

**Stop Wetland Loss:
Building a New Framework for Wetland Policy Design
and Implementation for British Columbia**

by

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Abstract

Wetlands are valuable ecosystems and contribute significantly to the social, environmental and ecological well being of British Columbia. Despite the host of values and functions that wetlands provide, they continue to be lost at an alarming rate due to a variety of drivers. In an effort to curb the loss of sensitive ecosystems such as wetlands, the Province of British Columbia has indicated interest in the development of Ecosystem Mitigation and Offsetting Policy. To date, there is no framework to support the development of such a policy. Using case studies and a literature review, this paper assists in providing structure to the policy development and implementation process by breaking down ecosystem mitigation and compensation policies into specific components. It concludes with providing recommendations on specific components of the policy including goal setting, scope and the enabling legislative and regulatory consideration.

Keywords: wetlands; wetland policy; ecosystem mitigation; mitigation policy framework; environmental compensation; offsetting

For Buck Sr.

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Glossary of Terms and Usage

Avoidance: Design of a project or facility to have no impact on wetlands; first and most desirable of the sequencing steps in wetland mitigation.

Compensation: Final step in the mitigation sequencing process to offset the loss of wetland or other aquatic resources if adverse impacts remain after avoidance and minimization. Compensation may consist of creating new or restoring existing but damaged wetlands to compensate for permitted damage or destruction of wetlands. Compensation can also take the form of mitigation banking or cash-in-lieu payments.

Compensation Ratio: The ratio of wetland to be enhanced or created in return for wetlands damaged or destroyed. Ratios typically vary according to the type of wetland, function or area, geographic context (location), time-frame, etc. and a case-by-case assessment of appropriate compensation may be used. Compensation ratios of 3:1 are common, but can be as low as 1:1 and as high as 10:1 depending on the situation.

Conservation: Includes protection, restoration and enhancement of wetlands.

Conservation covenants: Similar to a landowner agreement. This is a legally binding agreement, outlining management and/ or development constraints on the land. These registered on land title in perpetuity and are transferred to subsequent landowners at the point of sale.

Constructed wetland: An artificial wetland created for the purpose of storm water or wastewater treatment, or land reclamation after a disturbance such as mining.

Corporate social responsibility: Corporate Social Responsibility covers a broad range of activities and is generally understood to be the way a for-profit company achieves a balance or integration of economic, environmental, and social imperatives while at the same time addressing shareholder and stakeholder expectations.

Created wetland: Establishment of wetland area and/or function on a site that has not previously been wetland.

Design: the process of assembling necessary information and components to fulfill the requirement of the policy.

Degradation: loss of ecosystem features and functions. Can be a qualitative or quantitative reference.

Drivers: Cause or reason for wetland loss or degradation.

Easements: Taken to be synonymous with conservation covenant in this paper

Ecosystems: Ecosystems classified according to the BC Conservation Database

Effective: succeeds at meeting the goal of the policy by addressing the meta-policy problem.

Enhancement: includes actions that enhance wetland function(s) and value(s), whether applying to a site under development or elsewhere often as part of a compensation agreement.

Fee-simple land: Private land in BC, as per BC *Land Act*

Hydric soils: soil that forms under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions.

Hydrophytes: plants that grow in water or water logged soil.

Implementation: the process of enacting the policy

Industrial Development: Includes industrial development on crown land and private land in BC. Primary industries of concern include: transportation corridors, agriculture (intensive and extensive), oil and gas, mining, forestry, recreation

In-Kind Compensation: Creation, restoration, enhancement, or preservation of wetlands similar to those being impacted.

Landowner agreement: And agreement signed between government or a third party such as a land trust. This are typically tied to a site management plan and can be the terms of a financial transaction. Landowner agreements are typically effective for a specified amount of time.

Landscape level conservation/management: Landscape level conservation is a method that considers ecosystem needs at a broader landscape level scale when implementing conservation initiatives including planning, resource allocation, stewardship and compensation activities.

Loss: refers to loss of wetland features, such as wetland area or function. It can also apply to situations where there is a loss of area but no loss of function.

Minimization: Second most desirable of the sequencing steps in wetland mitigation, in which an activity that cannot avoid some impact on wetlands is designed in a manner to have minimal impact.¹

Mitigation: elimination, reduction or control of damage to wetlands through implementation of protocols during the planning, design, construction and operation of works or projects, which are designed to consider wetlands implications of various activities, such as resource extraction and development, prior to their approval. By considering wetlands impacts prior to approval, potential wetlands impacts can be minimized.

¹ National Research Council at page 301.

Mitigation Banking: restoring, enhancing or creating for purposes of providing compensatory mitigation in advance of authorized impacts to similar resources at another site.²

Mitigation Sequencing (Mitigation Hierarchy): in order to meet wetlands conservation goals, such as no net loss or net gain, wetlands decisions should be made with a consistent approach aimed towards meeting the goal. First, attempt to avoid wetland conversion or damage (i.e. look for other sites); second, if impacts are unavoidable, minimize such impacts; third, compensate for negative impacts to the wetland to ensure no net loss of wetland functions.³

Net Gain: a compensation policy in which the proponents would be required to create or enhance more wetland area or function than that damages or destroyed by the proposed project or operation. This policy may be most effective for rare or highly valuable classes of wetlands.

No Loss: refers to a policy of maintaining wetland area, function or both. No alteration is permitted. This policy may be most effective for particularly significant wetland areas. A downfall of this policy is that compensation for actual loss that occurs is typically not contemplated.

No Net Loss: A policy of maintaining stable levels of wetland area or function. This policy acknowledges that wetland impacts will occur, is flexible and can apply to all situations. No Net Loss Policies work well with mitigation sequencing.

Out of Kind Compensation: Restoration, creation, enhancement, or preservation of wetlands that provide different functions than those of wetlands being adversely affected by a project.

Permittee: one who receives a license or a permit to do an action. In the case of ecosystem mitigation the permittee is often synonymous with the project proponent.

Project proponent: the individual or group proposing or supporting a development

Protection: Protection maintains wetland area and function in the long-term (usually and ideally in perpetuity) through acquisition by a conservation entity, establishment of a conservation covenant, or other legal mechanism.

Reclamation/ restoration: Remedial actions taken on a degraded site to restore ecological functions.

² This definition of mitigation banking is used by the United States Army Corps Engineers and United States Environmental Protection Agency.

³ This avoidance, minimization, compensation hierarchy is used fairly universally with respect to wetlands.

Restoration: Re-establishment of wetland area and/or function on a site that has been disturbed or altered condition by human activity to a previously existing wetland condition.

Rural Development: includes development within local government jurisdiction, typically regional district jurisdiction and occasionally on crown land.

Species: classified plant and animal species types **Unsustainable:** natural capital is being lost faster than it is being replaced.

Too many: this is variable from region to region, but upwards of 80% of original wetlands lost in some areas of the province.

Urban Development: includes development within local government jurisdiction, typically municipal jurisdiction

Wetland: land area where soils are water-saturated for a sufficient length of time such that excess water and resulting low soil oxygen levels are principal determinants of vegetation and soil development. Wetlands will have a relative abundance of hydrophytes in the vegetation community and/or soils featuring “hydric” characteristics.⁴ Wetlands generally include swamps, marshes, bogs and similar areas.⁵

Wetland Policy: an assemblage of clearly articulated goals, information, decision making criteria, regulation, legislation, best practices and common understandings set up to achieve a specific outcome.

⁴ MacKenzie, W.H. and J.R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Res. Br., B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 52., at 18.

⁵ Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. 1251 - 1376; Chapter 758; P.L. 845, June 30, 1948; 62 Stat. 1155), EPA Regulations listed at 40 CFR 230.3(t).

1. Introduction

Wetlands contribute significantly to the social, environmental and ecological well-being of British Columbia (BC). However, despite the host of values and services that wetlands provide, they continue to be lost at an alarming rate. While there are many well intended efforts by government and the private sector to curb the loss of wetlands and to restore these habitats, some areas of the province have lost in excess of 70% of their original wetland habitat area.

Given the unlikelihood that all loss be stopped completely, most policy decision makers and stakeholders accept that some ecosystem impacts are an inevitable part of social and economic development. To help manage this issue, governments and many stakeholders are looking at ways to minimize overall impacts and magnitude of wetland loss. To this aim, ecosystem based management policies, supported by mitigation and offsetting policies have become an international standard.

The BC government has given indication that it will develop such a policy framework for British Columbia in order to support the targets put forth in the BC Conservation Framework: BC's new approach to species and ecosystems conservation¹. Wetlands would be a critical component of such a policy.

This paper addresses the problem of wetland loss in BC by structuring the key elements an ecosystem-based policy must contain. These include contextual, legal, procedural and administrative components. Designing and implementing a wetlands policy for BC is fraught with challenges ranging from information gaps, to equity considerations to political feasibility challenges. Many policy decision makers, when faced with the task of developing a wetland policy simply "Don't know where to start." Assisting with overcoming this problem of first steps is the objective of this paper.

¹ <http://www.env.gov.bc.ca/conservationframework/>

This paper:

- Outlines the case for wetland conservation;
- Provides the context for ecosystem based mitigation and offsetting policies;
- Sets out a policy development framework for mitigation and offsetting policies in general;
- Applies components of the framework to the case of wetlands to illustrate how the government of British Columbia could move toward a policy framework that reduces wetland loss.

This paper does not:

- Provide a detailed analysis on steps forward for each of the components. That is beyond the scope of this analysis;
- Entertain options unrelated to mitigation and offsetting. The province's commitment is to develop a mitigation and offsetting policy; that is thus my focus as well.

1.1. Problem Definition

This paper addresses the critical issue that too many wetlands are being lost in British Columbia due to urban, rural and industrial development and well as climate change. This loss is unsustainable and jeopardizes the future social, economic and ecological health and prosperity of British Columbia. I take as a starting point the Province of British Columbia's policy direction to curb wetland loss through the development of mitigation and offsetting policy for species and ecosystems. Currently, there is no policy framework developed to support the design and implementation of an effective wetland policy in BC. There are examples internationally and in other provinces, but nowhere is there a policy development 'checklist'.

2. Background

This section provides a background on wetlands. I focus on wetland classification and distribution in BC and why it is important to conserve them by illustrating their functions and values.

2.1. What is a wetland?

Technically speaking, wetlands are areas where soils are water-saturated long enough that excess water and resulting low soil oxygen levels are principal determinants of vegetation and soil development. These areas have a relatively high abundance of hydrophytes and/or soils featuring “hydric” characteristics.² Under the Ramsar Convention on Wetlands of International Importance (Ramsar), to which Canada is a signatory, wetlands are defined as “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.”

According to the National Wetlands Working Group (1997), wetlands in Canada are broken down into five freshwater and saltwater sub-classifications. These include peatlands such as bogs and fens, swamps, marshes, and shallow open waters such as sloughs and ponds. Other important wetlands are intertidal marshes (marine, brackish) as well as seasonal wetlands such as vernal pools or ephemeral wetlands. Other types of wetlands include non-natural constructed or created wetlands. The five basic classifications of wetlands can be further broken down into the sub-categories based on soil type. (See *Appendix A for a detailed description of wetlands in BC.*)

² MacKenzie, W.H. and J.R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Res. Br., B.C. Min. For., Victoria, B.C. Land Manage. Handbook. No. 52., at 18.

2.2. Distribution of wetlands in Canada and British Columbia

Canada is host to approximately 25 percent of the world's wetlands and over half of the wetlands in North America (Credit, 2011).³ Canada has over 13 million hectares of wetlands of international significance, more than any other of the 160 signatory countries of Ramsar.⁴ In BC, wetlands occur in all regions of the province and cover between 5.6 and 7 percent⁵ of the province, the equivalent of about 6 million hectares (Austin et al., 2008). All wetland classes are present in BC, though the distribution of specific wetland types tends to be regionalized (Cox and Bond, no date).⁶ Wetlands vary in size across the province from very small complexes of less than a hectare in size to aquatic bodies such as the Columbia Wetlands in the East Kootenay, which is over 15,000 hectares.

2.3. Why wetlands are important

Traditionally, wetlands were recognized for their plant and animal habitat, aesthetic values and as water sources for agricultural production. More recently, people view wetlands for their contribution to social, economic and ecological health and sustainability. It is now common to talk about wetlands in terms of their *functions* and *values*.

The *Canadian Wetland Evaluation Guide* defines wetland *functions* as the capabilities of wetland environments to provide goods and services including basic life-support systems (Cox and Bond, no date, p. 13).⁷ Depending on the classification and location of the wetland, functions change.

³ Ibid p.15

⁴ http://www.ramsar.org/cda/en/ramsar-home/main/ramsar/1_4000_0__, accessed 8 August 2011.

⁵ Austin, M.A, Buffett, D.J, Nicolson, G.G.E Scudder and V. Stevens (eds). 2008. Taking Nature's Pulse: The Status of Biodiversity in British Columbia. Biodiversity BC, Victoria, BC

⁶ Cox, Bond et al Wetland Evaluation Guide North American Wetland Conservation Council (Canada)

⁷ Cox, Bond et al *Wetland Evaluation Guide* North American Wetland Conservation Council (Canada) p.13

Wetland *functions* can often be translated directly into *values*. This means that one can ascribe a monetary value to the contributions that the particular function makes to society. These values can be rooted in life-support functions, socio-cultural contributions as well as productions. Table 1 illustrates some of the main functions and associated values of wetlands.

Table 1. Wetland Functions and Values (Adapted from Cox, Bond et al Wetland Evaluation Guide North American Wetland Conservation Council) ⁸

Functions	Examples of products, services or experience supported by wetlands	Examples of benefits to society derived from wetlands
Life-Support		
Regulation / Absorption	Climate regulation, toxic absorption, stabilization of biosphere processes, water storage, cleansing, carbon sequestration	Flood control (lives and \$ saved), contaminant reduction, clean water, storm damage reduction, health benefits, erosion control.
Ecosystem Health	Nutrient cycling, food chain support, habitat, biomass storage, genetic and biological diversity.	Environmental quality, maintenance of ecosystem integrity, risk reduction (and related option values).
Social/ Cultural		
Science/ Information	Specimens for research, zoos, botanical gardens, representative and unique ecosystems	Greater understanding of nature, locations for nature study, research, field education
Aesthetic/ Recreational	Non-consumptive uses such as viewing, photography, bird watching, hiking, swimming.	Direct economic benefits to users' personal enjoyment and relaxation benefits to tourist industry, local economy.
Cultural/ Psychological	Wetland uses may be part of traditions of communities, religious or cultural uses, future (option) opportunities	Social cohesion, maintenance of culture, value to future generations, symbolic values.
Production		
Subsistence Production	Natural Production of birds, fish, plants (e.g. berries, rushes, wild rice)	Food. Fibre, self-reliance for communities, import substitution, maintenance of traditions.
Commercial Production	Production of foods (e.g. fish, crops), fibre (e.g. wood, straw) soil supplements (e.g. peat)	Products for sale, jobs, income, contribution to GDP.

⁸ Ibid p.14 (Adapted from deGroot, 1988 and Filion, 1988)

2.3.1. *Examples of Wetland Valuation*

Many studies have attempted to place value on the ecosystem services rendered by natural capital in general and wetlands specifically. According to Costanza (1997), as shown in Table 2, wetlands rank as the most valuable global ecosystem as measured by per hectare value.

Table 2. Per hectare values of selected ecosystems

Biome	Total Value/Hectare (1994 US\$/ha/yr)
Marine	577
Forest	969
Grass/rangelands	232
Wetlands	14,785
Lakes/rivers	8,498
Cropland	92

Olewiler outlines various methodologies by which we can evaluate the economic value of wetlands in her paper, *Natural Capital in Settled Areas of Canada* (Olewiler, 2004).⁹ In a case study completed in the Fraser Valley, Olewiler finds that the waste services provided by wetlands alone in the lower Fraser Valley could add up to \$230 million per year in undocumented, avoided waste treatment costs. The conversion of natural areas in the Fraser Valley imposes great cost on society. Olewiler remarks that “Ignoring the value of natural capital is thus inefficient and costly for society today and for generations to come. Society also runs the risk of having no substitutes for natural capital, thus creating the potential for significant losses in our ability to sustain our economy and well being” (Olewiler, 2004, p. 25).¹⁰

⁹ Olewiler, N. 2004 *The Value of Natural Capital in Settled Areas of Canada*. Ducks Unlimited Canada and the Nature Conservancy of Canada. Available at: <http://www.ducks.ca/aboutduc/news/archives/pdf/ncapital.pdf>

¹⁰ Ibid pg.25.

In 2010, the David Suzuki Foundation released a report on the value of Natural Capital in BC's Lower Mainland. This report estimated the value of intact wetlands to be \$9,008 per hectare based on the costs to be borne if we lost these wetlands.¹¹

Looking beyond BC, a recent study conducted in the Broughton's Creek Watershed in Manitoba further illustrates the value of wetlands. A research team comprised of the University of Guelph and Tarleton State University, a member of the Texas A&M University system and Ducks Unlimited Canada examined the economic impacts of wetland drainage in the watershed (Yang, Wang, Gabor et al, 2008).¹² The findings were clear and startling: since 1968, over 70% of wetlands in the area had been lost or degraded due to agricultural development and drainage.

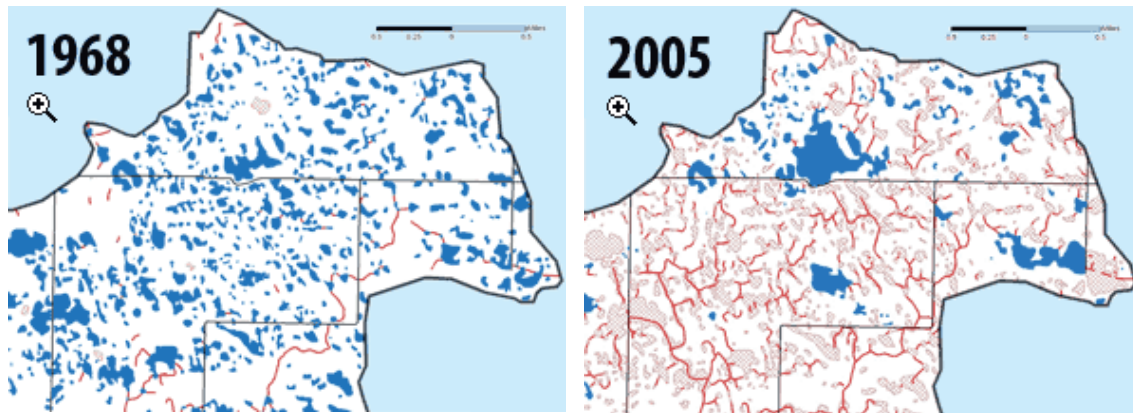


Figure 1. Wetland Loss in the Broughton's Creek watershed¹³

Note: Ducks Unlimited Canada 2010, with permission.

This has resulted in:

¹¹ Wilson, Sarah Natural Capital in BC's Lower Mainland: Valuing the Benefits from Nature. Prepared for the David Suzuki Foundation. 2010 p.48

¹² Yang, Wang, Gabor, Boychuk, Badiou *Water Quantity and Quality Benefits from Wetland Conservation and Restoration in the Broughton's Creek Watershed* Report for Ducks Unlimited Canada, 2008.

Report available at:

<http://www.ducks.ca/conservation/research/projects/broughtons/pdf/broughtons.pdf>

Factsheet: <http://www.ducks.ca/conservation/research/projects/broughtons/pdf/broughtons-factsheet.pdf>

¹³ Map thanks to Ducks Unlimited Canada

- 31 per cent increase in area draining downstream (an additional 19 square kilometers);
- 18 per cent increase in peak flow within the creek following rainfall;
- 30 per cent increase in stream flow;
- 31 per cent increase in nitrogen and phosphorus load from the watershed;
- 41 per cent increase in sediment loading;
- release of approximately 34,000 tonnes of carbon, equivalent to 125,000 tonnes of CO₂ – the annual emissions from almost 23,200 cars; and
- An estimated 28 per cent decrease in annual waterfowl production Wetlands collect and store water from the surrounding landscape during rain or snowmelt.

Extrapolating the results of this study to the provincial scale, this study finds that the economic implications of the draining amount to:

- An increase in total phosphorus loading by 114 tonnes per year to Lake Winnipeg. Every year the lake experiences massive algae blooms from increased nutrients resulting from wetland loss throughout the Lake Winnipeg watershed. This amount of phosphorus is the same as dumping 10 semi loads of commercial agricultural fertilizer or 544,000 bags (seven kilograms each) of lawn fertilizer directly into Lake Winnipeg every year;
- A release of 5.0 million tonnes of carbon stored in wetland sediments and plant material – equivalent to the emissions of 169,000 cars for 20 years; and
- An increase in area contributing run-off to Lake Winnipeg of 4,518 square kilometres.

The total present estimated present value of wetland ecosystem services associated with nutrient removal and carbon sequestration lost since 1968 is \$430 million. To replace the ecosystem services lost in Manitoba in 2005 alone would cost approximately \$15 million and this will increase to \$19 million by 2020 if the current rate of loss is not curbed.

2.4. Troubling Statistics: Status and Trends

Despite the unquestionable importance of wetlands, the interest that they garner from various stakeholders and the efforts to invest in their protection, restoration and conservation, the rate of wetland loss and degradation is staggering. Wetland loss occurs when a wetland is permanently lost due to development or land conversion.

Degradation can be defined as the permanent or temporary adverse impact on certain wetland functions and values, though not necessarily a loss of wetland area. In both cases, valuable features and functions have been compromised.

At a global level, the planet has completely lost over 50 percent of its wetlands. Over 50 percent of wetlands have been lost in the continental United States, and another 35 percent have been seriously damaged and degraded (Millennium Ecosystem Assessment, 2005).¹⁴

Rates of loss and degradation in Canada vary regionally. For example, over 68 percent of wetlands in southern Ontario have been lost and converted to other uses and wetland loss in many urban areas of the country have reached 80 percent (Olewiler, 2004).¹⁵

Unfortunately, wetland loss in British Columbia reflects this same trend. While there are no comprehensive wetlands trends data available for BC, local information exists for some parts of the province. For example, in the Fraser Valley, it is estimated that 50 percent to 70 percent of the original wetland habitat has disappeared. In the ecologically critical South Okanagan, wetland losses have reached 85 percent (BC Ministry of Environment).¹⁶

2.5. Causes of Loss

While there is currently no way to track the cause of the loss of wetlands in BC¹⁷, it is clear that there are a variety of drivers and some consistent factors that contribute to the problem. These include:

- Land development for urban, agriculture and other uses;

¹⁴ Millennium Ecosystem Assessment (MEA). 2005 *Ecosystems and Human Well-Being: Synthesis*. Island Press. Washington p.155

¹⁵ Olewiler, N. 2004 *The Value of Natural Capital in Settled Areas of Canada*. Ducks Unlimited Canada and the Nature Conservancy of Canada.

¹⁶ www.env.gov.bc.ca/wld/wetlands.html

¹⁷ Wetland trend data exists in other parts of Canada – such as Southern Ontario where they have published trend data. PEI also has the capability.

- Inadequate water quantity and quality for wetlands, in relation to wetlands' key roles in the global hydrological cycle;
- Increasing demands for water extraction;
- Impacts of a changing and increasingly extreme and unpredictable climate;
- Lack of understanding of the value of wetlands and their services in decision-making processes (Ramsar Strategic Plan 2009-2015);¹⁸
- Lack of coordination between levels of government;
- Invasive species;
- Lack of attention to cumulative effects monitoring.

Table 3. Wetland Loss in British Columbia (Adapted M. Carver, 2010 in draft)¹⁹

Ecoprovince (Subregion)	Wetland Classes		Drivers of Loss and Degradation
Georgian Depression (South Coast)	Marsh – Tidal, Estuarine, Shallow water – Tidal, Estuarine	Swamp, Marsh, Fen	<ul style="list-style-type: none"> • urban/rural development • agriculture (drainage & cultivation) • industrial waterfront development • forestry • invasive plants
Coast & Mountains	Marsh – Tidal, Estuarine; Shallow water – Tidal, Estuarine	Bog, Fen, Swamp	<ul style="list-style-type: none"> • forestry (logging - roads, landings, coastal log dumps) • industrial waterfront development • mining exploration
Southern Interior (Okanagan Valley)	Marsh, Swamp, Shallow water	Wet meadow, Fen (more common at higher elevations)	<ul style="list-style-type: none"> • agriculture (cultivation) • urban/rural development • cattle grazing • invasive plants • forestry
Southern Interior (Upper Fraser, Upper North & South Thompson R. Basins)	Swamp, Marsh	Shallow water, Fen	<ul style="list-style-type: none"> • forestry • dam & flooding of northern Rocky Mountain Trench • invasive plants
Southern Interior Mountains (Columbia Basin)	Columbia River Wetlands; Marsh – Riparian; Shallow water – Riparian; Swamp – Riparian	Other, Marsh, Shallow water, Wet Meadow, Fen (more common at higher elevations)	<ul style="list-style-type: none"> • agriculture • cattle grazing • recreation • forestry • invasive plants • dams for hydroelectricity generation & water storage

¹⁸ Ramsar Strategic Plan 2009-2015, page 4.

¹⁹ Carver, Martin. Strengthening Wetland Conservation: An Assessment of Data and Tracking Opportunities across British Columbia (Draft Report for the Canadian Intermountain Joint Venture) March 2011

Ecoprovince (Subregion)	Wetland Classes		Drivers of Loss and Degradation
Central Interior (South Central Interior)	Shallow water, Marsh	Wet Meadow, Fen	<ul style="list-style-type: none"> •cattle grazing •ditching & drainage •mowing for hay production •diking, damming & flooding for water storage
Central Interior (North Central Interior)	Fen, Shallow water, Marsh		<ul style="list-style-type: none"> • mowing for hay production •ditching & drainage •cattle grazing •diking, damming, flooding for storage
Central Interior (Chilcotin Ranges)	Shallow water, Marsh	Swamp Fen	<ul style="list-style-type: none"> •cattle grazing •mowing for hay production •ditching & drainage
Boreal Plains	Bog, Fen, Shallow water	Marsh Wet meadow	<ul style="list-style-type: none"> •agriculture - cultivation •oil & gas exploration & development •forestry •invasive plants
Taiga Plains	Bog, Fen, Swamp		<ul style="list-style-type: none"> •oil & gas exploration & development •wildfires
Sub-boreal Interior	Fen, Marsh	Swamp	<ul style="list-style-type: none"> •forestry
Northern Boreal Mountains	Fen, Bog	Marsh, Swamp	<ul style="list-style-type: none"> •mining exploration & development •wildfires

3. Elements of the Problem

Many factors compound the difficulty of addressing wetland loss. These include, but are not restricted to: jurisdiction, lack of statutory and non-statutory protective measures, inadequate planning and coordination, inadequate data and information, lack of education, various forms of market failures and socio-economic phenomena such as myopia.

