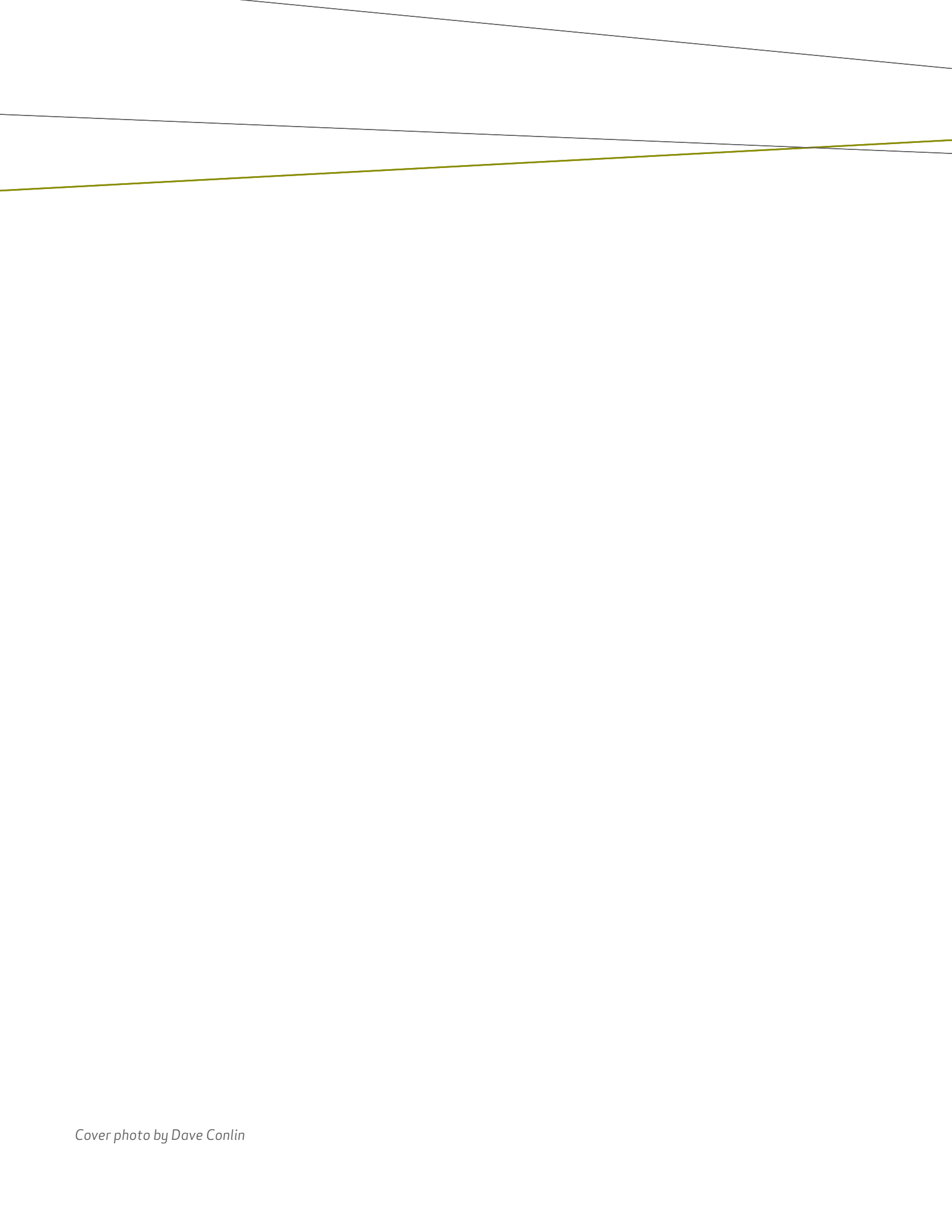


CITY OF EDMONTON WETLAND STRATEGY

2012





Cover photo by Dave Conlin

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EXECUTIVE SUMMARY

Edmonton's wetlands form a fascinating part of our landscape, providing essential ecosystem services for Edmontonians like water purification, erosion control and flood management, while supporting a huge range of biodiversity. Although they are critical to our quality of life and the health of the city's ecological network, natural wetlands face ongoing threats primarily due to urban development and the expansion of the city. The City of Edmonton has responded to these stressors with a suite of strategies and tools designed to secure and manage Edmonton's remaining natural wetlands, and engage the public and other partners in their conservation.

Constructed wetlands, which mimic natural wetlands and provide both ecological and drainage benefits, are becoming increasingly common around Edmonton. The City has developed an array of strategic commitments and tools to guide the integration of these sites into Edmonton's urban and ecological fabric.

To date, the strategies and tools pertaining to Edmonton's natural and constructed wetlands have been integrated into a wide range of plans, policies, programs and initiatives across the City of Edmonton. This *Wetland Strategy* has united all of these individual efforts to conserve

wetlands into a single document, in order to strengthen and coordinate the City's wetland conservation approach, raise the profile of the City's work in this area, and help to identify areas for improvement in current wetland conservation efforts.

The strategy has two main sections. The first section, Strategic Commitments, describes the overarching commitments that guide the City's wetland conservation practices. These commitments are drawn from five high-level policies and plans, approved by Edmonton City Council, with the City's Strategic Plan *The Way Ahead* as foundation. The second section, the Implementation Toolbox, contains a description of the tools that are used by the City to conserve Edmonton's wetlands, driven by its strategic commitments. Both of the sections are organized according to the three main goals of the *Wetland Strategy*:

1. **Secure** Edmonton's wetlands as part of the city's ecological network.
2. **Manage** Edmonton's wetlands to maximize their ecological function.
3. **Engage** Edmontonians to support wetland conservation.

1.0 INTRODUCTION TO EDMONTON'S WETLANDS

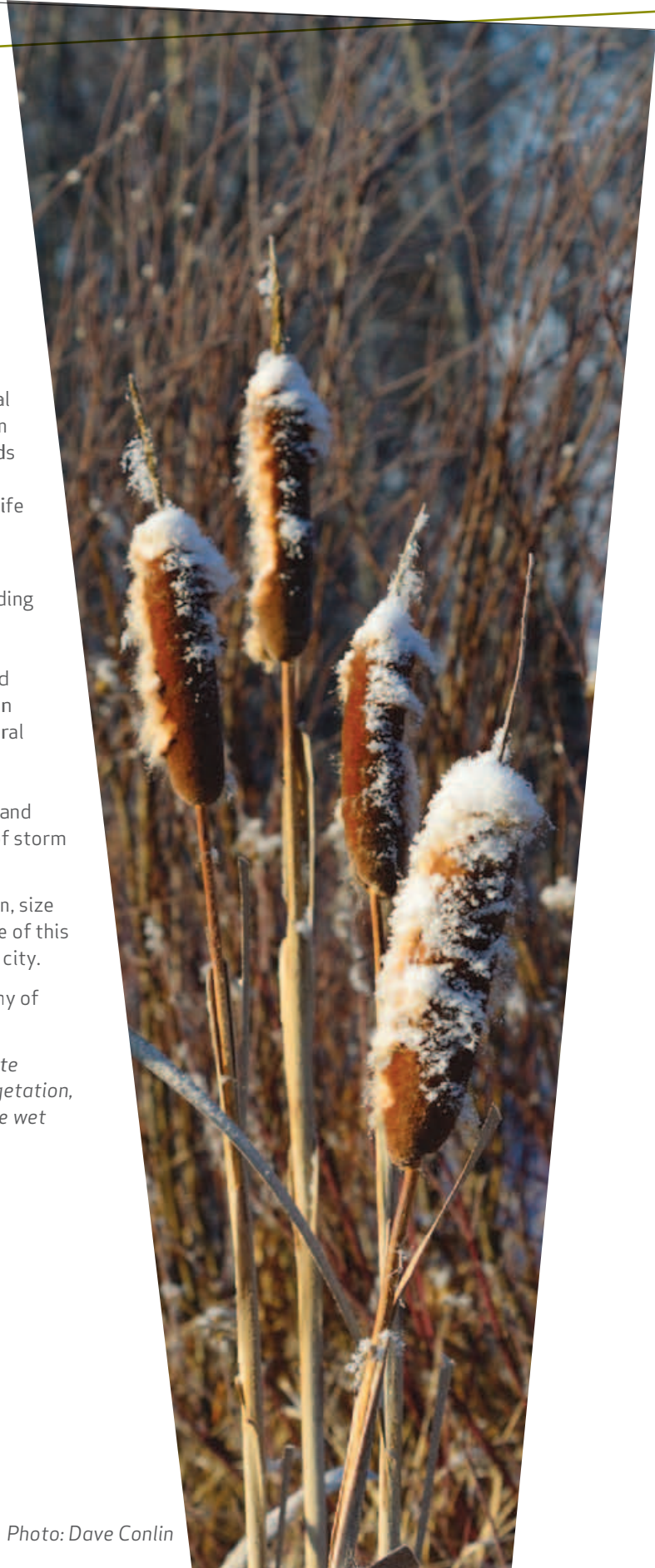
Wetlands form an important but often overlooked part of Edmonton's landscape. Dotted across the city, these vibrant natural areas are Edmonton's biodiversity hotspots, serving as refuge to an enormous array of plants, birds, insects and other animals. Wetlands provide Edmontonians with a multitude of ecosystem services, which save us money and contribute significantly to our quality of life through means as diverse as flood protection, climate moderation, and recreational enjoyment.

A variety of wetland types are present in the Edmonton area, including temporary depressions that hold water for as little as one to two weeks in the spring, semi-permanent wetlands, small shallow lakes and sloughs, bogs, fens and several large lakes. Wetlands may stand alone, or they may exist in conjunction with other natural vegetation like woodlands, shrublands and native grasslands. Sometimes several wetlands are connected to one another through drainage courses, forming wetland complexes. Adding to this variety are the City of Edmonton's ("the City's") growing number of constructed wetlands and stormwater influenced wetlands, which provide the dual benefits of storm water management and habitat creation.

Given the diversity of Edmonton's wetlands in terms of composition, size and seasonality, two definitions have been adopted for the purpose of this strategy that together describe the range of wetlands found in the city.

First, the following provincial definition of "wetland" describes many of Edmonton's natural wetlands:

"A wetland is land saturated with water long enough to promote formation of water altered soils, growth of water tolerant vegetation, and various kinds of biological activity that are adapted to the wet environment." (Alberta Environment, 2007)



While this definition describes many of the city's natural wetlands, most of Edmonton's temporary and ephemeral wetlands are not adequately included in this definition. Thus, for the purpose of this strategy, the following definition of "ephemeral wetland" is also used to describe Edmonton's wetlands:

"An area that is periodically covered by standing or slow moving water and that has a basin typically dominated by vegetation of the low prairie zone, similar to the surrounding lands. Because of the porous conditions of the soils, the rate of water seepage from these areas is very rapid, and surface water may only be retained for a brief period in early spring." (Alberta Water Council, 2007).

These two definitions are used throughout this report when referring to natural wetlands in Edmonton.

Wetland classification provides a further layer of detail in describing Edmonton's wetlands. In Alberta's White Zone or developed area (including Edmonton), natural wetlands are commonly classified as one of seven types, using the Stewart and Kantrud (1971) classification system (Table 1.1):

Table 1.1: Common classification of natural wetlands (Stewart and Kantrud).

| Class | Description | Defining Vegetation |
|-------|--|---------------------|
| I | Ephemeral ponds (Briefly in early spring) | Wetland Low Prairie |
| II | Temporary ponds (Few weeks after spring snowmelt) | Wet Meadow |
| III | Seasonal Ponds and Lakes (Usually dry by late summer/fall) | Shallow Marsh |
| IV | Semi-permanent Ponds and Lakes (Frequently wet into fall and winter) | Deep Marsh |
| V | Permanent Ponds and Lakes (Wet year-round) | Open Water |
| VI | Alkali Ponds and Lakes (High pH and salt concentration) | Salt-tolerant |
| VII | Fen Ponds (Saturated soils, alkaline) | Fen vegetation |

Edmonton's *Wetland Strategy* applies to all classes of natural wetlands within the city boundary. Also included in the strategy are the City's constructed and stormwater influenced wetlands:

Constructed wetlands are human-made systems, designed, constructed and operated to emulate natural wetlands or many of their biological processes. (Drainage Design Standards, 2009). They are distinct from the City's wet and dry stormwater ponds due to their abundance of natural vegetation and other design features like size, depth and bank slopes.


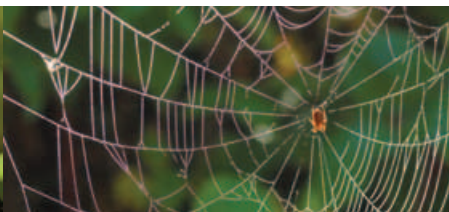

Stormwater Influenced Wetlands are natural wetlands that have been integrated into a stormwater management system (i.e. receives some or all of its water from the purposeful redirection of stormwater runoff) without significant physical disturbance to the wetland (Spencer Environmental, 2010a).

1.1 THE CRITICAL FUNCTIONS OF URBAN WETLANDS

Edmonton's wetlands and other natural areas provide invaluable benefits, most of which are not considered in conventional accounting. These benefits, or "ecosystem services," are described in Table 1.2: (adapted from World Resources Institute, 2005)*

Table 1.2: Ecosystem services provided by urban natural areas.

Photos: Dave Conlin

| | | |
|--|--|---|
|  |  |  |
| <p>Regulating services, or the range of vital functions carried out by ecosystems which are rarely given a monetary value in conventional markets. These include regulation of climate through the storing of carbon and control of local rainfall, and the removal of pollutants by filtering the air and water.</p> | <p>Supporting services are essential to the functioning of ecosystems and therefore indirectly responsible for all other services. Examples are the formation of soils and the processes of plant growth.</p> | <p>Cultural services contribute to the wider needs and desires of society, and therefore to people's willingness to pay for conservation. They include the spiritual, recreational or aesthetic value attached to particular ecosystems.</p> |

*Provisioning services, including the production of foods, fibres, and medicine, are generally cited as a fourth ecosystem service of natural areas. Because provisioning is not a common service provided by urban wetlands, it is not included in this discussion.

Sustaining Edmonton's wetlands means that their associated ecosystem services are available to us for free. In some cases, preserving these areas in the urban landscape can reduce the need to invest in expensive built infrastructure. For example, wetlands intercept rainfall and filter pollutants out of water, making us less dependent on stormwater and water treatment infrastructure. Wetland vegetation and other plants remove carbon dioxide from the air, reducing the harmful impacts of emissions on climate change. Wetlands also play an important role in soil stabilization and flood protection, at great benefit to the surrounding landscape. When wetlands are protected, so are these important intricate processes that they support.

Wetlands also contribute in important ways to Edmontonians' quality of life. Natural and constructed wetlands are increasingly valued for aesthetic reasons. New neighbourhoods frequently feature a constructed

or natural wetland as a gathering area or focal point, and homes with wetland views or frontage often enjoy increased property values. Urban wetlands can also be a source of recreational or spiritual enjoyment, and provide important opportunities for education and research.

Table 1.3 summarizes the many ecosystem services provided by Edmonton's wetlands, and the ways that these services benefit Edmontonians (Adapted from the World Resources Institute, 2005). The wetland services are categorized either as functions (services that a wetland naturally provides) or values (services that are of particular value to humans).

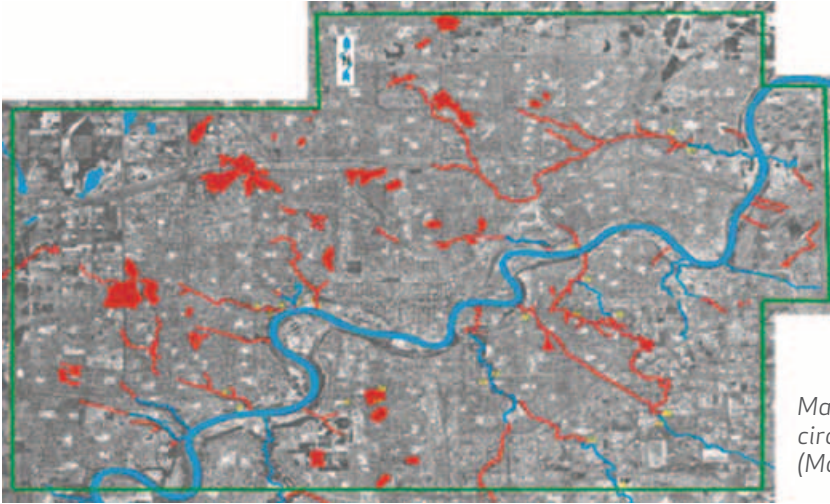
Table 1.3: Wetland ecosystem services and their associated benefits

| | Wetland Services | Regulating Service | Supporting Service | Cultural Service | Benefits to Edmontonians |
|------------------|--|--------------------|--------------------|------------------|---|
| Wetland Function | Fresh water | x | | | Storage and retention of water |
| | Climate regulation | x | | | Source of and sink for greenhouse gases; moderation of local and regional temperature and precipitation |
| | Water regulation (hydrological flows) | x | | | Groundwater recharge and recovery |
| | Water purification and waste treatment | x | | | Retention, recovery and removal of excess nutrients and other pollutants |
| | Erosion regulation | x | | | Retention of soils and sediments |
| | Natural hazard regulation | x | | | Flood control, storm protection |
| | Habitat for pollinators | x | | | Pollination of local plants and crops |
| | Soil formation | | x | | Sediment retention and accumulation of organic matter |
| | Nutrient cycling | | x | | Storage, recycling, processing, and acquisition of nutrients |
| Wetland Value | Spiritual and recreational | | | x | Opportunities for relaxation and enjoyment |
| | Aesthetic | | | x | Improved property values, community focal point |
| | Educational and research | | | x | Opportunities for teaching and learning |

Quite aside from the well-being of humans, sustaining wetlands also means protecting the many species that depend on them for survival, and ensuring the persistence of Edmonton's ecosystems for their inherent value and their intrinsic right to exist. Edmonton's wetlands support local, regional and even global biodiversity. In addition to a myriad of plants and invertebrates, the city's wetlands also provide habitat to birds and wildlife as diverse as raptors, foxes, boreal chorus frogs, and moose. The conservation and creation of wetland habitat is the best way to protect this important local biodiversity.

1.2 EDMONTON'S DISAPPEARING NATURAL WETLANDS

The soil, hydrological and topographic features of the Edmonton landscape mean that it is a prime area for wetlands. While historically wetlands would have been a common habitat across the Edmonton region, the majority of these sites have now been removed or significantly degraded through agriculture and increasing urbanization. Map 1.1 illustrates the general distribution of water bodies across central Edmonton in 1924, and uses red to denote those lost as of 2001 (Martell and Dammeyer, 2001).



Map 1.1: Historical waterbodies in Edmonton, circa 1924. Red denotes lost water bodies (Martell and Dammeyer, 2001).

The City began conducting inventories of its natural areas in 1988, and studies have become increasingly frequent and detailed in more recent years. Efforts are currently underway to identify the exact number, class and location of Edmonton's remaining natural wetlands (see Appendix A). This remains a challenging exercise, however, due to the temporary nature of many of the city's wetlands and the fact that it is common for a single wetland to be part of a larger natural area complex, making individual sites difficult to distinguish through aerial photography or satellite imagery.

Map 1.2 shows the location of Edmonton's known remaining natural wetlands and constructed wetlands. The map illustrates that the majority of the natural wetlands are clustered in the far northeast and southeast reaches of the city, as well as along Edmonton's western boundary. Many of these peripheral areas are currently undergoing development or slated for future development. Constructed wetlands are most often found in new neighbourhoods near the city's periphery, with more expected to be created as residential development continues.

