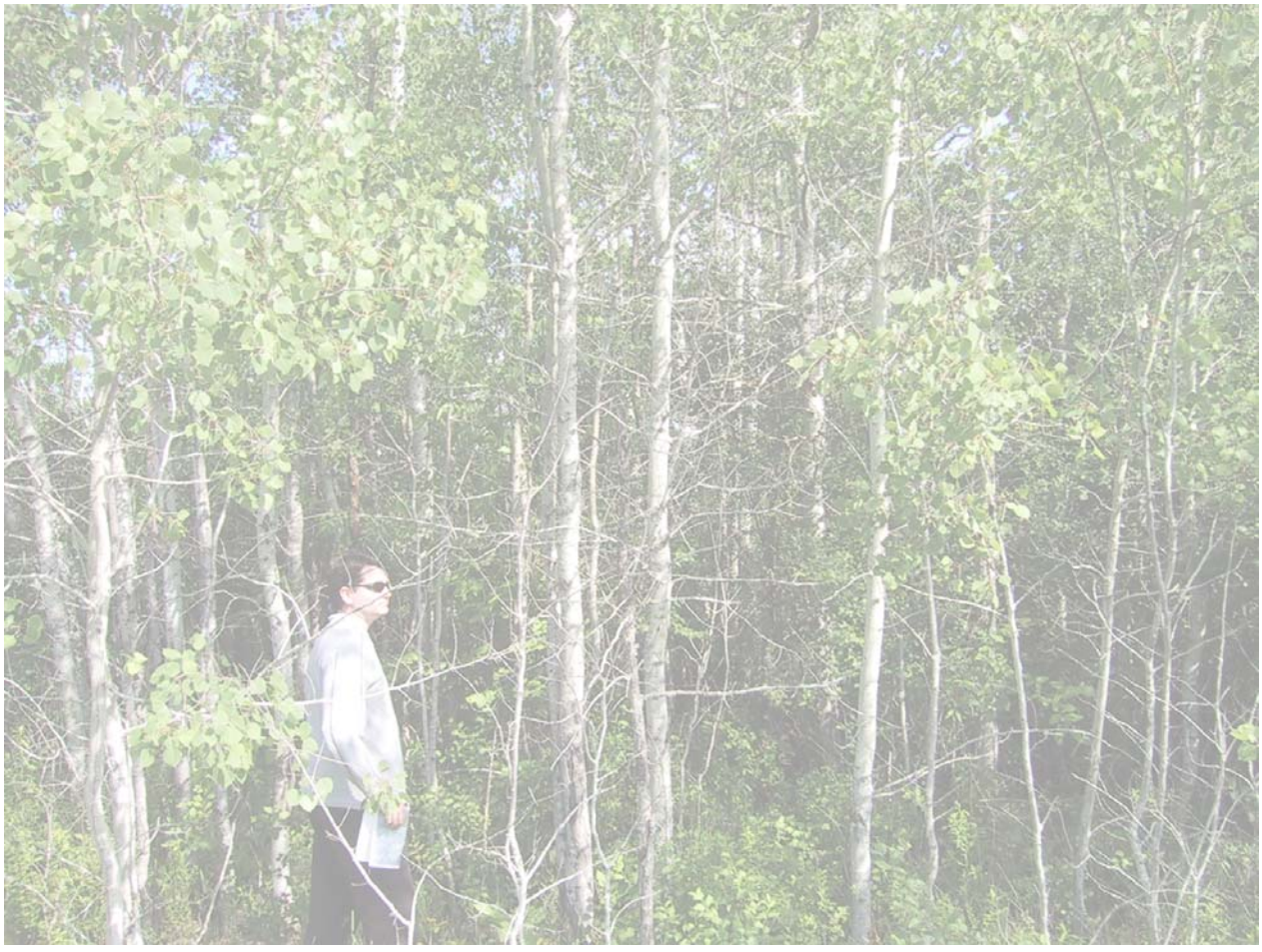
Owner's Environmental Management Manual



Merrickville Estates Subdivision
A Quality Country Living Community
Owner's Environmental Management Manual

This document is intended to provide residents of Merrickville Estates with valuable environmental management information relating to best management practices associated with protecting and preserving the Wolford Bog Nature Reserve, the watercourse corridors and the municipal nature park located in Phase 2.

One of the pillars of the quality country living philosophy of Merrickville Estates is being in touch with, and preserving nature. A key natural feature of the Merrickville Estates subdivision is the Provincially Significant Wolford Bog that exists to the south of Phases 2 and 3. All the way through the planning process associated with this community development project, and working with the Rideau Valley Conservation Authority (RVCA), an intentional effort was made to protect and preserve the Wolford Bog as a Nature Reserve. The RVCA has endorsed this environmental management approach.

As part of our Best Management Practices related to preserving the Nature Reserve, Merrickville Estates has imposed a 120 m "no-touch" buffer[1] along the lots which abut the Wetland. Don't worry, these lots are so large that there is plenty of building space for large estate homes and septic systems outside the buffer zone. The buffer zone is intended to ensure that no construction activities will degrade the Nature Reserve in any way, so that this important feature is preserved for passive recreational activities forever. All lots which overlap this 120 m wetland protection buffer have been zoned R-X, Residential Special. The land use designation R-X in the zoning By-Law establishes this no-touch requirement in law.

Equally important, are the water-corridors which flow towards the wetland, and the municipal nature park (between Lots 50 and 51) which connect the subdivision to the wetland. Both of these land reserves are municipal property, they provide eco-connectivity between human activity and the wetland, and are protected from alterations by all residents of the Municipality.

1 About the Wolford Bog Wetland

The provincially significant Wolford Bog Complex, is a grouping of two wetlands evaluated by the Ontario Ministry of Natural Resources (OMNR) in 1984/85 as provincially significant. The two wetlands are referred to as the "Wolford Bog Part 2" and the "Wolford Bog Part 3". The Merrickville Estates subdivision lies immediately north of Part 2 of the Bog which contains two wetland types: treed deciduous wetland which occupies 76% of the complex, with the remaining 24% an open water/marsh community.

[1] The no-touch concept implies there are certain prohibited activities as well as permitted activities that can occur in the buffer. Prohibited activities include clearing of vegetation, construction activity, installation of structures, site excavation, filling, etc. Natural improvements to the buffer are permitted and encouraged including native tree and shrub plantings, building of birdhouses, reptile refuge, etc. Consultation with the RVCA should be made for any activity that is planned for the 120 m buffer zone.

The Wolford Bog Complex includes the Merrickville Bog that is a large, diverse wetland with extensive open and treed domed bog communities. It is home to many plants and animals including the provincially significant Pied-billed Grebe and Southern Arrowwood and harbours a regionally significant deeryard. The wetland contains the most extensive bog areas seen in the Smiths Falls Limestone Plain and are the most important features to be protected. In addition to the bog communities there is a range of most other wetland types present including considerable mixed and coniferous swamp. For these reasons and others, it is recognized as both a provincially significant Life Science Area of Natural and Scientific Interest and a Wetland.

2 About the Merrickville Estates Site

2.1 Introduction

Merrickville Estates is a new subdivision on approximately 67 hectares of land, 1.5 kilometres southeast of Merrickville. It resides just north of lands known as the Wolford Bog Part 2. This wetland is considered to be provincially significant; as such, planning authorities are required to have regard to its natural heritage value.

Ecological Services was retained by Merrickville Estates to prepare an Environmental Impact Statement (EIS) to assess the potential environmental impact of the proposed land use. The EIS was primarily intended to assess the potential impact of a residential subdivision adjacent to the wetland, but the site was also examined for the presence of other natural heritage features. This section of the Owner's Manual contains valuable information from the original EIS as prepared in October 2004.

2.2 Provincial Planning Policy

The Provincial Policy Statement (PPS), issued under Section 3 of the *Planning Act*, came into effect in 1996. Policy 2.3 requires that municipalities consider natural heritage features in assessing development proposals.

In accordance with provincial policy for the protection of significant natural features, no development is to occur within that portion of the provincially significant Wolford Bog Wetland Complex located in the Merrickville Estates Subdivision. Furthermore, a 32-acre Nature Reserve has been created in the wetland, whose ownership has been transferred to the Rideau Valley Conservation Foundation for permanent stewardship.

2.3 Site Description

The subject property is located approximately 1.5 km southeast of Merrickville. South of Phases 2 & 3, the site is characterized by a dense growth of woody swamp vegetation, which is part of provincially significant Wolford Bog wetland complex (Brownell 1999).

An ecological land classification (ELC) system has been developed for Ontario (Lee *et al.* 1998), which allows a "consistent description, classification and mapping of ecological land units in southern Ontario." The site was mapped with this ELC system, and the resulting map depicts

the patchy site, with its upland areas that have been abandoned from agricultural use, areas of forest and swamp wetland to the south of Phases 2 & 3.

The majority of the property is classified as Cultural Meadow (CUM 1-1, after Lee *et al.* 1998). Cultural sites have 60% or less tree cover, often with a large proportion of non-native plant species; CUM 1-1 is described as an Old Field Meadow Type and has 25% or less cover in trees or shrubs. The old-field habitat on this site is typical of lands that are recovering from past agricultural land use, with low biological diversity and many non-native species.

Portions of the site are classified as Cultural Thicket (CUT 1, after Lee *et al.* 1998). These sites have 25% or less tree cover, but 25% or *more* shrub cover. These areas are contiguous with the CUM areas, and often grade into them. These portions of the site may have had a longer period of recovery from agriculture, may represent areas that were less heavily impacted by agriculture, or may lie in closer proximity to seed sources of shrubs.

In the extreme north-western part of the subject property, a small area of Cultural Savannah (CUS 1-2, after Lee *et al.* 1998) was observed, where tree cover (primarily White Cedar) was slightly denser.

Forested lands are also found on the property. Forest sites have 60% or greater tree cover; Coniferous Forest (FOC) is characterized by a canopy of over 75% coniferous tree species. A band of Coniferous Forest (FOC 4-1, after Lee *et al.* 1998) was a forest dominated by White Cedar, forming a dense band along the wetland boundary on much of the site. FOC 2-2 is another coniferous forest type dominated by White Cedar, but with the additional presence of White Spruce.

Portions of the site are classified as Deciduous Forest (FOD, after Lee *et al.* 1998). Deciduous forest (FOD) is characterized by a canopy of over 75% deciduous tree species. Here, the northeast corner of the site was FOD 5-1, or a deciduous forest type dominated almost entirely by Sugar Maple.

Finally, a small portion of the site is classified as Mixed Forest (FOM, after Lee *et al.* 1998). These areas are characterized by a mixture of deciduous and coniferous tree species (over 25% of each in the canopy).

The wetland portions south of the subdivision were not classified according to Lee *et al.* (1998), as development is not proposed to intrude into the wetland. Where the edge of the wetland was examined, however, it was primarily Coniferous Swamp (SWC1, after Lee *et al.* 1998), dominated by White Cedar, with some areas of Deciduous Swamp (SWD, after Lee *et al.* 1998). These observations are consistent with the wetland mapping (Brownell 1999), the external boundary of which, as defined by the Ministry of Natural Resources (Thompson, personal communication) appears to be fairly accurate.

An area of Swamp Thicket (SWT 2-2, after Lee *et al.* 1998) was found associated with a drainage course that bisects the property. This willow-dominated area had water in a sometimes ill-defined channel. Where it could be measured, water depth was approximately 2 cm, over a bedrock substrate; it is assumed that water depths may be greater in the dense willow areas. The channel flows east across the property into a dense coniferous forest and thence into the

Wolford Bog. The channel has the potential as fish habitat and must be considered as contributing to fish habitat.

2.4 Discussion

The primary natural heritage feature on the subject property is the Wolford Bog. As a provincially significant wetland, the PPS permits no development within the wetland, and allows development and site alteration on adjacent lands only if it has been demonstrated that there will be no negative impacts on the natural features or on the ecological functions for which the area is identified.

In developing the current subdivision, Merrickville Estates has considered several development concepts. The final master plan proposes no development within the wetland. It proposes a number of deep lots that contain land within 120 metres of the wetland boundary, (lands considered to be "adjacent lands" as referenced in the Provincial Policy Statement). Of the eighteen lots that intrude into adjacent lands, the average lot size is 14,309 m^2 (1.4 hectares or 3.4 acres). Each of these eighteen lots has some portion within the 120 m buffer area and some portion outside the buffer. For the above noted lots, no development and site alteration is permitted within 120 metres of the wetland boundary.

3 We Need to Protect these Natural Features

It is a requirement that all residents of the Municipality (not just residents of Merrickville Estates) understand our environmental and legal responsibilities towards protection of the wetland, watercourse-corridors and nature parks, and that we all contribute to the long terms health and safety of these natural features. It is for this reason, that this Owner's Manual has been provided to you, and we hope and expect that all members of our community will unite towards achieving the goals as stated herein. Owners should also be aware that the Rideau Valley Conservation Authority administers a "Development, Interference with Wetlands & Alterations to Shorelines & Watercourses" regulation pursuant to Section 28 of the Conservation Authorities Act of Ontario which is intended to ensure that development activities which could adversely affect the hydrologic function of the wetland will not be undertaken. The prior written permission of the Conservation Authority is required prior to any interference with the wetland or the lands immediately adjacent to it (120 metre adjacent lands). The regulations came into effect May 01, 2006.

To help understand the importance of these natural features and how to preserve them, 3 reference documents are attached which provide an overview of wetlands and means to protect them. These documents are:

- Working Around Wetlands? What you should know
- Rural Wetlands in Ontario, A Guide for Landowners
- Wetlands and Woodlots

These are all excellent reference documents that all Merrickville Estates residents and landowners should take the time to read, to understand why the 120 metre no-touch buffer has been established to protect the Wolford Bog Nature Reserve, and why a no alteration policy is to be enforced along the watercourse corridors and in the nature park.

4 Tertiary Treatment Septic Systems

Finally, we can all add value to our community by investigating the benefits of construction of Tertiary Treatment Septic Systems, instead of conventional septic systems. Tertiary systems provide advanced levels of biological decay resulting in cleaner leachate to the environment. The additional costs of these systems over conventional systems are minimal. The leachate beds are also smaller in size, compared to conventional beds. Merrickville Estates promotes the use of this technology, as it is in keeping with the project objectives; A quality country living community for all residents of Merrickville.

Let's jointly protect and enjoy this important natural features forever which will add long term value to our quality country living community.

For further information, please contact:

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Rideau Valley Conservation Authority
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Manotick, ON
K4M 1A5
692-3571
www.rideauvalley.on.ca

Reference Document

Working Around Wetlands? What you should know

Reference Document

Rural Wetlands in Ontario, A Guide for Landowners

Reference Document

Wetlands and Woodlots

Reference Document

Working Around Wetlands? What you should know

The Great Lakes Wetlands Conservation Action Plan (GLWCAP) is a partnership commitment between federal and provincial governments, and non-government organizations to establish a coordinated and comprehensive wetlands conservation program for Great Lakes wetlands.

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Throughout the world many different names are used to describe wetland areas. Marshes, swamps, bogs and fens are the types of wetlands found here in Ontario.

Characteristics of Wetlands Found in Ontario

Marshes
- Non-woody plants – rushes, reeds, cattails, sedges, water lilies, coontail
- Pondweed in open water areas
- Shrubs – sweetgale and red osier dogwood may be growing in drier areas
- Periodically or permanently flooded, usually open water areas
- Rare in some areas of northern Ontario

Swamps
- Woody plants – mostly trees (white cedar, tamarack, black spruce, silver and red maple, black ash) and/or shrubs (willow, dogwood, alder, and winterberry)
- Periodically or permanently flooded
- Often no standing water in mid to late summer

Bogs
- Predominantly sphagnum moss, sometimes low shrubs, sedges, also sundews, and pitcher plants
- Possibly black spruce trees in drier areas
- Depressions with stable water levels provided by rainwater or snowmelt
- Acidic (Peatlands)
- Rare in southern Ontario

Fens
- Predominately sedges, also mosses, grasses, reeds, low shrubs, sundews, pitcher plants and bladderworts
- Trees, when present, usually cedar or tamarack; usually where groundwater discharges to the surface
- Rare in southern Ontario (Peatlands)

Wetlands provide a variety of benefits.

Ecological Functions and Other Benefits of Wetlands

- Provide important habitat for a wide variety of wildlife species, including amphibians, reptiles, mammals, migratory birds, and waterfowl, and may also provide habitat, spawning and nursery areas for fish.
- Afford essential habitat for some of our rarest plants and animals, including Small White Lady's-slipper Orchid, Swamp Rose Mallow, Spotted Gar, Fowler's Toad, Wood Turtle, Spotted Turtle, Least Bittern, and Prothonotary Warbler.
- Protect shorelines from erosion by flowing water and wave action.

Ontario Ministry of Natural Resources

Many wildlife species use wetlands for habitat.