3.1.1. Jurisdiction

Technically speaking, and with very few exceptions, the water and 'beds' of all wetlands in BC are owned by the province. However, because of the nature of the ecosystems and their unique hydrological needs, land use around wetlands that occurs on a variety of land tenures has significant impacts on wetlands. Therefore, there are many instances where the decisions of other levels of government have a significant impact on the status of wetlands in the province.

The federal government has jurisdiction in cases of federal lands and federal parks, and federally led development projects. Similarly the planning and permitting decision made by local governments – such as zoning, bylaws and Official Community Plans (OCP) - have a significant impact on the landscape and direct development in way that either directly or indirectly impact wetlands.

There are also organizational issues within particular levels of government. For example, the issue of 'water' is dealt with by a host of ministries. The Ministry of Environment, Ministry of Forests Lands and Natural Resource Operations, Ministry of Energy and Mines, Ministry of Health and the statues that they uphold are just some examples of ministries that have some jurisdiction over water and wetlands. See *Appendix C for more information.*

3.1.2. Coordination

There is a general lack of coordination between governments and within governments with respect to wetlands. There is no central body that keeps track of the state and status of wetlands and coordinates efforts between agencies. This lack of coordination leads to ad hoc decision making and can result in agencies, legislation and regulations working at cross purposes. No one organization or designated group of organizations is held accountable for wetlands in BC.

3.1.3. Lack of Integrated Provincial Protective Measures

BC lacks clear law, regulation and policy around wetlands. Although the provincial government directly or indirectly controls resource management on most of the provincial land base, no statute directly addresses wetlands and outlines guidance for their protection. While some legislative and regulatory provisions exist, they are either vague or implicit rather than explicit, apply only in specific cases, to specific sectors or to specific parts of the province. As well, the BC government often lacks the regulatory capacity to enforce existing legislation where it does exist. *See Appendix B on legislative framework for wetlands in BC*

3.1.4. Science and Information

Wetland Data and Inventories

Wetland data and inventories are critical for supporting wetland conservation through planning and land use decision making. Currently, wetland data for BC are inconsistent, produced from a variety of sources. There is no comprehensive wetland inventory of the whole province except at a very coarse level. Excellent data exist for some parts of BC, but it is not always available to all stakeholders and different data sets use inconsistent and incompatible methodologies, technologies and data programs. Furthermore, there is no iterative process in place that requires consultation and consideration of this data. (*See Appendix on wetland data in BC.*)

Wetland Loss Tracking

The lack of an effective wetland inventory and loss tracking system obscures the seriousness of wetland loss and degradation overall. It also makes it impossible to track the loss of specific types of wetlands and ignores causes of loss and degradation. This makes it difficult to assess the scale of the losses and to set conservation targets.

3.1.5. *Education*

Information about the value of wetlands and trends in wetland loss exists, but this information often fails to reach urban, rural and industrial development proponents, regulatory agencies and the general public. Lack of understanding and information leads to planning and decision making that ignores the benefits of wetlands.

3.1.6. *Myopia*

Lack of information, planning and regulatory capacity leads to planning, development and permitting decisions that privilege short term-economic interests over long-term wetland conservation benefits.

3.1.7. *Stakeholder Pressure*

BC is a primary and secondary resource-based economy and industry stakeholders have a considerable political power. Despite international pressures in the market for 'green' products, corporate social responsibility, and environmental best management practices, intact wetlands and sensitive ecosystems can be viewed as foregone profits to industry and development. There is also considerable pressure in resource industries and the business community for the continuing trend toward deregulation.

3.1.8. Incentives

BC lacks good incentives for land use that supports the retention of wetlands. There are some incentives, such as funding through the Environmental Farm Plan²⁰ or through programs run by individual NGOs. However, effective incentive programs require that they be institutionalized at a broader level in BC and be available to a wide range of stakeholders. Examples of such programs include the Alternate Land Use Services (ALUS) model which is funded by the private sector, government and NGOs. This program has been implemented in some other Canadian provinces, but not in BC. ALUS provides compensation to landowners for implementing management practices that protect and retain natural capital.

3.1.9. Private Land

While over 94% of land in BC is crown land,²¹ much of the high-value land in terms of natural capital is found in the valley bottoms and along watercourses. Typically, this land is private land. While some environmental laws, policies and regulation apply to private land such as the *Riparian Areas Regulation*²² and the *Fish Protection Act*²³, they are often minimally enforced, or are in conflict with other statutes such as the *Land Act*²⁴ or the *Right to Farm Act*²⁵.

²⁰ <http://www.agf.gov.bc.ca/resmgmt/EnviroFarmPlanning/index.htm>

²¹ http://www.al.gov.bc.ca/clad/crownland_factsheet.pdf

²² http://www.env.gov.bc.ca/habitat/fish_protection_act/riparian/riparian_areas.html

²³ http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_97021_01

²⁴ http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_97021_01

²⁵ http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96131_01

4. Hypothesis

Based on the values of wetlands and the challenges to their protection, BC needs an ecosystem protection ‘policy’ for wetlands. There is a movement internationally and in other parts of Canada to adopt wetland policies that support mitigation and impact-offsetting frameworks. BC has made a clear statement of intention that it is looking at adopting this approach within BC for species and ecosystems (BC Ministry of Environment, 2010)²⁶.

The general hypothesis of this paper is that British Columbia should develop a comprehensive wetland policy to discourage wetland loss and promote sustainable land-use on public and private lands in BC. This must include a comprehensive “avoid-minimize-compensate” mitigation framework consistent with the best international examples of this approach. I focus on the provincial level because of its constitutional authority to manage its natural resources.

Other jurisdictions are adopting a mitigation approach to ecosystems impacts. The question is: what is the best option for wetland protection for BC? ‘Wetland Policies’ and Ecosystem mitigation frameworks are easy things to talk about, but nowhere is there clear guidance on all the steps, components and information required to assemble such a policy and to make it effective at achieving the desired outcome. In short: how would a wetland policy that includes a mitigation framework work in the province?

The remainder of this report focuses on analysis:

- Break down ecosystem based environmental protection policies and mitigation frameworks into their composite pieces based on case studies and a literature review
- Analyze best approaches for BC for some of the key elements of the components using criteria and measures

²⁶ http://www.env.gov.bc.ca/emop/docs/EMOP_DiscussionPaper.pdf

- Provide specific recommendations based on the analysis and highlight other considerations for moving forward; and
- Provide recommendations for further study.

5. Methodology

This report reviews literature and case studies of ecosystem-based management policies from other jurisdictions and in other ecosystem contexts. Please note that case studies will be referenced in the subsequent analysis sections, and more information is available for reference in the Appendices.

6. Components of a Wetland Policy Supported by a Mitigation and Compensation Framework

6.1. Basics of Ecosystem Mitigation Policies

The term mitigation stems from the Latin term *mītigātus*: *Mīt*, meaning to ‘soften or lessen’ and *gātus* meaning ‘to make’. Consistent with this etymology, environmental mitigation has come to refer to policies and frameworks that ‘soften’ or ‘lessen’ the net impact on particular ecosystems or particular ecosystem values. Most people accept some impacts to ecosystems in the context of social and economic development; mitigation policies strive to reduce or negate the overall ‘net’ impact.

In general terms, ecosystem-based conservation policies are a comprehensive suite of legal, planning and policy tools to protect ecosystems, species and functions and values. In the past 25 years, these policies have gained popularity, particularly in the United States, Europe and Australia. While there are a variety of approaches, most are premised on the idea that ecosystem services provide valuable benefits to society and that losses of natural capital should be offset.

Translated into economic terms, environmental mitigation seeks to optimize the use of our natural capital stocks perceived as shared public goods. The overarching goal is to sustain natural capital stock at a level adequate to provide a continual flow of goods and services over time. Natural capital stocks may decline in quantity and quality with use, so there is a need for policy to reduce this loss and if not possible, to mitigate by providing substitutes. The current system in BC has few concrete policies that address the protection of natural capital.

There are several benefits to mitigation policies – the most obvious being the maintenance of natural capital by directing development away from sensitive areas where possible and by compensating for unavoidable impacts. Another important benefit of mitigation policies is to reduce ad hoc decision-making and create certainty for

everyone: the regulatory agency, the proponent and for the public. Society benefits by having clearly articulated expectations the maintenance of environmental values. The regulatory agency benefits from having clear decision, compliance and enforcement criteria that can be adopted and implemented by all staff. Proponents benefit by increased equity, fairness and transparency because there are clearly articulated, consistently applied and predictable expectations and remedial actions for impacts. This increases certainty for proponents, and allows them to make business decisions based on a predictable and consistent regulatory environment.

6.1.1. Clarification of terms and concepts

For the purpose of this paper, the terms *Ecosystem Based Conservation Policies*, *Mitigation Policies*, and *Mitigation Frameworks* are used interchangeably and refer to the broader overarching policy or strategy. The term *Wetland Policy* will refer to a specific mitigation policy that applies to this ecosystem.

Mitigation is closely related to *offsetting*. However, mitigation generally refers to a more comprehensive policy and process that includes avoidance and minimization of impacts. Offsetting is the act of remediating impacts, as in the carbon market, by investing in alternate activities that offset the environmental loss generated.

Compensation is an important part of a mitigation policy and refers to the remedial efforts required by the broader mitigation framework in cases where avoidance is not possible. Compensation and offsetting are used synonymously and refer to specific applications of the policy in which action is taken to compensate or offset impact.

It is also critical to draw a distinction between *mitigation*, *compensation* and *restoration* or *reclamation* though they are not mutually exclusive and reclamation is often part of mitigation. Generally speaking, restoration, or reclamation as it is sometimes called, occurs when an impact to an ecological feature due to development or resource extraction is remediated immediately, or in a specified timeframe at the site. A simple example is timber harvesting where trees are subsequently replanted, thus restoring the balance of ecological goods and services over the long term. The

ecosystem features and values are typically restored on the site within a relatively short period as required by the *Forest and Range Practices Act* Timber Regulations. There is also the case of mining in which ecosystem values are compromised for many years, but the natural value can ultimately be restored by reclamation on the same site in accordance with reclamation provisions in BC's mining legislation and regulations. Mitigation, on the other hand, typically refers to a process in which impacts on site are avoided where possible, *restored* onsite where possible and *compensated* for offsite where functions and values either cannot be restored on a particular site (a wetland drained to accommodate the building a roads), or will not be restored in sufficient time to reinstate the benefit (fish habitat in creeks compromised by mining development).

6.2. Designing a framework for a wetland mitigation policy in BC

Mitigation policies are not one dimensional simple goal statement. Each component consists of a variety of possible approaches. The more carefully and thoughtfully the components are considered, the more effective the policy will be. This paper outlines the essential components and provides examples of approaches that could be taken for each component. This section begins by listing the components and providing examples. In the second part of the analysis, each option is carefully evaluated based on economic, political, scientific and sociological criteria.

This framework will not completely eliminate complexity; there are many possible directions and decisions requiring analysis by policy makers and experts in the fields of science, law, economics, and accounting. The following framework simply lays out some of the basic approaches and considerations, based on case studies and lessons learned, with the hope of focusing thinking and clarifying resource needs for the development of a wetland policy.

Many of the approaches listed under the various components are not mutually exclusive. Also, the order of components is just a guideline.

6.3. Laying the foundation for a Wetland Policy

This section sets out a number of key decisions for a wetland policy framework and lists possible approaches and considerations. The purpose of this section is not to provide definitive guidance of substantive elements of the policy, but rather the set out the larger framework for policy development and to highlight some key considerations for each element.

6.3.1. Goal Setting

The clear, unambiguous articulation of goal and purpose is arguably one of the most important components of a policy. The clarity with which the goal is articulated is critical and will help with all elements of policy development and implementation.

Approaches

One of the first and most challenging things to determine is whether the policy intends to mitigate for:

- Lost/ reduced ecosystem function, or
- Lost/ degraded area.

Considerations for Goal Setting Part 1

- A policy that focuses on area, would have clearly articulated in its goal statement that the purpose of the policy was directed as actual ecosystem area such as the maintainable of specified hectares of wetlands. For example, a 5 acre wetland would under the policy would target avoided and minimized impacts based on the 5 acre area, and any compensation required would be based on area at the pre-determined area compensation ratio. This type of policy relies extensively on mapping and inventory data that show wetlands by type and distribution.
- On the other hand, a policy that is based on function is not preoccupied with area. Let's say the 5 acre wetland supported fisheries values. A policy based on function would not base its avoidance, minimization and compensation actions on area, but rather whatever it would take to protect the fisheries function. This could mean that some impact is permissible to the wetlands if it didn't compromise the wetland's values and could also mean that compensation is conducted at a watershed scale. This type of policy goal setting relies extensively on science and site assessments and often necessitates landscape level ecosystem management.

Considerations for Goal Setting Part 2

Once it is determined whether a policy will focus on area or function, there are three primary types of overarching ecosystem policy goals that can apply; either alone or in combination.

- **No loss:** This goal means that the policy supports no loss of function, area or both. No loss policies can apply to everything, or can apply to a particular area or region or to specific ecosystem classifications.
- **No net loss:** likely the most common policy goal overall, no net loss policies recognize that some loss of ecosystem area or function is inevitable, but promotes no loss overall through a system of mitigation and compensation for impacts. This is an example of where the ecosystem goods and services would be maintained through some form of substitution. In this case, mitigation and the mitigation sequence of avoid-minimize-compensate are used to support the overall goal. The mitigation sequence is fundamental to most mitigation policies. It refers to a systematic, tiered approach that encourages: 1) directing development away from sensitive areas (ex: directing the road development away from a wetland), 2) minimizing impacts where complete avoidance is not possible (ex: only impacting a portion of a wetland/ riparian area), and 3) compensation for impacts where avoidance and minimization is not possible. As with no loss policies, this goal can apply to all ecosystems (wetlands) provincially, or regionally. This policy is a goal for federal wetlands under the Federal Policy on Wetland Conservation.²⁷
- **Net gain:** this goal means that the net effect of compensation for ecosystem impacts results in either more area or more ecosystem function than existed prior to the impacts. Again, this goal can apply to the whole policy area, or can target certain areas and/ or values and ecosystem types. A net gain policy is useful in areas incurring particularly high adverse impacts, or where specific functions, or ecosystem sub-classifications are under-represented in a provincial targeting system. Its goal is to restore the ecosystem goods and services lost and to contribute to more ecosystem services overall.

6.3.2. *Sponsoring Agency*

A wetland policy for BC could be enabled by a variety of different agencies. The important thing is that there be an agency or group of agencies that oversees the policy. This is often, but not always the agency responsible for implementation, compliance and enforcement of the policy.

²⁷ <http://publications.gc.ca/collections/Collection/CW66-116-1991E.pdf>

Approaches

In BC, the sponsoring agency for a wetland policy could be:

- Any of the natural resource ministries such as the Ministry of Environment, or Ministry of Forest, Lands and Natural Resource Operations
- Cabinet

Considerations

The sponsoring agency must ensure that it has the resources to implement and monitor the policy. As we observe in the case of Canada Federal Wetland Policy, one of the chief causes of policy failure of ecosystem mitigation policies is lack of enforcement. Therefore, capacity within a group or agency must be a primary consideration.

6.3.3. ***Enabling Legislation, Regulation and Policy***

A wetland policy requires a formal legislative, regulatory or other clearly articulated policy basis (such as a cabinet directive). The approach taken will largely depend on subsequent policy components such as scope, scale and exemptions, and will need to be evaluated throughout the development of the policy.

Approaches

- A lead agency develops a policy as protocol and decision making criteria for existing legislation (e.g., decision support tool to support *Environmental Assessment Act*)
- New regulations are drafted based on interpretation of existing legislation (ex: provincial *Water Act*)
- New legislation is drafted (e.g., a provincial 'Wetlands Protection Act')

Considerations

The stronger the legislative basis for the policy, the greater the chance will be of success. This does not mean that the policy needs to be enshrined in legislation, but that the trigger for the policy has a statutory impetus as in the case of the Department of Fisheries and Oceans Canada mitigation policy for the Management of Fish Habitat. In this case, the policy is triggered by the Federal Fisheries Act and the decision making criteria are in the supporting mitigation policy.

6.3.4. *Comprehensiveness*

A wetland policy for BC could exist alone, or as a component of a comprehensive ecosystem policy that is a broader conservation strategy for multiple ecosystems.

Approaches

- A wetland policy for BC that is exclusively focused on wetlands.
- An environmental mystification and offsetting policy for BC, of which wetland mitigation is a part.

Considerations

- There are advantages to having a wetland policy as part of a broader ecosystem mitigation and offsetting strategy as it creates a scale economy and therefore reduces overall costs for administration and delivery.
- There is often a fear that a larger, comprehensive strategy can de-emphasize attention on specific ecosystems, such as wetlands, because priority will be given to ecosystems that rank higher in the public and political interest at the time. For example, Gary Oak ecosystems in Victoria could receive a higher profile than peatlands in Boreal Forest in north eastern BC. This said, checks and balances such as very specific targets, stringent reporting requirements or 'watchdog' groups can be designed to reduce the likelihood that this will occur.
- If wetlands are included as part of a broader strategy, it is critical to maintain good wetland inventory data and set specific conservation targets by ecosystem.

6.3.5. *Scope*

The scope of the policy refers to where, in geographic terms, the policy applies within the province.

Approaches

- The policy applies to all lands in BC
- The policy applies exclusively to crown lands in BC
- The policy applies only in certain regions of the province, on all lands
- The policy applies only in certain regions of the province, on public lands

Considerations

The scope of the policy must weigh the ecological, political, social, economic, equity and administrative considerations.

6.3.6. Scale

Scale refers to the size of wetland to which the policy applies.

Approaches

- The policy applies to wetlands over 10 hectares
- The policy applies to all wetlands over 1 hectare
- The policy applies to all wetlands, regardless of size

Considerations

- Scale considerations apply most commonly to policies based on area, though they can be attached to function assessments that have been indexed on area.
- The types and scale of wetland data available in the policy jurisdiction are critically important in deciding scale of the wetlands included in the policy. For example, if a jurisdiction only has complete wetland inventory data for wetlands over 10 acres in size, this size unit would be easiest and least costly to include in the policy.
- The smaller the area of wetland included in the policy, the more effective the policy will be at protecting wetland area, functions and values overall.
- An investment in the development of wetland data and inventory is often an important investment and a 'sunk cost' of the policy development.
- The scale of the policy can change as better wetland inventory data are developed.
- Policies can occur in the absence of wetland inventories. In this case, the policy needs to include guidance for rigorous site assessments for project proposals. This is often very expensive for both the regulatory agency and the proponent.

6.3.7. Wetland Classification/ Type

There are five primary wetlands classifications and numerous others sub classifications in BC. The policy must clearly articulate to which classifications the policy will apply.

Approaches

- The policy applies to all wetland classifications in BC, including ephemeral or 'seasonal' wetlands
- The policy applies to all wetland classifications in BC, excluding ephemeral wetlands.

- The policy applies to some wetland classifications (or sub classifications) and exempts others.

Considerations

- The more sensitive the policy is to different wetland classes the more complicated the policy becomes. This is especially the case where compensation is necessitated.
- The ability of a policy to be sensitive to a variety of wetland types relates very closely to the details in the existing wetland data and inventories.
- One of the most contentious issues in other jurisdictions has been whether to include ephemeral wetlands in the policy. This was a large issue in the development of Alberta's draft policy.

6.3.8. Exemptions

The scope, scale and classification inclusion of the policy will implicitly create inclusions and exemptions. Other exemptions could be made based on jurisdiction or sector.

Approaches

- The policy clearly exempts certain activities
- The policy clearly exempts certain industry sectors
- The policy exempts local governments
- There are temporal exemptions for certain activities
- Some combination of the above

Considerations

- Exemptions are issues that often emerge in the development of ecosystem mitigation policies. They are critical considerations both from the perspective of the effectiveness of the policy relative to its intended purpose, and also from the perspective of political and stakeholder feasibility.
- This has been one of the most challenging issues in the development of Alberta Wetland Policy as there has been considerable political pressure to have it apply differently in Alberta Green zone (north, industrial) and White zone (south, urban-agricultural).

6.3.9. Priority Setting

Priority setting involves the identification of priority areas, functions and values for conservation. This commonly involves a priority ranking and can create provisions for no-loss, or net gain within the policy for certain areas or certain wetland types as well as articulating targets for restoration.

Approaches

- There are no priority areas for conservation or restoration. The policy applies uniformly across the province.
- Wetlands in BC are inventoried and have priority ranking that designate some wetlands as no-loss areas related to impact.
- Wetlands in BC are inventories and conservation and restoration efforts derived from the policy are directed to highest priority areas.

Considerations

- Priority setting can be one of the most valuable parts of an ecosystem mitigation policy in its ability to restrict impacts in areas of special interest and the ability to direct compensation towards the areas of highest needs and value.
- Similar to the issues of scope, horizontal equity and fairness issues become important considerations if there are different expectations in different parts of the province.

6.3.10. Date effective

The policy needs to articulate from when it applies and ensure that there is an adequate data baseline to support it. This must articulate not only the status of the policy relative to impacts, but also stipulate from when compensation projects can be eligible. Fundamental to the creation and implementation of ecosystem policies is the establishment of a habitat baseline. This requires a thorough survey of existing values and ecosystem extent and is generally achieved through mapping or other forms of ecosystem inventory. Not only is the representation and extent of a particular ecosystem type important, it is also important to establish a baseline based on a specific time to enable the tracking of gains and losses overtime.

Approaches

- The policy, relative to impacts on wetlands, is effective on a 'go-forward' basis from the point it gains assent
- The policy, relative to impacts on wetlands, is back-dated and applies retroactively to a specified date
- The policy, relative to eligible mitigation and compensation scenarios that are remedial or provide additional benefit, applies on a go forward basis.
- The policy, relative to eligible mitigation and compensation scenarios that are remedial or provide additional benefit, applies to compensation project within the 5 (example) years.

Considerations

- Adequate information and wetland inventory data may not be available, or only available for some types of wetlands or in some areas. This does not confound the policy, but does however necessitate on the ground scientific expertise and environmental impact assessments.

6.3.11. Triggers

Related closely with Scope and Scale, this component refers to the context or circumstance in which the policy is triggered.

Approaches

- The wetland policy is triggered at the proposal stage of a project
- The wetland policy is triggered through monitoring and enforcement done by the regulatory agency
- The wetland policy for BC is triggered through a permitting process by the regulatory agency.
- The wetland policy is triggered by the project proponent.
- The wetland policy is triggered by a third party verification body
- Consideration of the wetland policy becomes imbedded in existing processes such as provincial *Environmental Assessment*.

Considerations

- Clearly defined triggers and subsequent processes assist with the administration of a wetland policy.
- Applying a policy to an already existing process such as the BC Environmental Assessment process can be an effective and cost effective way to trigger a policy because of the efficiencies created by existing processes and administrative capacity.

6.3.12. Mitigation Hierarchy

A mitigation hierarchy typically refers to a ladder approach that focuses on avoidance, minimization and then compensation. How and the degree to which the policy aims to implement this ladder approach must be clearly articulated in the policy and supported by an effective process that steers both the proponents and the regulatory agents through the tiered approach.

Figure 2 is a coarse articulation of the basic steps in the 'mitigation' process as it would apply in the context of a project proposal.

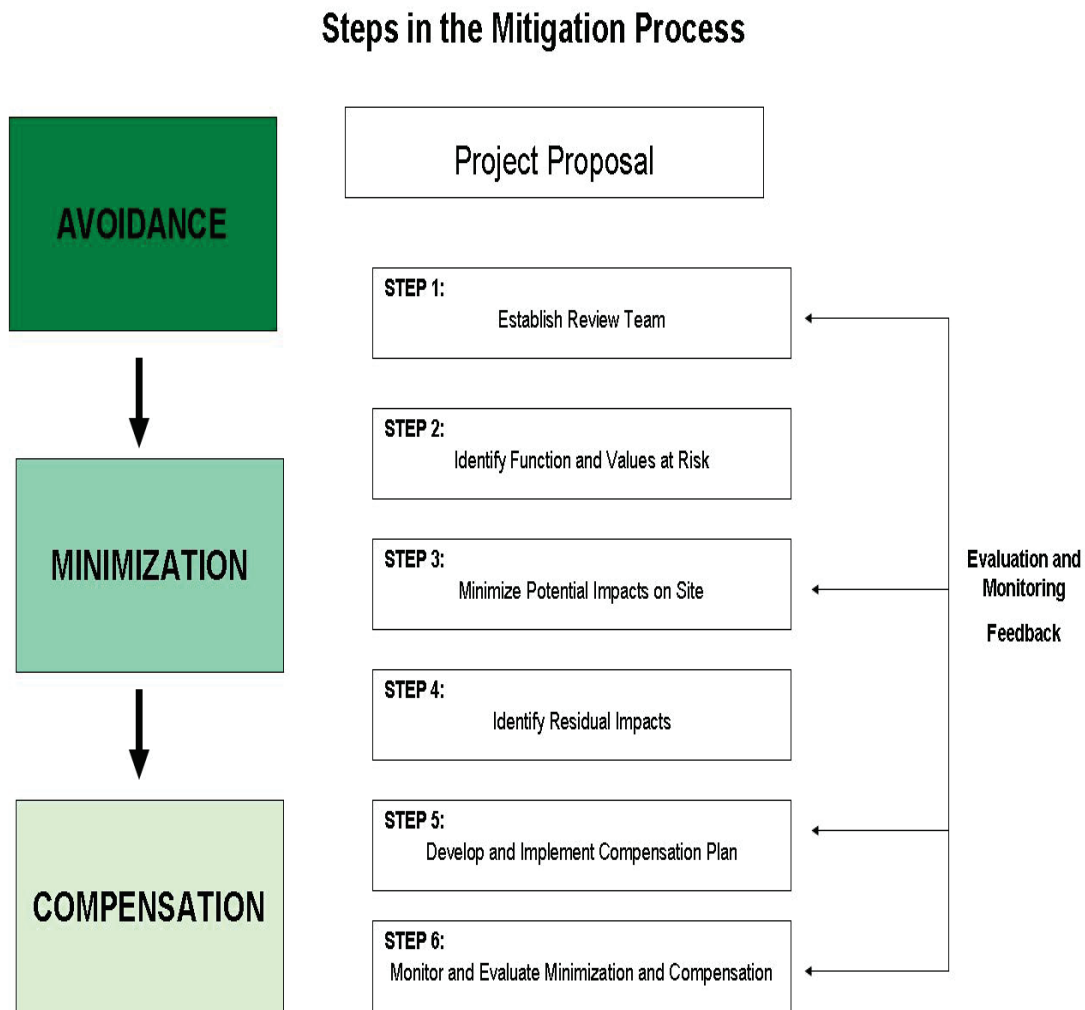


Figure 2. Steps in the Mitigation Process

Avoid

In this case, adverse impacts on wetlands are circumvented through planning, innovation or by directing development away from sensitive sites such that there is no negative net impact on wetland area and/or function.