Two primary pressures have contributed to the decline of Edmonton's natural wetlands over time:

a) Habitat Destruction and Fragmentation

The largest threat facing Edmonton's natural wetlands is the destruction of these habitats due to urban development. While subsequent sections describe the policies and tools used by the City of Edmonton to preserve

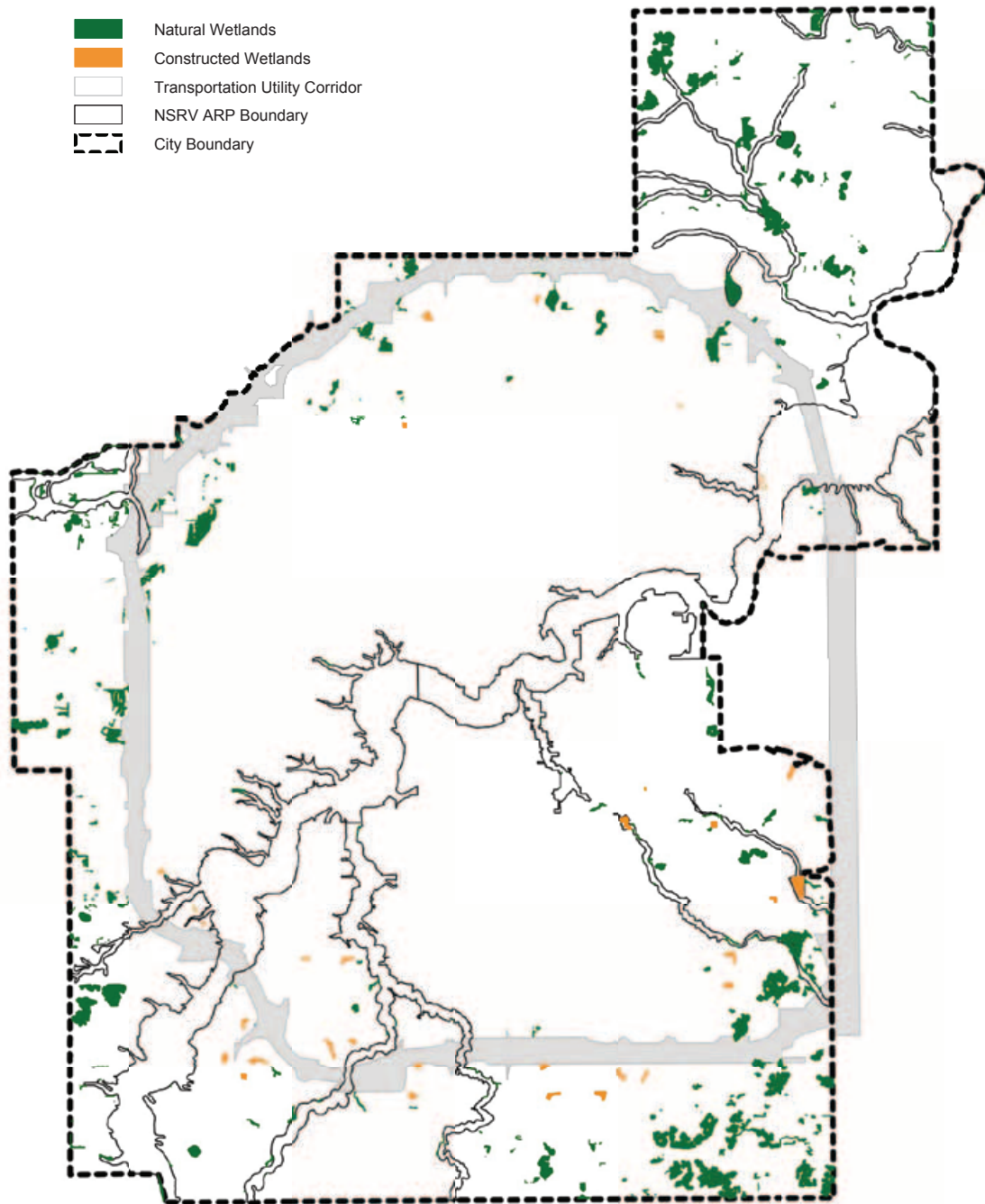
wetlands during land use planning and development, there remain limitations in the City's ability to protect all wetlands, as evidenced by their rapid rate of decline to date. Even when wetland compensation occurs at another site, the loss of these natural areas and the many services that they provide is irrevocable.

Edmonton's temporary and ephemeral wetlands are particularly vulnerable to habitat destruction because they may be visibly wet only for a short period of time during the spring, and then appear as dry depressions for the rest of the year. While this annual wet-dry cycling is an important part of their natural ecology, these wetlands are especially susceptible to conversion during dry periods.

Related to habitat destruction, habitat fragmentation occurs when isolated patches of wetlands and other natural areas suffer ecological decline because they are not spatially linked with other habitats. Edmonton's Ecological Network Approach, introduced later in this section, aims to address the issue of habitat fragmentation by conserving Edmonton's natural areas as part of a single, integrated system.

b) Habitat Degradation

Even when a natural wetland is protected from development, the quality of its habitat can be considerably reduced due to impacts like pollution, erosion and sedimentation, encroachment of activities on adjacent lands, disturbances from domestic animals, and inappropriate recreational use. Moreover, neighbouring residential or industrial development can alter the



Data Sources:
 Constructed Wetlands obtained from Drainage Facilities database
 Natural Wetlands derived from Government of Alberta SPOT satellite wetland data (2003), COE Natural Areas database, and Drainage Wetland Acquisition Plan priority site identification.

Map 1.2: Natural and constructed wetland sites in the City of Edmonton.

hydrology of a wetland and significantly change its ecological characteristics. Climate change can also degrade wetland habitats, as changing moisture and temperature patterns impact the ecological balance of these sites.

Edmonton's wetlands are also threatened by invasive plant and animal species that can upset the natural composition of these ecosystems. Species like Purple Loosestrife, Pale Yellow Iris and Himalayan Balsam present significant threats to Edmonton's wetlands by choking out native plant species and dominating available resources.

Habitat degradation in its various forms can be addressed through effective wetland management and monitoring, once a site is protected, as well as outreach and education.

1.3 EDMONTON'S WETLAND STRATEGY: PURPOSE AND STRUCTURE

a) Purpose

While Edmonton's river valley has a long history of stewardship stretching back to the early 1900s, conservation of Edmonton's wetlands and other tableland natural areas did not become a City focus until more recent years. Real change began in 1995 when the City adopted Policy C-467, Conservation of Natural Sites in Edmonton's Tablelands. This policy laid the groundwork for early conservation planning and represents an important turning-point in the City's approach to conservation in the tablelands.

In the nearly twenty years that have followed, the pressures on Edmonton's wetlands have only intensified, but so have the City of Edmonton's conservation efforts. General understanding about the value and vulnerability of urban wetlands has grown, and the City of Edmonton has developed a multi-pronged approach to conserving and managing the remaining wetlands within its boundaries.

To date, this approach has consisted of a range of wetland-related commitments and practices that have been integrated into numerous City of Edmonton policies and plans. This integrated approach has led to some important benefits, such as the inclusion of wetland conservation principles in high-level City policies, and the incorporation of wetland-related work activities into a range of City departments and branches.

This *Wetland Strategy* pulls together the array of City policies, plans and implementation tools that relate to Edmonton's wetlands and unites them all in a single document, complete with Council-approved strategic commitments, and tools for implementation. It is anticipated that this approach will lead to broader understanding of the issues at hand, and will strengthen and unify the City's overall position on wetland conservation.

b) Structure

Following this introduction, two main sections comprise the bulk of Edmonton's *Wetland Strategy*:

The first section, **Strategic Commitments**, describes the overarching commitments that guide the City's wetland conservation practices. These commitments are drawn from five high-level policies and plans, approved by Edmonton City Council.

Before exploring these five plans and policies in more detail, it is important to note that they are each rooted in the City of Edmonton's highest-level Strategic Plan, *The Way Ahead*. Developed in 2009, this plan embodies citizens' long term vision of what Edmonton will be like in 2040. At its core are six 10-year goals that will guide the City in reaching this vision, and a set of corporate outcomes and performance measures associated with each goal.

Table 1.4 describes how Edmonton's *Wetland Strategy* helps the City to achieve the goals and corporate outcomes described in the 2011 update of *The Way Ahead*. The link between each respective goal/outcome and this strategy is categorized as low, medium, or high.

Grounded in *The Way Ahead* are the five high-level plans and policies described in Table 1.5. Together, these form the foundation of Edmonton's *Wetland Strategy*. The **Implementation Toolbox** is the second main section of the *Wetland Strategy*. This section contains a description of the tools that are used by the City to conserve Edmonton's wetlands, driven by its strategic commitments.

Throughout the implementation section, Conservation Spotlights are used to provide more details about specific tools, and their on-the-ground application.

Both the Strategic Commitments and Implementation Toolbox sections are organized to reflect the three goals that underlie the City of Edmonton's *Natural Connections Strategic Plan*:

- 1. Secure** a functioning ecological network.
The City of Edmonton will secure a protected and functional ecological network.
- 2. Manage** Edmonton's ecological network.
The City of Edmonton will manage Edmonton's ecological network effectively and will work collaboratively with other conservation agencies to do so.
- 3. Engage** Edmontonians.
The City of Edmonton will work with the community to support conservation goals, and will form partnerships with conservation leaders in the community.

For the purpose of the *Wetland Strategy*, these goals have been modified slightly to accommodate wetland-specific conservation actions. These goals (and their corresponding sections in this strategy) are as follows:

- 1. Secure** Edmonton's wetlands as part of the city's ecological network.
- 2. Manage** Edmonton's wetlands to maximize their ecological function.
- 3. Engage** Edmontonians to support wetland conservation.

Throughout this strategy, the term "wetland conservation" is used to represent the cumulative activities of wetland securement, wetland management, and engagement of the public and City partners, with regard to both natural and constructed wetlands.

Figure 1.1 summarizes the underlying structure of Edmonton's Wetland Strategy:

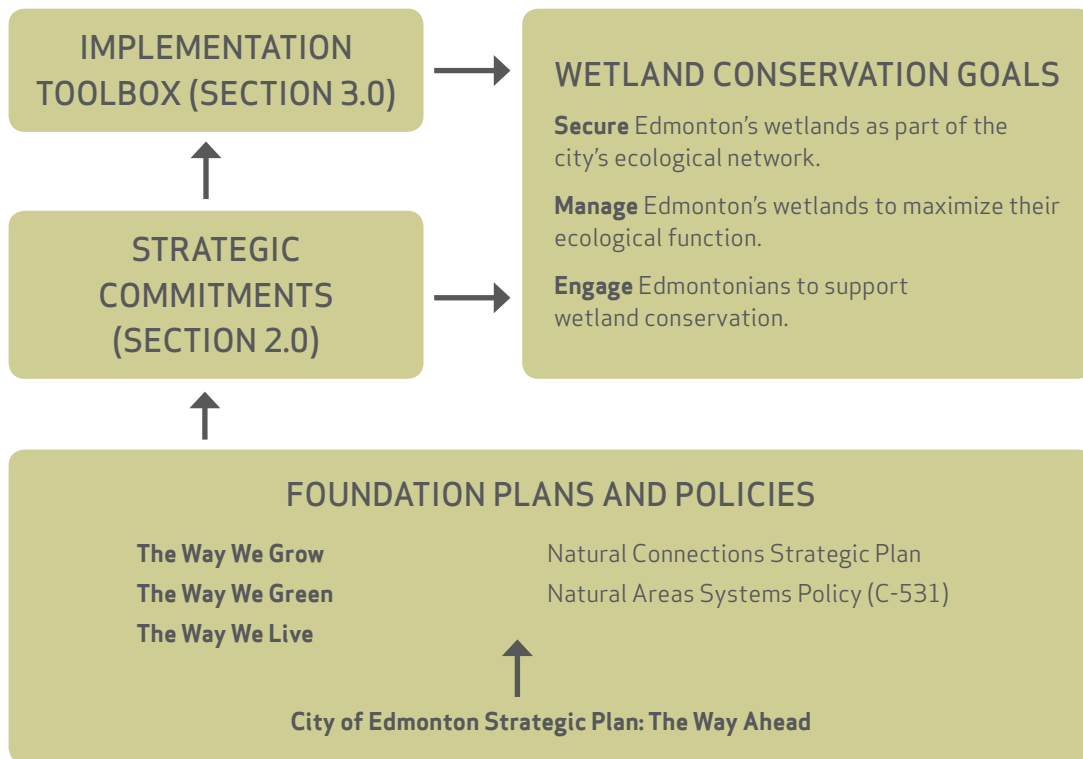


Figure 1.1: The underlying structure of Edmonton's Wetland Strategy

Table 1.4: Connections between The Way Ahead and Edmonton's Wetland Strategy

| Goals and associated Corporate Outcomes from <i>The Way Ahead</i> (2011) | Link between goal/ outcome and Wetland Strategy | | |
|---|---|--------|------|
| | LOW | MEDIUM | HIGH |
| GOAL: Transform Edmonton's Urban Form | | x | |
| Attractive and compact physical design with diverse neighbourhoods, amenities and public open spaces | | x | |
| Edmonton has sustainable infrastructure that fosters and supports civic and community needs | | x | |
| GOAL: Shift Edmonton's Transportation Mode | x | | |
| Citizens use public transit and active modes of transportation | x | | |
| Goods and services move efficiently through the city | x | | |
| The transportation system is integrated, safe and gives citizen choice to their mode of movement | x | | |
| GOAL: Improve Edmonton's Livability | | x | |
| Citizens are connected to their diverse communities and have pride in their city | | x | |
| Citizens use city infrastructure and participate in services and programs that provide enjoyment and personal health benefits | | x | |
| Complete collaborative communities that are accessible, strong, and inclusive with access to a full range of services | | x | |
| GOAL: Preserve and Sustain Edmonton's Environment | | | x |
| Partnerships with citizens, communities and organizations are leveraged to improve Edmonton's environmental health | | | x |
| The impact of City operations on air, land and water systems is minimized | | | x |
| Edmonton strives to be a leader in environmental advocacy, stewardship, preservation, and conservation | | | x |
| GOAL: Ensure Edmonton's Financial Sustainability | x | | |
| The City has well managed and sustainable assets and services | x | | |
| The City has a resilient financial position | | x | |
| The City has balanced revenue streams that are sustainable | x | | |
| GOAL: Diversify Edmonton's Economy | x | | |
| The Corporation supports a competitive business climate and delivers business friendly services | x | | |
| The City facilitates the development of established businesses and sectors | x | | |
| The City supports the development of high potential sectors | x | | |
| The City is an effective participant in regional partnerships and collaboration | | x | |

Table 1.5: Foundational Plans and Policies of the Wetland Strategy

| Title of Plan/Policy | Description |
|--------------------------------------|---|
| The Way We Grow | Edmonton's Municipal Development Plan is the City's 10-year strategic land use plan. Through this plan, the City of Edmonton will shape Edmonton's urban form and guide the development and implementation of more detailed plans. One of the main focus areas of the plan is to preserve the city's natural environment. The plan includes a corporate strategic directive and supporting policy statements specifically addressing wetland conservation. |
| The Way We Green | <i>The Way We Green</i> is Edmonton's Environmental Strategic Plan, which charts the way for Edmonton's transformation into a sustainable and resilient city. The plan designates 'Healthy Ecosystems' as an overarching environmental theme, and contains numerous objectives and strategic directions that relate directly to wetland conservation in Edmonton. |
| The Way We Live | Edmonton's People Plan aims to bring people together to create a civil, socially sustainable and caring society where people have opportunities to thrive and realize their potential in a safe, attractive city. The Plan recognizes the contribution that natural areas make to Edmontonians' quality of life and sets out several objectives and strategic directions that support natural areas conservation. |
| Natural Connections Strategic Plan | <i>Natural Connections</i> is Edmonton's Conservation Plan. It outlines the City's ecological network approach and sets guiding principles, goals, system outcomes, strategic directions and strategies for natural areas conservation, the majority of which have important implications for wetland conservation. |
| Natural Areas Systems Policy (C-531) | This policy provides the foundation for much of the City's conservation efforts. It forms the cornerstone of the City's ecological network approach by stating that all natural areas in Edmonton should be considered as part of an integrated system, and ensures that equal consideration is given to ecological, economic, and social issues in decision-making. The associated procedure defines specific City responsibilities for policy implementation. Attachments to the policy outline requirements for the provision of specific ecological information during the planning process, and guidelines for determining Environmental Reserve (see section 3.1), both of which play a significant role in wetland conservation. |

1.4 WETLAND CONSERVATION: ROLES AND RESPONSIBILITIES

a) City of Edmonton

Within the City of Edmonton, responsibilities for wetland securement, management and public engagement are shared by multiple branches and departments, and are identified in a myriad of work plans, activities, and decisions. While not exhaustive, Table 1.6 lists the main branches involved with wetland conservation in Edmonton, and indicates their involvement in the City's major wetland conservation activities, as described in this strategy.

It is important to note that all of the listed activities involve more than one branch, with some involving up to four, underlining the multi-faceted nature of wetland conservation, and the importance of an integrated, collaborative approach.

b) Government of Alberta

Overarching the City's wetland roles and responsibilities are those of the provincial government. In Alberta, the provincial Crown owns all water in the province, including water in wetlands, whether they are permanent, temporary, or constructed. The Crown also owns the right to make decisions about the diversion and disturbance of this water, under the *Water Act*. This Act states that parties carrying out any activity that could impact water and the aquatic environment are first required to seek approval from Alberta Environment. These activities include taking water from, constructing within, and draining or filling any wetland, regardless of class or features. Alberta Environment expects that approval applicants:

1. Avoid damage or destruction to the wetland
2. Minimize the impact and provide applicable compensation
3. Compensate for unavoidable damage or destruction

The Province also has some regulatory authority over constructed wetlands. Under the *Water Act*, approval from Alberta Environment is required to create a wetland where

none previously existed. After construction, the wetland's water and the right to divert it still belong to the provincial Crown (Kwasniuk, 2001).

Alberta Environment also administers the *Wetland Management in the Settled Area of Alberta, An Interim Policy*, adopted in 1993. This policy seeks to maintain Alberta's wetlands in a natural state and mitigate disturbance, whenever possible. It also aims to enhance and restore wetlands in areas where they have been depleted. A new provincial wetland policy is currently being developed.

Alberta's *Public Lands Act* gives the province ownership of the bed and shore of all permanent and naturally occurring wetlands, unless ownership has been specifically granted to another party. This Act is administered by Alberta Sustainable Resource Development.

c) Government of Canada





























The Federal Policy on Wetland Conservation applies to wetlands on federal property, as well as development projects that are funded by federal money or require approvals from federal departments. The policy seeks no net loss of wetland function through avoidance, minimization and compensation, where required.

Other relevant federal legislation that could apply to Edmonton's wetlands includes (Kwasniuk, 2001):

- The Fisheries Act prohibits anyone from carrying on any type of work that results in the harmful alteration, disruption or destruction of fish habitat, without statutory authorization.
- The Migratory Birds Convention Act prohibits anyone from doing anything that could harm migratory birds or their nests without statutory authorization.

The Navigable Waters Act prohibits anyone from carrying on any activities that could interfere with navigability of water without statutory authorization.

Table 1.6: Branch responsibilities for wetland conservation in the City of Edmonton.

| Branch | Secure | | | | | Manage | | Engage | |
|---|---|---|---|---|---|---|---|---|---|
| | Ecological Inventories | Land Use Legislation | Wetland Acquisition | Wetland Compensation and Restoration | Integrating Constructed Wetlands into the Ecological Network | Management Plans and Activities | Research, Monitoring and Reporting | Citizen Stewardship and Education | Formal Partnerships |
| Corporate Properties | | |  |  | | | | | |
| Current Planning |  |  |  | |  |  | | | |
| Drainage Services | |  |  |  |  |  |  |  | |
| Facilities and Programs | | | | | | | |  | |
| Neighbourhoods and Parks | | | |  | |  |  |  | |
| Urban Planning and Environment (including Office of Biodiversity) |  |  |  |  |  |  |  |  |  |

1.5 THE ECOLOGICAL NETWORK APPROACH

Critical to an understanding of the City of Edmonton's *Wetland Strategy* is an appreciation of Edmonton's ecological network approach to natural areas conservation. Through this approach, the City strives to consider all of its natural areas, including the North Saskatchewan River Valley and Ravines System, tableland treestands, wetlands, and all other natural habitats, as part of a city-wide, interconnected ecological network.

The major components of the city's ecological network are core biodiversity areas (larger natural areas), stepping stones (smaller natural areas) and natural linkages or corridors between natural areas. Also integral to this network are Edmonton's semi-natural areas like school yards, golf courses and private backyards, and ecologically hospitable parts of the 'matrix,' or developed part of the city within which the network is embedded (Figure 1.2). Ideally, these pieces of the ecological network all work together to promote wildlife movement, nutrient exchange, seed dispersal, and other essential ecological functions throughout the broader Edmonton region. Map 1.3 illustrates Edmonton's entire ecological network.

