BUFFER WIDTH DISCUSSION PAPER

August 5, 2022

north-south ENVIRONMENTAL

NIAGARA PENINSULA CONSERVATION AUTHORITY

CONTENTS

EXECUTIVE SUMMARY

Niagara Peninsula Conservation Authority (NPCA) is undertaking a review and update of its planning and permitting policies. The update is being undertaken in a manner consistent with the Policies and Procedures for Conservation Authority Plan Review and Permitting Activities (Ontario Ministry of Natural Resources, 2010) and the NPCA Strategic Plan. The current NPCA Policy Document requires review and updating based on change of corporate direction through the new Strategic Plan 2021-2031, on-going partner municipal Official Plan Reviews, changes to Provincial legislation and plans, and recent and pending changes to the Conservation Authorities Act and related Regulations.

Through the Phase 1 report prepared to review policies and undertake a gap analysis, it was recommended that a technical discussion paper be prepared to review buffer policies, and specifically if and how buffer widths should be prescribed in policy. This technical discussion provides a technical analysis of buffers, reviews best practices, undertakes a jurisdictional review of policies related to buffer widths, and reviews decision support tools that are used to inform the determination of appropriate buffer widths. The results of this technical work are intended to provide input into the policy development and potential decision support tools that will be developed within the Phase 2 work plan.

A review of the scientific literature provided clear support for the important benefit and function buffers provide at mitigating impacts, however, there is no consensus on a specific buffer width; rather there are ranges of effective buffer widths where the scientific evidence supports the notion that the wider the buffer, the more effective the buffer is at mitigating impacts. While the science alone does not provide a definitive answer on an appropriate buffer width it can be used in conjunction with targets, such as those tied to improving water quality, to identify an ecologically appropriate buffer that can help achieve targets and the objectives provided in policy documents or strategic plans.

Through the review of best practices and guidance documents it was found that buffer widths are typically determined based on the following factors:

- sensitivity of the feature and ecological functions;
- the potential impact from the adjacent land use;
- biophysical factors of the adjacent lands such as slope, soils, hydrology and vegetation;
- other mitigating factors (e.g., fencing between adjacent land use and buffer); and
- the ability of the buffer to meet objectives set out in policy.

Buffer widths should be informed by environmental studies, rationalized on the basis of the ability of the buffer to protect natural features and their associated ecological functions from impacts from the adjacent land use. While some guidance documents provide a minimum recommended buffer, all guidance documents recognize that the buffer width can be refined (i.e., increased or reduced) as informed by environmental studies. A “one-size-fits-all” approach to prescribing buffers is generally not recommended.

There is general consensus that some types of uses may be permitted within the buffer, however the function of the buffer should be maintained which may require a wider buffer to accommodate the ancillary use (e.g., recreational trail). In addition, infrastructure (e.g., storm water management facilities) that would not be compatible with a buffer (i.e., would reduce the effectiveness of the buffer) should not be permitted within the buffer.

Buffers should be outside of the development zone (i.e., beyond rear lot lines and areas of site alteration) and be vegetated with native species left in a "free to grow" state.

There is no consistently applied buffer width to features in Conservation Authority policy documents, however the following buffer widths to regulated features are most commonly identified:

- 15 m for warm water (Type 2 and 3 fish habitat) watercourses and intermittent streams
- 30 m for cool/cold water (Type 1 fish habitat) watercourses and permanent streams
- 15 m for non-Provincially Significant Wetlands
- 30 m for Provincially Significant Wetlands and locally significant wetlands
- 10 m - 15 m for valleylands
- 30 m for shorelines to lakes and water bodies

It should be noted that the identified buffer widths in Conservation Authority policy documents are generally related to mitigating impacts to water quality and do not necessarily consider impacts to other ecological functions, such as wildlife habitat (e.g., for area sensitive species such as birds). A wider buffer may be needed to effectively mitigate impacts to sensitive types of wildlife habitat.

Prescribing buffer widths that can be refined based on an evaluation of the sensitivity of features and the potential for impacts is considered the most appropriate approach. However, providing a guidance document (e.g., decision support tool) to inform refinements is necessary to ensure an objective and consistent approach is taken to inform ecologically appropriate buffer widths.

There is often disagreement between applicants and approval authorities over ecologically appropriate buffer widths. This is in part due to the lack of definitive science and variability in effectiveness of buffers between features, functions, and the differing objectives of the proponent (e.g., increased developable area) and the approval authority (e.g., high confidence that features and functions will be adequately protected). Therefore, it is imperative that buffer width policies are developed with consideration for achieving objectives and/or targets, are clear, robust, are prescriptive, but also provide some flexibility to ensure buffer width refinements are evaluated through an environmental study. Moreover, a decision support tool will be necessary to ensure an objective and consistent approach is applied to determining an appropriate ecological buffer width.

A decision support tool that follows a risk-based approach provides an opportunity to establish a starting point for a minimum buffer width that is generally increased based on site-specific information, or a robust buffer width that is typically reduced. There is inherent flexibility built into a decision support tool, however, the guidance provided in the decision support tool should be sufficient to ensure an objective, consistent approach to determining an appropriate ecological buffer width is followed that is supported by scientific literature. The

starting point of the robust buffer width, and the increases or decreases to the buffer width should be based on meeting the goals, objectives and targets established through the policy document.

Following a review of the definitions, best practices and jurisdictional review, and review of decision support tools, the following recommendations are provided regarding buffer policies in the NPCA policy document:

1. The term buffer should be defined including providing the purpose of the buffer.
2. Buffer width(s) should be prescribed in policy. The approach to set a minimum buffer or set a robust buffer should be determined by the NPCA Board with consideration of input received through the engagement program.
3. A decision support tool is necessary to inform the refinement to the prescribed buffer width (whether a minimum or robust width starting point).
4. The buffer policies, prescribed buffer width(s) and decision support tool should be developed with consideration of the goals, objectives and targets (if any) for protection, maintenance and enhancement of the natural features and ecological functions.

1. INTRODUCTION

Niagara Peninsula Conservation Authority (NPCA) is undertaking a review and update of its planning and permitting policies. The update is being undertaken in a manner consistent with the Policies and Procedures for Conservation Authority Plan Review and Permitting Activities (Ontario Ministry of Natural Resources, 2010) and the NPCA Strategic Plan.

The NPCA's Planning and Permitting Policies, formally known as the "NPCA Policy Document: Policies for the Administration of Ontario Regulation 155/06 and the Planning Act", was originally approved September 2018 and took effect November 1, 2018. The document was subsequently amended in June 2019 to add lot creation policies and to incorporate housekeeping amendments to the valleyland policies, and was amended again in May 2020 to remove the section dealing with policy variances. It is an important document used by NPCA staff in day-to-day decision making, both with respect to the review of requests for permission under The Conservation Authorities Act as well as in the review of applications by NPCA that are submitted to municipalities for approval under the Planning Act.

The current NPCA Policy Document requires review and updating based on change of corporate direction through the new Strategic Plan 2021-2031, on-going partner municipal Official Plan Reviews, changes to Provincial legislation and plans, and recent and pending changes to the Conservation Authorities Act and related Regulations. At the December 17, 2020, NPCA Board of Directors Meeting, NPCA staff were authorized to commence the Policy Document update and subsequent Procedural Manual projects.

Karen Wianecki, Director of Practice, Planning Solutions Inc., who is a Registered Professional Planner and expert in environmental planning with extensive experience working with Conservation Authorities, was retained to build upon work initiated by NPCA staff in 2021 and complete the Phase 1 policy review and gap analysis. The Phase 1 workplan had a four-fold focus:

1. To review NPCA's current Policy Document and identify policy gaps, deficiencies and inconsistencies with existing municipal policy and provincial policy, legislation and guidelines;
2. To review other Conservation Authority policies (with an emphasis on those in the Greater Golden Horseshoe) to identify good policies and good practices and to identify areas where there are points of convergence and divergence, particularly with respect to wetlands and other natural heritage buffer requirements;
3. To recommend technical reviews/studies as well as mapping/data gaps that would support the development of the new Policy Document; and
4. To develop a seven-month workplan for Phase 2.

The Phase 1 Report summarized in detail a buffer width comparative analysis of Conservation Authority policies in the Greater Golden Horseshoe. The report concluded that there is variation of buffer widths to regulated features across the Conservation Authority policy documents. These differences are reflective of the different watershed-specific landscapes and natural systems, types of land use within the watersheds and

applicable Provincial Plan vegetation protection zones. It was however noted that there is consistency in policies to allow some flexibility to reduce buffer widths subject to the completion of an Environmental Impact Study (EIS) to the satisfaction of the Conservation Authority and in accordance with their guidelines. To inform the review of buffer widths within the NPCA Policy Document that is reflective of the unique characteristics of the NPCA watersheds, it was recommended that a technical discussion paper be prepared to review buffer widths. The results of the technical work contained within the Buffer Width Discussion Paper are intended to inform the policy development that will proceed within the Phase 2 workplan. The NPCA Board of Directors directed staff to proceed with Phase 2 of the Policy Review and Procedural Manual project, including the preparation of a Buffer Width technical analysis and discussion paper.

To that end, the purpose of the Buffer Width Discussion Paper is to undertake a technical analysis of buffers, review best practices, undertake a jurisdictional review of policies related to buffer widths, and review decision support tools that are used to inform the determination of appropriate buffer widths. The results of this technical work are intended to provide input into the policy development and potential decision support tools that will be developed within the Phase 2 work plan.

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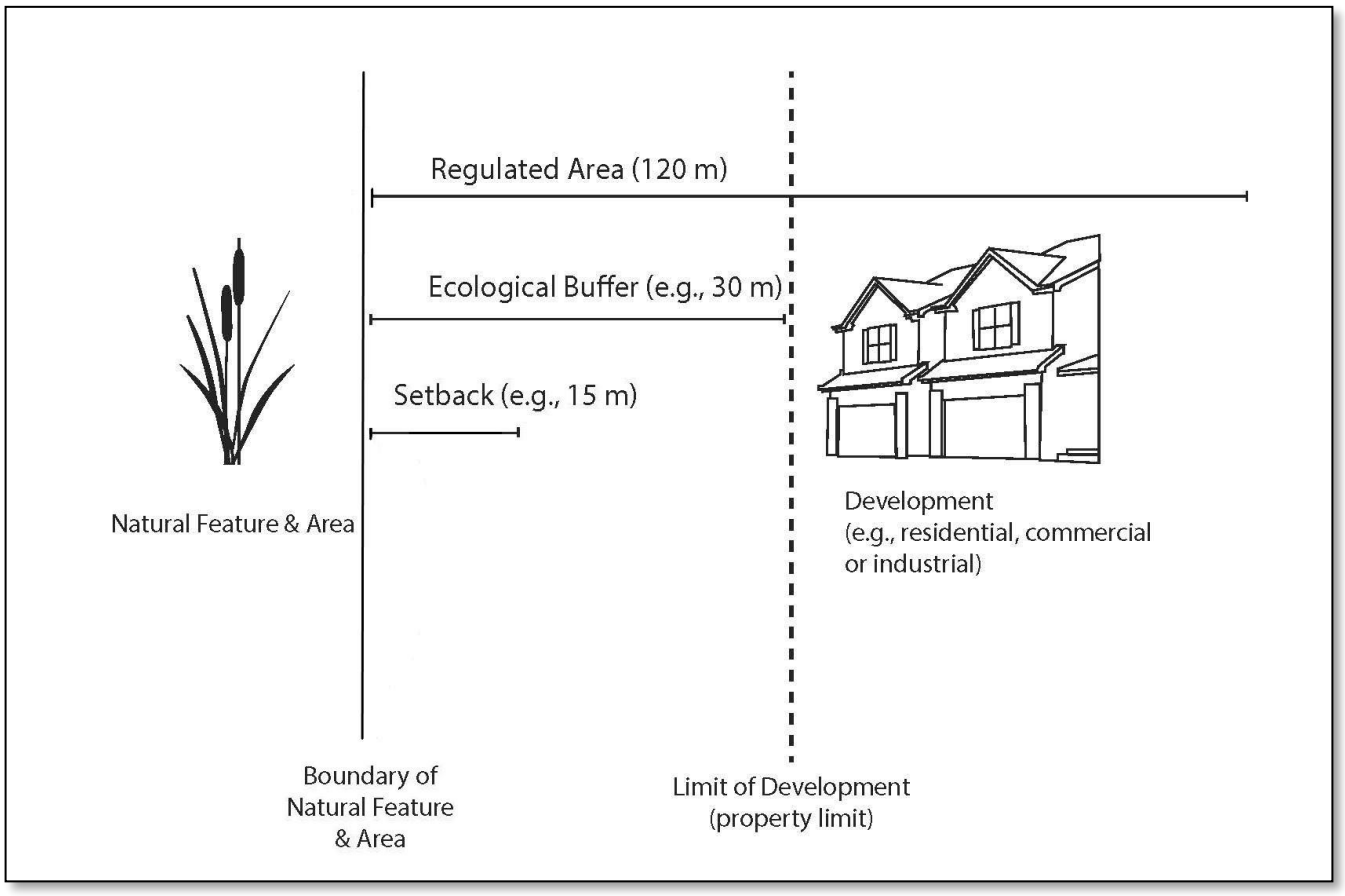
2. WHAT ARE BUFFERS?

In the context of land use planning, it is generally accepted that changes to adjacent lands of regulated features and areas, such as new development adjacent to a wetlands and watercourse should be "setback" from the feature. By definition, a setback is strictly a measured distance from the edge of an identified feature or area. The purpose of the setback is to separate the land use from the feature or area to avoid conflicts, protect property and individuals from natural hazards, allow access/maintenance, and minimize impacts to the natural feature; as such, setbacks form an important part of the regulations implemented through the Conservation Authorities Act. The width/distance of the setback can be determined based on a geotechnical assessment and hazard delineation, ecological buffer zone, rights-of-way and access. Although often used as a synonym for buffer, setbacks are strictly used to describe the minimum required distance between any structure or lot line and a feature and are not necessarily based on ecological considerations. That said, setbacks can include ecological buffers (see **Figure 1**)

An ecological buffer (or simply "buffer") means an area of land located adjacent to a natural feature and area, and usually bordering lands that are subject to development or site alteration. The term buffer is also synonymous with vegetation protection zone, a term used by the Growth Plan for the Greater Golden Horseshoe, the Greenbelt Plan and the Niagara Escarpment Plan, and in some municipal official plans.

Figure 1. Conceptual illustrated example to depict the differences and overlap between the regulated area, an ecological buffer and a setback from development.



Whereas a setback has a range of purposes, the purpose of a buffer is specifically intended to protect the feature and associated ecological functions by mitigating impacts of a proposed development, change in adjacent land use, or site alteration. Where new development is proposed, the width of the buffer and any activities that may be permitted within it (e.g., trails or storm water management ponds) are generally based on the sensitivity and significance of the natural feature and their contribution to the long-term ecological functions as determined through some sort of ecologically and/or hydrologically-based study (e.g., Subwatershed Study, EIS, or other similar study) that examines a sufficiently large area.

Buffers are typically vegetated (and in the case of vegetation protection zones in the Growth Plan for the Greater Golden Horseshoe and the Greenbelt Plan, “shall” be vegetated), whether through planting or natural regeneration.

2.1. Definitions and Purpose of Buffers

2.1.1. Buffers Defined in Conservation Authority Policies

Ontario's Conservation Authorities have been established to maintain the vitality of watersheds and protect peoples' lives and property from natural hazards such as flooding and erosion, as administered through the Conservation Authorities Act (R.S.O. 1990, last amended 2021). The core mandate of Conservation Authorities is to "undertake watershed-based programs to protect people and property from flooding and other natural hazards, and to conserve natural resources for economic, social and environmental benefits" (Conservation Ontario, 2022).

