

# Calgary Wetland Conservation Plan



# Table of Contents

<b>Acknowledgements</b> .....	<b>2</b>	<b>Monitoring Program</b> .....	<b>32</b>
<b>Introduction</b> .....	<b>6</b>	1. Inventory Monitoring (Landscape Assessment) .....	32
<b>Vision, Principles and Goals</b> .....	<b>8</b>	2. Development Standards/Wetland Restoration Monitoring .....	33
1. Vision .....	8	3. Ecological Monitoring .....	34
2. Principles And Goals .....	8	4. Economic Monitoring .....	34
2.1. <i>Conservation and Sustainability</i> .....	8	<b>Wetland Management</b> .....	<b>36</b>
2.2. <i>“No Net Loss”</i> .....	9	<b>Implementation Plan</b> .....	<b>37</b>
2.3. <i>Regional Planning</i> .....	10	<b>Appendix 1-9</b> .....	<b>38</b>
2.4. <i>Management of Wetland Habitats</i> .....	10	Appendix 1: Steward & Kantrud Wetland Classification System .....	38
2.5. <i>Wetland Monitoring and Research &amp; Development Program</i> .....	10	1. Class I – Ephemeral Ponds .....	38
2.6. <i>Public Education</i> .....	11	2. Class II – Temporary Ponds .....	39
<b>Types of Calgary Wetlands</b> .....	<b>12</b>	3. Class III – Seasonal Ponds and Lakes .....	40
<b>Inventory</b> .....	<b>14</b>	4. Class IV – Semi-permanent Ponds and Lakes .....	41
<b>Development Approval Policies</b> .....	<b>16</b>	5. Class V – Permanent Ponds and Lakes .....	42
1. Community Plan Policies .....	16	6. Class VI – Alkali Ponds and Lakes .....	43
2. Land Use/Outline Plan Policies .....	17	7. Class VII – Fen (alkaline bog) Ponds .....	43
2.1. <i>Crown Owned Wetlands</i> .....	17	8. Spatial Relationship of Vegetation Zones .....	44
2.2. <i>Environmental Reserve (ER) &amp; Natural Area Wetlands</i> .....	17	Appendix 2: Wetland Environmental Significance Assessment (ESA) .....	45
3. Tentative Plan Policies .....	21	Appendix 3: Tools for Wetland Protection .....	46
4. Construction Plan Policies .....	22	Appendix 4: Legal Tools for Municipalities to Conserve Environmentally Sensitive Areas .....	48
<b>Mitigation Process</b> .....	<b>24</b>	1. Designation Tools .....	48
<i>Mitigation Options</i> .....	25	2. Sales And Purchase Transactions .....	49
<b>The Benefits of Wetlands</b> .....	<b>26</b>	3. Gifts .....	50
<b>Issue Identification</b> .....	<b>28</b>	4. Personal, Term And Common Law Partial Interests .....	51
<b>Role of the Wetland Conservation Plan</b> .....	<b>30</b>		



- 5. Administrative And Planning Tools, Traditional . . . . . 53
- 6. Administrative/planning Novel. . . . . 54
- 7. Regulatory And Administrative Tools . . . . . 55
- Appendix 5: Mitigation. . . . . 56
  - 1. Avoidance Of Impact. . . . . 56
  - 2. Minimization And Mitigation Of Impacts . . . . . 56
  - 3. Mitigation For Impacts That Cannot Be Minimized. . . . . 56
- Appendix 6: Federal, Provincial and Municipal Legislation . . . . . 60
  - 1. Federal Legislation. . . . . 60
  - 2. Provincial Legislation. . . . . 61
  - 3. Municipal Legislation. . . . . 62
- Appendix 7: Wetland Functions and Values. . . . . 63
  - 1. Life Support . . . . . 63
  - 2. Hydrology. . . . . 64
  - 3. Water Quality . . . . . 65
  - 4. Socio-economic. . . . . 66
- Appendix 8: Review of Wetland Policies within Canada, the United States and Internationally . . 67
- Appendix 9: Wetland Functional Assessment. . . 70
  - 1. Introduction . . . . . 70
  - 2. Function . . . . . 70
  - 3. Assessment Methods . . . . . 70
  - 4. Utility in Mitigation . . . . . 71
  - 5. Terms of Reference . . . . . 71
- Glossary . . . . . 73**
- Maps . . . . . 77**
- Bibliography . . . . . 80**

**Document Abbreviations**

<b>BIA</b>	Biophysical Impact Assessment
<b>CCC</b>	Construction Completion Certificate
<b>ENGO</b>	Environmental, Non-Governmental Organization
<b>ER</b>	Environmental Reserve
<b>ESA</b>	Environmental Significance Assessment
<b>FAC</b>	Final Acceptance Certificate
<b>GIS</b>	Geographic Information Systems
<b>MR</b>	Municipal Reserve
<b>MSR</b>	Municipal School Reserve
<b>PE</b>	Public Park, School and Recreation District
<b>PUL</b>	Public Utility Lot
<b>SWMF</b>	Stormwater Management Facility
<b>TLL</b>	Total Loading Limitations

# Acknowledgements

The Wetland Conservation Plan took over one year to develop and involved the co-ordination, input and collaboration of several individuals and groups. These policies and procedures for wetland protection are the result of their dedication, hard work and awareness of the need to ensure that residential, commercial and industrial development continues in an orderly manner. The City of Calgary Parks would like to take this opportunity to acknowledge and thank all those involved:

## Project Management

Dennis LaFreniere, Planner, City of Calgary Parks.  
Chris Manderson, Planner, City of Calgary Parks.

## Working Committee

A Wetlands Working Committee was established to ensure that the Wetland Conservation Plan is comprehensive, sustainable and meets multiple needs. This committee assisted with the research, analysis and development of a draft policy and was made up of the following individuals. Thank you for your hard work:





## Key Stakeholder Advisory Committee

The Key Stakeholder Advisory Committee advised on the content of the Terms of Reference for the project, provided valued input through an issue identification workshop, and worked toward consensus on the content of the policy. Thank you to all of the members of the Advisory Committee:

Neil J. Angus

*Municipal District of Rocky View No. 44*

Jarret Berezanski

*Alberta Transportation*

*Planning*

Carolyn Bowen

*City of Calgary*

*Utilities and Environment Protection*

Jerry Brunen

*Ducks Unlimited Canada*

Bob Clark

*Carma Developers Ltd.*

*Urban Development Institute*

Deborah Cooper

*City of Calgary*

*Planning & Transportation Policy*

Yin Deong

*City of Calgary*

*Wastewater & Drainage*

Karen Donnelly

*City of Calgary*

*Planning & Transportation Policy*

Dave Elphinstone

*City of Calgary*

*Parks Resource Management*

Judy Ferguson

*Urban Development Institute*

Heather Ferguson

*Enviro Consult*

*Urban Development Institute*

Don Gerlinsky

*Alberta Infrastructure*

Paul Gregoire

*Canadian Wildlife Service*

*Environment Canada*

Denis Gourdeau

*City of Calgary*

*Parks Resource Management*

Hugo Haley

*University of Calgary Student*

*Calgary Wetlands Committee*

Tim Haufe

*City of Calgary*

*Law*

Heather Hemingway

*MD of Foot Hills*

Kim Jaska

*City of Calgary*

*Utilities and Environment Protection*

Michael Kenny

*City of Calgary*

*Parks Planning and Design Services*

# Acknowledgements

Gary Kindrat

*Ducks Unlimited Canada*

Denise Kors

*City of Calgary*

*Land Use & Mobility*

Judy Lupton

*City of Calgary*

*Development & Building Approvals*

Paula Magdich

*City of Calgary*

*Roads*

Patrick Mahaffey

*City of Calgary*

*Parks Planning and Design Services*

Sheena Majewski

*Fisheries and Oceans Canada Central and Arctic Region*

Dwayne Manchak

*Alberta Environment*

*Water Administration, Bow Region*

Greg McAndrews

*Sustainable Resource Development*

*Public Lands*

Steve Meadows

*Bow River Basin Council/River Valleys Committee*

Sandy Menzies

*City of Calgary*

*Corporate Properties*

Bill Morrison

*River Valleys Committee*

George Nieuwenhuis

*City of Calgary*

*Corporate Properties*

Grant Pearsell

*City of Edmonton*

*Planning*

Bob Pella

*Calgary Field Naturalists' Society*

Ian Rudland

*Alberta Environment*

*Water Management Division*

Pauline Scoffield

*Alberta Environment*

*Regional Services*

Kathy Strong-Duffin

*City of Calgary*

*Environmental Management*

Paul Taylor

*Hopewell*

*Urban Development Institute*

Tracy Tarves

*Parks Foundation, Calgary*

Terry Thompson

*Calgary Airport Authority*

Dave Travis

*City of Calgary*

*Urban Development*

Ron Ui

*Alberta Infrastructure*

David Weinkauff

*National Association of Industrial & Office Properties*

Les Wetter

*Ducks Unlimited Canada*

Pat Young

*Fish and Wildlife*

*Wildlife Management Branch*

Peter Ziriada

*City of Calgary*

*Parks Planning and Design Services*

### **Other Key Stakeholders, General Public and Community Associations**

The City of Calgary Parks would also like to thank all the community associations and other key stakeholder groups for their willingness to review and comment on the Public Draft for Discussion. Finally, we would like to thank the members of the general public who took time out of their busy schedules to attend the public open houses and provide us with valuable input.

### **Editorial Assistance**

Thanks to Julie Sengl, Calgary Parks for editing and proofreading the final draft.

# Introduction

The City of Calgary is home to some of the most significant wetland areas in North America.<sup>1</sup> In 1981, it was estimated that 78 per cent of the pre-settlement wetlands in Calgary had been lost. Today, the estimate is closer to 90 per cent. Urban development is now extending into areas of significant wetland complexes, some of which are considered provincially and nationally significant to breeding waterfowl.<sup>2</sup> These wetlands also play an important role in improving water quality and quantity, reducing flooding and soil erosion, providing bio-diversity, moderating climate conditions, contributing to an aesthetic urban design, and providing educational and recreational opportunities. To ensure that these benefits remain viable and sustainable for our future generations, The City of Calgary has developed the Wetland Conservation Plan, which sets priorities and explores alternatives for wetland conservation in order to guide future urban development.

In developing the Wetland Conservation Plan, several issues were identified by a Key Stakeholder Advisory Group (see Acknowledgements). They included:

- adherence to related provincial and federal laws and policies;

<sup>1</sup> U.S. Prairie Pothole Joint Venture. 1995. U.S. Prairie Pothole Joint Venture Implementation Plan (update). 86 pp. Jamestown, ND

<sup>2</sup> Ibid.

- ensuring “No Net Loss” of Calgary Wetlands by promoting their conservation and/or mitigation within areas of future urban development and within transportation and utility corridors;
- maintaining or improving local water quality and quantity;
- ensuring orderly and cost-efficient development of lands within the city while addressing engineering constraints;
- the use of naturally occurring wetlands for stormwater treatment while ensuring their long-term viability;
- identifying and mitigating the effects of telecommunication lines on avian life; and
- providing consistency, efficiency and effectiveness in dealing with wetlands through the development application process.

One major challenge in the development of the Wetland Conservation Plan was to ensure that The City maintains or improves local water quality and quantity while adhering to related provincial and federal laws and policies. A municipality’s authority for the protection of wetlands is primarily through the *Municipal Government Act* (i.e. protection as Environmental Reserve or protection as Municipal Reserve). The result within the Wetland Conservation Plan is that:





1. Approximately 600 wetlands were classified as seasonal, semi-permanent, permanent or alkali ponds within our wetland inventory (see p.18). These are the only wetlands that The City can legally classify and protect as Environmental Reserve, thus ensuring their long-term contribution to local water quality and quantity.
2. Approximately 6,800 ephemeral and temporary ponds which contribute to groundwater discharge/recharge and water purification (see Appendix 7, Items 2 and 3) are primarily protected through the *Provincial Water Act* which is administered by Alberta Environment. Through the development of the Wetland Conservation Plan it was recognized that The City of Calgary can assist in the protection of these wetlands by:
  - helping proponents of development adhere to legislation/regulations by circulating Community Plans and Land Use/Outline Plans to the appropriate provincial and federal agencies;
  - acquiring those wetlands that have been deemed environmentally significant or are of a quality and character that warrant conservation within a Natural Environment Park (see Conservation Plan 2.2.9, p. 23);
  - establishing a Total Loading Limits (TLL) program and action plan based on target limits of pollutants into the Bow River;
  - proactively planning for the quality of stormwater runoff in new communities in accordance with *Wastewater's Stormwater Management & Design Manual*; and
  - circulating all Master Drainage Plans to Alberta Environment for their approval at the Community Plan stage.

The *Wetland Conservation Plan* has policies and procedures for the timely identification of Calgary Wetlands and their associated environmental significance in order to ensure their conservation and/or mitigation within the development approval process (i.e. Community Plan stage through to Construction Plan stage). Guidelines have also been established for the implementation of a monitoring program that will continually evaluate the success of implementing the policies and procedures. Finally, criteria have been established for the development of management plans that will ensure the efficient and effective operation and maintenance of the city's wetlands.

# Vision, Principles and Goals

## 1. Vision

Calgarians have an awareness, understanding and appreciation of the benefits of wetlands. As a result, wetlands have become an integral part of our city's urban fabric and they are maintained for the benefit, use and enjoyment of present and future Calgarians and visitors.

## 2. Principles and Goals

### 2.1. Conservation and Sustainability

Balancing the conservation of Calgary's Wetlands within the context of urban development is a priority for The City. The primary goals for meeting this principle are:

2.1.1. Efforts shall be made to **avoid the impact from development** on Calgary Wetlands that are environmentally significant and/or contribute to water quality and quantity, and that can be integrated into urban development while maintaining their ecosystem survivability and sustainability.

2.1.2. The contribution of wetlands to water quality and quantity shall be considered in terms of:

a. the local watershed and/or aquifer; and

b. the Total Loading Limitations (TLL) which manage total pollutant loadings to the Bow River, in order to ensure acceptable water quality at the point that the Bow River exits the city.

2.1.3. A standardized, Corporate-wide policy shall be developed and innovative methodologies and practices will be supported for incorporating sustainable wetlands into the city of Calgary. Such standards will ensure that proponents of development are compliant with The City's statutory plans, bylaws, and policies (e.g. The Calgary Plan, Calgary Open Space Plan, Urban Parks Master Plan, Natural Area Management Plan, Calgary Stormwater Management & Design Manual, etc.).

2.1.4. Where possible, Calgary Wetlands shall be integrated into The City's Natural Environment Park system to ensure their long-term sustainability.

2.1.5. In a timely manner and at key decision points within the planning application process, proponents of developments that include Calgary Wetlands shall be advised to be compliant with the provincial *Water Act and Public Lands Act* as well as other provincial and federal laws and policies.



2.1.6. Clear and workable definitions that are consistent with the regulatory environment and accepted scientific authorities shall be provided to aid in the decision-making process. These would include the development of a working definition of a wetland and associated uplands.

## 2.2. “No Net Loss”

The City of Calgary shall ensure that there is No Net Loss of Calgary Wetlands after efforts have been made to avoid impact from development (see Conservation and Sustainability goal # 2.1.1). The primary goals for meeting this principle are:

2.2.1. The City of Calgary shall be proactive in setting a consistent development application process that would balance approved wetland disturbances or losses with mitigation through wetland restoration, enhancement and creation.

2.2.2. A wetland mitigation policy shall be developed where disturbances or losses to Calgary Wetlands will be considered in the following order of priority:

- a. **minimization of and mitigation** for unavoidable impacts;
- b. **mitigation** for residual impacts after avoidance (see Conservation and Sustainability goal # 2.1.1) and minimization have been considered.

2.2.3. The mitigation of disturbances or losses to Calgary Wetlands shall occur in places that make sense ecologically: adjacent to or contiguous with an existing or potential mosaic of upland and wetland systems, or as a sustainable part of an existing or potential Natural Environment Park. Potential locations for ecological mitigation shall be considered in the following order of priority:

- a. restoration of wetlands that have been disturbed;
- b. enhancement of wetlands within the same watershed of the Outline Plan area;
- c. creation of wetlands within the same watershed of the Outline Plan area;
- d. Compensation Banking for the enhancement or creation of wetlands within the same watershed outside the Outline Plan area;
- e. enhancement of wetlands outside the watershed within the Outline Plan area;
- f. creation of wetlands outside the watershed within the Outline Plan area;
- g. Compensation Banking for the enhancement or creation of wetlands outside of the watershed and outside the Outline Plan area.

# Vision, Principles and Goals

2.2.4. Using best practices and, as approved by The City of Calgary, proponents of development shall mitigate one or all of the following features and functions of a Calgary Wetland that have been disturbed or lost due to development:

- a. wetland and upland plant communities; to ensure their normal succession pattern;
- b. wildlife (including fish) habitat;
- c. hydrologic regimes (contribution to water quality and quantity);
- d. flood attenuation and erosion control functions;
- e. cultural, recreational and educational functions; and
- f. urban design functions.

2.2.5. The more environmentally significant a wetland is (see Appendix 2), the greater its overall functional contribution to the natural ecosystem. Furthermore, science cannot yet fully replicate the complexity of an environmentally significant wetland. Therefore, the amount of area required as mitigation for a disturbed or lost Calgary Wetland shall depend on its environmental significance, and the likelihood of success of a proposed mitigation plan, using best practices, to adequately compensate for disturbed or lost wetland functions.

## **2.3. Regional Planning**

Ecological boundaries of watersheds and/or aquifers do not respect political boundaries. Therefore, a regional planning perspective should be considered when unavoidable losses to existing wetlands are compensated through wetland enhancement and/or creation. The primary goals for meeting this principle are:

2.3.1. Mitigation for losses to existing wetlands shall first occur within the same watershed and/or aquifer within the city of Calgary.

2.3.2. Established inter-municipal mechanisms (e.g. The Calgary Regional Partnerships Committee, Inter-municipal Committees, Inter-municipal Development Plans) shall be used to provide clarity on the scope and nature of co-operation between The City of Calgary and surrounding municipalities. These inter-municipal mechanisms will work toward the development of a Regional Wetland Mitigation Plan that would work in conjunction with The City of Calgary Wetland Conservation Plan.

## **2.4. Management of Wetland Habitats**

Calgary Wetlands shall be managed to ensure their long-term sustainability. The primary goal for meeting this principle is:

2.4.1. Best management practices shall be developed and continually updated for the operations, maintenance, lifecycle and programming of Calgary Wetlands in accordance with approved Natural Area Management Plans.

## **2.5. Wetland Monitoring and Research & Development Program**

In partnership with other government, community, corporate and/or commercial organizations, The City of Calgary shall support a wetland monitoring and research and development program that will develop standards for, and measure the success of incorporating existing, restored, enhanced and created wetlands into the urban landscape. The primary goals for meeting this principle are:

2.5.1. Quality and quantity measurements shall be developed for determining:

- a. the sustainability of Calgary Wetlands;
- b. the success of current management practices; and
- c. the ecological and economic value of the wetlands to The City of Calgary.

2.5.2. In partnership with other government, community, corporate and/or commercial organizations, The City of Calgary shall facilitate the establishment of a foundation that will support one or more academic institutions in the long-term research and development of restoring, enhancing and creating wetlands, as well as developing engineered stormwater wetlands.

2.5.3. Due to the inability of current science to fully replicate the complexity of a wetland, the results of a wetland monitoring and research and development program will be used to update the Wetland Conservation Plan every two years.

## **2.6. Public Education**

Educating the public about the importance of wetland functions and their value in producing environmental, social and economic benefits will play an important role in wetland conservation and protection. The primary goal for meeting this principle is:

2.6.1. Educate the citizens of Calgary and their surrounding neighbours by increasing public:

- a. awareness of the role that wetlands play in addressing the pressures and demands that population growth and industrial developments are having on the local and regional water supply;<sup>3</sup>
- b. understanding that a wetland is one of the most biologically productive and bio-diverse ecosystems within our natural environment; and
- c. appreciation of how Calgary Wetlands contribute to the reduction in flooding and soil erosion, climate moderation, landscape variability, and educational and recreational opportunities.

---

<sup>3</sup> Government of Alberta. *Water for Life – Alberta's Strategy for Sustainability* – Draft. 2002-2003.

# Types of Calgary Wetlands

In general, wetlands can be defined as areas occupying a transitional zone between land and water. Adapting the definition outlined in *Wetlands of Canada*, wetlands are areas where the water table is at, near, or just above the surface, and where soils are saturated for a sufficient period of time such that they lack atmospheric oxygen (i.e. anaerobic). The result is the growth of plants that are adapted to grow in water (i.e. hydrophytic vegetation). Therefore, the primary characteristics of a wetland are:

- **Water** – Wetlands are characterized by the presence of surface water, sub-surface water, or both. The lands may be inundated with water for an extended period of time or for only some of the time.
- **Vegetation** – Wetlands support plants called hydrophytes or hydrophytic plants that are indicative of wet sites and can only be found in wetland ecosystems.
- **Soil** – Wetland soil is called hydric soil that has little or no oxygen and possesses physical and chemical properties that are characteristic of waterlogged conditions.

The above general definition and primary characteristics of a wetland, as well as the definitions, policies and legislation within the *Calgary Open Space Plan*, *Surveys Act* and *Water Act* were used to more

clearly define what a wetland is within the city of Calgary. It is important to note that periodically, the city of Calgary receives low amounts of precipitation due to its location within the Foothills Fescue and Foothills Parkland Natural Regions (see Map 1). During these periods of low precipitation it is quite common for the water table to fall below the surface of certain wetlands, at which time they contain no water.

