GREEN MUNICIPAL FUND
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WORKING WITH NATURE TO IMPROVE INFRASTRUCTURE PROJECT OUTCOMES

Why integrate nature into your infrastructure project planning?

Today communities are faced with the dual challenges of climate change and biodiversity loss. While nature alone can't solve the climate crisis, it can provide up to a third of the climate mitigation needed by 2030.[1] Recognizing this opportunity, a relevant commitment made at the **COP28 United Nations Climate Change Conference** was to foster "stronger synergies, integration and alignment in the planning and implementation of national climate, biodiversity and land restoration plans and strategies".

Infrastructure projects that integrate **nature-based solutions** can build resilience to climate change (such as contributing to flood control and countering heat island effects), while also helping to sustain local biodiversity and store carbon. In addition to supporting climate mitigation and adaptation, incorporating nature into projects provides ecosystem services such as improving air and water quality while also fostering **physical and mental health benefits**.

1 See The Nature Conservancy, **Natural Climate Solutions**

Nature's ability to contribute to core municipal services, such as stormwater management and erosion control, while also being resilient to climate change make it a good investment. The additional ecosystem services that come with integrating **natural assets** into infrastructure projects makes it a great investment. Economic analyses of applied **examples from six communities in Ontario** show how integration of **natural infrastructure** and other types of **green infrastructure** can be cost-effective and sustainable community assets in the short and long term.

Some key terms defined

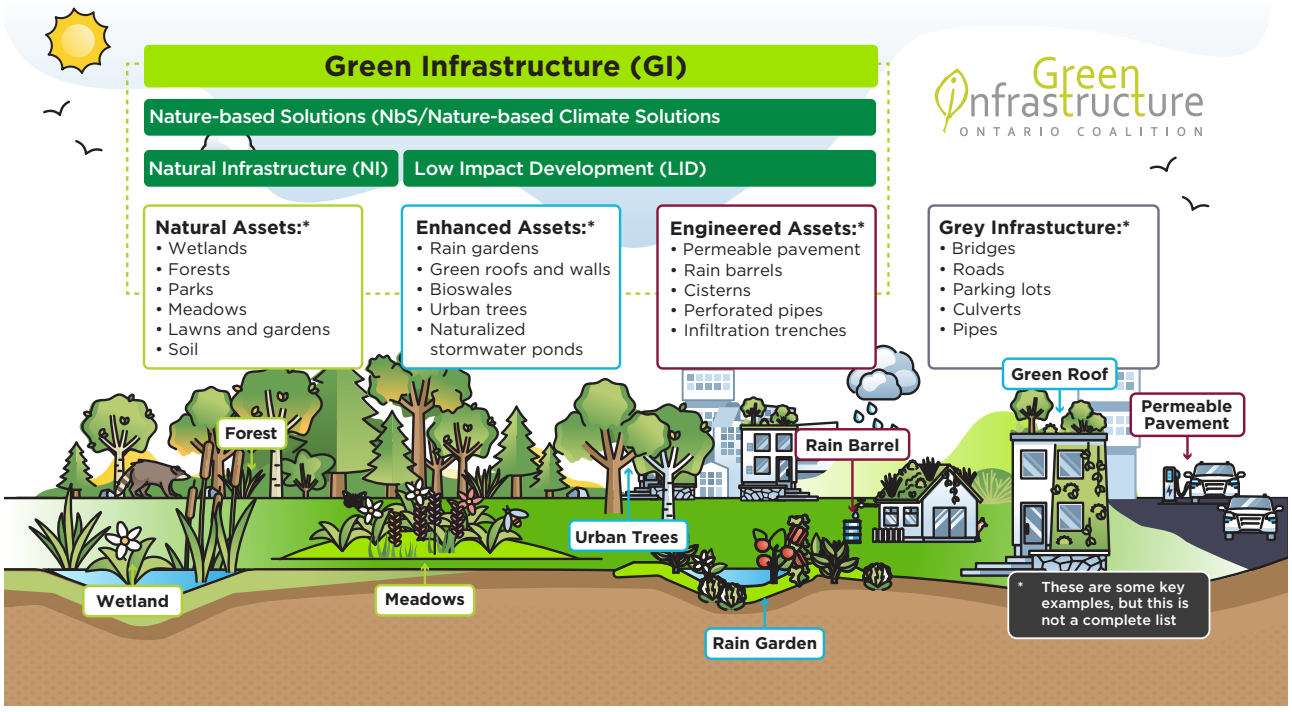
Biodiversity is the variability among living organisms including diversity within species, between species and of ecosystems.

