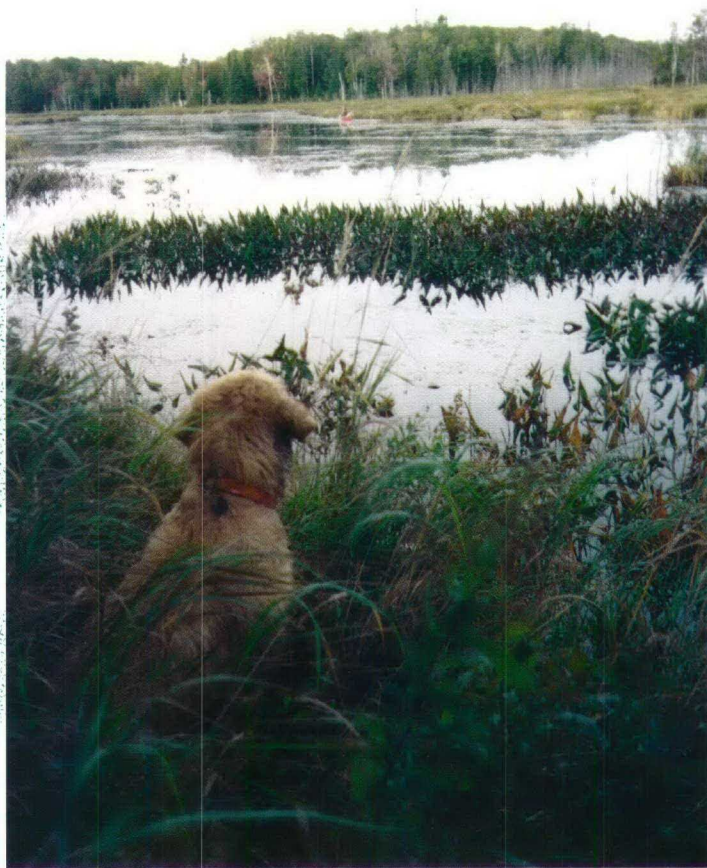


WETLANDS AND WOODLOTS



**SUSTAINING
wetlands**

ISSUES PAPER, No. 1995 - 1

PUBLISHED IN PARTNERSHIP WITH:



CANADIAN FORESTRY ASSOCIATION



Ducks Unlimited Canada



LANDOWNER
RESOURCE
CENTRE



North American Wetlands Conservation Council (Canada)