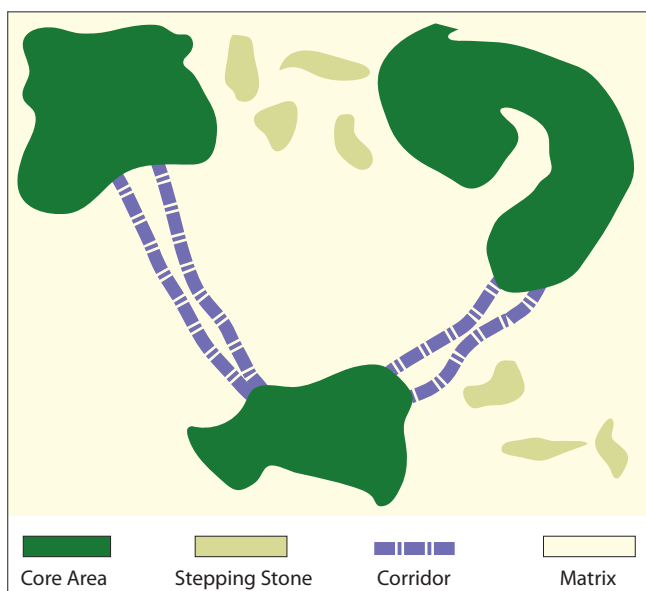
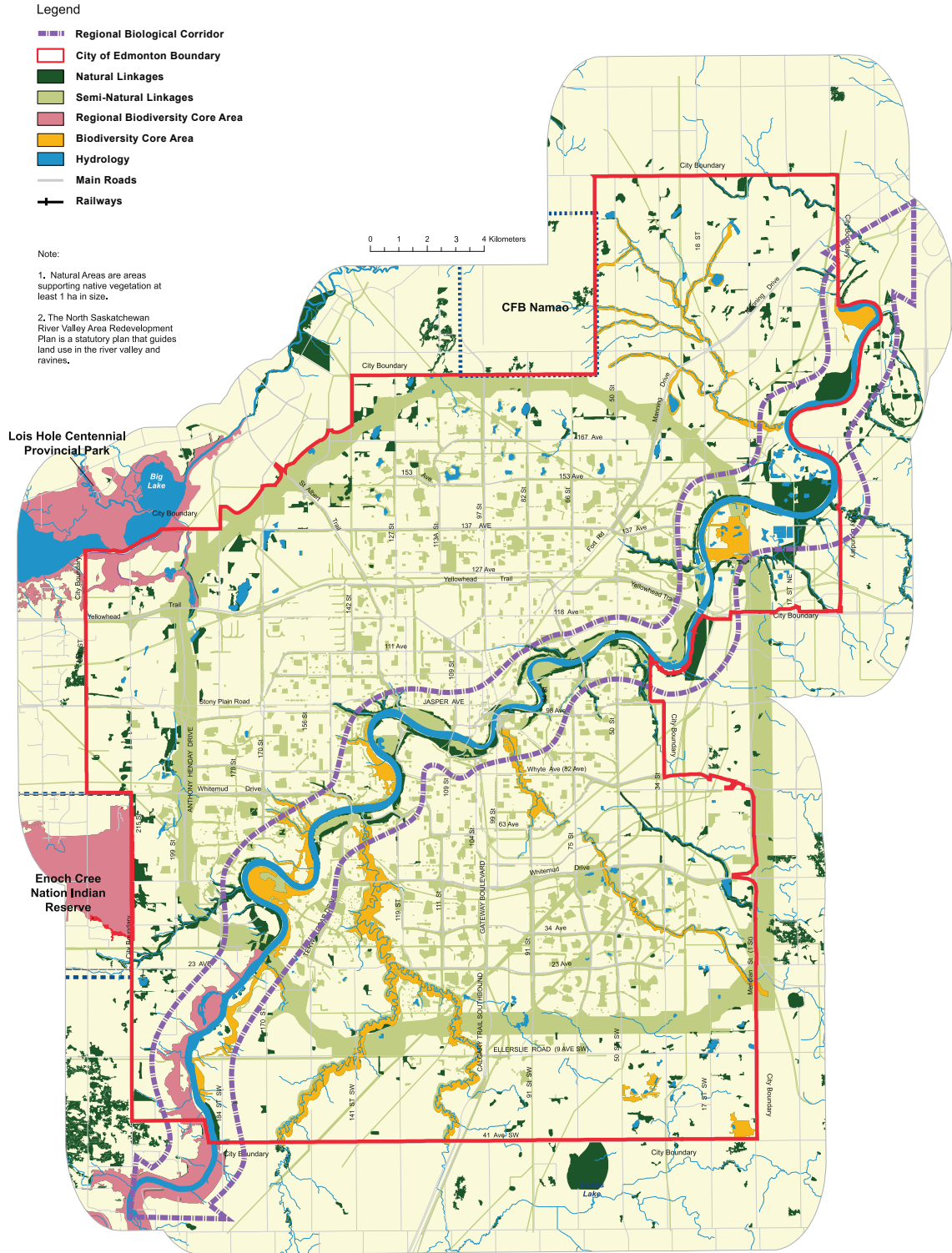


Figure 1.2: The basic components of an ecological network

During all phases of natural areas conservation and management, the City aims to consider individual natural sites in terms of their connection with Edmonton's broader ecological network. For example, through the ecological network lens, a single wetland may be viewed as a stepping stone, wildlife corridor, or core biodiversity area, with important contributions to the broader natural system. Similarly, the placement of a constructed wetland can strengthen the ecological network when the surrounding natural context is considered. This systems-based approach sustains the ecological quality of both individual sites as well as the whole of Edmonton's natural system.








The ecological network approach is particularly pertinent to wetland conservation because many of Edmonton's wetlands exist in combination with other types of natural areas. At these composite sites, a wetland may be surrounded by a shrubby upland, a treestand, or border a riparian zone of the North Saskatchewan River. The ecological function of these wetlands may depend on the surrounding habitat types, and conservation efforts must consider this broader context.

Edmonton's commitment to the ecological network approach is embedded in numerous high-level City plans and policies, approved by City council, as summarized in Table 1.7. These strategic commitments provide the foundation for Edmonton's *Wetland Strategy* and all other conservation work carried out by the City.



Map 1.3: Edmonton's Ecological Network

Table 1.7: Edmonton’s commitments to an ecological network approach for natural areas conservation.

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|---|---|---|---|---|---|
| Protect, preserve and enhance its natural environment by maintaining the integrity and interconnectivity of its natural areas, river valley, water resources, parks and open spaces, recognizing that these elements form a functioning ecological network within the Capital Region. (TWWGrow 7.1.1, TWWGreen 3.3) |  |  | | | |
| Ensure that public projects, new neighbourhoods and developments protect and integrate ecological networks, as identified in the Natural Connections Strategic Plan, by adopting an ecological network approach to land use planning and design. (TWWGrow 7.1.1.7, TWWGreen 3.3.7) |  |  | | | |
| Work with the Capital Region Board and adjacent municipalities to acquire, protect and restore natural systems and linkages, recognizing that Edmonton’s ecological network is part of a larger regional network. (TWWGrow 7.1.1.9, TWWGreen 3.3.9) |  |  | | | |
| Protect, manage and integrate natural wetlands into new and existing developments as key assets in Edmonton’s ecological network. (TWWGrow 7.2.11, TWWGreen 3.5) |  |  | | | |
| Enhance and maintain functional ecological linkages for the North Saskatchewan River and Ravine System, as well as the associated tablelands through watershed planning including consideration of natural hydrology and maintenance of riparian health and function in land use planning.(3.3.15) | |  | | | |
| Find synergies to reconnect Edmonton’s natural systems to increase functional ecological connectivity in the North Saskatchewan River Valley and Ravine System as well as associated tablelands with capital construction projects. (3.4.3) | |  | | | |
| Build and maintain a connected system of shared use trails, green and natural spaces. (2.2.3) | | |  | | |
| Adopt a systems approach to conservation planning, ensuring that proposed development is sensitive to both the structure and function of natural systems being integrated into new neighbourhoods. (p. 21) | | |  |  | |
| Conserve, protect, and restore our natural uplands, wetlands, water bodies, and riparian areas, as an integrated and connected system of natural areas throughout the city. | | | | |  |

2.0 STRATEGIC COMMITMENTS

As previously described, the City of Edmonton's Wetland Strategy is organized according to the three inter-related goals of wetland securement, wetland management, and engagement of the public and partners. This section details the City's strategic approach to wetland conservation with respect to each of these three goals.

2.1 SECURE EDMONTON'S WETLANDS AS PART OF THE CITY'S ECOLOGICAL NETWORK

A fundamental piece of wetland conservation in Edmonton lies in protecting the city's remaining wetlands from development, through a process called securement. When development proposals are submitted for land containing wetlands and other natural areas, the City of Edmonton has several opportunities to secure these sites and preserve their ecological functions into the future. There are five primary components of the securement process, as illustrated in Figure 2.1:



Figure 2.1: An overview of Edmonton's wetland securement commitments.

This section provides background information about each of these components, outlines their associated strategic commitments, and list the tools currently available to implement these commitments. It is important to note that a combination of these commitments and tools are commonly used in the City's securement work, and that this integrated approach often results in the best outcome for the wetland in question.

A) ECOLOGICAL INVENTORIES

Background:

A critical first step in securing Edmonton's natural wetlands is to understand the distribution and characteristics of these habitats using ecological inventories. The City of Edmonton began carrying out inventories of its natural areas as early as 1986, with the goal of tracking the progress of conservation efforts and better understanding the natural connections present within Edmonton's ecological network. A summary of these inventories can be found in Appendix A.

It should be noted that Edmonton's natural area inventories have generally not distinguished site-specific information about wetlands from information about other kinds of natural areas. This is in part because many of the city's natural habitats are characterized by a combination of forest, upland and wetland habitats, making such delineation very challenging using air photos or satellite imagery. The temporary nature of many of Edmonton's wetlands adds another layer of complication to this exercise, as does the fact that it can be difficult to distinguish natural wetlands from stormwater management facilities, industrial waterbodies or private ponds. Nonetheless, the City recognizes the need for landscape inventories that provide wetland-specific information like catchment size, distribution, abundance by class,









linkages with other natural areas, changes over time, and success of restoration projects. The City intends to make such inventories a priority in future years. A current best estimate of wetland distribution was provided in map 1.2 (section 1.2).

An important part of addressing this gap is the increasing involvement of developers in conducting ecological inventories at the site level. Through the City's strategic commitments outlined in table 2.1, information requirements within the development process ensure that ecological data is collected and factored into planning decisions, with the goal of minimizing impacts to wetlands and other natural areas, and strengthening Edmonton's ecological network.



Photo: Dave Conlin

Table 2.1: The strategic commitments made by the City of Edmonton to integrate ecological information into its planning process.

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|--|--|--|-----------------|---|---|
| Apply Ecological Information Requirements to development proposals that will affect, or potentially could affect, natural systems or ecological processes.(TWWGrow 7.1.1.8, TWWGreen 3.3.8) |  |  | | | |
| Require new developments, adjacent to natural areas, to demonstrate that they have incorporated ecological design best-practices to mitigate negative consequences. (TWWGrow 7.1.1.11, TWWGreen 3.3.11) |  |  | | | |
| Ensure that natural areas are considered early in the planning process so they can be effectively integrated into structure plans and protected through development. (p.p. 21) | | | |  | |
| Ensure the necessary natural systems information is obtained and made available through the planning process, and that the process facilitates the long-term protection of key systems. (p. 20) | | | |  | |
| Ensure that development proponents clearly understand natural systems information requirements and understand the means by which such information is to be considered by City staff in the evaluation of development applications. (p. 21) | | | |  | |
| Require ecological information to support planning and development applications. | | | | |  |

Tools for Policy Implementation: (refer to section 3.1.1 for more information)

Ecological Information Requirements (Policy C-531): This appendix within policy C-531 describes the ecological information that must be submitted as part of the development process.

Ecological Network Report: This type of report describes the ecological features within a plan area, and linkages with the broader ecological network.

Natural Site Assessment: Through this assessment, the natural features of a plan area are inventoried and the potential impact of development is analyzed.

Ecological Design Report: This type of report is used to incorporate ecological design elements into developments that are particularly environmentally sensitive.

B) LAND USE LEGISLATION

Background:

With detailed ecological information about wetlands in hand, City of Edmonton staff are in a better position to influence the planning process for the conservation of these natural areas. During land use planning, two provincial acts are frequently drawn upon by staff in the protection of Edmonton's wetlands.

First, the *Municipal Government Act* (MGA) enables the City of Edmonton, at the time of subdivision, to claim up to 10 percent of the net developable land area as Municipal Reserve (MR), to be used as a public park, public recreation area, school, or to separate lands used for other purposes. For the purpose of wetland conservation, MR can be used to secure adjacent upland habitat needed to support the lifecycle requirements of many wetland species.

The MGA also enables the City to claim the following as Environmental Reserve (ER) at the time of subdivision: Swamps, ravines, coulees or natural drainage courses; unstable lands or lands subject to flooding; or narrow buffers for the purpose of pollution prevention or public access. Many of Edmonton's wetlands fall into the definition of ER, and thus it is a critical conservation tool.

A second important provincial regulation, the *Public Lands Act* (PLA), grants ownership of the bed and shore of all permanent and naturally-occurring waterbodies in Alberta to the Crown. The PLA gives Alberta Sustainable Resource Development the right to claim these areas and protect them from development or any other type of land conversion.

A checklist describing the steps in the land use planning process relative to wetland conservation, including the application of these Acts, is provided in Appendix B. Table 2.2 explores how the City of Edmonton has integrated these land use acts within its strategic commitments to help achieve its wetland conservation goals.










“ The City will dedicate permanent, semi-permanent, and seasonal wetlands (i.e., Class III, IV, and V Wetlands in the Stewart and Kantrud system) and all peatlands as Environmental Reserve upon subdivision of land. ”

(The Way We Green 3.5.2)



Photo: Dave Conlin

Table 2.2: The strategic commitments made by the City of Edmonton to apply land use legislation to its conservation planning practices.

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|--|---|---|-----------------|---|---|
| Utilize the full legislative entitlements of environmental reserve, in accordance with the Municipal Government Act, during the land development process. (TWWGrow 7.1.10, TWWGreen 3.3.10) |  |  | | | |
| Work proactively with the Province to ensure that Crown interests in water bodies are addressed as early as possible in the planning process. (TWWGrow 7.5.1.2, TWWGreen 4.5.2) |  |  | | | |
| Determine appropriate buffer areas around the periphery of natural areas identified for protection. (TWWGrow 7.1.14, TWWGreen 3.3.4) |  |  | | | |
| Dedicate permanent, semi-permanent, and seasonal wetlands (i.e., Class III, IV, and V Wetlands in the Stewart and Kantrud system) and all peatlands as Environmental Reserve upon subdivision of land. (3.5.2) | |  | | | |
| Work with the Government of Alberta to see that it obtains the required information from development applicants in order for it to claim the bed and shore of local water bodies, as it sees fit. (p. 20) | | | |  | |
| Conserve, protect, and restore natural area systems through the physical planning and development process; according to the provisions of municipal, provincial and federal policy and legislation | | | | |  |

Tools for Policy Implementation: (refer to section 3.1.2 for more information)

Terms of Reference: Area and Neighbourhood Structure

Plans: These documents guide developers through the planning process and include information about Environmental Reserve and Municipal Reserve dedication.

Environmental Reserve Guidelines: These guidelines describe the City’s process for determining the buffer area surrounding wetlands and other water bodies.

Rural Southeast: Wetland Assessment and Crown Water Body Determination:

This study involved the assessment of wetlands in Edmonton’s southeast to assist ASRD in addressing Crown interests in water bodies early in the planning process.

C) WETLAND ACQUISITION

Background:

While planning and administrative tools do help the City of Edmonton to secure some wetlands during the development process, not all sites are successfully protected through these routes. Some of the limitations of these tools are:

- These tools only apply to land that is going through subdivision, and so cannot be used to protect wetlands on private land or on land for which development plans have already been approved.
- The amount of land that can be claimed as ER/MR is relatively small and may not be sufficient to secure a wetland. Moreover, the definition of ER may not apply to adjacent natural areas like shrublands or woodlands, which may be critical to a wetland's sustainability and are important for the broader ecological network.

- There can be conflicts between the various components that make up a new development (e.g. transportation network, drainage system, ecological network) that make it difficult to successfully secure wetlands and other natural areas.

Information about the Crown's intentions regarding wetland claims is not always well coordinated with the City's planning process.

In response to these challenges, an essential part of the City's wetland securement strategy is acquisition, whereby the City purchases wetlands, or encourages their donation by land owners. Land acquisition is a powerful approach to conservation because it ensures that wetlands are secured in the long-term, although it does face significant challenges, including rising land values and strong development pressures. Table 2.3 summarizes the City's strategic commitments guiding wetland acquisition.














Photo: Dave Conlin

“ The City of Edmonton will acquire and manage the most ecologically sensitive areas in Edmonton. ”

(The Way We Grow 7.1.1.2, The Way We Green 3.3.2)

Table 2.3: The strategic commitments made by the City of Edmonton regarding natural areas acquisition.

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|---|---|---|-----------------|---|---|
| Acquire and manage the most ecologically sensitive areas in Edmonton. (TWWGrow 7.1.1.2, TWWGreen 3.3.2) |  |  | | | |
| Develop procedures to support, encourage and promote innovative ways to acquire, preserve and maintain natural areas and connections on private and public lands, such as land swapping, easements, buffers and bylaws. (TWWGrow 7.1.1.3, TWWGreen 3.3.3) |  |  | | | |
| Acquire critical natural linkages and buffer zones to ensure natural areas of ecological value remain sustainable within an urban context. (TWWGrow 7.1.1.5, TWWGreen 3.3.5) |  |  | | | |
| Where privately held wetlands cannot be protected through other means, encourage their dedication through conservation easements. (TWWGrow 7.2.11, TWWGreen 3.5.1) |  |  | | | |
| Coordinate the processes of key internal branches to identify natural areas for acquisition. (p. 20) | | | |  | |
| Work with the Edmonton and Area Land Trust to encourage the securement of private natural areas in the form of conservation easements and donations.(p. 20) | | | |  | |
| Encourage voluntary conservation and corporate and private sponsorship of natural sites. | | | | |  |

Tools for Policy Implementation: (refer to section 3.1.3 for more information)

Natural Areas Reserve Fund and Natural Areas Acquisition Strategy: This fund and associated strategy will be used by the City to purchase approximately 100 ha of natural areas in unplanned areas of the city.

Wetlands Acquisition Plan: This strategy will see the purchase of natural wetlands for conservation and integration into the City’s stormwater system.

Voluntary Conservation Programs: These programs encourage land owners to protect natural areas through voluntary conservation easements and land donation.

D) WETLAND COMPENSATION AND RESTORATION

Background:

The reality of development in a growing city is that not all wetlands and natural areas can be protected through planning tools, purchase, or voluntary conservation. Inevitably some of these sites will be lost to development, and in the case of wetlands, compensation for their loss is required according to Alberta's *Water Act* and *Interim Wetland Policy for Settled Areas* (1993). These acts require that any alteration or loss of wetland must be approved by the province, and that approved wetland losses must be mitigated using the following provincial hierarchy:

1. **Avoid** impacts to the wetland,
2. **Minimize** impacts and require applicable compensation,
3. **Compensate for** impacts that cannot be avoided or minimized.





Compensation follows the *Provincial Wetland Restoration/Compensation Guide* (1997) and most commonly takes the form of enhancing or restoring degraded wetlands in rural areas. Compensation activities must be carried out by a provincially-recognized wetland restoration agency, currently Ducks Unlimited Canada. Occasionally, at the discretion of the province, the creation of new constructed wetlands or wetland restoration in urban areas qualifies as wetland compensation. The City's strategic commitments about wetland compensation (table 2.4) and associated tools for implementation reflect its desire to see more Edmonton-based wetland compensation projects.

“The City will require compensation within the borders of the city for wetland drainage or alteration of all non-ephemeral wetlands and peatlands in the form of restoration or construction of a similarly functioning wetland.”

(*The Way We Green* 3.5.2)



Table 2.4: The strategic commitments made by the City of Edmonton regarding wetland compensation and restoration.

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|---|---|---|-----------------|---|------------------------------|
| Work with land owners to see that compensation required by the Province, as a result of the alteration or destruction of wetlands, is carried out within city boundaries. (TWWGrow 7.2.1.1, TWWGreen 3.5.1) |  |  | | | |
| Restore ecologically degraded and/or damaged ecological systems and linkages to protect, expand and enhance biodiversity (TWWGrow 7.1.2, TWWGreen 3.4) |  |  | | | |
| Restore degraded natural areas and ensure ongoing protection of areas that have undergone restoration, where feasible. (TWWGrow 7.1.2.2, TWWGreen 3.4.2) |  |  | | | |
| Establish, implement, and maintain policies requiring biodiversity offsets to compensate for trees and wetlands that are lost as a result of the approval of Land Development Applications. (3.3.14) | |  | | | |
| Require compensation within the borders of the city for wetland drainage or alteration (in full or part) for all non-ephemeral wetlands (i.e., Class II, III, IV, and V wetlands in the Stewart and Kantrud system) and all peatlands in the form of restoration or construction of a similarly functioning wetland. (TWWGreen 3.5.3) | |  | | | |
| Work to improve the quality of “stepping stone” sites, ecological corridors, and the matrix generally through naturalization. (p. 22) | | | |  | |

Tools for Policy Implementation: (Refer to section 3.1.4 for more information)

The Wetland Loss Compensation Site Framework: This framework identifies candidate compensation sites in Edmonton that could be restored by developers as compensation for lost sites.

Wetland Mitigation Bank: This concept involves the City-led restoration of local wetlands, and the subsequent sale of credits to developers seeking compensation sites.

Ecological Restoration Plans: This type of plan describes the activities involved in the ecological restoration of a wetland.

E) INTEGRATION OF CONSTRUCTED WETLANDS INTO THE ECOLOGICAL NETWORK

Background:

Since 1998, constructed wetlands have increasingly become part of the City's inventory of stormwater management facilities, and they are now a common feature of new developments. In addition to their important contribution to stormwater management and quality enhancement, constructed wetlands share many other important benefits with natural wetlands, including habitat creation, soil stabilization, and educational and recreational opportunities.

Like natural wetlands, the land use planning phase is a critical time for constructed wetlands, when decisions are made about their location, design and function, including choices about how these sites will relate to and interact with natural wetlands and the broader ecological network.

The integration of constructed wetlands into Edmonton's landscape is guided and encouraged by City standards, but it is ultimately the choice of the developer to include one in a plan. The Drainage Services branch requires that constructed wetlands are designed to satisfy site specific requirements such as controlled release to a receiving system and to provide runoff quality enhancement.

Developers can choose from a suite of methods to meet these requirements, of which constructed wetlands are a particularly popular and effective option.







A developer may also propose that onsite natural wetlands, normally of Class IV or V, be used for stormwater retention and treatment. These "stormwater influenced wetlands" are approved on a site-specific basis, and require tailored management plans to minimize impacts on the natural ecosystem, with associated approvals from Alberta Environment. Many impacts can be mitigated through the creation of a forebay, where sediment and pollutants settle out prior to stormwater reaching the main body of the wetland.