Nature-based solutions (NbS) refers to the sustainable management and use of natural features and processes to tackle socio-environmental issues. These issues include climate change (mitigation and adaptation), water security, water pollution, food security, human health, biodiversity loss, and disaster risk management.

Natural assets / natural infrastructure are the stock of natural resources and ecosystems that yield a flow of benefits to people. They typically include natural features (such as forests, wetlands, meadows, shorelines and riparian areas) and can also include surface and groundwater resources (such as watercourses, lakes, ponds, seepage areas, springs and groundwater aquifers).

Green infrastructure is a broad category that includes natural infrastructure and designed and engineered elements that have been created to mimic natural functions and processes in the service of human interests (such as infiltration trenches, bioswales, and green roofs or walls).

Figure 1. Illustration of how natural assets / natural infrastructure are a type of green infrastructure.[2]



2 Adapted from Green Infrastructure Ontario Coalition (**What Is Green Infrastructure? – Green Infrastructure Ontario**)

How can you integrate nature into your infrastructure project planning?

To leverage the climate change resilience, biodiversity and other services provided by natural infrastructure, governments must (a) prioritize and accelerate projects that work with nature and (b) target, wherever possible, a net gain in biodiversity. This can be achieved by following what is called the "biodiversity mitigation hierarchy" (see **Figure 2**), which consists of the following four steps, listed from typically most to least preferred from an ecological perspective.

STEP 1

First, **avoid impacts** to existing natural assets and their ecological functions.

STEP 2

Secondly, **minimize impacts** to existing natural assets and their ecological functions.

