Implementation Guide

Natural Infrastructure for Flood Protection

August 2026

IISD
Natural Infrastructure for Water Solutions

Associated
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Unless otherwise noted, photos and illustrations are courtesy Associated Engineering.

Table of Contents

Purpose

Natural infrastructure works–and it can do more than many people realize.

This guide is designed to demonstrate the value of natural infrastructure, moving it from a promising concept to a practical part of everyday decision making. Focusing on flood risk reduction, it demonstrates how wetlands, grasslands, riparian areas, trees, and other natural systems can be used to manage water more effectively either on their own or combined with engineered systems. These approaches can reduce flood risk while also strengthening drought resilience, supporting water supply, and protecting water quality across the Canadian Prairies.

Developed by the International Institute for Sustainable Development (IISD), the guide draws on research, Prairie-based examples, and practical implementation advice. It is intended to support the broader adoption and scaling of natural infrastructure across Alberta, Saskatchewan, and Manitoba, with special focus on the Prairie ecoregion.

This publication is part of the Prairie Natural Infrastructure Guide Series, which also examines drought and water supply, quality, and treatment. Together, the series highlights how natural systems can deliver multiple, interconnected benefits.

Who These Guides Are For

These guides are written for a broad audience working to increase the use of natural infrastructure across the Prairies. The groups below will find them particularly helpful and each plays an important role in implementing the actions needed to scale up natural infrastructure (see Section 3).

Government and Infrastructure Owners

Watershed and Conservation Organizations

Indigenous Nations and Knowledge Holders

Practitioners and Contractors

Education, Training, and Knowledge Organizations

Private Sector and Investment Partners

Indigenous Acknowledgement

The region of focus for IISD's Natural Infrastructure for Water Solutions (NIWS) initiative spans over 200 traditional territories and homelands across the provinces we call Alberta, Saskatchewan, and Manitoba–including the Indigenous territories of the Nêhiyaw-Askiy (Plains Cree), Woodland Cree, Iyarhe Nakoda (Stoney Nakoda), Anishininiimowin (Oji-Cree), Niitsítapi (Blackfoot), Tsuut'ina, Očhéthi Šakówiŋ, Nakoda Oyadeb (Nakota), Lakota, Dakota, Anishinaabe (Ojibwe), Anisininew (Ojibwe Cree), and Salteaux, alongside Métis Nations, including the Otipemisiwak Métis, Métis Nation–Saskatchewan, and Red River Métis.

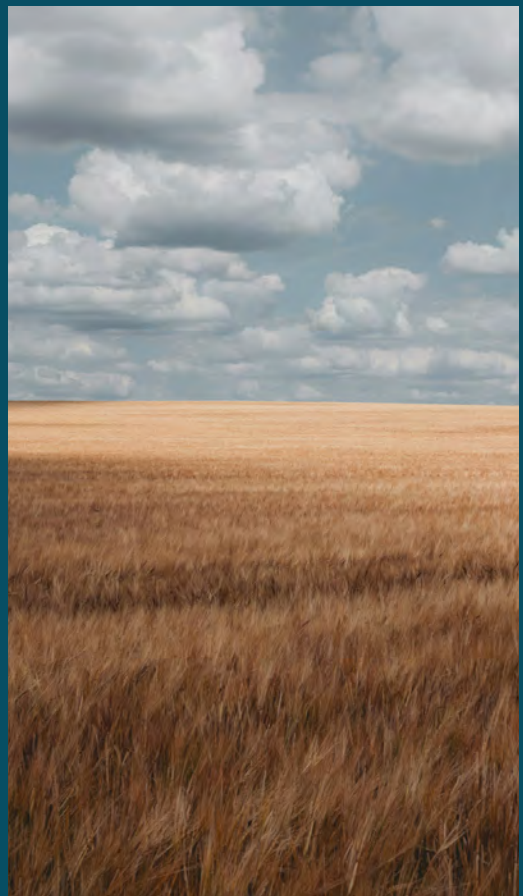


Photo by Jez Timms on Unsplash

Examples of Natural Infrastructure Solutions

WETLANDS

A wetland is an area of land where water is present at or near the surface for all or part of the year. Wetlands support diverse plants and wildlife and help reduce flooding, support groundwater recharge and improve water quality.

Photo credit: Ducks Unlimited Canada

PRAIRIE POTHOLE WETLANDS

Shallow, seasonal water basins unique to prairie regions. They are vital for wildlife habitat and water storage.

RIPARIAN RESTORATION

Actions that restore the natural health of river, stream, and lake shorelines to improve habitat, water quality, and erosion control.

FLOODPLAIN RESTORATION

Actions that restore natural floodplain areas to reduce flooding, improve habitat, and support healthier river systems.

NATIVE GRASSLANDS

Natural prairie landscapes dominated by native grasses and wildflowers that support wildlife, store carbon, and help maintain healthy soils.

CONSTRUCTED WETLANDS

Engineered systems designed to mimic natural wetlands. They use plants, soils, and natural processes to treat stormwater or wastewater, improve water quality, and help manage runoff.

SHELTERBELTS

Rows of trees and shrubs planted to reduce wind erosion, protect soil and crops, and provide habitat for wildlife.

RE-GRADED DITCHES

Reshaped drainage channels with gentle slopes that slow and retain runoff water. They increase water retention, reduce erosion, filter pollutants, and support water infiltration.

BIOSWALES/RAIN GARDENS

Landscaped areas planted with native vegetation that capture, filter, and absorb rainwater, helping reduce runoff and improve water quality.

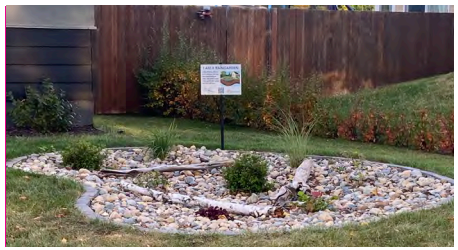


Photo credit: City of Brandon

GREEN ROOFS/SOIL CELLS

Green roofs are designed to be covered with plants and soil to help manage stormwater, reduce heat, and provide habitat. Soil cells are underground structures that hold soil and water to support healthy tree growth and manage stormwater beneath sidewalks and streets.

Photo credit: Living Lands Landscape and Design

Natural infrastructure is also described using related terms such as “nature-based solutions,” “green infrastructure,” “ecosystem-based approaches,” “low-impact development,” “sustainable design,” and “natural assets.” While these terms have slightly different meanings depending on the context, they all emphasize working with nature to deliver infrastructure and community benefits.

Prairie Flooding Context

Flooding is a natural Prairie process that supports wetlands, soils, ecosystems, and river systems. However, development and landscape changes can reduce the land’s ability to absorb, slow, and store water.

As communities grow and the climate changes, flood risks may increase in some areas. Natural infrastructure can help restore important watershed functions, including water storage, infiltration, and groundwater recharge, while supporting more resilient communities.

What Is Natural Infrastructure?

In this guide, natural infrastructure refers to ecosystems, whether natural, restored, or constructed, that provide environmental, social, and infrastructure-related benefits. Many types of natural infrastructure are suitable for use on the Prairies (see pages 11 to 13), including natural systems such as wetlands, forests, and rain gardens.

Natural infrastructure differs from conventional grey infrastructure. Grey infrastructure refers to engineered systems that rely on human-made materials, such as concrete, steel, and asphalt. In many cases, the two approaches work effectively together. Integrating natural and grey infrastructure can improve resilience, reduce long-term costs, and deliver multiple co-benefits.

Why the Prairies Are Ideal for Natural Infrastructure

Considered the breadbasket of Canada, the Prairies are a key agricultural region, with large acreage devoted to growing crops and raising livestock. At the same time, the region’s population is growing, with expanding towns and cities and increasing demands on infrastructure. This increases pressure on land and water systems. Natural infrastructure can help balance these demands.

The Prairies feature a diverse range of landscapes, including grasslands, forests, river valleys, and wetlands. One of its most distinctive features is the globally significant Prairie Pothole Region, which is defined by thousands of small, shallow wetlands formed by glacial activity. Unlike larger, permanent wetlands, prairie potholes are highly dynamic, filling and drying out with changing conditions. This allows them to store water during wet periods and slowly release it over time, making them especially effective for natural flood storage and groundwater recharge.

Photo credit: Freshwater Conservation Canada

Photo credit: Alisha Goldstein, EPA

What Is a Watershed?