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WETLANDS AND WOODLOTS

by

Lisa Twolan-Strutt

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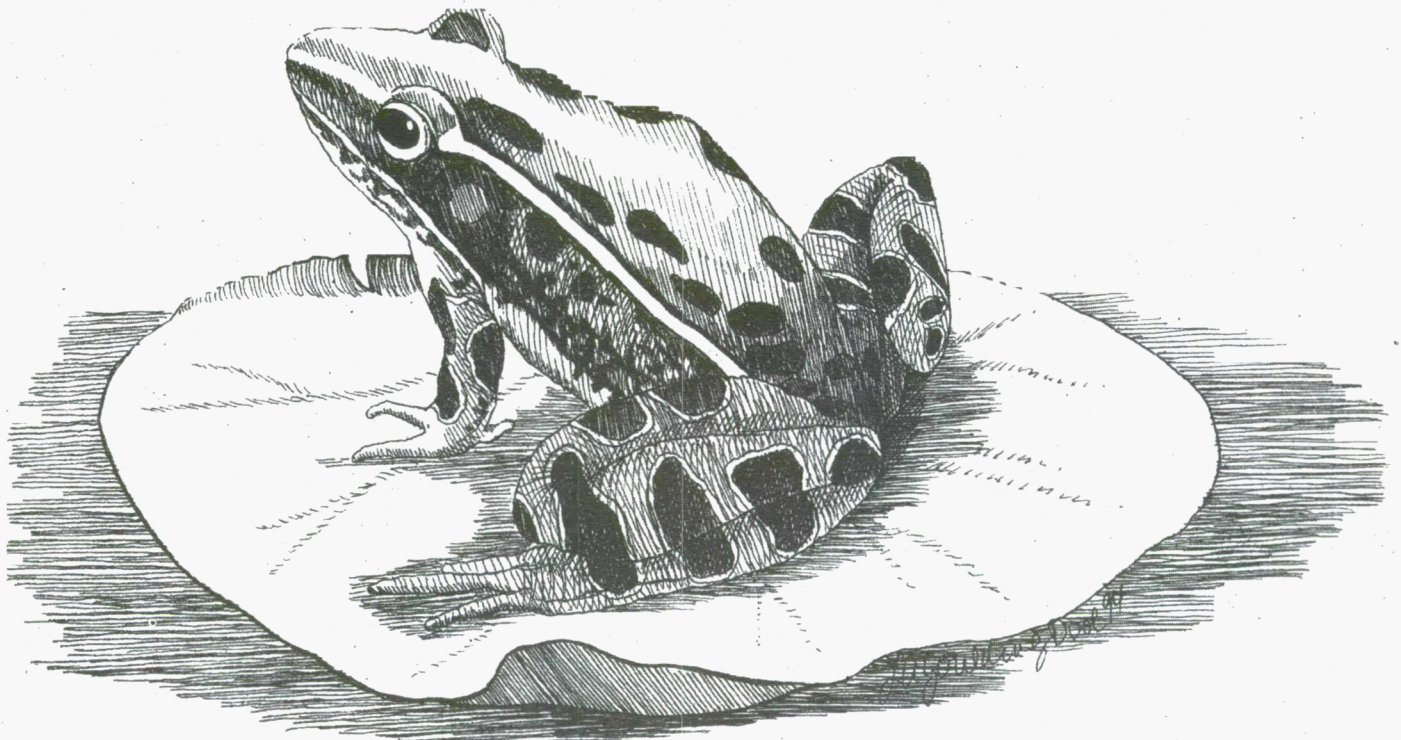
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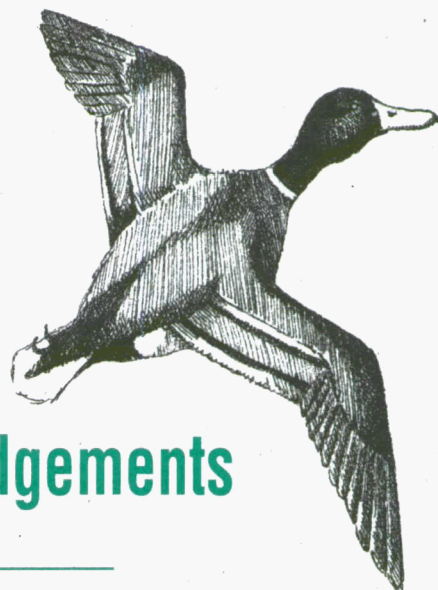
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Acknowledgements

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.

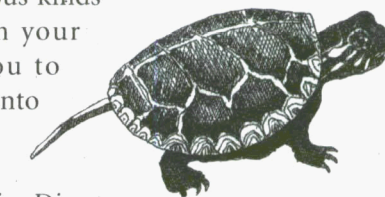
On many woodlots, wetlands form an important part of the forest ecosystem. They may not be commercially productive in growing timber, but their value in many

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*



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 (CO₂) from the air. Plants use CO₂ 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

Wetlands are not wastelands. They regulate and filter water, decrease soil erosion and are home to many species of mammals, birds, reptiles, amphibians, fish, invertebrates, and plants.

