

Wetland Management in Ontario: A Social Multi-Criteria Evaluation of Niagara Falls' Slough
Forests

by
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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement of the degree of
Master of Environmental Studies
in
Sustainability Management

Waterloo, Ontario, Canada, 2020

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

Abstract

Wetlands are unique ecosystems that provide a multitude of direct and indirect services to the human population. Yet, these ecosystems continue to be one of the most threatened biomes in the world with unsustainable rates of loss and degradation. To address the social, environmental and economic consequences resulting from the loss of wetland services, several policy frameworks have been developed and implemented at various levels of government around the world. These frameworks have varying degrees of flexibility to balance the need to protect remaining wetlands and pursue economic development. This study examined Ontario's policies governing wetlands and the competing interests surrounding land use decision-making of wetlands at the local level using a case study of a provincially significant wetland (PSW) in the City of Niagara Falls. A Social Multi-Criteria Evaluation was used to understand the problem surrounding the PSW and act as a decision-making support tool to effectively assess outcomes. Despite a high rate of inconsistency among participant's responses, the results of the evaluation demonstrated a split desire for complete conservation of the study area and allowing partial development outside the PSW and buffer areas with ownership of the PSWs transferred to a public authority. Therefore, Ontario, which currently relies on a command and control policy approach to wetland management, may benefit from the adoption of market-based policy instruments that seek to balance wetland protection with economic development. However, the type of market instrument appropriate for Ontario will require further study to address inefficiencies highlighted in the current provincial approach and assess public support as some market-based approaches have already demonstrated a lack of public support.

Acknowledgements

I would like to thank everyone that has contributed to the completion of this thesis. That includes my Supervisor, Dr. Jason Thistlethwaite, who helped format the structure of the research project, kept me on track whenever I got sidetracked with the details, and for providing words of encouragement whenever I was faced with challenges.

I would also like to thank Dr. Simron Singh who also helped structure the research project and provided expert advice on the SMCE methodology. He also taught me the underrated value of stakeholder engagement and who also took time during his sabbatical year to provide direction when needed.

Which leads me to give thanks to Dr. Nelson Grima who was not a part of the committee but was generous enough to provide insight into OPTamos and how to overcome challenges faced with an alternative interpretation of SMCE. Although I had spammed his inbox a number of times, he was always encouraging and willing to discuss solutions.

I would also like to give recognition and thanks to Dr. Marie-Claire Cordonier Segger for including me in her research projects external to this one that provided me with a breadth of analysis methods that I have incorporated in this thesis. I was able to apply various interpretations and analyses to the SMCE from a policy perspective because of her expertise and guidance.

Lastly, I would like to thank all nine of the participants of this study. As a requirement for participation, they have all remained anonymous but were a crucial part of the analysis and it would not have been possible without their unwavering passion and support for this issue. Some of them have dedicated years to this issue and I am grateful that they have shared their experiences with me, and I hope this project was helpful. They have taught me, not only about this land use conflict, but about Niagara's ecology, the lengths local activists will go to protect what they think is right, and the realities of local politics.

Thank you for everyone's support!

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List of Abbreviations

CBA	Cost-Benefit Analysis
EIS	Environmental Impact Study
EPA	Environmental Protection Agency
ES	Ecosystem services
FPWC	Federal Policy on Wetland Conservation
FOI	Freedom of Information
LPAT	Local Planning Appeal Tribunal
MCDA	Multi-Criteria Decision Analysis
MMA	Ministry of Municipal Affairs
MNRF	Ministry of Natural Resources and Forestry
MOU	Memorandum of Understanding
NAWCC	North American Wetland Conservation Council
NAWMP	North American Wetland Management Plan
NPCA	Niagara Peninsula Conservation Authority
OPA	Official Plan Amendment
OWES	Ontario Wetland Evaluation System
PES	Payments for Ecosystem Services
PPS	Provincial Policy Statement
PSW	Provincially Significant Wetland
SMCE	Social Multi-Criteria Evaluation
WTA	Willingness to Accept
WTP	Willingness to Pay

Chapter 1: Introduction

Wetlands are unique ecosystems that provide a multitude of direct and indirect services to the human population. Yet, these ecosystems continue to be one of the most threatened biomes in the world with unsustainable rates of loss and degradation, often as a result of economic development. To address the social, environmental, and economic consequences as a result of the loss of wetland services, several policy frameworks have been developed and implemented at various levels of government around the world with varying degrees of flexibility to balance the need for wetland conservation and development.

As will be demonstrated in the literature review below, the threat to wetlands and the need to protect them from further degradation is clearly accepted in academic literature. However, little attention has been given to the exploration of the attitudes towards wetlands in Ontario and the competing influences impacting local decision-making processes. In 2017, the Ontario government published a Wetland Conservation Strategy that seeks to identify threats to wetlands in the province and establish targets to address them by 2030 (Ontario Government, 2017). To help inform Ontario's 2030 wetland targets, this study seeks to provide insight into competing interests over wetlands in Ontario. The purpose of this study is to explore different wetland management approaches and compare them to Ontario's current approach. A case study is then used to highlight challenges to Ontario's current approach and identify acceptable compromises to stakeholders. The study will ultimately serve as a communication platform for competing interests in order to inform policy challenges.

As a result of the literature review outlined in the following chapters, the subsequent research questions emerged.

- 1) How does provincial policy ensure the protection of wetlands in Ontario? How effective are they?
- 2) What are some challenges of the current wetland management system in Ontario?
- 3) How does the local community and stakeholders view wetlands? How do they want them to be managed?
- 4) How effective is a Social Multi-Criteria Evaluation (SMCE) as a decision-making support tool? How can it support local decision-making of wetlands?

SMCE is a decision aid tool that considers a collection of objectives and criteria that may be conflicting, multi-dimensional, incomparable, and incommensurable (Oamnn, 2000; Dodgson, Spackman, Pearman & Philips, 2009). SMCE provides insight into the nature of conflicts and assists at arriving at political compromises by increasing the level of transparency into the decision-making process. The approach attempts to do this by simplifying and ordering solutions to complex decision-making problems that may affect various stakeholders, and which may have several possible outcomes (Garmendia et al., 2010). This tool will be discussed in further detail in Chapter 6 (Methodology).

The SMCE proved useful to address these research questions because of the conflicting values associated with wetlands among various societal groups. This makes the governance of

natural resources complex with uncertain and disproportionate consequences to various groups. SMCE seeks to address these concerns by providing a transparent and flexible framework to incorporate the knowledge of various stakeholders, some of whom are not typically included in formal decision-making processes (Reed, 2008), to improve the knowledge of a particular problem and effectively assess outcomes (Garmendia et al., 2010).

To inform the research questions, a comprehensive literature review will first explore the value wetlands provide to human society and sources threatening wetlands around the globe. An evaluation of policy approaches used by jurisdictions across North America to govern and protect these resources will then be explored. These approaches will be used to inform Ontario's approach to wetland management. Lastly, a SMCE will be applied to a case study of a prominent land use conflict in the City of Niagara Falls to inform challenges faced by Ontario's approach.

Between the Government of Ontario, Conservation Authorities and municipalities, wetlands are governed by a plethora of policies either directly or indirectly using a command and control governance approach. However, several challenges emerged among various levels of government. Although the overall rate of wetland loss in the province has declined, there continue to be conflicts between the need for economic development and the preservation of ecological functions of provincially significant wetlands. This is partly due to disputes over the Ontario Wetland Evaluation System and the criteria to classify significant wetlands that warrant protection. Although policies are being enforced by the province, these policies and processes appear to be threatened by politically influenced decision-making at the regional and local levels.

Other governance challenges include the lack of transparency and reported conflicts of interest in governing institutions such as Conservation Authorities. Also, the lack of adequate and sincere consultations, required under the province's Planning Act, among residents, including indigenous communities, have resulted in damaged relationships and mistrust between decision-makers and the public. These inefficiencies are common criticisms found among command and control policies and threaten the effectiveness of wetland management.

Despite a high rate of inconsistency among participant's responses, the SMCE case study demonstrated that participants are split between the desire for complete conservation of the study area and allowing some development with public ownership over the wetlands. Therefore, the province may benefit from market-based policy instruments that seek to balance development and wetland protection. However, the type of market instrument appropriate for Ontario will require further study to address inefficiencies highlighted in the current system and assess public support as some market approaches have already demonstrated a lack of support. Additional studies to further support the findings of this study may prove valuable in resolving land use conflicts around wetlands in Ontario and may help the province towards achieving 2030 targets.

Chapter 2: Introduction to Wetlands

2.1 What are Wetlands

Several definitions of wetlands exist depending on the location and institution, but they are commonly identified by the presence of water seasonally or permanently, on the surface or deeply absorbed in the ground, each type with its own unique soil conditions that differ from upper lands, and support vegetation adapted to such wet conditions (Verhoeven & Setter, 2010). The most commonly cited definition comes from the Ramsar Convention Secretariat adopted in 1971 that defines wetlands as “areas of marsh, fen, peat-land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does exceed 6 m”. This intentionally broad definition seeks to include both coastal and inland landscapes such as swamps, marshes, lakes, peatlands, mangroves, estuaries, deltas and coral reefs, as well as man-made lands including fishponds and rice paddies (Millennium Ecosystem Assessment, 2005; Tolentino, 2013; Kim, 2010). The Ramsar Convention’s definition remains the global standard but is much broader than some definitions adopted at the national level and has been the source of much debate between jurisdictions (Finlayson, Davidson, Pritchard, Milton & Mackay, 2011). In contrast, Ontario defines wetlands as “lands that are seasonally or permanently covered by shallow water as well as lands where the water table is close to or at the surface. In either case, the presence of abundant water has caused the formation of hydric (waterlogged) soils and has favoured the dominance of either hydrophytic (water-loving) or water-tolerant plants” (Ontario Government, 2017). In addition to uncertainty as to how to define such landscapes, there continue to be varying perspectives on how to manage and whether to conserve such areas. As will be demonstrated throughout this section, there is a significant and urgent need to protect wetlands and to enforce strong, accountable policy to prevent their further loss and destruction.

2.2 Importance of Wetlands

Wetlands around the globe make up approximately 7-10 million km², accounting for roughly 5-8 per cent of the world’s total land area (William & James, 2015; Xu, Jiang, Tan, Costanza & Yang, 2018). However, there continues to be difficulty providing an accurate estimate of remaining wetlands, resulting in inconsistent figures due to the lack of available information, technology and varying considerations of what constitutes a wetland (Hu, Niu, Chen, Li & Zhang, 2017). This lack of understanding is important to address because wetlands offer significant value to human beings as they provide many natural functions that support the provision of products, services, life systems and experiences at the local, regional, national, and international level depending on the type of function (Bond, Cox, Heberlein, Manning, Witty & Young, 1992).

The lack of understanding of the rate to which global wetlands are being lost contributes to concern for biodiversity and natural resource management, leading to the emergence of an Ecosystem Approach. This approach focuses on delivering more integrated policy and management at a landscape scale directed towards human well-being (Haines-Young & Potschin, 2010). The functions and services that wetlands provide include a variety of benefits that can be simply categorized into ecological, economic, and social services.

According to Costanza et al. (1997), ecosystem functions refer to the habitat, biological or system properties or procedures of an ecosystem. However, functions are often used to suggest an ecosystem's capacity or capability to provide something useful to people, which is often used in definitions of ecosystem services (ES). For example, an ES is defined as the benefits to human well-being that are derived from the ecosystem (Costanza et al., 1997; MEA 2005; Xu et al., 2018). Therefore, there continues to be debate around how to define and distinguish between ecosystem functions, services, and benefits to human well-being.

The service cascade model has been criticized for its simplicity and unrealistically linear interpretation of real world links but remains a valuable tool to demonstrate the connection between the functions flowing from an ecosystem to a service and finally to a benefit for human well-being (Haines-Young & Potschin, 2010). The model's purpose is to connect both ends of the 'production chain' linking ecological and biophysical structures and processes to elements of human well-being (Potschin & Haines-Young, 2011). Other iterations of the model suggest several intermediate steps. But this is sometimes a difficult connection to make depending on various geographical and societal factors. For example, wetlands have the potential to slow the flow of surface water which has the potential to reduce flood risk, which is useful to humans. However, this benefit is an indirect attribute of the ecosystem. Whether it is classified as an ES depends on if people consider it as a benefit, which is influenced by the geographical location and time (Haines-Young & Potschin, 2010). The cascade model attempts to clarify the direct and indirect benefits people derive from natural capital (Potschin & Haines-Young, 2011). Therefore, understanding the significant ecosystem functions, the factors constituting an ES, geographical location, and societal choices and values is necessary for holistic policy decisions.

It is noteworthy that ecosystem functions and services do not always express a one-to-one relationship (Costanza et al., 1997). In other words, it is not uncommon for a single ES to be a product of more than one ecosystem function and vice versa, therefore it is important to understand the links between functions and services before the implementation of policy initiatives. Some ES provided by wetlands are beneficial on a regional scale, including the ability to absorb large amounts of water and thereby act as a buffer zone to protect from extreme floods and storms (Verhoeven, Beltman, Bobbink & Whighman, 2006). Coastal wetlands typically support large areas of mangroves which protect shorelines from degradation and flooding (Adekola, Whanda & Ogwu, 2012). They also improve the quality of water which humans use for drinking water (MEA, 2005). Additionally, wetlands provide recreation and leisure for individuals who are within a proximity and find a spiritual connection with the natural environment (Herath, 2004; MEA 2005).

Other ES benefit human well-being on a global scale, such as the ability to sequester carbon (Verhoeven et al., 2006), although these services are often unnoticed. Nonetheless, wetlands have natural regulatory and supportive services such as climate regulation, oxygen production, nutrient cycling, and soil formation that indirectly benefit human well-being (Adekola et al., 2012). In the following sections, the four types of wetland services that are supported by the Ramsar Convention on Wetlands – 1) provisioning, 2) supporting, 3) regulatory, and 4) cultural services – will be explored to demonstrate their natural significance to

the well-being of the human population. The valuation method of these services will then be discussed as a means for communicating the value of these services.

2.2.1 Provisioning Services

Provisioning ES refer to the products that can be obtained from ecosystems, including food, water, timber, fibre, and genetic resources (Mitsch, Bernal & Hernandez, 2015; MEA, 2005). The two most significant services supporting human well-being are food (predominantly fish) and clean drinking water (MEA, 2005). The supply of renewable fresh water for human consumption comes from an array of inland wetlands such as lakes, rivers, swamps, and shallow groundwater aquifers (MEA, 2005). They have the capacity for groundwater recharge and water quality and quantity enhancement (MEA, 2005; Verhoeven et al., 2006; Ramsar Convention Secretariat, 2007; Durigon, Hickey & Kosoy, 2012). This is important as groundwater provides drinking water to roughly 1.5 – 3 billion people, used as source water for 40 per cent of industrial use (Verhoeven et al., 2006), and 20 per cent of irrigation usage (MEA, 2005). Therefore, in a time of foreseeable water scarcity, wetland services are becoming more valuable despite substantial losses (Verhoeven et al., 2006).

Wetlands also support an abundance of biodiversity, particularly waterfowl, shellfish, fish, and plant life (Zedler & Kercher, 2005). In addition to providing an avenue of sustenance for individuals and their families, capture fisheries in coastal regions such as estuaries, marshes, mangroves, and coral reefs account for \$34 billion in gross world product annually (MEA, 2005). Wetlands also significantly contribute to a country's gross domestic product (GDP) because of the natural goods and services available, leading to employment opportunities (Khan & Haque, 2010). Since humans typically settle in concentrations around wetlands (Adekola et al., 2012), many employment opportunities depend on the resources provided. For example, the fisheries sector provided about 60 per cent of the dietary protein requirements for rural communities in Bangladesh and accounted for roughly 6 per cent of their GDP (Khan & Haque, 2010).

2.2.2 Regulatory Services

Regulating ES encompasses many of the indirect benefits of wetlands that are often unnoticed. This includes, air quality regulation, climate regulation, water purification, disease regulation, pest regulation, pollination, and the regulation of natural hazards such as flooding (Mitsch et al., 2015; MEA, 2005).

For example, water purification and detoxification of wastes, particularly in marshes, have a significant role to play in treating contaminated water (de Groot et al., 2012). Some wetlands have even been attributed to the reduction of nitrate by over 80 per cent (MEA, 2005). Without these natural functions to purify the water supply, an increased risk of diseases may occur (MEA, 2005). The threat of disease due to inadequate water, sanitation, and hygiene amounts to 1.7 million deaths and results in a loss of at least 54 million health life years per year (MEA, 2005). Although there may be technological advancements to replace these natural services, they may not be widely assessable and affordable. Therefore, these natural ES are of the utmost importance to developing countries and marginalized communities.

In the face of increased discussion about climate change mitigation, wetlands play an important role in the regulation of the global climate through sequestering and releasing of carbon dioxide into the biosphere (Carpenter et al., 2009). For example, peatlands, although covering only an estimated 3-4 per cent of the world's land area, have been estimated to store 540 gigatons of carbon, representing roughly 1.5 per cent of the total estimated global carbon storage (MEA, 2005). In addition, as sea and precipitation levels rise, coastal and inland populations will be increasingly vulnerable to flooding and many other risks. However, mangroves, floodplains, lakes and reservoirs provide a physical buffer against climate change impacts (Turner et al., 2000; MEA, 2005). It is estimated that nearly 2 billion people live in areas with a high risk of flooding, which will be further exacerbated by the loss and degradation of wetlands (MEA, 2005). Therefore, wetlands provide provisioning services that are subtle but important protection for a significant portion of the population.

2.2.3 Cultural Services

Cultural ES are considered the benefits that individuals receive from the spiritual enrichment, aesthetics, recreation, ecotourism, formal and informal education, and cultural heritage (MEA, 2005). Wetlands have been acknowledged internationally for their significance, especially as it pertains to plant and animal (notably migratory birds) biodiversity (Verhoeven et al., 2006; Schulte-Hostedde & Schrubsole, 2003). International agreements such as the Ramsar Convention on Wetlands and the United Nations Convention of Biological Diversity (CBD) acknowledge the urgent need to protect valuable natural areas because of their significance to the natural environment (Verhoeven et al., 2006). This includes riverine wetlands, shallow lakes, and coastal wetlands, which are important natural habitats for fish to reproduce (Verhoeven et al., 2006). This, in turn, provides area for recreational purposes such as hunting and sport, which support tourist attractions and considerable income. For example, recreational fishing in the United States generates a total of \$24 – 37 billion annually (MEA, 2005).

2.2.4 Supporting Services

Supporting ES comprise basic natural processes such as nutrient cycling, soil formation and the hydrological cycle (MEA, 2005). These primary processes serve as the foundation for which the other three services and vital ecosystem functions derive (Mitsch et al., 2015; MEA, 2005), which benefits the well-being of many people as demonstrated above.

As previously mentioned, wetlands provide an abundance of services and benefits for human well-being as well as the natural environment. As the human population continues to grow, so does the demand for most ES (Carpenter et al., 2009). However, there is concern that these critical functions face increasing risk of destruction and are not being protected to the extent necessary to ensure their continued existence (Costanza et al., 1997; Carpenter et al., 2009; Adekola et al., 2012). There has been increased preference toward provisioning services to provide nutrients to support growing populations, which has ultimately resulted in the reduction of regulating, supporting and cultural services (MEA, 2005; Carpenter et al., 2009; Xu et al., 2018).

2.2.5 Wetland Valuation

As a result of the general preference towards provisioning ES, some policymakers have found themselves at odds with one another (MEA, 2005). To address this biased approach to wetland management, economists have attempted to convey the value of non-market ES in monetary terms to address the growing desire to include environmental and natural resources into the decision-making process (Carpenter et al., 2009; He, Dupras & Poder, 2016). Since many of these ES are non-market services and are instead perceived as positive externalities with no market value, policymakers encounter difficulties when conducting cost-benefit analysis when making decisions effecting wetlands (He et al., 2016). Using the valuation method, the values of non-market ES such as the regulation of water flows, habitat biodiversity, climate regulation, recreation and education are often greater than the economic gains that would be achieved from the conversion of wetlands to other uses such as agriculture or urban infrastructure (MEA, 2005; He et al., 2016).

The valuation approach can therefore be used to highlight associated trade-offs between alternative management approaches (Xu et al., 2018). For example, intact freshwater marshes in Canada are calculated to be valued at about \$5,800/ ha in comparison to \$2,400/ ha when they are drained and used for agriculture (MEA, 2005). However, studies such as these have been slow to emerge, with very few findings exploring practical management approaches (Xu et al., 2018). Expressing ES in monetary units can also act as a guide to understand stakeholder preferences and make it easier to allocate resources among competing uses (de Groot et al., 2012). For example, this approach has been used for the implementation of the CBD programme to integrate such values into national accounting systems (de Groot et al., 2012).

It should be noted that many scholars acknowledge that there are some cases in which the benefits of converting a wetland exceed those of conserving it (Costanza et al., 1997; Carpenter et al., 2009). However, as wetlands continue to be lost, the relative value of conserving remaining wetlands will increase (MEA, 2005). To understand these types of scenarios, valuation techniques attempt to place a common value, in many cases a dollar figure, on competing services to make informed decisions of the trade-offs (Carpenter et al., 2009). However, some critics caution this objective and quantifiable valuation technique which, is argued to have the potential to mask the complexity of critical processes underlying the production of ES behind monetary figures (Gomez-Baggethun & Ruiz-Perez, 2011). Although, Potschin and Haines-Young (2011) caution that valuation should only be applied to goods or services being consumed or used rather than the ecological structures and processes that support them. This is because the value of the structures and processes are already implied in the estimate and may contribute to various other goods and services, therefore should only be counted once.

Some critics of this method of decision-making argue that it is ultimately impossible or unwise to place a monetary value on things that are intangible such as human life, environmental aesthetics, and long-term ecological benefits (Costanza et al., 1997). However, these approaches have commonly been used for other ES. Another argument against valuation is that wetlands should be conserved based on the moral obligation to protect the environment which does not

require valuation (Costanza et al, 1997). This follows the critique posit that some things, for ethical reasons, should not be for sale and reject the frame of ES as commodities (O’Niell & Spash, 2000; McCauley, 2006). These concerns expressed around commodification are rooted in the commodity frontier (e.g. what should and should not be included in the realm of markets and trade) (Gomez-Baggethun & Ruiz-Perez, 2011). Additionally, some express concerns of equity exploitation resulting from commodification, turning publicly accessible ES into commodities that can only be accessed by those with the purchasing power to do so (Gomez-Baggethun & Ruiz-Perez, 2011). These concerns are not meant to criticize commodification in its totality. Rather, concerns are centered on the limits of commodification of ecosystems and wildlife (Prudham, 2007).

Since ES remain largely outside the market, they are often taken for granted or ignored, which results in the approval of development projects without considering the social and ecological costs of the decision (Costanza et al., 1997). It is argued by valuation proponents that expressing the monetary values of non-market ES has the ability to universally convey their relative importance to policymakers, which can help with the efficient allocation of funds by identifying where protection and restoration is needed most and the extent to which compensation should be paid for the loss of such services (de Groot et al., 2012). This does not suggest placing a price on such services, nor does it imply that they should be traded in private markets and treated as private commodities (de Groot et al., 2012). Rather, valuation is intended as an estimate of the various services provided by wetlands that benefit human well-being which will be greatly diminished if a wetland is degraded or lost (de Groot et al., 2012).

2.2.6 Era of Wetland Exploitation

Before ES valuation, the value of non-market ES derived from wetlands were easily overlooked. Kim (2010) uses three eras throughout human history to explain the evolution of wetland policy in developed countries. The first era, ranging from early civilization to the 1960s, is referred to as the Era of Wetland Exploitation (Kim, 2010). During this period, wetlands were drained and filled for agricultural practice and embankment projects for coastal safety measures (Kim, 2010). As these practices developed, reasons for wetland destruction began to diversify with the introduction of industrialization and urban development (Kim, 2010).

This era resulted in widespread destruction of wetlands, natural habitats, and ES due to intense pressure to develop for economic gain (Kim, 2010). Conversion practices were economically driven with little to no consideration for the negative consequences of the over-exploitation of natural resources (Kim, 2010). The effects of this era have been long lasting. However, as the environmental impacts of wetland conversions received more attention, a shift away from economic pursuit to shed light on the importance of ecological sustainability began to take place (Kim, 2010). This shift is covered over two eras which will be further explored in later sections.

2.3 Sources of Wetland Degradation

Despite providing humans with a plethora of functions and services, wetlands continue to be one of the most threatened ecosystem types (Daniels & Cumming, 2008) as a result of human impact (Verhoeven et al., 2006; Li, Deng & Huang, 2010). It is estimated that 50 per cent of the

world's wetlands have been lost due to human activity (Zedler & Kercher, 2005; Daniels & Cumming, 2008; Finlayson, 2012; Hu et al., 2017), with some reporting as high as 87 per cent loss since the beginning of the 18th century (Davidson, 2014). However, uncertainty around the exact rate and total area lost continues, largely due to limited historical data available and various definitions of what constitutes a wetland (Davidson, 2014; Hu et al., 2017).

Most of the area of wetlands lost in the first half of the twentieth century occurred in northern countries, but since the 1950s there has been increased wetland conversions in tropical and subtropical regions as well (Zedler & Kercher, 2005). Asia has experienced the largest overall loss, specifically China, which has lost nearly 29 per cent of wetlands due to direct human activity (Hu et al., 2017). However, the most severe case of wetland loss has been observed in Europe, which has experienced a loss of 45 per cent, followed by South America and Asia with approximate losses of 32 and 27 per cent (Hu et al., 2017). The amount lost in North America remains largely uncertain due to the central focus on the United States. Figures range from 8 per cent loss as reported by Hu et al. (2017) to 56 per cent as reported by Davidson (2014).

Some causes of this substantial loss have been attributed to agriculture, development practices, invasive species, pollution, and climate change (MEA, 2005; Verhoeven et al., 2006; Li et al., 2010; Durigon et al., 2012; Adekola et al., 2012; He et al., 2016; Hu et al., 2017). As a result, substantial but inconclusive evidence suggests that changes to wetland ecosystems increase the likelihood of unpredictable and potentially abrupt changes in ecosystems, which may have significant consequences for the human population (MEA, 2005). In the following sections, each of these sources of wetland destruction will be explored in further detail to understand their impact on the sustainability of wetlands.