A watershed includes the land that drains water to the same river, lake, wetland, or groundwater system. Rain and snowmelt move across the landscape through streams, wetlands, soils, and groundwater–connecting everything upstream and downstream.

Watersheds connect:

- Water
- People and communities
- Ecosystems and infrastructure

Why Watersheds Matter

Many natural infrastructure projects occur on agricultural and rural lands, while many flood and water quality benefits are realized downstream in towns and cities. This means successful watershed management depends on shared responsibility, partnerships, and coordinated investment across the landscape.

How Do Watersheds and Natural Infrastructure Work Together?

Natural infrastructure works throughout the watershed from wetlands and riparian areas to farms, parks, and urban green spaces. Different solutions perform different functions, but together they help slow runoff, increase infiltration, recharge groundwater, reduce erosion, and improve water quality.

Watershed-scale planning helps identify where different natural infrastructure solutions will provide the greatest combined benefit over the long term.

Watershed Resilience Requires Collaboration

Because watersheds cross property lines and jurisdictional boundaries, addressing flood risk and other water challenges requires coordinated action among Indigenous communities, landowners, agricultural producers, municipalities, watershed organizations, governments, conservation groups, and residents.

Natural infrastructure is most effective when planned and implemented at the watershed scale. By working together, partners can identify opportunities that provide the greatest collective benefit, align investments, and strengthen long-term resilience across the landscape.

Lasting results come not from a single project, but from many complementary actions implemented over time. Section 3 highlights the priority actions that different organizations and sectors can take to help accelerate the adoption of natural infrastructure across the Canadian Prairies.

Understanding Natural Infrastructure

Natural infrastructure uses ecosystems and natural processes to provide services that support communities and the environment.

Unlike conventional grey infrastructure that often focuses on a single function, natural infrastructure can deliver multiple benefits simultaneously, including:

- reduce flood impacts
- enhance drought resilience and groundwater recharge
- improve water quality
- provide habitat and biodiversity benefits
- increase climate adaptation and community resilience.

A Continuum of Solutions

Natural infrastructure can be implemented using various approaches depending on landscape conditions, community expansion, local economy, and watershed objectives.

The most effective and cost-efficient approach is to maintain existing natural systems first. Alongside protecting and maintaining existing natural assets, efforts can also include restoring degraded systems, enhancing working landscapes, and integrating natural infrastructure into built environments.

These four approaches form a continuum of solutions, with the appropriate approach reflecting the unique characteristics and priorities of each region and watershed. Successful watershed strategies often combine all four approaches.

Natural Infrastructure Continuum Across Landscapes

Indigenous Knowledges and Relationships with the Land and Water

Indigenous Knowledges

Indigenous Knowledges are grounded in long-standing relationships with land and water. These knowledges recognize that humans are part of nature and have responsibilities to care for ecosystems on behalf of future generations.

For many Indigenous Peoples, land is not viewed simply as a resource or commodity, but as a living relationship that supports culture, identity, health, and community well-being. Water, plants, animals, and ecosystems are deeply interconnected.

Colonialism and development disrupted many of these relationships by displacing Indigenous Peoples from their lands and limiting opportunities to practice stewardship and governance. Despite these impacts, Indigenous communities across the Prairies and Canada continue to lead and support important work related to land stewardship, restoration, monitoring, and climate resilience.

Recognizing and respecting Indigenous ways of knowing can strengthen natural infrastructure planning by supporting more holistic, long-term, and place-based approaches to caring for land and water.

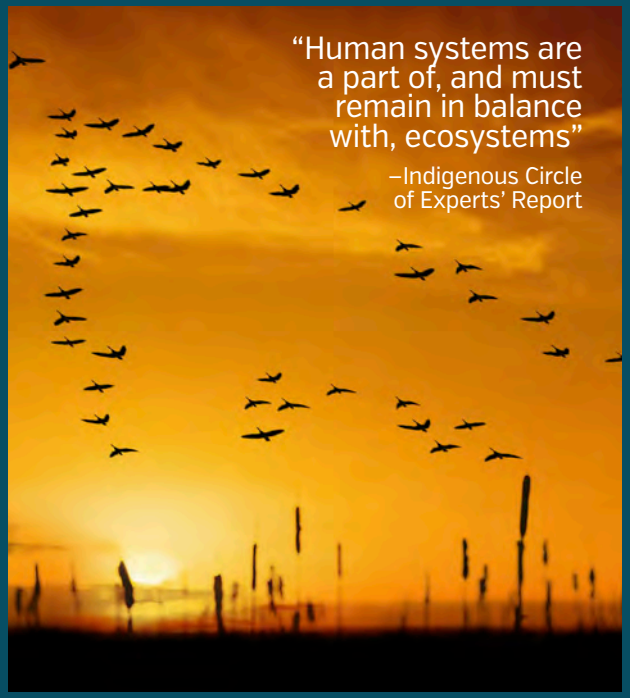
Indigenous Guardians Program

Indigenous Peoples have stewarded their lands and waters since time immemorial, guided by Indigenous laws, knowledge, and responsibilities.

The Indigenous Guardians program supports Indigenous-led stewardship by providing resources for monitoring ecosystems, protecting cultural sites, restoring habitats, and sharing knowledge across generations.

Since 2018, Indigenous Guardians funding has supported hundreds of initiatives across Canada while creating culturally meaningful employment opportunities connected to land and water stewardship.

The program highlights how caring for ecosystems can support cultural continuity, community well-being, biodiversity, and climate resilience at the same time.



https://www.canada.ca/en/environment-climate-change/services/environmental-funding/indigenous-guardians.html

Different Ways of Valuing Nature

Natural infrastructure can provide environmental, cultural, social, and economic value. Many of these connected benefits are not fully captured through traditional financial decision-making lenses.

ENVIRONMENTAL VALUE

Supporting biodiversity, healthy ecosystems, water storage, and cleaner air and water.

CULTURAL VALUE

Protecting relationships to land, Traditional Knowledge, cultural practices, and sense of place.

SOCIAL VALUE

Supporting recreation, mental health, education, community connections, and safer communities.