A Calgary Wetland is a waterbody and its bed and shores, that is naturally occurring or disturbed and is located within the Foothills Fescue and Foothills Parkland Natural Regions within the city of Calgary (see Map 1). This wetland is saturated with water long enough to promote wetland or aquatic processes, as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment.<sup>4</sup> The bed and shores of the waterbody end at the bank, or the physically ascertainable line where long action of water has caused the bed and shore to have no vegetation, distinct vegetation (i.e. marshland or other wetland vegetation), or a distinct soil.<sup>5</sup> There are four types of Calgary Wetlands:

---

<sup>4</sup> City of Calgary. *Open Space Plan*. Cerlox. 2003

<sup>5</sup> *Surveys Act*, R.S.A. 1980, c. s-29.1



1. **Crown Owned Wetland** – a Calgary Wetland that is permanent and naturally occurring and is owned by the Province because it was never subject to a grant, is specifically excluded from a land title, or is claimed under Section 3 of the *Public Lands Act*.
2. **Environmental Reserve (ER) Wetland** – a part of a parcel of land that is the subject of a proposed subdivision and is to be provided as environmental reserve as required by the subdivision authority. It is a Calgary Wetland that:
  - a. is located within the city of Calgary;
  - b. may or may not be an environmentally significant area;
  - c. a shallow-marsh zone, deep-marsh zone, deep-water zone or an intermittent-alkali zone dominates the deepest part of the wetland area (i.e. Class III, IV, V, or VI Wetland – Steward & Kantrud – see Appendix 1); and
  - d. is naturally occurring or disturbed.
3. **Natural Area Wetland** – a part of a parcel of land that is the subject of a proposed subdivision and may be acquired through a variety of means (see policy 2.2.9. p.23). It is a Calgary Wetland that is:
  - a. located within the city of Calgary;
  - b. in an environmentally significant area, or part of a proposed natural environment park or natural environment zone;
  - c. a wetland-low-prairie zone, a wet-meadow zone, or an intermittent-alkali zone dominates the deepest part of the wetland area (i.e. Class I, II, or VII Wetland – Steward & Kantrud – see Appendix 1); and
  - d. is naturally occurring or disturbed.
4. **Engineered Stormwater Wetland** – “A constructed and/or modified waterbody that fluctuates with water drainage peaks but holds water at all times. The wetland is used to improve stormwater runoff quality through nutrient and sediment removal using vegetation, detention, settlement and other best management practices. The wetland is also used to manage the volume of runoff through storage and restricted pipe outlets. Its depth will vary depending on site design criteria and its live storage area is vegetated. Engineered Stormwater Wetlands have a habitat function with existing or constructed riparian and upland vegetation communities. The boundary of the wetland will be dedicated as Environmental Reserve, in accordance with the *MGA*, and the adjacent buffer of riparian and upland vegetation will be dedicated as Municipal Reserve...and all forebays shall be dedicated as Public Utility Lots.”<sup>6</sup>

<sup>6</sup> City of Calgary. *Open Space Plan*. Cerlox. 2003.

# Inventory

In order to ensure the conservation and protection of Calgary Wetlands during the development approval process, a detailed inventory of the wetlands is required. Therefore, The City of Calgary entered into a letter of understanding with Ducks Unlimited Canada to conduct such an inventory (see Maps 2 & 3). The inventory identified:

1. **Environmental Reserve Wetlands and Potential Natural Area Wetlands** using Stewart and Kantrud (1971) Wetland Classification Methodology (Appendix 1).

Note: The numbering of the Stewart and Kantrud wetland Classes I through VII does not imply wetland priority or significance. The wetland Classes are numbered for identification purposes only.

2. **Riparian Areas:** Riparian areas are those areas where the plants and soils are strongly influenced by the presence of water. They are transitional lands between aquatic ecosystems (wetlands, rivers, streams or lakes) and terrestrial ecosystems.
3. **Upland Areas and Associated Vegetation and/or Condition (i.e. cultivated and/or urbanized):** An upland area is an area of land, usually terrestrial (not aquatic), either upstream or surrounding the wetland. It is not part of the wetland but may contribute to the integrity of the wetland.

Although **Crown Owned Wetlands** have not been identified in the inventory, they are a subset of the Environmental Reserve wetlands and they may be claimed under Section 3 of the *Public Lands Act* at the Community Plan stage.





Through the Steward and Kantrud Wetland Classification Methodology, using aerial photography, approximately 8,000 wetlands have been identified within the city of Calgary and entered into The Wetland Inventory. After field checking 1,000 wetlands, it was calculated that the Steward and Kantrud Class assigned to each wetland has an accuracy of 61 per cent, and the location of the waterbody boundaries has an accuracy of  $\pm 0.50$  metre. When there is an error in assigning a class to a wetland, the correct class will be either up or down

one class (i.e. if a wetland is incorrectly assigned a Class 3, the correct class will be either Class 2 or 4). Because the classes assigned to each wetland are not entirely accurate, they will need to be verified on site at the Community Plan stage as part of the Habitat and Environmental Significance Assessment. Furthermore, at the Land Use/Outline Plan stage, **surveyors** will locate the bank of Crown Owned, ER and Natural Wetlands at the normal or ordinary high water mark, and the limits of the ER surrounding these water bodies will be identified and delineated by a **Qualified Wetland Specialist**.<sup>7</sup>

---

<sup>7</sup> Kwasniak, Arlene. *Alberta Wetlands – A Legal & Policy Guide*. Environmental Law Centre and Ducks Unlimited Canada. 2001.

# Development Approval Policies

## 1. COMMUNITY PLAN POLICIES

1.1. Steward Kantrud Wetland Classes (identified in Maps 2 and 3) shall be verified on site at the Community Plan stage by the City through a Qualified Wetland Specialist (see Inventory p.18).

1.2. An Environmental Significance Assessment (Appendix 2) shall be completed by The City on all Calgary Wetlands to determine whether an existing wetland is environmentally significant. These assessments will be completed in conjunction with a Habitat Assessment and Environmental Significance Assessment of all Natural Areas.<sup>8</sup>

1.3. The first priority in The City's commitment to the conservation and protection of Calgary Wetlands is the avoidance of impact from development. Where it can be demonstrated to the satisfaction of the approving authority that avoidance of impact to a Calgary Wetland is not possible or practical due to inherent constraints upon a site, then disturbance to the wetland(s) will be considered in the following order of priority:

**Priority 2** – Minimization of and mitigation for unavoidable development impacts;

**Priority 3**– Mitigation for development impacts that cannot be minimized.

1.4. Further to policy 1.3, roads and utility rights-of-way shall only be allowed to cross Calgary Wetlands when:

- a. alternative alignments are neither reasonable nor practical;
- b. roads and utilities are aligned together to minimize the number of crossings;
- c. the amount of disturbance to the area is minimized; and
- d. any disturbed areas are restored using native plants.

1.5. Proponents of development are solely responsible for adherence to all relevant provincial and federal legislation/regulations (see Appendix 6). However, upon the submission of a proposed Community Plan, the Planning Authority will circulate the plans to:

- Alberta Environment – re: *Water Act*;
- Sustainable Resource Development, Public Lands and Forests Division – re: *Section 3, Public Lands Act*;
- Sustainable Resource Development, Fish and Wildlife Division – re: *Wildlife Act*;

<sup>8</sup> City of Calgary, *Open Space Plan*. Cerlox. 2003.



- The Department of Fisheries and Oceans – re: *Fisheries Act*;
- Environment Canada’s Canadian Wildlife Service – re: *Migratory Birds Convention Act and Species at Risk Act*.
- The Calgary Airport Authority – re: *Canada Aeronautics Act*.

**Note:** In no way should the above list of agencies and associated Acts be deemed comprehensive. It is solely the proponent’s responsibility to contact the appropriate administrative agencies to ensure that all legislation/regulations are adhered to.

## 2. LAND USE/OUTLINE PLAN POLICIES

### 2.1. Crown Owned Wetlands

2.1.1. If Crown Owned Wetlands are environmentally significant areas, or of a quality and character that warrant conservation within a Natural Environment Park, the Department of Sustainable Resource Development should issue a Recreation Lease or a License of Occupation to The City of Calgary.

2.1.2. If the Department of Sustainable Resource Development issues a Recreation Lease or a License of Occupation to The City of Calgary for Crown Owned Wetlands, the wetlands shall be subject to the Land Use/Outline Plan conditions described in policy 2.2 below.

### 2.2. Environmental Reserve (ER) & Natural Area Wetlands

#### General Conditions

2.2.1. Where a proponent of development is applying for land use and not a subdivision of the lands, and the lands contain privately owned wetlands that are not claimed by the Crown, and the wetlands have been identified as potential ER and/or Natural Area Wetlands, the proponent, through negotiations with The City, will be encouraged to meet the development approval policies of the Wetland Conservation Plan. Given that the proponent agrees to adhere to the development approval policies, if disturbance to the wetlands is avoided or minimized, and if the wetlands can be sustained into the future, the privately owned wetlands should be designated as Direct Control Sites. These sites should have a permitted land use of a Natural Area, and a Recreation

# Development Approval Policies

Lease should be issued to The City to ensure the ongoing monitoring, upkeep and protection of the wetlands as part of The City's Natural Environment Park System. **Note:** upon revision of the Land Use Bylaw, these privately owned wetlands will be designated as Natural Environment (NE) Sites.

2.2.2. For all ER and Natural Area Wetlands, a Biophysical Impact Assessment (BIA) will be completed at the Land Use/Outline Plan approval stage by a qualified professional, to the satisfaction of the approving authority.<sup>9</sup>

2.2.3. In accordance with Alberta law, **surveyors** will locate the bank of Crown, ER and Natural Area Wetlands. The bank will be located at the normal or ordinary high water mark.<sup>10</sup> The limits of the ER surrounding these water bodies will be identified and delineated in accordance to the Municipal Government Act by a **Qualified Wetland Specialist**.

2.2.4. If a Crown Owned Wetland naturally becomes permanently dry, the waterbody will accrue to the ER and/or MR parcel.

2.2.5. Where an ER or Natural Area Wetland within a Land Use/Outline Plan can remain viable and sustainable over the long-term, it shall be retained in a natural state, except for the following situations as determined by the approving authority:

- a. the addition of passive recreational amenities such as pathways, benches and viewing areas considered necessary to enhance public enjoyment of the area;
- b. grading or engineering improvements necessary to integrate the development with the wetland to ensure its sustainability in an urban context; and

- c. the incorporation of salvaged soils and plant material from disturbed wetlands, naturalized planting or landscaping that restores the wetland and its immediate shoreline.

2.2.6. Urban development adjacent to an ER and Natural Area Wetland should be designed in a manner that provides for a low impact interface with the wetland.

## **Acquisition (see also Appendix 3 & 4)**

2.2.7. All wetlands qualifying as an Environmental Reserve Wetland shall be dedicated to The City of Calgary as Environmental Reserve.

2.2.8. Based on the ESA and BIA reports, a negotiated buffer of upland area may be dedicated as MR on a site-by-site basis to assist in the long-term sustainability of an ER or Natural Area Wetland.<sup>11</sup>

2.2.9. Natural Area Wetlands that are Environmentally Significant Wetlands (see Appendix 2), or are of a quality and character that warrant conservation within a Natural Environment Park, should be protected in their natural state as determined through site specific evaluations and the Land Use/Outline Plan approval process, which includes (but is not limited to):

- a. owner dedication as credit Municipal Reserve;
- b. voluntary owner dedication as Environmental Reserve, in excess of the requirements of the *Municipal Government Act* (subject to negotiation);
- c. density transfers: both within developments and between developments (subject to negotiation);
- d. donations to appropriate not-for-profit agencies, Land Trusts, or The City (subject to negotiation);

<sup>9</sup> City of Calgary, *Open Space Plan*. Cerlox. 2003.

<sup>10</sup> Kwasniak, Arlene. *Alberta Wetlands – A Legal & Policy Guide*. Environmental Law Centre and Ducks Unlimited Canada. 2001.

<sup>11</sup> City of Calgary, *Open Space Plan*. Cerlox. 2003.

- e. outright purchase (subject to negotiation);
- f. land swapping and transfer of credit reserve (subject to negotiation);
- g. conservation easements and associated caveats to restrict development within or around the wetlands, as per the provisions of the *Environmental Protection and Enhancement Act*;
- h. Environmental Reserve easements, as per the provisions of the *Municipal Government Act*.

**Mitigation (see also Appendix 5)**

2.2.10. Once all avenues of avoidance and minimization of development impact have been explored by a proponent of development, and an appropriate level of disturbance has been authorized by the approving authority at the Community Plan stage, mitigation by the proponent for the impact on the wetland will adhere to the “No Net Loss” principle of the Wetland Conservation Plan (see p.12), and shall include one, or all of the following options in order of priority:

- Priority 1** – Restoration of wetlands that have been disturbed;
- Priority 2** – Enhancement of wetlands within the same watershed of the Outline Plan area;
- Priority 3** – Creation of wetlands within the same watershed of the Outline Plan area;
- Priority 4** – Compensation Banking for the enhancement or creation of wetlands within the same watershed, outside the Outline Plan area;
- Priority 5** – Enhancement of wetlands outside the watershed, within the Outline Plan area;
- Priority 6** – Creation of wetlands outside the watershed, within the Outline Plan area;

**Priority 7** – Compensation Banking for the enhancement or creation of wetlands outside the watershed, and outside of the Outline Plan area.

2.2.11. Further to policy 2.2.10, prior to Outline Plan approval, the proponent shall submit for approval by the approving authority, a Mitigation Plan indicating a recommended mitigation option(s) to restore, enhance, or create lost wetland functions based on:

- a. an approved Environmental Significance Assessment (Appendix 2); and
- b. an approved Functionality Assessment (Appendix 9) and Biophysical Impact Assessment prepared by a qualified professional.

2.2.12. Further to policy 2.2.11, if a Mitigation Plan includes Compensation Banking for the enhancement and/or creation of wetlands outside the Outline Plan area, the proponent shall provide funds toward a Wetland Mitigation Bank that is to be accounted for separately from General Revenue as compensation for the loss of wetland in accordance with the following calculation:

$$(C_1 \times EC) + C_2 = \text{funds to be provided as compensation}$$

Where

- $C_1$  = cost per square metre to enhance and/or create wetland(s) to ensure No Net Loss of functions on the site where the disturbance or loss occurred;
- $EC$  = the number of square metres of a wetland(s) to be enhanced or created as determined in the approved Mitigation Plan to ensure No Net Loss of functions; and
- $C_2$  = the cost of the land at the site(s) where the disturbance or loss occurred.

# Development Approval Policies

2.2.13. If compensation funds are received prior to July of any year, and together with other funds in the Wetland Mitigation Bank, are sufficient to complete the next priority wetland project, funding for that project will be included in the following year's budget, with the intent for it to be substantially complete within two years.

2.2.14. Further to policy 2.2.11, if a Mitigation Plan includes wetland restoration to disturbed wetlands, the proponent shall provide the following for approval:

- a. a preliminary Grading Plan showing the extent of any disturbance proposed on ER and Natural Area Wetlands; and
- b. a Landscape Concept Plan that is in accordance with the current edition of Calgary Parks' *Development Guidelines and Standard Specifications, Landscape Construction*, showing the proposed landscape and method of restoration.

2.2.15. Further to policy 2.2.11, if a Mitigation Plan includes wetland enhancement or creation within the Outline Plan area, the proponent shall provide for approval, a Landscape Concept Plan that is in accordance with the current edition of Calgary Parks' *Development Guidelines and Standard Specifications, Landscape Construction*.

**Note:** Where possible, the Concept Plan should include the use of soils and plant material from the wetland(s) that was disturbed or lost.

## **Provincial and Federal Legislation/Regulations (see also Appendix 6)**

2.2.16. Proponents of development are solely responsible for demonstrating adherence to all relevant provincial and federal legislation/regulations. However, upon the submission of proposed Land Use/Outline Plans, the Planning Authority will circulate the plans to:

- Alberta Environment – re: *Water Act*;
- Sustainable Resource Development, Public Lands and Forests Division – re: *Section 3, Public Lands Act*;
- Sustainable Resource Development, Fish and Wildlife Division – re: *Wildlife Act*;
- The Department of Fisheries and Oceans – re: *Fisheries Act*;
- Environment Canada's Canadian Wildlife Service – re: *Migratory Birds Convention Act and Species at Risk Act*.
- The Calgary Airport Authority – re: *Canada Aeronautics Act*

**Note:** In no way should the above list of agencies and associated Acts be deemed comprehensive. It is solely the proponent's responsibility to contact the appropriate administrative agencies to ensure that all legislation/regulations are adhered to.

2.2.17. Prior to the Alberta Energy and Utility Board granting a transmission line permit for the construction of a transmission line in or around Calgary Wetlands, the transmission line company must receive approval for the location of the line from Calgary Parks at the Outline Plan approval stage. Approval will be granted if the transmission line does not jeopardize the urban design, recreational and/or environmental protection functions of the wetland.

## Engineered Stormwater Wetlands

2.2.18. According to the *Municipal Government Act*, stormwater management facilities (SWMFs) cannot be located in an Environmental Reserve: they should be located in a Public Utility Lot. Prior to the approval by Wastewater of any new master drainage plans that incorporate SWMFs within ER and Natural Area Wetlands, a Biophysical Impact Assessment shall be conducted by the proponent of development, in consultation with The City of Calgary Parks, to determine if the following conditions, which would allow clean water to be accepted into the wetland from a Public Utility Lot, apply:

- a. the water is needed to maintain the predevelopment character of the wetland;
- b. the water will not cause any unacceptable environmental change to the wetland; and
- c. the wetland can be designed and managed to function in a natural manner.<sup>12</sup>

2.2.19. Subject to policy 2.2.18 above, Engineered Stormwater Wetlands will be supported in Major Natural Environment Parks where the wetlands can be integrated into an existing natural drainage course with minimal disturbance to the quality of the natural system.<sup>13</sup>

2.2.20. Engineered Stormwater Wetlands should not be located in Special Protection Natural Environment Parks.<sup>14</sup>

2.2.21. Engineered Stormwater Wetlands shall be designed to balance the functions of stormwater management with habitat creation/diversity and recreational use. The ER designation will extend to the boundary of the wetland, and MR designation beyond the boundary as required.<sup>15</sup>

**Note:** The City of Calgary will consider voluntary ER dedication on sites that were not classified as ER Wetlands prior to construction of the Engineered Stormwater Wetlands.

2.2.22. All forebays shall be located on Public Utility Lot lands outside the MR and ER.<sup>16</sup>

2.2.23. Urban development adjacent to an Engineered Stormwater Wetland should be designed in a manner that provides for a low impact interface with the wetland.

## 3. Tentative Plan Policies

3.1. Subdivision design, grading, Stormwater Management Plans, and roadway and utility alignments shall provide for a low impact interface with ER and Natural Area Wetlands by:

- a. providing for integration with the open space and regional pathway system where it can be achieved in an environmentally sensitive manner;
- b. encouraging the retention and re-use of stormwater on-site for irrigation or other suitable uses;
- c. providing a subdivision, regional pathway and road design that facilitates public access; and

<sup>12</sup> City of Calgary. *Open Space Plan*. Cerlox. 2003.

<sup>13</sup> Ibid.

<sup>14</sup> Ibid.

<sup>15</sup> Ibid.

<sup>16</sup> Ibid.

# Development Approval Policies

- d. creating parcels adjacent to wetlands of a size and orientation that will provide for suitable site interface conditions as outlined in policy 2.2.6.

3.2. Prior to approval of the Tentative Plan, ER and Natural Area Wetlands shall be fenced off by the proponent of development, to the satisfaction of the approving authority.

## 4. Construction Plan Policies

### General Conditions

4.1. All recreational amenity development, such as pathways, shall be located above the high water line.<sup>17</sup>

4.2. Where a stormwater pond is located adjacent to lands to be dedicated as ER or Natural Area Wetlands, the pond shall be:

- a. landscaped, designed, and managed in a satisfactory manner; and
- b. developed to enhance wildlife habitat and to provide for recreational opportunities.

### Mitigation

4.3. If an approved Mitigation Plan includes wetland restoration, proponents of development shall submit for approval detailed Restoration Plans in accordance with the current edition of Calgary Parks' *Development Guidelines and Standard Specifications, Landscape Construction* for approval.

4.4. If an approved mitigation plan includes wetland enhancement or creation, proponents of development shall submit for approval, detailed Construction Plans in accordance with the current edition of Calgary Parks' *Development Guidelines and Standard Specifications, Landscape Construction*.

4.5. When submitting detailed Restoration Plans and Construction Plan as described in policies 4.3 and 4.4 above, proponents of development shall reference the Council approved Integrated Pest Management Plan, and remediate against the creation of habitat for mosquitoes, other insects (e.g. midges), noxious weeds, etc.

### Engineered Stormwater Wetlands

4.6. Proponents of development will be, at their cost, solely responsible for the preparation of detailed construction drawings, and the associated development of Engineered Stormwater Wetlands.

4.7. Engineered Stormwater Wetlands shall be designed and constructed in accordance with the City of Calgary Wastewater's *Stormwater Management & Design Manual*, and the current edition of Calgary Parks' *Development Guidelines and Standard Specifications, Landscape Construction*.

