NVCA Natural Heritage Program Strategy

Direction and opportunities to enhance the NVCA Natural Heritage program.

DATE: May 13, 2022

Nottawasaga Valley
Conservation Authority

Contents

1.0 Introduction

Natural heritage is comprised of geological features and landforms and their associated terrestrial and aquatic ecosystems which sustain plants, fish and wildlife populations. This is inclusive of habitat features and and functions such as forests, streams, wetlands,regenerating fields and the linkages that connect these features which all support key ecological processes within the watershed.

Section 20 (1) of the *Conservation Authorities Act* states that "The objects of an authority are to provide, in the area over which it has jurisdiction, programs and services designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals. Further, that Section 21 (1) of the *CA Act* provides local Conservation Authorities with the jurisdiction and power, to study and investigate the watershed and to determine programs and services whereby the natural resources of the watershed may be conserved, restored, developed and managed. In accordance with the objectives of the *Conservation Authorities Act*, the purpose of natural heritage programming is to support the conservation, enhancement and management of local watersheds and resources for current and future generations (Government of Ontario, 2015).

The Nottawasaga Valley Conservation Authority (NVCA) natural heritage program was informally initiated in 2003; recognizing that initial natural heritage work was included in previous subwatershed studies, in particular the Willow Creek and Innisfil Creek subwatershed planning efforts. Additional natural heritage system work with member municipalities began in 2003: preliminary mapping of wetland features throughout the watershed was developed in 2005 and forest bird monitoring (Tiffin) commenced in 2005 with marsh bird monitoring (Minesing) added in 2008. Throughout the early stages of the natural heritage program, NVCA responded to the need for invasive species identification and management projects. Natural heritage input to NVCA Lands (Tiffin CA, Nottawasaga Bluffs, Minesing Wetlands) was provided in support of management plans and other reporting. The watershed report card/health check reporting program was initiated in 2007 and included reporting on watershed forests, wetlands and riparian cover.

Presently, the natural heritage program components consist of ongoing monitoring of key biodiversity indicators on NVCA lands at targeted stations; such as the forest bird monitoring program at the Tiffin Centre and marsh bird monitoring at the Minesing Wetlands and Marl Lake. Informal monitoring associated with vegetation community updates, wildlife and invasive species monitoring andwetland updates is undertaken to enhance watershed knowledge, and, in part, to inform long-term strategic reporting at scheduled intervals, such as the watershed health check and report card programs across Ontario Conservation Authorities. Natural heritage system (NHS) work with municipalities continues with participation in the Town of

Mono NHS in 2017/2018 the latest example. The present staffing complement is 0.5 full time equivalency.

The objective of this document is to outline the historical work completed within each program area and recommend the proposed directions moving to support to the recently released NVCA corporate strategic documents. The natural heritage program supports the NVCA's vision of "a sustainable watershed that is resilient to the effects of climate change, urban growth and other stressors and provides for safe, healthy and prosperous people and communities". This is achieved through biophysical investigation, monitoring and analysis delivered by natural heritage technical staff.The Integrated Watershed Management Plan (IWMP; NVCA, 2019), followed by a new Strategic Plan and Business Plan (NVCA, 2020) provides the ideal opportunity to evaluate and refocus the natural heritage program.

2.0 Corporate Strategic Alignment of Program

In support of the NVCA as a science-based organization, the Natural Heritage program supports an array of watershed management activities and requirements via data collection, review and analysis as well as reporting. The natural heritage program roles and responsibilities consist of:

1. Natural heritage monitoring including ecological surveys with provision of data to other NVCA departments/programs and outside partners for watershed management purposes.
2. Development of natural heritage systems to support watershed management objectives and plan review function.
3. Maintenance, update and custodianship of NVCA wetland regulation mapping.
4. Provide support including data analysis and reporting for Watershed Science communications.
5. Actively develop inter-agency and non-government organization (NGO) partnerships to support delivery of shared natural heritage objectives.

The natural heritage program foundationally builds on three key corporate strategic documents: The Integrated Watershed Management Plan, the 2020-2025 NVCA Strategic Plan, and the 2021-2025 NVCA Business Plan.

Integrated Watershed Management Plan (NVCA, 2019): integrated watershed management is the process of managing human activities and natural resources on a watershed basis by considering social, economic, and environmental issues as well as community interests in order to manage natural resources sustainably. The recently completed 20-year IWMP provides a guiding framework on current and future policy decisions related to watershed planning while incorporating water resource and natural hazard management in addition to climate change, natural heritage, and resilience planning.

The issues and strategies addressed in the IWMP are: water quality and quantity, flood and erosion management, resilient biodiversity and habitats, sustainable economic and recreation opportunities, improved quality of life and neighborhood desirability, and the ability of the watershed to adapt to stressors such as climate change and urban growth.

2020-2025 NVCA Strategic Plan (NVCA, 2020): the integrated watershed management approach outlined in the IWMP is captured through four core strategic areas: business excellence, watershed resilience, conservation through education, and watershed knowledge which aligns the individual program delivery. The key strategic priorities related to the delivery of the natural heritage program consist of:

Business Excellence Priorities:

- Work with non-governmental organizations, educational institutions and the private sector to better understand and address watershed issues.

Watershed Resilience Priorities:

- Identify and seek partnership opportunities to actively manage and restore natural systems to mitigate the effects of urban development, agricultural intensification and a changing climate.
- Encourage and support strategic land acquisition to increase landscape connectivity.
- Support member municipalities in the management of wetlands in accordance with applicable legislation.
- Partner with watershed stakeholders to update natural hazard and natural heritage mapping.

Watershed Knowledge Priorities:

- Enhance knowledge of the watershed's natural environment and its response to land use changes and climate change.
- Monitor and regularly communicate on the status of watershed health, emphasizing trends and required actions.
- Leverage scientific knowledge and monitoring capabilities to advance watershed-based resource management decisions and restoration initiatives.
- Develop an information management system to support improved scientific understanding of the watershed and to better communicate scientific information to stakeholders.

2021-2025 NVCA Business Plan (NVCA, 2020): the business plan outlines the definable and measurable objectives and associated targets compiled from the IWMP and the strategic plan. Specific to the natural heritage program is objective 5 which states: implement a natural heritage program for enhanced resource management and aid the planning process. The associated targets consist of:

Target 1: Continue to update wetland inventories through assessing unevaluated wetlands and woodlands, as well as those with existing, but dated, evaluations.

Target 2: Establish a watershed-scale Natural Heritage System plan to assist in the plan review process.

Target 3: Complete a natural capital asset inventory to quantify natural resources needed to maintain or enhance existing ecosystem services and to guide recreational activities on conservation lands.

3.0 Overview of the existing NVCA Natural Heritage Program

The natural heritage program was previously a component of the NVCA Watershed Monitoring Program which was rebranded in 2019 to the Watershed Science Program. Presently, the NVCA natural heritage program is built on 5 core elements:

1) Natural Heritage System (including ELC mapping),
2) Wetlands (wetland regulations mapping layer and field verification),
3) Conservation land inventories,
4) Natural heritage monitoring, and
5) Program communications.

Although intricately linked, the provision of technical advisory support to the planning and regulations programs is considered not a key natural heritage program component, but a key staffing component. Each program component is outlined below.

3.1 Natural Heritage System

A Natural Heritage System (NHS) is defined by the Province of Ontario as "a system made up of natural heritage features and areas, linked by natural corridors which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. These systems can include lands that have been restored and areas with the potential to be restored to a natural state" (Provincial Policy Statement 2014).

A watershed NHS can be used as a planning tool; for watershed securement, stewardship and restoration programs; for identification of natural heritage data gaps and to guide species or community inventories. Municipal planning authorities can utilize the system to review their existing natural heritage systems policies and strategies at the municipal scale to enhance the protection of natural heritage features and functions in their area of jurisdiction over the long term. NHS contributes to the health and well-being of the watershed's residents by making important contributions to surface and ground water quality, flood control, erosion control, air quality, pollination services, natural pest control, genetic resources, property values and quality of life, health and well-being.

A number of NHS initiatives have been undertaken within and adjacent to the NVCA watershed and are briefly summarized below.

NVCA-lead or assisted NHS projects:

In 2003, NVCA staff worked with Essa Township and the Town of New Tecumseth for natural heritage system development to assist with Official Plan review and meeting the intent of the Provincial Policy. This was complemented with NVCA mapping and modelling natural heritage features (including forests, wetlands and watercourses). NVCA worked closely with municipal staff and, in the case of Town of New Tecumseth, also with the Lake Simcoe Region Conservation Authority

(LSRCA) to develop natural heritage system models and associated reporting which was finalized in 2004. Municipal funding contributed to this work.

Finalized in 2005/2006, NVCA worked with the Town of Wasaga Beach to address municipally-identified natural heritage issues including: Eastern Hog-Nosed Snake Discussion Paper, Dune Outlier Study, South Bank Study, and The Natural Heritage Review and Landscape Model. These reports included some focused field work and were peer-reviewed reports by a 3rd party consultant. A Beach and Dune Conservation and Protection Report was added by NVCA staff.

Natural heritage system work was undertaken in Collingwood in 2010 and 2011 to assist the Town to meet new Provincial Policy Statement requirements. Significant field efforts were undertaken to form a base for natural heritage system discussion. Given that the Town was and is a Settlement Area, provincial guidance regarding natural heritage system development in these areas was followed (OMNR, 2010). This included significant consultation with the Town and local stakeholders including the Georgian Triangle Development Institute and Blue Mountain Watershed Trust. A draft report was presented to Town Council at a public council meeting in October 2011 and later peer-reviewed by a Town consultant.