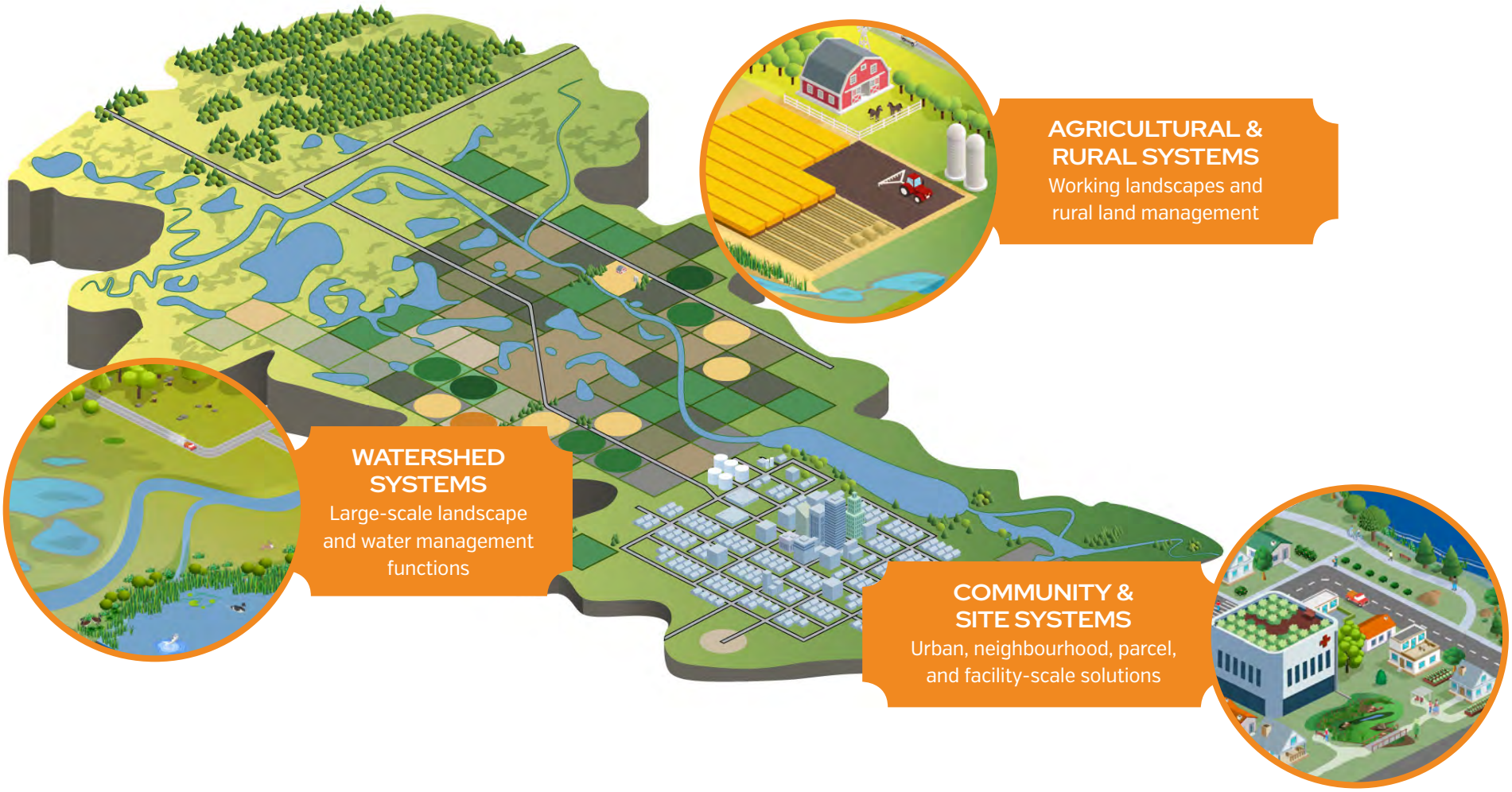
ECONOMIC VALUE

Reducing infrastructure costs, lowering flood damages, improving drought resilience, and supporting long-term sustainability.

Recognizing multiple ways of valuing nature can support more balanced and informed decision making.

Natural Infrastructure Solutions at Different Scales

Natural infrastructure can be applied across different parts of the landscape, from integrated approaches across a watershed to agricultural lands and urban areas. Different solutions are suited to different contexts, but together they help slow, store, recharge, and filter water while supporting broader environmental and community benefits.



Key Water Functions Supported by Natural Infrastructure

SLOW WATER
Reduce flood peaks and erosion

STORE WATER
Increase flood storage and drought resilience

RECHARGE WATER
Increase infiltration and support groundwater and base flows

FILTER WATER
Improve water quality and ecosystem health

2

Flood Management Roles of Natural and Grey Infrastructure

Natural infrastructure reduces flood volume peak flows before water reaches communities.

Grey infrastructure manages the residual flood risk that remains.

The most resilient flood management systems use both in a hybrid approach.

GREY INFRASTRUCTURE

Provides targeted flood protection where risks remain even with the use of natural infrastructure. Grey infrastructure is particularly useful in developed areas and around critical infrastructure.

Grey infrastructure can help to
- Convey floodwater safely
- Protect critical infrastructure
- Manage urban drainage
- Reduce residual flood risk.

Examples: Storm sewers, detention ponds, berms, dikes, channels.

Flood Resilience Happens Across the Watershed

Flood risk is best managed at the watershed scale by slowing, storing, and absorbing rainfall and snowmelt where it lands and moves through the landscape. Natural infrastructure supports these processes throughout the watershed, helping reduce the volume and speed of water reaching downstream communities and infrastructure.

As landscapes become more developed, impervious surfaces like roads, rooftops, and parking areas increase runoff while limiting infiltration, resulting in greater flood risk. The most resilient strategies integrate a hybrid approach with both natural and grey infrastructure across a connected watershed system.

Watershed-Scale System

- Greatest opportunity to reduce downstream flood peaks through natural water storage and retention
- Solutions are planned and/or coordinated at a watershed-scale
- Wetlands, riparian areas, grasslands, and floodplains reduce downstream flood peaks

Agricultural & Rural Systems

- On-site opportunities to slow runoff, increase infiltration, and retain water on the landscape
- Solutions are planned and/or coordinated at a more site-specific or localized level
- Water management can often be integrated with agricultural production

Community & Site Systems

- Development and infrastructure constraints limit available space for natural infrastructure
- Solutions are planned and/or coordinated at a more site-specific or localized level
- Rain gardens, bioswales, soil cells, and constructed wetlands help manage runoff close to where rain falls

Use natural infrastructure where appropriate or combine it with grey infrastructure where needed for even more resilient systems.

2

Watershed-Scale Systems

Coordinated watershed-scale conservation and restoration

Maintain natural systems
Native grasslands, riparian areas, and wetlands, including prairie potholes

Restore wetlands
Temporary and permanent wetland basins, including prairie potholes

Restore rivers and streams
Floodplain reconnection and channel naturalization with bends and meanders

Restore riparian areas and riverbanks
Live staking, naturalized plantings, bioengineering, and riverbed enhancements

Restore groundwater recharge
Infiltration areas and soil health improvements

Restore and protect water retention
Beaver dams and beaver dam analogues

PRIMARY BENEFITS — Flood Mitigation, Drought and Water Supply, Water Quality — SECONDARY BENEFITS

Natural Infrastructure Solutions for Watershed Systems

Watershed systems provide the greatest opportunity to reduce downstream flooding by slowing, storing, and naturally conveying water across the landscape. Protecting and restoring these large-scale natural systems strengthens flood resilience while also supporting drought resilience, groundwater recharge, biodiversity, and water quality.

Natural Infrastructure Examples

WETLANDS AND NATURAL AREA PROTECTION

RIPARIAN RESTORATION

PRAIRIE POTHOLE WETLANDS

Photo credit: Ducks Unlimited Canada

NATIVE GRASSLANDS

Agriculture and Rural Systems

Working landscapes and rural land management

Build natural water retention features
Small dams and constructed wetlands — 1, 2, 1

Restore and protect wetlands
Temporary and permanent wetland basins, including prairie potholes — 1, 2, 1

Enhance sustainable drainage systems
Regraded ditches, back-flooded dams, filter fields, and naturalized channels — 1, 2, 1

Restore marginal farmlands
Perennial vegetation, riparian restoration, and buffer zones — 2, 1, 1

Establish and protect trees
Shelterbelts, windbreaks, and silvopasture — 2, 1, 1

Restore riparian areas
Live staking, naturalized plantings, bioengineering, and riverbed enhancements — 2, 2, 1

PRIMARY BENEFITS (1, 1, 1): Flood Mitigation; Drought and Water Supply; Water Quality — SECONDARY BENEFITS (2, 2, 2)

Natural Infrastructure Solutions for Agricultural and Rural Systems

Agricultural and rural landscapes cover much of the Canadian Prairies, creating one of the greatest opportunities to improve flood resilience. Solutions in agricultural and rural systems focus more on individual projects rather than the large-scale planning and coordination seen at a watershed scale. Many natural infrastructure practices can be integrated into working landscapes while supporting agricultural productivity, water management, and long-term soil health.

Natural Infrastructure Examples

WETLAND RESTORATION

AGROFORESTRY & SHELTERBELTS

RIPARIAN BUFFER

REGRADED DITCHES

FILTER FIELDS

BACK-FLOODED DAMS

Photo credit: IISD

Community and Site Systems

Urban, neighbourhood, parcel, and facility-scale solutions

Enhance stormwater management
Rain gardens, constructed wetlands, bioswales, and soil cells

Consider land-use development to enhance flood protection
Naturalized stormwater ponds and tree canopy

Build bioswales
Vegetated conveyance channels

Build bioretention cells and rain gardens
Vegetated conveyance channels

Restore riparian areas
Live staking, naturalized plantings, bioengineering, and riverbed enhancements

Enhance urban tree canopy
Maintain healthy tree canopy, expand canopy cover, and soil cells

PRIMARY BENEFITS — Flood Mitigation; Drought and Water Supply; Water Quality — SECONDARY BENEFITS

Natural Infrastructure Solutions for Community and Site Systems

Community and site-scale natural infrastructure manages runoff close to where rain falls. Although space is often limited in developed areas, integrating natural infrastructure into streets, parks, neighbourhoods, and redevelopment projects can reduce runoff, improve water quality, and complement conventional stormwater systems by reducing the volume of stormwater.