Section 28 of the Conservation Authorities Act provides direction for regulations under the jurisdiction of the Conservation Authority. Pursuant to Section 28 of the Conservation Authorities Act, under Ontario Regulation 97/04, Content of Conservation Authority Regulations under Subsection 28 (1) of the Act: "Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses", each CA has developed individual regulations approved by the Minister that identify and regulate certain activities in and adjacent to:

- hazardous lands,
- wetlands,
- river or stream valleys the limits of which shall be determined in accordance with the regulations,
- areas that are adjacent or close to the shoreline of the Great Lakes-St. Lawrence River System or to an inland lake and that may be affected by flooding, erosion or dynamic beach hazards, such areas to be further determined or specified in accordance with the regulations, or
- other areas in which development should be prohibited or regulated, as may be determined by the regulations. 2017, c. 23, Sched. 4, s. 25.

Regulations for each Conservation Authority set out the area (referred to as the "regulation limit" or "regulated area") within which the regulations can apply, as is the case in O. Reg. 155/06 for the NPCA. In general, permissions (permits) may be granted for development within the regulated area where, in the opinion of the Conservation Authority, the control of flooding, erosion, dynamic beaches, pollution or the conservation of land is not impacted.

Ontario Regulation 155/06 outlines the role, responsibility and regulative power of the NPCA with respect to natural hazards. Ontario Regulation 155/06 states that development is prohibited in or on the areas within the jurisdiction of the NPCA that are or may be:

a) Adjacent or close to the shoreline of the Great Lakes-St. Lawrence River System or to inland lakes that may be affected by flooding, erosion or dynamic beaches;
b) River or stream valleys that have depressional features associated with a river or stream, whether or not they contain a watercourse;
c) Hazardous lands;
d) Wetlands; or

e) Other areas where development could interfere with the hydrologic function of a wetland, including areas up to 120 metres of all provincially significant wetlands and wetlands greater than 2 hectares in size, and areas within 30 metres of wetlands less than 2 hectares in size.

Conservation Authorities often produce a policy or guideline document to support administration of the regulation. The policy document typically provides the principles, objectives, and policies for the administration of the regulations, as well as articulates delegated roles and responsibilities within the planning and approvals process. The purpose of the policy document is to provide guidance for decision-making for Conservation Authority staff, landowners, developers, municipal planners and residents. As is the case with the current NPCA Policy Document: Policies for the Administration of Ontario Regulation 155/06 and The Planning Act (September 2018), the overall objectives of this policy document are to:

1. Provide transparency and clarity in decision-making.
2. Implement the provincial planning framework and clearly communicate policy direction for areas under the NPCA's regulated areas under Ontario Regulation 155/06.
3. Promote collaboration amongst the various agencies and governments within the watershed.
4. Provide a set of implementation policies to manage change within the watershed.

The policies in the document identify setbacks for development adjacent to regulated features and areas. However, in a review of the policy documents prepared by the 36 Conservation Authorities to guide implementation of their regulations, only 25 used the term buffers or required them, and of those, only 11 defined the term buffer (or vegetation protection zone) (see **Appendix A** for summary of the review of Conservation Authority policy documents noting which documents made reference to buffers, and which documents defined the term buffer or vegetation protection zone). It is notable that the Conservation Authorities Act does not use the term buffer or provide a definition.

2.1.2. Buffers Defined in Provincial Plans

2.1.2.1. Provincial Policy Statement (2020)

The Provincial Policy Statement (PPS) identifies significant features that shall be protected by municipalities through official plan policies either prohibiting or restricting development within significant features, and restricting development on adjacent lands. Where development is proposed adjacent to significant features, there is a requirement that there be no negative impacts to the feature and associated ecological functions. However, the policies do not specifically require that buffers be used as a form of mitigation to avoid negative impacts, nor are buffers defined in the PPS. Notwithstanding this, it has become standard practice of many planning agencies to require buffers adjacent to certain features. This is because buffers are widely recognized as necessary to sufficiently protect features and areas and demonstrate no negative impacts on natural features or on their ecological functions.

The Natural Heritage Reference Manual, which was prepared to provide guidance for the implementation of the 2005 PPS, provides the following definition for buffer:

> "an area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to development or site alteration. The purpose of the buffer is to protect the feature and its functions by mitigating impacts of the proposed land use and allowing an area for edge phenomena to continue (e.g., allowing space for edge trees and limbs to fall without damaging personal property, area for roots of edge trees to persist, area for cats to hunt without intruding into the feature). The buffer may also provide area for recreational trails and provides a physical separation from new development that will discourage encroachment. (Adapted from a definition in Fisher and Fischenich, 2000, citing Castelle et al., 1994)"

2.1.2.2. Greenbelt Plan and Growth Plan for the Greater Golden Horseshoe

The Greenbelt Plan (2017) and the Growth Plan for the Greater Golden Horseshoe(2019) define vegetation protection zone as "a vegetated buffer area surrounding a key natural heritage feature or key hydrologic feature".

2.1.2.3. Niagara Escarpment Plan

The Niagara Escarpment Plan (2017) defines a vegetation protection zone as "a vegetated buffer area surrounding a key natural heritage feature or key hydrologic feature within which only those land uses permitted within the feature itself are permitted".

2.1.2.4. Lake Simcoe Protection Plan

The Lake Simcoe Protection Plan (2009) does not define the term buffer nor vegetation protection zone.

2.1.3. Buffers Defined in Municipal Official Plans

Upper-tier, lower-tier and single tier municipalities that are within or close to the jurisdiction of the NPCA have been reviewed as part of this technical discussion paper to compare and contrast how buffers are defined. **Appendix B** compiles the definitions of those reviewed for easy reference.

The new Niagara Region Official Plan, adopted by Regional Council on June 23, 2022, defines buffers as "an area of land located adjacent to natural heritage features and areas, other wetlands, and watercourses and usually bordering lands that are subject to development or site alteration. The purpose of a buffer is to protect the features and areas and their ecological functions by mitigating impacts of the proposed development or site alteration. Buffers shall consist of natural self-sustaining vegetation as a condition of development (except where certain agricultural uses are exempt from the requirement of a buffer)."

Niagara Region's definition is similar to Halton Region's definition for buffer as defined in the Halton Region Official Plan (November 10, 2021 consolidated version); however, Halton Region's definition adds the following text:

> "The extent of the buffer and activities that may be permitted within it shall be based on the sensitivity and significance of the Key Features and watercourses and their contribution to the long term

ecological functions of the Regional Natural Heritage System as determined through a Sub-watershed Study, an Environmental Impact Assessment or similar studies that examine a sufficiently large area".

The Urban Hamilton Official Plan (consolidated version 2021) defines a vegetation protection zone (outside of the Greenbelt Plan area) as "a vegetated buffer area surrounding a Core Area which is of sufficient size to protect the features and functions from the impacts of the proposed change and associated activities that will occur before, during, and after construction. Where possible, the buffer should restore or enhance the features and/or functions of the Core Area. The width of the vegetation protection zone is to be determined when new development or site alteration is proposed within the adjacent lands to the Core Area".

The Haldimand County Official Plan (2009) does not define the term buffer or vegetation protection zone, although a 15 m buffer is required from warm water streams or Type 2 and Type 3 fish habitat, and a 30 m buffer is required from cold water streams or Type 1 fish habitat.

2.2. Ecological Function and Role of Buffers

The Natural Heritage Reference Manual identifies the following functions and benefits of buffers in Table 13-1, as follows:

- **Reduction of encroachment** - encroachment into natural features is a common impact associated with residential development. Buffers provide some area for minor encroachment without affecting actual features. Buffers, which may contain trails, are often public spaces; therefore the public may exert pressure to maintain the natural feature in good condition, further reducing the likelihood of encroachment from adjacent properties.
- **Reduction of light and noise** - the physical separation of development from a natural feature reduces the penetration of light and noise into the natural feature. This will be further reduced if the buffer supports dense vegetation.
- **Space for tree-fall** - where development abuts natural features, residents have asked municipalities to remove or prune edge trees that may be hazardous (i.e., in danger of falling) in order to preserve fences, outbuildings, etc. located in rear yards. Buffers that are approximately equal to the height of the canopy provide an area for tree fall to occur, thus preserving natural edge functions and reducing maintenance costs for the managing agency.
- **Protection of root zones** - The extent of root systems is highly variable, even among trees of the same species, and varies according to soil moisture, wind stress, companion species, land use, etc. Large buffers (in the range of 30 m from the drip line) probably capture most root systems and enhance long-term tree health.
- **Enhancement of woodland interior** - Although buffers should not become part of the feature, they will, if vegetated with shrubs or trees, extend the functional edge of a woodland, thus enhancing the development of interior conditions.
- **Allowance for hunting habits of cats and dogs** - Domestic pets, especially cats, have a significant impact on bird, small mammal and possibly amphibian populations. Cats' home ranges are not large

(Kays and deWan, 2004), and buffers will provide some of the required area, reducing impacts on natural features.

- **Location for trails** - Buffers provide locations for trails, thus contributing to healthy communities.
- **Attenuation of runoff** - Vegetated buffers slow down surface runoff and absorb nutrients and chemicals used for lawn care, agriculture and road maintenance, thus reducing impacts on natural features. If runoff is not controlled, impacts can include soil erosion/sedimentation, destruction of vegetation, and flushing of nests or eggs of amphibians and waterfowl. This is particularly important to adjacent wetlands and aquatic features where nutrients can enrich the system and lead to an abundance of nuisance weeds and/or algae.

The benefits of buffers and their ability to mitigate impacts from adjacent land uses on natural features and areas has been recognized for some time. In an Extension Note publication produced by the LandOwner Resource Centre (OMNR et. al. 2000) titled 'Buffers Protect the Environment', ecological benefits of buffers were identified as follows:

- Protection and improvement of air and water quality
- reduced soil erosion caused by wind and rain
- stabilization of the banks of streams, rivers and lakes
- traps water-borne sediments that pollute streams, rivers and lakes (can reduce up to 80 per cent of sediment)
- filtering of fertilizers, pesticides, organic chemicals, heavy metals, salt and other contaminants that pollute ground and surface water (reduces 40 per cent of phosphorous and a significant amount of nitrate)
- traps bacteria and other pathogens that cause water-borne diseases in people, livestock and wildlife (up to 60 % of pathogens removed from runoff)
- provision of habitat for fish and wildlife
- shading and cooling of streams and rivers, creating good conditions for trout and other cold-water species
- attenuation of runoff and preventing flooding

Vegetated buffers adjacent to riparian areas of surface water features are particularly important to maintain and improve water quality. For example, vegetated buffers reduce the frequency of having to clean out sediment, which ultimately saves time, energy and cost to clean drains, maintain tile outlets and irrigation ditches (Ontario Farm Environmental Coalition, Agriculture and Agri-Food Canada and Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs 2013). Natural overhanging vegetation also provides shade that cools watercourse, improving habitat for fish and wildlife, while reducing algae and undesirable vegetation. Riparian vegetation along watercourses and ditches beside cropland can also serve to reduce crop damage from waterfowl (Ontario Farm Environmental Coalition, Agriculture and Agri-Food Canada and Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs 2013). Vegetated buffers adjacent to riparian habitat also have the added benefit of supplying a diversity of cover and food for wildlife, stepping stone habitat, and improving linkage function by supporting wildlife corridors for larger animals.

While naturally vegetated buffers will provide habitat for wildlife and potentially enhance the functions of the feature, they should not (according to their intended purpose) be identified or managed as part of the feature; rather, they should be treated and managed for the function they were intended to fulfil, which is to provide protection from impacts resulting from changes in adjacent land use. This is articulated in the Natural Heritage Reference Manual which states "buffers should not be treated as extensions of the natural feature; therefore, if a buffer is allowed to become wooded, the natural feature boundary should not be extended to include it. The buffer may serve a number of functions, some of which may require management that may not be appropriate in a natural feature (e.g., trail construction), and such management should be allowed to occur" (OMNR 2010, p. 131).

There may also be a need to manage hazard trees within the buffer or remove vegetation that could pose a threat to human health and safety. The Natural Heritage Reference Manual notes that buffers be approximately equal to the heigh of the tree canopy to allow for tree fall to occur thereby preserving natural edge functions and reducing maintenance costs (Table 13-1, p. 130). This provides more rationale for a buffer of a sufficient width to ensure that management of hazards or vegetation does not require encroachment into the feature to which the buffer is intended to protect.

2.2.1. Role of Buffers

As per the definition of buffers provided in many planning and policy documents, the role of a buffer is to protect the features and areas and their ecological functions by mitigating impacts of proposed development or site alteration on adjacent lands.

The ability of a buffer to effectively mitigate impacts depends on a number of factors, including:

- Width – generally, the wider the buffer, the more effective it will be at mitigating impacts.
- Type of vegetation – the denser the vegetation in the various strata of the buffer (i.e., ground layer, shrub layer, lower and upper canopy) the more effective it will be at mitigating impacts.
- Slope, hydrology and soils – the steeper the slope down to the feature, the less effective the buffer will be at mitigating impacts. The movement of water over the landscape and through the buffer (sheet flow vs. channelized flow) as well as the volume of water affects the effectiveness of the buffer. Loam or sandy soils that allow for infiltration, vs. clay or silt soils that have lower permeability affects the ability of the buffer to mitigate overland flow and impacts related to water quality and quantity.
- Permitted uses within the buffer – While some uses may be considered more compatible or complimentary to the function of a buffer, the type of use, impacts associated with that use, and the need for maintenance of that use may diminish the effectiveness of the buffer at mitigating impacts.

When considered together, these factors determine the effectiveness of a buffer at mitigating impacts and inform the width of the buffer.

2.3. How Does the Science Inform Buffer Widths?

Science-based evidence is integral to informing objective, defendable policies, criteria or guidelines. With respect to the science around buffers, there are very few studies that have evaluated buffer effectiveness in southern Ontario, or elsewhere for that matter. The majority of the research examining buffers has focused on their ability to mitigate impacts to water quality and quantity to watercourse and wetlands. Studies examining various impacts from adjacent land use to other natural features, such as woodlands, often consider the extent of impact into the feature from the edge rather than from the edge of a buffer. While not specifically examining the effectiveness of a buffer, these studies do provide insight into the extent to which different impacts affect natural features and ecological functions which can inform ecologically appropriate buffer widths.

What is more, the research that has been undertaken that examines the effectiveness of buffers or the extent to which impacts are detected within features identifies various ranges of impacts extending into features and does not necessarily recommend a specific buffer width. The summary of research contained in the Credit Valley Conservation Ecological Buffer Guideline Review (Beacon, 2012) also found that there are a range of buffer widths recommended depending on feature type and impact, and that these ranges vary between different studies. **Appendix C** includes a summary of a selection of research published between 2012 and 2022 and provides examples of feature types, variables measured, and the extent to which the impacts extend into features. What is notable is the research into either the effectiveness of buffers or the extent to which impacts are found to extend into features has not yielded more definitive information to inform a set buffer width. The range in buffer widths is primarily due to the variation in measured effects of certain impacts and the variation in the ability of a buffer to mitigate the effect associated with certain impacts.

While the scientific evidence regarding the effectiveness of varying buffer widths should be used to inform policies regarding buffers, particularly when buffer widths are prescribed in policies, the science alone cannot inform appropriate buffer widths. The science informing buffer width should be linked directly to objectives or targets identified in policy documents. For example, where water quality is a concern, such as in the NPCA jurisdiction, the width of the buffer should be sufficient to support the objective of improving water quality rather than minimizing impacts to water quality. In this case, where the scientific literature provides ranges of buffers based the percentage of pollutant removal (e.g., nitrates, phosphorus, sediments, pesticides), a buffer width that is most effective at removing pollutants should be selected. That said, it is recognized there are other non-ecological considerations related to land use planning that may need to be factored into the decision of an appropriate buffer width. How those decisions are factored into the appropriate buffer width requires consultation with agency partners (e.g., municipalities and planning staff).

2.4. Primary Considerations That Inform Ecologically Appropriate Buffer Widths

As identified in some definitions of buffers and inherent in the purpose of a buffer, two of the primary considerations that inform ecologically appropriate buffer widths include, a) the sensitivity of the feature and associated ecological functions, and b) the potential for impacts resulting from specific type of land use.

