife management, snow survey, science measurement/research, buffer zone, forest management research, flooding reserve, Use, Recreation and Enjoyment of the Public Reserve/recreation reserve, public access/public trails), Forest tenure recreation areas, and Provincial recreation areas. |

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| | | • Class 3 is public resource lands are public and institutional forest. These are areas where urban expansion will be unlikely to occur, however, these lands are not protected to the same degrees as Classes 1 and 2. For example, they may be designated for potential timber harvest. Class 3 land use designations include Community watersheds, Municipal open lands (i.e., Summerland), Crown land, Municipal lands set aside for forestry or grazing (i.e., Penticton).<br>• Class 4 is agriculture and crown lease including Agricultural Land Reserve (primarily privately owned), Municipal lands zoned for agricultural purposes, Crown leases, Agriculture, Alpine skiing, Commercial, Commercial recreation, Communication, Community, Grazing, Industrial, Institutional, Quarrying, Recreational residential, Rural residential, Utility.<br>• The land management class map identifies private lands and First Nation Reserves, however, give their unique tenure status (except when they fall within the Agricultural Land Reserve) they were not included within the land management classes. |

## Case Study 12: Chittenden County ECOS Plan (2018)

Chittenden County is located in northwestern Vermont, United States, along Lake Champlain. The County's 350,000 acres contains a variety of landscapes, including forests, farmland, water bodies, suburban areas, and urban areas – vastly varying in size. In total, Chittenden is made up of 19 municipalities, some of which are the fastest growing municipalities within the state. To protect the County's resources and to guide development in the fast-growing region, the Chittenden County Regional Planning Commission (CCRPC) produced the *Chittenden County ECOS (Environment, Community, Opportunity, and Sustainability) Plan* (the "*Plan*"). The first draft of the Plan was created in 2013 and has since been updated in the *2018 Chittenden County ECOS Plan*. The *ECOS Plan* combines and expands on the *Metropolitan Transportation Plan,* the *Comprehensive Economic Development Strategy*, and the *Enhanced Energy Plan* to produce common objectives and collaboration across sectors. This *Plan* is not exclusively a natural heritage/ecosystem services (ES) plan and addresses community and environmental resiliency through the four main themes of natural systems, social community, economic infrastructure, and the built environment.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The first of the *Plan's* four main goals is to create, maintain, and manage a green infrastructure network of natural lands, working landscapes, and open spaces across its predominately rural landscape.<br>• The strategy is to decrease subdivisions of working lands and significant habitats and to concentrate 80 percent of new development in 15 percent of the County's area planned for growth.<br>• The CCRPC works to assist municipalities in incorporating these strategies into their Zoning bylaws.<br>• The *Plan* lays out actions for habitat preservation based on the Plan's 'Forest Integrity' map as a starting point to comply with regulations.<br>• It encourages habitat and working lands preservation beyond regulatory conservation and/or preservation through public and land trust investments.<br>• The *Plan* states an action for a resource protection audit to be conducted and mapped, followed by clear resource definitions and protection standards to be established within zoning and subdivision regulations.<br>• There is also a call for the increased education of engineers, developers, real estate professionals, planners, and the public on resources and methods for restoration and protection.<br>• The *Plan* maps State and local constraints, as protected by municipalities and State agencies, as well as possible local constraints (listed in Supplement Three), to mitigate the impact of development on said constraints.<br>• The *ECOS Plan* addresses non-point source pollution, river hazard protection and wastewater treatment plant upgrades to protect development as well as improve the habitat of rivers, streams, wetlands, and lakes.<br>• The *Plan* states the need for mineral extraction and processing facilities to plan for eventual rehabilitation to re-establish stable slopes and native species revegetation. |

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| **Long-Term Planning** |  | • The issues addressed throughout the *Plan* are approached from a long-range viewpoint with a focus on creating resiliency to a changing climate.<br>• The CCRPC's Long Range Planning Commission led the update of the *ECOS Plan*, and the *Plan* includes forecast & scenario planning to 2050.<br>• The *Plan* thoroughly discusses climate change and addresses this issue in four of the *Plan's* strategies (Concentrate Development & Infrastructure; Improve Water Quality & Safety; Protect Working Landscapes & Habitats; Increase Health & Personal Safety).<br>• The *Plan* recognizes the need for monitoring and adaptation and has produced over 90 indicators to monitor changes in the County relative to the *Plan's* goals.<br>• The *Plan* follows long-term planning principles by using a visioning process to formulate goals and guide each ECOS Plan update.<br>• The CCRPC conducted community visioning through community-created murals, community portraits, and youth creative writing described in Supplement One of the *Plan*. |
| **Engagement (and Education)** |  | • Supplement One describes the engagement and collaboration that was done in creating the original 2013 *ECOS Plan*, as well as the 2018 update.<br>• In creating the 2013 Plan, 65 partner organizations participate in the process of producing the plan and reviewing the work with their individual organizations.<br>• The *Plan* was created in five steps – each containing a public review and comment period.<br>• During step four, CCRPC's Equity Coordinator met with representatives from community and issue-oriented groups and organizations and key informants and informal leaders of various underrepresented ethnic and cultural groups.<br>• ECOS Project teamed-up with Burlington City Arts to engage the community through community-created murals, community portraits, and youth creative writing to learn about residents' priorities.<br>• In creating the 2018 *Plan*, CCPRC held comment periods for the *Metropolitan Transportation Plan, the Comprehensive Economic Development Strategy,* and *Enhance Energy Plan* individually, followed by two public hearings.<br>• The *Plan* includes actions to continue and improve the engagement and education of the public and professionals.<br>• The CCPRC also has produced a *Public Participation Plan* (2014) that provides the commission's traditional and innovative outreach methods for involving the public. |
| **Planning with Indigenous People** |  | • The *Plan* does not plan with Indigenous Peoples. |
| **Values of Ecosystem Services** |  | • The *Plan* links the preservation of natural systems to associated community benefits extensively outlined in Supplement Two.<br>• This supplement document also explores current and predicted implications of climate change on the community as it pertains to environmental quality, natural communities, public health, the built environment, and the local economy.<br>• The Natural Systems section of Supplement Two lists current issues/trends/insights and indicators for ecological systems, scenic, recreational and historic resources, and climate change themes.<br>▪ Relevant actions are proposed in the *Plan* document.<br>• Data is drawn from the *Natural Resources Analysis 2012 Report*.<br>• The *Plan* also claims farmland and forestland to be the 'soul of Vermont', promoting the preservation of forest pattern coverage to mitigate forest block islands that lead to biodiversity loss.<br>• The *Plan* does not assign a monetary value to ES. |

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| **Complimentary with Cultural and Economic Networks** |  | • The *Plan* uses a sustainability/resiliency framework to address cultural, economic, and natural system networks<br>• Most of the *Plan's* goals take an economic, social, or environmental focus, but also address elements of the other networks.<br>• The *Plan* highlights reducing and mitigating the fragmentation of the green network (which includes natural lands, working landscapes, and open spaces) to protect wildlife connectivity, while promoting food safety, supporting the agricultural sector, and improving air and water quality.<br>▪ It mitigates fragmentation by concentrating new development to designated growth areas with notable consideration to water source protection and climate change.<br>• The *Plan* mentions assisting municipalities in identifying natural, cultural, historic, and scenic resources to protect from development.<br>• The *Plan* calls for further support for the Vermont Outdoor Recreation Economic Collaborative who work to strengthen Vermont's outdoor recreation (tourism) economy.<br>• Strategy Five discusses how mitigating climate change and improving water and air quality can benefit residents' health.<br>• Strategy Four focuses on ensuring all strategies and actions of the ECOS Plan assess equity impacts and projects are designed to be inclusive. |
| **Propose Protective Policies/Strategies** |  | • The *Plan* does not propose new policies but provides actions and strategies to guide policies that comply with the *Plan's* goals.<br>• The recommendations use suggestive rather than 'strong' language.<br>• Strategies within the *Plan* include actions that call for well-defined standards for resource protection, setbacks, etc. established in municipal regulations (i.e., Zoning By-Laws).<br>• The *Plan* encourages tools and incentives that enforce the vision of the *Plan.*<br>▪ Recommendations include expanding and improving the implementation of financing tools available to municipalities that level the playing field between greenfield development and infill development and that direct new investment dollars to strengthen existing communities.<br>• One of the leading principles of the *Plan* is to foster innovation.<br>▪ It encourages proactive problem-solving to enable the risk-taking inherent in innovation that provides access to a sustainable future.<br>• The *Plan* does not discuss cross-jurisdictional collaboration but does describe the *Plan*'s compatibility with neighbouring municipal and regional plans (Supplement Three). |
| **Monitoring and Continuous Evaluation** |  | • The *Plan* is stated to be both a plan and a process.<br>• The CCRPC is committed to the constant monitoring of the plan's progress.<br>▪ This is to be primarily done through the creation of over 90 indicators to measure the County's progress in reaching the *ECOS Plan's* goals.<br>▪ Indicator data is updated yearly on the ECOS Scorecard.<br>▪ The ECOS Leadership Team has been created to improve partnership efforts, review the draft Indicator and Progress Report, and communications.<br>• The Leadership Team also has been producing Annual Reports since the 2013 *ECOS Plan's* adoption.<br>• The *Plan* is to be updated at least every eight years. |
| **Model Evaluation** |  | • No systematic model for spatial prioritization was used for this *Plan.*<br>▪ Although, maps were included to illustrate the underlying datasets of the CCRPC's Geographic Information Systems and provide a limited overview of existing and future regional conditions.<br>• The *Plan* does follow an implementation model in which indicators are measured annually to assess the progress of collective action implementation and to determine if goals are being met.<br>▪ The model is similar to the *Results-based Accountability Model* which is a data-driven, decision-making process to help take action to solve problems. |

