



Nottawasaga Valley Conservation Authority Integrated Watershed Management Plan Watershed Issues and Strategy Development

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1 Introduction

Integrated Watershed Management Planning (IWMP) is defined by Conservation Ontario as the process of managing human activities and natural resources on a watershed basis, taking into account social, economic and environmental issues, as well as community interests in order to manage water resources sustainably (Conservation Ontario, 2010; CCMOE, 2016). Conservation Ontario (2010) notes that, through Integrated Watershed Management (IWM), all community interests work together to identify what issues and actions are impacting the watershed's resources and then map out different strategies and plans to address those issues. These plans and strategies are implemented, monitored, reported on, and updated on a regular basis in order to adapt to changing land uses, new or increasing stressors (e.g., climate change), new information or different management approaches.

This report summarizes the issues that have been identified for the Nottawasaga Valley Conservation Authority (NVCA) watershed through the Characterization Report (**Section 2**). These issues were presented to IWMP stakeholders for review and discussion (**Section 3**). Preliminary identification of potential strategies to address the NVCA Watershed issues was completed jointly by the technical Study Team, NVCA staff and stakeholders (**Section 4**). These initial strategies will form the basis for the final list of strategies that are being developed for the IWMP report.

2 Watershed Issues

The IWMP development process began by undertaking a watershed characterization study using existing information. This study was released in the summer of 2018. Through this work, it became evident that, while there are many valuable attributes of the NVCA watershed, there are also issues of concern. There are also gaps in information and understanding.

A summary of the issues that have been identified for the NVCA watershed is provided below and is summarized in **Table 2-1**; additional detail is in **Appendix A**¹. These watershed issues form the basis from which objectives and targets for the protection, improvement or restoration are being developed, both within the context of existing and future land uses, climate change, and the environmental, social and economic prosperity of the watershed and its residents.

2.1 Surface Water Quality and Quantity

Overall, the surface water quality and water quantity, reflects the diversity of the NVCA watershed: the watershed topography, surficial geology and subsurface aquifer systems interact to create a diverse, bowl-shaped watershed that includes some of the steepest,

¹ Appendices are available, upon request, from NVCA

healthiest streams in southern Ontario. Around the margins of the bowl, the groundwater inputs from the Niagara Escarpment, Oak Ridges Moraine, and Oro Moraine contribute to high water quality which further benefits from an abundance of forest cover and minimal urban impacts.

Degraded water quality conditions occur in the central portion of the NVCA watershed where emerging urban, and intensive rural, land uses are common; this coincides with the flatter Algonquin Sand Plain region. The degraded water quality conditions include elevated concentrations of nutrients (e.g., phosphates and nitrates) and increased water temperatures. In those central portions of the NVCA watershed where the channel grade is relatively flat (< 0.2%), the assimilative capacity of the watercourses is reduced. The presence of instream barriers (i.e., those that impound water, such as dams and weirs), exacerbates the flat gradient effects on the assimilative capacity of these watercourses.

The thermal regime of watercourses in the Nottawasaga Valley has changed through time, resulting in a measurable deterioration of aquatic habitat health and a reduction in habitat diversity, particularly of coldwater habitats. Water temperatures increase where groundwater inputs are limited or non-existent, and/or where there is a lack of shade from riparian vegetation. In urban areas, warm water inputs from stormwater management facilities can also contribute to an increase in water temperature.

Degradation of aquatic habitat and wetlands is also attributed to high turbidity levels in watercourses which, if due to suspended sediments, can result in contaminants and nutrients associated with the sediment, being transported to waterbodies and shorelines (e.g., Georgian Bay Shoreline). High turbidity levels may also be due to algae and/or organic carbon suspended in the water column.

When water quality is degraded, it affects aspects of the natural environment (e.g., aquatic conditions, wetland health), and in turn surface water abstracted drinking water and recreation; both are valued services within the NVCA Watershed.

Low water levels, or lack of water, within some of the NVCA watercourses is attributable to drought conditions and water taking. Insufficient water supply affects aquatic habitat, crop productivity, recreation, and water quality (i.e., lower water levels lead to increased water temperature, stagnant water). Climate change studies indicate that a reduction in surface water volumes will likely occur in the future, which, in turn, could result in more intermittent flow, reduced baseflow and higher instream water temperatures. High water quantities due to flooding are discussed under 'natural hazards' below.