Introduction

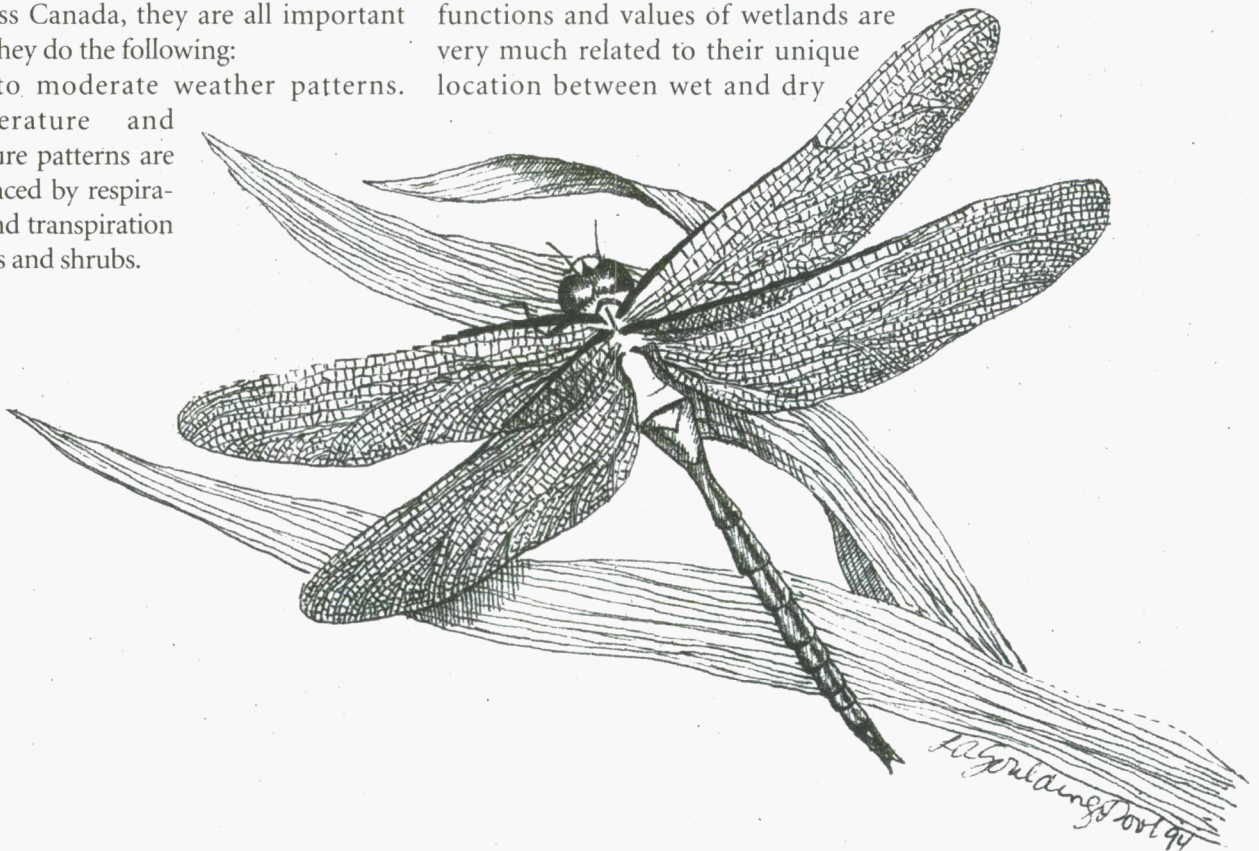


Table 1
Woodlots in Canadian Provinces

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.