A model loosely based on pre-existing Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) natural heritage efforts was developed to identify an NHS for Essa Township, Town of New Tecumseth, and (in part) Town of Wasaga Beach. The earlier Essa Township and Town of New Tecumseth efforts, undertaken prior to NVCA wetland layer development, took a cautious approach to wetland delineation and post-NHS wetland delineation as part of the broader development of the NVCA wetland layer identified additional wetlands in these municipalities. The Wasaga Beach NHS products included this model as well as additional field work which, though somewhat dated, may still be useful for NHS development. Further, the Collingwood NHS product was developed in a different manner as per provincial direction for NHS development within Settlement Areas. Significant field work and consultation with stakeholder groups was undertaken in support of this effort and this data is still relevant and useful for NHS development.

Since 2011, natural heritage system work with the member municipalities has largely been in a support role with municipalities and, in some case, their consultants, leading the efforts. These support efforts include natural heritage system development in: City of Barrie (2009/2010, 2012/2013), Town of Mono (2016/2017), Caledon/Peel Region (2018/2019) and Grey County (2015/2016) and were undertaken within existing staff capacity and budgeting. Additional municipal information relevant to NHS would include the Oro Moraine schedules/policies within the Oro-Medonte Township Official Plan (and associated reports).

Staff also note NHS development within the TRCA, LSRCA and CVC watersheds, and a need to consider edge-matching at our shared watershed boundaries.

Externally completed NHS projects:

The Simcoe County Greenlands *(MARXAN)* NHS model was completed by the Ministry of Natural Resources (MNR; now Ministry of Northern Development, Mines, Natural Resources and Forestry – MNDMNRF) in 2008. At the end of the process, the County/MNR "manually selected" additions to the Greenland system rather than using the results of MARXAN modeling. Defensibility of the mapping has long been a concern since there was no technical document released identifying how the Greenlands mapping was developed. NVCA staff have struggled with this mapping from a planning perspective since its release and identification in County Official Plan schedules.

In addition and contiguous to the NVCA watershed, Grey County undertook a NHS exercise from 2015-2017 culminating in a "Green in Grey" report in 2017. Natural Resource Solutions Inc. assisted with this work which was collaborative with many partners including NVCA and other conservation authorities. (*Grey County NHS https://www.grey.ca/programs-initiatives/green-grey-natural-environment-study)*

Policy Considerations:

At a provincial level, natural heritage schedules and policies within the Oak Ridges Moraine Conservation Plan, Niagara Escarpment Plan, Greenbelt and Greater Golden Horseshoe Growth Plan requires consideration/consistency as part of NVCA natural heritage system development. Specifically, the Growth Plan, which includes most of the watershed outside of Grey County, Settlement Areas and CFB Borden, outlines the criteria and methods used to develop and map the NHS which "were selected to identify a system at a regional landscape scale." The criteria and mapping were not intended to identify or connect all natural areas and features that may be important to consider at a local or smaller scale. These smaller features and areas can be incorporated into a local NHS that complements and connects to this Regional NHS. The criteria used for core areas and linkages in the Greenbelt Plan and the Oak Ridges Moraine Conservation Plan were used as a base for the NHS. The Growth Plan identifies other components of the natural heritage system including: key natural heritage features, key hydrologic features and key hydrological areas. Identification of consideration of these key features and areas will likely be required as part of NVCA NHS development.
https://www.sdc.gov.on.ca/sites/MNRF-PublicDocs/EN/CMID/GrowthPlan_NaturalHeritageSystem_TechnicalReport.pdf

3.1.2 Ecological Land Classification (ELC)

ELC mapping provides the base for most CA NHS initiatives with the Community Series level most commonly used by CAs in support of these efforts. The ELC system methodology provides a comprehensive and consistent province-wide approach for ecosystem description, inventory and interpretation. This system has been designed to facilitate conservation planning and ecosystem management objectives at various site to landscape scales of resolution (Lee et al., 1998).

The NVCA has undertaken several municipality and/or project specific ELC mapping exercises since 2003. In some cases, refinement to Vegetation Type (refinement of Community Series ELC) has occurred.

- Town of New Tecumseth and Essa Township NHS (Community Series with slightly undermapped wetlands)
- Town of Wasaga Beach NHS (Community Series and Vegetation Type mapping)
- Town of Collingwood NHS (Vegetation Type mapping)
- Tiffin Conservation Area (Vegetation Type mapping)
- Nottawasaga Bluffs Conservation Area (Vegetation Type mapping)
- Minesing Wetlands (Vegetation Type mapping; ongoing; also NCC input)

The information generated from these endeavors are provided to various partners upon request.

The Minesing Wetlands work has been used to inform, in part, the Forest Decline report (Rootham and Featherstone, 2014). Also, it has been used to provide input to the Minesing Wetlands management plan as well as other Minesing Wetland-related endeavours (i.e. Hine's Emerald Dragonfly-associated reporting) and could provide potential input to a Minesing Wetlands Biological Inventory (Bowles et al., 2007) update.

North-South Environmental Inc. completed ELC mapping in support of the Watershed Characterization Report (2018) as part of the NVCA IWMP (2019). The report acknowledges significant time and other constraints associated with this effort. This product cannot currently be used in a meaningful way, particularly at a local level. Further, ELC mapping, generally to Vegetation Type, is available in various consultant reports; however,this mapping is subject to QA/QC by NVCA staff given variable quality of this work. Staff note that refinement to Vegetation Type at a watershed level would be a time-consuming exercise and would require access to private lands.

NVCA undertook a land use layer exercise in 2008 which mapped natural features, rural and urban land uses. This layer is currently being updated. It would be possible to convert the new land use layer into a coarse ELC Community Class layer. This could form a base layer for NHS development within the watershed.

3.1.3 Challenges and Opportunities

NVCA currently does not have a NHS mapped across its complete jurisdiction which is needed to support ecosystem functions on the landscape and to provide watershed resiliency in the face of climate change. Presently, the NVCA-led NHS initiatives have been accepted; however, have been limitedly and unevenly incorporated into the respective municipalities Official Plans. The Greater Golden Horseshoe NHS corresponds to a regional exercise incorporating the geography of the Greater Golden Horseshoe (Simcoe County, Dufferin County, Region of Peel, and the Niagara Escrapment as it pertains to the NVCA) and can be refined at the local scale.

A watershed-wide natural heritage system will also assist with integrated watershed management and associated planning needs. Although Settlement Area natural heritage system considerations are somewhat different that those outside of Settlement Areas, natural heritage system development is still a requirement as per the Provincial Policy Statement. Working with municipalities to incorporate the system within their Official Plans is critical for implementation and will be important to dovetail/edge-match with contiguous jurisdiction NHS – particularly within municipalities with more than one CA.

Furthermore, NVCA currently does not have a complete ELC layer that is accurate at a local or watershed level. The current land use update offers an opportunity to develop a coarse ELC Community Class layer that could suffice for NHS development as well as other integrated watershed management endeavors including natural capital inventories. Provided that the land use layer is timely updated at regular intervals in the future, it will also provide an excellent opportunity to track natural area trends across the watershed.

3.2 Wetlands Regulation Layer

Traditionally, Section 28 of the Conservation Authorities Act described regulated activities in terms of Fill, Construction and Alterations to Waterways. These regulated activities were amended in 2005 as part of provincial efforts to streamline the regulatory framework to include regulation of development and interference with wetlands, watercourses, and shorelines (Conservation Ontario, Ministry of Natural Resources, 2005).

The original version of the NVCA wetlands regulation mapping layer was produced internally in 2005 following delegation of the wetland regulation to conservation authorities through Section 28 (4) of the *Conservation Authorities Act*. This exercise acknowledged a significant number of unmapped wetlands within the watershed. On-going wetland refinement/updates based on field visits, roadside checks, consultant reports and other studies continued following production of the original layer in 2005. Larger studies undertaken between 2005 and 2013, at least in partial support of wetland updates, included:

- Mulmur Township Official Plan review circa 2008: roadside and public request property checks.
- Town of Collingwood Natural Heritage System (2011): ELC mapping including wetland updates based on public land access, roadside and public request checks.
- City of Barrie Annexed Lands Natural Heritage System Framework (2012).
- Silver Creek Health Check and Terrestrial and Aquatic Ecosystem Health in the
- Silver Creek Watershed, Collingwood, Ontario report (in partnership with Blue Mountain Watershed Trust; Ferguson, et al, 2017).
- Grey County Natural Heritage System Study (Green in Grey; 2017).
- Town of Mono Natural Heritage Strategy (2018).

Broader scale work on this GIS layer has also occurred. In 2013, the watershed wetland layer was reviewed against the 2008 orthoimagery to further refine wetland polygons as well as identify areas of gain and loss. This information enabled the NVCA to provide wetland trend analysis based on changes to wetland cover between 2002 and 2008. This revised/updated wetland layer became the new wetland regulation layer for the watershed.

The wetland layer was again updated in 2019 using the 2015/2016 orthoimagery and the identical protocol as per 2013 was used to provide wetland trend analysis based on changes to wetland cover between 2008 and 2015/2016 for the entire watershed. This update also reviewed the 2015 MNRF unevaluated wetland layer to ensure that any previously unmapped wetlands (or wetland extensions) were brought into NVCA wetland mapping while, at the same time, ensuring to the extent possible that false positives (non-wetlands) were excluded from NVCA wetland mapping. The NVCA wetland layer is constantly being updated as new information becomes available and as further analysis is undertaken.

The wetlands regulation layer should be continuously updated to reflect best available science in support of regulatory, planning, and watershed health objectives. Operationally, the field verified wetland updates are completed and QA/QC'd through regular workflows of consultant report review, NVCA site visits and other assessments which are an essential part of layer maintenance and updating. This includes site visit data associated with planning and regs review as well as updates associated with more detailed orthoimagery review at a property level) which is QA/QC'd by the Senior Ecologist and updated accordingly in GIS. More than one hundred wetland polygon updates are undertaken each year.