The existing conditions depict a clear dichotomy of water quality/quantity conditions in the NVCA watershed. Looking forward, it is clear that, if left unchecked existing stressors, such as agricultural and urban land uses, and future stressors such as climate change and urban growth, will continue to degrade water quality/quantity in the flat, impacted downstream river reaches and could begin to threaten the health of headwater features around the watershed margins. The threat of cumulative effects is

that without intervention, the watershed may experience a more precipitous decline in health and therefore action is needed to address water quality and quantity concerns in the NVCA watershed.

2.2 Groundwater Quality and Quantity

The regional Source Protection Plan delineates and protects key groundwater-related vulnerable areas for municipal drinking water. While groundwater quality was generally classified as 'good' as per the NVCA Watershed Health Check (2018), nitrate and sodium concentrations exceeded provincial water quality standards within several Provincial Groundwater Monitoring wells in the NVCA watershed (NVCA, 2013b, NVCA 2015). These monitoring wells represent points on the landscape, and exist within several discrete aquifer units.

A reduction in groundwater volume has been identified as an issue of concern due to high rates of groundwater extraction required to support municipal drinking water and localized water taking for industrial use. The stakeholder consultation indicated that water taking for agricultural purposes is a lesser concern. There is already evidence in some subwatersheds that groundwater/surface water taking has potential to threaten baseflows of watercourses and impact aquatic habitats. Such conditions may be expected to worsen under both drought conditions and through climate change.

Continued high groundwater use may affect the volume of future available groundwater for drinking water, industrial use, agricultural use, and affect hydrological linkages with the natural environment (e.g., wetlands, aquatic habitat). Contamination of groundwater would directly affect drinking water within the NVCA watershed, given the strong reliance on groundwater for both rural and urban residents.

2.3 Terrestrial Environment

Several issues have been identified regarding the natural heritage system, and particularly as it relates to terrestrial habitat and biodiversity. Fragmentation of habitat along road networks and within developing areas has affected the ecological integrity of all habitats, including forests, wetlands and successional habitat (meadows, thickets and young woodlands). There has been habitat loss for 'Species at Risk' and other species of conservation concern. Bird species of meadows, thickets and young woodlands are a guild of birds that has been identified as undergoing particularly severe declines (Cadman et al. 2007).

Wetlands and forests are threatened by changes in surface and ground water quality and quantity. Successional habitat has been threatened by the influx of invasive species when disturbances are reduced (e.g., fire suppression; declines in grazing lands and their replacement by more intensive farming; control of flooding caused by beaver activity). Successional habitat is also threatened by conversion to row crops and increase in grazing intensity associated with feed lots.

Cumulative impacts of fragmentation, changes in water quality and quantity, and other disturbances have led to the proliferation of invasive species in some areas. Generally, the watershed's natural features are of higher quality than in more highly urbanized areas in other parts of Ontario such as the Greater Toronto Area.

Long-term habitat loss within the NVCA watershed is difficult to quantify, but there is evidence of declines in wetlands and forests.

- Conservative estimates of wetland area lost in Grey, Dufferin and Simcoe Counties between 1967 and 2002 are 8%, 10% and 7%, respectively (Ducks Unlimited 2010).
- There has been a loss of 0.39% of forest in the NVCA watershed since 2002 (NVCA Watershed Health Check 2013).
- A 37% loss in forest cover has occurred in the Minesing Wetland since the 1950s (Rootham and Featherstone, 2014). This, including degradation of forest cover adjacent to development, has resulted in a reduction in wetland and forest interior cover that has led to a reduction in species diversity and/or decrease in high quality habitat.

Cumulative impacts to the NVCA's wetlands, and in particular the Minesing Swamp Complex Provincially Significant Wetland, have also contributed to a loss of biodiversity. Changes in biodiversity include invasion of non-native species and the replacement of habitat-specific species with generalist species.

Degradation and alteration of shoreline areas, and curtailment of natural processes of erosion and deposition of sand, have led to loss of habitat for rare plant species and invasion of non-native species. In some areas there has been increased shoreline erosion with loss of sand dune and beach habitat.