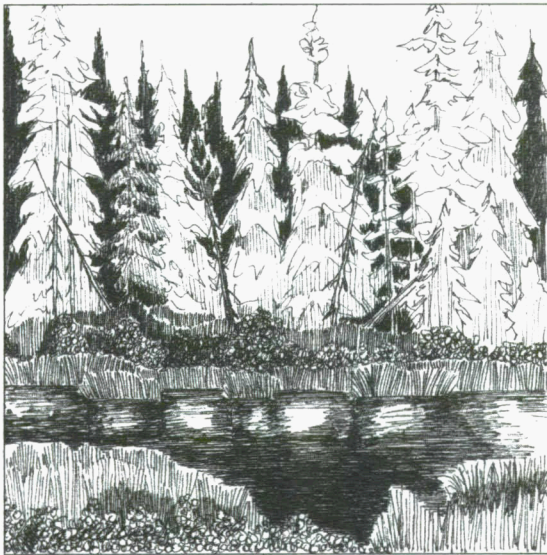
Wetland Loss

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

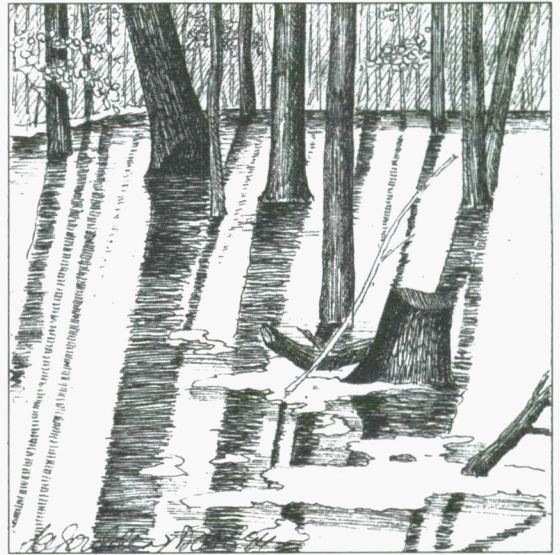
Table 2 Classes of Canadian Wetlands

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).



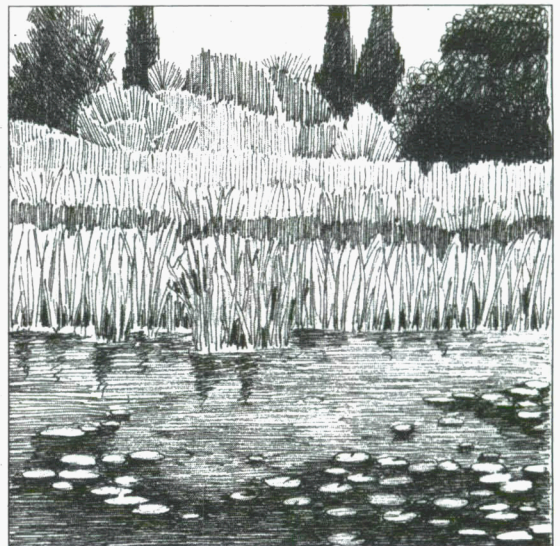
Bog



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.

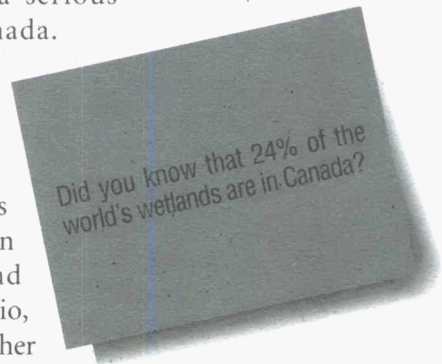
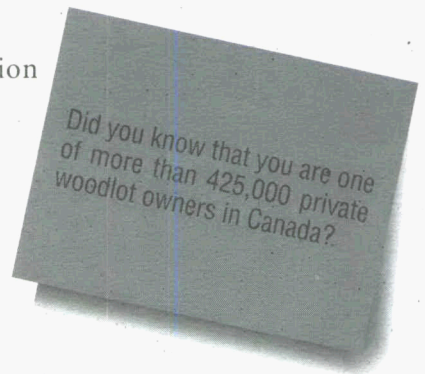


Table 3
Distribution of Canadian Wetlands

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).