## Case Study 13: Lethbridge River Valley Parks Master Plan (2017)

The *Lethbridge River Valley Parks Master Plan (RVPMP)* identifies a new long-term approach to preserve and enhance the natural characteristics of the Region, to guide new development, and to improve upon the area's recreation and conservation use. The ingenuity of the *RVPMP* is that it emphasizes the relevance of protecting the natural heritage of the River Valley in order to maintain the economic and cultural prosperity of the City of Lethbridge and the surrounding area. The *RVPMP* provides clear direction for improving the stewardship, incorporating Traditional Ecological Knowledge, and resource protection, while balancing desire for new development.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *RVPMP* emphasizes all aspects of a Natural Heritage System (NHS) and aims to improve habitat connectivity.<br>• Many principles that make up the vision of this *Report* emphasize improving the connectivity, quality, and quantity of the NHS within the River Valley.<br>• The recommendations also include improving and monitoring riparian areas, species at risk communities, restoration efforts, and conserving healthy ecosystems. |
| **Long-Term Planning** |  | • The *RVPMP* indicates that its vision is for long-term protection and sustainability of the River Valley.<br>• It does not specify a timeline, but it indicates that it is a long-term planning horizon focused on protecting the NHS for generations to come.<br>• The *RVPMP* discusses the impact of climate change on the flora, fauna, hydrology, and wetlands in the area, but it does not go into detail about how the plan will adapt or mitigate climate change impacts. |
| **Engagement (and Education)** |  | • The *RVPMP* undertook a three-phase engagement process with the public and stakeholders:<br>▪ Phase One was to inform the public of the *Plan* and collect input on the values within the community; with this information, a strength-weakness-opportunity-challenges (SWOC) analysis was completed.<br>▪ Phase Two of the engagement process included the presentation of the vision, principles, and objectives of the project to the public and the collection of any additional feedback and/or insight.<br>▪ Phase Three of the engagement processes asked the public to rank various planning scenarios and elements of the plan, which was used to gage the priorities of the community.<br>• Each phase of the engagement processes had multiple open houses held at various times in order to capture the public's availability and as many opinions as possible. |
| **Planning with Indigenous People** |  | • An advisory group with representation from various Indigenous communities around the region was created.<br>• This advisory group met periodically to ensure that the *RVPMP* has historical accuracy and cultural appropriateness of *Plan* specifics.<br>▪A major component of the *RVPMP*, which was guided by the *Truth and Reconciliation Commission's Call to Action*, was to incorporate Indigenous symbols, images, as well as Traditional Ecological Knowledge into the River Valley plan.<br>• The *RVPMP* went further than just the Duty to Consult with the surrounding Indigenous communities. |
| **Values of Ecosystem Services** |  | • The *RVPMP* report did not give the ecosystem services an evaluation to determine the cost benefits, both economic and cultural, that are being provided by the NHS in the River Valley. |
| **Complimentary with Cultural and Economic Networks** |  | • Among the nine principles of the *RVPMP*, two include 'Make the Valley Accessible' and 'Improve Valley Amenities'.<br>• These two goals outline improving equal access and distribution of park amenities to create a more equitable system, as well as ensuring that there are features such as improved parking, improved access points, and improved accessibility park amenities. |

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| **Propose Protective Policies/Strategies** |  | • The *RVPMP* considers the Oldman River Valley, which is the larger region containing the County of Lethbridge, as instructed by the *Intermunicipal Development Plan*.<br>• Table 2 of the report also details other plans that are relevant to the broader Oldman River Valley, which require consideration in order to create a compatible plan with the larger surrounding region. |
| **Monitoring and Continuous Evaluation** |  | • One of the principles of the *RVPMP* is 'Ensuring Sustainable Use and Management'.<br>• This principle requires ongoing monitoring and an adaptive management approach to ensure that changes and impacts can be identified and incorporated in the long-term.<br>• There is no description of how to achieve this adaptive management approach or how it will be enforced in the long-term. |
| **Model Evaluation** |  | • The *Plan* uses a Circuitscape model to identify wildlife habitat and corridors that need to be protected.<br>• The *RVPMP* Circuitscape model is based on determining pinch-points in the landscape that are used by species to navigate through the ecosystem.<br>• This method is comparable to other corridor-based models used in urbanized areas, which identify the primary habitat and networks that can be prioritized for protection.<br>• The report gives an in-depth explanation and justification of determining the appropriate model type for protection. |

## Case Study 14: Integrated Rural Development and Nature Conservation's *Strategic Plan* 2015-2025 (2015)

The Integrated Rural Development and Nature Conservation (IRDNC) is an organization that community leaders in the sub-Saharan country Namibia founded in 1982. The IRDNC's specific conservation framework is a form of Community-Based Natural Resource Management that was pioneered by Namibia. IRDNC's framework has led to the successful monitoring and conservation of Namibia's wildlife, including black rhinos and elephants, to the point at which wildlife population have recovered and become an important natural asset in Namibia's economy and culture.

The framework is "a holistic approach, resting on the three fundamental pillars of natural resource management, enterprise development, and strong local governance" that effectively democratize conservation processes by creating communal conservancies (p.22). Communal conservancies allow communities to have legal rights to revenues derived from wildlife conservation. The IRDNC's framework is especially interesting because it is based on and revolves around finding ways for conservancies to be self-sufficient. Since the 1990s, the IRDNC's community-based conservation strategies have focused on sustainable wildlife and native species use (hunting, tourism, and conservation), wildlife monitoring, land use planning, management of protected areas, policy, enforcement, and the creation of Transboundary (transnational) Conservation Areas. The IRDNC's initiatives are guided by community interest in establishing communal conservancies rather than mapping or modeling.

| Evaluation Criteria | Rating | Rationale |
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| **Natural Heritage Systems Protection** |  | • The IRDNC's framework does not use the term 'Natural Heritage System'. Instead the framework uses a conservation biology approach to environmental systems, which approaches wildlife and habitats as integral parts of a broader natural system including humans, agricultural activity, culture, and the economy.<br>• Wildlife population recovery and harmonious human-wildlife relations are cornerstones of the IRDNC framework.<br>• As of 2015, IRDNC's framework accounted for over 20 percent of Namibia's land being managed through communal conservancies.<br>• The framework identifies fragmentation as a key threat to conservation, tourism, and economic viability. The framework also values larger contiguous forests and conservation areas, and aims to enhance human-wildlife interconnectivity. |
| **Long-Term Planning** |  | • The IRDNC's framework speaks to a 10-year period extending from 2015-2025.<br>• Communal conservancies are managed for long-term viability beyond the lifetimes of the organizers in that conservancies are managed as resources for future generations.<br>• The framework calls for a visioning process using surveys on governance processes and revenue and budget allocation. The IRDNC intends to develop a "fresh and revitalized vision for conservancy management" (p.30). |
| **Engagement (and Education)** |  | • The IRDNC supports community-based conservation and economic development using a grassroots approach. The framework plays a supportive role rather than a leadership one; therefore, local community members lead the management and governance of their communal conservancies, so top-down engagement is not typical.<br>• The IRDNC supports communities' local governance of finances and revenues from the conservancies, this includes engagement programs for women and youth.<br>• The IRDNC facilitates "extensive training" for the conservancies' governing committees to build capacity and encourage accountability and regards community governance of conservation essential to sustainability (p.27).<br>• The framework's strategic priority is to revitalize local governance systems through:<br>  ◦ Direct engagement;<br>  ◦ Technical support;<br>  ◦ Committee constitution improvements;<br>  ◦ Reallocation of responsibilities between committees and general members; |