- Trap moderate amounts of soils running off nearby uplands before they enter lakes and streams.
- Maintain and improve water quality by filtering contaminants and excessive nutrients.
- Renew groundwater supplies.
- Help to control flooding and reduce flood damage.
- Provide a source of economically valuable products such as fuel wood, timber, animal pelts, wild rice, cranberries, and commercial fish.
- Support recreational activities including fishing, hunting, nature appreciation, bird watching, walking and hiking.
- Provide opportunities to participate in outdoor educational activities and to enjoy the aesthetic qualities of wetlands.

Planning Work in or Around Wetlands?

When considering a project, it is important to remember that the essential physical, chemical and biological processes of wetlands are varied and complex. Wetlands have different functions throughout a watershed, all of which are needed to maintain healthy lakes, rivers and

- Avoid areas used by spawning fish, breeding amphibians, nesting birds, and other wildlife for rearing young.
- Harvest wetland resources or resources on nearby lands in a sustainable manner.

Getting Started

As a landowner with a very special habitat, it is important to think about the effect your activities may have on wetland areas. Careful planning is essential. Also, consider your neighbours and the effect that your project may have on their property.

If you are planning a major undertaking, seek expert advice. Many sources of technical assistance are available from a variety of agencies and programs. Start by contacting your Local Stewardship Council, the Landowner Resource Centre, or one of the many agencies listed at the end of this brochure (see 'Sources').

Landowners may be eligible for tax rebates or other financial incentives for protecting, enhancing and maintaining wetland areas on their property. Some programs require that wetlands be evaluated by trained evaluators to determine if the site can be designated as provincially significant or certified under a new federal program for ecologically sensitive lands. For further information contact your local Municipality, Ontario Ministry of Natural Resources or Environment Canada office. Long-term management agreements with agencies such as Ducks Unlimited Canada, Wildlife Habitat Canada and others can also provide financial benefits to landowners.

Considerations When Working Around Wetlands

Wetlands in Urban Areas

Although wetlands cannot function independently from surrounding land uses, even in heavily populated areas healthy wetlands can be successfully maintained and enjoyed. To minimize disturbances to vulnerable wetland areas on or near your property, it is beneficial to create or enlarge an adjacent upland habitat area with a buffer.

Consider letting as much as possible of the area close to the wetland return to its natural state. Letting it regenerate will provide a variety of native plants that are not only visually appealing, but more importantly, provide a diversity of habitat for many wildlife species. Buildings, cleared areas, lawns, and gardens should be as far away from wetlands as possible to minimize disturbance. Delay mowing upland areas until mid-July so that nesting waterfowl and other birds can rear young.

Since the balance of water in a wetland is critical, ensure that changes to the surrounding area do not cut a wetland off from its sources of water. Also, make sure that water draining off your property into the wetland is of good quality and does not contain pesticides, fertilizers, salt, or other pollutants.

Wetlands in urban areas provide many opportunities to experience nature and to appreciate wildlife. Excessive human use, however, can damage fragile wetland ecosystems. Keep in mind that your family pet may be a potential threat to wildlife species, particularly during sensitive nesting or breeding times.

Suggestions...

- Maintain natural vegetation in wetlands, nearby uplands and buffer areas. Leave dead trees standing and avoid mowing to the edge of wetlands.
- Restrict use of fertilizers and pesticides.
- Do not dump lawn cuttings and other garden waste in wetlands. Consider using a backyard composter instead.
- Birdhouses or nesting boxes suitable for wetland dependent cavity nesters may compensate for limited nesting cavities. Ensure that these are properly maintained and equipped with predator guards.
- Keep pets on a leash in wetland areas.
- If nearby wetlands are used for public recreation, limit the impacts of your activities and stay on established paths.

Wetlands in Rural Settings

It is possible to improve wetland areas while still meeting farm business objectives. Many wetland improvements can be done at relatively low cost, are eligible for financial assistance and can ultimately benefit agriculture.

Barry McCullough

A buffer of trees between the farm field and marsh protects the wetland.

Some agricultural practices may negatively impact nearby wetlands. For example, poorly designed water crossings and over cultivation can enhance soil erosion. Eroded soils can increase turbidity in water, damage vegetation, cover fish spawning areas, and damage wildlife and waterfowl habitat. Loss of soil cover can also decrease agricultural productivity. Further, improper use of pesticides and excessive fertilization can also affect water quality. It is advisable to establish or maintain buffers around wetlands and nearby uplands. As well as providing valuable wildlife habitat and corridors and protecting wetlands from surrounding land uses, buffers can filter some eroded soils, pesticides and fertilizers before they reach the wetland. Buffers further benefit farmers by sheltering crops, providing windbreaks, reducing soil erosion, and protecting livestock.

If possible, agricultural drains should be maintained when flows are low. Try to avoid times during spring and autumn that are critical for bird nesting or fish spawning. Keeping soil on the land is one of the best ways of reducing the need for drain maintenance. Planting and maintaining vegetation along drain banks will improve bank stability.

Although many wetland areas have been converted to agricultural uses, these may be difficult, unproductive, or unprofitable to farm. In some situations there may be more value in restoring wetlands to their natural state. Further information is available from the Ontario Ministry of Agriculture, Food and Rural Affairs in the Best Management Practices – Fish and Wildlife Habitat Management booklet.

Suggestions...

- Restrict or eliminate livestock access to sensitive wetlands through the use of fencing, or by densely planting selected trees and shrubs to form a barrier. Living fences are attractive and offer cover and habitat for many species of birds and other wildlife.

- Establish or maintain buffers around wetlands and do not cultivate or mow right to the edge.
- Consider installing alternative watering devices for livestock to limit access to streams and wetlands. The benefits to water quality and livestock health are well worth the relatively low cost investment.
- Install properly designed water crossings, using only recommended materials such as concrete culverts and gravel. Asphalt paving or old metal drums should not be used in or near the water. Permits may be required from the Ontario Ministry of Natural Resources for construction of water crossings.
- Use conservation tillage techniques and grazing management systems.
- Delay haying and install flushing bars on tractors to protect ground nesting birds from injury.

Water Diversion and Control

Presence of water throughout much of the year is the most critical factor in maintaining a wetland. Changes to water depth and length of wet or dry conditions may have profound effects on wetland function. Apart from destroying habitat, draining wetland areas lowers the water table, and can increase downstream erosion and flooding which can affect other landowners.

Water level control may benefit wetlands.

The use of water level control structures may be beneficial to wetlands in certain circumstances. Occasional drawdowns help to recirculate nutrients and provide temporary mudflats for shorebirds. Maintaining constant water levels during winter benefits muskrat, fish and amphibian populations. Increased flooding to a marsh may create open water areas which encourages the growth of a diversity of aquatic plants and provides habitat for waterfowl and other wildlife. These activities may also provide ideal conditions for invasion by exotic species such as

purple loosestrife, so caution is warranted. Since each wetland is unique, changes should not be made without expert guidance.

Additional information on farm water management can be found in the following Best Management Practices (BMP) booklets available from the Ontario Ministry of Agriculture, Food and Rural Affairs: Water Management; Fish and Wildlife Habitat Management; and, Irrigation Management. Please note that permits are required from the Ontario Ministry of Natural Resources for stream diversions, enclosures, dams, weirs, channelization, and pond creation.

Suggestions...

- Maintain the existing balance of water in a wetland.
- Install water level control structures, such as berms, low-flow weirs, dams, and beaver bafflers in appropriate situations to ensure consistent water levels or periods of drawdown.
- Before making any changes, seek advice from your local Stewardship Council, Conservation Authority, Ontario Ministry of Natural Resources, or one of the many agencies listed under 'Sources'.

Some wetlands do not appear wet year round.

Best Management Practices - Fish and Wildlife Habitat Management

Harvesting Wood Products

Wooded swamps can, if carefully managed, provide a continuous supply of wood products including fuel wood and cedar posts. Although many tree species normally used for sawlogs do not grow well in wet soils, some hardwood species adapted to wetland areas can furnish timber products.

Many transitional habitats or marginal agricultural lands, including seasonally flooded wetlands, can be reforested. The selection of appropriate tree species will depend on soil and drainage conditions. The continuous presence of surface water, however, usually favours the growth of shrubs and emergent aquatic plants and may be harmful to the survival of tree seedlings.

open water areas. Any mechanical method may be used to remove aquatic plants providing you do not dredge; however, it is usually only a temporary solution lasting a single season. Avoid the use of herbicides in the water. Use of these chemicals requires an approval from the Ontario Ministry of Environment and Energy. Keep in mind that any plant removal will affect the wetland and its wildlife. Ask yourself if there is some other way of solving the problem, and preventing future problems.

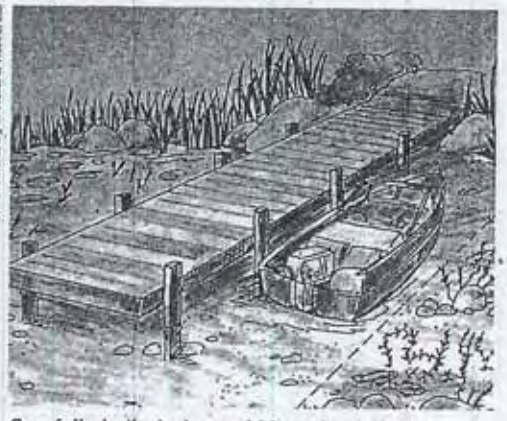
Removal of some aquatic plants may benefit wetlands.

Suggestions...

- Ensure septic systems are functioning properly, reduce the use of fertilizers, carefully time the application of fertilizers, and reduce agricultural runoff. This decreases the amount of nutrients entering the wetland.
- Physical removal, such as hand pulling or raking is one of the most environmentally sound methods to control aquatic plants.
- Be sure to remove all of the aquatic plants from the water otherwise they may root again. Moreover, dead aquatic plants will decompose and remove oxygen from the water.

Constructing Docks and Boathouses

Many wetland areas bordering lakes and streams are used for fishing and boating. Care should be taken to ensure that structures built for these activities do not harm fish and wildlife habitat. Docks and boathouses should be carefully planned, built and located. Solid foundations should be avoided since they impede the movement of fish, destroy aquatic plants, disturb underwater sediments, and destroy wildlife habitat including critical fish spawning areas. A work permit is required from the Ontario Ministry of Natural Resources for the construction of any solid structures in the water.


Ontario Ministry of Natural Resources

Carefully built docks avoid harming habitat.

Suggestions...

- Seek expert guidance on timing of construction and site selection to avoid disturbing wildlife, and to avoid placing structures in spawning or nesting areas.
- If docks and boathouses must be situated at the edge of wetland areas, cantilevered, floating and post-supported structures are preferred. This type of structure may actually improve fish habitat by providing shelter and shade. Be careful when selecting wood products since many wood preservatives and building materials can impair water quality. Use metal, plastic, or untreated wood such as cedar, for any part of a structure that will be in the water.
- Boathouses with a marine railway setup which raises and stores boats out of the water are preferred. Construct boathouses above the high water mark taking care to ensure that excavated materials do not disturb wetland areas.

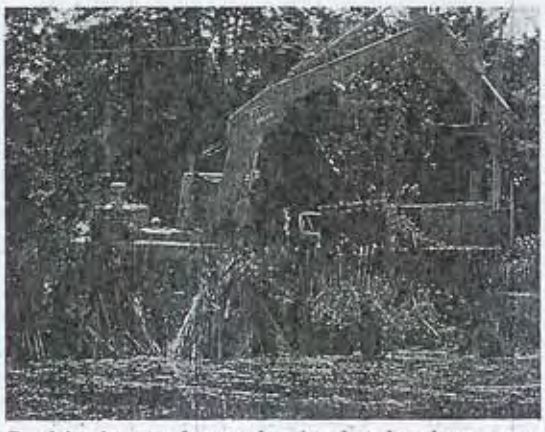
Dredging

Removing soil, gravel or rocks to improve boat access or to deepen open water areas in wetlands can destroy important fish and wildlife habitat. Additionally, dredging can release contaminants that have settled in wetland sediments, adversely affecting water quality. Dredging is generally not favoured because this technique provides only a temporary solution and can cause environmental damage. However, carefully dredged channels sometimes do provide important deeper water habitat for waterfowl and other wildlife. Permits are required from the Ontario Ministry of Natural Resources for most dredging activities.

Suggestions...

- Consider other alternatives and keep the amount of dredging to a minimum. A boat channel should be no wider than six metres.
- Try not to disturb wetland plants and avoid areas used by fish and wildlife for reproduction, rearing young, or cover from predators.

- Avoid dredging activities on windy days or during fish spawning seasons.
- Since dredging may increase sedimentation downstream, the careful use of a silt screen is recommended to contain sediments suspended during dredging operations.
- Additionally, since dredged soils may release contaminants and fine dredged materials may wash back into the water, removed materials should be suitably contained on land above the high water mark.



Ontario Ministry of Natural Resources

Dredging is not a favoured option, but does have some applications.

Filling (Not recommended)

Filling a marsh, swamp, bog, or fen is strongly discouraged because it destroys wetland function and may result in the loss of important fish and wildlife habitat. It can also increase downstream flooding by reducing water storage in the floodplain. Filling a wetland could be a violation under the habitat provisions of the Canada Fisheries Act. For further information and to determine if you require a permit, contact your local Ontario Ministry of Natural Resources office.

Sources of Further Assistance

Depending on the type of project, you may wish to contact one or more of the following agencies.

Landowner Resource Centre LRC
Information on resource management, referrals to other agencies. In 613 area 1-800-387-5304; elsewhere 613-692-2390.

Local Stewardship Councils
Promote the wise use of soil, water, woodlands and other natural resources through partnerships between landowners, community, and resource organizations. Check your local phone book.

Ducks Unlimited Canada DUC
Advice and financial support for restoration of wetlands with significant waterfowl value. 705-721-4444.

Wildlife Habitat Canada WHC
Landowner contact representatives, wetlands restoration planning assistance, conservation agreements, wetland securement. 613-722-2090.

Eastern Habitat Joint Venture EHJV
Support and funding for wetland protection and restoration in partnership with federal and provincial governments, DUC, WHC, and the Nature Conservancy of Canada.

The Ontario Federation of Anglers and Hunters OFAH
Information, educational materials on habitat enhancement and recreational activities in wetlands. 705-748-6324. Invading Species Awareness Program in partnership with OMNR 1-800-563-7711.

Federation of Ontario Naturalists FON
Educational materials on wetland conservation, nuisance species. 416-444-8419.

Environment Canada DOE
Information on habitat restoration techniques and federal tax credits for donations of ecologically sensitive lands. Check the blue pages of your local phone book.

Ontario Ministry of Natural Resources OMNR
Work permits, wetland evaluation, information on fish, wildlife, and wetland habitat protection and management. Check the blue pages of your local phone book.

Ontario Ministry of Agriculture, Food and Rural Affairs OMAFRA
Farm drainage, best management practices. Check the blue pages of your local phone book.

Ontario Ministry of Environment and Energy OMOEE
Permits for water taking and chemical weed removal, information on ground water impacts, environmental assessment (EA) process. Check the blue pages of your local phone book.

Local Municipality
Local municipal planning and bylaws, natural heritage policies including wetlands policy, and environmental protection policies. Check the blue pages of your local phone book.

Ontario Ministry of Municipal Affairs and Housing OMMAH
Planning Act, natural heritage policies including wetlands policy. Check the blue pages of your local phone book.

Local Conservation Authority CA
Water supply and flood control, dredge and fill rules. Support for some habitat improvement projects. Check the blue pages of your local phone book.

Unravelling the Red Tape

Many activities that are beneficial to wetlands do not require approval or permits. However, there are a number of laws and policies that may potentially apply to work in wetland areas (see below). Unfortunately, the complexity of laws and policies, levels of government, and different types of activities, make it impossible to give specific advice that will apply in all situations. Also, regulations and policies are continually reviewed and revised. Landowners planning work in or around wetlands in Ontario are encouraged to ask first whether their project will require approval or permits. Remember to check on any requirements before beginning any work around wetlands to avoid possible penalties and to ensure conservation of the resource. One or more of the many agencies previously listed under 'Sources' will help you to determine what requirements currently apply.

Some Relevant Legislation

Law/Policy	Contact	Protects or Regulates
Canada Fisheries Act	OMNR/Fisheries & Oceans Canada	Fish and fish habitat. Prohibits work that results in harmful alteration or destruction of fish habitat.
Conservation Authorities Act	Local Conservation Authority/OMNR	Flood plain areas. Work in watersheds and flow of floodwaters.
Drainage Act	OMAFRA/OMNR	Land drainage and drain maintenance. Work on drains must not result in harmful alteration of fish habitat nor destroy fish or fish eggs.
Endangered Species Act	OMNR	Endangered plants, and wildlife.
Environmental Protection Act	OMOEE	Discharge of contaminants and emissions.
Game and Fish Act	OMNR	Fish and wildlife. Regulates access to fish and wildlife resources through licensing.

