Natural Heritage Compensation Guidelines

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County of Essex, Planning Services
360 Fairview Avenue West, Essex, ON, N8M 1Y6
Ph. 519-776-6441, Fax.519-776-5688

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For additional information regarding this document, please contact:

Rebecca Belanger, Manager, Planning Services, County of Essex

Email: rbelanger@countyofessex.ca

Phone: 519-776-6441

Corinne Chiasson, Senior Planner – Environmental

Email: cchiasson@countyofessex.ca

Phone: 519-776-6441

How to Read this Document

The Natural Heritage Compensation Guideline is a planning tool that should only be utilized after full implementation of the Essex County Environmental Impact Assessment Guideline. Consideration of compensation as a demonstration of no negative impact must result in a net-gain to the natural heritage system and protection of any species at risk affected by the development and mitigation proposed. Typically, compensation should only be considered as result of undue hardship, necessary infrastructure, or required services. Applicants and consultants requesting consideration for a compensation plan will be required to utilize this guideline and demonstrate no net-loss and a net-benefit to the natural heritage system. All compensation plans are required to include recommendations for benefit and enhancements to the natural heritage system, and require confirmation that the lands will be protected in perpetuity.

This guideline therefore presents an approach to replacing portions of natural heritage features lost through the inevitable result of a development process, and/or infrastructure planning process after the decision to compensate has been fully evaluated and deemed acceptable to the planning authority. The application of compensation shall be consistent with relevant provincial, municipal and other approval authority natural heritage system planning policies, legislation and regulations.

This Guideline consists of eight (8) sections, a glossary, references, and appendices. All figures, diagrams and terms have been cited from the TRCA Guideline for Determining Ecosystem Compensation, which can also be utilized for reference and comparison.

Section 1: An introduction provides an overview of the context, rationale, and outlines principles that establish the intent of the Guideline.

Section 2: Outlines an approach for determining compensation requirements that attempt to replicate, to the extent possible and without significant delay or lag time, the same ecosystem structure and associated level of ecosystem functions that are to be lost.

Section 3: Lists and describes important considerations in planning and implementing a compensation project.

Section 4: Explains the habitat and restoration planning and implementation approach

Section 5: Typical examples of project design for restoration projects

Glossary: Provides definitions of terms used in this Guideline

References: Lists documents sourced in the development of this Guideline

Appendices: Provides examples of restoration plans, typical monitoring and maintenance agreement templates, and typical compensation options

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Natural Heritage Compensation Guidelines

1.0 Introduction

The County of Essex, our municipal partners, and the Essex Region Conservation Authority (ERCA) are dedicated to the protection, restoration and enhancement of our natural heritage system, its features and functions, and the valuable ecosystem services that the system provides to the Essex region. Population increases, and urban expansion pose challenges to the sustainability of the natural heritage system. This guide is intended to offer guidance to the region's approval authorities, agencies, consultants and the public, for a consistent, practical, and science-based approach to protecting and enhancing the natural heritage system for future generations.

The Essex Region falls within the highly important Carolinian Zone, one of the most biologically diverse regions in Canada. An area known for unique flora and fauna species, major migratory corridors, and vital habitat systems that support many listed endangered and rare species. Our unique location in extreme Southwestern Ontario acts as a bridge between the large open waters of the Great Lakes system. Our remnant wetlands, woodlands, and natural heritage systems provide vital habitat and rest areas for transient species seasonally. These important natural areas provide important breeding, nesting, foraging and spawning areas for many species at risk. Due to historic prime agricultural activities and urban settlement in the region, the natural cover of Essex County has been significantly reduced and altered resulting in only nine (9) percent natural cover. Protection and enhancement of the existing natural heritage system is therefore critical to sustain the existing species population. In accordance with the County of Essex Official Plan natural heritage policies, the objective is to expand the natural heritage system to a more sustainable fifteen (15) percent by 2050 to ensure resiliency from the impacts of a changing climate.

The natural heritage system is an interconnected network of watersheds made up of wetlands, valleylands, woodlands, fence rows and restoration sites that contribute collectively towards the protection of endangered and threatened species, as well as their habitat. *Ecosystem services* provided by *natural heritage systems* play a vital role in offsetting impacts of a changing climate, reducing flooding and erosion hazards, neutralizing harmful pollutants from built environments, and protection of our drinking water sources.

The purpose of this manual is to guide regional and local government officials and administration, along with developers, consultants, and the public through the evaluation and implementation process of a natural heritage compensation plan. The use of this guide does not negate the applicant's requirements to first satisfy the Mitigation Hierarchy outlined in the County of Essex Environmental Impact Assessment Guideline, as well as other pieces of legislation that may be applicable to the project such as screening and permit requirements under the Ontario Endangered Species Act (ESA) administered through the Ministry of the Environment, Conservation and Parks (MECP) or the Federal Species as Risk Act (SARA), or the Federal Fisheries Act, administered through the Department of Fisheries and Oceans (DFO). For more information please see the following links: https://www.ontario.ca/page/how-species-risk-are-protected ,

https://www.canada.ca/en/environment-climate-change/services/environmental-enforcement/acts-regulations/about-species-at-risk-act.html .
https://laws-lois.justice.gc.ca/eng/acts/f-14/

In 2024, the County of Essex reviewed and updated the ERCA guidelines for the completion of Environmental Impact Assessments (EIAs) (ERCA, 2019). These EIA guidelines provide guidance relating to the preparation and review of EIAs in support of planning and development applications processed under the *Planning Act*. Specifically, the purpose of the EIA guidelines is to:

- explain the various policies that trigger the need for an EIA (i.e., Provincial Planning Statement (PPS 2024) (MMAH, 2024));
- provide methodologies and data standards for conducting an EIA and to identify the level of detail required for an EIA;
- identify ways to **avoid, minimize, or mitigate** potential impacts to natural heritage features and ecological functions; and,
- enable municipal decision-making on development proposals which have the potential to impact a natural heritage feature or the identified natural heritage system (ERCA, 2019).

The EIA guidelines however, do not specifically address situations where: through a *Planning Act* or *Environmental Assessment Act* process, a natural heritage feature (either wholly or partially) has been adequately justified and authorized to be removed. In such cases, consideration of suitable compensation or offsetting measures to account for the specific natural heritage values of the feature to be removed from the landscape must be thoroughly demonstrated and assessed. Provincial and regional natural heritage policies still require an overall demonstration of no negative impact, or no net loss of the natural heritage area, or ecosystem function. Within this context, ecosystem compensation becomes an important tool to ensure that critical ecological functions lost are restored back into the landscape for an overall-benefit to both the ecological and anthropogenic communities.

Avoidance and minimization are the precedent before Compensation can be considered:

Appropriate standards according to the *Mitigation Hierarchy (1. Avoid, 2. Minimize, 3. Mitigate, 4. Compensate)* must be applied for each development that affects natural features. Development proposals that avoid or minimize impacts to natural heritage features are typically the most cost effective and feasible approaches for undertaking Environmental Impact Assessments. Development projects that initially intend to remove a natural feature (partially or its entirety), without first demonstrating that the mitigation hierarchy has been assessed **will not** be supported. The natural heritage compensation guidelines shall only be utilized after the EIA Guideline mitigation hierarchy has been evaluated and applied. The mitigation hierarchy is explained further in this guide in Section 1.1, Figure 1.

Compensation Principles and Standards

Historically, the Essex Region has seen significant loss to the natural heritage system, as well as ecologic and hydrologic functions of watersheds. For these reasons the County of Essex, and the local Municipalities have implemented Official Plan policies to protect the remaining natural heritage system and support future enhancement. This guideline is intended

to ensure **no net loss** to the existing natural heritage system, and set principles and standards for a net-benefit compensation process.

It should be strongly advised that compensation plans are complex and challenging, and should only be considered after all other options in the mitigation hierarchy are exhausted due to the following typical issues:

- limited land availability for restoration;
- the risk and complexity associated with restoration;
- Length of time required for ecological studies;
- lengthy negotiations between landowners, developers, and the approval authority;
- the need for transparency and consistent reporting of results, and in many instances, an inability to fully replace the lost ecosystem functions and land base;
- Requirement for financial support for long-term monitoring and maintenance to ensure long-term success of the restoration compensation project

Adaptation by Municipalities and Other Public Agencies

Each of the municipalities within the County of Essex may have differing objectives and approaches to natural heritage compensation. This guideline is intended to provide a minimum standard methodology and metrics to ensure no net loss in the natural heritage system to satisfy the natural heritage policies in the County of Essex Official Plan. Nothing in this guide would limit a municipality from requesting additional measures to ensure successful compensation results in accordance with applicable Provincial, regional and local policies.

It is important to note that there are limits to considering compensation as a demonstration of no negative impact. Some local natural heritage features are irreplaceable due to existing rare vegetation communities or species at risk habitat. Approval authorities should ensure a comprehensive approach is undertaken when reviewing development applications and environmental impact studies that recommend a compensation plan. The compensation plan must be scientifically defensible, and planned and implemented by qualified professionals. Compensation is a long-term, adaptive, and co-operative process undertaken by multiple stakeholders, including developers, landowners, municipalities, NGO's, and regulatory agencies. Approval authorities will require development agreements that include: protection in perpetuity, maintenance and monitoring timeframes, survival rate reporting and replacement costs with the developers and landowners. Approval Authorities working with their consultant peer reviewers should strive to recognize impacts to the natural heritage system at both local and regional levels.

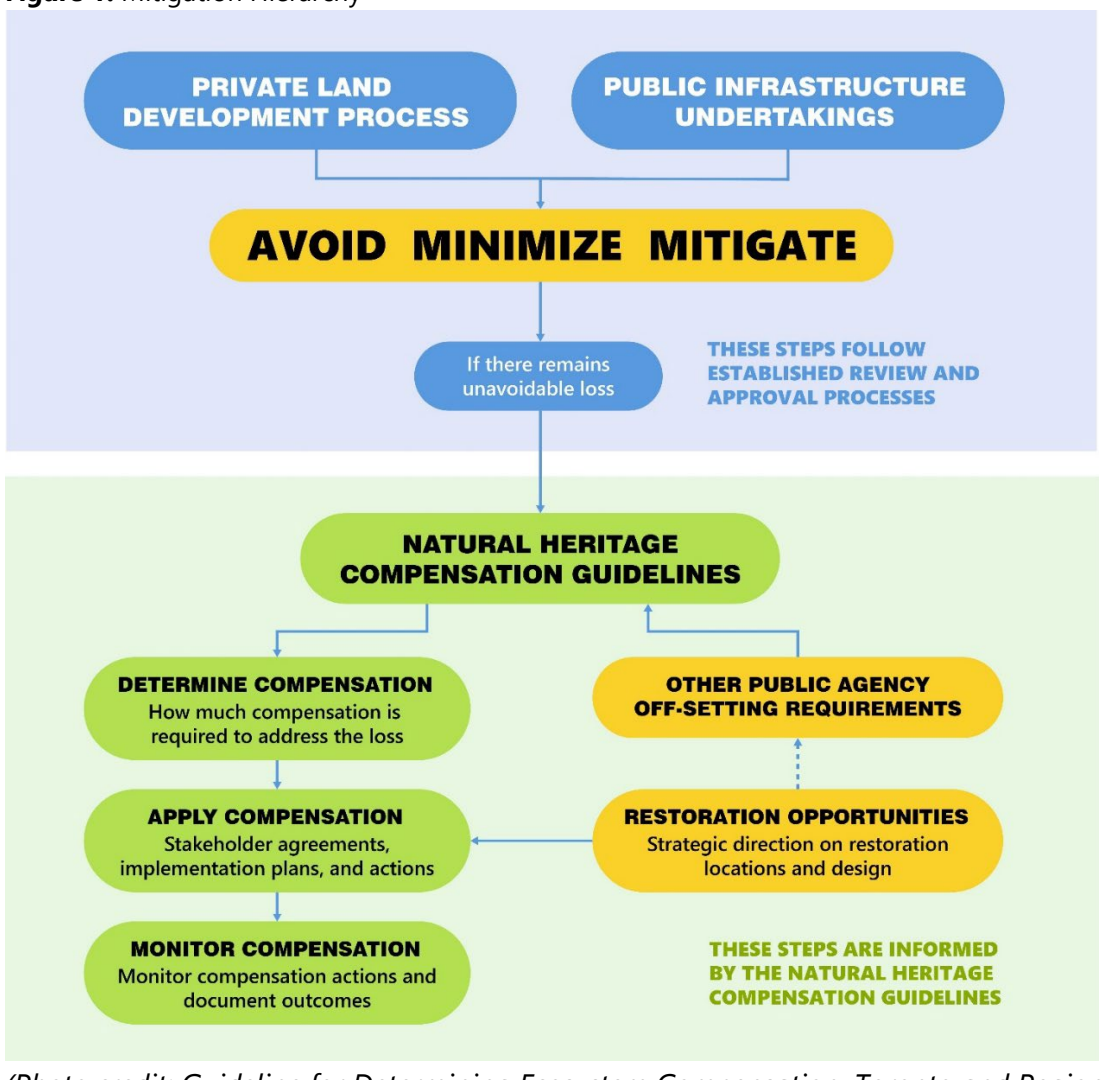
1.1 Mitigation Hierarchy

Developed and adopted by ecological professionals, through proven conservation science, the Mitigation Hierarchy is the standard approach for ecological offsetting programs, and is utilized by organizations throughout the world, including the United Nations (Convention on Biodiversity & Environmental Program), the World Bank, and the Department of Fisheries and Oceans Canada. The Mitigation Hierarchy assists decision-makers and proponents in prioritizing the approach to addressing negative impacts on natural features and their ecological and ecosystem functions from proposed

development projects. It calls for the avoidance of impacts first, then minimization, followed by mitigation, with compensation (or offsetting) as a final option only when and where impacts are unavoidable. By following this series of steps, which support the principle of "no net loss", the end result may be regarded ultimately as an adequate demonstration of no negative impact, as required by the PPS (MMAH, 2024). The goal of "no net loss" is to balance unavoidable losses from development with habitat restoration, rehabilitation or enhancement, so there is no overall loss to ecosystem function on the landscape. Complete loss of a natural heritage feature and its inherent ecological functions is not an acceptable approach in the development approval process, regardless of historical planning decisions made prior to the establishment of Provincial natural heritage policies. Additionally, it should be noted that a lack of formal designation of an applicable feature within relevant official planning documents does not equate to the absence of significance. The proponent and their consultant are responsible for assessing the natural heritage feature's significance in accordance with provincial and local guidance documents and policies.