Not all features and ecological functions have the same sensitivity to impacts or stressors. For example, a smaller meadow marsh (e.g., < 2 ha) with low native species diversity and with fewer ecological functions such as habitat for area sensitive wildlife species and amphibian breeding habitat, would be less sensitive to changes in adjacent land use than a larger wetland (e.g., swamp) that supports habitat for breeding frogs and salamanders, as well as interior habitat for area sensitive bird species. Generally, the more sensitive the feature and associated ecological functions, the wider the buffer should be to achieve the intended purpose of the buffer.

Likewise, not all types of adjacent land use have the same potential or extent of impacts on natural features and ecological functions. For example, replacement of an existing structure or a small addition to an existing residential home would result in a smaller potential impact than a greenfield development of a high-density residential subdivision.

Therefore, when determining an ecologically appropriate buffer, both the sensitivity of the feature and the potential for impacts from the adjacent development will need to be factored into the assessment.

2.5. Key Takeaways from Review of Definitions, Function, Role and Science of Buffers

Buffers are widely accepted as playing an important role in mitigating impacts from adjacent land uses. However, the definition for buffers or the use of the term in policy varies between the various Conservation Authority policy documents and official plan documents. That said, several common components to the definition include:

1. Buffers are to be left in a naturally vegetated state;
2. Definitions commonly include a description of the role/purpose of buffers;
3. Some definitions acknowledge that the width of the buffer should be determined based on the sensitivity of the feature and ecological functions as well as the type of development / adjacent land use; and
4. Buffers are to be informed by an environmental study (e.g., EIS).

Buffer widths should be informed by sensitivity of the feature and associated ecological functions as well as the potential for impacts from the proposed development / change in adjacent land use. In addition, the biophysical characteristics (e.g., slope, soils, vegetative cover) of the adjacent lands is an important consideration in determining the effectiveness of a buffer.

The scientific literature examining the effectiveness of buffers reveals that the ability of a buffer to mitigate impacts varies depending on the feature being studied, the type of impact being evaluated, and the type and width of the buffer. While the scientific literature reinforces the important benefit and function buffers provide at mitigating impacts, there is no consensus on a specific buffer width; rather there are ranges of effective buffer widths, where the evidence supports the principle that the wide the buffer, the more effective the buffer is at mitigating impacts. While the science alone does not provide a definitive answer on an appropriate buffer width, it can be used in conjunction with targets, such as those tied to improving water quality, to identify an ecologically appropriate buffer that can help achieve those targets and the objectives provided in policy documents or strategic plans.

3. BEST PRACTICES AND JURISDICTIONAL REVIEW OF POLICIES

When developing policies and guidance documents it is beneficial to review current best practices and consider how comparative agencies address the issues through policy and what guidance is provided to inform interpretation and implementation. The following sections provide a review of best practices and a jurisdictional review of comparative planning documents that could be used to inform buffer policies and guidance documents for the NPCA.

3.1. Best Practices and Guidance to Inform Buffer Widths

The following section provides a review of best practice documents prepared by Provincial ministries, Conservation Authorities and municipalities that inform the determination of ecological appropriate buffer widths.

3.1.1. Natural Heritage Reference Manual

The Natural Heritage Reference Manual (NHRM) (2010) is a provincial guidance document specifically written to assist in the implementation of the PPS (2005). The NHRM provides guidance related to interpretation and implementation of the natural heritage for achieving consistency with the PPS 2005. Although it was developed to provide guidance for implementing the 2005 PPS, the NHRM is often referenced today as it still contains relevant technical information that is extremely helpful in undertaking studies related to the

identification and protection of natural heritage features. Moreover, the majority of the science that has been used to provide guidance for the implementation of the PPS has not substantially changed since 2010, thus the technical guidance is still relevant.

Section 4.5 of the NHRM cites one of the roles of buffers is to ensure no negative impacts as determined as part of the following studies or planning processes:

- an EIS or equivalent study by a proponent and approved by the planning authority
- a secondary plan or development approval process
- a comprehensive study
- a subwatershed study

Buffers are described in section 13.5.4.2 as the lands set aside from development between natural feature boundaries and the development that is kept in a vegetated state as a means to mitigate the impacts of land use changes on adjacent natural features. The NHRM recognizes that ecologically appropriate buffer widths will vary depending on the sensitivity and functions of the features and proposed adjacent land uses.

Buffer widths must be identified and rationalized based on their ability to protect natural features and their associated functions. The NHRM recognizes that as the impacts of adjacent development become better understood and more research is conducted on the ecology of various features, buffer requirements may change; therefore, a review of current literature must be undertaken to determine the impacts relevant to the feature under consideration.

The NHRM includes a brief literature review (Section 16) along with buffer ranges that should be considered depending on the sensitivity of the feature and the potential for impacts from the adjacent change in land use, development or site alteration (appendix C.1.2); for example:

- 30 m to protect the edge function of trees
- 15 m – 120 m for fish habitat
- 73 m – 275 m for freshwater turtles
- 15 m – 30 m for wetlands and streams to filter nutrients
- 7.5 m – 90 m for riparian areas
- 23 m - 76 m for streams
- 300 m from interior habitat
- 50 m – 175 m for riparian zone widths for birds
- Up to 4,000 m to protect water quality
- 200 m to mitigate mammalian nest predation
- 60 m from streams and wetlands to remove total suspended solids

What is noteworthy is that the NHRM does not prescribe or recommend buffer widths to natural features and areas other than 30 m to protect the edge of treed features (e.g., swamps, woodlands, forests) to allow for tree fall without the need to manage tree hazards within the feature.

3.1.2. Carolinian Canada Draft Guide for Determination of Setbacks and Buffers

Carolinian Canada developed a set of guidelines for determining buffers in 2003 (Carolinian Canada Committee. 2003. Carolinian Canada Draft Guide for Determination of Setbacks and Buffers. In: Take Carolinian Canada to the Limit, Environmental Impact Statement Conference, at Grand River Conservation Authority, Cambridge, Feb. 13, 2003, pp. 27-33.) that came out of a conference titled "Buffers Best Evidence Conference from 2000 (see Proceedings of Buffers Best Evidence Conference, Carolinian Canada 2000). The 2003 guideline provides a definition for both setbacks and buffers in addition to explaining the purpose of a buffer. The draft guideline recommends the following buffer widths:

- 100 m for wildlife habitat
- 10 m for woodlands to protect the rooting zone
- 30 m for wetlands
- 30 m from the high water mark of watercourses

The draft guideline notes that "buffer widths may be increased depending on the expected impacts from the development and the sensitivity of the features and functions being buffered." The draft guideline also goes on to state the "the minimum buffer width should apply unless compelling evidence is provided that shows the natural heritage feature or function will be adequately protected by a narrower buffer".

The draft guideline also provides the following recommendations:

- rehabilitate and enhance all ecological buffers with native species
- the boundary of the buffer must be outside of the development zone (i.e., beyond rear lot lines and areas of grading or fill)
- infrastructure, such as storm water management facilities, holding tanks and impervious surfaces are not permitted in the buffer

Of relevance for the assessment of impacts from various types of land use are rankings of "high", "medium" and "low" impact that can be used to inform a decision support tool. The draft guidelines also characterize various biophysical features by categorizing them as either "highest sensitivity" or "lowest sensitivity".

3.1.3. Natural Heritage Assessment for Renewable Energy Projects

Appendix A.1.2 of the Natural Heritage Assessment for Renewable Energy Projects guidance document (Ministry of Natural Resources, 2012) provides the following recommendations for buffers to natural features and areas:

- 30 m for Provincially Significant Wetlands and Provincially Significant Coastal Wetlands; and
- 30 m from Significant Woodlands

3.1.4. Shoreline Vegetative Buffers – District of Muskoka

In 2003 the Municipality of the District of Muskoka prepared a guideline for identifying Shoreline Vegetative Buffers. This guidance document describes what a shoreline buffer is, how development affects shorelines, and how wide a buffer should be. Based on a review of literature the guideline recommends a minimum 30 m buffer strip to protect shorelines.

3.1.5. Grand River Conservation Authority Guidelines

The Grand River Conservation Authority EIS Guidelines and Submission Standards for Wetlands (GRCA, 2005) provides Buffer and Setback Guidelines in Appendix D in that document. The guidelines define buffers and setbacks, including a description of the benefits and functions for each. The guideline states that "a one-size-fits-all buffer width is not recommended, and flexibility in width may be warranted on a site-by-site basis" due to site-specific differences (p. 18). The following statements are pertinent to informing buffer widths:

- 15 m - 20 m buffer on slopes less than 12 percent with good ground cover
- 15 m is effective for sediment and nutrient removal, except where steep slopes are present
- 30 m buffers or greater may be necessary to protect environmentally sensitive bogs and fens or wetlands supporting locally, regionally or provincially rare species
- Minimum buffer widths based on water quality are likely insufficient to protect wildlife

3.1.6. City of London Guidelines for Determining Setbacks and Ecological Buffers

The City of London Guideline Document for the Determination of Ecological Buffers and Development Setbacks, as found in Appendix A of the City of London Environment Management Guidelines (2007) sets out recommended criteria and parameters to facilitate the identification of Ecological Buffers (as defined in the City of London Official Plan, s. 15.3.6.iv). This guideline document was informed by Carolinian Canada Draft Guide for Determination of Setbacks and Buffers (Carolinian Canada 2003). The guideline provides an overview of the role and function of buffers, and summarizes the thinking at the time on buffers and how they are accommodated within the EIS process. The guideline documents suggests that a "standardized approach for determining appropriate buffer is not recommended" for urban settings (p. 118). The guideline provides a figure that illustrates the process recommended for establishing ecological buffers based on the following:

1. Identify boundaries.
2. Consider management factors
    a. Ecological/environmental
    b. Proposed land use
3. Identify/delineate management unit
4. Determine buffer zone requirements for each management unit
5. Develop an environmental management plan

The following minimum buffer widths are recommended in the guideline:

- 10 m from the dripline of woodlands
- 30 m for wetlands to mitigate impacts to water quality
- 30 m from the high water mark of permanent watercourses
- 15 m from the high water mark of intermittent watercourses
- 10 m from the top of bank of valleylands/ravines

The following additional considerations are provided:

- Buffer widths may be increased depending on the expected impacts from the development and the sensitivity of the features and functions being buffered
- Old field and other non-treed, cultural habitats that are not wetlands may be included in the buffer where they are present adjacent to a woodland patch and not included in the boundary of the patch.
- At least the minimum buffer width should apply unless compelling evidence is provided that shows the natural heritage feature or function will be adequately protected by a narrower buffer.
- The geotechnical allowance (zone a) may be included in the buffer when appropriate except for slopes >25%, that must not be included in the buffer width.
- Any setback that is less than 30 m wide must be enhanced through a rehabilitation, enhancement and planting plan.
- Rehabilitate and enhance all ecological buffers with native species
- The boundary of the buffer must be outside of the development zone (i.e., beyond rear lot lines and areas of grading or fill)
- Infrastructure, such as storm water management facilities, holding tanks and impervious surfaces are not permitted in the buffer

3.1.7. Credit Valley Conservation Ecological Buffer Guideline Review

A comprehensive literature review was previously prepared for Credit Valley Conservation in the report 'Ecological Buffer Guideline Review' (Beacon, 2014). The literature review provides an assessment of the effectiveness of varying buffer widths for various ecological features and functions. The review provides an eight-step evaluation methodology to determine buffer width for urban planning that considers intrinsic conditions (i.e., vegetative structure, soils, slope and hydrology) and extrinsic conditions (i.e., nature and extent of land use impacts), as well as sensitivities of the protected natural feature and functions, and buffer design and management options that may improve buffer effectiveness. Two important key findings from the review recognize the importance of buffers for mitigating disturbances and increasing certainty of protecting natural features and ecological functions:

1. There is affirmation that buffers are an appropriate mitigation tool: "… there is substantial empirical evidence that vegetative buffers can and do perform a number of functions that help protect various types of natural features and mitigate the impacts of human disturbances or changes in land use in the

adjacent lands." (Beacon, 2014 p. 83), albeit this is qualified by noting that there are gaps in the science.

2. There are very few studies that provide guidance on buffer widths for some aspects of upland woodlands. The review took an innovative approach to presenting the ranges of appropriate buffer widths organized by the "Risk of Not Achieving the Desired Buffer Function" (Beacon, 2014 Table 7, p. 88 – Figure 1 of this report). Not surprisingly, the risk declined as buffer widths increased. This approach speaks to "increasing the certainty" that biodiversity and ecological function will be preserved. Based on the Beacon framework, providing a wide buffer reduces the risk of not achieving the desired function and thus increases the certainty that natural feature and area and associated ecological function are preserved.

Following the review of literature, the document synthesizes the data and provides ranges of appropriate buffer widths related to a risk level (i.e., high, medium and low) whereby the wider the buffer, the lower the risk of no achieving the desired goals and objectives of the buffer (see **Figure 2** below).

"In general, Table 7 illustrates that, in the scientific literature:

- For all natural feature types (except for meadows where there is insufficient data), even narrow buffers (i.e., less than 5 m) have been shown to provide some functions related to water quality and screening against impacts associated with adjacent land uses;
- For watercourses and wetlands, the recommended ranges are the same, and most "high risk" buffer widths fall between 1 m and 10 m;
- For most buffer function categories and most habitat types (except for meadows), "medium risk" buffers range from 11 m to 30 m, except for woodlands / forests where "medium risk" buffers range from 5 m to 30 m; and
- The hazard mitigation function of buffers is recognized, but a review and analysis of the literature on this topic was not undertaken as part of this review, and therefore cannot be addressed quantitatively here" (p. 85).

The document emphasizes that while wider buffers may be more effective than narrower buffers, the range of buffers reflect different responses to different variables (e.g., soil type) or different sensitivities of different species or guilds to impacts more than increasing effectiveness. "It is also worth considering that buffer effectiveness is expected to decrease for many of these functions with increasing size of the feature, since with respect to core habitat protection, the value of a buffer generally tends to decrease as the size of the feature increases" (p. 86).

Figure 2. Table 7 as provided in the CVC Ecological Buffer Guideline Review providing buffer widths related to a risk level with not achieving the desired goals and objectives of the buffer.

Natural Heritage Feature Category	Buffer Function Category	< 5 m	5 – 10 m	11 – 20 m	21 – 30 m	31 – 40 m	41 – 50 m	51 – 60 m	61 – 70 m	71 – 80 m	81 – 90 m	91 – 100 m	101 – 110 m	111 – 120 m	> 120 m
WATERCOURSES and WATER BODIES															
	A. Water Quantity	data indicate that this is not mitigated by site specific buffer													
	B. Water Quality														
	C. Screening of Human Disturbance / Changes in Land Use														
	D. Hazard Mitigation Zone	should be based on consideration of hazards, but may overlap with buffers													
	E. Core Habitat Protection														
WETLANDS															
	A. Water Quantity	data indicate that this is not mitigated by site specific buffer													
	B. Water Quality														
	C. Screening of Human Disturbance / Changes in Land Use														
	D. Hazard Mitigation Zone	should be based on consideration of hazards, but may overlap with buffers													
	E. Core Habitat Protection														
UPLAND WOODLANDS and FORESTS															
	A. Water Quantity	insufficient data													
	B. Water Quality	insufficient data													
	C. Screening of Human Disturbance / Changes in Land Use														
	D. Hazard Mitigation Zone	should be based on consideration of hazards, but may overlap with buffers													
	E. Core Habitat Protection														
MEADOWS															
	A. Water Quantity	insufficient data													
	B. Water Quality	insufficient data													
	C. Screening of Human Disturbance / Changes in Land Use	insufficient data													
	D. Hazard Mitigation Zone	insufficient data													
	E. Core Habitat Protection*														

*data available for area-sensitive grassland birds only

Note 1: In all cases the buffer is to be applied from the Critical Function Zone limit, not strictly the feature boundary.

Note 2: Supporting literature is identified in Appendix A.