Lakes and Rivers Improvement Act	OMNR	Alterations to lakes and rivers. Requires approvals for any work that forwards, holds back or diverts water, such as channelization, pond creation/by-pass, dams, weirs, and locks.
Migratory Birds Convention Act	Environment Canada	Migratory birds through prevention of destruction of nests and habitat, and regulating hunting. Allows control of certain nuisance species.
Ontario Water Resources Act	OMOEE	Quality and quantity of surface and ground water resources.
Planning Act	Local Municipality OMMAH	Prime agricultural lands, natural heritage features (including provincially significant wetlands), surface and groundwater. Provincial policies are to be considered when land use changes are proposed.
Public Lands Act	OMNR	Public (Crown) lands (which includes beds of most navigable lakes, rivers and streams) and shore lands (including areas seasonally inundated with water adjacent to navigable waters).
Trees Act	Local Municipality	Woodlands. Requires permits for tree clearing under certain circumstances. Only applies in municipalities where bylaw enacted.
Natural Heritage Policy, including Wetlands Policy	OMMAH/OMNR	Provincially significant wetlands through provisions of the Planning Act.

Reference Document

Rural Wetlands in Ontario, A Guide for Landowners

Rural WETLANDS in Ontario...

A guide for landowners.

Ducks Unlimited Canada

Dear Landowner:

This booklet has been produced because many people told us they wanted more information on wetlands, especially how to conserve the wetlands on their farm. This book provides basic information and helpful hints. In Southern Ontario approximately 80% of the original wetlands have been lost and 80% of the remaining wetlands are found on farms. Farmers, and rural landowners in general, are well known for their concern for the environment and their interest in wetlands, which are among the earth's most productive and valuable ecosystems.

You may be aware of the work that has been done in the past by Ducks Unlimited and other conservation organizations to preserve, restore and enhance wetland habitat in Ontario. However, you may not be aware of the work these organizations have done with the agricultural community, providing financial assistance and technical expertise to landowners who have wetlands on their property.

After all, healthy wetlands benefit everyone, not just the wildlife who call wetlands 'home'. Wetlands benefit humans in many important ways. They filter pollutants from our drinking water, reduce the impact of soil erosion and act like sponges to prevent the extremes of flood and drought.

If you want more detailed information please contact us or any of the other conservation-oriented organizations listed in the reference section on page 16.

We commend you on your interest in wetlands!

Yours in conservation,

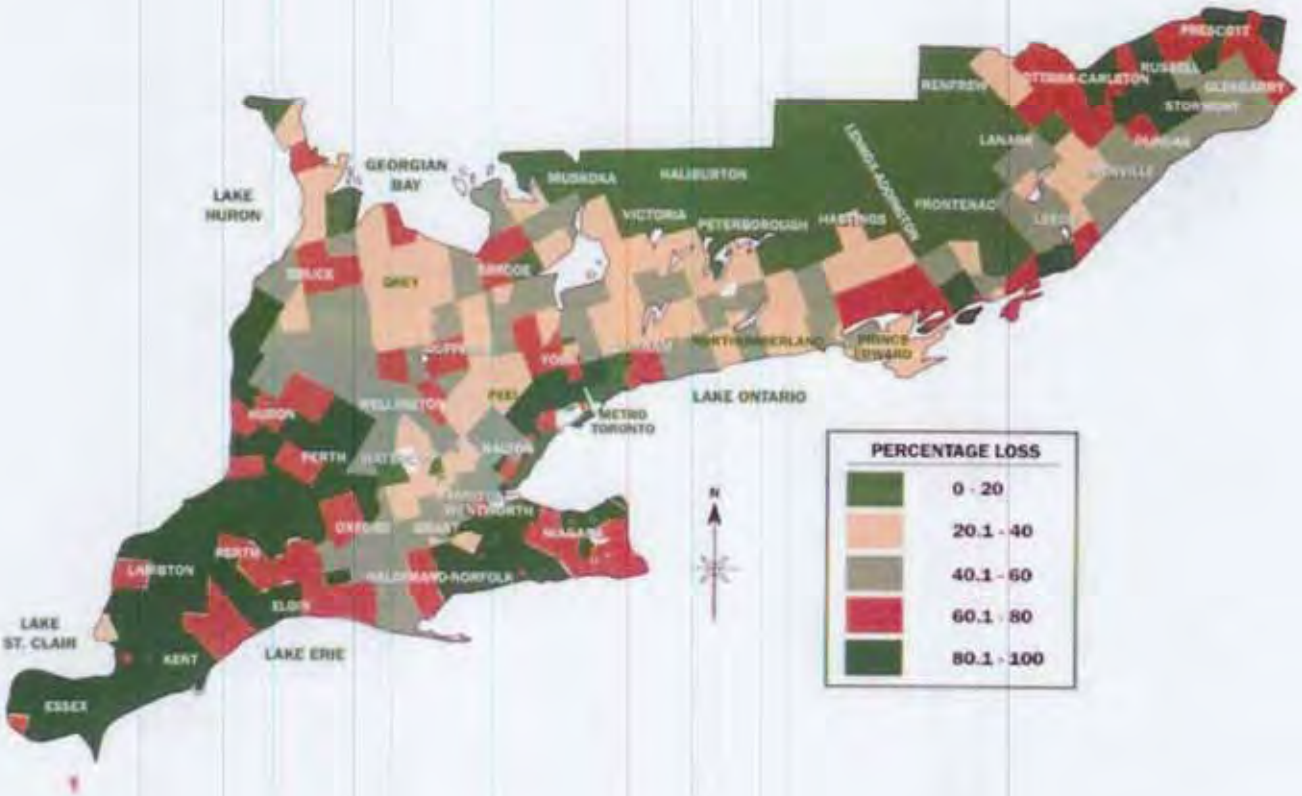
Ducks Unlimited Canada

Ontario AT A GLANCE

At one time, there were over five million acres of wetlands in Southern Ontario.....

It is estimated that only about 20% of those wetlands remain.

Historically, wetland loss in Southern Ontario has been due to urban development and drainage.



Wetland Distribution and Conversion in Southern Ontario, Environment Canada 1987.

Why ARE WETLANDS IMPORTANT?

Wetlands act as nature's water filtration and purification system. Wetlands are capable of filtering pollutants such as chemicals and nutrients from water destined for our lakes, rivers and our drinking water. Wetlands are often a valuable source of water for farms.

Wetlands also offer numerous recreational opportunities such as fishing, hunting, wildlife viewing, canoeing and nature photography.

Wetlands are one of the earth's most diverse and productive ecosystems in Ontario. They are home to over 600 species of birds, mammals, fish and plant life, many of which are rare or threatened.

One of a farmer's main concerns is conserving soil - keeping it on the ground. Wetlands slow the overland flow of water, reducing the amount of soil sediment entering our streams, rivers and lakes.

Wetlands can help to reduce flooding by acting like giant sponges to absorb excess water and releasing it slowly.

This temporary storage of water also allows water to evaporate or to seep into the ground, replenishing the watertable.

Wetlands are a renewable source of wood products such as lumber, firewood and posts.

What Exactly is a Wetland?

There are four main types of wetlands in Ontario. Swamps and marshes are most common in Southern Ontario while fens and bogs appear most often in Northern Ontario.

SWAMP

- Characterized by flooded trees
- Often contain much deeper water in the spring as a result of melted snow and in the fall due to rainfall
- May dry out each summer
- Supports woody plant life
- Characterized by trees such as soft maple, black ash and cedar.

MARSH

- The most productive wetland type for most wildlife
- In its most productive state it has an equal mixture of diverse emergent plants and open water
- Contains plants such as cattails, bulrush, sedges, arrowhead, duckweed, wild iris and water lily.

Wetlands can be defined as an area of land which is covered by water for part or all of the year.

BOG

- Found mostly in the North
- Soil mainly peat (decomposed plants) making this type unique
- Tends to have poor drainage (no outflow)
- Low oxygen: acidic
- Very old
- Vegetation includes sphagnum moss, cotton grasses, pitcher plants, sedges and black spruce.

FEN

- Similar to a bog but with better drainage
- Increased drainage results in lower acidity, therefore more plant life
- Also most common in Northern areas
- Plants include some low shrubs as well as sedges, grasses, pitcher plant and sundew
- Low oxygen: alkaline.

TEMPORARY WETLANDS

Seasonally flooded areas are important to migrating waterfowl and shorebirds, as places to rest, feed and breed. These areas are also used extensively by other species, namely amphibians.

What Can You Do?

The best place to start is with a plan. This will help you assess your property's characteristics and set goals tailored to your wetland. Planning can also open doors to various groups who sponsor wetland projects. Various guidebooks exist that can help your planning activities. Refer to page 16, Wetland Habitat Fund Program.

If you have wetlands on your property, there are many things you can do to conserve, restore or enhance them.

This book will provide you with basic information on the following:

- The life cycle of a wetland
- Water management techniques
- Land stewardship techniques that benefit wetlands and adjacent uplands
- The role of native plants
- How placing nest boxes can help
- Beaver pond management
- Where to go for more detailed help.

The most important thing is realizing how valuable wetlands are to all of us.

Wetlands AND WATER LEVELS

Marshes are among the most productive of wetland types. However, if the water level in a marsh becomes too deep or the wetland is impacted by adjacent land use changes, the productivity of the marsh can be reduced. In order to keep marshes in a productive state for wildlife you can use a number of water level management techniques. The ideal condition is characterized by water depths generally less than one metre, resulting in a mixture of diverse plants with patches of open water. Vegetation is essential as a food resource, for nesting sites and as escape cover for many birds and animals. Vegetation is also a good indicator of wetland health.

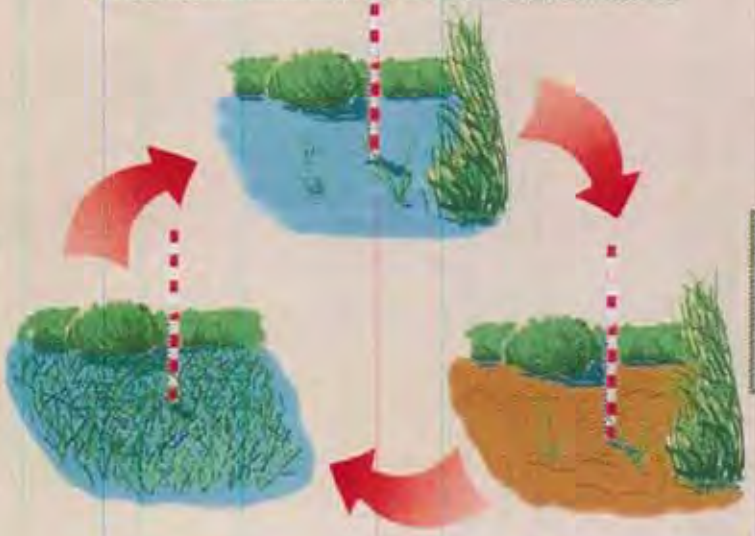
If you have a large wetland (over 5 acres) on your property which is not in a healthy condition, Ducks Unlimited may be able to design and construct a water management system for you. We do not suggest attempting this yourself without the appropriate engineering or construction expertise due to technical and regulatory concerns. If, however your wetland is relatively small (less than 5 acres) you may decide to use one of the simple water level management devices illustrated. Before starting any wetland project, be sure to check local permit requirements.

Life Cycle of a Wetland

FLOODED

Over time, deep water in a pond drowns out vegetation and renders the wetland much less productive.

In a natural state this "lake type" wetland would not occur for many years. However, modern day impacts often mean that this state occurs more quickly. This is why Ducks Unlimited uses a system of water level management.



DRAWDOWN

Lake-type wetlands require dewatering to restore vegetation. A drawdown (de-watering) allows plants to germinate on the pond bottom to allow vegetative regrowth.

HIGHLY PRODUCTIVE YEARS

When water levels are restored, the marsh is again at its most productive state for most wildlife. Varying water levels (of less than one metre) allow for richly diverse vegetation.

Water Level Management Devices

The Drop Inlet

This is a fixed level control system, however a check valve at the bottom of the structure can be used to remove all water from the basin.

The Hickenbottom

This upright structure is connected to a 6" tile drain through the berm. The holes in the upright allow more water to escape as the water level rises.

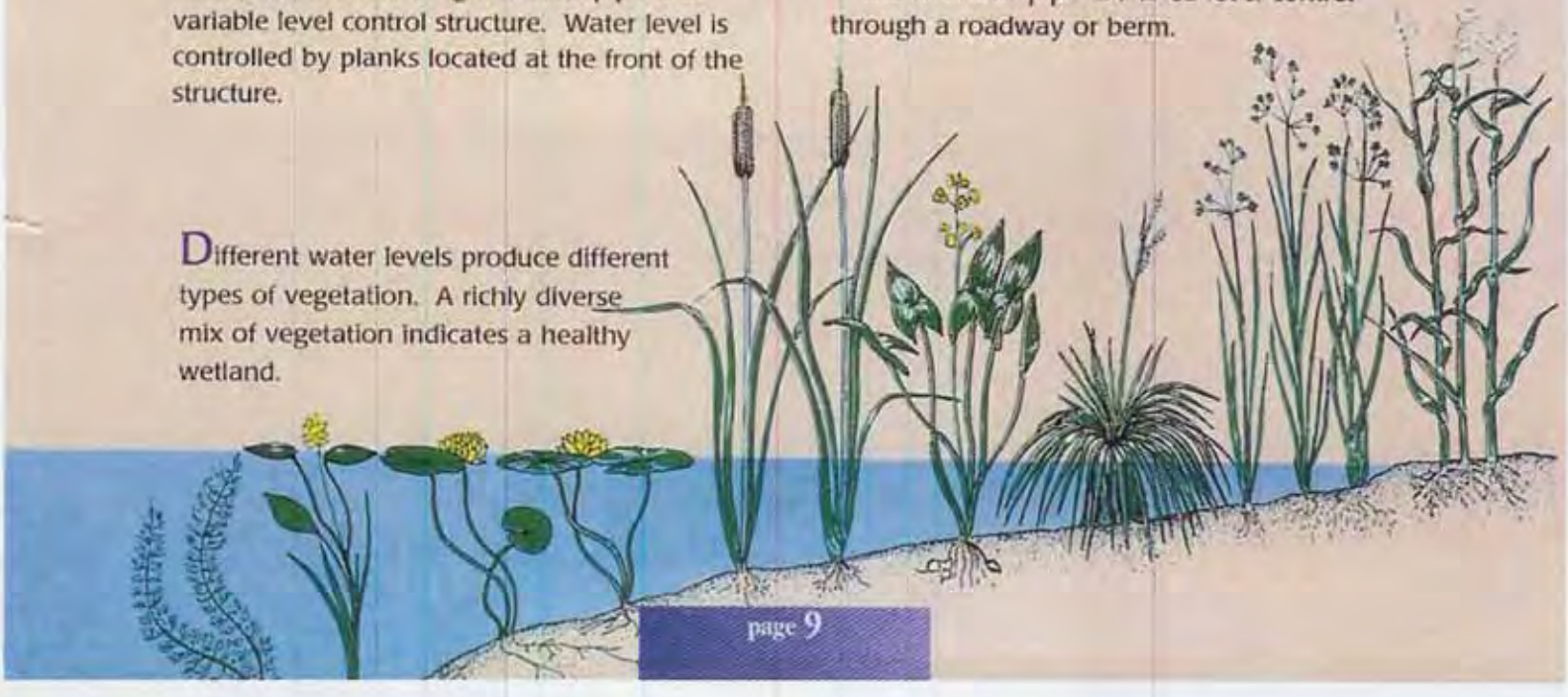
The Half Round

The half round corrugated steel pipe is a variable level control structure. Water level is controlled by planks located at the front of the structure.

The Overflow Pipe

The overflow pipe is a fixed level control through a roadway or berm.

Different water levels produce different types of vegetation. A richly diverse mix of vegetation indicates a healthy wetland.



Land STEWARDSHIP

How we use the land **around** a wetland can greatly affect its health and its ability to perform important functions.

Here are some practical techniques for you to implement on your property:

Controlling Livestock Access

On many farms, a wetland, farm pond or stream provides the sole drinking water for livestock. Unfortunately, this can have a negative impact on wetland habitat and the livestock.

- Livestock trample the banks, causing erosion along edges of wetlands
- Livestock destroy young vegetation in the wetlands
- Allowing livestock access to the wetland can adversely affect the productivity of the animals
- Livestock disturb wildlife in and around the wetland
- Manure from livestock standing in or loitering on the banks of a wetland can negatively influence water quality.

UNFENCED

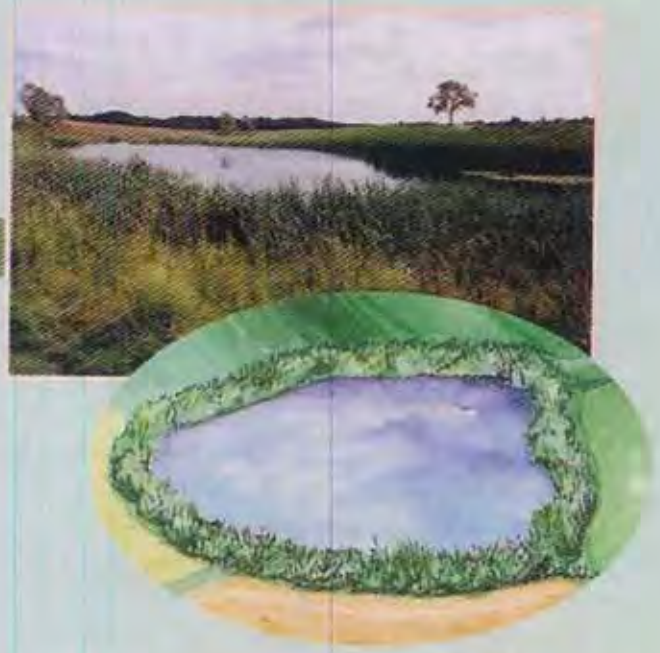
FENCED

What Can Be Done?