Drainage Services is the City branch responsible for constructed and stormwater influenced wetlands. The Drainage Master Plan (2004 - 2014) states that "Drainage Services would like to incorporate, wherever possible, natural, altered, or constructed wetlands into the City's drainage infrastructure." The strategic commitments listed in table 2.5 and the associated tools for implementation provide further support for this goal.

“ The City of Edmonton will establish, implement, and maintain a Stormwater Quality Control Strategy that gives priority to managing stormwater runoff through the use of on-site natural features (i.e., low impact development) and other best management practices. ”

(The Way We Green 4.2.1)

Table 2.5: The strategic commitments made by the City of Edmonton regarding integration of constructed wetlands into the ecological network:

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|---|---|---|-----------------|---------------------|------------------------------|
| Design, arrange, and locate new infrastructure and buildings to mitigate impacts upon the water system. (TWWGrow 7.5.1.1, TWWGreen 4.2.5) |  |  | | | |
| Require new development to demonstrate that it has incorporated ecological design best practices into the design of neighbourhoods and buildings to reduce stormwater run-off. (TWWGrow 7.5.1.1, TWWGreen 4.5.1) |  |  | | | |
| Incorporate sustainable neighbourhood design principles, low impact development and ecological design approaches when planning and building new neighbourhoods. (TWWGrow 5.5.1.2) |  | | | | |
| Establish, implement, and maintain a Stormwater Quality Control Strategy that gives priority to managing stormwater runoff through the use of on-site natural features (i.e., low impact development) and other best management practices.(4.2.1) | |  | | | |

Tools for Policy Implementation: (Refer to section 3.1.5 for more information)

Design and Construction Standards: These standards provide guidelines for developers, including details about the design and construction of constructed wetlands.

Stormwater Quality Control Strategy and Action Plan: This document provides a road map to guide the City as it strives to improve stormwater quality and watershed health.

Total Loadings Plan: This plan outlines the City's approach to limiting discharge of Total Suspended Solids to the

North Saskatchewan River, in part through the use of constructed wetlands.

Stormwater Servicing Strategy: This strategy analyzes the City's stormwater system and provides recommendations for improvement, including the increasing use of natural and constructed wetlands for stormwater management.

2.2 MANAGE EDMONTON'S WETLANDS TO MAXIMIZE THEIR ECOLOGICAL FUNCTION.

Securement alone does not ensure the long term viability of a wetland. Particularly in an urban setting, wetlands are impacted by ongoing stressors that require monitoring and continual management. Altered hydrologic regimes, pollution, invasive plants and insects, recreational impacts, vandalism and litter are among some of the disturbances that can impact the ecological function of conserved wetlands.

Wetland management requires an iterative approach, where management goals and activities are constantly monitored and altered as new circumstances arise. As illustrated in Figure 2.2, the City's wetland management commitments fall into two main themes and are underpinned by the foundational plans and policies introduced in section 1.3.



Figure 2.2: An overview of Edmonton's wetland management commitments.

This section outlines the City's wetland management commitments and lists the tools currently available to implement these commitments.






A) MANAGEMENT PLANS AND ACTIVITIES

Background:

The City of Edmonton is committed to effective, long-term management of the wetlands and other natural areas that it has secured. In 2010, the City managed over 2,100 hectares of natural areas city-wide, including wetlands, treestands, and sites throughout the North Saskatchewan River Valley and Ravine System. The City also manages and maintains constructed and storm-water influenced wetlands to ensure their ongoing function.

The responsibility for wetland management in Edmonton is shared across several City branches. The Drainage Services and Neighbourhoods and Parks branches carry out most of the day-to-day management activities, with some high-level input from the Office of Biodiversity. Developers, community groups, and individual citizens also play important roles in wetland management. The City's overall approach to wetland management is best described by the strategic commitments listed in table 2.6.

Table 2.6: The strategic commitments made by the City of Edmonton regarding natural areas management plans and activities.

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|---|-----------------|---|-----------------|---|------------------------------|
| Manage Edmonton’s ecological network effectively, working collaboratively with other conservation agencies.(3.3.19) | |  | | | |
| Increase capacity for ecological stewardship by implementing programs and practices that establish clear management roles and responsibilities, support the efforts of conservation organizations and private corporations, and reflect a watershed approach to the management of Edmonton’s natural systems. (p. 21) | | | |  | |
| Develop a clear corporate natural area management program and set of practices that is understood by all staff, particularly those responsible for implementation. (p. 21) | | | |  | |
| Develop guiding documents that outline best practices for various aspects of natural areas management (e.g., wetlands, riparian areas, tree stands, etc.) (p. 21) | | | |  | |
| Use management plans to develop clear management goals and objectives for each protected natural area (including appropriate use), ensure they are understood by operations staff, developers and the public, and that there is adequate capacity to operationalize them. (p. 22) | |  | | | |

Tools for Policy Implementation: (Refer to section 3.2.1 for more information)

Natural Area Management Plans: The City’s NAMPs provide objectives, strategies and operational guidelines for natural areas management both at the City-wide and site-specific scales.

Urban Parks Management Plan: This plan guides the acquisition, development, maintenance, preservation and use of parkland in the city, including natural areas.

Vegetation Management Programs: Integrated Pest Management programs are used to control invasive weeds in parks and natural areas.

Constructed Wetland Management Programs: These programs include monitoring and management activities that ensure the sustainability of constructed wetlands.

License of Occupation Agreements: An agreement formed when the City manages a wetland that has been claimed by the Crown.

Mosquito Control Program: Edmonton’s mosquito program controls mosquitoes while protecting the health and biodiversity of wetlands.

B) RESEARCH, MONITORING AND REPORTING

Background:

Successful wetland management depends on ongoing research and monitoring to ensure that management activities are tailored to the ever-changing needs of urban wetlands. Results from monitoring activities can also indicate how well wetlands as a whole are being conserved in Edmonton, alongside other components of the city's

ecological network. Effective reporting is another essential component of wetland management, so that results of conservation efforts can be shared among City staff and stakeholders, and continual improvement can be achieved to meet high level objectives.

Table 2.7: The strategic commitment made by the City of Edmonton regarding natural areas research, monitoring and reporting.

| | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|--|-----------------|------------------|---|---------------------|------------------------------|
| <p>The City of Edmonton will: Actively monitor natural systems and the implementation of management plans, and use this information to evaluate management needs. (p. 22)</p> | | |  | | |

Tools for Policy Implementation: (Refer to section 3.2.2 for more information)

Wetland Research and Monitoring Programs: These include biological and water quality monitoring programs that take place at natural and constructed wetlands.

Corporate Reporting: Progress measures and indicators are used to track successes and challenges in meeting the City's conservation objectives.

2.3 ENGAGE EDMONTONIANS TO SUPPORT WETLAND CONSERVATION.

Healthy, protected wetlands are public assets that bring multiple ecological, economic and social benefits to urban residents. Edmontonians, in turn, play an important role in the protection and enhancement of these sites. Their actions and attitudes towards these sites can make the difference between a healthy or degraded wetland ecosystem. To strengthen the connection between citizens and Edmonton’s wetlands, the City supports a host of stewardship and awareness-building programs, and actively nurtures conservation partnerships.

The City’s commitments related to wetland engagement and education fall into two main categories, as shown in Figure 2.3.

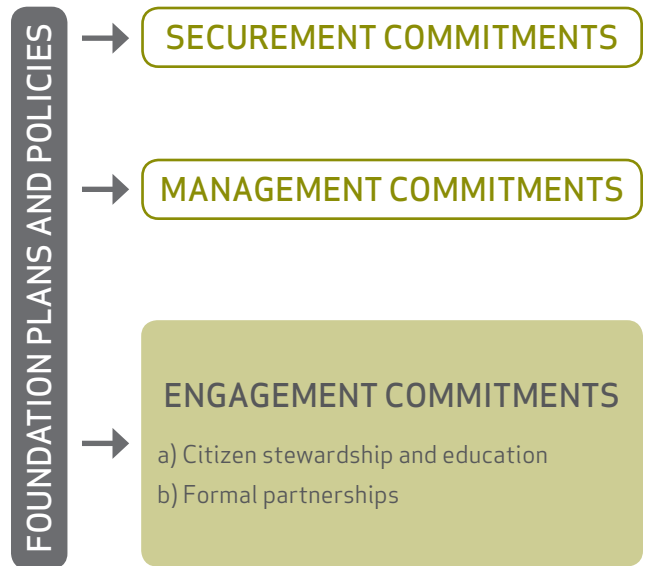


Figure 2.3: An overview of Edmonton’s wetland engagement commitments.



A) CITIZEN STEWARDSHIP AND EDUCATION

Background:

The City of Edmonton acknowledges that its wetland conservation efforts can be significantly strengthened through the support of citizens, who can help monitor, maintain and enhance these sites across the city. Such citizen stewardship efforts help immensely with the continual on-the-ground work of wetland management, and build awareness and appreciation for these sites among the broader community. Edmontonians with wetlands right

in their own neighbourhoods sometimes worry that sites will suffer from vandalism and neglect, or provide habitat for mosquitoes, algae and weeds. Public education helps to dispel myths about urban wetlands, and to raise awareness about their many benefits. The strategic commitments listed in table 2.8 underlie the City's efforts to engage citizens in natural areas stewardship and promote wetland education.

“ The City of Edmonton will encourage people to explore and enjoy their connection to the natural environment ”

(The Way We Live 1.2.3)

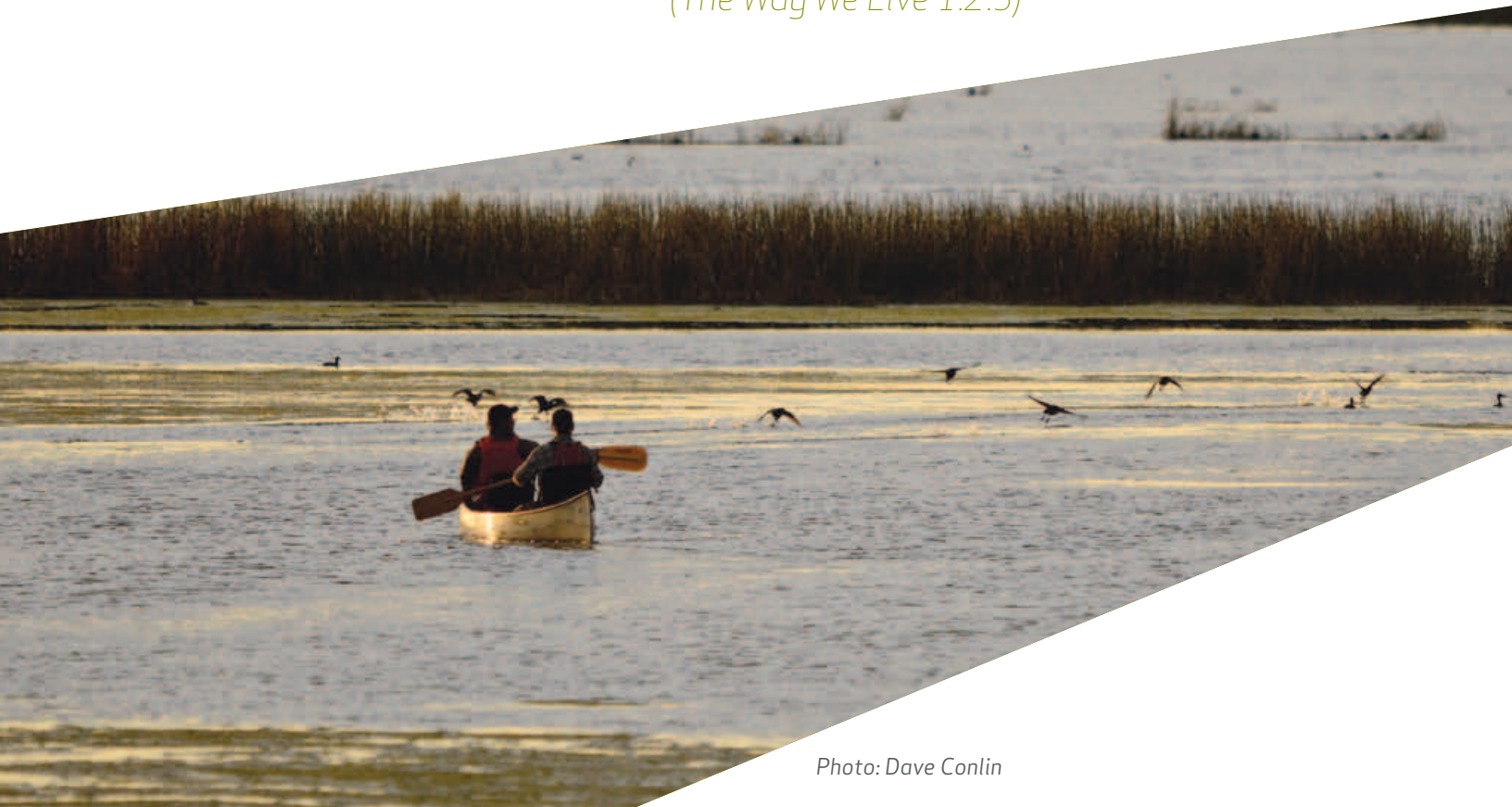







Photo: Dave Conlin

Table 2.8: The strategic commitments made by the City of Edmonton regarding natural areas stewardship and nature education.

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|---|-----------------|---|---|---|------------------------------|
| Deliver programs and initiatives that engage and educate citizens about nature. (3.1.5) | |  | | | |
| Encourage people to explore and enjoy their connection to the natural environment (1.2.3) | | |  | | |
| Provide for the well-being of its citizens through outstanding parks, natural, green and public spaces. (2.2) | | |  | | |
| Facilitate community engagement in stewardship, monitoring and restoration of natural areas on public and private lands. (p.34) | | | |  | |
| Encourage the understanding of key ecological terms, current trends in conservation and loss, and conservation efforts being made internally and externally (p.35) | | | |  | |
| Encourage the understanding of the many benefits natural areas provide Edmontonians, including ecosystem services and quality of life enhancements. (p.35) | | | |  | |
| Work to move community members towards the leadership end of the “stewardship scale” (aware → steward → lead) (p.35) | | | |  | |
| Work with schools and youth programs to instill in young people a strong understanding of the value of natural areas (p.35) | | | |  | |
| Establish processes and tools to capture, store and make accessible the local ecological knowledge of Edmontonians (p.35) | | | |  | |
| Work with private landowners to share information about the value of naturalization of residential, commercial and industrial land, and techniques for accomplishing it.(p. 35) | | | |  | |
| Engage the public in natural area issues, and encourage businesses, residents, and the community to secure new natural area systems and steward what we have effectively. | | | |  | |

Tools for Policy Implementation: (Refer to section 3.3.1 for more information)

a) **Biodiversity CEPA Initiative:** CEPA aims to improve internal and external communication about Edmonton’s biodiversity.

b) **Master Naturalist Program:** This program teaches citizens about local biodiversity, in exchange for conservation-focused volunteerism.

c) **School and Facility-based Programs:** These include a range of programs and facilities that teach Edmontonians about local wetlands.

d) **Support for Community Groups:** The City strives to partner with community groups who are involved in wetland conservation.

B) FORMAL PARTNERSHIPS





Background:

It has long been recognized in Edmonton that partnership building is a critical part of natural areas conservation. Successful past partnerships have enabled the City and other organizations to share information, work more effectively and support one another in what can be a complex and sometimes difficult endeavor to conserve natural sites. In the realm of wetland conservation,

potential partners may include land owners, land trusts, community organizations, surrounding municipalities, and other levels of government.

The City has made several strategic commitments (Table 2.9) that together guide its approach to conservation partnership-building.

Table 2.9: The strategic commitments made by the City of Edmonton regarding formal partnerships for natural areas stewardship and conservation.

| The City of Edmonton will: | The Way We Grow | The Way We Green | The Way We Live | Natural Connections | Natural Areas Systems Policy |
|--|-----------------|------------------|---|---------------------|------------------------------|
| Establish a well-connected network of conservation partners, including conservation and other community groups, landowners, the development and academic communities, adjacent municipalities, and other orders of government, to foster the sharing of information and expand organizational capacity. (p.36) | | |  | | |
| Establish a Regional Conservation Network, including representation from key conservation groups, adjacent municipalities and provincial and federal departments, to work cooperatively to achieve common goals. (p.34) | | |  | | |
| Work with developers and landowners to achieve “win-win ecology” that protects natural systems and processes, is economically rewarding, and respects the interests of property owners. (p.34) | | |  | | |
| Partner with the Edmonton and Area Land Trust to encourage the conservation and sound stewardship of privately-owned natural systems (p.34) | | |  | | |

Tools for Policy Implementation: (Refer to section 3.3.2 for more information)

Land Trust Partnerships: Partnerships with land trusts help the City to promote voluntary conservation through land donation or conservation easements.

Regional Partnerships: Partnerships with adjacent municipalities encourage a regionally-based conservation approach, which supports the broader ecological network.

Provincial Partnerships: The City participates in provincial partnerships to ensure that the unique challenges facing urban wetlands are addressed at the provincial level.

International Partnerships: The City has a growing number of international partners focused on conserving local biodiversity.

3.0 WETLAND CONSERVATION TOOLBOX

The City's diverse range of strategic commitments and their integration into high-level policies and plans provide a strong base for wetland conservation in Edmonton. Still, only through consistent and effective implementation of these commitments will real, positive impacts be achieved for Edmonton's wetlands. This section provides detailed descriptions of each of the "tools for policy implementation" listed earlier in this document, organized according to the strategy's three overarching goals of securement, management and engagement.

3.1 SECUREMENT TOOLBOX

3.1.1 ECOLOGICAL INVENTORY TOOLS

The following tools help the City of Edmonton to meet the strategic commitments outlined in section 2.1(a), related to the use of ecological inventories for wetland conservation.

a) Ecological Information Requirements (Policy C-531)

The City of Edmonton's Natural Area Systems Policy (C-531) requires that developers submit specific ecological information in conjunction with development proposals, which helps ensure ecological factors are considered early in the planning process and enables City staff to make informed decisions about natural areas, including wetlands. The policy states that ecological information may include but is not limited to:

"an identification and description of affected natural areas, a description of the proposed development and associated facilities and services that may affect the natural areas, a description of the potential impacts of the proposed development on the affected natural areas; an analysis of the relationship of natural areas to Edmonton's ecological network, and indication of interest in voluntary conservation."

An attachment within the policy outlines the specific information required from developers, based on the type of planning application. When impacts to wetlands are possible, these requirements may include an Ecological Network Report, Natural Site Assessment, and Ecological Design Report, described below.

b) Ecological Network Report

The City of Edmonton requires developers to submit an *Ecological Network Report* for all Area Structure Plan applications, Servicing Concept Design Brief applications, and major plan amendments that could impact natural areas or natural features. At the discretion of City staff, this report may also be required for Neighbourhood Area Structure Plans. Developers are required to hire a qualified environmental evaluator who uses a site check, background research and his or her knowledge of ecological attributes and the development proposal to complete the assessment.

The final report includes information about:

- The existing ecological network, including all wetlands and crown-owned water bodies,
- A functional and structural connectivity assessment of landscape features both within and surrounding the site,
- Historical and current drainage patterns and floodplain boundaries,
- The recommended ecological network, and recommended overlay with transportation, drainage and utility networks,
- Management and mitigation recommendations for optimal preservation of the ecological network.

The overall intention of the Ecological Network Report is to achieve early, integrated planning for the protection of the ecological network, so that development is tailored to the ecological network, not the opposite. The completed reports are used by the staff to make decisions that favour the protection of natural areas, including wetlands, to the extent that it is possible.

c) Natural Site Assessments

Natural Site Assessments (NSAs) are required for all Neighbourhood Structure Plans, industrial Area Structure Plans, and major amendments that have the potential to affect one or more natural areas. NSAs are carried out by an environmental evaluator who explores significant environmental issues related to the proposal, as well as measures to mitigate potential impacts.

The NSA is completed using an ecological network approach, with consideration given to all natural features within the plan area, rather than individual natural sites. Environmental elements including flora, fauna, ecological linkages, biodiversity, surface and groundwater quality, and topography are analyzed, and mitigation and management plans are developed to address impacts from development.

With the information contained in the NSA, City of Edmonton staff are better able to make informed decisions about how the proposed development can be tailored to conserve wetlands and other natural features.

d) Ecological Design Report

At the discretion of City staff, an Ecological Design Report may be required at the Neighbourhood Structure Plan application stage, particularly if a plan area contains or borders regionally significant natural areas. The purpose of this type of report is to ensure that ecological design principles are integrated into the early stages of the design of a neighbourhood, in order to protect biodiversity and reduce the neighbourhood's ecological impact.

Some of the approaches with positive impacts on wetlands that have been described in past Ecological Design Reports include:

- Maintaining ecological buffers around wetlands and ensuring connectivity with other natural areas;
- Creating naturalized stormwater wetlands to provide additional wetland habitat,
- Using water quality sedimentation ponds to maintain the water quality of natural wetlands,
- Planning roadways to reduce impacts on wildlife movement around wetlands.

Conservation Spotlight A describes the application of the ecological design process in new neighbourhoods under development on the shore of ecologically-sensitive Big Lake.