Key: Risk of Not Achieving the Desired Buffer Function
HIGH
MODERATE
LOW

3.1.8. Cataraqui Region Conservation Authority Guidelines for Ecological Buffer Areas

The Cataraqui Region Conservation Authority (CRCA) prepared a document titled Guidelines for Ecological Buffer areas as Appendix F to the CRCA Environmental Planning Policies document (2015). The purpose of the document is “to provide information about protecting, enhancing and maintaining vegetated buffers around natural features such as waterbodies, wetlands and woodlands.” The guideline document provides an overview including a description of buffers, their role and function, and benefits of buffers. Of note is that this

guideline document references and takes direction from both the Muskoka Watershed Council guidance document for shoreline buffers and the Credit Valley Conservation Ecological Buffer Guideline Review. Several important points made in the CRCA guideline document are as follows:

- There is no on-size-fits-all buffer width
- While a typical buffer width around waterbodies and wetlands is 30 metres, this width can be adjusted (wider or narrower) based on relevant factors for a given circumstance
- effective buffer width will vary depending on:
    - the sensitivity and functions of the natural feature that is to be protected
    - the functions which the buffer is expected to perform
    - the setting (e.g. slopes, soils, surface drainage, groundwater conditions and flows); and
    - the proposed adjacent land uses and activities
- it is likely that a buffer will be more effective as it becomes wider, flatter and more densely vegetated
- surrounding land uses and activities that are busier, brighter and noisier and that generate more air and waterborne contaminants will require more buffering than quieter and cleaner ones
- buffers should consist of native species
- fencing may be necessary to demarcate the start of the buffer and minimize intrusion
- Infrastructure, such as storm water management facilities, holding tanks and impervious surfaces are not permitted in the buffer

The CRCA goes on to describe the “component parts” of a buffer that include the littoral zone (edge of aquatic feature), riparian zone (typically extends 15 m – 30 m, but may extend up to 90 m), and transitional zone (minimum 6 m filter strip of vegetation) that can also provide amenity space around a building or a location for recreation pathways.

The CRCA buffer guideline also provides guidance for managing buffers to “enhance and maximize their effectiveness over time”. Management may include removal or maintenance of select vegetation to allow views of features being buffered (e.g., wetland or water body), manage hazard trees or vegetation, manage invasive species or pest infestations, or for maintenance of minor access paths. However, any management activities must still ensure the function of the buffer is maintained.

In addition, the CRCA buffer guideline provides guidance for preparation of an ecological buffer plan that is intended to:

- identify the appropriate buffer extent / width;
- outline if and how the existing vegetation needs to be augmented;
- define the activities that should take place within the buffer;
- describe how the buffer will insulate the natural feature from negative impacts of surrounding land uses and activities; and
- propose how the buffer will be maintained and enhanced over time.

3.2. Jurisdictional Review of Policies

The following section provides a review of relevant provincial, conservation authority and municipal plans and policy documents as they related to buffers.

3.2.1. Conservation Authority Policies

Appendix D of this technical discussion paper provides an overview of policy documents with reference to buffer widths to features and areas identified within policy documents of Conservation Authorities located within the Greater Golden Horseshoe.

It is noted that there is no consistently applied buffer width to features, however the following buffer widths to regulated features are most commonly identified:

- 15 m for warm water (Type 2 and 3 fish habitat) watercourses and intermittent streams
- 30 m for cool/cold water (Type 1 fish habitat) watercourses and permanent streams
- 10-15 m for non-Provincially Significant Wetlands
- 30 m for Provincially Significant Wetlands and locally significant wetlands
- 10 m - 15 m for valleylands
- 30 m for shorelines to lakes and water bodies

It is also worth noting that while the Conservation Authority regulations set specific setbacks or limits within which development can be regulated by the CA (e.g., 120 from PSWs and wetlands greater than 2 ha in size, or 15 m from the stable top of bank of river or stream valleys), Conservation Authority policy documents typically prescribe buffer widths that extend beyond their regulatory limit. For example, the Hamilton Conservation Authority, Kawartha Region Conservation Authority, Central Lake Ontario Conservation, and the Otonabee Region Conservation Authority all prescribe a 30 m buffer from critical fish habitat or cold/coolwater fish habitat (see **Appendix D**) even though their regulation limit is 15 m from the stable top of bank. It is also notable that these buffer widths are consistent with municipal official plan and Provincial plan policies where buffers are prescribed for the same features (e.g., City of Hamilton Official Plan also prescribes 30 m buffers for cold water fish habitat).

What is also notable is that where buffer widths are identified, the majority of policies permit a reduction in widths as informed by an environmental study approved by the Conservation Authority.

3.2.2. Provincial Plans

Policy 3.2.5.4 of the Greenbelt Plan states that:

> "In the case of wetlands, seepage areas and springs, fish habitat, permanent and intermittent streams, lakes, and significant woodlands, the minimum vegetation protection zone shall be a minimum of 30

metres wide measured from the outside boundary of the key natural heritage feature or key hydrologic feature."

The policies pertaining to vegetation protection zones (VPZs) within the Growth Plan are consistent with the Greenbelt Plan. Regarding the NPCA jurisdiction, other than within settlement areas, all key hydrologic features, which includes some regulated features (i.e., wetlands, permanent and intermittent streams, and lakes) are provided with a minimum 30 m VPZ. There are few exceptions to the minimum 30 m buffer requirement. The minimum buffer widths are to be applied from the edge of the feature being protected. It should be noted that in some cases more detailed studies may recommend a buffer width greater than the minimum 30 m buffer width in order to protect natural heritage features (e.g. Provincially Significant Wetlands, significant wildlife habitat) and critical function zones.

The Lake Simcoe Protection Plan (LSPP) (2009) was prepared as part of the government's overall strategy to protect and restore the ecological health of the Lake Simcoe watershed. The LSPP was passed by the Legislature and received Royal Assent in December 2008. "The objectives of the Plan as set out in the Lake Simcoe Protection Act, 2008 are to:

- protect, improve or restore the elements that contribute to the ecological health of the Lake Simcoe watershed, including, water quality, hydrology, key natural heritage features and their functions, and key hydrologic features and their functions;
- restore a self-sustaining coldwater fish community in Lake Simcoe;
- reduce loadings of phosphorus and other nutrients of concern to Lake Simcoe and its tributaries;
- reduce the discharge of pollutants to Lake Simcoe and its tributaries;
- respond to adverse effects related to invasive species and, where possible, to prevent invasive species from entering the Lake Simcoe watershed;
- improve the Lake Simcoe watershed's capacity to adapt to climate change;
- provide for ongoing scientific research and monitoring related to the ecological health of the Lake Simcoe watershed;
- improve conditions for environmentally sustainable recreation activities related to Lake Simcoe and to promote those activities;
- promote environmentally sustainable land and water uses, activities and development practices;
- build on the protections for the Lake Simcoe watershed that are provided by provincial plans that apply in all or part of the Lake Simcoe watershed, including the Oak Ridges Moraine Conservation Plan and the Greenbelt Plan, and provincial legislation, including the Clean Water Act, 2006, the Conservation Authorities Act, the Ontario Water Resources Act, and the Planning Act; and
- pursue any other objectives set out in the Lake Simcoe Protection Plan." (Ministry of the Environment, 2009).

Policy 6.2-DP of the LSPP requires a minimum VPZ in a shoreline built-up area of 30 metres from the Lake Simcoe shoreline, or larger if determined appropriate by an evaluation as required by the LSPP. The VPZ for the remaining Lake Simcoe shoreline, outside of existing settlement areas and outside of shoreline built-up areas,

is 100 metres from the Lake Simcoe shoreline. That said, policy 6.4-DP allow for development within the VPZ subject to the following tests:

a) there is no alternative but to place the structure in this area and the area occupied by such structures is minimized;
b) the ecological function of the VPZ is maintained; and
c) pervious materials and designs are used to the extent feasible.

Policy 6.24-DP requires a 30 m minimum VPZ for all key natural heritage features and key hydrologic features outside of existing settlement areas and outside of the Greenbelt area and Oak Ridges Moraine area, which includes:

- significant woodlands
- significant valleylands
- natural areas abutting Lake Simcoe
- wetlands
- permanent and intermittent streams
- lakes other than Lake Simcoe

A larger VPZ may be require if determined appropriate by an evaluation as required in the LSPP. Policy 6.28-DP requires that "the buffer or vegetation protection zone shall be composed of and maintained as natural self-sustaining vegetation."

3.2.3. Municipal Official Plans

Upper-tier municipalities vary in their approach to requiring buffers through the policies of their official plans. Most municipal official plans do require buffers, and generally take one of two approaches:

1. They specify minimum buffer widths, with the caveat that an environmental study must be done to determine the adequacy of the minimum width and recommend greater widths where warranted; or
2. They leave the determination of buffer width completely up to site-specific studies.

Niagara Region's new Official Plan (June 2022, Council approved, yet to be ministry approved) requires buffers, but does not prescribe them in settlement areas. Outside of settlement areas (outside of the Natural Heritage System of the Growth Plan and Greenbelt Plan) the following minimum prescribed buffers are required:

- 30 m from Provincially Significant Wetlands
- 20 m from Significant Woodlands
- 10 m from Other Woodlands
- 15 m from Significant Valleylands
- 20 m from Life Science Areas of Natural and Scientific Interest

Halton Region does not prescribe buffers; however, 30 m buffers are mapped as part of the Regional NHS outside of urban areas and are treated as a component of the NHS, thereby being afforded protection as per the NHS policies in Halton's ROP.

The Region of Waterloo provides for the following, as noted in Policy 7.C.11 (Waterloo Official Plan 2015):

"The location, width, composition and use of buffers will be in accordance with the approved Environmental Impact Statement, with buffers being a minimum of 10 metres as measured from the outside boundary of the Core Environmental Feature and established and maintained as appropriate self-sustaining native vegetation."

The York ROP (June 2022 council approved) provides the following direction in table 3 (section 3.4.13):

- Within the Oak Ridges Moraine Conservation Plan (ORMCP) area
    - 30 m from fish habitat, Significant valleylands, Significant woodlands, Sand Barrens, Savannahs's, Tallgrass Prairies, Provincially Significant Wetlands, Permanent and Intermittent Streams, Lakes and their Littoral Zones, Seepage Areas and Springs
- Lake Simcoe Protection Plan (see Section 3.2.1 above)
- Regional Greenlands System
    - 30 m from fish habitat, Significant woodlands, Provincially Significant Wetlands, Permanent and Intermittent Streams, Lakes and their Littoral Zones, Seepage Areas and Springs,
- Urban Areas, Towns and Villages, Hamlets, New Community Areas (outside ORMCP area)
    - 10 m from significant woodlands
    - 30 m from Provincially Significant Wetlands
    - 15 m from other evaluated wetlands (outside of Provincial Plan area)
    - 30 m from Lake Simcoe Shoreline

Other municipalities prescribe minimum buffers from key features that vary in width depending on the significance and sensitivity of the feature and the location of the feature (e.g., urban vs. rural areas). For example, in the rural area of the City of Hamilton the following VPZs are prescribed:

- 30 m from each side of watercourses, wetlands, lakes, fish habitat, significant woodlands (drip line), Life Science ANSIs
- 15 m from other woodlands (drip line) and top of bank of significant valleylands

Whereas in the urban area in the City of Hamilton the following VPZs are prescribed:

- 30 m from coldwater watercourse, critical habitat, P.S.W.s
- 15 m from warmwater watercourses, unevaluated and locally significant wetlands, significant woodlands (dripline), Life Science A.N.S.I.s
- 10 m from other woodlands (dripline)

It should be noted that although these VPZs are identified as minimums in the City of Hamilton's OP, the policies do provide flexibility for site specific applications to recommend a greater or lesser buffer where supported by an approved ecological study.

The City of Guelph prescribes minimum buffers as follows:

- 30 m from provincially significant wetlands
- 15 m from locally significant wetlands
- 30 m from cold/cool water fish habitat
- 15 m from warm water fish habitat
- 10 m from the drip-line of significant woodlands.

These buffers are considered minimums (i.e., they cannot be reduced) and through an ecological study a larger buffer width may be recommended depending on the sensitivity of the feature and potential for impact from the change in land use. It should be noted that minimum buffers are not applied to lands containing existing development which may preclude achievement of the minimum buffers. Rather, redevelopment of such lands would require an EIS to determine an appropriate buffer width.

The City of Markham's Official Plan also specifies specific minimum vegetation protection zones (buffers widths) for various features as follows:

- Significant Valleylands: 10 m subject to site-specific tests that may require additional width
- Valleylands: 10 m (with exceptions in the urban areas)
- Significant Woodlands: 10 m
- Woodlands: 10 m
- Provincially Significant Wetlands: 30 m
- Wetlands: 15 m

Similar to other official plans, the Markham Official Plan defers to the provincial plan standards for applications on the Oak Ridges Moraine and in the Greenbelt.

Whether or not official plans specify minimum buffer widths, they generally include a requirement for appropriate ecological studies (e.g., EIS/Assessment, subwatershed studies, etc.) to be completed and approved to determine the final width of buffers. In the majority of cases where a municipality has identified minimum buffers in their official plan, these buffer widths are used in development planning applications and are not applied to existing uses.

The considerations and direction for determining an appropriate buffer width can be found in some EIS/assessment guidelines. For example, the Region of Waterloo Greenlands Network Implementation Guideline (2016) provides guidelines for determining buffers around environmental features based on the following three principles:

- Protection of environmental features from adverse environmental impacts originating on contiguous lands approved for development or site alteration;
- Transition between new development or site alteration and environmental features; and
- Opportunities for net ecological enhancement or wherever feasible, restoration of the ecological functions of the Core Environmental Feature.

The Region of Waterloo's Greenlands Network Implementation Guideline goes further to provide considerations in the design (e.g., width and function) of buffers.

What is clear from the jurisdictional review is that many, but not all municipalities prescribe buffers. In most cases, an environmental study (e.g., EIS) is required to determine the ecologically appropriate width of the buffer as determined by the sensitivity of the feature and the potential for impacts from the adjacent development or site alteration.

Permitted Uses within Buffers

Where buffers are required in policy, there are often permissions provided for specific uses within buffers. The following provides several examples of permitted uses within buffers identified in policy.

City of Hamilton Urban Official Plan (2013)

> 2.5.12 "Permitted uses within a vegetation protection zone shall be dependent on the sensitivity of the feature, and determined through approved studies. Generally, permitted uses within a vegetation protection zone shall be limited to low impact uses, such as vegetation restoration, resource management, and open space. Permitted uses within the vegetation protection zone shall be the same uses as those within the Core Area in Policy C.2.5.1 and the vegetation protection zone should remain in or be returned to a natural state."

Niagara Region Official Plan (2022)

Several policies in the Niagara Region Official Plan provide exemptions to certain types of development or permission for certain development within buffers:

> 3.1.9.8.3 "Development or site alteration shall not be permitted in the minimum buffer set out in Table 3-2, with the exception of that described in Policy 3.1.9.5.3 or infrastructure serving the agricultural sector, unless it has been demonstrated through the preparation of an EIS that there will be no negative impacts and the buffer will continue to provide the ecological function for which it was intended."
>
> 3.1.9.8.4 "Notwithstanding Policies 3.1.9.7.1 and 3.1.9.8.3, the following types of minor construction is permitted within adjacent lands set out in Table 3-1 and minimum buffers set out in Table 3-2 provided there is no alternative, without an EIS and/or hydrologic evaluation:
>
> a) new buildings and structures for agricultural uses, agriculture related uses, or on-farm diversified uses below 200 m^2;
> b) expansions to existing buildings and structures for agricultural uses, agriculture-related uses, or on-farm diversified uses below 50% of the size of the original building, provided the expansion is less than 200 m^2;
> c) new accessory buildings to a residential use (garage, workshop, etc.) below 50 m^2;
> d) expansions to existing accessory buildings for a residential use below 50% of the size of the original building;
> e) expansions to existing residential buildings below 50% of the size of the original building; and
> f) reconstruction of an existing residential dwelling of the same size in the same location.

3.1.9.8.5 "Notwithstanding Policy 3.1.9.8.3, outside of settlement areas, consideration can be given to including passive recreational uses such as trails in buffers if it has been demonstrated that the buffer will continue to provide the ecological function for which it was intended." This same policy is reiterated in policy 3.1.9.9.4 for buffers within settlement areas.

3.1.9.9.2 "Development or site alteration shall not be permitted in the mandatory buffer, with the exception of that described in Policy 3.1.9.5.3 or infrastructure serving the agricultural sector unless it has been demonstrated through the preparation of an EIS that there will be no negative impacts and the buffer will continue to provide the ecological function for which it was intended."