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| | | • Enhanced membership participation in decision-making;<br>• Employment of professional managers at the local level;<br>• Mentorship for future conservancy local leadership; and<br>• Increasing engagement with women and youth using targeted programming (e.g. gendered and age-specific economic opportunities; exchanges, visits, tours of other places to encourage new ideas and dialogue). |
| **Planning with Indigenous People** |  | • The IRDNC was established in Namibia shortly after the nation gained independence from colonial rule; therefore, the framework does not discuss nation-to-nation planning with rightsholder communities within the country. However, the plan does discuss increasing engagement and "Traditional Authorities" at the regional level (p.30). |
| **Values of Ecosystem Services** |  | • The framework is entirely based on an overarching, philosophical appreciation of the economic value of ecosystem services; however, the plan does not aim to engage in resource-intensive valuation research.<br>• Namibia's wildlife recovery has become an essential source of household income for communities with communal conservancies. Communal rangelands, forests, fisheries, wildlife tourism, and hunting are known in Namibia to be high-value natural economic assets. The framework seems keenly aware that a holistic approach to habitat conservation is incredibly valuable at an intrinsic sustenance level. |
| **Complimentary with Cultural and Economic Networks** |  | • Communities involved with communal conservancies report cultural pride in conservation efforts and results. Communal conservation have also created viable industries, investment, tourism, and economic activity, especially involving wildlife, forests, and fisheries.<br>• Communal conservancies are implemented in local contexts where unemployment, demographic change, business opportunities, changing aspirations and education levels, and urbanization are crucial factors in the design and management of the conservancy.<br>• The IRDNC's plan discusses economic costs related to wildlife recovery, specifically regarding impacts on agriculture. The IRDNC plans for strong responses to community concerns regarding impacts of wildlife on agriculture because the organization sees responsiveness to community concerns as crucial to maintaining local support for conservation.<br>• Integration of communal conservancy areas and improved rangeland conditions for livestock management present opportunities for greater economic value. The IRDNC plans to expand economic opportunities to water management, forestry, fisheries, wildlife corridors, infrastructure planning, and community land tenure – the plan calls for the integration of diverse nature resource economies using strong local governance.<br>• The IRDNC's programming intends to increase governance roles for rural woman and girls has the potential to be culturally impactful.<br>• Overall, the framework's impact on Namibian culture and its economy has been transformative. The nation has developed economic potential through local governance and cultural human-wildlife/habitat relations have been transformed. The framework's capacity-building programming in rural communities has also made rural lifestyles more economically sustainable. |
| **Proposes Protective Policies/Strategies** |  | • The IRDNC's framework's integral conservation strategy is to support locally governed conservation initiative. However, as an organization the IRDNC also proposes institutional and regional-level strategic goals.<br>• The framework provides the following three strategies:<br>• Expand trans-boundary (transnational) conservation to create larger conservation mega-regions that traverses five neighbouring nations' political borders. This strategy is focused on cross-jurisdictional collaboration and coordination.<br>• IRDNC's communal conservancies have limited legal jurisdiction to control land uses due to gaps and weaknesses in the *Communal Land Reform Act*. Despite this, the IRDNC plans to intensify land use planning, zoning, and corridor-creation efforts.<br>• Communal conservancies require long-term financial stability and self-sufficiency; therefore, the IRDNC plans to establish trust funds to enhance long-term financial sustainability. |

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| **Monitoring and Continuous Evaluation** |  | • The framework does not specify how specific communities plan to design and implement monitoring and evaluation programs. |
| **Model Evaluation** |  | • The framework does not discuss or mention mapping or modeling approaches. |

## Case Study 15: Nature Without Borders: Vision for Comox Valley Conservation Strategy (2013)

Comox Valley is a Regional District in British Columbia, composed of three member municipalities and three electoral areas, which spans over 1,725 square kilometres and serves a population of 66,527 (Statistics Canada, 2016). The Region's borders extent from Crook Creek in the south to the Oyster River in the north, west to Strathcona Park, and east to include both Denman and Hornby Islands. The *Comox Valley Conservation Strategy (CVCS)* was developed by the Comox Valley Land Trust based on the environmental research and information from the 2008 *Nature Without Borders First Edition* Report, which calls on local governments to develop local ecosystem lands and a conservation strategy for protecting sensitive ecosystems on private lands. Based on the three principles of precaution, connectivity, and conservation of ecosystem services, the *CVCS* aims to address the continuing loss and fragmentation of sensitive natural areas in the Comox Valley by updating and revising the information, data and maps contained in the 2008 report.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *CVCS* recognizes that connectivity "maintains the resilience of nature, increasing its ability to adapt to and recover from human and natural disturbances, including climate change" (pp. 16). Connectivity is codified in the natural areas network through two fundamental building blocks: priority ecological areas and recreational greenway trails.<br>• Priority ecological areas propose biodiversity corridors as a method of connectivity conservation, a long-term planning approach that is based on three underlying principles:<br>▪ Large habitat areas are better than small areas;<br>▪ Habitat areas closer together are better than areas far apart; and<br>▪ Areas with low fragmentation are better than areas with high fragmentation.<br>• The strategy stipulates that local governments have a responsibility to incorporate connectivity conservation into their policies and bylaws, such as through conservation zoning, to ensure that human activities do not prevent or threaten the functional linkages between natural areas in the landscape.<br>▪ Conservation zones could include core areas, buffer areas, corridors, and sustainable use areas, to allow and restrict land uses that support connectivity.<br>• In the Comox Valley, the proposed biodiversity corridors are aquatic habitat corridors, which utilize 30 metre buffers to protect aquatic and riparian ecosystems, and upland habitat corridors, which are one kilometre corridors that traverse the region and incorporate a variety of land uses.<br>• Priority ecological areas also include sensitive ecosystems, which are identified by the province as the regions which are most heavily impacted by fragmentation, specifically, forests, woodlands, riparian ecosystems, and wetlands. In addition, priority ecological areas include water resources which recognize the importance of protecting the natural function of the hydrological cycle.<br>• In the Comox Valley, human activities such as land clearing, urban development, shoreline modification, road building, mining, and logging on private timber lands in upper watershed areas, have altered hydrological processes, aquatic ecosystems, and the quality and quantity of water resources.<br>• This three-pronged approach to natural areas protection covers a comprehensive range of critical points within natural heritage systems. |
| **Long-Term Planning** |  | • The *CVCS* does not specify a long-term planning horizon, but affirms that "the way that we plan, develop and govern the interconnected communities that make up the Comox Valley is determining now, and for the future, the long-term health, sustainability and ecological integrity of our region" (pp. 3).<br>• This is an appropriate stance given that a core pillar to the framework is the Precautionary Principle, which holds that the complexities of interacting ecosystems, operating in time and space, exceed our scientific capacity for understanding; therefore, the full effects of human activities can never be accurately predicted (pp. 13).<br>• In this regard, visioning involves acknowledging that Comox Valley is part of a concerning world-wide trend of biodiversity loss, and that only by rekindling humanity's relationship with nature can human-caused extinctions be halted, natural ecosystem functions sustained, and biodiversity restored. |

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| | | • The *CVCS* aims to alter the current trajectory of landscape fragmentation and "represents the hope for conservation certainty in the face of dramatic growth-related change" (pp. 7). While the *Strategy* provides clear evidence on this stance, more clarity on the visioning process and planning horizons would help enhance the strategy's rigour and accountability. |
| **Engagement (and Education)** |  | • After Comox Valley's four local governments unanimously endorsed the goal of protecting a regional natural areas network, the Community Partnership was created to embody a coordinated effort between community organizations, governments, First Nations, businesses, landowners, and local citizens to promote and implement a regional conservation strategy.<br>• It is therefore through the Community Partnership that the *CVCS* identifies the plans and priorities of the larger community and promotes regional collaboration. Having a legitimized and central body that works on the conservation issues is helpful in empowering social organization within the Valley, however the citizen power is still relatively handicapped by the discretion and veto power of the Comox Valley Land Trust. |
| **Planning with Indigenous People** |  | • The *CVCS* recognizes that the loss of Traditional Ecological Knowledge in the Valley is a major gap in understanding how to sustain the region's natural systems and resources.<br>• The Community Partnership "welcomes opportunities to build relationships and work together in respect for the land and people of the K'omoks First Nation" (pp. 50). Moreover, the strategy's first recommendation in establishing effective regional administrative structures is to "consult with the K'omoks First Nation on all matters of land use and conservation planning; demonstrate respect for legal rights, historic and cultural use of the land, waters, and estuaries, and traditional ecological knowledge" (pp. 36).<br>• This is an important acknowledgment, but it does not provide specific language or examples for what 'respect' or 'consultation' mean in practice. Moreover, the valorization of Traditional Ecological Knowledge can imply that planning with Indigenous Peoples is important insofar as it supports the regional sustainability agenda, rather than for the sake of strengthening self-determination for the K'omoks First Nation themselves. |
| **Values of Ecosystem Services** |  | • The conservation of ecosystem services is the third principle of the *CVCSs* framework, and it recognizes four types of ecosystem services: provisioning, regulating, cultural, and supporting.<br>• The *Strategy* does not attempt to apply a monetary value for ecosystem goods and services but acknowledges them as "indispensable" and "the foundation upon which all life depends" (pp. 19).<br>• The *Strategy* affirms that the restoration of natural systems is important, and the Comox Valley Regional Growth Strategy Bylaw No. 120 states that "where cost effective, consider the restoration or creation of natural systems to provide sustainable environmental services (e.g., storm water ponds for improving water quality; tree cover for capturing carbon and reducing GHG emission)" (pp. 19). However, while restoration is important, the *Strategy* emphasizes that protecting biodiversity *before* impacts occur is much cheaper and more effective at securing the flows of ecological goods in the long run, which is a positive approach to conservation, and one that is particularly relevant to the County of Frontenac. |
| **Complimentary with Cultural and Economic Networks** |  | • The second component to the natural areas network is the priority greenway trails, which are "off-road greenways that are designed for low impact uses such as walking, cycling and nature viewing and are intended to preserve public access to natural areas" (pp. 30). Having a strong foundation for a region-wide network for walkers, cyclists and other users links the communities together, provides access to natural areas, and opens up additional opportunities for expansion and connections.<br>• This green infrastructure is identified based on assessment of map layers displaying the existing and proposed park and greenways in the Comox Valley, as well as the recreational greenways identified by the plans and reports recorded in the Conservation Database. The Comox Valley Land Trust Board also considers conservation and stewardship activities along the trails, the train's aesthetic character, and historic values, when choosing the Priority Greenway Trails. |

