

Guidelines Respecting the Management of Impoundments on Prince Edward Island

May 14, 2009



Glenfinnan Pond, PEI



**Fisheries and Oceans
Canada**

**Pêches et Océans
Canada**



**Environment,
Energy and Forestry**

Table of Contents

- 1.0 Introduction
 - 1.1 Background and Objectives
 - 1.2 Impoundment Inventory
 - 1.3 Functions, Values and Impacts of Impoundments
 - 1.4 Challenges to Managing Impoundments and Associated Wetlands
- 2.0 Guidelines and Management Considerations for Impoundments on Prince Edward Island
 - 2.1 Applications for New Impoundments
 - 2.2 Management Guide and Best Management Practices for Existing Impoundments and Associated Wetlands
 - 2.3 Management Considerations for the Reconstruction of Impoundments
 - 2.4 Decommissioning
- 3.0 Glossary
- 4.0 Appendices
 - 4.1 Appendix I: Annual Inspection Reporting
 - 4.2 Appendix II: Reconstruction Project Criteria

The Minister of Fisheries and Oceans Canada and the Ministers of Fisheries and of Environment in the Province of Prince Edward Island signed a Memorandum of Understanding (MoU) to improve co-operation on Fish Habitat Management on September 26, 2002. The purpose is to promote increased co-operation between the two levels of government to manage fish habitat in Prince Edward Island efficiently, effectively and consistently.

The MoU established a management committee to implement the MoU and key activities and priorities. Priorities included improved coordination of work activities, efficient and timely decision making. The development of protocols that clarify organizational roles and responsibilities, and the processes and procedures to carry out activities was also a priority.

An initial activity identified was to update the Prince Edward Island Watercourse and Wetland Alteration Guidelines, while incorporating the national operating statements from Fisheries and Oceans Canada into the project activities. All key activities or works that would be considered for an alteration permit in or near water were described in this document, including a section on Impoundments.

In 1998, guidelines to manage impoundments on Prince Edward Island were developed in an effort to provide consistency and reduce the assessment period for proposals involving impoundments. Progress on this review was presented to the management committee and it was recommended that a scoping document be prepared co-operatively by staff of Fisheries and Oceans Canada, Prince Edward Island Department of Environment, Energy and Forestry and Ducks Unlimited Canada.

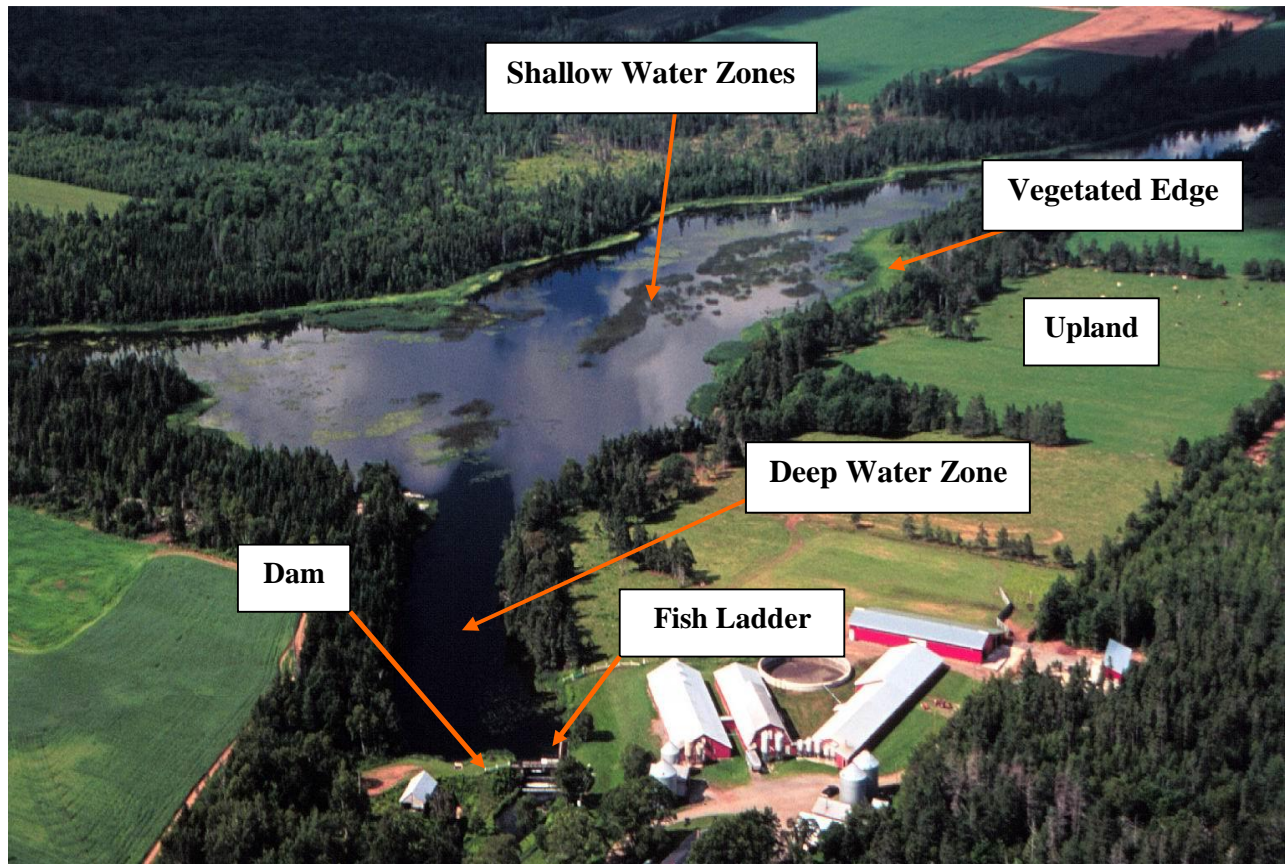
The 1998 guidelines were developed as a response to emerging issues regarding impoundments throughout Prince Edward Island. As issues varied from water quality concerns related to fish habitat to the value of these impoundments for recreation or other wildlife, an attempt was made to score impounded wetlands on fishery, productivity and community values scale.