Considerations

- Cost to economy for avoided impacts;
- Needs for extension/support services such as best management practices (e.g., Wetland Ways²⁸, Develop with Care²⁹, Living by Water,³⁰) for the proponent to help the proponents plan for avoided impacts;
- Local governments have many tools at their disposal to avoid impacts by directing development away from sensitive areas such as the Green Bylaws Toolkit³¹;
- Lack of information, and data gaps can make it more challenging for developers to plan to avoid impacts;
- High quality inventories and ecosystem atlases, such as the Sensitive Ecosystem Inventories assist with directing development away from sensitive areas;³²
- Often best supported by providing incentives.

Minimize

In this case, efforts were made to reduce impacts and were successful in part, however still created a net impact on wetland area or function. For example, a project that only affects a portion of the wetland, or causes some degradation but not outright loss of area or function.

Considerations

- can be difficult to evaluate grades of impact

²⁸ http://www.env.gov.bc.ca/wld/documents/bmp/wetlandways2009/wetlandways_docintro.html

²⁹ http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare2006/develop_with_care_intro.html

³⁰ <http://www.livingbywater.ca/>

³¹ www.greenbylaws.ca

³² <http://www.env.gov.bc.ca/sei/>

Compensate

Compensation occurs in any case where there needs to be value added to offset any impacts or any variance with respect to the goal of the wetland policy. This applies in the case of both loss and degradation. As is outlined below, compensation can necessitate either a cash payment or a proponent-driven compensation project, as stipulated in the policy. In any event, the key concept here is that the proponent is obligated to restore the ecosystem services.

Considerations

- Compensation requirements should be designed carefully so that they provide incentive for people to change their practices and avoid and minimize impacts where possible.
- It can be hard to find and fund compensation options – especially in BC for two reasons. First, some ecosystems (wetlands) have very specific geographic requirements, and there are times where no areas exists for appropriate compensation to take place. More often, the cost of land in a particular area, such as the Fraser Valley, makes compensation extremely expensive.

Implementing a mitigation hierarchy refers to the deliberate emphasis on avoidance and minimization of impacts before turning to compensation. It is generally considered good public policy to emphasize avoidance and minimization of impact as a way to minimize net impact overall. The mitigation policy, which includes guidelines for compensation, therefore acts as an incentive to implement proactive planning approaches that minimize net impact, and to implement best management practices.

6.3.13. Compensation

If avoidance is not possible and either minimized or non-minimized impacts occur, the wetland policy will necessitate compensation. What follows are important considerations when developing a compensation system.

In-kind and out-of-kind Compensation

The policy must provide guidance on whether compensation will be in-kind, out-of-kind or a combination. This distinction refers to the type of habitat or value: in-kind mitigation refers to a like-for-like impact/compensation for a particular instance of

impacts; out-of-kind mitigation refers to compensation projects that are not like-for-like impact/compensation scenarios. While restricting compensation options to in-kind mitigation seems like an effective way to achieve a conservation target, most jurisdictions allows for out-of-kind compensation to occur in larger, institutionalized compensation systems where there are clearly delineated conservation targets by wetland type. As will be seen in sections to come, this decision also depends on the option for a mitigation system is chosen.

Table 4. In-Kind and Out-of-Kind Compensation

Type of Compensation	Notes	Advantages	Disadvantages
In-kind		<p>Better assurance that functions and values garnered from specific ecosystem features will be restored.</p> <p>If the total economic value of the ecosystem is computed as part of the compensation cost passed on to the proponent, this will provide economic incentives for developing in some areas and not others.</p>	<p>Finding opportunities for in-kind compensation can be challenging and/or very costly.</p>
Out-of-Kind	<p>Out-of kind compensation is typically made possible by the existence of a mitigation bank.</p>	<p>Better overall efficiency in the system as finding in-kind compensation within the designated timeframe and geographic area is often challenging and expensive.</p> <p>The ability to direct compensation efforts to the highest and best use.</p> <p>Being consistent with setting and directing resources to meet conservation targets for certain wetland types and/ or functions.</p>	<p>If economic valuation is not part of the out-of-kind compensation calculation, can risk disproportionate loss of certain ecosystem features, values and functions based on market drivers such as land values.</p>

6.3.14. Compensation Ratios

Compensations relate very closely to the goals of the policy (no-loss, no-net-loss, net gain). They refer to the amount of habitat or functions that need to be invested to offset the loss and to satisfy the requirement of the policy. In most cases, compensation ratios refer to the amount of area required for compensation relative to the area of

adverse impacts, though they can be a calculation based on function. In all cases, determining what compensation ratio is appropriate must involve consultation with wetland scientists.

Approaches

- BC provides clear decision making criteria for compensation that applies in all cases.
- BC provides a variety of indexed compensation ratios, based on value, function, location of the project and conservation priorities
- Compensation ratios are assessed on a project-by-project basis

Considerations

- Some common examples of ratios in the literature include 1:1, 2:1, 3:1 compensation for area lost or impacted.
- Higher ratios can be a deliberate attempt to support a net-gain policy, as well as a way to manage compensation efforts given that not all compensation projects will be successful at restoring area and function due to unforeseen variables and the complexity and uncertainty of wetland science.
- Acceptable ratios vary based on a variety of factors including:
- Proximity of compensation site to the site of original impact. Typically the further away the compensation site is, the greater the compensation .
- The type of project used for compensation (protection, restoration, creation, enhancement) will influence the total net additional benefit
- Size and siting considerations that are known to increase/reduce project failure rates.

6.3.15. *Acceptable Forms of Compensation*

There are a variety of ways to approach compensation on sites. The following are the most commonly held types; each having its benefits and drawbacks.

Protection

Protection occurs when there is an additional protective mechanism placed on the wetland to ensure that it is not impacted in the future, thus minimizing risk of net-loss of natural capital. There are various mechanisms that can be employed to add protection, most of them legal in nature and some offering 'stronger' protection than others. These include:

- Fee-simple purchase (government, Land Trust, mitigation bank)
- Landowner management agreements
- Conservation easements/covenants (NGOs)
- Zoning, bylaws (local government)
- Environmental Development Permit Areas
- Transfers of administration³³
- Land Designations (e.g., Wildlife Management Areas, National Wildlife Areas, federal and provincial Parks)

Restoration

Wetland restorations occur when the function and area of a historic wetland complex is restored in all or part. This is generally considered an ideal form of adding ecosystem value because the success rate of habitat restoration is very high and the potential negative externalities associated with the project are reduced in areas of traditional habitat. However, restorations can be a very expensive option. Sites for wetland restorations can be difficult to find, and often require dealings with private landowners or tenure holders on land that is often of high value. In some cases this option's cost can be prohibitive.

Enhancement

Value is added by enhancing the functions and values of an existing wetland. Enhancements increase a specific value and as such are often useful when compensating for lost functions and values such as flood control, erosion, water filtration or habitat for specific plants and animals. They are not often seen as an ideal option for compensation as there is generally no increase in wetland areas. Examples of enhancement projects include:

- invasive plant removal
- moderate increase in wetland area
- improved reliability of water to the wetland complex
- restricting access (riparian grazing management)

³³ http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96245_01#section15 sections 16, 17.

- riparian restoration
- upland management

Creation/ construction

Creation or construction, as the name would imply, refers to the development of a wetland or aquatic complex in an area that previously did not have such a habitat. It can be an effective way to increase overall area and function, though typically are more prone to failure than restorations.

An important distinction must be made between created and constructed wetlands. Created wetlands refer to wetland that are human-made in an area where the ecosystem did not exist previously, but the construction was motivated to maximize functions and values of natural wetlands.

Conversely, constructed wetlands are developed to perform a specific service for people and often provide minimal other values, or may create negative effects. Examples of constructed wetlands are tailings ponds and those created for storm water retention. This definition is important when considering eligible types of compensation projects.

Table 5 provides a summary of the different forms of mitigation.

Table 5. Strengths and Weaknesses of Forms of Mitigation

Method	Strengths	Weaknesses	Use
Protection	<ul style="list-style-type: none"> • Ensures ecological sustainability of a particular ecosystem, water shed or habitat • Can be a lower cost option 	<ul style="list-style-type: none"> • Cannot prevent loss of area of function • Inconsistent with no net loss and net gain policy goals 	<ul style="list-style-type: none"> • Consistent with priority ranking and protection of wetlands of particular importance
Restoration	<ul style="list-style-type: none"> • Increased wetland function/area • Re-establishes historic function • Restoration agencies increase efficiency 	<ul style="list-style-type: none"> • Requires expertise • Appropriate sites can be hard to find or cost prohibitive (land value, opportunity cost on the land) 	<ul style="list-style-type: none"> • Whenever/wherever possible
Enhancement	<ul style="list-style-type: none"> • Allows specific functional goal to be met such as improvement to water quality, habitat, etc. 	<ul style="list-style-type: none"> • Difficult to measure/monitor • No increase in overall wetland area • Inconsistent with net gain of wetland area 	<ul style="list-style-type: none"> • Where specific ecosystem service is targeted

Method	Strengths	Weaknesses	Use
Creation	<ul style="list-style-type: none"> •Choice of location •Siting is possible on less expensive sites 	<ul style="list-style-type: none"> •Functions differently than natural wetlands •Can become 'wildlife traps' •Can be toxic and lead to adverse environmental effects •Little knowledge about carbon cycling in constructed wetlands •They can negatively impact adjacent natural systems. 	<ul style="list-style-type: none"> •As a last resort •When considering waste water treatment systems

6.3.16. Options for the Compensation System

There are numerous ways in which mitigation systems can be organized to make the compensation component operate in the most efficient and effective manner possible. It is generally considered inefficient to have each compensation effort addressed individually and therefore the compensation system is usually institutionalized.

Generally speaking, all types of compensation can be divided into one of two broad systems: direct habitat or fee-based. Direct habitat systems occur when the proponent is directly responsible for an appropriate compensation activity and either does an appropriate project him/herself, or contracts such a project. The cost of the project is based on factors such as land values, material cost, contracting, legal fees etc. The other system is a fee-based system. These systems require indexed values for certain types of impacts (e.g., 1 acre of peatland lost in a particular area equates to a dollar value). Many governments and non-government delivery agencies have propounded fee-based compensation systems. This is because money generated from the system can be applied to the highest and best use and the system overall creates economies of scale that direct habitat options do not, especially in the site selection, planning, design, construction and management.³⁴

³⁴ Apogee Research Inc., Alternative Mechanisms for Compensatory Mitigation: Case Studies and Lessons about Fee-Based Compensatory Wetlands Mitigation, 1993 page at ii. ("Apogee") Available online at: <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA343875&Location=U2&doc=GetTRDoc.pdf>

A second classification of compensation systems is the distinction among three distinct mechanisms: banking, in lieu fee and permittee-responsible mitigation. Permittee-responsible mitigation is typically a direct habitat approach. In this case, the permittee (proponent) maintains liability for the construction and long-term success of the site. Mitigation banking and in-lieu fee mitigation are both fee based systems and are forms of "third party" compensation, where the liability for project success is transferred to the mitigation bank or in-lieu fee sponsor.

Table 6 illustrates the strengths and weaknesses of each approach and each is described in more detail below.

Table 6. Strengths and Weakness of Forms of Compensation

Delivery Option	Strengths	Weaknesses
Mitigation Banking (Fee-Based System)	<ul style="list-style-type: none"> • Mitigation may occur prior to wetlands impacts • Well-monitored sites • High performance standards • Competition may create a market for wetland credits 	<ul style="list-style-type: none"> • Mitigation may occur far from the impacts • May contribute to less avoidance and minimization of impacts • Small valuable wetlands may not be replaced
In-Lieu Fee Mitigation (Fee-based System)	<ul style="list-style-type: none"> • Easy for proponents • Compensation may occur before or after impacts • Expertise will be employed in restoration 	<ul style="list-style-type: none"> • Fee payment before impacts may result in adequate compensation • Fee payment after impacts may result in (at least temporary) loss of function habitat
Permittee-Responsible-Mitigation (Direct Habitat)	<ul style="list-style-type: none"> • Mitigation is likely to occur on-site or nearby • Loss of a single site is less catastrophic 	<ul style="list-style-type: none"> • Proponent may lack expertise • Smaller sites may pose a greater risk of failure • Habitat fragmentation

Mitigation banking

Mitigation banking is a mechanism by which a wetland, stream, or other aquatic resource area has been restored, established, enhanced, or (in certain exceptional circumstances) preserved for the purpose of providing compensation for unavoidable impacts.³⁵

³⁵ Definition taken from United States Environmental Protection Agency, Compensatory Mitigation Fact, Sheet page 2, available at: <http://www.epa.gov/owow/wetlands/pdf/CMitigation.pdf>

Typically, a mitigation bank site is a property purchased and developed by a public agency, utility, private agency or other approved restoration agency. Credits are generated through the restoration, creation, and/or enhancement of wetlands on the property. The credits are sold to compensate for adverse impacts to wetlands due to development activities of other agencies, utilities or private sector developers. The proponent, upon acquiring authorization to impact the wetlands, can purchase credits from a mitigation bank to meet the required compensation. The value of mitigation credits purchased is variable, determined by quantifying the wetland functions or acres restored or created. The third-party mitigation bank, rather than the proponent, is responsible for the success of the mitigation project, which is performed off-site.

Table 7. Benefits and Criticisms of Mitigation Banking

Benefits of mitigation banking	Criticisms of mitigation banking
<ul style="list-style-type: none"> • Sites consolidated for mitigation can be large and thus more ecologically robust than on-site mitigation options • More time can be devoted to follow up and monitoring due to the smaller number of larger compensation sites where a large wetland or wetland complex has been restored • Less time is required to review individual compensation projects • Numerous permittees may transfer responsibility for the mitigation site to a single entity • Mitigation banking can also result in wetlands of greater ecological value by reducing the effects of habitat fragmentation. • Mitigation banks may also restore historic wetland diversity and distribution within a watershed. • Consolidation of restoration efforts can result in wetlands of greater value because of their size and the commitment to long- term management. 	<ul style="list-style-type: none"> • The site chosen by mitigation bank operators may not be representative of the wetland type where actual losses occur; • Failure of a mitigation bank would result in a greater setback to achieving no net loss than would the failure of a single-permit mitigation site; • Monitoring may be required for a long period of time; • There may be an overall loss of wetland function if wetlands are not replaced according to hydrogeomorphic principles or in an appropriate location in the watershed; • Bank or consolidated mitigation sites may not be in close proximity to a specific impact site; and • A belief that there will be less avoidance and minimization if a mitigation bank exists.

Considerations

- The adoption of mitigation banking as a preferred compensation method brings with it requirements of long-term monitoring and maintenance. It may be best for monitoring to be the domain of a provincial government agency.

- Mitigation banks should be located, designed, and constructed to replace wetland functions according to hydrogeomorphic principles.³⁶
- Some argue that wetland mitigation banking inevitably leads to relocation of wetlands, and therefore changes, either positively or negatively, the functions they perform and ecosystem services they provide.³⁷

In-Lieu Fee Mitigation

In-Lieu fee typically refers to the collection of fees for some ongoing or future program in-lieu of a specific compensatory mitigation action. Like mitigation banking, in-lieu fee mitigation typically occurs "off-site." In-Lieu Fee Mitigation occurs when a proponent provides funds to an in-lieu-fee sponsor who is then responsible for the success of the mitigation rather than the proponent. Some compensation programs use a trust fund model to finance restoration, enhancement and creation projects,³⁸ others do not.³⁹

³⁶ This refers to principles based on three fundamental factors that influence how wetlands function: position in the landscape (geomorphic setting), water source (hydrology), and the flow and fluctuation of the water once in the wetland (hydrodynamics). (Regulatory Program of the US Army Corps of Engineers. National Action Plan to Develop the Hydrogeomorphic Approach for Assessing Wetland Functions. Federal Register - Notices - 16 August 1996).

³⁷ Brown, P. and C. Lant, The Effect of Wetland Mitigation Banking on the Achievement of No-Net-Loss. *Environmental Management* Vol. 23, No. 3, pp. 333–345.

³⁸ For example, Dade County, the Ohio Wetlands Foundation, Maryland Department of Natural Resources and Louisiana Nature Conservancy.

³⁹ For example, Arkansas Nature Conservancy and Vicksburg District.

Table 8. Benefits and Criticisms of In-lieu fee systems

Benefits of in-lieu fee systems	Criticisms of In-lieu fee systems
<ul style="list-style-type: none"> • Many say that this model is more efficient, because conservation organizations and agencies with experience with compensation projects and technical expertise produce high quality projects. This is typically a public agency or non-profit organization that is recognized within the mitigation policy framework. • The sponsor may collect funds from multiple proponents in order to pool the financial resources necessary to build and maintain mitigation sites. In this way, the fees imposed for wetlands impacts are combined to fund larger and more expensive projects that are anticipated to be more ecologically beneficial. • The fees acquired through fines or penalties may be added to this fund. • Having a pool of funds collected helps to direct funding towards the highest and best use. • The spending of this fund can be made consistent with priority setting for conservation and can include restoration targets by wetland type. 	<ul style="list-style-type: none"> • Challenges in setting the appropriate ‘fee’ in the absence of enough ecosystem valuation data • Compensatory mitigation often does not occur prior to the project impacts and that mitigation efforts have lacked a clear timetable.⁴⁰ • The result is a temporary loss of wetland area and function.⁴¹ • In the absence of timely mitigation delivery, costs can increase substantially, making it difficult or impossible for the sponsor to accomplish the mandated quantity of restoration. • There may also be problems associated with the payment of compensation prior to the project’s completion or prior to its commencement. This is because compensation at this early stage is based on estimated wetlands impacts. Actual impacts may be much more severe or widespread than anticipated. • In-lieu mitigation systems operate on the principle that mitigation requirements are fulfilled when fees have been assessed and paid. The fees are in-lieu of the proponents providing mitigation directly. Proponents are unlikely to be satisfied with a system that allows for reassessment and imposition of additional fees. While there may be many reasons to require pre-emptive fee payment, there are also potential downfalls.

Considerations

- Development of an in-lieu program requires a variety of expertise and requires a clear organizational framework to ensure that all fee funds are filtered to appropriate wetlands projects, fees are assessed in a transparent and predictable manner and adequate long-term maintenance and monitoring occurs.
- Restoration agencies, such as Ducks Unlimited Canada in Alberta, are often tasked with long-term maintenance of mitigation sites.
- This model relies on a sophisticated metric by which one can evaluate the ‘cost’ and in turn the fee appropriate for a specific mitigation action.

⁴⁰ Jessica Wilkinson, In-lieu mitigation: coming into compliance with the new Compensatory Mitigation Rule, 2009 Wetlands Ecol Manage 17:53-70, at 54. (“Wilkinson”)

⁴¹ EPA: <http://www.epa.gov>

Examples of in-lieu fee policies

USA

The United States has experimented extensively with in-lieu fee programs and has adapted practices and protocols based on lessons learned. In an effort to help make in-lieu fee programs more timely and predictable there has been some major renovation of the regulatory framework in the US. The US published a series of regulations,⁴² in an attempt to correct some of the shortcomings of past programs.⁴³ The new standards will affect both mitigation banking and in-lieu programs to promote no net loss of wetlands by improving wetland restoration and protection policies, increasing the effective use of wetland mitigation banks and strengthening the requirements for the use of in-lieu fee mitigation. Some of the key features include:⁴⁴

- Emphasizes that the process of selecting a location for compensation sites should be driven by assessments of watershed needs and how specific wetland restoration and protection projects can best address those needs;
- Requires measurable and enforceable ecological performance standards for all types of compensation so that project success can be evaluated;
- Requires regular monitoring to document that compensation sites achieve ecological performance standards;
- Clearly specifies the components of a complete compensation plan based on the principles of aquatic ecosystem science; and
- Emphasizes the use of science-based assessment procedures to evaluate the extent of potential water resource impacts and the success of compensation measures.

Alberta

Fee In-Lieu programs assess the compensation payable by a proponent to wetlands impacts. Alberta, for example, has developed Compensation Guidelines to assist the assessment of where compensation projects should occur, including:⁴⁵

⁴² Compensatory Mitigation Rule Regulations require that the “in-lieu fee” programs meet ten new requirements by June 2010.

⁴³ EPA: <http://www.epa.gov/wetlandsmitigation/#regs>

⁴⁴ <http://www.epa.gov/owow/wetlands/pdf/MitigationRule.pdf>

⁴⁵ Alberta Guide at page 1.

- Compensation will be provided through restoration of drained or altered naturally occurring wetlands;
- Compensation should take place within the same watershed as the impacted wetland, or in a watershed close by;
- Where wetland alteration or destruction takes place within a highly impacted watershed (urban or rural), it is not always practical to restore within the same watershed;
- Wetlands should not be restored within the projected 30-year expansion limits of urban areas unless it can be incorporated into a secure or protected system, such as a park or flood plain;
- Off-site compensation will be allowed if altered local wetlands do not exist near the site of the development or if sites are deemed unsuitable; and
- Where an approval applicant plans to minimize the impact to the wetland, some compensation measures may still be required as determined by Alberta Environment on the recommendation of a Qualified Wetland Aquatic Environment Specialist (QWAES).

Permittee-Responsible Mitigation

Permittee-Responsible Mitigation is a compensatory mechanism in which the proponent is ultimately responsible for the construction and long term maintenance of the mitigation site. It refers to a situation in which restoration, establishment, enhancement or conservation of wetlands undertaken by a permittee in order to compensate for wetland impacts resulting from a specific project. The proponent/permittee performs the mitigation after the permit is issued and is ultimately responsible for implementation and success of the mitigation. Permittee-responsible mitigation may occur at the site of the permitted impacts or at an off-site location; preferably within the same watershed.⁴⁶

Considerations

- This type of compensation may not be ideal, given the vulnerability of the proponent to bankruptcy.
- Performance Bonds are a mechanism to ensure that the cost of failure is not borne by the public.
- Monitoring costs to ensure compliance with compensation commitments may increase with this type of mechanism as there will be a proliferation of smaller-scale mitigation sites.

⁴⁶ EPA: <http://www.epa.gov>

- A related cause for concern is the greater risk of failure associated with small mitigation sites.
- On-site mitigation by the permittee is often unsuitable; due to fundamental site changes caused by the project itself (e.g., mining, urban development).

6.3.17. Identification of Compensation Sites

A wetland policy must provide direction on what constitutes acceptable compensation projects to fulfill requirements for functional replacement. Typically questions relate to the proximity of a compensation site to the impact site and often relate to compensation siting, compensation types of permissible mitigation.

Approaches

- Proponent proposed mitigation sites
- Mitigation bank (indexed values)
- Government staff led assessment
- Qualified third party (Qualified Environmental Professional (QEP))
- Non Government Organization proposed sites
- Private landowners

Considerations

- Identification of appropriate mitigation sites requires resources and considerable technical expertise
- There is generally a higher failure rate for smaller mitigated wetland than for larger ones, typically as a result of hydrological variables and pressures from adjacent lands
- The failure to replace small wetlands can potentially serious impacts on habitat connectivity
- The areas surrounding the mitigation site, including riparian and upland vegetation cover must be considered.
- Possible impacts from surrounding and adjacent land parcels must be considered (ex: wetland drainage/ hydrological disturbance in close proximity)

6.3.18. Administration

There are several administrative elements that are critical to consider in developing a wetland policy. Some of these considerations include:

- **Timing of compensation:** Timeframes for when compensation must occur should be unambiguously stipulated in the policy. Approaches in this category vary in case studies, though typically policies stipulate that compensation payments or habitat restoration must occur within the first 5 years.
- **Administration:** the agency responsible for the administration of the policy in general. Note that the administration of the policy from a regulatory perspective is not always the same as the agency or group responsible for coordinating/ verifying compensation projects. This will vary depending on whether the policy has a legislative or a policy foundation.
- **Implementation:** A wetland policy for BC could be implemented at different levels of government depending on resource, regulatory or planning jurisdiction. Effective ecosystem policies can be developed and implemented at a federal, provincial, local government level or a mixture. In some cases, it takes more than one level of government to effectively implement a policy.
- **Defined Process:** Does the policy have a clearly defined and clearly communicated process that is consistent across the province and between proponents or stakeholders
- **Compliance and Enforcement:** this component looks to who or which agency is responsible ensuring compliance and enforcement with the policy. This component also deals with determining recourse for non-compliance.
- **Reporting guidelines:** Reporting is an important way to ensure the transparency and accountability of a policy. Reporting guidelines can apply to both the project proponents and the efforts that they are making to implement the policy as well as the regulatory agency and their reporting to the public.

7. Analysis

Having laid out the framework for the development of a wetland policy, outlining various approaches and considerations, this paper now analyses the best approaches to take for some of the fundamental components. This means moving the analysis beyond listing the considerations, and applying an analytical framework to establish which approach is best suited to BC for some of the key components of the policy. It is beyond the scope of this study to examine all aspects of wetland policy formation, so I focus on a few critical first steps of goal setting, policy/legislative and regulatory requirements, comprehensiveness and scope. These components are fundamental to any policy.

A set of criteria and measures provide the framework for the analysis and can be used to provide recommendations for the aforementioned, as well as the other components not covered in this report. All approaches are legally feasible given provincial jurisdiction. Technical feasibility is measured through cost and economic impact as a proxy.

7.1. Criteria and Measures

7.1.1. *Government Regulatory Cost*

This criterion relates to the cost to government to develop and implement the particular component of the policy. Components of cost include direct expenditures as well as staff time.

Measure: (low, low-medium, medium, medium-high and high in relative dollar terms)

7.1.2. *Compliance cost to proponents*

This criterion relates to the over-all cost to stakeholders.

Measure: (Quantitative), opportunity cost, cost associated with compliance with the policy (Low, Low-Medium, Medium, Medium-High and High in relative dollar terms)

7.1.3. Political feasibility

This criterion relates to the political support for the approach taken.

Measure: Likelihood that approach will be accepted by political decision makers. (Low, Low-Medium, Medium, Medium-High and High)

7.1.4. Public support

This criterion relates to the likelihood that the public, taking into account all stakeholder interests, will support the approach. For our purposes, the public includes a wide range of stakeholders from the private sector including industry, ENGOs and individuals.

Measure: Likelihood that approach will be accepted (Low, Low-Medium, Medium, Medium-High and High)

7.1.5. Horizontal Equity

This criterion relates to equity or 'fairness' consideration between similar projects and stakeholders profiles in different areas of the province.

Measure: Degree of equity and fairness (Low, Low-Medium, Medium, Medium-High and High)

7.1.6. Effectiveness

This criterion relates to the extent to which the approach is effective at achieving the goal of the policy.