Photo: Dave Conlin

CONSERVATION SPOTLIGHT A: BIG LAKE NEIGHBOURHOODS

Edmonton's northwest corner borders Big Lake, an 8 km long lake and wetland complex that in 2005 became the site of Edmonton's newest provincial park. The area is globally recognized as a significant bird area and is a local biodiversity hotspot, with rich uplands, diverse wetlands, and several streams. With three new neighbourhoods currently under development along the shores of Big Lake, and more planned, the City has requested that developers submit ecological design reports to determine how localized ecological networks can best be protected and enhanced.

Numerous design features have been recommended in these reports, including linking vegetated wildlife corridors with nearby core habitat areas and creating stepping stone habitats like parks and constructed wetlands. Other design recommendations include using bioswales for stormwater management, reverse housing (a concept in which houses front onto shared green spaces to reduce the neighbourhood's overall footprint), wildlife friendly lighting, and public education about local wildlife and habitats.

To date, the Ecological Design Reports have helped to facilitate a successful planning process in what could have been a very controversial development. The neighbourhood plans have generally received support from diverse stakeholders, and the approach has built the foundation for progressive planning that reflects the needs of the ecological network. The reports offer a promising tool for future developments, particularly those in highly sensitive ecological areas.

3.1.2 LEGISLATIVE TOOLS

The following tools help the City of Edmonton to meet the strategic commitments outlined in section 2.1(b), related to the use of legislative tools for wetland conservation.

a) Terms of Reference for Area and Neighbourhood Structure Plans

The City of Edmonton's *Area Structure Plans (ASP) Terms of Reference* and *Neighbourhood Structure Plans (NSP) Terms of Reference* are documents that were created to guide developers through the ASP and NSP application process. Among other things, these documents provide development proponents with detailed requirements regarding the dedication of lands as ER and MR and Crown-owned water bodies.

During the ASP phase, the Terms of Reference direct developers to:

- Identify all water features and their ownership within the plan area including wetlands, water bodies, and filled-in water bodies as these may be subject to both ownership and regulatory interest by the Province or Municipality.
- Contact the Alberta Sustainable Resources Development (ASRD) Public Lands Division and provide any necessary information (e.g. aerial map of plan area identifying land and water features) to facilitate review of the plan area. Following review of the plan area, the Province will make a determination as to Crown interest and land ownership. Applicants are required to forward a copy of this determination to City staff, who will review the City's interest in any lands left unclaimed by the Province for the plan area. In rendering its determination, the City will act

to acquire lands for natural area preservation and or conservation (e.g. buffer) as required.

- Provide a statistical summary of proposed land use for the area, including the amount of land to be dedicated as Natural Area Environmental Reserve and Natural Area Municipal Reserve.

During the NSP phase, the Terms of Reference direct developers to:

- Delineate (i.e. conduct a legal survey) all water features for participating lands within the plan area subject to ownership and or regulatory interest by the Province or Municipality. This includes wetlands, water bodies, and filled-in water bodies. Where participating lands occupy a portion of a water feature, the remnant portion of this area (i.e. non-participating land ownership) will be surveyed in accordance with Alberta Land Surveyor code of practice.
- Provide a statistical summary of proposed land use for the neighbourhood, including the amount of land to be dedicated as Natural Area Environmental Reserve and Natural Area Municipal Reserve.

b) Environmental Reserve Guidelines

The City of Edmonton has created *Guidelines for Determining Environmental Reserve (ER) Dedication for Wetlands and Other Water Bodies*, which outline how to determine the boundary of the vegetated buffer zone surrounding wetlands and other water bodies that have been dedicated as Environmental Reserve. These guidelines are embedded as an appendix into City Policy C-531, Natural Areas Systems Policy.

As discussed in section 2.1, the City can claim certain lands as Environmental Reserve (ER) under the *Municipal Development Act*, including swamps, ravines, natural drainage courses, unstable lands, lands subject to flooding, and a buffer zone for pollution prevention and access. In developed areas, a buffer zone can be essential to the health of a wetland, by protecting it from pollutants, neighbouring land uses and other human impacts.

The Environmental Reserve Guidelines provide a methodology for determining the buffer zone width requirements for each of the four components of ER (i.e. flooding, instability, pollution prevention and public access). According to the Guidelines, the greatest extent of all of these ER components should be identified as the required area for ER dedication. The Guidelines state that a minimum of 30 metres of land from the wetland boundary is required as a buffer for purposes of pollution prevention, and thus serves as the automatic minimum total buffer width.

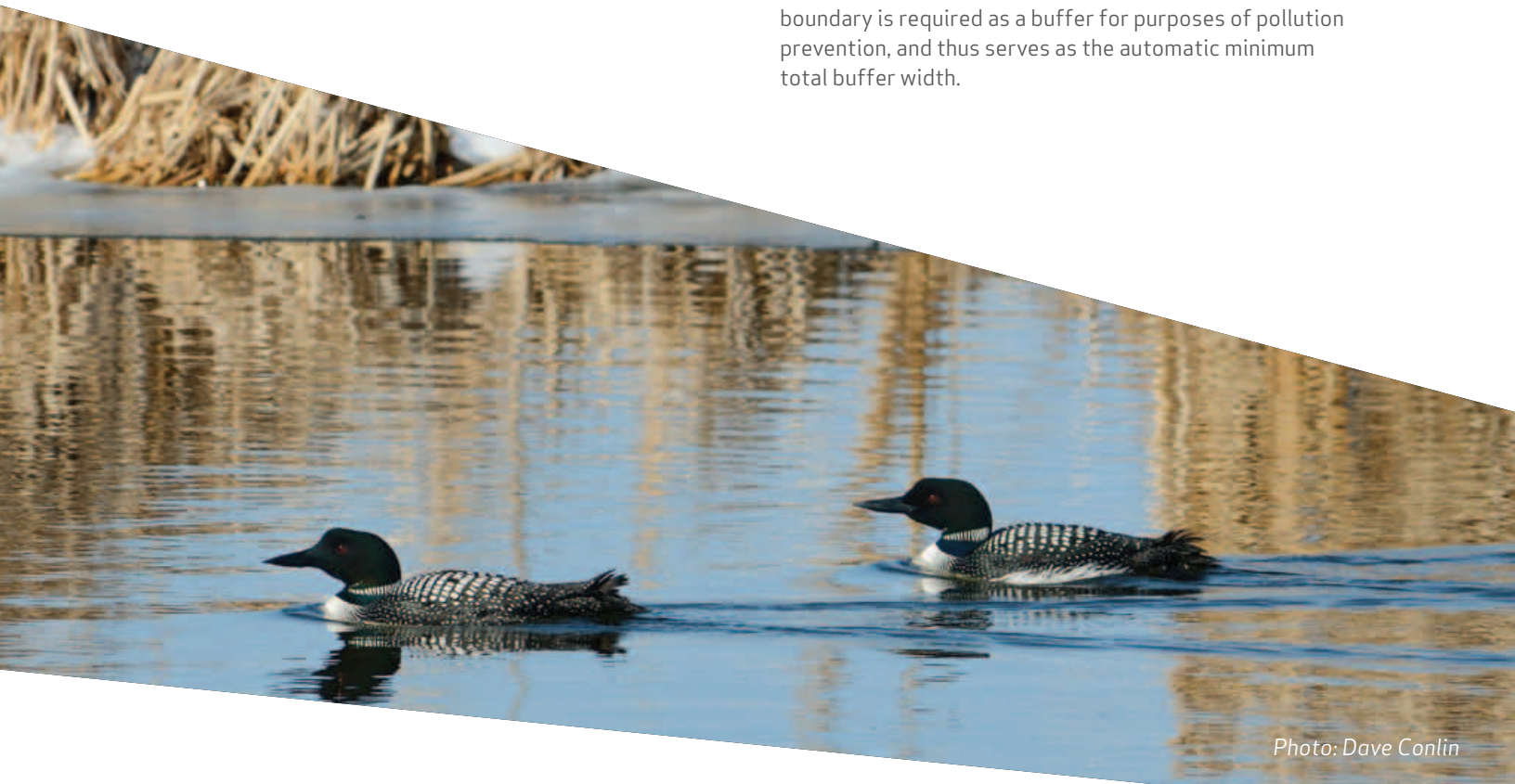




Photo: City of Edmonton

CONSERVATION SPOTLIGHT B: THE SECORD WETLAND-UPLAND COMPLEX

The Secord Wetland natural area is a unique 4.4 hectare site located in Edmonton's Lewis Farms area. The natural area consists of a wetland surrounded by a balsam poplar-dominated upland forest. This natural area is a remnant patch of the formerly larger Winterburn School natural area, and was conserved in 2006.

Upon development, the natural wetland portion of this site was modified to receive inputs from the stormwater system, and three forebays were constructed to protect the site from stormwater sediment and other pollutants. The site's natural vegetation was preserved, and the wetland supports a diverse aquatic plant community.

Of particular note at this site are the connections present between the wetland and the forested uplands. The upland area acts as a buffer to stabilize and protect the wetland from urban impacts, and significantly increases the diversity of habitats found at the site. The wetland-upland complex provides habitat for animals that require elements of both wetlands and forests, such as goldeneye ducks and frogs. Other species that may be encountered at the Secord Wetland natural area include white-tailed deer, fox, coyote, small mammals, amphibians, and many different types of birds. The ecological complexity of the site emphasizes the importance of the Environmental Reserve Guidelines in maximizing the biodiversity and functionality of Edmonton's wetland complexes.

c) Rural Southeast: Wetland Assessment and Crown Water Body Determination

Edmonton's far southeast contains a multitude of natural wetlands, many of which are situated on private land that could be developed in the coming years. In response to its policy commitment to "work proactively with the Province to ensure that Crown interests in water bodies are addressed as early as possible in the planning process," the City of Edmonton hired a company to conduct an assessment of the rural southeast's wetlands in 2011. The consultants measured a range of features for each wetland, including class, size, and maximum hydroperiod, and developed an information package for Alberta Sustainable Resource Development (ASRD). The intent of this information package is to provide ASRD with the data they need to make informed, timely decisions about bed and shore claims within Edmonton's city limits. With site-specific wetland information already at hand, it is hoped and anticipated that ASRD staff will be able to claim wetlands early in the development process.

3.1.3 WETLAND ACQUISITION TOOLS

The following tools help the City of Edmonton to meet the strategic commitments outlined in section 2.1(c), related to the use of land acquisition for wetland conservation.

a) Natural Areas Reserve Fund and Natural Areas Acquisition Strategy

Edmonton's Natural Areas Reserve Fund (NARF) was created in 1999 for the purpose of acquiring wetlands and other tableland natural areas in developing areas of the city. Originally, \$250,000 was dedicated to the fund each year, and in 2005, City Council increased the annual dedication to \$1,000,000. Despite this funding, many natural areas in the city's newly developing areas continued to be lost.

By 2009, it was clear that a more proactive approach would be required to keep up with rising land prices and rapid development on the city's fringe. Also during this year, City Council approved the Natural Areas Acquisition

Strategy, through which the NARF funds are leveraged in order to borrow \$20 million. The City is applying the funds strategically to ensure an even distribution of protected natural areas across Edmonton, including several larger core biodiversity areas. The funds are only applied to unplanned areas (i.e. areas without an ASP or NSP) to take advantage of lower land values.

Natural areas acquired through the fund are selected according to the following criteria, wherever possible:

- Target under-represented ecosystem types within the City for a wider diversity of protected natural area types.
- Ensure an even distribution of natural areas throughout the City to achieve the most favourable network of natural areas.
- Target large Core Biodiversity Areas that provide interior habitat from which species dispersal to other areas could occur.
- Target natural areas with the highest biodiversity and conservation potential.
- Target natural areas fully contained within few legal parcels, resulting in limited number of owners in the negotiation process and less extraneous land.
- Target natural areas that present opportunities for coordination with other departments, branches or Crown lands.
- Target natural areas with strong potential for public education.

The City estimates that approximately 100 ha of natural areas will be protected over the lifetime of this fund, including multiple wetlands.

b) Wetlands Acquisition Plan

The Drainage Master Plan (2004 – 2014) states that “Drainage Services values natural wetlands for their stormwater management and water quality enhancement benefits. Drainage Services would like to incorporate, wherever possible, natural, altered, or constructed wetlands into the City’s drainage infrastructure.”

In line with this aspiration, Drainage Services has been strategically purchasing wetlands to integrate into the City’s storm water management system since 1993. These “stormwater influenced” wetlands include Poplar Lake, Hodgson Wetland, Maple Ridge Wetland, and

Secord Wetland, many of which were protected for their conservation value as well as drainage potential.

Effort has been made to ensure that the integrated wetlands remain ecologically sustainable through construction of adjacent storage cells and/or sediment forebays to separate run-off and associated sediment from the natural wetland. Disturbances, like impacts to the shoreline and basin deepening, are kept to a minimum. The City also carries out biological monitoring of its constructed and stormwater-influenced wetlands according to a rotating annual schedule, described in section 3.2.2.a.

To ensure its acquisition funds are put to best use, Drainage Services initiated the development of a Wetlands Acquisition Plan in 2010, with the goal of contributing “to wetland conservation and environmental sustainability through acquisition (purchase) of naturally occurring wetlands to be used for stormwater management purposes” (Associated Engineering and Spencer Environmental, 2011). The Acquisition Plan is intended to be a wetland conservation tool that supplements other City efforts to protect wetlands on developed and undeveloped lands, including efforts undertaken by the City’s Office of Biodiversity, while remaining consistent with the Drainage Services mandate:

“to provide stormwater drainage services to Edmonton residents by planning, building, operating, and maintaining the pipes, tunnels, pump stations, stormwater management facilities that make up the City’s drainage network”

The objectives of the Wetland Acquisition Plan are to strategically acquire wetlands that could be incorporated into the City’s drainage infrastructure in order to protect, conserve, and where possible, enhance those wetlands. At its core, the acquisition plan aims to identify wetlands for purchase that are not likely to be protected through other tools (i.e. Crown ownership, MR/ER, Natural Areas Acquisition Strategy).

Through an extensive inventory, 50 unprotected wetlands have been prioritized for acquisition. This shortlist was selected from a group of more than 300 potential candidate sites through screening at three levels:

- **Level 1:** Sites were prioritized at a coarse level, with drainage potential as the most important characteristic

- **Level 2:** Wetland presence was confirmed, and sites were re-evaluated using aerial photos. Site boundaries and planning status were confirmed.
- **Level 3:** Short-listed sites were scored as High, Medium or Low according to two equally-weighted criteria:
 1. *Ecological Priority Rank:* Includes the size and number of wetland(s), Class (Stewart and Kantrud), presence or absence of adjacent native upland.
 2. *Drainage Priority Rank:* Includes the storage capacity, site relief, and probability of integrating the site without significant modification disturbance.

The 50 selected sites will be further narrowed down during the plan's implementation, beginning in 2012. Numerous strategic directions for implementation are listed in the plan, including:

- Coordinate the acquisition plan with the Office of Biodiversity (OoB) to take advantage of natural synergies between the two programs and identify sites that are structurally or functionally connected to one of the OoB's priority sites. Where two Drainage Services short-listed sites are being considered, selection should favour the site that is structurally or functionally connected to one of the OoB priority sites.
- Consider the wetland's planning status in the selection of candidate sites, placing higher priority on those unprotected sites that are located within approved ASPs and lower priority to those located within unplanned areas and to wetlands within approved NSPs, but which provide a statutory plan in advance that 'locks in' the value of the wetland.
- Place higher priority on acquiring sites in industrial areas as those areas tend to have a simpler planning process.
- Establish increased setbacks for industrial lands owing to their greater potential impact on wetland water quality.
- Wetlands owned by the City of Edmonton should be given preference to wetlands that are privately held.
- Wetlands owned by the Crown and wetlands to be taken as ER should be evaluated to determine if there is a need to use fund to secure a buffer that would ensure a high-functioning wetland.

Map 3.1 shows the location of the priority acquisition sites, the majority of which are located in Edmonton's far southeast and northeast, and along the city's western edge.

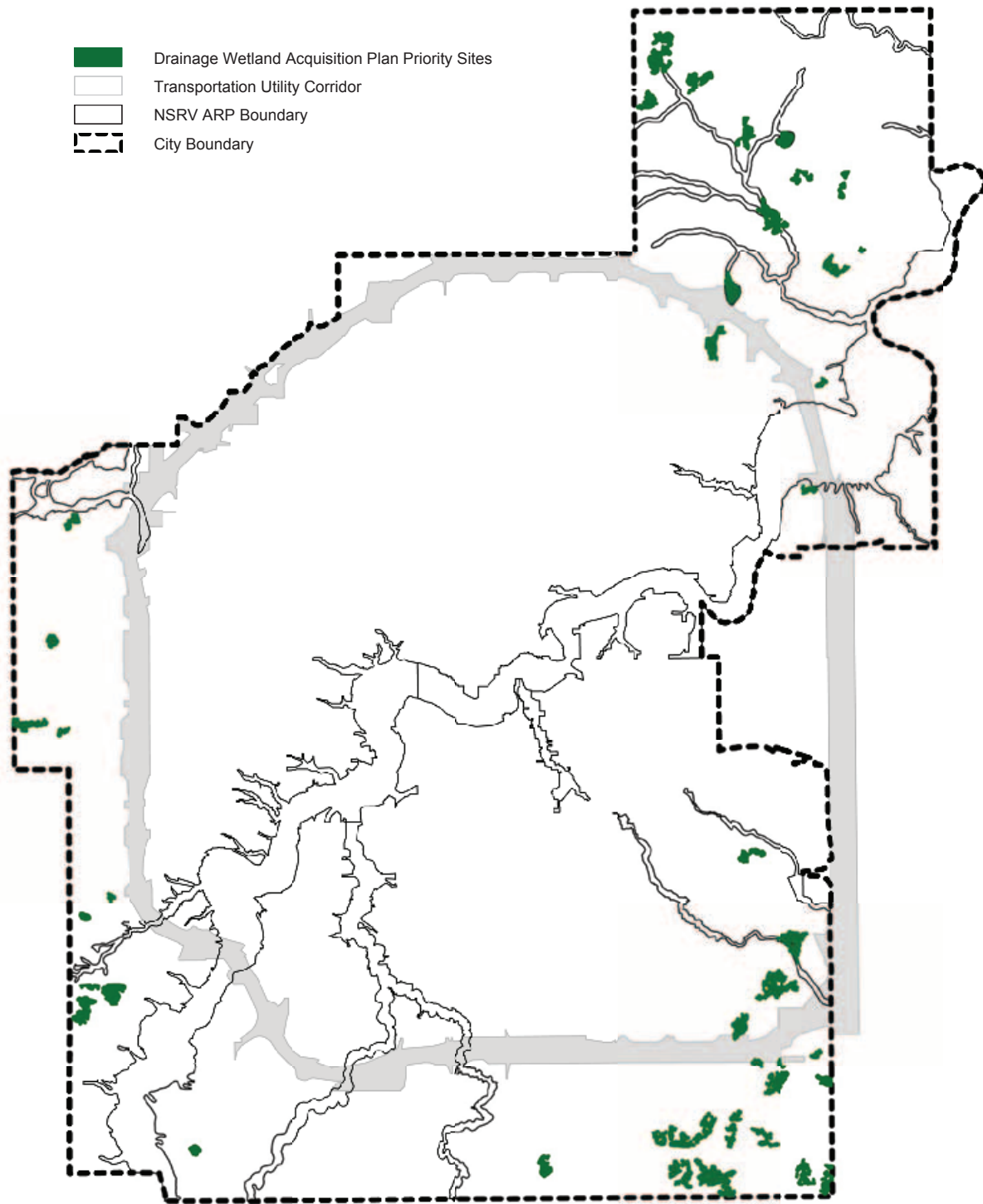
c) Voluntary Conservation Programs

In cases where wetlands are privately-held, not subject to subdivision, and the City cannot afford to purchase them, there is one conservation option that remains: encouraging the landowner to dedicate the land to conservation, either as a donation or conservation easement. The Edmonton and Area Land Trust (EALT), of which the City of Edmonton is a founding member and ongoing partner, plays an essential role in supporting voluntary land conservation in the city. The EALT partnership and its role in wetland conservation is described in further detail in section 3.3 of this strategy.

Land donation involves the transfer of land ownership from a land owner to a conservation organization or land trust like the EALT. A conservation easement is a variation of this concept, where private land is voluntarily dedicated to a qualified land trust agency, but the donor remains the land owner and has control over specific types of use and development on the land, even if the property changes hands.

Both Environment Canada's Ecological Gifts program and the City of Edmonton's Ecological Conservation Assistance Program (ECAP) provide incentives to landowners wishing to protect the natural features of their land through these means:

Environment Canada's Ecological Gifts program applies to wetlands and other natural habitats that are certified to be ecologically sensitive according to a range of criteria, such as providing habitat for an endangered, threatened or vulnerable species, buffering other ecologically sensitive lands, or providing opportunities for enhanced ecological functioning through restoration. Either through direct land donation or the creation of a conservation easement, the land (or a partial right to it) is transferred to a recipient agency, which is responsible for maintaining the land's habitats and biodiversity in perpetuity. In turn, donors receive significant tax benefits and the assurance that the environmental heritage of their land will always be preserved. The EALT is one of over 180 recipient groups in Canada approved to accept land donated through this program.