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

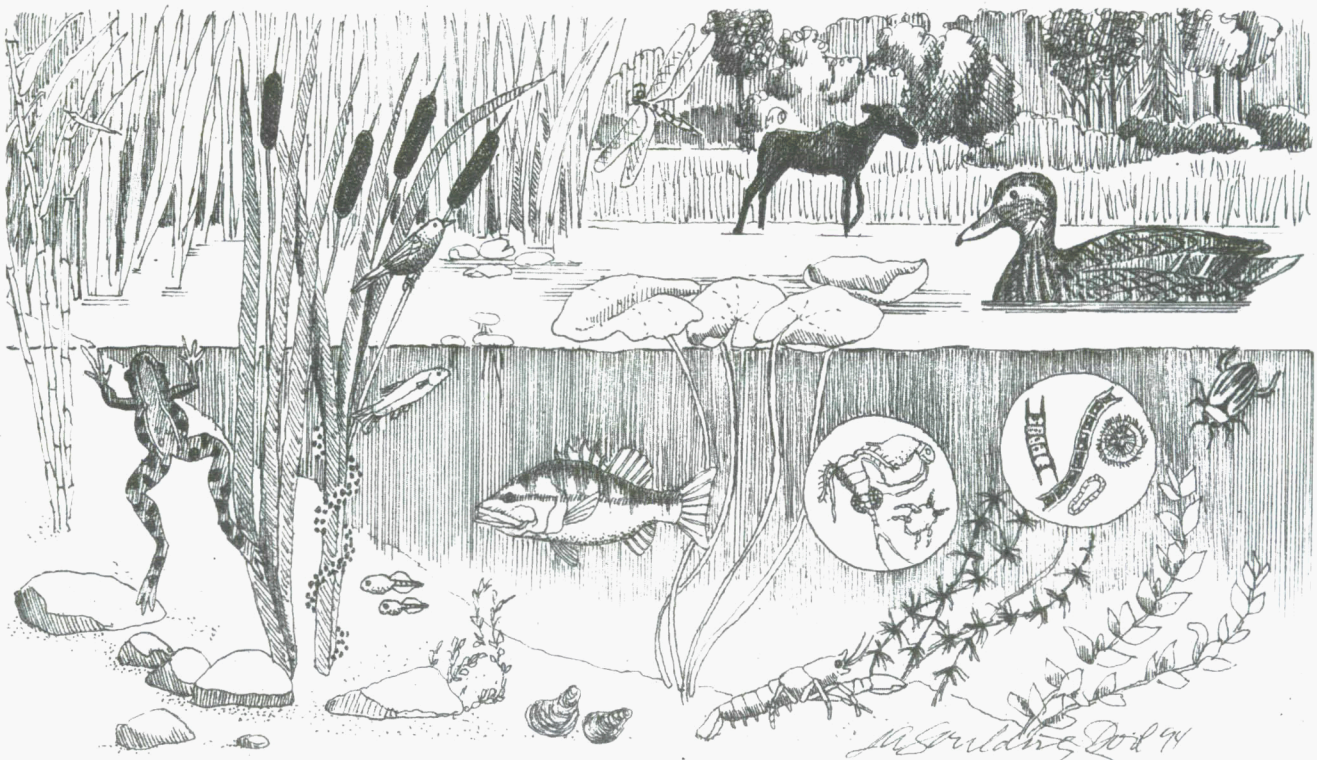
The Global Role of Wetlands

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.

The Role of Wetlands in the Environment



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.

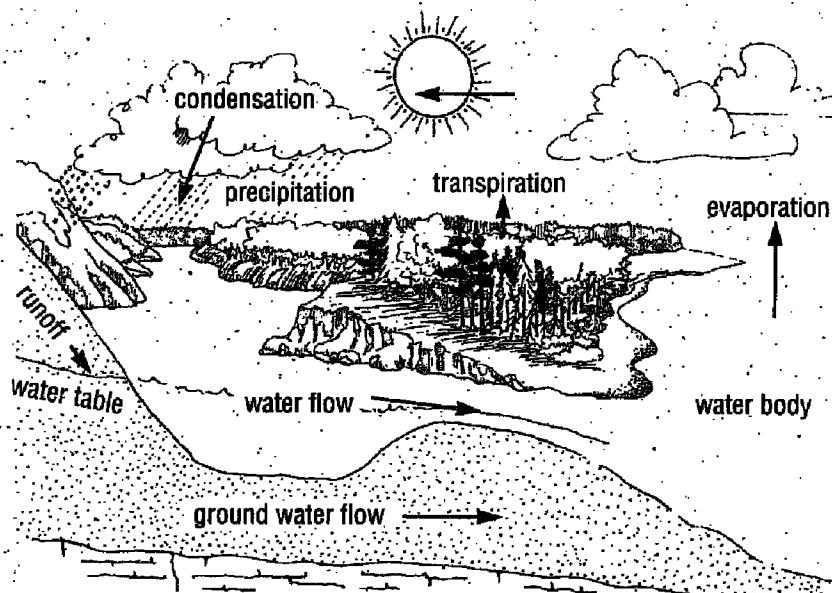
Prevention of Erosion

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

- A wetland's role in nature is to:
- 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