Measure: degree to which an approach is effective at achieving the goal of the policy (Low, Low-Medium, Medium, Medium-High and High)

7.2. Color Scheme

For ease of interpretation, the following color scheme is used to help analyse the results of the analysis, given the different scales and measures used for each criterion.

Best Option						Worst Option
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7.3. Analysis by Component

7.3.1. Goal Setting Part 1

This analysis evaluates whether the policy should be based on mitigation of lost/ impacted wetland function or lost/ impacted wetland area.

Table 9. Criteria and Measures – Goal Setting 1

Approach	Government Regulatory Cost	Economic Impact	Political Feasibility	Public Support	Horizontal Equity	Effectiveness
No-loss	Med	High	Low	Med	High	
No-net-loss	Med/ High	Med	High	High	High	
Net gain	Med/ high	Med	Med	Med	Med	

Government Regulatory Cost

The primary difference between a wetland policy based on function or area is the cost associated with each approach. While both require a considerable investment in technical expertise and data, the relative cost of measuring function far exceeds that of area.

The primary costs associated with area-based systems are mapping and building an effective wetland inventory system to support the policy. This can be the cost of mapping new areas, increasing degree of detail in existing mapped areas, or standardizing existing data so that different data sets are compatible and that they are

available for use by both the regulatory agencies as well as proponents. *See Appendix on mapping data available in BC*

While mapping and inventory can be expensive, the costs of measuring function are very high and would certainly exceed that of area for several reasons. First, function is a broad term that encompasses the measurement of many separate elements (see Figure 2 on function, page 7-8), all of which require sophisticated science to quantify. Measuring different functions requires different methodologies and technologies. For example, measuring a habitat function could require vegetation and wildlife population measurements over time, carbon sequestration would require specialized instruments to measure CO₂ capture and emissions, and soil erosion and flood abatement studies could require conducting large watershed scale studies. Secondly, in many cases, the cost of these studies and instruments required to gather information is considerable and often unknown. Third, there is the risk that if funds are limited, only some of the functions will be examined and the project will therefore be deemed lower value than it actually is. Finally in many cases there are not the methodologies or the instruments designed to fully capture and quantify the functions and would require significant capital cost for their development.

Compliance Cost

The economic impact of a policy based on function could also be greater than one that is based on area. A policy based on function could necessitate compensation for impact for all functions which could easily translate into a sophisticated suite of compensation requirements depending on the assessed values – driving up both the transaction costs and well as the compensation cost to the proponent/ landowner. In addition to this, the assessment cost for each compensation scenario is typically borne by the proponent or landowner. An assessment requires sophisticated science and valuation methodology and thus increases the cost to the stakeholder for any project approval.

Political Feasibility

Both of these approaches are moderately politically feasible. First, function based policy would appeal to political decision makers who are in favour of ecological goods

and services (EG&S) type calculations. This said, governments in Canada have expressed high level interest in ecosystem function systems, but have not generally demonstrated leadership in developing systems to support EG&S. For this reason, function ranks medium for this criterion. Area based policies appeal to political decision makers who favour the simplicity and lower cost and cause this approach to rank higher. An area-based policy also allows each elected official to promote what he/she is doing for their own region, whereas function is hard to describe to the electorate.

Public Support

The public would likely show moderate support for either approach. Decision makers could expect some stakeholders that were directly impacted by the policy to support the area based policy because of cost.

Horizontal equity

A policy based on function likely implies localized function assessments when the policy is triggered. Because of the nature of function assessments – and the fact that they are all unique – it will be very difficult to create standardized decision making criteria, or ‘indexed wetland functions and values’ that apply in each case and that don’t implicitly turn into an area calculation. This degree of subjectivity means that there is a possibility that there will be unequal treatment of stakeholders of the same project type in different areas. Area calculations, in contrast, are based on mapping and inventory data that are readily available and that create objectivity and predictability with the policy. An area based wetland policy better supports horizontal equity.

Effectiveness

The effectiveness cannot be assessed at this point in the absence of a goal statement with which one can evaluate effectiveness.

Recommendation

This analysis suggests that, at this time, an area-based policy is the better approach. This is primarily because of cost and equity considerations and will allow the policy to proceed with less stakeholder and political resistance.

Further Considerations

As the science develops with respect to the evaluation of wetland function by wetland types and by location, it is possible that function could become an added dimension of the policy. For example, specific functions could form the basis of priority ranking zones within the policy for conservation and investment in compensation sites. (e.g., habitat for species at risk, water storage functions in drought-affected regions).

7.3.2. Goal Setting Part 2

This analysis evaluates whether the policy should be based on a principle of no-loss, no-net-loss, or net gain.

Table 10. Criteria and Measures – Goal Setting 2

Approach	Government Regulatory Cost	Economic Impact	Political Feasibility	Public Support	Horizontal Equity	Effectiveness
No-loss	Med	High	Low	Med	High	
No-net-loss	Med/ High	Med	High	High	High	
Net gain	Med/ high	Med	Med	Med	Med	

Regulatory Cost to Government

The cost of any of the approaches is moderate. Primary sources of cost include design, implementation, compliance and enforcement as well as administration costs (including transaction costs). In all cases the costs are similar except where administration is concerned. In this case, a no-loss policy would be less expensive because, as the name implies, the policy would be for no loss, and therefore, compensation would not apply. It would not necessitate the same administration system to oversee implementation of the mitigation sequence and to coordinate compensation projects. Similarly there would be very low transaction costs borne by either government or the proponents.

Compliance Cost to Proponent

While cost to government would be lowest in the case of a no loss policy, the cost to industry would be significantly greater. A no loss policy eliminates all economic development opportunity on a particular piece of land and could result in reduction of economic competitiveness overall in the province. A no-net-loss policy would allow proponents to decide whether the cost of compensation outweighs the value of avoided or minimized impacts of a project. For a very basic example, a farmer could decide whether the opportunity to drain a wetland for agricultural production and compensating for the impact makes more sense than the crop revenue forgone by conserving the wetland. While the purpose of the policy would be to discourage the development of wetlands, the provision for no-net-loss would allow for these sorts of calculations to take place. A net gain policy typically relates to the compensation ratios demanded by a policy and increases the economic burden to stakeholders held responsible for compensating for impacts.

Public Support

The mainstream public demonstrates a moderate concern for wetland loss in general.⁴⁷ The preference for the approach taken would depend on the stakeholder group consulted. Generally speaking the environmental community would support no-loss or net gain, while the business community would prefer the no-net-loss policy.

Horizontal Equity

The no-loss and no-net-loss both provide a high degree of equity between stakeholders across the province because the same rules apply for compensation regardless of where a stakeholder was in the province. Depending upon how a net-gain policy was structured, it could also be very equitable provided the net-gain portion of the policy was accounted for by high compensation ratios that apply everywhere, rather than compensation ratios that vary based on region. Because of the possibility of dissimilar treatment of stakeholders in different regions of BC, the net-gain policy scores lower on the equity criterion.

⁴⁷ http://livingwatersmart.ca/water-act/docs/wam_report-on-engagement.pdf

Effectiveness

As with the decision for the policy to support functions or area, these approaches determine the overall goal of the policy and the conditions for effectiveness.

Recommendation

No-net-loss policy (covering the whole province) with certain wetlands of provincial significance designated as no-loss in areas such as the Fraser Valley, the east coast of Vancouver Island and the Okanagan where there are very high rates of historic loss. It is also recommended that high compensation ratios be considered (greater than 3-1) to buffer for failure in compensation projects and to promote net-gain of wetlands in areas of high historic wetland loss. The province must dedicate a team of qualified scientists and economists to study the issue of appropriate compensation ratios for BC.

Further Considerations

A no loss policy in some areas of the province might be appropriate to reflect already high rates of historic loss. It is also worth investigating the opportunity of net gain through higher compensation ratios or conservation targeting paying close attention to economic and equity considerations.

7.3.3. Enabling Provisions: Legislation, Regulation and Policy

This analysis evaluates whether the policy should be based on policy pursuant to existing legislation, new regulation or new legislation.

Table 11. Criteria and Measures – Enabling the Policy

Approach	Government Regulatory Cost	Compliance Cost to Government	Political Feasibility	Public Support	Horizontal Equity	Effectiveness
Policy to support existing legislation	Low		High	Med/high		Med
New regulations	Med		Med	Low		High
New legislation	Med		Low	Low		High

Government Regulatory Cost

The cost of each of these approaches does not vary considerably, though the relative cost to government of developing a standing policy is lower than drafting new legislation. This is due primarily to the increase technical, particularly legal expertise that would be required to introduce new legislation.

Compliance Cost to proponent

Assuming the wetland policy has the same application and is enforced equally under each approach, the economic impact of each will roughly be the same.

Political feasibility

Politicians generally prefer options that are less costly and that do not confer additional legal liability on government. For this reason a wetland policy that is enabled by standing policy rather than regulation or legislation will be more popular with political decision makers. New legislation and regulation is difficult in many cases to get political support also exposes government to more criticism and scrutiny, but seems even more the case in where environmental laws and regulation are concerned. Passing new laws and regulations is not the preferred option of most risk-averse governments, particularly where environmental issues are concerned

Horizontal Equity

Assuming the policy, legislation or regulation would apply to all stakeholders in all parts of the province, this criterion is not considered as part of this analysis.

Effectiveness

The effectiveness of any of these approaches is largely dictated by the way in which it is implemented. Even a policy based approach would still often be triggered by a regulation or piece of legislation. This said, it could be argued that a more strongly and precisely worded statute might increase the clarity and strength of the policy.

Recommendation

It is recommended that policy to support existing legislation is an appropriate approach. There are already many statutes in place in BC that have a direct or indirect impact on wetlands. The issue is that there are no decision making criteria or recourse associated with them. For example, wetland are technically protected under the provincial *Water Act*, however in cases where wetlands are drained, there is no policy outlining recourse and no incentive to adhere to the legislation. This would be the value of a provincial wetland policy. A policy based approach would be supported by existing statutes. (See appendix on legislation that supports wetlands in BC)

Further Considerations

- A wetland policy based that is enabled by policy requires a clear understanding of the statutes, regulations and processes that trigger the policy. This requires significant staff training within government. Any wetland policy is only as effective as its implementation and compliance monitoring. If a policy is not applied effectively and adequate compliance and enforcement is not present then it is useless.
- There is opportunity for significant changes to the provincial *Water Act* that would increase the legal protection of wetlands and trigger the wetland policy by direct and clear reference to wetlands protection.⁴⁸ This would be accomplished by an inclusion of wetlands as part of the proposed ecosystem flows requirements component of the *Act* would provide a direct trigger for a wetland policy. Protection of ecosystem flows is the recommended policy direction for the new statute and specific ties to wetlands would strengthen the statutory trigger for the wetland policy.

⁴⁸ http://www.livingwatersmart.ca/water-act/docs/wam_wsa-policy-proposal.pdf

7.3.4. **Comprehensiveness**

This analysis evaluates whether the policy should be a stand-alone wetland policy, or whether it should be part of broader overarching ecosystem management policies.

Table 12. Criteria and Measures – Comprehensiveness

Approach	Government Regulatory Cost	Compliance Cost to Proponent	Political Feasibility	Public Support	Horizontal Equity	Effectiveness
Stand-alone Wetland Policy	High	Med	Low	Med		Med
Broader ecosystem mitigation policy	Med	Med	High	Med		Med

Government Regulatory Cost

It is impossible to predict the actual cost of either scenario. However, the marginal cost of an individual ecosystem policy is likely less than a comprehensive policy, but of course, there may need to be many individual interventions to be equivalent to a comprehensive one, so the comparison needs to be based on the total cost of having an equivalent outcome. The BC government has indicated through its dedication to the provincial conservation framework that it intends to use ecosystem based management policies to support the conservation of ecosystems. A comprehensive policy thus will be less costly overall because of economies of scale with respect to implementation and administration of the policy through centralizing and consolidating systems, institutions and processes that support the policy.

Compliance Cost to Government

A comprehensive policy has benefits to stakeholders and reduces the overall economic burden. Having a consistent process for all ecosystems makes the rules and processes more transparent and facilitates easier planning for business. A holistic

ecosystems approach also allows the proponent the opportunity for compensation on site that is broader than a focus on wetlands alone and can allow tradeoffs among types of ecosystems and their goods and services. For example, a comprehensive policy may enable an ecosystem ‘market’ in which the loss of a wetland can be offset/compensated for by the enhancement of another ecosystem. based on other values in the context of larger habitat banking and that promotes the greatest efficiency overall through the establishment of a “habitat credit” market. This market would allow the proponent, or another party, to complete a compensation project in accordance with the provincial conservation targets that at the lowest marginal cost. Perhaps a landowner impacts a wetland and is unable to offset this impact by a project on his/her land through an allowable wetland compensation project. The landowner however is able to restore and protect antelope brush habitat. This action would then be accounted as part of the larger system and has the advantage of lowering transaction costs overall. A comprehensive approach such as this would require the development of indexed values by ecosystem or ecosystem component; an audacious and expensive task.

Political feasibility

The province has made commitments to manage species and ecosystems in accordance with the provincial Conservation Framework that includes a host of species and ecosystems as part of a comprehensive approach. Reneging on this commitment by going back to a wetlands-only system could be politically damaging and thus the ecosystem approach ranks more favourably. There is also indication that this is the policy direction that the province is taking on an Ecosystem Mitigation and Offsetting Policy for BC (see appendix for more information on BC’s current policy direction).

Public support

There is no reliable way to predict public support for either approach. We can speculate that a comprehensive approach would be attractive because of the broader market based mechanisms that provide more opportunity for offsetting impacts and a centralized administrative system that makes it more straightforward for the public and stakeholders to get information and seek guidance. Furthermore ‘Ecosystem Based Management’ type language generally has broad public appeal.

Horizontal Equity

My analysis does not find there to be any foreseeable horizontal equity issues that arise from either approach.

Effectiveness

The effectiveness of either approach depends on how the policy is implemented. The concern that arises in the context of a comprehensive system is the perception that a focus on all ecosystems will mean that there is not enough specific emphasis on implementing the wetlands component of the policy.

Recommendation

Based primarily on the inherent ecological and economic efficiencies of a comprehensive system, this paper recommends that the province continue with the development of a comprehensive ecosystem offsetting system that includes wetlands as a key component.

Further Considerations

- It is worth investigating different options to maintain the profile of wetlands in the context of a broader policy. Some options include a developing a wetlands secretariat such as those developed under Ramsar and the *North American Wetlands Conservation Act*^{49,50}, or some other form of provincial oversight body.
- A comprehensive system that allows for out of kind compensation necessitates an investment in science to determine ecosystem valuation for each ecosystem in order to determine the appropriate amount of out of kind compensation.

7.3.5. Scope

This analysis evaluates whether the policy should apply to all lands in BC, to crown lands only and whether it should be provincial or regional in scope.

⁴⁹ <http://www.wetlandscanada.org/nawca.html>

⁵⁰ http://www.ramsar.org/cda/en/ramsar-home/main/ramsar/1_4000_0__

Government Regulatory Cost

The primary costs to government in determining the scope of the policy include the initial data to support the policy, administration of the policy, compliance and enforcement of the policy. Additionally, in the case of a policy that applies to all lands, the province of BC could incur potential costs in developing extension services, or financial support programs for private landowners affected by the policy. Because of these factors, this analysis rates the relative cost to government as higher in the case of an 'all-lands' approach, particularly if the policy applies to all wetlands in all regions.

Compliance Cost to Stakeholders

The economic impact of the policy, if applied to all lands, is significantly greater than if it only applied to public lands because of the foregone production and development benefits that could be incurred by private landowners, such as farmers and urban and rural land developers, especially considering the concentration of wetlands that exist on private land. While a policy that applies to public land would still affect industrial development in sectors such as forestry, mining and oil and gas, these impacts would be less relatively speaking. This is because intensive type industries often have more options in planning and siting developments and can direct development away from wetlands with a significantly lower opportunity cost. A policy that applies only to crown land would have a smaller net negative economic impact on the economy overall.⁵¹

Political Feasibility

The highest amount of relative political support will be for a policy that applies to crown land. It is here where the province has clearest jurisdiction and where the majority of the Acts that support wetland conservation apply, such as the *Forest and Range Practices Act*. This is also the type of land upon which most of the provincial

⁵¹ Private use of crown land is through leases and not ownership. Hence, the compensation if a takings occurs prior to the end of the lease is simply the return of that portion of the lease payment (or nothing if the payment is made annually) plus any investment (e.g., private company had reforested land for timber harvests and were going to harvest the timber in a future year – would have to pay for the lease + timber value. But the point remains that opportunity cost on crown land are typically lower.

Environmental Assessments (*Environmental Assessment Act*) take place and into which it makes sense to pilot a wetland policy. While there are certainly many industries that rely on crown land, there is less of a liability for politicians to have the policy only apply on public land from a voter perspective.

As we have observed with the implementation of the federal *Species at Risk Act* recovery plans, and through consultation on the proposed new provincial *Water Sustainability Act*, agricultural and private landowners have considerable political capital and are adverse to government infringement on their ability to make decisions about their private lands. Few political decision makers in a contemporary political climate would support a politically unpopular approach in fear of losing votes. This said, it could be the case that there is sufficient political support in some parts of the province to pilot an all-lands policy in areas where there is considerable wetlands loss and recognized water challenges as in the Okanagan Valley.

Public Support

While some of the general public would support better land stewardship on public lands, many stakeholders would resist the idea of more restrictions on private lands.

Horizontal Equity

A policy that applies to all lands in BC makes the most sense from an equity perspective. This is an important consideration from an economic development perspective because no sector, and no area of the province is given advantage over another. Applying the policy only to crown land creates less inequality between stakeholders within the same sector (mining company to mining company), but creates inequities between sectors (forest company to berry farmer). The least equitable options are those that apply only in certain regions.

Effectiveness

A policy that applies to all lands in BC will be most effective at meeting the proposed goal of no net-loss of wetlands in BC because of the high numbers of wetlands that exist and that are at risk on private lands. (See Appendix for maps showing

wetlands in private lands in BC) A policy that does not apply to all lands is unlikely to achieve the proposed goal.

Recommendation

Recognizing that the most effective policy will apply to all lands, it is suggested that the province begin by application to all crown land because of the political sensitivities associated with action on private lands and the cost of compensation. This paper recommends that the province of BC invest in developing incentives for conservation on private land with the ultimate goal of having the policy apply to all lands within the next 10 years.

7.4. Summary of Recommendations

This paper recommends that the province of British Columbia continue with the development of a no-net-loss wetland policy. Initially, this policy should focus on wetland area. This said, continued research into wetland functions is encouraged. This may provide valuable information that should be incorporated into the policy and that might eventually allow the policy to account for function as well as area. This policy should act as decision-making support to other existing legislation and should be implemented and administered in the context of a broader ecosystem mitigation and offsetting policy for the province. While the ultimate goal should be application to all lands in British Columbia, the province should proceed initially with implementing the policy on provincial crown land. A phased-in approach to the scope of the policy will allow government to partner with industry on the development of a support framework that consistent of Best Management Practices to encourage avoided and minimized impact to wetlands as well as market and non-market based incentives to support the implementation of the policy on crown land in such a way that it minimizes political and economic risks.

There are many other components of the policy in the framework outlined above that need to be developed and refined. The province should apply the same systematic approach to analyzing which approaches are suitable for other elements of the policy.

8. Conclusions

Developing effective ecosystem-based management policies is an audacious task, but one that is really important for wetlands in BC. The province of BC is right to consider this an effective approach to wetland conservation and should move forward with a thorough analysis of approaches that satisfy the components of this framework. Over and above the specific recommendations listed in the previous section, the following are some concluding remarks and suggestions for procedural and process considerations.

1. **Start now, manage adaptively.** Developing a wetland policy for BC will take time and will require extensive technical expertise, as well as social and political buy-in. Given all the various components that need to be addressed, the province should proceed with design and consider a phased in approach. The policy is intended to address high rates of wetland loss, so the province cannot afford to wait very long; the policy can be modified based on adaptive management. A pilot project can help with risk management through the development and initial implementation of such a policy.
2. **Invest in science and data.** Ecosystem based mitigation policies require a variety of types of data including mapping and inventory, trends and drivers function and values and well as economic information. The more sophisticated and complete the data, the more helpful it will be in the design and implementation of the policy. While it may seem daunting, initial 'sunk cost' investments in science will prove invaluable in the long run. Not only is the procurement of information itself critical, it is also critical to have the information available to all stakeholders so that they can use to build their understanding and for planning purposes.
3. **Emphasize the mitigation *sequence*.** The policy should clearly articulate the preference for avoid, minimize, and not simply provide decision criteria where compensation is necessary. A mitigation system that simply defaults to compensation will inevitably fail at compensating for all impacts due to the scientific and economic infeasibility of large scale compensation projects.
4. **Describe avoid and minimize:** The province should work with industry and the private sector to help define what it means to have

avoided and minimized impacts as well as planning and management strategies to avoid and minimize impacts.

- 5. How to design compensation components.** The policy should function as a disincentive to destroy wetlands and encourage sustainable development based on avoided and minimized impacts to sensitive ecosystems. In order for the policy to accomplish this, compensation requirements, including compensation ratios need to be designed so that they are not too complex or costly, but have enough impact to discourage the destruction or degradation of wetlands. This means that careful thought is required in the development of compensation guidelines. This requires considerable understanding of resource economics in the province.
- 6. Forge partnerships.** Whether developing science, conducting site assessments, developing policy guidelines or considering possible administration systems it is highly beneficial that the province forges meaningful partnerships with academia, businesses and NGO engage others who are working with wetlands. Not only do partnerships create opportunities for efficiencies caused by resource sharing (the private sector is a terrific holder and developer of valuable information), they also create political buy-in and accountability. See appendix for information on groups that work with wetlands in the province)
- 7. Consider designating a body responsible for wetlands.** The purpose for this body would not only be to oversee the implementation of the policy, but also to direct science, evaluate the administration of the policy and forge partnerships. This body could exist within government, but is likely better as a third party Advisory Committee on the Design and Implementation of Wetland Policy.
- 8. Create incentives.** A mixture of economic and market based instruments will help make it easier for proponents to adopt a conservation approach. BC needs more incentives, particularly on private lands.
- 9. Be conscious of other jurisdictions and processes.** Where possible, coordinate BC wetland policy with other policies and processes in other jurisdiction where there is overlap (example BC Environmental Assessment Office and the Canadian Environmental Assessment Agency). Also, be conscious of role of local government in the design and implementation of the policy.
- 10. Keep the big picture in mind.** Policy is a necessary, but not sufficient condition for wetland conservation. The most carefully crafted policy will fail if it is not properly implemented and if the requirements of the policy are unachievable by industry. Working with stakeholders and developing incentives is critical for the success of the policy.

9. Recommendations for Future Study

1. Design a framework and methodology for an effective wetlands trends monitoring system for BC. This would not only highlight the trends in wetland loss and gain, but also outline the primary drivers of the loss.
2. Conduct an analysis of other ecosystem based management policies based on their effectiveness at meeting their goals. Which systems have worked best? What has worked? What hasn't?
3. Conduct research into the economic valuation of wetlands. The more research on this the better.
4. Enhance the study of wetland functions, including economic valuation.
5. Undertake the science to support the development of compensation ratios.
6. Study the resilience of ecosystem mitigation policies in the context of climate change
7. Explore the development of conservation tools, including economic and market based instruments that support wetland conservation and to help industry meet the requirements of the policy
8. Establish precise area calculations for wetlands on private vs. crown lands
9. Explore options for developing an overarching body that deals with wetlands such as a wetlands secretariat or advisory committee.
10. Ensure the compatibility of wetland habitat mitigation with carbon mitigation.

10. References

- Austin, M.A, Buffett, D.J, Nicolson, G.G.E Scudder and V. Stevens (eds). 2008. *Taking Nature's Pulse: The Status of Biodiversity in British Columbia*. Biodiversity BC. Victoria, BC
- Barnett A, Dunster K, Kirkby J, Pobran T. et al 2010. *A Wetland Action Plan for British Columbia*
- B.C. Ministry of the Environment. (2010). Towards an environmental mitigation and offsetting policy for british columbia. Victoria B.C.: Government of British Columbia.
- Brown, P. and C. Lant, The Effect of Wetland Mitigation Banking on the Achievement of No-Net-Loss. *Environmental Management* Vol. 23, No. 3, pp. 333–345.
- Carver, Martin. *Strengthening Wetland Conservation: An Assessment of Data and Tracking Opportunities across British Columbia (Draft Report for the Canadian Intermountain Joint Venture)* March 2011
- Cox, Bond et al *Wetland Evaluation Guide* North American Wetland Conservation Council (Canada)
- Cox and Grose (Eds.), *Wetland mitigation in Canada: a framework for application. Sustaining wetlands issues paper 2000-1* (Ottawa: North American Wetlands Conservation Council, 2000).
- Lynch-Stewart, P. et al. *The federal policy in wetland conservation: implementation guide for federal land managers*, (Ottawa: Environment Canada, 1996).
- Mackenzie, W.H. and J.R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Res. Br., B.C. Min. For., Victoria, B.C. Land Manage. Handbook. No. 52., at 18.
- Millennium Ecosystem Assessment (MEA). 2005 *Ecosystems and Human Well-Being: Synthesis*. Island Press. Washington
- Milko, *Wetlands environmental assessment guideline*, (Ottawa: Environment Canada, 1998).
- North American Wetlands Conservation Council (Canada), *A Coming of Age: Policy for Wetland Conservation in Canada*, North American Wetlands Conservation Council (Canada) Report No. 93-1 at 14, available at: <http://www.wetlandscanada.org/pubs.html> .

- Olewiler, N. 2004 *The Value of Natural Capital in Settled Areas of Canada*. Ducks Unlimited Canada and the Nature Conservancy of Canada.
- Schulte-Hostedde B, Walters D, Powell C, Shrubsole D, *Wetland management: an analysis of past practice and recent policy change in Ontario*, 2007 J. Environ. Manage 8:83-94.
- Wilson, Sarah *Natural Capital in BC's Lower Mainland: Valuing the Benefits from Nature*. Prepared for the David Suzuki Foundation. 2010
- Yang, Wang, Gabor, Boychuk, Badiou *Water Quantity and Quality Benefits from Wetland Conservation and Restoration in the Broughton's Creek Watershed* Report for Ducks Unlimited Canada, 2008

Appendix A. Types of Wetlands in BC

There are 5 major classifications of wetlands that occur in BC. The following are the main categories of wetland present in British Columbia as per the Canadian Wetland Classification System with the addition of intertidal wetlands and ephemeral wetlands.

Fens: Fens are peatlands with mineral-bearing groundwater within the rooting zone, slow drainage, and low to moderate nutrient content dominated by sedges and brown mosses. Fens may contain shrubs or trees.