4.8. During the design and construction of Engineered Stormwater Wetlands, proponents of development will work closely with The City of Calgary Parks and Wastewater to ensure the following:

- a. opportunities are sought to tie in the riparian and acquired upland area with the wetland to assist in the long-term sustainability of the wetland's ecosystem;

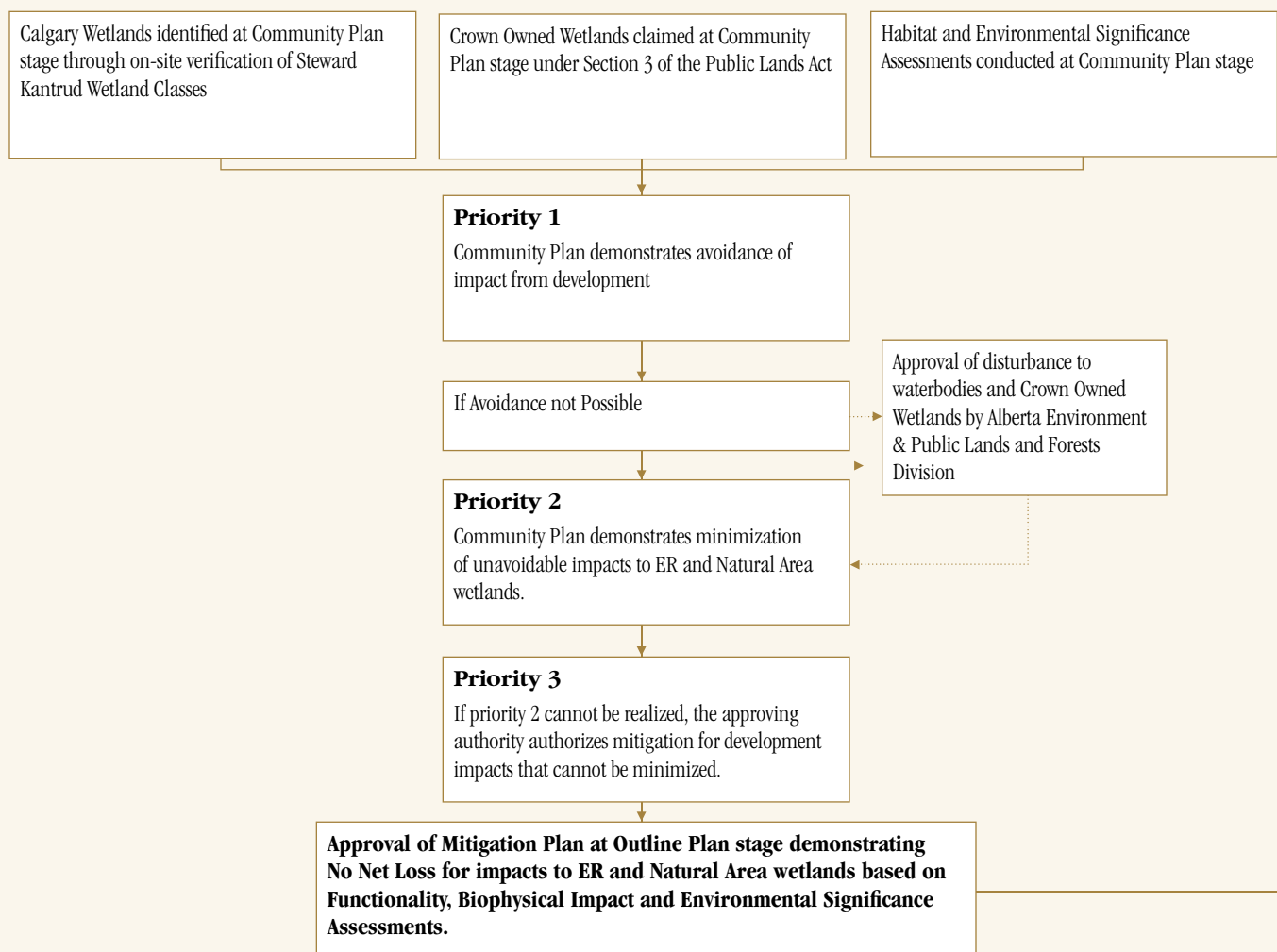
<sup>17</sup> City of Calgary, *Open Space Plan*. Cerlox. 2003.



- b. base flows from the forebay (Public Utility Lot) to the wetland are maintained to ensure positive effects on the natural system;
- c. the re-creation of existing vegetative communities;
- d. the protection of rare/unique plant or animal species that will be directly affected;
- e. the development and execution of a monitoring program to ensure that re-establishment of environmental communities is completed successfully;
- f. the use of locally grown plant material to maximize establishment rates; and
- g. the system shall be designed for the long-term conservation of the natural wetland system.

# Mitigation Process

In order to facilitate use of the Wetland Conservation Plan, the following is a summary of the mitigation process described within the Development Approval Policies (p.20 and Appendix 5):





### Mitigation Options

**Priority 1** – Restoration of wetlands that have been disturbed.

**Priority 2** – Enhancement of wetlands within the same watershed of the Outline Plan area.

**Priority 3** – Creation of wetlands within the same watershed of the Outline Plan area.

**Priority 4** – Compensation banking for the enhancement or creation of wetlands within the same watershed, outside the Outline Plan area.

**Priority 5** – Enhancement of wetlands outside the watershed, within the Outline Plan area.

**Priority 6** – Creation of wetlands outside the watershed within the Outline Plan area;

**Priority 7** – Compensation banking for the enhancement or creation of wetlands outside the watershed, and outside the Outline Plan area.

# The Benefits of Wetlands

Alberta's wetlands provide a host of environmental, social and economic benefits that are often overlooked until those benefits are lost through habitat degradation or drainage. The primary benefits of wetlands and their associated riparian habitats are discussed below. There are however, numerous other benefits that wetlands provide to the environment and our society. A more detailed discussion on the functions and values of wetlands in producing environmental, social and economic benefits is provided in Appendix 7.

## Water Quality and Quality Improvement Values:

- **Improve Water Quality:** Wetlands can improve water quality by reducing sedimentation and serving as natural filters that remove and store suspended solids, nutrients and other pollutants from water.
- **Groundwater Recharge:** Many wetlands serve as a source of water to maintain local and regional groundwater supplies.
- **Regulate Soil Salinity:** As long as their riparian vegetation is left intact, wetlands can help moderate movement of salts.

## Flood Attenuation and Erosion Control Values:

- **Buffer Shorelines:** Wetlands can protect shorelines against excessive erosion if their riparian vegetation is left intact.
- **Flood Reduction and Erosion Control:** Wetlands store and gradually release water, reducing flooding and soil erosion.
- **Flood Attenuation:** Wetlands reduce the intensity of flooding by storing and slowly releasing water to their watershed, thereby reducing the need to construct man-made flood control works.

## Ecological Values:

- **Biodiversity:** Wetlands serve as a substantial source of biodiversity by increasing the complexity of landscapes.
- **Fish Habitat:** Wetlands can provide critical nursery habitat for many species of fish.
- **Wildlife Habitat:** Wetlands provide habitat for an incredible diversity of animal and plant species including many threatened and endangered species.



- **Drought Buffering:** Wetlands can provide a particularly valuable source of water for habitat during drought conditions.
- **Nutrient Source:** Wetlands provide nutrients that fuel food webs in many freshwater systems.

#### **Climate Amelioration Values:**

- **Carbon Sequestration:** Many wetlands can store atmospheric carbon in their vegetation and soils.
- **Climate Stabilization:** Wetlands provide a source of atmospheric water and oxygen and can help moderate variation in climatic conditions accordingly.
- **Temperature Moderation:** Wetlands can help moderate temperatures through their high thermal inertia (i.e., they heat up or cool down slowly).

#### **Socio-Economic Values:**

- **Urban Design:** Wetlands are a valuable amenity within a proposed development. They are complex natural areas with high bio-diversity that enhances the quality, form and function of the built environment by providing visual aesthetics, character, variety, noise/sight buffering and the creation of public areas.
- **Cultural Heritage Areas:** Because of their importance to man over time, many wetlands are key historical or archeological sites.
- **Educational Opportunities:** Wetlands can provide enhanced educational and scientific research opportunities because of their high bio-diversity.
- **Recreational Opportunities:** Wetlands can provide numerous opportunities for tourism, boating, bird watching, nature photography and other recreational activities.

# Issue Identification

On 2002, June 21, an Issues Identification Workshop was held with a Key Stakeholder Advisory Committee. The issues identified during the workshop provided a focus for the development of the Wetland Conservation Plan. The main issues identified that relate to provincial and federal laws and policies are:

1. Under Section 3 of the *Public Lands Act*, the Crown owns all permanent, naturally occurring waterbodies. This ownership is not registered on title — ownership is legislated. Recently, the Public Lands and Forests Division claimed waterbodies in two subdivisions after land use was granted by Council. As a result, the need for The City to work with the Public Lands and Forests Division was identified.

**Note:** Any development within Crown owned waterbodies requires approval under the *Public Lands Act*.

2. Any development with the potential to disturb waterbodies requires an approval under the *Water Act* and/or the *Environmental Protection and Enhancement Act*. As a result, Alberta Environment has requested to work co-operatively with The City to develop a wetland policy that ensures development complies with the *Water Act* and *Environmental Protection and Enhancement Act*.

3. The Wetland Conservation Plan should be consistent with existing municipal and provincial policy (e.g. *The Interim Policy on Wetland Management in the Settled Area of Alberta*).
4. The Calgary Airport Authority has identified the issue of providing input to wetland protection within a zone of control as per the *Aeronautics Act*. Proposed changes to this Act would allow them to provide input on wetlands as it relates to aviation safety within a specified zone around the Calgary airport. Furthermore, the Calgary Airport Authority has recognized a need to develop a wetland policy for its lands that addresses issues related to aviation safety, wetland loss and mitigation.
5. The Wetland Conservation Plan should reflect additional legislation including the *Wildlife Act*, the *Federal Fisheries Act*, the *Navigable Waters Act*, the *Canadian Environmental Protection Act*, the *Canadian Environmental Assessment Act*, the *Species at Risk Act* and the *Migratory Birds Convention Act*.



With the above **regulatory issues** in mind, several other issues were also identified:

6. Protection of wetlands within transportation and utility corridors.
7. Identifying and mitigating the effects of telecommunication towers on avian life.
8. Maintenance and/or enhancement of water quality and quantity.
9. Use of wetlands for stormwater treatment (e.g. Engineered Stormwater Wetlands), and ensuring their viability following development.
10. Ensuring that engineering constraints are addressed.
11. Ensuring orderly and cost-efficient development of lands within the city.
12. Ensuring that development applications for lands containing wetlands receive consistent, efficient and effective approvals from the municipal, provincial and federal approving authorities.
13. Exploration of the ramifications of all means of ensuring No Net Loss of wetland habitat, such as mitigation, Compensation Banking, etc.

# Role of the Wetland Conservation Plan

The role of the Wetland Conservation Plan is to provide policies and procedures for the conservation of wetlands within the city of Calgary. Detailed implementation will occur as Community Plans, Outline Plans, Area Redevelopment Plans, etc. are developed and implemented. The following table illustrates where the Wetland Conservation Plan fits within the overall planning framework:<sup>18</sup>

<b>Municipal Government Act and Other Provincial and Federal Legislation</b>						
<i>e.g. the Public Lands Act, Water Act, Environmental Protection and Enhancement Act.</i>						
<i>City- wide / larger in scope; multiple functions; partnerships</i>	Inter-municipal Development Plans		The Calgary Plan and other Council-approved policies (e.g. Go Plan, Land Use Bylaw)		Joint Use Agreement	
<i>City- wide; all open space</i>	Open Space Plan					
<i>City- wide; specific to an issue or aspect of open space. Examples include:</i>	Urban Park Master Plan	Natural Areas Mgmt Plan	Wetland	River Valleys Plan	Stormwater Mgmt Plan	Urban Forestry Mgmt Plan
<i>Policy for a broad geographic area</i>	Area Redevelopment Plans		Community Plans Area Structure Plans		Special Studies (e.g. Bow Valley Centre, CFB)	
<i>Plans for location / configuration of open space in a specific area</i>	Land Use Amendments, Outline Plans and Tentative (Subdivision) Plans					
<i>Implementation of policy through development of a specific site or project</i>	Development Permits Review of Developer-built/Partnership projects Development agreements			Design Development Plans for City park projects Business Plans		

<sup>18</sup> City of Calgary. *Open Space Plan*. Cerlox. 2003.





**\*\*Note:**

- A summary of federal, provincial and municipal legislation that guided the development of the Wetland Conservation Plan is in Appendix 6; and

- See Appendix 8 for a review of wetland policies from within Canada, the United States and internationally that were referenced in the development of the Wetland Conservation Plan.

# Monitoring Program

Protecting and improving wetland quality and determining the success of the Wetland Conservation Plan relies on a successful monitoring program. Establishing a monitoring plan for wetlands allows The City of Calgary to identify trends and relationships related to the health, functionality, value, economics and overall wetland resources within an urban context. Collecting and monitoring data over time is critical for making informed management decisions and for evaluating whether or not policy objectives are being met.

Monitoring is both a research and a management tool. Monitoring programs must be designed to assess specific wetland criteria, resulting in scientifically credible data while maximizing available resources. The type of information to be monitored depends on the management questions being asked. Within The City of Calgary, criteria to be monitored can be classified into four general categories:

1. Inventory monitoring: monitoring of wetland resources (i.e., numbers of wetlands/area over time).
2. Development standards/wetland restoration monitoring: monitoring and inspecting wetlands and restored wetlands to the CCC (Construction

Completion Certificate) and the FAC (Final Acceptance Certificate) requirements in the development/landscape construction phase of park development.

3. Ecological monitoring: monitoring the overall value, function and quality of the wetlands once incorporated into an urban landscape.
4. Economic monitoring: monitoring the economic components of wetland protection within the city, such as land values in relation to wetland protection, which is important for potential mitigation and the economics of wetland protection.

## **1. Inventory Monitoring (Landscape Assessment)**

Assessing and monitoring wetland resources over time, including wetland area and numbers and types of wetlands, can provide valuable information, such as trends and current status of wetlands within the city, patterns of wetland distribution, abundance of wetland types and changes over time, wetlands lost or disturbed due to development, and success of wetland mitigation projects.



Inventory monitoring is important for providing quantitative, credible information that can be used by decision-makers within The City of Calgary. The information collected is especially relevant to subdivision and park planning and to establishing contiguous natural areas and wildlife corridors. Reporting on wetland resources also allows The City to monitor progress toward the goals outlined in The City's Wetland Conservation Plan.

Monitoring can provide the means for developing environmental indicators, or trends, and information on the health of Calgary's ecosystems. Several environmental indicators are currently being monitored by The City of Calgary and are published in the *State of the Environment Report*, providing a snapshot of trends in Calgary's environment.

Inventory monitoring is essential to effective integrated pest management. Monitoring will provide information for the control of mosquitoes, other insects (e.g. midges), noxious weeds, etc.

Inventory and monitoring is inextricably linked with wetland and environmental management. To manage the environment effectively, The City of Calgary is implementing an Environmental Management System. A component of the Environmental Management System requires that monitoring and measurement

programs be established for significant environmental aspects, including Wetlands and other Natural Areas.

Establishing a program for monitoring wetland resources is relatively simple. The baseline data has been collected through the Wetland Inventory. By establishing a reporting and fieldwork schedule, and maintaining and updating the database already in the Geographic Information System (GIS), changes in wetland resources can be monitored over time.

## **2. Development Standards/wetland Restoration Monitoring**

Specific development guidelines/specifications are identified for restoration, enhancement and creation of Calgary Wetlands within the current edition of Calgary Parks' *Development Guidelines and Standard Specifications, Landscape Construction*. Proponents of development must meet these criteria prior to receiving Construction Completion and Final Acceptance Certificates. Monitoring is therefore necessary to ensure that The City's development requirements are being met.

# Monitoring Program

## 3. Ecological Monitoring

Several studies indicate that the affects of urbanization on the ecology and hydrology of urban wetlands changes the functionality of wetlands compared with those found in non-urban environments. As well, urban wetlands may take on urban-associated values not found in rural wetlands. Monitoring for functionality and value of wetlands within the urban environment is therefore critical.

The goal of ecological monitoring is to preserve and restore the functions and values of urban wetlands, and to provide information on how the functions have been changed and affected by human activities. Monitoring also increases the effectiveness of wetland restoration and protective actions, correlates wetland conditions with land use practices, provides evidence of wetland value, and improves decision-making related to wetland management and mitigation. Monitoring can include restored/enhanced/created wetlands, Engineered Stormwater Wetlands and Natural Area Wetlands.

Sampling design depends on the management question being asked. At the broadest level, a monitoring program should include:

- a. detecting and characterizing the baseline conditions of existing wetlands;
- b. describing whether wetland condition is improving, degrading or staying the same;

- c. defining seasonal patterns in wetland conditions;
- d. identifying thresholds for system stressors (how much can be disturbed without causing unacceptable changes in the wetland system (EPA, 2002)); and
- e. identifying thresholds for the control of mosquitoes, other insects (e.g. midges), noxious weeds, etc

## 4. Economic Monitoring

Monitoring the economics of wetland protection over time is critical to the sustainability of wetland protection. A cost benefit analysis may be able to provide economic information on protecting specific wetlands, and this information may be extrapolated to include wetlands in general. Other economic information relating to wetlands, land values and distance from Calgary become important in mitigation decision-making.

**Note:** Mitigation outside the city will only be considered after a Regional Wetland Mitigation Plan has been developed (see Principle 2.3, p.13).

Several questions to be answered from a Monitoring Plan include:

- a. What does wetland protection mean to proponents of development, financially? Does conserving wetlands become a significant burden for proponents or The City to bear?
- b. What does wetland protection do to the cost of development?
- c. What is the net cost of using existing wetlands as stormwater wetlands vs. the cost of building an engineered wetland, and what are the pros and cons?

- d. What is the relationship between land values and the distance from Calgary? If mitigation occurs, how do the economics and functionality of wetlands relate to The City of Calgary (i.e., the further from the city, the lower the land value but less functionality to The City of Calgary)?
- e. What is the economic contribution of natural wetlands towards the sustainability of the city?

To ensure that goals described above (inventory monitoring; development standards/wetland restoration monitoring; ecological monitoring; and economic monitoring) are evaluated on a continual and efficient basis, The City needs to establish a detailed monitoring program.

# Wetland Management

Management plans shall be developed for all Crown Owned Wetlands that The City holds a Recreation Lease or License of Occupation from the Department of Sustainable Resource Development, and for all Environmental Reserve Wetlands and Natural Area Wetlands. Management plans will be developed for either individual wetlands or for the Natural Environment Park that the wetland would be located within. At a minimum, the management plans should contain the following:

1. Goals and objectives for the wetland.
2. Plant species management strategies.
3. Migratory bird and wildlife management strategies (if applicable).
4. Restoration strategies (if applicable).
5. Stormwater retention strategies, including water quality and quantity (if applicable).
6. Maintenance strategies.
7. Lifecycle strategies.
8. Program and public education strategies (if applicable).
9. Facility development strategies (if applicable).
10. Pest control strategies.

# Implementation Plan

The role of the Wetland Conservation Plan is to provide policies and procedures for the protection of priority wetlands within the city of Calgary. Detailed implementation of its policy and procedures will occur as Community Plans, Outline Plans, Area Redevelopment Plans, etc. are developed and implemented. However, in meeting the policies and procedures, further detail is required for effective and efficient implementation, operations, and monitoring. The following provides a description of the work required and the projected cost and timelines for their completion:

## **2004 – \$140,000 one-time to Parks’ operating budget, previously approved by Council.**

- Amend the Land Use Bylaw to reflect the Wetland Conservation Plan;
- Deliver training sessions on the Wetland Conservation Plan to City staff, developers and consultants;
- Identify Priority Wetland Mitigation Sites within the city (\$5,000);
- Complete inner city wetland inventory (\$20,000);

- Develop a wetland functional assessment protocol in consultation with the UDI, Ducks Unlimited Canada, Alberta Environment and Sustainable Resource Development (\$105,000);
- Develop a project charter for a monitoring and research and development program (\$10,000); and
- Establish a wetland mitigation bank that collects funds from proponents of development as compensation for the loss of a Calgary Wetland. The wetland mitigation bank shall be a revenue account separate from general revenue for the future enhancement or creation of wetlands within the city.

## **2005 – \$110,000 base budget adjustment to the Parks’ operating budget for consideration in the 2005 Shadow Budget Guidelines.**

- Implementation of a monitoring and research and development program in partnership with the UDI, the scientific community, Ducks Unlimited Canada, etc.;
- Develop a pilot public education workshop; and
- Develop a project charter for a regional wetland plan and inventory.

# Appendix 1-9

## Appendix 1: Steward & Kantrud Wetland Classification System<sup>19</sup>

Seven major classes of wetlands in natural basins are recognized on the basis of ecological differentiation. Each class is distinguished by the vegetational zone occurring in the central or deeper part and occupying 5 percent or more of the total wetland area being classified. The classes are designated as follows:

### 1. Class I – Ephemeral Ponds.



Picture 1: The wetland-low-prairie zone dominates the deepest part of the pond basin.