Simple two-strand electric (or other type) fencing is an inexpensive way to keep livestock out of wetlands. Then, of course, you will need to consider an alternate watering system. Fact sheets on fencing and alternate watering systems are available from Ducks Unlimited. Further information may be found in a comprehensive booklet entitled, *Water Management Guide: For Livestock Production, Water Quality and Wildlife Habitat*. To obtain a copy, contact the Ontario Cattlemen's Association at (519) 824-0334.

Additional Practical Ideas

There are a number of things you can do to enhance the habitat for waterfowl and other wildlife on your land.



BUFFER STRIP

Wetlands are one of your farm's most precious resources. They naturally filter runoff, recharge and maintain groundwater and control flooding. But only if there's a healthy green zone of bulrushes, grasses and shrubs around the basin.

FLUSHING BAR

By attaching a homemade flushing bar to your tractor, you can warn nesting birds and other wildlife that you are approaching.

CONSERVATION TILLAGE

The crop residue also provides food and cover for wildlife.

Ducks Unlimited has detailed fact sheets on the above techniques, available to interested landowners.

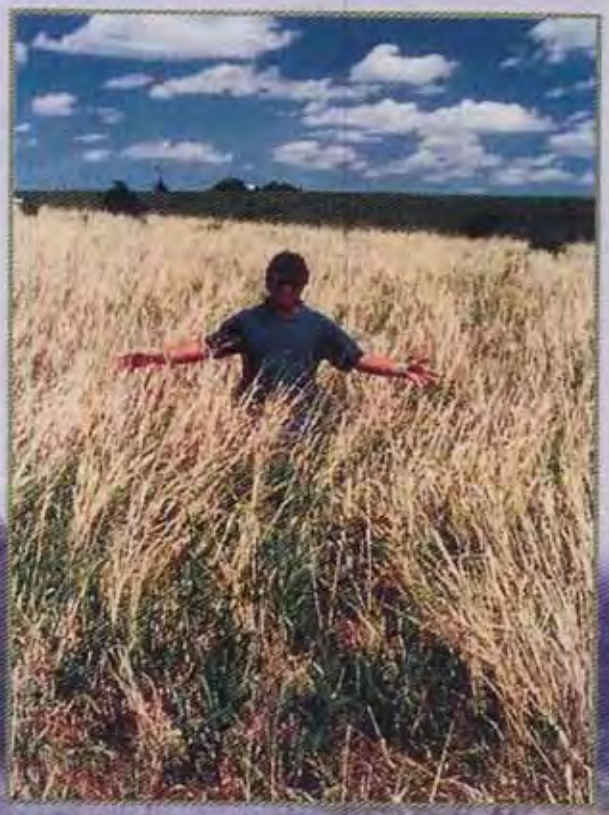
Establishing NATIVE PLANTS

Native grasses, historically a prominent part of the southern Ontario landscape have been reduced to a few remnant stands. This was due to the conversion of land to cropland and the introduction of tame forage species.

Because of their ability to withstand snow cover, native grasses provide excellent spring nest cover for waterfowl. The grasses also have potential value to agriculture as summer pasture and to revegetate fragile lands.

Planting a mixture of native grasses, wildflowers and shrubs around a wetland can go a long way towards creating a diverse long-lasting, easily managed upland area. This area of native plants will provide excellent food, cover and nesting habitat for a wide range of wildlife species.

A mixture of native grasses including switchgrass, Indiangrass, little bluestem and big bluestem can be used when soil conditions are right.



A PRODUCTIVE STAND OF NATIVE GRASSES SHOWN IN EARLY SPRING

To add colour and increase the diversity of the area, add some wildflower seeds to the native grasses *once the grasses have been established.* The wildflowers are excellent for songbirds and butterflies, and will encourage a wider range of species of wildlife to make use of the area. Black-eyed susan, butterfly milkweed, goldenrod, asters and wild bergamont are some of the many native flowers that will provide a blaze of colour in mid and late summer.

It is a good idea to enhance the upland areas with rows or clumps of native shrubs. Shrubs to consider are sumac, ninebark, gray, silky and red osier dogwood, elderberry, service berry and high bush cranberry.

BLACK-EYED SUSAN IS ONE OF THE MORE COMMON AND EASY TO GROW WILDFLOWERS

CONSIDER PLANTING WILDLIFE SHRUBS SUCH AS SERVICEBERRIES

Nest STRUCTURES

Where there is an absence of trees or only very young trees around the wetland, certain species of birds suffer from a shortage of nesting sites. Cavity nesters such as the wood duck require holes in mature trees in which to nest. To address the shortage, consider placing nesting structures around your wetland. Nest boxes should be placed on steel poles or T-bars complete with predator guards. Boxes simply affixed to trees are an easy target for predators such as raccoons. As a guideline, one box per acre is appropriate for small ponds under 10 acres. One box per three acres is the maximum for larger ponds. Each winter the nest boxes must be cleaned out and lined with clean wood shavings.

Mallards, on the other hand, usually nest on the ground adjacent to the wetland but they may use a structure such as this nest tunnel. On some wetlands the usage rate of these structures is close to 100%. These structures are inexpensive and easy to build and maintain.

Plans and installation instructions for the above structures are available through Ducks Unlimited.

Beaver Pond Management

Beavers are responsible for creating many wetlands in Ontario. They do this by damming flowing water to create ponds which later become swamps or marshes. While this can create very productive wetland habitat, farmers often consider beavers a nuisance because they can flood agricultural land or kill trees in forested areas. A simple device known as a beaver baffler (shown below) can help to alleviate this problem by controlling the depth of water.

Wetlands AND YOU

We all want to do our part to keep the environment as healthy as possible, for our children and our grandchildren.

As landowners, you are in the enviable position of being able to directly impact the health of the environment more than most people. We hope this booklet has given you some ideas about the ways in which you can take small steps towards a healthier environment for people, agriculture and wildlife.

There are many groups who share your concern for wetlands and the environment. Financial and/or technical help with the restoring or enhancing of your wetland may be available from:

Ducks Unlimited Canada
Advice and financial support for restoration & enhancement of wetlands with significant waterfowl value. 705-721-4444

Wetland Habitat Fund Program
An initiative of Wildlife Habitat Canada and the Ontario Ministry of Natural Resources to improve the quality and abundance of wetlands as habitat for wildlife by supporting conservation projects of private landowners across Ontario. 519-651-8177

Local Stewardship Councils or Networks
Promote the wise use of soil, water, woodlands, and other natural resources through partnerships between landowners, community and resource organizations. Check your local phone book.

Local Conservation Authority
Watershed management, land use planning, flood and erosion protection. Environmental education and outdoor recreation. Technical advice for ecosystem regeneration projects. For more information, contact your local Conservation Authority or Conservation Ontario, Ontario's Conservation Network. 905-895-0716

Ontario Ministry of Natural Resources
Work permits, wetland evaluation, information on fish, wildlife and wetland habitat protection and management. Check the blue pages of your local phone book.

The Ontario Federation of Anglers and Hunters
Information, educational materials on habitat enhancement and recreational activities in wetlands. 705-748-6324

Federation of Ontario Naturalists
Education materials on wetland conservation, nuisance species. 416-444-8419

Local Municipality
Local municipal planning and bylaws, natural heritage policies, including wetlands, and environmental protection policies. Check the blue pages of local phone book.

Ontario Environmental Farm Plan Program
Workbook allows farmers to complete a comprehensive environmental assessment of current management and develop an appropriate action plan. Workshop or independent study options available at no charge to farmers. Financial incentive for projects available. 1-800-265-9751

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Ducks Unlimited Canada

CANADA'S GREEN PLAN
LE PLAN VERT DU CANADA

Canada/Ontario Agriculture Green Plan through Agriculture and Agri-Food Canada in cooperation with the Ontario Ministry of Agriculture & Food

ONTARIO WETLAND HABITAT FUND
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The network of 38 Conservation Authorities

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Ministry of Natural Resources

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Reference Document

Wetlands and Woodlots

WETLANDS AND WOODLOTS

SUSTAINING wetlands

ISSUES PAPER, No. 1995 - 1

PUBLISHED IN PARTNERSHIP WITH:

CANADIAN FORESTRY ASSSOCIATION

Ducks Unlimited Canada

LANDOWNER RESOURCE CENTRE

North American Wetlands Conservation Council (Canada)

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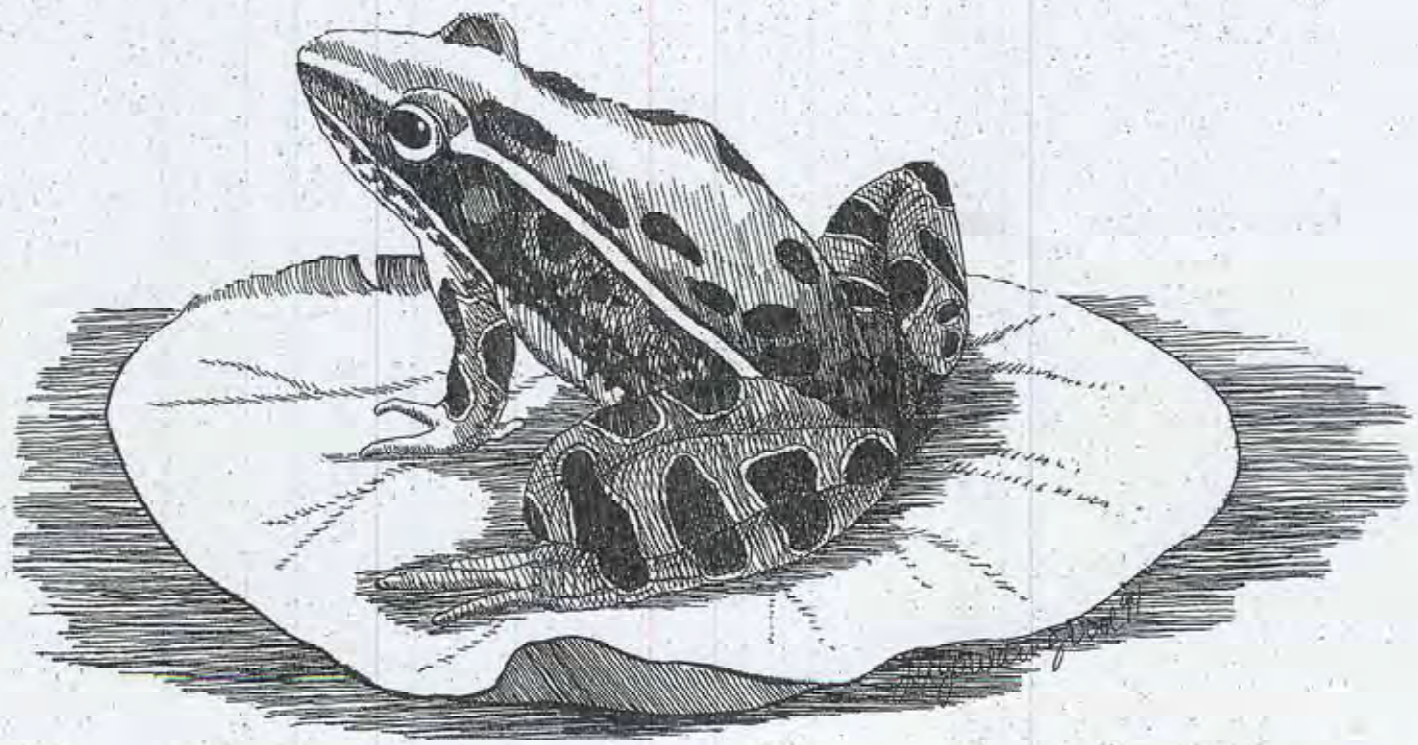

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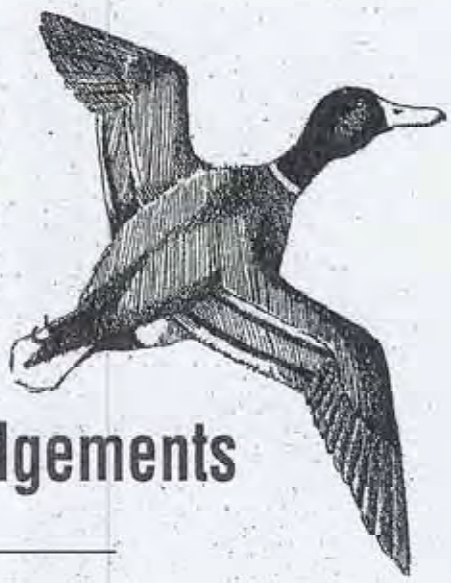


Acknowledgements

Foreword

The Canadian Forestry Association is pleased to join with the North American Wetlands Conservation Council (Canada) and Ducks Unlimited Canada in presenting this publication on Wetlands and Woodlots. We believe this is the most accurate and comprehensive publication on the subject.

Why such a booklet? Private woodlot owners own almost six percent of the forest land in Canada. Almost all of it lies in the southern half of the country, where the forest is most productive and where most forest management takes place. This is where people have the most impact on the forest environment.

Countless surveys tell us that the reasons people like you own forest land are varied. Aside from the production of wood products such as lumber, pulpwood and firewood, most woodlot owners value their land for other things such as recreation, aesthetics, Christmas trees, maple products, wildlife benefits, and just the pure satisfaction of owning a piece of Canada. Most woodlot owners have a strong sense of stewardship for their land. They want to do the right thing with their forests — for themselves and for future generations.

On many woodlots, wetlands form an important part of the forest ecosystem. They may not be commercially productive in growing timber, but their value in many other ways may mean more in the long run than a few truckloads of wood products. Anyone who has spent a few hours silently watching a beaver at work, photographed a great blue heron, stalked a moose, erected a nest box for wood ducks, or snowshoed across a frozen bog in the dead of winter, will recognize that wetlands enhance our quality of life. Wetlands can also provide a source of income for the landowner. Wetlands are valuable for hunting, fishing, and trapping, as well as the production of berries and wild rice.

This booklet points out many of the benefits of wetlands to you and to society as a whole. It also shows you what you can do to preserve and enhance these areas, how you can apply that sense of stewardship to something too many of us may have taken for granted.

We hope that this booklet gives you a greater appreciation of the various kinds of wetlands you may have on your property, and encourages you to incorporate their conservation into your forest management plans.

Glen Blouin, Executive Director
Canadian Forestry Association

Introduction

Woodlots in Canada

Woodlot owners have an important role to play in helping to manage and look after wetlands in Canada. There are over 425 000 private woodlot owners in Canada whose combined forest land represents six percent of the Canadian forest, or 15.5 million hectares (38.6 million acres).

There are many different kinds of woodlots in Canada. For instance, if you live in the northern boreal region of Canada from Newfoundland to northeastern British Columbia, your woodlot is likely made up of evergreen tree species such as white spruce, black spruce, balsam fir and jack pine, as well as deciduous species such as white birch and poplar. If you live in the southern temperate region of eastern Canada, your woodlot likely contains tolerant deciduous trees, such as oak, beech, maple, and ash. Forested areas between these two extremes have a mix of both evergreen and deciduous trees. The woodlot you own may even be quite different from one just down the road from where you live. To find out more about the other woodlot owners in your province, see Table 1. In spite of differences among woodlots across Canada, they are all important because they do the following:

- help to moderate weather patterns. Temperature and moisture patterns are influenced by respiration and transpiration of trees and shrubs.
- provide oxygen. One of the "by-products" of photosynthesis is oxygen.
- prevent ***soil erosion***. The root systems of trees help to trap soil.
- remove carbon dioxide (CO_2) from the air. Plants use CO_2 in photosynthesis.
- provide ***habitat*** to many wildlife and plant species.
- clean air pollutants.
- play an important role in the water cycle.
- yield timber products, firewood, maple syrup and Christmas trees.
- provide recreational opportunities.
- contribute to the beauty of the countryside.