It is noted that the recently completed NVCA report entitled *Wetlands and Wetland Delineation: History and Proposed Protocol (*Featherstone, 2020) documents the comprehensive corporate legacy overview related to:

- The policy context for wetland planning and mapping.
- Outline the timeline evolution of the NVCA wetland layer development.
- Data sources used in the NVCA wetland layer construction.
- Future directions regarding wetland mapping.
- Establish a protocol for future mapping updates within the watershed.

The report also notes deficiencies in wetland evaluation throughout the watershed. The *NVCA Watershed Wetland Evaluation and Prioritization* report (Featherstone, 2021) provides a comprehensive overview of wetlands, evaluated and unevaluated, within the NVCA jurisdiction. A total of 39 evaluated provincially significant wetlands (PSWs), 36 evaluated non-provincially significant wetlands (non-PSWs) and 80 unevaluated wetlands were identified within the NVCA jurisdiction. Almost all wetlands in the watershed would benefit from additional evaluation. Priority wetlands for evaluation were identified on a subwatershed basis. Based on the wetland assessment provided in the report, the following ten wetlands were identified as the highest priority for assessment within the NVCA jurisdiction.

1. Midhurst Swamp (evaluated non-PSW))
2. Copeland-Craighurst-Guthrie (evaluated PSW)
3. Minesing Wetlands (Minesing Swamp; evaluated PSW)
4. Phelpston Swamp (evaluated non-PSW)
5. Tiffin Swamp (evaluated PSW)
6. Willow Creek-Little Lake Wetland (evaluated PSW)
7. Melancthon Wetland Complexes (Upper Pine and Upper Mad subwatersheds; evaluated PSW and non-PSW)
8. Upper Boyne and Primrose Wetlands (unevaluated wetland complexes)
9. Glencairn Wetland Complex (evaluated non-PSW)
10. Bailey Creek Swamp (evaluated non-PSW)

NVCA staff have identified the need to evaluate these prioritized wetlands over time using the Ontario Wetland Evaluation System (OWES; MNR, 2013) methodology to fully map their extent, determine their level of significance and submit to MNRF for review/approval to aid in their protection and to inform future planning endeavors.

3.2.2 Challenges and Opportunities

The wetlands regulation layer requires ongoing updating and maintenance in order to provide best available science to internal and external clients. Field-based work in support of priority evaluations will lead to further refinement of wetland layers within and proximal to the complex that is being evaluated. Periodic updates of the orthoimagery at the watershed scale will continue to be used to enhance this corporate layer in addition to the land use layer which potentially influences the corporate land use layers and the associated derivatives, e.g. a coarse community scale ELC layer to support the NHS.

3.3 NVCA Conservation Land Inventories

Natural heritage inventories have been completed on a number of NVCA properties, including those proposed for acquisition as part of a broader property assessment. This includes assistance and leading natural heritage inventory reports for the Tiffin Conservation Area, Nottawasaga Bluffs Conservation Area, and Minesing Wetlands. These products have provided valuable input for management planning in these areas by NVCA and other partners such as Nature Conservancy Canada (NCC; Minesing Wetlands Management Plan). Aquatic resources on NVCA properties have generally been well documented on most NVCA properties with significant inventories completed in 2013.

The 2004 Tiffin CA management plan included ELC mapping for the property and documentation of a full array of natural features and functions including full lists of flora and fauna (aquatic, wetland and terrestrial). Input pertaining to physiography, soils, geology and hydrology was also provided as well as input into final management recommendations. Similar input was provided as part of the development/update of the Nottawasaga Bluffs CA management plan in 2006/2007.

The internationally significant Minesing Wetlands (a considerable NVCA and other public land holdings) has been subject to extensive Watershed Science program effort since 2003 including the following;

- NVCA played a key role in directing and conducting field work in 2006 associated with the NVCA staff co-authoring the 2007 Minesing Biological Inventory Report. (Bowles et al, 2007))
- In 2013/2014, NVCA staff analyzed various imagery and reported on forest decline in the Minesing Wetlands. (Rootham and Featherstone, 2014)
- Following discovery of the Hine's Emerald Dragonfly (Endangered species only found in Minesing Wetlands to date), NVCA has undertaken work to monitor and understand the hydrogeology of this important area and have strongly contributed to the species recovery plan.
- Vegetation community (ELC) mapping updates are ongoing in Minesing Wetlands; this includes updates of invasive species mapping.
- Marsh monitoring has been undertaken annually by NVCA in Minesing since 2008 (as per 2007 Inventory Report recommendation).
- Partnered with McMaster University to better understand water quality associations with Minesing Wetland as well as turtle movement within and proximal to the wetland.
- Watershed Science program continues to be involved with the Minesing Management Plan with NVCA Lands and other partners (Nature Conservancy Canada, Nature Barrie, private landowners).

Watershed Science staff note the need for updates of key documents within the Minesing Wetlands, in particular the Minesing Biological Inventory (Bowles et al., 2007) and Minesing Forest Decline report (Rootham and Featherstone, 2014). The Minesing Biological Inventory is more than a decade old and could be updated with a variety of data gathered by NVCA staff (and others including NCC) since that report was published.

Additional natural heritage property assessments mostly consisted of inventories of natural heritage features and functions on the properties including ELC mapping, and include the following properties:

- Dirjanecz (2011; not acquired)
- Dunsmore (2010)
- Mason (2009)
- Wagner (2011)
- Oliver/Boyne Valley Springs (2009, 2020; Featherstone, 2021)
- Tiffin (Springwater; 2004; now County forest)

These projects were completed for the NVCA Lands Program and consisted of a memo or short reports with associated ELC figures.

NVCA properties with lesser, but some, natural heritage input include:

- Ravines (some ELC work 2007);
- Moss (wetland delineation/other; 2007/2015)
- Elba Wetlands (2008/2010)

- Pretty River Dke (various vegetation surveys)
- Petun (ELC in support of dam decommissioning 2017/2019; garlic mustard)
- Utopia (wetland delineation; ELC start; 2019)
- Osprey (minor survey work initiated 2007/2009)
- New Lowell (water quality in support of dam maintenance 2011)

Regarding other public lands, support and input has been provided for several municipal and provincial park plans. These include:

- Springwater Provincial Park (2016)
- Wasaga Beach Provincial Park (management plan, ongoing)
- Ardagh Bluffs (City of Barrie; 2007)
- Little Lake (City of Barrie; 2005-2007)

Most of this input has occurred within existing budgets. The Baker Property in the Town of Mono is an exception where the Town funded NVCA staff to undertake a suite of natural heritage studies in support of property purchase and management as outlined in the NVCA authored report to the Town of Mono (Featherstone and Ockenden, 2013).

3.3.2 Challenges and Opportunities

Natural heritage inventories are incomplete, absent or dated for many NVCA properties. Of 25 total NVCA property areas assessed, only seven properties have full ELC mapping with a few properties in progress. For example, the Osprey Wetlands properties might warrant consideration for a NH inventory given extent of NVCA holdings and likely variety of natural heritage features and functions. In addition, the Utopia Conservation Area is another area for consideration. The provincial direction focusing on conservation authority lands management may provide an opportunity to concentrate efforts on these properties.

3.4 Natural Heritage Monitoring

The NVCA natural heritage monitoring is subdivided into: 1) watershed characterization monitoring and 2) performance and compliance monitoring.

Watershed Characterization Monitoring

The NVCA watershed monitoring program was initiated in 1996 following the identification of environmental monitoring as a core priority of the NVCA in its Board-approved Watershed Management Plan. The initial focus was on stream health via benthic monitoring and surface water quality work with segue into terrestrial and wetland work in 2003.

Bird Monitoring: Forest bird monitoring has been conducted annually at the Tiffin CA since 2005 as per a recommendation of the Tiffin CA management plan. It is completed as per the Ontario Forest Bird Monitoring Program protocol. Results have been used to produce the Tiffin Conservation Area Forest Bird Monitoring Program: 2005 to 2018 report (Mills et al, 2018) and to contribute to the provincial program data set. This report evaluates long-term patterns in forest bird diversity within the

conservation area and broader physiographic setting, and provides a resource that can assist in guiding future management of the conservation area as well as a resource for identifying forest bird trends.

Marsh bird monitoring has been conducted annually in Minesing Wetlands and Marl Lake since 2008. The Minesing Wetlands survey has been generally been a staff-driven effort (exception 2020 where Friends of Minesing Wetlands undertook the work) and follows a recommendation from the Minesing Biological Inventory Report. The Marl Lake survey has historically been undertaken on a volunteer basis with data internally captured but has recently become part of permanent staff workflows. Monitoring at both sites is undertaken as per the Marsh Monitoring Program protocol. This program is a binational program aimed at monitoring marsh birds in the Great Lakes basin and NVCA staff continue to provide data to Birds Canada (one of the binational partners) each year.

Incidental records of birds are commonly obtained through other monitoring program efforts and planning program site visits.

Herpetofauna Monitoring: Herpetofauna (amphibians and reptiles) is not a formal component of the current NVCA natural heritage monitoring program; incidental sightings of herpetofauna observed while undertaking other aspects of natural heritage program work are recorded. Occasionally, a more formal survey/data review is undertaken and include:

- Collingwood amphibian survey (April 2013) – in part to support Collingwood NHS findings.
- Hockley Valley Provincial Nature Reserve – working with NEC in 2006 to identify potential vernal pools and reconfirm presence of Jefferson Salamander (Endangered).
- Pretty River Provincial Park vernal pool survey (2007) to identify potential habitat for amphibians including Jefferson Salamander (which were confirmed based on this information by MNRF staff in 2015).
- Ongoing documentation of western chorus frog (federal Species of Concern) within the watershed via incidental sightings, personal observations and report records.

Vegetation: Formal vegetation surveys are not currently undertaken as part of the natural heritage program. Informal work consists of documenting rare vegetation communities present within the watershed including: Great Lakes Coastal Marsh (Collingwood and west Wasaga Beach), tallgrass communities (Wasaga Beach, Barrie), sand dunes (Wasaga Beach) and others. Rare species are also documented as part of ongoing natural heritage program work and through planning program site visits.