2.3.1 Agriculture

One of the main indirect drivers that contribute to the degradation and loss of wetlands is population growth (MEA, 2005). The result of an increased population is the demand for increased production of food and housing, leading to the accelerated development of agriculture and urbanization (Hu et al., 2017). For example, in the United States, it has been estimated that 25 – 30 per cent of wetlands have been lost as a result of rural and urban development, including agricultural practices (Hu et al., 2017). Natural wetlands such as floodplains have typically been cleared and drained for agricultural purposes (MEA, 2005; Zedler & Kercher, 2005; Tolentino, 2013). By 1985, roughly 56 – 65 per cent of inland and coastal marshes had been drained in Europe and North America (MEA, 2005) and an estimated 26 per cent of global wetlands had been drained for agriculture purposes (Zedler & Kercher, 2005).

Agricultural practices have had a wide range of adverse effects on wetlands internationally. About 70 per cent of global water use is allocated for irrigation, and nutrient loading (particularly nitrogen and phosphorus) in fertilizers has resulted in the decline of many ES such as drinking water availability and some fish species (MEA, 2005; Verhoeven & Setter, 2010; Hu et al., 2017). The combination of drainage for irrigation and soil alterations has widely resulted in the destruction of their ecological integrity and ES (Verhoeven & Setter, 2010).

Despite intensive agricultural activity in the past, the rate of wetland loss attributed to agricultural practices since the early 1990s has significantly decreased, accounting for 20 per cent of wetland conversions (Gutzwiller & Flather, 2011). This is compared to urban and suburban development accounting for 57 per cent of losses (Gutzwiller & Flather, 2011).

But the pressure on the agricultural sector to feed an increasing population poses new concerns. Global food production has doubled in the past 40 years and has been able to keep up with the needs of a growing population (MEA, 2005). However, based on projected increases in the global population since 2005, food requirements are predicted to increase 50 per cent by 2030 (Verhoeven & Setter, 2010). These practices have come at a cost to biodiversity, disruptions to element cycles, eutrophication and toxification to freshwater sources, and loss of regulating ES as a result (MEA, 2005).

2.3.2 Development Practices

Development practices, particularly urban development, is another major cause of wetland degradation that can be traced in response to an increasing population. The Millennium Ecosystem Assessment (2005) found 80 – 98 per cent of global wetlands located in or adjacent to large urban areas had disappeared. This significant loss can be attributed to rapid economic development and increased population density resulting in urban sprawl around the globe (Mao et al., 2018). For example, China's urban population between 1978 – 2012 increased from 17.9 per cent to 52.6 per cent (Mao et al., 2018). An increasing population often results in the expansion of a city's infrastructure, putting wetlands in the surrounding area at extreme risk of degradation due to rapid land use changes (Holland, Honae, Gwin & Kentula, 1995). As a result, wetland ES such as natural habitat, recreational activities, flood mitigation, and air and water quality are threatened. Watersheds located within proximity of urban areas are often subject to clearing, land use changes, and overall fragmentation of the landscape as a result of development practices (Holland et al., 1995).

As urban populations continue to increase, small wetlands are often destroyed because of the few remaining undeveloped areas or are among the cheapest areas to develop (Kentula, Gwin & Pierson, 2004). As the number of small wetlands being destroyed accumulates, nearby watersheds may reach a point to which it can no longer provide ES (Holland et al., 1995). Holland et al. (1995) found that remaining wetlands within urban areas had been altered or degraded to some extent by construction practices. As a result, sediments may be channelled into the wetland and may continue in the form of run-off after the project has been completed, thereby continuing to contaminate the wetland (Holland et al., 1995).

Coastal wetlands are also at risk of development. Nearly half of the globe's major cities are settled within 50 kilometers of a coastline and are typically 2.6 times denser when compared to inland cities (MEA, 2005). Extreme population density in coastal areas places wetlands such as mangroves, one of the most productive and highly threatened ecosystems in the world, at a high risk of urban and suburban expansion (MEA, 2005; Rojas, Munizaga, Rojas, Martinez & Pino, 2019).

The rampant conversion of wetlands is driven, in part, by a shortage of suitable land space for agricultural and urban settlement and has been reinforced by the lack of consideration for the value ES provide to human society (He et al., 2016). As a result, economic costs related to flood damage have significantly increased over the past 100 years in large part due to agricultural and urban development (Zedler & Kercher, 2005). However, with increased research and recognition for the role wetlands play in flood mitigation, there has become increased interest in the restoration of wetlands (Zedler & Kercher, 2005). As the risk of extreme weather such as flooding increases, it will be ever more important to protect wetlands and their ES despite the pressure for further development (Kentula et al., 2004).

2.3.3 Invasive Species

Agricultural and urban runoff into wetlands consequently displace native plant species and create an environment which supports invasive plants (Zedler, 2003). Invasive plants are described as exotic, native, or hybrid plant species or strains that rapidly spread and overrun existing plant communities (Kercher & Zedler, 2004). These species have been linked to major local extinction of native freshwater species which drastically affect the biodiversity of the ecosystem. Two thirds of freshwater species introduced into the tropics and more than half of species introduced in temperate regions have established self-sustaining populations (MEA, 2005) from nutrient rich runoff or groundwater sources (Zedler & Kercher, 2005).

Wetlands that source water for agricultural and urban watersheds tend to be subjected to many invasive species, therefore, individual drivers of wetland loss and degradation such as agriculture and development practices, as mentioned above, should not be seen as separate factors, rather interconnected causes of increased human population and overexploitation. As a result, these invasive species affect both the biodiversity and human enjoyment of wetland ecosystems (Zedler & Kercher, 2005).

2.3.4 Pollution

Studies focusing on global pollution have found that few places on Earth remain free of contaminants (Zedler & Kercher, 2005). This is partly attributed to the draining of wetlands and the effect on natural process of collecting the flow of nutrients and other substances, including pollutants. Agricultural and urban areas are primary sources of contaminants which typically contain large amounts of nitrates and phosphorus that stimulate algal growth (Zedler & Kercher, 2005). The process of eutrophication, the decreased levels of oxygen in the water, increases the risk of death of fish species and disruptions to the aquatic food chain (Zedler & Kercher, 2005). This can lead back to humans by effecting commercial fishing and therefore sources of income and food supply for many individuals, enjoyment and recreational use of the wetland, and many other ES humans rely on.

It is strongly encouraged by existing literature to reduce the use of pesticides and the risk of runoff due to the environmental hazards that may occur (Blankenberg, Haarstad & Baskerud, 2007). However, even when fertilizer and pesticide use is reduced, agricultural fields will continue to discharge more surface water runoff and nutrients when compared to undisturbed soils (Zedler, 2003). Wetlands, such as rivers, lakes, creeks, and ponds, have natural processes such as sedimentation, uptake and adsorption to organisms, biological degradation,

photodegradation, diffusion and dilution to reduce contaminants (Blankenberg, Haarstad & Baskerud, 2007). Despite these processes, high concentrations of contaminants may persist in natural environments and the capacity to provide clean and reliable sources of water may be compromised (MEA, 2005; Blankenberg, Haarstad & Baskerud, 2007).

2.3.5 Climate Change

Although climate change is expected to have varying effects around the globe with unestablished certainty of the exact effects, it is ultimately expected to exacerbate the loss and degradation of many wetlands, leading to increased threat to the species and human populations reliant on their services (MEA, 2005). In some regions, climate change is expected to increase drought due to increased temperatures and changes in precipitation patterns (Withey & van Kooten, 2011). This is likely to have adverse effects on agricultural ecosystems and the environment's ability to support waterfowl (Withey & van Kooten, 2011). In other regions, increased precipitation is expected to provide some wetlands with pronounced harmful impacts to their ecosystems (MEA, 2005).

Climate change is of particular concern for coastal wetlands due to rising sea levels and the elimination of wetlands along the coastal edge (Zedler & Kercher, 2005). As wetlands are filled by rising sea levels and destroyed from human expansion, this is likely to result in increased risk of flooding to nearby communities. Especially as development practices are eliminating coastal wetlands at a rate of 1 per cent per year, increased risk to coastal populations is likely to occur (Zedler & Kercher, 2005).

Despite inconsistent figures representing wetland loss, it is widely acknowledged that a significant proportion of historical wetland areas have been degraded or lost (Zedler & Kercher, 2005). Permitting systems, exemptions, mitigation, and enforcement problems (Gutzwiller & Flather, 2011) have largely allowed the continuation of wetland conversion to continue. Although some wetland types have increased across the United States, such as manmade freshwater ponds to attract wildlife and floodplains which have formed as a result of beaver dams, the substantial loss of wetlands have lasting effects, most notable the loss of ES (Zedler & Kercher, 2005).

The general preference for provisioning services to supply the human population with food and drinking water over the past century have been achieved at the expense of regulating, supporting, and cultural ecosystem services (MEA, 2005; Carpenter et al., 2009; Xu et al., 2018). These types of land-use decisions frequently involve deciding which trade-offs to make among ES where a preference for one service may be at the expense of another (Jessop et al., 2015). These decisions have typically been made with little sympathy for the needs of local residents who benefit most from the conservation of wetlands with a process that lacks sufficient transparency and accountability (MEA, 2005). This approach is misguided because local communities possess deep, practical knowledge of the connection between wetland condition and the provision of wetland ES that decision makers at many levels are unaware of (MEA, 2005). Decisions are rarely made based on market and nonmarket services provided by wetlands, resulting in the exaggerated distribution of subsidies that encourage the drainage and destruction of wetlands for agricultural and development practices (MEA, 2005).

Chapter 3: Introduction to Decision Aid Tools

3.1 Multi-Criteria Decision Analysis

As demonstrated above, the value of wetlands in their natural state is clearly supported in academic literature. However, sources of degradation continue to threaten these ecosystems as the need for economic development persists. Some of these sources of wetland degradation are driven by alternative land uses, such as development practices as mentioned above, for economic gain and other social benefits to human society, therefore, damaging natural ecological processes that provide several widespread ES to serve immediate human needs. These conflicts leave wetlands caught in the middle of competing values and interests among various societal groups. So, how does one decide on the best approach to wetlands management?

Environmental conflicts are typically complex, uncertain, multi-scale, and affect various social actors and institutions, requiring decision-making that is flexible, transparent, and incorporates the specialized knowledge of diverse stakeholders (Reed, 2008). As a result, decisions have often fallen short at the policy level due to the inability to consider all relevant options and their impacts on various stakeholder groups (Omann, 2000).

The use of valuation techniques has contributed to making informed decisions by communicating, in monetary terms, the value of ES absent from a given market (Carpenter et al., 2009). However, the complex nature of ES cannot always be adequately translated into economic valuation frameworks since ES may involve several competing interests and values over the same resource, leading to high levels of uncertainty at the decision-making level (Oikonomou, Dimitrakopoulos & Troumbis, 2011). Although economists have provided useful tools for environmental policy, these are by no means a complete tool for making informed environmental decisions.

Scientists can also suggest solutions for environmental policy, but such expertise is ultimately limited at the decision-making level without input from the rest of society to inform policymakers (Omann, 2000; Munda, 2004). Local actors and citizens who traditionally have been excluded from the decision-making process can provide considerable value as non-experts by relating personal experiences on issues that experts may overlook (Garmendia et al., 2010). Decision-making should consider all relevant impacts of a decision before committing to a course of action. An effective way to do that is through the involvement of relevant stakeholders in the evaluation process (Omann, 2000).

In light of continued over-exploitation and degradation of ES, the increased awareness and interest in the inter-connection and inter-dependency of ecosystems has emphasized the need for multi-dimensional frameworks that incorporate various values into the decision-making processes (MEA, 2005; Oikonomou et al., 2011). A tool typically used for environmental decision-making, especially at the micro-level, has been the cost-benefit analysis (CBA) (Omann, 2000). However, the use of CBA for complex issues has exposed several weaknesses in its approach (Omann, 2000).

Multi-criteria decision analysis (MCDA) was developed in response to the shortfalls of a CBA (Omann, 2000). The concept of multi-criteria analysis originated from the field of

economics to support decision-making processes and has recently been applied to natural resource management (Garmendia, Gamboa, Franco, Garmendia, Liria & Olazabal, 2010; Singh et al., 2016). MCDA refers to an approach and broad set of decision aid techniques that consider a collection of objectives and criteria that may be conflicting, multi-dimensional, incomparable, and incommensurable (Oamnn, 2000; Dodgson, Spackman, Pearman & Philips, 2009). Decision options may vary to the extent of achieving several objectives (Dodgson et al., 2009) but the approach is intended as a way of simplifying and ordering complex decision-making problems that affect various stakeholders, several possible outcomes, complex and sometimes uncertain criteria in order to effectively assess outcomes (Garmendia et al., 2010).

The ultimate objective of MCDA is to aid decision-makers by addressing difficulties involved in dealing with large quantities of complex information in a consistent manner (Dodgson et al., 2009). It does this by structuring data sets to assess alternative actions to reveal (Messner, Zwurner & Karkuschke, 2006) a single preferred option, a rank of options, or identify acceptable versus unacceptable options to solve a given conflict (Dodgson et al., 2009). It should be noted that while MCDA cannot solve all conflicts, it can, however, provide insight into the nature of conflicts and assist with arriving at political compromises by increasing the level of transparency into the decision-making process (Martinez-Alier, Munda, O'Neill, 1998). Compromises are realized by teaching the decision-maker that it is often not possible to optimise all objectives at the same time (Munda, 2004). Therefore, a balance should be attempted among conflicting incommensurable values (Munda, 2004).

One difficulty in this approach has been the subjectivity of decisions and identifying an operative definition of “value” despite societal actors who have different definitions, interests, goals, and cultural identities towards that “value” (Munda, 2004). MCDA addresses this problem by requiring the decision-making team to establish objectives and criteria, identifying their relative importance by attributing weights, and deciding the level of contribution of each option to each criterion (Dodgson et al., 2009). MCDA uses subjective aggregation of data, criteria definition and weighing for the purposes of evaluating individual strategies (Messner et al., 2006). This subjectivity may be a cause of concern, but it is important to note that any evaluation method, including CBA in the selection of a proper discount rate, explicitly or implicitly relies on subjective elements as well (Messner et al., 2006).

MCDA has several advantages, one of which being the ability to compare different options, assessed through specific criteria with different units of measure (Singh et al., 2016). Criteria are thus able to be measured and compared on a variety of scales regardless of the unit (qualitative, quantitative, mixed) (Omann, 2000), making it possible to manage complex problems that CBA cannot (Martinez-Alier et al., 1998; Siciliano, 2009; Singh et al., 2016). Thus, MCDA attempts to deal with weak comparability – evaluation of units with different, and therefore irreducible, but still comparable measures (Martinez-Alier, et al., 1998; Munda, 2004; Singh et al., 2016). This is in contrast to strong comparability in which a single comparative value is shared and can be ranked among all criteria (Martinez-Alier, et al., 1998). In addition, transparency of the process enables one to express the evaluation of all criteria in relation to their unit of measure, which eliminates the need to convert criteria into unique values such as dollar

figures (Siciliano, 2009). This also allows any decision-making group to analyse the chosen objectives, criteria, scores and weights, and make changes if it is felt appropriate (Dodgson et al., 2009). MCDA is unique from other decision analyses, such as CBA, because of its ability to consider large data sets, relations and objectives that are directly attributable to a real-world decision-making problem and can be analyzed from various dimensions (Martinez-Alier et al., 1998).

A potential downside of MCDA could be that it may fail to identify a single best solution on the grounds that different parties and interests are involved (Dodgson et al., 2009; Singh et al., 2016). However, it could be argued that this is not the objective of the method. Rather, it is to identify acceptable compromises for all relevant stakeholders and serve as a communication platform with which competing interests can interact (Munda, 2004; Reed, 2008; Singh et al., 2016). Furthermore, what could be identified as the ‘best’ option may be in contrast to the goal of improving welfare, thus no action may be, in principle, the most acceptable option (Dodgson et al., 2009).

3.1.1 Social Multi-Criteria Evaluation

Social multi-criteria evaluation (SMCE) has evolved from MCDA and is defined as a process which combines multi-criteria analysis with institutional and social analyses (Siciliano, 2009). The defining characteristic of SMCE is its capacity to include the local community and therefore increase democracy within the evaluation process (Siciliano, 2009). The purpose of this communal participation is to improve knowledge of a particular problem (Munda, 2004; Garmendia et al., 2010). Therefore, public participation should be considered as a necessary but not a sufficient component of the process (Munda, 2004). It is also important to account for social discrepancies such as influence of powerful stakeholders, lack of representation of qualitative research approaches (e.g. in-depth interviews, focus groups, etc.), and inclusion of non-organized societal actors (Garmendia et al., 2010). SMCE processes are built on the importance of transparency, therefore ethical judgements of the components of the evaluation process must be transparent (Munda, 2004; Garmendia et al., 2010).

A multi-criteria framework depends on the process itself since the subjective nature of the problem will greatly affect the results (Munda, 2004). However, below is a general overview of the five steps of a SMCE.

3.1.1.1 Scoping

The first step of the SMCE process is to conduct a historical analysis to determine the purpose of the evaluation, define the geographical and temporal scales, parties involved, power dynamics, and past solution attempts to gain a better understanding of the problem before engaging with participants (Singh et al., 2016). Official administrative or legal documents, newspaper articles, reports, interviews, and surveys may be used to provide this context (Siciliano, 2009; Singh et al., 2016). In doing so, examining the conflict will result in the identification of existing institutional structures that may influence the outcome of the issue and may or may not already be included in the decision-making process (Messner et al., 2006).

3.1.1.2 Institutional and Stakeholder Analyses

The institutional and stakeholder analyses are then used to gain a deeper understanding of the conflict in addition to the structural dynamic among involved actors and their vested interests (Garmendia et al., 2010). The analyses are used to define the natural phenomenon, identify affected individuals, groups and organizations (which may include non-humans, non-living entities, and future generations), and prioritize their involvement in the decision-making process (Reed, 2008). For studies involving stakeholders and the environment, these analyses can be useful to identify the ES that are significant to each stakeholder group (Oikonomou et al., 2011).

3.1.1.3 Generating Options and Criteria

The development of options and criteria are taken from the discussions with stakeholders (Oikonomou et al., 2011; Singh et al., 2016). Based on discussions about the ES and potential threats to them, stakeholders/participants are asked to express their desired outcomes and expectations regarding potential actions to protect the identified ES (Oikonomou et al., 2011). These outcomes can be in the form of identifying restricted activities or the encouragement of others (Oikonomou et al., 2011) through policy strategies (Messner et al., 2006). These policy options will broadly reflect four basic outcomes which include (1) business as usual, (2) the ideal best option, (3) a hypothetical worse case scenario, and (4) a compromise solution (Garmendia et al., 2010). The participants will then be asked to identify criteria to evaluate each policy option as indicators of success based on their objectives which can often be categorized into social, economic, environmental, and cultural criteria (Munda, 2004).

3.1.1.4 Weighing and Scoring

Multi-criteria analyses apply numerical analysis in two stages. Scoring is first done on a numerical scale to reflect the expected outcomes of each option to represent the performance of each option according to the criterion (Garmendia et al., 2010). Then each criterion is weighted numerically based on the relative importance when a shift occurs in the scales (Dodgson et al., 2009; Singh et al., 2016).

It is also possible to establish thresholds for cases in which an option is rejected if the threshold of one criterion is not met (Dodgson et al., 2009). With the use of computer programs, the two stages are combined, and an overall assessment of each option is conducted in a consistent manner assisted by previous consultations with stakeholders (Dodgson et al., 2009). As a result, rankings of the options are presented in addition to the distance between the various options in terms of acceptability (Dodgson et al., 2009; Singh et al., 2016). In the case of conflicting values or criteria, the weighing process is used on the criteria which reflects the structures outlined by consulted stakeholders or a conflict analysis is used to evaluate the gains and losses of all impacts on the different groups involved to form compromise solutions (Omann, 2000).

3.1.1.5 Sensitivity Analysis

The last step of the SMCE is to conduct a sensitivity analysis to reveal whether a change in weights may affect the results (Singh et al., 2016). Doing so helps to ensure the robustness of the test results, informs the understanding of relationships between inputs and outputs, reduces uncertainty by identifying the criteria used for inputs, checks for errors, and enhances

communication among decision makers (Singh et al., 2016). The analysis is conducted by observing how the ranking of options may change depending on different scoring or weighing scenarios (Dodgson et al., 2009). This may result in multiple options consistently ranking among the best options, which may indicate that some options can be associated with a slight loss of an overall benefit (Dodgson et al., 2009). These are important things to consider in SMCE, especially due to the subjectivity of the process it is important to analyze the validity of the results.

The purpose of this chapter is to provide information on the processes of the SMCE. In the following chapter, the process will be applied to the case study of the land use conflict in the City of Niagara Falls, Ontario. It will begin with an in-depth problem analysis consisting of a legal, stakeholder and historical analysis. It will then be followed by a discussion of the decision-making options and criteria. Lastly, the results will be outlined followed by a discussion and interpretation of the results of how they relate to Ontario's approach to wetland management.

Chapter 4: Policy Approaches to Wetland Management

4.1 Wetland Protection and Sustainable Use

There is a growing consensus for the need to protect remaining wetlands despite perceived economic benefits from their development (La Peyre, Mendelsohn, Reams, Templet & Grace, 2001; Durigon et al., 2012; Peimer et al., 2017; Vaissière, Levrel & Pioch, 2017). Herath (2004) suggests that a key element to successful wetland management is obtaining an in-depth understanding of stakeholders and ecological processes unique to wetland systems and integrating this knowledge into management strategies. A downfall of many current wetland protection strategies is they are often embedded within broader frameworks of water and biological resource protection (Peimer et al., 2017). This general policy focus can result in weak environmental protection because wetland-specific needs become diffused or overpowered by broader objectives of the government (Ramsar Convention Secretariat, 2010). This is also true when there are wetland-specific chapters or sub-chapters, which are often framed in the broader context of environmental protection. Therefore, wetland-specific policies are useful to recognize the unique problems wetlands face with targeted action to address them (Ramsar Convention Secretariat, 2010).

4.1.1 The Era of Policy Transition

Between the 1970s and 1990s, greater understanding of the importance of wetland conservation in response to the negative impact on wildlife populations, particularly migratory birds led to what Kim (2010) refers to as the Era of Policy Transition. Previous wetland management strategies that allowed conversions for economic gain were no longer appropriate and consideration for wetland ecosystem functions such as production, regulation, and carrier functions was necessary (Kim, 2010). A greater understanding of ES led to the recognition of the value natural wetland systems provide such as their ability to function as a buffer zone between land and sea (Kim, 2010). Thus, these values began to appear in planning and decision-making processes when deciding which areas to develop. During this era, many attempts were made to protect and conserve wetland ecosystems at the international level. The most notable is the Convention on Wetlands of International Importance, which led to the Ramsar Convention in 1971 (Kim, 2010).

4.1.2 The Ramsar Convention

The Ramsar Convention on Wetlands of International Importance (Ramsar Convention) is an intergovernmental environmental treaty with the goal of leading a collaborative framework and policy mechanisms that promote the conservation and wise use of wetlands, including their ES around the globe (Matthews, 1993; Finlayson et al., 2011; Finlayson, 2012; Peimer et al., 2017). It was signed on 2 February 1971 by representatives from 18 countries that were concerned about the dramatic loss and degradation of wetlands around the world (Finlayson et al., 2011). Negotiations leading to the Ramsar Convention began with the establishment of a mechanism for the protection of waterfowl by creating an international network of sanctuaries

for migratory birds, but as negotiations progressed, the conservation and wise use of wetlands became the centre of discussions (Finlayson et al., 2011).

The Ramsar Convention relies on the collaborative effort of neighboring countries to protect water systems that support the international circulation of water and support of transboundary species (Matthews, 1993). Its aim is to conserve wetlands deemed important by individual national governments at an international level by encouraging the adoption of management regimes (Farrier & Tucker, 2000). As of February 2020, the list of Ramsar sites includes 170 Contracting Parties with 2,388 designated Ramsar Sites covering a total area of 253,870, 023 hectares (Ramsar, 2020).

When a party signs on to the Ramsar Convention, it commits to the inclusion of wetland conservation planning policies within its national boundaries and to implement this planning in a way that promotes the wise use of wetlands within their jurisdiction (Finlayson et al., 2011). The parties also commit to the designation of at least one wetland that meets the Convention's nine criteria for site selection to the Ramsar List of Wetlands of International Importance within its territory, and to apply the Convention's Strategic Framework and Guidelines for the Further Development of the List of Wetlands of International Importance to ensure a cohesive network of sites (Farrier and Tucker, 2000; Finlayson et al., 2011).

Although the 'wise use' principle is mentioned in the 1971 text, a definition of this concept was not provided at the time (Finlayson et al., 2011). It was only at the Third Conference of the Parties (COP3, 1987) that this concept was defined as "their sustainable utilization for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem" (Finlayson et al., 2011, p. 183-184) but has since evolved to reflect the more specific objective of maintaining the "ecological character" of wetlands as opposed to the broad language of "sustainable utilization" (Tolentino, 2013). However, several definitions of 'wise use' have been used to explain the need to maintain the ecological character of wetlands (Farrier and Tucker, 2000; MEA, 2005; Finlayson et al., 2011; Finlayson, 2012). Nonetheless, the focus of these definitions recognizes the interdependence of human beings and the environment and the essential need to maintain a wetland's 'ecological character', defined by Farrier and Tucker (2000) as the structure and interrelations among biological, chemical, and physical mechanisms resulting from the interconnections of particular processes, functions, attributes, and values of wetland ecosystems. The adoption of this principle ensures a clear framework demonstrating how direct and indirect drivers of ecosystem alteration affect the ability of an ecosystem to deliver ES that support human well-being (Finlayson et al., 2011).

The Ramsar Convention's approach to the wise use of wetlands highlights critical connections between humans and the sustainable use of natural resources in a manner that encourages community engagement and transparency in deciding amongst trade-offs and equitable outcomes for conservation (Finlayson et al., 2011). It does this by taking into account economic benefits in addition to cultural values and natural heritage in the decision-making process, thereby adopting a joint, integrated and multi-disciplinary approach to wetland management (Tolentino, 2013).