Degradation of terrestrial habitat affects not only the natural environment and biodiversity, but also affects the quantity and quality of ecological service functions such as pollinator habitat that is beneficial to the agricultural industry, carbon sequestration, gas regulation, aquatic habitat quality, loss of hydrological function (e.g., flood mitigation), water quality improvement, and the recreational industry that is tied to nature appreciation. Climate change and urban growth may lead to further degradation of natural heritage features.

Natural habitats such as forests, woodlands, wetlands, grasslands and thickets play an important role in carbon sequestration which reduces greenhouse gases from anthropogenic sources of carbon emissions. Given the high percentage of natural cover within the NVCA watershed, it may play a larger role in sequestering carbon than other watersheds in southern Ontario.

2.4 Aquatic Environment

Degraded stream health has led to a deterioration or loss of aquatic habitat along most watercourses and a decline in fish species with specialized habitat requirements such as wetland spawning walleye. This walleye population is unique in the Great Lakes and in North America because of its requirement for wetlands for spawning, primarily in the Minesing Wetlands. The spatial distribution of native brook trout has changed and the habitat for lake sturgeon is threatened. Brook trout are native to the headwaters of most of the Nottawasaga River and its major tributaries, and are now restricted to these areas because they are an intolerant, coldwater species. Their habitats are under threat from modifications to riparian habitat and instream habitat, and gradually increasing water temperatures that is due to a number of factors, including climate change. Lake sturgeon utilize the middle/upper reaches of the Nottawasaga River as spawning and nursery habitat and these segments of the river system are under threat from a variety of stressors, in particular water quality/quantity effects from urban/rural land use, riparian habitat loss, climate change, fish barriers and loss of instream habitat.

Fish barriers along some watercourses limit available habitat for migratory salmon and trout. Alterations to watercourses by development, agriculture and recreation have led to habitat fragmentation and contributed to degraded habitat. Continued degradation of water quality may reduce the suitability of some existing streams from supporting coldwater resident and migratory trout and salmon. In addition to a loss of species diversity and progressive loss of habitat that has led to a reduction in species numbers, degraded aquatic conditions affects recreation and tourism.

The effects of climate change and further urban growth could lead to additional adverse effects for aquatic habitat both directly, and indirectly.

2.5 Natural Hazards

Within the NVCA watershed, several communities are prone to flooding. Greater flood frequency and magnitude increases risk to public safety and property, contributes to the loss of productivity and/or crop damage in agricultural fields, and can negatively impact sensitive natural environment features (e.g., wetlands). Increased flood frequency can also shorten the lifespan of municipal infrastructure (roads/bridges/culverts). Flood risk may increase due to climate change.

Erosion along watercourses is a natural process that can become exacerbated and could be a systemic issue when the flow regime changes in response to uncontrolled stormwater discharge. Erosion in the NVCA Watershed also occurs in areas where channel banks lack sufficient riparian cover. Shifts in precipitation patterns due to climate change also affect hydrograph characteristics that can aggravate erosion processes. The products of erosion could contribute to a deterioration of water quality (turbidity, nutrient and contaminant adherence to sediment particles), a loss of

agricultural land, and degradation of aquatic habitat. Moreover, various impacts to infrastructure and private property may result from amplified erosional processes.

Within the NVCA watershed, more than eighty per cent of the Wasaga Beach Shoreline is classified as a dynamic beach. A 'dynamic' beach is one that undergoes changes on a broad range of scales due to variations in wind conditions, water levels, and lake bed materials. Therefore, the natural hazard limit associated with a dynamic beach must account for the continual variability in the physical extent of the beach.

2.6 Emerging Issues

Past studies have established several emerging issues within the NVCA watershed. For example, while chloride concentrations in surface water samples remain below provincial water quality objectives (PWQO), review of water quality data indicates that there is an upward trajectory in chloride concentrations in some subwatersheds (e.g., Boyne River). Concern over pharmaceuticals in surface water and drinking water is increasingly identified as an emerging issue for human and aquatic health. Protection of successional habitat (meadows, thickets and young woodlands) has also become an emerging issue, as this type of habitat is not generally protected by planning policy (except through identification of Significant Wildlife Habitat, which is not a priority in many municipalities), yet a large number of declining bird species are dependent on successional habitat.