Species At Risk: Although these species are associated with the mandate of the Ministry of Environment, Conservation and Parks (MECP); historical, NVCA-assisted SAR work consisted of:

- Forked Three-awned Grass (part of recovery team)

- Jefferson Salamander (as per above; past participation in recovery team)
- Eastern Prairie-fringed Orchid (monitoring/partnering with Province and Nature Conservancy Canada)
- Spotted Turtle (two watershed locations)
- Hine's Emerald – associated studies (groundwater/ecology) and input into recovery plan
- Western chorus frog (as per above with input into provincial and federal deliberations)

Input also includes data submitted in support of the Forest Bird Monitoring Program and the Marsh Monitoring Program, which often includes bird SAR data within the larger suite of data collected.

Invasive Species: The program's current role is to provide information upon request to watershed partners and residents and support watershed partners with monitoring and control as capacity permits. Historical invasive species work consisted of the following:

- Invasive species work began in 2003 with documentation and removal of garlic mustard from the periphery of its core population at Tiffin CA which is ongoing. Dog strangling vine, also identified at Tiffin CA, has been mapped with past control by NVCA Forestry staff.

- A broad survey of garlic mustard was undertaken along 109 km of the Bruce Trail in 2009. This led to control efforts by various parties including the Nature League Collingwood/NVCA at Petun CA from 2011 to 2016.

- Dog strangling vine was identified by NVCA staff along the North Simcoe Rail Trail proximal to Minesing Wetlands in 2008 and Simcoe County Forestry controlled this species on their lands (Charcoal Tract) along the trail. Nature Conservancy Canada has also assisted with control efforts here.

- Phragmites:
    - Non-native Phragmites was identified and mapped along the periphery of Minesing Wetlands from 2009-2015. Nature Conservancy Canada has assisted with control efforts here.

    - A significant shoreline mapping and control effort was undertaken along the Town of Collingwood shoreline between 2015 and 2021 with the Town, Blue Mountain Watershed Trust (BMWT) and Georgian Bay Forever as key partners with funding from various sources. BMWT continues to be interested in control here.

    - Monitoring (and some control) continues within the City of Barrie. NVCA has worked with Dr. Rick Irvin, Jim Karagatzides (Georgian College) and others to map/control Phragmites at several locations including Dunsmore/Georgian College Wetland, Little Lake and Bear Creek Wetlands. 2020 report for Bear Creek Wetlands at

https://www.nvca.on.ca/Pages/Phragmites-Infestation-in-Bear-Creek-Wetland.aspx

- Giant hogweed and wild parsnip have been tracked to some extent in the watershed since at least 2009. Historically, Watershed Science staff have assisted the Town of Collingwood with giant hogweed control along the Oak Street Canal (including into Harbourview Park).

- NVCA "discovered" and are also informally tracking *Glyceria maxima* (exotic manna grass; major Minesing Wetlands infestation) and two *Miscanthus* (Silver Grass) infestations: one associated with George Johnston Road/Snow Valley Road and another along Innisfil Beach Road west of Hwy 400.

Performance/Compliance Monitoring
NVCA staff review planning and permit applications each year. Many of these applications require mitigation to reduce and avoid impacts to natural heritage features and functions. Occasionally, offsetting (also referred to as compensating) of impacts is required to achieve no net loss of features and functions. From a compliance perspective, monitoring allows the opportunity to assess whether mitigation/restoration/offsetting commitments made by project proponents during the permitting and planning process have been carried through and if the project has succeeded in its objectives. Although this is an important component of development and stewardship works, it is not always implemented.

3.4.2 Challenges and Opportunities

The current NVCA natural heritage monitoring program consists of only three formal annual monitoring efforts focusing exclusively on bird monitoring, including one that has been volunteer-based in the past. It also consists of a variety of less formal, one-time efforts that are important for the understanding of watershed science but have less value in terms of understanding watershed trends in terms of biodiversity and response to watershed stressors over time.

The lack of an integrated data management system limits the usefulness and applicability of the data across different business units and multi variable analysis including integrated watershed management, subwatershed planning, etc. There is an opportunity to address this by building on the existing program and drawing from other CA program examples and various Citizen Science initiatives. Further, existing monitoring data is stored in various business units predominantly in MS Excel with no centralized spatial data management system existing for the natural heritage program. The spatial database should be set up to facilitate data extraction for other purposes, including supplying data and information to external parties via an open source data portal.

Regarding performance and compliance monitoring and particularly with regard to planning/permitting works, NVCA staff often note an inability to perform compliance monitoring in support of permit and planning approvals due to staff and resourcing

constraints. Further, follow-up monitoring to assess effectiveness of mitigation/restoration/offsetting is seldom undertaken with the aggregate sector a possible exception where this type of reporting is required under provincial legislation/requirements.

The capacity to undertaken performance and compliance monitoring could be done as a fee for service. Historically, Watershed Science staff have been contracted to undertake performance monitoring in support of municipal wastewater treatment plant operations (typically benthic monitoring at WWTP outfall, impact, recovery and control stations) as well as similar development monitoring (Spring Lakes, Snow Valley). Should proponents be responsible for monitoring their own works (i.e. natural channel design, wetland creation) and submitting reports to NVCA or is there an opportunity, as per above, to bring NVCA staff in with appropriate funding to undertake this work on their behalf.

3.5 Program Communications

Previous communication avenues for natural heritage have been focused on the report card format. Initially released in 2007, this effort includes general descriptions and detailed accounts of forest conditions, stream health and wetland conditions associated with each subwatershed. This is a vehicle to communicate watershed health (land and water) to the public which supports reporting on Conservation Ontario's land and water conservation objectives and serve as management and evaluation tool for Conservation Authorities (CAs) and other resource management agencies. Three rounds of watershed report cards have been completed in 2007, 2013, and 2018 (NVCA, 2007 et al).

Separate from the Conservation Ontario report cards, the the "NVCA Health Checks" were released in 2013 to better represent the watershed science and as the principle internal watershed communication tool. In addition to the information and categories reported on in 2007, new sections were added associated with groundwater and stewardship and trends for forests, wetlands and stream health.

The 2018 effort corresponded to the production of the Conservation Ontario report card for the NVCA watershed as well as the more detailed health checks. Trends were reported for wetlands and stream health but not for forests due to lack of an updated forest/land use mapping layer. Similarly, the ability to report on natural riparian cover and wetland buffer was hampered by lack of an updated land use mapping layer.

The report card format has been employed for specific catchment and physiographic features and includes the following products:

- Bass Lake (2008) and Orr Lake (2012) report cards in partnership with local cottage associations interested in the lake health and protection. As well as a review of stream health, forests and wetlands within the respective watersheds, focus was on lake water quality and review of lake shoreline

conditions with recommendations as to how to enjoy the lake while keeping it healthy. The Orr Lake effort included discussion of groundwater.
- In 2010, NVCA worked with LSRCA and the Oro-Medonte Environmental Group Advisors to produce a report card for the Oro Moraine – a significant glacial landform eventually draining via various watercourses to Lake Simcoe, the Nottawasaga River and Severn Sound. Forest, stream health, wetland and groundwater conditions were reported on as well as stewardship.
- NVCA worked with the Conservation Authorities Moraine Coalition in partnership with the Greenbelt Foundation in 2014 and 2015 to develop reporting for the NVCA portion of the Oak Ridges Moraine and contiguous Greenbelt which include two of NVCA's subwatersheds: Innisfil Creek (Bailey Creek and Beeton Creek catchments) and the Upper Nottawasaga River. This including reporting on forest conditions, surface water quality, groundwater and coldwater fish/stream temperatures. Information and analysis were included in the broader Oak Ridges Moraine report as well as in a stand-alone NVCA report.
- In 2016, NVCA worked with the Blue Mountain Watershed Trust to develop a report card for the Silver Creek watershed (Blue Mountain subwatershed). This included significant field work in support of terrestrial and aquatic reporting. A report card similar to NVCA's health check report was produced as well as a technical report describing field work and findings.
- NVCA staff have historically considered production of Little Lake and Nottawasaga Bay report cards; however, these report cards have not been completed to date

In addition, a number of fact sheets for the public have been completed, including:
- Wasaga Beach Coastal Dunes (2017; Lake Simcoe Georgian Bay Cleanup Fund (LSGBCUF))
- Nottawasaga Bay Water Quality and Shoreline Stewardship (2017; LSGBCUF)
- Collingwood's Globally Rare Coastal Marshes (2015)
- European Common Reed (Phragmites; 2015)
- Controlling Phragmites (2016)
- Ornamental Grasses (2016)
- Invasive Species – Collingwood's Dirty Dozen (2016)
- Giant Hogweed (2009)
- Wild Parsnip (2010)

Some of these factsheets have received updates since original production.

3.5.1 Challenges and Opportunities

Historical program communication efforts have been focused on the development of report-based watershed-wide and geographic-specific reports respectively via website postings. An online presence on the NVCA webpage highlights the various program delivery areas, recently completed reports, etc. These static reports lack the dynamic nature to visualize the integrated data. Further, timely and frequent

reporting provides stakeholders with critical knowledge on program value, information utility, and relevance is required to enhance the brand through the development of an on-going digital presence. Further, the use of blogs, social media releases, and ESRI StoryMaps specifically catered to target audiences is gaining in popularity over the traditional paper or electronic reporting style and can assist in program communications. It is important to maintain and continue long-term monitoring datasets and trend reporting associated with health check categories and associated indicators within this new framework.