Bogs: Bogs are peat-covered wetlands with strongly acidic soils typically supporting the growth of cushion-forming sphagnum mosses and heath shrub vegetation with or without trees. There are many types of bogs in BC including blanket bogs, which are globally rare. Burns Bog in Delta is an example of a raised peat bog; its remaining 3,000 hectares is the largest undeveloped urban landmass in North America.

Swamps: Swamps are wetlands where standing or gently moving water occurs seasonally or persists for long periods, leaving the subsurface continuously waterlogged. The water table in a swamp may seasonally drop below the rooting zone of vegetation, creating aerated conditions at the surface. Swamps are nutrient-rich, productive sites. Vegetation may consist of dense coniferous or deciduous forest or tall shrub thickets. Swamps are most common in southern temperate areas of Canada. Impacts usually occur as a result of drainage for agricultural or urban development purposes or as a result of altered water level fluctuations and forestry development.

Marshes: Marshes are wetlands that are periodically or permanently inundated by standing or slowly moving water and hence are rich in nutrients. Marshes are mainly wet, mineral soil areas. They are subject to a gravitational water table, but water remains within the rooting zone or plants for most of the growing season. There is high oxygen saturation. Marshes are characterized by an emergent vegetation of reeds, rushes, cattails, and sedges. The surface water levels of marshes may fluctuate seasonally (or even daily) with declining levels exposing drawdown zones of matted vegetation, mud or salt flats. Impacts are usually caused by agriculture, diking, filling for urban development, or impoundment. They are common along major temperate lakes and in tidal coastal areas as well as in association with grassland ponds.

Shallow Open Water: Shallow open waters include potholes, sloughs, or ponds as well as waters along river, coast, and lakeshore areas. They are usually relatively small bodies of standing or flowing water commonly representing a transitional stage between lakes and marshes. The surface waters appear open, generally free of emergent vegetation. Many are in dry interior climates, and are alkaline, providing unique environments for rare and specialized species. The depth of water is usually less than two metres at mid-summer levels. Shallow open waters are most likely to be affected by drainage for agricultural or urban development purposes as well as harbour, recreational, and industrial development.

Intertidal: In addition to the above five categories, intertidal wetlands are found in coastal BC and include mud flats and salt marshes. Salt marshes are found between land and salty or brackish water, often around stream estuaries. Estuaries are found at the mouth of rivers and streams where freshwater meets the sea and creates diluted brackish water within a tidal environment. The productivity of plants in intertidal wetlands is among the highest on earth. The fresh water brings nutrients and organic debris into the marine environment, fuelling highly productive ecosystems with high values for waterfowl, shorebirds, coastal bear populations, and as fish habitat. In particular, brackish water is often vital for the success of eelgrass communities, most of which provide nursery habitat for hundreds of fish and marine invertebrate species.

Vernal or Ephemeral Wetlands: Vernal pools are seasonal depressional wetlands that occur under the Mediterranean-like climate conditions of the West Coast of British Columbia. They hold shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall. These wetlands range in size from small puddles to shallow lakes and are usually found in a gently sloping plain of grassland or coastal bluff. Although generally isolated, they are sometimes connected to each other by small drainages known as vernal swales. Beneath vernal pools lies either bedrock or a hard clay layer in the soil that helps keep water in the pool. They are sometimes associated with wet meadows, and often provide habitat for rare and specialized species.

In addition to these classifications, different types of wetlands are identified based on site type, meaning where they are located on the landscape. It follows that lacustrine wetlands are associated with lakes (most often found at inflow or outflow sites or along the shoreline), riverine wetlands are those found adjacent to rivers, streams and on floodplains, palustrine wetlands are those that occur upslope of lacustrine and riverine wetlands. These may or may not have an inflow and have intermittent or permanent outflows. Finally isolated wetlands are those that are detached from other

immediate water bodies, receiving water and nutrients either from groundwater or landscape sources (i.e. snowmelt).⁵²

The following figure shows a further break down of wetland types in British Columbia beyond the 5 major wetland types in BC into 19 minor level classifications that are based on soil types and vegetation.

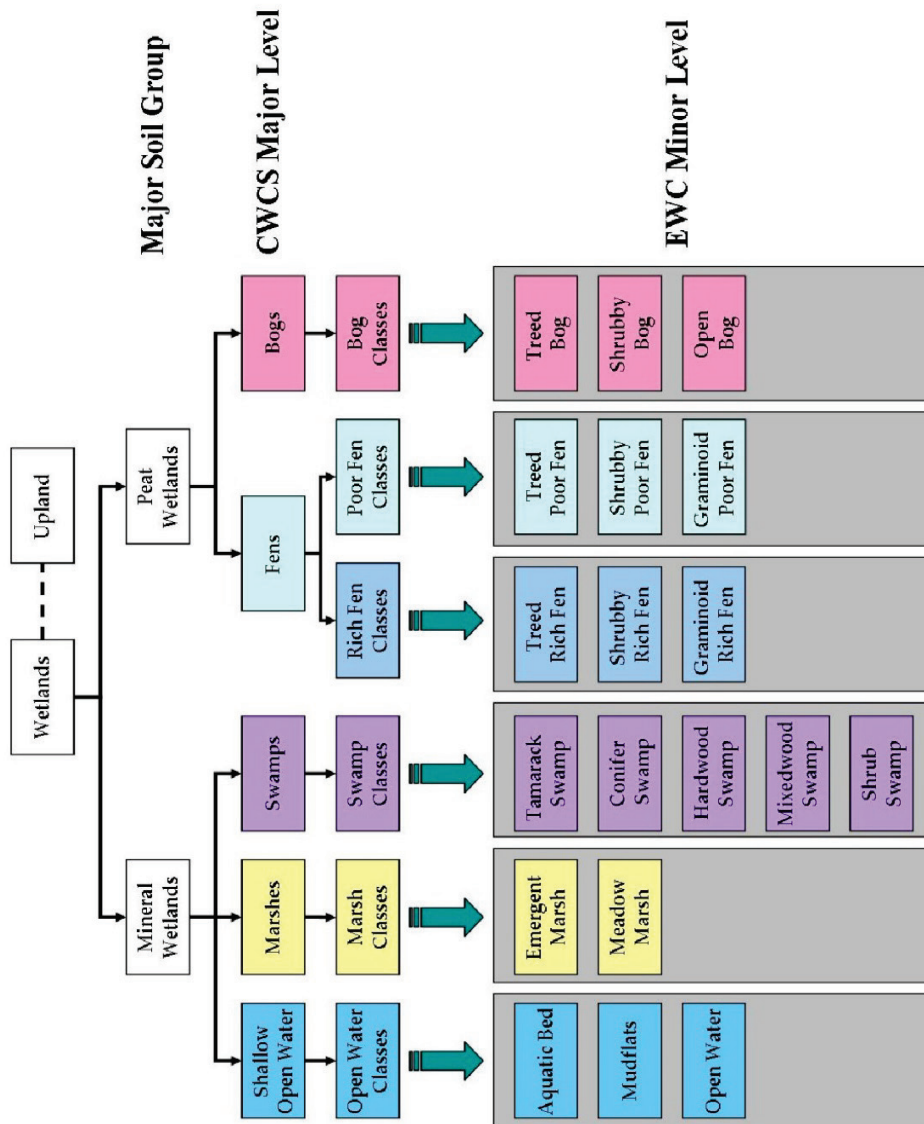


Figure A1. Wetland classification by Soil Type (Alain Richard, Ducks Unlimited Canada, 2011)

⁵² Barnett A, Dunster K, Kirkby J, Pobran T. et al 2010. *A Wetland Action Plan for British Columbia* pp.3-5

Appendix B. Partners in Wetland Conservation

There are a number of partners, stakeholders and groups dedicated to wetland conservation. These not only play an important role in wetland conservation, but in the development of wetland policies for the knowledge, capacity and political capital that they bring to the policy development process.

1. International community

Several international conventions and agreements have been struck regarding wetlands and the values that they support. The Ramsar Convention of 1971 is one of the most important. Its mission is “the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout. In April 2003, at meetings amongst G7/G8 Ministers of Environment it was agreed in an official declaration that “If we fail to protect forests and wetlands, if we do not manage soils with precaution, water will disappear. We can build all the water pipes and treatment plants we want; there will be nothing to drain or clean.”

2. Academia

Academia participates extensively in wetland conservation in BC in several ways, but largely through the production of information. Extensive studies have been conducted by the academic community on the value of wetlands from an ecological, economic and social standpoint. Academic institutions also play an important role in conveying information to stakeholders and the larger public through the publication of research and information in journals and reports. There are several universities and scholars in Canada who engage in wetland research. Some to mention include but are not restricted to: Royal Roads University, the Environmental Law Clinic at UVic, Simon Fraser University, University of Guelph, University of British Columbia, Thompson Rivers University and the University of Alberta.

3. Government

The BC government is involved in wetlands in a variety of capacities: conservation planning, research, land use designations, resource management (invasive plant management) and the administration and delivery or partnering on programs.

The obvious role of government as it relates to wetlands in BC is the role that various ministries within the province of BC as the regulatory agencies. While many would argue that the province has not succeeded in the protection of wetlands, they have been clear in underscoring their value from a research and planning perspective. For example, there is extensive reference to wetlands in the B.C. water plan, titled *Living Water Smart: British Columbia's Water Plan*, 2008. It includes commitments for the protection and rehabilitation of BC's wetlands. According to the then Environment Minister Barry Penner, “protecting our wetlands is a key part of the B.C. Government's Living Water Smart plan for keeping our water healthy and secure for everyone.”⁵³ In addition to planning, over the years, the province has either initiated or partnered on researching wetlands in BC.

⁵³ Media Release, July 27, 2009. Available at: http://www.livingwatersmart.ca/news/docs/MR-WSP-Announcement_072709.pdf

In 2008, the province released a *Conservation Framework* for BC in an effort to better support and plan for sustainable species and ecosystems in BC. This project acknowledges the need for wetland conservation, and sets targets for wetlands as part of BC's integrated approach to species and ecosystem conservation.

The province also works to support healthy wetlands through leadership and partnership on programs such as the invasive plant management as well as the creation of special land use designations. Parks, *Wildlife Management Areas* (WMA) and *Wildlife Habitat Areas* (WHA) are examples of designations that can be created based on provincial enabling legislation. In each of these cases, particular areas are designated and can be made subject to specific management guidelines that support wetlands.

Other levels of government also work to protect wetlands through various mechanisms. The federal government has several mechanisms that they employ including the establishment of National Wildlife Areas, Parks and RAMSAR sites. The federal government expresses particular interest in wetlands insofar as they relate to achieving their mandates with respect to the *Migratory Bird Protection Act* and the federal *Species at Risk Act*.

Some Municipal governments and Regional Districts also demonstrate leadership in wetlands conservation through various conservation planning initiatives, as well as local area bylaws and development plans that direct development away from wetland areas. An example is the City of Kelowna that made all wetlands within its municipal boundaries Development Permit Areas in 2011.

4. Public

While the public shows a reasonably high degree of support for environmental issues in general in BC, wetlands are often overlooked and undervalued by much of the mainstream public. This said, there is evidence that many people value wetland conservation. However, in the recent *Water Act Modernization* (WAM) consultation process, many individuals and groups demonstrated a high degree of support for improved protection of wetlands in the new Act.

5. NGOs

Some of the most active groups in the conservation of wetlands in British Columbia are from the Non-Government (NGO) sector. NGOs as a sector invest in science to help better understand wetland function and values and to inform planning. They also assist with communicating this knowledge and information to supporters and the public but it typically it is the NGOs that invest in positive habitat change through a variety of mechanisms such as conservation covenants, land purchases and stewardship program. Examples of NGOs in BC that focus on wetlands include but are not limited to Ducks Unlimited Canada, the David Suzuki Foundation, the Nature Conservancy of Canada, Delta Waterfowl, BC Wildlife Federation, BC Nature (formerly the Federation of BC Naturalists), Grasslands Conservation Council of BC, The Invasive Plant Council of British Columbia and the Nature Trust.

6. Partnerships

While many groups work independently on issues involving wetlands, it is common for different constellations of government and non-government groups to work together to achieve mutually beneficial outcomes. Examples include the Wetland Stewardship Partnership,⁵⁴ a group of

⁵⁴ www.bcwetlands.ca Partners include: Environment Canada, Ministry of Environment (Canadian Wildlife Service), Ministry of Healthy Living and Sport, Ministry of Forests, BC Hydro, Ducks Unlimited Canada, The Nature Trust, The Nature Conservancy of Canada, BC Wildlife Federation, BC Nature, The Pacific Salmon Foundation, the Union of BC Municipalities.

government and non-government agencies that come together to elevate the profile of wetlands in British Columbia and enhance their protection through the implementation of the Wetland Action Plan.⁵⁵ *Biodiversity BC: Taking Nature's Pulse* is an example of a project produced by a partnership of government and non-government agencies. The goal was to report in the status of biodiversity in BC. The report, released in 2008, was not ecosystem specific, however devoted much attention to wetlands as an indicator ecosystem. The report highlights 7 major findings and the issue of wetland loss was one of them.⁵⁶

7. Industry

There is no single opinion about wetlands on behalf of industry in BC, many industry sector groups recognize the value of wetlands. The Cariboo Cattlemen's Association, for example, in recognizing the value that wetland provide to watersheds as a whole and in turn to irrigation and stock water values for ranchers partner with government and various NGOs on the Healthy Watersheds program in the San Jose watershed. The BC Cattlemen's Association's Farmland Riparian Interface Stewardship Program (FRISP) provides technical assistance and support for riparian habitat enhancement with a focus on directly or indirectly improving salmon habitat. The program is funded by the Provincial Living Rivers Trust Fund.

8. Recreational users and user groups

Wetlands provide a host of benefits to recreational users and recreational groups often take interest in conservation and habitat stewardship. The BC Wildlife Federation, for example, has long expressed an interest in wetlands from a hunting and angling perspective and since 1996 has devoted resources to a program specifically related to wetland conservation and education.⁵⁷

⁵⁵ <http://bcwetlands.ca/tools/wetland-action-plan/>

⁵⁶ Austin, M.A, Buffett, D.J, Nicolson, G.G.E Scudder and V. Stevens (eds). 2008. *Taking Nature's Pulse: The Status of Biodiversity in British Columbia*. Biodiversity BC, Victoria, BC

⁵⁷ <http://bcwetlands.ca/tools/wetland-action-plan/>

Appendix C. International Conventions, Agreements, and Programs

Convention/ Agreement/ Program	Agency	Year	Content	Legal Obligation (Y/N)	Agency Responsible for Implementation
The Convention on Wetlands of International Importance	All United Nations member states eligible. Inter-governmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories. Unlike the other global environmental conventions, Ramsar is not affiliated with the United Nations system of Multilateral Environmental Agreements, but it works very closely with the other MEAs and is a full partner among the "biodiversity-related cluster" of treaties and agreements.	1971 (Ramsar, Iran)	⁵⁸ The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world". The Ramsar Contracting Parties, or Member States, have committed themselves to implementing the "three pillars" of the Convention: to designate suitable wetlands for the List of Wetlands of International Importance ("Ramsar List") and ensure their effective management; to work towards the wise use of all their wetlands through national land-use planning, appropriate policies and legislation, management actions, and public education; and to cooperate internationally concerning trans boundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands. ⁵⁹	No, but maintenance required on Ramsar sites	Canadian Wildlife Service

⁵⁸ There are three Ramsar sites in British Columbia: The Columbia Wetlands, The Creston Valley Wildlife Management Area and Alaksen.

⁵⁹ http://www.ramsar.org/cda/en/ramsar-about-mission/main/ramsar/1-36-53_4000_0

Convention/ Agreement/ Program	Agency	Year	Content	Legal Obligation (Y/N)	Agency Responsible for Implementation
The Convention on Biological Diversity (CBD)	International Treaty	1992 (Rio de Janeiro, Brazil)	Signed by 150 government leaders at the 1992 Rio Earth Summit, the Convention on Biological Diversity is dedicated to promoting sustainable development. Conceived as a practical tool for translating the principles of Agenda 21 into reality, the Convention recognizes that biological diversity is about more than plants, animals and micro organisms and their ecosystems – it is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. ⁶⁰	No	Canadian Wildlife Service
The North American Waterfowl Management Plan (NAWMP)	Canada, United States, Mexico	1986 (USA)	The North American Waterfowl Management Plan is an international action plan to conserve migratory birds throughout the continent. The Plan's goal is to return waterfowl populations to their 1970s levels by conserving wetland and upland habitat. Canada and the United States signed the Plan in 1986 in reaction to critically low numbers of waterfowl. Mexico joined in 1994 making it a truly continental effort. The Plan is a partnership of federal, provincial/state and municipal governments, non-governmental organizations, private companies and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species and people. ⁶¹	No	Government/ NGO partnership

⁶⁰ <http://www.cbd.int/convention/>

⁶¹ http://www.nawmp.ca/eng/index_e.html

Convention/ Agreement/ Program	Agency	Year	Content	Legal Obligation (Y/N)	Agency Responsible for Implementation
The Britain (Canada) – USA Migratory Birds Convention Act	USA, Great Britain (on behalf of Canada)	(1918 and 1994)	Establishment of a Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 U.S.C. 703) ⁶²	Yes	Canadian Wildlife Service

⁶² <http://www.fws.gov/laws/lawsdigest/migtrea.html>

Appendix D. National Policies and Legislation

Policy/ Legislation	Agency	Year	Content	Legal Obliga- tion (Y/N)	Agency Responsible for Implemen- tation
Federal Policy on Wetland Conservation <a href="http://dsp-
pssd.pwgsc.gc.ca/
Collection/CW66-
116-1991E.pdf">http://dsp- pssd.pwgsc.gc.ca/ Collection/CW66- 116-1991E.pdf	Environment Canada (Canadian Wildlife Service)	1991	<p>Objective: To promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future</p> <p>Goals:</p> <ol style="list-style-type: none"> 1) maintenance of the functions and values derived from wetlands throughout Canada 2) no net loss of wetland functions on all federal lands and waters 3) enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands or their functions have reached critical levels 4) recognition of wetland functions in resource planning, management and economic decision-making with regard to all federal programs, policies and activities 5) securement of wetlands of significance to Canadians 6) recognition of sound, sustainable management practices in sectors such as forestry and agriculture that make a positive contribution to wetlands conservation while also achieving wise use of wetland resources 7) utilization of wetlands in a manner that enhances prospects for their sustained and productive use by future generations 	Yes	Environment Canada (CWS)
Canada Wildlife Act (National Wildlife Areas)	Environment Canada	1973	This Act provides a mechanism by which the federal government of Canada can designate specific areas as National Wildlife Areas to preserve habitats that are critical to migratory birds and other wildlife species, particularly those that are at risk. ⁶³	Yes	Canadian Wildlife Service

⁶³ <http://lois.justice.gc.ca/eng/acts/W-9/>

Policy/ Legislation	Agency	Year	Content	Legal Obliga- tion (Y/N)	Agency Responsible for Implemen- tation
Species at Risk Act	Environment Canada	2002	<p>It is designed to meet one of Canada's key commitments under the International Convention on Biological Diversity. The goal of the Act is to protect endangered or threatened organisms and their habitats. It also manages species which are not yet threatened, but whose existence or habitat is in jeopardy.</p> <p>SARA defines a method to determine the steps that need to be taken in order to help protect existing relatively healthy environments, as well as recover threatened habitats. It identifies ways in which governments, organizations, and individuals can work together to preserve species at risk and establishes penalties for failure to obey the law.</p> <p>The Act designates COSEWIC, an independent committee of wildlife experts and scientists, to identify threatened species and assess their conservation status. COSEWIC then issues a report to the government, and the Minister of the Environment evaluates the committee's recommendations when considering the addition of a species to the List of Wildlife Species at Risk.^{64,65}</p>	Yes	Canadian Wildlife Service
National Parks Act	Environment Canada	2000	<p>This federal law allows the government of Canada to protect lands of national significance. The creation of various land use designations are enabled by this legislation including national parks, national parks reserves, and wilderness areas. This area can and does apply to wetland areas and provides a high degree of ecosystem security.⁶⁶</p>	Yes	Parks Canada

⁶⁴ http://en.wikipedia.org/wiki/Species_at_Risk_Act

⁶⁵ <http://laws-lois.justice.gc.ca/eng/acts/S-15.3/index.html>

⁶⁶ <http://laws-lois.justice.gc.ca/eng/acts/N-14.01/>

Policy/ Legislation	Agency	Year	Content	Legal Obliga- tion (Y/N)	Agency Responsible for Implemen- tation
Oceans Act (Marine Protected Areas Act)	Department of Fisheries and Oceans	1996	The Federal Oceans Act creates a provision by which the government of Canada can designate certain areas of interests as marine protected areas. This provision can apply to intertidal wetlands and provide a high level of protection. ⁶⁷	Yes	Department of Fisheries and Oceans
Canadian Environmental Assessment Act	Environment Canada	1992	This is an Act of federal parliament that requires land that applies all federal lands or lands and resources within federal jurisdiction to enter a formal environmental impacts assessment process for eligible project proposals. Impacts to wetlands on are considered as part of this process. ⁶⁸ Wetlands can be considered valued ecosystem components as part of the cumulative effects assessment under the act.	Yes	Canadian Environmental Assessment Agency (CEAA)
Federal Fisheries Act	Environment Canada	1985	This federal legislation is intended to protect Canadian fisheries resources. This legislation applies to ocean and inland habitats and is binding for all levels of government. Much of the focus of this Act is on habitat management. Coastal and inland wetlands can be protected by this legislation through regulations for marine plant and fisheries habitat protection regulations under the Act. ⁶⁹	Yes	Department of Fisheries and Oceans
Navigable Waters Protection Act	Ministry of transportation	1985	Regulates activities that have the potential to interfere with passage on a historically navigable watercourse. The relevance of this Act relates to streams that have been deemed navigable and the construction of stream crossing that could have impacts on adjacent wetlands by interrupting water flow.	Yes	Ministry of transportation

⁶⁷ <http://laws.justice.gc.ca/eng/acts/O-2.4/>

⁶⁸ <http://laws-lois.justice.gc.ca/eng/acts/C-15.2/>

⁶⁹ <http://www.dfo-mpo.gc.ca/habitat/role/141/1415/14151-eng.htm>

Appendix E. Land Use tools to Protect Wetlands (adapted from Deborah Curran, 2009)

Designation	Legislation (Lead Agency)	Applies to:	Implemented by:	Effectiveness	Limitations	Who may be Impacted?
Provincial						
Wildlife Mgmt Areas (WMA)	Wildlife Act Ministry of Environment (MoE)	Land under the administration of the Minister responsible for the Wildlife Act (e.g. Provincial Crown land, or private land leased to Minister)	Minister, with Cabinet's approval	Provides reasonably strong protection, enforceability, and flexibility due to regional manager's authority over all activities in a WMA.; strong degree of decision-making by agency responsible for wildlife habitat; example is Columbia River Wetlands WMA.	Requires formal act of designation in order for wetlands to be protected; requires high level (Cabinet) consent for Minister's designation decisions; may be difficult for agency to acquire "administration" of land as pre-requisite for WMA designation; cannot regulate all activity impacting wetlands (e.g. boating restrictions).	Expanding WMA designations could affect licensed users of the Crown land gaining WMA status; however, some uses could be accommodated depending on the impact to wetlands.
Critical Wildlife Areas Wildlife Sanctuaries						
Provincial Parks						
Provincial Parks	Park Act (MoE)	Provincial Crown land	Legislature or Cabinet	Strongest "protected area" designation, because many require Act of Legislature to change boundaries.	Park Act has strong recreation focus; requires high level approval to designate; may not be suitable for wetlands that require active interventions; not well-suited to small designations of specific wetlands.	None
Ecological Reserves	Ecological Reserves Act (MoE)	Provincial Crown land	Cabinet (some require the Legislature to modify boundaries)	Strong legislation for protection of ecosystems; takes priority over all other legislation.	Science-based research & education focus; good for many wetlands, but not for those that require active management.	None

Designation	Legislation (Lead Agency)	Applies to:	Implemented by:	Effectiveness	Limitations	Who may be Impacted?
Ad Hoc designations	Environment and Land Use Act	All land in BC	Cabinet	Good, flexible legislation that can be tailor-made to special circumstances, where other tools are a poor fit; prevails over other legislation.	Protection and enforcement is only as good as the Order that is passed by Cabinet in a given situation. Past enforcement problems were addressed under s.6 of the Park Act, but that might not fit every situation.	Depends on the Cabinet OIC – potentially anyone
Development Permit Areas (DPAs)	Local Government Act	Private and public land within a municipality	Local governments	Does not preclude development in most cases, but attempts to control the form and character of development so as to preserve, protect, restore or enhance wetland values.	Depends on local govt willingness to designate DPAs, and quality of requirements in each development permit.	Local governments; property owners
Wildlife Habitat Areas (WHAs) Wildlife Habitat Features (WHFs)	Forest and Range Practices Act (Government Actions, Forest Planning and Practices, Range and Woodlots Regulations)	Crown forest land, range land, and private land in a Tree Farm Licence area, Community Forest Area, or Wildlife Area	Minister of Environment	WHAs are probably of limited use for wetlands, but may provide additional protection, e.g. where general wildlife measures prohibit activity that might occur in smaller wetlands coincidentally with no reserve zone. WHFs are mentioned as a possibility where the Minister of Env (Deputy Minister) could identify specific localized features of a wetland habitat to protect a species at risk. Practices requirement for a WHF, once established, is “must not damage or render ineffective” the WHF.	WHAs only apply to identified wildlife (but some, e.g. tailed frog) are wetland species; depends on strength of general wildlife measure for the identified wildlife; not very flexible; implementation is highly constrained (but more for timber impacts).	Would mostly affect forest or range licensees carrying out forest practices

Designation	Legislation (Lead Agency)	Applies to:	Implemented by:	Effectiveness	Limitations	Who may be Impacted?
Reserves, notations and transfers	Land Act ss. 15, 16, 17	Crown land (reserves are sometimes referred to as wildlife habitat management areas, natural environment areas, recreation conservation mgmt areas)	Land and Water B.C. Inc.	Effective in withdrawing Crown land from disposition; could be important tool in implementing a provincial policy in which important Crown wetlands are not sold; serves to notify.	Not necessarily effective in protecting wetlands habitat from land use practices, because there are no enforceable measures to protect habitat per se; seen more as an interim designation to preserve conservation opportunity until more appropriate designation is made.	Land and Water B.C. Inc. Possibly potential purchasers of Crown land