Natural Infrastructure Examples

CONSTRUCTED WETLANDS

GREEN ROOFS

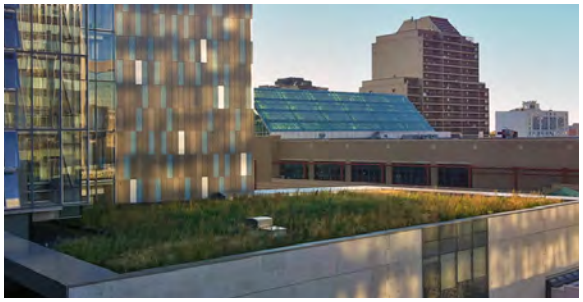


Photo credit: Mark Bauche

BIORETENTION, RAIN GARDENS

Photo credit: Mat Langford

BIOSWALE

Photo credit: IISD

SHORELINE RE-NATURALIZATION

SOIL CELL

Common Metrics

PERCENT CHANGE (%)
Shows how much a solution increased or decreased a measurable outcome such as peak flow, runoff or erosion.

RETURN ON INVESTMENT (ROI)
Compares economic benefits to dollars invested.

SOCIAL RETURN ON INVESTMENT (SROI)
Captures broader social, environmental and economic value.

COST-BENEFIT RATIO
Compares total benefits to total costs. Values greater than 1 indicate benefits exceed costs.

ECOSYSTEM SERVICE VALUE (ESV)
Estimates the value of services provided by natural systems, such as flood mitigation, water quality improvement, and wildlife habitat.

How Natural Infrastructure Effectiveness Is Measured

The following pages summarize Prairie-based evidence showing how natural infrastructure can reduce flood risk and provide additional benefits.

Evidence in this guide focuses on three questions:

FLOOD PERFORMANCE
Measures how effectively natural infrastructure:

- Reduces peak flows
- Stores water
- Increases infiltration
- Reduces erosion

ECONOMIC PERFORMANCE
Measures whether natural infrastructure can:

- Reduce flood damages
- Lower infrastructure costs
- Reduce long-term maintenance needs

CO-BENEFITS
Measures additional benefits such as:

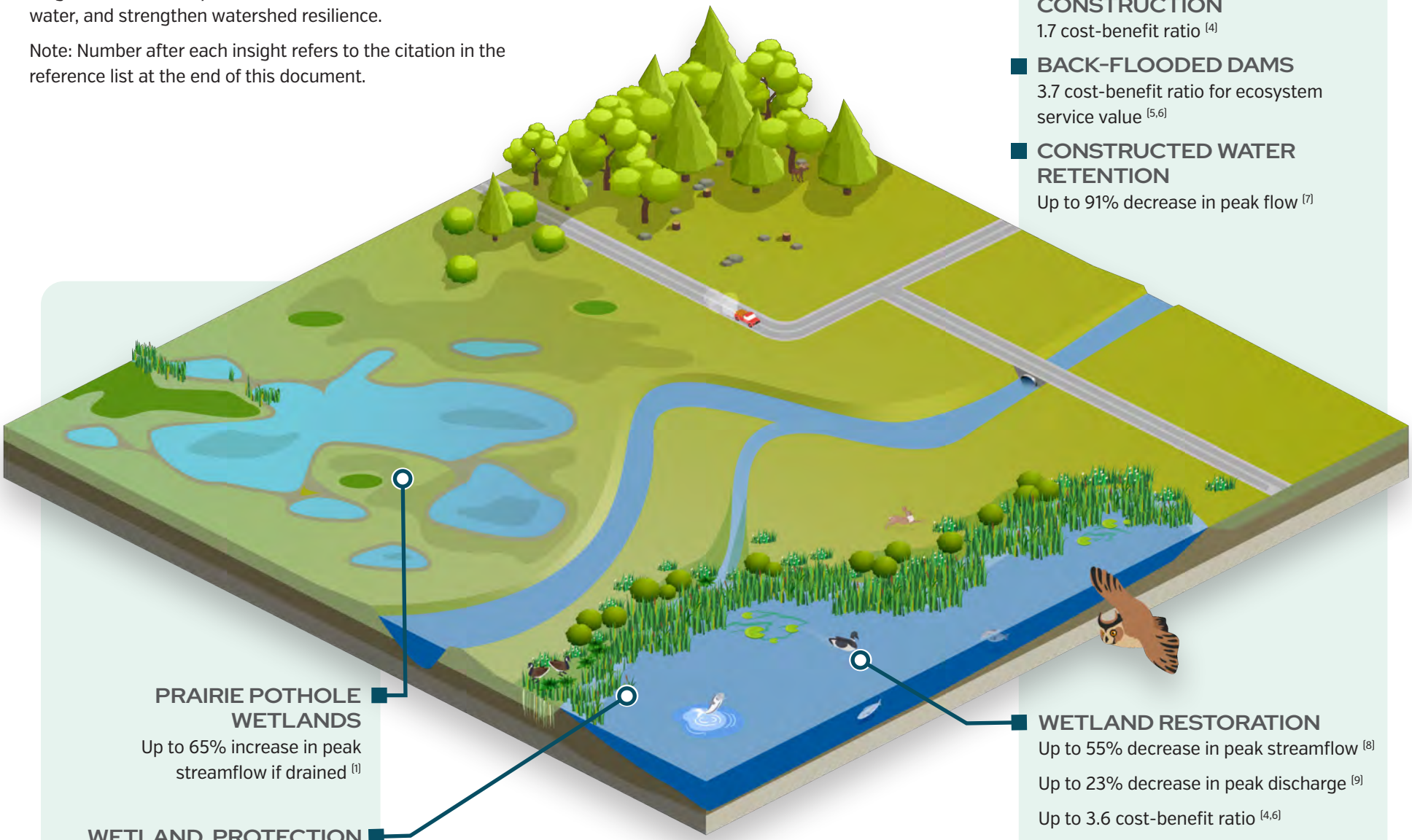
- Water quality improvement
- Drought resilience
- Habitat and biodiversity
- Recreation and community well-being

Important Note:
Results are intended to support relative comparison and understanding. Actual performance will vary depending on local conditions, design, scale, and watershed context.

Watershed-Scale Evidence

Large-scale natural systems can reduce flood risk, store water, and strengthen watershed resilience.

Note: Number after each insight refers to the citation in the reference list at the end of this document.



STORAGE WETLAND CONSTRUCTION

1.7 cost-benefit ratio [4]

BACK-FLOODED DAMS

3.7 cost-benefit ratio for ecosystem service value [5,6]

CONSTRUCTED WATER RETENTION

Up to 91% decrease in peak flow [7]

PRAIRIE POTHOLE WETLANDS

Up to 65% increase in peak streamflow if drained [1]

WETLAND PROTECTION

3.17 social return on investment for flood control over 30 years [2]

7.1 social return on investment of overall value of retaining wetlands [3]

WETLAND RESTORATION

Up to 55% decrease in peak streamflow [8]

Up to 23% decrease in peak discharge [9]

Up to 3.6 cost-benefit ratio [4,6]

CAD 17,000 /ha annual value of flood reduction and contaminant removal [4]