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| | | • The limitation of these considerations is that they are based on the knowledge of the CVLT Board and are therefore bound by the extent to which the Board consults stakeholders on the community values. Nonetheless, having economic and cultural values embedded into the framework itself assists the strategy in leveraging its applicability across the Valley. |
| **Proposes Protective Policies/Strategies** |  | • The *CVCS* recognizes that the land tenure within the region is predominantly privately owned, and this presents both a challenge and opportunity for the conservation partners to maintain respectful relationships, identify common interests, and use creative approaches that benefit landowners. The strategy provides several action items for how local governments can achieve the strategy's nine objectives, which are:<br>▪ Create Effective Regional Structures for Conservation;<br>▪ Conserve and Protect Remaining Sensitive Ecosystems;<br>▪ Restore Degraded Sensitive Ecosystems;<br>▪ Maintain Natural System Function;<br>▪ Maintain and Improve Landscape Connectivity;<br>▪ Maintain and Restore Riparian Areas;<br>▪ Conserve and Protect Estuaries and Foreshore Areas;<br>▪ Conserve Healthy Water Resources; and<br>▪ Develop and Maintain a Regional Recreational Trail Network.<br>• The strategy also provides a Property Evaluation Tool, which is a matrix for conservation decision-making at the site level to determine the conservation importance and urgency for protection. The matrix in the strategy is quite simplistic, however as data becomes more available the Community Partnership may increase the complexity of the factors, or weighting of the criteria. Altogether, these policies and action items are innovative, feasible, and comprehensive for the Comox Valley. |
| **Monitoring and Continuous Evaluation** |  | • The Community Partnership conducts performance monitoring and action reporting to ensure accountability within the *CVCS,* increase public knowledge and understanding, and gain momentum for the natural areas network.<br>• The Community Partnership has three targets and indicators which are consistent with other regional planning processes and supported by baseline data. The targets are:<br>▪ No further loss of Sensitive Ecosystems in the Nanaimo Area Lowland Ecosection;<br>▪ 20 percent of *CVCS* project area protected by 2020; and<br>▪ 100 percent increase in Sensitive Ecosystems protected by 2050.<br>• The indicators for these targets are the total hectares of sensitive ecosystem, total hectares of protected area, and total hectares of mapped sensitive ecosystem, respectively. The targets and indicators are flexible to change as more information becomes available. These targets and indicators are vague, simplistic, and unrefined, yet they encompass an ambitious vision for the future which demonstrates innovation and initiative. |
| **Model Evaluation** |  | • The *CVCS* is based on the evidence from the reports and studies that informed the 2008 *Nature Without Borders* report, which compiled maps in various formats (i.e. ArcView shape files, AutoCAD files, and paper maps) from the three municipal governments and from the Comox-Strathcona Regional District.<br>• The report recognizes that a significant challenge in developing a regional strategy is that the local governments do not use a common mapping system (tools, methods, and protocols), and therefore the accuracy of the compiled maps is affected by variations in the original format of the information. Despite this limitation, the *CVCS* has capitalized on the opportunity to improve the Valley's data-sharing mechanisms by developing several mapping tools which can be used to identify the priority Conservation Areas. |

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| | | • The Conservation Database was created by the Comox Valley Land Trust to act as a searchable Community Conservation Features Database containing conservation reports and land use plans. These features map out 'conservation significance' and document the environmental and cultural values, as well as specific conservation recommendations made by the authors of the respective plans.<br>• The Regional Conservation Atlas acts as a comprehensive library of digital map layers and is intended to support existing online map applications by providing high-level conservation and land use information to anyone with internet access.<br>• The Regional Priorities Map acts as a guide for regional planners and decision-makers; however, this is merely used for illustrating the minimum requirements for protecting the natural areas network over the long-term.<br>• The *Strategy* represents significant improvements in the Valley with regards to having consistent regional databases, however there is still a huge opportunity to develop a single systematic computer model for spatial prioritization. |

## Case Study 16: Parkland County Environmental Conservation Master Plan: Phase 1 Background Technical Report (2014)

This report updates the 2004 *Environmental Conservation Plan* and is Phase One of a three-phase plan. The main goals and objectives in Phase One are to update the Environmentally Significant Areas (ESAs) inventory for the region and to update the Best Management Practices. Phase Two and Three of the Plan intend to create a set of policies, procedures, and mapping tools for the county to use. The *Environmental Conservation Master Plan (ECMP)* (the "*Plan*") uses comprehensive mapping tools through geographical information systems and workshops to obtain information from the public, professionals, and other stakeholders, to identify areas of ecological significance. The *ECMP* is recognized for acknowledging that landscapes have a gradient of environmental values and that, by preserving critical nodes, the majority of ecological functions will remain intact. The *Plan* also used ecosystem services (ES) as the foundation of its framework. A major component of the completion of this *Plan* is the cornerstone role that stakeholders played in incorporating local knowledge into the determination and prioritization of ESAs. Online tools were utilized to capture information from individuals who were unable to attend open houses due to the rural landscape and low density of the County. The *ECMP* received an award for Planning Excellence in 2015 by the Canadian Institute of Planners for its innovation, incorporation of landscape ecology, multi-criteria modelling, and interactive web-mapping tool.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The purpose of the *Plan* is to update the County's *Parks Master Plan*, and to provide further protection of the Natural Heritage System (NHS)<br>• The *ECMP* (Phase One) focuses on defining vital places for long-term enhancement, maintenance, and rehabilitation if needed.<br>• The *Plan* uses Indispensable Landscape Patterns to ensure the landscape is ecologically protected, focuses on four components: large patches, connectivity, vegetated corridors, and stepping stones. |
| **Long-Term Planning** |  | • The Plan utilizes ESAs as set out by the provincial framework, which recognizes the role of ecosystems in providing production of economic foods, maintaining life-support systems, and providing essential green infrastructure in the long term.<br>• The *ECMP* was created using ESAs as its foundation, and, therefore, addresses a long-term horizon.<br>• The *Plan* does not specify the length of time it is designed for. |
| **Engagement (and Education)** |  | • The *ECMP* used centralized and decentralized methods of engagement for a dispersed rural population and incorporated an online mapping tool to ensure those who could not make it were still able to virtually engage and provide feedback on the *Plan*.<br>• Stakeholders played a cornerstone role in ensuring the *ECMP* appropriately reflects the goals and values of Parkland County.<br>• The *ECMP* conducted consultation in three stages and targeted five groups of stakeholders which include:<br>▪ Technical Stakeholders;<br>▪ General Public;<br>▪ First Nations;<br>▪ Parkland County Committees and Council; and<br>▪ Parkland County Staff.<br>• Prior to the three-phase workshops, there was an initial public online survey conducted which was used to gain information on how the community prioritizes environmental issues.<br>• Phase One had a Public House which worked on annotating maps with sticky notes, getting public feedback, as well as creating a SWOC (strengths, weaknesses, opportunities, challenges) analysis.<br>• The stakeholder workshops included the presentation of draft ESAs, and participants reviewed and provided feedback based on six themes:<br>▪ Species, Habitats, and Landscape Ecology;<br>▪ Wetlands, Landforms, and Steep Slopes;<br>▪ Groundwater and Surface Water Resources; |

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| | | ▪ Protected Areas and Development Pressure;<br>▪ Recreation, Scenic and Cultural Resources; and<br>▪ Environmentally Significant Areas Inventory.<br>• Stakeholders also had the ability to comment on the Beneficial Management Practices, in which they determined three broad topics to be integrated in the plan:<br>▪ Education and Outreach;<br>▪ Compliance and Enforcement; and<br>▪ Support and Compensation. |
| **Planning with Indigenous People** |  | • There is very little mention of consultation with any Indigenous communities in the *Plan*.<br>• Section 2.6 of the *Plan* discusses the opportunities to interact with the Enoch Cree First Nations and Paul First Nations, and that all consultation was conducted through the Office of the Mayor.<br>• The P*lan* does not elaborate on what feedback, discussion, or the frequency of communication with the Indigenous communities.<br>• Seeing as this *Plan* reflects only Phase One of Three, engagement may increase as the project progresses. |
| **Values of Ecosystem Services** |  | • The *Plan* does not quantify the monetary value of ecosystem services, but the *ECMP* uses an ES framework as the foundation of the *ECMP*.<br>• The objective of the ES framework is to recognize the role of ecosystems in providing economic goods, providing green infrastructure, as well as creating a more holistic relationship between community members and the ecosystem.<br>• They described the ES of wetlands as having eight major themes:<br>▪ Biodiversity;<br>▪ Water quality improvement;<br>▪ Flood peak reduction;<br>▪ Drought buffering;<br>▪ Groundwater recharge;<br>▪ Carbon sequestration/Climate regulation;<br>▪ Recreational, scenic, and aesthetic values; and<br>▪ Other services.<br>• The *ECMP* discusses various opportunities provided by wetlands for recreation and tourism. The *Plan* states that ES increase house values by 5,000 dollars per house in the City of Calgary. |
| **Complimentary with Cultural and Economic Networks** |  | • Cultural and economic networks were not a crucial part of this *Plan*.<br>• Although the *ECMP* did briefly discuss the use of ecosystem services for increasing the value of land, it did not discuss opportunities for increasing equity or aging communities. |
| **Proposes Protective Policies/Strategies** |  | • Policy and strategies were not developed in this phase of the *Plan* but are to be developed thoroughly to guide municipal legislation in Phase Two and Three. |