Several Conservation Authority policy documents also provide permissions for certain types of uses in buffers. For example, policy 2.1.3 h. vii) of Hamilton Conservation Authority policy documents notes the following:

"Trails and paths may be allowed in the vegetation protective zone provided that:

1. The trail or path is located outside of erosion hazard, except for crossings;
2. The trail or path should not come closer than 4 m to the edge of a watercourse, except for crossings, unless it has been demonstrated through the completion of an Environmental Impact Statement (EIS) that there will be no negative impacts on the natural features or on their ecological functions;
3. The trail or path does not impede the natural function of valleylands;
4. Permeable surfacing is recommended for trail or path construction; and
5. There is a compensating vegetation protective zone allowance added to the width of the vegetation protective zone."

In another example, Credit Valley Conservation polices note the following regarding development within buffers:

6.1 l) "CVC recognizes that certain types of development (2) and site alteration by their nature must locate within the natural heritage system, including natural heritage features and areas, significant natural areas, hazardous land, erosion access allowances and associated buffers. Considering this, CVC may support such works where they have been addressed through an environmental assessment, comprehensive environmental study or technical report, completed to the satisfaction of CVC. This may include, but is not limited to, the following:

i. infrastructure, including stormwater management facilities;
ii. development and site alteration associated with passive or low intensity outdoor recreation and education;
iii. development which by its nature must locate within hazardous land;
iv. development and site alteration associated with conservation or restoration projects or management activities following sustainable management practices;
v. hazardous land remediation or mitigation works required to protect existing development; and
vi. modifications to components of the natural heritage system to implement the recommendations of an environmental assessment, comprehensive environmental study or technical report that has been completed to the satisfaction of CVC.

That said, some conservation authority policies limit the type and extent of development permitted within a buffer or setback, typically to permit redevelopment within the existing footprint or to allow development on an existing lot of record where no alternative exists. For example, Conservation Halton policies limit development within the setback or vegetated buffer as follows:

vii. 2.6.2 "Exceptions to Policy 2.6.1 may be considered on a site-specific basis in areas of existing development, where the works will not encroach into the setback any further than the existing building/structure and where no other reasonable alternative exists".

While buffer policies are generally prohibitive of most types of development within buffers, there are often permitted uses, typically associated with low-intensity recreational trails or forms of development that would not further encroach into the buffer or impact the natural features and ecological functions. Where this is contemplated, policies are generally consistent in requiring an environmental study be completed that evaluates the proposed development and the ability of the buffer (or feature) to retain it's function.

3.3. Prescribing Buffers in Policy

There are several approaches to determining buffer widths in policy documents. The CVC Buffer Guideline Review (Beacon 2012) lists the policy approaches to determining buffers (p. 91), as follows:

1. Approach #1 - Prescribed buffers: Set buffer widths for all protected features (e.g., 30 m to 50 m based on the feature with no EIS required for buffer width determination.
2. Approach #2 - Base buffer + Risk-based Assessment: Combination of a prescribed buffer width plus consideration for additional buffer width based on as set of risk-based parameters as evaluated through an EIS.
3. Approach #3 - Risk-based Assessment: Buffer width determined on a set of risk-based parameters as evaluated through an EIS; no base buffer width prescribed in policy.
4. Approach #4 - Base Buffer + EIS: Combination of a prescribed buffer width plus additional buffer width, as determined based on an EIS; no risk-based parameters provided.
5. Approach #5 - Case by Case: Buffer widths identified based on an EIS. No minimum buffers prescribed and no risk-based parameters provided.

Each approach has benefits and limitations. When comparing the policy approaches to determining a buffer width, several factors should be considered as part of determining which approach should be incorporated into policy:

- Consistency;
- Well-structured and contextually appropriate;
- Defensibility;
- Effectiveness; and
- Efficient use of resources.

Table 1 provides an overview of the factors that should be considered when selecting an approach to prescribing (or not) buffer widths in policy.

Table 1: Factors for consideration in determining the appropriate approach for prescribing buffers in policy.

Factors for Consideration	Comments
Consistency	
Conformity with Provincial Plans	The approach to prescribing buffer widths in policy should conform to the minimum requirements of relevant provincial plans (PPS, Greenbelt Plan, Growth Plan, Niagara Escarpment Plan) to ensure consistency within those planning areas as not to result in an overly complex or confusing planning regime within that area. That said, the approach to prescribing buffer widths could exceed provincial minimum requirements.
Achieves the Goals and Objectives of the Strategic Plan and Policy Document.	This ensures the buffer width policies will support the goals and objectives of the NPCA as well as provides a defendable position for establishing buffer policies.
Well-Structured and Contextually Appropriate	
Provides consideration for ecologically appropriate buffer widths identified based on the site-specific conditions	This consideration factors in either policies that support a more complex approach with flexibility (e.g., case-by-base assessment based on the sensitivity of the feature and the potential for impacts from the adjacent land use), and how and where that flexibility will occur / be implemented **or** to develop policies for a more prescriptive and simplified approach that limits flexibility in their interpretation and implementation.
Considers stakeholder needs and interests	It is important to understanding the needs and interests of various stakeholders (e.g., agricultural, environmental, developers) when developing an approach for buffer width policies.
Defensibility	
The policies apply an approach informed by best practices	The approach is informed by best practices for the determination of ecologically appropriate buffers. As such, the policies, and any guidance documents used to inform them should be informed by those best practices that remain relevant today (i.e., recognizing some guidance documents are older and may be informed by dated information).
Policies are informed by the science and incorporate and science-based approach.	A scientifically defensible approach to identifying buffer widths should be used to inform the approach adopted in the policies. While it is recognized the science varies in what buffer widths are needed to achieve a certain degree of effectiveness, scientific studies can be used to prescribe ecologically appropriate buffer widths. The determination of

Factors for Consideration	Comments
	a final buffer width can also be informed using a science-based approach that considers the sensitivity of the feature and the potential for impacts from the proposed development / change in land use.
Effectiveness	
The policy and approach to determining buffer widths can be effectively implemented.	The approach and policy should consider how (e.g., through what processes and using what tools) the policies will be interpreted and implemented. This may inform the need for updated guidance documents or new tools.
Ensure protection of regulated features and areas.	The objectives of the NPCA regulations include protection of water resources and ecological functions of regulated features and areas. As such, the approach must be measured against the ability to achieve this objective.
Efficient Use of Time and Resources	
Anticipated timeline to develop implementation tools (e.g., EIS guidelines, decision support tool, etc.).	The approach may include different implementation tools. Consideration should be given to the anticipated timeline required to develop those tools and the process required to have them in place.
Anticipated costs to develop implementation tools (e.g., EIS guidelines, decision support tool, etc.).	As an extension to the preceding consideration, this specifically evaluates anticipated expenditures associated with developing implementation tools. This may include internal costs to the NPCA, consulting fees, etc.
Time associated with staff reviews of Environmental Impact Studies and costs and time related to appeals to the NPCA Board or the Ontario Land Tribunal.	The approach selected should factor in the time and resources required by staff to review an EIS that has evaluated and recommended a buffer width. In addition, depending on the approach selected and the buffer policies, landowners/developers may appeal decisions by the NPCA Board and appeal to the Ontario Land Tribunal.

The approaches for incorporating buffers in policies vary according to the factors identified above. The following provides an evaluation of how each approach addresses the factors identified in Table 1.

Consistency

Approach #1, #2 and #4 provide the opportunity to develop policies with prescribed buffer widths that can be consistent with provincial and municipal official plans and be designed to meet goals and objectives of the NPCA Strategic Plan and policy document. That said, official plan policies for areas outside of provincial plan areas (e.g., within urban areas) where buffers are prescribed may differ between municipalities. The NPCA should decide whether a simple approach to applying the most restrictive buffer policies across all municipalities should be adopted, or if the NPCA policy document should defer to each municipal official plan for buffer width policies within the urban/settlement areas. Approach #3 and #5 have no ability to ensure

consistency with provincial or municipal policies to ensure buffers identified through an EIS will meet the goals and objectives developed by the NPCA.

Well-Structured and Contextually Appropriate

Approach #1 provides no flexibility, and while it ensures a consistent and straightforward approach, it may not be appropriate or feasible in all situations, and therefore may be difficult to implement or enforce. Furthermore, Approach #1 does not consider the sensitivity of the feature and functions or the potential for impacts from the proposed development / change in adjacent land use. This approach is also generally not preferred by proponents of development applications who may find the "one-size fits all" approach unfair. What is notable from the review and conclusions noted in the CVC Buffer Guideline Review is that these opinions have not changed from those expressed in 2000 as documented in the Proceedings of Buffers Best Evidence Conference (Carolinian Canada 2000).

Approaches #2 through #5 provide an opportunity to consider site specific circumstances and increase in the amount of flexibility in order of the approaches identified. Approaches #4 and #5 provide the most flexibility, but are the most prone to subjectivity (or bias) and inconsistent application. These latter options are more commonly found in policy documents, and often pose a challenge to approval authorities that have to consider how buffers are intended to support the objectives of the policies.

For the most part, where minimum buffers are prescribed in policy as per Approach #4, the vast majority of ecological studies recommend the minimum buffer as prescribed through policy, regardless of the sensitivity or significance of the feature and the potential for negative impacts resulting from a change in land use on adjacent lands. Ecological studies will also often recommend buffer widths below minimum buffers where policies permit. We know of only a few examples where an ecological study undertaken in support of a development recommended increasing the minimum buffers. In one instance a Significant Woodland buffer was increased from the minimum 10 m to 20 m based on ecological sensitivities related to area sensitive breeding bird habitat. In another instance the buffer to a Provincially Significant Wetland was recommended to increase from 30 m to 50 m to mitigate impacts of adjacent development to the habitat of Least Bittern (a Species at Risk listed as Threatened in Ontario) and stopover habitat for Sandhill Crane. In both cases, these refinements were recommended as part of an environmental study.

Defensibility

It is acknowledged that the science is not definitive on what buffer width should be provided to effectively mitigate impacts given the variation in the results of the scientific studies. That said, for Approach #1, setting a fixed prescribed buffer would be more difficult to defend given the lack of consensus on an appropriate buffer width. However, where buffer widths are prescribed by other provincial or municipal planning documents, adopting those buffer width can be used to defend prescribing buffers that are consistent with policies of those other planning documents.

Approaches #2 and #4 both prescribe buffer widths that can be either refined according to a risk-based assessment, or determined as part of an EIS. The adoption of buffer widths identified in scientific literature

that support the NPCA's goals and objectives would provide a defensible position to prescribe buffer widths in policy. In addition, developing a decision support tool or EIS Guidelines that provide direction to refine prescribed buffers that are informed by best practices would also provide a defensible approach to prescribing buffers that can be refined as part of an EIS. However, providing a well-developed and clear guidance document (e.g., decision support tool) to inform refinements is critical to ensure an objective and consistent approach is taken to inform ecologically appropriate buffer widths.

Approaches #3 and #5, while not prescribing a buffer width in policy, can also be informed by the science, as evaluated through an EIS that is based on a more thorough and directive guidance document. However, the lack of a prescribed buffer in the policy document does not provide certainty that a buffer considered acceptable to the NPCA will be recommended by the EIS.

Effectiveness

Approach #1 will ensure a robust buffer will be provided to features and areas. However, this approach does not provide the opportunity for a refinement process that may recommend an increase to the buffer for features and areas with a very high degree of sensitivity to land use and change and development on adjacent lands. As such, while a prescribed buffer will guarantee a set width, it may not be sufficient to adequately protect some features.

Approaches #2 and #4 provide an opportunity to ensure a minimum buffer width is achieved, and with adequate guidance or a decision support tool, the recommended buffer width can be effective at achieving the objects and goals of the NPCA for protection of features and functions.

Approach #3 does not provide a policy basis to ensure a specific buffer width is achieved as prescribed in policy. The determination of a buffer would be based on the recommendation from the EIS as informed either by the EIS Guidelines or a decision support tools. This puts more reliance on the clarity and thoroughness of those documents to ensure an appropriate buffer is recommended through the EIS.

Approach #5 relies entirely on the guidance provide in EIS Guidelines. The NPCA will need to prepare a comprehensive and descriptive process for determining ecologically appropriate buffers within an EIS guidance document that ensure recommended buffers satisfy the NPCA's expectations for protection of features and functions.

Efficient Use of Resources

Approach #1 will limit the need for an evaluation of ecologically appropriate buffers and a review by the NPCA to determine if the buffers are appropriate. However, given the lack of flexibility and "one-size-fits-all" approach, there may be more appeals to the NPCA Board to seek relief from the policies that could result in a reduced buffer width. This may also put the Board in a difficult position on a more regular basis, to make decisions that are better informed by an environmental study and with review and approval by qualified NPCA staff. Furthermore, an applicant may appeal a decision or even condition set by the NPCA to the Ontario Land Tribunal resulting in more staff time and financial resources being used in that process.

Approach #2 through #4 requires an evaluation through an EIS and application of either EIS Guidelines or a decision support tool to determine an ecologically appropriate buffer width, weather a base buffer width is prescribed or not. While this make take more time and resources to determine, it allows for consideration of site-specific circumstances, application of a guidance document that would result in a consistent outcome following an objective approach, and an opportunity for qualified staff at the NPCA to review and provide input on the appropriate buffer width.

Approach #5 will require the same level of assessment and review as Approaches #2 through #4, however, with a lack of guidance or decision support tool (which is currently the status quo for many municipalities and Conservation Authorities), may result in a recommendation made in an EIS for a minimal buffer that is not considered by the approval authority to be adequate to effectively protect the feature and functions. This can lead to disagreements between the applicant's ecological consultant and the approval authority regarding an appropriate buffer width and result in multiple submissions of the EIS.

3.3.1. Summary of Approach to Prescribing Buffer Widths in Policy

Each approach to prescribing (or not) buffers widths in policy has its benefits and limitations with respect to providing a consistent, defensible, and effective approach that efficiently uses limited resources with policies that are well-structured and contextually appropriate. Ultimately, the approach that best achieves the NPCA's goals and objectives for natural feature and area protection should be selected as the preferred approach to developing buffer policies. Based on the direction provided by the NPCA Board to consider prescribing buffer widths of 30 m in policy, and the review of best practices and a jurisdiction scan of policy documents, the NPCA should consider one of the following two approaches for inclusion in the policy document:

1. Minimum buffer widths with no opportunity to reduce the width, but can be increased through an environmental study; or
2. Robust buffer widths that can be reduced or increased with support from an environmental study.

Both of these approaches will require a comprehensive EIS Guideline document as well as a decision support tool to ensure an objective and consistent approach is applied to determining an ecologically appropriate buffer width.

3.4. Key Takeaways from Best Practices and Jurisdictional Review

Buffer widths are typically determined based on the following factors:

- sensitivity of the feature and ecological functions;
- the potential impact from the adjacent land use;
- biophysical factors of the adjacent lands such as slope, soils, hydrology and vegetation;

- other mitigating factors (e.g., fencing between adjacent land use and buffer); and
- the ability of the buffer to meet objectives set out in policy.

Buffer widths should be informed by environmental studies, rationalized on the basis of the ability of the buffer to protect natural features and their associated ecological functions from impacts from the adjacent land use. While some guidance documents provide a minimum recommended buffer, all guidance documents recognize that the buffer width can be refined (i.e., increased or reduced) as informed by environmental studies. A "one-size-fits-all" approach to prescribing buffers is generally not recommended.

There is general consensus that some types of uses may be permitted within the buffer, however the function of the buffer should be maintained which may require a wide buffer to accommodate the ancillary use (e.g., recreational trail). In addition, infrastructure (e.g., storm water management facilities) that would not be compatible with a buffer (i.e., would reduce the effectiveness of the buffer) should not be permitted within the buffer.

Buffers should be outside of the development zone (i.e., beyond rear lot lines and areas of site alteration) and be vegetative with native species left in a "free to grow" state.