<sup>19</sup> Stewart, Robert E. and Harold A. Kantrud. *Classification of natural ponds and lakes in the glaciated prairie region*. Resource Publication 92, Bureau of Sport Fisheries and Wildlife. U.S. Fish and Wildlife Service, Washington, D.C. (Northern Prairie Wildlife Research Center Home Page). 1971.

### Wetland-low-prairie zone.

In certain types of basin wetlands, low-prairie vegetation may occupy the central area of a pond. Occasionally, in deeper ponds and lakes with other zones, a narrow border of surrounding low prairie is inundated during unusually high water. Because of the porous condition of the soil in this vegetational zone, the rate of bottom seepage is very rapid. As a result, surface water ordinarily is maintained for only a brief period in the early spring before the bottom ice seal disappears. Measurements of specific conductance (micromhos/cm<sup>3</sup>) of surface water in low-prairie plant associations in central areas of pond basins indicate that these species are characteristic of fresh water.

In natural untilled low-prairie zones, a normal emergent phase, with low-prairie plants, occurs regularly. Occasionally in the early spring, when water levels rise above the tops of low-prairie plants, an open-water phase without submerged aquatic plants develops. Under agricultural use, the cropland tillage phase nearly always persists as dry tilled soil, with or without weedy plant growth or crops. Tilled low-prairie zones may also appear briefly in the open-water phase during extremely high water conditions.





## 2. Class II – Temporary Ponds.



Pictures 2 & 3: The wet-meadow zone dominates the deepest part of the wetland area. A peripheral low-prairie zone is usually present.

### Wet-meadow zone.

Wet-meadow vegetation occupies the central areas of many of the shallower pond basins and commonly occurs as a peripheral band in most of the deeper ponds and lakes. Water loss from bottom seepage is fairly rapid in this zone, so that surface water usually is maintained for only a few weeks after the spring snowmelt and occasionally for several days after heavy rainstorms in late spring, summer and fall. Wetland phases in untilled wet-meadow zones include a normal emergent phase with typical wet-meadow plants occurring as emergents, and an open-water phase that develops only when water levels rise above the tops of wet-meadow plants. Most of the more numerous plant species in the normal emergent phase are fine-textured grasses, rushes, and sedges of relatively low stature. Under cultivation a wet-meadow zone in early spring normally has an open-water phase without submerged aquatic plants; this is soon replaced by a drawdown bare-soil phase unless old-growth plants from previous years are present. Shortly afterwards, typical species of the cropland drawdown phase appear. A similar sequence of phases may take place later in the season, particularly when surface water is temporarily replenished or when there is repeated cultivation. Cultivation of dry bottom soils results in the appearance of the cropland tillage phase.

# Appendix 1-9

Wet-meadow zones in the central areas of shallow pond basins are restricted to fresh or slightly brackish wetlands, while peripheral bands of wet-meadow zone frequently occur in deeper, more permanent ponds or lakes with salinity ranging from fresh to subsaline. Characteristic species of plant associations in the normal emergent phase and cropland drawdown phase differ markedly, and major differences in species composition within the normal emergent phase may be correlated with variations in salinity.

### 3. Class III – Seasonal Ponds and Lakes.



Pictures 4 & 5: The shallow-marsh zone dominates the deepest part of the wetland area. Peripheral wet-meadow and low-prairie zones are usually present.

#### Shallow-marsh zone.

Shallow-marsh vegetation dominates the central areas of pond basins that normally maintain surface water for an extended period in spring and early summer but frequently are dry during late summer and fall. In the deeper, more permanent ponds and lakes, this zone often occurs as a concentric band between wet-meadow and deep-marsh zones; in shallow alkali ponds and lakes it may occur as a band between wet-meadow and intermittent-alkali zones.

Under natural untilled conditions, this zone is represented by four wetland phases: a normal emergent phase of regular occurrence; an open-water phase, often with submerged aquatic plants, occurring during high water; and a natural drawdown emergent phase, occasionally preceded by a drawdown bare-soil phase that develops during periods of low precipitation. Typical dominant species in the normal emergent phase are grasses or grass-like plants that are intermediate in height in comparison with emergent plants in the normal emergent phase of wet-meadow and deep-marsh zones.

Wetland phases occurring when this zone is tilled include the following: an open-water phase, with or without submerged aquatic plants, which is generally present during the spring and occasionally present after heavy rainstorms in summer and fall; a drawdown bare-soil phase, developing as open surface water disappears; a cropland drawdown phase that becomes established on exposed mud flats, particularly during late summer and fall; and a cropland tillage phase immediately following cultivation. Whenever surface water is maintained for a considerable period in late spring and summer, a distinctive normal emergent phase characteristic of the tilled shallow-marsh zone occurs. This phase is composed of pioneering shallow-marsh species that also appear, although less commonly, in the normal emergent phase of natural untilled shallow-marsh zones.

Shallow-marsh zones occurring in central areas of pond basins are largely restricted to fresh, slightly brackish, or moderately brackish ponds or lakes. In the deeper, more permanent ponds and lakes, the concentric bands of shallow marsh adjoining the more centrally located deep-marsh zones are of regular occurrence throughout the range of salinity, from fresh to subsaline. Tillage of shallow-marsh zones ordinarily occurs only in fresh, slightly brackish, and moderately brackish ponds. Outer bands of shallow marsh in strongly saline alkali lakes are subsaline, in contrast to the greater salinity of the central open areas. Surface water in brackish and subsaline shallow marsh tends to be shallower and less permanent than surface water in shallow-marsh zones of the fresher ponds and lakes. Nevertheless, the spatial relation of shallow-marsh to wet-meadow and deep-marsh remains the same, regardless of salinity.

Differences in species composition are quite pronounced between shallow-marsh plant associations characteristic of untilled and tilled conditions, and among emergent, open-water, natural drawdown, and cropland drawdown phases of this zone. More subtle differences within each phase may be represented as a continuum of overlapping species that is correlated with differences in salinity.

#### 4. Class IV – Semi-permanent Ponds and Lakes.



Pictures 6 & 7: The deep-marsh zone dominates the deepest part of the wetland area. Shallow-marsh, wet-meadow, and low-prairie zones are usually present, and isolated marginal pockets of fen zones occasionally occur.

# Appendix 1-9

## Deep-marsh zone.

Deep-marsh vegetation dominates the central areas of pond basins that ordinarily maintain surface water throughout the spring and summer and frequently maintain surface water into fall and winter. Deep-marsh zones usually occur also as marginal bands that adjoin the deep permanent-open-water zones of permanent ponds and lakes.

Four wetland phases are represented in this zone: a normal emergent and an open-water phase, both of regular occurrence, and a drawdown bare-soil (nonvegetated) phase and a natural drawdown emergent phase, both of which develop only during drought. In the deeper ponds, an alternation of the normal emergent phase and the open-water phase is common because of annual and seasonal changes in water depth. The normal emergent phase is generally present in the shallower areas of this zone, while the open-water phase occupies the deeper areas. In permanent lakes, marginal bands of deep marsh are usually represented by the normal emergent phase in the outer, shallower portions, while the open-water phase is typical of the deeper portions that adjoin the permanent-open-water zone. Submerged or floating plants are often found throughout this zone; certain species of these plants occur as subdominants in the normal emergent phase, while many other species are characteristic of the open-water phase. Dominant plant species in the normal emergent phase are in general coarser and taller than corresponding species in shallow-marsh zones.

Deep-marsh zones are nearly always present in the deeper ponds and lakes in which salinity ranges from slightly brackish to subsaline. During high water this zone may also be found locally in some of the deep fresh-water ponds. Species composition of plant associations differs noticeably in the three vegetational phases of deep marsh and under different ranges of salinity within each phase.

## 5. Class V – Permanent Ponds and Lakes.



Picture 8: The permanent-open-water zone dominates the deepest part of the wetland area. Peripheral deep-marsh, shallow-marsh, wet-meadow, and low-prairie zones are often present, and isolated marginal pockets of fen zone occasionally occur.

### Permanent-open-water zone.

This deep-water zone, of local occurrence in a few ponds and lakes that maintain fairly stable water levels, is represented only by the open-water phase. Measurements of specific conductance (micromhos/cm<sup>3</sup>) indicated that water in this zone may be classified as slightly brackish, moderately brackish, brackish, or subsaline. Only two species of vascular plants were found in this zone (see under Class V). Western widgeongrass (*Ruppia occidentalis*) is quite regular in occurrence, and occasionally it is associated with big-sheath pondweed (*Potamogeton vaginatus*). In some lakes the deeper portions of this zone are completely devoid of submerged vegetation. Because of stability of water levels and greater water depth, emergent plants do not develop in this zone. Toward shore this zone is frequently bordered by a band of open water representing the open-water phase of the deep-marsh zone. Although superficially similar in appearance, this shallow open-water band differs in species composition of submerged plants.

## 6. Class VI – Alkali Ponds and Lakes.



Picture 9 & 10: The intermittent-alkali zone dominates the deepest part of the wetland area. Peripheral shallow-marsh, wet-meadow, and low-prairie zones are usually present. A deep-marsh zone is normally absent except occasionally for isolated patches near marginal seepage areas. A few isolated pockets of fen zone are normally present along the margins.

### Intermittent-alkali zone.

This zone is characterized by highly saline shallow water that frequently alternates with exposed glistening-white alkali saltflats. The principal salts represented are sulfates and chlorides of sodium and magnesium, which are termed alkali salts by common usage throughout the Great Plains. Under dry conditions this zone is frequently subject to wind erosion. On windy days it is not unusual for great clouds of white alkali dust to form.

Emergent plants do not develop in this zone, apparently because of the high salt content, but one submerged aquatic species, saltwater widgeongrass (*Ruppia maritima*), is frequently abundant whenever surface water is maintained for a few weeks during the summer.

## 7. Class VII – Fen (alkaline bog) Ponds.



Picture 11: The fen zone dominates the deepest part of the wetland area. Peripheral wet-meadow and low-prairie zones are often present.

### Fen (alkaline bog) zone.

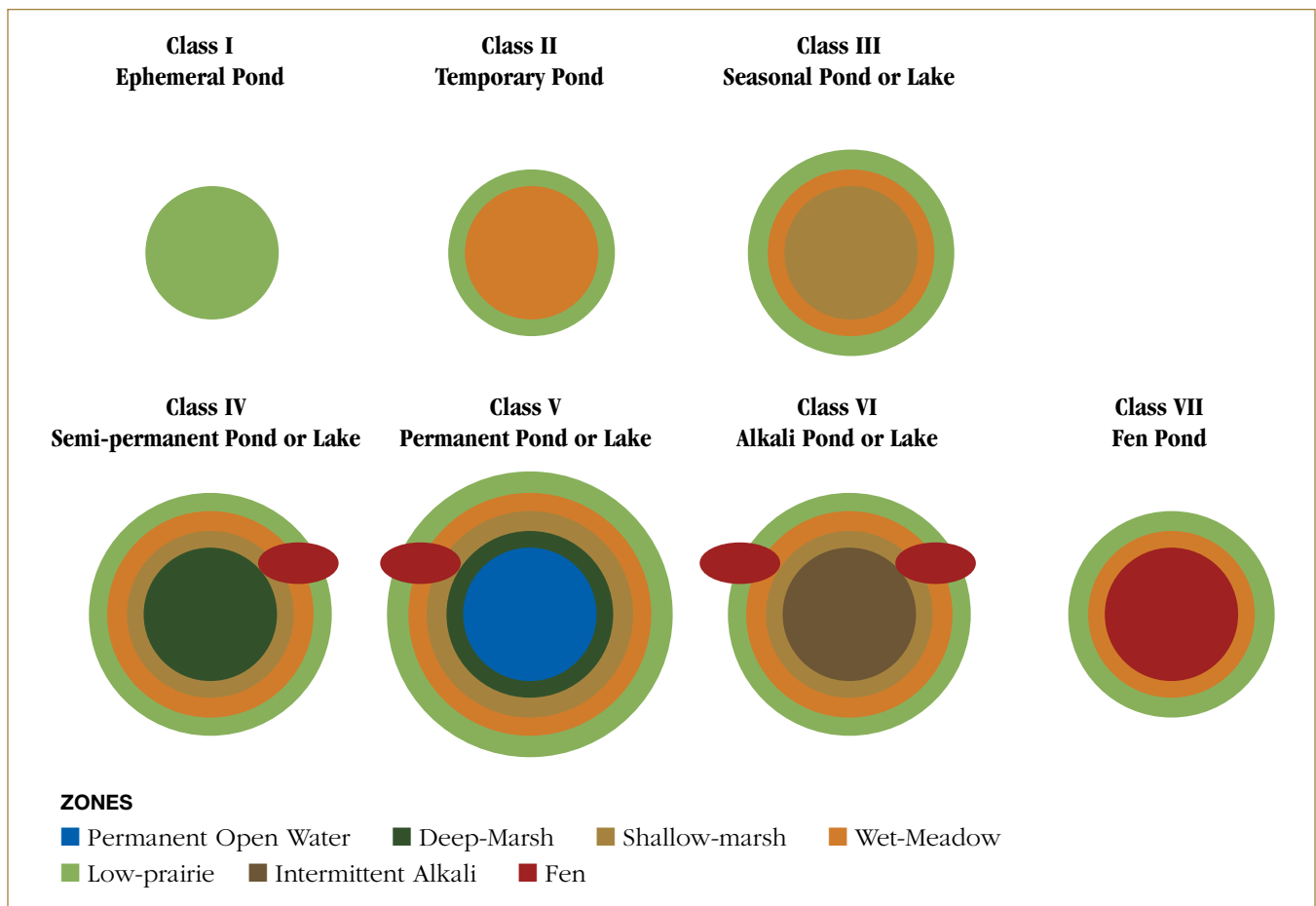
Vegetation characteristic of fens occasionally dominates the central areas of pond basins, but more frequently occurs as isolated pockets along the margins of typical ponds and lakes. Surface water is sometimes lacking in this zone, although the bottom soils are normally saturated by alkaline ground-water seepage. Most bottom soils in the deeper portions have the consistency of soft muck or ooze. In many cases, fen zones could be considered quagmires with floating or quaking surface mats of emergent vegetation. Springs are sometimes present, and these are usually on raised mounds of wet organic material that are covered with mats of dense vegetation. Specific conductance ( $\mu\text{mhos}/\text{cm}^3$ ) measurements of surface water indicate that fen zones are in the slightly brackish salinity range.

# Appendix 1-9

Pockets of fen zones adjoining the more typical basin wetlands are most frequent along the margins of brackish, subsaline, and saline ponds and lakes. In these situations fen zones are often located on gently sloping terrain with a perceptible flow of ground water on or near the surface, extending from seepage inflow or spring sites to the ponded surface water below. Ordinarily, salinity increases as water moves down the slope, and this is reflected in changes in species composition of wetland plants. Typical fen species gradually merge with and are replaced by species characteristic of salinity ranges in other zones. Vegetation of fens is represented by a normal emergent phase and an open-water phase.

## 8. Spatial Relationship of Vegetation Zones

Below are illustrations of the spatial relations of vegetational zones in the major classes of ponds and lakes. Normally, wetland classes are easily distinguished in the field. Occasionally, a pond or lake intermediate between two classes will be encountered in which the deepest part of the wetland area is occupied by a mixture of species characteristic of two different zones. In such a case, the class designation would depend on which characteristic species group represents more than 50 percent of the vegetational growth in the deeper central area.



## Appendix 2: Wetland Environmental Significance Assessment (ESA)

MEETS ONE OR ALL OF THE CRITERIA BELOW							
Significance	Disturbance	Flora	Fauna	Flood & Erosion Control	Hydrological (water quality & quantity) Function	Cultural, Recreational & Educational Potential	Urban Design Potential
<b>Environmentally Significant Wetland</b>	Very little to no disturbance is evident.	Dominated by native species that may: <ul style="list-style-type: none"> <li>• Exhibit high flora diversity relative to other area wetlands; and/or</li> <li>• Be unique species including those that are locally, provincially or nationally rare.</li> </ul>	<ul style="list-style-type: none"> <li>• High species diversity;</li> <li>• Act as an important staging area for wildlife movement; or</li> <li>• Contains unique species.</li> </ul>	High contribution to flood and erosion control.	High contribution to the long-term maintenance of the hydrological regime beyond its boundaries.	High potential for developing passive recreational, interpretative, and/or educational facilities.	High potential to enhance the quality, form and function of the built environment through visual aesthetics, character, variety, sun allowances, noise/sight buffering, and/or the creation of public spaces.
<b>Major Wetland</b>	Moderate to very little disturbance is evident.	Predominately native in character with some non-native species and may have: <ul style="list-style-type: none"> <li>• moderate to high flora diversity.</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate to high species diversity; or</li> <li>• Act as a moderately important to important staging area for wildlife movement.</li> </ul>	Moderate to high contribution to flood and erosion control.	Moderate to high contribution to the long-term maintenance of the hydrological regime beyond its boundaries.	Moderate to high potential for developing passive recreational, interpretative, and/or educational facilities.	Moderate to high potential to enhance the quality, form and function of the built environment through visual aesthetics, character, variety, sun allowances, noise/sight buffering, and/or the creation of public spaces.
<b>Supporting Wetland</b>	High to moderate disturbance is evident	High to moderate invasion by non-native species and may have: <ul style="list-style-type: none"> <li>• low to moderate flora diversity.</li> </ul>	<ul style="list-style-type: none"> <li>• Low to moderate species diversity; or</li> <li>• Low importance to moderately important staging area for wildlife movement.</li> </ul>	Low to moderate contribution to flood and erosion control.	Low to moderate contribution to the long-term maintenance of the hydrological regime beyond its boundaries.	Low to moderate potential for developing passive recreational, interpretative, and/or educational facilities.	Low to moderate potential to enhance the quality, form and function of the built environment through visual aesthetics, character, variety, sun allowances, noise/sight buffering, and/or the creation of public spaces.

# Appendix 1-9

## Appendix 3: Tools for Wetland Protection

There are several legal tools (Appendix 4) available to The City of Calgary for protecting wetlands from potential development. Although these tools are available, there is a need for a more in-depth awareness and understanding of their utility. The following information was adapted from *Conserving Edmonton's Natural Areas: A Framework for Conservation Planning in an Urban Landscape*, Alberta Environmental Network and the City of Edmonton, 2001.

### 1. Conservation Easements

In 1996, the provincial government amended the *Alberta Environmental Protection and Enhancement Act* (EPEA) to increase the property rights of landowners. It now gives landowners a choice to not develop the land (indefinitely, or for a specific time period) and to preserve the land's natural value. This legal agreement is called a Conservation Easement. The landowner retains ownership of their property but specifies certain rights to a land conservation organization or a public body, to protect the natural values of all, or part of their land, for reasons identified in the EPEA.

The owners, or future owners, agree not to make changes to the property that would negatively affect the natural features of the site, such as filling in wetlands. The landowner does not lose full control of the land even though some development rights may be transferred. The organization holding the Conservation Easement is responsible for monitoring compliance with the terms of agreement and has the right to enforce the restrictions under provincial or

territorial laws, and to require restoration, should the terms be broken. Conservation Easements may be granted to certain qualifying non-profit, conservation organizations with charitable status.

### 2. Administrative and Planning Tools

Administrative and planning tools include land taken as Municipal Reserve and Environmental Reserve. The City is entitled to acquire Municipal Reserve (MR) under sections 661-670 of the *Municipal Government Act*. Ordinarily, the municipality may take no more than 10 per cent of land and must incorporate that land for schools, public parks or recreation areas or to separate land used for different purposes within this 10 per cent allotment.

The City is entitled to acquire Environmental Reserve (ER) under section 664 of the *Municipal Government Act*, without compensation. ER may be acquired only if it consists of a swamp or gully, land that is subject to flooding, is unstable, or land (not less than 6m) abutting the bed and shore of any lake, river, stream or other body of water (see definition of ER in the Glossary of Terms).

Both ER and MR are only triggered by application for subdivision and the amount of land is limited. However, advantages of MR/ER dedication are that it may be acquired by the subdivision authority as a condition for the subdivision; it is simple; and does not cost The City. ER generally offers a high degree of protection and is difficult to undo. Where the municipality and the landowner agree, Environmental Reserve may be taken as an Environmental Reserve Easement, where the title to the reserve land remains in the name of the landowner.



### 3. Acquisition

The City of Calgary can acquire land through an outright purchase. It is simple and offers a high degree of protection if The City agrees. However, it is costly for The City and the landowner must be willing to sell. Typically, it doesn't bind future landowners.

### 4. Ecological Gifts

The Ecological Gifts program is a federal program for private and corporate landowners in Canada to make donations of land, or interests in these lands, with tax benefits. An ecological gift must be land that is certified by the federal Minister of the Environment to be ecologically sensitive, and is subject to long-term restrictions on future sale and land use changes.

**Other tools** for wetland protection include voluntary action by landowners; leases to The City; and density transfers (i.e., City approving authority provides added subdivision or development potential in return for protecting wetlands).

### 5. Natural Area Wetland Protection

Approximately 6,800 ephemeral and temporary ponds which contribute to groundwater discharge/recharge and water purification (see Appendix 7, Items 2 and 3) are primarily protected through the *Provincial Water Act* which is administered by Alberta Environment. Through the development of the Wetland Conservation Plan it was recognized that The City of Calgary can assist in the protection of these wetlands by:

- helping proponents of development adhere to legislation/regulations by circulating Community Plans and Land Use/Outline Plans to the appropriate provincial and federal agencies;
- acquiring those wetlands that have been deemed environmentally significant or are of a quality and character that warrant conservation within a Natural Environment Park (see Conservation Plan 2.2.9, p. 23);
- establishing a Total Loading Limits (TLL) program and action plan based on target limits of pollutants into the Bow River;
- proactively planning for the quality of stormwater runoff in new communities in accordance with *Wastewater's Stormwater Management & Design Manual*; and
- circulating all Master Drainage Plans to Alberta Environment for their approval at the Community Plan stage.