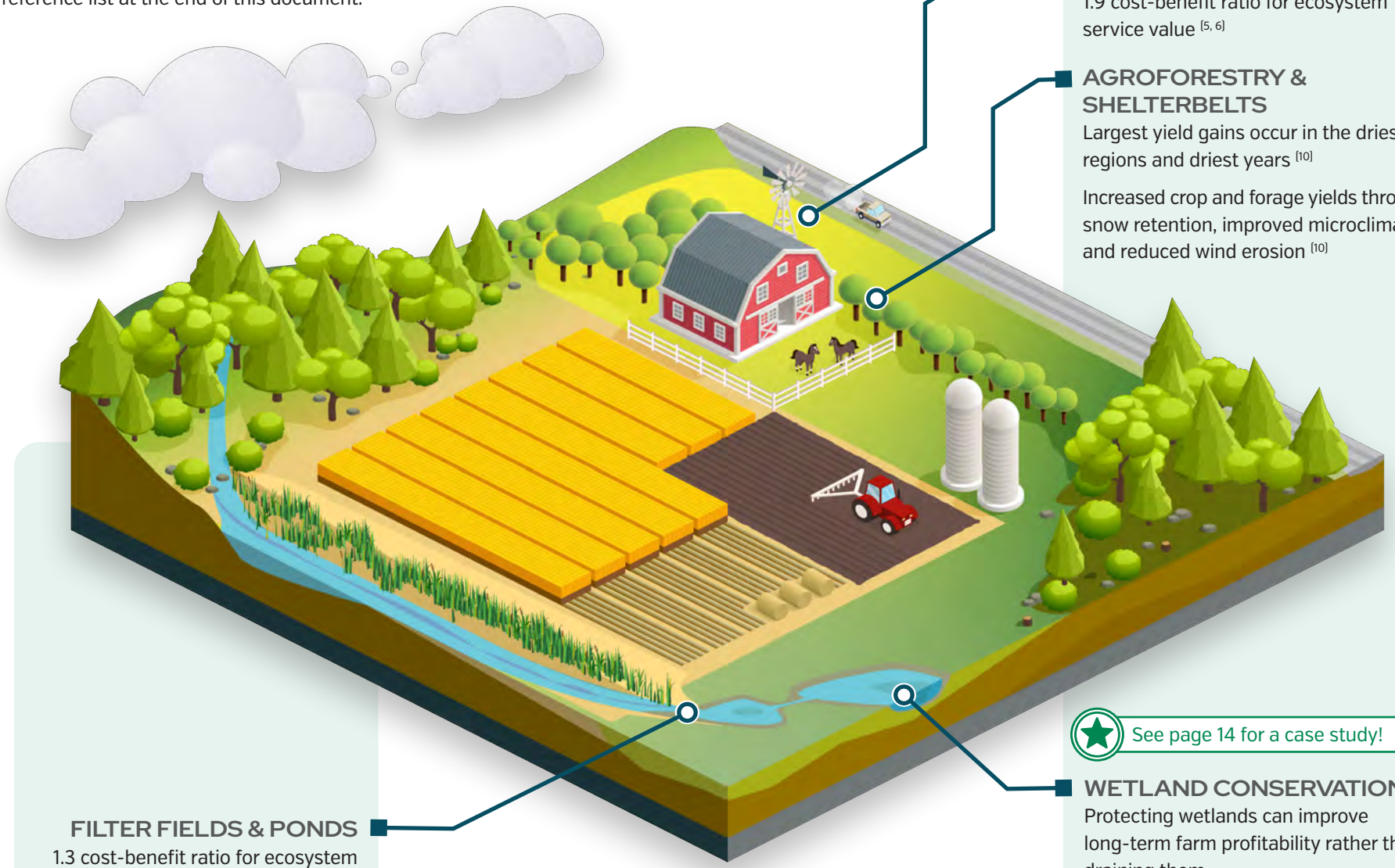
Water storage at comparable cost to dry dam, but further co-benefits [3]

Disclaimer: Values on pages 11–13 are for relative comparison since local context will affect the specific values. Dollars presented are based on what is presented in the reference and have not been converted.

Agricultural and Rural Evidence

Working landscapes can reduce runoff, improve soil moisture retention, and strengthen resilience during floods and droughts.

Note: Number after each insight refers to the citation in the reference list at the end of this document.



RE-GRADED DITCHES

1.9 cost-benefit ratio for ecosystem service value [5, 6]

AGROFORESTRY & SHELTERBELTS

Largest yield gains occur in the driest regions and driest years [10]

Increased crop and forage yields through snow retention, improved microclimate, and reduced wind erosion [10]

See page 14 for a case study!

WETLAND CONSERVATION

Protecting wetlands can improve long-term farm profitability rather than draining them

- 70% missed profitability targets [11]

FILTER FIELDS & PONDS

1.3 cost-benefit ratio for ecosystem service value [5, 6]

Community and Site Evidence

Urban natural infrastructure can reduce runoff, lower infrastructure costs, and improve community resilience.

Note: Number after each insight refers to the citation in the reference list at the end of this document.

See page 14 for a case study!

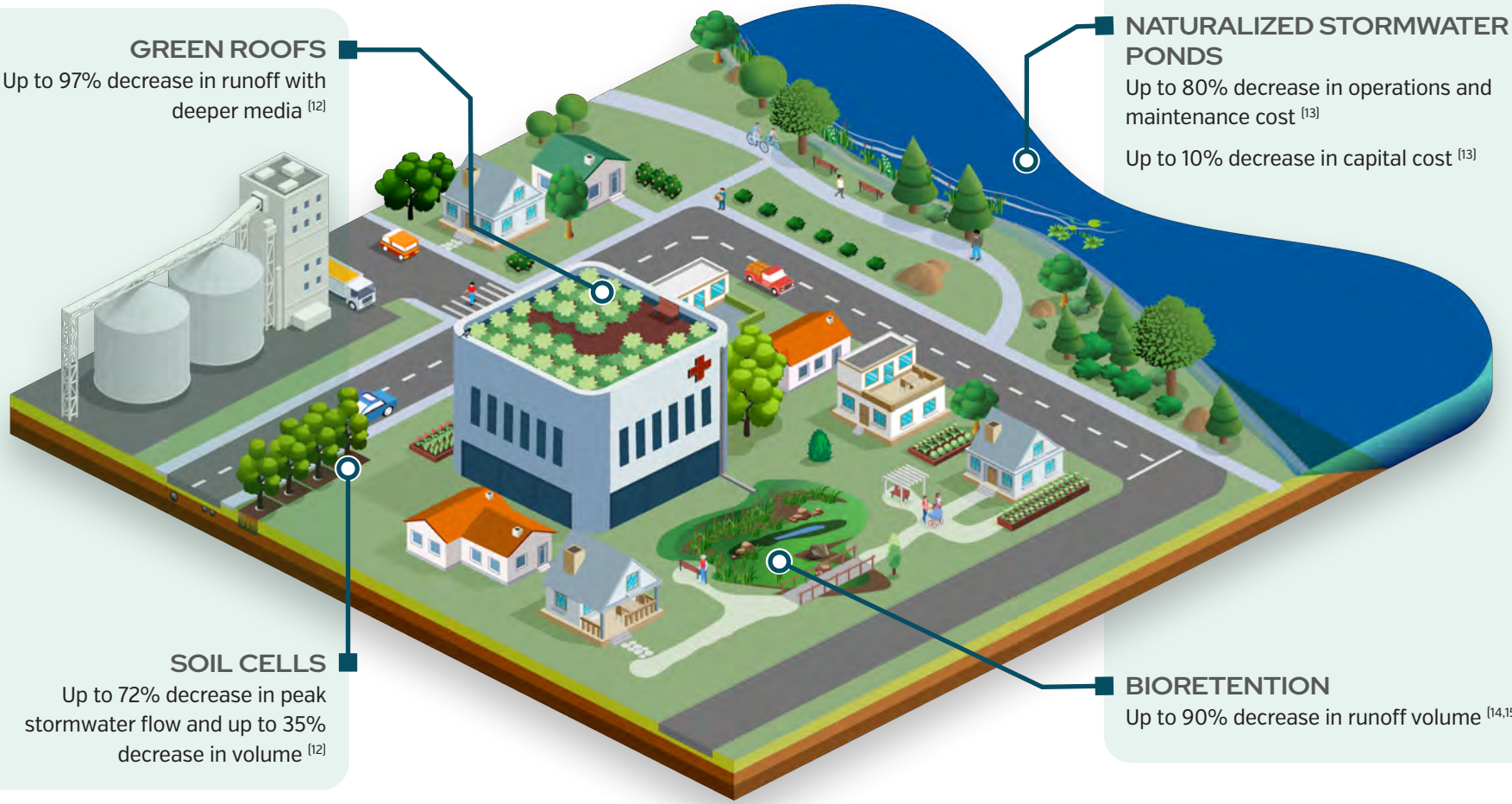
GREEN ROOFS

Up to 97% decrease in runoff with deeper media [12]

NATURALIZED STORMWATER PONDS

Up to 80% decrease in operations and maintenance cost [13]

Up to 10% decrease in capital cost [13]



SOIL CELLS

Up to 72% decrease in peak stormwater flow and up to 35% decrease in volume [12]

BIORETENTION

Up to 90% decrease in runoff volume [14,15]

PRAIRIE CASE STUDIES

Communities across the Canadian Prairies are already using natural infrastructure to reduce flood risk, improve watershed function, and lower long-term costs.