Wetlands in Canada

A wetland is an area which is wet or flooded either periodically or all year round. Wetlands are transitional areas between upland areas such as old fields and forests and aquatic areas such as streams, lakes, and rivers. Therefore, wetlands are areas where two different habitats blend together. The functions and values of wetlands are very much related to their unique location between wet and dry

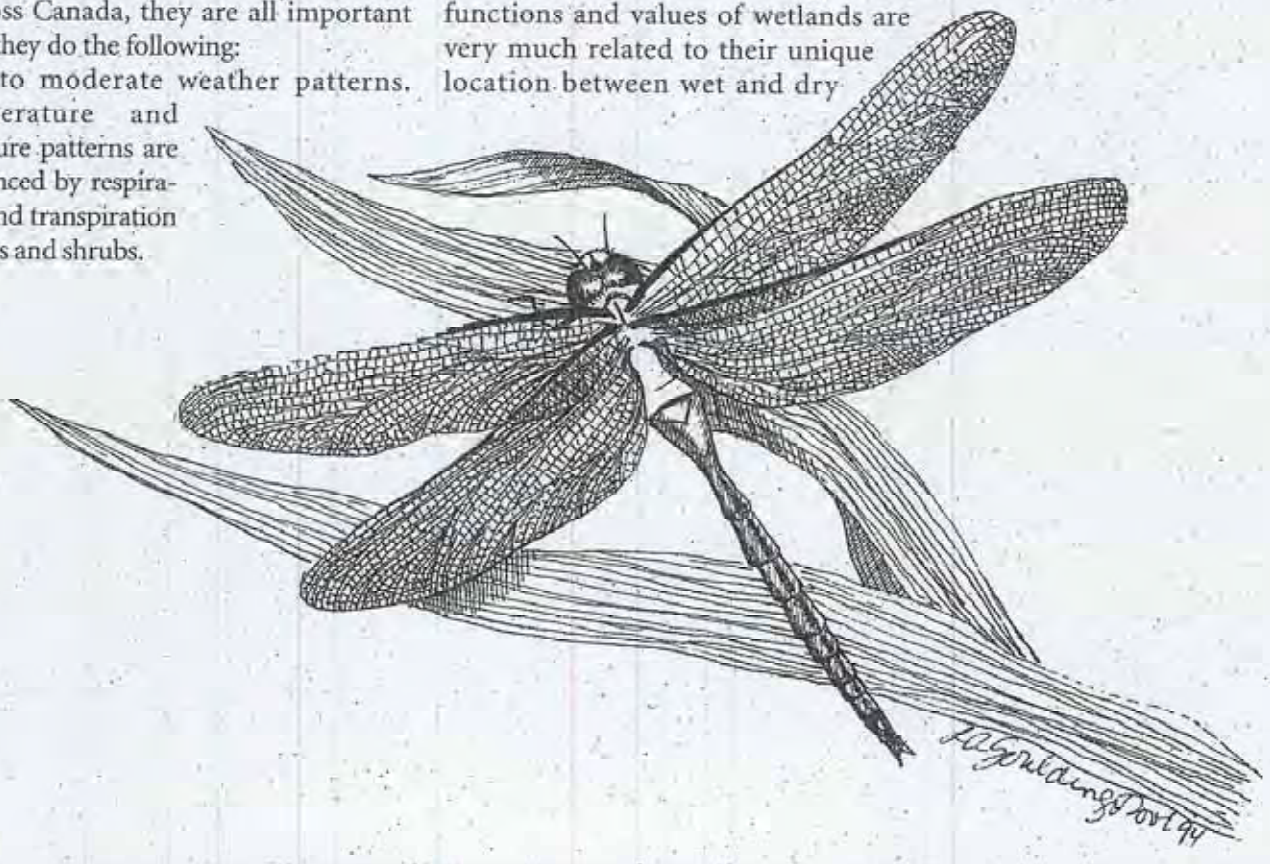


Table 1
Woodlots in Canadian Provinces

Province	Number of non-industrial private woodlot owners[1]	Area of non-industrial private forest land[2] in 00 000 hectares (00 000 acres)	% non-industrial private of total forest land[3]	Average size of woodlots[4] in hectares (acres)	Reason for woodlot ownership[5]
Newfoundland	4 500	1 (2)	0.3		
Prince Edward Island	16 000	3 (7)	93	12-16 (30-40)	40% no particular reason; 30% recreation
Nova Scotia	31 000	19 (48)	48	50 (123)	39% satisfaction; 34% firewood
New Brunswick	35 000	19 (47)	31	53 (131)	main: firewood; 2nd: satisfaction
Quebec	120 000	38 (94)	5	48 (119)	80% firewood; 60% recreation
Ontario	169 000	56 (139)	12	north: 174 (431) south: 36 (88)	44% part of property; 18% many reasons
Manitoba	3 500	12 (29)	5	44 (108)	main: personal residence and other 2nd: land inherited
Saskatchewan	15 000	2 (6)	1	16-24 (40-60)	—
Alberta	7 500	—	—	—	—
British Columbia	21 000	21 (50)	3	30 (74)	56% part of farm or ranch 20% principal residence

Sources: [1,2,3] *Forestry Canada (1992)*
[4] *Welton (1988), Manitoba Forestry Assoc.(pers. comm.), New Brunswick Private Woodlot Resources Study (1983), Smyth and Nausedas (1981), P.E.I. Dept. of Agriculture, Fisheries and Forestry (pers. comm.), Nadeau et al. (1993), Saskatchewan Farm Woodlot Association (pers. comm.)*
[5] *Welton (1988), McKinney and Rounds (1990), New Brunswick Private Woodlot Resources Study (1983), Wellstead (in prep.), Rousseau (1982), Nadeau et al. (1993)*

environments. Not all wetlands are the same; they vary in characteristics such as soil type and water availability. In Canada, wetlands are grouped into five classes. These are:

- bogs
- fens
- swamps
- marshes
- shallow open water

For more information about these different classes of wetlands, see Table 2.

A wetland in your woodlot may make your land more valuable. Wetlands are not unproductive wasteland areas, they are important components of our natural environment.

Wetlands are distributed all across Canada (see Table 3) and cover 127 million hectares (320 million acres) of the country. In fact, 24% of the world's wetlands are in Canada. Because Canadians are responsible for a large portion of the wetlands on the planet, it is important that we understand their role in the environment.

Wetland Loss

A significant portion of our world's wetlands have been lost. The following are examples of wetland loss around the world:

Table 2
Classes of Canadian Wetlands

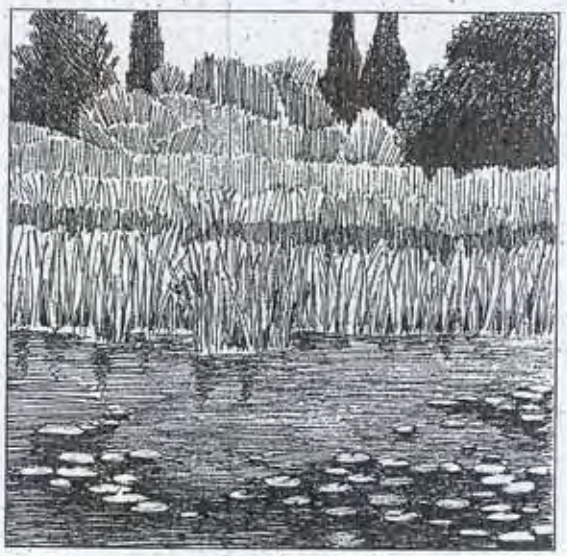
Wetland Class	Characteristics
Bog	has dense layer of peat, is acidic, has low nutrients, water is near soil surface, usually covered in moss, shrubs and sedges, may have trees
Fen	is covered in peat, water is close to soil level, has higher nutrient levels than a bog, usually contains sedges and grasses, may or may not have trees and shrubs
Swamp	has standing water or gently moving water, high amount of nutrients, usually has trees or clumps of shrubs
Marsh	occasionally or permanently flooded, no trees, has emergent plants, usually has high nutrient levels
Shallow Open Water	includes potholes, sloughs or ponds and the wet areas along lakes, rivers and the coast, has submerged plants and floating-leaved plants

Source: National Wetlands Working Group (1988).

Bog

Swamp

Fen



Marsh

- 54% of wetlands in the United States lost since colonial times
- 40% of coastal wetlands of Brittany lost since 1960
- 80% of lands drained in southwest France
- 70% of the western Algarve in Portugal has been drained
- 90% of New Zealand wetlands destroyed since European settlement
- 67% of the Philippines' mangrove resources lost from 1920-1980

These losses have been due to drainage for agriculture, forestry and mosquito control, dredging and stream channelization for navigation and flood protection, filling for solid waste disposal and conversion for aquaculture and other uses.

The conversion of wetlands to urban, industrial, agricultural, recreational, and other uses often occurs because it is difficult to measure the economic value of maintaining wetlands in their natural state. In Canada alone, over 14% of wetlands (20 million hectares or 51 million acres) have been converted to other land uses over the last 200 years. Eighty-five percent of these wetlands have been converted to agricultural land and nine percent to urban and industrial areas (the latter includes loss due to hydro-electric facilities). Certain wetland areas have been more impacted than others. Wetlands estimated to have been lost through agricultural expansion alone include:

- 65% of Atlantic coastal marshes
- 70% of southern Ontario wetlands
- 71% of prairie wetlands
- 80% of Fraser River Delta, British Columbia
- 70% of Pacific estuarine wetlands

It has also been estimated that 98% of the wetlands surrounding Canada's major cities have been lost due to agricultural and urban expansion.

The population in Canada almost doubled between the years 1951 and 1991 and predictions are that it will increase another seven percent by the year 2000. As the population of Canada increases, more natural areas are lost.

Wetland loss has become a serious environmental issue in Canada. Conservation efforts are now underway to protect Canada's wetlands. The *Federal Policy on Wetland Conservation*, aimed at preventing further loss of wetlands in Canada, is the first of its kind in the world. Provincial wetland policies currently exist in Ontario, Alberta and Saskatchewan and other provinces are developing draft policies.

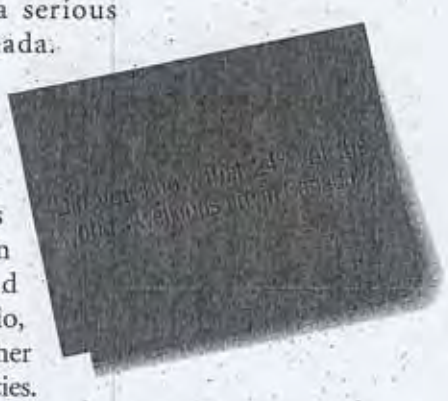


Table 3
Distribution of Canadian Wetlands

Province or Territory	% of Canadian wetlands	% of province or territory	Thousands of hectares (acres)
Ontario	23	33	29 000 (72 400)
Northwest Territories	22	9	27 800 (68 800)
Manitoba	18	41	22 500 (55 600)
Alberta	11	21	13 700 (33 900)
Quebec	10	9	12 200 (30 100)
Saskatchewan	8	17	9 700 (24 000)
Newfoundland	5	18	6 800 (16 800)
British Columbia	3	3	3 100 (7 700)
Yukon	1	13	1 500 (3 700)
New Brunswick	0.4	8	540 (1 400)
Nova Scotia	0.1	3	180 (440)
Prince Edward Island	0.007	1	9 (22)

Source: National Wetlands Working Group (1988).

The Role of Wetlands in the Environment

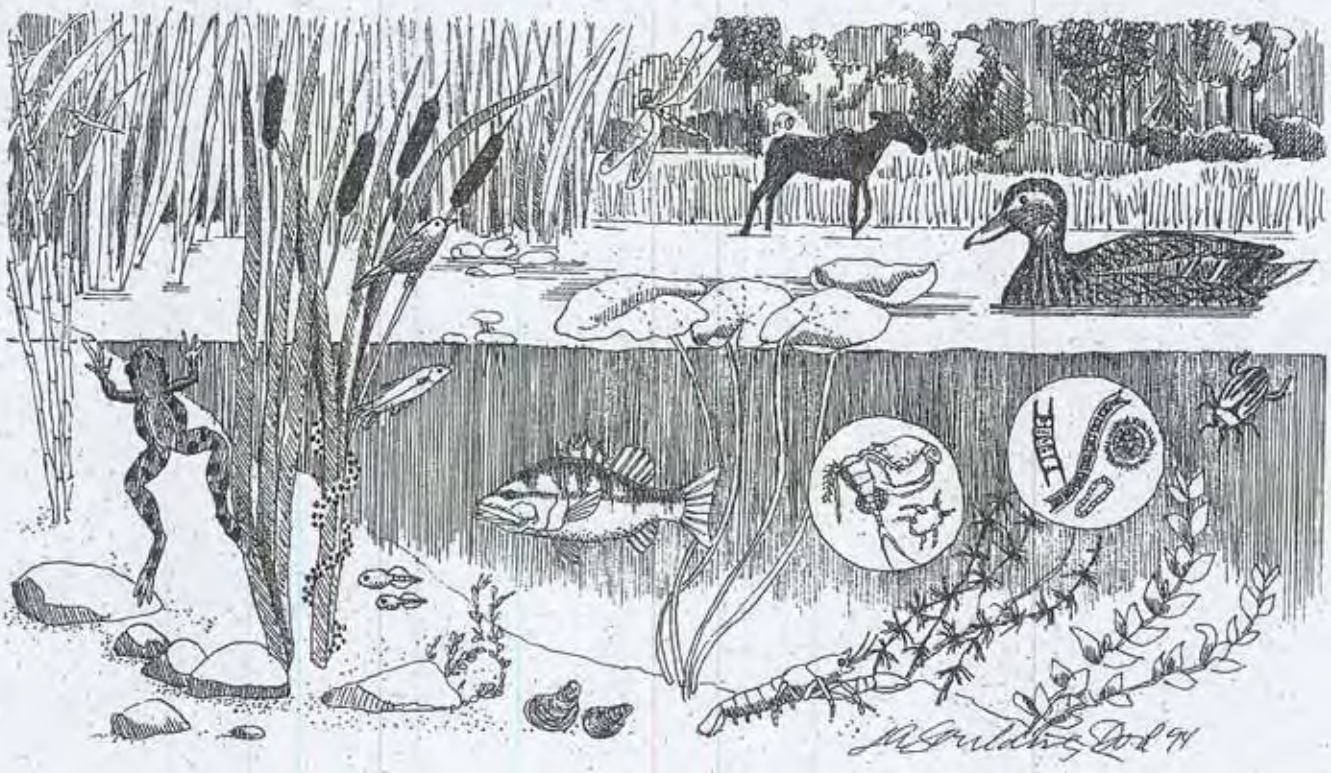
Wetlands play an important role in the natural environment. They are involved in processes that affect the entire planet and in processes that affect the local or regional area where the wetland is located. Wetlands . . .

- moderate climate
- cycle carbon and nutrients
- regulate water availability
- improve water quality
- reduce soil erosion
- provide habitat to many plants and animals
- provide habitat to many ***endangered, threatened*** and ***vulnerable*** species
- produce large amounts of ***organic*** material

The Global Role of Wetlands

Aspects of our climate are affected by wetlands. Precipitation is affected by the evaporation of water from the leaves and stems of wetland plants and from the surface of wet soil. This water is returned to the atmosphere and eventually comes back to the earth as either rain or snow.

Wetlands are critical in the ***carbon cycle.*** Wetland plants convert inorganic carbon (e.g., carbon dioxide) into organic compounds via ***photosynthesis.*** This is a process where plants use carbon dioxide, water and the sun's energy to form organic compounds and oxygen. It is estimated that 75 billion metric tonnes of carbon per year are bound into organic material by photosynthesis. Organic compounds include ***carbohydrates, lipids, proteins*** and the molecules that form *DNA*, all of which play a key role in living systems. Wetlands use up carbon dioxide and release it as well.



Plants and animals in wetlands release carbon dioxide into the atmosphere via *respiration.* Plants do this by releasing carbon dioxide from their roots and leaves and animals do this simply by breathing. Both photosynthesis and respiration are required to sustain life on this planet and wetlands play a key role in these processes.

Wetlands also help to circulate and reuse essential nutrients such as nitrogen and phosphorus. Wetland plants absorb nutrients from both soil and water. These nutrients are used by plants for various functions and are stored in plant tissue. When plants die or lose their leaves and stems (perennial plants) nutrients are released back into the soil and water. Nutrients are also released into wetland soil and water in animal waste or when animals die.

Water Regulation

Because of their unique location between terrestrial and aquatic communities, wetlands help regulate water levels. A wetland temporarily stores some of the water flowing through or near it, functioning like a sponge. It can accumulate water when water levels are high and hold back peak water flow, reducing flooding. This saves money in flood control costs and your municipal taxes, which cover flood prevention costs, are reduced.

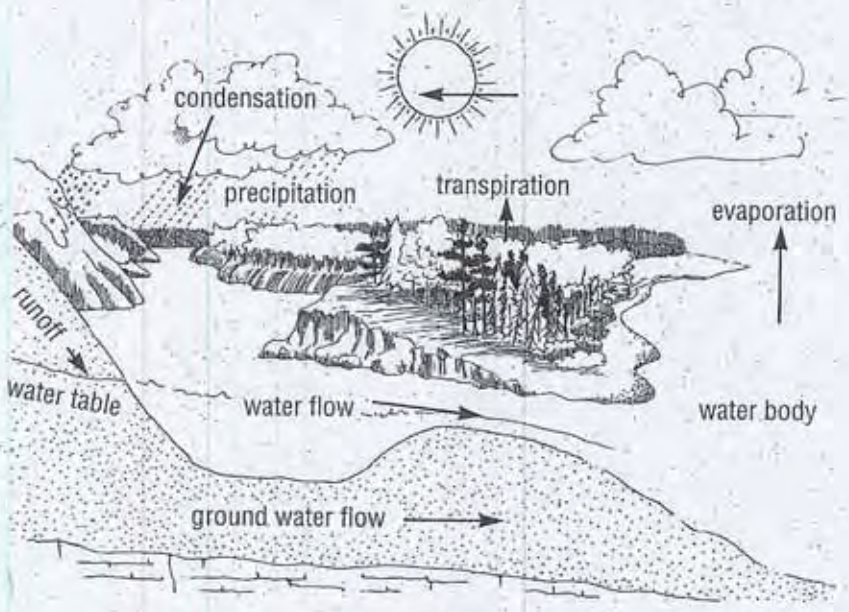
The water stored in or absorbed by a wetland evaporates from plants and the soil surface and returns to the atmosphere. Water absorbed by wetlands also helps to recharge groundwater and supply water to adjacent areas during dry periods of the year. In this way, wetlands influence our climate and assist in keeping precipitation at normal levels.