Out of this initiative, a great deal public consultation was sought and a draft for an Impoundment Management Guideline was developed. This guideline document was vetted in its final draft form at a public meeting in April 1998. This draft became the reference document for regulatory agencies when applications were received for review, although it was never adopted in a more formal manner.

Although progress was made in developing this draft, the process involving three scoring systems was cumbersome and in the end did not definitively provide clear direction. Since 1998, a number of changes have occurred. First, there has been a shift in focus by conservation agencies from the construction of new impoundments toward the better management of existing impoundments. Many impounded wetlands are also approaching the need for re-construction or decommissioning and this was not dealt with in detail in the original guideline document. The regulatory agencies decided that there was a need for a revised guideline to respond to the current issues. The following document represents that effort and is expected to be considered and accepted by senior management as a reference document when considering applications for activities involving Impoundments on Prince Edward Island.

TYPICAL IMPOUNDED WETLAND

(Officer's Pond, Suffolk, PEI)



Prince Edward Island has a long history of constructing impoundments. European settlers impounded streams to harness energy to be used for the operation of saw, grist, woolen, and starch mills. Some were later used for small scale electrical generation. Impoundments were also built to provide a source of water for agricultural purposes. Regardless of the original purpose, the general public also valued most of these impoundments for recreational purposes such as hunting and fishing, or simply for aesthetic appeal.

Farm impoundment programs sponsored by the federal government through the *Agriculture and Rural Development Act* (ARDA) contributed to the creation of wetlands during the 1960's. Beginning in the 1970's, a number of privately owned millponds were at, or near, their life expectancy. Many were acquired by the Province to ensure public access to the wildlife resource associated with these ponds. With management rights to these pond sites, the Province replaced the wooden dams with concrete water control structures, often incorporating "drawdown" capability and fish passage facilities. Water depths were set to maintain habitat primarily for brook trout, waterfowl and other wildlife species. Ducks Unlimited Canada often partnered with the Province in these ventures through the 1970 – 90's.

There are two main objectives to the Guidelines Respecting the Management of Impoundments on Prince Edward Island.

- i. To develop a guide to assist regulatory agencies to assess man-made impoundments and the resulting flooded zones with the intent to manage these impoundments for the benefit of fish, wildlife and people within the context of watershed planning.
- ii. To provide a consistent standard for landowners and managers to manage impoundments on PEI.

Currently, there are approximately 550 impoundments on Prince Edward Island, of which 115 are managed, either solely or cooperatively, by the Province and/or Ducks Unlimited Canada. Impounded wetlands represent 6.4% of the total number of wetlands on Prince Edward Island and 11.9% of total wetland area on PEI, occupying approximately 3830 hectares.