The following outlines the steps of the mitigation hierarchy and how the County of Essex and Municipal staff consider the hierarchy when reviewing planning and/or permit applications and associated environmental studies.

Figure 1: Mitigation Hierarchy



(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

Avoidance: Prevents impacts from occurring by development being located completely outside of the natural heritage system

It is to be the first priority and most cost-effective approach for developers to locate development proposals completely outside of any features within the natural heritage system. This method is the most fiscally responsible demonstration of no negative impact. Avoidance may be effectively achieved by modifying the proposed development location and/or the scope, nature and timing of activities.

Minimize: Reduce the impact to acceptable level

If impacts cannot be completely avoided, the next best approach is to minimize impacts as practically feasible. This would include measures to reduce the duration, intensity and/or extent of impacts (e.g., reducing the footprint of works), including direct, indirect and cumulative impacts that cannot be completely avoided. Minimizing reduces potential impacts and is often tied to mitigation including consideration of opportunities for restoration and enhancement.

Mitigate: Apply mitigative techniques to maintain feature and functions

Where avoidance or minimization are not considered feasible, the next step is to explore options for mitigation. Mitigation involves implementing specific measures to reduce the duration, intensity, and/or extent of impacts, including direct, indirect, and cumulative impacts, where feasible. Examples of mitigation measures include installation of sediment and erosion controls; establishing adequate setbacks, buffers and exclusionary fencing; and timing works to occur during less sensitive periods for wildlife. Opportunities for restoration, rehabilitation and enhancement of degraded or impacted ecosystems may also be considered to mitigate impacts. It should be noted that all mitigation measures (such as buffers, fencing, erosion controls) are to be undertaken outside of the extents of the natural heritage feature.

Compensate (Offset): Create new or restore features to offset for loss

The final approach, to be used only as a last resort, is to compensate or offset any residual significant, adverse impacts where avoidance, minimization, and mitigation are not considered feasible measures. Offsetting is a methodical and calculated approach for assessing potential adverse impacts resulting from development on natural features, and compensating for these impacts appropriately. It involves intentional restoration and/or enhancement of an existing natural heritage feature, or the creation of a new feature in an alternate and appropriately evaluated and approved location.

Offsetting is a well-known and long-established ecological approach for dealing with ecological loss, where the need has been demonstrated and no alternative exists. Some development proposals, despite having followed the first three steps of the Mitigation Hierarchy approach, still result in a loss of natural heritage features. Infrastructure proposals, such as new roads, are examples where the loss of features is sometimes unavoidable. Infill development within settlement areas where urban hedgerows exist may also be another example. In these situations, where compensation is the only option, a “net gain” in natural heritage features/ecosystem function should be pursued.

1.2 Compensation Policies and Principles

In accordance with the PPS (MMAH, 2024), County and Municipal OP's contain policies for the long-term protection of the natural heritage system. These OP's also contain specific policies and guidelines relating to the completion of EIAs. Local compensation policies should incorporate the following concepts:

- Policies should always advocate first for the protection of natural heritage features and the full natural heritage system, including defined restoration opportunities.
- Compensation must be considered only as a "last resort" once the established Mitigation Hierarchy of: avoid, minimize, mitigate has been applied first.
- The decision to pursue compensation for lost ecosystem services would only be available if:
    - the natural heritage system is not fully protected by any other applicable federal, provincial, or municipal requirement(s);
    - all other efforts to protect the natural heritage system have been evaluated and exhausted first, utilizing the Mitigation Hierarchy;
    - it takes place in consultation with the municipality and the landowner, and if applicable the County of Essex; and,
    - it takes place at the appropriate level of the planning and development process for maximizing options for enhancement to the natural heritage system.

- Where feasible, compensation should take place in proximity to where the loss occurs, ie. the same subwatershed. Compensation should be informed by the Essex Region Natural Heritage System Strategy (ERNHSS) (ERCA, 2013), and any other applicable provincial, regional or municipal natural heritage inventories and evaluations. Compensation outcomes should strive to fully replace the same level of lost ecosystem structure and function and where possible achieve an overall net gain.
- Ecosystem restoration should be configured in such a way to improve the size and shape of the natural heritage system as a whole, and protected from adjacent land uses
- Restoration should strive for interconnectivity between watersheds, to support cross functionality and enhance genetic diversity
- The compensation process should be carried out in a transparent manner to ensure accountability of all parties involved.
- Implementation of compensation should be completed in a timely manner so that ecosystem functions are re-established as soon as possible after (or even before) losses occur.
- The compensation process should use an adaptive management approach incorporating monitoring, tracking and evaluation to gauge success and inform program improvements.
- Lands secured for compensation restoration should be placed in public ownership and designated and zoned in an environmental protection category. They should also be in proximity or merged with public held lands to be accessible, and to enable the long-term protection and management.

The County of Essex continues to work in partnership with member municipalities and conservation authorities to strengthen protection policies, advocate for an integrated approach to community design, and continually highlights the importance of our region's natural heritage system to the well-being of communities. The development of these compensation guidelines does not in any way diminish the County of Essex's commitment, or the commitment of its

member municipalities, to the protection of natural heritage features, functions and services of the natural heritage system. Accordingly, the establishment of these guidelines does not negate the need for development and infrastructure applications to first apply the Mitigation Hierarchy. Natural heritage removal will not be permitted solely on the basis of convenience, increasing lot yield, or making an otherwise "undevelopable" property into a "developable" property. If a property is constrained due to natural heritage or other restrictions an alternative development layout may need to be considered.

The principles and standards established herein are intended to ensure that compensation remains a last resort and that all efforts for protection are exhausted prior to contemplating removals. These guidelines outline the important standard principles and methods needed for successful compensation outcomes, while also recognizing that municipalities or other public agencies may wish to enhance these to their own needs.

1.3 Purpose and Scope of the Guideline

The purpose of this guideline is to determine the total amount of compensation required to replace destroyed or altered ecosystem features. This shall only be done after it has been decided that compensation is required by the approval authority, through completion of an environmental impact assessment that has assessed the mitigation hierarchy. The Essex County EIA Guideline and the Compensation Guideline are intended to assist developer's consultants, planners, stakeholders, ecologists, and other practitioners through this process. These studies are based on ecological research and design principles and outline a consistent and practical implementation process to create a minimum standard for natural heritage restoration.

1.4 What the Guideline is Not

This guideline does not perform the following:

- Determine if a project requires compensation. This is done through planning and ecological inventory and evaluation, environmental assessment, or permit processes, and is guided by policy addressing compensation when applicable.
- Replace or negate the requirements of other legislation that relates to impacts to species or ecosystems at each governmental level.
- Make suggestions or alter any steps leading up to the decision to require natural heritage compensation.
- Apply to built types of green infrastructure or individual trees located in parks or along roadsides. Natural heritage compensation strictly applies to natural ecosystems. Municipalities may have by-laws containing provisions for tree replacement.
- Directly address compensation requirements for aquatic ecosystems. This guideline will defer any compensation of the loss of fish habitat to the Department of Fisheries and Oceans' Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the Fisheries Act (2019) may be required.

1.5 Applicability of the Guideline

Eligible Natural Features for Compensation

Natural heritage compensation guidelines may be applicable to the following natural features dependent on the result of Environmental Impact Assessment (EIA) evaluation, Species at Risk Screening and their underlying Official Plan designations and Zoning categories:

- Forests
- Woodlands
- Wetlands
- Thickets
- Meadows

These natural features must be deemed eligible for compensation through applications for development, infrastructure, or ERCA permits.

Elements Not Covered for Compensation

Natural Heritage compensation does not apply to the following:

- Loss of fish habitat (defer to the Department of Fisheries and Oceans Canada (DFO).
- Built types of green infrastructure or community amenities.
- Individual trees located in parks or along roadsides.
- Buffers or Vegetation Protection Zones.
- Provincially significant wetlands

Another mechanism for restoring lost habitat is the Ontario Ministry of Environment, Conservation and Parks (MECP) Overall Benefit Permit (OBP) process under the Ontario *Endangered Species Act* (ESA). Where an ESA Permit is required, the County of Essex defers to MECP for their requirements under their species-specific permitting process. However, it is recognized that the provision of overall benefit required through the ESA Permit process only addresses impacts to regulated habitat of the subject species at risk and **may not compensate for all of the lost habitat and ecological function provided by the entire ecosystem impacted by the development.** Therefore, there may be cases where a portion of the impact to habitat is compensated through one mechanism (eg. MECP Benefit Permit) while the remaining impact is compensated through a different mechanism (EIA Review through a PLA application). In these cases, determining what is required to compensate for the remaining impact can be accomplished through the application of these guidelines.

1.6 Intent of the Guideline

The following principles represent the intent of the guideline.

1. Consideration for natural heritage compensation may only be applicable where it is consistent with the appropriate legislation, regulations and supporting policies and guidelines.
2. Compensation must follow the mitigation hierarchy of Avoid, Minimize, Mitigate, then Compensate. Compensation is to only be applied after a detailed analysis has determined that the mitigation hierarchy is not possible or feasible.
3. Transparency must be prioritized during the compensation process to ensure accountability of all parties involved.
4. The compensation process must aim to be consistent and replicable.
5. Restoration projects resulting from compensation should strive to replace the level of lost ecosystem structure and function in full and where possible achieve an overall net-gain. Restoration should be ideally in close proximity to where the loss occurs.
6. Strategic watershed and restoration planning should inform on-the-ground ecosystem restoration in the compensation process.
7. Implementation of compensation should occur promptly so that ecosystem functions are re-established as soon as possible after (or even before) losses occur.
8. The compensation process should use an adaptive management approach incorporating monitoring, tracking, and evaluation to gauge success and inform program improvements.

2.0 Components of a Compensation Project

In determining what compensation will be required, some important components that must be considered are the location of the compensation project, and who will undertake the project.

The project may be located in the following:

- On-site: compensation occurs on the same site that the ecosystem impact is taking place; and/or,
- Off-site: compensation occurs in a different location from where the impact is taking place.

The compensation may be implemented by the following:

- the Proponent: contractors hired by the proponent to plan, design, prepare the site, undertake the restoration work, and monitor and maintain the restored ecosystem, in accordance with sections 3.2 and 3.3.
- ERCA: ERCA's restoration staff plan, design, prepare the site, undertake the restoration work, and monitor and maintain the restored ecosystem, in accordance with sections 3.2 and 3.3
- a public agency other than ERCA: the municipality or other public body may choose to plan, design, prepare the site, undertake the restoration work, and monitor and maintain the restored ecosystem, in accordance with Sections 3.2 and 3.3. The applicable Restoration Typical(s) in Appendix A can be a useful reference when designing and implementing restoration works.

In the instances that the proponent or another public agency will be undertaking the compensation project, the planning approval authority, the County of Essex, ERCA, or any other relevant review agencies can review the proposed compensation project to ensure the intent of the guidelines is being met and the quality of the restoration plan is

acceptable. Compensation agreements are recommended to be utilized, as a basis. (Examples that can be used as a guide can be found in Appendix A of the *Guideline for Determining Ecosystem Compensation*, published by the Toronto and Region Conservation Authority (TRCA, 2023)).

On-Site Compensation is Preferred
Compensation of natural heritage can either happen on-site, or off-site of the development area; however, on-site compensation is preferred. This removes the complex process of acquiring new lands in proximity to where loss has taken place. The ERNHSS, will be utilized as a basis to support if on-site compensation is preferred versus off-site or cash-in-lieu.

Cash-in-Lieu and Land Base Calculations
When a compensation project is implemented by the County of Essex, local municipality, ERCA or another public agency, proponents provide funds to the respective public body in lieu of undertaking the compensation project themselves. The amount of the cash-in-lieu is based on the cost to restore the impacted ecosystem's structure (Section 2.1), the cost of replacing its land base, and cost for 1, 3, and 5-year maintenance and reporting as outlined in (Section 2.2). The cash-in-lieu will either be held in a reserve by the County/municipality or transferred to ERCA to be utilized in the Clean Water Green Spaces Program.

Public Infrastructure and Land Base
Section 2.2 should be referenced when a public infrastructure project is undertaken by a municipality. Certain public infrastructure projects may have special circumstances for the application of the land base portion of compensation where there are alternative methods of compensation.

Combination of Cash-in-Lieu and Public Infrastructure
A combination of both options listed above may be considered. This may include partial on-site or off-site restoration by ERCA, the County of Essex, local municipality and cash-in-lieu. Regardless of the method for achieving compensation, that method should match the intent of the natural heritage compensation guidelines. In particular, sections 1.4, 3.0, and 5.0 shall be followed.

2.1 Replicating Ecosystem Structure

Ease of re-establishing and restoring ecosystem structures varies among the different types of ecosystems. Regardless of the method used to determine compensation needs, efforts to restore lost ecosystem structures and functions often fall short, especially in the short term. Recognizing this limitation, this guideline proposes an approach that aims to replicate, as closely and promptly as possible, the original ecosystem structure and associated functions that will be lost.

Non-treed Ecosystems
The ability to restore a similar structure within a reasonable timeframe varies depending on the type of ecosystem. For instance, some ecosystems like cultural meadows can regenerate relatively quickly due to rapid vegetation growth, minimizing lag time. However, this does not imply these ecosystems are less complex or less vital, nor does it eliminate the risks and uncertainties associated with their restoration; it simply recognizes that vegetation in non-treed ecosystems can be established and function ecologically relatively quickly.