There is no consistently applied buffer width to features, however the following buffer widths to regulated features are most commonly identified:

- 15 m for warm water (Type 2 and 3 fish habitat) watercourses and intermittent streams
- 30 m for cool/cold water (Type 1 fish habitat) watercourses and permanent streams
- 15 m for non-Provincially Significant Wetlands
- 30 m for Provincially Significant Wetlands and locally significant wetlands
- 10 m - 15 m for valleylands
- 30 m for shorelines to lakes and water bodies

It should be noted that the identified buffer widths are generally related to mitigating impacts to water quality and do not necessarily consider impacts to other ecological functions, such as wildlife habitat (e.g., for area sensitive species such as birds). A wider buffer may be needed to effectively mitigate impacts to sensitive types of wildlife habitat.

Prescribing buffer widths that can be refined based on an evaluation of the sensitivity of features and the potential for impacts is considered the most appropriate approach. However, providing a guidance document (e.g., decision support tool) to inform refinements is necessary to ensure an objective and consistent approach is applied to inform ecologically appropriate buffer widths.

4. REVIEW OF DECISION SUPPORT TOOLS

4.1. Region of Halton Buffer Width Refinement Framework

The Region of Halton has recently prepared a comprehensive Framework for Regional Natural Heritage System Buffer Width Refinements for Area-Specific Planning (Halton 2017), yet to be endorsed by Regional Council. The purpose of the Buffer Refinement Framework is to "… provide assistance in identifying refinements to the buffer component of the Regional Natural Heritage System (RNHS in the context of developing and implementing an Area-Specific Plan, in accordance with ROP policies." An Area-Specific Plan is defined as "a Local Official Plan Amendment applying to a specific geographic area such as a secondary plan or a Regional Official Plan Amendment applying to a specific geographic area" (Halton ROP, policy 216.2). As such, the Buffer Refinement Framework relates specifically to a set of development applications that would trigger an official plan amendment and not necessarily other development applications where an EIS /Assessment is required (e.g., severance, building permit, zoning amendment, etc.).

The document title is noteworthy in the use of "refinement" as opposed to "determination". This inherently reflects the Region's position on buffers where they are part of the Regional NHS and are included in schedules. Therefore, buffers are refined from their starting point of 30 m as opposed to being determined. Thus, changes to buffer widths constitute a refinement to the RNHS and require meeting tests as outlined further in the ROP.

The framework provides a detailed methodology that includes a three-part assessment for determining buffer width that consists of:

1. The sensitivity and significance of ecological features and functions protected;
2. The potential negative impacts on ecological features and functions arising from adjacent land use; and
3. The management and uses within the buffer which may mitigate and/or exacerbate potential negative impacts on ecological features and functions.

Based on the outcome of the assessment the "base buffer" of 30 m (currently mapped as part of the RNHS) may remain the same, be reduced by five to ten metres in certain situations or be increased in width as determined through more detailed studies.

Buffer refinements are determined by following three steps:

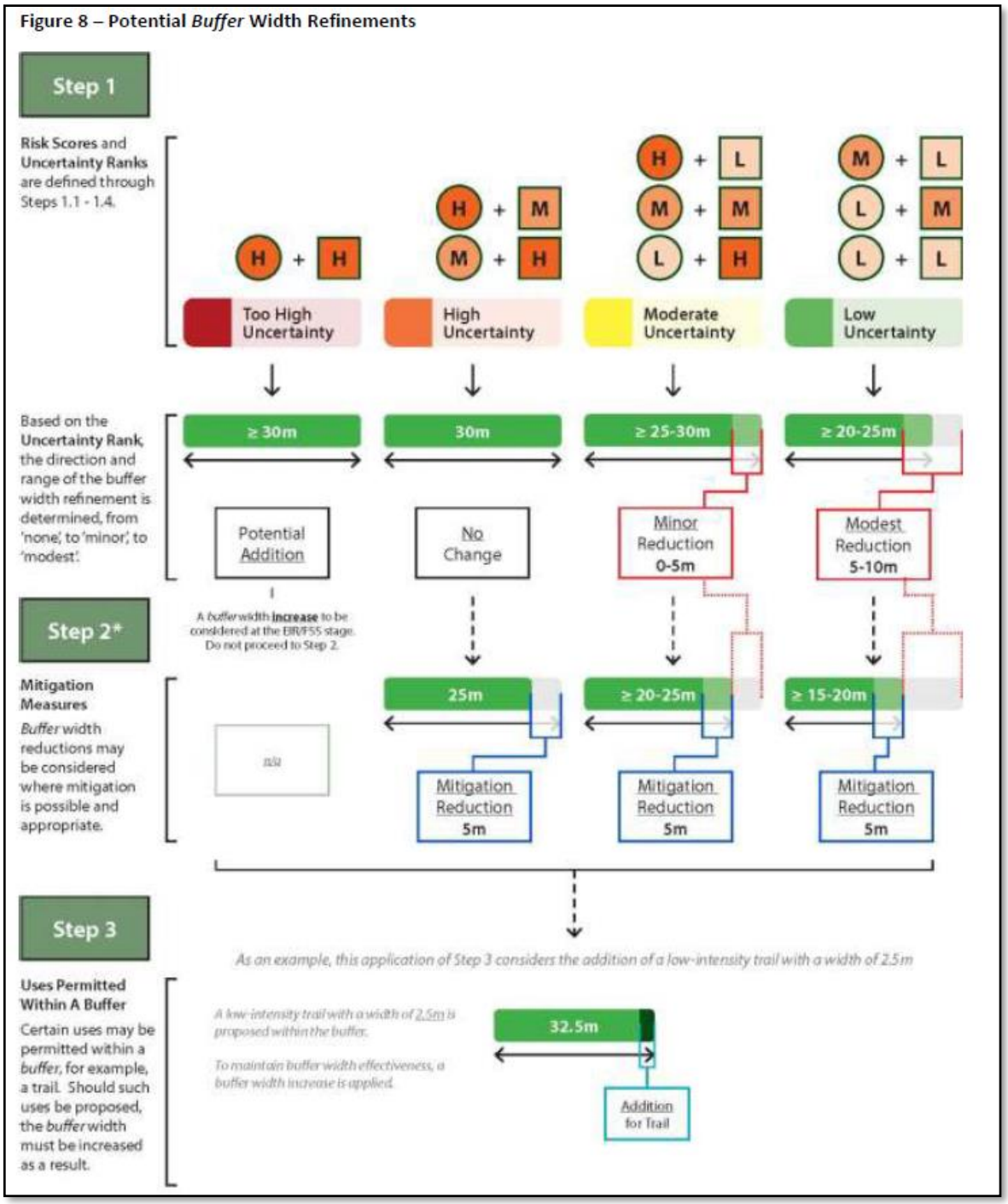
1. Risk factor assessment – assess risk factors that have the potential to decrease the certainty that a buffer will be able to achieve its intended function based on the sensitivity of the feature (low, medium, or high) and the potential for impact from the adjacent land use (low, medium, or high). Based on a risk assessment an uncertainty ranking is identified either as low, medium or high uncertainty.

2. Mitigating factors assessment – assess the ability of mitigating factors, such as a fence to supplement the buffer effectiveness where the result may be a reduction in buffer width.
3. Uses within a buffer assessment – while uses within a buffer a limited to compatible or low impact uses such as recreational trails, where these uses are proposed within a buffer this step would result in an addition to the buffer width to ensure the function of the buffer is maintained.

The steps to inform buffer width refinements are illustrated on Figure 2 (Figure 8 from the Region's Buffer Refinement Framework).

While the reductions in buffer widths as determined through the decision support tool are founded in science, the risk scores and reductions in buffer withs have factored in the Region's goal "to increase the certainty that the biological diversity and ecological functions within Halton will be preserved and enhanced for future generations" (policy 114).

Figure 3. Figure 8 from Halton Region's Buffer Refinement Framework. This figure depicts the steps to refine the 30 m buffer width based on the sensitivity of the feature and the potential for impacts from the proposed development.



4.2. CVC Ecological Buffer Guideline Review

This document recommends a buffer determination process that is based on the following:

1. Identifying a base buffer width that is derived from the "high risk" range from the science identified in the risk-based guidelines provided in Table 7 of that document.
2. Providing an additional buffer width, based on site specific biophysical and land use considerations identified through an EIS with consideration for the current science.

Figure 11 from the Guideline Review document (Figure 4 below) illustrates the steps recommended to determine an appropriate buffer width.

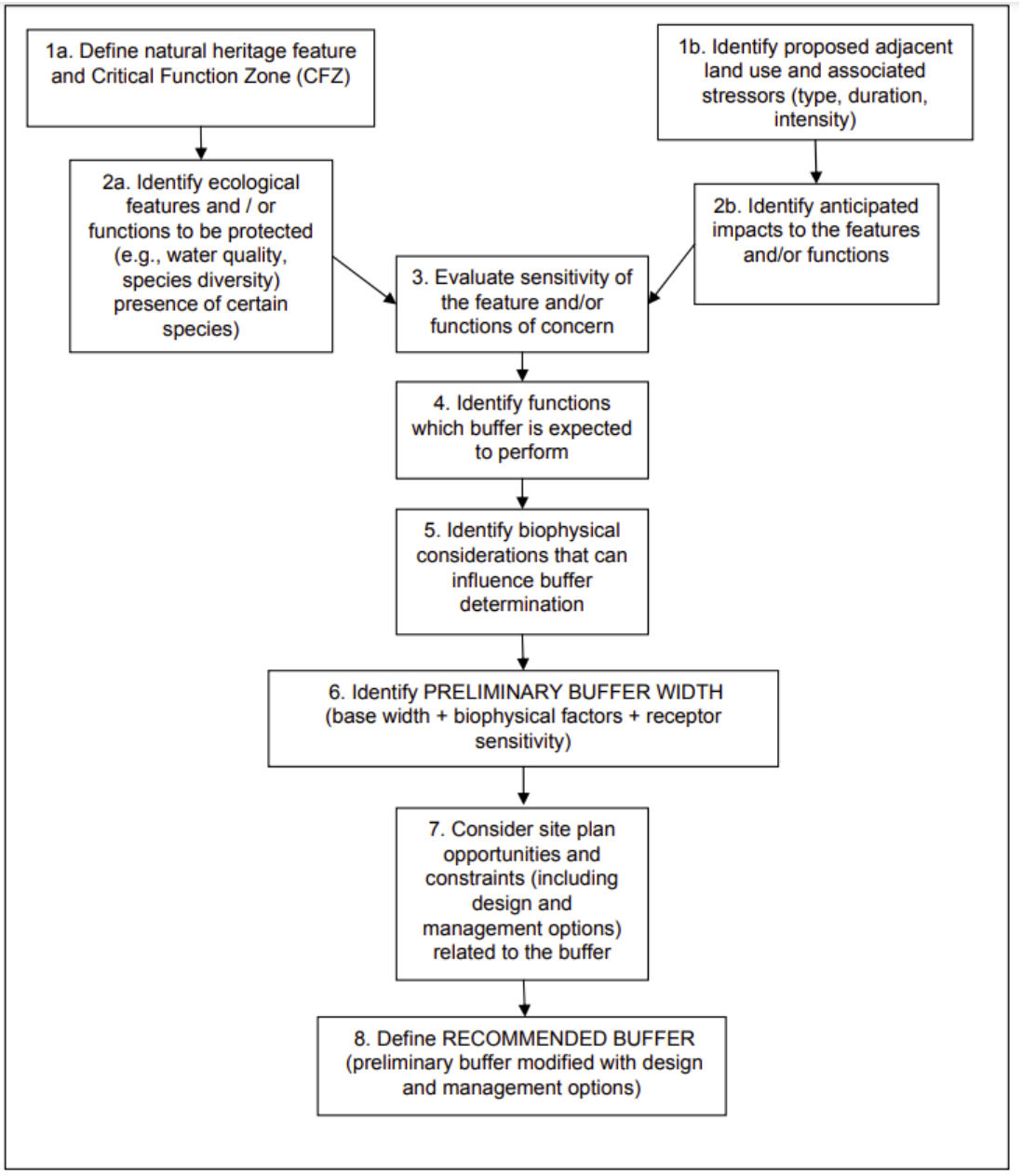
Regarding steps 1 through 5, these are determined through an environmental study such as an EIS. The Ecological Buffer Guideline Review document does not provide guidance for additional buffer widths that should be provided based on biophysical conditions (e.g., slope, sensitivity of feature, ecological functions, etc.) or how certain types of development may result in impacts of varying degrees.

Step 6, which recommends the starting point of "high risk" for a buffer width does not provide further guidance to account for the range of impacts or sensitivity of the feature and ecological functions. Therefore, there is subjectivity that is introduced at Step 6.

Step 7 considers the site plan opportunities and constraints (including design and management options) related to the buffer. For example, where a trail is proposed within the buffer, a width of 6 m (or the width of the trail plus edge management zone) would be added. In another example provided, where a fence is provided between the buffer and the rear property line, the buffer may be reduced by 5 m recognizing the mitigating effect the fence provides at preventing encroachment into the buffer.

It should be noted that the starting point of high, medium or low risk should be based on the level of confidence the approval authority requires regarding buffers achieving their intended function and the objectives provided in the policy document. Starting at the "high risk" level assumes the impacts are minimal and that the feature sensitivity is low; this approach does not provide a high level of confidence that the feature and ecological functions will be sufficiently protected from the impacts of the adjacent land use. The starting point of the base buffer of "high risk" may not align with the approval authority's expectations regarding the buffers and policy objectives, and a starting point of "medium risk" or "low risk" may be more appropriate.

Figure 4. Buffer determination process as illustrated in the CVC Ecological Buffer Guideline Review.



4.2.1. City of London Guidelines for Determining Setbacks and Ecological Buffers

The City of London has developed "Ecological Buffer Assessment Calculations" as provided in their Environmental Impact Assessment Guidelines (2007). The recommended buffer width is based on the following calculation:

(buffer width based on size of development + buffer width related to slope)/2
+
(buffer width based on feature type + buffer width based on adjacent land use)/1.5
Recommended Buffer Width

Where:

- Size of parcel: 0-20 ha = 2-10m, 21-50 ha = 5-15m, 51-150 ha = 15-30m, 150 ha = +: 30m+
- Slope (average): 0-10% = 2-5m, 11-20% = 5-10m, 21-25% = 10-20m, 25%+ = 20m+
- NHS Feature (consider drip-line): Zone A = 30m+, Zone B = 15-30m, Zone C = 2-15m
- Adjacent land use (intensity): Open space = 2-10m, Residential (low, medium, and high density) = 5-25m, Commercial (light and heavy) = 10-50m, Industrial (light and heavy) = 30m+, Collector and/or Arterial Roads = 10-50m
- Zone A:
    - ESA (environmentally significant areas) and potential ESAs
    - PSW (provincially significant wetland)
    - ANSI (areas of natural and scientific interest)
    - VTE (vulnerable, threatened, and endangered species)
- Zone B:
    - Stream/ravine corridors (stream flood plain, valley wall, riparian vegetation, etc.)
    - Woodlands
    - LSW (locally significant wetland)
    - Fish habitat
    - Headwater recharge areas
    - Recharge and discharge areas
- Zone C:
    - Upland corridors
    - Naturalization areas
    - Open space

Other factors for consideration in determining the buffer width:

Purpose	Minimum (m)	Maximum (m)
Water quality	10	50
Bank stabilization	10	30
Scour erosion	30	70

Geomorphic stability	30	70
Natural communities	10	50
Wildlife habitat	30	100
Travel corridor	10	30

4.3. Key Takeaways from Review of Decision Support Tools

It should first be noted that where policies prescribe buffers that can be refined (increased or reduced) through the evaluation contained in an environmental study, a decision support tool is necessary to ensure a consistent, objective approach to refinements is undertaken. Decision support tools are generally designed with consideration for the following:

- the sensitivity of the feature;
- potential for impacts resulting from change in adjacent land use;
- biophysical characteristics of the adjacent lands (e.g., slope, soils, vegetation cover, hydrology); and
- other mitigating factors that may supplement the effectiveness of the buffer.