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| **Monitoring and Continuous Evaluation** |  | • The *Plan* recommends various planning strategies, all of which including ongoing monitoring in various capacities depending on the feature. For example, ESAs and lakes should have biannual monitoring if near agricultural sites in order to evaluate the water nutrient levels and various other potential contaminants.<br>• Ongoing monitoring is also recommended for ESAs that are at risk from invasive species and various other ecological threats.<br>• Policies are outlined to retain an environmental specialist to analyze, inspect, and monitor a site's pre-development, construction, operation, and reclamation phases. |
| **Model Evaluation** |  | • The *ECMP* use an innovative multi-criteria modeling process to identify ESAs, using techniques such as overlay mapping using Geographic Information Systems (GIS) to generate a comprehensive map of ESAs.<br>▪ A major phase of this included field reconnaissance to create ground-truthing for accuracy, which included looking at aerial photos, driving public access roads, and a fly-over of the County.<br>• The *ECMP* also conducted several workshops utilizing an interactive web-mapping tool to compile information from stakeholder groups, technical professionals, and the public to integrate into the model.<br>• The model incorporated international, national, provincial, regional, and local areas of significance in the determination of new ESAs.<br>• The methods had five steps:<br>▪ Define ESA objectives;<br>▪ Build criteria that meet specific objectives;<br>▪ Acquire the data that best represents established criteria;<br>▪ Systematically weigh and score criteria; and<br>▪ Conduct spatial modelling to determine the location, classification, and relative significant of ESAs.<br>• Analysis established quantifiable metrics of ESAs that can be designed to meet specific objectives outlined by Parkland County.<br>• Once the modelling overlays were determined, the ESAs were classified into a hierarchy of significance. This was determined by incorporating international, national, provincial, regional, and local values which were then used to systematically classify which ESAs can be protected depending on levels of significance and current development pressures. |

## Case Study 17: Peel Watershed Regional Land Use Plan (2019) (Yukon)

The *Peel Watershed Regional Land Use Plan* (the "*Plan*") addresses an area of 67,431 square kilometers in northern Yukon. The headwaters of the Peel River are in the Ogilvie Mountains in central Yukon. From here, it flows north to empty into the Mackenzie River delta. Its watershed is drained by six major tributaries. These rivers flow through diverse landscapes from high rugged mountains to low, flat taiga forests. The Region has no permanent residents, few roads, and only limited development, creating a wilderness character different from most watersheds of its size in North America. This plan is the result of a 2017 Supreme Court Ruling requiring the Yukon Government to follow the land use planning process set out in Chapter 11 of the Final Agreements of Tr'ondëk Hwëch'in, First Nation of Na-cho Nyäk Dun, and Vuntut Gwitchin.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The *Plan* is scoped by the Peel Watershed with an emphasis on protecting headwaters, and defines 16 landscape management units based on areas with similar ecological properties, planning issues, and management intent.<br>• The *Plan* also uses a land use designation system to determine land management strategies.<br>• 83 percent of the Region is designated as Conservation Areas – areas designed to protect and conserve ecological and heritage resources and maintain wilderness character.<br>▪ 55 percent of the Region designated as Special Management Area (SMAs) - areas with permanent protection.<br>▪ 25 percent of the Region designated as Wilderness Area - areas with interim protection.<br>▪ 3 percent of the Region designated as Wilderness Area-Boreal Caribou – areas with interim protection and are designed to address Yukon's obligations under the Federal Species at Risk Act to protect boreal habitat, requiring legal designation and a management plan,<br>• 17 percent of the Region designated as Integrated Management Areas (IMAs) – areas where a variety of land uses, and new surface access can occur.<br>• 50 percent of the *Plan's* goals focus on maintaining wilderness character, ecological integrity, water quality, quantity and rate of flow, and restoration of disturbed lands to their natural state. |
| **Long-Term Planning** |  | • The *Plan* intends to address concerns regarding the effects of climate change on the region's land, water, wildlife, fish, and the people's uses of these resources.<br>• The adaptive management principle is employed in that the *Plan* is designed to be flexible and act as a living document through periodic changes and revisions as agreed by the parties.<br>• Uses a visioning process.<br>▪ Long-term vision for the region through the Statement of Intent.<br>▪ Goals were developed to address environmental, cultural, and economic aspects of the region.<br>▪ Strategies to achieve these goals include policies and research recommendations and the prescription of best management practices.<br>▪ Employs indicators and indicator levels to provide concise statements about the desired status and current state of the indicators.<br>• No time-horizon was defined – does not prescribe an expiry date. |
| **Engagement (and Education)** |  | • The *Plan* Parties include The First Nation of Na-Cho Nyäk Dun, the Vuntut Gwitchin First Nation, the Tr'ondëk Hwëch'in, the Gwich'in Tribal Council, and the Government of Yukon.<br>▪ Parties of the *Plan* have the main responsibility for its implementation.<br>• Other groups may also be responsible for putting the *Plan* into effect include the Government of Canada, Yukon Environmental and Socio-economic Assessment Board, Yukon Land Use Planning Council, and other Umbrella Final Agreement boards and committees.<br>▪ Until the Parties have decided how to jointly implement the *Plan*, the roles and responsibilities for these other groups are undetermined.<br>• The *Plan* was reviewed and approved through formal consultations in Old Crow, Dawson City, Mayo, Whitehorse, Aklavik, Tsiigehtchic, Fort McPherson and Inuvik and with all affected First Nations. |

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| **Planning with Indigenous People** |  | • The *Plan* Implementation Committee consists of two members from the Yukon government and one member each from Tr'ondëk Hwëch'in, First Nation of Na-cho Nyäk Dun, Vuntut Gwitchin Government and Gwich'in Tribal Council.<br>• This Committee will guide the implementation and monitoring of the Plan on all lands.<br>• For the management of future SMAs, Parties shall:<br>▪ Have joint management authority for all of the SMAs in the Peel Watershed;<br>▪ Jointly prepare, or have prepared a management plan for each SMA;<br>▪ Jointly make best efforts to complete the management plans within five years of the establishment of the SMAs; and<br>▪ Jointly review each management plan at least once every 10 years.<br>• General Terms of Reference are intended to:<br>▪ Promote the well-being of the affected First Nations, other residents of the planning region, the communities, and the Yukon as a whole, while having regard to the interest of other Canadians;<br>▪ Recognize and promote the cultural values of the affected First Nations and other affected Yukon Indian People; and<br>▪ Provide for enhanced opportunities to have ongoing cooperative land use planning activities between the Peel Watershed Planning Commission and the Gwich'in Land Use Planning Board.<br>• Any Regional Land Use Planning Commission, or other planning agency, shall consult with the Gwich'in Land Use Planning Board. |
| **Values of Ecosystem Services** |  | • A core principle of the Plan is sustainable development.<br>• Society, the environment, and economic activities do not overlap equally.<br>▪ Society is embedded within the environment and limited by the environment's capacity.<br>▪ Appropriate economic activities fall within the overlapping circles of society and the environment, while inappropriate economic activities fall outside of the overlapping circles.<br>• Fundamental priority refers to ecosystem integrity and sustaining lands, waters, living things, and natural processes.<br>▪ Loss of ecosystems means societies and economies cannot be sustained.<br>▪ Sustainable communities and sustainable ecosystems are intertwined. |
| **Complimentary with Cultural and Economic Networks** |  | • The *Plan's* goals emphasize ensuring that the traditional ways of living of affected First Nations are maintained.<br>• It also recognizes the importance of the co-existence of traditional and wage-based economies to the regions inhabitants and focuses on accommodating both.<br>▪ Wage-based economic development within IMAs.<br>▪ Protection of traditional economies in Conservation Areas.<br>• There is an emphasis on the ecosystem as fundamental to sustaining the Region's societies and economies.<br>• Appropriate sustainable economic activities include:<br>▪ Activities that do not degrade the land or undermine communities and can be sustained indefinitely; and<br>▪ Activities that deplete resources but from which the land can recover. |
| **Proposes Protective Policies/Strategies** |  | • 83 percent of the Region is designated as Conservation area and given varying degrees of protection.<br>▪ 55 percent of SMA are prescribed full protection from new industrial land uses and surface access.<br>▪ 25 percent of Wilderness areas are given interim protection from new industrial land uses and surface access.<br>▪ Three percent of Wilderness areas-boreal caribou are provided interim protection from new industrial land uses and surface access, with changes requiring a formal review conducted by the parties. Wilderness areas-boreal lands are designated specifically to address Yukon's obligations under the *Species at Risk Act* to protect boreal caribou habitat. |