Treed Ecosystems
Treed ecosystems require significantly more time to recover due to their lengthy growth periods and the inability to transplant fully grown trees. To address this challenge, this guideline suggests that the loss of a mature forest should be compensated by establishing a larger, young forest with a greater plantation ratio to account for the loss.

This guideline employs basal area as a measure to determine restoration ratios (in hectares). Basal area is a standard forestry measurement, is included in the *Ecological Land Classification for Southern Ontario* (Lee et al., 1998), and is a widely used standard practice that can be easily measured using basic equipment (see Section 6.0). It refers to the cross-sectional area occupied by tree stems at chest height (1.3 m), and expressed as a unit of land area (m^2/ha). In general terms, older and higher functioning treed ecosystems will have a greater basal area. Basal area also loosely equates to, and can be used as a surrogate for, above ground biomass within a treed ecosystem. Biomass in turn correlates to some of the ecosystem functions that a treed ecosystem is able to provide. Therefore, attempting to re-establish the same basal area in the newly restored treed ecosystem as was lost, helps, in part, to ensure that the same level of some ecosystem functions is maintained.

Dead Trees
For the purposes of these Compensation Guidelines, dead trees are included in the basal calculations. Dead trees contribute to the function of forested ecosystems and therefore should be considered in the assessment of the natural feature that is being lost. This in turn informs the restoration requirements in order to replace the lost feature. This is particularly relevant at this time, given that a number of ash trees continue to die due to the Emerald Ash Borer.

Compensation Ratios Based on Basal Area
The objective for treed ecosystems is to re-establish the same level of basal area within 10 years of implementing the compensation restoration. Based on the survival and growth rates of previous restoration projects, it is typical to achieve a basal area of 5 m^2/ha at the 10-year mark. Table 1 (below) is used to determine the compensation ratios for various basal area categories.

Table 1: Compensation ratios based on basal area of impacted site.

Basal area range (m^2/ha)	Average basal area (m^2/ha)	Lag time factor* (m^2/ha)	Compensation Ratio (ha: ha)
0-5	5	5	1:1
5.1 – 10	10	5	2:1
10.1 – 15	15	5	3:1
15.1 – 20	20	5	4:1
20.1 – 25+	25	5	5:1
*Basal area of 10-year-old restoration site			

While some ecosystems can recover quickly after restoration, others, particularly treed ecosystems, require longer periods due to their structural complexity and growth dynamics. Basal area serves as a practical proxy for assessing above-ground biomass and ensuring the maintenance of ecosystem functions post-restoration.

Procedure for Determining Replacement Ratios with Basal Area

1. Determine the vegetation type(s) for the area being impacted using the *Ecological Land Classification for Southern Ontario* (ELC) system (Lee et al., 1998). If more than one ecosystem type is being impacted, then the vegetation type must be determined for each.

2. Calculate the area (in hectares) of each vegetation type being removed.

3. Determine the basal area for each impacted vegetation type (refer to Section 6.0). If only a portion of the feature is affected, calculate the average basal area based on the entire feature rather than just the impacted portion.

4. Referencing Table 1, establish the compensation ratio for each vegetation type being removed. Vegetation communities with minimal or no trees, indicated by a basal area of $5m^2$/ha or less, may be replaced at a 1:1 ratio.

5. Based on the area of each vegetation type being removed and the corresponding compensation ratios, calculate the total restoration area required for each vegetation type.

In some cases, specific ecosystem functions provided by the impacted area may be required for restoration as part of planning or infrastructure review processes. These conditions can influence the restoration obligations outlined in Section 3.2, which details project-specific requirements.

Land Area Required for Restoration
There are instances where the area needed to restore similar ecosystem functions exceeds the area impacted. In such cases, excess restoration may be conducted on other identified and protected lands designated for natural system restoration purposes. Examples illustrating on-site and off-site compensation are provided in Section 5.0.

Scattered Mature Trees within a Natural Feature
Certain circumstances may necessitate assessing impacts to individual trees within an ecosystem, such as a temporary disturbance to a cultural meadow with scattered mature trees. While meadow habitats can recover relatively quickly post-impact, compensating for mature tree loss may also be necessary. In these cases, an alternative to the basal area method may be required to calculate compensation requirements. Section 7.0 offers guidance on determining tree replacement ratios for individual trees where municipal tree by-laws do not apply.

Woodland Understory Vegetation within Natural Features
The understory of a woodland feature must also be considered in compensation plans as this midlevel region of the natural feature contains tree saplings, shrubs, herbaceous seedlings, shelter for wildlife such as logs and fine woody material that contribute to the ecological and hydrologic functions and services of the woodland. This area represents the future replacement generation if part of the mature canopy is lost. When evaluating no net-loss and recommending benefit solutions, the understory ecosystem must be evaluated and included in the compensation plan.

2.2 Restoring Ecosystem Types and Functions

The purpose of compensation policies is to ensure restoration of the same ecosystem type(s) as what is to be lost to development (e.g., restoration of a forest equivalent to the forest lost). However, there may be instances where this is not

achievable due to the specific site conditions of the restoration location, or not desirable based on strategic restoration priorities. Site conditions, including soil type, drainage, exposure and aspect, will dictate which ecosystem types are suitable for a particular location. There may also be circumstances that dictate special technical direction that deviates from a typical "like for like" approach. Nevertheless, in all cases, the type(s) of features to be restored will be guided by relevant approval authority, provincial and municipal natural heritage objectives, restoration programs and strategic ecosystem management priorities.

In addition, there may be particular ecosystem functions provided by the impacted ecosystem that warrant consideration in the design and implementation of the compensation/restoration works. For example, habitat for a particular species or group of species may need to be incorporated into restoration projects to help address the loss of this habitat as a result of the ecosystem removal. Specific requirements for restoration could include:

- restoration of particular ecosystem type(s), vegetation type(s), or plant assemblages;
- a greater biodiversity in the restoration plantings in order to provide habitat with a higher species richness;
- the need to re-use soil, rock or woody material for habitat structure in the restored site; and/or,
- perform a plant transplantation in order to rescue populations of rare plant species.
- Specific habitat replacement for species at risk (ESA) as result from a MECP Benefit Permit.

2.3 Compensation Project Location

ERCA's *Essex Region Natural Heritage System Strategy* (ERNHSS) (ERCA, 2013) identified the need to not only protect core natural features and areas, but to sustainably expand on them through restoration and connections within the landscape. The overall size of the natural heritage system plays an important role in determining the ecosystem functions they provide. Larger, more connected ecosystems are more diverse, provide greater levels of ecosystem functions and are better able to withstand the stresses of urbanization and climate change. It is therefore critical to ensure that any losses of our region's natural heritage due to the impacts of development, be addressed by restoring lands within the identified natural heritage system.

In cases where natural heritage system land is lost due to the removal by development or infrastructure projects, new lands must be added to the natural system through compensation so there is no net-loss. Any loss to the natural system should be compensated at a ratio determined by this guideline, and EIA or ESA approval processes. Lands identified for addition to the natural system, whether on the development site or elsewhere, must be configured to enhance overall ecological function, with additional guidance provided in Section 3.0.

For off-site compensation projects replicating land base, two points are considered:

- The new lands should be as close as possible to the original location to maintain accessibility of restored ecosystem functions and services to the local community (refer to section 3.2 for more information).
- Lands secured off-site for compensation should ideally be located within the ERNHSS identified restoration opportunities layer with a mechanism for long term protection or securement.

Proximity to Loss

The location chosen for the compensation project (both land acquisition and ecosystem restoration) should ideally be within the same geographic area as the ecosystem that was removed (same neighborhood, subwatershed, or municipality). This ensures that the restored ecosystem functions and services benefit the same area. In cases where land acquisition is part of the compensation, the lands to be acquired and the lands designated for restoration do not need to be on the same site. Existing lands that have been previously identified and secured may be restored to address the ecosystem restoration component, while separate lands are acquired to fulfill the land base compensation component. However, both should be located within the same geographic area as the impacted site. The suitability of the restoration location may also be influenced by requirements to restore specific ecosystem types or achieve particular natural heritage objectives.

ERNHSS Restoration Opportunities

The compensation lands should be located within the area identified within the ERNHSS (ERCA, 2013) restoration opportunity area. This is required to ensure that compensation projects assist in implementing strategic restoration of areas within the overall identified natural heritage system, ie., adding to core natural heritage features and creating linkages between them.

Land Ownership and Designation

Lands acquired for compensation purposes should be placed under public ownership and designated and zoned for environmental protection. Ideally, these lands should be situated near existing public lands, ensuring accessibility for effective long-term protection and management.

Land Availability

In highly urbanized watersheds, adding lands to the natural system may be challenging due to limited availability. In such cases, municipalities, the County of Essex, and proponents can collaborate to identify lands within the natural system that require restoration to compensate for permitted losses. However, this should be an exception rather than the rule, as it could lead to a net loss of land within the natural system. Alternatively, lands can be secured outside the impacted municipality but within the upper portion of the same watershed, ensuring downstream municipalities benefit from long-term ecosystem services.

Ecosystem Configuration

Ecosystem restoration projects should be designed to enhance the size and shape of the natural heritage system, thereby improving local ecosystem function and the larger natural system overall. Newly restored ecosystems should also be strategically positioned to protect them from adjacent land uses. When selecting restoration and land acquisition locations, maximizing ecosystem connectivity is essential. Enhancing east-west connectivity, for instance, can improve cross-watershed functions.

Municipal Infrastructure Projects

Investment in infrastructure and the protection of natural systems both serve the public good. Environmental impact assessments for public projects as part of the Environmental Assessment are crucial in minimizing impacts on natural features and their functions. When impacts cannot be avoided, compensatory measures should be implemented to maintain the public benefits provided by these natural systems.

This guideline outlines requirements for compensation projects, reflecting best practices for restoring lost features and enhancing the natural system. Additionally, it assists in review and approval processes by specifying restoration costs and explaining the critical role of the natural system's land base in its ongoing function. Municipalities typically allocate right-of-way lands primarily for infrastructure, often leaving little surplus land. (Refer to Section 8.0 for a diagram example of Municipal Infrastructure.) In such cases, the land area removed from the natural system due to infrastructure projects can be tracked and monitored. This cumulative tracking helps assess how these losses affect natural system function and explore strategies to offset them, such as leveraging existing municipal land acquisition and ecological restoration programs.

For individual infrastructure projects that impact large portions of the natural system (multiple hectares) or affect publicly owned lands, discussions may be necessary to determine compensation requirements on a case-by-case basis.

2.4 Cash-in-lieu Option

When on-site compensation is not feasible and suitable off-site land is unavailable, proponents may provide cash-in-lieu equivalent to the market value of the developable land acquired to the municipality. The funds would be held by the municipality, or the County of Essex, or forwarded to the ERCA for the Clean Water Green Spaces Program for implementation. Should the funds be retained by the Municipality they would be set aside in a natural heritage restoration reserve account to be utilized within a determined timeframe, to achieve equivalent restoration loss or until such time as land area becomes available for a restoration project. The amount of the cash-in-lieu should be based on the cost of actual restoration (supplies, materials, staffing costs, equipment, etc.) including follow-up monitoring and management, as well as any costs associated with the acquisition of land for the project (if necessary).

3.0 Application of Replacement and Compensation

Once the municipality, County of Essex, and the proponent agree to the specifics of the compensation project, the final decision is documented, the need for legal agreements is determined, and a land securement (if applicable) and ecosystem restoration implementation plan are established.

3.1 Agreements

Agreements will vary depending on the compensation approach and which party will oversee implementation. Examples of agreements may include conditions within draft plan approvals for subdivisions, site plan agreements, or commitments from Environmental Assessments. Alternatively, there may be a standalone agreement specifically for the compensation plan, signed by all relevant parties (proponent, municipality, and County of Essex). The terms and conditions of these legal agreements will be determined by the parties involved in compensation decisions. The following are factors to consider when drafting agreements:

- Agreements for conditional approval should specify using current restoration costs and current land values (at the time funds are received) in calculating compensation funds
- Compensation funds transferred to a public agency must be used for installing the agreed ecosystem type, including land acquisition if necessary, and maintenance and monitoring to ensure funds are directed towards replacing lost ecosystem functions and services.

- Funds transferred to a public agency should be received before any features are removed.
- A timeline for implementation may be set to ensure replacement of the ecosystem as soon as possible, ideally before the impact occurs.
- If the proponent undertakes compensation actions, a security should be held until the warranty period expires. Warranty periods will vary but should align with the monitoring duration determined. Security amounts will vary based on perceived risks and the complexity of restoration actions. Phased release of securities may be negotiated depending on the nature of the project to ensure development applicants undertake the required compensation work.
- If upon review it is found that an agreement is not being followed, the proponent will be advised in writing and ERCA may be transferred the security in order to use the funds to undertake the necessary work. This ensures that the appropriate funding is available should the applicant fail to undertake or complete the agreed upon compensation.

In addition to these considerations, circumstances may necessitate additional measures to mitigate risks to an acceptable level. Examples of such measures include the following:

- Requiring greater financial securities to support potential mitigation measures and contingencies.
- Extending the duration for which financial securities must be held to ensure newly restored ecosystems are established.
- The County and/or municipality reserves the right to utilize the security deposit to undertake the necessary works should a proponent not fulfill the conditions of a compensation agreement within the specified timeframe.
- The County and/or the municipality reserves the right to request an increase to the size of the required restored ecosystem based on the assessment.
- Use ERCA to undertake ecosystem restoration, land securement, monitoring, and any remedial works required.
- Lands secured for compensation should be placed in either public ownership or designated and zoned under an appropriate environmental protection category which protects the feature in perpetuity. Should lands remain in private ownership, a maintenance plan should be put in place to ensure the success of the plan is maintained for 5 years along with the ability for the approval authority to inspect the restored site to monitor the survival rate.