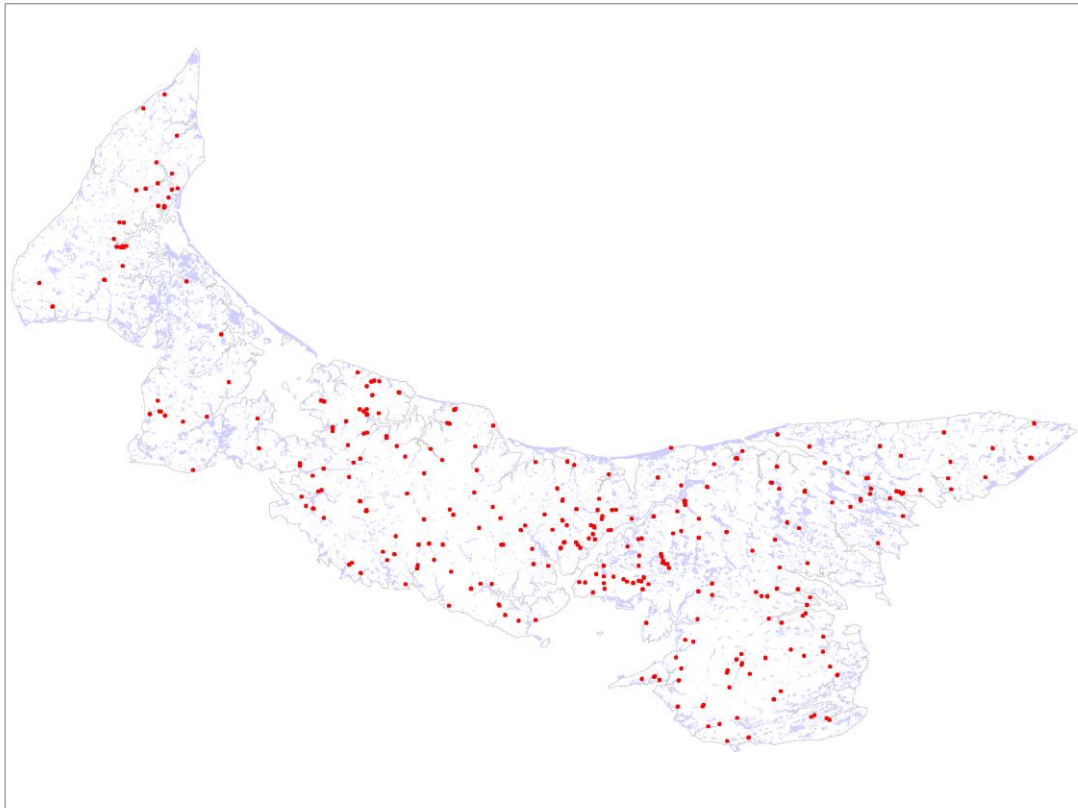
Wetlands in Prince Edward Island

Dominant Wetland Class	Number of Wetlands	Number of Wetlands in Size Range				Total Area (ha)
		< 10 hectare s	10 – 25 hectare s	25 – 75 hectare s	> 75 hectare s	
Salt marsh	1185	1021	105	49	10	6843
Open water	1427	1349	51	20	6	3647
Deep marsh	649	569	61	14	5	3263
Shallow marsh	361	349	9	2	1	666
Meadow	1562	1549	12	1	0	1930
Wooded or shrub swamp	1863	1701	116	39	7	8088
Bog	1506	1349	105	42	10	7834
Total	8553					32271



Scale's Pond, PEI

Map of Locations of Impounded Wetlands on Prince Edward Island



Typical Historical Impoundment Design

Wetlands are areas that are wet for part or all of the year. Wetlands are often referred to as ponds, marshes, swamps or bogs. Wetlands may be found in low areas and or depressions, but in other areas they may be found in high ground with steep slopes that may have poor drainage, or in high ground between stream drainages. Regardless of the location, the area must be wet long enough to alter soil properties and create biological changes. This provides a favorable habitat for plants that are capable of withstanding long periods of high moisture and will allow them to function as an organic and inorganic nutrient sinks. Ample water is a feature required for some plants to establish, while other plant species have adapted to year-round moisture, which can result in oxygen depletion at the water soil interface. Wetlands often provide an opportunity for plant species transition from land-based to aquatic plant species, and are often considered to be the most productive ecosystem on earth.

Ecological Functions

Wetlands can transform many of the common pollutants that are discharged from any watershed, and may be converted into harmless byproducts. Despite the depletion of oxygen at the benthic level, wetland ecosystems are likely to have a very high level of biological activity. There are several activities occurring within a functioning wetland including: sedimentation, photosynthesis, fermentation, nitrification, denitrification and microbial phosphorus removal. Some of these activities are physical, while others may be biological or microbial in nature, but all of them serve to reduce the impact of pollutants in the wetland area and any adjacent watercourses. Although wetland vegetation plays an important role, it represents only five percent of the utilization of incoming nutrients.

Wetlands have the capacity to convert these nutrients and byproducts from some upland activities into plant matter by collecting the energies from the sun and the biochemical reactions that occur within this environment.

Recently wetlands have been threatened by industrial, municipal and transportation demands encroaching on these areas to expand their interests. Unfortunately, the benefits of wetlands are not widely appreciated by all public sectors. Fourteen percent of Canada's land mass is comprised of wetlands found along the shores of rivers and along the banks of our oceans. Excessive inputs to wetlands may increase eutrophication and cause changes in water quality, limit habitats and limit biodiversity. Wetlands play an important role in the removal of pathogenic bacteria. This is achieved via a combination of factors such as; die off, temperature, UV light (sunlight), water chemistry, predation and sedimentation. Wetlands have been shown to provide removal rates of up to 80 to 90 % of pathogenic bacteria, but results may vary with abundance of wildlife in the area and input values.

Many of these processes are not well understood and wetlands have only recently been recognized for their capacity to treat industrial and municipal wastewaters. These treatment wetlands are now being developed as a way to polish wastewaters and domestic wastes. This technology has limits and may create biological oxygen demand (BOD) that can not be assimilated within a wetland. Wastewaters may come from sources that are untreated and contain very high sediment loads and can inundate the wetland, thereby interfering with its function. On Prince Edward Island, impoundments face unique conditions where extremely high levels of sediments and nutrients move

from upland areas into streams and deposit in impoundments.

The creation of an impoundment changes flowing water or “lotic” habitat to standing water, or “lentic” habitat. This change can have profound impacts on fish habitat. Impounding water increases the surface area exposed to solar radiation, thereby increasing summer water temperatures. When fish become stressed due to high water temperatures, they seek refuge in springs or areas of groundwater upwelling. High concentrations of fish in these refuge areas can leave fish vulnerable to angler harvest and mammalian/avian predation, and allow easy transmission of parasites, such as gill lice.

Some impoundments with high summer water temperatures experience periods of depressed oxygen levels, particularly in the lower regions of the water column. This may force fish to move out of an impoundment.

Water quality under ice cover can also be compromised in impoundments due to decreased photosynthesis under ice and decomposition of organic matter leading to oxygen depletion or anoxia and accumulation of toxic hydrogen sulfide.

The physical change from lotic to lentic habitat can also have negative impacts on salmonids. Issues with physical blockage range from impoundments without fish passage, the difficulty of designing fish passage for all species to the ongoing maintenance of the structure. The creation of an impoundment can destroy salmonid spawning areas.

Impoundments provide areas for sediment deposition. While this may

help to protect fish habitat downstream, the accumulation of sediment can adversely affect salmonid habitat and significantly shorten the life of the impoundment.

Fish and Wildlife Value

Impoundments constitute a significant portion of the high quality open water habitat in the province. Impoundments provide easy access to fishing areas for recreational angling for species such as brook trout, rainbow trout, and salmon. Other fish species which may be present in the wetland include American eel, rainbow smelt, gaspereau, white perch, and sticklebacks. Fish species are a food source for wildlife species within the area.