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| | | • 17 percent of the Region is designated as IMAs where policies and research recommendations have been proposed to address issues regarding managing surface disturbance, disturbance to wildlife and terrestrial habitats, disturbance to fish, aquatic habitats and hydrology, and contaminated sites.<br>• Additional consideration is given for the management of overlay zones which are features where adjacent land requires special consideration and additional management directions.<br>• Overlay zones are identified by major river corridors and the Dempster Highway corridor. |
| **Monitoring and Continuous Evaluation** |  | • The *Plan* uses a results-based management framework which is a structured approach to determine if the *Plan's* goals are being met.<br>• Monitoring cumulative effects indicators for IMAs are designed to capture the effects of change on the environment.<br>• Two indicators are identified to provide guidance to the acceptable limits of human-caused disturbances in the IMAs:<br>▪ Direct surface disturbance referring to the area of land disturbed by human activity, including features such as structures, roads, seismic lines, and access trails. This describes the physical footprint of features and potential impacts on habitats; and<br>▪ Linear density refers to the total length of all human-created linear features in an area and acts as an indicator of habitat fragmentation.<br>• Two indicator levels are identified:<br>▪ Cautionary level that identify when an indicator is close to reaching undesirable levels, provides an early warning signal, and allows time for pro-active management to avert or limit potential impacts; and<br>▪ Critical level which is the point at which the indicators have reached or surpassed acceptable levels.<br>• As human-caused surface disturbances recover through natural re-vegetation or active reclamation, they are subtracted from the total amount of disturbed area within an Landscape Management Units (LMU). |
| **Model Evaluation** |  | • LMUs identify and organize spatial units around distinct areas of land that have similar ecological properties, similar planning issues, and management intent.<br>▪ Used cultural, economic, and environmental overlays to guide LMU designations.<br>• Borders are determined by rivers, roads, and other identifiable features including First Nation Land selections.<br>• The management intent is expressed by the land use designation system, which addresses the different management needs of the LMU.<br>• General management directions provide strategies, best management practices, and recommendations and these apply to the IMAs.<br>• Cumulative effects indicators are used to monitor and provide guidance on the acceptable limits of human-caused disturbances in the IMAs. |

## Case Study 18: Perth's *Regional Environmental Strategy* (2016 – 2020)

Perth is a region in south-western Australia comprised of six local governments, a land area of about 2,100 square kilometres, and an estimated population of 365,500 people. The Eastern Metropolitan Regional Council (EMRC) is a regional local government working on behalf of the six member councils. The 2016-2020 *Regional Environmental Strategy (RES)* represents one of the first attempts, by the EMCR, to progress regional environmental management in Australia under the global United Nations Sustainable Development Goals (SDGs) framework. The *RES* identifies seven of the 17 SDGs as being particularly relevant to the environment in Perth, and the framework translates the SDGs into specific strategic objectives, which are then developed into several initiatives. Together, these form a regional Action Plan.

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • The 15th SDG aims to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" (p. 17). To give effect to this goal, Strategic Objective 6 is that Perth Region "protects, restores and enhances terrestrial ecosystems, addresses land degradation and prevents biodiversity loss" (p.2).<br>• The *Strategy* sets out several targets that aim to restore freshwater ecosystems, combat desertification, reduce biodiversity loss and the impact of invasive species, integrate ecosystem and biodiversity values into national and local planning and development processes, and increase poverty reduction strategies.<br>• These targets, while comprehensive, are purely qualitative and could be improved using some quantitative metrics; not only to provide a benchmark to which the region can be held accountable, but also to illustrate the scale and scope of the change necessary to realize the objective. |
| **Long-Term Planning** |  | • The *RES* is designed for the 2016–2020-time frame with the goal of aligning state and federal priorities with local environmental strategies by 2020.<br>• While a four-year horizon is quite short-term, this may be appropriate given the political dimension to the strategy; having a short-term vision requires the regional leaders in power to achieve the objectives by the end of their mandates.<br>• Moreover, the SDGs are set out in the United Nations' *2030 Agenda for Sustainable Development*; therefore, most of the *Strategy*'s relevant SDG targets aim to accomplish the regional initiatives by 2030.<br>• While the *Strategy* does include language stressing the importance of long-term resiliency and sustainability, most of it emphasizes the urgency of taking immediate action. This is appropriate given that Australia is grappling with the threat of natural disasters resulting from the impacts of climate change.<br>• There are no details on the specific visioning techniques used to develop the strategy. |
| **Engagement (and Education)** |  | • A key strength of the *RES* is that it recognizes that there are a myriad of plans and initiatives throughout Perth that address sustainability planning. The *Strategy*'s intention is not to duplicate existing activities but to act as an enabler that will add value to member councils' own initiatives. Some enablers include regional advocacy, education information and engagement, cross-regional programs, funding, strategic consulting, technical support, research and innovation, and collaboration.<br>• The *RES* arose from an initial technical discussion paper that explored key environmental drivers for the region, which was followed by a consultative process. Consultation included initial contact with key representatives of the EMRC's member councils, where they discussed their current priorities for environmental planning, the structure of the EMRC, and what support they can provide in the future.<br>• Other stakeholders who were contacted and provided opportunity for interviews or meetings include:<br>▪ Natural Resource Management groups;<br>▪ Universities;<br>▪ Government departments; and<br>▪ Community groups.<br>• There were two main workshops held when developing the strategy: the first with environmental services staff and the second with general stakeholders. |

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| | | • The strategy does not specify the extent to which these stakeholders affected the vision and objectives. |
| **Planning with Indigenous People** |  | • The *RES* reflects SDG 17th 'Partnerships for the Goals' by setting out three initiatives in its action plan that affirm the need for member councils to engage more effectively with the Aboriginal community regarding environmental management.<br>• The *Strategy* does not indicate whether Aboriginal communities were consulted when developing the regional strategy, and in this regard, planning with Indigenous People remains largely an afterthought within this document. |
| **Values of Ecosystem Services** |  | • The *RES* emphasizes that "environmental programs and services are no longer separate from other strategies, programs and projects; they are foundational and integral" (pp. 4). Within the context of the EMRC, the Environmental Services Team is a regional department which delivers programs and services related to energy, climate change, water, conservation, and other environmental issues. Therefore, this commitment helps legitimize and elevate the role of the Environmental Services team and establish a precedent for incorporating the team into other regional initiatives.<br>• The RES does not put a monetary value on environmental services but does stress the cost-effectiveness of capitalizing on opportunities for greening the economy (such as through investing in renewable energies, like solar and wind, that are declining in cost), as well as preventing the costs of future environmental disasters and devastation through current mitigation and prevention measures.<br>• The *RES* also recognizes that a key issue in the region is a lack of accounting of environmental impacts in cost-benefit analyses for new developments or infrastructure projects and commits to providing technical support and advocacy to member councils to develop consistent cost-benefit analysis tools for environmental assets. This is a positive commitment, but an unactualized one, since the strategy promises to *develop* consistent values for environmental services, rather than *providing* those values itself. |
| **Complimentary with Cultural and Economic Networks** |  | • The *RES* recognizes the regional opportunity to advocate for 'green growth' as an approach to economic development.<br>• The 11th SDG, 'Make Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable', supports Perth's commitment to several economic and social targets, including:<br>▪ Expand public transport networks across the region;<br>▪ Protect the vulnerable populations from water-related natural disasters;<br>▪ Develop and implement holistic disaster risk management;<br>▪ Provide universal access to green spaces, support rural and peri-rural planning through stronger regional development planning; and<br>▪ Strengthen efforts to safeguard the world's cultural and natural heritage.<br>• Key advocacy on emerging planning policies and guidelines will ensure that a regional approach to planning is supported. |
| **Propose Protective Policies/Strategies** |  | • Because the *RES* is high-level, there are no specific policies that will result in direct natural heritage protection. However, part of the *Strategy*'s implementation plan is its priority determinants. For an initiative to progress it should display at least three of the following seven priority determinants and not negatively affect any others:<br>▪ Regional significance;<br>▪ Sustainable development goals;<br>▪ Economies of scale;<br>▪ Emerging issue/opportunity;<br>▪ Investment ready;<br>▪ Profile (raising awareness of the region as an innovator); and<br>▪ Collaboration.<br>• Examples of significant proposed initiatives include:<br>▪ Secure funding for implementation of regional urban heat island effect mitigation program including technical support or strategic consulting for urban canopy enhancement;<br>▪ Provide technical support and advocacy to member councils to develop consistent and reliable data systems in relation to environmental assets;<br>▪ Continue to build partnerships and provide technical support, research and information relating to weed, pathogen control; and |

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| | | ▪ Identify funding opportunities that enable restoration of degraded land and soil as opportunities arise. |
| **Monitoring and Continuous Evaluation** |  | • The *RES* is intended to act as a living document with an annual progress review to ensure the *RES* evolves over time.<br>• To ensure regular reporting and monitoring, local councils will be kept up to date through a newly created Regional Environment Strategy Advisory Group and the annual review.<br>• Where appropriate, the community will be updated through the EMRC website, media releases and newsletters.<br>• An emphasis on facilitating stewardship, through supporting volunteer networks and community engagement, particularly among youth, is also an initiative that the EMRC hopes will help integrate ecosystem and biodiversity protection into planning processes.<br>• More details on specific metrics and benchmarks for success would improve the *Strategy*'s evaluation techniques. |
| **Model Evaluation** |  | • Since the *RES* is not proposing spatial policies or systems, there is no spatial prioritization model codified in the *Strategy*. However, the *RES* does have a service delivery model, which outlines a framework for progressing from research, strategy, advocacy, and relationship-building, toward achieving improved economic, environmental, and social outcomes. |