Agreements and Public Agencies as Proponents

Securities/letters of credit are generally not applied where the proponent is another public agency such as a municipality. The County of Essex, municipalities, or other public agencies will work together, in a transparent and consistent manner and agree on the best approach toward implementing compensation that meets the principles of these guidelines. Nonetheless, if implementation is being undertaken by a public agency, that agency (municipality, County of Essex, or other) accepts responsibility for the effective implementation and monitoring of the compensation works, unless otherwise arranged between agencies. However, in the case of public-private partnerships, securities may be required.

3.2 Implementation and Monitoring

Once the appropriate compensation amount has been determined and agreed upon by all parties involved, the next step involves developing and executing a plan for securing land (if applicable) and implementing ecosystem restoration. The execution of this plan will depend on the compensation location and the responsible entity for the restoration work.

However, certain considerations remain consistent, including project-specific details, principles of ecosystem restoration, and overarching directions from the County of Essex or municipal programs.

Compensation actions should focus on reinvesting in local ecosystem restoration efforts and the lands necessary for these initiatives. They should align with strategic watershed management and restoration planning documents and priorities including the County of Essex Official Plan and the ERNHSS. Compensation efforts should target new projects or expand existing ones that require additional investment and resources such as the ERCA Clean Water Green Spaces.

Project Specific Requirements
Certain compensation projects may include specific requirements and outcomes outlined in the compensation agreement. These may involve restoring a specific ecosystem type, recycling soil or woody materials, or rescuing plants from the affected ecosystem. The impacted ecosystem may have provided critical functions that need careful consideration during the planning and execution of restoration efforts. For instance, if the ecosystem supported habitat for particular species or groups, restoration projects may need to incorporate measures to mitigate the habitat loss caused by the ecosystem's removal. These requirements must be adhered to these, planned accordingly, and documented during implementation.

Consideration for Assessments, Monitoring, and Maintenance
Assessing and monitoring outcomes are required throughout the compensation process. Regardless of the entity responsible for implementation, it is the implementer's duty to conduct assessments and monitoring to identify any necessary remedial actions. Typically, monitoring and maintenance should be secured for at least a five (5) year term to establish a functional equilibrium and survival rate, and the lands secured for protection in perpetuity. The success of each individual project is required to achieve the goals set out in the compensation plan, which in turn informs improvements to the overall compensation program over time.

Site Assessments
Site assessments should be conducted at 1, 3, and 5 years after construction or planting completion. These assessments allow for early detection and correction of any failures in planting or construction.

Three (3) years after installation of the planting materials, monitoring should verify a minimum of 70% survival rate for original plant material with a replacement for any short fall of this threshold. The proponent is responsible for the monitoring (by a qualified ecologist) and the replacement costs. A monitoring and maintenance report will be required in years one (1), three (3) and five (5). The planning authority reserves the right to inspect the finished project at the specified milestones, permissions to access any private lands will form a component of the compensation agreement.

Flora and Fauna Monitoring
For complex restoration projects, monitoring of flora and fauna is essential to evaluate whether restored sites are fulfilling anticipated ecosystem functions. This monitoring includes establishing baseline data and assessing the site once the newly restored ecosystem has matured. Ideally, sites should be monitored for 5 years post-implementation, though this may vary based on project-specific conditions and constraints, particularly for wetland projects, or MECP benefit permits. Documentation should be uploaded into the County of Essex compensation database, if implemented by the County of Essex, or provided to another public agency overseeing proponent-led implementation for review.

Responsibility and Documentation
Assessment, monitoring, and maintenance responsibilities typically lie with the parties undertaking the restoration work. These responsibilities are confirmed and documented in agreements outlined in section 3.1. Monitoring reports document

project outcomes and are crucial for identifying any deviations from approved designs, which may necessitate investigations and modifications to ensure project success. Securities held by public agencies can enforce compliance with these requirements (see section 3.1). Monitoring and maintenance also serve as learning opportunities that inform future compensation decisions and implementation strategies.

Planting Replacement Contingency
As a standard practice, all project budgets will include a contingency cost for replacement planting due to unforeseen conditions, 5 years monitoring and reporting to ensure an 70% planting survival rate, and maintenance of the site, regardless of the implementing party. Project budget proposals and typical contingency costs may require a peer review if requested by the planning authority. The local conservation authority may be consulted on for support in cost listing prices and expertise in their long-established restoration programs.

3.3 Documenting the Compensation Project

For each compensation project, a detailed report must be prepared by the entity responsible for implementation or their designated agent. This report should comprehensively document the following:

1. Adherence to Principles:
    - Explanation of how the principles outlined in section 1.4 of the guideline have been followed.
2. Compensation Determination:
    - Justification of how the required compensation was determined in accordance with section 2.0.
3. Guideline Adherence:
    - Confirmation of adherence to the direction provided in section 3.0.

Additionally, the report must include the following:

- Description of the Impacted Ecosystem: A concise identification with aerial photography, maps, and site photos of the ecosystem that has been affected.
- Calculations of Compensation Ratios: Must be in accordance with these guidelines.
- Compensation Location Description: Brief descriptions, aerial photography /maps, and onsite photos, and rationale for the selection of proposed compensation sites.
- Detailed Restoration Plan: Rationalization as to how the project will adequately compensate for all expected impacts.
- Proposed Work Plan: Outline of the intended actions and timeline for implementation.
- Detailed Design Drawings: Technical drawings illustrating the design specifications for the compensation project.
- Construction Phasing Plan: Sequence of construction activities and their scheduling.
- Monitoring Plan: Strategy for monitoring project progress and outcomes.
- Other Relevant Details: Any additional pertinent information required by agreements between the proponent and approval authority, based on specific site conditions.

The documentation must clearly demonstrate that the projects are designed to leverage existing site conditions effectively and will deliver the agreed-upon outcomes.

4.0 Essex Region Natural Heritage System Strategy (ERHNSS) – Strategic Restoration Implementation

ERCA developed a comprehensive ecological restoration program that has been successfully implementing restoration projects across the Essex County region for many years. In many circumstances, ERCA is well suited to manage compensation implementation actions due to expertise in ecological restoration and their established restoration program. For those cases where the parties involved have identified ERCA as the most effective agency to undertake compensation restoration and/or land securement actions, ERCA will follow a transparent and consistent approach, ensuring accountability and ultimately successful outcomes. This approach will utilize several processes including strategic site selection tools, a Restoration Opportunities Database, ERNHSS, a project tracking and monitoring database, and project implementation expertise. Priority restoration projects can be found in the Essex Region Natural Heritage System Strategy (ERNHSS) found on the County of Essex website. In addition to scenarios where ERCA undertakes compensation restoration, these tools are available to help inform restoration actions by municipalities, other public agencies, as well as private proponents and their consultants.

5.0 Typical Project Design Details for Restoration

This section outlines standard project design details for planning, implementing, maintaining, and monitoring restoration projects. It also includes standard planting densities for relevant ecosystem types. These design standards serve as a reference for developing and executing restoration efforts. It is important to note that these standards are typical and may require adjustments to fit specific site conditions and contractual agreements.

Each type of restoration is categorized by a capital letter indicating its ecosystem type:

- W for Wetland
- F for Forest
- R for Riparian
- M for Meadow

Typical Budget Items and Costs
While this section lists typical budget items for each restoration type, specific costs are not provided due to potential market fluctuations (e.g., fuel, materials). For up-to-date cost information, please consult with County of Essex staff, the local municipality or ERCA.

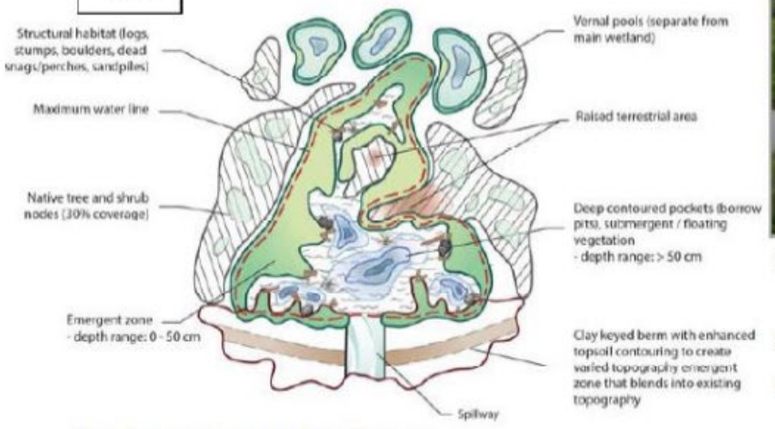
Restoration Security

The proponent may be required to provide a security payment and/or a letter of credit to cover the projected cost of the compensation project, which may include the costs of monitoring and replacement. The security would be held in trust by the planning approval authority for the period of 5 years, until monitoring is complete for the project. The amount of the security payment is calculated to incorporate the value of the restoration work.

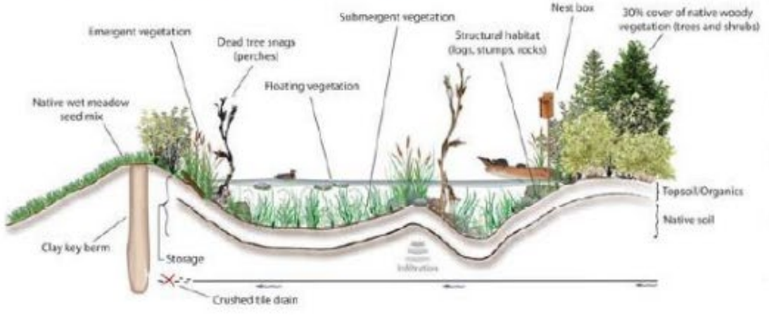
Cash in Lieu Calculation

The cash in lieu calculation is based on the value of the proposed loss of the natural heritage feature, and the cost of the restoration plan. A single value approach is intended to be inclusive of all potential costs associated with implementing natural heritage compensation, including: administration, design, construction, materials, monitoring, and maintenance of the restored feature. This may also include the cost of obtaining the lands required for the compensation. This value is subject to an annual inflationary increase.

MARSH WETLAND RESTORATION



MARSH WETLAND TYPICAL PLAN



MARSH WETLAND TYPICAL CROSS SECTION

Details:

Project planning and development (permits, survey, detailed design and project management), site preparation (staging, access, layout, sediment & erosion control, etc.), berm and spillway construction, wetland contouring and grading, habitat structure installation, planting and seed application.

Restored marsh wetland, post implementation monitoring.

Features to include inDesign:

- Reversal of altered hydrology (crushed tile drains, decommissioning straightened ditches)
- Varying topography including shallow water (0 - 50 cm depth) and open water/deep pockets (50 - 200 cm depth)
- Proper and stable water level control
- Proper erosion and sediment control methods
- 10 - 20 Habitat structures (dead trees, snags, basking logs, log perches, sand piles, nest box, etc.)
- Site preparation for planting and removal of invasive species
- 0.7 ha aquatic (50% of wetland footprint planted with aquatic plugs (2,250 plugs at 6 inch spacing)
  - 0.28 ha open water/submergent plantings (225 plugs)
  - 0.42 ha emergent vegetation plantings (2,025 plugs)
- 0.3 ha terrestrial (100% planted with trees & shrubs (1,000 stems)
  - Shrubs planted in 50 groups of 10 at 1 m spacing
  - Trees planted in 50 groups of 10 at 2.25 m spacing
- 6 kg Native wetland/wet meadow seed for disturbed soils
- 46 kg erosion and sediment control cover crop
- 800 m of deer fencing to mitigate or prevent predation of, and damage to, terrestrial plantings by wildlife

Project Goals:

- Restore ecosystem form and function
- Restore soil and soil processes
- Restore natural hydrologic processes
- Enhance and restore natural cover and essential habitat

Suggested plant species:

Plant native early successional riparian tree and shrub species and wet tolerant conifer species. Based on specific site conditions and existing vegetation, species might include:

- Red osier dogwood
- Nannyberry
- Cottonwood
- Birch
- Balsam poplar
- Tamarack
- Eastern white cedar

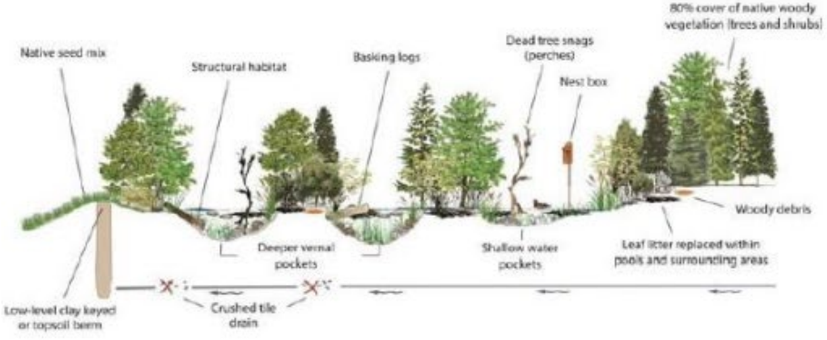
(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

Marsh Wetland Typical Construction Cost Estimate (1 ha)		2023 Cost Year
Project Management	**Notes**	**Cost ($)**
Project Management	Initiating, planning, executing, controlling, and closing	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Construction		
Planning and Design	Permits, survey, archaeology, engineering, and project design	$
Equipment	2 days of site preparation and 8 days of construction (Truck, trailer, excavator, loader, water pump)	$
Materials	Herbicide application, aggregate, erosion and sediment control, filter cloth, round stone, (10 loads) wood/logs, (46 kg) cover crop, (6 kg) native seed, and habitat structures	$
Labour	2 days of site prep, 8 days of construction (1 day each for mobilization and demobilization) for 3 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Deer Fence		
Equipment	Truck, trailer, ATV	$
Materials	8 rolls of fencing (100m rolls), 360 T-bars (2.3 m), staples and flagging tape	$
Labour	4 days for installation, maintenance and removal for 4 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Edge Planting		
Equipment	Truck, trailer, ATV	$
Materials	300 potted (2 gal) coniferous, 160 potted (2 gal) deciduous, 40 bareroot deciduous, 400 potted (2 gal) shrubs, 100 bareroot shrubs, and (1 load) mulch	$
Labour	3 days implementation for 5 staff	$
	Subtotal	**$**
Contingency	10%	$
Plant Replacement	25% replacement of material	$
	Total	**$**
Aquatic Planting		
Equipment	Truck, trailer	$
Materials	2,250 plugs planted	$
Labour	2 days implementation for 5 staff	$
	Subtotal	**$**
Contingency	10%	$
Plant Replacement	25% replacement of material	$
	Total	**$**
Habitat Installation		
Equipment	Truck	$
Materials	2 Wood duck boxes	$
Labour	1 day implementation for 2 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Monitoring and Assessment	Pre (year 0) /Post (year 10) Monitoring for Flora and Fauna 3 Rapid Restoration Assessment visits (year 1, 3 and 5) with reporting	$
	Total	**$**
	Project Management Subtotal	**$**
	Construction and Planting Subtotal	**$**
	Contingency and Replacement Subtotal	**$**
	Monitoring and Assessment Subtotal	**$**
	GRAND TOTAL	$

** Typical Budget Items and Costs: While each restoration type includes typical budget items, specific costs for these items are not provided. Costs may vary due to market price fluctuations (e.g., for fuel, materials, etc.) and are subject to change. For the most up-to-date costs, please contact County of Essex staff. (Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)*

FORESTED WETLAND RESTORATION

FORESTED WETLAND TYPICAL PLAN



FORESTED WETLAND TYPICAL CROSS SECTION

Details:

Project planning and development (permits, survey, detailed design and project management), site preparation (staging, access, layout, sediment & erosion control, etc.), subtle regrading to create low level control berm and spillway, wetland contouring and grading, enhanced wildlife habitat and/or bird box installation, planting and seed application.