Map 3.1: Drainage Wetland Acquisition Plan priority sites in the City of Edmonton.

The City of Edmonton's ECAP program is also designed to financially reward and assist landowners in conserving privately-held wetlands and other natural areas. The program provides a one-time grant of \$5,000 per hectare (up to a maximum of 50 hectares or \$250,000) to landowners wanting to make an ecological gift to the City of Edmonton. Land donated either through direct donation or conservation easement is managed by the EALT into perpetuity.

3.1.4 WETLAND COMPENSATION TOOLS

The following tools help the City of Edmonton to meet the strategic commitments outlined in section 2.1(d), related to wetland compensation.

a) The Wetland Loss Compensation Site Framework

As stated in *The Way We Green* (see section 2.1d), the City requires "compensation within the borders of the city for wetland drainage or alteration (in full or part) for all non-ephemeral wetlands (i.e., Class II, III, IV, and V wetlands in the Stewart and Kantrud system) and all peatlands in the form of restoration or construction of a similarly functioning wetland." Whereas most wetland compensation currently takes place in rural areas outside of the city boundary, Edmonton-based compensation projects would help to maintain some of the ecosystem services of the lost wetlands at the local level.

Developed in 2010, the Wetland Loss Compensation Site Framework (Spencer 2010b) is a launching point for the City's efforts to ensure that future wetland compensation can take place within City of Edmonton boundaries. The purpose of this framework was to identify candidate compensation sites in Edmonton that could be restored by developers as compensation for lost sites. Under the framework, compensation could include:

- Restoration or enhancement of degraded natural wetlands,
- Construction of a stormwater wetland; and/or
- Modification of an existing stormwater management facility, decommissioned and abandoned gravel pit, or park pond, for the purposes of increasing wetland function.

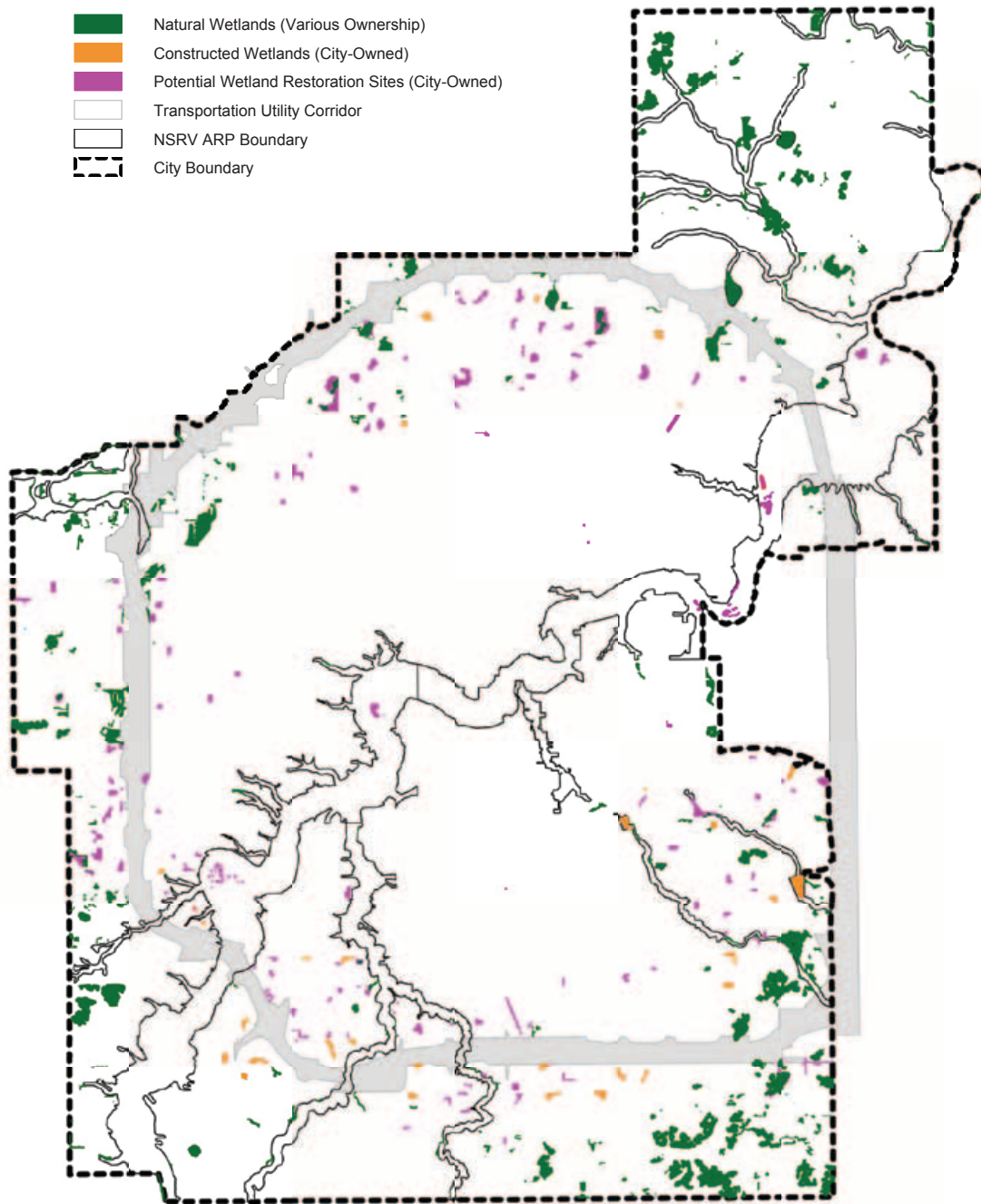
Through the creation of this framework, the City identified the following wetland compensation objectives:

1. Compensate for wetland loss in a timely way, to avoid temporary loss of function.
2. Comply with all applicable municipal, provincial and federal statutes and policies.
3. Through detailed compensation plan design, maximize wetland function provided by compensatory sites.
4. Consider the contribution of surrounding or nearby, structurally connected uplands/wetlands when evaluating compensatory potential.

A total of 294 candidate sites were identified among Edmonton's natural wetlands, stormwater management facilities, park ponds, and gravel sites. These were then ranked according to the following ten factors:

- Site catchment (larger catchment areas ranked highest)
- Site age (older sites ranked highest)
- Site size (larger sites ranked highest)
- Site ownership (City-owned sites ranked highest)
- Proximity to other Storm Water Management Facilities (close proximity ranked highest)
- Proximity to tableland natural areas (close proximity ranked highest)
- Proximity to key components of the ecological network (close proximity ranked highest)
- Ecological barriers (fewest barriers ranked highest)
- Existing programmed use (sites with existing programs and activities ranked lowest)
- School grounds (sites on school grounds ranked lowest)

Map 3.2 shows the location of the top ranked candidate sites, along with Edmonton's natural and constructed wetlands. The map illustrates that restoration of the candidate sites would help to increase wetland habitat in non-peripheral areas of the city, and would bolster Edmonton's network of stepping stones, ecological linkages and core habitat areas.



Data Sources:
Constructed Wetlands obtained from Drainage Facilities database
Natural Wetlands derived from Government of Alberta SPOT satellite wetland data (2003), COE Natural Areas database, and Drainage Wetland Acquisition Plan priority site identification.

Map 3.2: Inventory of wetland sites in the City of Edmonton, including City-owned sites with restoration potential.

b) Wetland Mitigation Bank

Though still conceptual in nature, the City of Edmonton is pursuing the possibility of creating a Wetland Mitigation Bank that would encourage local, ecologically-rich wetland compensation projects.

A Wetland Mitigation Bank would facilitate the sale of credits generated through wetland restoration projects to parties required to carry out wetland compensation. Under this scheme, the City would create or restore wetlands within Edmonton, and would then generate a specific number of credits based on the features of the resulting wetlands. Developers with requirements to compensate for lost wetlands could buy these credits instead of carrying out their own restoration projects. Although the fine details are yet to be determined, it is possible that the City would maintain responsibility for the monitoring and management of the compensatory wetlands, and an authority like the Provincial government would oversee the process to ensure that ecological and financial requirements were satisfied.

A wetland mitigation bank offers some important ecological and economic benefits. This approach:

- Enables wetland mitigation within city limits
- Results in larger, more sustainable wetlands rather than multiple, small parcels,
- Limits uncertainty about the ability of compensation efforts to offset project impacts,
- Reduces permit processing times and administration,
- Eliminates design, construction, monitoring, and maintenance responsibilities for developers.

Although it is still only under consideration at the conceptual level, Wetland Mitigation Banking could help the City ensure that high quality, sustainable wetlands are created and restored within Edmonton city limits.

c) Ecological Restoration Plans

Ecological restoration is an important tool that initiates or accelerates the recovery of an ecosystem with respect to its health and sustainability. One of the City's most extensive and successful wetland restoration projects occurred in 2004 at Roper Natural Area, a constructed

wetland that was designed to mimic a riverine marsh environment, while improving stormwater quality. Located on a formerly polluted stretch of Mill Creek, Roper Natural Area is now an award-winning ecological oasis in the midst of an industrial park. Conservation Spotlight C provides a more detailed description of Roper Natural Area's features and ecology.

This successful restoration project was guided by an Ecological Restoration Plan (Gibbs & Brown Landscape Architects Ltd. & Spencer Environmental Management Services Ltd. 2003), which envisioned restoration of the site's disturbed areas occurring alongside natural succession, with as little intervention as possible. Some of the key aspects of the plan included on-site soil conservation, retention of riparian areas, establishment of wetland, woodland, meadow, and grassland plant communities, habitat enhancements and public education. The plan was developed with the aim of providing a model for future wetland restoration projects in Edmonton, and included a restoration assessment to measure the performance of the plan.

The restoration plan was influenced by the *Guidelines for Developing and Managing Ecological Restoration Projects* (Clewett et al., 2000) set out by the Society for Ecological Restoration (SER). These guidelines provide a framework that can apply to any type of restoration project. The guidelines are grouped into six phases of restoration, with specific tasks associated with each of the phases:

1. Conceptual planning
2. Preliminary tasks
3. Implementation planning
4. Project implementation
5. Post-implementation tasks
6. Evaluation and publicity

With the anticipation of increasing wetland compensation within Edmonton's boundaries, wetland restoration may become more of a focus for the City in the future. The Ecological Restoration Plan for Mill Creek will undoubtedly provide a strong grounding for future restoration projects.



Photo: City of Edmonton

CONSERVATION SPOTLIGHT C: ROPER NATURAL AREA RESTORATION

In the midst of an industrial park in southeast Edmonton lies Roper Natural Area, a naturalized stormwater treatment facility that was created in 2004 on a degraded section of Mill Creek. The site was designed to mimic a riverine marsh environment, and features a large open water area surrounded by emergent vegetation and naturalized planting beds. A treed island stands in the middle of the pond as a hideout for wildlife.

The pond links with riparian areas in nearby Mill Creek ravine and provides excellent habitat for birds, mammals, amphibians and insects. Habitat enhancements at the site include shoreline willow plantings, dragonfly boulders, swallow boxes, and bat boxes. Nature lovers are invited to stroll along a network of walking trails surrounding the wetland.

It is a surprise to most visitors that this ecological oasis has a polluted past. As a former industrial site, the area was contaminated with domestic and industrial waste. 5,600 tonnes of contaminated soil were removed from the area prior to construction, as well as large amounts of rubbish. The successful restoration project has provided an important wildlife refuge in the middle of industrial Edmonton, with positive impacts on the broader ecological network.

3.1.5 CONSTRUCTED WETLAND INTEGRATION TOOLS

The following tools help the City of Edmonton to meet the strategic commitments outlined in section 2.1(e), related to integrating constructed wetlands into the ecological network.

a) Design and Construction Standards

The City of Edmonton uses eight discipline-specific Design and Construction Standards to provide a set of consistent guidelines for all City contracts and private development projects. These standards are not intended to be viewed as rigid requirements. When developers propose variations in the standards that will result in a better outcome overall, the City is receptive to such changes.

Two of these standards include details related to the design and construction of constructed wetlands:

i) Drainage Design and Construction Standard

This standard guides developers through the drainage planning process, and describes the various reports that must be submitted (Figure 3.1). If a constructed wetland is planned for the development, these reports must include information about how the wetland will interact with the surrounding drainage system and watershed, provide detailed design and construction specifications, and describe management and maintenance requirements related to vegetation and water quality. As the process moves from conceptual to detailed, more information is required about the proposed constructed wetland's layout, features, and monitoring and maintenance programs.

| | | |
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| DETAILED | Detailed Engineering Drawings | <p>The Drainage Standard also includes detailed specifications for constructed wetlands, including but not limited to:</p> <ul style="list-style-type: none"> • Sizing • Land dedication • Drainage area • Wetland service area • Number of wetlands • Soil characteristics • Wetland and upland vegetation • Water quality • Sediment forebay • Recreational uses • Access • Signage • Maintenance and monitoring |
| | Neighbourhood Environmental Impact Assessment | |
| | Neighbourhood Hydrogeotechnical Impact Assessment | |
| | Neighbourhood Design Report | |
| | Area Environmental Impact Assessment | |
| | Area Hydrogeotechnical Impact Assessment | |
| | Area Master Plan | |
| | Watershed Plan/Preliminary Drainage Report | |
| CONCEPTUAL | Regional Master Plan | |

Figure 3.1: Reports associated with the Drainage planning process.

The standard specifies that the land required for the constructed wetland will be dedicated to the City, and that it not be part of the municipal or environmental reserve dedications. Generally, the site and its associated right-of-ways will be designated as a Public Utility Lot.

ii) City of Edmonton Landscaping Design and Construction Standard

This standard describes the minimum requirements that developers must meet when preparing and implementing landscape plans. The standard has a section detailing landscape requirements for constructed wetlands. These requirements specify the number, size and spacing of trees and shrubs surrounding the wetland, erosion control techniques, and control of noxious weeds.



b) Stormwater Quality Control Strategy and Action Plan

Edmonton's Drainage Services branch is working to reduce the volume of stormwater entering the North Saskatchewan River and its tributaries, while removing sediment and contaminants from this runoff. The *Stormwater Quality Control Strategy and Action Plan* provides a road map to guide the City as it strives to improve stormwater quality and watershed health. The strategy's guiding principles include:

- Flood and erosion protection,
- Controlling site-specific allowable peak runoff rate,
- Working to advance design standards to also control for total runoff volume
- Supporting the goals of the total loadings approach in partnership with Alberta Environment for the core parameters of nutrients, sediment, and bacteria,
- For existing developed basins, pursue retrofit opportunities where practical and feasible for stormwater quality improvement including end-of-pipe facilities (Kennedale wetland for example),

- Pursue pilot demonstration projects for testing new stormwater design technologies,
- On-going watershed monitoring programs,
- For both new and existing areas, advance and promote innovative stormwater management practices that address quality and quantity.

Constructed wetlands have a key spot within the strategy, due to their important role in flood control and water quality improvements. The action plan states that Edmonton will use "end-of-pipe" retrofit projects to improve run-off quality. Generally, end-of-pipe treatments occur right before stormwater is released into receiving waters. In the City of Edmonton, these projects include the Kennedale, Pylypow and Morris Pond constructed wetlands, with more sites under review. Conservation Spotlight D provides more information about the Kennedale constructed wetland.



Photo: City of Edmonton

CONSERVATION SPOTLIGHT D: KENNEDALE CONSTRUCTED WETLAND

An old gravel pit in Hermitage Park has been transformed into Kennedale Constructed Wetland, with positive impacts for the North Saskatchewan River. While the City's other constructed wetlands are built primarily for flood control, with water treatment as a secondary benefit, the main role of the Kennedale site is to remove pollutants from stormwater, and ultimately, protect the North Saskatchewan River. The award-winning site treats stormwater using the physical, chemical and biological processes that are naturally part of the wetland ecosystem. Pollutants are absorbed by plants and digested by bacteria, and sediments settle out in the wetland before being released to the river.

The Kennedale wetland captures 70% of the run-off from the Kennedale Storm Basin, which covers 7,250 ha and is one of Edmonton's four main storm basins. An estimated 44% of suspended solids will be captured by the wetland before the stormwater is released to the river. The water quality improvements associated with this end-of-pipe facility make it a cornerstone of Drainage Service's Stormwater Quality Strategy.

c) Total Loadings Plan

Edmonton's Total Loadings Plan (TLP) was developed in 2009 with the aim of limiting discharges of total suspended solids (TSS) into the North Saskatchewan River. The TLP outlines how Drainage Services will limit TSS discharges to baseline levels, defined as the long-term average of TSS loading between 2000 and 2008.

According to the TLP, constructed wetlands play and will continue to play an important role in limiting Edmonton's TSS discharges. Together, the Kennedale Constructed Wetland and the planned Groat Road Constructed Wetland are forecasted to considerably reduce TSS discharges, along with other works including enhanced primary treatment, low-flow diversions, and the City's Low Impact Development urban drainage design practices. The TLP is currently under implementation by Drainage Services.

d) Stormwater Servicing Strategy

Edmonton's Stormwater Servicing Strategy is an analysis of the City's entire stormwater drainage system, including piped stormwater collection and conveyance works, stormwater management facilities, real time controls, and outfalls to the various creeks and the North Saskatchewan River. The Strategy identifies deficiencies in the existing system, explores emerging servicing issues, proposes improvements to the system as a whole, and provides strategic policy directions to proactively deal with land drainage issues.

Both natural and constructed wetlands are prioritized within the strategy, for new residential and non-residential developments. The strategy promotes the integration of natural wetlands into the stormwater management system as stormwater-influenced wetlands, through implementation of Drainage Service's Wetland Acquisition Plan. The strategy recommends developing a program to monitor the performance of integrated natural wetlands prior to development, as well as mitigative measures to promote their long-term viability post-integration. Where natural wetlands are not onsite, constructed wetlands are promoted for new residential and non-residential developments, along with a program to monitor their ability to improve water quality.

An implementation plan for the strategy is underway and is based on three time intervals: short-term (within five years), medium-term (five to 10 years) and long-term (10 or more years).

3.2 MANAGEMENT TOOLBOX

3.2.1 MANAGEMENT PLANS AND ACTIVITIES

The following tools help the City of Edmonton to meet the strategic commitments outlined in section 2.2(a), related to wetland management plans and activities.

a) Natural Area Management Plans

Edmonton is implementing its City-Wide Natural Area Management Plan (NAMP), which provides objectives, strategies and operational guidelines for natural areas management across Edmonton's entire ecological network, including all City-owned wetlands. The City-wide NAMP provides guidance for operational staff on the following topics:

- Vegetation
- Wildlife and Habitat
- Safety
- Hydrology and Water Resources
- Human Use
- Education

The management approach is rooted in broad guiding principles, which feed into management objectives and strategies and more detailed operational guidelines (see Figure 3.2). These activities are then integrated into the work plans of City operational staff to ensure that wetlands and other natural areas across Edmonton receive consistent and effective management.

The City-wide NAMP contains objectives and strategies that will help to sustain the basic ecosystem requirements of Edmonton's natural wetlands. For example, the plan lists management objectives for maintaining vegetation health and diversity, responding to invasive species, protecting sensitive species, providing habitat enhancements, addressing vandalism, and maintaining hydrological flows and water quality.

The NAMP also describes the important role that community stewardship plays in the City's natural areas

management approach. As described in section 3.3, citizens are already involved in important monitoring and stewardship activities in Edmonton’s wetlands, and there are many more opportunities available for this type of work.

Linked with the City-wide NAMP are the site-specific NAMPs that are submitted by developers during the planning process. These plans provide more detailed information about the management requirements of specific natural areas, including a baseline description of the natural area and roles and responsibilities for biodiversity management.

Site-specific NAMPs for natural areas containing wetlands may prescribe activities like controlling invasive weeds and planting colonizing species, removal of litter and floating debris, and promoting wildlife use through bird houses, bat boxes and floating vegetative mats. Like the City-wide NAMP, these site-specific management activities are integrated into the work plans of City staff to ensure effective natural areas management. The format of the site-specific NAMPs is currently being updated to ensure consistency between sites and more effective implementation.