Impoundments are busy places, full of wildlife and activity. Common sites in these marshlands are dense stands of plants such as cattails and bulrushes. Other emergent plants characteristic of marshes include water arum, reeds, and sedges. Common floating and underwater plants include the water lily, duckweed, and pondweed. This lush vegetation provides food for countless numbers of creatures including mammals, birds and amphibians.

Wetlands attract a wide variety of animals, ranging from muskrats to diving beetles. These habitats provide prime breeding and rearing habitat for many species of birds, such as black ducks, pied-billed grebes and red-winged black birds. With the exception of a few freshwater wetland complexes located along the coast and beaver ponds located inland, most of the waterfowl that breed on Prince Edward Island (PEI) utilize impoundments. The change in our upland areas from forested to agricultural land along with the presence of impoundment has increased the numbers of wigeon, gadwall and mallard

species. A variety of other birds, such as songbirds (yellow rumped warbler), raptors (marsh hawk), and aquatic birds (great blue heron) are dependent on impoundments for nesting and foraging. In the absence of impoundments, PEI would be supporting far fewer aquatic birds.

Other wildlife also abound in these wetlands. Many amphibians rely on marshes for breeding habitat. Each year, several species of frog and salamander migrate by the thousands from their forest homes to marshes to mate and lay their eggs. The young hatch and mature in impoundments before returning to land as adults. Mammals such as muskrat, mink and red fox use these wetlands extensively.

Social Benefits

The impoundments created by the construction of impoundments in PEI watercourses have provided a variety of social benefits historically, and continue to do so today. However, the quality of some of these benefits has diminished over time. Many of the early impoundments were created for industrial or commercial purposes including agricultural use. Some were constructed primarily for the recreational angling of speckled trout. Regardless of the primary purpose, these areas often increased the biodiversity of the landscape by creating wildlife habitat, and secondary benefits to people, in addition to angling, included excellent opportunities for hunting and trapping. The impoundments also provided areas for recreational pursuits such as boating and bird watching in summer, skating and hockey in winter, and a ready supply of water for fire protection. All of these social benefits, combined with a pleasant and attractive scenic appeal, have led to a strong public identity with their local impoundment that remains today in many Island communities.

Structural Integrity

Early designers and builders often used earthen berms or wooden water control structures, or a combination of the two, and occasionally concrete was used. Modern engineering techniques were rarely used, and as a result, many of these structures were prone to and often did “wash out”. Provision for the movements of anadromous fish species was rarely considered and blocked access for these species to habitat upstream of the structure.

In the early part of the 1900’s, newer and more efficient technologies rendered most of these impoundments redundant, although many still remained useful by providing the secondary benefits noted above. By the 1970’s, the structural deficiencies of many of these impoundments became apparent and regulators began to require fitting engineering standards into new construction or repairs, where needed, to existing impoundments. Wooden water control structures were replaced with concrete structures, and these newer designs accommodated extreme flow events, and provision for fish passage was included where deemed necessary. Meanwhile, other impoundments were simply abandoned. During this period the Province and DUC often replaced existing impoundments or constructed new ones with more appropriate designs.

Internal Ecological Processes

Impoundments like natural wetlands, age through natural succession and are greatly influenced by upland land use. Processes such as erosion and sedimentation eventually infill the impoundment beginning in the upper sections and progressing toward the water control structure. This process of infilling is accelerated on PEI because of

the fragile soil structure. Sources of erosion and sedimentation include agricultural, highway, and forestry activities as well as development on commercial and residential lands. A large number of PEI impoundments are showing signs of accelerated aging and eutrophication. The impact of impoundments on water temperature and dissolved oxygen can be exacerbated with increasingly shallow water and excessive plant growth.

Watershed Planning

Impoundments need to be managed on a watershed basis and in context with provincial and federal legislation, strategies and plans. Impoundment management decisions should be based on the impoundments impact and benefits to the watershed and its overall contribution to the provincial fish and wildlife resources. To date, most planning decisions for impoundment management has been on a site by site basis without considering its overall impact in the watershed. This needs to change to include a more holistic review process. Current information and relevant documents should be consulted during any impoundment management planning process.

Guidelines Respecting the Management of Impoundments on Prince Edward Island
Section 2.0 GUIDELINES AND MANAGEMENT CONSIDERATIONS FOR IMPOUNDMENTS
ON PRINCE EDWARD ISLAND



Affleck's Pond, PEI



Hardy Mill Pond, PEI

Applications for new impoundments will be reviewed based on the wetland's impact on the watershed or sub-watershed as determined by the scope of the project. The scoping exercise will be considered on both the watershed and sub-watershed levels. The following criteria will be used to assess applications for new impoundments:

Location

New impoundments will not be permitted at the head of tide, in tidal waters or on associated salt marshes.

New impounded wetlands will not likely be permitted on second or greater order streams. New impoundments may be considered in areas on first order streams with ephemeral or low flow and where fisheries resources are unlikely to be negatively affected.

New impoundments may be considered for locations where the wetland may provide a significant ecological benefit to the sub-watershed or watershed (i.e. treatment wetlands, flood control).

Water Control Structures

All new impoundments must incorporate adequate fish passage for fish species that presently move through the proposed site, or that could be reasonably expected to do so.

Control structures must be designed with structural integrity, drawdown capabilities to the original stream bed elevation and capable of handling anticipated peak flows as determined by regulatory agencies.