2.7 Growth and Development

Growth and development, if not properly managed, can increase stresses on the natural environment resulting in degraded systems. These increased stresses could ultimately have a negative impact on the economy, environmental resources, and social/cultural well-being.

Growth and development also pose a threat to the land base suitable for agricultural food production. In response, the face of agriculture is also changing with the growth of agribusiness and ever intensifying land uses to increase production. Land intensive uses such as agriculture, urban growth and aggregate resource development are competing for a declining land base that also supports critical water and natural heritage systems.

2.8 Climate Change

Climate change complicates an already complex inter-connected system of cause and effect and contributes to an exacerbation or acceleration, of existing issues.

Consideration must be given to the changing climate when planning communities so that they are resilient and are prepared for extreme weather events. The cumulative impacts of urban development and climate change on the natural heritage features/functions, natural hazards, and the residents within the watershed need to be anticipated and managed where possible.

2.9 Linkages

The condition of any one aspect of a watershed is not the result of any one particular activity or management strategy. Instead, there are numerous factors or stressors/threats that affect the existing conditions of the NVCA Watershed. Degradation of one aspect of the natural environment (e.g., water quality) affects the condition of other watershed components (e.g., aquatic habitat, drinking water, assimilative capacity of surface water). This concept of linkage or interconnectedness is illustrated in **Figure 2-1**.

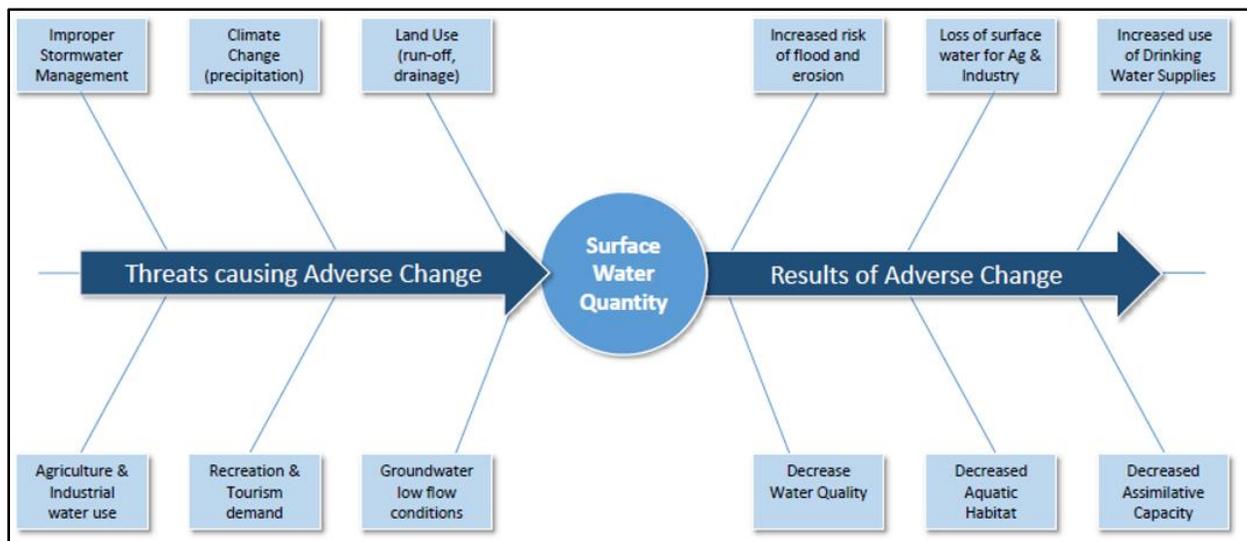


Figure 2-1. Example of Linkage between factors that define threat to watershed conditions and effect of degraded conditions on other watershed components.

Recognition of the inter-connectedness amongst different watershed issues is important since this understanding forms the basis for developing strategies that not only address the threats/stressors, but also address the effect of the degraded condition on other aspects of the NVCA Watershed including the economy and human health.