Despite international efforts by the Ramsar Convention, global wetland coverage continues to decline among the increasing number of wetland policies, leading some to question the effectiveness of the Convention and the frameworks put forth at the national level (Farrier and Tucker, 2000; Finlayson, 2012; Tolentino, 2013). The Convention's approach to wetland management is criticized by some, claiming it is limited by its segmented approach to land and water rather than the catchment as a whole system (Farrier and Tucker, 2000). By considering the entire system, it is argued that it would help identify threats tracing back to a variety of sources (Farrier and Tucker, 2000). The focus on 'wise use' has also been criticized for its emphasis on human values as opposed to the maintenance of a pristine habitat (Farrier and Tucker, 2000).

Another drawback of the Ramsar Convention is the dependence on individual nations to implement its framework. Although the Ramsar Convention has developed a definition of what constitutes a wetland, countries are not required to adopt this interpretation and many countries have yet to establish a clear definition of a wetland in their jurisdiction (Tolentino, 2013). There is also concern over a country's selection process to the List of Wetlands of International Importance. Without an understanding of a wetland's hydrological and biological interaction among a larger ecosystem, the proper selection of 'important' wetlands may fall short (Durigon et al., 2012). Since selection to the List is made by individual nations, there is no governance of the geo-spatial distribution on a global scale (Durigon et al., 2012), which may contribute to the loss of wetlands that support significant ES to human well-being and natural habitat for migratory birds, especially with the lack of guidance on how to balance conservation with sustainable use from an ecological perspective (Finlayson et al., 2011). In spite of these concerns, the Ramsar Convention's pressure to ensure wise use of wetlands, has encouraged the adoption of several mechanisms around the world to achieve just that. The movement towards sustainable wetland management reflects Kim's (2010) third era of historical wetland policy called the Era of Wetland Conservation.

4.1.3 The Era of Wetland Conservation

From the 1990s to present day is what Kim (2010) refers to as the Era of Wetland Conservation. During this time period, developed countries, including the USA, Netherlands, Germany, and UK, led the world in wetland policy with the purpose of preserving wetland ecosystem functions and services with new technologies and systems aimed to facilitate the wise and sustainable use of wetlands (Kim, 2010). The perception of wetlands switched from an exploitive nature, emphasizing consumerism, privatization and commercialization, to that of a conservative nature, reflecting non-consumptive, public, and non-commercial uses (Kim, 2010). This new ecological focus promoted cultural ES that had previously been excluded from policy decisions.

It should be noted that not all countries have entered this era. Those with a need for economic development continue to prefer conversions of wetlands in order to satisfy the needs outlined in previous eras. But developed, or what Kim (2010) refers to as 'advanced', countries that have the resources and social capital will implement wetland conservation policies as they move to this third era (Kim, 2010).

There are three characteristics that Kim (2010) uses to identify whether a nation has entered this third era. The first is whether the nation has established a strict review system for permitting wetland conversions to determine if it is socially urgent or unavoidable, such as rising sea levels. The second characteristic is whether the government requires strict mitigation or replacement of wetland functions when one has been lost to restore reclaimed wetlands as seen in the EU and their use of de-polderisation. Lastly, new uses and activities will have arisen from the increased awareness and appreciation for wetland ecosystem services, fostering increased desire to protect ecologically significant wetlands. In an effort to demonstrate the complex nature of wetland management, the following sections will explore and evaluate various policy mechanisms used to manage the services provided by wetlands.

4.2 Command and Control

Each policy mechanism tries to solve a similar problem, whether it is the reduction or elimination of pollutants or preservation of natural space, it is the behaviour that each mechanism capitalizes on that sets them apart. Command and control, for example, primarily uses coercion to ensure compliance while market-based mechanisms typically focus on incentives (Karp & Gaulding, 1995).

Command and control policies generally refer to attributions exclusive to the State (federal, state or local) system (Karp & Gaulding, 1995; Porto & Lobato, 2004). They include a rigid regulatory scheme that relies on the law and police enforcement power to induce compliance with the application of sanctions (Karp & Gaulding, 1995; Porto & Lobato, 2004). When the actions of individuals, institutions, or nature go against a society's desires or expectations, command and control regulations have traditionally been the dominant government response to shift human or ecosystem behaviours back to a predictable and controlled state (Holling & Mefe, 1996; Sinclair, 1997). These types of regulations were used when a problem was perceived and a solution was formulated to control it in a direct, feasible, and effective manner through the control of the processes proactively, leading up to, in response to, or after the problem had already occurred (Holling & Meffe, 1996). These policies were often in the form of compulsory legal norms for polluters, outright bans, limits to emissions, and technical requirements for particular products (Sánchez & Deza, 2015). Command and control policies are centred around the idea that polluters should be required to compensate society for the damage they have created by paying the cost of the pollution generated through some penal means (Sánchez & Deza, 2015).

In the face of declining natural resources and a growing population, this approach applies a strict hierarchical, top-down management style to natural resources in order to control ecosystems and socioeconomic institutions that respond to sporadic ecosystem behaviour with strict control policies (Holling & Meffe, 1996; Knight & Meffe, 1997; Durigon et al., 2012). The use of this approach has predominantly been in an effort to control the environment for the purposes of harvesting products, reducing threats to the human population, and establishing highly predictable outcomes in the short-term for the benefit of society (Holling & Meffe, 1996). From a command and control perspective, nature is regarded as ordered, segmented, and mechanistic, with strict cause-and-effect relationships, therefore, governing agencies must be

compartmentalized into specialties to manage such processes (Knight & Meffe, 1997). Its purpose is grounded by a desire to turn an unpredictable and ‘inefficient’ natural system to a predictable and economically efficient system that benefits a growing society (Holling & Meffe, 1996; Khan & Haque, 2010). It does this by applying sanctions – in the form of financial incentives (fines), incarceration, and negative external outcomes such as tarnished reputation – high enough to instill fear of punitive consequences to achieve compliant behaviour (Karp & Gaulding, 1995).

4.2.1 United States Clean Water Act

Although command and control mechanisms are common in environmental policy, it was strongly emphasized in the initial implementation of the United States Clean Water Act of 1972 (Porto, 2004). It did this by creating a program with a strong central authority in the federal Environmental Protection Agency (EPA) that was carried out at the state level with extremely ambitious and restrictive goals of protecting against sources of water pollution (Porto, 2004). However, despite efforts and large investments, the water quality objectives required under the Act failed to be met due to two major difficulties. The first was the inefficiency of controlling pollution through inspections, and the second was the complex nature of controlling non-point sources of pollution due to the inability to identify a known ‘violator’ (Porto, 2004). Immense difficulties in identifying, measuring, and controlling non-point sources of pollution made it difficult to effectively allocate responsibility over the control of such pollutants (Knopman & Smith, 1993). Additionally, the costs of controlling the complexity of non-point sources were seen to greatly exceed the controls required for point sources which leads many to believe alternative policy mechanisms are required (Knopman & Smith, 1993; Robertson, 2006; Vatn, 2015). As a result, the restrictive command and control mechanisms in the Clean Water Act persisted for only three decades due to the huge financial investment, giving the impression that this approach is not feasible for a jurisdiction with limited financial capacity (Porto & Lobato, 2004).

4.2.2 Evaluating Command and Control

Despite being considered an outdated, costly, and inefficient policy instrument (Hahn & Stavins, 1991; Sinclair, 1997; Knight & Meffe, 1997), command and control regulations have been credited in one major way, achieving desired results, at least in the short term. Given its strict thresholds and punitive measures, the risk of being punished is generally enough to deter most actors from noncompliance (Sánchez & Deza, 2015). If sanctions are not feared due to a lack of severity, command and control policies will have little to no effect (Karp & Gaulding, 1995), as was demonstrated in the discussion of the Clean Water Act. Another advantage of command and control policies, particularly as they relate to watersheds, is that they do not need extensive data sets on individual river basins, thereby saving the governing agency in monitoring costs (Porto & Lobato, 2004). Although, this lack of upfront research is susceptible to criticism, in complex socio-ecological systems in which wetlands are a part of, several factors need to be considered before determining the success of a policy instrument.

The initial phase of command and control policies are almost always successful in their response to the loss of ecosystem resilience (Holling & Meffe, 1996). As a consequence,

agencies responsible for the management of the resource often shift their focus from research and monitoring of the problem to methods of improving the internal functioning of the agency through cost efficiency and institutional survival (Holling & Meffe, 1996). As a result, the agency often becomes detached from public signals of concern and grow rigid in their response to ecological changes (Hahn & Stavins, 1991; Holling & Meffe, 1996). Additionally, command and control instruments rely on the imposition of pollution control with little decision-making power given to technicians and agencies responsible for the process (Porto & Lobato, 2004). As a result of this rigidity, economic losses can be substantial which may damage the effectiveness of the policy in some cases (Porto & Lobato, 2004). This can have severe negative impacts on external groups, such as local communities, who are dependent on such resources and are rarely consulted or given decision-making power (Knight & Meffe, 1997). Through analysis of the Clean Water Act, shortcomings could be attributed to the dominant role of the state on the behaviours of social actors. Rather than creating a policy to stimulate innovation and collective decision-making, the command and control approach enforced by the Clean Water Act imposed strict, rigid, costly, and therefore inefficient measures.

As agencies become more rigid with their approaches to resource management, they may become less effective at responding to changing environmental circumstances, which may lead to a lack of confidence and mistrust by local actors (Mendez, Isendahl, Amezaga & Santamaria, 2012). Alternatively, some societal groups may fixate on the initial successes of command and control policies and advocate for greater implementation, ignoring underlying ecological changes and further emphasizing an inflexible structure (Holling & Meffe, 1996). Command and control approaches inherently assume problems are clearly defined, relatively basic, and generally consistent with a linear cause-and-effect relationship (Holling & Meffe, 1996). This can have damaging effects when applied to a complex, nonlinear, and relatively unpredictable ecological, social, and economic system that is poorly understood (Holling & Meffe, 1996).

Another criticism of command and control policies is their tendency to focus on achieving short-term goals. To control variation, resource extraction, and function of natural ecosystems, the ecological processes inevitably become less resilient to natural and human-induced disturbances (Knight & Meffe, 1997). Changing circumstances are rarely planned for, which can have unforeseen consequences on the natural environment and human well-being.

Wetland ecosystems are complex landscapes to manage, especially since humans have become a crucial component of the system and who have immense control over its trajectory. Since a complete understanding of these landscapes has yet to be fully obtained, a hierarchical, one-size-fits-all approach is unlikely to be effective (Knight & Meffe, 1997). Multiple perspectives in the decision-making process may defuse 'power trips' and promote the replacement of rigid and ineffective policy approaches with innovative solutions (Hahn & Stavins, 1991; Sinclair, 1997; Knight & Meffe, 1997). Some critics of command and control regulations have advocated for policies based on economic incentives which imply less stringent governance over institutions (Sinclair, 1997). However, incentive-based approaches have also received criticisms in the monitoring and implementation of conservation targets. These incentives will be explored in more detail in the following section on market-based instruments.

Due to a vast and complex set of actors influencing the success of the policy, it is quite difficult to ‘command’ all the factors by way of law enforcement and financial penalties (Porto & Lobato, 2004). Tools that were successful when a limited number of pollutants were released from a limited number of sources are inadequate today as society develops and sources of wetland degradation become increasingly difficult to control, especially with non-point sources (Karp & Gaulding, 1995). Thus, although command and control policies were once the dominant policy instrument for environmental management, it has been demonstrated that with greater understanding of socio-ecological systems and the continuing development of human society, it is no longer considered an adequate policy instrument on its own for addressing large environmental issues.

4.3 Market-Based Instruments

Since the 1970s, many countries, most prominently the United States, have adopted market-based instruments to address environmental concerns (Robertson, 2006). These policies have been viewed more favourably in recent decades than command and control policies, especially by environmental economists, because of their ability to address inefficiencies that command and control policies lack (Robertson, 2006; Vatn, 2015). Based on conventional economic theory, well-functioning markets ensure the most efficient and cost-effective way of achieving environmental regulatory requirements (Robertson, 2006). In addition, it is believed that a market for ES can ensure consumers using such services have a useful way of measuring, in financial terms, the cost of environmental degradation (Costanza et al., 1997; Robertson, 2006).

However, some scholars express concern for an economic framework that centers around “selling nature to save it” (McAfee, 1999). Some critics of market-based instruments have expressed unease about and mistrust for the way market-based instruments view the world from a neoliberal perspective since conservation of natural resources are thereby tied to the very forces and logics that threaten and destroy the ecosystems to begin with (McAfee, 1999; Van Hecken et al., 2015; Kolinjivadi et al., 2019).

The key principle of market-based instruments is the development of a market that ensures voluntary trade among actors over specific goods or services (Vatn, 2015). This is different from a command and control policy because, it encourages trade among actors which encourages revenue to be reverted back to the industry, thereby creating incentives for environmentally sustainable behaviours (Sánchez & Deza, 2015). This is contrasted with a command and control policy which may issue permits and collect revenue by a central government institution (Sánchez & Deza, 2015).

Overall, this type of policy has gained popularity because of the flexibility it provides polluters in determining how they pursue environmental sustainability. If it is cheaper for a firm to improve their sustainability on their own rather than pay the price of pollution, they can do so. Similarly, if the cost of sustainability is more expensive than the price of pollution, they can pay that price (Sánchez & Deza, 2015). Another benefit of market-based instruments is their ability to promote technological advancements to address environmental degradation (Sánchez & Deza, 2015). However, when applied to the sustainable use of wetlands, this approach has had

difficulties with lax compliance and poor policy design (Robertson, 2006). In this section, offsetting, the main market-based tool for addressing wetland degradation, will be evaluated. The country that is cited the most for the use of this policy approach is the United States, which will be used to discuss this instrument in further detail.

4.3.1 Section 404 Program

The implementation of market-based instruments is most prominently demonstrated by the United States and its application of a wetland credit market through a regulatory mechanism known as Section 404 of the Clean Water Act, 1972 (Hough & Robertson, 2009; Clare, Krogman, Foote & Lemphers, 2011). Section 404, through a permitting program, seeks to restore and maintain the chemical, biological and physical integrity of the country's waters (Clare et al., 2011). The program requires the issuance of an Individual Permit for any activity resulting in the discharge of fill materials or dredge into American waters, including wetlands (Hough & Robertson 2009; Clare et al., 2011). The authority to approve permits is given to the Army Corps of Engineers (the Corps) and the EPA (Robertson, 2006; Clare et al., 2011). The Corps has responsibility over day-to-day administration of the permit program, issuing permits for projects effecting national waters (Robertson, 2006). While the EPA is tasked with developing environmental criteria used by the Corps to make decisions about permit approvals (Hough & Robertson, 2009). These permits typically require "compensatory mitigation" in the form of wetland restoration to balance the effects of wetland loss from proposed projects (Robertson, 2006). However, this shared enforcement authority between the Corps and the EPA for the formation and interpretation of mitigation requirements under Section 404 has proven difficult as will be explored in further detail in the discussion of biodiversity offsetting (Hough & Robertson, 2009).

4.3.1.1 Mitigation Sequence

In 1980, guidelines for the permit program were released and formalized the concept of "sequencing" wetland permit decision-making to assist the Section 404 program in preventing further habitat loss or damage (Brown & Lant, 1999; Clare et al., 2011). The first step of the mitigation sequence is to *avoid* impacts on wetlands altogether by not taking part in a particular act; if a developer can prove that the first step cannot be taken, the next step of the sequence is to *minimize* impacts on the land by limiting the scale of action or implementation; lastly, if all else fails, the developer is required to *compensate* for any damages caused by the proposed project by replacing or providing a substitute resource (Brown & Lant, 1999; Hough & Robertson, 2009). Thus, the purpose of the wetland mitigation sequence is to restore, create, and enhance wetlands for the purpose of providing compensatory mitigation before a permit is approved (Brown & Lant, 1999).

The practice of wetland creation and restoration has been controversial due to the uncertainty that lies with defining what is ecologically necessary to properly create and restore important and complex wetland ecosystems (Mitsch et al., 1998). Some ecologists believe there is a lack of understanding of proper wetland creation and restoration and, instead, is used as a tool by developers to drain and destroy remaining wetlands (Roberts, 1993). This is reinforced by the inconsistency of successfully recreated ecological functions of constructed wetlands (Mitsch et al., 1998).

Although the purpose of the sequence is to avoid damage to wetland ecosystems at all cost, it has proven difficult to enforce this first stage of the mitigation sequence (Hough & Robertson, 2009). Before a permit can be issued to offset damages (last stage of the sequence) to a wetland in favor of a development project under these guidelines, it must be demonstrated that there is no other available, feasible, or conservative alternative to the proposed project (Clare et al., 2011). This process legally requires developers to abide by a mitigation sequence with clear steps that include impact avoidance, impact minimization, or impact compensation, in that order (Hough & Robertson, 2009; Clare et al., 2011; Vaissière et al., 2017). However, the threshold for each step of the mitigation sequence has failed to be adequately addressed (Hough & Robertson, 2009). Permit approvals are typically made on a case-by-case basis, making it difficult to remain consistent and ensure environmental protection (Hough & Robertson, 2009).

Although regulations emphasize avoidance of wetland loss over minimization and compensation, the argument can still be made by a developer that no practical alternatives exist for a proposed project to avoid impacts due to issues of land ownership or availability, geographical scope, economic viability, logistics, or technological feasibility (Clare et al., 2011). Additionally, federal agencies have been known to compromise their integrity on permit applications so long as it could be shown, at least on paper, no net loss of wetlands is achievable (Hough & Robertson, 2009). This leniency is partly a result of the EPA's hesitancy to make use of Section 404(c), which allows the EPA to veto the Corps' permits (Hough & Robertson, 2009). Therefore, it is broadly acknowledged by scholars, regulators, scientists, policymakers, and the regulated community that the first step of the mitigation sequence, avoidance, is ignored more often than it is implemented (Hough & Robertson, 2009; Clare et al., 2011).

The failure to effectively implement the first stage of the mitigation sequence may be attributed to the lack of agreement on how to define avoidance (Clare et al., 2011). Avoidance could be interpreted in several ways, including the prevention of direct impacts such as filling materials into the wetland or an attempt regardless of the outcomes (Clare et al., 2011). Therefore, regulators are given a high degree of discretion when interpreting permits for approval (Clare et al., 2011) resulting in approvals rarely being denied (Hough & Robertson, 2009).

4.3.1.2 No Net Loss Policy

Further preference for compensation over avoidance in the management of wetlands was reinforced in 1989 with the adoption of "no net loss" policy (Clare et al., 2011) which aims to achieve no net loss between the gains and losses of ecological functions (Vaissière & Leverel, 2015). On one hand, some believe that this policy has raised awareness for the issue of wetland loss at the national level (Hough & Robertson, 2009). On the other hand, the argument could be made that no net loss policy is being used to allow impacts to occur and require compensation rather than the denial of permits through the avoidance or minimization stages (Hough & Robertson, 2009). As a result, the concept of mitigating damages to wetlands through minimization or compensation has gained traction over avoidance (Hough & Robertson, 2009; Clare et al., 2011).

4.3.2 Biodiversity Offsetting

Biodiversity offsetting is a market-based policy tool used to ensure ecological gains that counterbalance negative impacts to biodiversity (Calvet, Napoléone & Salles, 2015). The concept was initially proposed to offset losses to natural wetlands from development projects by constructing man-made marshes to reduce environmental damages (Hough & Robertson, 2009). Biodiversity offsetting can be described as measurable conservation outcomes as a result of compensating for significant enduring adverse impacts on biodiversity from development projects after the first two steps of the mitigation sequence have failed (Bull, Suttle, Gordon, Singh & Milder-Gulland, 2013). This gives government regulators the ability to encourage companies to contribute to conservation and meet regional conservation goals that are integrated into government and business plans (Kiesecker et al., 2009). The ultimate objective of biodiversity offsetting is to achieve no net loss or, ideally, net gain of biodiversity with regards to habitat structure, species composition, ecosystem function, human use and cultural value associated with the biodiversity (Gibbons & Lindenmayer, 2007; Bull et al., 2013). To achieve this, biodiversity offsetting attempts to compromise between economic development and the protection of biodiversity (Peimer et al., 2017). It assumes that impacts from development on biodiversity can be offset elsewhere, ideally somewhere in proximity of the impacted region, to ensure the protection or enhancement of habitat space (Gibbons & Lindenmayer, 2007).

Offsetting has been widely adopted despite underdeveloped methodologies and conceptual frameworks (Bull et al., 2013). However, it has been advocated for in the political spheres because of its combined regulatory approach of a polluter-pays principle and economic incentives structure (Calvet et al., 2015). It is believed that this structure can meet biodiversity conservation objectives without obstructing economic development (Bull et al., 2013). The controversy remains over the need to accept ecological losses in the face of uncertain gains (Bull et al., 2013).

Since biodiversity offsets represent a significant cost for developers (responsibility, in some cases, for ensuring the success of the offset and financial costs of doing so) it is thought to provide an incentive to limit a project's impact on biodiversity, based on the assumption that rational actors will weigh economic costs and benefits of decision-making (Calvet et al., 2015). When a project is unable to avoid or mitigate impacts to a wetland, offsetting can be used to satisfy the compensation step of the mitigation hierarchy. Thus, offsetting has the potential to benefit industry by increasing the likelihood that permission is granted for new development projects with greater support from the public in a more effective manner that takes environmental risks into consideration (Kiesecker et al., 2009).

However, academics have been wary of the ability to successfully replicate lost ecological functions based on evidence from prominent failures (Kentula et al., 1992; Bull et al., 2013). For example, a development project in Washington County resulted in the offsetting of several ponds in Oregon (Kentula et al., 1992). However, an examination of the newly constructed ponds found that these water features were not a typical wetland of the region and were not constructed hydrologically akin to the few ponds native to the region (Kentula et al., 1992).

Many of the criticisms of wetland offsetting have focused on the lack of evidence that demonstrates its ability to meet no net loss goals, especially with regards to the Section 404 program (Harper & Quigley, 2005), particularly since a majority of approved 404 permits have resulted in a net loss of wetlands (Kentula et al., 1992). It is argued that in the best-case scenario, in which an offset is protected in perpetuity and supported so the habitat may one day resemble the composition and structure of the lost habitat, there is still an initial net loss of habitat (Bekessy et al., 2010). This failure to achieve no net loss can be attributed, in part, to the ambiguity and undefined parameters of this principle. Offsets can be used to provide compensation for lost ES, ecosystem function, biodiversity, or all the above, however it is up to the discretion of stakeholders to define the objective of no net loss (Bull et al., 2013). Although it is often assumed that the baseline is measured against biodiversity, no net loss measures are often undefined (Bull et al., 2013).

When offsets are developed in accordance with permit conditions there remains the issue of ecological equivalence in the type, location, time, and ecological context of the offset (Gibbons & Lindenmayer, 2007; Bull et al., 2013). This is the case even if the same type of wetland is created, there remains fundamental differences between natural and man-made wetlands (Bull et al., 2013). Typically, offsets have been measured based on size alone, which is criticized as a very crude approach to monitoring no net loss because of the quality and type of habitat (Hough & Robertson, 2009; Quétiér & Lavorel, 2011). The longevity of the offset is also inconsistently implemented, some required to last as long as the impacts of development persist, while some are required in perpetuity (Bull et al., 2013). However, even the meaning of perpetuity is plagued with ambiguity (Bull et al., 2013). There is also debate over who should be responsible for ensuring the successful implementation of the above concerns. The lack of clarity of how an offset should be maintained, for how long, and by whom contributes to the lack of effectiveness and efficiency of offsetting (Bull et al., 2013).

The biggest concern from academics with regards to offsetting is uncertainty of future gains (Bekessy et al., 2010; Bull et al., 2013). Especially when there is a considerable lag between biodiversity lost and the establishment of an offset (Gibbons & Lindenmayer, 2007). Although impacts from development could, in some cases, be reversed through restoration, reversibility also remains undefined in objective terms (Bull et al., 2013). Although biodiversity offsetting has theoretical potential to address the loss and degradation of wetlands, case studies of its application leave many scholars and policy practitioners uncertain of its ability to achieve no net loss.

4.3.3 Payments for Ecosystem Services

In addition to biodiversity offsetting, payments for ecosystem services (PES) provides an alternative market-based solution to environmental degradation. PES has also been favoured over command and control regulation because of its flexibility and ability to address ES providers specifically (Engel, Pagiola & Wunder, 2008). Rather than ineffective sanctioning of rule violators using punitive measures, PES seeks to resolve developmental and environmental trade-offs using direct and conditional payments to land managers (also referred to as ES providers) (Wunder, 2005; Van Hecken, Bastiaensen & Windey, 2015).

Wunder (2005) introduced a definition of PES that was widely adopted. According to this definition a PES framework consists of “a voluntary transaction where a well-defined ES (or land-use likely to secure that service) is being ‘bought’ by a (minimum one) ES buyer from a (minimum one) ES provider if, and only if, the ES provider secures ES provision (conditionality)” (Wunder, 2005, p.2). Conditionality is defined as the ‘business-like principle’ to which one will pay only if the service is delivered (Wunder, 2005). This is a crucial and distinctive feature of PES programs as it attempts to add value to conservation (Kolinjivadi et al., 2019).

Following this definition was much debate over its inclusiveness and appropriate wording. It was argued that not all PES programs fit this defined framework (Engel et al., 2008) because it excludes numerous PES schemes that operate under different guidelines, with ill-defined ES or insufficient provision standards (Kosoy & Corbera, 2010). For example, Engel et al. (2008) noted several ‘PES-like’ compensation schemes in the tropics that match several features of the 2005 definition but do not satisfy all criterion. It was also argued that this framework was primarily based on an environmental economics approach (Wunder, 2005; Engel et al., 2008) which is derived from theoretical economic perspectives centered around how efficient gains can be achieved by utilizing market forces and providing individual price incentives (Van Hecken et al., 2015).