4.0 Proposed NVCA Natural Heritage Program

Building on the elements present in other conservation authority natural heritage programs the forward positioning NVCA Natural Heritage program is envisioned to continue with the four previously defined program areas consisting of:

1) development of a Natural Heritage System (including ELC mapping),
2) wetlands (wetland regulations layer and field verification mapping),
3) conservation land inventories, and
4) natural heritage monitoring (watershed characterization monitoring and performance/compliance monitoring), and
5) program communications.

The following philosophies will be used to frame the program's direction per component:

- Builds on the strengths of the past while recognizing the value of current natural heritage monitoring and planning approaches.
- Designed to support integrated watershed management needs and an array of NVCA programs.
- Aims to assist in the NVCA understanding and communication of watershed health as well as the understanding of the watershed natural heritage system and its protection as a means to provide resilience for the watershed and its natural and human communities in the face of climate change.

4.1 Natural Heritage System

A watershed-wide natural heritage system is required for the NVCA as this will allow the NVCA to support our municipal partners in land use planning and conformity requirements and NVCA watershed and sub-watershed planning. Further, a NVCA-wide NHS will assist in addressing IWMP issues and strategies associated with water quality/quantity, flood and erosion, resilient biodiversity/habitats and stressor adaptation (urban growth, agricultural intensification and climate change).

Natural heritage schedules and policies associated with provincial documents including the Oak Ridges Moraine Conservation Plan, Niagara Escarpment Plan, Greenbelt and Greater Golden Horseshoe Growth Plan (GGHGP) will require consideration/consistency as part of NVCA natural heritage system development.

Examples of NHS development from neighboring CAs are outlined below that may assist the NVCA NHS development:

Lake Simcoe Region Conservation Authority (LSRCA): The LSRCA has developed a Natural Heritage System and Restoration Strategy (NHSRS) for the Lake Simcoe watershed (2018). This NHS and Restoration Strategy is an update to the LSRCA Natural Heritage System for the Lake Simcoe Watershed, Phase 1 (Beacon Environmental & LSRCA, 2007).

A GIS approach defined and categorized the NHS into core features, targeted areas that enhance the NHS, and buffers. Core features are those considered critical to the NHS whose protection and longevity are imperative to ecosystem functions and services of the Lake Simcoe watershed. LSRCA land use data, including ELC Community Series data and agricultural/urban/impervious was used as a base for analysis. *https://www.lsrca.on.ca/Shared%20Documents/reports/Natural-Heritage-Systems-Restoration-Strategy.pdf*

The LSRCA NHS system was support by the watershed-scale ELC mapping (https://www.lsrca.on.ca/Shared%20Documents/watershed_elc.pdf). This project is best described as an inventory project in its initial stages, due to the nature of the work in characterizing and inventorying vegetation community types. The project also lends itself to some degree of long-term monitoring, as changes in vegetation cover types can be continually assessed, quantified, and added to the existing inventory over time. It is assumed that this project was initially completed as an aerial mapping interpretation exercise; however, a variety of information sources can be used to continually update, verify, and increase the level of detail in the mapping.

It also represents a valuable internal resource for LSRCA staff, who can consult the mapping to obtain valuable on-the-ground context during the process of reviewing development applications. The mapping is also readily available for external use, contributing to consistency of land cover data during development review processes, including the preparation of environmental studies. Landowners can also consult this resource to identify the natural land cover associated with their property.

Toronto Region Conservation Authority (TRCA): Based on earlier studies analyzing the distribution of species and vegetation communities within its jurisdiction, the TRCA determined that the existing biodiversity within its area of jurisdiction (16% natural cover) would not withstand the impact of projected urbanization in the region. TRCA set targets for quality, distribution and quantity of natural cover that would contribute to sustainability of the region. To achieve these targets would require an expansion of the existing natural heritage system. TRCA (2007) used predictive modeling based on a staff-developed raster-based model to assist in determining the appropriate placement of the expansion of the system to most

efficiently meet the targets. Land cover used in analysis consisted of four broad categories of natural cover: forest, successional (which was included with forest when evaluating natural cover), wetland, cultural meadow, and shoreline habitats such as beach, dune, or bluff. Urban and agricultural cover was also digitized as two broad land use categories. Designing the targeted TNH system involved dividing the entire landscape into a grid of cells, or "pixels". In this case, the pixels are 10 x 10 meters. *https://trca.ca/conservation/lands/terrestrial-natural-heritage/*

Credit Valley Conservation (CVC): CVC undertook a Credit River Watershed Landscape Scale Analysis circa 2011 as part of their "Towards a Natural Heritage System for the Credit River Watershed" initiative. Watershed ELC Community Series polygons were aggregated into habitat patches, defined as areas of contiguous natural and semi-natural cover within the watershed. NVCA staff note that this aggregation is similar to NVCA's early municipal NHS efforts. Nine criteria were used in the Landscape Scale Analysis. Further to this effort, CVC developed a NHS consisting of three components:

- natural heritage features: valleylands, wetlands, woodlands, aquatic habitat, Lake Ontario shoreline, significant wildlife habitat, and habitat of endangered species and threatened species.
- natural heritage feature buffers.
- natural heritage areas: Centers for Biodiversity containing concentrations of high-quality natural heritage features these areas are important for supporting native biodiversity in the watershed over the long term. NVCA staff note that a "Centre for Biodiversity" was identified in NVCA's Collingwood NHS effort. *https://cvc.ca/wp-content/uploads/2015/12/CRWNHS-Phase-3-Natural-Heritage-System-methodology_2015-10-02-FINAL.pdf*

It is noted that the Natural Heritage program will be identifying the methodology to be used towards the development of a NVCA NHS based on the review of various NHS approaches.

4.2 Wetlands

Wetlands Regulation Layer

Operationally, the wetland regulation area will continue to be updated as various new, vetted information becomes available as supported by field-based mapping and detailed orthoimagery interpretation and as incorporated into regularly updated wetland working files.

Field verification mapping of wetlands

The broader wetland mapping updates based on updated orthoimagery review are required on a five-year basis to support watershed health reporting and to support

the NVCA wetland regulation mapping. Detailed wetland evaluation work, as outlined below, provides a more detailed analysis of wetland polygons within and proximal to the wetland under evaluation. This detailed mapping refinement contributes to the accuracy of the NVCA wetland regulation layer.

Priority wetlands for evaluation have been identified on a subwatershed basis. Based on the wetland assessment provided in recent NVCA reporting (Featherstone, 2021), the following ten wetlands were identified as the highest priority for assessment within the NVCA jurisdiction.

1. Midhurst Swamp (evaluated non-PSW)
2. Copeland-Craighurst-Guthrie (evaluated PSW)
3. Minesing Wetlands (Minesing Swamp; evaluated PSW)
4. Phelpston Swamp (evaluated non-PSW)
5. Tiffin Swamp (evaluated PSW)
6. Willow Creek-Little Lake Wetland (evaluated PSW)
7. Melancthon Wetland Complexes (Upper Pine and Upper Mad subwatersheds; evaluated PSW and non-PSW)
8. Upper Boyne and Primrose Wetlands (unevaluated wetland complexes)
9. Glencairn Wetland Complex (evaluated non-PSW)
10. Bailey Creek Swamp (evaluated non-PSW)

NVCA staff have identified the need to evaluate these prioritized wetlands over time using the Ontario Wetland Evaluation System (OWES; MNR, 2013) methodology to fully map their extent, determine their level of significance and submit to MNDMNRFfor review/approval to aid in their protection and to inform future planning endeavors. It is anticipated that one of these wetlands will be evaluated each year by NVCA staff.

4.3 NVCA Conservation Lands Inventories

It is recommended that one NVCA property per year be identified for natural heritage inventory work as prioritized with the NVCA Lands program. Further, a subset of NVCA properties should be considered for longer term annual monitoring and include aquatic monitoring as well as forest/wetland associated monitoring. This inventory and monitoring efforts on conservation lands is in alignment with the current provincial direction toward lands management of a core CA mandate.

Watershed Science staff note the need for updates of key documents within the Minesing Wetlands, in particular the Minesing Biological Inventory (Bowles et al., 2007) and Minesing Forest Decline report (Rootham and Featherstone, 2014). The Minesing Biological Inventory is more than a decade old and could be updated with a variety of data gathered by NVCA staff (and others including NCC) since that report was published.

This work of CA Lands inventories and monitoring will assist in addressing IWMP issues and strategies associated with water quality/quantity, flood and erosion,

resilient biodiversity/habitats and stressor adaptation (urban growth, agricultural intensification and climate change). This work will also assist NVCA Lands with management planning and is in keeping with recent provincial direction regarding CA land management.

4.4 Natural Heritage Monitoring

Natural heritage (NH) monitoring can provide a great deal of information on the functionality and quality of habitats within a watershed. As with most monitoring programs, data collected through monitoring can help to inform land-use planning decisions. Identifying such features may result in greater protections through formal acknowledgement on land use planning schedules.

As part of development of a NH monitoring strategy for the NVCA, it is prudent to review external examples of the questions and data gaps being addressed by other CAs through NH monitoring. The following section highlights examples of NH monitoring work being completed by other CAs with review designed to be consistent with broader NVCA Monitoring Strategy review of other CA programs. Each review includes a summary of an existing NH monitoring program, the purpose behind the monitoring, and the potential benefits and links to other program areas at that respective CA.

4.4.1 Other CA NH Monitoring Programs.

LSRCA – Ecological Land Classification Mapping
Similar to the NVCA, LSRCA's watershed is on the northern edge of the Greater Toronto Area [GTA], and is experiencing a similar degree of development pressure. One noteworthy initiative undertaken by LSRCA is the mapping of vegetation cover across the entire watershed.
https://www.lsrca.on.ca/Shared%20Documents/watershed_elc.pdf

This project is described as a watershed-scale vegetation cover mapping exercise using a standardized classification scheme outlined in the Ecological Land Classification (ELC) System for Southern Ontario (Lee et al., 1998). This is a standardized approach to characterizing land cover in Ontario,

The project lends itself to some degree of long-term monitoring, as changes in vegetation cover types can be continually assessed, quantified, and added to the existing inventory over time. This project was initially completed as an aerial mapping interpretation exercise; however, a variety of information sources can be used to continually update, verify, and increase the level of detail in the mapping.