# Appendix 1-9

## Appendix 4: Legal Tools for Municipalities to Conserve Environmentally Sensitive Areas

(Adapted from the Environmental Law Centre's (Arlene Kwasniak) contribution to *Conserving Edmonton's Natural Areas: A Framework for Conservation Planning in an Urban Landscape* (Alberta Environmental Network and City of

Edmonton 2001), (by Westworth Associates Environmental Ltd., The Dagny Partnership, the Land Stewardship Centre of Canada and the Environmental Law Centre.)

**The following has been taken directly from: Kwasniak, Arlene. *Alberta Wetlands – A Legal & Policy Guide*. Environmental Law Centre and Ducks Unlimited Canada. 2001.**

### 1. Designation Tools

Tool	Advantages and Benefits	Disadvantages and Costs	Comments
Sale to and establishment by the federal government as a national park, park reserve, national historic site, migratory bird sanctuary or national wildlife area	<ul style="list-style-type: none"> <li>• High degree of protection</li> <li>• Difficult to undo</li> <li>• Flexible protection</li> <li>• Federal government carries out monitoring, upkeep and enforcement, less costly to City and proponent</li> </ul>	<ul style="list-style-type: none"> <li>• Dependent on action from the federal government</li> <li>• Provincial government must agree</li> <li>• Costly to the federal government</li> <li>• Difficult to meet criteria</li> </ul>	<ul style="list-style-type: none"> <li>• See the Canada National Parks Act, the Migratory Birds Convention Act, the Canada Wildlife Act</li> </ul>
Gift to and establishment by the federal government as a national park, park reserve, national historic site, migratory bird sanctuary or national wildlife area	<ul style="list-style-type: none"> <li>• High degree of protection</li> <li>• Difficult to undo</li> <li>• Flexible protection</li> <li>• Federal government carries out monitoring, upkeep and enforcement; less costly to City and proponent</li> <li>• Tax advantages if a gift of capital property</li> <li>• Could be an ecological gift</li> </ul>	<ul style="list-style-type: none"> <li>• Dependent on action from the federal government</li> <li>• Provincial government must agree</li> <li>• For best tax benefits must qualify as an ecological gift</li> <li>• Costly to the land owner</li> <li>• Difficult to meet criteria</li> </ul>	<ul style="list-style-type: none"> <li>• See the Canada National Parks Act, the Migratory Birds Convention Act, the Canada Wildlife Act</li> </ul>
Sale to and designation by the provincial government as a provincial park, wildlands park, recreation area, ecological reserve, natural area, wilderness area or wildlife sanctuary	<ul style="list-style-type: none"> <li>• Varying degrees of protection depending on designation</li> <li>• Some designations are difficult to undo</li> <li>• Flexible protection</li> <li>• Provincial government carries out monitoring, upkeep and enforcement; less costly to City and proponent</li> </ul>	<ul style="list-style-type: none"> <li>• Dependent on action from the provincial government</li> <li>• Costly to the provincial government</li> <li>• Difficult to meet criteria</li> </ul>	<ul style="list-style-type: none"> <li>• See the <i>Wilderness Areas, Ecological Reserves and Natural Areas Act</i>, the <i>Provincial Parks Act</i> and the <i>Wildlife Act</i></li> </ul>

## 2. Sales And Purchase Transactions

Tool	Advantages and Benefits	Disadvantages and Costs	Comments
Sale to the City	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Flexible protection</li> <li>• High degree of protection if City agrees</li> </ul>	<ul style="list-style-type: none"> <li>• Costly for the City</li> <li>• Land owner must be willing to sell the land</li> <li>• City free to develop land in future</li> <li>• Does not bind future owners</li> </ul>	
Sale of Conservation Easement to City or other Government Body	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Flexible protection</li> <li>• High degree of protection</li> <li>• Binds future owners</li> <li>• Less costly than sale of land itself</li> </ul>	<ul style="list-style-type: none"> <li>• Costly to the City or other government recipient</li> <li>• Easement must fit within purpose set out in s. 22.1(2) of EPEA</li> <li>• Easement can be terminated by agreement or by the Minister of Environment</li> </ul>	<ul style="list-style-type: none"> <li>• The City, Alberta or government agencies qualify to accept a grant of a conservation easement.</li> </ul>
Sale to an ENGO	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Flexible</li> <li>• Unlikely to be undone</li> <li>• ENGO carries out monitoring, upkeep and enforcement;</li> <li>• Less costly to City and proponent.</li> </ul>	<ul style="list-style-type: none"> <li>• Costly to the ENGO</li> <li>• Land owner must be willing to sell the land</li> </ul>	
Sale of Conservation Easement to ENGO.	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Terms of the agreement can be modified by agreement</li> <li>• Binds future owners</li> <li>• ENGO carries out monitoring, upkeep and enforcement;</li> <li>• Less costly to City and proponent.</li> </ul>	<ul style="list-style-type: none"> <li>• Costly to the ENGO who must pay market value for the easement</li> <li>• Easement must fit within a purpose set out in s. 22.1(2) of EPEA</li> <li>• Easement can be terminated by agreement or by the Minister of Environment</li> </ul>	<ul style="list-style-type: none"> <li>• The ENGO must be a “qualified organization” as set out in s. 22.1(1)(e)(iv) of EPEA.</li> </ul>

# Appendix 1-9

## 3. Gifts

Tool	Advantages and Benefits	Disadvantages and Costs	Comments
Gift to City	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Flexible protection</li> <li>• Tax benefits if a gift of capital property</li> <li>• Could be an ecological gift</li> <li>• High degree of protection if City agrees</li> </ul>	<ul style="list-style-type: none"> <li>• Costly to Owner</li> <li>• Land owner must be willing to give the land</li> <li>• For best tax benefits must qualify as an ecological gift</li> <li>• City free to develop land in future if not an ecological gift</li> <li>• Does not bind future owners if not an ecological gift</li> </ul>	<ul style="list-style-type: none"> <li>• An ecological gift must be land that is certified by the federal Minister of the Environment to be ecologically sensitive land.</li> <li>• A sale, transfer or land use change of land donated as an ecological gift without the approval of the federal Minister of Environment will give rise to a tax penalty</li> </ul>
Gift of Conservation Easement to City or other Government Body	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Flexible protection</li> <li>• High degree of protection</li> <li>• Binds future owners</li> <li>• May be tax deductible if capital property</li> <li>• Could be an ecological gift</li> <li>• Less costly than sale of land itself</li> </ul>	<ul style="list-style-type: none"> <li>• Easement must fit within a purpose set out in s. 22.1(2) of EPEA</li> <li>• For best tax benefits must qualify as an ecological gift</li> <li>• Costly to land owner</li> </ul>	<ul style="list-style-type: none"> <li>• An ecological gift can be an easement if certified by the Minister of the Environment to be ecologically sensitive land the conservation and protection of which is important to the preservation of Canada's environmental heritage.</li> </ul>
Gift to an ENGO	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Certain</li> <li>• May be tax deductible if capital property</li> <li>• Could be an ecological gift</li> <li>• ENGO carries out monitoring, upkeep and enforcement; less costly to City and proponent</li> <li>• High degree of protection</li> </ul>	<ul style="list-style-type: none"> <li>• Costly to Owner who gives up the difference between market value of the land and the value of any tax deduction for a gift to charity</li> <li>• For best tax treatment must qualify as an ecological gift</li> <li>• Land owner must be willing to give the land</li> </ul>	<ul style="list-style-type: none"> <li>• An ecological gift must be land that is certified by the Minister of the Environment to be ecologically sensitive land. The beneficiary of the gift must be a registered charity one of the main purposes of which is the conservation and protection of Canada's environmental heritage.</li> </ul>
Gift of Conservation Easement to ENGO	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Terms of the agreement can be modified by agreement</li> <li>• May be tax deductible if capital property</li> <li>• Could be an ecological gift</li> <li>• High degree of protection</li> <li>• ENGO carries out monitoring, upkeep and enforcement;</li> <li>• Less costly to City and proponent</li> <li>• Binds future owners.</li> </ul>	<ul style="list-style-type: none"> <li>• Easement must fit within a purpose set out in s. 22.1(2) of EPEA</li> <li>• For best tax treatment must qualify as an ecological gift</li> </ul>	<ul style="list-style-type: none"> <li>• The ENGO must be a "qualified organization" as set out in s. 22.1(1)(e)(iv) of EPEA.</li> </ul>

4.

#### 4. Personal, Term and Common Law Partial Interests

Tool	Advantages and Benefits	Disadvantages and Costs	Comments
Voluntary action by owner to refrain from or limit development	<ul style="list-style-type: none"> <li>• Simple</li> </ul>	<ul style="list-style-type: none"> <li>• Easy to undo</li> <li>• Expensive to land owner</li> <li>• Does not bind future owners</li> <li>• Limited protection</li> </ul>	
Lease to City	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Flexible</li> <li>• Unlikely to be undone during term of lease</li> <li>• City carries out monitoring, upkeep and enforcement</li> </ul>	<ul style="list-style-type: none"> <li>• Could be costly to City</li> <li>• Leases usually must be of an entire parcel and not to part of a parcel</li> <li>• Land owner must be willing to lease land</li> <li>• No protection after term expires</li> </ul>	<ul style="list-style-type: none"> <li>• Must be registered at Land Titles if for over three years in order to bind future purchasers</li> </ul>
Lease to ENGO	<ul style="list-style-type: none"> <li>• Simple</li> <li>• Flexible</li> <li>• Unlikely to be undone during term of lease</li> <li>• ENGO carries out monitoring, upkeep and enforcement;</li> <li>• Less costly to City</li> </ul>	<ul style="list-style-type: none"> <li>• Could be costly to ENGO</li> <li>• Leases usually must be of an entire parcel and not to part of a parcel</li> <li>• Land owner must be willing to lease the land</li> <li>• No protection after term expires</li> </ul>	<ul style="list-style-type: none"> <li>• Must be registered at Land Titles if for over three years in order to bind future purchasers</li> </ul>
License to City or ENGO	<ul style="list-style-type: none"> <li>• Owner could give a license to enter onto land to carry out a conservation program</li> </ul>	<ul style="list-style-type: none"> <li>• Is not an interest in land, so does not bind future purchasers</li> <li>• Could be costly to City or ENGO</li> <li>• No protection after term expires</li> </ul>	
Profit a Prendre to City ( <i>right to enter onto land and take some "profit" of the soil</i> )	<ul style="list-style-type: none"> <li>• Owner could give City exclusive right to trees or other vegetation while City holds right, no one else may remove vegetation</li> <li>• City carries out monitoring, upkeep and enforcement</li> <li>• High degree of protection if rights not exercised</li> <li>• Could be for a term or be granted in perpetuity</li> </ul>	<ul style="list-style-type: none"> <li>• Could be costly to City to purchase right</li> <li>• Conservation goal only realized if City chooses not to exercise right</li> <li>• Land owner must be willing to sell a profit a prendre</li> </ul>	<ul style="list-style-type: none"> <li>• Profits a prendre are interests in land and bind subsequent purchasers if registered on title</li> </ul>

# Appendix 1-9

Tool	Advantages and Benefits	Disadvantages and Costs	Comments
<p>Profit a Prendre to ENGO (right to enter onto land and take some "profit" of the soil).</p>	<ul style="list-style-type: none"> <li>• Owner could give ENGO exclusive right to trees or other vegetation while ENGO holds right, no one else may remove vegetation;</li> <li>• ENGO carries out monitoring, upkeep and enforcement</li> <li>• High degree of protection if rights not exercised</li> <li>• Could be for a term or be granted in perpetuity</li> </ul>	<ul style="list-style-type: none"> <li>• Could be costly to ENGO to purchase right</li> <li>• Conservation goal only realized if ENGO chooses not to exercise right</li> <li>• Land owner must be willing to sell a profit a prendre.</li> </ul>	<ul style="list-style-type: none"> <li>• Profits a prendre are interests in land and bind subsequent purchasers if registered on title</li> <li>• May exist in gross, meaning, no need for a dominant tenement as in easements and restrictive covenants</li> </ul>
<p>Common law Easement from owner regarding neighbouring land</p>	<ul style="list-style-type: none"> <li>• Binds future owners</li> <li>• May contain positive or negative covenants</li> <li>• Less expensive than sale of land itself</li> <li>• Could be for a term or be granted in perpetuity</li> </ul>	<ul style="list-style-type: none"> <li>• Easement on a parcel (servient tenement) must benefit another land (dominant tenement)</li> <li>• Can be undone by owner of the dominant tenement</li> </ul>	<ul style="list-style-type: none"> <li>• See ss.71 &amp; 72 of <i>Land Titles Act</i></li> </ul>
<p>Restrictive Covenant regarding neighbouring land</p>	<ul style="list-style-type: none"> <li>• Binds future owners</li> <li>• Less expensive than sale of land itself</li> <li>• Could be for a term or be granted in perpetuity</li> </ul>	<ul style="list-style-type: none"> <li>• Restriction on one parcel (servient tenement) must benefit another parcel (dominant tenement)</li> <li>• Covenants can only be negative and not positive</li> <li>• Can be undone by owner of dominant tenement</li> <li>• Can be removed by the Court in the public interest</li> </ul>	<ul style="list-style-type: none"> <li>• See s. 52 of <i>Land Titles Act</i></li> </ul>

## 5. Administrative and Planning Tools, Traditional

Tool	Advantages and Benefits	Disadvantages and Costs	Comments
Municipal Reserve required by City	<ul style="list-style-type: none"> <li>• May be required by the subdivision authority as a condition for subdivision</li> <li>• Simple</li> <li>• Not costly to municipality</li> </ul>	<ul style="list-style-type: none"> <li>• Is only triggered by an application for subdivision</li> <li>• Amount of land is limited by ss. 666 and 668 of <i>Municipal Government Act</i></li> </ul>	<ul style="list-style-type: none"> <li>• See ss. 661 – 670 of <i>Municipal Government Act</i></li> <li>• Municipal reserve is dedicated without compensation</li> </ul>
Environmental Reserve required by City	<ul style="list-style-type: none"> <li>• May be required by the subdivision authority as a condition for subdivision</li> <li>• High degree of protection</li> <li>• Simple</li> <li>• Difficult to undo</li> <li>• Not costly to municipality</li> </ul>	<ul style="list-style-type: none"> <li>• Is only triggered by an application for subdivision</li> <li>• Must comply with s. 664(1) of <i>MGA</i> so does not apply to all environmentally sensitive land</li> </ul>	<ul style="list-style-type: none"> <li>• See s. 664 of <i>Municipal Government Act</i></li> <li>• Environmental reserve is dedicated without compensation</li> </ul>
Environmental Reserve Easement required by City.	<ul style="list-style-type: none"> <li>• If the owner and city agree can replace the environmental reserve</li> <li>• High degree of protection</li> <li>• Simple</li> <li>• Flexible</li> <li>• Not costly to municipality</li> </ul>	<ul style="list-style-type: none"> <li>• Is only triggered by an application for subdivision</li> <li>• Costly to the proponent as the easement is granted without compensation</li> <li>• Must comply with s. 664 of <i>MGA</i> so does not apply to all environmentally sensitive land</li> </ul>	<ul style="list-style-type: none"> <li>• See s. 664(2) &amp; (3) of <i>Municipal Government Act</i></li> <li>• Environmental reserve easement is dedicated without compensation</li> <li>• Title stays in name of proponent</li> </ul>
Natural Area Land Use Designation under Land Use Bylaw of City and other exercising of municipal authority involving down-zoning to regulate land use	<ul style="list-style-type: none"> <li>• Uses the City Land Use Bylaw and zoning powers</li> <li>• Simple</li> <li>• Flexible</li> <li>• Binds future owners unless changed by City</li> <li>• If a legitimate use of zoning powers no compensation is payable</li> </ul>	<ul style="list-style-type: none"> <li>• May be politically difficult for the City</li> <li>• Requires the definition of new land use category</li> <li>• Can be changed by City</li> <li>• Down-zoning must be in pursuit of long-term planning objectives</li> </ul>	<ul style="list-style-type: none"> <li>• See s. 640 of <i>Municipal Government Act</i></li> <li>• Case law has shown that there is ample scope to downzone land for protection of environment without having to pay any compensation. See <i>F. Laux, Planning Law and Practice in Alberta</i>, Second Edition, Chapter 8.</li> </ul>

# Appendix 1-9

## 6. Administrative/planning Novel

Tool	Advantages and Benefits	Disadvantages and Costs	Comments
Conservation easement instead of Environmental or Municipal Reserve	<ul style="list-style-type: none"> <li>• Could be more flexible than municipal or environmental reserve</li> </ul>	<ul style="list-style-type: none"> <li>• Can be discharged by the Minister of Environment in the public interest</li> </ul>	<ul style="list-style-type: none"> <li>• See <i>Environmental Protection and Enhancement Act</i>, s. 22.1</li> <li>• Title remains in the landowner</li> </ul>
Formal transfer of development potential by City to proponent from one parcel to another	<ul style="list-style-type: none"> <li>• Equitable</li> <li>• Cost Effective</li> <li>• Complex if possible</li> <li>• Flexible</li> <li>• Could have high degree of protection</li> </ul>	<ul style="list-style-type: none"> <li>• Would require legislative changes</li> </ul>	<ul style="list-style-type: none"> <li>• Is not specifically anticipated by existing legislation</li> </ul>
Informal transfer of development potential by City to proponent from one parcel to another	<ul style="list-style-type: none"> <li>• Equitable</li> <li>• Cost effective</li> <li>• Simple</li> <li>• Flexible</li> <li>• Could have high degree of protection</li> </ul>	<ul style="list-style-type: none"> <li>• May be legally challenged if part of process is City taking reserves in excess of those technically allowed by law in exchange for approval of other development</li> <li>• Is voluntary</li> <li>• Owing to novelty of tool, may be difficult to get City staff and Council “on-side”</li> </ul>	<ul style="list-style-type: none"> <li>• “Informal” means that current legislation does not specifically authorize transfers of development potential</li> <li>• “Potential” is used instead of “right” since all relevant development is subject to municipal regulatory approvals</li> </ul>
Bareland Condominium (unit owners own a common interest in a portion of parcel)	<ul style="list-style-type: none"> <li>• Flexible</li> <li>• Allowed by current legislation</li> <li>• Unit owners manage natural area for mutual benefit</li> <li>• Could use in conjunction with a conservation easement over common area to better protect natural values</li> </ul>		<ul style="list-style-type: none"> <li>• See <i>Land Titles Act</i> and <i>Condominium Properties Act</i></li> </ul>
Bonusing (City approving authority provides added subdivision or development potential, for example, density, in return for protecting an area.)	<ul style="list-style-type: none"> <li>• Flexible</li> <li>• Unlikely to be undone</li> </ul>	<p>May be legally challenged if part of process is City taking reserves in excess of those technically allowed by law in exchange for approval of other development, e.g. greater density</p> <ul style="list-style-type: none"> <li>• Is voluntary</li> <li>• Owing to novelty of tool, may be difficult to get City staff and Council “on-side”</li> </ul>	
Building scheme restrictive covenants	<ul style="list-style-type: none"> <li>• Binds future owners</li> </ul>	<ul style="list-style-type: none"> <li>• Covenants may only be negative and not positive</li> <li>• Can be removed by the Court in the public interest</li> </ul>	<ul style="list-style-type: none"> <li>• Has been used in Strathcona County in a subdivision to protect natural values in conjunction with conservation easements</li> </ul>



## 7. Regulatory and Administrative Tools

Tool	Advantages and Benefits	Disadvantages and Costs	Comments
Municipality's general bylaw making	<ul style="list-style-type: none"> <li>• Could regulate many aspects of land uses (e.g. Surrey BC has a tree cutting bylaw)</li> <li>• Can protect land before subdivision and development stage</li> <li>• Flexible protection</li> <li>• City must carry out monitoring, upkeep and enforcement</li> </ul>	<ul style="list-style-type: none"> <li>• Must have Council on side</li> <li>• Could be unpopular with landowners</li> <li>• Could be challenged if conflicts with Provincial regulation or goes beyond municipal jurisdiction</li> </ul>	<ul style="list-style-type: none"> <li>• See the Part I, Division 1, <i>Municipal Government Act</i></li> </ul>
Municipal taxation	<ul style="list-style-type: none"> <li>• In limited circumstances could be used to lower or exempt taxes where landowner helps realize natural area municipal policy</li> </ul>	<ul style="list-style-type: none"> <li>• Exemption or reduction only allowed by <i>Municipal Government Act</i> in limited circumstances</li> </ul>	

# Appendix 1-9

## Appendix 5: Mitigation

**The first priority** in The City's commitment to the conservation and protection of Calgary Wetlands is the **avoidance of impact from development**. Where it can be demonstrated to the satisfaction of the approving authority at the Community Plan stage that, due to inherent constraints upon a site, avoidance of impact to a Calgary Wetland is not possible or practical, then disturbance to the wetland(s) will be considered in the following order of priority:

**Priority 2 – Minimization of and Mitigation** for unavoidable development impacts; and

**Priority 3 – Mitigation** for development impacts that cannot be minimized.

Therefore, wetland mitigation is a process or sequence of events, starting with the first step of avoidance, the second step of minimization and mitigation, and the final step of mitigation for development impacts that cannot be minimized. The use of the mitigation process as a conservation tool is based on the premise that the environment and the economy are inextricably linked, and that, in the long-term, a healthy environment underpins a healthy economy.<sup>20</sup> A discussion of each of the above steps follows:

### 1. Avoidance of Impact

Avoidance of the impact of development on Calgary Wetlands is the ideal conservation approach and is embodied in the policies of the development approval process (see p.20). However, if the avoidance of an impact from development is not possible, the approving authority at the Community Plan stage shall authorize the level of disturbance.<sup>21</sup>

<sup>20</sup> *Wetland Mitigation in Canada – A Framework for Application*, Cox & Grose, 2000.