Prevention of Erosion

Wetlands also reduce soil erosion. Wetland plants trap *sediments* and their roots stabilize both soil and sediments by holding them in place. In this way, they protect soil from water runoff, waves, tides and wind erosion.

Water Quality Improvement

Wetlands improve water quality by acting as natural filters. Because wetlands slow down the flow of water, solid material in the water settles on the soil surface or in the sediments. In this way, wetland vegetation removes sediments and debris from the water. Wetland plants take up nutrients, such as phosphorous and nitrogen, from the water. The nutrients are used for plant growth and water quality is further improved. Heavy metals, such as lead and nickel, which are hazardous to human and wildlife health, can also be removed from water by wetland plants and soils. Wetlands filter pesticides, *pathogens,* and other toxic chemicals from water and buffer the effects of *acid precipitation.* Water quality improvement saves taxpayers money



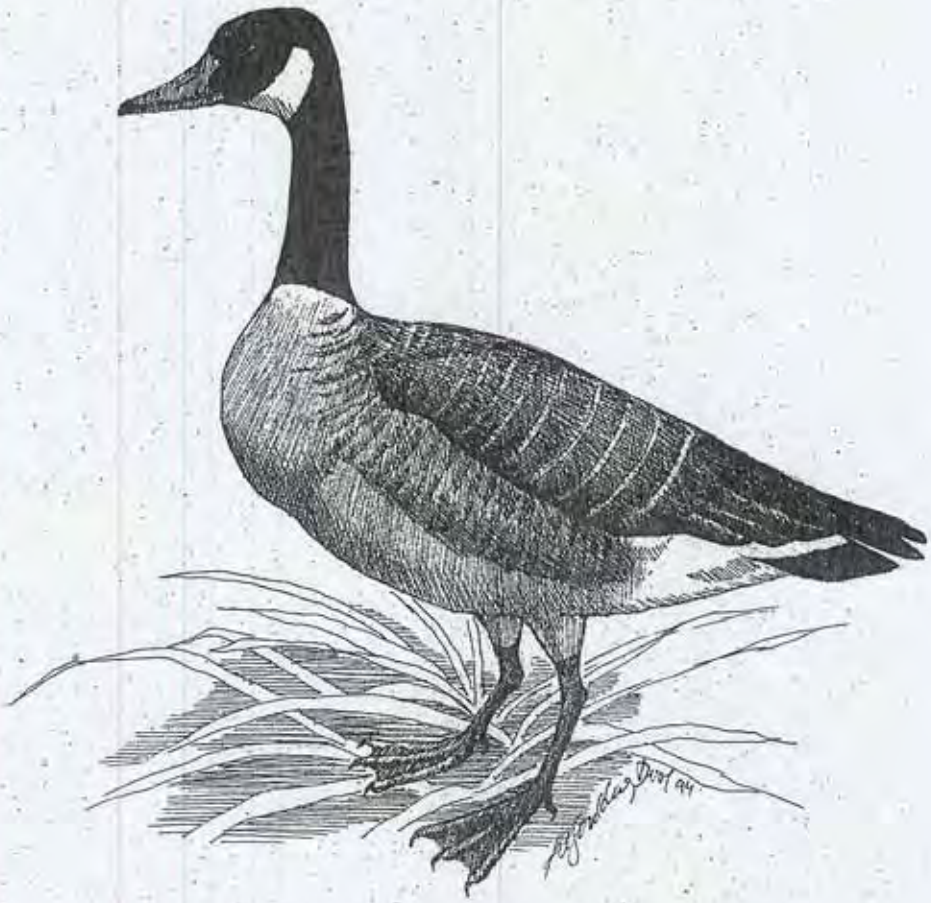
THE WATER CYCLE

by reducing both health care and water treatment costs. In many parts of the world, human-made wetlands are being used for sewage treatment centres.

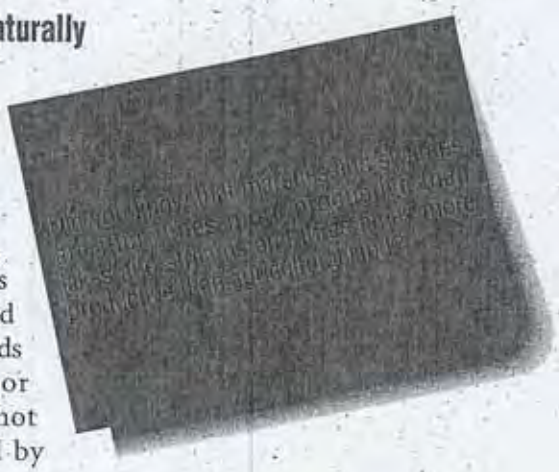
Wetlands are Home to Many Species

In a wetland, the edge of a dry terrestrial habitat meets the edge of a wet aquatic habitat. These edges are not abrupt; the two areas blend together forming a transitional zone. A wetland, therefore, has characteristics of both terrestrial and aquatic areas. Because of this, a large number of plants, mammals, birds, amphibians, reptiles, fish and insects live in these areas. In other words, it has very high ***biological diversity.*** Both common and rare species inhabit wetlands. Examples of common wetland plant species are the common cattail and the great bulrush; examples of common wetland bird species are the mallard duck and the swamp sparrow. Uncommon species may be either endangered, threatened or vulnerable. These species are at risk, usually due to loss of habitat. An example of an endangered wetland plant is the small white lady's slipper, an orchid which grows in bogs. An example of an endangered wetland bird is the whooping crane. Table 4 lists some additional endangered wetland species.

Wetlands support many organisms partly because they can be very productive areas. A productive area is one in which plants produce large amounts of organic material through photosynthesis. The organic material is then stored by plants in their leaves and stems and other tissues, where it is made available to other organisms. Wetland wildlife obtain this stored carbon by eating the plants directly or eating other animals that have eaten the vegetation. Marshes and swamps are, on average, four times more productive than lakes and streams, four times more productive than grasslands, and three times more productive than agricultural land. This means that marshes and swamps produce more ***biomass*** per year than many other natural ecosystems. Their high productivity allows them to support complex food chains.



Wetlands Change Naturally



It is important to understand that a wetland is continually changing; this is called ***succession.*** Natural areas, such as wetlands, are not fixed or permanent. Wetlands gradually change or evolve, whether or not they are influenced by human activity.

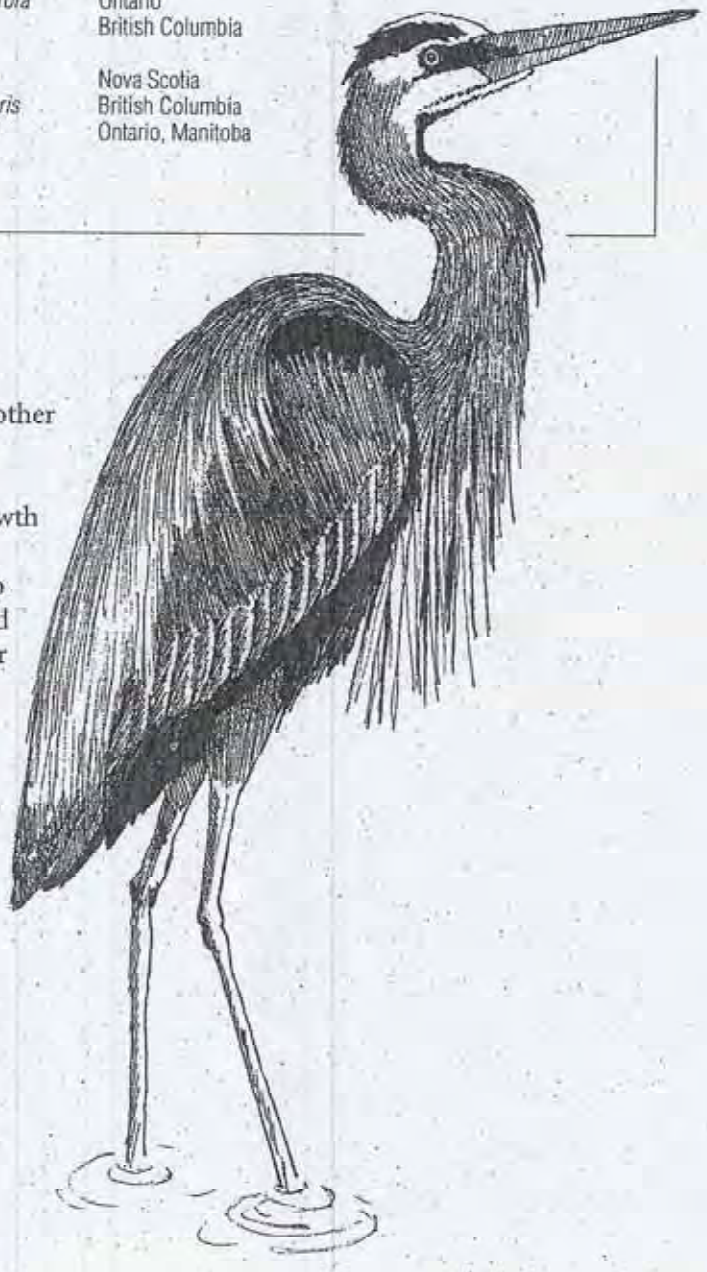
Wetlands are Complex Systems

A wetland is a complex ***ecosystem***, where habitat is provided for many species and where these species all interact and interconnect. This means that not only does the wetland provide habitat for a number of

Table 4
Some of Canada's Endangered Wetland Species

Species group	Common name	Scientific name	Geographical location
Birds	Piping Plover	*Charadrius melodus*	Alberta, Manitoba, Saskatchewan, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec
	Whooping Crane	*Grus americana*	Northwest Territories
	Henslow's Sparrow	*Ammodramus henslowii*	Ontario
Amphibians	Blanchard's Cricket Frog	*Acris crepitans blanchardi*	Ontario
Reptiles	Lake Erie Water Snake	*Nerodia sipedon insularum*	Ontario
Fish	Acadian Whitefish	*Coregonus canadensis*	Nova Scotia
	Aurora Trout	*Salvelinus fontinalis aurora*	Ontario
	Salish Sucker	*Catostomus* sp.	British Columbia
Plants	Pink Coreopsis	*Coreopsis rosea*	Nova Scotia
	Southern Maidenhair Fern	*Adiantum capillus-veneris*	British Columbia
	Small White Lady's Slipper	*Cypripedium candidum*	Ontario, Manitoba

Source: Committee on the status of Endangered Wildlife in Canada (1993).



species, but the species in the wetland interact with each other. Four examples of these interactions are:

- plants compete for light and nutrients
- animals feed on plant material
- insects pollinate plants
- birds feed on insects

These interactions are complex and continuous and dependent, to a large extent, on the role or *niche* a species has in the wetland ecosystem.

There are other levels of interactions as well. The organisms living in a wetland interact with the wetland itself (e.g., the non-living parts of the wetland such as the soil). An example of this is demonstrated in the following sequence of events:

1. a trees loses its leaves or a plant dies in autumn
2. these dead leaves, plant stems, and flowers *decompose*
3. the decomposed material increases soil fertility
4. more nutrients become available for use by trees and other plants in the spring
5. increased growth of trees and plants leads to increased food and shelter for wildlife

Wetland and Wooded Areas are Interconnected

Not only is there interaction among the components of the wetland ecosystem, but ecosystems can interact with each other. It is important to understand that the wetlands and wooded areas on your property are interconnected. If you alter the wetland ecosystem, you may also alter an adjacent forested ecosystem. Your wetland should be considered an integral part of your woodlot.

One of the important interactions between wetland and forested ecosystems has to do with natural wildfires. Most Canadian wetlands are subject to fire at times of the year that are different from when forested areas are subject to fire. Different burning patterns in wetland and forested ecosystems help to increase the diversity in wetland and forested areas. Wetlands may also serve as a source of water for forest fire suppression in an emergency. Your wetland may save trees, wildlife, homes, and even, human lives.

A wetland acts as an ecosystem and must be seen and understood in this way. Any change that occurs in an ecosystem affects all the species in it. Furthermore, wetland areas function as part of the surrounding environment. For example, activities such as excavation for gravel may adversely affect a neighbouring wetland.

The wetland and wooded areas of your property are interconnected. For example, if you remove all the trees from around your wetland, the water level in your wetland [illegible]

Wetland Wildlife

Wetlands are Home to Wildlife Species

Wetlands provide diverse habitat to many different kinds of mammals, birds, reptiles, amphibians, fish, insects and plants. Some people feel that you can only find abundant wildlife in special areas like national parks. You might be surprised at the abundance of wildlife in your own wetland. Wildlife are dependent on wetlands for food, water and shelter.

Plants and animals that live in wetlands are adapted to their environment. Some plants that live in the acidic, peaty and low nutrient soils of bogs are carnivorous. For instance, pitcher plants, sundews and bladderworts trap insects from which they absorb proteins, rather than rely on the few nutrients found in acidic peat bogs.

Wetland Wildlife varies across Canada

Wildlife habitat varies considerably in different parts of our country. The wildlife you have in your wetland depends very much on where you live.

If you live in the boreal region of Canada, you may see ducks like the green-winged teal feeding in your wetland and birds such as the American kestrel nesting in dead trees. You may also see woodland caribou, long-toed salamanders and masked shrews.

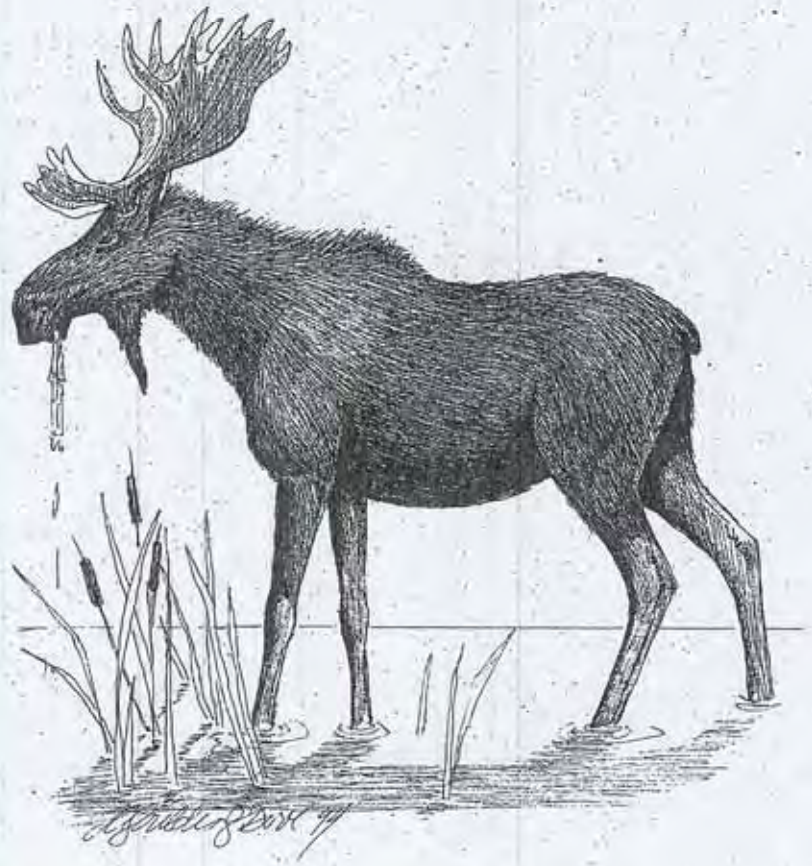
A Prairie wetland may boast horned grebes and ducks such as the mallard, as well as birds of prey like the northern harrier. Your wetland may also be used for food and shelter by mammals such as white-tailed deer, mink, muskrat and meadow-jumping mouse; and amphibians such as the wood frog.

If your wetland/woodlot area is in the eastern temperate region, you may see birds like the common goldeneye and the common yellowthroat. Largemouth bass and northern pike may use your wetland for spawning. Your wetland may also be home to snapping turtles, painted turtles, eastern fox snakes and spring peepers.

In Atlantic Canada you may see American black ducks and great blue herons in your wetland. Large mammals such as moose and black bears and small mammals such as muskrats, river otters and star-nosed moles may also live in the wetland you own. There may also be suitable habitat for brook trout and harvester butterflies.

Pacific Canada wetlands are suitable for birds such as the green-winged teal and the belted kingfisher. They are also home to salmon and lake trout, amphibians like the wood frog, insects such as the northern blue butterfly, and mammals such as beavers and water shrews.