An overview of specific threats or stressors that determine degraded conditions is provided in **Table 2-1** and in further detail within **Appendix A**. The tables in **Appendix A** also identify the effects that each identified issue exerts on other watershed components.

Table 2-1. Overview of NVCA Watershed Issues and Contributing Stressors

NVCA Watershed Issues	Stressors
SURFACE WATER QUALITY	
Nutrients and contaminants	<ul style="list-style-type: none"> • Fertilizers (urban, agriculture) • Pesticides (urban, agriculture) • Lack of riparian buffers • Roads • Wastewater treatment facilities • Flooding
Turbidity	<ul style="list-style-type: none"> • Erosion • Road maintenance • Algal growth • Runoff from exposed soil (agriculture, construction) • Reduced water quantity
Temperature and Dissolved Oxygen	<ul style="list-style-type: none"> • Climate change • Lack of riparian buffers • Urban runoff • Heat island effect due to urbanization • Flooding • Online ponds • Nutrient loading
Emerging Issues	<ul style="list-style-type: none"> • Increasing concentrations of chloride • Road maintenance • Snow storage management (meltwater) • Pool water release • Contamination from pharmaceuticals • Improper residential disposal of pollutant sources
SURFACE WATER QUANTITY	
Volume of supply (drought)	<ul style="list-style-type: none"> • Climate change • Agricultural use • Aggregate extraction below groundwater table • Reduction of infiltration rates
GROUNDWATER QUALITY	

NVCA Watershed Issues	Stressors
Quality – drinking water supply	<ul style="list-style-type: none"> • Wastewater treatment (septic beds) • Septic Systems • Fertilizer and pesticides (urban, agriculture) • Urbanization (road salt, sand) • Climate change
GROUNDWATER QUANTITY	
Quantity – use/abundance	<ul style="list-style-type: none"> • Municipal water taking for drinking water • Industrial use • Agricultural use • Climate change
NATURAL HAZARDS	
Flooding	<ul style="list-style-type: none"> • Climate change • Urban development (lack of adequate stormwater management) • Loss of terrestrial vegetation and wetland features
Erosion	<ul style="list-style-type: none"> • Loss of riparian vegetation • Flooding and altered flow regime (climate change) • Urban development (lack of adequate stormwater management)
NATURAL HERITAGE FEATURES	
Wetlands: <ul style="list-style-type: none"> • Size • Quality and connectivity Forests: <ul style="list-style-type: none"> • Size Quality and connectivity	<ul style="list-style-type: none"> • Urban encroachment and roads • Pollutants • Direct human impacts through filling of wetlands and/or removal of forested areas • Tourism (degradation from recreational/tourist activities) • Degradation of groundwater and surface water regimes • Climate change
Unique Features: <ul style="list-style-type: none"> • Minesing Wetlands • Wasaga Beach • Beaches and dunes • Niagara Escarpment 	<ul style="list-style-type: none"> • Flooding of treed wetlands (swamps) and replacement with open wetlands due to both human and natural influences. • Tourism and recreation • Urban encroachment and roads • Invasive species • Degraded water quality (temperature, nutrients) • Climate change

NVCA Watershed Issues	Stressors
Emerging Issues Successional Habitat (meadows, thickets, young woodlands)	<ul style="list-style-type: none"> • Loss of disturbance that maintains successional habitat • Increase in woody species resulting in loss of successional habitat • Invasion of non-native species • Urban development
AQUATIC HABITAT	
Unique Features: <ul style="list-style-type: none"> • Lake Sturgeon habitat • Walleye habitat 	Similar to above
Habitat Quality	<ul style="list-style-type: none"> • Degraded surface water quality • Loss of habitat/natural channel form (urban development; agriculture) • Lack of adequate stormwater management (sediment inputs) • Temperature modification, sedimentation - modification of streamside/riparian vegetation • Climate change – thermal regimes, storm flow impacts

2.10 Cumulative Effects

In addition to recognizing that there are multiple threats that contribute to the existing condition of watershed components, it is important to recognize the concept of cumulative effects. That is, when there are multiple threats or stressors, the combined or cumulative effect is greater than individual effects (**Figure 2-1**). This means that while one threat may not, in itself, result in much degradation, when it is combined with other threats, the impact is much greater.