Newly planted trees and shrubs in forested wetland site

Features to include in Design:

- Reversal of altered hydrology (crushed tile drains, decommissioning straightened ditches)
- Proper and stable water level control
- Proper erosion and sediment control methods
- Varying topography including shallow water (0 - 50 cm depth) deeper vernal pockets (50 - 100 cm depth)
- 20 - 30 Habitat structures (basking logs, log perches, 2 wood duck boxes)
- Site preparation for planting and removal of invasive species
- Terrestrial area planted with 80% woody vegetation (native trees and shrub pots)
  - Trees planted in groups of 10 at 2.4 m spacing (1,240 stems)
  - Shrubs planted in groups of 10 at 1 m spacing (1,200 stems)
- 6 kg native wetland/wet meadow seed mix for disturbed soils
- 46 kg erosion and sediment control cover crop
- 1,800 m of deer fencing to mitigate or prevent predation of, and damage to, terrestrial plantings by wildlife

Project Goals:

- Restore ecosystem form and function
- Restore soil and soil processes
- Restore natural hydrologic processes
- Enhance and restore natural cover and essential habitat

Suggested plant species:

Plant native early successional riparian tree and shrub species and wet tolerant conifers. Based on specific site conditions and existing vegetation, species might include:

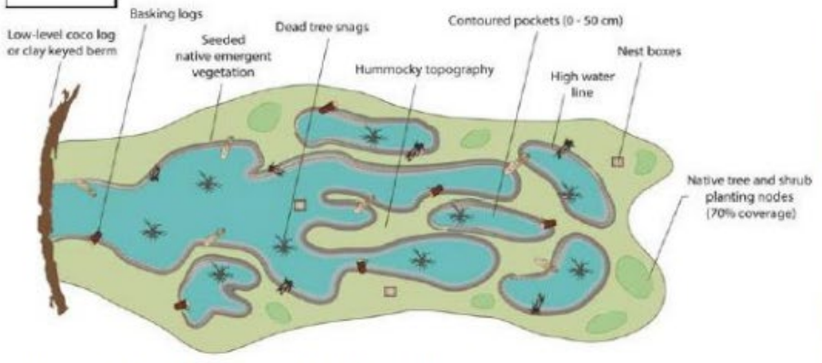
- Red osier dogwood
- Alder
- Silver maple
- Birch
- Eastern white cedar
- Tamarack
- White spruce

(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

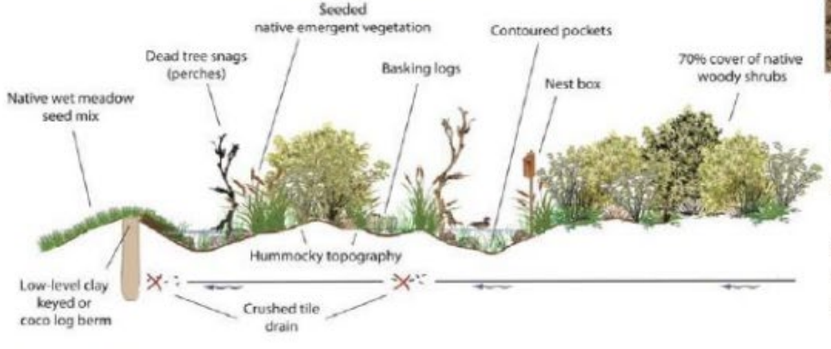
Forested Wetland Typical Construction Cost Estimate (1 ha)		2023 Cost Year
Project Management	**Notes**	**Cost ($)**
Project Management	Initiating, planning, executing, controlling, and closing	$
	Subtotal	$
Contingency	10%	$
	Total	$
Construction		
Planning and Design	Permits, survey, archaeology, engineering, and project design	$
Equipment	2 days of site preparation and 6 days of construction (Truck, trailer, excavator, loader)	$
Materials	Herbicide application, aggregate, erosion and sediment control, filter cloth, round stone, (10 loads) wood/logs, (46 kg) cover crop, (6 kg) native seed, and habitat structures	$
Labour	2 days of site prep, 6 days of construction (1 day each for mobilization and demobilization) for 3 staff	$
	Subtotal	$
Contingency	10%	$
	Total	$
Deer Fence		
Equipment	Truck, trailer, ATV	$
Materials	18 rolls of fencing (100m rolls), 810 T-bars (2.3 m), staples and flagging tape	$
Labour	8 days for installation, maintenance and removal for 4 staff	$
	Subtotal	$
Contingency	10%	$
	Total	$
Tree and Shrub Planting		
Equipment	Truck, trailer, ATV	$
Materials	640 potted (2 gal) coniferous, 480 potted (2 gal) deciduous, 120 bareroot deciduous, 960 potted (2 gal) shrubs, 240 bareroot shrubs, and (4 loads) mulch	$
Labour	9 days implementation for 5 staff	$
	Subtotal	$
Contingency	10%	$
Plant Replacement	25% replacement of material	$
	Total	$
Habitat Installation		
Equipment	Truck	$
Materials	2 Wood duck boxes	$
Labour	1 day Implementation for 2 staff	$
	Subtotal	$
Contingency	10%	$
	Total	$
Monitoring and Assessment	Pre (year 0) /Post (year 10) Monitoring for Flora and Fauna 3 Rapid Restoration Assessment visits (year 1, 3 and 5) with reporting	$
	Total	$
	Project Management Subtotal	$
	Construction and Planting Subtotal	$
	Contingency and Replacement Subtotal	$
	Monitoring and Assessment Subtotal	$
	GRAND TOTAL	$

** Typical Budget Items and Costs: While each restoration type includes typical budget items, specific costs for these items are not provided. Costs may vary due to market price fluctuations (e.g., for fuel, materials, etc.) and are subject to change. For the most up-to-date costs, please contact County of Essex staff. (Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)*

WET SHRUB THICKET RESTORATION



WET SHRUB THICKET TYPICAL PLAN



WET SHRUB THICKET TYPICAL CROSS SECTION

Details:

Project planning and development (permits, survey, detailed design and project management), site preparation (staging, access, layout, sediment & erosion control, etc.), berm and spillway construction, wetland contouring and grading, habitat structure installation, planting and seed application.

Restored wet shrub thicket, post construction, prior planting

Red osier dogwood shrub node on wet shrub thicket site

Features to include in Design:

- Reversal of altered hydrology (crushed tile drains, decommissioning straightened ditches)
- Proper and stable water level control
- Proper erosion and sediment control methods
- Varying/hummocky topography including shallow open water (0 - 50 cm depth)
- 20 - 30 Habitat structures (dead trees, snags, basking logs, log perches, nest boxes, etc.)
- Site preparation for planting and removal of invasive species
- Native terrestrial and emergent vegetation
  - 0.7 ha terrestrial (50% planted with shrubs (4,200 stems)
  - 0.3 ha aquatic
- 6 kg native wetland/wet meadow seed mix for disturbed soils
- 46 kg erosion and sediment control cover crop
- 900 m of deer fencing to mitigate or prevent predation of, and damage to, terrestrial plantings by wildlife

Project Goals:

- Restore ecosystem form and function
- Restore soil and soil processes
- Restore natural hydrologic processes
- Enhance and restore natural cover and essential habitat

Suggested plant species:

Plant native early successional riparian shrub species, such as:

- Willow
- Red osier dogwood
- High bush cranberry
- Buttonbush

(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

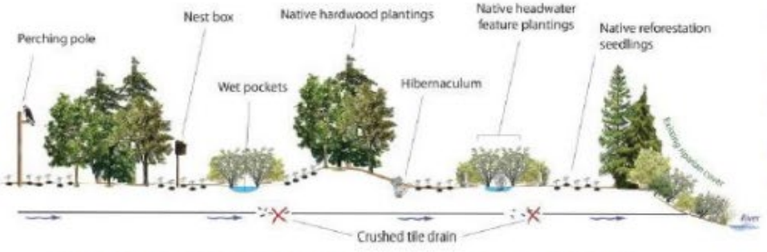
Wet Shrub Thicket Typical Construction Cost Estimate (1 ha)		2023 Cost Year
Project Management	**Notes**	**Cost ($)**
Project Management	Initiating, planning, executing, controlling, and closing	$
	Subtotal	$
Contingency	10%	$
	Total	$
Construction		
Planning and Design	Permits, survey, archaeology, engineering, and project design	
Equipment	2 days of site preparation and 6 days of construction (Truck, trailer, excavator, loader)	$
Materials	Herbicide application, aggregate, erosion and sediment control, filter cloth, round stone, (5 loads) wood/logs, (46 kg) cover crop, (6 kg) native seed, and habitat structures	$
Labour	2 days of site prep, 6 days of construction (1 day each for mobilization and demobilization) for 3 staff	$
	Subtotal	$
Contingency	10%	$
	Total	$
Deer Fence		
Equipment	Truck, trailer, ATV	$
Materials	9 rolls of fencing (100m rolls), 405 T-bars (2.3 m), staples and flagging tape	$
Labour	6 days for installation, maintenance and removal for 4 staff	$
	Subtotal	$
Contingency	10%	$
	Total	$
Tree and Shrub Planting		
Equipment	Truck, trailer, ATV	$
Materials	2,000 potted (2 gal) shrubs, 1000 bareroot shrubs, 1,200 units bioengineering, and (4 loads) mulch	$
Labour	10 days implementation for 5 staff	$
	Subtotal	$
Contingency	10%	$
Plant Replacement	25% replacement of material	$
	Total	$
Habitat Installation		
Equipment	Truck	$
Materials	2 Wood duck boxes	$
Labour	1 day implementation for 2 staff	$
	Subtotal	$
Contingency	10%	$
	Total	$
Monitoring and Assessment	Pre (year 0) /Post (year 10) Monitoring for Flora and Fauna 3 Rapid Restoration Assessment visits (year 1, 3 and 5) with reporting	$
	Total	$
	Project Management Subtotal	$
	Construction and Planting Subtotal	$
	Contingency and Replacement Subtotal	$
	Monitoring and Assessment Subtotal	$
	GRAND TOTAL	$

** Typical Budget Items and Costs: While each restoration type includes typical budget items, specific costs for these items are not provided. Costs may vary due to market price fluctuations (e.g., for fuel, materials, etc.) and are subject to change. For the most up-to-date costs, please contact County of Essex staff. (Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)*

F

ENHANCED REFORESTATION

ENHANCED REFORESTATION TYPICAL PLAN



ENHANCED REFORESTATION TYPICAL CROSS SECTION

Details:

Project planning and development (detailed design and project management), site preparation, wildlife structures and/or bird box installation

Reforestation monitoring, year 1

Reforestation monitoring year 1

Reforestation monitoring year 5

Features to include in Design:

- Reversal of altered hydrology (crushed tile drains, decommissioning straightened ditches)
- Proper erosion and sediment control methods
- 20 - 30 Habitat structures (log perches, large woody debris, hibernacula, nest boxes)
- Site preparation and removal of invasive species
- 100% woody vegetation (native trees and shrubs, including bareroot seedlings) planted.
  - Shrubs planted in groups of 10 at 1 m spacing (1,000 pieces)
  - Bareroot trees scatter planted at 1.7 m spacing (1,000 seedlings)
  - Potted trees planted in groups of 10 at 2.45 m spacing (1,000 pots)
- 4 kg native meadow seed mix for disturbed soils
- 46 kg erosion and sediment control cover crop
- 1,500 m of deer fencing to mitigate or prevent predation of, and damage to, terrestrial plantings by wildlife

Project Goals:

- Restore ecosystem form and function
- Restore soil and soil processes
- Restore natural hydrologic processes
- Enhance and restore natural cover and essential habitat

Suggested plant species:

Planting early to mid-successional tree and shrub species based on specific site conditions and existing vegetation, species might include:

- Elderberry
- Sumac
- Dogwood
- Birch
- Eastern white cedar
- White pine
- Poplar
- Spruce