<sup>21</sup> City of Calgary, *Open Space Plan*. Cerlox. Calgary: 2003.

**Note:** Any planned use and/or disturbance of waterbodies or Crown Owned Wetlands must be approved by Sustainable Resource Development – Public Lands and Forests Division, and Alberta Environment.

### 2. Minimization and Mitigation of Impacts

If the impact of development is unavoidable, the proponent of development must demonstrate that all practicable means to minimize the overall impact to the Calgary Wetlands have been explored. A thorough evaluation of all options, including an assessment of wetland functions, is to be done as a part of a Biophysical Impact Assessment at the Outline Plan stage. The assessment should be based upon a Wetland Functional Assessment (see Appendix 9), as well as engineering and planning requirements. Losses that cannot be avoided or minimized must be clearly identified.

### 3. Mitigation for Impacts that Cannot Be Minimized

All development activities that result in a disturbance to, or loss of, a Calgary Wetland will require mitigation. Mitigation for impacts that cannot be minimized is the least desirable option. The avoidance or minimization of development impacts must be shown to be unfeasible prior to The City considering this option. If avoidance of impacts from development is not possible or practical due to inherent constraints upon a site, **The City of Calgary shall ensure that there is No Net Loss of Calgary Wetlands.**

**Mitigation to ensure No Net Loss means** that, using best practices, the proponent of development will restore, enhance, or replace one or all of the following functions of an affected wetland:

- a. wetland and upland plant communities to ensure their normal succession pattern;
- b. wildlife (including fish) habitat;
- c. hydrologic regimes (contribution to water quality and quantity);
- d. flood attenuation and erosion control functions;
- e. cultural, recreational and educational functions; and
- f. urban design functions.

The greater the environmental significance of a wetland (see Appendix 2), the greater its functional contribution to the natural ecosystem. Furthermore, the science to fully replicate the complexity of an environmentally significant wetland is currently inadequate. Therefore, the amount of area required as mitigation for a Calgary Wetland being disturbed or lost shall depend on its environmental significance, and the likelihood of success of a proposed mitigation plan – using best practices – to adequately compensate for disturbed or lost wetland functions.

To minimize the effects of a disturbance or loss of a wetland to the local environment and/or community, **Wetland Mitigation Plans** shall be developed by proponents of development, for approval by The City, at the Outline Plan stage. The Mitigation Plans to restore, enhance or create lost wetland functions shall recommend mitigation option(s) in the following order of priority, based on:

- a City conducted Environmental Significance Assessment (Appendix 2); and

- an approved Functionality Assessment (Appendix 9), and Biophysical Impact Assessment that have been prepared by a qualified professional.

**Priority 1** – Restoration of wetlands that have been disturbed;

**Priority 2** – Enhancement of wetlands within the same watershed of the Outline Plan area;

**Priority 3** – Creation of wetlands within the same watershed of the Outline Plan area;

**Priority 4** – Compensation Banking for the enhancement or creation of wetlands within the same watershed, outside the Outline Plan area;

**Priority 5** – Enhancement of wetlands outside the watershed, within the Outline Plan area;

**Priority 6** – Creation of wetlands outside the watershed, within the Outline Plan area;

**Priority 7** – Compensation Banking for the enhancement or creation of wetlands outside the watershed and outside of the Outline Plan area.

### **Wetland Restoration**

Wetland restoration is the most desirable mitigation option since it is the most economical solution with the best likelihood of success. Proponents of development shall submit the following plans for approval by The City of Calgary Parks:

1. A preliminary Grading Plan showing the extent of any disturbance, at the Outline Plan stage;
2. A Landscape Concept Plan for the restoration, at the Outline Plan stage; and
3. A Restoration Plan at the Construction Plan approval stage. The Restoration Plan shall ensure that:

# Appendix 1-9

- a. the key functions of the wetland are restored;
- b. (**Note:** Higher priority may be given to certain wetland functions over others based upon the likelihood of these functions remaining post-development. For example, water quality/quantity or recreational and educational functions may be given priority over fish and wildlife habitat, if the habitat will be severely impaired following development. In all cases, this will be evaluated within a framework of ensuring No Net Loss of functions within the city of Calgary.)
- c. opportunities are sought to tie in adjacent upland area with the wetland to ensure the long-term sustainability of the wetland ecosystem;
- d. the re-creation of existing native plant communities;
- e. the protection of rare/unique plant or animal species that will be directly affected;
- f. the development and execution of a monitoring program to ensure that the re-establishment of wetland communities is completed successfully by using clearly articulated performance standards that are based on the best available science; and
- g. the use of locally grown plant material to maximize establishment rates.

**Note:** The above plans must be developed in accordance with the current edition of Calgary Parks' *Development Guidelines and Standard Specifications, Landscape Construction*.

## Enhancement and/or Creation of Wetlands

The Enhancement and/or creation of other wetlands shall be approved only if an approved disturbance to a wetland is of such a degree that it would preclude its long-term sustainability. The enhancement and/or creation of wetlands should occur in areas that:

- provide the best opportunities for replacing all of the key functions of a wetland lost as a result of development disturbance; and
- ensure the survivability and sustainability of the wetland ecosystem.

Proponents of development shall submit the following plans for approval by The City of Calgary Parks:

- A Landscape Concept Plan at the Outline Plan stage; and
- Detailed Construction Plans at the Construction Plan approval stage.

**Note:** The above plans must be developed in accordance with the current edition of Calgary Parks' *Development Guidelines and Standard Specifications, Landscape Construction*

## Compensation Banking

Compensation Banking has many benefits. By compensating for losses in advance of them occurring, banking can reduce temporal losses of wetland functions. Compensation Banking also offers political expediency as it allows development, especially in urban areas, to proceed in a timely fashion. Another advantage of Compensation Banking is that it allows for the consolidation of funds for the enhancement, creation, or preservation of more substantial wetland projects, thus increasing the chances of success as compared to smaller, isolated replacement sites. Compensation Banking may also provide the necessary funds for the acquisition of resources and expertise that might otherwise be limited in smaller, stand-alone projects. **Caution: Due to the benefits of Compensation Banking, proponents of development may recommend jumping directly to the Compensation Banking stage. Ensure the steps of restoration, enhancement, and creation within the watershed of the Outline Plan area are considered first, as required by this policy.**

In this scenario, proponents of development will pay to The City a compensation for the disturbance or loss of wetland that shall be kept by The City in a "Wetland Mitigation Bank." The City will use the funds at a later date for the enhancement, creation, and/or preservation of other wetland habitat.

If a Mitigation Plan includes Compensation Banking for the enhancement and/or creation of wetlands outside the Outline Plan area, prior to the approval of the Outline Plan, proponents of development shall provide funds as compensation for the loss of wetland in accordance with the following calculation:

$(C_1 \times EC) + C_2 =$  funds to be provided as compensation

Where

$C_1$  = cost per square metre to enhance and/or create wetland(s) to ensure No Net Loss of functions on the site where the disturbance or loss occurred;

EC = the number of square metres of a wetland(s) to be enhanced or created as determined in the approved Mitigation Plan to ensure No Net Loss of functions; and

$C_2$  = the cost of the land at the site(s) where the disturbance or loss occurred.

To ensure that decisions regarding where wetland mitigation funds will be used are made in a timely fashion, priority lists for the enhancement, creation, and preservation of wetlands within the city shall be developed by December 2004. Furthermore, if compensation funds are received prior to July of any year and, together with other funds in the Wetland Mitigation Bank, are sufficient to complete the next priority wetland project, funding for that project will be budgeted for in the following year with the intent for it to be substantially complete within two years.

# Appendix 1-9

## Appendix 6: Federal, Provincial and Municipal Legislation

A major portion of the following summary of federal, provincial, and municipal legislation, which has played a key role in the development of the Wetland Conservation Plan, has been taken directly from the following source: Kwasniak, Arlene. *Alberta Wetlands – A Legal & Policy Guide*. Environmental Law Centre and Ducks Unlimited Canada. 2001.

**Note:** In no way should the below list of agencies and associated Acts be deemed comprehensive. It is solely the proponent's responsibility to contact the appropriate administrative agencies to ensure that all legislation/regulations are adhered to.

### 1. Federal Legislation

The federal government has the right to legislate over some wetland related matters, including:

- Natural, commercial, sport or recreational fishery habitat in wetlands, whether on federal or non-federal lands, and whether on privately owned or public lands; and
- Migratory birds and, to a limited degree, migratory bird habitat, whether on federal or non-federal lands, and whether on privately owned or public lands.

There are three main federal environmental statutory authorizations relevant to wetlands:

#### ***The Fisheries Act***<sup>22</sup>

Prohibits anyone from carrying on any type of work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat without statutory authorization. The Act also prohibits the deposit of deleterious substances into water frequented by fish.

#### ***Migratory Birds Convention Act***<sup>23</sup>

Prohibits anyone from doing anything that could harm migratory birds or their nests without statutory authorization. It also prohibits the deposit of oil, oil wastes or any other substances harmful to migratory birds in any waters frequented by them, without statutory authorizations.

#### ***The Navigable Waters Protection Act***<sup>24</sup>

Prohibits anyone from carrying on any activities that could interfere with navigable water without statutory authorization.

#### ***The Species at Risk Act***<sup>25</sup>

*The Species at Risk Act* formally became Law on 2003, June 5, but the prohibitions will not come into force until 2004, June 1, as further time is required to develop the guidelines and regulations. The Act prohibits the killing, harming or harassing of endangered or threatened species, and the damage or destruction of the residence of an endangered or threatened species. The Act also prohibits the destruction of critical habitat however, this will gradually be implemented over the next several years.

<sup>22</sup> *Fisheries Act*, R.S.C. 1985, c. F-14.

<sup>23</sup> *Migratory Birds Convention Act*, 1994, S.C. 1994, c. M-7.01, especially ss. 5.6 and 35.

<sup>24</sup> *Navigable Waters Protection Act*, R.S.C. 1985, c. N-22, s. 5.

<sup>25</sup> *Species at Risk Act*, R.S.C. 2003.

The Act also provides for stewardship incentives. Although at the time of writing, the prohibitions are not yet in force, the intent of the Act is clear, and most species will be protected under other provincial and federal legislation, therefore, if a proponent of development anticipates to undertake an activity in or around a Calgary Wetland, they must conduct a survey for listed species at risk, and if present, take measures to avoid harming these species, in consultation with wildlife authorities.

## 2. Provincial Legislation

Provincial governments have the right to legislate over some wetland matters, including:

- wetlands on provincial lands (e.g. wetlands in provincial parks or other provincial public lands) and all resources on these lands;
- activities relating to the bed and shores of all naturally occurring permanent wetlands (since these are provincial lands by virtue of section 3 of the *Public Lands Act*; and
- wildlife, wherever it occurs in the province, whether on public or private lands, except for on federal lands.

The major provincial statutes that are relevant to Alberta wetlands are the *Water Act*<sup>26</sup> and the *Public Lands Act*<sup>27</sup>

### ***Water Act and Public Lands Act***

In Alberta, just as in other Canadian provinces, the provincial Crown owns all water in the province, including water in wetlands, as well as the right to divert and generally, to disturb water. The Crown has asserted this right for over 100 years, and the Alberta Crown currently asserts this ownership right in the *Water Act*.<sup>28</sup> It does not matter whether water is on private or on public land, the Crown owns it. It does not matter whether a wetland is permanent or intermittent, the Crown owns the water in it and the right to divert and generally disturb it. The question of permanency **only** is relevant to who owns the bed and shores of a wetland, since the Crown is the owner of the bed and shores of nearly all naturally occurring, permanent wetlands in the province.<sup>29</sup>

The Crown gives itself and others the right to use, divert or disturb water through different types of *Water Act* statutory authorizations. One category of statutory authorization consists of exemptions from having to get any specific authority to use, divert or disturb water. Another category is specific statutory authorizations to use, divert or disturb water in the form of a license, approval, registration, preliminary certificate or notice.

<sup>26</sup> *Water Act*, S.A., 1996, c. W-35.

<sup>27</sup> *Public Lands Act*, R.S.A. 1980, c. P-30.

<sup>28</sup> *Water Act*, S.A. 1996, c. W-3.5, s. 3.

<sup>29</sup> *Public Lands Act*, R.S.A. 1980, c. P-30, s. 3. See Chapter 3 – *Bed and Shores*.

# Appendix 1-9

## **Wildlife Act**

Section 38 of the *Wildlife Act* states that without authorization, a person shall not willfully “molest, disturb or destroy a house, nest or den of prescribed wildlife or a beaver dam in prescribed areas or at prescribed times.” Authorization may be given under the *Agricultural Pests Act*<sup>30</sup> or the *Water Act*<sup>31</sup> by or under a license authorizing the control of wildlife depredation or the collection of wildlife, by regulations regarding wildlife depredation, or by written authorization of the minister.

So, unless authorized, it is a *Wildlife Act* offence to carry out any willful activity on either public or private land that could harm a nest or den of prescribed wildlife. “Prescribed wildlife” means:

The regulation states that section 38 applies to:

- wildlife animals that are endangered animals,<sup>32</sup> throughout Alberta and throughout the year
- migratory game birds, migratory insectivorous birds and migratory nongame birds as defined in the *Migratory Birds Convention Act* (Canada) throughout Alberta and throughout the year
- snakes and bats, throughout Alberta and from September 1 in one year to April 30 in the next

<sup>30</sup> *Agricultural Pests Act*, R.S.A. 1980, c. A-81.

<sup>31</sup> *Water Act*, S.A. 1996, c. W-3.5.

<sup>32</sup> The *Act* defines endangered animal in s.1 to be an animal prescribed in the regulations. It defines “animal” to mean a vertebrate animal other than a human being or fish. The following animals are currently prescribed: swift fox, bison, whooping crane, woodland caribou, barren ground caribou, northern leopard frog, trumpeter swan, ferruginous hawk, burrowing owl (recent amendments have changed listing of species), any hybrid resulting from the crossing of two endangered animals, and bison within specified northern boundaries. Alta. Reg. 143/97, Schedule 6, *Wildlife Act*.

- to the houses and dens of beaver, on any land that is not privately owned land, and
- to the houses, nests and dens of all wildlife, in a wildlife sanctuary throughout the year, and to the nests of game birds, in a game bird sanctuary throughout the year
- to the dens of prairie rattlesnakes used as hibernacula, throughout Alberta and throughout the year.<sup>33</sup>

## **3. Municipal Legislation**

Municipalities do not directly derive the power to regulate wetlands from the *Constitution Act*. Their powers must be authorized by provincial legislation. Accordingly, municipalities can have no greater constitutional authority to regulate matters than provinces.

Municipalities own many lands that contain wetlands. This is especially so in respect of lands taken as Environment Reserves or other reserves in the subdivision process. The *Municipal Government Act* is the main Alberta statute that governs how municipalities may deal with their lands. Nevertheless, naturally occurring, permanent wetlands that are found on municipal land are the property of the provincial Crown.

<sup>33</sup> *Wildlife Regulations*, Alta. Reg. 143/97.



## Appendix 7: Wetland Functions and Values

Wetlands are some of the most biologically productive ecosystems on the planet, providing extensive habitats to a wide diversity of flora and fauna that are directly or indirectly dependent for survival. Wetlands also provide a multitude of beneficial functions and values to society, such as water quality treatment, flood attenuation, and groundwater recharge.

“Functions and values” have been commonly used to describe: the typical role of a wetland and its ability to produce benefits to society, and its importance to the watershed. “Functions” describes what a wetland does, without respect to any values being assigned to the function by society. “Values” describes the net consequence of the wetland function to society.<sup>34</sup> Frequently, wetland values such as sustaining ecological processes and providing sociological benefits to adjacent communities may not have a direct monetary benefit. On the other hand, water quality improvement and treatment functions produce a more tangible economic valuation in terms of the cost of treatment of storm water by wetlands.

Wetland functions may be categorized into four major groups: life support, hydrology, water quality, and socio-economic functions.

<sup>34</sup> D.A. Westworth, 1993. *Functions and Values of Alberta's Wetlands*. Edmonton, AB: Wetlands Management Steering Committee, Sept. 1993.

### 1. Life Support

Wetlands are unique ecosystems that develop at the interface between water and the upland habitats. They are often sites of high ecological activity and biological production.<sup>35</sup> Diverse wetland types found in Calgary provide habitats for many plant and animal species. The value of wetlands as habitat depends on factors including vegetation structure and diversity, surrounding land use, vertical and horizontal zonation, and water chemistry.<sup>36</sup>

One of the most important functions of Calgary Wetlands is to provide food, shelter and habitat for a wide variety of wildlife species from invertebrates, amphibians, fish, birds and waterfowl, and mammals. In Alberta, at least 204 species of birds, 16 species of mammals, 61 species of fish, and 11 species of amphibians and reptiles are found to be dependent on wetland habitat for survival.

A number of the sport fish species, such as salmonids, utilize wetlands as rearing habitats, spending their entire juvenile phases in these highly productive and safe environments. The adult form of the salmonid species has been known to migrate into wetlands to overwinter, seeking refuge from extreme weather conditions. The forage fish species such as sticklebacks, suckers, and minnows are among the common residents of shallow marshes and ephemeral waterbodies. With the ability to tolerate aquatic habitats that are somewhat eutrophic, they are able to exploit a niche within the wetland ecosystem.

<sup>35</sup> Hammer, Donald A. *Creating Freshwater Wetlands*. 1992; Maltby, Edward. *Waterlogged Wealth: Why Waste the World's Wet Places*. 1986; and Etherington, John R. *Wetland Ecology, Studies in Biology*. 1983

<sup>36</sup> Sather et al. *An Overview of Major Wetland Functions and Values*. 1984; Clark, Judith. *Fresh Water Wetlands: Habitats for Aquatic Invertebrates, Amphibians, and Fish*. 1978; and Weller, Milton W. *Wetland Habitats*. 1978.

# Appendix 1-9

Waterfowl use wetlands extensively for breeding as well as overwintering and migratory stopover habitats.

Other wildlife such as raptors, coyotes and foxes may use wetland habitats as a food source.

The regional hydrological regime and landscape features are important factors in the formation of complex wetland habitats. More complex wetland ecosystems, with vertical and horizontal zonation, would present a more diverse species and structure capable of offering a greater range of niches for wildlife.

## 2. Hydrology

**Flood Attenuation and Storage.** The effectiveness of the wetland flood attenuation function is dependent on a combination of factors such as vegetation structure, wetland geomorphology, and permeability of underlying substrates. During storm events, the flood peaks are lessened by reducing the flow velocity and by providing storage capacities for storm flows. The stormwater retained in wetlands can percolate to recharge the groundwater flow and supplement the surficial flow as baseflow during low flow periods.

The consumptive and non-consumptive activities that contribute to wetland destruction and degradation in Canada was estimated to exceed \$10 billion annually.<sup>37</sup> Data collected by the US Army Corps of Engineers (1991) revealed that the destruction of existing wetlands in the United States would cost landowners and taxpayers \$7.7 billion to \$30.9 billion a year in flood-related repair costs and expenditures

for flood proofing structures. Dahl and Johnson (1991) reported that shoreline wetlands are essential for providing buffer to lessen the impacts of hurricanes and other ocean storms on lands adjacent to coastal areas.<sup>38</sup> They estimated that shoreline wetlands save \$4 million in damage costs each year.

**Erosion Control.** Wetland vegetation provides effective protection from shoreline erosion during a storm event. The erosion protection value offered by wetlands is of a significant value to the various adjacent land use types such as Natural Environment Parks, residential, commercial, industrial, and agricultural developments. Topsoil lost to flood and wind erosion in the agricultural areas of Alberta, could be trapped by wetlands for later recovery.

**Groundwater Recharge and Discharge.** Groundwater discharge is considered an important source of fresh water for inland streams, lakes and wetlands. In drought conditions, these waterbodies may be entirely supplied by groundwater flow. Topography, permeability, size and the extent of contiguous wetland systems in a watershed regulate the groundwater flow. Following storm events, retained stormwater percolates through the underlying substrate, entering the water table and recharging the groundwater flow. The flow eventually discharges into streams, rivers, marshes, lakes and oceans or, as springs.

Due to the porosity of the underlying substrates, some ephemeral wetlands may be more closely associated to the recharge areas, making the wetland more effective in flood attenuation. Permanent wetland, on the other hand, may increase the storage capacity

<sup>37</sup> Kennedy, G. and T. Mayer, 2002. *Natural and Constructed Wetlands in Canada: An Overview*. Water Quality Research Journal of Canada, 37 (2): 295-325 (2002).