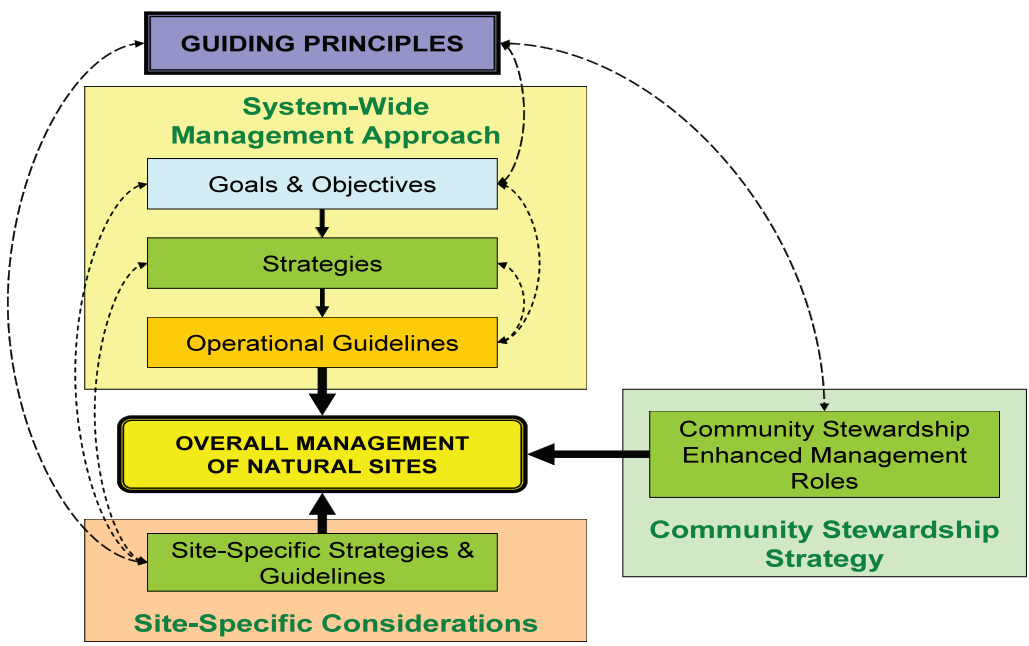


Figure 3.2: The relationship between the City-wide NAMP, the Community Stewardship Strategy, and the site-specific management plans.

b) Urban Parks Management Plan

Edmonton’s Urban Parks Management Plan (UPMP) guides the acquisition, development, maintenance, preservation and use of parkland in the city, including natural areas. The UPMP outlines high-level management guidelines for protected natural areas, including wetlands where applicable. These guidelines are as follows:

- Public access to natural sites will be maintained; however, minimal development will be provided (e.g., signage, trails, park furniture).
- Construction of natural area amenities (e.g., signage, trails, park furniture) will be sensitive to and preserve resident natural features.
- Rare plant and animal habitats will be preserved and protected from urban intrusion through creative design.
- Interpretative signage will increase awareness of natural assets on site.

- Selective planting will support and diversify plant and animal species on site as required.
- Unauthorized structures that are not consistent with plant or animal species preservation will be removed (e.g., tree forts, fire pits, etc.).
- Dead or dying plant material that makes the site unsafe for users will be cut down but will not be removed unless it poses a substantial fire hazard to the community. The plant material left behind will provide habitat for small mammals or insects.
- Invasive noxious weeds and plant species will be removed.
- Developers will provide root barriers or other measures to mitigate weed or root migration from natural areas to surrounding development.
- Wildlife and wildlife habitat will be mapped and protected.

These activities are intended to complement those described in the City-wide and site-specific NAMPs. The UPMP notes that these are interim guidelines that may be influenced or altered by new City management plans for natural areas.

c) Vegetation Management Programs

Edmonton's natural and constructed wetlands are vulnerable to infestations of prohibited noxious and noxious weeds, as identified under the Provincial Weed Control Act. The prohibited noxious classification means that when found, the plant must be destroyed in its entirety. As opposed to prohibited noxious weeds, noxious weeds need to be controlled by inhibiting growth or spread, but destruction of the plant in its entirety is not required.

If left unmanaged, invasive weeds can infiltrate a wetland and degrade its natural balance, by choking out native species, consuming local resources, and reducing overall wetland biodiversity. Furthermore, creek and river systems that connect with local wetlands can facilitate the spread of invasive weeds to other sites, making the management of new infestations nearly impossible.

The City's Vegetation Management team works to control invasive weeds on the land surrounding constructed and natural wetlands, as well as other natural areas and parks, using an Integrated Pest Management (IPM) approach. According to the City's Integrated Pest Management Policy (C501), under the IPM approach "a variety of preventive and non-chemical pest management strategies are used or considered before using the least toxic approved pesticide. Approved pesticide applications will be used in circumstances where alternative practices or products have failed to manage the pest." In wetland areas, preferred weed control techniques include clipping seed heads, hand pulling, weed whipping/mowing, digging, biological control (including the introduction of selective weed-feeding insects), and planting new species to shade weeds out. Depending on the distribution and biology of the targeted weeds, species-specific plans are in place or under development to manage invasive species efficiently.

The following prohibited noxious wetland weeds are of highest concern to Vegetation Management staff:

Purple loosestrife (*Lythrum salicaria*) is wide-spread throughout Edmonton, and poses significant risks to wetland ecosystems. Staff are currently investigating various mechanical and chemical treatments to address purple loosestrife infestations.

Himalayan balsam (*Impatiens glandulifera*) is well-established throughout the river valley and in some ravines. As a water-loving plant, it has a high potential to infest natural and constructed wetlands. A management program is in place, where known infestations are monitored annually and plants removed if necessary.

Several **pale yellow iris** plants (*Iris pseudacorus*) have been found in stormwater ponds in recent years, and localized eradication efforts have been developed in response.

While not currently reported in Edmonton, **flowering rush** (*Butomus umbellatus*) is found nearby in St. Albert along the Sturgeon River. Staff are in close contact with St. Albert's vegetation management team and are on alert in anticipation of its spread.

To date, there have not been any confirmed sightings of **marsh thistle** (*Cirsium palustre*) in Edmonton. City staff remain on watch for it due to its invasive nature and success in other parts of Alberta.

Eurasian water milfoil (*Myriophyllum spicatum*) has been found in other parts of Alberta but its status in Edmonton is currently not known. An intense survey of all large standing water bodies (e.g., stormwater management facilities) is required and planned to be conducted in the future.

In addition, numerous noxious weeds can be found in the upland zone surrounding Edmonton's wetlands, including:

- Canada thistle (*Cirsium arvense*)
- Perennial sow thistle (*Sonchus arvensis*)

- Common Tansy (*Tanacetum vulgare*)
- Scentless chamomile (*Matricaria maritima*)
- Toadflax (*Linaria vulgaris*)

City staff continue their efforts to control these species, and remain on the look-out for new invasives.

In certain cases, vegetation management plans have been developed on a site-specific basis to address weed issues in a consistent and strategic manner. One such site is Fulton Creek/Fulton Creek Marshland, a 30 ha constructed wetland near Whitemud Drive. With numerous noxious weeds on site, City staff developed a vegetation management plan to guide their weed control efforts. A similar plan is currently under development for Mill Creek.



Photo: City of Edmonton

CONSERVATION SPOTLIGHT E: WETLAND WEED I.D. CARDS

Prohibited, noxious weeds are becoming increasingly common in Edmonton's parks and natural areas, and pose a significant threat to wetland ecosystems. In response, the Parks branch developed a plant identification key for use by City staff who are regularly onsite to monitor the operations of constructed and stormwater influenced wetlands.

The pocket-sized guide provides photos and identification features for six prohibited and noxious weeds:

- Purple loosestrife (*Lythrum salicaria*)
- Himalayan balsam (*Impatiens glandulifera*)
- Pale yellow iris (*Iris pseudacorus*)
- Flowering rush (*Butomus umbellatus*)
- Marsh thistle (*Cirsium palustre*)
- Eurasian water milfoil (*Myriophyllum spicatum*)

If any of these species are sighted, staff are asked to report information about species, location and size of infestation to a central email address.

While some of the species being monitored have not yet been positively identified in Edmonton, they all have the potential to infiltrate local wetlands and water bodies. Early detection of these invasives will help City staff to formulate and carry out an effective control plan.

d) Constructed Wetland Management Programs:

According to the City of Edmonton *Drainage Design and Construction Standards*, a developer who creates a constructed wetland is required to manage the site over the course of a two-year maintenance and warranty period. During this time they may be required to remove accumulated sediment, replace or adjust plantings, and manage invasive species. At the end of this period, the developer can apply for a final acceptance certificate, at which time the City becomes responsible for the management of the site.

Drainage Services' Environmental Services area manages and monitors the aquatic portion of the City's constructed wetlands, in addition to its suite of dry and wet ponds. Staff check the inlets and outlets of the constructed wetlands in the spring and fall, and visually inspect the overall health of the site.

The shallow bed and natural vegetation of constructed wetlands can hinder hands-on management practices at these sites. For example, weed outbreaks in wet ponds can be treated mechanically, using large equipment, or sometimes with herbicides. These treatments are not suitable for constructed wetlands. Fortunately, to date, the City's constructed wetlands have been largely self-sustaining, with few requirements for intervention. When unique problems arise, such as algal blooms and foul odours, Drainage Services has hired consultants to investigate the root cause of the issue, and propose solutions. The Environmental Services area is continually trialing new technologies and techniques for wetland management, meaning that management techniques for constructed wetlands will likely evolve over time.

e) License of Occupation Agreements

In some cases, the Province may choose to claim a wetland within Edmonton's boundaries, but grant the management of the site to the City. In this situation, a License of Occupation (LOC) is issued to the City of Edmonton to describe the terms of this agreement, including appropriate uses of the land and general management criteria. For example, an LOC might stipulate that the City control noxious weeds, prevent soil erosion, protect the water body from sedimentation, and maintain native vegetation. While not very common in Edmonton, LOCs normally apply over a long timeframe (e.g. 25 years), and so provide an important opportunity for the City to be involved in the long-term management of a number of conserved wetlands.

f) Mosquito Control Programs

During the spring and summer months, the City of Edmonton runs a program to reduce the production of *Aedes* mosquitoes. The program focuses on the larval stage of the mosquito, which is primarily found in semi-permanent bodies of water, including ditches, small manmade depressions, and Class I and II wetlands. Within city limits, these water bodies are monitored for larvae, and if necessary, treated with Bti, a bacterial-sourced pesticide that targets only mosquito larvae and a few closely related groups of aquatic fly larvae (*Chironomids* or midges). Other invertebrates, wildlife and plants are not impacted by Bti, nor does it reduce soil or water quality.

Permanent bodies of water, including Class IV and V natural wetlands as well as constructed wetlands are not treated because they contribute very little towards nuisance mosquito populations. Additionally, these habitats tend to support more complex insect communities, including mosquito predators like dragonflies.

The Drainage Design and Construction standard (3.1.5 a) requires that developers include design features in constructed wetlands that discourage mosquito breeding. These features may include vegetation management to prevent stagnant backwaters and shading of the water surface, and providing habitat for mosquito predators like purple martin, swallows, dragonflies, and bats.

3.2.2 RESEARCH, MONITORING AND REPORTING TOOLS

The following tools help the City of Edmonton to meet its strategic commitments outlined in section 2.2(b), related to wetland research, monitoring and reporting.

a) Wetland Research and Monitoring

Edmonton's natural and constructed wetlands are the focus of ongoing research and monitoring, with the intention of better understanding the ecology of these systems, and adapting management activities to meet the needs of each site.

In 2007, the City's Drainage Environmental Monitoring group initiated a five year wetland monitoring program to measure the biological functioning of constructed wetlands relative to natural wetlands. Each year, a different combination of wetlands are selected and monitored according to a range of biological indicators. To date, natural, constructed and storm-water influenced wetlands have all been studied. Monitoring has included features like amphibian abundance, plant diversity, bird nesting behaviour, and ecological connectivity. Invertebrate richness and diversity are also measured, in part to learn more about the water quality of each site. Based on these observations, recommendations are made each year that guide the City's design of constructed wetlands and the ongoing management of natural and constructed sites.

Some of the recommendations made during the 2009 monitoring year included (Spencer Environmental 2011):

- When constructing new wetlands that have wildlife productivity as a design feature, or wet ponds designed to naturalize, consider testing methods of installing planting beds (woody communities) that will result in more natural vertical structure but still discourage weed establishment.
- When creation of upland or wetland habitat is a primary project objective, do not mow areas that have been seeded with natural grasses, as this is counter to the wildlife habitat objectives.
- Where naturalization is desired, avoid the use of riprap along wetland margins. Considering the potential contribution of a deep marsh zone to overall site biodiversity, use riprap only when absolutely necessary, even in wet ponds.
- When integrating natural wetlands into development, retain as much of the pre-existing natural habitat as possible.
- When making decisions regarding 1) wetland retention, acquisition and integration, and 2) stormwater facility location and design, continue to promote means of increasing post-development terrestrial and aquatic functional and structural connectivity to increase biodiversity and conservation values.

The results of the annual monitoring program are presented internally to Drainage Services staff. If deemed appropriate, the recommended actions are adopted as part of the Drainage Design Standard upon revision.

In some cases, further research is required to determine if and how the recommendation should be put into action. For example, during the 2010 monitoring year, a recommendation was made to leave a certain buffer of grass unmown around wetlands, in order to preserve shallow marsh and wet meadow communities, provide nesting habitat for waterfowl, and strengthen ecological connections between the wetland and nearby vegetated patches. The City is currently exploring this recommendation by selecting sites that would be amenable to new mowing practices, on a trial basis.

In addition to biological monitoring, water quality is also measured at three of the City's constructed wetlands: Canossa, Fulton Marsh, and Roper Natural Area. Numerous water quality parameters of inlet and outlet flows are studied at each site, including total suspended solids, metals, pesticides, *E.coli*, and various nutrients. Sampling occurs between May and October, both under dry and wet conditions. The Kennedale constructed wetland also has a separate, rigorous water quality monitoring program. Water quality data from all of the sites is compared to water entering the river through stormwater outfalls, in order to gauge the effectiveness of the constructed wetlands at improving stormwater quality.

On top of these biotic and abiotic monitoring programs, Drainage Operations/Environmental Services staff inspect the City's stormwater management facilities (including constructed and stormwater influenced wetlands) several times a month. While these inspections focus primarily on the functionality of the sites from a drainage perspective, such as looking for plugged pipes, staff do perform a visual weed check at each visit.



Photo: City of Edmonton

CONSERVATION SPOTLIGHT F: WETLAND MONITORING BY CITIZEN STEWARDS

Community members are increasingly involved in the monitoring of Edmonton's wetlands. The City's Master Naturalist program, described in detail in section 3.3, provides ecological training to citizen stewards, who then may be involved in ecological monitoring projects at local wetlands.

One program graduate has embarked on a multi-year project to survey the diversity of invertebrate populations in more than 30 stormwater lakes and constructed wetlands across Edmonton. The habitat quality of these constructed water bodies varies widely, with some containing naturalized shorelines and native aquatic vegetation, and others bordered by hard surfaces like concrete or rip-rap. The purpose of the study is to see how well the sites mimic the biodiversity of natural ecosystems, and how the species assemblages found in the lakes and constructed wetlands change with time.

With more than 30 sites already surveyed, some interesting trends are starting to emerge. The more naturalized stormwater facilities have the highest biodiversity, as well as the largest concentrations of higher invertebrate taxa such as dragonfly larvae, which may be an indicator of ecosystem health. Many of the naturalized sites also support songbirds and waterfowl.

Those sites without naturalized edges and with less overall plant cover tend to have lower biodiversity, and are often dominated by a very few number of species. They also tend to be the sites that receive the most public complaints about issues like odours and insect swarms.

The results from these surveys are passed on to City of Edmonton staff involved in the design and maintenance of the stormwater lakes. The City hopes to support such citizen-led monitoring projects into the future, as they bring important benefits to Edmonton's wetlands and other natural areas, and help to build connections with community members.

b) Corporate Reporting

Edmonton's efforts to secure and manage wetlands and other natural areas are reported through several channels. At the highest level, the City's 10-year strategic plan, *The Way Ahead*, includes the following corporate outcome: "The impact of City operations on air, land and water systems is minimized." A corresponding corporate measure of "Total priority natural areas secured" is reported to track progress in this area.

Natural Areas information is also reported through the Parks' Environmental Management System, Enviso. Two indicators are currently monitored: the number of hectares of Priority Natural Areas secured annually, and the number of hectares of natural areas managed by City staff.

Currently, neither of these reporting mechanisms distinguishes wetland conservation or management from other types of tableland natural areas. Improvements to the City's wetland inventory will make it easier to track and report on specific statistics about wetland conservation.

Commitment and Countdown 2010. Inspired to go further in raising awareness about the importance and fragility of Edmonton's natural habitats, including wetlands, the City joined the LAB Communication, Education and Public Awareness (CEPA) WorkNet in 2010, with the goal of strengthening communication and education about biodiversity.

The CEPA program has several components, including the completion of an assessment report to evaluate biodiversity communication and education efforts, both among internal staff and with the general public. This report feeds into the creation of an action plan to address shortcomings and focus on opportunities for improvement that were identified in the assessment report. This action plan is a collaborative effort shared across several City departments, and is currently underway. Once completed, the plan will help the City to communicate more effectively about the importance of wetlands and other natural habitats, and will enhance efforts to engage the broader public in conservation.

3.3 ENGAGEMENT TOOLBOX

3.3.1 CITIZEN STEWARDSHIP AND EDUCATION TOOLS

The following tools help the City of Edmonton to meet the strategic commitments outlined in section 2.3(a), related to citizen stewardship and wetland education.

a) Communication, Education and Public Awareness (CEPA) Initiative

Between 2007 and 2009, the City of Edmonton joined 20 other pioneer cities from around the world in the BiodiverCities program (formerly Local Action for Biodiversity), an international initiative designed to protect and raise the profile of urban biodiversity. During the first phase of LAB, the City completed a Biodiversity Report, created a Biodiversity Action Plan, and pledged support for biodiversity protection through the Durban

b) Master Naturalist Program

In 2009 the Office of Biodiversity launched the Master Naturalist Program, a "learn and serve" program for citizens who are interested in learning more about ecology and naturalization in Edmonton, and being involved in the stewardship of local natural areas. Every summer, up to 30 Edmontonians are invited to become Master Naturalists by attending 35 hours of free training and field trips provided by community members and City employees with expertise and experience in natural areas stewardship. In exchange for this training, participants volunteer for 35 hours in activities that support natural areas management, protection, and education. These program graduates are an extremely valuable resource to the City — knowledgeable, passionate and dedicated ambassadors and stewards who provide much-needed support for the sound management of Edmonton's natural areas.

The program has some important links with wetland conservation. The course includes a field trip to a thriving constructed wetland, and numerous presentations about plants and wildlife found in Edmonton's natural areas, including wetlands. The Master Naturalists are introduced to the concept of ecological monitoring and become well-versed in Edmonton's ecological network approach.

Many program graduates are now engaged in wetland-related stewardship activities. Some Master Naturalists work on a solo basis to monitor the biodiversity of these sites, remove invasive species, and watch for signs of vandalism and other inappropriate uses. Others have formed or joined stewardship groups to pool their efforts in caring for local natural or constructed wetlands. Still more focus on community education and seek to raise awareness about these unique habitats.

To better address the management requirements of individual wetlands and other natural areas, the City is working to coordinate the activities of Master Naturalist graduates with the management tasks set out for each specific site, as described in the Natural Area Management Plans (see section 3.2). By helping Master Naturalists to focus their efforts in this way, the City hopes to address some of the existing gaps in natural area management and monitoring, while enabling citizens to become involved in local, meaningful stewardship activities.

c) School and Facility-based Programs

The City offers several programs that aim to build awareness of and appreciation for Edmonton's wetlands.

At the City of Edmonton's John Janzen Nature Centre, local students are invited to investigate an on-site wetland through the interpreter-led Pond Exploration program. The program's objectives include introducing students to wetland ecosystems and organisms and helping them to understand how human actions can negatively impact wetlands. Offered to a range of grades, students gain appreciation for wetland ecosystems by dipping for insects, viewing local reptiles and amphibians, and handling real wetland artifacts. The field trips have direct links with the school curriculum, and include in-class activities for additional learning.

The City's Drainage Services Branch has developed a set of teacher's guides to educate Edmonton students about their role in protecting local water systems, including wetlands. As part of a program called *Treat it Right!*, the guides are sent to all Grade 4, 5 and 8 teachers in Edmonton. These resources provide teachers with lesson ideas and activities that teach students about Edmonton's wastewater and storm water systems and explain how individual actions benefit the river, wetlands, and aquatic biodiversity. A puppet show and a wetland field trip are offered as program enhancements for some grade levels.

Though not yet part of a formal education program, the Edmonton Valley Zoo is currently constructing a new, interactive trail system called "The Wander." Scheduled for completion in 2013, The Wander will form the central corridor of the zoo and will help visitors to experience the natural features of the North Saskatchewan River Valley. Wetlands are planned to be a key habitat feature of this new area, and there will be associated opportunities for visitors to learn about native flora, fauna and natural areas conservation.

d) Support for Community Groups

Whenever possible, the City supports and partners with local community groups involved in natural areas stewardship. Some of these groups have a specific focus on wetland conservation, and thus play an important role in supporting the aims of this strategy.

Living by Water is an educational program administered by the Federation of Alberta Naturalists that helps waterfront residents to adopt environmentally-friendly practices on their properties in order to maintain shoreline health and water quality. In Edmonton, Living by Water has worked with residents living near stormwater ponds using homesite consultations, “workshops-in-a-box”, and a detailed and creative handbook called “Living Near Urban Lakes”, which was created by the Federation of Alberta Naturalists with funding from the City of Edmonton.

Another partner, Cows & Fish (formally the Alberta Riparian Habitat Management Society) is an organization that strives to foster a better understanding of the value of riparian areas, including wetlands, and how we can manage, protect and restore them. Cows & Fish offers workshops, demonstrations, field days, and ecological monitoring to help Albertans understand the health of riparian areas. Cows & Fish is a partner of the City’s Master Naturalist Program, and has run local riparian assessment and training workshops for Master Naturalists and other community members.