3 Stakeholder Consultation

A key component of any IWMP is stakeholder consultation and engagement. Ultimately, many of the implementing actions will require either the direct leadership of, or active participation from, the watershed stakeholders, so it is imperative that the stakeholders have an active role in the creation of the IWMP. NVCA has sought input from their watershed stakeholders in the form of in-person meetings and online surveys (**Appendix B²**).

² Appendices are available, upon request, from NVCA

3.1 Stakeholder Meetings

To date, NVCA has hosted two stakeholder meetings (see **Appendix B1** for a list of invitees). Stakeholders from federal, provincial and municipal government, Indigenous communities, conservation authorities, the agricultural community, development industry and not-for-profit environmental organizations were invited to join the NVCA and IWMP study team to share their thoughts on the issues and stressors in the NVCA watershed, and to collaborate with other stakeholders to identify potential strategies to address these issues and stressors. Each of the stakeholders have unique perspectives and vested interests in the long-term welfare of the NVCA watershed.

The first stakeholder meeting was held on July 26, 2018, for the purposes of reviewing the Characterization Report and obtaining preliminary input from the stakeholders on the watershed characterization and issues / stressors that they are aware of in the NVCA watershed. Sixty-three (63) stakeholders participated in the first meeting (see **Appendix B2** for a list of attendees). A summary of this meeting is in **Appendix B3**.

The second stakeholder meeting was held on October 18, 2018, with 54 stakeholders in attendance (see **Appendix B4** for a list of attendees). The purpose of the second meeting was to provide the stakeholders with an opportunity to collaborate in order to recommend strategies to address the issues / stressors within the watershed. The stakeholders were provided with a list of preliminary strategies for consideration; these were developed by the NVCA and study team to address the watershed issues and to strive for a balance between the needs of the human, economic and natural environment. Results of the stakeholder collaboration were documented on worksheets (**Appendix B5**) for the NVCA and study team's further review and consideration (**Section 4.2**). The stakeholders were invited to review, and provide input to the draft mission, vision, and value statements developed for the IWMP.

3.2 Focus Group Meeting

At the request of the agricultural representatives involved in the first two stakeholder meetings, a separate focus group meeting was held with members of the agricultural community on December 6, 2018. The purpose of this meeting was to discuss in more detail the issues, stressors and strategies for the IWMP from an agricultural perspective. Feedback obtained during this meeting was input into the stakeholder meeting #2 worksheets and is shown in red font in **Appendix B5** to differentiate from the feedback that was received during the larger stakeholder meeting. A summary of the general discussion at this meeting is also included in **Appendix B6**.

3.3 Online Surveys

Two online surveys have been created to obtain additional feedback from stakeholders and from people who live, work and play in the NVCA watershed. The first survey was circulated just to the NVCA stakeholders (as listed in **Appendix B1**) shortly after the

first stakeholder meeting. The purpose of the survey was to obtain feedback from those stakeholders that were unable to attend the in-person stakeholder meeting and/or from those stakeholders who attended the meeting but had additional input to provide that was not captured at the meeting. A summary of the results of this survey can be found in **Appendix B7**.

The second survey was created to obtain input from those people who live, work and play in the NVCA watershed to discover: (1) what they value about the watershed; (2) what they see as the issues affecting the watershed; and, (3) what actions or strategies they think would be helpful in addressing the watershed issues. This survey was promoted on the NVCA's social media platforms including their website, e-newsletter, Twitter and Facebook. This survey is currently active, with a closing date of January 30, 2019.

4 IWMP Strategy Development

The IWMP will build upon recent work and recommendations made regarding anticipated climate impacts within the NVCA Watershed and will support both member municipalities and upper tier municipalities in responding to the climate change requirements in the updated Provincial Policy Statement. The updated IWMP will also support the watershed management components now required under the provincial Growth Plan. Development of a suite of strategies that together make up the IWMP represents the culmination of a process from watershed characterization; mission, vision and value development; and issue identification, to strategy development. The process of developing strategies for the IWMP is illustrated in **Figure 4-1**.