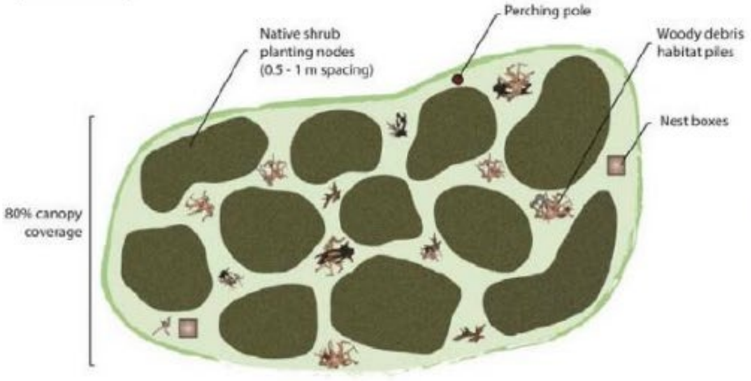
(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

Enhanced Reforestation Planting Typical Cost Estimate (1 ha)		2023 Cost Year
Project Management	**Notes**	**Cost ($)**
Project Management	Initiating, planning, executing, controlling, and closing	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Site Preparation		
Equipment	4 days of equipment time for minor grading, tilling, seeding. (Truck, trailer, tractor, tractor Implements, ATV)	$
Materials	Herbicide application, (46 kg) cover crop, (4 kg) native seed	$
Labour	4 days of implementation for 2 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Deer Fence		
Equipment	Truck, trailer, ATV	$
Materials	15 rolls of fencing (100m rolls), 675 T-bars (2.3 m), staples and flagging tape	$
Labour	7 days for installation, maintenance and removal for 4 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Planting		
Equipment	Truck, trailer, ATV	$
Materials	1,000 tree seedlings, 1,000 potted (2 gal) shrubs, 500 potted (2 gal) coniferous, 500 potted (2 gal) deciduous, and (3 loads) mulch	$
Labour	8 days implementation for 5 staff	$
	Subtotal	**$**
Contingency	10%	$
Plant Replacement	25% replacement of material	$
	Total	**$**
Habitat Installation		
Equipment	4 days of equipment time for minor grading and structure installation. (Truck, trailer, tractor, tractor Implements, ATV)	$
Materials	4 bird boxes and (5 loads) wood/logs	$
Labour	4 days implementation for 2 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Site Assessment	3 Rapid Restoration Assessment visits (year 1, 3 and 5) with reporting	$
	Total	**$**
	Project Management Subtotal	**$**
	Site Preparation and Planting Subtotal	**$**
	Contingency and Replacement Subtotal	**$**
	Monitoring and Assessment Subtotal	**$**
	GRAND TOTAL	**$**

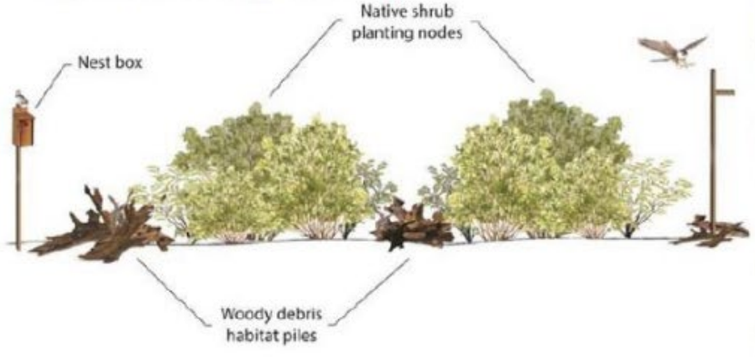
** Typical Budget Items and Costs: While each restoration type includes typical budget items, specific costs for these items are not provided. Costs may vary due to market price fluctuations (e.g., for fuel, materials, etc.) and are subject to change. For the most up-to-date costs, please contact County of Essex staff. (Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)*

F

SHRUB THICKET PLANTING



SHRUB THICKET TYPICAL PLAN



SHRUB THICKET TYPICAL CROSS SECTION

Details:

Project planning and development (detailed design and project management), site preparation, essential wildlife structures and/or bird box installation.

Recently mulched shrub node in shrub thicket restoration

Features to include in Design:

- Reversal of altered hydrology (crushed tile drains, decommissioning straightened ditches, culvert removal)
- Proper erosion and sediment control methods
- 10-20 Habitat structures (log perches, large woody debris, 4 nest boxes)
- Site preparation for planting and removal of invasive species
- 0.8 ha, (50% planted with shrubs (4,000 stems)
- Mulch application around plants
- 4 kg native wetland/ wet meadow seed for disturbed soils
- 46 kg erosion and sediment control cover crop
- 1,000 m of deer fencing to mitigate or prevent predation of, and damage to, terrestrial plantings by wildlife

Project Goals:

- Restore ecosystem form and function
- Restore soil and soil processes
- Restore natural hydrologic processes
- Enhance and restore natural cover and essential habitat

Suggested plant species:

Plant native early succession shrub species, based on specific site conditions and existing vegetation, species might include:

- Grey dogwood
- Alder
- Flowering raspberry
- Serviceberry
- Elderberry

(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

Shrub Thicket Planting Typical Cost Estimate (1 ha)		2023 Cost Year
Project Management	**Notes**	**Cost ($)**
Project Management	Initiating, planning, executing, controlling, and closing	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Site Preparation		
Equipment	4 days of equipment time for minor grading, tilling, seeding	$
Materials	Herbicide application, (46 kg) cover crop, (4 kg) of native seed	$
Labour	4 days implementation for 2 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Deer Fence		
Equipment	Truck, trailer, ATV	$
Materials	10 rolls of fencing (100m rolls), 450 T-bars (2.3 m), staples and flagging tape	$
Labour	6 days for installation, maintenance and removal for 4 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Planting		
Equipment	Truck, trailer, ATV	$
Materials	3,000 potted (2 gal) shrubs, 1000 bareroot shrubs, and (4 loads) mulch	$
Labour	11 days implementation for 5 staff	$
	Subtotal	**$**
Contingency	10%	$
Plant Replacement	25% replacement of material	$
	Total	**$**
Habitat Installation		
Equipment	4 days of equipment time for minor grading and structure installation. (Tractor, tractor Implements, ATV)	$
Materials	4 bird boxes and (5 loads) wood/logs	$
Labour	4 days of implementation for 2 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Site Assessment	3 Rapid Restoration Assessment visits (year 1, 3 and 5) with reporting	$
	Total	**$**
	Project Management Subtotal	**$**
	Site Preparation and Planting Subtotal	**$**
	Contingency and Replacement Subtotal	**$**
	Monitoring and Assessment Subtotal	**$**
	GRAND TOTAL	**$**

** Typical Budget Items and Costs: While each restoration type includes typical budget items, specific costs for these items are not provided. Costs may vary due to market price fluctuations (e.g., for fuel, materials, etc.) and are subject to change. For the most up-to-date costs, please contact County of Essex staff. (Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)*

R RIPARIAN PLANTING

RIPARIAN PLANTING TYPICAL PLAN

RIPARIAN PLANTING TYPICAL CROSS SECTION

Details:

Project planning and development (permits, detailed design and project mgmt.), site preparation, essential wildlife structures and/or bird boxes installation, 90% of riparian area planted with trees and shrubs (2,650 stems), and mulch application.

Recently planted riparian area

Riparian planting post implementation

Features to include in Design:

- Reversal of altered hydrology (crushed tile drains, decommissioning straightened ditches)
- Proper water level control
- Proper erosion and sediment control methods
- 20 - 30 Habitat structures (basking logs, log perches, turtle nesting piles, 4 nest boxes)
- Site preparation for planting and removal of invasive species
- 90% woody vegetation (native trees and shrub pots)
  - Trees planted in groups of 10 at 2.4 m spacing (1,350 stems)
  - Shrubs planted in groups of 10 at 1 m spacing (1,300 stems)
- 4 kg native riparian/wet meadow seed for disturbed soils
- 46 kg erosion and sediment control cover crop
- 2,000 m of deer fencing to mitigate or prevent predation of, and damage to, terrestrial plantings by wildlife

Project Goals:

- Restore ecosystem form and function
- Restore soil and soil processes
- Restore natural hydrologic processes
- Enhance and restore natural cover and essential habitat

Suggested plant species:

Plant native early successional riparian tree and shrub species, to increase stabilization of soils adjacent to a watercourse or drainline, reducing sediment transport into receiving waters. Species selection based on specific site conditions and existing vegetation; species might include:

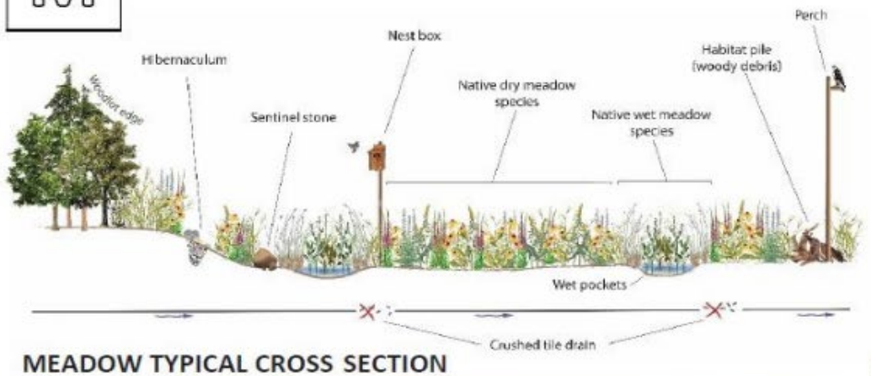
- Sandbar willow
- Speckled alder
- Red osier dogwood
- Silky dogwood
- Meadowsweet
- Buttonbush
- Silver maple
- Trembling aspen
- Eastern white cedar

(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

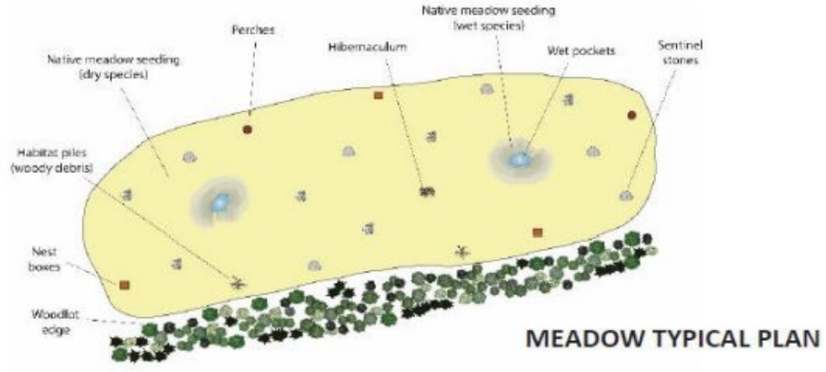
Riparian Planting Typical Cost Estimate (1 ha)		2023 Cost Year
Project Management	**Notes**	**Cost ($)**
Project Management	Initiating, planning, executing, controlling, and closing	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Site Preparation		
Equipment	4 days of equipment time for minor grading, tilling, seeding. (Truck, trailer, tractor, tractor implements, ATV)	$
Materials	Herbicide application, (46 kg) cover crop, and (4 kg) native seed	$
Labour	4 days implementation for 2 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Deer Fence		
Equipment	Truck, trailer, ATV	$
Materials	20 rolls of fencing (100m rolls), 900 T-bars (2.3 m), staples and flagging tape	$
Labour	8 days for installation, maintenance and removal for 4 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Planting		
Equipment	Truck, trailer, ATV	$
Materials	650 potted (2 gal) coniferous, 560 potted (2 gal) deciduous, 140 bareroot deciduous, 1,000 potted (2 gal) shrubs, 300 bareroot shrubs, and (3 loads) mulch	$
Labour	8 days implementation for 5 staff	$
	Subtotal	**$**
Contingency	10%	$
Plant Replacement	25% replacement of material	$
	Total	**$**
Habitat Installation		
Equipment	4 days of equipment time for minor grading and structure installation. (Truck, trailer, tractor, tractor Implements)	$
Materials	4 bird boxes and (5 loads) wood/logs	$
Labour	4 days implementation for 2 staff	$
	Subtotal	**$**
Contingency	10%	$
	Total	**$**
Site Assessment	3 Rapid Restoration Assessment visits (year 1, 3 and 5) with reporting	$
	Total	**$**
	Project Management Subtotal	**$**
	Site Preparation, Planting and Habitat Subtotal	**$**
	Contingency and Replacement Subtotal	**$**
	Monitoring and Assessment Subtotal	**$**
	GRAND TOTAL	**$**

** Typical Budget Items and Costs: While each restoration type includes typical budget items, specific costs for these items are not provided. Costs may vary due to market price fluctuations (e.g., for fuel, materials, etc.) and are subject to change. For the most up-to-date costs, please contact County of Essex staff. (Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)*

M NATIVE MEADOW RESTORATION



MEADOW TYPICAL CROSS SECTION



MEADOW TYPICAL PLAN

Meadow restoration, 5 years post implementation

Project Goals:

- Restore ecosystem form and function
- Restore soil and soil processes
- Restore natural hydrologic processes
- Enhance and restore natural cover and essential habitat
- Enhanced natural corridor connections
- New model for managing hydro corridors

Suggested Plant Species:

Plant native forbes and grasses to increase biodiversity and natural cover. Recommended:

- 20% flowers
- 80% grasses
- (percentages can be adjusted based on specific restoration goals).

Details:

Planning and development (permits, detailed design and project management), site preparation that includes tilling, herbicide application, mowing, planting a nurse crop, to be followed with a fall native seeding. In the spring, mow and spray area, plant seeds and monitor.
Assess, maintain, and adaptively manage over a 10 year period.
Three monitoring events for flora/fauna occur in years 1, 5 and 10 of the project period.