A risk-based approach provides an opportunity to establish a starting point for a minimum buffer width that is generally increased based on site-specific information, or a robust buffer width that is typically reduced. There is inherent flexibility built into a decision support tool, however, the guidance provided in the decision support tool should be sufficient to provide an objective, consistent approach to determining an appropriate ecological buffer width that is supported by scientific literature. The starting point of the robust buffer width, and the increases or decreases to the buffer width should be based on meeting the goals, objectives and targets established through the policy document.

5. CONSIDERATIONS FOR SETTING BUFFER WIDTHS IN POLICY

Developing policies for prescribing buffers to regulated features should also consider other planning documents that prescribe buffers in policies for the same features. In particular, the Growth Plan for the Greater Golden Horseshoe requires a minimum VPZ of 30 m for new development from wetlands, permanent and intermittent streams, and lakes outside of settlement areas. For consistency with provincial plans, the NPCA should consider if it is appropriate to maintain a consistent set of prescribed buffers for these features with those policies of provincial plans.

Moreover, when considering impacts, the PPS and most municipal official plans accept that there will be impacts on natural features and areas and their ecological functions whereby the test is to avoid “negative impacts”, not impacts more generally. This is clearly articulated in the Natural Heritage Reference Manual (OMNR 2010) in Section 13.2 that states that “not all impacts are negative” and mitigation can be used to

alleviate impacts. From a policy perspective, the development or site alteration cannot have a "negative impact" on the natural features or their ecological functions, where negative impacts are defined by the PPS as:

> "in regard to policy 2.2 [Water], degradation to the quality and quantity of water, sensitive surface water features and sensitive ground water features, and their related hydrologic functions, due to single, multiple or successive development or site alteration activities"
>
> "in regard to fish habitat, any permanent alteration to, or destruction of fish habitat, except where, in conjunction with the appropriate authorities, it has been authorized under the Fisheries Act"
>
> "in regard to other natural heritage features and areas, degradation that threatens the health and integrity of the natural features or ecological functions for which an area is identified due to single, multiple or successive development or site alteration activities."

Please note that the following terms contained within the definition of negative impacts are also defined by the PPS and provide further context related to the interpretation of this definition:

- quality and quantity of water
- sensitive
- surface water features
- ground water features
- hydrologic functions
- development
- site alteration
- fish habitat
- fisheries act
- natural heritage features and areas
- ecological functions

- Focus on regulated features, but expand to include other natural heritage features

What is relevant in the case of considering the role of buffers at mitigating impacts and avoiding a negative impact is to what level of confidence the approval authority (e.g., NPCA) expects regarding the ability of the buffers to mitigate impacts to not only avoid a negative impacts, but also contribute to achieving the goals and objectives related to protection and enhancement of features and areas.

Based on the review of policies that prescribe buffers, personal experience, and opinions expressed by other professionals (see the Proceedings of Buffers Best Evidence Conference, Carolinian Canada 2000) the following paragraphs provides rational for prescribing buffers in policy.

Without a starting point, whether it is a minimum buffer, or a more robust buffer width that can be reduced by a limited amount (or increased depending on the sensitivity of the feature and associated ecological functions and the potential for impacts from the adjacent land use), there will continue to be disagreements between a developer and the approval authority regarding the appropriate ecological buffer. The rational for what is

considered an appropriate buffer may be based on the science and ecological opinions of the professionals, however these disagreements are typically rooted in the objective of the given party (i.e., to maximize development potential vs. increasing the certainty that the feature and ecological functions will be sufficiently protected). This is further complicated by the lack of definitive science-based evidence to support a specific buffer width (e.g., buffers can vary from as little as 5 m to as much as 4,000 m, depending on the feature or function being assessed and the impact being measured).

In order to avoid unnecessary arguments that cause delays in approvals, excessive costs for studies and review, or hearings before the Ontario Land Tribunal, the policies should prescribe a starting point for buffers that are intended to achieve the objectives of the approval agency while providing flexibility to refine buffers depending on the sensitivity of the feature and potential from impact from the adjacent land use. This could be a more robust (i.e., wider) starting point that allows for refinement (usually a decrease) depending on the specifics of the feature and ecological functions, and impacts from the adjacent land use. While experience has revealed that a minimum buffer as a starting point often results in the minimum being recommended through an environmental study, the policy could prescribe a minimum buffer whereby the guidelines or a decision support tool are designed to result in an increase to the minimum as informed by an environmental study. Whether a minimum buffer starting point or a more robust starting point, both require a guideline or decision support tool to provide an objective and consistent approach to refining the starting point (i.e., wider or narrower width) that is supported by ecological principles and meets the objectives identified in policy by the approval authority.

On the last point, policies in planning documents are generally intended to achieve objectives set out in the planning document or a strategic plan. With respect to policies related to buffers, these are specifically related to the protection, maintenance or enhancement of natural features and ecological functions. In some cases, the policies may be developed with the intention of achieving a certain target, such as related to natural area cover, improving water quality, or enhancing biodiversity. Clear objectives are not only important to set clear policies, but they act as a basis on which to interpret the intent of policies. In the case of policies related to buffers, having a clear set of objectives will inform the type of policies (e.g., prescriptive) and the extent to which flexibility (e.g., refinements to buffer widths or permitted uses in buffers) is provided in the policy.

6. SUMMARY AND RECOMMENDATIONS

Buffers are known to play an important role in mitigating impacts from development and changes in land use on adjacent lands to natural features and areas. Planning and policy documents commonly define buffers based on their composition, purpose, and role in mitigating impacts. While often required to mitigate impacts and avoid negative impacts, buffers widths are not always prescribed in policy documents. Where buffers widths are prescribed in planning and policy documents, they vary in width depending on the feature type and sensitivity of ecological functions, and are often permitted to be refined (i.e., reduced or increased) as informed by an environmental study (e.g., EIS).

Through various reviews of the scientific literature examining the effectiveness of varying buffer widths to different features and functions, it is not surprising that there is a range of what is considered an effective buffer width. However, what is clear based on the scientific literature is that the wider the buffer, the more effective the buffer is at reducing impacts to natural features and ecological functions.

Best practice and guidance documents identify the following factors that should be used to inform ecologically appropriate buffer widths:

- sensitivity of the feature and ecological functions;
- the potential impact from the adjacent land use;
- biophysical factors of the adjacent lands such as slope, soils, hydrology and vegetation; and
- other mitigating factors (e.g., fencing between adjacent land use and buffer)

While some guidance documents provide a minimum recommended buffer, all guidance documents recognize that the buffer width can be refined (i.e., increased or reduced) as informed by environmental studies. A "one-size-fits-all" approach to prescribing buffers is generally not recommended. Environmental studies are undertaken to evaluate the buffer widths on the basis of the ability of the buffer to protect natural features and their associated ecological functions from impacts from the adjacent land use.

There is general consensus that some types of uses may be permitted within the buffer, however the function of the buffer should be maintained which may require a wide buffer to accommodate the ancillary use (e.g., recreational trail). In addition, infrastructure that would not be compatible with a buffer (i.e., would reduce the effectiveness of the buffer) should not be permitted within the buffer. Furthermore, buffers should be outside of the development zone (i.e., beyond rear lot lines and areas of site alteration) and be vegetated with native species left in a "free to grow" state.

There is no consistently applied buffer width to features, however the following buffer widths to regulated features are most commonly identified:

- 15 m for warm water (Type 2 and 3 fish habitat) watercourses and intermittent streams
- 30 m for cool/cold water (Type 1 fish habitat) watercourses and permanent streams
- 15 m for non-Provincially Significant Wetlands
- 30 m for Provincially Significant Wetlands and locally significant wetlands
- 10 m - 15 m for valleylands
- 30 m for shorelines to lakes and water bodies

It should be noted that the identified buffer widths are generally related to mitigating impacts to water quality and do not necessarily consider impacts to other ecological functions, such as wildlife habitat (e.g., for area sensitive species such as birds).

Prescribing buffer widths that can be refined based on an evaluation of the sensitivity of features and the potential for impacts is considered the most appropriate policy approach. However, providing a guidance document to inform refinements is necessary to ensure an objective and consistent approach is taken to inform ecologically appropriate buffer widths.

There is often disagreement between applicants and approval authorities over ecologically appropriate buffer widths. This is in part due to the lack of definitive science and variability in effectiveness of buffers between features, functions, and the differing objectives of the proponent (e.g., increased developable area) and the approval authority (e.g., high confidence that features and functions will be adequately protected). Therefore, it is imperative that buffer width policies are developed with consideration for achieving objectives and/or targets, are clear, robust, are prescriptive, but also provide some flexibility to ensure buffer width refinements are evaluated through an environmental study. Moreover, a decision support tool will be necessary to ensure an objective and consistent approach is applied to determining an appropriate ecological buffer width.

The decision support tool should be designed with consideration for the following:

- the sensitivity of the feature;
- potential for impacts resulting from change in adjacent land use;
- biophysical characteristics of the adjacent lands (e.g., slope, soils, vegetation cover, hydrology); and
- other mitigating factors that may supplement the effectiveness of the buffer.

A risk-based approach should be adopted that provides an opportunity to establish a starting point, whether it be a minimum buffer width that can be increased based on site-specific information, or a robust buffer width that is typically reduced. While the decision support tool allows for site-specific information to be taken into consideration, the guidance provided in the decision support tool should be sufficient to provide an objective, consistent approach to determining an appropriate ecological buffer width that is supported by scientific literature. The starting point of the robust buffer width, and the increases or decreases to a minimum buffer width should be based on meeting the goals, objectives and targets established through the policy document.

Following a review of the definitions, best practices and jurisdictional review, and review of decision support tools, the following recommendations are provided regarding buffer policies in the NPCA policy document:

1. The term buffer should be defined including providing the purpose of the buffer.
2. Buffer width(s) should be prescribed in policy. The approach to set a minimum buffer or set a robust buffer should be determined by the NPCA Board with consideration of input received through the engagement program.
3. A decision support tool is necessary to inform the refinement to the prescribed buffer width (whether a minimum or robust width starting point).
4. The buffer policies, prescribed buffer width(s) and decision support tool should be developed with consideration of the goals, objectives and targets (if any) for protection, maintenance and enhancement of the natural features and ecological functions.

6.1. Next Steps

This Discussion Paper will be used in conjunction with a Policy Theme Discussion Paper to solicit comment and feedback from the public, stakeholders, Indigenous groups, and municipalities regarding the direction for the NPCA's new policies. NPCA staff will take this feedback and release a draft of updated NPCA Policies later this year for further comment before making a final recommendation to the Board of Directors. At the same time,

any Decision Support Tools needed to assist with policy implementation will also be developed and recommended to the Board of Directions.

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APPENDIX A - Summary of Conservation Authority Policy Documents with Reference to Buffers

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
Ausable Bayfield (2009)	Ausable Bayfield Conservation Authority Stormwater Management Policies and Technical Guidelines	Yes	No
Catfish Creek	None	No	No
Essex Region	None	No	No
Grand River (2009)	Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation Ontario Regulation 150/06 (Last Amended in 2015)	Yes	No
Grey Sauble (Last amended 2013)	None	No	No
Halton Conservation (Last Amended/Updated in 2020)	Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document April 27, 2006 (last amended, November 26, 2020)	Yes	No
Hamilton Conservation (Oct 2011)	Hamilton Conservation Authority Planning & Regulation Policies and Guidelines	Yes	Pg 98 (buffer definition, refers reader to Vegetation Protective Zone)

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
			"Vegetation Protective Zone (Buffer): means permanent zones of natural self-sustaining native vegetation that border natural features (e.g. streams, wetlands, woodlots, shorelines) and are established to protect natural areas from the impacts of development or site alteration. The width of the vegetation protection zone is to be of sufficient size to protect the feature and its functions from the impacts of the proposed change and associated activities that will occur before, during and after construction, and where possible, restore or enhance the feature and/or its function. [Greenbelt Plan, 2005]" Pg 108
Kettle Creek (2006)	Policies and Procedures for the Administration of Section 28 Regulations: Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation	Yes	No
Long Point (2017)	Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation	Yes	No
Lower Thames Valley Conservation (Last amendment 2013)	Operational Guidelines Lower Thames Valley Conservation Authority Development, Interference with Wetlands and Alteration to Shorelines and	No	No

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
	Watercourses Regulation Ontario Regulation 152/06 (Under O.R. 97/04)		
Maitland Valley Conservation (2016)	Maitland Valley Conservation Authority Policies and Procedures for Compliance with the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation	Yes	No
Niagara Peninsula (2018)	NPCA Policy Document: Policies for the Administration of Ontario Regulation 155/06 and the Planning Act	No	No
Saugeen (*Amended/Updated in 2018)	Saugeen Valley Conservation Authority Environmental Planning and Regulations Policies Manual	Yes	An area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to development or site alteration. The purpose of the buffer is to protect the feature and its function(s) by mitigating the impacts of the proposed land use and allowing an area for edge phenomena to continue. A buffer may also provide an area for recreational trails and a physical separation for new development that will discourage encroachment (adapted from Ontario Ministry of Natural Resources' Natural Heritage Reference Manual, 2nd Edition, 2010). The vegetation within a buffer can be managed (e.g. trimmed, cut, thinned, but not cultivated)

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
			providing that the integrity of the buffer remains intact" (pg 136)
St.Clair Region (*Written/Updated 2016)	SCRCA section 28 wetland policy SCRCA Policies and Procedures of Administration of Section 28 Regulations Wetland Policies	Yes	No
Upper Thames River (Last revised October 24, 2017)	Environmental Planning Policy Manual for the Upper Thames River Conservation Authority	Yes	"Buffers: means planned and managed strips of land and vegetation located between natural heritage features/areas and development sites which are intended to protect the natural heritage feature." Pg 7-2
Central Lake Ontario (2014)	Policy and Procedural Document for Regulation and Plan Review	Yes	"Buffers - an area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to development or site alteration. The purpose of the buffer is to protect the feature and its function(s) by mitigating the impacts of the proposed land use and allowing an area for edge phenomena to continue. A buffer may also provide an area for recreational trails and a physical separation for new development that will discourage encroachment (adapted from Ontario Ministry of Natural Resources' Natural Heritage Reference Manual, 2nd Edition, 2010). The vegetation within a buffer can be managed (e.g., trimmed, cut, thinned, but not cultivated) providing that the integrity of the buffer remains intact." (pg. 94)

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
Credit Valley Conservation (Version from 2010	Credit Valley Conservation: Planning and Development Administrative Procedural Manual	Yes	No
Ganaraska Region Conservation (2014)	Policies for the Implementation of Ontario Regulation 168/06 Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation	Yes	No
Kawartha Conservation (Last Revised 2013)	Plan Review and Regulation Policies	Yes	An area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to development or site alteration. The purpose of the buffer is to protect the feature and its function(s) by mitigating the impacts of the proposed land use and allowing an area for edge phenomena to continue (adapted from Ministry of Natural Resources' Natural Heritage Reference Manual, 2nd Edition (2010)). The vegetation within a buffer can be managed (e.g., trimmed, cut, thinned, but not cultivated) providing that the integrity of the buffer remains intact. (Pg 148)
Lake Simcoe Region Conservation (Document dated Jan 2022)	Lake Simcoe Region Conservation Authority Ontario Regulation 179/06 Implementation Guidelines (Formerly Watershed Development Guidelines) Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation	Yes	"Buffer: means an area or band of permanent vegetation, preferably comprised of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to development and site alteration. The purpose of the buffer is to protect the feature

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
			and its function(s) by mitigating the impacts of the proposed land use and allowing for edge phenomena to continue." Pg 67
Nottawasaga Valley Conservation August 28, 2009	Nottawasaga Valley Conservation Authority Planning and Regulation Guidelines	Yes	No
Otonabee Conservation (Manual updated in 2015)	Watershed Planning & Regulations Policy Manual	Yes	"Buffers are an area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to development or site alteration. The purpose of the buffer is to protect the feature and its function(s) by mitigating the impacts of the proposed land use and allowing an area for edge phenomena to continue (e.g., allowing space for edge trees and limbs to fall without damaging personal property, area for roots of edge trees to persist). A buffer may also provide an area for recreational trails and a physical separation for new development that will discourage encroachment (adapted from Natural Heritage Reference Manual 2nd edition, 2010)." (Pg.168)
Toronto and Region Conservation *Last update—2008. Currently being updated according to website*	Planning and Development Procedural Manual	Yes	No