Designation	Legislation (Lead Agency)	Applies to:	Implemented by:	Effectiveness	Limitations	Who may be Impacted?
Federal						
Migratory Bird Sanctuaries	Migratory Birds Convention Act (Canadian Wildlife Service, Environment Canada)	Any land in Canada Mostly where hunting regulation is main objective	Federal Cabinet	Considered archaic legislation and not implemented south of 60° for over 50 years; potentially useful designation that can provide protection for wetlands where there are nationally significant migratory bird populations.	Primary focus is hunting regulations; poor to no protection for habitat other than nests while active; would not protect wetlands outside of nationally significant migratory bird habitat.	Depends on whether regulations apply only in sanctuaries, or in any areas frequented by migratory birds
National Wildlife Areas (NWAs)	Canada Wildlife Act	Land under the "administration" of the Minister of Environment	Federal Minister of Environment	Flexible, open-ended designations for areas required for wildlife conservation; good enforcement provisions for NWAs; less difficult to establish and more flexible than National Park designations.	Regulations do not have habitat focus, but prohibit many activities that harm habitat; there should be stronger protection for NWAs from outside activity; requirement for federal "administration" of land requires provincial cooperation (purchase, donation or transfer).	Depends on areas designated NWA
Marine Protected Areas	(Canadian Wildlife Service, Environment Canada)	Internal marine waters of Canada				
National Parks	Canada National Parks Act (Parks Canada)	Lands owned by Canada, or agreed to by Province	Federal Cabinet	Generally strong protection for wetlands in national parks, but broad exceptions available; good ecological integrity requirements.	Purpose is not protection of wetlands; would be of ancillary benefit only; low penalty for environmental damage.	N/A
Marine Protected Areas	Oceans Act (Fisheries & Oceans Canada)	Internal waters of Canada (e.g. tidal wetlands which support fisheries)	Federal Cabinet	Unproven, but shows promise for marine wetlands of federal and joint jurisdiction.	Premature to say at this time; main gap will be the limits on where MPAs apply.	N/A

Designation	Legislation (Lead Agency)	Applies to:	Implemented by:	Effectiveness	Limitations	Who may be Impacted?
Local Gov't						
Environmentally Sensitive Areas (ESAs) Development Permit Areas (DPAs)	Local Govt. Act	Potentially any land in a municipality, regional district, or area under Islands Trust jurisdiction	Municipal councils, regional district boards, local committees of the Islands Trust	Local governments have the capacity to declare wetlands as ESAs in official community plans and regional growth strategies, and to restrict use of wetlands through zoning bylaws, development permit areas, etc.	Enabling only – no provincial direction, policy or model to guide local governments; potential for wide discrepancy in results.	Owners of wetland properties

Appendix F. Regulation of Specific Land Use Activities that Could Impact Wetlands (adapted from Deborah Curran, 2009)

Activity	Legislation	Lead Agency	Tools	Effectiveness	Limitations	Who is Impacted?
Provincial						
Coordinated impact assessment of proposed major development in BC.	Environmental Assessment Act (Bill 38)	Environmental Assessment Office	Certain types of proposed projects must undergo environmental impact assessment & obtain an E. A. certificate in order to proceed. Major groundwater extraction or water diversion projects may be reviewable under EAAct.	The Reviewable Projects Regulation defines the types and sizes of projects that are automatically subject to EAA process. The Minister has power to designate a project as reviewable even though it is not included in RP Reg.	Act's application is discretionary; increased threshold for review; no guaranteed participation for communities, First Nations, local governments, or the public; government may decide that economic interests prevail over environmental protection.	Major project proponents
Forest practices (incl. forestry, range, some oil & gas activities) on Crown forest and range land, & some private land within tenures	Forest and Range Practices Act (FRPA)	Ministry of Forests and Range	Classification scheme and riparian mgmt areas for wetlands, combined with buffer requirements; well-developed discretionary mgmt guidelines	Effective, because it requires classification of all wetlands and for wetlands greater than 5 hectares, requires restrictive reserve zone. Most wetlands also have a discretionary management zone, with clear management guidelines.	Classification scheme based on size; wetlands greater than 5 hectares do not get the benefit of any reserve zone; the number and the habitat value of these wetlands are high.	Forest and range tenure holders
Forest practices on private land classified as "identified land", AKA "managed forest land" under the Assessment Act	Private Managed Forest Land Act and Regulations	Private Managed Forest Land Council	Regulations that specify mgmt requirements for timber harvesting, silviculture, & road-related activities	Not effective for wetlands; may be some minor benefit to wetlands associated with fish streams.	No wetlands protection.	Owners of private forest reserve land

Activity	Legislation	Lead Agency	Tools	Effectiveness	Limitations	Who is Impacted?
Mineral & coal exploration activities	Mines Act, Mineral Exploration (MX) Code	Ministry of Energy & Mines	Regulatory Code of Practice with some restrictions according to size of wetland	Discourages road construction and exploratory work in most wetlands (those <1,000 ha and >.25-.5 ha, depending on biogeoclimatic zone).	Not as protective of wetlands as the Forest and Range Practices Act; many discretionary exceptions and some contradictions; numerous small and some large wetlands would not be protected.	Coal and mineral exploration
Dike construction and maintenance	Drainage, Ditch and Dike Act (Part 1 of Act repealed by Bill 8, 2002) Dike Maintenance Act	Local governments, Ministry of Transportation	None – but s.63 requires compliance with Water Act	Establishes authority for activities that can impact wetlands, but does not impose accountability for wetlands impacts; under the BC Environmental Assessment Act, new dikes that protect areas > 10 km ² from flooding are reviewable projects (see Table A1.3. below).	May have considerable impact on wetlands, yet does not address wetlands at all. However, most diking is historic; new diking is undertaken by local govt or Ministry of Transportation.	Local governments, Ministry of Transportation

Appendix G. General Environmental Protection Regulations Affecting Wetlands (adapted from Deborah Curran, 2009)

Mechanism	Legislation	Lead Agency	Effectiveness	Limitations	Who is Impacted?
Provincial					
Ministerial Authority to set guidelines/standards. Permitting and prohibitions relating to deposit of waste	Environmental Management Act Municipal Sewage Regulation under EMA	Environment (MoE)	Provides good authority to order environmental protection for any existing or proposed work, undertaking, product use or resource use that has or potentially has a detrimental environmental impact; used to protect wetlands in Cowichan Estuary Environmental Management Plan. Provides protection for wetlands impacted by the deposit of waste into the environment. The Municipal Sewage Regulation encourages use of reclaimed water and identifies permitted uses, together with a code of practice. Local governments have a number of powers under EMA, e.g.: Regional districts can, for the purposes of implementing an approved waste management plan, pass bylaws regulating the transportation and management of solid waste and recyclable materials. Bylaws can potentially be used to require landfills to install pollution prevention works or to follow codes of practice that avoid harm to the environment.	N/A	Industry, developers and land owners.
Protection of fish & fish habitat	Fish Protection Act	(MoE)	Currently in force are sections dealing with designation of sensitive streams, recovery plans, and no new dams on specified rivers. Sections not yet in force provide for: issuance of stream flow protection licences; orders for temporary reduction in water use in case of drought; identify fish & habitat considerations in water management plans; authorize reduction of water rights in accordance with water management plans.	s.8 – 11 not yet in force.	Local governments, land owners, water licence applicants & holders, developers / industry.

Mechanism	Legislation	Lead Agency	Effectiveness	Limitations	Who is Impacted?
Streamside Protection Policy Directives (to be replaced by Riparian Area Regulation) and Sensitive Stream Designation	Fish Protection Act	(MoE)/ Local governments	Directives will help fish-associated wetlands, especially if they are critical to maintaining MAD and base-flow requirements under a recovery plan; wetlands expressly addressed in regulations; provides provincial guidance for local governments; regulations incorporate no net loss approach; restricts licensing under <i>Water Act</i> ; Sensitive Stream designation allows for recovery plans that may help associated wetlands.	Fish-stream focused; limited ability to address agricultural impacts to wetlands; local governments must establish streamside protection and enhancement areas within 5 years.	Local governments, land owners, some water licence applicants, developers/industry.
Prohibitions on bulk water removal	Water Protection Act	(MoE)	Confirms provincial ownership of Crown surface water & groundwater. Province has right to ensure its protection & sustainable use. Prohibits bulk water removal from BC, and diversion of water between major watersheds within BC.		Water licence applicants, developers.
Regulation of hunting	Wildlife Act	(MoE)	Limited ability to help wetland species through hunting regulations, s.9 (beaver dams) and s.34 protection for birds, eggs and some nests; ability to designate threatened and endangered species, and provide for critical wildlife areas within WMAs (see above).	Focus on "take" regulation is a limiting means of managing wildlife: habitat provisions are limited, usually requiring formal designation, but available; threatened & endangered provisions under-utilized.	Depends on approach taken. Presently, affects mainly hunters, some farmers.

Mechanism	Legislation	Lead Agency	Effectiveness	Limitations	Who is Impacted?
Federal					
Prohibitions on deposit of deleterious substances & harmful alteration to fish habitat	Fisheries Act	Fisheries & Oceans Canada	Strong federal laws that may help wetlands associated with fish habitat; enforcement provides deterrent, and creative sentencing may require remediation.	After the fact – reactive rather than proactive; limited in its ability to help wetlands due to a focus on fish.	N/A
Environmental assessment where federal govt has authority	Canadian Environmental Assessment Act	Canadian Environmental Assessment Agency	Casts a broad net over many of the potential ways that the federal government can affect wetlands; the primary means of implementing the Federal Policy on Wetland Conservation.	Lack of clear criteria or guidelines for determining the acceptability of projects and mitigation measures.	Federal agencies, proponents of federally approved projects
Regulation of toxic wastes & substances	Canadian Environmental Protection Act	Environment Canada	Provides indirect benefits to wetlands by regulating release of toxic substances, pollutants and wastes into the environment.	N/A	N/A

Appendix H. Canadian Provincial & Territorial Wetlands Initiatives (adapted from Deborah Curran,2009)

Canadian Territories	<p>More than 40percent of Canada’s land mass is in the three northern territories: Yukon, Northwest Territories and Nunavut.⁵⁸ Unlike the provinces, the territories of Canada have no inherent jurisdiction; their respective powers have come via statutory delegation from the federal government in their respective acts.⁵⁹ The federal government retains responsibility for much of the land-use planning and management. As such, the FPWC applies to the activities of all federally administered northern programs. The breadth of this jurisdiction is decreasing over time with the increasing devolution of many activities to territorial and aboriginal governments.</p> <p>The development of protected areas strategies in the Yukon, the Northwest Territories and Nunavut has been an important component of conservation efforts, including wetlands protection.⁶⁰ As well, land claim settlements have become important in establishing wildlife and ecosystem conservation plans with recognition of the changing roles of the aboriginal, territorial and federal governments.⁶¹</p>
Alberta	<p>In 1993, Alberta adopted an interim policy for <i>Wetland Management in the Settled Area of Alberta</i>, provided direction for the management of slough/marsh wetlands in the settled area of Alberta. It was prepared in response to wetlands losses and the need for consistent direction to guide provincial government departments.⁶²</p> <p>After a decade long review of its water legislation and policy, Alberta adopted a new <i>Water Act</i> in 2000.⁶³ Also developed during the review process was a <i>Framework for Water Management Planning</i>, outlining Alberta’s commitments to “maintaining, restoring or enhancing the condition of the aquatic environment,” including wetlands.⁶⁴ Alberta Environment also created a <i>Provincial Wetland Restoration/Compensation Guide</i>, describing how applications under the <i>Water Act</i> are reviewed when wetland loss occurs.⁶⁵</p> <p>The guide explains wetland compensation, adopting the mitigation hierarchy (avoidance, minimization and compensation) for projects affecting wetlands. It also details a permit application process, which requires submission of a mitigation proposal for restoring drained or altered, naturally occurring wetlands.⁶⁶ This mitigation process has been applied for the past six years. Rudland has described this process, including three case studies with compensation ratios ranging from 3:1 to 7.7:1 for lost wetland area with off-site replacement projects, located 12 to 67 km away.⁶⁷</p>

⁵⁸ Rubec at 11.

⁵⁹ See *Northwest Territories Act*, R.S.C., 1985, c. N-27 at section 16; *Yukon Act*, R.S.C., 2002, c. 7 at section 18; and *Nunavut Act*, R.S.C., 1993, c. 28 at section 23.

⁶⁰ Rubec at 11.

⁶¹ Ibid.

⁶² <http://environment.alberta.ca>

⁶³ *Water Act*, R.S.A. 2000, c. W-3.

⁶⁴ At 6, available at: http://environment.alberta.ca/documents/Framework_for_water_management_planning.pdf

⁶⁵ Alberta Environment 2005, revised February 2007, available at: http://www3.gov.ab.ca/env/water/reports/Prov_Wetland_Rest_Comp_Guide.pdf

Saskatchewan	<p>In 1995, Saskatchewan adopted the <i>Wetland Policy Statement</i>, promoting sustainable management of wetlands. Its goals are to:⁶⁶</p> <ul style="list-style-type: none"> (i) To encourage sustainable management of wetlands on public and private lands to maintain their functions and benefits; (ii) To conserve wetlands that are essential to maintain critical wetland species or wetland functions; and (iii) To restore or rehabilitate degraded wetland ecosystems where previous destruction or alteration has resulted in a significant loss of wetland functions or benefits. <p>A <i>Guide to Saskatchewan Wetland Policy</i> was adopted in the same year. Saskatchewan recognized wetlands as including wet basins and transitional lands to a minimum of 10 m adjacent to these areas in normal full water supply level.⁶⁹ However, a downfall of the Policy is that it contains no mitigation provisions.</p> <p>Saskatchewan's <i>Environmental Management and Protection Act</i> (EMPA) was adopted in 2002 through Saskatchewan Environment; it protects all Crown water bodies by requiring a development permit.⁷⁰ In Saskatchewan, "Crown waters" do not include waters on private lands unless they flow into a provincial watercourse, thus excluding isolated basins, sloughs and marshes.⁷¹ This may limit the effectiveness of mitigation efforts and result in continued loss of wetlands in Saskatchewan.⁷²</p> <p>The <i>Saskatchewan Watershed Authority Act</i> was adopted in 2005,⁷³ allowing the Saskatchewan Watershed Authority to licence on-farm wetland drainage. In order to engage in on-farm wetland drainage, the proponent must satisfy this Act and the EMPA. The Watershed Authority is also responsible for issuing drainage licences on agricultural Crown lands.</p>
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⁶⁶ The Alberta Environment policy is for restoration to take place within the same watershed as the affected wetland if possible, or a nearby watershed. Restoration is not performed by the licensee, but is performed by a Wetland Restoration Agency. Ducks Unlimited is the only recognized restoration agency in Alberta.

⁶⁷ Rudland, *Wetland Policy and Mitigation in Alberta*, (2005), cited in Rubec at 7.

⁶⁸ Saskatchewan Wetland Policy, available at:
<http://www.swa.ca/Publications/Documents/SaskatchewanWetlandPolicy.pdf>

⁶⁹ Rubec at 8.

⁷⁰ Environmental Management and Protection Act, R.S.S. 2002, c. E-10.21.

⁷¹ Rubec at 8.

⁷² Thompson, *An introduction to wetland mitigation in Canada*, cited in Rubec at 8.

⁷³ R.S.S. 2005, c. S-35.03.

Manitoba In 1990, Manitoba adopted wetland objectives through the *Manitoba Water Policies*.

Objectives of these policies include:

- (i) conservation of wetland values;
- (ii) retention of wetlands with regulation where required; and
- (iii) special consideration for waterways.

Despite aiming for sustainable management of lakes, waterways and wetlands, Manitoba has yet to adopt specific “no net loss goals.”⁷⁴ In 2003, Manitoba has established a *Water Strategy and Nutrient Management Strategy* and advanced wetland conservation through the creation of a new provincial agency, entitled *Manitoba Stewardship*. In 2004, the Manitoba government tabled the *Water Protection Act*.⁷⁵ The stated purpose of the Act is to provide for the protection and stewardship of Manitoba’s water resources and aquatic ecosystems, recognizing (among other things) the need to protect riparian areas and wetlands.⁷⁶ However, the Act does not identify mitigation measures.

Mitigation measures in Manitoba exist in other forms, such as the Habitat Compensation Fund (HCP). A no net loss goal and mitigation hierarchy for wetlands are included in the HCP. As well, the HCP calls for habitat losses and gains to be monitored; suitable habitat transferred in title to the Manitoba Habitat Heritage Corporation; and a Wetland Compensation Procedure to be adopted. The HCP procedure requires environmental survey, impact assessment, design of a compensation plan and ongoing monitoring.⁷⁷

⁷⁴ Rubec at 8.

⁷⁵ C.C.S.M. 2005, c. W65.

⁷⁶ *Ibid.* at section 2.

⁷⁷ Schroeder, wetland policy and Mitigation in Manitoba, 2005 cited in Rubec at 8.

Ontario	<p>Ontario has had policies and programs related to wetlands for over 20 years.⁷⁸ The main statutes regarding protection of wetlands are the <i>Planning Act</i>⁷⁹ and the <i>Conservation Authorities Act</i>.⁸⁰ The 2005 Provincial Policy Statement (PPS) for the <i>Planning Act</i> prohibits development and site alteration in:⁸¹</p> <ul style="list-style-type: none"> (i) significant wetlands in southern Ontario; (ii) significant coastal wetlands throughout the province (e.g. Great Lakes); and (iii) significant wetlands in northern Ontario (unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions). <p>The PPS does not refer to a mitigation hierarchy or to compensation. However, the PPS regarding water provides that mitigation and/or alternative development may be required in order to protect, improve or restore sensitive surface water features, sensitive groundwater features, and their hydrologic functions.⁸²</p> <p>Under the <i>Conservation Authorities Act</i>, Conservation Authorities can prohibit, regulate or provide permission for impacts to watercourses, shorelines and wetlands.⁸³ There is also a mitigation aspect to <i>Ontario's Environmental Assessment Act</i>.⁸⁴ An environmental assessment must include a description of the actions necessary (or reasonably expected) to prevent, change, mitigate or remedy the effects upon the environment.⁸⁵ The conservation of wetlands in Ontario is also influenced by the <i>Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation</i>,⁸⁶ which provides an application process for projects that impact wetlands.</p>
Quebec	<p>Quebec does not have a provincial wetland policy. However, proposed projects that will affect any wetland in Quebec are subject to a certificate of authorization issued by the Ministère du Développement durable de l'Environnement et des Parcs (MDDEP) under section 22 of the <i>Quebec Environment Quality Act</i>.⁸⁷ A major shortcoming is that there is no requirement for proponents to undertake wetland compensation or restoration if wetland destruction occurs subject to approval issued by the MDDEP.</p>

⁷⁸ Schulte-Hostedde B, Walters D, Powell C, Shrubsole D, *Wetland management: an analysis of past practice and recent policy change in Ontario*, 2007 J. Environ. Manage 8:83-94.

⁷⁹ R.S.O. 1990, c. P.13.

⁸⁰ R.S.O. 1990, c. C.27.

⁸¹ At section 2.1.3 & 2.1.4, available at: <http://www.mah.gov.on.ca/Page1485.aspx>. See also, Rubec at 8.

⁸² *Ibid.* at 2.2.

⁸³ At sections 21(1) & 28.

⁸⁴ R.S.O. 1990, c. E.18.

⁸⁵ At section 6.1(2).

⁸⁶ Ontario Regulation 97/04.

⁸⁷ R.S.Q., c. Q-2.

New Brunswick In 2002, New Brunswick Department of Environment adopted the *Wetlands Conservation Policy* (WCP). The WCP has goals of:⁸⁸

- (i) no loss of Provincially Significant Wetland habitat,
- (ii) no net loss of wetland function for all other wetlands that are larger than 1 hectare (2.5 acres) in size; and
- (iii) Promote and develop wetlands conservation education, stewardship and securement initiatives.

The policy contains several criteria for determination of Provincially Significant Wetlands, including wetlands that may include or contain:⁸⁹

- (i) Remnants of formerly widespread wetland type (e.g. coastal marshes);
- (ii) Sites managed or set aside for conservation;
- (iii) Endangered species or those with special status;
- (iv) Significant species diversity/assemblages;
- (v) Significant hydrologic value; and
- (vi) Significant social or cultural value.

The WCPs goal of “no net loss of wetland function,” applies to all wetlands greater than one hectare in size, regardless of land ownership; any activity within 30m of a wetland greater than 1 hectare in size or if it connected to a watercourse requires a permit.⁹⁰ In addition, projects that have the potential to impact wetlands two or more hectares in size, are subject to the environmental impact assessment process of the *Clean Environment Act*.⁹¹ Both processes assess potential impacts to wetland functions before the mitigation hierarchy is applied.⁹² Proponents are required to follow the 2003 *Department of Natural Resources Draft Mitigation Guidelines*. A provincial technical review team, consisting of provincial and federal staff, has been established to review wetland compensation projects that are required either by the provincial *Wetland Conservation Policy* or both the federal and provincial policies.⁹³ In addition, New Brunswick has a *Peat Mining Policy* (2005),⁹⁴ requiring that an approved restoration plan be developed prior to a certificate of operation for peat harvesting. The plan includes alternative post-harvest land use and requires a percentage of the land area to be returned to a peat accumulating wetland.

⁸⁸ New Brunswick Wetland Conservation Policy, available at:
<http://www.gnb.ca/0078/publications/wetlands.pdf>

⁸⁹ Ibid.

⁹⁰ The permit issued is a Watercourse and Wetland Alteration Permit under the *Clean Water Act*, R.S.N.B. 1989c. C-6.1.

⁹¹ R.S.N.B. 1973, c. C-6.

⁹² Cox and Grose (Eds.), *Wetland mitigation in Canada: a framework for application*. Sustaining wetlands issues paper 2000-1 (Ottawa: North American Wetlands Conservation Council, 2000).

⁹³ Rubec at 10.

⁹⁴ Policy Number MRE-004-2005, available at:
http://www.gnb.ca/0078/Minerals/pdf/Peat_Mining_Policy-e.pdf

Appendix I. Canadian Wetlands Policy Content

The following chart is reproduced from Clayton Rubec and Alan Hanson, *Wetland Compensation and Mitigation: Canadian Experience*, Wetlands Ecol Manage (2009) 17:3-14

Jurisdiction	Mechanism of implementation	Mitigation hierarchy	Compensation guidelines	Reporting guidelines
Government of Canada	(1) EA; Individual Decisions (2) EA; Permit for a HADD (harmful alteration, destruction or disruption) of fish habitat	Yes Yes	No Some	No Some
British Columbia	(1) None (2) Licence for Forestry Operations and Penalties	No No	No No	No No
Alberta	Water Act permits; EA	Yes	Yes	Some
Saskatchewan	Environmental Management & Protection Act; Watershed Authority Act; EA	No	No	No
Manitoba	Water Protection Act; EA	No	No	No
Ontario	Permits related to Planning Act; Conservation Authorities Act; and EA	No	No	No
Quebec	Quebec Environmental Quality Act—Development Permit	No	No	No
New Brunswick	Watercourse and Wetland Alteration Permit; EA for wetlands >2.0 ha	Yes	Draft	Some
Prince Edward Island	Environmental Protection Act	Yes	Yes	Some
Nova Scotia	Environment Act wetland alteration permit; EA for wetlands >2.0 ha	Yes	Some	Some
Newfoundland and Labrador	Environmental Assessment Regulations for 'undertakings'	No	No	No

Appendix J: Overview of Canadian Wetlands Policies

The following chart is reproduced from Clayton Rubec and Alan Hanson, *Wetland Compensation and Mitigation: Canadian Experience*, Wetlands Ecol Manage (2009) 17:3-14

Table 1 Federal and provincial wetland conservation policies, their objectives, application, mechanisms, adherence to mitigation sequence, and presence of compensation and monitoring guidelines in Canada

Jurisdiction	Primary wetland conservation policies	Policy objective	Responsible authority	Application
Government of Canada	(1) Environment Act— <i>Federal Policy On Wetland Conservation</i>	(1) Sustain wetland functions in delivery of government programs	(1) All Departments Environment Canada has oversight role	(1) Federal: lands, decisions, funding
	(2) Fisheries Act— <i>Policy for Management of Fish Habitat</i>	(2) Protection of habitats directly or indirectly supporting existing or potential fisheries	(2) Department of Fisheries and Oceans	(2) All waters
British Columbia	(1) <i>Wetland Action Plan</i> in Development	(1) Na	(1) Wetland Stewardship Partnership	(1) Na
	(2) Forest practices codes—Riparian Areas	(2) To minimize or prevent impacts of forest and range uses on wetlands and on the diversity, productivity, and sustainability of wildlife habitat and vegetation adjacent to wetlands	(2) Ministry of Forestry and Range	(2) Crown land, wetlands >1.0 ha
Alberta	(1) Wetland management in the settled area of Alberta—Interim Policy	Conserve, mitigate, enhance and restore wetlands	(1) Water Resources Commission	All wetlands
	(2) Draft policy for managing Alberta's peatlands and Non-settled areas wetlands		(2) Water Resources Commission	
	(3) Provincial wetland policy being developed		(3) Alberta Environment	
Saskatchewan	Wetland Policy Statement - Water Management Framework	Sustainable management of wetlands to maintain numbers, diversity and productive capacity	Saskatchewan Environment	Crown waters
Manitoba	Manitoba Water Strategy	Sustainable management of water (lakes, waterways, wetlands)	Manitoba Environment	All wetlands
Ontario	(1) Provincial Policy Statement on Natural Heritage	(1) Protection of: all coastal wetlands; significant wetlands in southern ON; wetland function in northern ON	(1) Ontario Ministry of Natural Resources	(1) Wetlands regardless of ownership or size.
	(2) Conservation Authorities Act	(2) Prevent the loss of life and property due to flooding and erosion, and to conserve and enhance natural resources	(2) Conservation Authorities	(2) Areas regulated by Conservation Authorities
Quebec	Quebec Water Policy	Protection of public health and aquatic ecosystems	Ministère du Développement durable, de l'Environnement et des Parcs du Québec	All wetlands
New Brunswick	(a) NB Wetlands Conservation Policy	(a) No loss of provincially significant wetlands and no net loss of wetland function	Department of Environment	(a) Wetlands >1.0 ha
	(b) NB Coastal Areas Protection Policy	(b) Restrict development within coastal feature and its 30 m buffer		(b) All coastal features
Prince Edward Island	Wetland Conservation Policy for PEI	No net loss of wetlands and wetland functions	Dept. of Environment, Energy & Forestry	All wetlands
Nova Scotia	Environment Act and Regulations	To prohibit alteration of a wetlands, except by permit	Nova Scotia Environment and Labour	All wetlands (except federal)
Newfoundland and Labrador	Policy Directive for Development in Wetlands	Control activities that may impact the hydrology, recreational, aesthetics, natural functions and uses of wetlands	Department of Environment and Conservation	All wetlands

Appendix K. Case Studies

Canada Case Studies

Policy Component	Policy for the Management of Fish Habitat ⁹⁵	Federal Policy on Wetland Conservation ⁹⁶	Nova Scotia Wetland Conservation Policy ⁹⁷	Alberta Wetland Policy ⁹⁸
Date established	1986	1991	2009 (in draft)	1993 (interim policy) up for renewal 2011
Jurisdiction	Canada (National)	<ul style="list-style-type: none"> • Canada; It applies to lands under federal jurisdiction and to federal agencies, programs, and projects.⁹⁹ The policy directs all federal departments to sustain wetland functions in the delivery of their programs. • The federal government only has jurisdiction over approximately 29 percent of wetlands in Canada.¹⁰⁰ 	Province of Nova Scotia	Settled areas in Alberta (white zone)

⁹⁵ Department of Fisheries and Oceans (DFO/4486, 1986) <http://www.dfo-mpo.gc.ca/habitat/role/141/1415/14155/fhm-policy/page03-eng.asp#c2.1> or <http://www.dfo-mpo.gc.ca/Library/23654.pdf>

⁹⁶ Government of Canada (1991), <http://dsp-psd.pwgsc.gc.ca/Collection/CW66-116-1991E.pdf>

⁹⁷ Government of Nova Scotia (2009a, in draft), <http://www.gov.ns.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf>

⁹⁸ Currently being revised and in draft format, <http://environment.gov.ab.ca/info/library/6169.pdf>

⁹⁹ *Wetland Policy Implementation in Canada: Proceedings of a National Workshop*, North American Wetlands Conservation Council (Canada) Report No. 94-1 at 19. The FPWC has served as a model for wetland policy and mitigation development by many other Contracting Parties to the Ramsar Convention (Rubec, *Policy for wetland conservation*, in Lal R (Ed.) *The encyclopedia of soil science* (New York, 2002).