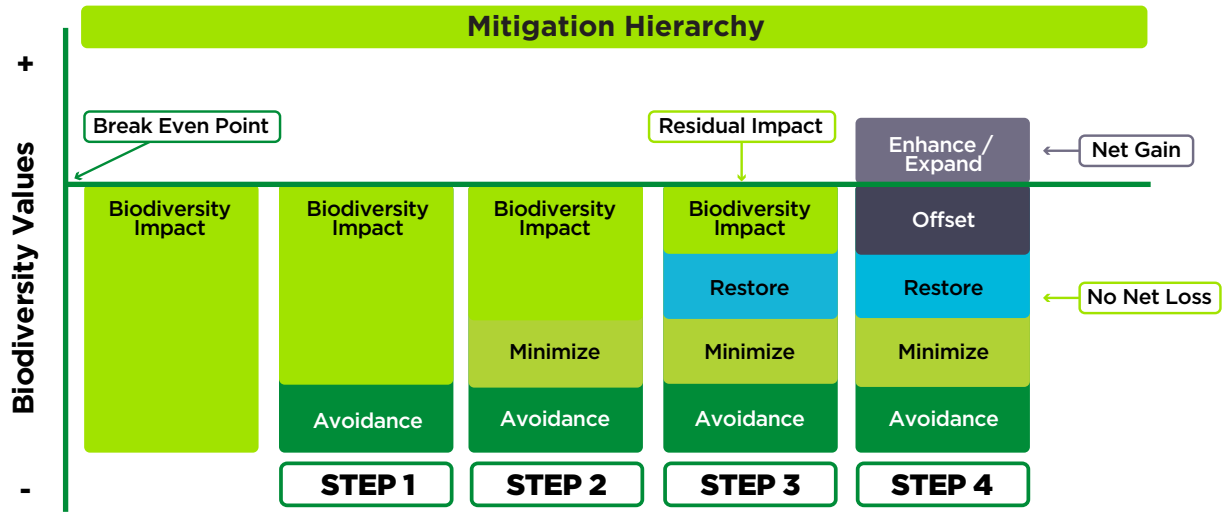
STEP 3

Thirdly, **restore or create natural assets to mitigate or offset impacts** that cannot be avoided or minimized to ensure no net loss (for example, by re-aligning, creating a new marsh wetland to replace one that needed to be removed).

STEP 4

Finally, wherever possible, contributing to enhancing and / or expanding natural assets within the study area or nearby to achieve a **net gain in biodiversity** (for example, by re-aligning, daylighting and naturalizing a piped watercourse).

Figure 2. Illustration of the biodiversity mitigation hierarchy[3]



3 Adapted from Ecology by Design (**Biodiversity mitigation hierarchy explained | Ecology by Design**),

It is critical to recognize that, while some "simpler" types of natural assets can be reasonably well restored or created (for example, marsh wetlands or young forests), effectively restoring or creating natural assets often requires very advanced technical knowledge and skills as well as significant budgets. These are also some types of natural assets we have not been able to effectively recreate. Avoidance of impacts remains, in most cases, the better and most cost-effective ecological option.

Key considerations for integrating nature into your projects

STEP 1

Avoiding impacts to existing natural assets is the most effective way to maintain their ecological functions. It can reduce study and design costs and facilitate project environmental review and approval processes. It is also typically more cost effective to retain and protect existing natural assets than to restore or create them. Avoidance also pre-empts temporary losses of ecosystem services associated with natural infrastructure being impacted or removed. At the pre-planning stages of your project, consider how site selection, project design and project scheduling can help avoid impacts to existing natural assets.

STEP 2

Minimizing impacts to existing natural assets and their ecological functions is often required to accommodate project requirements where no feasible alternatives exist. Minimization actions include: adapting infrastructure design to reduce potential harmful impacts (e.g., bird-friendly glass), implementing operational controls (e.g., buffers) to protect existing ecological features from damage during site preparation, construction and operations, and reducing the level of pollutants and nuisances being generated by the project (e.g., eliminating the use of pesticides, reducing light pollution). Workable solutions can be identified through multi-disciplinary collaboration.

STEP 3

Restoring natural assets involves the process of assisting the establishment or recovery of an ecosystem that has been degraded, damaged, or destroyed for the purposes of re-establishing habitats, biodiversity, or ecosystem services. Key principles underpinning successful ecological restoration and habitat creation are outlined below.

STEP 4

Enhancing or expanding natural assets requires application of the key principles listed below to help ensure project success. Natural assets are versatile in that they can be integrated at various scales. For example, natural asset projects can range from protection of a large forest within a public natural area to creation of a "mini-forest" in a municipal park.

However, ecosystem services associated with natural infrastructure tend to accrue exponentially as the scale of the project increases, and so maximizing the scale of natural asset integration (within the limits of what is technically and financially feasible) will lead to the greatest ecosystem service outcomes.

Key principles[4] for successful natural asset protection, restoration and creation