Wunder (2013) attempted to address these concerns by broadening the term ‘ecosystem services’ to ‘environmental services’ that goes beyond services we consider to be of a systemic nature. He later altered the PES criteria to: “(1) voluntary transactions (2) between service users (3) and service providers (4) that are conditional on agreed rules of natural resource management (5) for generating offsite services” (Wunder, 2015, p. 241). In response to previous criticisms, this new definition acknowledges that most agreements center around resource-use proxies as the main performance measure and compliance indicator rather than ES which can be difficult to define (Wunder, 2015). In addition, the term ‘buyer’ and ‘seller’ was previously criticized for being too market driven and was thus replaced with ‘user’ and ‘provider’ to encompass all whom an ecosystem buyer and seller would recruit from (Wunder, 2015). Lastly, the fifth criteria purposely link the PES framework to the environmental externalities, which the fourth criteria seeks to address (Wunder, 2015). This definition recognizes that ES users are typically external to the site to which the services are derived and who typically benefit indirectly (Wunder, 2015). However, some critics feel the improved definition fails to address the lack of conditionality in real-world setups, which is a critical component of PES programs (Hausknot et al., 2017).

Utilizing an incentive-based market approach, PES emerged in response to the rigidity of command and control policies, because of its ability to generate creative tailor-made approaches grounded in the belief that rational individuals act based on self-interest (Kolinjivadi, Van Hecken, Almeida, Dupras & Kosoy, 2019). PES programs are based on the rationale of mainstream economic theory that ES are externalities because they provide benefits for human beings which are obtained for free and therefore left out of economic decisions (Kosoy & Corbera, 2010). PES assumes that these externalities are a result of market failures, thus if individuals were to pay for such services this apparent discrepancy would be addressed (Engel et

al. 2008; Muradian et al., 2013; Hausknost, Grima & Singh, 2017). Without such incentives, it is assumed that land-users (individuals benefitting from ES) are unmotivated to implement environmentally conscious land-use practices (Engel et al., 2008; Kolinjivadi et al., 2019).

PES has emerged as a tool for integrating ES into economic systems by establishing a mechanism for suppliers (landowners) of ES to be compensated for their continued delivery (Wunder, 2005; Engel et al., 2008; Van Hecken et al., 2015; Bennett & Gosnell, 2015; Hausknost et al., 2017). Such services include provisioning, regulating, cultural, and supporting (Adhikari & Agrawal, 2013), all of which are supplied in some form by wetlands. As a result, PES programs are being endorsed around the world to incentivize sustainable management of various ES (Bennett & Gosnell, 2015). This includes international organization such as International Union for Conservation of Nature, the Convention on Biological Diversity, and The Economics of Ecosystems and Biodiversity which brought the concept of ES to the forefront of international initiatives (Grima et al., 2016; Hausknost, Grima & Singh, 2017).

PES frameworks assume that ecosystem managers (e.g. farmers, loggers, and protected area managers) are typically inadequately compensated for conservational land use practices and the benefits they receive from alternative land uses (e.g. conversion to cropland) often outweigh those received from conservation (Engel et al., 2008). However, deforestation can result in negative effects to downstream populations whose access to ES such as water filtration are negatively impacted (Engel et al., 2008). Since the cost of environmentally harmful practices effecting ES users can be greater than the land manager's opportunity cost, it follows that payments by users could incentivize the land manager to adopt conservational land use practices (Engel et al., 2008; Van Hecken et al., 2015). By emphasizing positive externalities, PES moves away from the commonly applied "polluter pays principle" towards a "beneficiary pays principle" (Van Hecken et al., 2015).

PES programs are typically developed in economic, social, and environmental contexts that are influenced by several stakeholders (Engel et al., 2008). However, the likelihood of successful implementation has been demonstrated in several studies showing that the benefits for households and communities of environmental service markets can be realized and heightened through information dissemination (Adhikari & Agrawal, 2013). In helping realize these benefits, which are often provided over a long period of time, the only way to demonstrate its effect is by comparing it to its counterfactual baseline, which is the result of no intervention (Wunder, 2005).

Payments are typically made in cash or through other in-kind benefits (Wunder, 2005) such as special recognition of indigenous or local rights to natural resources, health and education facilities for the local community, initiatives towards improving welfare, or the improvement of social services (Adhikari & Agrawal, 2013). PES schemes are ideally based on output payments that are made on the basis of the ES provided under the agreement (Engel et al., 2008). However, since many ES are difficult to directly observe (especially cultural services), input-based payments are used more often, which attaches payments to particular land uses on a per-hectare basis (Engel et al., 2008). Whatever form payments take, it must exceed any additional benefit the ecosystem manager would have received from alternative land practices

but at a price ES users are willing to pay (Engel et al., 2008). Input-based programs typically monitor to ensure (i) that ecosystem providers are complying with their contracted agreement through specified land uses, and, in some cases, (ii) whether the land uses are resulting in the desired effect (Engel et al., 2008).

Buyers of these programs are typically either direct users of the ES or is an agency (typically an NGO or government entity) acting on behalf of the users (Engel et al., 2008). Sellers are then individuals who have the ability to ensure the protection and delivery of the ES, typically landholders (Engel et al., 2008). Regardless of who the sellers are, the goal of PES frameworks is to utilize knowledge of ES provision and seek providers at the lowest cost (Engel et al., 2008). Most ecosystems provide a number of services; therefore, efforts are sometimes made to sell ‘bundled’ services or ‘layer’ payments from several users towards payments to providers (Engel et al., 2008; de Groot et al., 2012). An ES can only be considered as such if it is perceived to be a benefit to human beings and is a socially viable product of nature, although it has yet to be determined how such validation is required (Kolinjivadi et al., 2019).

It is not necessary to use valuation techniques to determine a price for ES provided under PES, although it might be a helpful tool in PES design (Wunder, 2013). Instead, cost can be determined through negotiations or proposed costs on a take-it-or-leave-it basis between users and providers (Wunder, 2013). It should be noted that due to a great deal of uncertainty and disconnect between sustainable land use practices and associated ecological effects, a user’s willingness to pay (WTP) is likely to increase if an established link is made between the land uses and the environmental outcomes (Adhikari & Agrawal, 2013). In addition, there will only be payments for ES that are deemed valuable and the users’ WTP exceeds the sellers’ willingness to accept (WTA) (Van Hecken et al., 2015). Therefore, if the economics between WTP and WTA do not square up, there is no grounds for PES (Wunder, 2013).

Wunder (2008) observes that ES beneficiaries (users) frequently hold a stronger negotiating position because there are typically fewer of them, therefore creating a higher demand, and they are generally better informed than ES providers. Even if poor ES providers become better off as a result of a PES program, questions remain about how much and in what form this will occur (Wunder, 2008). This is because with any commercial transaction, there is an inherent struggle over the buyers’ desire to maximize surplus (conservation gains) and the sellers’ desire to maximize their income, therefore equitable PES arrangements will greatly depend on the negotiating power between both parties (Wunder, 2008). If the users’ WTP and providers’ WTA do not align there will be no grounds for PES. In other words, if the potential profits of alternative land uses (e.g. land development) are too high, service users will be ill-equipped to sufficiently compensate landowners to pursue conservation practices (Wunder, 2013; Muradian et al., 2013).

PES is only successful in regions with the right culture that understands the need for service users to pay and for providers to be motivated by payments to ensure the delivery of such services (Wunder, 2013). For example, Wunder (2013) finds that few irrigating farmers are willing to pay for watershed services despite being relatively wealthy and a predominant resource user which may be attributed to the cultural perspective of free water rights in the past.

However, even if payments are made it is not guaranteed that social and ethical behaviours will improve and, in some cases, this may even undermine genuine intentions (Muradian et al., 2013). This may result in ‘leakage’ which refers to the displacement of activities harmful to an ES to other areas outside the geographical region protected under PES (Engel et al., 2008; Von Thaden et al., 2019). If this occurs, environmental benefits derived from PES may be miscalculated (Engel et al., 2008). Grima et al. (2016) identify four major takeaways of successful PES programs in Latin America. This includes the importance of (1) continued provisioning of critical resources while contributing positively to local livelihoods, (2) local and regional level programs ranging between 10-30 years, (3) the use of in-kind contributions rather than only cash payments, and (4) the dominance of private actors with few intermediaries between buyers and sellers.

Critics of PES argue that the framework is not interested in saving nature but rather creating markets to operate in (Van Hecken et al., 2015). Reinforcing this perception, Kosoy and Corbera (2010) argue that PES reflects a ‘commodity fetishism’ that strips ecosystem values down to a single measure, thereby obscuring their social relations. It has been argued by several scholars that the creation of a market will ultimately favour the economically and socially powerful, resulting in hardships for the poor (McAfee, 1999; Kosoy & Corbera, 2010; Muradian et al., 2013). This has been expressed in some cases in which receivers of payments (providers) are significantly wealthier than the local users of such services, therefore raising equity concerns (Muradian et al., 2013). Many criticisms of PES are similar to those of valuation as discussed in Chapter 2, expressing concerns such as the potential to mask the complexity of critical processes underlying ES production (Gomez-Baggethun & Ruiz-Perez, 2011) or selling out nature (McAfee, 1999; O’Niell & Spash, 2000; McCauley, 2006).

PES have been used for the protection of many types of ES in several countries at different levels of government. To demonstrate its relevance to the ES provided by wetlands, Manitoba, Canada’s Alternative Land Use Services (ALUS) program will be explored in the following section.

4.3.3.1 Manitoba’s ALUS Program

Unfortunately, little research has been done covering PES schemes in Canada. However, there is evidence that they have been successfully implemented at the local level. This has been demonstrated by the municipality of Blanshard, Manitoba, Canada and its Alternative Land Use Services (ALUS) program from 2006 to 2008, which targeted environmental stewardship in agricultural development (Mann, Grant & Kulshreshtha, 2014; France & Campbell, 2015). Throughout the duration of the program, the community and farmers displayed tremendous support with over 8,000 ha of wetlands, native prairie, and riparian areas involved (France & Campbell, 2015). The program was supported by many organizations including Delta Waterfowl, the Manitoba Rural Adaptation Council, duck stamp funds from several U.S states, the local government, and in-kind support from the Little Saskatchewan River Conservation District (France & Campbell, 2015). Annual payments were allocated on a per-acre basis at \$15.00, \$7.50, and \$5.00 in exchange for forgoing agricultural use, haying and grazing (Mann et al., 2014). Although compensation was modest, farmers reported receiving enough support to cover

their property tax, which they considered more-than-adequate compensation (France & Campbell, 2015).

The program was deemed a success because of its ability to attract both environmentally conscious farmers who were already undertaking similar practices and farmers who required financial incentive (France & Campbell, 2015). However, the program was not without some criticism. Two major points of criticism were the emphasis on historical loss rather than continued sources of degradation of wetlands, resulting in a focus of creating new as opposed to protecting existing ecosystems (France & Campbell, 2015) and, second, some participants reported inconsistent monitoring standards which resulted in some farmers being ineligible for payment (France & Campbell, 2015). Despite these criticisms the overall success of the program encouraged the expansion of PES programs into Norfolk, Ontario and a province wide program in Prince Edward Island (France & Campbell, 2015).

This chapter has demonstrated that there are several policy approaches to the management of wetlands, each with their own set of solutions and criticisms. The following chapter will explore the evolution of wetland policy in Canada and Ontario with an assessment of the policy approach utilized.

Chapter 5: Wetland Policy in Canada

5.1 Wetland Policy in Canada

Since Canada joined the Ramsar Convention, several steps have been taken at the federal level to address the need for wise use and management of wetlands. The development of wetland policy and legislation in Canada has predominantly focused on wetland functions that Canadians receive a direct financial benefit from, such as flood damage reduction, water quality, resource harvesting, and recreational activities, with functions that are valued at over \$10 billion CAD annually (Rubec, 1994). However, as a result of the division of powers outlined in the Constitution Act of 1867, the governance of wetlands is not allocated to a single government body across the country, rather it varies depending on provincial jurisdiction (Austen & Hanson, 2007). The management of natural resources, such as wetlands, are generally governed by the provinces, while the federal government is responsible for only 29 per cent of wetlands in the country, which lie within federal lands such as military reserves, National Wildlife Areas, National Parks, and land in the northern territories (Rubec & Hanson, 2009). Although wetlands are predominately governed by the provinces, a brief survey of Canada's approach to wetland management will be explored first followed by an in-depth discussion of Ontario's policy approach in light of the command and control discussion outlined above.

Federal authority is grounded in its responsibility to maintain the quality of the environment, inland and ocean fisheries, migratory bird populations, international and transboundary resources, and federal land holdings (Lynch-Stewart, Kessel-Taylor & Rubec, 1999). Therefore, the conservation and management of natural habitats and biodiversity primarily depends on the provinces. As a result, statutes related to land-use planning, wildlife management, water management, environmental assessment, sustainable use of resources, private land conservation and the designation of protected areas have been established but none of which exclusively deal with wetland protection (Lynch-Stewart et al., 1999). In addition, municipalities can also impact and regulate wetlands with land use plans, zoning by-laws, building regulations and site plan controls (Bond et al., 1992).

5.1.1 Ramsar Convention

One of the decisions driving a federal wetland policy was Canada's membership in the Ramsar Convention, effective as of 1981, and the concomitant commitment to the wise use of wetlands, including the designation of wetlands of international importance and ensuring the present and future conservation of their resources (Lynch-Stewart et al., 1999; Schulte-Hostedde, Walters, Powell, Shrubsole, 2007). As of 2019, Canada has designated 37 wetlands of international significance, 9 of which are located in Ontario (Ramsar, 2014). However, most wetlands in Canada are not identified under the Ramsar Convention nor are they within federal jurisdiction to designate (Schulte-Hostedde et al., 2007).

5.1.2 North American Wetland Management Plan

The North American Wetland Management Plan (NAWMP) of 1986 was signed by Canada and the United States (and later endorsed by Mexico) and focuses on the rejuvenation of waterfowl and other wildlife populations through the conservation of uplands and wetlands by utilizing partnership plans, projects and programs (Lynch-Stewart, Rubec, Cox & Patterson,

1993). To promote coordination among countries, the North American Wetland Conservation Council (NAWCC) was established in 1990 to implement the NAWMP (Rubec, 1994). The multilateral program sought to invest over \$1.5 billion in wetland conservation and management in Canada, resulting in the securing of more than 830,000 hectares of upland and wetland habitat (Rubec, 1994).

5.1.3 Federal Policy on Wetland Conservation

The Federal Policy on Wetland Conservation (FPWC) in 1991 was later developed to compliment the Ramsar Convention, NAWMP and several other wetland related policies (Government of Canada, 1991) to outline the goals, objectives, and guiding principles to conserve and manage wetlands on federal lands, involving federal departments or programs that require federal funding (Cox, 1997; Loftus, Smardon & Potter, 2004). The FPWC is an overarching policy and requires all federal departments to sustain wetland functions in the development of new policies and programs (Rubec & Hanson, 2009). This includes policies that promote and sustain ecological and socio-economic functions of wetlands now and in the future (Government of Canada, 1991; Lynch-Stewart et al., 1993). It outlines seven strategies for the wise use and management of Canadian wetlands and the delivery of effective wetland science and public awareness among the national and international community (Rubec, 1994). However, it should be noted that the FPWC focuses on performance objectives rather than on prohibitions and regulations of activities (Rubec & Hanson, 2009).

Two major goals of the FPWC are to ensure that there is no net loss of wetland functions on federal land and waters and to encourage the rehabilitation and enhancement of wetlands where wetland functions have reached critical levels (Loftus et al., 2004). To achieve these goals, Canada emphasizes the mitigation sequence, although it has been criticized as being ineffective at achieving no net loss (Austen & Hanson, 2007). The first two stages of the mitigation sequence (avoidance and minimization) were initially given the most effort during the early years of the FPWC, but compensation was thought to be a necessary component of the sequence in order to prevent net loss of wetland functions (Rubec & Hanson, 2009). However, there remains no formula in place to objectively determine how much one should compensate, and requirements are typically decided on a case-by-case basis, making a standardized national mitigation sequence difficult to achieve (Rubec & Hanson, 2009).

5.2 Ontario's Wetlands

Ontario accounts for roughly 25 per cent of Canada's wetlands and about 6 per cent of all the wetlands globally, covering more than 350,000 km² mostly found in the northern region of the province (Ontario Government, 2017). However, despite this large land cover, it is only a fraction of what once was. It is estimated that more than three-quarters of the wetlands that were found in Ontario pre-colonization have been lost in southern Ontario (below the Canadian Shield) due to land clearing, dredging and filling, drainage, and other land uses (Lynch-Stewart et al., 1993). Ontario has implemented both policy and legislation, predominantly through the provincial Planning Act (1990) by governing land use plans to address conservation and management of internationally and provincially significant wetlands (Rubec, 1994). Although Ontario does not have legislation specifically directed at wetland management and conservation,

a number of policies and legislation are used that either address wetlands specifically or can be used more broadly (Loftus et al., 2004).

Since the 1980s, Ontario has incrementally developed an approach to wetland management, beginning with the development of the Ontario Wetland Evaluation System (OWES) (Schulte-Hostedde et al., 2007) in the Provincial Policy Statement under Section 3 of the Planning Act (Stadel et al., 1993). The goals of Section 3 are to (1) identify and protect wetlands sufficiently through a land use planning process; and (2) to ensure no loss of provincially significant wetlands (Schulte-Hostedde & Shrubsole, 2003).

5.2.1 Ontario Wetland Evaluation System

The Ontario Planning Act was implemented in 1947 to establish procedures and authority for decision-making and guide local governments around land use changes on both private and municipal land (Schulte-Hostedde & Shrubsole, 2003). It was not until the 1980s, when the public became more aware and appreciative of environmental values, that amendments to the Planning Act took place to protect natural resources (Schulte-Hostedde & Shrubsole, 2003).

The 1982 Planning Act emphasized municipal responsibility through official plans, subdivision control, zoning by-laws and several other tools to reinforce its objectives (Schulte-Hostedde & Shrubsole, 2003). In 1984, the Ontario Ministry of Natural Resources established the OWES to objectively classify significant wetlands in a standardized procedure (Schulte-Hostedde et al., 2007) with the goal of protecting all provincially significant wetlands (PSWs) (Lynch-Stewart et al., 1993). OWES categorizes wetlands into the four common wetland ecosystems in Ontario – marsh, swamp, bog and fens – as determined by the field evaluator on the basis of major plant associations and physical, substrate and hydrological information obtained in the wetland and immediate surroundings (McKenna, December 11, 2017).

A wetland is classified based on their social, biological, hydrological and special features, each category with the ability to score a total of 250 points (Schulte-Hostedde & Shrubsole, 2003; Schulte-Hostedde et al., 2007). The biological component considers that wetlands vary in terms of productivity and habitat diversity (Ontario Government, 2017). The social component measures some of the direct benefits to humans, including marketed products (e.g. wild rice, commercial fish, and furbearers), recreational and educational uses (Ontario Government, 2017), and Aboriginal and cultural heritage values (Government of Ontario, 2013). The hydrological component characterizes water-related benefits such as natural storage capacity, flood mitigation, protection against erosion, contributions to groundwater recharge and discharge, and improvements to water quality (Ontario Government, 2017). Lastly, the special features component considers geographic rarity of the type of wetland, the presence of rare plant and animal species, age of the ecosystem, and habitat quality for land and aquatic wildlife (Ontario Government, 2017). Therefore, the OWES identifies and considers the various ecosystem services provided by wetlands in its approach to wetland management.

If a wetland unit scores at least 600 points or 200 points in the biological or special features categories the wetland is classified as a PSW (Schulte-Hostedde & Shrubsole, 2003; Schulte-Hostedde et al., 2007). Once a wetland or area of wetlands (known as a wetland

complex) has been identified, it then gains protective status under the Planning Act and Provincial Policy Statement. OWES intentionally ignores the level of disturbance to a wetland and focuses on the state that it is currently in at the time of the evaluation and the type of ecosystem functions and services that are being generated (McKenna, December 11, 2017). Although it has been criticized as a frustrating and inefficient method for developers and land use practitioners, the OWES does not categorize individual wetlands into separate wetland pockets. Rather, wetlands in proximity are often complexed together because of their related biological, social, or hydrological functions (McKenna, December 11, 2017). The OWES takes into consideration that, in some cases, wildlife in the area of the complex may variably depend on the presence of the entire complex of wetlands, each wetland contributing to the whole (McKenna, December 11, 2017).

The OWES approach to wetland management has been criticized for prioritizing the protection of the most ‘valuable’ wetlands (Schulte-Hostedde et al., 2007) by granting some protective status while others remain unprotected. On the opposite side, some evaluation practitioners have criticized and expressed a lack of clarity and robustness in the evaluation system (Savanta Inc., n.d). This includes the variability of complexing groups of small wetlands, the potential to undermine the ability to identify the relative importance of a wetland in terms of features and functions over others, and the need to modernize OWES to include more recent scientific assessments (Savanta Inc., n.d).

It could be argued that the OWES approach has been largely successful at protecting wetlands as the rate of wetland loss in Southern Ontario has been reduced to less than 2 per cent (Ontario Government, 2017). However, this figure falls short of Ontario’s 2025 goal to halt net loss of wetlands and the 2030 goal of achieving a net gain in wetland area and function (Ontario Government, 2017). Those classified as PSWs are supposed to be protected from negative impacts to the natural features or ecological functions (Provincial Policy Statement, 2014), however evidence has shown that some attempts have failed to fully protect their ecological functions (Stadel et al., 1993), thereby placing in question the effectiveness of monitoring and enforcement mechanisms.

5.2.2 Provincial Policy Statement

The Provincial Policy Statement (PPS) was first released in 1996 under the authority of the Planning Act between the Ministry of Municipal Affairs (MMA) and the Ministry of Natural Resources and Forestry (MNR) (Lynch-Stewart et al., 1993), which includes policy areas such as natural heritage and specific wetland policies (Loftus et al., 2004). Its goal is to provide direction on land use planning and development that are of provincial interest (Loftus et al., 2004). Currently, under Section 3 of the Planning Act, 2008, the PPS (2014) prohibits development and site alteration on significant wetlands and significant coastal wetlands unless no negative impacts to the natural features or ecological functions have been demonstrated (Provincial Policy Statement, 2014). This principle also applies to adjacent lands unless no negative impacts to the natural features or functions of the PSW can be demonstrated (Provincial Policy Statement, 2014).

However, the PPS has been criticized for its exemption of agricultural practices such as peat harvesting and drainage, which is not considered ‘development’ (Lynch-Stewart et al., 1999; Schulte-Hostedde et al., 2007). Through a review period of the PPS that occurs every 5 years, the PPS has addressed shortcomings to its initial focus on development by establishing a need to prove that no negative impacts will occur as a result of development and to ensure decisions are consistent with the goals of the PPS (Schulte-Hostedde et al., 2007). However, despite these amendments, critics point out areas of concern such as fragmented jurisdictions, financial arrangements, enforcement, and informed decision-making (Schulte-Hostedde et al., 2007).

The Ontario government relies on top-down control, through the Planning Act, over the processes affecting wetlands by establishing restrictions to activities on or near PSWs. In order to achieve the desired behaviour, Ontario uses a command and control approach that relies on law to outline prohibited behaviours and police enforcement to induce compliance with the application of penalties. This reinforces a command and control mandate by assuming environmental wrongdoers should compensate society by paying the cost of damages to PSWs through penal means. However, scholars such as Knight and Meffe (1997) caution that due to the lack of understanding of wetland ecosystems, a hierarchical, one size fits all approach is unlikely to be effective in the long-term. As was demonstrated in the example of the Clean Water Act in the previous chapter, the increasing array of direct and indirect threats to natural resources pose challenges for command and control policies.

5.2.3 Conservation Authorities

Conservation authorities are unique to Ontario in that they are corporations with a degree of autonomy from provincial and municipal governments (Lysyk, 2018) that represent local watershed management agencies that deliver programs and services with the purpose of protecting and managing impacts to water and other natural resources (Conservation Ontario, n.d). While other jurisdictions manage their natural resources between provincial and municipal governments, Ontario began this form of governance in the 1940s in response to severe flooding and erosion problems across Ontario (Conservation Ontario, n.d). In 1946, the Conservation Authorities Act was passed to establish a legislative framework for the funding and operation of conservation authorities across the province (Lysyk, 2018). A conservation authority’s mandate, according to the Conservation Authorities Act, is “to provide for the organization and delivery of programs and services that further the conservation, restoration, development and management of natural resources in watersheds in Ontario” (Conservation Authorities Act, 1990).

Each conservation authority’s boundaries are determined by the watershed it resides on (Lysyk, 2018). A watershed is an area of land that channels precipitation into a common body of water such as a lake, river, stream, or marsh (Lysyk, 2018). The rationale for this watershed-based approach is to provide a meaningful scale to address local needs by considering how one part of a watershed may affect downstream communities that cross municipal boundaries (Lysyk, 2018).

Currently, there are thirty-six conservation authorities in the province (Conservation Ontario, n.d) that govern approximately 90 per cent of Ontario’s population (Lysyk, 2018). Each

has its own Board of Directors comprised of members, most of which are elected municipal officials, appointed by local municipalities (Conservation Ontario, n.d).

The conservation authority relevant to this case study is the Niagara Peninsula Conservation Authority (NPCA), which was established in 1959 and serves the entire Niagara Region. The Region is made up of twelve municipalities: 21 per cent of the City of Hamilton and 25 per cent of Haldimand County (Lysyk, 2018). It manages over 2,400km² of land, approximately 64 per cent of which is used for agricultural activities, 21 percent in a natural state, and 15 per cent urbanized (Lysyk, 2018).

This chapter has served as a review and assessment of Canada and Ontario's approach to wetland management. Despite a decentralized management approach among the Ontario government, conservation authorities, and local governments, the province utilizes a top-down command and control style. As outlined in the previous chapter, command and control policies encounter issues of inefficiency and ineffectiveness in the management of wetlands, making them vulnerable to criticisms. The following chapter will introduce the purpose of the social multi-criteria evaluation, the methodology used for the case study, and review each step of the process for greater clarity.

Chapter 6: Methodology

A case study of a threatened PSW in the City of Niagara Falls, Ontario, Canada was chosen to showcase the common conflict between sustainable wetland management and economic development in the province. Due to the enviro-political nature of the conflict, a SMCE framework was chosen to inform the potential management options of the property. Although the PSW resides on private property, stakeholders from the local community were invited to participate in the study to gain a deeper understanding of the conflict and implications of different management options on various societal groups.