Naturalized Stormwater Ponds Preferred Over Conventional Stormwater Ponds

CITY OF WINNIPEG, MB

The City of Winnipeg has increasingly turned to naturalized stormwater ponds as a cost-effective alternative to conventional options. In 2000, Winnipeg operated roughly 100 conventional ponds; today, the city has more than 200 stormwater facilities, with nearly all new systems required to be built as naturalized ponds. While initial capital costs are slightly lower for naturalized ponds (CAD 1.38M per basin versus CAD 1.54M), the largest savings come from operations and maintenance. Over 20 years, naturalized ponds cost about CAD 178,000 per basin to maintain, compared to CAD 852,000 for conventional ponds, resulting in approximately CAD 67.4 million in savings across 100 basins. Naturalized ponds are currently the City standard for new developments.

Photo Credit: Bryana Nicolas

Wetland Restoration to Avoid the Ongoing Cost of Road Repair and Replacement

PARKLAND COUNTY, AB

Investing in wetland restoration can reduce the cost of road repair and replacement. The project demonstrated that restoring these ecosystems could significantly reduce water flow and prevent road washouts, offering a long-term alternative to traditional grey infrastructure at a comparable or lower cost. For example, adding wetlands reduced water flow by 13%–55% –similar to the cost of repairing a washed-out road but with added ecological benefits. The estimated cost of restoring wetlands for three sites in the county ranged from CAD 150,000 to CAD 260,000 per site, which is the same as reconstructing and repairing roads. However, in the long term, wetland restoration can prevent further flood damage to roads and the need for multiple repairs.

PRAIRIE CASE STUDY

Service Value of Natural Assets

CITY OF CALGARY, AB

UP TO CAD **2.5**

billion per year

In ecosystem services provided by City-owned natural infrastructure, including:

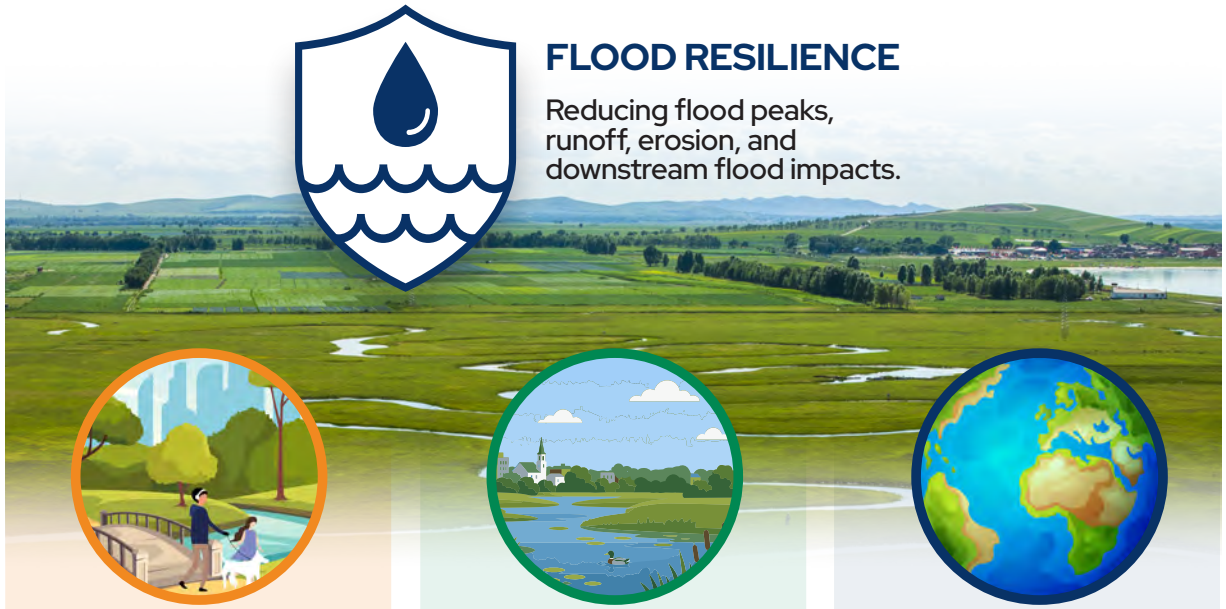
- WATER RETENTION
- RECREATION
- URBAN HEAT REDUCTION
- CARBON STORAGE (CO_2)
- AMENITY VALUE

Interested in learning more about the benefits of natural infrastructure?
Visit the City of Calgary's Climate and Environment Dashboard

Visit the NIWS website for more resources: https://www.iisd.org/niws

Natural Infrastructure Delivers Benefits for People, Nature, and Climate

While this guide focuses on flood risk reduction, natural infrastructure investments often deliver multiple benefits at the same time–creating value for communities, rehabilitating ecosystems, and providing long-term climate resilience.



FLOOD RESILIENCE

Reducing flood peaks, runoff, erosion, and downstream flood impacts.

NATURE FOR PEOPLE

- Recreation and well-being
- Urban cooling and shade
- Community spaces and livability
- Property and amenity value

NATURE FOR NATURE

- Habitat and biodiversity
- Ecosystem health
- Water quality improvement
- Pollinator and wildlife support

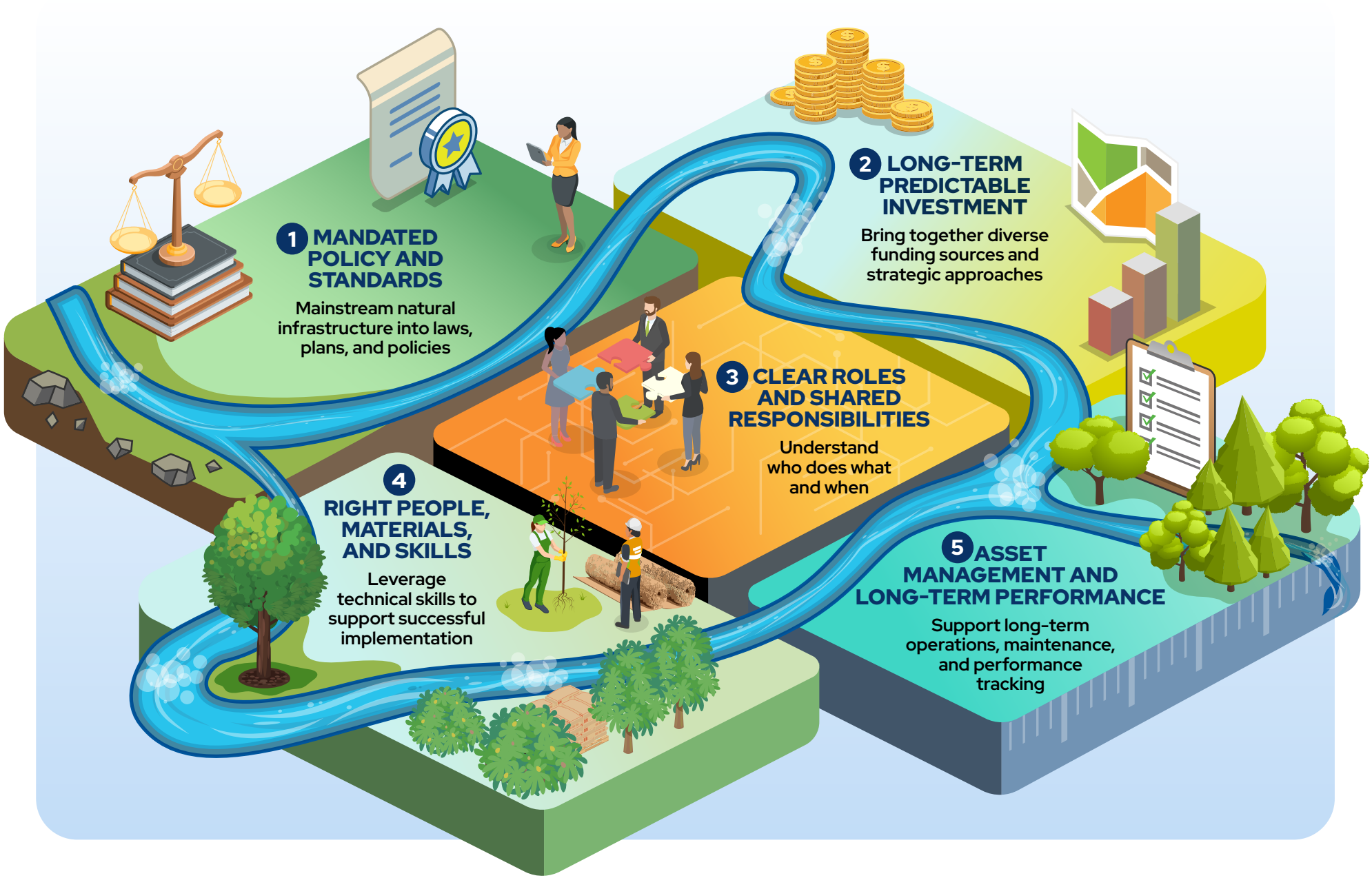
NATURE FOR CLIMATE

- Carbon storage
- Drought resilience
- Groundwater recharge
- Adaptation to changing climate conditions

Natural infrastructure investments are often pursued to reduce flood risk, but their greatest value comes from delivering benefits for people, nature, and climate at the same time.