Size of New Impoundment

For impoundments greater than 0.5 hectares, including open water and associated moist soil areas, the applicant must file an Environmental Impact Statement with the PEI Department of Environment, Energy and

Forestry specifically addressing the following points:

- Description and size of the direct zone of influence including existing vegetation, water source and elevations of the adjacent lands that will be flooded by the proposed impoundment.
- Description of watercourse upstream and downstream of the proposed impoundment.
- Description of the land use activities adjacent to and upstream of the proposed project.
- Copies of landowner agreements providing the wetland manager or owner permission to flood lands.
- A risk assessment must be prepared to evaluate the changes the impoundment will have on existing or new wildlife species including the fishery resource as a result of the proposed project.

On projects deemed by the regulatory bodies to be of significant size or complexity, the applicant may need to:

- Provide a statement of proposed maintenance and management activities.
- Post a performance bond of 25% of the project budget before construction to be held in trust by the PEI Department of Environment, Energy and Forestry. This is necessary if the project runs into financial difficulties. The regulatory authorities will use the bond to either complete the project or restore the site to the original condition.

The applicant must provide documentation that a public consultation was conducted (i.e. public meetings, open houses).

To ensure impoundments perform satisfactorily and do not threaten downstream resources, a proactive approach led by government and owners or managers of impoundments is needed. Many resource based agencies such as Agriculture and Agri-Food Canada, Fisheries and Oceans Canada, PEI Department of Environment, Energy and Forestry, and other provincial resource agencies are developing and using best management practices, operational statements and integrated watershed planning to achieve better results in resource management. This document will provide managers and landowners of impoundments with information and tools to better maintain their wetlands and will provide regulators with a benchmark to judge due diligence on the part of the landowner or manager.

Risk Assessment

Landowners and managers need to understand that impoundments require active management, monitoring and inspections and related water control structures in order to comply with a number of provincial and federal Acts such as the *Fisheries Act* and the *PEI Environmental Protection Act*. Many impoundments were built decades ago when construction of these wetlands was not extensively regulated. The result was the loss of many of these wetlands due to washouts because the structure was poorly designed or poorly constructed and/or ill-maintained. Even the impoundments that have remained intact over several decades require assessments to determine their lifespan, capability to withstand future intensive storm events, impact on water quality and fish habitat, and capacity to provide fish passage.

Assess Hydrological Capacity

A large number of existing impoundments may not have the capacity to facilitate anticipated high flows. Climate change is resulting in more frequent and intense weather events. Structures need to be assessed by an accredited professional to determine if impoundments and water control structures have the capacity and integrity to handle anticipated storm water flows.



Egolf's Pond, PEI

Inspections provided by an accredited professional will help to identify risks. In the past, annual washouts were often repaired without permit or consultation with regulatory agencies. An accredited professional is able to compute the minimum discharge area (expressed in square meters) to safely discharge the anticipated volume of water based on information including overall watershed size and the frequency and intensity of storm events.

Assess Capacity for Fish Passage

A large number of impoundments may not have adequate capacity to pass local fish species migrating up and downstream. Structures need to be

assessed by an accredited professional to determine if the structures have the capacity to facilitate fish passage for species expected to be present in the area. Structures that do not provide passage are likely to be re-designed or modified. Fish-ways are designed to allow certain volumes of water through or around an obstruction that can dissipate the energy within the structure and allow fish to ascend or descend with out undue stress. Some obstructions may affect certain species of fish or individuals within a population such as the weakest swimmers or fish of a certain size. These factors must be taken into consideration when re-designing or modifying a fish-way so that fish are able to pass through the structure.

Assess Impacts on Water Quality and Fish Habitat

Some impoundments can adversely affect water temperature and dissolved oxygen levels, both within the impoundment and downstream. Impoundments should be periodically assessed to ensure that water quality parameters remain within acceptable levels for all species of fish which utilize the area. These assessments should be carried out or supervised by a qualified professional.

Performing Preventive Maintenance

Annual inspections and record of inspections must be completed by landowners or managers to ensure the impoundment is intact and structural features are functioning. For an annual inspection report template, refer to Appendix I.

Minor damage to impoundments (i.e. caused by partial washouts, muskrat holes or slumping) need to be repaired by the landowner or manager.

Water control structures and fish-ways must be maintained and kept free of debris during high flow periods to prevent washouts and reduce the risk of creating a barrier to fish passage during times of significant fish migration (April through to July and from mid September to mid November).

For structures that are likely to be impacted with beaver debris, landowners or managers may need to consider preventive maintenance such as the installation of beaver leveler pipes or over flow structures.

Improving or Sustaining Wetland Productivity

Impoundments, like natural wetlands, move through a typical succession pattern from the time they are originally flooded. Wildlife managers typically try to maintain the impoundment at a state that is highly productive for wildlife which generally consists of a variety of plants distributed throughout the impoundment. This can be managed through the manipulation of water levels using water control structures.

On impoundments with the capability of variable water levels:

- i. In consultation with regulatory agencies, the normal operating level will be established with the landowner or manager.
- ii. Water level adjustments and drawdowns should only occur when there is a minimum negative impact to fish and wildlife and other resource users.

Management Activities Involving a Water Drawdown

There is no best time for a drawdown or de-watering of an impoundment, but depending on the intended outcome of

the drawdown there are times that a wetland manager should avoid. A drawdown is a significant event for an individual wetland, since the habitat is being altered from a wet environment to a dry land situation.