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
Cataraqui Region Conservation (2021)	Environmental Planning Policies	Yes	No
Crowe Valley Conservation (Updated 2020)	Watershed Planning and Regulations (O. Reg 159/06) Policy Manual	Yes	Buffers are an area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to development or site alteration. The purpose of the buffer is to protect the feature and its function(s) by mitigating the impacts of the proposed land use and allowing an area for edge phenomena to continue (e.g., allowing space for edge trees and limbs to fall without damaging personal property, area for roots of edge trees to persist). A buffer may also provide an area for recreational trails and a physical separation for new development that will discourage encroachment (adapted from Natural Heritage Reference Manual 2nd edition, 2010).(Pg. 123)
Lower Trent Conservation (Updated Feb 2022)	Lower Trent Region Conservation Authority Ontario Regulation 163/06 Policy Document	Used once; primarily the word "Setback" is used	No
Mississippi Valley Conservation (Updated 2021)	Development, interference with Wetlands and Alteration to Shorelines and Watercourses Regulation Policies	Yes	An area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature and usually bordering lands

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
			that are subject to development or site alteration. The purpose of the buffer is to protect the feature and its functions by mitigating impacts of the proposed land use and allowing an area for edge phenomena to continue. The buffer may also provide area for recreational trails and provides a physical separation from new development that will discourage encroachment. (Adapted from a definition in Fisher and Fischenich, 2000, citing Castelle et al., 1994 in Natural Heritage Reference Manual, MNR 2010) (pg 61)
Quinte Conservation (revised 2017)	Development and Interference with Wetlands and Watercourses Regulation - Policies and Procedures Manual for Planning Act Applications	No	No
Raisin Region Conservation	*Regulations Page either is absent or did not load*	No	No
Rideau Valley Conservation (Approved/Updated 2018)	Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 174/06 Under Section 28 of The Conservation Authorities Act, R.S.O. 1990, C. C.27) Wetland Policies	Yes	An area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to 13 development or site alteration. The purpose of the buffer is to protect the feature and its functions by mitigating impacts of the proposed land use and allowing an area for edge phenomena to continue. The buffer may also provide area for recreational trails and provides a physical separation

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
			from new development that will discourage encroachment. (Adapted from a definition in Fisher and Fischenich, 2000, citing Castelle et al., 1994 in Natural Heritage Reference Manual, MNR 2010) (pgs 12-13)
South Nation Conservation (Feb 2022)	Regulation Policy Pursuant to Section 28 of the Conservation Authorities Act, R.S.O. 1990, c. C.27 Ontario Regulation 170/06: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses	No	No
Lakehead Region Conservation (2021)	None (Only cites regulations)	No	No
Mattagami Region Conservation (2013)	Mattagami Region Conservation Authority: Regulation of Development, Interference with Wetlands And Alterations To Shorelines And Watercourses	No	No
Sudbury Conservation (2014)	Direction on the Administration of Ontario Regulation 156/06 - Wetlands	Yes	No
North Bay-Mattawa (2020)	Planning & Development Administrative Procedural Manual	No	No

Conservation Authority	Policy Document	Is the term buffer used in the policy document	Definition provided
Sault Ste. Marie Region Conservation (2017)	Sault Ste. Marie Region Conservation Authority Policies for the Administration of Ontario Regulation 176/06	Yes	Buffer: means an area or band of permanent vegetation, preferably comprised of native species, located adjacent to a natural heritage feature and usually bordering lands that are subject to development and site alteration. The purpose of the buffer is to protect the feature and its function(s) by mitigating the impacts of the proposed land use and allowing for edge phenomena to continue

APPENDIX B – Buffers Defined in Municipal Official Plans

Municipality	Policy Document	Term Buffer used in policy document	Is the term Buffer Defined in the policy document?	Definition provided or context used
Welland	City of Welland Official Plan	Yes	No	**Section 6**: Related to vegetation buffers, EIS, fish habitat and natural heritage systems.
Niagara-On-The-Lake	Town of Niagara on the Lake Official Plan	Yes	Yes, as a Vegetation Protection Zone	"A Vegetation Protection Zone (VPZ) is a vegetated buffer area surrounding a key natural heritage feature or key hydrologic feature. Uses within the VPZ are limited to those permitted within the feature itself. Agricultural operations (with no buildings or structures) and working landscapes may be part of the vegetation protection zone." **Pg 143, Section 8.6.1**
Niagara Falls	Official Plan for The City of Niagara Falls	Yes	Yes	"Buffer: a naturally vegetated protective zone adjacent to a natural heritage feature or area serving to cushion and protect it from the impacts of human activities." Appendix I—Definitions.
Fort Erie	Town of Fort Erie Official Plan	Yes	No	While no definition is provided for the term buffer, policy 4.17.14.3, Associated Buffer Area, notes that a 30 m buffer is identified in Schedules SHP-2 and SHP-3 around locally significant wetlands. Policy 4.18.12.2 f) notes that "Schedules RTB-2 and RTB-3 illustrate the PSW feature and the 30m buffer area associated with the feature. Development within the buffer area is regulated by the NPCA and generally not permitted unless approved by the NPCA."
Port Colborne	City of Port Colborne Official Plan	Yes	No	While not defined in policy, "naturally vegetated" buffers are required to be "retained in a natural state" (policy 4.1.1. k) and "be enhanced by the planting of native species" (4.4.4. l)

Municipality	Policy Document	Term Buffer used in policy document	Is the term Buffer Defined in the policy document?	Definition provided or context used
				In addition, policy 5.3.3.7 a) vi) notes that the purpose of the buffer adjacent to hydrologic features is to "mitigate potential changes to the hydrologic regime and protect the natural heritage feature from negative impacts of the adjacent land use".
Thorold	Official Plan of the City of Thorold	Yes	Yes, as a Vegetation Protection Zone	"Vegetation Protection Zone A vegetated buffer area surrounding a key natural heritage feature or key hydrologic feature within which only those land uses permitted within the feature itself are permitted. The width of the vegetation protection zone is to be determined when new development or site alteration occurs within 120 metres of a key natural heritage feature or key hydrologic feature and is to be of sufficient size to protect the feature and its functions from the impacts of the proposed change and associated activities that will occur before, during, and after, construction, and where possible, restore or enhance the feature and/or its function. (GP)" Appendix A, pg. 23
St. Catherines	The Garden City Plan: City of St. Catharines Official Plan	Yes	No	Policy 13.2.2 Natural Area General Policies, notes a buffer will be identified through an EIS. Buffers are identified through Natural Heritage policies (section 13.2.4).
Pelham	Pelham Official Plan	Yes	No	While not defined, section C2.1.1 and C7.2 require buffers and provide direction for their width and ability to refine buffers through an EIS
Grimsby	Town of Grimsby Official Plan	Yes	Yes, as a Vegetation Protection Zone.	"Vegetation Protection Zone means a vegetated buffer area surrounding a key natural heritage feature or key hydrologic feature within which only those land uses permitted within the feature itself are permitted. The width of the vegetation protection zone is to be determined when new development or site alteration occurs within 120 metres of a key natural heritage feature or key hydrologic feature and is to be of sufficient size to protect the feature and its functions from the impacts

Municipality	Policy Document	Term Buffer used in policy document	Is the term Buffer Defined in the policy document?	Definition provided or context used
				of the proposed change and associated activities that will occur before, during, and after, construction, and where possible, restore or enhance the feature and/or its function". Section 4-128—Section 4-129.
Wainfleet	Wainfleet Official Plan	Yes	No	While buffers are not defined, section **3.2.1.10, 3.2.2.14** notes that vegetated buffer are to be identified through an EIS and be left in a naturally vegetated state. **Section 3.2.3.3**: vegetated buffers of 30 m from critical fish habitat, and 15 m buffers from streams with marginal fish habitat are required but may be reduced as determined through an EIS. **Section 4.3.2** notes that vegetated buffers are encouraged along the Lake Erie shoreline.
Lincoln	Lincoln Official Plan	Yes	Yes, with reference to the Regional Official Plan	**Lincoln plan**: "Buffer" means buffer as defined in the Regional Official Plan **Niagara Region Official Plan:** "The term vegetation protection zone applies to key natural heritage features in a Provincial natural heritage system and to any key hydrologic feature outside of a settlement area. Elsewhere in the region the term buffer is used."
West Lincoln	Official Plan of the Township of West Lincoln	Yes	Yes (As Vegetation Protection Zone)	""Vegetation protection zone" means a vegetated buffer area surrounding a natural heritage feature or hydrologic feature within which only those land uses permitted within the feature itself are permitted." pg. 205

APPENDIX C – Selection of Buffer Studies Between 2012 and 2022.

Focal species or group	Impact Type	Extent of Impacts or range of buffer	Source	Comments
Watercourses and waterbodies				
Frogs	Logging	≥ 14 m	(Hawkes & Gregory, 2012)	
Groundwater quality	Pollutants (e.g., fertilizer, pesticide)	15 m	(King et al., 2016)	
Macroinvertebrates, fish, water quality	Pollutants (e.g., fertilizer, pesticide), temperature	≥ 30 m	(Sweeney & Newbold, 2014)	Review Article
Trout	Temperature	≥ 13 m	(Albertson et al., 2018)	
Flora biodiversity	Logging	≥ 30 m	(Elliott & Vose, 2016)	
Water quality	Dairy Agriculture (Nutrients, pathogens)	> 30 m	(Aarons & Gourley, 2013)	
Moss	Logging	> 30 m	(Oldén et al., 2019)	Finland
Water quality	Pollutants (e.g., fertilizer, pesticide)	30 – 50 m	(Medina et al., 2016)	
Migratory birds	Encroachment (e.g., dumping, structures, etc.)	≥ 100 m	(Medina et al., 2016)	
Water quality	Agriculture (fertilizer)	≥ 10 – 20 m	(Mancuso et al., 2021)	
Water quality	Herbicides	8 m	(Lerch et al., 2017)	
Water quality	Agriculture (total suspended solids)	50 m	(Sirabahenda et al., 2020)	
Reptiles and amphibians	Encroachment (e.g., dumping, structures, etc.)	55 m	(Guzy et al., 2019)	
Broad conservation goals	Encroachment (e.g., dumping, structures, etc.)	30 m	(Denryter et al., 2021)	
Water quality	Logging	15.2 m	(Secoges et al., 2013)	

Wetlands				
Freshwater turtles	Encroachment (e.g., dumping, structures, etc.)	200 m (90% of species) 1000 m (100% of species)	(Steen et al., 2012)	
Water quality	Agriculture (fertilizers, pesticides	150 m	(Sawatzky & Fahrig, 2019)	
Frogs	Agriculture	> 300 m	(Sawatzky et al., 2019)	
Frogs and salamanders	Logging	> 100 m	(Veysey Powell & Babbitt, 2015)	
Broad conservation goals	Encroachment (e.g., dumping, structures, etc.)	240 m	(Denryter et al., 2021)	
Water quality	Agriculture	≥ 40 m	(Haukos et al., 2016)	

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APPENDIX D – Conservation Authority Policy Documents with Reference to Buffer Widths

Conservation Authority	Feature Type	Buffer Width	Section	Comments
Niagara Peninsula Conservation Authority	Watercourse	**10 m** -Watercourses containing intermittent flow **15 m** - Water courses containing permanent water flow and providing specialized aquatic or riparian habitat, cold water or cool water systems	**9.2.5** Watercourse Buffer Composition.	Policy **9.2.5.2** allows for reductions of buffer widths to a limit of 5 m "to be considered in special circumstances based on a site specific evaluation by NPCA staff"
Credit Valley Conservation	Watercourse, woodlands, wetlands	**10 m** - flood hazard, erosion hazard, dynamic beach hazard, significant woodlands, and other wetlands **30 m** - Provincially Significant Wetlands, and 30 m from the bankfull flow of watercourses	**6.2.1 b)** Development Limits	Policy **6.2.1 c)** allows for a reduced buffer "based on the results of a comprehensive environmental study or site-specific technical report completed to the satisfaction of CVC, and consistent with provincial and municipal policy."
Central Lake Ontario Conservation Authority	Wetlands, watercourses, river and stream systems, woodlands.	**Single Dwelling, minor additions, accessory building and reconstruction** **10 m** - Wetlands between 0.5 and 2 hectares	**6.4.2** Policies for Development in other areas **8.4** Lot Creation	Policy **8.4** states if a provincial plan requires a greater buffer, the greater buffer width will take precedence.

Conservation Authority	Feature Type	Buffer Width	Section	Comments
		15 m - Wetlands greater than 2 hectares and PSWs **Lot creation adjacent to the Natural Heritage System** **15 m** - other wetlands **30 m** – PSWs **10 m** - woodlands **10 m** – River and Stream Systems **30 m** – cold water watercourse **15 m** – warmwater watercourse, watercourses.		
Grand River Conservation Authority	Valleys, *river systems	None		While buffer widths are not prescribed, policy **8.2** notes that "the 15-metre allowance helps to buffer development from the hazards of slope instability and to prevent the influence of development on the rate of slope movement".
Hamilton Conservation Authority	Watercourses	**15 m** - For "important habitat" and "marginal habitat" or fish habitat **30 m -** Critical Habitat, coldwater or coolwater watercourses	**Section 13**: Definitions	Section **13** definitions prescribe different buffer widths depending on the assessed habitat. It is also noted that 'Buffer' and 'vegetation protection zone' are interchangeable in this document.

Conservation Authority	Feature Type	Buffer Width	Section	Comments
Lake Simcoe Conservation Authority	Lakes, wetlands, and streams.	**30 m** – Lakes, wetlands, and streams	Policy **6.1.1** refers to the Lake Simcoe Protection Plan for required vegetation protection zone widths.	
Conservation Halton	Valleys, Wetlands	**30 m** - Provincially significant wetlands or wetlands greater than 2 ha in size **15 m** - wetlands less than 2 ha in size	**3.4.2**	
Toronto and Region Conservation Authority	Stream corridors, wetlands, woodlands, shorelines.	**10 m** – valley and stream corridor and any contiguous natural features or areas, woodlands and any continuous natural features or areas, other wetlands and any continuous natural feature, Lake Ontario Shoreline **30 m** - Provincially Significant Wetlands	**7.3.1.4** Potential Natural Cover and Buffers.	Policy **7.3.1.4** describes buffer conditions and widths in greater detail and explains the need for them in each circumstance. The policy notes a wide range of buffer uses and reasons for them. Policy 7.4.2 details both the need to protect buffers and other examples of buffers regarding building and safety hazards, etc. EISs are also recommended.
Kawartha Region Conservation Authority	Water systems, wetlands.	**30 m** - from fish habitat, and wetlands but can be reduced to **20 m** for coldwater and **10 m** for warmwater fish habitat if supported through an EIS	**3.4.6** Fish Habitat (Entire section including sub sections 3.4.6(1) to 3.4.6(13)	Policy **3.4.6** notes that buffer widths can be shortened depending on both the water feature type (cold water vs warm water) and if an EIS indicates that a smaller buffer would be appropriate. This section also notes that there may be instances where greater buffer widths

Conservation Authority	Feature Type	Buffer Width	Section	Comments
		30 m - from Trent-Severn Waterway lakes and connecting rivers		may be recommended depending on sensitive soil conditions.
Otonabee Region Conservation Authority	Water features including streams, ponds, Watercourses providing fish habitat.	**30 m** - Warmwater, coolwater and coldwater fish habitat, inland water bodies on the Canadian Shield, and Trent-severn waterway lakes and connective rivers, wetlands (can be reduced – see comments)	**2.3.7(4) - 2.3.7(12)** Fish Habitat Buffers	Policy **2.3.7(7)** allows the buffer to be reduced to 15 metre buffer width for warmwater systems and a minimum 20 metre buffer width for coolwater when an EIS demonstrates no negative impacts on the fish habitat Policy **2.3.7(11)** allows the width of a buffer to fish habitat and wetlands to be reduced to 15 m subject to an EIS demonstrating no negative impact Policy **2.3.7(12)** references that there may be instances where greater buffer widths are recommended. The policy also notes the difference between buffer and setback.

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