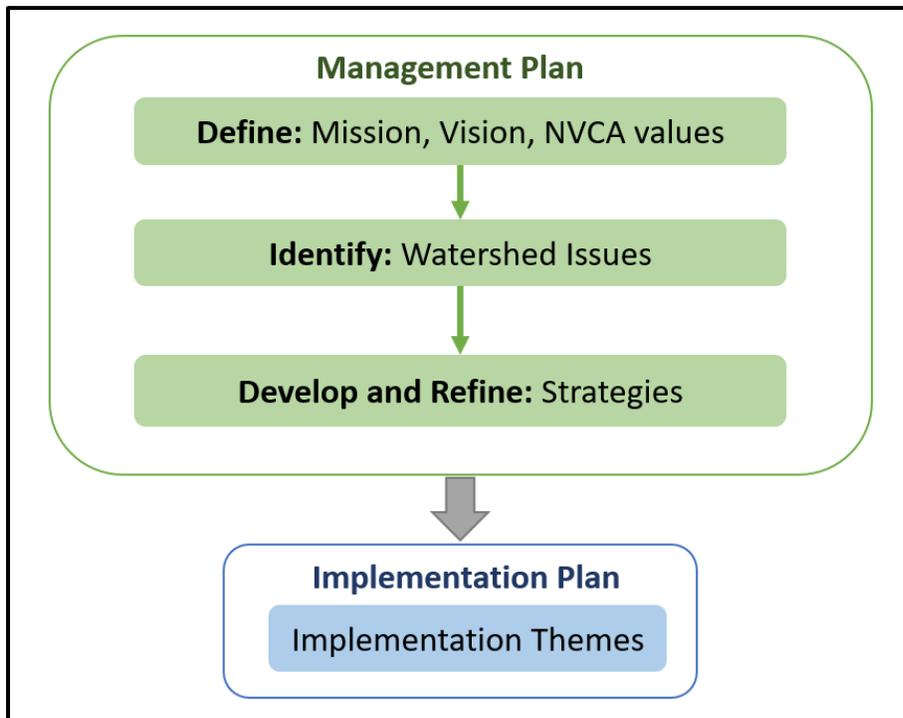


Figure 4-1. Key Components of Developing the Integrated Watershed Management Plan.

4.1 Mission, Vision and Values

NVCA staff developed a Mission, Vision and Values statement to guide the development and implementation of the IWMP. Input to these was provided by the stakeholders and the project team (**Section 3.1**).

The draft version of the Mission, Vision and Values statements, developed for the IWMP, to date, are as follows:

Mission

Working together to deliver innovative, integrated watershed management that is responsive to the environmental, economic and social sustainability of the NVCA watershed.

Vision

A sustainable watershed that is resilient to the effects of climate change, and future growth, and that provides for healthy and prosperous people and communities.

Values

What we value in the Nottawasaga Valley Watershed:

- Clear water, clean air and fertile soils that provide for healthy people and communities.
- Natural heritage systems and the ecosystem services they provide, particularly as they support resilience to the effects of a changing climate and future growth.
- Landforms and waterways - Georgian Bay coastline, Niagara Escarpment, Minesing Wetlands, Oak Ridges Moraine, and others - that give our watershed a unique sense of place.
- Recreational opportunities that our hills, forests, meadows, wetlands, waterways and coastline provide for residents and tourists alike.
- The resources and capacity of our watershed to provide for thriving communities, successful economies and sustainable agriculture, now and in the future.

4.2 Development and Evaluation of Strategies

Results from the watershed characterization and issue identification process, along with input from knowledgeable stakeholders provided the framework for development of the watershed strategies. The process of developing the IWMP strategies from the initial long list of strategies drafted by the stakeholders (**Section 3.1**) to a shorter, and implementable list, is provided below.

Step One (Appendix B5): The NVCA and technical Study Team developed a preliminary list of strategies, organized by each of the identified watershed issues (**Section 2**); this was reviewed and further expanded upon by the stakeholders at the second workshop (**Section 3**), resulting in a long list of over 200 strategies (**Appendix B5**). It was apparent, upon reviewing the long list of strategies, that many of the strategies addressed more than one of the watershed issues; for example, implementing Stormwater Management plans and LID facilities addressed each of aquatic resources, flood hazards and erosion hazards. It was also apparent that there was overlap and duplication of strategies between issues; that is, similar strategies were often identified under different watershed issues.