Five Action Areas to Scale Natural Infrastructure

Scaling natural infrastructure requires action across five interconnected areas. Progress can begin anywhere, but long-term success depends on advancing all five together. The following pages describe each action area, recommend a priority action to pursue to support implementation, and share case studies for inspiration.



1. Mandated Policy and Standards

Outcome: Natural infrastructure is no longer optional –it is a standard part of planning, development, and infrastructure delivery.

KEY AUDIENCES

Indigenous and local governments, municipal associations, conservation organizations and land trusts.

Governments

Watershed Partners

Collaborative Networks

WHY THIS MATTERS

Natural infrastructure becomes standard practice when expectations are clear, mandatory, and consistently applied.

Without policy certainty, implementation depends on individual champions rather than established practice.

PRIORITY ACTION

Embed natural infrastructure requirements into policies, standards, and approval processes so they become standard practice.

- Adopt existing, credible natural infrastructure standards and tools rather than creating new ones.
- Integrate natural infrastructure requirements into official plans, land-use bylaws, development and subdivision standards, and permitting processes.
- Make compliance with natural infrastructure requirements a condition of approval.
- Apply requirements consistently across projects and proponents.

ADDITIONAL OPPORTUNITIES

Strengthen provincial policies supporting wetland protection and restoration to preserve natural flood storage.

Require public reporting of natural infrastructure performance and value into financial and asset management frameworks.

Key Resources: CSA W218:23 Natural Asset Inventories; Standards Council of Canada Nature-Based Solutions initiatives; emerging CSA standards supporting natural asset management and natural infrastructure implementation.

Okotoks, AB

CANADIAN EXAMPLE

Using Existing Standards to Mainstream Natural Infrastructure

Standards and guidance for natural infrastructure already exist in Canada, reducing the need for communities to create new approaches from scratch. National standards and guidance provide practical direction for inventorying, valuing, and integrating natural infrastructure into decision making. While voluntary, these standards can be embedded into local policies, plans, and approval processes to make natural infrastructure standard practice.

PRAIRIE PROGRESS

Communities across the Prairies are already building on this foundation. Municipalities including **Calgary, Edmonton, Saskatoon, Okotoks, Canora,** and **Brandon** have completed natural asset inventories, valuations, or related natural infrastructure initiatives. These efforts demonstrate growing momentum toward integrating natural infrastructure into municipal decision making.

2. Long-Term, Predictable Investment

Outcome: Natural infrastructure is routinely planned, protected, built, and maintained because funding is stable, accessible, and aligned with long term performance.

KEY AUDIENCES

Governments & infrastructure owners, private sector & investment partners, conservation organizations and land trusts, and municipal associations.

- Governments and Asset Owners
- Private Sector and Investors
- Watershed and Conservation Partners

WHY THIS MATTERS

Short-term funding cannot support long-term infrastructure performance. Natural infrastructure requires sustained investment for protection, implementation, monitoring, and maintenance.

PRIORITY ACTION

Establish long-term investment approaches that fund natural infrastructure as an essential component of flood resilience.

- Inventory existing natural infrastructure assets and identify the flood mitigation and other services they provide.
- Identify priorities for protection, restoration, enhancement, and new implementation across the watershed.
- Estimate lifecycle funding needs, including planning, construction, operations, maintenance, and monitoring.
- Align funding approaches with the flood reduction and broader services that natural infrastructure delivers.
- Establish stable, long-term funding mechanisms by embedding natural infrastructure into policies and asset management systems.

ADDITIONAL OPPORTUNITIES

- Collaborate with the private sector (e.g., insurers, developers) to explore alternative investment sources.
- Advocate for dedicated funding programs for natural infrastructure implementation across watershed, agriculture, community and site scales.
- Develop tools to communicate flood mitigation benefits, such as peak flow reduction, storage capacity, avoided damages and broader co-benefits.

Bioretention Garden, Edmonton, AB

Photo credit: EPCOR Water Services

PRAIRIE EXAMPLE

Utility Collaborations With the Private Sector (Edmonton, AB)

The City of Edmonton's flood mitigation plan was originally priced by staff at a cost of up to CAD 4.7 billion, with a delivery timeline of up to a century. Upon engaging the expertise and capacity of its City-owned utility, EPCOR, the approach was revisited to use more natural infrastructure and to manage risk more strategically. The price was reduced to CAD 1.6 billion (66% reduction) over 20 years and is detailed in EPCOR's Stormwater Integrated Resource Plan. EPCOR approaches the projects within the plan through their utility financing model, leveraging cost spread over a longer time period through incremental utility charge increases.

3. Clear Roles and Shared Responsibility

Outcome: Natural infrastructure is planned and delivered in a way that can be upscaled through coordinated action at the local government and watershed levels.

KEY AUDIENCES

Indigenous and local governments, municipal associations, conservation organizations and land trusts.

Governments | Watershed Partners | Collaborative Networks

WHY THIS MATTERS

Watersheds cross jurisdictional boundaries, but governance often does not. Clarifying roles and strengthening partnerships helps avoid fragmented investments and missed opportunities.

PRIORITY ACTION

Strengthen local leadership and watershed-scale collaboration to coordinate flood resilience efforts through natural infrastructure.

- Establish a formal mandate describing how departments and partner organizations, including developers, will work together.
- Secure dedicated resources to support ongoing watershed coordination activities, in addition to project implementation costs.
- Clearly define and communicate roles and responsibilities among organizations, interested parties, and community members involved in natural infrastructure implementation.

ADDITIONAL OPPORTUNITIES

- Develop shared watershed priorities with upstream and downstream partners to maximize drought-resilience benefits.
- Create opportunities to collaborate with the private sector, landowners, and communities.

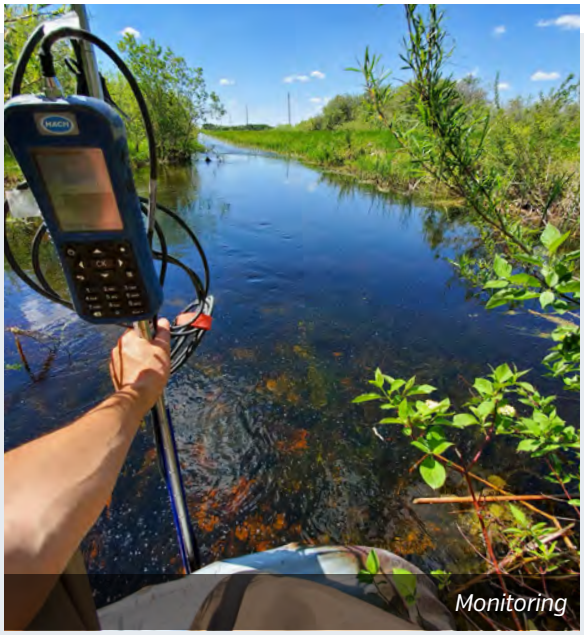


Photo Credit: IISD

Monitoring

PRAIRIE EXAMPLE

Collaborative Watershed Management Through Distributed Water Retention

South Tobacco Creek Watershed, MB: Municipalities, landowners, watershed organizations, governments, and researchers have collaborated for decades to implement distributed water retention projects and beneficial management practices across the watershed. Clear roles, shared funding, and ongoing coordination enabled natural infrastructure solutions to be implemented at a watershed scale.

Monitoring and modelling have shown these retention measures can reduce downstream peak flows by an estimated 13%–25%, demonstrating how collaborative watershed governance can successfully scale natural infrastructure while supporting both flood resilience and agricultural sustainability.