## Case Study 19: Queensland's Regional Ecosystems: Building and maintaining a biodiversity inventory, planning framework, and information system for Queensland (2019)

The state of Queensland, in north-east Australia, covers 1.73 million square kilometres, encompassing a wide variety of landscapes across temperate, wet and dry tropics, and semi-arid to arid climatic zones. Queensland has a long history of vegetation surveys and mapping data dating back to 1946. Queensland has undertaken systematic vegetation surveys since 1971, leading up to the 1990s when the Queensland Environmental Protection Agency developed the unique Regional Ecosystem (RE) Framework. The regional ecosystem mapping is a product of decades of investment, effort, and expertise, and it was delivered by a single agency, the Queensland Herbarium. The RE framework was developed to provide a systematic means of describing biodiversity across the different environments of Queensland, and it classifies Queensland's regional ecosystems by combining three major attributes in a hierarchal manner: (1) Broad-scale landscape patterns as described by bioregion; (2) Geology, soils, and landforms, which are described as land zones; (3) Vegetation, which is described in terms of structure and floristics. The RE survey and mapping program was developed to produce a "consistent, seamless, versatile, best-practice and legally-defensible 1:100 000 scale regional ecosystem coverage of the state of Queensland" (p. 6).

| Evaluation Criteria | Ranking | Rationale |
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| **Natural Heritage Systems Protection** |  | • Queensland uses a RE Framework to regulate vegetation clearing where an RE is defined as a vegetation community (a vegetation community is defined in terms of the structure and floristics of the ecologically dominant layer) in a bioregion that is consistently associated with a particular combination of geology, landform and soil.<br>• The underlying premise of the framework is that "different biophysical environments, represented by land zones and bioregions in the RE structure, will enable regional ecosystems to provide more effective surrogacy for the full scope of biodiversity, including unique and distinct biodiversity (maybe in the lower plants, fungi, or invertebrates) than classifications based only on vegetation communities" (p.9).<br>• The RE maps are used to calculate the appropriate vegetation management class and associated codes; then landowners apply those codes by referring to the appropriate mapped RE when, for instance, fodder harvesting, managing encroachment, or managing weeds.<br>• The Wetlands and the Groundwater Dependent Ecosystems mapping is also derived directly from the RE mapping.<br>• The Commonwealth uses the RE mapping in Queensland to illustrate and assess the threatened ecological communities listed under the *Environment Protection Act* and *Biodiversity Conservation Act.*<br>• This is a comprehensive and sophisticated method of ensuring that the quality and quantity of natural resources are understood, preserved, and thoroughly connected through natural processes. |
| **Long-Term Planning** |  | • There is no long-term planning horizon identified in the framework, however, the long and established history of the mapping system indicates that it is intended to be sustained in perpetuity.<br>• The framework acknowledges that vegetation is dynamic and can undergo structural and floristic composition changes due to climate change and the increased frequency of extreme weather events. The mapping programs are designed to incorporate this dynamism into the classification systems. |
| **Engagement (and Education)** |  | • The State Land and Tree Study advisory panel involves stakeholders and academics to govern and advise on the development of this framework. The framework involved long-term scientific leadership when developing the best practices and methods, as well as ensuring training was done consistently.<br>• Cooperation with the Remote Sensing Centre, as well as other departments, particularly Natural Resources and Mines, at both the policy and operational levels was also essential in facilitating a successful mapping program. The program lead to the development of a specialist Geographic Information Systems skills officer, who trained botanists and developed "efficient and best practice routines for processing and storing satellite imagery, capturing line work from imagery, building coverages and analysing the spatial data "(pp. 12). |

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| | | • In addition to offering special training courses, Herbarium staff also provided seminars on the RE framework to stakeholders, politicians, and guest lectures at various universities.<br>• A four-part RE framework training and educational package was developed and is freely available on the Queensland government website.<br>• A bioregional coordinator was appointed to facilitate consistency across the bioregion, and a state-wide technical reference panel was set up to oversee standards in the framework across Queensland. The framework was delivered by a single agency, the Queensland Herbarium, and this is considered a strength because in other states where the responsibility for vegetation mapping is dispersed or fragmented across agencies, coordinated outcomes have been harder to achieve. |
| **Planning with Indigenous People** |  | • The only mention of planning with Indigenous Peoples within the document is when a senior planning officer noted that the mapping has been used to "stratify field survey work in protected areas, potential protected areas and with Traditional Owners on Aboriginal freehold land" (pp. 43).<br>• The absence of Indigenous experts in the mapping program is interesting, particularly since a key component to the baseline data acknowledges that pre-clearing vegetation is defined in terms of 'pre-European' contact, prior to major impacts from non-Indigenous people. In this regard, the incorporation of Traditional Ecological Knowledge would assist in the rigour of the mapping program. |
| **Values of Ecosystem Services** |  | • The RE mapping framework is not currently used to assign a specific value to ecosystem services, but it has been a critical tool in mapping the functional RE groups, comparing pre-clear and present- day vegetation cover to assess change, and developing focused restoration efforts of ecosystem services and the ecological processes that underpin them.<br>• The RE mapping has been useful to showing how the catchments in the receiving waters of the Great Barrier Reef have changed and which planning interventions can help restore these coastal ecosystems. This definitive analysis of the pre-clearing and remnant extent of regional ecosystems is critical to assessing the status of the REs under the federal conservation legislation, particularly since the land clearing is a highly political issue. The programs provide rigorous scientific data that has been used by a large variety of stakeholders and clients, and the benefit-cost ratios are in the order of 40:1 to 50:1.<br>• The framework also recognizes that extreme events such as cyclones and floods have similar destructive impacts on biodiversity and land clearing, and these events should be clearly defined within the classification system, since this strengthens the ability to hold people legally accountable for human-caused ecosystem disruptions, and the costs they have incurred on the environment. |
| **Complimentary with Cultural and Economic Networks** |  | • The RE maps are intended to be used by various stakeholders, in industry and government, and through *the Vegetation Management Act* (1999) has had a considerable impact on management and development options on land. Specific maps are available by request on the Queensland Government's website, and the Queensland Globe, which displays the RE digital coverages in shapefile format, can be used by the public by searching 'regional ecosystems.'<br>• The Regional Ecosystems Description Database is available to the general public and provides up-to-date information on the current list of regional ecosystems.<br>• The RE maps are certified legal documents in the implementation of the *Vegetation Management Act* and there is a rigorous certified map modification process developed to respond to contestations. Some mapping decisions have been disputed in court, which has involved some challenges in explaining and debating ecological concepts in the legal arena.<br>• The programs have been widely accepted by government and stakeholders because of "…the scientific reputation, transparent documentation of processes and the delivery of user-friendly and accessible map products" (pp. 26). Since the mapping is so consistent and credible, it effectively compliments other economic and cultural initiatives in the region. |

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| **Propose Protective Policies/Strategies** |  | • While the RE mapping was designed to be used at the regional scale of 1:100 000, there are many occasions where the GIS technology allows the mapping to be used beyond its intended scale of use. The "readily available and high-quality of the mapping lead to RE mapping being used for planning for local government authorities, landholder properties, and even individual developments" (pp. 20).<br>• The real estate industry can use the maps to search for possible land use limitations. The momentum of this effort to develop more detailed regional mapping has increased the quality, precision, quantity, and affordability of satellite imagery, digital aerial photography, LIDAR and radar.<br>• The RE mapping is also one of the main spatial inputs for the Biodiversity Assessment and Planning Methodologies which are conducted on a bioregional basis around the state, and the RE maps are also fundamental to the implementation and regulation of the Environmental Protection Act as it pertains to developments such as mining. RE is a critical layer in planning for infrastructure and access trails and the management of state-owned real estate.<br>• The pre-clearing mapping is widely used for planning offsets and providing guidance on what vegetation should grow on a site. This is also used to calculate the potential carbon that can grow on a site through the regrowth benefits tool. |
| **Monitoring and Continuous Evaluation** |  | • As stated above, the program used 'pre-clearing' vegetation, or vegetation before European contact, as an accurate and defendable standard to provide a baseline and assess change. Other mapping programs tend to refer to 'natural vegetation' as a baseline, which can involve a confusion over what defines the threshold for 'non-natural' environments and can lead to problems across jurisdictions as these definitions vary.<br>• There are still opportunities to enhance the mapping data, and as more areas are mapped and field surveys gather more ecological site data, the administrative cost of maintaining this data increases. The improved data sources also become in greater demand for a variety of applications and uses, so staff need to continue to update data distribution methods to ensure they are efficient.<br>• As plant nomenclature changes, there are scientific name changes that need to be adjusted, and one opportunity for improving the program and reducing maintenance cost is developing structure databases that can automatically flow through all relevant products and adjust the data accordingly if changes are made.<br>• Investments in scoping and designing an integrated ecological database has occurred through the Biodiversity Systems Modernisation program; however, there are still several opportunities for improvements.<br>• The framework recognizes the need to monitor changes in either flora or fauna to ecological sites, and this provides a measure of the effectiveness of the present management and the impacts of biodiversity threats such as climate change or feral species. |
| **Model Evaluation** |  | • Most vegetation classification systems in Australia use floristics and structure as the two primary elements in classifying vegetation, and all use growth form (physiognomy) to distinguish and describe vegetation units (pp. 17).<br>• The Queensland Herbarium adopted a modified vegetation classification system which defined communities on the basis of the ecologically dominant layer rather than the tallest layer. Since Queensland is made up of a wide variety of landscapes across different climatic zones, consistency across the state or bioregion is achieved by amalgamating the vegetation units and regional ecosystems into the higher-level classification of Broad Vegetation Groups. These Broad Vegetation Groups can encompass the domination of a single species, a distinct structural formation, or a combination of a structural formation and habitat. Specialized habitats such as coral islands and intertidal areas form other groups.<br>• The digital map layers allow users to produce maps based on these broad vegetation groups, and there are three levels of the groups which reflect the approximate scale at which they are designed to be used: the 1:5 000 000 (national), 1:2 000 000 (state) and 1:1 000 000 (regional) (pp. 18). Broad vegetation groups make the RE classification part of a nested hierarchy: below regional ecosystems, there are vegetation associations (which are differentiated with an alphabetical suffix to the RE code), then vegetation associations can be used to acknowledge the variations of the core theme within a RE.<br>• A state-wide technical reference panel involving Herbarium bioregional coordinators and technical experts from other government departments was set up to oversee standards in the state-wide framework (pp. 21). Since RE maps are important regulatory tools, the maps are heavily scrutinized, and where errors are found or perceived, there is often attention given in the rural media. |