<sup>38</sup> Dahl T.E. and C.E. Johnson, 1991. *Status and Trends of Wetlands in the Conterminous United States, Mid-1970's to Mid-1980's*. US Department of the Interior, Fish and Wildlife Services, Washington, D.C.

by overflowing into the floodplain areas. Despite the saturated condition of the permanent wetland soils, groundwater flow may still be influenced by a hydraulic gradient established by the water table.

The value of groundwater for consumption is measurably significant. At least 7.9 million Canadians rely on groundwater for domestic use. Approximately 5 million of these users live in rural areas where groundwater supplies are more reliable and less expensive than those obtained from surficial waterbodies.

The wetlands found throughout Calgary are predominantly areas of groundwater discharge.

**Climatic Regime.** There are at least 8,000 wetland areas identified throughout Calgary. In concert with the large waterbodies such as the Glenmore Reservoir, the Bow and Elbow rivers, and the man-made lakes, Calgary Wetlands may influence the regional climatic regime. Studies have speculated that high levels of evaporation from waterbodies, and transpiration from wetland vegetation, stimulate and maintain the precipitation regime.<sup>39</sup> The wetlands in Northern Alberta may have a moderating effect on climate during temperate months.<sup>40</sup>

Wetlands may function as “carbon sinks” whereby atmospheric carbon is absorbed by wetland vegetation and leached out into the soils. The result of this activity is the removal of carbon from the atmosphere and the ecological cycles that would otherwise have been produced through decomposition. Considering their carbon storage function, wetlands may contribute significant climatic stabilization value.

<sup>39</sup> Maltby, Edward. *Waterlogged Wealth: Why Waste the World's Wet Places?* 1986.

<sup>40</sup> Gannon, P.T., Barthdic, J.F., and Bill, R.G. in *Climatic and Meteorological Effects on Wetlands, Wetland Functions and Values: The State of Our Understanding*. P.E. Greeson, J.R. Clark, and J.E. Clark (eds.), (Minneapolis, Minnesota: American Water Resources Association). 1979.

### 3. Water Quality

It is common knowledge that wetlands perform the important function of water purification. This process is threefold:

- removal of sediment;
- removal of nutrients and toxins such as heavy metals and organic compounds; and
- microbial actions.

**Sediment Removal.** As storm flow enters a wetland, emergent vegetation and shallower slopes reduce the flow velocity. The reduction of flow velocity allows sediment to drop out of the water column. In combination, the emergent vegetation acts as a filtration system, which contributes to further sediment removal from the water column.

**Removal of Nutrients.** Emergent vegetation species, such as cattails and sedges, are capable of absorbing and storing nutrients, namely: nitrogen, phosphorus, heavy metals and other constituents. Storage of these constituents can effectively prevent their transmission further downstream or in the ecological cycle. Nutrient absorption performed by the wetland vegetation prevents eutrophication, resulting in a cleaner aquatic environment.

Heavy metals attached to the suspended sediment entering the wetlands through storm events can be prevented from further transmission downstream. As with the sediment load, the attached heavy metals are trapped in the precipitated sediment layer. Some emergent plants, such as cattails, are capable of removing heavy metals from the sediment through uptake and deposition into the plant's physiology.

**Microbial actions.** The many forms of microbes inhabiting wetland environments may ingest contaminated substances or pathogens, absorbing the required nutrients and removing the hazardous elements from the water column.

# Appendix 1-9

**Engineered Stormwater Wetlands.** Currently, there are a number of initiatives to create water treatment wetlands throughout Canada with the purpose of controlling non-point source pollution. The science of Engineered Stormwater Wetlands in Calgary is still in its infancy, and the construction of wetlands is still largely experimental. Engineered Stormwater Wetlands are typically constructed for the purposes of managing stormwater quality and quantity in new development areas. These facilities differ from the more traditional stormwater retention facilities more commonly known as storm ponds.

Engineered Stormwater Wetlands are typically designed and constructed to treat the water quality of the stormwater flow – not to replace existing functional wetland habitats. Considering the high cost of constructing a wetland to replicate one of the numerous important wetland functions, there needs to be a balance for the conservation and protection of natural wetlands in order to maintain the functions naturally.

## 4. Socio-economic

Wetlands are common places for people to go to appreciate the beauty of nature. They provide a wide range of recreational, educational and urban design opportunities.

Wetlands in urban areas are highly valued by adjacent residents, providing areas of respite from the city landscapes and the hustle and bustle of urban life. Bridlewood Creek Wetland in southwest Calgary was incorporated into the Lamont Development as part of the stormwater management program. The benefits of wetland preservation extend beyond the enjoyment of nature to environmental protection such as erosion prevention; improved water quality; and maintenance of bio-diversity.

The City of Calgary Parks, Public Education & Program Services, in co-operation with Ducks Unlimited Canada, have been extensively involved in the delivery of numerous wetland education programs to the public.

Albertans spend millions and millions of dollars on wildlife viewing, photography, and nature interpretation within wetland areas because of the exceptional opportunities they provide to view wildlife. A 1990 study of the recreational use of prairie wetlands showed that total visitation of wetlands in southern Saskatchewan for recreational purposes exceeds 3 million user-days annually.<sup>41</sup> The study also found that passive recreational activities such as nature enjoyment, hiking or walking and bird watching, are just as important as hunting. 1991 statistics from the United States showed that 30 million Americans spent more than \$2.6 billion while enjoying wildlife viewing and related activities. The majority of their wildlife observation was conducted in wetland areas.

Wetlands offer significant opportunities for a wide range of scientific studies, including the importance of wetlands for the conservation of fish and wildlife habitat, environmental protection and climatic amelioration, and pollution reduction/control.

---

<sup>41</sup> Usher, R., and J. Scarth. *Alberta's Wetlands: Water in the Bank!* 1990.

## **Appendix 8: Review of Wetland Policies within Canada, the United States and Internationally**

Within Canada, the federal government and the five provinces of Alberta, Saskatchewan, Manitoba, Ontario and New Brunswick all have wetland policies in place. Alberta's interim wetland policy is in the process of being rewritten and is expected to be finalized in 2004. Other provinces are in various stages of either developing wetland policies or developing their own tools to address wetland stewardship and conservation. The provincial directive of wetland protection guides most municipalities as no wetland policies specific to cities within Canada have yet been found.

The following presents a review of provincial, federal, North American and international wetland policies:

### **Canada**

The objective of the Canadian government's wetland policy is to promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions now and in the future. The two key commitments of the policy are:

- 1) No Net Loss of wetlands on federal lands and waters through mitigation of all impacts of development related to wetlands; and
- 2) Enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands has reached critical levels.

In addition to the five Canadian provinces that currently have wetland policies in place, Prince Edward Island and Nova Scotia are at various stages of developing or adopting their wetland policies. The Yukon and Northwest Territories follow the federal government policy in Crown wetland decisions. British Columbia, Newfoundland and Quebec use a combination of other means to protect their wetlands.

Overall, the federal and provincial policies share some underlying themes. The policies emphasize a voluntary, non-regulated approach to wetland stewardship, with a focus on public awareness, education and incentives. The policies recognize landowner rights and the need for co-operation from stakeholders and the general public in protecting wetlands. Other themes found in wetland policies include: a sustainable development approach for maintaining wetland functions while understanding the need for economic development; an ecosystem approach considering the interrelationships between wetlands and the surrounding environment; and a focus on maintaining wetland functions and values.

### **The United States**

Overall, the U.S. lacks a comprehensive national wetland policy. Instead, their approach to wetland conservation is based on fragmented guidelines and policies established by various agencies, as well as federal and state legislation. Most states rely on federal legislation, while some (such as Michigan and Oregon) enact more specific wetland protection measures in the form of local ordinances.<sup>42</sup> The following policies were established and form the foundation for wetland conservation in the United States:

---

<sup>42</sup> Mitsch and Gosselink in Schultink, G. and Richard van Vliet. "Wetland Identification and Protection: North American and European Policy Perspectives." Agricultural Experiment Station Project #1536. Department of Resource Development, Michigan State University. 1997.

# Appendix 1-9

- Executive Order 11988 on Floodplain Management (1977) established federal policy on protection of floodplains;
- Executive Order 11990 on Protection of Wetlands (1977) requires all federal agencies to minimize destruction, loss or degradation of wetlands, and to be responsible for wetland preservation and enhancement; and
- The “No Net Loss” Wetland Action Plan (1998/99) was a plan written by the U.S. Fish and Wildlife Service in response to the National Wetlands Policy Forum (1987) objective to achieve no overall net loss of the nation’s remaining wetlands. This concept became the foundation of wetland conservation in the United States.

The United States does not have a national law on wetland protection, but legal tools include a variety of laws addressing other purposes, such as: *The Swamp Land Act (1850)*; *River and Harbour Act (1899)*; *Water Bank Act (1970)*; *Clean Water Act (1972)*; *Endangered Species Act (1973)*; *Food Security Act (1985)*; *Tax Reform Act (1986)*; and the *Emergency Wetlands Resources Act (1986)*.

Many states rely on existing federal measures for wetland protection. Some states, such as Michigan, have developed self-regulating wetland protection measures in the form of local ordinances. West Eugene, a municipality in Oregon, started the West Eugene Wetlands Special Area Study in 1989, to address wetland issues.<sup>43</sup> By 1992, the study was adopted locally and provided a comprehensive wetland plan to address land use and water resource issues. It was so successful that the U.S. Environmental Protection Agency and the Association of State Wetland Managers have used it as a model for other urban wetland situations.

<sup>43</sup> West Eugene Wetlands Plans, 2000 ([http://www.ci.eugene.or.us/wewetlands/WEWP2000\\_Index.htm](http://www.ci.eugene.or.us/wewetlands/WEWP2000_Index.htm)).

## International Wetland Policies

The *Convention on Wetlands of International Importance*, also known as *the Ramsar Convention*, was adopted in 1971 and is an intergovernmental treaty that provides the framework for international co-operation in conserving the world’s wetlands. As of 2001, June 1, *the Ramsar Convention* has 124 Contracting Parties (worldwide delegates). In 1990, the Ramsar Wise Use Guidelines were established, complementing global sustainable development goals. These guidelines are important to wetland conservation because they call on the Contracting Parties to:

- establish and implement national wetland conservation policies;
- undertake a review and revision of the legislative and governmental infrastructure to promote wetland conservation;
- undertake wetland inventories for wetland management;
- promote wetland research;
- establish protected wetland reserves; and
- promote public education and awareness of wetland values and conservation.<sup>44</sup>

<sup>44</sup> Schultink, G. and Richard van Vliet. *Wetland Identification and Protection: North American and European Policy Perspectives*. 1997.

Internationally, *the Ramsar Convention* has been significant in instigating policy or directive development on wetland protection in a number of countries. The Ramsar Convention on Wetlands, National Wetland Policies, 1986, was approved by the New Zealand Cabinet Policy Committee based on the premise that it was broad-based. The policy promotes the protection of representative important wetlands but does not bind the government to any course of action restricting activities in and around wetlands. The policy recognizes the values associated with wetlands and that, as a society New Zealand has expressed the desire to preserve representative wetlands. The policy objectives are to preserve and protect wetlands (of priority are the nationally important wetlands), maintain a wetland inventory, and promote public awareness of wetland values (i.e. the educational, scientific and recreational values of wetlands) as well as encourage public participation in the management of the wetlands.

*The Ramsar Convention* has also been important in setting the European Union directive on wetland protection. It is estimated that at least two thirds of all wetlands in Europe have been lost since 1900. The trend of declining wetlands appears to be continuing in spite of the fact that European wetland policies and directives have emerged in the last 20 years, and the thought is that the number of wetlands will continue to decline into the near future.<sup>45</sup> European wetland directives and policies are generally designed specifically to protect internationally significant, sensitive ecosystems. They incorporate European – and recently, European Union – views on wetland conservation. Directives which influence wetland conservation and protection include; *the Bern Convention (1979)*, which is the convention on Conservation of European Wildlife and Natural Habitats; *the Ramsar Convention*; *the E.U. Directive on the Conservation of Wild Birds (1981)*; *E.U. Habitat Directive*; and *the Urban Waste Water Treatment Directive*.

---

<sup>45</sup> Ibid.

# Appendix 1-9

## Appendix 9: Wetland Functional Assessment

### 1. Introduction

Through the development of the Wetland Conservation Plan, it became apparent that additional work was required to develop a framework within which to evaluate and rank Calgary Wetlands and their functions based on the best available science and a clear, consistent methodology. Furthermore, the evaluation procedure must remain objective, transparent and serve as a guideline for making land use decisions affecting wetlands. Therefore, a Wetland Functional Assessment will be required as a part of any wetland mitigation where there are residual impacts requiring compensation. The assessment will be used as a means of evaluating the roles and benefits of the wetland on the basis of its ecological, hydrological and socio-economic functions. These functions will then provide a basis for determining appropriate mitigation.

### 2. Function

“Function” in this context refers to properties and processes (physical, chemical and biological) that occur within a wetland. Processes can include water storage, creation of biomass, nutrient uptake, and the provision of wildlife habitat (see Appendix 7).

Wetland function can be broadly grouped into the following categories:

- a. **Biological** (e.g., habitat supply, species diversity);
- b. **Hydrological** (e.g., surface water storage, groundwater recharge, water quality improvement);
- c. **Socio-economic** (e.g., bird watching, hunting, fishing, aesthetic value);

Not all wetlands will perform all of these functions, nor will all wetlands perform all functions equally well. Many factors influence a wetland’s performance, including:

- a. long-term and short-term climatic conditions;
- b. water quality and quantity;
- c. position in the landscape/watershed;
- d. surrounding land use;
- e. human disturbances to the wetland or adjacent upland; and
- f. species diversity/presence of non-native species.

As a general rule, environmentally significant wetlands (see Appendix 2) are assumed to possess a higher degree of function than those of less significance.

### 3. Assessment Methods

There are several accepted methodologies for assessing wetland function, including the Ontario Wetland Evaluation System<sup>46</sup> and the Canadian Wetland Evaluation Guide.<sup>47</sup> Developing a single, comprehensive method for assessing the functions of a wetland is no trivial task. There is an inherent degree of uncertainty and risk in wetland mitigation. The science of understanding, describing and, ultimately replacing wetland ecosystems is not yet well developed. It can be very time consuming to fully understand all the functions of a wetland ecosystem. That having been said, decisions must be made based upon the best science available.

Furthermore, a wetland assessment method must not only provide for a means of understanding the value of a given wetland relative to others, but it must also be used to provide guidance in evaluating the effectiveness of proposed mitigation measures.

<sup>46</sup> Ontario Ministry of Natural Resources, 1993.

<sup>47</sup> North American Wetland Conservation Council. Bond *et al.* 1992



#### 4. Utility in Mitigation

An understanding of wetland function and values will form the basis of any mitigation negotiations.

It was originally proposed that wetland loss be compensated for on a fixed ratio basis. For example, for every square metre of wetland lost, three to four square metres of restored, enhanced or created wetlands would be required as compensation. Many jurisdictions consider a compensation ratio to be an acceptable proxy for the loss of wetland function. The rationale for this was based upon the following:

- Wetland ecosystems are extremely complex and cannot be fully understood or described using current science; and
- Our ability to fully replace wetland function is limited.

As a rule, environmentally significant wetlands do provide a greater degree of wetland function however, not all wetlands function at equivalent levels. In some cases, an environmentally significant wetland may be less functional in certain respects than a non-significant wetland. Furthermore, it is generally well accepted that some wetland functions can be more easily replaced than others.

There was a strong concern that mitigation decisions should be considered on a case-by-case basis using a Functionality Assessment. The functional values of a particular wetland should be evaluated and any subsequent mitigation work be approached with the goal of ensuring No Net Loss of those functions.

#### 5. Terms of Reference

The Wetland Functional Assessment will be developed as follows:

##### Evaluation System

The wetland evaluation system will be developed based upon the following broad categories of wetland function:

1. Biological function (e.g. species diversity, breeding habitat, habitat use, species at risk);
2. Hydrological (e.g. flood attenuation, water quality treatment, groundwater discharge);
3. Socio-economic (aesthetic value, recreational potential, educational/scientific value).

A list of functional, measurable attributes will be determined for each of the above categories based upon existing literature and consultation with appropriate specialists in each field. An aggregate ranking system will be developed that weighs all these factors to determine the overall functionality of the wetland.

##### Mitigation Process

All development applications with a potential to affect a Calgary Wetland must be evaluated under the Mitigation Process. Avoidance and minimization of impact must always be considered first.

A Wetland Functional Assessment must be conducted by a Qualified Wetland Specialist. The need for an assessment and the scope of the study must be determined in consultation with The City of Calgary Parks.

# Appendix 1-9

A Wetland Functional Assessment will be required for all wetlands requiring mitigation. Where impacts to a wetland are considered unavoidable, minimization of impacts will be determined based upon the described functions and values of the wetland. The purpose of the mitigation process will be to ensure the retention and continuation of the functions of that system – not to determine a dollar value for the wetland functions.

## **Compensatory Wetlands**

All proposed compensatory measures (wetland restoration, enhancement or creation) will be evaluated in the context of replacing those functions that are lost in the affected wetland. The intent is to take the necessary steps to ensure that No Net Loss of wetland function occurs.

Implicit in this is an understanding that it will not always be possible to fully replace one or more functions of a wetland. In these situations, the proponent must propose alternate measures to mitigate for the loss. In some cases, a replacement ratio for replacement habitat will be determined on a case-by-case basis as a part of the mitigation process.

The above process will be used over the short term for Wetland Mitigation. A more detailed process that measures and ranks the functional attributes of wetlands will be developed in conjunction with the Urban Development Institute and Ducks Unlimited Canada. This process will be ready for implementation by 2005, January.

# Glossary

**Creation** – The process of constructing a completely new wetland ecosystem as the result of either an approved loss of a wetland or an approved disturbance to a wetland that is of such a degree to preclude its long-term sustainability.

**Compensation Banking** – If an approved mitigation plan includes mitigation through the enhancement and/or creation of wetlands outside a proponent's Outline Plan area, they shall provide funds toward a Wetland Mitigation Bank as compensation for the loss of a Calgary Wetland. A Wetland Mitigation Bank is a revenue account that is separate from General Revenue for the future enhancement or creation of wetlands.

**Disturbance** – The following activities are considered disturbances to Calgary Wetlands:

- Partial or complete infilling of a waterbody for recreational, agricultural, and industrial uses road construction, residential development, or any other purposes;
- Any activity impacting or having the potential to impact (cumulative effects) the aquatic environment and involving the disturbance, alteration or modification of a waterbody which includes field ditching;
- Erosion protection (e.g. rip-rap, rock armouring, gabion baskets, etc.)
- Removal or destruction of vegetation, aquatic plants and trees within the confines of bed and shores of a waterbody;
- Draining of a waterbody; or
- Re-alignment of a waterbody.<sup>48</sup>

**Disturbed Wetland** – A wetland that has been altered by humans.

**ENGO** – An Environmental, Non-Governmental Organization such as Ducks Unlimited Canada, Land Trusts, etc.

**Enhancement** – The process of improving the functionality of another wetland ecosystem as the result of either an approved loss of a wetland or an approved disturbance to a wetland that is of such a degree to preclude its long-term sustainability.

**Environmental Reserve or ER (as per the *Municipal Government Act*)** – A part of a parcel of land that is the subject of a proposed subdivision and is to be provided as Environmental Reserve as required by the subdivision authority if it consists of:

1. A swamp, gully, ravine, coulee or natural drainage course.

---

<sup>48</sup> Administrative Guide for Approvals to Protect Surface Water Bodies Under the Water Act. December, 2001.

# Glossary

2. Land that is subject to flooding or is, in the opinion of the subdivision authority, unstable, or
3. A strip of land, not less than 6 metres in width, abutting the bed and shore of any lake, river, stream or other body of water for the purpose of:
  - a. preventing pollution; or
  - b. providing public access to and beside the bed and shore.

**Environmentally Significant Area** – A natural area site that has been inventoried prior to potential development and which, because of its features or characteristics, is significant to Calgary from an environmental perspective and has the potential to remain viable in an urban environment. A site is listed as an Environmentally Significant Area on the basis of meeting one or all of the criteria listed in Appendix C of The City of Calgary Parks' Open Space Plan.

**Eutrophic** – Having waters rich in mineral and organic nutrients that promote a proliferation of plant life (especially algae) which reduces the dissolved oxygen content and often causes the extinction of other organisms.

**Migratory Bird** – Means:

1. Migratory Game Birds:
  - (a) Anatidae or waterfowl, including brant, wild ducks, geese, and swans;
  - (b) Gruidae or cranes, including little brown, sandhill, and whooping cranes;
  - (c) Rallidae or rails, including coots, gallinules and sora and other rails;

(d) Limicolae or shorebirds, including avocets, curlew, dowitchers, godwits, knots, oyster catchers, phalaropes, plovers, sandpipers, snipe, stilts, surf birds, turnstones, willet, woodcock, and yellowlegs;

(e) Columbidae or pigeons, including doves and wild pigeons.