This project was used to inform and developed the LSRCA Natural Heritage system. It also represents a valuable internal resource for LSRCA staff, who can consult the

mapping to obtain valuable on-the-ground context during the process of reviewing development applications. The mapping is also readily available for external use, contributing to consistency of land cover data during development review processes, including the preparation of environmental studies. Landowners can also consult this resource to identify the natural land cover associated with their property.

CLOCA – Wildlife Monitoring Program
Central Lake Ontario Conservation Authority (CLOCA) has a relatively small watershed jurisdiction that encompasses the urban/rural interface associated with several growing municipalities on the eastern edge of the Greater Toronto Area (GTA). CLOCA has a fairly diverse and dynamic NH monitoring program, including several long-term oriented programs focused on monitoring wildlife.
http://cloca.ca/resources/Monitoring%20reports/Wildlife%20Monitoring%20Program_Durham%20Logo.pdf

CLOCA's long-term wildlife monitoring programs take place on CA-owned lands and other publically-accessible locations. The programs note that monitoring wildlife populations can provide a great deal of information on the functionality and quality of habitats within a watershed. These programs can identify significant changes over time in wildlife populations, which can often be indicative of landscape-scale impacts, such as habitat fragmentation. Early identification of such issues is particularly important in fast-growing regions around the GTA.

As rationale for its NH monitoring programs, CLOCA states: "The information gathered through these programs enables CLOCA to better understand the existing conditions within a watershed, determine ecological trends over time, and provide guidance to planning agencies to assist them in making informed land-use decisions" (CLOCA, 2013). Examples of CLOCA's wildlife monitoring programs include:

- *Forest Bird Monitoring Program*: CLOCA maintains a long-term bird monitoring program in two of its larger conservation areas, with 3-5 monitoring stations in each route. The Forest Bird Monitoring Program (FBMP) protocol, a standardized approach to monitoring forest birds created by the Canadian Wildlife Service, Environment and Climate Change Canada is used for monitoring.

- *Durham Region Coastal Wetland Monitoring Project*: This is a long-term monitoring project targeting marsh bird and amphibian activity in coastal marsh areas, using standardized protocols derived from the Marsh Monitoring Program, a Bird Studies Canada initiative. CLOCA maintains monitoring stations at nine different coastal marsh locations, five of which are monitored annually by CLOCA staff, and the remainder of which are monitored by volunteers.

- *General Breeding Bird Monitoring*: This is an inventory type program developed to characterize bird habitat quality/quantity throughout CLOCA's jurisdiction. Using standardized Ontario Breeding Bird Atlas protocols, a series of roadside points are monitored rotationally for bird activity, with changes in habitat functionality assessed over time.

- *Salamander Cover Board Monitoring*: This is a scoped monitoring project aimed at evaluating salamander diversity within two of CLOCA's properties. The project involves strategic placement of cover boards within candidate salamander habitat, and periodic monitoring of the boards to determine if any salamander species are present.

As with most monitoring programs, data collected through wildlife monitoring can help to inform land-use planning decisions. Properly designed monitoring programs may help to identify features and locations of high ecological sensitivity (e.g. presence/absence of Species at Risk). Identifying such features may result in greater protections through formal acknowledgement on land use planning schedules.

Ganaraska RCA – Terrestrial Natural Heritage Strategy
This strategy was development in October 2013 and became a component of the Watershed Monitoring Plan in 2014 which stated a need for an integrated approach to monitoring.

Section 8.6 in the Watershed Monitoring Plan outlines the Terrestrial Natural Heritage component which includes:
- ELC mapping (initially constructed using 2002 imagery and since updated)
- Monitoring in support of the Durham Coastal Wetland Monitoring project (as per CLOCA)
- Amphibian surveys – wetland and roadside wetland surveys as per MMP (modified for roadside)
- Bird surveys – using FBMP at one conservation area and roadside surveys (modified FBMP)
- Invasive plant surveys on public lands (for input into EDDMapS (provincial invasives mapping)
- Road impacts on wildlife (mortality surveys)

A brief search for implementation of the strategy, including review of the 2018 Watershed Monitoring Report, suggests that the full strategy has not been implemented to date though ELC work has been completed and monitoring in support of the Durham Coastal Wetland Monitoring project (two wetlands) has continued. Forest bird monitoring at two sites has been implemented.

Conservation Halton - Long-term Environmental Monitoring Program (LEMP; 2005)
The CH factsheet notes the following elements associated with the terrestrial monitoring portion of the program:

- ELC mapping
- Forest health monitoring using EMAN plot protocols including shrub/sapling regeneration and ground cover subplots
- Plethodontid salamander monitoring (red-backed salamander and possibly four-toed salamander)
- Bird surveys (FBMP for forests, MMP for marshes)
- Amphibian surveys (MMP)

Conservation Halton conducted marsh monitoring at eight sites in 2016.
Their Ecological Monitoring Protocols document (2017) provides a highly detailed look at associated monitoring protocols including a variety of indices used to assess the data collected. It also delves into "performance monitoring" and consideration of Significant Wildlife Habitat.

CVC – Integrated Watershed Monitoring Program (1999)
One of the first integrated watershed monitoring initiatives in Ontario, this program includes monitoring of: climate (8 stations), groundwater (15 stations), forests (30 stations), wetlands (30 stations) and streams (95 stations) that are monitored annually or bi-annually. Stations are established throughout the watershed and stratified into upper, middle and lower watershed areas based on a combination of subwatershed and physiographic boundaries. Urban and rural land uses also play a role in stratifying station establishment.

Assessment of forests includes analysis of plant, birds, amphibians, soil conditions, tree health and dead wood. Assessment of wetlands includes analysis of plants, frogs, tree health and dead wood. Indices of Biotic Integrity are used to assess collected data.

4.4.2 Proposed NVCA NH Monitoring Program

The NVCA natural heritage monitoring program is presently limited to forest bird monitoring at the Tiffin CA and marsh bird monitoring in Minesing Wetlands and Marl Lake although informal program components consist of vegetation, herpetofauna, invasive species, and species at risk monitoring.

At present, it is envisioned that the core natural heritage monitoring will focus on the continuation of the forest and marsh bird monitoring as well as informal monitoring of watershed flora and fauna including invasive species. These efforts will be led internally and will be complemented by various citizen science endeavors to augment the data collection and integration to support data visualization, watershed planning, and resource management. Bird monitoring will assist:

- To better track wildlife trends in the face of stressors such as urban growth, agricultural intensification and climate change
- To support NVCA IWMP, Strategic Plan and Business Plan goals and objectives
- To support broader provincial, federal and international initiatives

Regarding invasive species, the natural heritage program should continue to provide best-available invasive species science to watershed partners and residents and engender these important community partnerships through various means including: partnership building, provision of invasive species science (including appropriate control methods), potential monitoring services (mapping of invasive species), and potential assistance with control as capacity permits. Invasive species monitoring may also constitute a component of natural heritage monitoring on priority public lands within the watershed formally through specific protocols or informally through incidental observations while on these lands.

A number of citizen science initiatives may serve as potential key data sources to support natural heritage monitoring, focusing both on flora and fauna attributes in alignment with the Integrated Watershed Management Plan and the Strategic Plan. The MMP and FBMP which NVCA is already involved with could be mined for watershed information and other programs such as EDDS (invasive species), the Ontario Breeding Bird Atlas and iNaturalist could be reviewed for NVCA watershed-specific data. As a next step, the identification of high priority objectives will be required to ensure efficient use of limited resources.

In addition, NVCA has a data sharing agreement with the provincial Natural Heritage Information Centre (NHIC) which holds thousands of records of aquatic/terrestrial Species at Risk and other rare species within our watershed. Currently used primarily for plan review input and occasionally to support the NVCA Lands program, this data could be mined to inform Species at Risk updates for the watershed and assist with watershed communication tools.

An audacious program goal is the expansion of the natural heritage monitoring initiatives. These efforts will be focused on thirteen public land holdings that were identified following a fulsome review of more than one hundred public lands within the watershed (NVCA, provincial, County Forest and some municipal lands) based on subwatershed, municipality, natural heritage features/designations, existing information and, ultimately, monitoring potential (Appendix 1). Each property has a unique set of natural heritage features/functions and will require development of its own natural heritage monitoring program though protocols for individual monitoring components will be standardized and will follow other CA direction. Further, each property will require development of its own monitoring program, using the above components as a foundation. Logistics associated with time/capacity will have to be considered in addition the links to citizen science.

4.5 Program Communications

Moving forward, it is recommended that the Conservation Ontario report card continue to be produced on schedule to contribute to broader watershed reporting across the province. However, it is envisioned that the program will migrate away from the watershed health check approach and embrace data visualization through the use of dynamic dashboard and storyboard map formats on the NVCA website is the principal communication vehicle for the watershed science in a visually descriptive, user-friendly manner.

Examples of this approach can be found at:

- https://trca.ca/watershed-planning-reporting/: The Reporting Hub allows users to interactively explore data at various scales, including by watershed, region, or local municipality. It identifies current conditions by theme, and explains the importance of different environmental indicators for understanding watershed and ecosystem health. It also shows how conditions are changing over time, and where the TRCA is relative to where it wants to be.
- https://www.cloca.com/online-tools: CLOCA uses the ESRI Story Map Series template to walk readers through the watershed ecosystems, which represent the health of the watershed. Each tab on the story map features a Story Map Journal that provides more detail about an ecosystem. This format creates a sequence that makes it easy for readers to follow the story of the watershed monitoring program. It is complemented with the use of embedded dashboards created with Operations Dashboard for ArcGIS and Web AppBuilder for ArcGIS.