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| | | • The program aims to achieve accuracy greater than 80 percent across Queensland, and while there are no reliable independent data sets for comparison, various in-house assessments indicate this accuracy is likely greater than 90 percent. Stakeholders also note a requirement for homogenous polygons for RE's to make the maps easier to use and clearer to understand. |

# APPENDIX B: ADDITIONAL RESOURCES

## Contents

Ontario Headwaters Institute. (2016). Protecting Ontario's Headwaters: Extending the Co-ordinate Land Use Planning Review to Preserve Ontario's Natural Heritage, Watersheds, and Ecological Integrity. *http://www.ontarioheadwaters.ca/wp-content/uploads/2016/11/Protecting-Ontarios-Headwaters.pdf*

*Protecting Ontario's Headwaters* (2016) was produced by The Ontario Headwaters Institute (OHI) and recommends that headwater protection should focus on Contiguous Upland Headwater Catchments. This OHI construct focuses on protecting first and second-order streams that touch each other in the upstream areas of any watershed. This document describes why headwaters, and their contiguous upland catchments are important and offers three recommendations for Ontario. These include:

1. Consult on the establishment of targets for how much natural heritage should be set aside, based in part on the federal publication *How Much Habitat is Enough*;
2. Focus the development of its proposed watershed planning guidance document on Integrated Watershed Management; and,
3. Integrate the OHI construct of Contiguous Upland Headwater Catchments into the three of the Four Directions related to natural heritage, watershed planning, and significant surface water contribution areas.

The Economics of Ecosystems and Biodiversity. (2020). *Making Nature's Values Visible*. http://teebweb.org/

When it comes to assigning economic value to components of the environment, the international project 'The Economics of Ecosystems and Biodiversity' (TEEB) provides a model for how this can be done. TEEB sees the invisibility of nature in the economic choices we make as a key driver of the ongoing depletion of ecosystems and biodiversity and seeks to make the environment more visible across the domains of international, national, and local policy-making, public administration, and business. TEEB takes a three-pronged approach: recognize value in ecosystems, landscapes, and species; demonstrate value in economic terms for decision-makers to consider the full costs and benefits of their choices; and capture value by introducing mechanisms that incorporate environmental values through incentives and price signals.

Alderville First Nation. (2015). *Alderville First Nation Consultation Protocol*. http://alderville.ca/wp-content/uploads/2017/02/AFNProtocol2.pdf

This protocol is an example of one First Nation's- Alderville First Nation - consultation rules, process, and principles. The resource explains the legal context for consultation, the order that each step should occur, and the way information and communication should flow. The resource refers to the Crown's (federal and provincial government's) Duty to Consult and Accommodate Indigenous Nations, but the steps and considerations outlined therein exemplify the processes that the County of Frontenac may come to better understand through ongoing engagement with Indigenous rightsholders in long-term Natural Heritage System (NHS) planning.

MacDonald, I. R. (2020). *Indigenous Consultation and Engagement: A Primer.* ASI Heritage. https://asiheritage.ca/wp-content/uploads/2020/06/Indigenous-Consultation-and-Engagement-digital1.pdf

This brief resource by a private heritage management firm explains the definitions of and relationships between reconciliation, consultation, engagement, and Indigenous law.

Federation of Canadian Municipalities (FCM), Community Economic Development Initiative (CEDI), & Cando. (n.d.). *Creating a joint working for First Nation-Municipal partnership.* https://fcm.ca/en/resources/cedi/working-group-tool

This is a four-part tool to help municipalities form and use an effective Indigenous-Municipal working group in their planning processes. The guide is based off of First Nation-Municipal working groups from across Canada. The package offers an explanatory guide and three templates to create a Terms of Reference; Dialogue Principles; and Meeting Agenda.

Federation of Canadian Municipalities (FCM), Community Economic Development Initiative (CEDI), & Cando. (n.d.). *Stronger together: A toolkit for First Nations-Municipal community economic development partnerships.* https://fcm.ca/sites/default/files/documents/resources/tool/stronger-together-toolkit-cedi.pdf

Based on two years of research and engagement processes, this resource explores how municipalities and First Nations can build strong working relationships based on common goals and a shared vision. The resource does this through the prism of community economic development, which overlaps with the need to integrate economic, cultural, and environmental networks into a Natural Heritage System (NHS) plan. The step-by-step guide, tools, and templates in chapters two, three, and four may be useful.

Federation of Canadian Municipalities (FCM), Community Economic Development Initiative (CEDI), & Cando. (n.d.). *Economic recovery and resilience: A guide for First Nation-Municipal collaboration*. https://www.edo.ca/downloads/cedi-guide- economic-recovery.pdf

This Indigenous-municipal emergency response and preparedness guide was created to be used in tandem with the *Stronger Together Toolkit* (included in this list of additional resources). Creating a plan for collaborative emergency response is especially salient in light of the drastic climate change impacts that communities in Canada are experiencing. This guide encourages "building relationships and together before an emergency" and recovering from natural disasters using a long-term planning lens (p.2).

Federation of Canadian Municipalities. (2019). *Sustainable land use practices in Canadian municipalities: A snapshot.* https://fcm.ca/en/resources/gmf/report-sustainable-land-use-practices-in-canadian-municipalities

This report uses case study analysis to recommend 27 best practices and 10 "highlights" for sustainable land use planning in Canadian places, both large and small. The best practices speak to planning in mostly urban settings, but the report's suggested "key success factors" for ecosystem services valuation, stemming (rural) sprawl, and green infrastructure policies, etc., may be relevant to Frontenac County's Natural Heritage System (NHS) planning context.

Ontario Nature. (2014). *Best Practices Guide to Natural Heritage Systems Planning*. https://ontarionature.org/wp-content/uploads/2017/10/nhs-guide-web-1.pdf

This resource explains systems-based natural heritage planning in an Ontario context. The guide recommends best practices in NHS planning principles, Ontario case study examples, and Official Plan policy examples.

Municipal Natural Assets Initiative (MNAI). (2019). *Advancing and integrating municipal natural asset management through asset management planning in Ontario*. https://mnai.ca/media/2020/01/MNAI_MNAPOntario.pdf

MNAI is an expert in the emerging field of ecosystem services valuation. This resource discusses integrating climate change measures into natural asset management planning and developing the natural assets inventory (as recommended in our report for Frontenac County). The report includes an extensive "Resources" list regarding how to create and use a natural assets inventory.

Municipal Natural Assets Initiative (MNAI). (2017). *Defining and scoping municipal natural assets: Discussion paper*. https://mnai.ca/media/2018/02/finaldesignedsept18mnai.pdf

This resource is a brief introduction to natural assets – What are they? How are they identified? How are they assessed? What is the difference between natural assets and green infrastructure? Where is the intersection between natural assets, green infrastructure, and municipal assets? This report answers these foundational questions in an accessible manner using diagrams.

Natural Resources Canada. (2014). *Tracking climate change effects: Potential indicators for Canada's forests and forest sector*. Government of Canada. https://cfs.nrcan.gc.ca/publications?id=35231

This report discusses indicators that can be monitored to observe and measure the impacts of climate change on forests in Canada. One of the anticipated climate change impacts on forests is tree species migration; within 50-to-100 years, Frontenac County's forests may be home to different tree species. However, due to the intimate relationship between insects, birds, trees, and many other flora and fauna, tree species migration may have a profound ripple effect on all living beings in

the Natural Heritage System (NHS). This report from 2014 may not have the most current information, but its list of indicators and accessible explanations of the opportunities and challenges may be useful to gain a high-level understanding of the issues that a climate change lens could capture in Frontenac's next NHS plan.