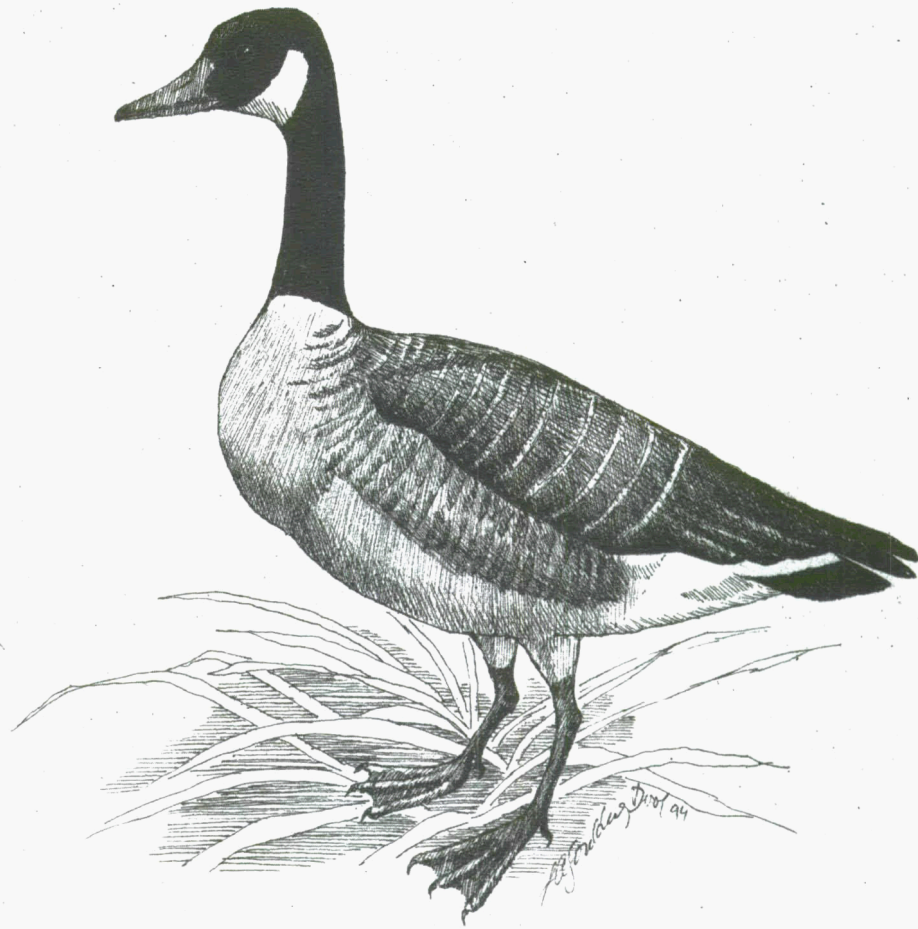
THE WATER CYCLE

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.

Did you know that marshes and swamps are four times more productive than lakes and streams and three times more productive than agricultural land?

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

8 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 tree 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

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 will be affected.



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.

Wetland Wildlife

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.

Caribou, moose, mink, muskrats, star-nosed moles, northern pike, brook trout, long-toed salamanders, wood frogs, mallards, black ducks, snapping turtles, belted kingfishers and northern blue butterflies are only some of the wildlife that depend on 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



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.

The Value of Wetlands

- Wetlands are valuable for:
- education and research
 - photography, bird watching, hiking, skating, canoeing, snowshoeing
 - hunting, fishing, and trapping
 - producing timber, wild rice, peat

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

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.



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.