Features to include in Design:

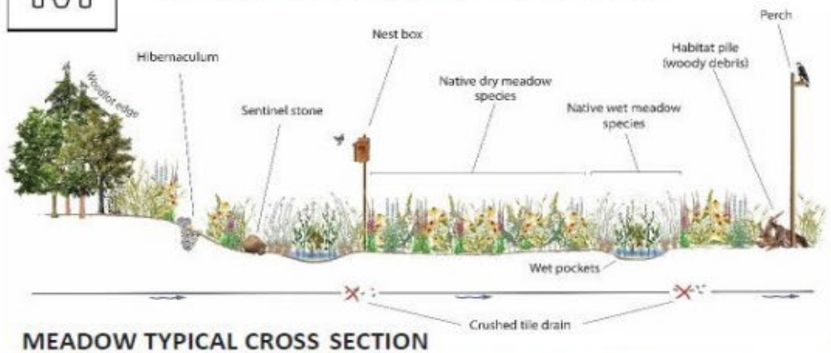
- One year site preparation for native meadow seeding with removal of invasive species
- Site grading and reversal of altered hydrology (crushed tile drains, decommissioning straightened ditches)
- 20 - 30 Habitat structures (Large woody debris piles, log perches, sentinel stones, hibernacula, nest boxes)
- Native meadow seed mix planted into prepared area.
- Maintain with a mow and spot herbicide treatment to reduce invasive and/or woody species competition

(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

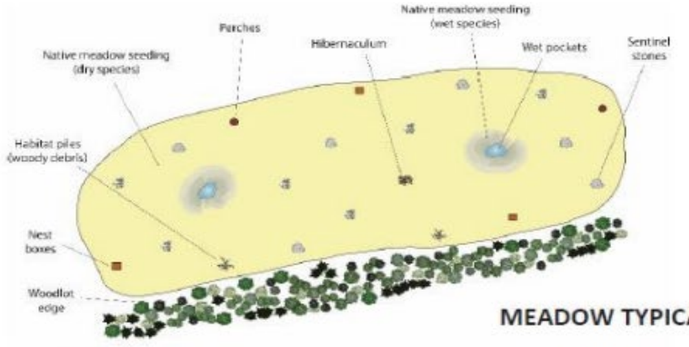
Native Meadow Typical Cost Estimate (1 ha)		2023 Cost Year
Project Management	**Years 1-10**	**Costs ($)**
	Initiating, planning, executing, controlling, and closing	$
	Subtotal	$
Contingency	10%	$
	Total	$
Site Preparation and Seeding	**Year 1**	
Equipment	12 days of equipment time for initial mow, tilling 3x, spraying 2x, seeding cover crop (truck, trailer, tractor, tractor implements)	$
Materials	90 kg oats cover crop, 6 signs & posts, contractor broadcast spray 2x, contractor drill native seed (14 kg) in the fall	$
Labour	Implementation	$
	Subtotal	$
Contingency	10%	$
	Total	$
Planting	**Year 2 & 5**	
Equipment	4 days of equipment time for seeding nurse crop, maintenance high cut mow in August (truck, trailer, tractor, tractor implements)	$
Materials	Nurse crop of oats or millet (30 kg), Contractor spot spray invasives	$
Labour	Implementation	$
	Subtotal	$
Contingency	10%	$
	Total	$
Maintenance Mowing	**Years 3, 6, and 9**	
Equipment	3 days of equipment time for low maintenance mow in fall (truck, trailer, tractor, tractor implements)	$
Materials	None	$
Labour	Implementation	$
	Subtotal	$
Contingency	10%	$
	Total	$
Adaptive Management	**Years 3-10**	
Equipment	5 days of equipment time to monitor for invasive species and spot spray where needed (truck)	$
Materials	Herbaceous spot spray application years 3,4,6 & 9 Woody herbicide	$
Labour	Implementation	$
	Subtotal	$
Contingency	10%	$
	Total	$
Monitoring	**Year 1, 5 and 10**	
	Year 1 (Pre implementation) set up and reporting	$
	Year 5 visit with reporting	$
	Year 10 (Post implementaiton) visit with reporting	$
	Subtotal	$
Contingency	10%	$
	Total	$
	Project Management Subtotal	$
	Site Preparation and Planting Subtotal	$
	Maintenance Mowing and Adaptive Management Subtotal	$
	Monitoring Subtotal	$
	Contingency Subtotal	$
	GRAND TOTAL	$

** Typical Budget Items and Costs: While each restoration type includes typical budget items, specific costs for these items are not provided. Costs may vary due to market price fluctuations (e.g., for fuel, materials, etc.) and are subject to change. For the most up-to-date costs, please contact County of Essex staff. (Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)*

NATIVE SAR MEADOW RESTORATION



MEADOW TYPICAL CROSS SECTION



MEADOW TYPICAL PLAN

Meadow restoration, 5 years post implementation

Project Goals:

- Restore ecosystem form and function
- Restore soil and soil processes
- Restore natural hydrologic processes
- Enhance and restore natural cover and essential habitat
- Enhanced natural corridor connections
- Restore ecosystem specifically utilized by SAR

Suggested Plant Species:

Plant native forbes and grasses to increase biodiversity and natural cover. Recommended:

- 20% flowers
- 80% grasses
- at least 3 grass species, one of which grows 50cm or taller
- (percentages can be adjusted based on specific restoration goals)

Details:

Planning and development (permits, detailed design and project management), site preparation that includes tilling, herbicide application, planting a nurse crop, and fall native seeding. Native seeding is followed with herbicide spot spray and fall mow for 5 years. Subsequent maintenance for 15 years to include herbicide spot spray or prescribed burn and fall mow every 3 to 4 years.

Restoration area to be at least 200 meters by 200 meters (4 hectares).
Implementation, maintenance and adaptive management occur over a 20 year period.
Bird monitoring to occur through implementation to year 5, at least 3 times a year when SAR birds are likely to be present.

Features to Include in Design:

- One year site preparation for native meadow seeding with removal of invasive species
- Site grading and reversal of altered hydrology (crushed tile drains, decommissioning straightened ditches)
- 20 - 30 Habitat structures (Large woody debris piles, log perches, sentinel stones, hibernacula, nest boxes)
- Native meadow seed mix planted into prepared area.

(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

Native SAR Meadow Typical Cost Estimate (4 ha)		2023 Cost Year
Project Management	**Years 1-20**	
	Initiating, planning, executing, controlling, and closing	
	Subtotal	
Contingency	10%	
	Total	
Site Prep and Planting	**Implementation (Year 1) Mow, Herbicide, Till, Seed**	
Equipment	28 days of equipment time for mow, tilling 3x, spraying 3x, seeding cover crop (truck, trailer, tractor, tractor Implements)	
Materials	3 applications of herbicide, 10 signs & posts, 248 kg cover crop, seeding contractor to drill native (56 kg) in fall	
Labour	Implementation	
	Subtotal	
Contingency	10%	
	Total	
Maintenance Mowing	**Years 1-20**	
Equipment	3 days of equipment time for fall mow (truck, trailer, tractor, tractor implements); once/yr (yrs 1-5); once every 3-4 yrs (yrs 6-20)	
Materials	Yr 1 - Oats or millet Nurse crop (120 kg), Contractor spot spray invasives	
Labour	Implementation	
	Subtotal	
Labour	10%	
	Total	
Adaptive Management	**Years 1-20**	
Equipment	Work trucks/Sprayers	
Materials	Blanket herbicide spray yr 1, woody herbicide yr 1, (2/yr) herbaceous spot spray yrs 1-5, 9, 13	
Labour	Implementation	
	Subtotal	
Contingency	10%	
	Total	
Monitoring	**Years 1-5**	
	Year 1 visit with reporting	
	Year 2 visit with reporting	
	Year 3 visit with reporting	
	Year 4 visit with reporting	
	Year 5 visit with reporting	
	Subtotal	
Contingency	10%	
	Total	
	Project Management Subtotal	
	Site Preparation and Planting Subtotal	
	Maintenance Mowing and Adaptive Management Subtotal	
	Monitoring Subtotal	
	Contingency Subtotal	
	GRAND TOTAL	

** Typical Budget Items and Costs: While each restoration type includes typical budget items, specific costs for these items are not provided. Costs may vary due to market price fluctuations (e.g., for fuel, materials, etc.) and are subject to change. For the most up-to-date costs, please contact County of Essex staff. (Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)*

6.0 Guidelines for Basal Area Calculations

General guidance on how to perform the basal area calculation can be sought from the *Ecological Land Classification for Southern Ontario Field Guide* (Lee et al., 1998) or the *Ontario Tree Marking Guide* (MNRF, 2004). The following recommendations are provided in order to standardize the collection and submission of basal area calculations related to application of these *Natural Heritage Compensation Guidelines*.

Please consult with County of Essex staff before deviating from the ideal data collection methods.

1. Selection of Sampling Area:
    - Basal area should be measured within the contiguous ecosystem type (Ecological Land Classification polygon) where the unavoidable loss or impact to natural features has been identified.
2. Prism and Plot Methodology:
    - Use a BAF 2 metric prism.
    - Use fixed area plots when the prism provides less accuracy (e.g., young plantations or dense hardwood stands). For instance, use circular plots with a 200 m^2 area (plot radius of 7.99 m).
3. Sampling Requirements:
    - Take a minimum of 3 plots (either prism sweeps or fixed area plots) within the impacted ecosystem type, covering at least 10% of the area.
    - Ideally, plots should be located at least 40 meters from the edge of the polygon to minimize edge effects. Avoid placing plots solely along the edge.
4. Spatial Considerations:
    - Ideally, maintain a minimum distance of 80 meters between sweeps or plots.
    - Use a grid pattern marked in the office before field data collection.
5. Field Data Collection:
    - Mark the center of each sweep or plot on the ground and record its GPS coordinates for verification by the consultant. Provide mapping and data collection sheets to the County of Essex or other relevant approval authority.

6. Recording Basal Area:
    - Record basal area by tree species.
    - Exclude all dead trees from the basal area calculation.
    - Record diameter measurements for all borderline trees. Use a Plot Radius Factor Table (found in Appendix D of the Ontario Tree Marking Guide) to determine plot inclusion.

Basal Area Collection Form

Basal Area Calculation Form[1]	**Site:**
	Ecosystem Type:
	Date:
	Surveyor(s):

Tree Tally by Species:

Prism Factor:

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	AVG.

DEAD							
TOTAL							**100**
BASAL AREA (BA)							

Stand Composition:

Community Profile Diagram:

Adapted from the *Ecological Land Classification for Southern Ontario Field Guide (Lee et al., 1998)* for use with the County of Essex's Natural Heritage Compensation Guidelines. ***(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)***

7.0 Tree Replacement Ratios and Cost

When the basal area approach is impractical for determining compensation, especially in cases involving individual trees where no municipal tree by-laws apply, tree replacement ratios become a valuable alternative. The following section provides information on tree replacement ratios and typical costs associated with planting individual trees.

The following tree replacement table was formulated by the Toronto & Region Conservation Authority (TRCA)and is supported by the County of Essex, taking into consideration various data and information sources. In general, older or more significant trees are replaced at higher ratios than smaller ones.

Table 2: Replication Tree (Planting) Ratio by Diameter at Breast Height (DBH)

	DBH Range (cm)	Replication Ratio
1	0 – 10	1:1
2	10.1 – 20	1:3
3	20.1 – 30	1:10
4	30.1 – 40	1:15
5	40.1 – 50	1:20
6	50.1 – 60	1:30
7	60.1 – 70	1:40
8	70.1+	1:50

Efficiency in implementation can be enhanced by bundling multiple tree plantings under a single contract. For the purpose of this Guideline, the following assumptions were applied:

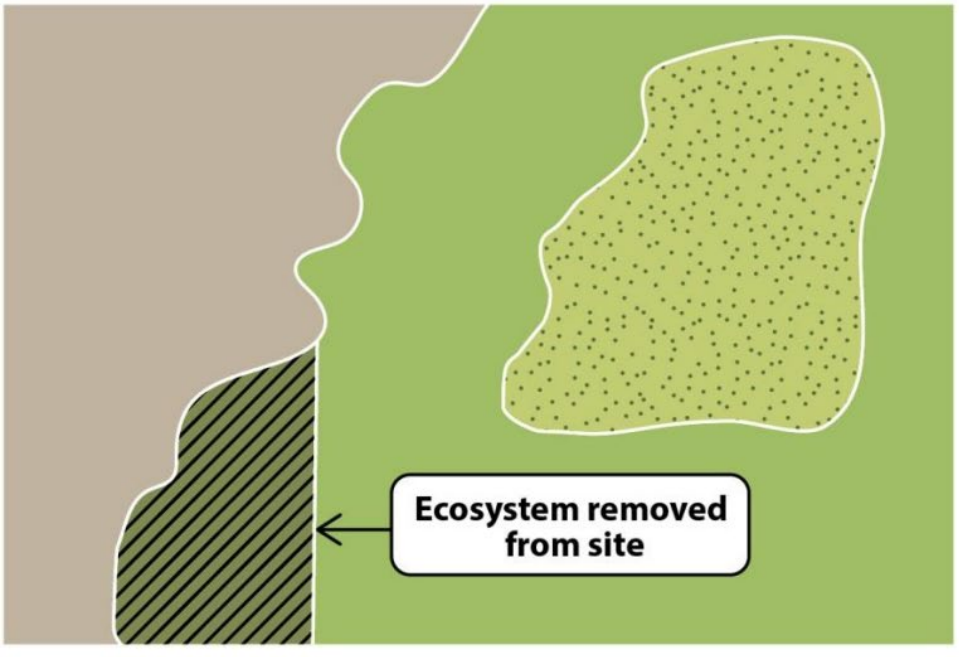
1. Replacement of individual trees requires a minimum 60 mm wire basket caliper tree.
2. Cost estimates include maintenance and monitoring with a minimum 2-year warranty.
3. Costing is based on typical industry standards for planting within parkland settings.

Note that costs associated with these plantings may vary due to market fluctuations in fuel, materials, etc. For the most current cost information, please consult County of Essex staff.