Figure 1 demonstrates how the conceptual framework of a SMCE was used to address this conflict. Whether it is environmental, social, or economic, stakeholders were chosen based on their common interest in maximizing the utility of the property. Based on discussions with members of each stakeholder group, a list of criteria was developed in addition to a short list of management options that are deemed acceptable to the participants. The value of including various stakeholder groups is demonstrated in the following sections of the SMCE process.

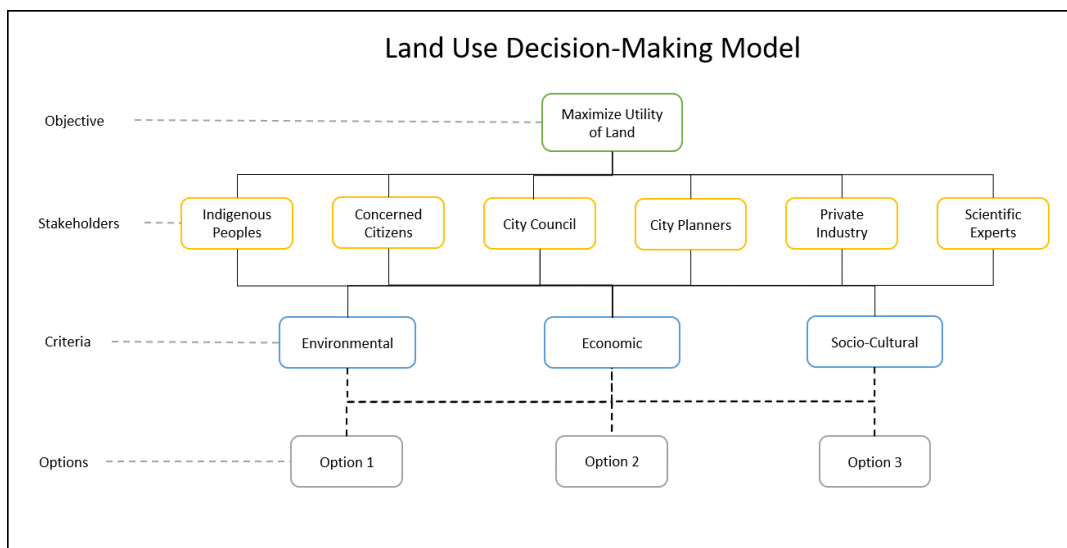


Figure 1 SMCE Conceptual Framework

6.1 Scoping

6.1.1 Legal Analysis

To gain a deeper understanding of the issue at hand, a legal analysis was conducted to survey relevant policies to the protection of wetlands in Ontario. Policies included provincial legislation and municipal by-laws, in addition to City Council meeting minutes and email correspondences obtained through Freedom of Information (FOI) requests by concerned citizens. This analysis was used to understand the legal framework to which decisions at the local level were made upon and to inform the rationale for decisions at the local level as they evolved throughout the duration of the conflict.

6.1.2 Stakeholder Analysis

Information was gathered through ethics cleared interviews with local stakeholders to inform each step of the SMCE process. To identify relevant stakeholders involved, a stakeholder analysis was conducted simultaneously with a historical analysis. Stakeholders were chosen based on their common interest in the property and the knowledge they possessed of the conflict. Individuals were initially identified based on their professional positions or reputation surrounding the issue in local newspaper articles and city council meeting minutes. Due to the high-profile nature of the case in the Niagara Region, several activists were identified as key stakeholders. Contact with these individuals were initially made through a professional contact of the research team who made introductions via e-mail. A snowball technique was then used to identify other stakeholders in their network that were not mentioned in the literature. This led to discussions with representatives from various groups such as the private landowner, indigenous community, city council, scientific experts, planners, and concerned citizens. These groups included individuals who have been a part of the decision-making process as well as those typically excluded but take an active role in raising awareness of the issue.

As a result of the diverse backgrounds and perspectives on the issue, a comprehensive understanding was developed in addition to the formal and informal relationships amongst various actors. Stakeholders were not meant to be representative of members of an organization or community in a way that statistical sampling would. Rather, stakeholders were individuals who were privy to the events surrounding the conflict of the PSW and were able to provide reliable information about the community and the knowledge that came from their experiences.

6.1.3 Historical Analysis

A total of nine individuals participated in the study. Participants were asked to be prepared to partake in two semi-structured interviews. The first interview was to inform the historical analysis and develop a list of options and criteria. The second interview involved an interactive process of weighing and scoring the options and criteria developed in combination with all the initial interviews. However, a total of sixteen interviews were conducted because two participants were unavailable for their second interview.

The first interview, which participants were informed would last about two hours, would be used to understand the conflict from their perspective and to generate a list of options and criteria used for the SMCE. In this interview, participants were asked how they learned about the proposed development project, how they are associated with the land, how they have been involved in the issue, and the events that led up to the conflict.

After surveying the legal mechanisms for wetland management in Ontario, conducting initial interviews with participants, reviewing materials gained through FOI requests, and assessing reports and air photos of the property, a deeper understanding of the conflict was developed. The information gathered was then used to inform conflicts among active participants in addition to the complex and uncertain nature of in the decision-making process with regards to natural resources.

6.2 Options and Criteria

Initial interviews with participants were used to identify the specific benefits that were recognized and used by participants on the property and its wetlands to inform the decision-making criteria. Questions were asked such as, in what ways does the property support your life, what benefits do you receive from the property, and what benefits do you think development would bring to your life.

The discussion of ES proved challenging for some participants who were not familiar with the concept, especially since most participants did not have firsthand contact with the ES and often reiterated knowledge they had heard from others (e.g. carbon sequestration, flood mitigation, and temperature regulation). Additionally, because the property is privately owned, direct interaction with the ES was limited and a result of trespassing. However, after further explanation and discussion of ES generally, all participants were able to identify ES provided by the property in some form or another. Participants described many ES and general aspirations for the future of the Niagara Region as it related to the property and were largely reflected in decision-making criteria.

6.3 Weighting and Scoring

In the SMCE process, an interdisciplinary discussion about the assumptions of impacts by various stakeholders plays an active and important role to encourage open dialogue. However, rather than conducting this step in a single, interdisciplinary workshop discussion, as typically seen with this analysis, individual assessments were completed and compared. The reason for this is due to the lack of resources available for the research project. Funding was not available to compensate participants for their time away from their professional and personal responsibilities to allow for a full-day workshop.

Additionally, since the conflict had been an ongoing concern for the past five years, almost all individuals involved in the study knew of or had previous interactions with each other. Some individuals distinctly expressed animosity and distrust towards others involved. Therefore, individual evaluations with each participant were conducted in order to reduce the amount of time required to complete the evaluation and to avoid stalemate discussions, as predicted by several participants based on experiences from Open House meetings hosted at Niagara Falls City Hall. It should also be noted that the sample of participants is heavily influenced towards opinions and preferences against development. Since the conflict in Niagara Falls has been greatly publicized in local media, participants against the development project were more likely to want to be involved in the study than those in favour of development.

The second interview, which participants were informed would last anywhere between fifteen minutes to an hour, was used to evaluate the options and criteria previously developed. Participants were shown the categorized evaluation criteria and options and were asked to complete a two-step evaluation. The first step of the evaluation was to weigh each option to each criterion. This was done by comparing each option on either side of a scale ranging from -9 to +9. Participants were asked to indicate, using the numerical scale, the expected outcome of the evaluating criteria if only two options were being considered. Participants were told that a negative indication has not representative of an undesirable outcome, rather an indication

towards either side of 0 would suggest a preference towards the option indicated on that side of the scale. Participants were told that a 0 indicated that the options being compared would have the exact same effect on the criteria being evaluated. If the participant felt that this was not the case, they were to indicate how much, using the numerical scale, the favourable option would accommodate for the criteria.

For the second step of the evaluation, participants were asked to use the same scale to indicate the degree of importance, in their opinion, each criterion held when compared to each other. The spreadsheets on which each evaluation was conducted with each participant were kept separate and coded to ensure anonymity of all participants. A sample of both steps of this interview is shown in Appendix A.

6.3.1 Informing the Impact Matrix

OPTamos, the decision-making tool used for this evaluation, translates the weights (preferences) into a numerical scale to ensure consistency and uniformity among criteria which may have different units of measure. For example, biodiversity may be measured by the population size of various species while economic growth may be measured by the number of jobs created. This is why participants were asked to use the 19-point scale, to accommodate for this feature in OPTamos. Although OPTamos is an open source tool, all data was coded and locked in a password protected account to ensure anonymity.

Singh et al. (2016) note that in the development of similar analyses, an acceptable value of inconsistency is ≤ 0.1 . If the value remains below 0.1, it means that the answers provided by participants remain unchanged regardless of how the question was framed. However, many answers provided by participants resulted in an inconsistency ratio above this value as shown in Table 1. Based on observations of participants completing the evaluation, it appeared as if some held onto biases in favour and against certain options. For example, one participant (A2) demonstrated extreme preference for any option other than Development as Planned despite the criteria being evaluated. Another participant (P1) would argue that Alternate Development would likely ensure a better job of safely guiding human interaction with the natural environment than Conservation. It was then argued that Conservation was better than Development as Planned. But when asked to compare Development as Planned and Alternate Development, they were considered to have the same impact, thereby contradicting the statements previously made. Therefore, the high rate of inconsistency should be considered when interpreting the results of the evaluation.

Due to the relative inconsistency of the answers provided, it would appear that most participants do not feel they have a strong understanding of the impacts to the selected criteria by each option. This may be due to the abstract and intangible nature of the criteria. Therefore, the answers given by all participants should not be taken to be generalizable since several answers tended to be skewed towards their own biases rather than on realistic, objective expectations.

Criteria	Inconsistency Ratio per Participant (≤ 0.1)						
	A1	S2	P1	A2	I1	S1	D1
<i>Environmental Sustainability</i>	0.22	0.44	0.24	0.48	0.53	0.05	0.43
<i>Safe interaction with nature</i>	0.32	0.19	1.65	0.00	0.19	0.02	0.00
<i>Cultural Identity</i>	0.12	0.05	0.25	0.53	0.32	0.01	0.00
<i>Education</i>	0.25	0.28	0.25	0.53	0.19	0.06	0.00
<i>Economic growth</i>	0.47	0.01	0.06	0.53	0.25	0.32	0.00

Table 1 Inconsistency Ratios

Participants were then asked to evaluate the criteria against one another to indicate the relative importance from their perspective. This was a difficult task for many participants as they were forced to consider the personal preference of conflicting and complementary criteria. For example, many participants found education to be closely tied to cultural identity, often claiming one fed into the other. While Economic Development and Environmental Sustainability were often identified as opposing criteria.

6.4 Sensitivity Analysis

A sensitivity analysis was conducted after each evaluation to determine whether the results are affected by a change in the weights. This was done using the sensitivity analysis feature in OPTamos and observing how a change in the ranking of options may be associated with a loss of overall benefit.

Chapter 7: Scoping Results

7.1 Legal Analysis

Since Ontario does not have a policy directly addressing wetland management, an in-depth survey of relevant policies at the provincial and local level was conducted as it pertains to the City of Niagara Falls (see Appendix B). The PPS (2014), under the Planning Act (1990), provides the highest level of direction for the management and protection of wetlands in the province since decisions made by a conservation authority, City and Region must be consistent with these policies. The PPS prohibits development and site alteration in significant wetlands and adjacent lands in the ecoregion of Southern Ontario, unless it has been demonstrated that no negative impacts to the natural features or ecological functions will occur (Provincial Policy Statement, 2014). This also applies to habitat of endangered and threatened species unless it is in accordance with federal and provincial requirements (Provincial Policy Statement, 2014). The Conservation Authorities Act (1990) also prohibits activities that interfere with a wetland unless a regulation allows it (Conservation Authorities Act, 1990). The PPS does not make any mention of achieving no net loss; however, this is discussed in the *Wetland Conservation Strategy for Ontario 2017-2030* in which wetland offsetting policies are discussed while abiding by the mitigation sequence. However, the Strategy mentions that some sites, features and habitats, such as PSWs protected by the 2014 PPS, will be ineligible for offsetting based on their status (Ontario Government, 2017). Therefore, provincial policies are clear that negative impacts to provincially significant wetlands are to be avoided in their entirety.

The PPS remains relatively silent on the issue of buffer zones between wetlands and development practices. The only mention of buffer zones occurs when addressing major facilities and sensitive land uses, stating that they should be planned to ensure they are buffered to prevent or mitigate adverse effects such as noise, contaminants, minimize risk to public health, and ensure long-term viability of major facilities (rather than sensitive land uses) (Provincial Policy Statement, 2014). The responsibility of establishing the size of these buffers is then left to the local government and conservation authority. This is demonstrated in Ontario Regulation 155/06 under the Conservation Authorities Act and the Official Plan Amendment 128 (OPA 128) by the City of Niagara Falls. Ontario Regulation 155/06, referring specifically to the Niagara Peninsula Conservation Authority (NPCA), addresses this issue to an extent by discussing maximum (rather than minimum) distances between wetlands and development. Under this regulation, development is not permitted in a wetland or areas where development could interfere with the hydrological function of a wetland (O. Reg. 155/06). This includes up to 120 metres from all PSWs and wetlands greater than 2 hectares in size. Wetlands less than 2 hectares are given a buffer of up to 30 metres (O. Reg. 155/06). The Regulation makes no distinction between wetlands and PSWs. Due to the lack of guidance from provincial policies, the City of Niagara Falls approved an OPA 128 that establishes a 30-metre buffer to protect the ecological and hydrological functions of the natural heritage features (City of Niagara Falls, 2018). However, this buffer may be altered with the approval of an Environmental Impact Study (EIS) through the subdivision and development application process.

If development is to occur within a wetland on the property specific to the OPA 128, it must be based on the findings and conditions of an EIS and a work permit shall be obtained from the conservation authority before the approval of development plans (City of Niagara Falls, 2018). If the terms of the work permit are violated, the conservation authority has several legal tools at its disposal. It can issue a stop order that requires the person to stop engaging in an activity that violates the work permit, a fine can be issued, or a rehabilitation order can be issued to a person to remove any development ordered by the court or to take actions to repair or rehabilitate the damage that had resulted from the offence (Conservation Authorities Act, 1990). The PSW on the study area is, therefore, subject to the combined regulatory efforts of the PPS, Conservation Authorities Act, and Niagara Falls' OPA 128.

7.2 Historical Analysis

7.2.1 About the Property

7.2.1.1 *Basics of the Land*

On November 5, 2015, the project applicant purchased 484 acres of land in the City of Niagara Falls, Ontario, locally known as Thundering Waters, for \$22.5 million (Ontario Land Registry Office, 2016, April 18; Savanta Inc, 2017). The property is located north of the Welland River/Chippawa Parkway, east of the Ontario Power Generation Inc./Chippawa Power Canal, south of Oldfield Road and west of Stanley Avenue (Savanta Inc, 2017). It is located near the heart of the City, within walking distance of several tourist attractions such as the Niagara Falls, Marineland Park, and the Casino District.

7.2.1.2 *What does the project want to do?*

On November 13, 2015 a non-legally binding Memorandum of Understanding (MOU) was signed between the project applicant and the City of Niagara Falls outlining an agreement for the intended use of the property, later referred to as Riverfront Community (Memorandum of Understanding, 2015, November 13). The agreement outlines the desires of both parties to support and attract investment to the project (Memorandum of Understanding, 2015, November 13).

The Riverfront Community development project proposes to develop 121 acres (Savanta Inc, 2017) of the property for a mix of residential, commercial, and institutional uses (Ministry of Municipal Affairs, 2016, December 13). The plan sets out four stages that are projected to span eight years that would include train services linking to Niagara Falls tourist sites and casino resorts, commercial and recreational spaces, and residential areas (Spiteri, 2018 February 1). The goal of the project is to encourage a healthy, active lifestyle by providing access to outdoor amenities on the property such as golf training and sports facilities (GR Investment Group, 2019).

The project is estimated as a \$1.5 billion deal for the City of Niagara Falls (Diodati, 2016, December 2) that plans to include more than 1,000 dwelling units, 500 hotel units, creating 1,800-2,800 jobs and benefitting over 2,600 people (Spiteri, 2018 February 1). The project is expected to create desirable economic development and employment opportunities, adding to the City's destination vacation and tourism infrastructure (Diodati, 2016, December 2). The Mayor of Niagara Falls has argued that the development project would demonstrate progressive land use

planning policies, including the protection of the Natural Heritage System, integrated live-work communities, affordable housing opportunities, and support for local and regional transit initiatives (Diodati, 2016, December 2).

7.2.1.3 Project Challenges

Despite the potential economic gains to the City of Niagara Falls the plan has faced substantial obstacles. According to the Niagara Region's Official Plan, the property had been included in the Urban Area Boundary for development since the 1970s (Diodati, 2016, December 2). Therefore, in an effort to prevent urban sprawl and meet the needs of the Provincial Growth Plan that emphasizes the utilization of existing urban lands, the property was re-designated from industrial to residential use in 2008 with the approval of the Official Plan Amendment #81 (OPA 81) (Diodati, 2016, December 2).

However, according to environmental impact studies, the property contains several natural heritage features protected under the PPS, including 282 acres of PSWs at the time of purchase (Ministry of Municipal Affairs, 2016, December 13), which prevents development from occurring on or near designated wetlands (Provincial Policy Statement, 2014). This area was further increased to 334 acres in 2016 after a field assessment from the MNRF, designating approximately 70 per cent of the property as provincially protected (Ministry of Municipal Affairs, 2016, December 13). The property is also home to several endangered and threatened species, in addition to provincially and regionally rare species (Dougan & Associates, 2016; Savanta Inc, 2017). As a result of additional PSWs, the project was then stalled because original plans had identified newly designated PSWs as areas for development and therefore violated provincial policy (Dougan & Associates, 2016).

7.2.2 Environmental Impact Studies

7.2.2.1 Characteristics of Wetlands on the Property

EIS were completed on the property in June of 2016 and September of 2017 by two independent consulting firms. The studies assessed several aspects of the property including plant and wildlife species, significant wetlands, significant valleyland, significant wildlife habitat, habitat of endangered and threatened species, impacts of development on these areas and several other aspects of the property (Savanta Inc, 2017).

According to the 2010 OWES evaluation, the property was presented with a total score of 624 out of a possible 1,000 points, exceeding the threshold for a PSW (Savanta Inc, 2017). The total area of wetland within the complex was identified as 281.3 acres with a total catchment area of 2,079.56 acres (Savanta Inc, 2017). This includes several small units of wetlands, some varying in size from 0.00 ha (too small to measure) to 54.64 ha (Savanta Inc, 2017). However, the MNRF notes that this is a standard procedure of the OWES and considers the entire area as a single wetland despite profound ecological differences across the landscape (McKenna, 2016, December 11). Therefore, during EIS evaluations, the property should be evaluated as a single unit including all wetland types (McKenna, 2016, December 11) rather than just the evaluation of the slough forest that makes up a majority of wetland area on the property (99.6 ha), which has remained relatively pristine woodlands and wetlands (Savanta Inc, 2017).

The slough forest features, also referred to as vernal pools, have small catchments around individually isolated pool features that collect water from precipitation and overland runoff from nearby catchments (Savanta Inc, 2017). Vernal pools are well known for their potential to support local amphibians (e.g. salamanders) for breeding and offspring development (Savanta Inc, 2017). The EIS definitively confirmed the significance and sensitivity of these slough features, covering the majority of the property but were confirmed to be outside the area proposed for development (Savanta Inc, 2017).

Other areas on the property had been actively farmed after the 1960s but have returned to natural vegetation cover (refer to Appendix C) (Savanta Inc, 2017). The EIS also refers to an area on the southern side of the property of relatively young wetland features that show signs of significant disturbances that have been affected by large-scale activities such as the re-alignment of the Welland River, the creation of the Chippawa Power Canal and Conrail Drain and railway line, and associated deforestation and filling of the land (Savanta Inc, 2017). Since then, vegetation has continued to grow but has experienced ongoing active and passive recreation disturbances (e.g. recreational vehicles and hunting) in some areas associated with uncontrolled access to the property (Savanta Inc, 2017). This has resulted in relatively limited ecological features and functions, leading the EIS assessor to question their merit as PSWs (Savanta Inc, 2017). Based on discussions with individuals involved, this assessment of varying degrees of quality of individual wetland features has supported discussions of development on part of the property that consist of PSWs with limited ecological functions but has received substantial backlash from environmentalists.

7.2.2.2 Mitigation Measures

While direct construction impacts are avoided on slough forest wetland features, the EIS notes the importance of maintaining hydrological conditions (quantity and quality) sensitive to changes in the landscape that are associated with construction activities such as the deposition of sediment and changes to oxygen levels (Savanta Inc, 2017). The EIS recommends several mitigation measures to avoid and limit direct and indirect impacts to wetland features. This includes further assessments of hydrological conditions, maintenance of migratory linkages between wetland units and the establishment of buffer zones ranging from 10-30m (Savanta Inc, 2017).

However, the EIS notes the removal of almost 11 acres of PSWs to support the proposed development, suggesting these units do not warrant a PSW classification (Savanta Inc, 2017). Yet, the MNRF has dismissed this assessment and reinforces the PPS which states that there shall be no development or site alteration within PSWs in southern Ontario (Thornton, 2016, August 19; McKenna, 2016, December 11). The MNRF concluded with feedback on both studies and supplementary materials claiming that they do not adequately inform the OPA 128 for further development (McKenna, 2018, January 15) that sets the policy framework for the proposed project on the property (Niagara Falls City Council, 2018 May 8).

7.2.3 Attempts at Resolution

Based on an interview with a Niagara Falls city councillor, there had been no attempt at conflict resolution to date to address concerns among competing interests. However, the Mayor

of Niagara Falls and the NPCA had made previous attempts to address concerns by seeking assistance from the Provincial government.

In an effort to resolve the planning issues created by the newly designated PSWs and continue with development, the Mayor of Niagara Falls requested assistance from the provincial government in the form of a Provincial Development Facilitator that would work with local, regional, and provincial staff to facilitate the development of the project (Diodati, 2017, January 9). The Mayor reiterated in his correspondence with the Province that the investment opportunity with the project applicant is a result of a joint effort by the City and the Province to attract Chinese investment to Ontario and this project specifically would leverage significant investment in a growing trade partner and stimulate economic growth locally (Diodati, 2017, January 9; Diodati, 2017, January 12). The Mayor continues by expressing the additional designations of PSWs in 2016 severely limit the potential for development and threaten to put an end to the project entirely (Diodati, 2017, January 12). However, this request was subsequently denied by the Province (Mauro, 2017, January 25). When these correspondences came to light as a result of FOI requests by concerned citizens, several opponents of the project claimed the Mayor had been lobbying the provincial government on behalf of the developer, thereby exemplifying a conflict of interest.

After interviewing several interested parties, it appears that public attention and scrutiny of the Riverfront Community project began after public presentations were made by the Region of Niagara proposing biodiversity offsetting of several units of wetlands at a 3:1 ratio, thereby promoting a net gain of wetlands as a result of the project (Lysyk, 2018). The initiative was put forth as a pilot project by the NPCA but was not supported by the Province (Lysyk, 2018). Nearly all interview participants, as well as NPCA staff members (Lysyk, 2018), expressed unease at the lack of scientific evidence articulating an ability to recreate the ecological conditions of the slough forest. After intense opposition from the local community and the lack of support from the Province, biodiversity offsetting was subsequently abandoned.

The MNRF has weighed in on several occasions, urging the City, Region and developer to abide by the direction set out by the Planning Act and the PPS stating that there shall be no development or site alteration within PSWs in southern Ontario (Thornton, 2016, August 19; Ministry of Municipal Affairs, 2016, December 13). The MMA has also encouraged that all decisions affecting planning matters shall be made in accordance with the PPS, including decisions made under the Growth Plan that support planning and economic development, promotion of increased opportunities for cross-border trade, and movement of goods and services (Ministry of Municipal Affairs, 2016, December 13).

7.2.4 Opposition to Development

According to personal communication with the event organizer, in the summer of 2017 a group of citizen activists demonstrated in an act of civil protest by camping on the property for several days. The purpose of the protest was to attract attention to the property and the threats to the ecosystem (Bennett, 2017). They did this by encouraging individuals to visit the property and learn about the different species and the ecosystem services provided by wetlands. It was also used to demonstrate to local politicians that the public was concerned for the species and

wetlands on the property and should therefore be protected in future city council meetings (Bennett, 2017).

Protestors expressed concern that despite provincially protected wetlands, the development on any part of the land has the potential to isolate species that depend on open spaces such as the meadows and thickets in between the wetlands that are subject to development (Niagara Falls Review, 2017). According to a city councillor who visited the property during the protest, she expressed feeling thrilled to learn about and have the opportunity to see the different species within her neighborhood.

Throughout the planning stages of the project the City of Niagara Falls held several city council meetings where citizens were given the opportunity to voice their support or opposition for the Riverfront Community. The most noteworthy was the council meeting held on May 8, 2018 discussing the approval of the OPA 128 that sets the policy framework for the proposed project on the property. Despite public opposition against biodiversity offsetting, OPA 128 refers to “habitat relocation” of significant species if permits or approvals are obtained by MNRF (Niagara Falls City Council, 2018, May 8). The amendment also plans that if a PSW designation is removed and does not warrant any other protective status (e.g. Significant woodland, significant wildlife habitat), the feature will assume the status of adjacent lands (Niagara Falls City Council, 2018, May 8).

When the floor was opened to the public, five citizens spoke in favour of the development project citing the promotion of businesses in the area (Niagara Falls City Council, 2018, May 8). However, twenty-five others spoke against the proposed project, citing concerns for the PSWs, wildlife, drinking water, and the premature nature of the proposal (Niagara Falls City Council, 2018, May 8). Despite this majority, city council voted 6-2 (one absent councillor) in favour of OPA 128 (Niagara Falls City Council, 2018, May 8).