These examples are only a small sample of wetland wildlife in Canada. Species listed in each region may occur in other regions of Canada as well.



The Role of Beavers in Wetlands

The beaver is a wildlife species which plays a key role in wetlands, especially those close to wooded areas. Some people view beavers as nuisance animals because they cut down trees and they build dams. It is important to understand the important role beavers play in our environment.

Beavers build dams to create ponds. These ponds allow beavers to enter their lodges underwater and to store food for winter under the ice surface. Beavers move to an area and use trees, shrubs and herbaceous plants for food and building material. Excessive flooding kills the trees and shrubs nearby, which creates gaps in the forest. Increased water levels also lead to the growth of aquatic plants. Beaver ponds are important to more than beavers; they are also used as resting and feeding areas by fish like brook trout. Waterfowl, such as wood ducks, use them for resting, nesting and feeding. Muskrats, minks, raccoons, salamanders, frogs and toads use them for water, food and shelter. Birds such as woodpeckers and other cavity-nesters make use of the dead standing trees for nests and great blue herons may nest in tall trees in and around the beaver pond.

When the beavers have removed all useable trees and shrubs, they move to a more suitable site and begin to make a new beaver pond. With no beavers to maintain water levels, wetland grasses and sedges invade the wetland, followed by shrubs and trees and the pond becomes what is called a beaver meadow. After some time, the area may or may not revert to what it was like before the beavers arrived. In this way, beavers play an important role in wetland ecology, and their behaviour should be understood in terms of how they interact with their environment.

The Value of Wetlands

Not only are wetlands important because of the role they play in our environment, they are estimated to be worth billions of dollars to Canadians and also have many intangible benefits. They are valuable to society for many reasons, including:

- education and research
- spiritual and cultural experience and relaxation
- recreational activities such as hiking, bird watching and photography
- hunting, fishing and trapping
- small scale production of fish, berries and wild rice
- large scale production of timber and peat

Social and Cultural Values

The ecological value of wetlands has been explained because of their role in global processes, their ability to reduce flooding, reduce soil erosion, increase water quality and provide habitat to a large number of organisms. Wetlands are also valuable for many other reasons, including education and research. By increasing our knowledge about the role of wetlands, we learn more about their natural systems and the impact of different management techniques on them.

Wetlands are popular places for photography, bird watching, canoeing, nature hikes, snowshoeing, relaxation and other recreational and spiritual/cultural experiences. These activities are called non-consumptive uses because resources are not removed from the wetland. Many Canadians go on trips or excursions to watch, photograph and study wildlife. In 1991, almost four million Canadians or 19% of the Canadian population participated in trips of this kind. Canadians who participated in these activities spent on average 22 days a year doing so. More specifically, in 1991, 2.4 million Canadians (11% of the population) reported seeing waterfowl on these trips.

Wetlands are Valuable for the Production of Natural Resources

Wetlands are also valuable for hunting, fishing and trapping. In 1991, 1.5 million Canadians (seven percent of the Canadian population) hunted. In that same year, Canadian hunters spent on average 16 days

hunting. Of these, 394 000 Canadians or two percent hunted waterfowl. For more information about the extent to which wildlife is important to Canadians, see Table 5.

These activities increase tourism to wetland areas which boosts local economies. Wetlands are ecologically, socially and economically beneficial to Canadians.

As well as the production of waterfowl, fish, and mammals, wetlands are also used for producing craft items, cranberries, blueberries, wild rice, fuel wood, timber and peat. In 1993, peat shipments in Canada were valued at 112.9 million dollars.

Table 5
The Use of Wildlife For Non-consumptive Activities and Hunting in each Canadian Province during 1991

Province	Non-consumptive		Hunting	
	Percentage of population participated	Average days participated	Percentage of population participated	Average days participated
Newfoundland	17	21	20	20
Prince Edward Island	11	23	6	17
Nova Scotia	22	18	13	18
New Brunswick	17	24	16	16
Quebec	17	20	8	15
Ontario	19	21	5	17
Manitoba	19	19	8	14
Saskatchewan	16	20	10	12
Alberta	20	24	7	16
British Columbia	24	25	5	15

Source: Filion et al. (1993).

Wetland Conservation and Management

If you are a wetland owner you are probably interested in the stewardship and conservation of its habitat. This means that you are willing to care for your wetland and manage it so that it can be used for many things. To do this, there are various options available to you. You may want to take steps to preserve, restore and/or manage your wetland. What you do with your wetland depends on the type of wetland you own and what your management goals are.

Wetland Preservation

If you are interested in preserving your wetland, you may want to leave it untouched and allow nature to take its course. If your wetland is not currently being affected by humans (e.g., if it is not being drained or filled), the best way to preserve it is simply to leave it alone. Your wetland may support some endangered species; leaving it alone is the best way to ensure that the habitat for those species remains suitable. You should also be aware that some wetlands are more significant than others and must be protected. A biologist or wetlands specialist can help you understand this.

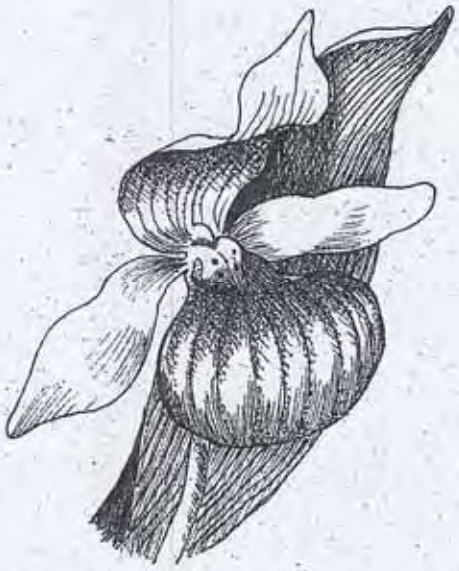
Preserving your wetland does not mean that it will remain the way it is now. Remember that wetlands are always changing. Preserving a wetland simply means that it will be left unaltered by humans. This approach requires no money and no labour.

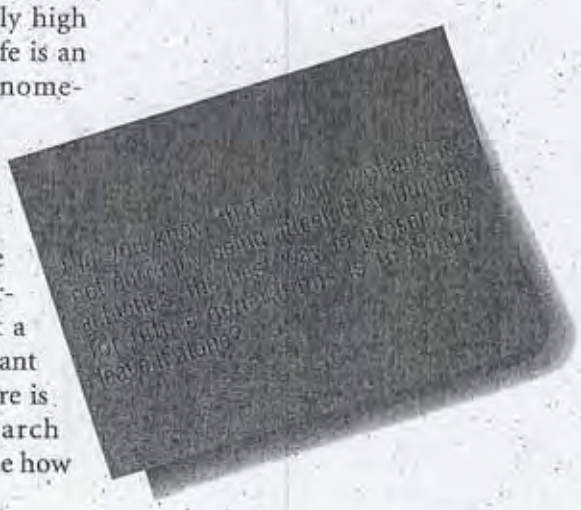
Wetland Restoration

If you know that your wetland has been negatively impacted in the past or present, you can try to restore the wetland to its former state. For instance, if the wetland in your woodlot was drained by previous landowners, you can try to fill in the ditches that were dug to drain it. The area should then slowly start to restore itself.

Another practice that is becoming popular is to resow *native* plants that grew before the wetland was altered. To do this you will need to determine what species were in the wetland originally and either order or collect the seeds needed.

Many wetland plants are not native to Canadian wetlands. Some of these plants create a serious problem in wetland ecosystems. They change the species composition of an area, reducing food sources and wildlife habitat. Non-native plant species replace native wetland plants by out-competing them for basic requirements such as nutrients and light. Additionally, non-native plants are often not eaten by any native insects or animals, allowing them to multiply at alarmingly high rates. Purple loosestrife is an example of this phenomenon. This plant has showy pink flowers and has invaded and taken over many wetlands during the past 20 years. Its natural beauty has made it a favourite *perennial* plant in home gardens. There is now extensive research underway to determine how





to restore wetlands that have been changed by this invasive plant species. For more information about identifying this plant and how you can remove it from your wetland, contact the Canadian Wildlife Service of Environment Canada.

Wetland Management

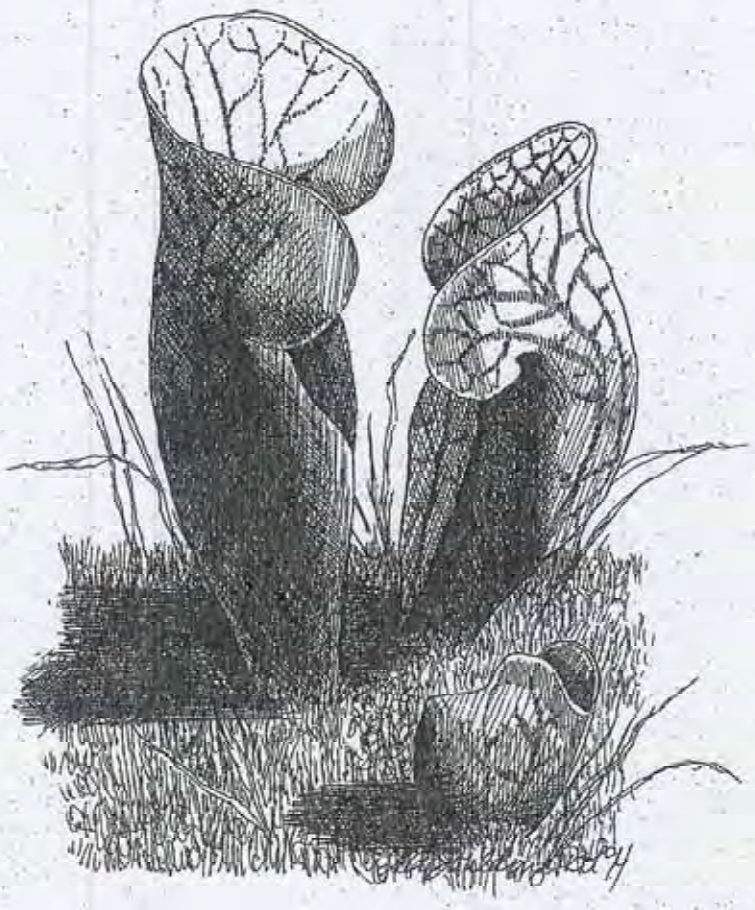
If you choose to manage your wetland, you first need to understand what kind of wetland you have and what potential uses it might have. Because wetlands are ideal wildlife habitat, many owners use their wetlands for activities such as bird watching, photography, canoeing and fishing. Therefore, you may choose to manage your wetland/woodlot area with the goal of increasing its potential for wildlife.

You may want to enhance wildlife habitat for certain species such as wood ducks, northern pike or a rare species like Henslow's sparrow or Blanchard's cricket frog. Of course, you can only expect to attract species to your property that are naturally suited to it. For details on how to manage your wetland for specific wildlife, please contact the department responsible for natural resource management in your province or Ducks Unlimited Canada. This section only provides general information about how to increase the potential of your wetland for wildlife.

Some Techniques for Increasing Wildlife on your Wetland/Woodlot

The basic requirements of all wildlife are food, water, shelter and space. Food is provided by many natural sources, such as flowers, berries, nuts, grasses, legumes and insects. You can improve food sources by planting suitable native trees and shrubs.

Wildlife depend on wetlands, ponds, streams and rivers as natural sources of water. You can increase water availability by preserving the wet/aquatic areas of your property. Be aware that chemicals such as pesticides, household cleaning products, motor lubricants and hydraulic fluids can cause harm to many organisms that depend on your wetland/woodlot complex. Therefore, do not dump chemicals into wetlands or streams on your property. Be careful about what you put down your drain as well.



Wildlife use shelter for protection from harsh weather and natural *predators*. You can increase the amount of shelter in your wetland/woodlot area by creating brush piles, rock piles, making and putting up nest boxes, leaving *snags* standing and leaving *"wolf"* trees on your property. See Table 6 for a list of food, water and shelter sources for wildlife.

In general, wildlife diversity will increase with increased size of protected area and its

Table 6
Food, Shelter and Water Sources for Wildlife Habitat

Food sources	Shelter sources	Water sources
fruits	trees	beaver ponds
berries	shrubs	marshes
grain	grasses	swamps
seeds	flowers	springs
nectar sources	rock piles	streams/brooks
nuts and acorns	brush piles	lakes
woody twigs	cut banks	rivers
woody buds	hollow trees (snags)	bogs
grasses	nest boxes	fens
legumes	burrows	shallow open water
aquatic plants	bridges	tidal flows
insects	abandoned buildings	surface run off
	cliffs	ditches

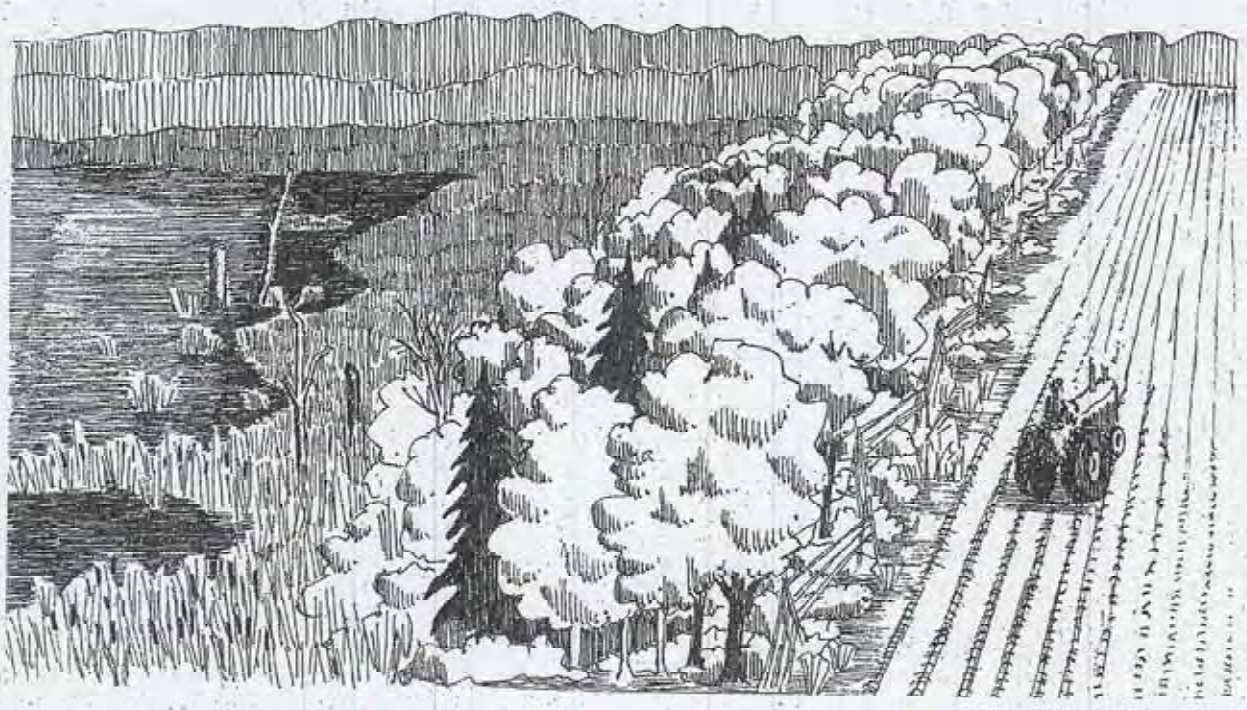
Source: Henderson (1987).

increased connectedness with other natural areas. You may not be able to increase the size of your property, but you can increase the amount of suitable wildlife habitat.

You can also connect wildlife areas to each other with strips of natural areas (brushy *hedgerows* or *fencerows*). For instance, if you have two wooded wetland areas at opposite ends of a field, you may want to establish a strip of vegetation along a fence so that wildlife can travel from one wetland to another without being exposed to predators or harsh weather. These strips of land can be thought of as corridors that connect two or more natural areas together.

You can also increase the amount of suitable habitat by increasing the amount of *edge* on your property. An edge is where two different types of habitats meet. These areas are great for some wildlife because there is a greater variety of food and shelter for them to choose from. For instance, an abrupt division between the wooded area and the wetland area on your property will not provide as much edge as wooded and wetland areas that gradually blend into one another. One way you can increase edge is by leaving a riparian zone or *buffer zone* around your wetland, which will also serve as a corridor for wildlife.

A diverse wetland/woodlot area generally has a higher diversity of species. It is preferable to have different ages and sizes of trees, shrubs and plants (i.e., open areas, a herbaceous zone, shrubby areas, young trees, medium aged trees and old growth trees). There are some species that depend on old growth habitat, of which there is very little left because of past land use practices. You may decide to designate a section of your wetland/woodlot area that will never be cut.



Other Management Options

You may also want to manage for other natural resources such as timber, wild rice, fish or berries. Although we cannot go into detail here about specific management plans for each resource, we encourage you to contact one of the agencies listed in the Assistance Available section at the end of this booklet for help.