It is noted the importance of maintenance and the continuation of long-term monitoring datasets and trend reporting associated with health check categories and associated indicators within this new framework.

Several features/functions of interest within the watershed could be highlighted via factsheets/storybook and could build on the existing factsheet library. These include: species at risk, Areas of Natural and Scientific Interest (ANSIs; Life Science but also Earth Science), tallgrass habitats, and Niagara Escarpment to Canadian Shield corridor.

Also other social media vehicles such as blogs, facebook, etc could be targeted to enhance program brand development,recognition and value added to watershed residents and the public.

5.0 Strategic Next Steps

The proposed NVCA natural heritage program has been developed to directly support the unique needs of the organization and is intended to build upon its past foundation and associated successes and move the program into the future. It focuses on providing exceptional services to the internal NVCA and watershed partners with an ability to support integrated watershed management during forthcoming times of watershed and climate change.

5.1 Program Clientele

In addition to provision of watershed monitoring services, the Natural Heritage program contributes to integrated watershed management via development and monitoring of natural heritage systems and maintenance and updating of the corporate wetland layer. The program works with watershed champions to facilitate invasive species monitoring and control as well as citizen science.

The clients of the NVCA Natural Heritage Program consist NVCA program areas and external clients.

5.1.1 Internal NVCA Program Clients

Planning and regulations is the key internal program that the natural heritage program services support. Secondary program support includes restoration services, education, and lands.

Natural heritage program support to planning and regulations consist of the development and maintenance of key datasets and mapping products to support decision making processes. This is envisioned to be anchored by the natural heritage system and wetland mapping. In addition, there may be an opportunity to capture QA/QC'd data provided in consultants report to aid in the watershed-wide understanding of natural heritage systems.

Support to the lands program will mainly constitute the completion of natural heritage mapping and reporting in support of Conservation Areas/lands management plans. This is envisioned to include mapping of the vegetation to ELC community series along with species list for Conservation Areas (fauna surveys include breeding birds and amphibians).

The development and maintenance of key datasets and mapping products identified to support the planning and regulations program is envisioned to also support the restoration program, allowing focus on targeted and key areas for restoration. Also, continued joint effort is envisioned on invasive species with the natural heritage program continuing to map, model, and manage data on invasive species whereas restoration services focuses on the removal of invasive species.

5.1.2 External Program Clients

The program external clients are envisioned to comprise of the NVCA member municipalities, key provincial ministeries, and non-governmental organizations. Delivery of services is targeted to be completed through various mechanisms ranging from MOUs, special benefitting projects, or opportunitistic funding and associated calls for proposals.

Municipalities: Muncipalities are envisioned to be the most significant external client for the natural heritage program. The services listed below are envisioned as non-

core activities, completed through the MOU process. It is noted core natural heritage program components are identified above to aid in the planning and regulations program support. The key program service areas to the NVCA member municipalities is targeted to consist of the following:

Terrestrial and Integrated Ecosystem Planning:

- Natural heritage system development and implementation to support land use planning, EA planning, watershed planning, restoration planning, and municipal comprehensive review processes.
- Research and communication of best management practices for natural system and ecosystem protection and restoration, natural system planning and other natural heritage and aquatic habitat initiatives in support of municipal plans and strategies.
- Support incorporating natural assets into asset management planning.

It is noted that a watershed natural heritage system, although a potential future cornerstone of the NVCA natural heritage program, will only be as strong as its incorporation within municipal planning documents and processes. If not incorporated, it will remain a useful internal tool but will have little bearing on plan and permit review. Further and fundamentally, it is envisioned the development of a NVCA natural heritage system will require county endorsement. If not, at best the NVCA will have a patchwork of lower-tier and upper-tier municipal Natural Heritage Systems, in part based on provincial land use plans such as the GGH Growth Plan and those embodied in the Niagara Escarpment Plan and Oak Ridges Moraine Conservation Plan.

Terrestrial Inventory and Assessment and Monitoring:

- Terrestrial biological inventory and assessment conducted on a site by site basis to inform land use and EA planning process and complement the long-term monitoring data
- Wetland evaluation as per the Ontario Wetland Evaluation System.
- Targeted project-specific monitoring to address specific questions of project concerns such as wetland and upland compensation.
- Watershed performance monitoring of ambient condition measurement to inform resource management decisions, continued long term monitoring at key locations to track, assess, and report on natural heritage/ecology: breeding birds, amphibians, vegetation communities, invasive species, and species at risk.

It is noted that several of these elements are not in current work flow and would require funding from the municipality to achieve sufficient capacity to undertake.

MNRF and MECP: The two key provincial clients for the delivery of natural heritage program services are MECP and MNRF. Principally, the provision of data and information is targeted to be the main program component, e.g. species at risk

data (MNRF), supporting information towards permit to take water applications (MECP), NVCA wetlands data including evaluations for PSW consideration, etc.

Non-Governmental Organizations: It is envisioned that services provided to the NGO sector will be via scoped, special benefitting and funded projects related to the five core program service delivery areas. Two historic examples of this delivery model consists of phragmities removal in Collingwood via funding from Georgian Bay Forever and the development of a report card for Orr Lake and Bass Lake.

Further, provision and receipt of natural heritage data to support the natural heritage monitoring program component is anticipated to be through various NGOs including Birds Canada in addition to building the program citizen science component.

5.2 Short-Term Program Goals

It is envisioned that the natural heritage system will anchor the program along with the wetlands (wetlands regulations mapping complemented by wetland field verification mapping) which will result in a majority of staff time allocation. Tiered, the natural heritage monitoring and the CA natural heritage inventory components will constitute a secondary and reduced amount of staff time respectively.

Specific to the natural heritage program, objective 5 of the 2021-2025 NVCA Business Plan states: implement a natural heritage program for enhanced resource management and aid the planning process. The associated targets consist of:

- Target 1: Continue to update wetland inventories through assessing unevaluated wetlands and woodlands, as well as those with existing, but dated, evaluations. (ongoing)
- Target 2: Establish a watershed-scale Natural Heritage System plan to assist in the plan review process. (timeframe 2021-2022).
- Target 3: Complete a natural capital asset inventory to quantify natural resources needed to maintain or enhance existing ecosystem services and to guide recreational activities on conservation lands. (timeframe 2022).

The short-term program goals consist of:

1. Completion of the watershed-wide land use cover update using recent ortho imagery. This will allow for the potential coarse Community level ELC mapping which will form the basis for the natural heritage system and possibly the natural asset evaluation. This updated land use layer expected to be completed in Q4, 2021.
2. Working with the Dufferin and Simcoe counties develop a natural heritage system either internally or building on the existing NHS products evaluated through the municipal comprehensive review process. It is understood that the Simcoe County NHS review, completed by North-South Environmental, will be finished in Q4, 2021

3. Field-based work includes undertaking one prioritized wetland inventory update identified in section 4.2, working with the NVCA Lands program completing a natural heritage inventory for one conservation authority property per year, and complete the bird monitoring and other monitoring initiatives as capacity permits.
4. Data visualization of key program elements completed through story board maps and dashboards.
5. Business development to support performance and compliance monitoring and other program growth areas. This could include potential private sector funding of monitoring efforts as per previous biomonitoring in Snow Valley and Spring Lakes and also compliance/performance monitoring of mitigation measures associated with approved development
6. Offsetting and enhancement of wetlands through the use of the approved NVCA wetland offsetting compensation guidelines.

5.3 Bill 108/229 Implications

Bill 108 and 229 introduced mandatory and non-mandatory programs and services related to Conservation Authority delivery. In support of this, the Province has released a 'consultation guide' for developing the final regulations - not the regulations themselves. This document is titled Regulatory Proposal Consultation Guide: Regulations Defining Core Mandate and Improving Governance, Oversight and Accountability of Conservation Authorities (released in May, 2021; https://conservationontario.ca/policy-priorities/conservation-authorities-act). As presented, the components of the natural heritage program are considered to be a non-mandatory program which will require agreements with participating municipalities to fund non-mandatory programs and services with municipal dollars (it is presently funded through municipal levy). Further, the consultation guide identifies:

1. Mandatory Programs and Services that would be incorporated in the strategy including Land Management for the Protection of Natural Heritage and anticipated to incorporate natural heritage inventory on CA lands.
2. Non-Mandatory Programs and Services on Behalf of a Municipality including invasive species management and natural heritage mapping,
3. Non-Mandatory Programs and Services an Authority Determines Are Advisable including Ecological Monitoring Outside of Conservation Authority Owned Land.

It is envisioned that this document will help solidify the program's objectives, roles and responsibilities in advance and in support of the MOU development. It is also recognized that the Bill 108 regulations could impact the delivery of the natural heritage program, especially the non-mandatory program components.

Regardless, it is noted that the Simcoe County MCR is progressing with the development of natural heritage system, Dufferin County partnered with the

Greenbelt Foundation to undertake a natural asset inventory project, etc.; supporting dynamic progress forward in light of Bill 229/108 ramifications.

5.4 Program Resources

Strategic and annual work planning will be dependent on program funding recognized as per Bill 108/229 and associated staff capacity in addition to external factors. The delivery of the current natural heritage program is based on 0.5 full time equivalency of the senior ecologist with limited input from the planning ecologist. The current program delivery is focused around wetlands: wetland regulation layer complemented by wetland field verification mapping and limited natural heritage monitoring focused on forest and marsh bird monitoring.