Approval of OPA 128 allows the project applicant to move to the next stages towards the development of the project which are plans for subdivision and zoning by-law amendments. With approval, the amendment seeks to allow the Riverfront Community plan to proceed in advance of the secondary plan (City of Niagara Falls, 2018, May 8). Included in the approval were twenty-seven recommendations by Council that involved the clarification of the location of PSWs in relation to development, size of buffers, and several other considerations iterated in the EIS to ensure that the project abides by provincial policy (City of Niagara Falls, 2018, May 8).

Shortly after the approval of the OPA 128, in August of 2018, a local environmentalist filed an appeal with the Local Planning Appeal Tribunal (LPAT) citing inconsistencies between the OPA 128 and provincial policy concerning PSWs and wildlife habitat (Spiteri, 2019 November 4). The LPAT is an independent administrative tribunal that is responsible for hearing appeals on a variety of municipal matters and whose members are appointed by the Lieutenant Governor in Council (Ministry of Municipal Affairs and Housing, 2020). In November of the following year the appeal was dismissed, concluding that the appellant cited unqualified opinions and statements in his submission that were not supported by the record or any qualified planner

or ecologist sought by the Tribunal (Spiteri, 2019 November 4). Despite this decision, the appellant is currently seeking a review of the LPAT dismissal (Spiteri, 2019 November 8).

A vocal group against the proposed Riverfront Community is the Haudenosaunee, consisting of the Mohawk, Oneida, Onondaga, Cayuga, Seneca, and Tuscarora Nations, who held a rally in 2016 in opposition of the development proposal (Ministry of Municipal Affairs, 2016, December 13). The Haudenosaunee feel they represent the communities with the land and all that inhabit it and have taken on responsibility to heal and protect the land generally to ensure better conditions for future generations (Lickers, 2017, March 8).

The Haudenosaunee claim that the Riverfront Community will interfere with, impair and infringe upon Haudenosaunee title, rights and interests as guaranteed and recognized by the Nanfan Treaty of 1701, Mitchell map of 1755, August Treaty of 1764 and the Treaty of Fort Stanwix of 1768 (Detlor, 2016). It is also claimed that the decision in *Seneca Nation of Indians v. New York* (2004) confirms that Thundering Waters was to have been held in trust for the Haudenosaunee Confederacy (Detlor, 2016).

The Haudenosaunee confirmed that the Crown's fiduciary duty to receive consent before the infringement of treaty rights had not occurred and requested the planning process be placed on hold until such time as Ontario has fulfilled these obligations (Detlor, 2016). To refuse or fail to fulfill this obligation would be considered an act of bad faith (Detlor, 2016). The Haudenosaunee express disapproval for the development project because of the perceived detrimental effects to the remaining natural space on the property and specific concern for the resident wildlife that rely on the land (Lickers, 2017, March 8).

MMA has urged the Region of Niagara to consult with Indigenous and First Nations Communities regarding the Region's Secondary Plan (OPA No. 117) (Ministry of Municipal Affairs, 2016, December 13). The PPS encourages municipalities to coordinate planning matters with indigenous communities and to implement the policy in a manner that recognizes and affirms treaty rights in Section 35 of the Constitution Act (City of Niagara Falls, 2018, May 8). According to the City of Niagara Falls' Planning Department, the Mississaugas of the New Credit, the Six Nations Elected Council, the Haudenosaunee Development Institute (HDI), and the Metis Nation of Ontario were given notices of public meetings and public forums (City of Niagara Falls, 2018, May 8). It was also noted that City staff had met with Six Nations Council and the HDI during the secondary planning process and the HDI had expressed that the duty to consult rests with the Crown and cannot be undertaken by municipal governments which are not considered Crown entities (City of Niagara Falls, 2018, May 8). According to the HDI, municipalities may negotiate details of a proposal with Indigenous communities, but this does not constitute fulfilling the duty to consult (City of Niagara Falls, 2018, May 8). Therefore, the Indigenous community has continued to express opposition of the Riverfront Community citing concerns for the biodiversity, the land to which they feel responsible for protecting, in addition to title and treaty rights.

7.2.5 Niagara Peninsula Conservation Authority

According to the Auditor General's 2018 audit of the NPCA, the Niagara Region's representatives were almost entirely (11 out of 12) comprised of elected officials in 2015. In 2017, the NPCA received roughly \$8.9 million, or 71 per cent of its total annual revenue, from municipalities (Lysyk, 2018). Therefore, a clear influence from the Region's municipal governments had led to mounting concerns and criticisms against the conservation authority.

The audit concluded with several operational issues specific to the property and the NPCA that could be rooted back to the broader governance of conservation authorities, including the authority to vote and generally act on behalf of their municipality, as mandated by the Conservation Authorities Act (Lysyk, 2018). However, employees of the NPCA and the public felt it should act in the best interest of the conservation authority it represents (Lysyk, 2018).

The audit report found several instances in 2015 of NPCA senior management taking steps that would threaten to destroy the wetland complex on the property. This was reflected in meeting minutes of NPCA staff with representatives from the City of Niagara Falls, Niagara region and the developer (Lysyk, 2018). It was in these notes that NPCA senior management informs the developer that it was working on alternative ways to address the obstacle posed by the wetlands (Lysyk, 2018). It was also discovered that the NPCA had retained the services of a lobbying firm to organize meetings with the provincial government to discuss the approval of a pilot project that would utilize biodiversity offsetting of the wetlands on the property with a 3:1 ratio to compensate (Lysyk, 2018). NPCA staff expressed concern for the lack of scientific evidence to support the proposed pilot project because no studies of the property's ecosystems had been conducted to determine whether they contained unique features that cannot be replicated (Lysyk, 2018).

It was noted that in 2008, before the wetlands were designated as provincially significant under the Planning Act thereby prohibiting development, a municipal staff member requested that the NPCA allow biodiversity offsetting on the property (Lysyk, 2018). However, NPCA staff expressed concerns to the NPCA Board that, although development was not prohibited, a large-scale relocation of wetlands to accommodate a development project was outside the parameters of NPCA policies.

The NPCA Code of Conduct requires its members to avoid conflict of interest with regards to their fiduciary duties (their duty to care for the NPCA's resources) but fails to address how its members' competing interests, as elected municipal officials, may also be considered a conflict of interest (Lysyk, 2018). The Board had no procedural guidance on how to identify such circumstances or relationships that could lead to this conflict of interest, therefore the onus is on the individual members to recognize and declare, in their opinion, whether there is a conflict.

In addition to conflicts of interest, the NPCA has received criticisms for failing to address environmental wrongdoings. There were several cases of the NPCA failing to act when the Conservation Authorities Act was violated (e.g. when wetlands are destroyed or damaged, or debris is dumped into a waterway) (Lysyk, 2018). It was noted that between 2013-2017, one

quarter of complaints of Conservation Authority Act violations were still open, therefore the potential violation had not been addressed and environmental damages had not been resolved.

As a result of what some citizens described as a ‘dual agenda’ among Board members who held elected municipal positions, a level of distrust and discontent began to emerge. Some citizens felt that elected officials had infiltrated the conservation authority in order to push development projects through. The most prominent example was of the mayor of Niagara Falls who held a position at City Council, Regional Council and the NPCA. While holding these positions, he had flown to China and returned with a signed MOU discussing the partnership and intention to ‘promote investment and development’ opportunities without consultation from the Niagara Falls City Council (Memorandum of Understanding, 2015, November 13).

7.2.6 Present Day

Five years after the property was purchased no development has been permitted. Despite this, violation notices by the NPCA have been filed against the project applicant in 2018 and 2020 for violating the Conservation Authorities Act and causing damages to PSWs as a result of unauthorized work on the property within range of a PSW (Howard, 2018, December 3; Hill, 2020, January 24), thereby adding to the mistrust and damaged relationship between the developer and concerned environmentalists.

Despite a large-scale development project with the potential to bring sizeable economic opportunities to the City of Niagara Falls, the project is faced with substantial opposition to preserve remaining wetlands in the region that are threatened by such projects. The case of Riverfront Community demonstrates the classic example of the competing interests of various societal groups pertaining to land use management in Ontario and the strategies needed to balance these concerns.

The lack of transparency within the decision-making process and perceived conflicts of interest in local governance structures has resulted in tension between citizens and decision-makers that has impacted the ability to address these competing interests. To better understand how different perspectives and conflicts inform land use decision, a social multi-criteria evaluation was used that incorporated the knowledge of local stakeholders to generate policy options and criteria to manage and evaluate these competing interests. The purpose of this evaluation was to identify acceptable compromises to involved stakeholders and serve as a communication platform for competing interests.

Chapter 8: SMCE Results

8.1 Options and Criteria

A majority of participants focused their discussion of criteria on the protection of ecological and biological aspects of the property that indirectly benefit their well-being with the knowledge that the natural environment was being managed sustainably despite any direct interaction with these features. The criteria are meant to represent major trade-offs in the empirical application of the decision-making model. As a result, a large number of criteria was identified, as shown in Table 2 and condensed into a short list that reflected three main classifications: environmental, socio-cultural, and economic criteria as shown in Table 3.

Class	Criteria	Description
Environmental	Protect biodiversity	Ensure population of species are maintained with corridors to allow migration and the invasive species are reduced/eradicated
	Maintain forest cover	Maintenance of area covered by forest to ensure the promotion of clean air
	Safe interaction with nature	Light trails guiding human interaction with natural areas and limiting impact to wildlife
	Sustainability	Ensures the long-term sustainability of wetlands and other natural heritage features
Cultural	Refuge from City	Amount of available green space away from city streets
	Maintain unique Canadian landscape	Amount of slough forest maintained (% of overall land)
	Cultural Identity	Maintenance of local traditions and knowledge
	Education	Available formal and informal education of wetland services
Economic	Local employment	Generation of steady, permanent jobs for locals
	Economic growth	Economy of Niagara Falls/Region is stimulated and growing
	Affordable housing	Attend to housing demand and address increasing housing demand
	Markets	Promote the development of various industries that foster the local economy
Social	Maintain natural aesthetics	Ensure green space to enjoy
	Public accessibility	Public access to natural areas. Absence of fences or barriers
	Intergenerational equity	Changes are long lasting to benefit future generations

Table 2 Criteria Derived from Participant Interviews

Class	Criteria	Description
Environmental	Environmental sustainability	Ensure the population of species are maintained with corridors to allow migration on the property, invasive species are reduced/eradicated, forest cover is maintained to ensure the long-term sustainability of natural areas to benefit future generations.
	Safe interaction with nature	Light trails are created to guide human interaction through natural areas while limiting impact to wildlife and ecological functions of wetlands.
Socio-Cultural	Cultural identity	Maintenance of local traditions and knowledge and spiritual connection with the land.
	Education	Available formal and informal education of wetland ecosystem services.
Economic	Economic growth	The economy of Niagara Falls and the Region is stimulated and growing, promoting the development of various industries and generating steady employment for locals.

Table 3 Categorized Evaluation Criteria

Management options were also discussed in interviews with individual participants to generate alternative management approaches with regards to the property and its natural resources. The landowners' land use plan as described in the City of Niagara Falls' OPA 128, referred to here as 'Development as Planned', was used as the baseline option for which alternatives were to be generated around (see Appendix D for a map describing this scenario). However, due to the encroachment of development into PSWs included in this plan and therefore a violation of the PPS (2014), the option is put forth under the assumption that the PSW designation of impacted wetlands on the south-western portion of the property are removed under the authority of the MNRF.

Many participants expressed their desires to see the property turned into a publicly accessible conservation area to preserve the ecological functions of the Carolinian forest of which the property is a part, with no development occurring on any part of the property. As a result, many participants referred to this option as their ideal, best case scenario throughout discussions and was therefore included as a Conservation option in the evaluation.

Since the issue of biodiversity offsetting was already put forth previously by the NPCA and subsequently dismissed, it was not considered as a management option in the evaluation. One participant expressed his support for offsetting but admitted that it was not an approach that would be accepted by the general public as a result of the poor relationship the NPCA held with the public. The main concerns driving the dismissal of biodiversity offsetting centered on the lack of trust to adequately recreate the ecological functions of the wetlands, particularly the slough forest on the northern portion of the property. When participants were prompted to consider the offsetting of the relatively new and manmade wetlands on the southern portion of the property, many participants pointed to the OWES and its rationale for their recent designations. It was argued that if those wetlands met the threshold for a PSW, then it should be

respected without interference. Additionally, in a FOI request correspondence, the MNRF explicitly expresses its disapproval of the offsetting of PSWs (Thornton, 2016, August 19; Ministry of Municipal Affairs, 2016, December 13).

The potential of implementing a PES program was also rejected by most participants. Some expressed interest but lacked faith that it would be supported by residents of the community. It was argued that because the projected revenue for the proposed project is so high it would not be feasible for the community to raise the money to compensate the landowner to forgo the project and manage the rehabilitation of the property in its entirety.

As an alternative option, many participants expressed varying degrees of support for a scaled back version of the project that does not encroach on any PSW, including the smaller wetlands on the south-western portion of the property, while maintaining a respectable buffer. This option is demonstrated in a visual shown in Appendix E and referred to as ‘Alternate Development’. As a condition for allowing development to occur, ownership of the area covered by PSWs, including a 30-metre buffer as recommended in the 2017 EIS, is transferred to a public authority. The landowner then retains ownership of the remaining land to develop where feasibly possible without isolating PSWs from the rest of the complex or blocking migratory paths of terrestrial species.

As a result, three management options (Table 4) were generated for the evaluation. Although these were the names given to the options, many participants clarified and highlighted their preferences by evaluating the scenarios based on their interpretation of each option. For example, one participant differentiated between Alternate Development and Development as Planned as publicly owned wetlands and privately-owned wetlands. In a second interview, participants were then asked their opinions on these options as they relate to the criteria and were asked to assign weights accordingly.

Option Type	Scenario Description
Conservation	Public or privately owned conservation park with publicly accessible trails. No development occurs.
	Formal, binding agreement with financial penalties/incentives holding the landowner responsible for the protection of wetlands.
Alternate Development	Scale back project - ALL significant wetlands are avoided with a 30-metre buffer. Ownership of the area covered by PSWs and buffers is transferred to a public authority as a condition for development to occur. Remaining area remains privately owned for development.
Development as Planned	Development as planned (according to the OPA Schedule A-6) with the removal of PSW designation on impacted wetlands by the province. Entire property remains privately owned.

Table 4 Evaluation Options

8.2 The Impact Matrix

From the nine individuals who participated in an initial interview, seven were available for a second interview to weigh and score the options and criteria. The results of the individual

assessments are discussed below, noting favourable options and criteria while highlighting notable findings where appropriate. Screenshots from OPTamos are also used to conceptualize the results of each analysis. A further discussion about the combined results will be explored in the following chapter.

8.2.1 Participant A1

The results of the evaluation for the participant coded A1 is demonstrated in Table 5 and Figure 2. Participant A1 favoured the protection of the natural environment from human activity to ensure long term sustainability. Therefore, Environmental Sustainability (36.5%) and Safe Interaction with Nature (31.5%) were identified as the most important criteria when evaluating the options. While Economic Growth was identified as the least important criteria (1.87%).

Criteria	Conservation	Alternate Development	Development as Planned	Inconsistency ratio	% of importance
Environmental Sustainability	37.21	58.37	4.42	0.22	36.49
Safe Interaction with Nature	38.02	57.89	4.09	0.32	31.54
Cultural Identity	52.76	42.71	4.52	0.12	17.35
Education	39.44	56.34	4.23	0.25	12.76
Economic Growth	7.11	41.85	51.04	0.47	1.87
	39.89	54.93	5.18		

Table 5 A1 Impact Matrix

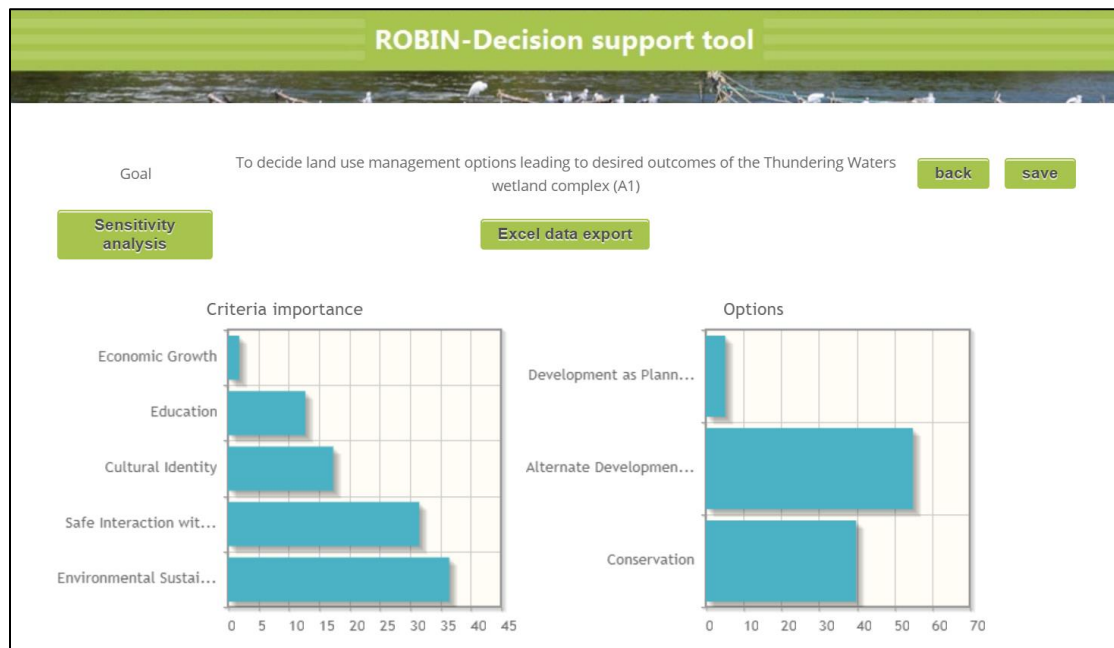


Figure 2 A1 Impact Matrix

As a result, Alternate Development (54.93%) was the preferred choice by a significant margin because the participant felt that a public authority was necessary to address the threat of invasive species on the property and protect from further degradation to the ecological functions of the wetlands on the property. Conservation (39.89%) followed as the next best option, with Development as Planned (5.18%) indicated as barely acceptable. The only criteria Development as Planned was thought to address adequately, compared to the other options, was Economic

Growth (51.04 points). However, due to the low level of importance assigned to this criterion, this made little difference to the acceptability of Development as Planned as a viable option to pursue. The only criteria Alternate Development did not outperform the other two options were Cultural Identity, which was thought to be best address through Conservation, and Economic Growth, which was thought to be best addressed through Development as Planned. However Alternate Development was ranked the second-best option to address both these criteria.

Despite a sensitivity analysis, by which the weights of the criteria were changed, Alternate Development remained the clear choice for Participant A1 when considering all five criteria. Conservation consistently ranks in the second position while Development as Planned is ranked as the last option.

8.2.2 Participant S2

Participant S2’s results are shown in Table 6 and Figure 3. Participant S2 also favoured Environmental Sustainability (37.37%) over all other criteria. It is worth noting that Participant S2 argued that Safe Interaction with Nature (26.42%) and Education (24.52%) were closely related, which is why they were given similar levels of importance. It was thought that through educating the public on the importance of wetlands it would also teach them how to safely interact with the natural environment, including wetlands. The lowest ranked criteria were Cultural Identity (5.61%) and Economic Growth (6.08%).

<i>Criteria</i>	<i>Conservation</i>	<i>Alternate Development</i>	<i>Development as Planned</i>	<i>Inconsistency ratio</i>	<i>% of importance</i>
<i>Environmental Sustainability</i>	63.85	32.28	3.87	0.44	37.37
<i>Safe Interaction with Nature</i>	55.72	38.31	5.97	0.19	26.42
<i>Cultural Identity</i>	80.09	13.11	6.79	0.05	5.61
<i>Education</i>	70.48	25.06	4.46	0.28	24.52
<i>Economic Growth</i>	52.94	30.88	16.18	0.01	6.08
	63.58	30.94	5.48		

Table 6 S2 Impact Matrix

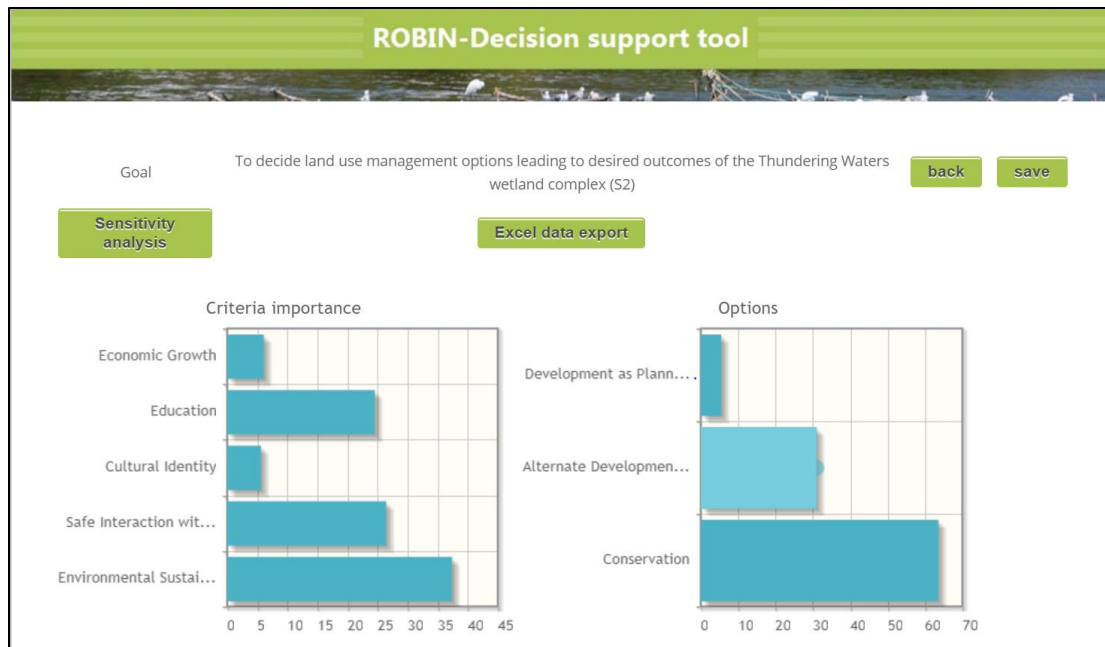


Figure 3 S2 Impact Matrix

The results clearly indicate a strong preference for Conservation (63.58%) as it outperformed the other options in every criterion, including Economic Growth. During the evaluation, the participant reasoned that the non-market values of the ecosystem services were of more value to the Niagara Region's economy than any scale of development. The strong preference for Conservation did not change with the sensitivity analysis and therefore demonstrates Participant S2's clear preference towards Conservation.

Development as Planned (5.48%) was not viewed as a favourable option when considering any of the criteria. When it came time to evaluate Alternate Development and Development as Planned against each other, Participant S2 often mentioned that the lesser of two evils (Alternate Development) was being chosen. Therefore, although Alternate Development was indicated as the second preferred option, it was not seen as a favourable option because of the consequences increased human interference has on its immediate surroundings as a result of development, such as noise, construction, spread of invasive species, and run-off of contaminants.

Overall, there is a clear ranking of the options. Conservation is argued to ensure all criterion to the greatest extent. This is followed by Alternate Development which did not outperform any of the options in any of the criteria but was rather regarded as the lesser of two evils. Lastly, Development as Planned was regarded as the worst-case scenario by this participant.

8.2.3 Participant P1

Participant P1's results are shown in Table 7 and Figure 4. P1's perspective was very different from Participants A1 and S2. Rather than Environmental Sustainability, as indicated by Participants A1 and S2, this participant favoured Economic Growth (42.57%) above all other

criteria. While Cultural Identity (6.84%) was identified as the least important criteria, just below Environmental Sustainability (10.85%). However, Safe Interaction with Nature (20.87%) and Education (18.86%) were regarded as relatively important.

Criteria	Conservation	Alternate Development	Development as Planned	Inconsistency ratio	% of importance
Environmental Sustainability	26.01	69.36	4.62	0.24	10.85
Safe Interaction with Nature	36.93	51.84	11.23	1.65	20.87
Cultural Identity	27.32	66.71	5.97	0.25	6.84
Education	27.32	66.71	5.97	0.25	18.86
Economic Growth	6.08	64.93	28.99	0.06	42.57
	20.14	63.14	16.72		

Table 7 P1 Impact Matrix

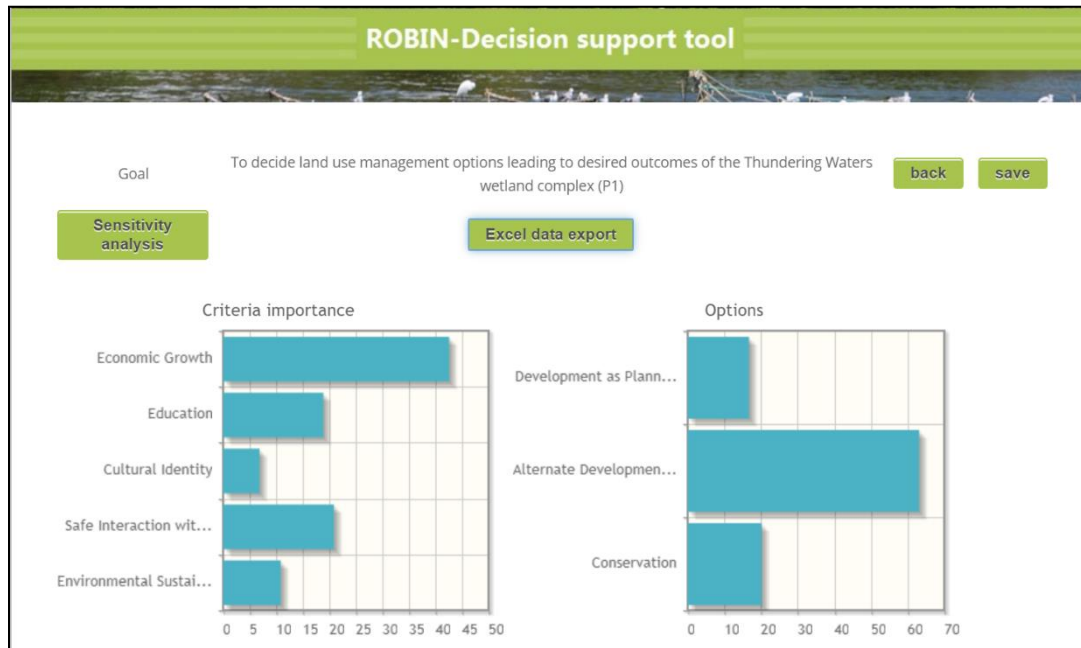


Figure 4 P1 Impact Matrix

Participant P1 clearly preferred Alternate Development (63.14%) to Conservation (20.14%) and Development as Planned (16.72%). Throughout the evaluation, the participant indicated the potential for Alternate Development to outperform the other two options in each of the criteria, allocating a mean average of 63.91 points towards Alternate Development. It was thought that Conservation would address each of the criteria relatively well except for Economic Growth, but no criteria were to the same potential as Alternate Development because of the ability for intervention and to provide safe accessibility to the public. The participant explained that intervention through Alternate Development was necessary to raise more awareness of the value of wetlands (Education) and why they are important to others (Cultural Identity). In the participant's view, this would not occur if the property was turned into a conservation area and left in its current state.