2. Migratory Insectivorous Birds: bobolinks, catbirds, chickadees, cuckoos, flickers, flycatchers, grosbeaks, humming birds, kinglets, martins, meadowlarks, nighthawks or bull bats, nuthatches, orioles, robins, shrikes, swallows, swifts, tanagers, titmice, thrushes, vireos, warblers, waxwings, whippoorwills, woodpeckers, wrens, and all other perching birds which feed either entirely or chiefly on insects.
3. Other Migratory Non-game Birds: auks, auklets, bitterns, fulmars, gannets, grebes, guillemots, gulls, herons, jaegers, loons, murre, petrels, puffins, shearwaters, and terns.<sup>49</sup>

**Mitigation** – The process of conserving Calgary Wetlands through the application of a hierarchical progression of alternatives, which include:

- **Avoidance** of impacts;
- **Minimization of and mitigation for** unavoidable impacts; and
- **Mitigation** for development impacts that cannot be minimized.

---

<sup>49</sup> Article I of the *Migratory Birds Convention*, attached as a Schedule to the *Migratory Birds Convention Act*.

**Natural Environment Park** – A City owned park, classified as MR and/or ER, where the primary role is the protection of an undisturbed or relatively undisturbed area of land or water, or both, and which has existing characteristics of a natural/native plant or animal community and/or portions of a natural ecological and geographic system. Examples include wetlands, escarpments, riparian corridors, natural grasslands and woodlots.

**Note:** A relatively undisturbed Natural Environment Park would either retain or have re-established a natural character, although it need not be completely undisturbed. The three types of Natural Environment Parks are:

1. **Special Protection Natural Environment Park** – A Natural Environment Park that has approximately 75 per cent of its land base composed of natural environment in good condition, is of provincial and/or regional significance, and contains highly productive and suitable wildlife habitat.
2. **Major Natural Environment Park** – A Natural Environment Park that has approximately 50 per cent of its land base composed of natural environment in good condition, is of city-wide significance, and contains wildlife habitat of varying productivity.

3. **Supporting Natural Environment Park** – Parkland that would be considered regional in nature, with variable natural conditions and habitat productivity. These sites are usually remnant natural areas, often acquired as Environmental Reserve through the subdivision process, usually with developed parkland immediately adjacent to them. An example would be Strathcona Ravines.

**Natural Environment Zone** – A portion of City park land, other than a Natural Environment Park, that is dominated by a natural feature. An example would be the east end of Prince's Island Park.

**Naturally Occurring Wetland** – A wetland that has not been altered by humans.

**Prescribed Wildlife** – means:

- wildlife animals that are endangered animals (i.e. vertebrate animals other than a human being or fish that is prescribed in the regulations), throughout Alberta and throughout the year.
- migratory game birds, migratory insectivorous birds and migratory non-game birds as defined in the *Migratory Birds Convention Act* (Canada) throughout Alberta and throughout the year.
- snakes and bats, throughout Alberta and from Sept. 1 in one year to April 30 in the next.
- the houses and dens of beaver, on any land that is not privately owned land; and
- the houses, nests and dens of all wildlife, in a wildlife sanctuary throughout the year, and to the nests of game birds, in a game bird sanctuary throughout the year.
- the dens of prairie rattlesnakes used as hibernacula, throughout Alberta and throughout the year.<sup>50</sup>

---

<sup>50</sup> *Wildlife Regulations*, Alta. Reg. 143/97.

# Glossary

**Public Utility Lot (PUL)** – Land required to be given under the *Municipal Government Act* for public utilities. A public utility is a system or works used to provide certain services for public consumption or benefit. Examples of public utilities include water, public transportation, irrigation, drainage, waste management and telecommunications.

**Qualified Wetland Specialist** – means a person who can identify and delineate wetlands. Typically this person will have the following qualifications:

- enough knowledge and experience of wetland ecology to be able to correctly identify and classify a wetland, its characteristic species and features (see Appendix 1);
- knowledge of flora and fauna and the ability to identify wetland species;
- knowledge of soil classification and the ability to identify hydric soil indicators; and
- an understanding of hydrological processes.<sup>51</sup>

**Restoration** – The process of recovering a wetland ecosystem to its original condition as a result of an approved disturbance to that wetland.

**Riparian Areas** – Riparian areas are those areas where the plants and soils are strongly influenced by the presence of water. They are transitional lands between aquatic ecosystems (wetlands, rivers, streams or lakes) and terrestrial ecosystems.

**Upland Area** – An area of land, usually terrestrial land (not aquatic), either upstream or surrounding the wetland. It is not part of the wetland but may contribute to the integrity of the wetland.

**Waterbody** – As per the *Water Act*, any location where water flows or is present, whether or not the flow or the presence of water is continuous, intermittent or occurs only during a flood, and includes, but is not limited to wetlands and aquifers.<sup>52</sup>

**Watershed** – An area of land drained by a river and its associated streams or tributaries. A watershed may be defined under the Water Survey of Canada designation, or as a major river basin boundary as described in the Water (Ministerial) Regulation.<sup>53</sup>

<sup>51</sup> City of Calgary, *Open Space Plan*. Cerlox. 2003.

<sup>52</sup> *Water Act*, s. 1(1)(hhh).

<sup>53</sup> Alberta Environment. *A Guide to Wetland Mitigation Banking – Draft for Discussion*. 2003.

# Maps

**MAP 1 – ALBERTA NATURAL REGIONS<sup>54</sup>**



**Natural Subregions**

**BOREAL FOREST**

- Central Mixedwood
- Dry Mixedwood
- Wetland Mixedwood
- Sub-Arctic
- Peace River Lowlands
- Boreal Highlands

**ROCKY MOUNTAIN**

- Alpine
- Subalpine
- Montane

**FOOTHILLS**

- Upper Foothills
- Lower Foothills

**CANADIAN SHIELD**

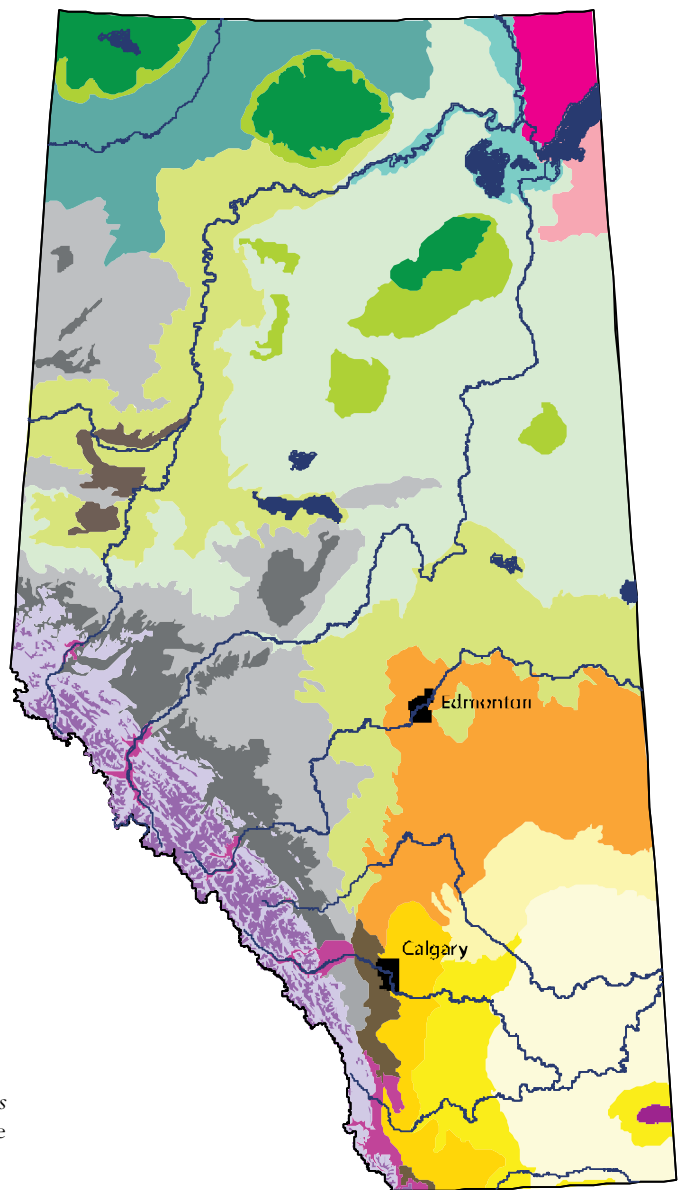
- Athabasca Plain
- Kazan Upland

**PARKLAND**

- Foothills Parkland
- Peace River Parkland
- Central Parkland

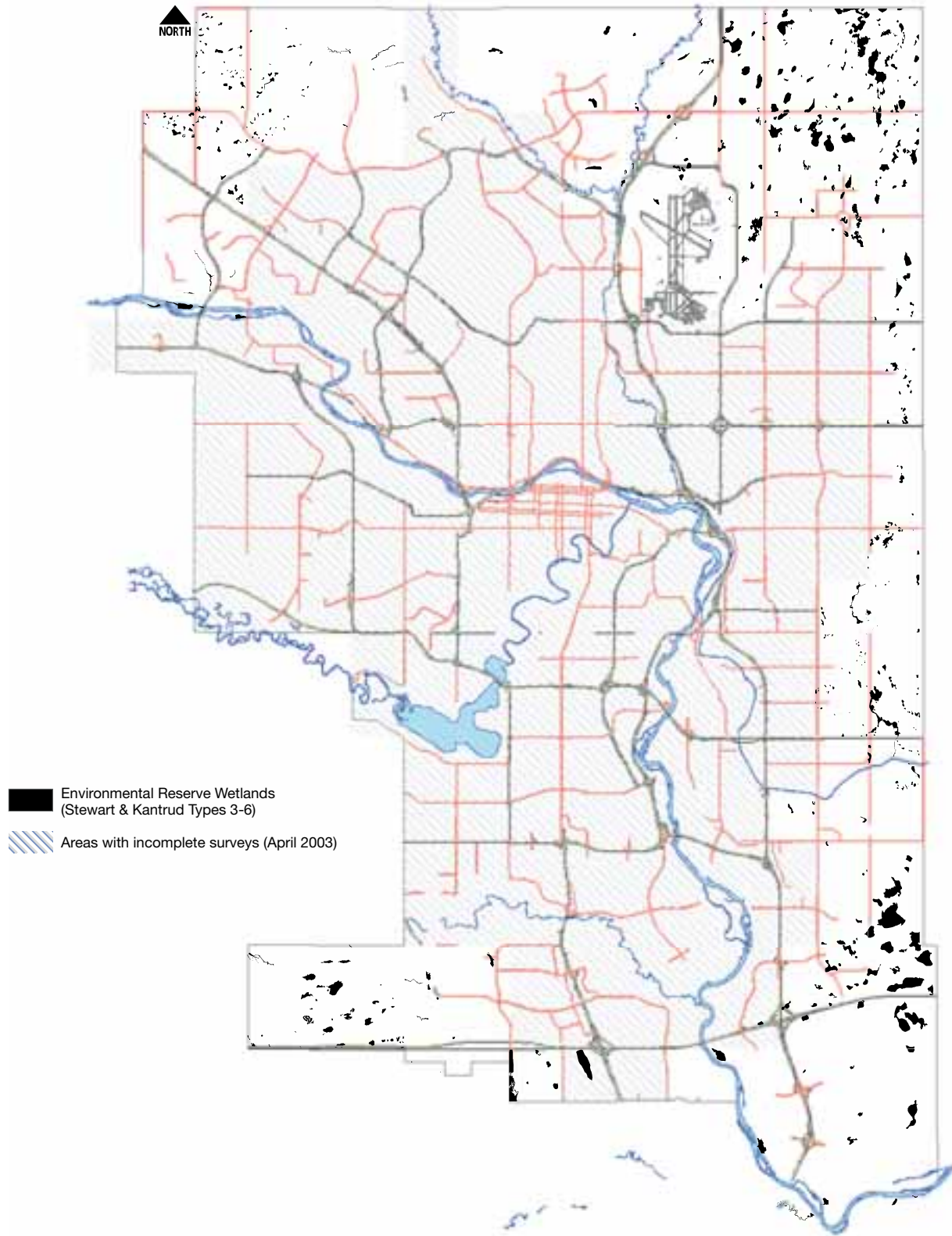
**GRASSLAND**

- Dry Mixedgrass
- Foothills Fescue
- Northern Fescue
- Mixedgrass



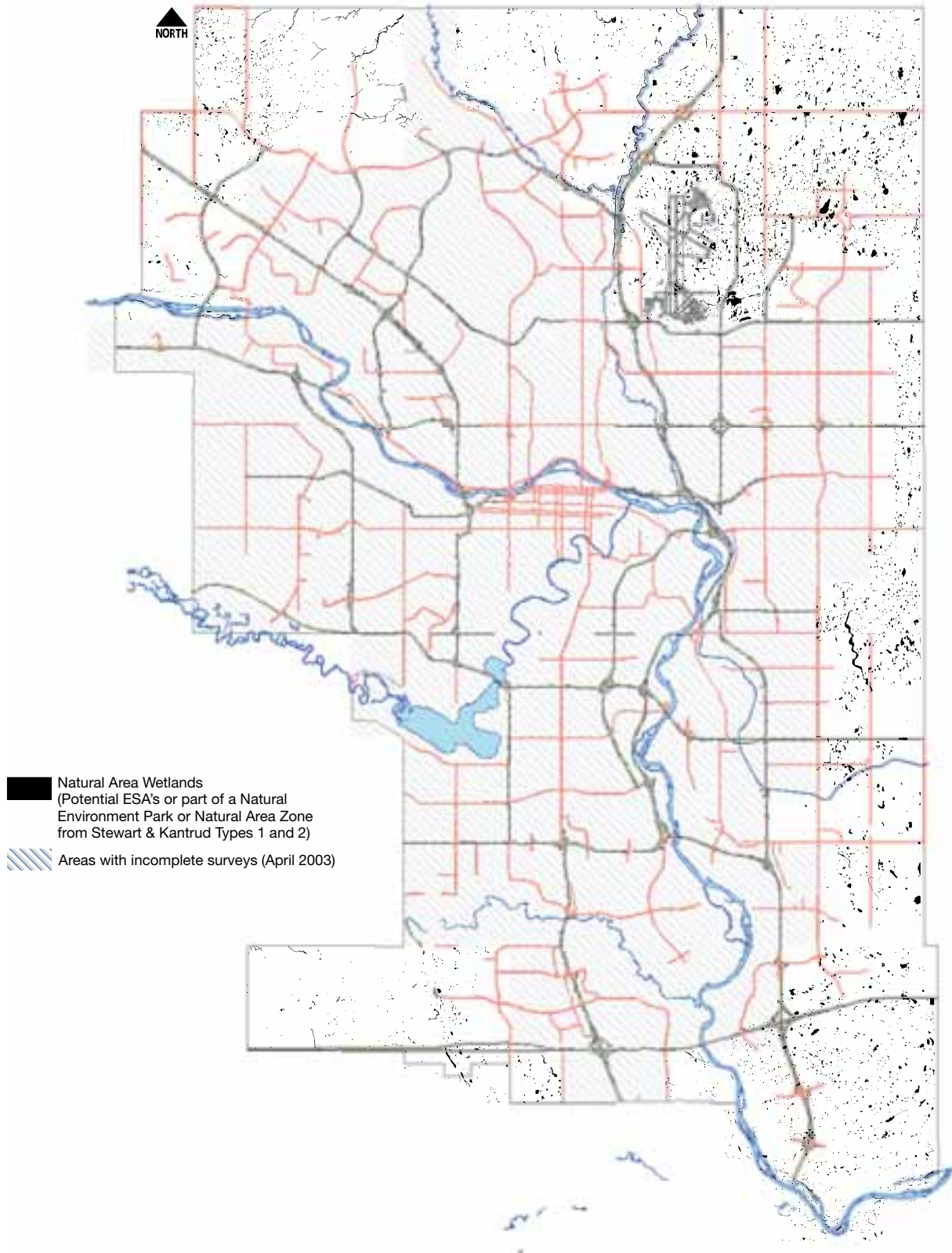
<sup>54</sup> Government of Alberta. *Map of Alberta Natural Regions and Subregions* – updated October 10, 2002. (Alberta Community Development Home Page, 2003).

MAP 2 – ENVIRONMENTAL RESERVE WETLANDS 1:125,000





MAP 3 – NATURAL AREA WETLANDS 1:125,000



# Bibliography

- Azous, Amanda L. and Richard R. Horner (editors). *Wetlands and Urbanization: Implications for the Future. Final Report of the Puget Sound Wetlands and Stormwater Management Research Program.* Washington State Department of Ecology, Olympia, WA. King County Water and Land Resources Division and the University of Washington. Seattle, WA. 1997.
- Bond et al. Canadian Wetland Evaluation Guide. North American Wetland Conservation Council. 1992.
- City of Calgary. *Open Space Plan.* Cerlox. 2003.
- Clark, Judith. Fresh Water Wetlands: Habitats for Aquatic Invertebrates, Amphibians, and Fish. In *Wetland Functions and Values: The State of our Understanding.* Proceedings of the National Symposium on Wetlands. Disneyworld Village, Lake Buena Vista, Florida, pp. 330-343. American Water Resources Association. St. Anthony Falls Hydraulic Laboratory, MN. 1978.
- Cox & Grose. *Wetland Mitigation in Canada – A Framework for Application.* 2000.
- Dahl, T.E. and C.E. Johnson. *Status and Trends of Wetlands in the Conterminous United States. Mid-1970's to Mid-1980's.* US Department of the Interior, Fish and Wildlife Services, Washington, D.C. 1991.
- Etherington, John R. *Wetland Ecology, Studies in Biology.* Edward Arnold (Publishers) Ltd. 1983.
- Gannon, Patrick T. Sr.; Bartholic, Jon, F. and Bill, Robert G. Jr. *Climatic and Meteorological Effects of Wetlands.* In *Wetland Functions and Values: The State of our Understanding.* Proceedings of the National Symposium on Wetlands. Disneyworld Village, Lake Buena Vista, Florida, pp. 330-343. American Water Resources Association. St. Anthony Falls Hydraulic Laboratory, MN. 1978.
- Government of Alberta. *A Guide to Wetland Mitigation Banking – Draft for Discussion.* 2003.
- Government of Alberta. *Administrative Guide for Approvals to Protect Surface Water Bodies Under the Water Act.* December, 2001.
- Government of Alberta. *Agricultural Pests Act,* R.S.A. 1980.
- Government of Alberta. *Map of Alberta Natural Regions and Subregions – updated October 10, 2002.* (Alberta Community Development Home Page. 2003).
- Government of Alberta. *Public Lands Act,* R.S.A. 1980.
- Government of Alberta. *Surveys Act.* R.S.A. 1980.
- Government of Alberta. *Water Act,* S.A., 1996.
- Government of Alberta. *Water for Life – Alberta's Strategy for Sustainability – Draft.* 2002-2003.
- Government of Alberta. *Wildlife Regulations,* Alta. Reg. 143/97. 1997.



Government of Canada. *Article I of the Migratory Birds Convention, attached as a Schedule to the Migratory Birds Convention Act*. 1994.

Government of Canada. *Fisheries Act*, R.S.C. 1985.

Government of Canada. *Migratory Birds Convention Act*, 1994, S.C. 1994.

Government of Canada. *Navigable Waters Protection Act*, R.S.C. 1985.

Government of Canada. *Species at Risk Act*, R.S.C. 2003.

Hammer, Donald A. *Creating Freshwater Wetlands*. Lewis Publishers Inc., Chelsea, Mi. 1992.

Kennedy, G. and T. Mayer, 2002. *Natural and Constructed Wetlands in Canada: An Overview*. Water Quality Research Journal of Canada, 37(2): 295-325 (2002).

Kwasniak, Arlene. *Alberta Wetlands – A Legal & Policy Guide*. Environmental Law Centre and Ducks Unlimited Canada. 2001.

Maltby, Edward. *Waterlogged Wealth: Why Waste the World's Wet Places?* Earthscan. 1986.

Ontario Ministry of Natural Resources. *Ontario Wetland Evaluation System*. 1993.

Sather, J. H. and Smith, R.D. *An Overview of Major Wetland Functions and Values*. United States Department of the Interior. Report No. FWS/OBS-84/18. 1984.

Schultink, G. and Richard van Vliet. *Wetland Identification and Protection: North American and European Policy Perspectives*. Agricultural Experiment Station Project #1536. Department of Resource Development, Michigan State University. 1997.

Stewart, Robert E. and Harold A. Kantrud. *Classification of natural ponds and lakes in the glaciated prairie region*. Resource Publication 92. Bureau of Sport Fisheries and Wildlife, U.S. Fish and Wildlife Service, Washington, D.C. Northern Prairie Wildlife Research Center Home Page. 1971.

U.S. Prairie Pothole Joint Venture. *U.S. Prairie Pothole Joint Venture Implementation Plan (update)*. Jamestown, ND. 1995.

Usher, R. and J. Scarth. *Alberta's wetlands: Water in the Bank!* Edmonton, Alta.: Environment Council of Alberta. 1990.

Weller, Milton W. *Wetland Habitats. In Wetland Functions and Values: The State of our Understanding*. Proceedings of the National Symposium on Wetlands. Disneyworld Village, Lake Buena Vista, Florida, pp. 330-343. American Water Resources Association. St. Anthony Falls Hydraulic Laboratory, MN. 1978.

West Eugene Wetlands Plans, 2000. ([www.ci.eugene.or.us/wewetlands/WEWP2000\\_Index.htm](http://www.ci.eugene.or.us/wewetlands/WEWP2000_Index.htm)).

Westworth, D.A. *Functions and Values of Alberta's Wetlands*. Edmonton, AB.: Wetlands Management Steering Committee. Sept. 1993.