8.0 Compensation Example Graphics

The following examples are intended to demonstrate the application of the compensation project as described in this guideline. These do not include every scenario of compensation, but can provide insight into how some common scenarios are performed.

DESCRIPTION OF THE IMPACTED SITE AND ECOSYSTEM PROPOSED TO BE REMOVED



ECOSYSTEM REMOVED

Ecosystem type: Forest

Size of habitat: 1 hectare (ha)

Basal area: 15 m^2/ha

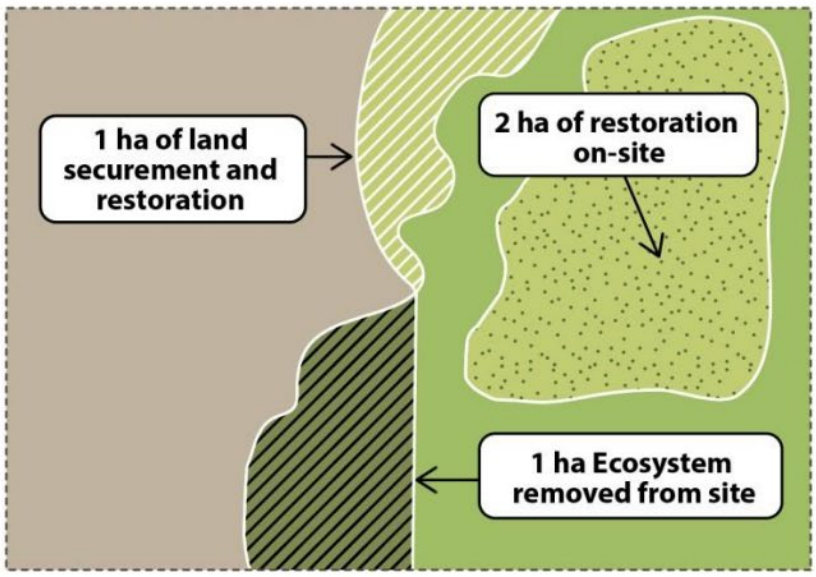
LEGEND

- Natural system
- Developable area
- Ecosystem removal
- Potential restoration area

LEGEND

Natural system
Developable area
Ecosystem removal
Potential restoration area
Compensation land area
Property boundary

OPTION 1 - ON-SITE COMPENSATION



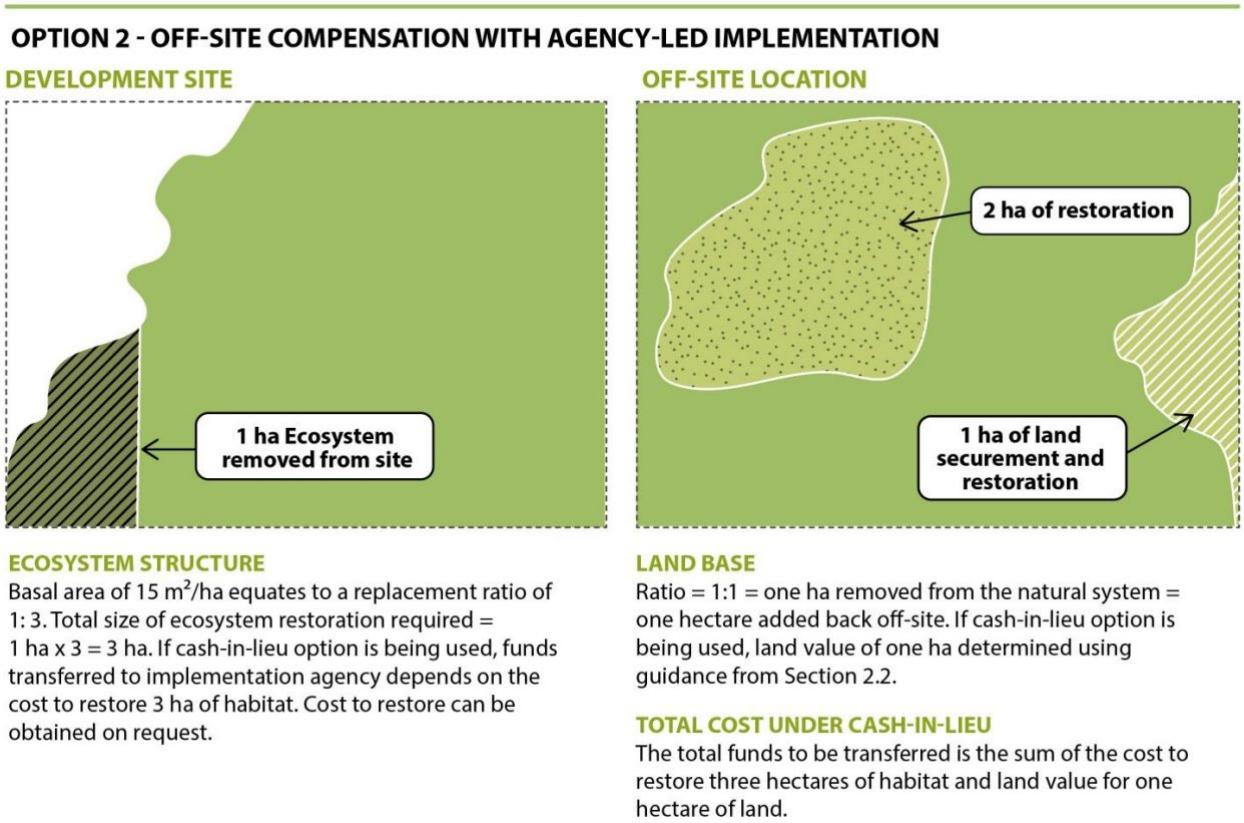
ECOSYSTEM STRUCTURE

Basal area of 15 m^2/ha equates to a replacement ratio of 1:3. Total size of ecosystem restoration required = 1 ha x 3 = 3 ha

One hectare of restoration can occur on site within the area required to compensate for the lost land base. The remaining two hectares of restoration can occur within the potential restoration area on site.

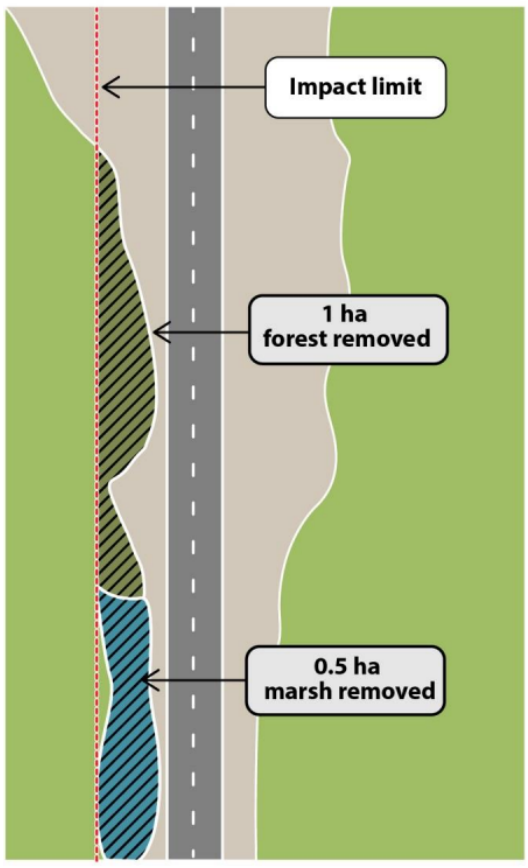
LAND BASE

Ratio = 1:1 = one ha removed from the natural system = one hectare added back on the same site
(as illustrated in light green hatching)



(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

MUNICIPAL INFRASTRUCTURE EXAMPLE



ECOSYSTEM REMOVED

Ecosystem type: Forest
Size of habitat: 1 hectare (ha)
Basal area: 15 m^2/hectare

Ecosystem type: Marsh
Size of habitat: 0.5 ha

ECOSYSTEM STRUCTURE

Forest
Assuming a forest basal area of 15 m2/ha, a 3ha:1ha replacement ratio is required. One ha of forest removed requires restoration of three ha.

Marsh
Marsh habitat is restored at a 1ha:1ha ratio. Therefore, 0.5 ha of marsh habitat must be restored to address the removal.

Restoration can occur on site to the extent possible with the remaining restoration being implemented elsewhere in proximity to the impact

LAND BASE

Land base compensation does not need to be addressed on an individual project basis. TRCA and the Municipality can track the land area removed from the natural system from all infrastructure projects and work together to explore avenues to off-set these losses through existing municipal land acquisition and ecological restoration programs or other means.

(Photo credit: Guideline for Determining Ecosystem Compensation, Toronto and Region Conservation Authority, June 2023)

Glossary

Accepted appraisal principles: Refers to the Canadian Uniform Standards of Professional Appraisal Practice, 2018 (as amended) by the Appraisal Institute of Canada.

Basal area: Biomass Basal area is the common term used to describe the cross-sectional area of a tree measured 1.3 metres above the ground. Stand Basal Area is the total cross-sectional area of all stems in an ecosystem typically expressed in m^2 per hectare.

Biomass: Biomass is biological material derived from living, or recently living organisms; the accumulation of living or recently living matter within an ecosystem.

Buffer: A strip of permanent vegetation that helps alleviate the negative effects of development on natural features and functions and can include a non-vegetated erosion access allowance required to manage a natural hazard. Buffers may also be referred to as vegetation protection zones.

Compensate: The replacement of a lost/altered natural feature or area and its functions.

Ecological Land Classification System for Southern Ontario: The Ministry of Natural Resources and Forestry's Southern Ontario system of classification of lands from an ecological perspective; an approach that attempts to identify and classify ecologically similar areas; published in 1998, and as may be updated from time to time.

Ecosystem functions: The natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems, and landscapes. These may include biological, physical, and socio-economic interactions.

Ecosystem services: The benefits to humans and other species, provided by nature.

Ecosystem structure: The biotic (living) and abiotic (non-living) form and composition (e.g. dominant plant species, size of vegetation, soil type and topography) of ecosystems that give each ecosystem its own definition and function.

Green infrastructure: Natural vegetation, vegetative technologies, soil in volumes and qualities adequate to sustain vegetation and absorb water, and supportive green technologies that replicate ecosystem functions and that collectively provide society with a multitude of environmental, social and economic benefits.

Headwater Drainage Features: Ill-defined, non-permanently flowing drainage features that may not have defined bed or banks; they are zero-order intermittent and ephemeral channels, swales and rivulets, but do not include rills or furrows.

Impact(s): Removal or partial removal of a component of the Natural System.

In Situ: In the context of ecosystem compensation, in situ refers to maintaining the subject ecosystem and its associated functions and services in its current location.

Lag Time: In the context of this Guideline, lag time refers to the time required for a newly restored ecosystem to reach a similar level of function as the impacted ecosystem it is attempting to replace.

Market Value: The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress. (Appraisal Institute of Canada)

Mitigate: The prevention, modification, or alleviation of negative effects on the environment. It also includes any action with the intent to enhance beneficial effects.

Mitigation Hierarchy: Avoid, minimize, mitigate, compensate.

Natural Cover: Land occupied by naturally and culturally occurring native or non-native vegetation that is not characterized as agricultural or urban land uses.

Natural Heritage System: The natural heritage system is comprised of water resources, natural features and areas, natural hazards, and restoration areas of potential natural cover and/or buffers). (Essex Region Natural Heritage System Strategy ERNHSS)

Risk: In compensation, the potential for the replication of ecosystem structure or function to fail. Risk increases with ecosystem complexity or specific conditions difficult to reproduce.

Vegetation Type/ Vegetation Community: An ecosystem as described by its vegetation composition and form. For example, an oak-maple forest. The level of mapping detail for the “Vegetation Type” is defined by the Ecological Land Classification System for Southern Ontario.

References

Essex Region Conservation Authority (ERCA) 2013. Essex Region Natural Heritage System Strategy - (An Update to the Essex Region Biodiversity Conservation Strategy). Essex, Ontario. 319 pp. (https://essexregionconservation.ca/resources/reports/essex-region-natural-heritage-systems-strategy/)

Essex Region Conservation Authority (ERCA). 2019. Environmental Impact Assessment (EIA) Guidelines. Essex, Ontario. 34 pp. (https://essexregionconservation.ca/resources/reports/environmental-impact-assessment-guidelines/)

Lee, H.T., W.D. Bakawsky, J.Reily, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02. (https://www.researchgate.net/publication/248626765_Ecological_Land_Classification_for_Southern_Ontario_First_Approximation_and_Its_Application)

Ontario Ministry of Municipal Affairs & Housing (MMAH). 2020. Provincial Policy Statement, 2020 - Under the Planning Act. Ontario. 57 pp. (https://files.ontario.ca/mmah-provincial-policy-statement-2020-accessible-final-en-2020-02-14.pdf)

Ontario Ministry of Natural Resources and Forestry (MNRF). 2004. Ontario Tree Marking Guide, Version 1.1. Queen's Printer for Ontario. Toronto, Ontario. 252 pp. (https://dr6j45jk9xcmk.cloudfront.net/documents/2807/guide-treemarking.pdf)

Ontario Ministry of Natural Resources and Forestry (MNRF). 2015. Wetland Conservation in Ontario: Discussion Paper. Toronto, Ontario. 28 pp. (https://ontarionature.org/wp-content/uploads/2015/10/wetlandsdiscussionpaper_en.pdf)

Toronto and Region Conservation Authority (TRCA). 2023. Guideline for Determining Ecosystem Compensation. Toronto, Ontario. 46 pp. (https://trcaca.s3.ca-central-

1.amazonaws.com/app/uploads/2022/03/30134818/TRCA-Guideline-for-Determining-Ecosystem-Compensation-June-2018-v5.pdf

Nottawasaga Valley Conservation Authority (NVCA) 2021. Achieving Net Gains through Ecological Offsetting – September 24, 2021

Credit Valley Conservation (CVC) 2020. Ecosystem Offsetting Guidelines – March 13, 2020