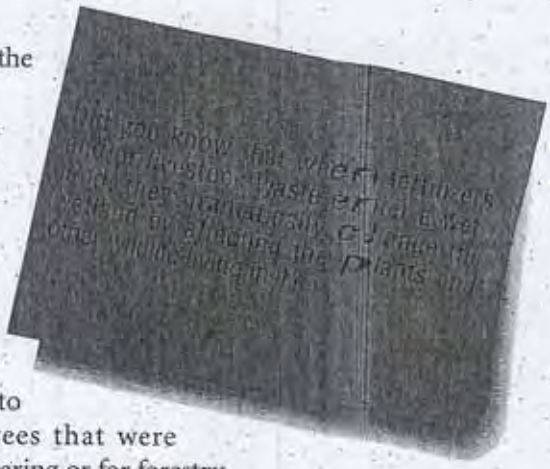
Many wetland/woodlot owners in Canada are using areas adjacent to wetlands for forestry and/or farming. The following are some tips to help you reduce the negative impact of these practices on your wetland. This is not an exhaustive list; there may be other ways in which you are able to reduce the impact of various activities on your wetland. Please note that a number of the listed practices require permits in some provinces. Please consult with one of the agencies in the Assistance Available section at the end of this booklet to obtain information about land use in and around wetlands on your property.

Tips to help You Reduce the Effects of Agricultural and Forestry Practices on your Wetland

1. *Avoid draining and/or filling sections or all of your wetland.*
   Why? Water and fertility levels are the two most important factors in wetland ecology. Draining a wetland leads to lower water levels or no water at all. Removing all water for a prolonged time period kills wetland vegetation which requires moist soil or standing water to survive. Upland herbs, shrubs and trees will then invade the area. Reduced water levels lead to changes in the types and abundance of plant species in your wetland. Species requiring high water levels start to die out and those needing low water levels increase. Wildlife composition also changes in your wetland due to changes in food sources, nesting sites and other habitat needs.

   Filling in a wetland affects both water and fertility levels, and leads to an entirely different community of animals and plants. Filling a wetland completely alters the wetland ecosystem, resulting in its destruction.

2. *Avoid forestry operations in or near wetlands.*
   Why? Removing trees from a wetland area alters the wetland and the species living in it. For instance, removing trees leads to a decrease in the amount of water absorbed by tree roots and evaporated into the atmosphere. This decrease in water evaporation increases the water level in the wetland which in turn leads to different wetland vegetation. Changing the vegetation affects the wetland and the wildlife living in or near it. If forestry operations are unavoidable, their negative impact may be reduced by using single tree and group selection harvesting techniques, by using equipment with wide flotation tires, and harvesting selected trees when the wetland is frozen.



3. *Plant trees and leave as many snags, "wolf" trees and fallen trees as possible.*
   Why? Planting trees on your property will help to compensate for trees that were removed for farm clearing or for forestry operations. Plant tree and shrub species appropriate for wetland sites, or plant some of the same species that occurred prior to clearing. Leaving snags, "wolf" trees and naturally fallen trees provides shelter to many wildlife species.

4. *Leave a buffer zone around your wetland.*
   Why? A buffer zone or an area of uncut vegetation provides a natural zone between your wetland and fields, pastures and wooded areas. The buffer zone helps to protect your wetland from damage. For instance, if you are farming and you cultivate to the edge of your wetland, the natural vegetation around the wetland is destroyed. This natural vegetation reduces erosion, shades streams, provides food for invertebrates and provides habitat for many insects required by fish for food. The buffer size required to protect your wetland will depend on the qualities and features of your particular wetland. As a guide, the *Ontario Wetlands Policy* recommends 120 m wide buffers around wetlands.

5. *Fence off your wetland area and buffer zone.*
   Why? This will prevent livestock from using these areas for grazing or drinking. Livestock waste in and around a wetland or stream increases the nutrient levels in the area (this process is called

eutrophication). Increasing nutrient levels in your wetland has long term effects. This dramatically changes the wetland by affecting the plants and other wildlife in the wetland. For instance, many wetlands close to agricultural areas are dominated by cattail, a wetland plant well suited to high nutrient areas. This is an example where eutrophication has changed a wetland with high plant diversity to one containing a monoculture of one plant species. A drastic change such as this also changes the composition of wildlife species that use the wetland. Animal movement in a wetland along a stream also leads to increased soil and bank erosion and soil compaction. Providing water troughs in pastures removes the need for cattle to enter the wetland, especially if the troughs are in proximity to shade and mineral or salt "licks".

6. *Build proper bridges or use portable bridges for machinery and livestock stream crossing.*
   Why? Animal or machinery movement in streams compacts soil and increases sedimentation in the water, which destroys or alters habitat for invertebrates, fish and other aquatic life. Never drive your forestry or farm equipment through a wetland, stream or other waterway.

7. *Avoid using snowmobiles or ATVs in and around wetlands for recreational use.*
   Why? These machines negatively impact wetlands in various ways. First, the noise of these motorized vehicles causes certain wetland wildlife to avoid an area in which it needs to travel for food, water and/or shelter. Secondly, these vehicles damage and kill plants and change soil conditions by compacting it or tearing it up. Thirdly, gas or oil leaks from snowmobiles and ATVs pollute the area. The effects of this are explained in Tip No. 11.

8. *Do not pile manure near a wetland or stream area.*
   Why not? Drainage from the manure pile enters the water and leads to increased nutrient levels in the wetland (eutrophication).

9. *Do not construct roads or landings in or near wetlands.*
   Why not? Constructing roads and landings in areas where the soil is prone to erosion and compaction (i.e., fine and wet soils) leads to soil erosion, wetland pollution, and destruction of wildlife habitat. Besides, building roads in or near wetlands is difficult and expensive.

10. *Minimize the use of pesticides and fertilizers and never clean pesticide spraying equipment in or near a wetland.*
    Why? Pesticides used adjacent to wetlands eventually enter the wetland area and water table, where they are a threat to many species. Fertilizers used on adjacent farmland also enter the wetland area and lead to increased rates of eutrophication.

11. *Do not refuel/relubricate or store fuel near wetlands.*
    Why not? Petroleum products enter the wetland area and pose a threat to the species that depend on the wetland by polluting both water and soil. Wildlife ingest these pollutants and plants are negatively affected by changes in soil and water chemistry.

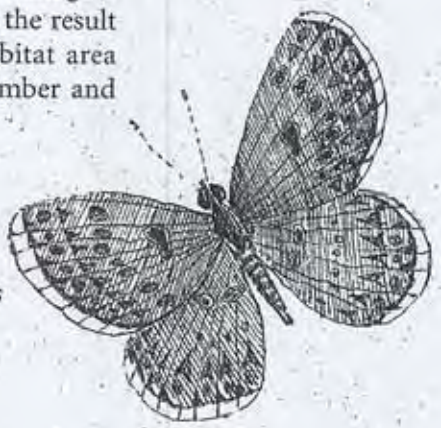
12. *Do not leave logging debris or other debris in or around your wetland.*
    Why not? Large quantities of logging debris in water blocks the flow of water and decreases the amount of oxygen available to aquatic organisms. Other debris (i.e., garbage, including pesticide, gas, oil, chain oil, and hydraulic fluid containers) pollute the wetland and negatively impact the species living in the wetland.

13. *Do not dispose of household cleaning products down your drain.*
Why not? Phosphates, bleaches, household cleaning products, and old paints are all toxic substances which harm the environment if disposed of carelessly.

14. *Do not dump garbage in or near wetlands.*
Why not? In the past, many landowners have used portions of their wetlands and woodlots as garbage dumps. This practice destroys wildlife habitat and is not very aesthetically pleasing. Toxic materials, such as old paint cans, are particularly harmful to water systems.

You Can Manage along with Others

You can manage your wetland/woodlot area alone or with your neighbours. Remember that your property is part of a larger natural area. You can save time, money and make better use of your land by coordinating your conservation activities with a neighbour. For instance, if both you and your neighbour decide to manage a portion of your land for wildlife, the result will be a larger total wildlife habitat area which should attract a larger number and diversity of wildlife species.



Assistance Available

For more information about the topics covered in this booklet, you may want to contact one of the following agencies or do some additional reading on your own. The following list contains the names of both government and non-government organizations, whose staff may be able to assist you in various ways, including sending you additional information about wetlands and woodlots, informing you of regulations related to land use in and around wetlands, advising you on natural resource management, and providing lists and descriptions of rare species. If you are not sure where to start, perhaps visit your local library or talk to a biology or environmental sciences teacher at your local high school.

Federal Agencies
- Environment Canada (Canadian Wildlife Service)
- Fisheries and Oceans Canada
- Natural Resources Canada (Canadian Forest Service)

Provincial Agencies
- Environment Departments
- Fisheries Departments
- Forestry Departments
- Natural Resource Departments

Universities and Technical Schools
Non-Government Organizations
- Canadian Forestry Association and provincial affiliates
- Canadian Nature Federation
- Canadian Parks and Wilderness Society
- Canadian Wildlife Federation
- Ducks Unlimited Canada
- Field Naturalists Groups
- Nature Conservancy of Canada
- Whooping Crane Conservation Association
- Wildlife Habitat Canada

Community and Volunteer Groups
- many community and volunteer conservation groups exist across Canada

Electronic sources such as Freenet or Internet

Further Reading

1. National Wetlands Working Group. 1988. *Wetlands of Canada.* Ecological Land Classification Series, No. 24. Sustainable Development Branch, Environment Canada. Ottawa, Ontario, and Polyscience Publications Inc., Montreal, Quebec.

2. Cox, K. 1993. *Wetlands. A Celebration of Life.* Sustaining Wetlands Issues Paper Series, No. 1993-1, North American Wetlands Conservation Council (Canada). Ottawa, Ontario.

3. Sheehy, G. 1993. *Conserving Wetlands in Managed Forests.* Sustaining Wetlands Issues Paper Series, No. 1993-2, North American Wetlands Conservation Council (Canada). Ottawa, Ontario.

Glossary

acid precipitation sulphur dioxide (SO_2) interacts with water vapour to produce dilute sulphuric acid (H_2SO_4)

biological diversity the variety of species and ecosystems on earth and the ecological processes of which they are a part

biomass total weight of all organisms (or some group of organisms) living in a particular habitat or place

buffer zone a section of natural vegetation between a natural area and an area of human activity

carbohydrate an organic compound consisting of a ring of carbon atoms to which hydrogen and oxygen are attached in a ratio of approximately 2:1; carbohydrates include sugars, starch, cellulose, etc.

carbon cycle worldwide circulation and reuse of carbon atoms, chiefly due to processes involving living organisms

decompose to decay

DNA carrier of genetic information of cells

ecosystem the organisms associated in a given natural area and the environment with which they interact

edge a zone where two habitat types meet

endangered a species threatened with imminent extinction (no longer exists anywhere) or extirpation (no longer exists in Canada) throughout all or a large portion of its range

eutrophication the increase in nutrients in rivers, lakes, streams and wetlands beyond the system's ability to self-purify. Often due to human activities in agricultural areas

fencerow section of natural or planted vegetation growing along a fence

habitat — the place in which individuals of a particular species can be found

hedgerow — section of natural vegetation along a boundary such as a field

herbaceous — any nonwoody plant

lipid — one of many organic substances that are insoluble in water; lipids include fats, oils, waxes, etc.

native — a species that originally occurred in an area (i.e., not introduced by human activity)

niche — the physical space occupied by an organism and its functional role in the community

organic — of, or formed from, living organisms

pathogen — any disease-producing organism

photosynthesis — the process in a leaf by which the sun's energy is used to create sugar, oxygen and water

perennial — a plant that persists in whole or in part from year to year and usually produces seeds in more than one year

predators — organisms that eat other living organisms

proteins — compounds that occur in all living matter and are essential for the growth and repair of animal tissue

respiration — the physical and chemical processes by which oxygen and carbohydrates are assimilated into the system and the oxidation products, carbon dioxide and water, are given off

sediment — very fine particles of solid matter suspended in liquid or settling to the bottom

siltation — settling of sediments

snag — standing dead tree

soil erosion — the wearing away of soil

succession — the gradual process by which the mix of species in a natural area changes

threatened — a species likely to become endangered in Canada if the factors affecting its vulnerability are not reversed

vulnerable — a species particularly at risk because of low or declining numbers, small range or for some other reason, but not a threatened species

"wolf" tree — tree that has a large crown and many branches

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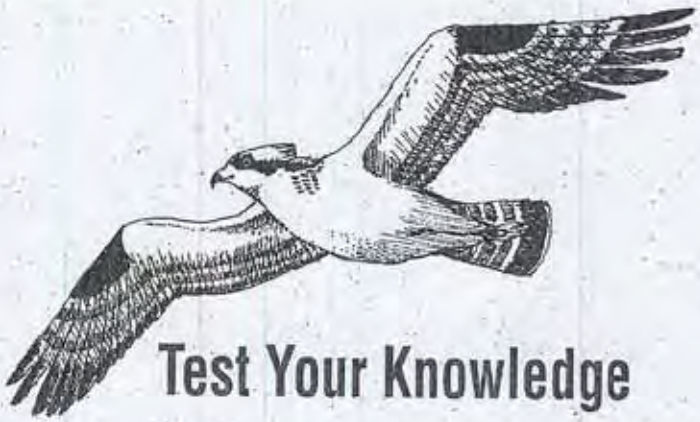
The following is a list of True or False questions about the information contained in this booklet. The answers to these questions are found below, with a reference to the subheading where the topic is discussed in the booklet.



Test Your Knowledge

1. Wetlands are prevalent throughout Canada, but our wetlands make up only a small proportion of the world's wetlands. True or False?
2. Greater than 14% of Canadian wetlands have been converted into other land uses such as agriculture and urban development. True or False?
3. Wetlands are unproductive areas that are not valuable to woodlot owners. True or False?
4. Wetlands provide suitable habitat to many more types of wildlife than ducks and geese. True or False?
5. Your wetland improves water quality and reduces the risk of flooding. True or False?
6. Most wetlands are areas of high biodiversity. True or False?
7. Wetlands provide habitat to endangered and threatened species. True or False?
8. If left alone, a wetland will remain unchanged over time. True or False?
9. A wetland provides habitat to many species, but the wetland environment is not affected by the species living in it. True or False?
10. Wildlife in wetlands are abundant partly due to the diversity of food sources. True or False?
11. The wildlife in your wetland may be quite different from that in other areas of Canada. True or False?
12. Beavers destroy wetlands and provide no benefit to the natural area. True or False?
13. Wildlife is only abundant in wetlands that occur in provincial or national parks. True or False?
14. Your wetland is only valuable to you if you can harvest timber, produce peat or grow wild rice. True or False?
15. Wetlands are not popular areas for hunting and fishing. True or False?
16. The use of wetlands for recreational activities is not economically valuable in Canada. True or False?
17. The best way to preserve a wetland may be to leave it alone. True or False?
18. To improve wildlife habitat on your property, you should remove all snags, brush and fallen trees to increase the amount of open space. True or False?
19. You should leave a buffer zone around your wetland to reduce the impact from adjacent agricultural practices. True or False?
20. It is possible to manage your wetland for wildlife and the production of renewable resources. True or False?

1. False. 24% of the world's wetlands are in Canada. Wetlands in Canada
2. True. Over 14% of wetlands in Canada have been converted to other land uses over the last 200 years. Wetland Loss.
3. False. Wetlands are extremely productive areas which play an important role in nature. The Role of Wetlands in the Environment.
4. True. Wetlands provide habitat to many species of plants and animals Wetland Wildlife.
5. True. Wetlands store excess water, reducing the risk of flooding. Water Regulation and Water Quality Improvement.
6. True. Wetlands are more productive than many other habitats and this allows them to support many different species. Wetlands are Home to Many Species.
7. True. Wetlands provide habitat to many endangered, threatened, and vulnerable species. Wetlands are Home to Many Species.
8. False. Wetlands are continually changing through a process called succession. Wetlands Change Naturally.
9. False. The species within a wetland interact with each other and their environment. Wetlands are Complex Systems.
10. True. A variety of food sources supports a variety of wildlife species. Wetlands are Home to Many Species.
11. True. The wildlife in your wetland depends on where you live. Wetland Wildlife varies across Canada.
12. False. Beavers play an important role in wetland ecology. The Role of Beavers in Wetlands.
13. False. Even small wetlands support many species of plants and animals. Wetlands are Home to Many Species.
14. False. Wetlands are popular places to enjoy many activities. Social and Cultural Values.
15. False. A large percentage of Canadians spend time hunting and fishing in wetland areas. Wetlands are Valuable for the Production of Natural Resources.
16. False. Recreational activities in wetlands are beneficial to local economies. Wetlands are Valuable for the Production of Natural Resources.
17. True. One way to protect your wetland is to leave it untouched and allow nature to take its course. Wetland Preservation.
18. False. Snags, brush and fallen trees provide shelter for wildlife species. Some Techniques for Increasing Wildlife On Your Wetland/Woodlot
19. True. A buffer zone provides an area of natural habitat between other land uses and wetlands. Other Management Options.
20. True. Wetlands are diverse areas which lend themselves to a variety of different uses. Wetland Management.