The Edmonton Naturalization Group (ENG) works in partnership with the City on a range of projects focused on protecting and promoting native plants in Edmonton. Some of these have direct, positive impacts on wetland fauna, like the ongoing work of ENG volunteers to steward Hodgson Wetland through weeding, planting native species,

and community outreach. The group also propagates native plants at the City’s nursery for use in naturalization projects, including some wetland-adapted species. Their seeds and plants are available for Edmonton-based restoration projects. In addition, the ENG works to remove invasive plant species from Edmonton’s natural areas. Canada thistle (*Cirsium arvense*) is a common target of their “weed patrol” efforts, and is a plant that can easily infiltrate wetland environments. Members of the ENG have also shared their native plant expertise with the City’s Master Naturalist classes through presentations and field trips.

Increasingly, Edmontonians are forming neighbourhood-based stewardship groups that focus on preserving and improving a local natural area. These groups include the Friends of Kinnaird Ravine, Keepers of Mill Creek, Graunke Park Naturalization Committee, and Hodgson Wetland Stewardship Group, with more still in formation.

These stewardship groups carry out activities such as site monitoring and clean-up, removing invasive plants and planting native ones, and nature interpretation for the community, as outlined in a City of Edmonton Partners in Parks agreement. Such an agreement provides clarity for the City and the stewardship group about the activities to be undertaken, and is revisited and revised as necessary on an annual basis.

The Partners in Parks model offers numerous important benefits to both the City and to the community groups. It also encourages longer-term stewardship activities that respond to the specific management requirements of the natural area. It provides a channel for communication between the City and community stewards, and brings community members together to participate in the preservation of a local natural site.



Photo: City of Edmonton

CONSERVATION SPOTLIGHT G: HODGSON WETLAND STEWARDSHIP GROUP

Hodgson Wetland is a unique wetland in Edmonton's southeast neighbourhood of Hodgson. The 2.2 ha site is a permanent, natural wetland that is home to various waterfowl, songbirds and amphibians, and serves as an ecological stepping stone to other nearby natural areas including Whitemud Creek and a naturalized stormwater pond. The wetland is a very visible part of the surrounding neighbourhood, with houses, pathways and a viewing platform abutting its vegetated shore.

Although protected from future development since 2002, the wetland still faces other challenges associated with its location in a growing suburban neighbourhood. Litter, vandalism, bush parties, pollution and invasive plants pose ongoing threats to the delicate ecological health of the wetland.

A group of committed citizens, including some Master Naturalist graduates, have taken Hodgson Wetland under their wing by forming the Hodgson Wetland Stewardship Group. The group aims protect and enhance the health of the site and raise community awareness about the importance of urban wetlands. A Partners in Parks agreement is in place to describe the group's specific roles and focus.

To date, the group's main activities have included removing garbage and invasive species from the site, and enhancing the existing vegetation. In the spring of 2010 they organized a major planting event to better connect the wetland with Whitemud creek. Volunteers young and old came out en masse and planted 500 native plants within a single morning, which will help to enhance ecological connectivity and boost overall biodiversity.

3.3.2 PARTNERSHIP TOOLS

The following tools help the City of Edmonton to meet the strategic commitments outlined in section 2.3(b), related to partnership-building for wetland conservation.

a) Land Trust Partnerships

Land trusts play an essential role in promoting voluntary land conservation, and are very important partners for wetland conservation. The City of Edmonton is one of six partners and a founding member of the Edmonton and Area Land Trust (EALT). The other partners are the Edmonton Community Foundation, the Edmonton Nature Club, the Urban Development Institute, the Land Stewardship Centre of Canada, and the Legacy Lands Stewardship Society. The EALT is a not-for-profit charitable conservation agency that was established by the City of Edmonton in 2006, through organizational support and funding of \$3 million. It uses a range of tools to protect natural areas, including donations of land and money, land purchase, and the use of conservation easement agreements.

In 2010, the City of Edmonton signed a Memorandum of Understanding (MOU) with the EALT. The MOU is not legally-binding but is intended to strengthen and clarify the organizations' shared goal of conserving wetlands and other natural areas in Edmonton. The MOU states that the EALT and the City will work together to achieve the

purchase of land or conservation easements for some of the fifteen priority natural areas outlined in the Natural Areas Acquisition Strategy and securement priorities for the North Saskatchewan River Valley and Ravine System.

Within this MOU, the EALT's primary role is to consult with relevant landowners and provide them with information about their conservation options. The City supports this role by offering the EALT applicable natural areas information, technical help, and assistance with landowner consultations, as required. Should a natural area be available for conservation, funding may be provided from the City's Natural Areas Acquisition Strategy, with possible contributions from the EALT. Both organizations hope that they can work synergistically to secure important pieces of Edmonton's ecological network.

The City of Edmonton is also a member of the Alberta Land Trust Alliance (ALTA), a non-profit, province-wide organization comprised of individual land trust organizations and supporters. The ALTA's goal is to increase land trust collaboration, provide leadership, build capacity and promote awareness about land conservation in Alberta. The Alliance strives to ensure that Alberta's future landscapes are rich in biodiversity and have strong ecological integrity. The ALTA speaks as a unified voice on behalf of the province's 12 land trusts, including the Edmonton Area Land Trust.



Photo: Dave Conlin

b) Regional Partnerships

From the point of view of many of Edmonton's travelling or migrating species, the city's ecological network is only a small part of a larger regional landscape. The wetlands, forests, farmland, industrial complexes and human settlements that surround the city form a regional network of stepping stones, corridors and core habitat areas. Ecological processes cross right through Edmonton's urban boundaries, making regional partnerships a key ingredient of the City's conservation strategy.

The City of Edmonton has recently been involved in a wetland-based regional partnership that resulted in the creation of the first provincial park in many years, and the protection of a provincially significant biodiversity hot spot. In 2005, the City partnered with the Province and several municipalities bordering Big Lake, in Edmonton's northwest, to see the creation of Lois Hole Centennial Provincial Park. The park's wetland ecosystem is surrounded by healthy uplands and is globally recognized as a significant bird area due to its large nesting grounds and many migrating waterfowl. This partnership made important contributions to regional wetland conservation, and will serve as a foundation for future regional partnerships. Conservation Spotlight A (3.1.1d) provided more information about Big Lake.

Regional conservation will also undoubtedly be guided by the Capital Region Growth Plan. In 2008 the City of Edmonton joined 23 adjacent municipalities to form the Capital Region Board. Together they created the Capital Region Growth Plan with the shared goals of coordinating their efforts to manage growth while minimizing their development footprint, strengthening communities, focusing on transit-oriented development, and ensuring a strong economy in the future.

One component of the Capital Region Growth Plan, the Land Use Plan, contains a policy that aims to protect wetlands on a regional scale. It states that "any development which fragments contiguous natural features, functions and habitat, such as water systems, moraines, forests, wetlands and wildlife habitat and corridors shall be discouraged" (Capital Region Board, 2009). This policy provides a strong, positive direction to guide regional wetland partnerships in the future.

c) Provincial Partnerships

The challenges and threats that face Edmonton's urban wetlands are very distinct from those impacting Alberta's non-urban wetlands. The City realizes that participation in partnerships at the provincial level can help ensure that the unique situation of urban wetlands is reflected in provincial wetland plans and policies. To this end, the City has been and continues to be involved with numerous provincial bodies that make important decisions about Alberta's wetlands.

Established in 2004, the Alberta Water Council is a multi-stakeholder partnership with 24 members from government, industry, and non-government organizations. The Council's primary task is to implement Alberta's Water for Life strategy and to champion achievement of the strategy's three outcomes of a safe, secure drinking water supply, healthy aquatic ecosystems, and reliable, quality water supplies for a sustainable economy. The City of Edmonton represents the Large Urban Sector on the Council.

Edmonton has also been involved in the Province's efforts to create a new Wetland Policy. From 2005 - 2008, the City was represented on the Provincial Wetland Policy Working Group, which was established by the Alberta Water Council to develop recommendations for the new policy. Currently, the City's Office of Biodiversity represents the Alberta Urban Municipalities Authority (AUMA) on the provincial Relative Wetland Function Working Group.

d) International Partnerships

Edmonton also has an expanding network of conservation partnerships in the international sphere. Since 2007 the City has been involved with the BiodiverCities program (formerly Local Action for Biodiversity), an international initiative led by ICLEI Local Governmental for Sustainability. The program aims to help local governments conserve biodiversity within the urban environment by linking them together to share their experiences, successes and challenges, and by providing technical support and advocacy. As a BiodiverCities pioneer, Edmonton was one of the first cities to participate in the program, joining 20 other leaders in the field of urban biodiversity such as Bonn, Germany; Durban, South Africa and Leicester, UK.

BiodiverCities partners are invited to participate in a multi-phase program. During phase one, Edmonton produced a Biodiversity Report and associated Biodiversity Action Plan, and signed the Durban Commitment and Countdown 2010 to pledge support for biodiversity protection. The City's second phase of work, currently underway, focuses on improving communication and education about biodiversity through the Communication, Education and Public Awareness (CEPA) WorkNet. CEPA was described in more detail in section 3.3.1a.

In 2009, Edmonton joined 40 other cities in an initiative called the City Biodiversity Index (CBI), run by the Convention on Biological Diversity, the Global Partnership on Cities and Biodiversity, and the Singapore National Parks Board Convention on Biological Diversity. The CBI is

comprised of 23 indicators, which together measure native biodiversity within the city boundary, the ecological goods and services provided by this biodiversity, and the quality of governance related to ecological conservation. Care was taken during the creation of the CBI to ensure that the indicators are general enough that they can be applied successfully to cities in every part of the world. The index is primarily designed to be used by individual cities as a self-assessment tool, but the results from participating cities will also be shared publicly so that they can learn from and be inspired by one another.

The City is also a partner of the PLUS Network (Partners in Long-Term Sustainability), a network of over 30 cities from around the world committed to action that supports urban sustainability through integrated strategic planning and best practices.

Together, these partnerships have helped the City to learn about best biodiversity practices from other parts of the world, and to build internal momentum by linking to a global conservation movement. Though none of the international partnerships focus specifically on wetlands, they all help to advance the City's conservation agenda, and thus indirectly support the aims of this strategy.

4.0 CONCLUSION

The City of Edmonton's dedication to wetland conservation is embedded in the myriad of commitments and tools described in this strategy. These have been developed over time in response to both the growing stresses facing natural wetlands, and the important drainage and ecological potential of constructed wetlands. The aim of this strategy is to document the existing wetland-related plans, policies and activities that are currently threaded throughout various City branches and offices and pull them together in one document. It is hoped that this united approach will make the City's approach to wetland conservation more consistent and effective, and will lead to broader understanding of the issues at hand.

This strategy is not intended to be a final outcome of the City's wetland conservation work. Rather, it is meant to be a launching point for new, innovative conservation commitments and tools that can push the City's conservation effort to a new level. While there are already many important tools in place to protect Edmonton's wetlands, without future action these areas will face increasingly serious threats. The City and its partners must continue to reach higher and farther to ensure that wetlands remain an enduring part of Edmonton's landscape.



Photo: Dave Conlin

GLOSSARY

Compensation

Activities undertaken to increase wetland function at a particular site as a means of offsetting unavoidable loss of wetland function elsewhere.

Conservation Easement

A voluntary agreement between a private landowner and a qualified organization whereby the landowner donates the ecological and/or natural portions of his/her land while still retaining title to the land.

Constructed Wetland

Constructed stormwater wetlands are human-made systems, designed, constructed and operated to emulate natural wetlands or many of their biological processes.

Ecological Buffer

An area of land adjacent to or surrounding a wetland that provides protection from pollutants, neighbouring land uses and other human impacts.

Ecological Information

Information submitted during the development process which identifies and describes affected natural areas, analyzes potential impacts from development, and describes the site in context of the broader ecological network.

Ecological Network

A coherent system of natural and/or semi-natural landscape elements that is configured and managed with the objective of maintaining or restoring ecological functions as a means to conserve biodiversity.

Ecosystem Services

Ecosystem services are the benefits that people derive from nature, including provisioning, regulating, supporting, and cultural services.

Environmental Reserve

Under the Municipal Government Act, municipalities can claim the following land as Environmental Reserve (ER) at the time of subdivision: Swamps, ravines, coulees or natural drainage courses; unstable lands or lands subject to flooding; or narrow buffers for the purpose of pollution prevention or public access.

Environmentally Sensitive Area

An undisturbed or relatively undisturbed site which, because of its natural features, has value to society and ecosystems worth protecting, but is susceptible to further disturbance.

Ephemeral Wetland

An area that is periodically covered by standing or slow moving water and that has a basin typically dominated by vegetation of the low prairie zone, similar to the surrounding lands. Because of the porous conditions of the soils, the rate of water seepage from these areas is very rapid, and surface water may only be retained for a brief period in early spring.

Municipal Reserve

First, the *Municipal Government Act* (MGA) enables the City of Edmonton, at the time of subdivision, to claim up to 10 percent of the total developable land area as Municipal Reserve (MR), to be used as a public park, public recreation area, school, or to separate lands used for other purposes. During wetland conservation, MR can be used to secure adjacent upland habitat needed to support the lifecycle requirements of many wetland species.

Prohibited Noxious Weed

A plant designated by the Weed Control Act as noxious. Under the Weed Control Act a local authority may conduct control programs for these weeds if they feel they may have significant ecological or economic impact on lands within their municipality.

Peatland

A type of wetland that forms in cool, wet areas where drainage is poor and the soil lacks oxygen and nutrients.

Priority Natural Area

Edmonton's unprotected Significant Natural Areas and Environmentally Sensitive Areas, the North Saskatchewan River Valley and Ravines System, and other individual areas identified during the planning process.

Prohibited Noxious Weed

A plant designated by the Weed Control Act as prohibited noxious. Under the Weed Control Act a person has a responsibility to destroy a prohibited noxious weed.

Restoration

Re-establishment of a naturally occurring wetland with a functioning natural ecosystem whose characteristics are as close as possible to conditions prior to drainage or other alteration.

Significant Natural Area

A natural site that has the potential to remain sustainable within an urban environment and is significant from an environmental perspective to the community of Edmonton because of its size or features.

Stormwater

Water that flows into the sewers from the surface (streets, yards, etc.) is referred to as stormwater.

Stormwater Influenced Wetland

A natural wetland that have been integrated into a stormwater management system (i.e. receives some or all of its water from the purposeful redirection of stormwater runoff) without significant physical disturbance to the wetland.

Tableland Natural Area

A natural area (normally wetland, grassland or treestand) located in upland areas above the North Saskatchewan River Valley and Ravine System.

Wetland

Land having the water table at, near, or above the land surface or which is saturated for a long enough period to promote wetland or aquatic processes as indicated by water-saturated soils, water-loving vegetation, and various kinds of biological activity which are adapted to the wet environment.

Wetland Conservation

The cumulative activities of wetland securement, management and engagement.

Wetland Mitigation Banking

The restoration, creation, enhancement, or preservation of a wetland, which offsets expected adverse impacts to similar nearby *ecosystems*.

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APPENDIX A: HISTORICAL INVENTORIES OF EDMONTON'S NATURAL AREAS

The City of Edmonton began carrying out inventories of its natural areas as early as 1986, with the goal of tracking progress of conservation efforts and better understanding the natural connections present within Edmonton's ecological network. The following are some of the City's most detailed landscape inventories:

- **Urban Natural History Interpretive Sites In and Adjacent To Edmonton** (City of Edmonton 1986): This inventory was conducted, in part, to survey natural features of the 357 km² annexed to Edmonton in 1982. The inventory describes and maps the dominant natural vegetation types on Edmonton's tablelands. After 'deciduous woodland', the 'willow/wetland' classification was the second most common vegetation type of the 1049 natural areas identified in the report.
- **Inventory of Environmentally Sensitive and Significant Natural Areas** (Geowest 1993): This report was the first to identify Environmentally Sensitive and Significant Natural Areas in Edmonton's tablelands. A total of 311 sites were identified as Natural Areas, of which 27 were labeled as Significant Natural Areas (SNAs, defined as sites that would have low to moderate sensitivity to disturbance) and 38 as labeled Environmentally Sensitive Natural Areas (ESAs, defined as sites that would be highly sensitive to disturbance). Together, these SNAs and ESAs comprise Edmonton's Priority Natural Areas.
- **Natural Areas in Edmonton: An Assessment of Conservation Value and Potential** (Geowest 1999): This report ranked 63 of the ESAs and SNAs identified in 1993 according to five criteria: Biophysical features, ecological integrity, ecological uniqueness, geographical distribution, and land use pressure. Each site is described in an appendix, with details provided about habitat types, including wetlands. In many cases the natural areas are defined by a combination of habitats, including treestands, shrublands, grasslands and wetlands.
- **Conserving Edmonton's Natural Areas** (Westworth 2001): This report narrowed down the 63 sites identified in Geowest (1999) to compile a short-list of 13 natural areas recommended for conservation. The site-selection criteria included linkages, size, diversity, cost, opportunity, ecological importance, threats, location, and accessibility. The report recommended that these 13 sites be prioritized for purchase using City natural areas funding.
- **Edmonton State of Natural Areas Report** (Spencer Environmental 2006): In this report, aerial photos were used to inventory all natural areas in Edmonton's tablelands, river valley and surrounding regions and examine the loss of sites between 1993 and 2005. A connectivity analysis was then performed to develop an understanding of Edmonton's Ecological Network.
- **Natural Areas Loss Assessment** (Golder 2007): With this inventory, the City began assessing natural area loss on an annual basis, using aerial photos. This loss assessment also included a retrospective analysis back to 2000. Aerial photo analysis will continue each year into the future and provides a strong basis for corporate reporting about natural areas conservation (see Section 3.2).
- **Remote Sensing Analysis** (Golder 2011): This inventory used high resolution satellite imagery to map various features of Edmonton's natural landscape, including wetlands. However, challenges with the data set meant that obtaining detailed information about wetlands, like zonation of site features and identification of wetland class was not possible.

- **Wetland Acquisition Plan** (Spencer Environmental 2010a, and Associated Engineering and Spencer Environmental 2011): This inventory was part of a study conducted for Drainage Services to identify wetlands for acquisition and integration into the City's stormwater infrastructure. Various inventory tools were used in the study, including an analysis of mapped depressions greater than 1 ha and intersecting a known natural area. While this tool has some important data limitations, in combination with the other tools used in the survey, it helped to identify 50 potential sites for acquisition.

The Government of Alberta also conducts wetland inventories. Two inventories in particular contain valuable information about Edmonton's wetlands:

- **The SPOT Inventory** covers nearly all of Edmonton's land area. The inventory was derived using the SPOT satellite and classifies wetlands as Lentic Alkali, Lentic Seasonal, Lentic Semi-Permanent, Lentic Temporary or Lentic Open Water. The SPOT inventory uses multiple years of imagery with the majority being from 2000 to 2003, and has a minimum mapping unit of 0.04 ha. Within Edmonton city limits the wetland types and associated areas captured are:
 - Lentic Alkali (1,070,790 m²)
 - Lentic Seasonal (3,388,0794 m²)
 - Lentic Semi-Permanent (28,794,356 m²)
 - Lentic Temporary (7,701,511 m²)
 - Lentic Open Water (11,276,717 m²)
- **The Hi-Res Inventory** contains wetlands that were digitized from 2007 aerial photography at scales around 1:30,000. Wetlands were classified to the Canadian Wetland Classification System which identifies wetlands as either Marsh, Bog, Fen, Open Water or Swamp. The inventory has a minimum mapping unit of approximately 3x3m. In Edmonton, the wetland types and associated areas captured are Marsh (65,868 m²) and Open Water (81,752 m²).

APPENDIX B: PLANNING CHECKLIST FOR THE CONSERVATION OF NATURAL WETLANDS

1. Are there any Environmentally Sensitive Areas, Significant Natural Areas, Natural Areas or other natural features in the planning area?

If Yes:

- An **Ecological Network Report** is necessary for a Servicing Concept Design Brief, Area Structure Plan, major plan amendment, and potentially for a Neighbourhood Area Structure Plan.
- **Stage 1 and 2 Natural Site Assessments** are required if processing an application for a Neighbourhood Area Structure Plan, Neighbourhood Structure Plan, or major plan amendment.
- In plan areas that contain or abut regionally significant ecological areas (e.g., Big Lake, Upper North Saskatchewan River Valley) preparation of an **Ecological Design Report** may be required.
- If a decision is made to retain a natural area, a **Natural Area Management Plan** will be required at the Neighbourhood Structure Plan stage.

2. Are there any ponds, wetlands, sloughs or lakes in the planning area?

If Yes:

- **Crown Ownership Verification** is required. The Province owns the bed & shore of all permanent and naturally occurring water bodies. The boundary of Provincial ownership must be determined as soon as possible, preferably at the Area Structure Plan stage. If not already provided, this determination must be provided at the current planning stage. Responsibility for this determination rests with the applicant. This also applies to permanent & naturally occurring water bodies that have been filled.
- If the Province does not claim bed & shore of a water body, the City of Edmonton may require that it be retained as Environmental Reserve (ER) in accordance with the Municipal Government Act and *The Way We Green* Strategic Action 3.5.2 (regarding Class III, IV, and V wetlands and peatlands).
- Dedication of ER buffers around Crown water bodies and those retained by the City should follow procedures outlined in the Office of Biodiversity's *Guidelines for Determining ER Dedication for Wetlands and other Water Bodies* (Attachment 3 of Natural Area Systems Policy C-531).

3. Does the Proponent propose to alter any wetland areas?

If Yes:

- The Province owns all of the water in Alberta. Any wetlands that are drained, filled or altered will require an approval from Alberta Environment.