There is limited opportunity at current staffing capacity to fulfill a significant subset of the program components. For example, recommended expansion of annual natural heritage monitoring across the watershed, while an important objective for integrated watershed monitoring and management, cannot be fully implemented at existing staff capacity. As identified in the short-term program goals, key targeted area with the current capacity is the development of a watershed-based natural heritage system, built upon by the Community Series ELC mapping. Expansion of program capacity is not positively envisioned in the current Bill 229/108 climate. It is noted that the program should remain opportunistic and assess potential funding opportunities and inter agency partnerships for their merit in contributing to this strategy. Avenues to increase program delivery capacity includes strategic partnering, using citizen science to focus integrated natural heritage monitoring results, identifying and focusing on core instrumental and foundational program components (e.g. coarse community level ELC mapping based on the update land use layer), and enhancing data visualization and digital communications to enhance program branding. This strategy will also help cement the program strategic direction to assist in the development of MOUs for non-core program delivery and may identify areas of additional resource allocation.

Program funding is envisioned to be predominantly centered around the municipal levy contributions and will be subject to MOU establishment. For instance, the development of the of watershed wide natural heritage system will be completed using municipal levy. Special benefitting project funding, with the multitude of identified partners, will be opportunistically pursued when aligned with the program vision.

6.0 Conclusions

The NVCA natural heritage program has historically and will continue to service five key program pillars**:** natural heritage system, wetlands, natural heritage monitoring, NVCA conservation land inventories, and program communications. Three natural heritage program tasks were identified in the 2021-2025 NVCA

Business Plan focusing on natural asset inventory, the development of a watershed wide natural asset inventory, and continued wetland evaluation and updating.

Recognizing the implications of Bill 229/108 and the non-mandatory nature of the refocused natural heritage program, innovative and creative opportunities are presented to solidify the vision and mission of the NVCA natural heritage program and associated components.

Key short-term goals of the program are 1) the completion of updated land use layer and the associated coarse-Community level ELC mapping to support the natural heritage systems development, 2) initiate business plan development and communication with key stakeholders in the development of a natural heritage system, and 3) complete ongoing wetland updates and evaluation and monitoring.

Capacity limitations will require creative approaches and associated partnerships to accomplish these short-term goals. Additional program capacity is recognized and required to fulfill the objectives and direction of program delivery as outline in this document. Moving forward, the refocused and strategically aligned NVCA natural heritage program will allow for key Integrated Watershed Management Plans objectives to be meet.

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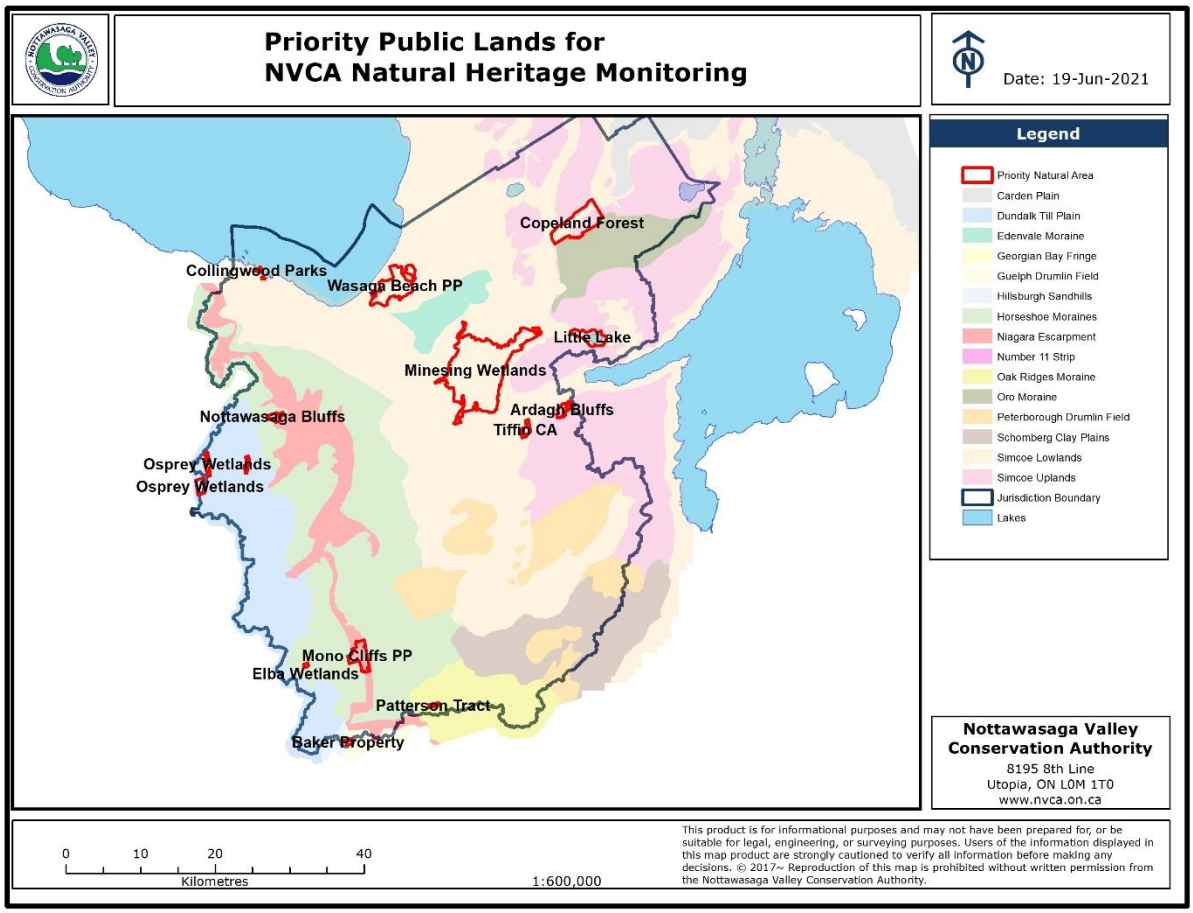
Appendix 1: proposed additional natural heritage monitoring locations on public land holdings

Property	Public Land Type	Subwatershed	Municipality	Physiographic Feature	Rural/ Urban	Comments
Elba Wetlands	NVCA	Upper Nott	Amaranth	Horseshoe Moraines	Rural	High priority from subwatershed, municipality, physiographic and land use perspectives.
Osprey Wetlands	NVCA/ Cty Forest	Mad	Grey Highlands	Dundalk Till Plain	Rural	High priority from subwatershed, municipality, physiographic and land use perspectives.; East and West NVCA properties could be combined with Osprey Wetland tracts (Grey County)
Nottawasaga Bluffs	NVCA	Mad	Clearview	Horseshoe Moraines	Rural	High priority from subwatershed, municipality, physiographic and land use perspectives. Baseline ELC data.
Minesing Wetlands	NVCA/ Cty Forest	various	various	Simcoe Lowlands	Rural (most)	Existing monitoring; High priority from subwatershed, municipality, physiographic and land use perspectives. Inclusive of Miller Tracts
Tiffin	NVCA	Middle Nott	Essa	Simcoe Lowlands	Rural	Existing monitoring. High priority from High priority from subwatershed, municipality, and land use perspectives.

Property	Public Land Type	Subwatershed	Municipality	Physiographic Feature	Rural/ Urban	Comments
Wasaga Beach PP (including Marl Lake, Jack's Lake and Ross's Woods)	Province	Lower Nott/Blue Mtn	Wasaga Beach	Simcoe Lowlands	Urban/ Rural/ Urbanizing	Existing monitoring (Marl Lake). High priority from subwatershed, municipality, physiographic and land use perspectives. Working partnership with Park.
Copeland Forest	Province	Willow (and SSEA)	Oro-Medonte	Oro Moraine and Simcoe Lowlands	Rural but urbanizing	High priority from subwatershed, municipality, physiographic and land use perspectives but note most lies within SSEA; Oro Moraine; Friends of Copeland Forest link. Baseline data via Friends.
Patterson	County Forest	Innisfil	Adj-Tos	Oak Ridges Moraine	Rural	Rare ORM/Innisfil public land holding
Collingwood Parks	Town	Blue Mtn	Collingwood	Simcoe Lowlands (Nottawasaga Bay shoreline)	Urban and urbanizing	High priority from subwatershed, municipality and land use perspectives Town/BMWT interest likely; globally rare veg comms; urban pressure, SAR
Ardagh Bluffs	City	Middle Nott	Barrie	Simcoe Uplands	Urban	Likely City interest, ANSI, SAR; combine with Dyer tract. City Master Plan
Little Lake	City	Willow	Barrie/Springwater	Simcoe Lowlands	Urban, urbanizing	High priority from subwatershed, municipality, physiographic and land use perspectives; City interest; urbanizing;

Property	Public Land Type	Subwatershed	Municipality	Physiographic Feature	Rural/ Urban	Comments
					and Rural	Georgian College tie-in; City Master Plan
Baker Property	Town/ Cty Forest	Upper Nott	Mono	Guelph Drumlin Field	Urbanizing	High priority from subwatershed, municipality, physiographic and land use perspectives. Combine with Hockley tract. Various baseline data.
Mono Cliffs	Province	Upper Nott	Mono	Escarpment	Rural	High priority from subwatershed, municipality, physiographic and land use perspectives.


Priority Public Lands for
NVCA Natural Heritage Monitoring
Date: 19-Jun-2021
Legend
Priority Natural Area
Carden Plain
Dundalk Till Plain
Edenvale Moraine
Georgian Bay Fringe
Guelph Drumlin Field
Hillsburgh Sandhills
Horseshoe Moraines
Niagara Escarpment
Number 11 Strip
Oak Ridges Moraine
Oro Moraine
Peterborough Drumlin Field
Schomberg Clay Plains
Simcoe Lowlands
Simcoe Uplands
Jurisdiction Boundary
Lakes
Copeland Forest
Collingwood Parks
Wasaga Beach PP
Little Lake
Minesing Wetlands
Ardagh Bluffs
Tiffin CA
Nottawasaga Bluffs
Osprey Wetlands
Osprey Wetlands
Mono Cliffs PP
Elba Wetlands
Patterson Tract
Baker Property
Nottawasaga Valley
Conservation Authority
8195 8th Line
Utopia, ON L0M 1T0
www.nvca.on.ca
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