¹⁰⁰ Rubec at 3.

Policy Component	Policy for the Management of Fish Habitat⁹⁵	Federal Policy on Wetland Conservation⁹⁶	Nova Scotia Wetland Conservation Policy⁹⁷	Alberta Wetland Policy⁹⁸
Sponsoring Agency	Department of Fisheries and Oceans (DFO) Canada is the primary agency responsible for implementation and oversight of the policy. DFO has a memorandum of understanding with Environment Canada (EC) whereby EC delivers all aspects of the policy that relate to the control of pollutants that affect fish.	• Environment Canada (Canadian Wildlife Service and Environmental Conservation Branch) The Canadian Wildlife Service is responsible for coordinating the implementation of the policy and for providing expert advice, especially with respect to mitigation. ¹⁰¹	Nova Scotia Environment	Alberta Environment, Alberta Water Council ¹⁰²
Enabling legislation	Federal Fisheries Act (1985), Constitution Act (1982)	• Federal Cabinet Endorsement	Still in draft. Various pieces of legislation support wetland conservation, though there is no comprehensive enabling legislation.	Revised policy still in Draft. Alberta Water Act ¹⁰³

¹⁰¹ *Ibid.* The Canadian Wildlife Service is a department within Environment Canada.

¹⁰² <http://www.albertawatercouncil.ca/>

¹⁰³ <http://environment.alberta.ca/02206.html>

Policy Component	Policy for the Management of Fish Habitat ⁹⁵	Federal Policy on Wetland Conservation ⁹⁶	Nova Scotia Wetland Conservation Policy ⁹⁷	Alberta Wetland Policy ⁹⁸
Goal Setting	This policy unambiguously states its goal: 'net gain' of the productive capacity of fisheries habitat to benefit present and future generations of Canadians. Interpretations of 'Fisheries Habitat' and 'productive capacity' are defined in the policy. The <i>conservation goal</i> articulated in the policy is of <i>no-net loss</i> .	<ul style="list-style-type: none"> The federal government's stated objective with respect to wetland conservation is to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future."¹⁰⁴ Vaguely a no-net-loss policy. Key goals of this policy include:¹⁰⁵ <ol style="list-style-type: none"> 1)no net loss of wetland functions on federal lands and waters and in areas affected by federal programs through the mitigation of impacts of development related to these wetlands, 2)no further loss of wetland area where wetland loss has been severe, and 3)enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands has reached critical levels. 	To prevent the net loss of wetlands in Nova Scotia through wetland conservation practices that balance the need for wetland protection with the need for sustainable development and for the future. ¹⁰⁶	No net loss of area. Original intent was to support no net loss of function, but lack of information and stakeholder pushback revised the plan. The goal of the Alberta Wetland Policy is to sustain the social, economic and environmental benefits that functioning wetlands provide, now and in the future.
Baseline	1986 habitat conditions	• no clear baseline established	Yes	Unclear
Data to support policy		• Canadian Wetland Inventory mapping data, select local area data	Nova Scotia Wetland Inventory ¹⁰⁷ and NSDNR aerial photographs 1:10,000 ¹⁰⁸	

¹⁰⁴ *A Coming of Age: Policy for Wetland Conservation in Canada*, North American Wetlands Conservation Council (Canada) Report No. 93-1 at 14, available at: <http://www.wetlandscanada.org/pubs.html> .

¹⁰⁵ FPWC at 5: <http://dsp-psd.communication.gc.ca/Collection/CW66-116-1991E.pdf>

¹⁰⁶ *Ibid* p. 7

¹⁰⁷ <http://www.gov.ns.ca/natr/wildlife/habitats/wetlands.asp>

¹⁰⁸ <http://gov.ns.ca/natr/wildlife/wetlands/nswi.htm>

Policy Component	Policy for the Management of Fish Habitat ⁹⁵	Federal Policy on Wetland Conservation ⁹⁶	Nova Scotia Wetland Conservation Policy ⁹⁷	Alberta Wetland Policy ⁹⁸
Priority Setting	There are no priority areas for the implementation of the policy, nor are there priority areas for net gain articulated in the policy.	• Not explicitly, though the policy does indicate the need for protected and priority areas for 'significant wetlands' as part of the implementation strategy.	This policy proposed a system by which certain wetlands can be designated as <i>Ecologically Significant Wetlands</i> (ESW).	Strategic direction includes a provision for the protection of wetlands of extraordinary value (no clear metric by which to evaluate this).
Scope	This policy applies to both crown and private land that affects fisheries habitat.	• All Canadian Federal Lands	Policy covers all wetlands in the province with the exception of wetlands under 100m ² , former salt marshes under the <i>Agricultural Marshlands Conservation Act</i> ¹⁰⁹ , wetland constructed for storm water and wastewater treatment, wetland created on uplands not for the purpose of compensation, wetlands that develop as a result of drainage ditches for agriculture and transportation corridors or urban and rural construction. ¹¹⁰	Alberta White Zone – both crown and private land.
Scale	This applies to any case where there is or could be impact to fisheries habitat.	• Not specified	wetlands over 100 m ²	
Triggers	Generally at the project proposal/ approval stage of projects (BC Environmental Assessment, Canadian Environmental Assessment). Policy is triggered when there is an anticipated net-loss of habitat. The policy directs compensation efforts toward a net gain.	• At the planning stage. The FPWC is a factor for consideration in federal projects that are evaluated under the Canadian Environmental Assessment Act ("CEAA"). ¹¹¹ Supporting Guidelines for Wetlands under CEAA have been published; ¹¹²	Planning stage of projects	Development application phase.

¹⁰⁹ <http://nslegislature.ca/legc/statutes/agricmar.htm>

¹¹⁰ <http://www.gov.ns.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf> p. 8

¹¹¹ Canadian Environmental Assessment Act, R.S.C. 1992, c.37.

¹¹² Milko, *Wetlands environmental assessment guideline*, (Ottawa: Environment Canada, 1998).

Policy Component	Policy for the Management of Fish Habitat ⁹⁵	Federal Policy on Wetland Conservation ⁹⁶	Nova Scotia Wetland Conservation Policy ⁹⁷	Alberta Wetland Policy ⁹⁸
Temporal Application	3 years	• Not specified	Not specified	Not specified
Process	This policy has a clearly articulated process that outlines procedural steps for no-net loss. There are: 1. Notification 2. Examination 3. Public Consultation 4. Decision 5. Audit 6. Enforcement ¹¹³	• Not really. This is more of a high-level, overarching policy. CEAA	Not specified	Yes
Clear decision making criteria	This policy does not have very clearly articulated decision making criteria though the nature of the policy means that it is in-kind mitigation.	• No. Not focussed on Mitigation per se.	Not specified	Yes, strong and explicit decision making criteria ¹¹⁴
Mitigation ratios	Not clearly stated. These are usually established via consultation	• No. Compensation requirements have varied in accordance with the nature of the project and the wetlands involved. ¹¹⁵ For example, compensation ratios of 3:1 are common; however, where “like-for-like” compensation has not occurred, ratios have been higher. ¹¹⁶	Not specified	Yes

¹¹³ <http://www.dfo-mpo.gc.ca/habitat/role/141/1415/14155/fhm-policy/page06-eng.asp>

¹¹⁴ <http://www.wetlandpolicy.ca/alberta-wetland-policy/wetland-mitigation.html>

¹¹⁵ Refer here to the variation in results depending on negotiation skills of proponents.

¹¹⁶ *Ibid.* Note: The importance of wetlands as fish habitat has been recognized and compensation for ‘harmful alteration, disruption or destruction’ (HADD) of fish habitat under the Fisheries Act and its related Policy for the Management of Fish Habitat (1986) has included wetland restoration projects. For example, the Nova Scotia Department of Transportation and Public Works will restore six salt marshes totalling 50 ha as HADD compensation during the 2005–2007 period, (Rubec at 7).

Policy Component	Policy for the Management of Fish Habitat ⁹⁵	Federal Policy on Wetland Conservation ⁹⁶	Nova Scotia Wetland Conservation Policy ⁹⁷	Alberta Wetland Policy ⁹⁸
Mitigation hierarchy	The policy loosely advances a mitigation hierarchy by emphasizing avoiding any loss in the first place where possible.	<ul style="list-style-type: none"> • No, though implied preference for avoidance and minimization. The FPWC is supported by an Implementation Guide for Federal Land Managers, which outlines a three-step mitigation sequence of avoidance, minimization and compensation for unavoidable impacts.¹¹⁷ In the early years of the FPWC avoidance and minimization aspects of the Policy were emphasized. It was soon acknowledged that the long-term outcome of mitigation without compensation would be a net loss of wetland function.¹¹⁸ However, since the FPWC does not provide prescriptive guidance, the federal government's approach to compensation has been flexible acknowledging that there is a need for compensation to provide a cost-effective mechanism for replacement of lost wetland functions.¹¹⁹ 	No explicit reference to hierarchy, although there is considerable mention of the need to avoid impacts.	Yes
Inclusion of Economic Valuation	None	• None	None	None

¹¹⁷ Lynch-Stewart, P. et al. The federal policy in wetland conservation: implementation guide for federal land managers, (Ottawa: Environment Canada, 1996).

¹¹⁸ Rubec at 6.

¹¹⁹ Ibid.

Policy Component	Policy for the Management of Fish Habitat⁹⁵	Federal Policy on Wetland Conservation⁹⁶	Nova Scotia Wetland Conservation Policy⁹⁷	Alberta Wetland Policy⁹⁸
Compensation site	Variable	<ul style="list-style-type: none"> No explicit guidance in the policy 	No explicit guidance in the policy	Preference compensation sites that are close, but not rigid.
Allowable types of compensation	Restoration, enhancement.	<ul style="list-style-type: none"> No explicit guidance in the policy 	No explicit guidance in the policy	Restoration, enhancement
Administration/delivery	Varies, contract based (Ducks Unlimited Canada)	<ul style="list-style-type: none"> All Canadian Federal Agencies 	Primarily Nova Scotia Environment	Alberta Environment, NGOs
Compliance and Enforcement	DFO	<ul style="list-style-type: none"> Minimal enforcement of the policy. Responsibility for this is with Environment Canada. 	Nova Scotia Environment	Alberta Environment
Implementation Guidelines	Vague	<ul style="list-style-type: none"> The FPWC is supported by an Implementation Guide for Federal Land Managers, which outlines a three-step mitigation sequence of avoidance, minimization and compensation for unavoidable impacts.¹²⁰ The policy describes seven strategies for wetland conservation stemming from the policy including:¹²¹ <ul style="list-style-type: none"> Public awareness <ul style="list-style-type: none"> Federal lands, waters, programs Federal protected areas Cooperation with other levels of government National network of secured significant wetlands Sound scientific basis for the policy International actions and strategies for wetland conservation 		Yes. Very explicit, particularly where compensation guidelines are concerned.

¹²⁰ Lynch-Stewart, P. et al. The federal policy in wetland conservation: implementation guide for federal land managers, (Ottawa: Environment Canada, 1996).

¹²¹ FWPC at 7-11: <http://dsp-psd.communication.gc.ca/Collection/CW66-116-1991E.pdf>

Policy Component	Policy for the Management of Fish Habitat ⁹⁵	Federal Policy on Wetland Conservation ⁹⁶	Nova Scotia Wetland Conservation Policy ⁹⁷	Alberta Wetland Policy ⁹⁸
Comprehensiveness	This policy applies only to Fisheries Habitat.	• This policy applies only to federal wetlands	While not part of a broader species and ecosystems strategy for Nova Scotia, there is explicit intention to align this policy with those of New Brunswick and PEI in the Draft policy.	No.
Provision to address climate change	Nothing explicit.	• Nothing explicit.	Nothing explicit.	Nothing explicit.

USA Case Studies ¹²²

Component of the Policy	Oregon Fish and Wildlife Habitat Mitigation Policy (OAR 635-415) ^{123,124}	U.S. Fish and Wildlife Service Mitigation Policy (46 FR 7656) ¹²⁵	US Federal Wetlands Policy ¹²⁶
Date established	Feb 2010	1981, 1993	1994
Jurisdiction	Oregon State, all lands	USA, National	USA, All Water (public and private land)

¹²² The United States is home to several federal wetlands conservation initiatives related to the 1985 *Farm Bill*, 1990 *Farm Bill* and 2002 *Farm Bill*, including:

(i) The **Conservation Reserve Program** (“CRP”) authorizes the federal government to enter into contracts with agricultural producers to remove highly erodible land from production for ten years in exchange farmers receive an annual rental payment for the term of the multi-year contract. Conservation plans are put in place for eligible lands and seeded to cover (grass or trees). In this way the Conservation Reserve Program reduces soil erosion, protects food and fibre production, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Cost sharing is provided to establish the vegetative cover practices. While the program is directed at erodible land, substantial acreage is comprised of wetlands. In fact, CRP secured acreage is four times greater than all federal and state fish and wildlife efforts combined.

(ii) The **Wetland Reserve Program** (“WRP”) also authorized in the *Farm Bill*, The Wetlands Reserve Program is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. The program pays for 100 percent of restoration costs for a 30 year or permanent conservation easement and up to 75percent of the restoration costs for shorter term easements (normally a minimum of 10 years). The goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

¹²³ http://www.dfw.state.or.us/lands/mitigation_policy.asp

¹²⁴ <http://www.dfw.state.or.us/OARs/415.pdf>

¹²⁵ <http://www.fws.gov/policy/501fw2.html>

¹²⁶ <http://www.fws.gov/policy/660fw1.html>

Component of the Policy	Oregon Fish and Wildlife Habitat Mitigation Policy (OAR 635-415) ^{123,124}	U.S. Fish and Wildlife Service Mitigation Policy (46 FR 7656) ¹²⁵	US Federal Wetlands Policy ¹²⁶
Sponsoring Agency	Oregon Department of Fish and Wildlife	US Fish and Wildlife (Department of the Interior)	Department of the Interior
Enabling legislation	Multiple pieces of supporting legislation depending on the species or ecosystem.	Various	<p>In the United States, the <i>Clean Water Act</i> (“CWA”) prohibits the discharge of dredged or fill material into waters of the United States, unless a permit issued by the Army Corps of Engineers (“Corps”) or approved State authority under Section 404 authorizes such a discharge.¹²⁷ The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.</p> <p>In the United States, federal regulatory authority over wetlands alteration is structured in the following way:</p> <ol style="list-style-type: none"> 1. The Environmental Protection Agency (EPA) administers the <i>Clean Water Act</i> and establishes procedures and guidelines for permit processing; 2. The Corps has authority to issue permits for regulating the discharge of dredge or fill material through Section 404; 3. EPA maintains authority to veto Corps decisions (this is rarely done); 4. The U.S. Fish and Wildlife Service and National Marine Fisheries Service are provided opportunities to comment on all applications.
Goal Setting	This policy is based on the classification of 6 habitat categories and corresponding mitigation strategies		
Priority Setting	This policy advances 6 habitat categories and corresponding mitigation strategies.	No	

¹²⁷ Clean Water Act.

Component of the Policy	Oregon Fish and Wildlife Habitat Mitigation Policy (OAR 635-415)^{123,124}	U.S. Fish and Wildlife Service Mitigation Policy (46 FR 7656)¹²⁵	US Federal Wetlands Policy¹²⁶
Scope	All land and water 'development actions'. Development actions are any activity subject to regulation by local state or federal government.	Provisions of this chapter apply service wide for personnel involved in making recommendations to protect or conserve Fish and Wildlife resources. There are some exclusions to the policy.	All lands
Scale	Variable	Variable	All projects involving water
Triggers	Applies at the planning stage, prior to any development actions.		
Process	Yes	Yes	yes
Clear decision making criteria	Yes		Yes
Mitigation ratios	Depends on the classification of impacted species and ecosystem.	Unclear	Yes
Mitigation hierarchy	Yes, very explicit.	Yes	The mitigation hierarchy applied requires that when discharge is authorized the "adverse impacts to wetlands, streams and other aquatic resources must be avoided and minimized to the extent practicable". When adverse impacts to wetlands cannot be avoided, "compensatory mitigation is required to replace the loss of wetland and aquatic resource functions in the watershed." In this context, "compensatory mitigation" refers to the restoration, establishment, enhancement, or in certain circumstances conservation of wetlands, streams or other aquatic resources for the purpose of offsetting unavoidable adverse impacts. ¹²⁸
Inclusion of Economic Valuation	None	None	None
Compensation site	Various	Various	Various

¹²⁸ EPA Compensatory Mitigation Fact Sheet, at 2.

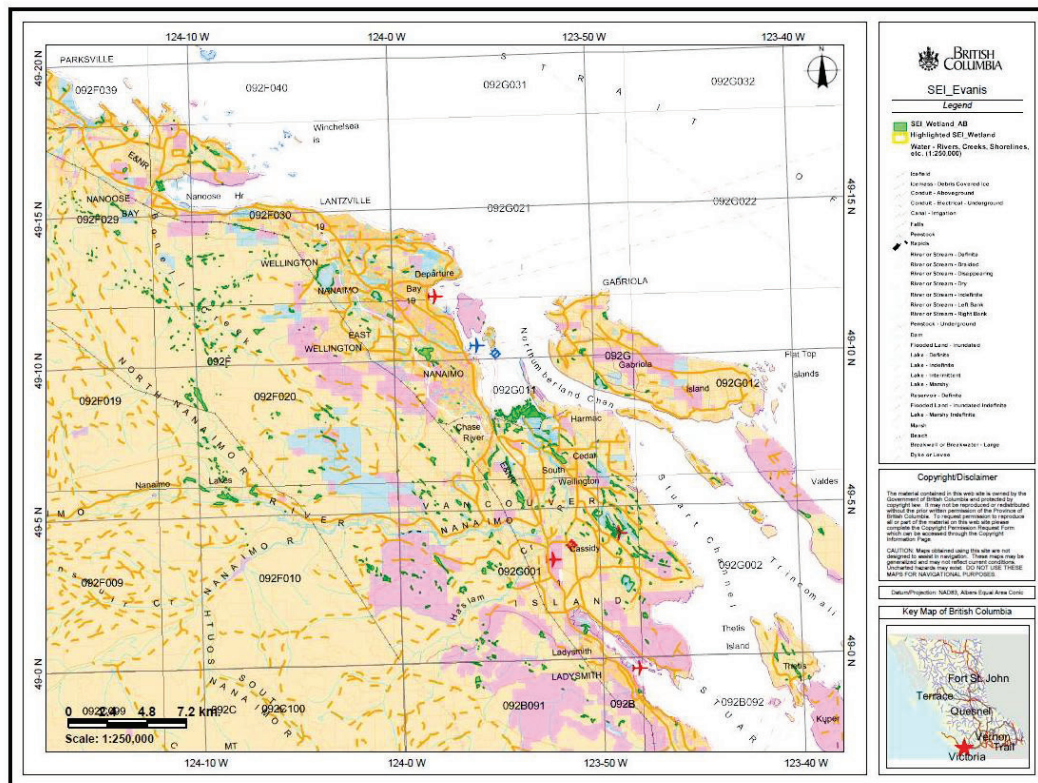
Component of the Policy	Oregon Fish and Wildlife Habitat Mitigation Policy (OAR 635-415)^{123,124}	U.S. Fish and Wildlife Service Mitigation Policy (46 FR 7656)¹²⁵	US Federal Wetlands Policy¹²⁶
Allowable types of compensation	Various.	Various	The Corps and EPA advocate three mechanisms for the satisfaction of compensatory mitigation requirements. The mechanisms supported are: permittee-responsible mitigation, purchase of mitigation banking credits and payment to approved in-lieu mitigation programs. ¹²⁹
Administration/delivery	Oregon Department of Fish and Wildlife	USFW	USFW
Compliance and Enforcement	Oregon Department of Fish and Wildlife, other permitting agencies.	USFW	USFW
Implementation Guidelines	Yes	Yes	Yes
Comprehensiveness	Multiple species and ecosystems.	Multiple species	Wetland only
Provision to address climate change	Not explicit.	Not explicit	Not explicit

¹²⁹ Wilkinson at 53.

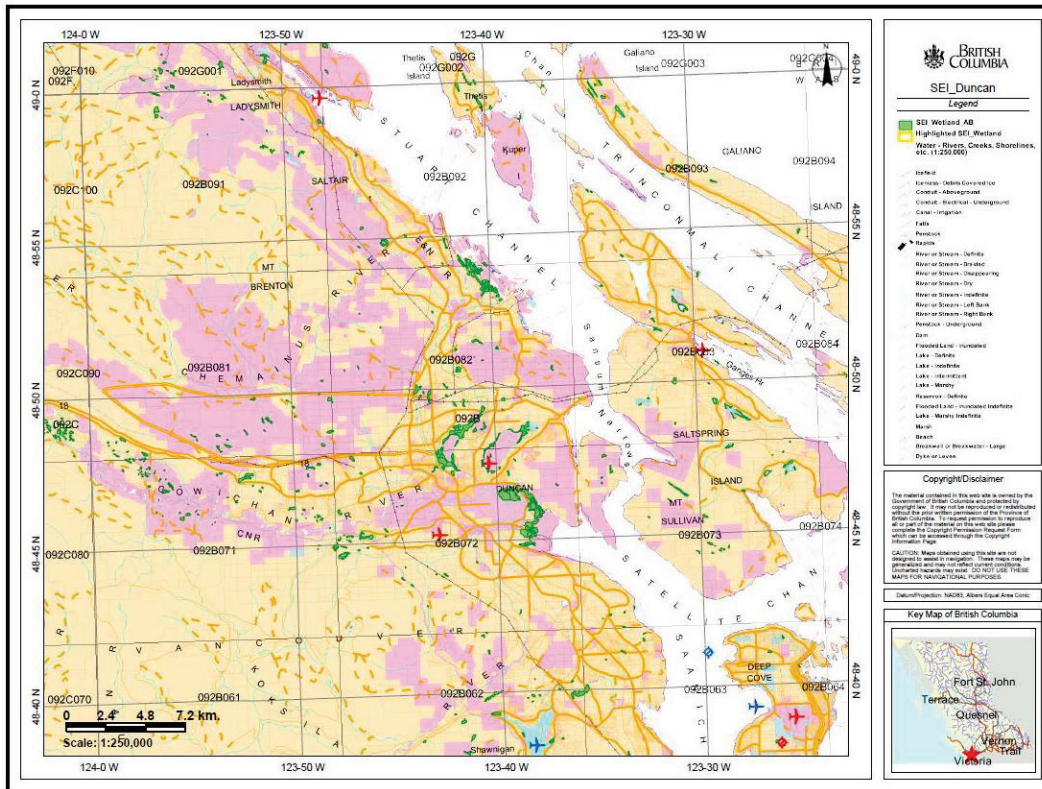
Appendix L. Crown/ Private Land Wetland Distribution

The following maps are a few local snapshots from the Province's Sensitive Ecosystem Inventory data base with land title information overlaid. They show the general distribution of wetlands on crown and private lands. Wetlands appear in Green, crown land in indicated by Pink, private lands in indicated in Beige and unclassified land appears in White. While the vectors are not available in this data set to calculate the actual land area, it is obvious from these images that a large portion of wetlands in these areas fall on private lands.

SEI: East Coast Vancouver Island



SEI: South Okanagan SEI: Duncan



Appendix M. Status of Wetland Data in BC

(Adapted from Carver, 2011)

There is no comprehensive, detailed wetland inventory for all of British Columbia that provides information on the various classifications and sub-classification of wetlands for the entire province. This said, wetland data in BC has come a long way over the years with the advance of technology and through the initiative and funding contributions of many government and non-government groups. Currently there are several data sources in BC that provide information regarding wetlands in BC and that are based on a variety of mapping approaches including ecosystem mapping, vegetation and soil type mapping. As will be further described in what follows, the scale, scope and data collection method for each of these systems varies. There are also a variety of locations in which the data is housed as well as variation between the ownership and maintenance of the data.

In most cases, the regional and sub regional data sets are focused on *ecosystem mapping*. This form of mapping stratifies the landscape into units depicting various land features including climate, physiography, surficial material, bedrock geology, soils and vegetation.¹³⁰ There are three primary types of ecosystem mapping used in BC: Terrestrial Ecosystem Mapping (TEM), Predictive Ecosystem Mapping (PEM) and Sensitive Ecosystems Inventory (SEI). The scale of these data sets is variable, the most common being 1:20,000 and 1:50,000. There are larger scale versions of this data for specific interpretations. These data sets are housed in various locations including, the BC Ministry of Environment's Ecological Reports Catalogue (EcoCat)¹³¹ which is a large data repository supported by the province.

¹³⁰ Carver, Martin. Strengthening Wetland Conservation: An Assessment of Data and Tracking Opportunities across British Columbia (Draft Report for the Canadian Intermountain Joint Venture) March 2011

¹³¹ EcoCat: The Ecological Reports Catalogue <http://a100.gov.bc.ca/pub/acat/public/welcome.do>

Terrain Resource Inventory Mapping (TRIM)

TRIM mapping is a valuable data resource because of the extensive coverage of the province and as such creates important baseline data. This program began in the 1980s and is based on a series of aerial photographs that cover the entire province. The scale is 1:20,000 and there are over 7, 027 map tiles in the data suite. The majority of the images and analysis were conducted in the late 1980s and there was no on the ground verification of the data. A total of 375,342 wetlands are identified in the original TRIM. The size distribution of these wetlands shows that, by number, over 60% of all wetlands are between 0.5-5.0 hectare.