4. Right People, Materials, and Skills

Outcome: Natural infrastructure will be protected, restored, designed, built, and maintained successfully because the right local knowledge, expertise, materials, and systems are in place.

KEY AUDIENCES

Practitioners, contractors, Indigenous Knowledge Holders & First Nations, professional associations, educational institutions, watershed organizations, supply chain partners.

Practitioners and Contractors

Education and Training Partners

Indigenous Knowledge Holders & Land Stewards

WHY THIS MATTERS

Natural infrastructure depends on living systems that require specialized knowledge and resources.

Building workforce capacity and supply chains enables projects to be delivered successfully at scale.

PRIORITY ACTION

Build the workforce capacity, technical knowledge, and supply chains needed to successfully deliver natural infrastructure for flood resilience.

- Develop and deliver role-specific training for practitioners, contractors, and operators on funding opportunities, design practices, maintenance requirements, and compliance obligations.
- Enable the supply chain by coordinating procurement, supporting bulk purchasing opportunities, and aligning implementation schedules with growing seasons.
- Understand local site conditions (e.g., soil type, moisture) to make sure the appropriate natural infrastructure solutions are selected.

ADDITIONAL OPPORTUNITIES

- Encourage peer-to-peer learning across jurisdictions to share experiences and lessons learned.
- Partner with post-secondary institutions and local Indigenous Nations to develop experiential learning opportunities.
- Learn from Indigenous Knowledge Holders about local flood patterns, water movement, and land stewardship in flood-prone areas.
- Work with local nurseries and greenhouses to source flood-tolerant plant species suited to local hydrology and flood conditions.

Site Restoration

CANADIAN EXAMPLE

Native Seed Producers of Canada (NSPC)

By uniting skilled producers, NSPC supports the availability of high-quality, regionally appropriate seed–one of the most critical inputs for natural infrastructure success. Through collaboration across farms, conservation organizations, and restoration practitioners, NSPC strengthens both the human capacity and material supply needed to deliver effective, resilient natural infrastructure projects across Canada. NSPC also provides publicly available resources to share knowledge and promote collaboration. Building a strong network of skilled growers and high-quality native seed supply is essential for successful natural infrastructure implementation.

5. Asset Management and Long-Term Performance

Outcome: Natural infrastructure will be managed (protected, maintained) as an integral part of asset management systems.

KEY AUDIENCES

Includes Indigenous, local, provincial, and federal governments, utilities and infrastructure owners, watershed groups managing natural assets.

- Governments
- Infrastructure Owners and Utilities
- Watershed Groups

WHY THIS MATTERS

Infrastructure delivers value only when it is actively managed.
Treating natural infrastructure as an asset helps secure long-term funding, maintenance, and public confidence.

PRIORITY ACTION

Manage natural infrastructure as essential infrastructure through asset management systems and ongoing stewardship.

- Include natural infrastructure in asset inventories.
- Report on condition, service level, and value through state of infrastructure or asset management reporting structures.
- Incorporate natural infrastructure into life-cycle and capital decisions.
- Establish ongoing maintenance and monitoring requirements to sustain performance, including water storage and supply functions where appropriate.

ADDITIONAL OPPORTUNITIES

- Assign ownership and clarify responsibilities for inspections, maintenance, and issue reporting, especially after flooding events.
- Establish dedicated operations and maintenance budgets for flood resilience features, including sediment removal, vegetation management and erosion repair.
- Monitor performance and support adaptive management through clear service-level metrics.
- Plan for vegetation establishment periods and recognize that natural infrastructure performance increases over time.

Key Resources: https:/naturalassetsinitiative.ca and CSA W218:23 Standard

Photo by Josh Alex on Unsplash

CANADIAN EXAMPLE

Integrating Natural Infrastructure Into Asset Management

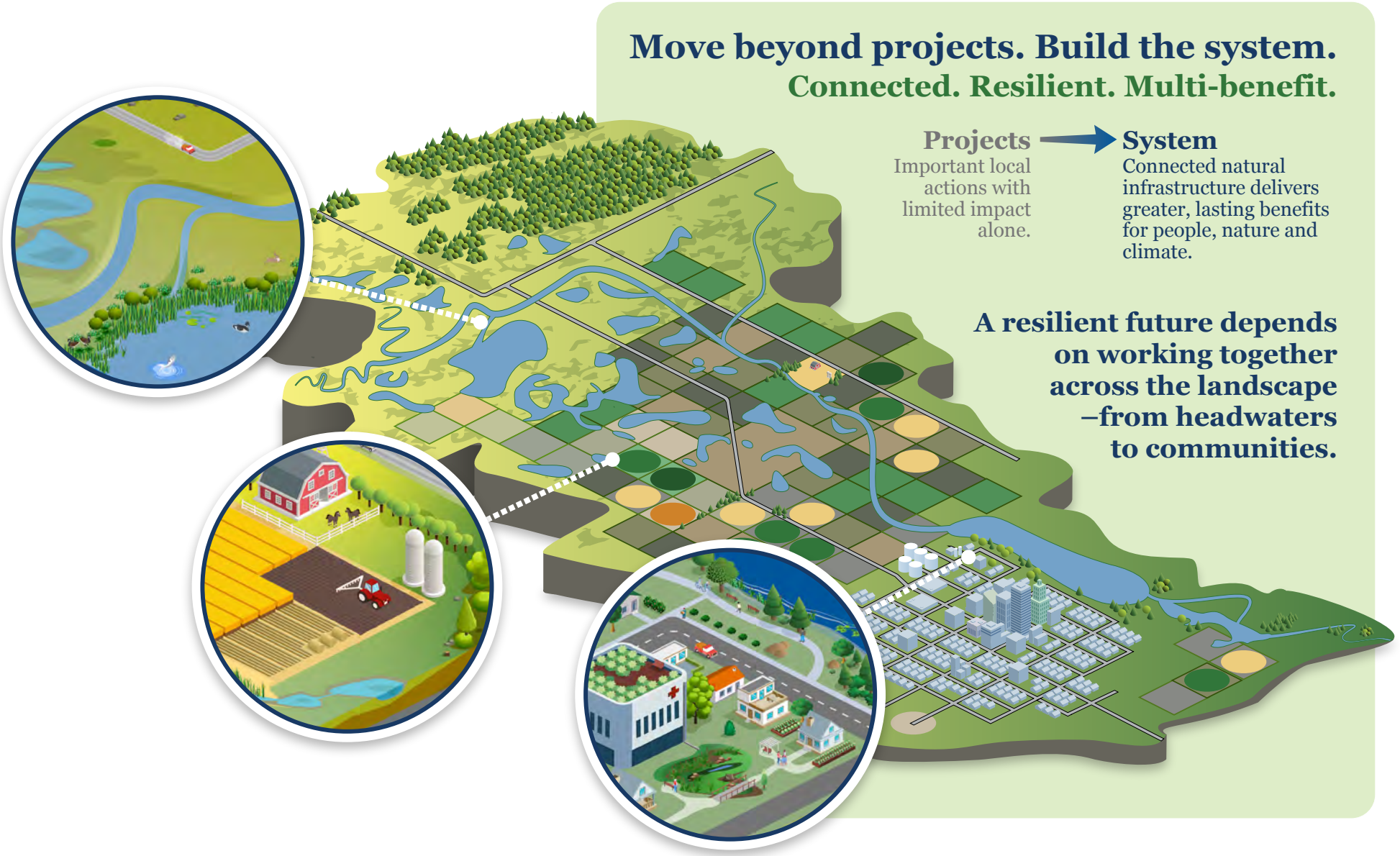
The City of Markham, ON, integrated natural assets into its municipal asset management system, including the 2025 Asset Management Plan. Recognizing that natural assets provide critical services comparable to engineered infrastructure, Markham completed a Natural Assets Inventory and Evaluation Study to formally embed these resources into asset management planning. The estimated replacement value of these natural assets is just under CAD 170 million, while ecosystem service benefits total approximately CAD 62 million per year from City-owned assets and up to CAD 120 million annually across all ownerships.

PRAIRIE PROGRESS

While many Prairie municipalities are progressing from natural asset inventories and valuation toward formal asset management integration, the City of Saskatoon is among the leading regional examples advancing natural asset management frameworks and pilot management plans.

Scaling Natural Infrastructure: From projects to a resilient system

Integrate nature in how we plan, fund, deliver, and manage infrastructure at the scale our communities and watersheds need.



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