No matter what time of the year the drawdown occurs, some species of fish and wildlife or resource users may be negatively affected. The objective of the following section is to illustrate some of the considerations prior to selecting a drawdown date. Any water level alteration will require a permit issued by regulatory agencies. Landowners or managers should review the PEI Watercourse and Wetland Alteration Guidelines (2006) for detailed considerations on drawdowns and considerations for downstream resources and resource users.

Timing of Drawdowns

Winter drawdown (January– March)

Winter drawdowns are the most difficult to perform and should be avoided. Many species of wildlife (i.e., muskrat and beaver) have established shelter and species such as brook trout and a variety of amphibians have migrated into the wetland to over-winter. Drawing the water down at this time of the year may result in significant mortality of wildlife and fish species and may create hazards to human safety (i.e., shell ice).

Spring drawdown (April – June)

Early spring drawdowns are more advantageous than winter drawdowns since most wildlife can adjust by moving to adjacent waters or other wetlands. The majority of waterfowl nesting takes place from May-June so April drawdowns are more desirable than later spring drawdowns. However, if angling is a primary activity within the area, then a drawdown at the beginning

of fishing season in mid April should be avoided. One should also avoid an early spring drawdown if there has been significant salmonid spawning downstream from the structure. Drawing an impoundment down before young fish have emerged from redds can result in an influx of sediment which can smother salmonid fry.

Summer drawdown (July – Sept)

Drawdowns during this time period should be scheduled in September to avoid loss of habitat for a variety of birds that either nest in wetlands or whose young depend on wetlands prior to fledging. Drawdowns of more than three weeks during the summer months will promote the growth of vegetation and may allow invasive species such as reed canary grass and purple loosestrife to invade exposed mud flats.

Fall drawdown (October–December)

Early fall drawdowns are less disruptive to wildlife than in the late fall. Amphibians, fish and mammals may be able to relocate to other wetlands in October. Some species may suffer mortalities during cold weather in the late fall. If the wetland is used by hunters or trappers their activities will be affected by a drawdown.

Drawdown Frequency

The frequency of drawdowns depends on surrounding land use and the objectives of the impounded area, as determined by the impoundment manager or landowner. If the impoundment is subject to high levels of sediment filling the upper end and altering the incoming stream, then drawdowns may be required more frequently, up to once each five years. However, drawdowns should not be used as a substitute for poor land use practices. If high levels of sediments are

flowing into the impoundments, then steps must be taken to mitigate the issue.

Many impoundments in the province have not been drawn down since their original construction several decades ago. However, little research has occurred on PEI impoundments to determine the overall costs and benefits of performing drawdowns.

Length of Drawdown

The length of a drawdown depends on the overall result that the landowner or manager is trying to achieve. If the drawdown takes place in order to carry out maintenance work, then the water only needs be drawn off for a minimal amount of time to reduce impact to wildlife. If the objective is to manipulate or remove vegetation or accumulated sediments, then landowners should consult with experienced fish and wildlife managers and regulators before finalizing the watercourse / wetland alteration application.

Internal Management

Landowners can carry out a number of activities to enhance their wetland for wildlife use. Techniques such as island construction, placement of loafing logs, control of invasive species, and installation of nesting structures are activities that landowners or managers may wish to consider. Additional information may be obtained by consulting with trained professionals or the following websites: www.wetkit.net/ and www.hww.ca/.

There are also techniques which can minimize the impact of an impoundment on downstream water quality. For example, the use of a bottom draw mechanism can be used to draw water from cooler bottom depths, thus

preventing excessively warm surface water from moving downstream. Experienced fish and wildlife managers can provide expertise in planning or implementing such a strategy.

Impoundment Dredging or Excavation

Impoundments may become filled with sediments to a level where they do not look or function as originally intended. To address this issue, some landowners and managers have opted for very expensive techniques of excavating sediment from impoundment bottoms. These techniques come with some significant risk to the environment; therefore, excavation plans must be carefully developed in consultation with regulatory authorities. Additionally, the Province has a policy on impoundment excavation that landowners need to review before proceeding with plans.

In some situations these projects can be quite successful while others have yielded dubious results. Excavation is not a substitute for good land management. If the level of sediments entering the impoundment has not been reduced through sound land management, there is little value in excavating impoundments because they will rapidly fill back in.

All impoundments and associated infrastructure (i.e., earthen berm and bypass, concrete weir, wooden box or culvert) will age over time and may need to be re-built in order to ensure structural integrity or decommissioned. For the purposes of this guide, reconstruction of an impoundment or its water control structure is defined as an activity where the concrete, steel works, culvert, earthen berm or bypass channel needs to be replaced. Reconstruction does not include normal operational works such as baffle replacement, repairs to earthen berms due to damage such as muskrat activity, beaver leveler installation or debris removal from water control structures.

Where an impoundment washes out due to an under designed water control structure, regulatory authorities may require the landowner or manager to re-design the structure before issuing a permit to repair the impoundment. On washouts caused by poor maintenance practices, regulatory agencies may require the landowner or manager to provide a long term plan to ensure inspections and maintenance activities are completed at regular intervals.

The reconstruction of impoundments need to be assessed in the context of multiple federal and provincial Acts and programs that attempt to reduce the risk of negative impacts. The primary Acts in which impoundments on PEI are managed under are the *Fisheries Act* which is federal and the *Environmental Protection Act*, provincial legislation.

The *Fisheries Act* provides the legal basis for protecting and conserving fish and fish habitat. There are a number of habitat protection provisions within the Act. Section 20 provides the Minister with the authority to approve designs of

fishways. Section 35 is the key habitat protection provision which prohibits any work or undertaking that would cause the harmful alteration, disruption or destruction (HADD) of fish habitat, unless authorized by the Minister of Fisheries and Oceans Canada.