Distribution of wetland size within original TRIM

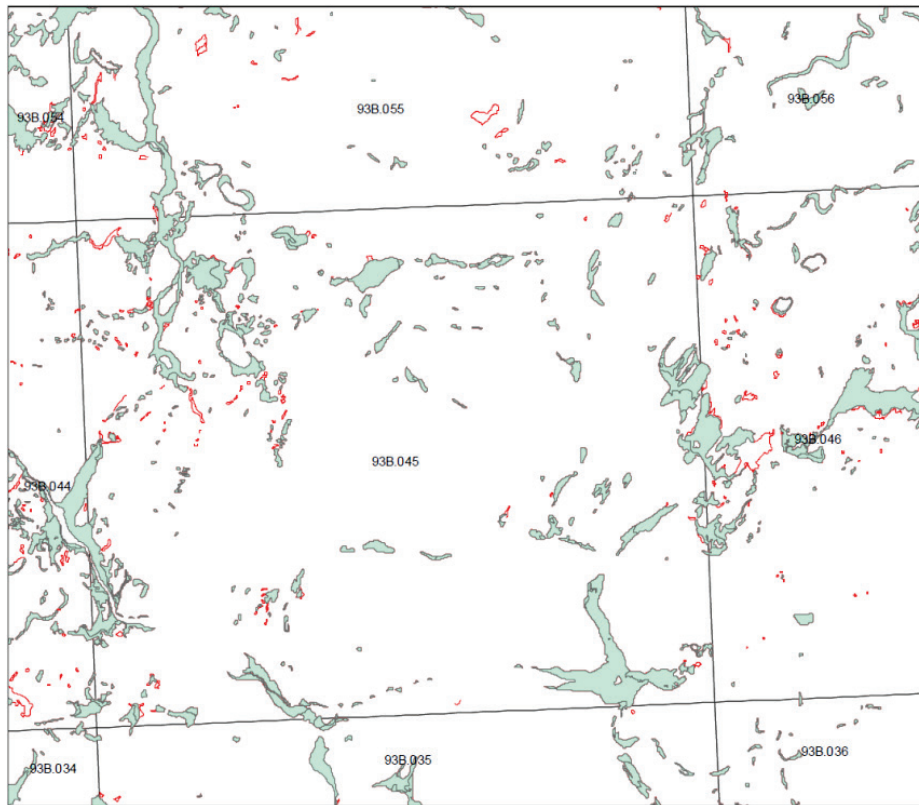
Size Range (ha)	Number of Wetlands	Percentage of Total Area
>=10	32,627	8.7
5-10	31,776	8.4
1-5	150,980	40.2
0.5-1	78,834	21.0
0.25-0.5	57,390	15.3
0.1-0.25	22,040	5.9
<0.1 ha	1,695	0.5

In 1994, the original TRIM data set was updated to provide a higher degree of detail: creating TRIM 2 and significantly enhancing the value of the data tool. This used color photograph and a high resolution 1:10,000 scale for select areas of the province.¹³² Many of the original TRIM map blocks have been updated to 1:10,000 mapping and are available online¹³³. While this data source provides very important information, it does have its limitations; particularly the large scale in which it was originally conducted, the fact that it has never been ground truthed and as such offers no information on wetland type and classification as well as the fact that some important

¹³² Another benefit to TRIM2 was the ability to track wetland loss trends through comparison with the original TRIM data set.

¹³³ <http://archive.ilmb.gov.bc.ca/crgb/pba/trim/10kprod/>

wetland types, such as ephemeral wetlands were not captured through the air photos to begin with.



Provincial base mapping of wetlands for a site near Williams Lake.¹³⁴

Terrestrial Ecosystem Mapping (TEM)

Data for Terrestrial Ecosystem Mapping (TEM) is generated using a combination of air photo interpretation and field verification to confirm information and classification. TEM projects will typically inventory wetlands and identify location and type at a finer scale. In general and high level terms, the combination of air photo data and field testing make this data source reliable for wetlands, and also a relatively expensive and labor intensive method. Despite the excellent coverage and quality wetland inventory in some parts of the province, there is inconsistency provincially to this approach and as to how the wetlands are delineated and classified and often caused by human error or

¹³⁴ Original TRIM is shown in turquoise and the additional wetland units mapped under TRIM2 are shown in red.

difference in interpretation. This is on account of the fact that there are different TEM project areas, the date of mapping differs, different people on project teams meaning that there is no consistency in the interpretation and field testing and the emphasis on wetlands differs throughout the province for a variety of reasons¹³⁵. There are also challenges associated with TEM methodologies when it comes to classifying small wetlands because of the fact that they fall within larger complexes and are often times subsumed into the larger classification. All this said, TEM can be considered a strong data set that can be well linked to wetlands with reduced error in comparison with TRIM and other large-scale data sets. TEM mapping is publically available on EcoCat^{136 137}

Sensitive Ecosystems Inventory Mapping

As with TEM mapping, Sensitive Ecosystems Inventory (SEI) relies on a combination of air photo and field testing. This type of mapping identifies and maps rare and fragile terrestrial ecosystems. Generally speaking, the purpose of this is to identify sensitive sites to inform better land use practices.

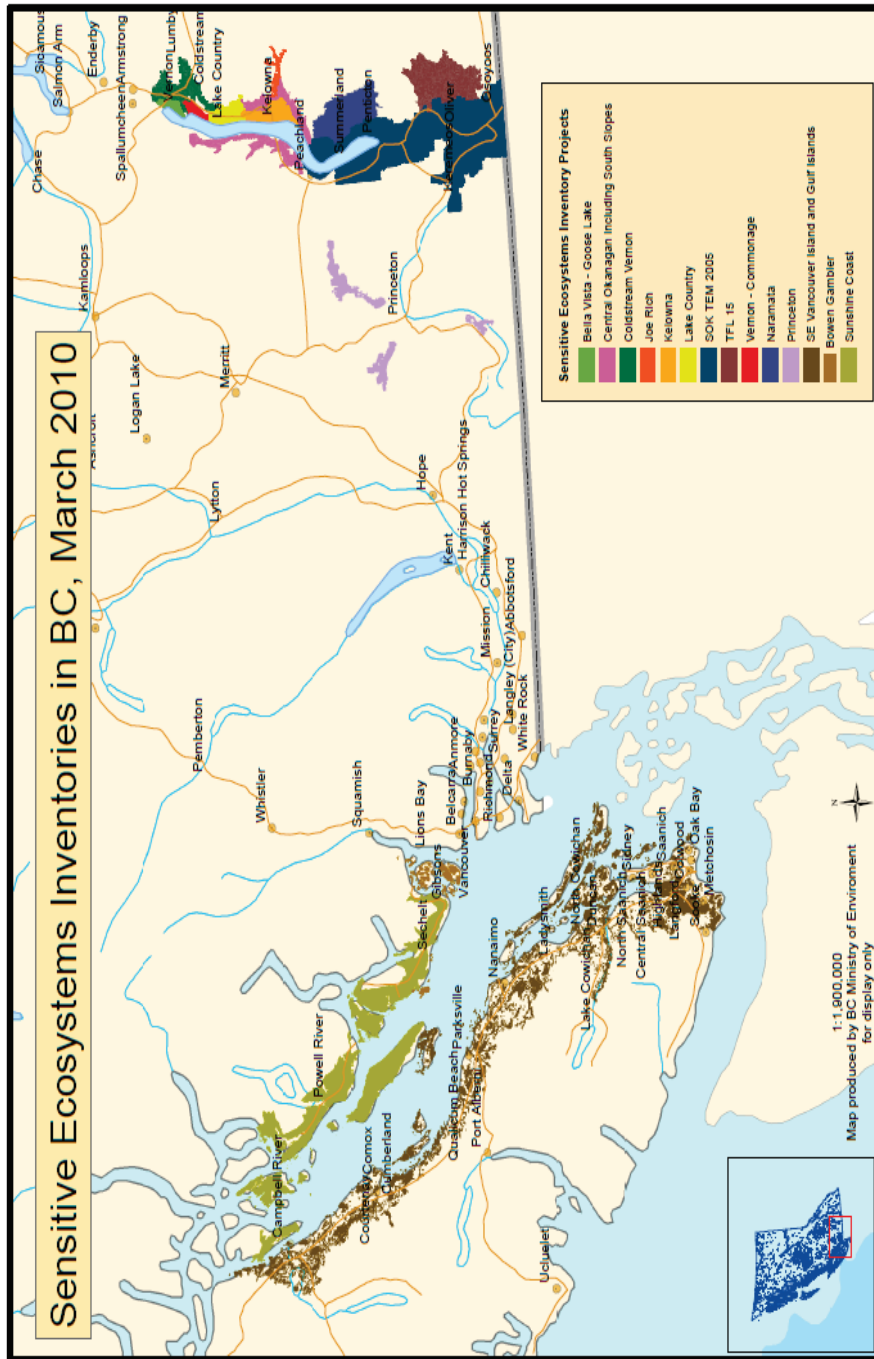
There are two methods have been used in BC to generate sensitive ecosystems maps. Most SEI projects rely on TEM data as a base. The TEM data is then further evaluated for sensitive ecosystems. In other cases, a direct map of the sensitive ecosystems is developed using airphoto interpretation. Regardless, SEIs are typically mapped at 1:20,000 (or larger) and use ArcInfo GIS. The sensitive ecosystems mapping at the regional level vary. Common ecosystem types identified in SEI mapping projects typically include the following categories or classes: coniferous forests, woodlands, wetlands, riparian areas, natural meadows and grasslands.

¹³⁵ For Instance, in the Okanagan Valley, where sensitive ecosystems and species at risk that depend on those ecosystems are threatened as a result of past and present agriculture and urban land uses, a high priority is given to mapping sensitive ecosystems for conservation, biodiversity and habitat protection purposes. In contrast, the objectives for TEM projects in other parts of the province less impacted by those land uses may rather be to provide a tool for landscape unit planning, forest or range management or wildlife interpretations.

¹³⁶ http://www.env.gov.bc.ca/cdc/documents/tempem_index_dec06.pdf

¹³⁷ For more information, or to locate missing index maps contact Corey Irwin at Corey.Erwin@gov.bc.ca.

SEI mapping generally speaking provides excellent information about wetlands, however only exists in certain areas of the province. To date, SEI mapping exist in the South Coast (East Vancouver Island and the Gulf Islands, and Sunshine Coast and Adjacent Islands) and the Southern Interior (Okanagan and Lower Similkameen Valleys, and Rural Princeton). SEI mapping is an excellent tool to indentify wetlands and often includes very small wetlands (including small wetlands to about 0.5 ha). It includes wetland classification information based on the Canadian Wetland Classification system and in many cases includes information about wetland condition.



Location of sensitive ecosystem inventories in BC.

SEI projects in BC

Area	Project Title	Digital Files Available in EcoCat		
		Report &/or Map Legend	Data & Map Files	Images
Okanagan and	South Okanagan Gap Areas, 2010 TEM (2010)	•	•	•

Lower Similkameen Valleys	Refined and Updated Ecosystem Mapping for the South Okanagan and lower Similkameen Valley (2010)	•	•	
	Conservation Analysis and Updated Ecosystem Mapping for the Central Okanagan Valley: Central Okanagan, South Slopes, Kelowna, Ellison and Joe Rich project areas (2009)	•	•	•
	Coldstream – Vernon, 2007 TEM (2008)	•	•	•
	TEM of City of Kelowna (2008)		•	
	Central Okanagan Joe Rich, 2006 TEM (2007)	•	•	
	Updated Ecosystem Mapping for the South Okanagan Valley (2006)	•	•	
	Naramata SEI (2006)		•	
	Lake Country, 2005 TEM (2006)	•	•	•
	Vernon Commonage 2005 TEM (2006)	•	•	•
	Central Okanagan, 2000–2001 TEM (2004)	•	•	•
	Bella Vista – Goose Lake Range 2003 TEM (2003)	•	•	
	TEM with Wildlife Interpretations for Weyerhaeuser TFL 15 2000	•	•	
	SE Vanc. Isl. & Sunshine Coast	Sensitive Ecosystems Inventory: East Vancouver Island and Gulf Islands 1993 – 1997: Vol 1 (1998), Vol 2	•	•
Bowen/Gambier Islands	Sensitive Ecosystems Inventory (SEI) Bowen - Gambier Trust Areas (1999)		•	•
Sunshine Coast	SEI of the Sunshine Coast and Adjacent Islands (2005)	•	•	•

Other Forms of Mapping Available in BC

Baseline Thematic Mapping

Another form of wetland mapping available online is Baseline Thematic Mapping, or BTM.¹³⁸ This mapping data is focused on land use and uses Landsat imagery data compile by the province between 1999 and 2001. This data set contains several different categories such as forest landscape, agricultural areas, recent logging and burns as well as wetlands. The Landsat images were originally shot 705km from the earth at a scale of 1:250,000. The benefit to this product is that is focused on land use themes and implicitly, can point to pressures. The drawback to this data resource is that it, while it includes swamps, bogs, marshes and fens, only wetlands over 10 ha are mapped. This means that a huge number of provincial wetlands are excluded from the data set. BTM can be accessed through the Geographic Data Discovery Service and from Hectares BC. GeoBC is the data custodian for BTM.

Vegetation Resource Inventory

Originally a forestry resource data base, the ***Vegetation Resource Inventory***, or VRI is a provincial data set that is comprised of a mixture of a wide variety of mapping data including old and new mapping that covers 35-45% of the province.

Soils and Terrain Mapping

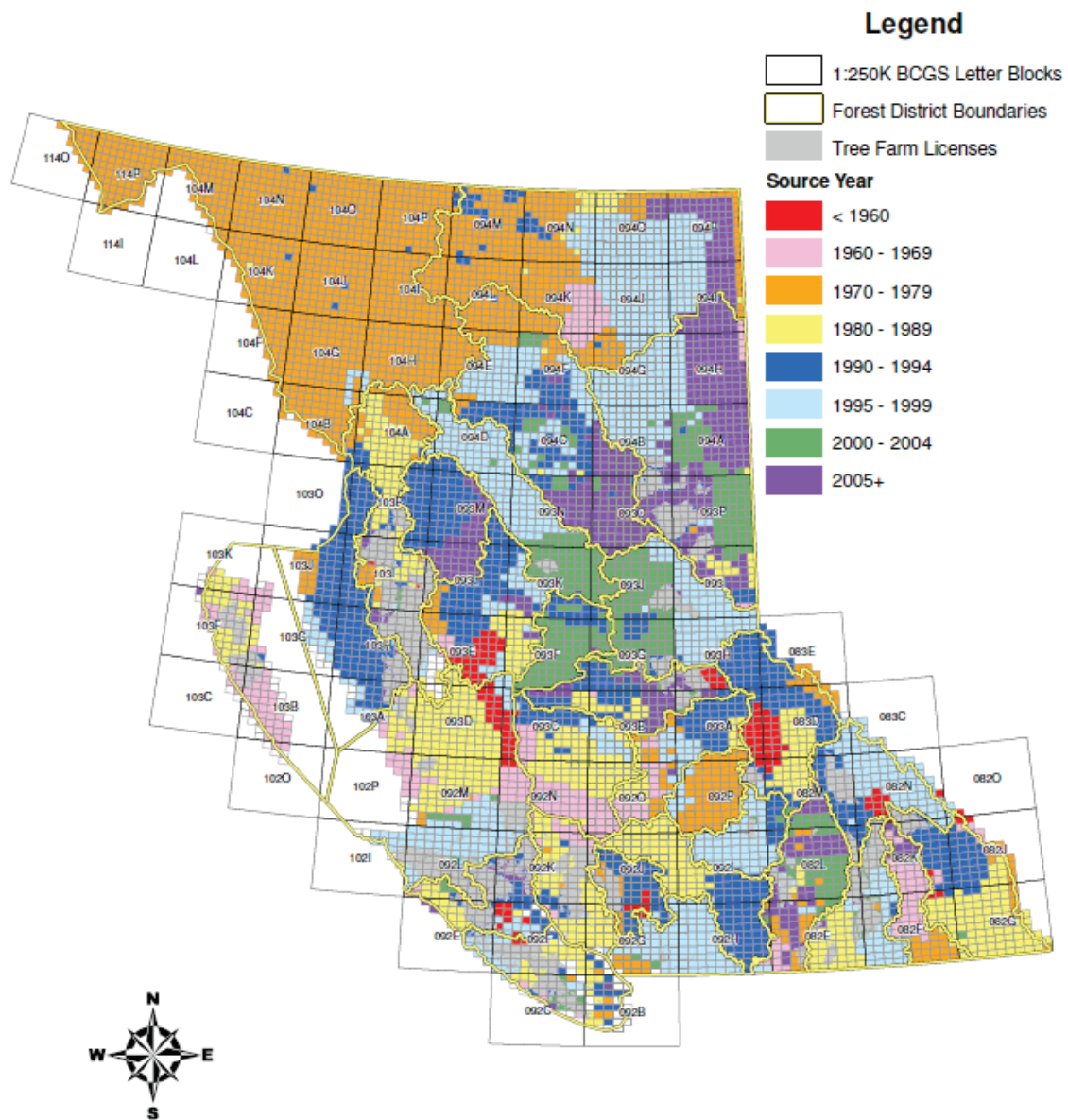
In contrast with Terrain and soils mapping inventory collects information on surficial materials, landforms and geomorphological processes and include information on parent material texture, drainage and slope range. This mapping relies on air photo interpretation that is verified through field checking.

Soils mapping includes detailed descriptions about soil associations (pedons) as well as information about terrain attributes. Each soil description includes general comments, soil profiles, landscape cross-sections and characteristics that include comments about native vegetation, detailed soil characteristics and brief descriptions of soil phases and variants. The general comments include information on parent materials, topography, soil texture, soil classification, drainage, landuse, suitability of soil for agriculture and soil management.

¹³⁸ <http://aardvark.gov.bc.ca/apps/metastar/metadataDetail.do?from=search&edit=true&showall=showall&recordSet=ISO19115&recordUID=37011>

Soils mapping methodology incorporates four classes of organic genetic materials including Bog (B) – sphagnum or forest peat, Fen (N) – fen or sedge peat, Organic (O) – undifferentiated, and Swamp (S) – forest peat. The surface expression classes of wetland organic soils identify form and patterns of form (i.e blanket, domed, floating, ribbed, sloping).

Limitations of terrain and soils mapping for mapping and tracking wetlands is that although both types of mapping delineate water bodies as well as wetlands, they do not differentiate between shallow water wetlands and deep water. Other limitations include the use of composite polygons and small-scale mapping for some projects. In composite polygons, the specific locations of wetland types are not identified and wetland areas cannot be accurately determined. Small-scale mapping does not have the resolution to delineate small wetlands. As a result, there is a high probability that smaller wetlands would not be captured during mapping or would be included as a small component within a composite map unit. However 1:50,000 and possibly up to 1:~125,000 scale mapping may be adequate for broad-scale regional and provincial wetland inventories and tracking. Wetlands that are identified in simple and composite map units at those scales would likely be classified with a reasonable level of accuracy.

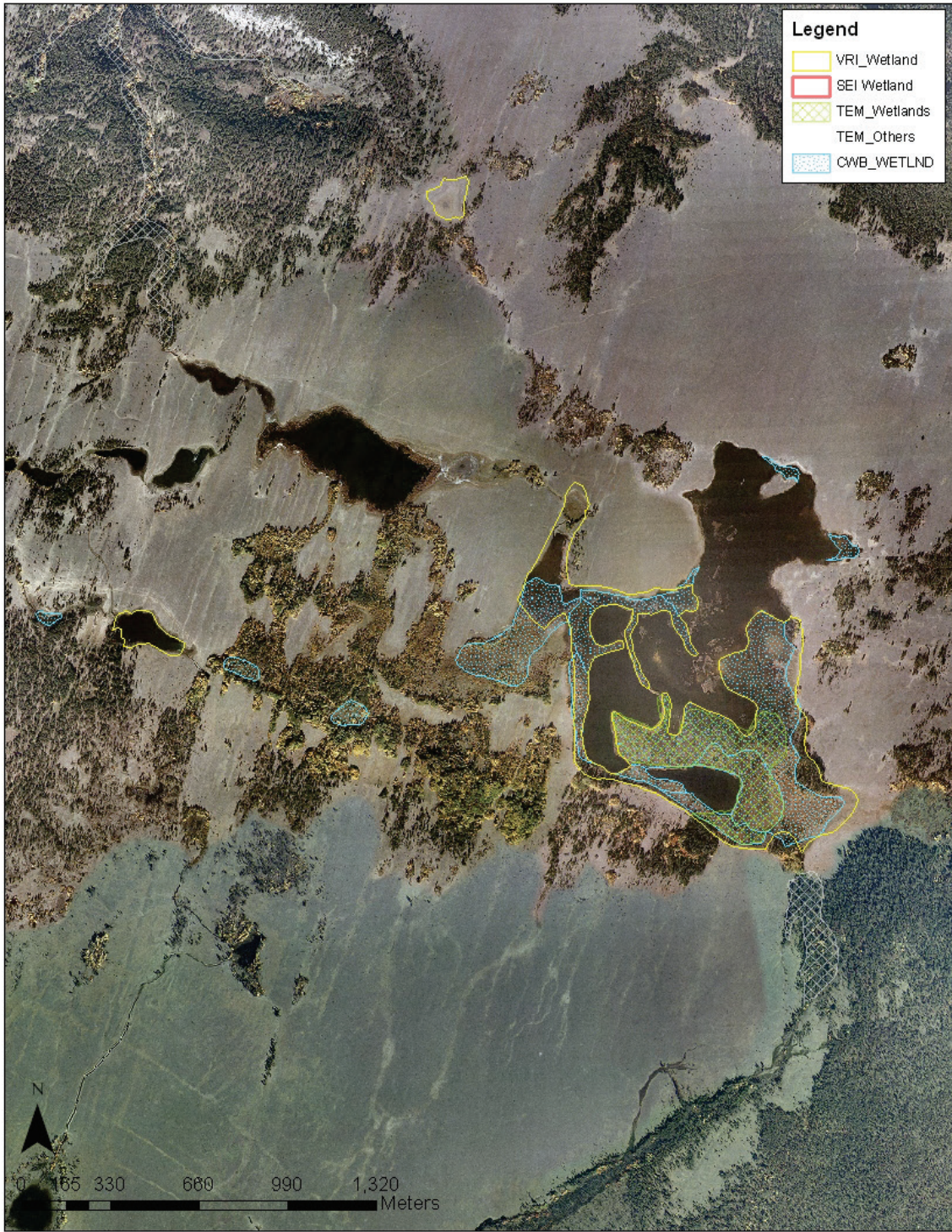


Source year of Vegetation Resource Inventory data to Feb. 26, 2010.



Comparison of wetland and open water mapping by TRIM and airphoto interpretation for the Cariboo Grasslands TEM.

Red lines are TEM polygon boundaries, blue lines delineate TRIM water and yellow lines delineate TRIM wetlands.



Comparison of wetland mapping by VRI, TRIM (CWB_WetLnd) and TEM wetlands in the Cariboo grasslands area.

TEM projects (1:20,000) available within selected priority areas

Area	Project Title	Digital Files Available in EcoCat		
		Report &/or Map Legend	Data & Map Files	Images
Okanagan and Lower Similkameen Valleys	South Okanagan Gap Areas, 2010 TEM (2010)	●	●	
	Refined & Updated Ecosystem Mapping: the South Okanagan and lower Similkameen Valley (2010)	●	●	
	Conservation Analysis and Updated Ecosystem Mapping for the Central Okanagan Valley: Central Okanagan, South Slopes, Kelowna, Ellison and Joe Rich project areas (2009)	●	●	
	Coldstream – Vernon, 2007 TEM (2008)	●	●	●
	TEM of City of Kelowna (2008)		●	
	Central Okanagan Joe Rich, 2006 TEM (2007)	●	●	
	Updated Ecosystem Mapping for the South Okanagan Valley (2006)	●	●	
	Lake Country, 2005 TEM (2006)	●	●	●
	Vernon Commonage 2005 TEM (2006)	●	●	●
	Central Okanagan, 2000–2001 TEM (2004)	●	●	
	Bella Vista – Goose Lake Range 2003 TEM (2003)	●	●	
TEM with Wildlife Interpretations for Weyerhaeuser TFL 15 2000	●	●		
Chilcotin Plateau	Ecosystem Mapping of the Churn Creek Study Area (1999)	●	●	
	TEM of the Cariboo Grasslands (Dog Creek, Becher's Prairie, Chilcotin River Grasslands) (1998)	●	●	
East Kootenays – Rocky Mountain Trench	Brewer Creek TEM (2003)	●	●	
	Premier Lake TEM (2000)		●	
	TEM of Premier Ridge – Diorite (2000)	●	●	
	TEM of TFL 14 (1999)	●	●	
	East Columbia Lake Study Area (1998)	●	●	
Peace River - Chetwynd	TEM with Wildlife Interpretations for the Lower Sukunka Landscape Unit, BC (2002)	●	●	
	Burnt River Landscape Unit (LU14) TEM with Wildlife Interpretations (1997)		●	
SE Vancouver Island &Sunshine Coast	TEM of the Coastal Douglas-Fir Biogeoclimatic Zone (2008)	●	●	●
	Saltspring Island Provincial Parks TEM Conservation Assessment (2007)	●		in report
Thompson Plateau?	TEM of the TFL 35 Study Area (2001)	●	●	

Data Sets in BC

Dataset Name	Location	Scale	Completion Date	Status of TEM – SEI conversion table	Map showing a: extent b: sample
TEM Various projects	various	1:20,000 or 1:50,000	various	to be completed	Yes Yes
CDF-TEM	EVI area and Fraser Valley	1:20,000	Jun 2008	to be completed	Yes No
VRI	all BC	1:20,000	various	N/A	Yes Yes
SEI EVI	EVI and Gulf Islands area	1:20,000	Jun 1998 (disturbance mapping 2002)	N/A	Yes Yes
SEI Sunshine Coast	Sunshine Coast	1:20,000	Oct 2005	N/A	Yes Yes
SEI - Okanagan Valley (derived from TEM)	Okanagan Valley Vernon to Osoyoos	Mixed	Jul 2010	conversion completed	Yes Yes
TRIM II	?	1:10,000 – 1:20,000	?	N/A	?
EOSDmod (modified EOSD)	all BC	30m x 30m	2000	N/A	Yes Yes
CWB	all BC	1:20,000	various	N/A	Yes Yes