Step Two (Appendix C1): The long list of strategies was classified into a number of common categories including: Capital Works, Education, Emerging Issue, Funding, Monitoring, Planning, Program, Regulation, Stewardship, Study. All of the strategies in each of these categories were then collapsed into a smaller number of strategies by reducing and eliminating overlap and duplication. Further, strategies under Education/Communication and Environmental Monitoring categories were organized into watershed-wide strategies, because they were considered to have broad support and were applicable to most, if not all, watershed issues. Strategies categorized under

Emerging Issues were removed as they were considered to be both outside of the NVCA purview and too uncertain at this time. Through this process, the long list of strategies was shortened to approximately 70 strategies.

Step Three (Appendix C2): The shortened list of strategies in each of the categories was ranked in terms of the number of watershed issues that it addressed since many strategies addressed more than one watershed issue.

Step Four (Appendix C3): The shortened list of strategies was further evaluated/ranked under the following headings: Ability to meet Study Values, Land Requirements, Cost, Stakeholder/Landowner Acceptance, Agency Acceptance, Support for Climate Change, Implementing Agencies (Lead/Support), Focus Area (Geographic/Political).

The shortlisted group of strategies from Step Four will form the basis for the IWMP and will be further refined through further consultation with the stakeholders and NVCA's technical team. It is anticipated that, given the diversity of watershed conditions and issues, strategies will need to consider local geography and that prioritization will need to balance the various challenges and priorities of local municipalities.

4.3 Implementation Themes

Through the strategy shortlisting process, Education/Communications and Environmental Monitoring were identified as two key recurring themes. The Education and Monitoring strategies will be formulated into comprehensive strategies, each with several "action" items or priority actions for implementation.

Other implementation themes could include the following:

- Urban Growth Management
- Climate Change
- Private Land Stewardship
- Natural Heritage Protection
- Funding

For each theme, several "action" items or priority actions for implementation will be identified.

5 Next Steps

The Integrated Watershed Planning process is outlined by Conservation Ontario (2010). The general process is illustrated in **Figure 5-1**.



Figure 5-1. Overview of the IWMP study process

Subsequent to this Issues and Strategies Report, the Study Team will prepare a draft Integrated Watershed Management Plan. This will include refinement of IWMP goals, objectives, and targets, and developing a priority list from the preliminary strategies; an implementation framework will also be developed. The implementation framework will include general recommendations for timing of implementation and partnerships for implementation both with respect to funding and leadership. Further stakeholder consultation will occur to develop the IWMP into a document that is endorsed by the NVCA Board of Directors board and member municipalities. It is the intent of the IWMP that stakeholders, in partnership with the NVCA, can begin implementing the strategies developed within the IWMP so that the NVCA watershed will be, in turn, more resilient to the impacts of climate change and future growth.

6 References

Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier. 2007. The Atlas of the Breeding Birds of Ontario, 2001-2005. Published by: Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature. 728 pages.

Conservation Ontario. 2010. Integrated Watershed Management: Navigating Ontario's Future, A Water Management Framework for Ontario.

CCMOE. 2016. Summary of Integrated Watershed Management Approaches Across Canada. PN 1559. ISBN 978-1-77202-034-2. PDF.

Ducks Unlimited Canada. 2010. Southern Ontario Wetland Conversion Analysis. Accessed on-line December 2018 at https://www.ducks.ca/assets/2010/10/duc_ontariowca_optimized.pdf.

NVCA. 2013. Nottawasaga Valley Watershed Health Check.

NVCA. 2013b. NVCA Provincial Groundwater Monitoring Network Groundwater Quality Overview 2002 – 2013.

NVCA. 2015. Nottawasaga Valley Source Protection Area Approved Assessment Report.

Rootham, S. and D. Featherstone. 2014. 60 years of forest change in the Minesing Wetlands (1953-2013): Causal factors, ecological implications and recommendations for reforestation. Report for the Nottawasaga Valley Conservation Authority and Friends of Minesing Wetlands.