Although Development as Planned was regarded relatively poor among each of the criteria by this participant, it was thought to bring relative Economic Growth (28.99 points), although not to the extent of Alternate Development (64.93 points). Due to the relatively high

importance the participant gave to Economic Growth, this increased the overall acceptability of Development as Planned as an option. Even after a sensitivity analysis, the preferred order of options remained the same with Alternate Development as the clear choice by Participant P1. Overall, this participant clearly associated Alternate Development as the most preferred option with Conservation only slightly more desirable than Development as Planned due to the environmental and socio-cultural criteria.

8.2.4 Participant A2

The results from Participant A2 are shown in Table 8 and Figure 5. This participant demonstrated a strong preference for any option that promoted Environmental Sustainability, as this was indicated as the most important criteria (47.5%). Education (24.44%) and Safe Interaction with Nature (17.64%) were thought to be closely tied and relatively important, while Cultural Identity (8.61%) was regarded as slightly more important than Economic Growth (1.81%).

Criteria	Conservation	Alternate Development	Development as Planned	Inconsistency ratio	% of importance
Environmental Sustainability	64.99	31.26	3.75	0.48	47.50
Safe Interaction with Nature	33.33	33.33	33.33	0.00	17.64
Cultural Identity	63.06	33.33	3.60	0.53	8.61
Education	63.06	33.33	3.60	0.53	24.44
Economic Growth	63.06	33.33	3.60	0.53	1.81
	58.74	32.35	8.92		

Table 8 A2 Impact Matrix

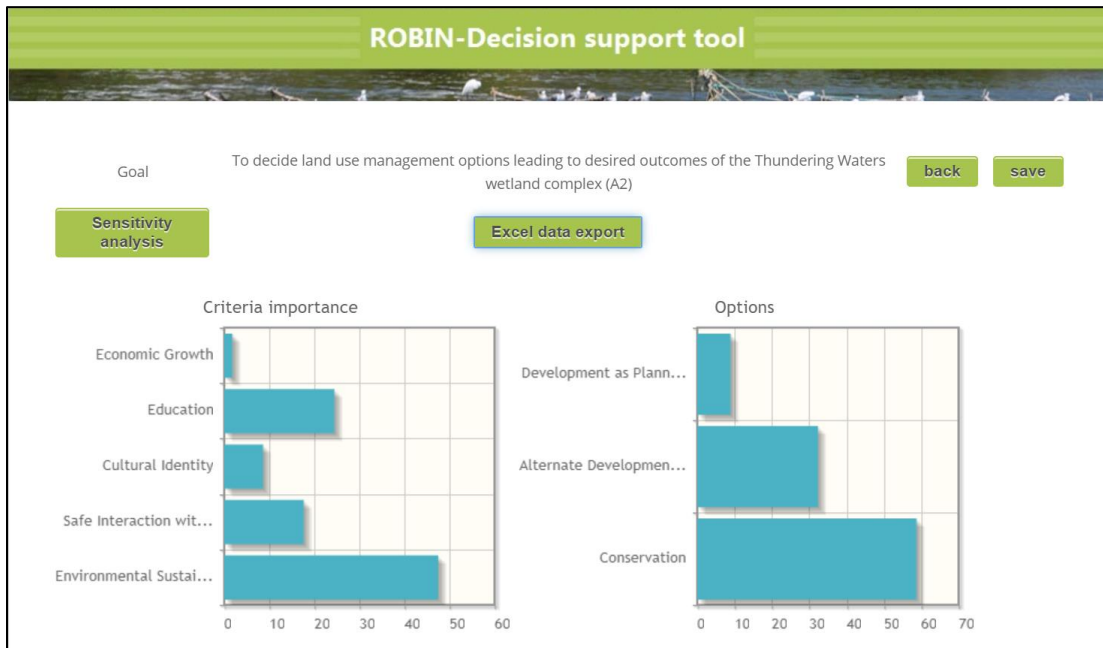


Figure 5 A2 Impact Matrix

Throughout the evaluation, the participant expressed that any option that was not Conservation would be unacceptable. Therefore, Conservation (58.74%) resulted as the preferred choice, followed by Alternate Development (32.35%) and Development as Planned (8.92%). Whenever the participant was to evaluate a scenario that included Development as Planned, it

was indicated that the preference should be completely given to the alternative option regardless of whether the option was Conservation or Alternate Development. Therefore, just as Participant S2 indicated, Participant A2 made decisions based on the lesser of two evils, rather than consideration of what the expected outcome would be of each criterion.

Although Safe Interaction with Nature (17.64%) was given relative importance, the participant indicated that all options would have the same effect because none of the options should, from the participant’s perspective, allow public access to the property. Rather, people should be able to enjoy the nature from the road without stepping onto the property. The last three criteria (Cultural Identity, Education, and Economic Growth) were all heavily skewed towards Conservation (63.06 points). The participant did not give much reasoning for this, but again expressed discomfort for any development that occurred on the property that, from the participants’ perspective, would damage the ecological functions and ability to support biodiversity on the property. Therefore, regardless of the weights changed through a sensitivity analysis, the order of preferred options remained constant with Conservation as the preferred option.

8.2.5 Participant I1

The results from Participant I1 are shown in Table 9 and Figure 6. This participant identified Environmental Sustainability as the most important criteria (39.28%). While Safe Interaction with Nature (21.61%) and Cultural Identity (21.14%) closely followed. Economic Growth (1.83%) was identified as the least important criteria, which aligns with what several other participants have demonstrated in previously discussed evaluations.

<i>Criteria</i>	<i>Conservation</i>	<i>Alternate Development</i>	<i>Development as Planned</i>	<i>Inconsistency ratio</i>	<i>% of importance</i>
<i>Environmental Sustainability</i>	63.06	33.33	3.60	0.53	39.28
<i>Safe Interaction with Nature</i>	54.64	40.98	4.37	0.19	21.61
<i>Cultural Identity</i>	57.89	38.02	4.09	0.32	21.14
<i>Education</i>	54.64	40.98	4.37	0.19	16.14
<i>Economic Growth</i>	33.33	59.14	7.53	0.25	1.83
	<i>58.25</i>	<i>37.69</i>	<i>4.07</i>		

Table 9 I1 Impact Matrix

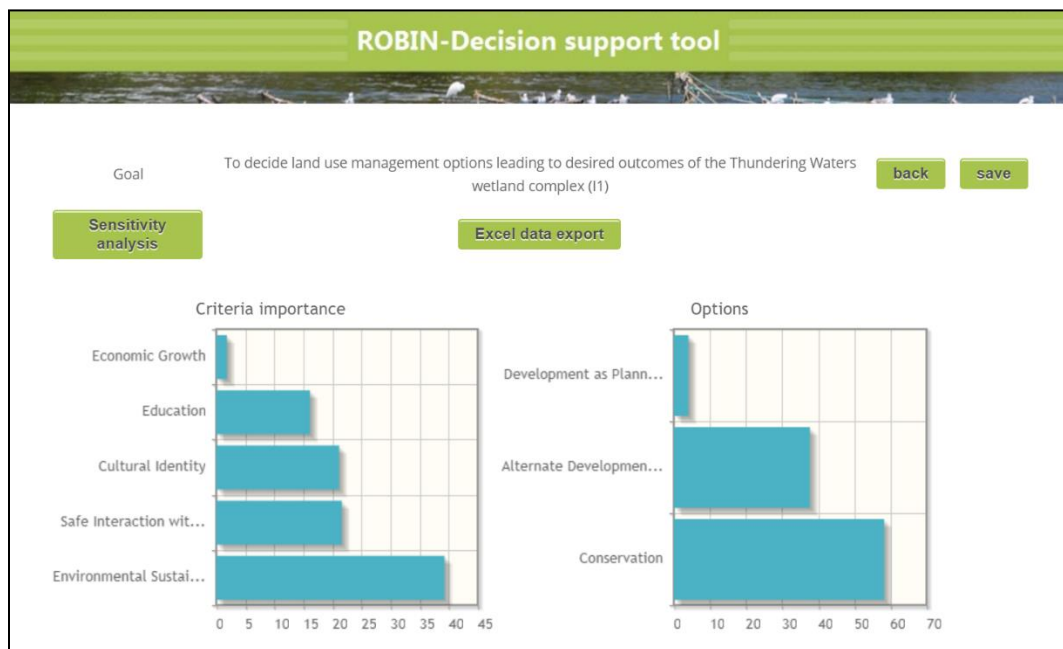


Figure 6 II Impact Matrix

Overall, Conservation (58.25%) was strongly preferred to Alternate Development (37.69%). With Development as Planned (4.07%) scoring very low against all criteria. Conservation was identified as the most favourable option for every criterion except for Economic Growth (33.33 points), for which Alternate Development (59.14 points) was identified as the option to address this criterion most effectively.

The order of preferred options did not change with a sensitivity analysis, thereby confirming the participant’s clear preference towards Conservation, followed by Alternate Development, and Development as Planned last.

8.2.6 Participant S1

The results of Participant S1 are shown in Table 10 and Figure 7. After reviewing the results of the evaluation, it appears that Economic Growth (39.46%) is the most important criteria for this participant, followed by Environmental Sustainability (30.85%). Cultural Identity (4.6%) and Education (4.54%) were closely regarded as the least important criteria, to this participant, and were often seen as the same, if not complementary of one another.

Criteria	Conservation	Alternate Development	Development as Planned	Inconsistency ratio	% of importance
Environmental Sustainability	14.37	78.16	7.47	0.05	30.85
Safe Interaction with Nature	53.50	34.39	12.10	0.02	20.54
Cultural Identity	63.58	18.54	17.88	0.01	4.60
Education	59.91	32.68	7.41	0.06	4.54
Economic Growth	4.09	38.02	57.89	0.32	39.46
	22.68	48.52	28.79		

Table 10 S1 Impact Matrix

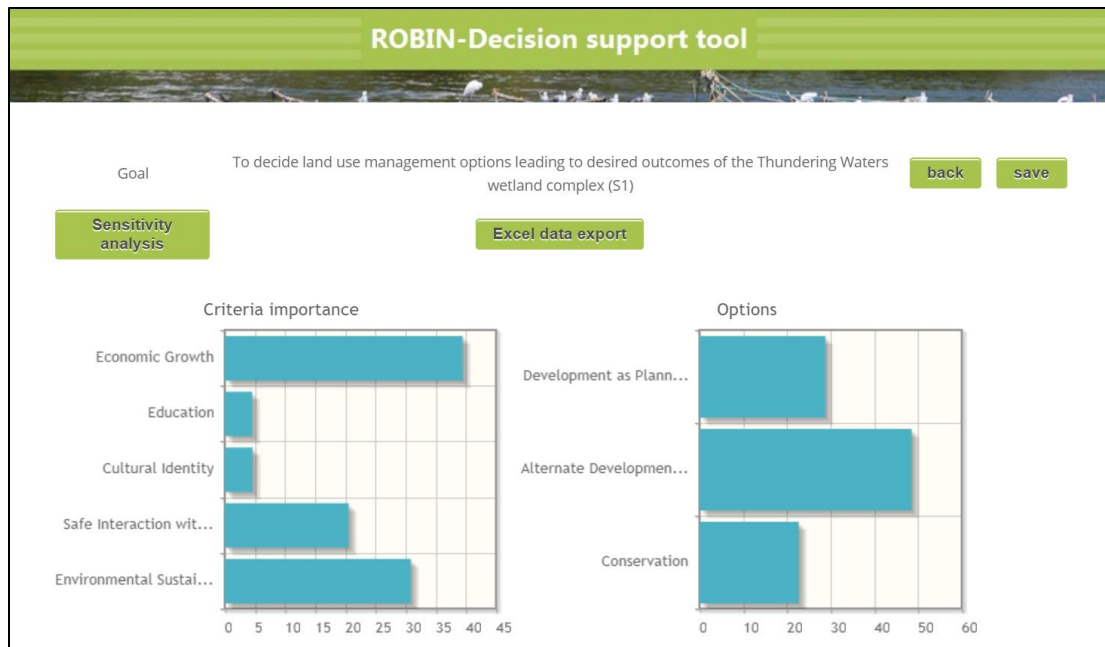


Figure 7 S1 Impact Matrix

Although Development as Planned was indicated to address Economic Growth the best out of the three options (57.89 points), Alternate Development (48.52%) was regarded as the most preferred option overall with Development as Planned (28.79%) slightly more favourable than Conservation (22.68%). Participant S1 indicated Alternate Development as the option that would best ensure Environmental Sustainability by a wide margin (63.79 points greater than the second preferred option, Conservation) largely attributed to the potential for human intervention to address invasive species and opportunities for ecological enhancement.

Conservation was regarded as the best option to address the socio-cultural criteria (Cultural Identity and Education) and Safe Interaction with Nature by a significant margin. However, these were regarded as the least important criteria by this participant. Additionally, Economic Growth, the most important criteria to this participant, was the least adequately addressed by Conservation (4.09 points). Therefore, Conservation was indicated as the least preferred option overall by participant S1 (22.68%).

Although the least preferred option was subject to change during the sensitivity analysis, Alternate Development remained the most preferred option in most cases. This was only subject to change if the weights of the least preferred criteria (Education and Cultural Identity) were dramatically increased, resulting in the overall preference for Conservation by a small margin while Development as Planned decreased in acceptability. Overall, participant S1 supports Alternate Development while Conservation and Development as Planned are subject to change in preference.

8.2.7 Participant D1

The results of Participant D1 are shown in Table 11 and Figure 8. Economic Growth (48%) was the most important criteria to this participant by a significant margin while Safe

Interaction with Nature (8%) was the least important. Environmental Sustainability, typically identified as one of the most important criteria to most participants, was ranked relatively low in terms of importance to the participant (12%). While Cultural Identity (22%) was believed to be the second most important criteria.

Criteria	Conservation	Alternate Development	Development as Planned	Inconsistency ratio	% of importance
Environmental Sustainability	19.83	14.05	66.12	0.43	12.00
Safe Interaction with Nature	33.33	33.33	33.33	0.00	8.00
Cultural Identity	33.33	33.33	33.33	0.00	22.00
Education	33.33	33.33	33.33	0.00	10.00
Economic Growth	33.33	33.33	33.33	0.00	48.00
	31.71	31.02	37.27		

Table 11 D1 Impact Matrix

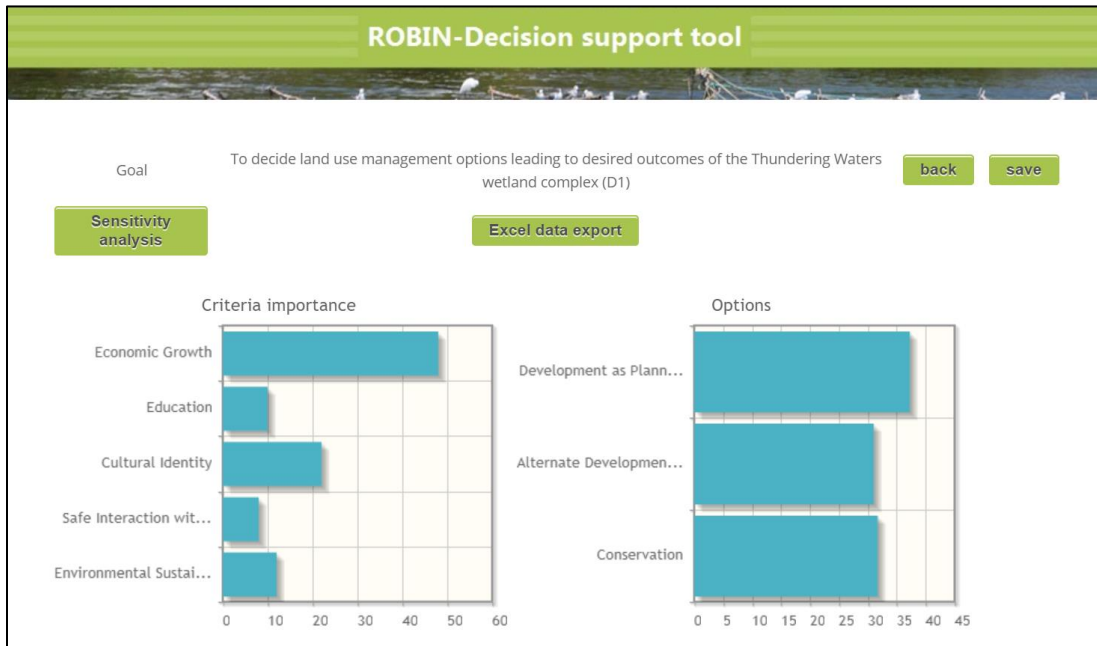


Figure 8 D1 Impact Matrix

It should be noted that during the evaluation of Economic Growth, Participant D1 expressed dissatisfaction with the three options presented and instead opted to consolidate the two development options (Alternate Development and Development as Planned) into one, therefore conducting a simple evaluation of Conservation against Development in general. In this case, the participant articulated that Conservation and Development in general would have the same effect on Niagara's economy. However, due to the evaluation format of OPTamos, it was not possible to consolidate these options when evaluating one specific criteria. To accommodate this view, it was assumed that both development options would have the same effect on Economic Growth. Therefore, all three options were thought to have the same expected outcome when considering Economic Growth.

It was thought that all three options would have the same expected outcome for many of the criteria. The reasoning for this was that the participant thought that all options should always be trying to find a balance. This was the outcome for all criteria except for evaluating the

expected outcome to Environmental Sustainability for which it was thought that Development as Planned (66.12 points) would ensure the most desirable outcome. While Conservation (19.83 points) and Alternate Development (14.05 points) were thought to provide little desirable outcomes. Therefore, Development as Planned (37.27%) resulted as the most desirable option overall. While Conservation (31.71%) and Alternate Development (31.02%) closely followed.

Since the three options were expected to have very similar outcomes, a sensitivity analysis showed very little change to the order of preferred options regardless of the weight assigned to each criterion. Development as Planned consistently resulted as the most preferred option while Conservation was closely followed by Alternate Development. A broader discussion to interpret the combined results and their implications on wetland management in Ontario will proceed in the following chapter.

Chapter 9: Discussion

Reviewing the results from individual SMCE's it appears that there is a split between participants who support Conservation and Alternate Development (3-3), with one participant supporting Development as Planned. It should be noted that many participants expressed discomfort with Development as Planned because of the destruction of wetlands that, under the conditions of the option in this study, were no longer deemed provincially significant under the authority of the MNRF. It should be noted that for Development as Planned to be implemented in practice without violating provincial policy, MNRF would need to remove PSW designations on the property. This would only occur if the authority believed that the wetlands no longer met the criteria of the OWES, which some participants felt it does not. The Niagara Falls City Council approved the first stage of the development process (OPA 128) with recommendations that further study be undertaken by the developer to ensure designated PSWs were not negatively impacted. It should also be noted that OPA 128 provides guidelines should the designations be removed, which is for the wetlands to assume the status of adjacent wetlands.

The option most supported often correlated with the criteria the participant found most important. For example, if a participant identified Environmental Sustainability as the most important criteria, they were more likely to favour Conservation. This was true for three out of the four participants who favoured Environmental Sustainability as the most important criteria.

Additionally, if a participant identified Economic Growth as the most important criteria, they were more likely to identify Alternate Development as the most acceptable option. This was the case for two out of the three participants who favoured Economic Growth, with the third favouring Development as Planned. No participant who favoured Economic Growth identified Conservation as the most favourable option. However, one participant who favoured Environmental Sustainability favoured Alternate Development. Although this participant favoured Environmental Sustainability, the reasoning aligned with those who favoured Alternate Development, which was that intervention was necessary to address the threats to biodiversity and ecological functions through rehabilitation and enhancement measures.

Therefore, the acceptable option is often correlated with the highest ranked criteria, which varies among participants. Although the preferred option varied among participants, the sensitivity analysis demonstrated that despite changes to the weights assigned to the criteria, the participants still believed their given option would have the most desirable outcome. However, the high inconsistency ratio resulting from the expected outcomes of each criterion assessed by each participant should be carefully considered when interpreting the results, as many participants held onto preconceived biases towards certain options.

Throughout the SMCE process, it was clear from discussions with participants and data analysis that conflicts between the desire for economic development and wetland conservation continue to be viewed as opposing goals in Ontario. As has been explored above, Ontario relies on a command and control approach that uses several policy tools and institutions to govern and protect wetlands. The most significant policy tools are the OWES, Planning Act (1990), and Conservation Authorities Act (1990). The OWES is used to determine the significance and level of protection warranted to a given wetland complex, while the Planning Act, including the PPS,

outlines policies and limitations to which all decisions made at the regional and local level must comply with. Additionally, the Conservation Authorities Act and the Planning Act set penalties for noncompliance. This governance structure suggests that Ontario utilizes a command and control approach to wetland management. The repeated offences against the Conservation Authorities Act in this case study may highlight inefficiencies with the use of applied sanctions to control behaviour. Alternatively, repeated offences may be due to the lack of perceived economic cost attributed with receiving a fine when compared to the potential cost of forgoing development plans, both of which are common criticisms of command and control policies.

Based on this case study, it appears that provincial policies are generally being enforced at the provincial level by the MNRF and MMA. However, participants highlighted several concerns regarding processes of implementing policies and political influences behind decision-making at the regional and local level that threaten Ontario's wetlands. Some of these concerns are rooted in a series of amendments of key provincial environmental legislation, including the Planning Act and the Local Planning Appeal Tribunal Act, known as Bill 108, that seeks to streamline government processes.

All participants mentioned that they were not opposed to development in Niagara Falls. However, many believe that the geographical area it is being proposed (within proximity to PSWs) is the on-going concern. Some participants, when asked what the conflict is about, described it as an enviro-political issue, referring to concerns that political processes governing land use decision-making were being mis-used by local government officials and threaten PSWs. This may inform why a significant focus of discussions with participants were on environmental evaluation criteria and the political processes threatening them.

Criticisms of the OWES classification of PSWs continues to be a topic of debate among several participants who question the validity and merit of some PSWs on the property. This is also reflected in the 2017 EIS's recommendation to remove almost 11 acres of PSWs on the property. This argument is mainly centred around past and present functions of disturbed and arguably man-made wetlands. However, participants supporting OWES argue these disturbed wetlands, although less biologically diverse, play a critical role in protecting the functions of the property as a whole and the future sustainability of the larger, slough forest wetlands. This perspective supports the policy's intent by the MNRF that entire wetland complexes are to be evaluated rather than of individual wetland pockets. It is also an important part of the debate among participants who supported Conservation as the most desirable option and those that supported Alternate Development.

Processes to allow incomplete EIS's to inform impacts of development on PSWs prior to the approval of the OPA 128 also raised concerns from some participants and the MNRF. Concerns are grounded in the PPS which prohibit site alteration to PSWs and their adjacent lands unless it has been demonstrated that there will be no negative impact to the natural features and functions. Despite incomplete mapping of species' habitat, Niagara Falls city council approved the OPA 128 (the first step of the project's approval process) along with twenty-seven recommendations for the developer to address. Many participants felt that the recommendations should have been addressed prior to approval in order to fully inform environmental impacts of

the proposed project and by not doing so was a result of city officials pushing for their own agenda. This mistrust in public officials to obtain full ecological impacts as a result of development led several participants to support Conservation as the most acceptable policy approach.

These concerns were also highlighted in discussions with participants about the degree of inclusivity and adequate consultation in the decision-making process, particularly through public meetings regarding OPAs required under the Planning Act. Several participants, including a Niagara Falls city councillor, expressed dissatisfaction with how public meetings are conducted. Many felt that the vote among City Council had already been decided prior to public consultations and citizens who spoke at the meeting had little influence on the decision. This was demonstrated in the public meeting regarding OPA 128's approval in which most speakers opposed its approval. This led many participants to believe that public meetings are treated by city council as a procedural formality rather than an opportunity for the public to provide input on land use decisions. Additionally, these concerns are further exacerbated by changes to the Planning Act proposed in Bill 108 which threaten to eliminate the requirement for approval authorities, often local municipalities, to give notice before deciding on a plan of subdivision application, thereby eliminating the opportunity for the public to be consulted on development projects moving forward in the approval process (Niagara Region, 2019).

An alternative avenue for the public to challenge land use decisions is the LPAT. However, the LPAT has recently undergone several changes, including the closing of the Local Planning Appeal Support Centre (Tribunals Ontario, 2019) that had previously assisted residents in navigating the complicated processes of the LPAT, including free legal services to assist with decision appeals (Crawley, 2019). The LPAT is therefore seen as another procedural obstacle for concerned citizens, which further limits opportunities for public participation in land use decision-making and holding city officials accountable. Changes to the LPAT Act under Bill 108 would include restrictions to third party appeals of plans for subdivision and certain official plan amendments, thereby giving greater autonomy of decision-making to municipalities while reducing opportunities for public consultations. Changes would also limit evidence and expert witnesses prior to hearings at the Tribunal's discretion. Participants claim such changes to the appeal process make a complicated process more difficult for those trying to navigate the system.