1. Engage with a broad range of stakeholders and partners — including First Nations, Métis and potentially urban Indigenous communities and organizations, as well as equity-deserving communities — and seek local knowledge and a range of perspectives.
2. Get technical guidance from a multi-disciplinary team of professionals with the right expertise (e.g., ecologists, engineers, and geoscientists — including hydrogeologists and geomorphologists) and an understanding of local natural systems and related regulations.
3. Look to appropriate reference habitats and / or ecosystem types for setting targets and objectives, and for habitat restoration or creation projects, seek to mimic appropriate levels of genetic diversity while also planning for climate change conditions.
4. Look beyond the asset itself to protect and / or leverage existing natural conditions and processes, particularly as they relate to surface and groundwater, to help ensure the natural assets remain or can become self-sustaining in time.
5. Establish clear goals and practical, measurable performance indicators.
6. Recognize that changes in plant community form and composition will occur over time. Lean on technical experts to distinguish shifts that are considered "acceptable" (i.e., aligned with project biodiversity goals) from shifts considered "not acceptable" and which require targeted intervention to help the system become self-sustaining.
7. Maximize the scale at which the natural asset restoration or creation is implemented to optimize the positive outcomes for climate change, biodiversity and other ecosystem services.
8. Ensure an adaptive management approach is implemented whereby the protected, restored or created assets are regularly monitored and that, if needed, targeted maintenance and / or other interventions can be undertaken.

Note that natural assets in urban settings tend to be subject to more frequent and intense disturbances, and therefore tend to require more active management.

4 Adapted from the **International Principles & Standards for the Practice of Ecological Restoration, 2nd ed.**

EXAMPLE: Fairwinds Park (Park 524-525), City of Mississauga, Ontario

The development of Fairwinds Park (also known as **Park 524-525**) in Mississauga, Ontario involved:

- Protecting the existing Cooksville Creek floodplain corridor running through the park and most of the associated wetlands and wooded areas (**STEP 1** in the Biodiversity Mitigation Hierarchy)
- Limiting the natural asset removals to two small wetland pockets and some immature cultural woodlands outside of the City's mapped Greenlands (**STEP 2**)
- Offsetting the wetlands and woodlands removed by restoring woodlands and creating wetlands close to existing natural assets being retained on site (**STEP 3**), and
- Improving local flood control, climate resilience and biodiversity by creating additional wetland pools in the floodplain and biodiverse meadows in the uplands (**STEP 4**).

The final development concept (**Figure 4**) shows how Fairwinds Park effectively integrates extensive natural features (including the floodplain corridor, woodlands, wetlands and meadow habitats) with active community amenities (including a playground, a basketball court, tennis courts, outdoor fitness stations, and informal sports fields) and carefully designed trails to provide appropriate public access to the protected, restored and created natural assets.

Figure 4. Final concept plan for Fairwinds Park, City of Mississauga, Ontario[5]

5 Credit: **The MBTW Group**

Some helpful resources

Over the past decade a growing number of local governments across Canada, and elsewhere, have started looking to nature-based solutions as part of their infrastructure project planning. Why? Because they are struggling with infrastructure shortfalls, and finding this approach can be cost-effective while also contributing to climate mitigation and adaptation and improved biodiversity.

Practices, tools and techniques related to natural asset management project planning are evolving quickly as local governments, and others, learn by doing. There is a growing body of resources available online. A few examples are provided below.

- The **Nature-based Infrastructure Global Resource Centre** provides access to data on the performance of nature-based projects around the world and a collaborative platform.
- **Perspectives: Natural Climate Solutions** is an online resource hub supported by The Nature Conservancy that provides links to case studies, videos, scientific reports and summaries, articles, and other resources focused on natural climate solutions.
- **biodiverCities: A primer on nature in cities** developed by ICLEI Canada and Toronto and Region Conservation provides examples of where biodiversity has been successfully integrated into municipal services and programs.
- **A Regional Approach to Biodiversity-led Green Infrastructure** is a webinar hosted by the Climate Risk Institute cities looking at intentional, regional approaches to planning green infrastructure in ways that benefit biodiversity in a changing climate.
- **Engineering With Nature** is a U.S. Army Corps of Engineers initiative that shares research and resources related to projects focused on the integration of engineering and natural systems to achieve cost-effective infrastructure development.
- **Naturebase** a free and interactive data platform that uses the latest science-based data on projects around the world that benefit the climate while also protecting biodiversity.
- **The Municipal Natural Asset Initiative Coastal Protection and Benefit Tool** and **Managing natural assets to increase coastal resilience: Guidance document for municipalities**