The *Prince Edward Island Environmental Protection Act* was enacted to protect and enhance the environment. It is through this Act, in Section 10, that landowners and impoundment managers must obtain permits allowing for the operation, reconstruction or decommissioning of impoundments.

In addition to these Acts, impoundments contribute to other programs and government priorities such as the *Migratory Bird Convention Act*, *Species At Risk Act*, *Wildlife Conservation Act*, Biodiversity Strategy, Drinking Water Strategy, Provincial Wetland Conservation Policy, and the Federal Policy on Wetland Conservation. PEI Tourism also lists impoundments as destinations for recreational activities. At the international level, Canada is a signatory along with the United States and Mexico on the North American Waterfowl Management Plan. This plan is delivered locally through the Eastern Habitat Joint Venture which PEI is a signatory and has funded the construction and management of impoundments on PEI. It is within this mix of legislation and programs that decisions must be made by regulatory agencies on the reconstruction of wetlands.

On projects where regulatory agencies have an expressed concern regarding fish passage, fish habitat either within the wetland or downstream, potential risk of washout, accumulated sediments

or other issues, the regulatory agencies working with the landowner or manager will assess applications for reconstruction considering the checklist located in Appendix II of this document.

When an impoundment has experienced a washout or is slated for reconstruction, it is an ideal time to consult with the public regarding management of the site. The applicant may be asked to consult with the public.

Proposals where the applicant can demonstrate that the project is of minimal environmental risk, submissions will be considered by regulatory agencies based on the following design and construction details.

Design Criteria

The reconstruction of a water control structure requires careful planning and the assistance of an accredited professional to develop construction plans to current standards. These plans will detail the following:

- i. the area and depths of the flooded zone
- ii. the residence time of the impoundment
- iii. ice and water forces on the structure
- iv. maintenance flow within the watercourse
- v. fish passage design
- vi. provision of fish passage during reconstruction
- vii. structural upgrades (i.e., drawdown capacity)

- viii. legal flooding rights / landowner agreements

Normal Operating Level

A description of the normal operation of the impoundment, noting the maximum drawdown and normal operating level (NOL) of the water control structure will be required. This would include a statement on the intended range of operating conditions and the likely consequences of operating outside of that range.

Sediment Accumulation

The rate of sediment accumulation and volume of material in the impoundment must be considered when planning management options such as drawdown or reconstruction works. A sediment control plan will be required by regulatory agencies prior to the commencement of work.

In situations where a manager of an impounded wetland determines that they wish to decommission an existing pond, they will apply to the PEI Department of Environment, Energy and Forestry for a watercourse alteration permit. The scope of the environmental assessment will reflect the site specific requirements and be determined in consultation with regulatory authorities. In general, the landowner or manager will provide the following information:

- i. a description of the direct zone of influence, i.e. dimensions of the footprint of the dam - water control structure, flooded areas, and

areas downstream

- ii. an assessment of impacts on the fisheries and wildlife resources
- iii. provisions to manage accumulated sediments that are likely to be transported downstream following decommissioning
- iv. a description of upstream land use,
- v. anticipated changes in water quality
- vi. the applicant may be asked to consult with the public

Accredited professional (within this document) is a person who holds recognized professional training in engineering, with valid membership in an engineering organization. This person will be able to provide signed, stamped drawings for reconstruction, rebuilds and decommissioning projects.

Impoundment (for the use of this document) refers to the volume of water that is retained behind a physical barrier.

Lentic to Lotic Ratio refers to the ratio of impounded surface area to the area of the flowing water. It has been shown that this ratio can be a yardstick in determining the suitability of an impoundment for fish, as water residence time, dissolved oxygen, and water temperature are affected by this ratio.

Wetland Classes

1. **Open Water:** Refers to wetland with water depths of one to three metres (3 to 10 feet), associated with any of the other wetland classes, but usually with deep or shallow marshes. Submergent and surface vegetation are dominant.
2. **Deep Marsh:** This class applies to wetlands with an average water depth between 6 in. and 3 ft. (10 cm. and 1 m.) during the growing season. Emergent marsh vegetation is usually dominant, with surface and submergent plants present in open areas.
3. **Shallow Marsh:** This class applies to wetlands dominated usually by robust or marsh emergents, with an average water depth less than 6 in. (15 cm.) during the growing season. Surface water may be absent during the late summer and abnormally dry periods. Floating-leaved plants and submergents are often present in open areas.
4. **Seasonally Flooded Flats:** This class applies to extensive river floodplains where flooding to a depth of 12 or more inches (30 cm.) occurs annually during late fall, winter and spring. During the summer, the soil is saturated, with a few inches of surface water occurring locally. Dominant vegetation usually is emergent, but shrubs and scattered trees may be present.
5. **Meadow:** This class applies to wetland dominated by meadow emergents with up to 6 in. (15cm.) of surface water during the late fall, winter and early spring. During the growing season the soil is saturated and the surface exposed except in shallow depressions and drainage ditches. Meadows occur most commonly on agricultural land where periodic grazing or mowing keeps shrubs from becoming established.
6. **Shrub Swamp:** This class applies to wetlands dominated by shrubs where the soil surface is seasonally or permanently flooded with as much as 12 in. (30 cm.) of water. Sedges are often the ground cover under shrubs with meadow emergents occupying wetter areas.
7. **Wooded Swamp:** This class refers to wetlands dominated by trees growing in a muck soil. The soil surface may be seasonally flooded with up to 1 ft. (30 cm.) of

water. Several levels of vegetation are usually present including trees, shrubs, and herbaceous plants. In mature wooded swamps, differences in elevation may result in pronounced micro-habitats (micro topography), where trees and shrubs occupy the drier areas whereas marsh emergents and ferns may occupy the ephemeral pools of standing water.