As outlined in the historical analysis above, the NPCA has received many criticisms regarding its management and operations. This includes political influences working alongside developers to push approvals through and address procedures protecting wetlands. In her report, the Auditor General identified several instances of conflicts of interest among NPCA members. Although conflicts of interest with regards to fiduciary duties is outlined in the NPCA's Code of Conduct, it remains unclear how their roles as elected municipal officials may present competing and conflicting interests.

Failure to address violations to the Conservation Authorities Act, including damage to PSWs, was highlighted in the Auditor General's report. The lack of applied deterrent mechanisms by the NPCA has also been demonstrated by the repeated violations to the Act by

the landowner in this study. This result also supports literature highlighting the inefficiencies and challenges encountered by command and control instruments.

Several participants noted that they became involved in the dispute as a result of 'questionable' proposals put forth by the NPCA. These participants expressed feeling disappointed that an agency, whose responsibility includes the enforced protection of PSWs, was allowing wetlands to be destroyed without proper enforcement and compensation. This led participants to monitor the NPCA's decisions and hold its Board to account by rallying public support against the Board in the following election. Something participants expressed they should not have to do, rather they should be able to go about their lives knowing provincial policy was being adequately enforced by governing institutions. As a result of the work of prominent concerned citizens, a new Board was elected, which several participants feel have fewer ties to municipal operations and can hold private landowners to account more effectively. This change in Board members played a small but significant role in the evaluation of Alternate Development as an acceptable option. It was felt that with an accountable public authority, PSWs could be monitored and protected from adverse impacts more effectively than private ownership.

Alternatively, some participants feel that the policies and procedures have been followed as required by provincial law and therefore should be reflective of an environmentally safe and conscious practice. Two EIS were completed along with an addendum to inform the ecological impacts. Draft plans for subdivision and zoning bylaw amendment requests have also been submitted that accommodate environmental protection areas. Therefore, some participants felt that development could safely occur on the property without negatively impacting PSWs, thereby supporting Alternate Development and Development as Planned as viable and ecologically sensitive options.

Some participants expressed support for a level of development (Alternate Development and Development as Planned) on the property if wetlands and their buffers are respected. However, several participants felt more reassured that development could proceed without impacting wetlands if a public authority took ownership and responsibility for protecting them. This desire for change in ownership was fueled by the poor relationship the project applicant holds with the public as a result of two violations against the Conservation Authorities Act for negatively impacting wetlands or their buffers. It is believed by these participants that a public authority would be held to a higher level of accountability for managing and protecting natural heritage features. Therefore, more participants were found to favour Alternate Development (publicly owned wetlands) over Development as Planned (privately owned wetlands).

Additionally, the poor relationship the project applicant has with the public also contributes to the lack of confidence in the adequate recreation of biodiversity offsets. Although participants stated the questionable offsetting proposal put forth by the NPCA was the initial cause of concern, proposals by the project applicant on the methods of creating offsets were cause for many participants to reject biodiversity offsetting on the property. Concerns over wetland offsetting techniques lacking scientific credibility led many participants to fear the project applicant's role in ensuring lasting ecological functions. The lack of scientific evidence supporting reliable recreation processes and the ambiguity of a responsible authority for creating

and maintaining offsets are both common criticisms of biodiversity offsetting and often result in the inefficiency and ineffectiveness of such programs.

Although biodiversity offsetting makes an attempt to compromise between economic development and the protection of biodiversity, both of which are supported by the study participants, concerns continue to be unaddressed over the ability to achieve the same habitat structure, species composition, ecosystem function, human use and cultural values associated with biodiversity. These concerns thereby reiterate criticisms by Bull et al. (2013) of accepting ecological losses in the face of uncertain gains.

A PES program was also denied feasibility due to the high cost associated with foregoing development. In principle, if the potential profits of an alternative land use (e.g. land development) are too high, ES users will be ill-equipped to sufficiently compensate landowners to pursue conservation practices (Wunder, 2013; Muradian et al., 2013). According to Engel et al. (2008), payments must exceed any additional benefits the ES provider (landowner) would receive from alternative land use. Participants thought that the residents of the Niagara Region would not collectively support the allocation of millions of dollars towards a private landowner to conserve a wetland complex. Therefore, the Niagara Region's WTP was much lower than the project applicant's WTA and according to Wunder (2005), if transactions are not voluntary and ES users do not identify themselves as direct users, a PES program will not be successful. The culture necessary for PES programs as described by Wunder (2013) does not appear to be present in the City of Niagara Falls. In a society where common pool resources are typically free a PES program may seem inappropriate.

Although market-based instruments receive support in broader literature to address the inefficiencies of command and control policies, they have not received general support by the participants in the City of Niagara Falls. Echoing concerns from scholars such as McAfee (1990), Van Hecken et al. (2015), and Kolinjivadi et al. (2019), the concept of selling nature to save it was a new and difficult concept for participants to support. Several participants, especially those supporting Conservation, felt biodiversity offsetting would diminish the value of the wetlands and would further degrade them after they were relocated. It was argued, by conservationists in the study, that offsetting would ultimately tie the sustainability of the wetlands to the project applicant who has little incentive to ensure wetland functions are adequately replicated and maintained. This is a similar criticism that biodiversity offsetting has received in the United States and the failure to achieve no net loss targets of biodiversity (Silverstein, 1994; Brown & Lant, 1999; Calvet et al., 2015). Additionally, the lack of existing public policy guiding and regulating a market in Ontario makes it difficult for participants, most of which are not familiar with or typically included in the decision-making process, to support a new and unfamiliar policy.

The SMCE proved valuable in highlighting these governance concerns and applying them towards the identification of acceptable solutions to a land use conflict. The criteria identified by participants addressed social, economic, and environmental concerns. Although discussions were predominantly focused around environmental concerns, participants recognized the inter-connected and inter-dependency of the conflict. Although results had a high

inconsistency rate, the evaluation required participants to assess and discuss the conflict from multiple dimensions, leading to a more constructive discussion on acceptable solutions that had not been attempted in the past. This supports the literature on SMCE and its value in addressing environmental conflicts. It should be noted again that SMCE are not meant to solve all conflicts but are able to provide insight into the nature of the conflict and assist at arriving at political compromises by increasing the level of transparency in the decision-making process.

The policy discrepancies and ambiguity in the approach to wetland conservation, in addition to the perceived lack of adequate public consultation in the decision-making process, may contribute to the ongoing conflict between developers and the general public on the management of wetlands in Ontario. It may also inform the split results among participants in the case study between the desire for Conservation and Alternate Development. Although it is unanimously agreed among participants that PSWs should be protected to ensure the long-term sustainability of their natural features and functions, there remains significant differences in opinion on how to objectively ensure this outcome while balancing the need for economic growth.

Chapter 10: Conclusion

In what Kim (2010) describes as the Era of Wetland Conservation, developed countries are moving towards the development of wetland policies to preserve wetland ecosystem functions and services with new technology and systems aimed at facilitating the wise and sustainable use of wetlands. In Canada, Ontario is seeking to achieve this through command and control measures enforced by key policies such as the Planning Act and Conservation Authorities Act. Ontario has recognized the urgent need to address the continued loss of wetland ES in its Wetland Conservation Strategy and this study has helped inform the Strategy's 2030 targets by providing insight into competing interests over wetlands in the province.

This study has addressed the research questions by exploring different wetland management approaches and comparing them to Ontario's current approach. In order to address and inform challenges faced in Ontario, local stakeholders participating in the SMCE identified acceptable compromises to a specific land use conflict. Although the SMCE faced challenges with a high inconsistency rate, the study ultimately served as an effective communication platform for competing interests in order to inform the province's policy challenges.

Each step of the SMCE informed the decision-making framework by seeking insight from the community. The evaluation not only highlighted management challenges of the current policy framework but also provided an opportunity for open dialogue for stakeholders to voice the rationale behind their concerns. Including information gathered by discussions with local stakeholders provided a deeper level of understanding of the conflict, relationships, and potential areas for compromise that would not have been identified otherwise. Additionally, the decision-making software, OPTamos, provided a secure, simple, and efficient tool to conduct the impact matrix to easily highlight participants' preferences.

Ontario addresses wetland management at the provincial, regional, and municipal level. However, Ontario's wetland policies appear to be experiencing challenges at the regional and local level in terms of implementation and enforcement of provincial policies. Although the overall rate of wetland loss in the province has declined (Ontario Government, 2017), conflicts between the desire for economic development and wetland conservation persist. The case study in the City of Niagara Falls reflects an ongoing tension in wetland management between societal actors seeking economic development and those seeking environmental sustainability.

Future studies should attempt to include more participants who support development and those formally involved in the decision-making process in order to balance and inform the sample of participants. Due to the time restrictions and limited resources of the study, input from government officials was mainly obtained from FOI request correspondences rather than input from SMCE discussions. Including discussions and evaluations from government officials would provide a deeper understanding of the current operations of the decision-making process at each level of government. Also, the politically sensitive nature of the conflict contributed to the lack of representation from individuals supporting development. Further insight into opinions supporting development would help inform the decision-making process by representing a more diverse and representative sample of the conflict. Insight into how provincial policies are being interpreted and implemented by each jurisdiction may also provide clarity during discussions

with other participants who are not directly involved and often rely on media reports to inform opinions.

Although several constraints were identified in this SMCE model, the analysis proved useful in demonstrating how Ontario's use of command and control policies address conflicts between economic development and wise and sustainable use of wetlands. The attitudes among diverse stakeholders with regards to sustainable land use decision-making of wetlands in Ontario were also addressed in the analysis. Overcoming the limitations identified in this study would provide a deeper understanding of the challenges Ontario faces with regards to the protection of significant wetlands and provide insight into opportunities for acceptable solutions moving forward. This study and future contributions may also prove valuable in resolving regional land use conflicts around wetlands in Ontario and assist the province in achieving its 2030 target.

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Appendix A: Impact Matrix Evaluation Sheet

Evaluation 1: Scenarios																					
Criteria	Scenario																			Scenario	
<i>Environmental Sustainability</i>		- High			- Mid			-Low			+ Low			+ Mid			+ High				
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Alternative Development
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
	Alternative Development	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
<i>Safe interaction with nature</i>		- High			- Mid			-Low			+ Low			+ Mid			+ High				
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Alternative Development
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
	Alternative Development	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
<i>Cultural Identity</i>		- High			- Mid			-Low			+ Low			+ Mid			+ High				
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Alternative Development
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
	Alternative Development	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
<i>Education</i>		- High			- Mid			-Low			+ Low			+ Mid			+ High				
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Alternative Development
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
	Alternative Development	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
<i>Economic growth</i>		- High			- Mid			-Low			+ Low			+ Mid			+ High				
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Alternative Development
	Conservation	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned
	Alternative Development	-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Development as Planned

Evaluation 2: Criteria																					
		- High			- Mid			-Low			+ Low			+ Mid			+ High				
Economic growth		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Affordable housing
		- High			- Mid			-Low			+ Low			+ Mid			+ High				
Education		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Economic growth
Education		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Affordable housing
		- High			- Mid			-Low			+ Low			+ Mid			+ High				
Cultural Identity		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Education
Cultural Identity		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Economic growth
Cultural Identity		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Affordable housing
		- High			- Mid			-Low			+ Low			+ Mid			+ High				
Safe interaction with nature		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Cultural Identity
Safe interaction with nature		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Education
Safe interaction with nature		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Economic growth
Safe interaction with nature		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Affordable housing
		- High			- Mid			-Low			+ Low			+ Mid			+ High				
Environmental Sustainability		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Safe interaction with nature
Environmental Sustainability		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Cultural Identity
Environmental Sustainability		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Education
Environmental Sustainability		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Economic growth
Environmental Sustainability		-9	8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	Affordable housing

Appendix B: Wetland Policies

Niagara Falls Official Plan Amendments

Policy	Relevant Provisions	Mention of Wetlands	Summary of Provisions
Official Plan Amendment #81	13.56.1	✓	The Amendment reclassifies the area of Thundering Waters from industrial to residential. The extent of the residential designations and Environmental Protection Area designation may be affected by environmental studies yet to be completed at the time of the amendment and will be refined through the Secondary Plan process.
Official Plan Amendment #128	2.5 Natural Heritage System 2.5.3 & 2.5.4 Provincially Significant Wetlands 2.5.14 & 2.5.15 Buffers	✓	Amendments to Official Plans set out policies to guide a particular development project by addressing land use management, the protection of natural heritage features (woodlands, wetlands, significant species habitat, endangered and threatened species) and municipal services. The specific provisions addressing wetlands designates any PSW identified by MNRF as Environmental Protection Area. However, if a feature no longer holds its PSW status by MNRF, it shall assume the land use designation of the adjacent land use provided that it fails to meet other criteria (e.g. Significant Wildlife Habitat) in which case the applicable policies of the OPA shall apply. A thirty (30) metre buffer shall be established to protect natural heritage features. The buffer may be increased or decreased based on an approved Environmental Impact Study (EIS). Any development that has the potential to negatively effect PSWs is required to undergo an EIS to the satisfaction of the City in consultation with the Niagara Region and the NPCA.

Ontario Policies

Policy	Relevant Provisions to Thundering Waters	Mention of Wetlands	Summary of Provisions
Planning Act (1990)	2.0 Provincial Interests 16.1 Contents of official plan 16.14 Climate change policies 34.4 Zoning by-laws	✓	The Act addresses economic development within municipalities while protecting the natural environment through land use planning. The Minister, municipal council, board and Tribunal have the ability to carry out these responsibilities with regard to ecological systems and natural areas. Municipalities shall provide official plans that address social, economic, built or natural environments of the municipality. The contents of such plans must be in accordance with provincial legislation such as the Planning Act. Additionally, zoning by-laws may be passed by municipal councils for the purpose of prohibiting the erection of structures on sensitive areas such as wetlands.
Provincial Policy Statement (2014)	1.2.6 Land Use Compatibility 2.1 Wise Use & Management of Resources- Natural Heritage	✓	Under section 3 of the Planning Act, 2008. Prohibits development & site alteration on “significant wetlands”, “significant coastal wetlands” unless no negative impacts to the natural features or their ecological functions have been demonstrated. No development and site alteration is permitted to habitat of endangered species or threatened species except in accordance with provincial and federal requirements. Includes protection of ‘adjacent’ lands unless ecological function of the adjacent land is demonstrated to not negatively impact the natural features and functions. There is no standard buffer size mentioned. It only mentions that major facilities and sensitive land uses should be appropriately

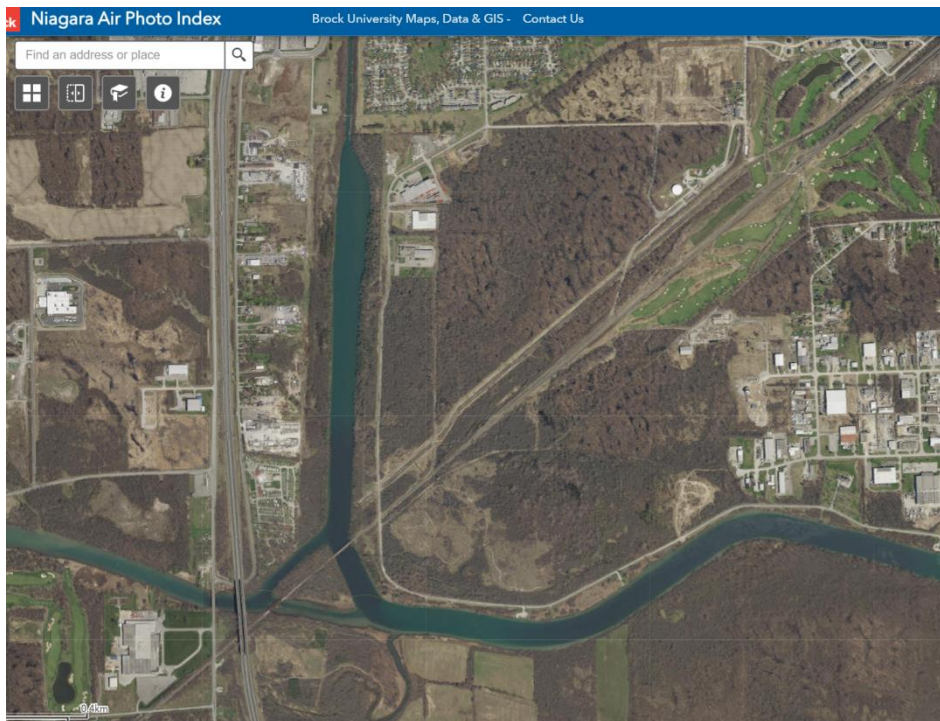
			planned, buffered and/or separated to prevent or mitigate adverse effects.
Conservation Authorities Act (1990)	14.1 Members of authority 19.1 By-laws 21.1 Powers of authorities 23.1 Minister's powers 25 & 27 Local Planning Appeal Tribunal 28. Regulations of areas over which authorities have jurisdiction	✓	Gives conservation authorities (CAs) the ability to regulate activities regarding natural resources in watersheds within a given region designated by the Minister of the Environment, Conservation and Parks. CAs are representatives of municipalities, appointed by city council. CAs have authority to conserve, regulate or approve development of areas within their jurisdiction. However, appeal processes are in place which allow municipalities and individuals recognized by the Local Planning Appeal Tribunal to hold CAs accountable. A CA has the authority to issue orders to remove development, rehabilitate watercourses or wetlands, monetary fines or imprisonment.
Municipal Act (2001)	8.1 Scope of powers 8.2 Ambiguity 8.3 Scope of by-law making power 9.0 Powers of a natural person 11.2 By-laws 23.3.1 Powers that cannot be delegated 135.1 Tree by-laws 151.1 Powers re licences 153.2 Compliance with land use control by-law	✗	The Act outlines jurisdiction and powers of municipalities. Wetlands are not specifically mentioned but planning and development regulations are the responsibility of the municipality which can be determined through by-laws. However, the Minister of Municipal Affairs may override areas of regulation and some require the approval of the Minister before implementation can occur.
Environmental Assessment Act (1990)	3.0 Application of Act 6.2 Preparation of environmental assessment: Contents 6.3 Public notice of submission 7.6 Rejection of environmental assessment 9.2 Basis for decision	✗	The Act seeks to protect, conserve and promote the wise management of the environment in Ontario through an environmental assessment application process to which the Minister may restrict or prohibit an enterprise.
Niagara Escarpment Planning and Development Act (1990)	4.1 Advisory Committee 6.2 Applications or requests to amend Plan 7.0 Consultation during preparation of plan 9.0 Contents of Plan 22.0 Regulations 23.0 Regulations 24. Development Permits	✗	The Minister may make regulations of 'development control' for which no person shall develop in the area unless specifically exempt by a development permit. Violation may result in fines to individuals or corporations.
Endangered Species Act (2007)	9.1 Prohibition on killing, etc. 10.1 Prohibition on damage to habitat, etc. 28.1 Habitat protection order 28.2 Contents of order 40.0 Penalties	✗	No person is permitted to kill, harm, capture, sell or buy species listed on the Species at Risk in Ontario List. This includes species that reside and are dependent on wetlands for habitat, reproduction or feeding. The Minister may make an order if it is believed an activity is destructive or seriously damaging to an important feature of a habitat for a species that requires the activity to stop or take steps to rehabilitate an area. Monetary fines are set to discourage violation of the Act.
Conservation Land Act (1990)	3.2 Conservation easements and covenants	✓	Wetlands are specifically included in the term 'conservation land'. The owner of land may allow an easement to enter into a covenant with conservation bodies to conserve, maintain, restore or enhance land or wildlife on the land. The landowner can also do so for the purposes of protecting water quality and quantity, in addition to watershed protection and management.
Environmental Protection Act (1990)	6.1 Prohibition, contamination generally		Wetlands are not specifically mentioned but 'land' is defined in the Act to include 'land covered by water' and 'natural environment' includes 'land and water, or any combination or part thereof'. The

	<p>14.1 Prohibition, discharge of contaminant</p> <p>17.0 Remedial orders</p> <p>18.2 Grounds for order</p> <p>97.1 Orders by Minister, spills</p> <p>100.1.1 Municipality’s order for costs and expenses</p> <p>124.0 Control orders</p> <p>128.0 Content of stop order</p> <p>168.12.2 Actions taken by municipalities</p> <p>170.0 Duties of Council</p> <p>182.1 Environmental penalties</p>	×	<p>Act seeks to protect and conserve the natural environment, from contaminants, particularly by prohibiting contaminants that are discharged as a result of human action and cause or have the potential to cause adverse effects to the natural environment or animal or plant life. Orders can be issued by the Director or Minister to repair damages and take measures to prevent or reduce damages by the responsible party. An Environmental Council is also established to advise the Minister on current research relating to the protection of the natural environment and pollution. Monetary fines are established for contraventions to the Act.</p>
Invasive Species Act (2015)	<p>5.3 Temporary designation of invasive species</p> <p>7.0 Prohibited invasive species</p> <p>8.1 Restricted invasive species</p> <p>10.1 Authorizations</p> <p>12.1 Agreements</p> <p>13.1 Prevention and response plans</p> <p>13.2 Content of Plans</p> <p>22.1 Order re: unknown invasive species</p> <p>22.2 Order to contain suspected species</p> <p>25 Compliance orders</p> <p>27. Actions to control or eradicate invasive species</p> <p>44.1 Penalties</p> <p>45.1 Order re: other penalties</p>	×	<p>Wetlands are not specifically mentioned but ‘harm to the natural environment’ in the Act refers to adverse effects to biodiversity of ecological processes or to the natural resources. The Act includes the issue of orders by the Minister or an inspector that requires the prevention, elimination, or reduction of adverse effects of invasive species on public or private property. It also prohibits restricted species from being brought into the province. Penalties against the Act include imprisonment, fines, or an order requiring a particular action be, or not be taken.</p>
Place to Grow Act (2005)	<p>6.0 Contents of Plan</p>	×	<p>Act enables decisions about growth to be made with the purpose of sustaining a robust economic, strong communities and promote a healthy environment. The Growth Plan may contain policies to protect sensitive and significant lands, including agricultural lands and water resources.</p>

Appendix C: Property Air Photos



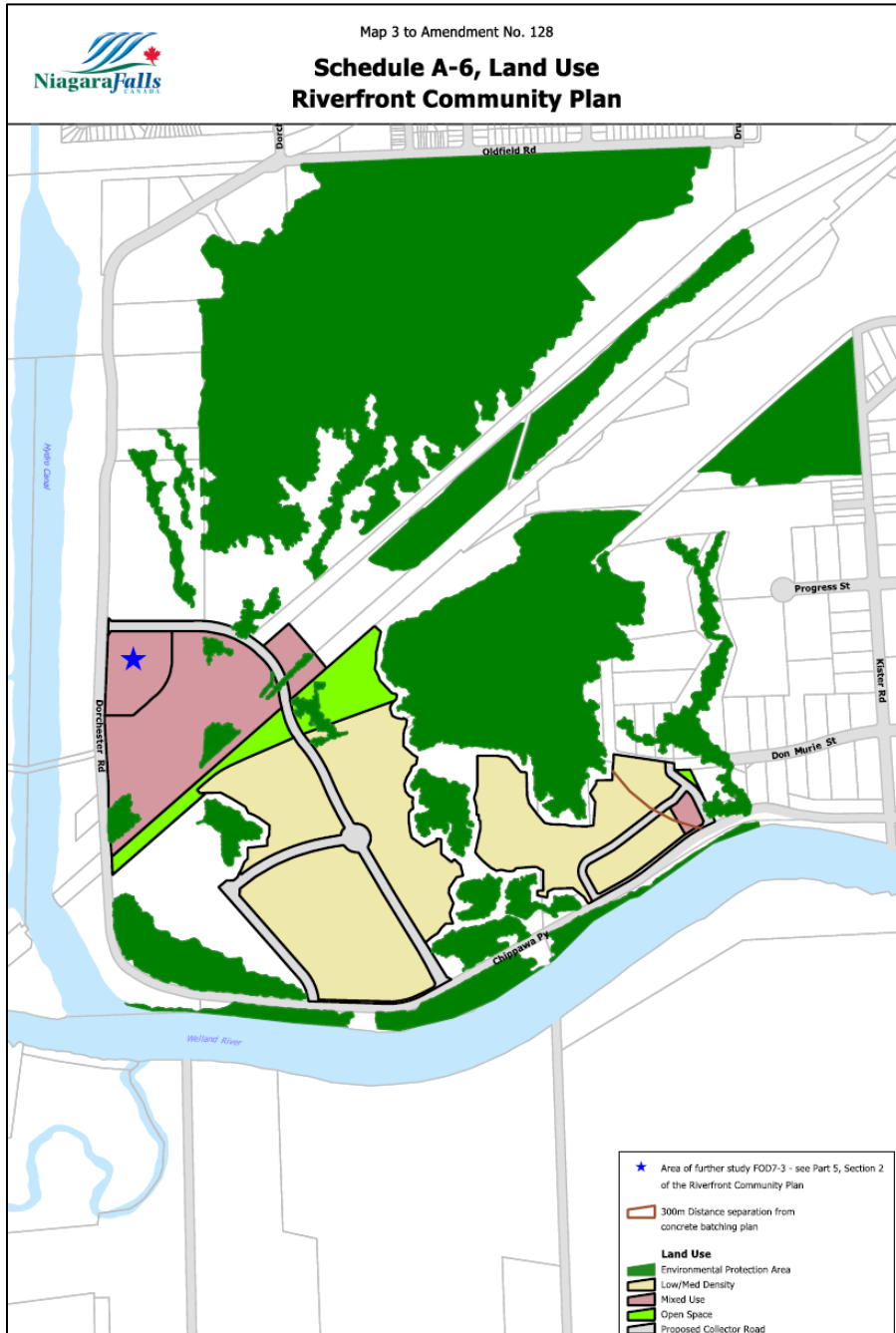
Air photo of the property taken in 1965 from the Brock University Air Photo Library.



Air Photo taken of the property in 2015 from the Brock University Air Photo Library.

Appendix D: Development as Planned

This map was used as a visual reference for the management option ‘Development as Planned’ (assuming PSW designations are removed) and the baseline to generate alternative options during the SMCE.



Source: Niagara Falls Official Plan Amendment No. 128 Schedule A-6

Appendix E: Alternate Development

This map was used as a visual reference for the Alternate Development option.