8. **Bog:** This class applies to wetlands where the accumulation of Sphagnum moss, as peat, determines the nature of the plant community. Young bogs commonly have floating peat mats that creep outward from shore over the surface of open water. *Picea mariana* and *Larix laricina* are typical tree species. *Chamaedaphne calyculata*, *Kalmia angustifolia*, *Sarracenia purpurea*, and *Eriophorum* spp. are characteristic plants found in bogs throughout the Northeast.



Glenwood Pond, PEI



Millvale Pond, PEI

Preventative Maintenance Reporting: Record of Annual Inspection**Impoundment:** _____**Date Inspected:** _____ **Inspected By:** _____**Obstructions**

Many impoundments have the potential to affect fish migrations. The most obvious situations involve an obstruction by which fish cannot pass. An obstruction does not necessarily have to result in a complete blockage of fish passage in order to have a significant effect on a population. Some obstructions may only affect certain species or individuals within a population such as the weakest swimmers or fish of a certain size. Physical obstructions (i.e. debris build-up on structures or screens) are the most common form of fish passage barrier, but other effects such as changes in water velocity can be just as significant. These situations are best mitigated by regular monitoring and maintenance of the site.

Structure	Obstruction at Site (Yes / No)	Action(s) Taken
Weir		
Fishway		
Spillway		
Trash Rack		
Bottom Draw		

*Please note that not all features listed above will be present at all locations.

Overall Assessment of Condition

Indicate the condition of the following features annually in April, August and November:

Component	Condition (Good / Fair / Poor)	Comments
Control structure		
Fishway Baffles		
Chutes		
Bottom Draw		
Safety Signs		
Safety Rails		

Water Level

1. Measure the actual depth from the top baffle of the fishway or from the top of fishway wall to the water's surface, just upstream of the baffles.
2. Measure the actual depth over the weir stoplog.

General Comments and/or Observations

Note: This review is an attempt to gather all relevant information so an informed and prudent decision can be made. There is no attempt to develop a numerical scoring system since value is typically arbitrary and weighing scores seldom reflects real life situations.

1. Does the impoundment provide fish passage for all species of fish that would be expected to migrate through this site?

If yes, move onto Question 2.

If no,

- a. List the species of concern and the overall limitation this obstruction has on the population of this fish within the sub-watershed and its larger watershed or on a provincial basis.
- b. Is there any way to mitigate or to improve on the current fish passage situation?

2. Is seasonal habitat for certain species of fish and wildlife within the associated wetland a concern?

If no, move onto Question 3.

If yes,

- a. Identify the species of concern and the limiting factors.
- b. What time of the year and how long do the undesirable conditions persist?
- c. State the magnitude of the habitat limitation in terms of the overall effect to the fish or wildlife population on a sub watershed, watershed or provincial basis.
- d. Is there any way to mitigate or improve habitat conditions for the species of concern?

3. Do the impoundment and associated wetland occupy a habitat type that is of concern to regulators?

If no, move onto Question 4.

If yes,

- a. Describe the habitat type that existed prior to the original impoundment being constructed. Identify what habitat or species are being displaced due to the existence of the impoundment and its associated wetland.
- b. State the magnitude of this concern by determining the area converted to an alternate habitat in context of the sub watershed, watershed or provincial basis.
- c. Is there any way to mitigate for the habitat conversion?

4. Have the impoundment and associated wetland trapped large quantities of sediments?

If no, move onto question 5.

If yes:

- a. Estimate the volume of sediments based on depth and area the sediments occupy.
 - b. What provisions will be made in the reconstruction plan to minimize the transport of sediments downstream?
5. Sediments suspended in watercourses typically settle out in impoundments. If decommissioning is being considered, are there sediment sources upland or sediment loads upstream from the impoundment that will move within the watercourse?

If no, refer to “Design Criteria”, “Normal Operating Level” and “Sediment Accumulation” in Section 2.3 for projects of minimal environmental risk.

If yes,

- a. Assess potential for negative impacts on downstream water resource users (i.e., public shellfish beds, commercial fisheries) and propose mitigation to minimize these impacts.

On projects where the habitat concern cannot be satisfactorily mitigated, regulatory agencies must arrive at a decision based on the scope of the issue as stated above in relation to the value of the impoundment and associated wetland as indicated by the following considerations:

1. What ecological role does this impoundment and associated wetland play within the context of the sub watershed, watershed or provincially based on:
 - a. Nutrient assimilation
 - b. Sediment removal
 - c. Bacterial die-off
 - d. Pesticide assimilation
 - e. Water storage
 - f. Biodiversity contributions
2. What economic value does this impoundment or associated wetland generate in relation to:
 - a. Tourism
 - b. Agriculture
 - i. Irrigation
 - ii. Livestock watering
 - c. Fisheries and aquaculture
 - d. Health and safety
 - i. Outdoor exercising
 - ii. Water source for fire fighting
 - e. Fur trapping
 - f. Bio-resources

3. Is there significant social value attached to this impoundment or associated wetland based on:
 - a. Historic value
 - b. Community or individual attachment
 - i. Aesthetics
 - ii. Education
 - c. Recreational value
 - i. Angling
 - ii. Hunting
 - iii. Skating
 - iv. Swimming
 - v. Wildlife viewing
 - vi. Hiking/walking