In 1991, almost four million Canadians took trips to watch, photograph and study wildlife. 2.4 million of these Canadians reported seeing waterfowl.

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).

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

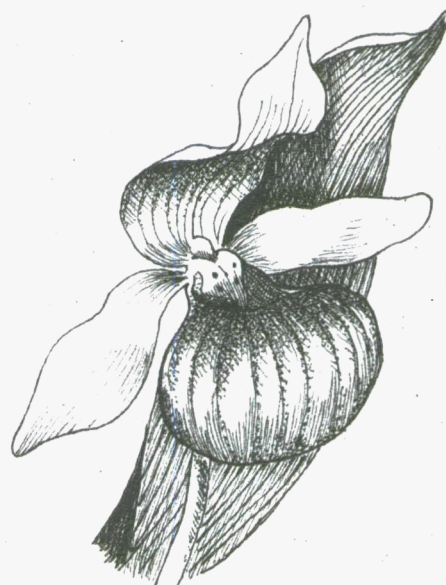


can try to restore the wetland to its former state. For instance, if the wetland in your woodlot was drained by previous landowners, you can try to fill in the ditches that were dug to drain it. The area should then slowly start to restore itself.

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

Wetland Conservation and Management



Did you know that if your wetland is not currently being affected by human activities, the best way to preserve it for future generations is to simply leave it alone?

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

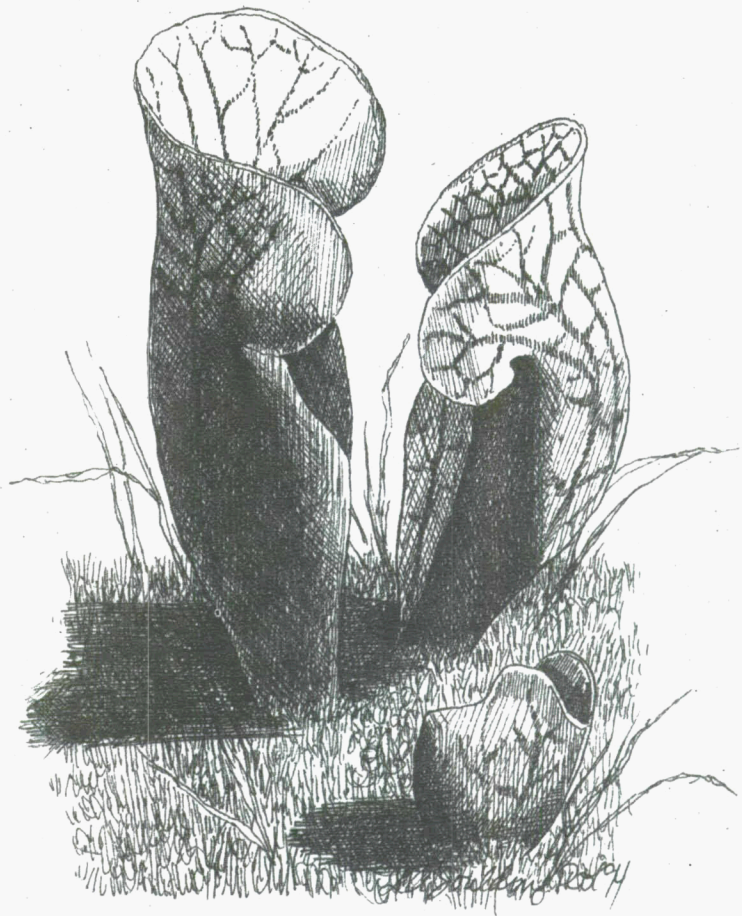
The basic requirements of all wildlife are food, water, shelter and space. Food is provided by many natural sources, such as flowers, berries, nuts, grasses, legumes and insects. You can improve food sources by planting suitable native trees and shrubs.

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



You may be able to increase wildlife in your wetland/woodlot area by:

- connecting natural areas together
- increasing the size of natural areas
- cooperating with neighbours to increase the size and connectedness of natural areas in and around your property

Table 6
Food, Shelter and Water Sources for Wildlife Habitat

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

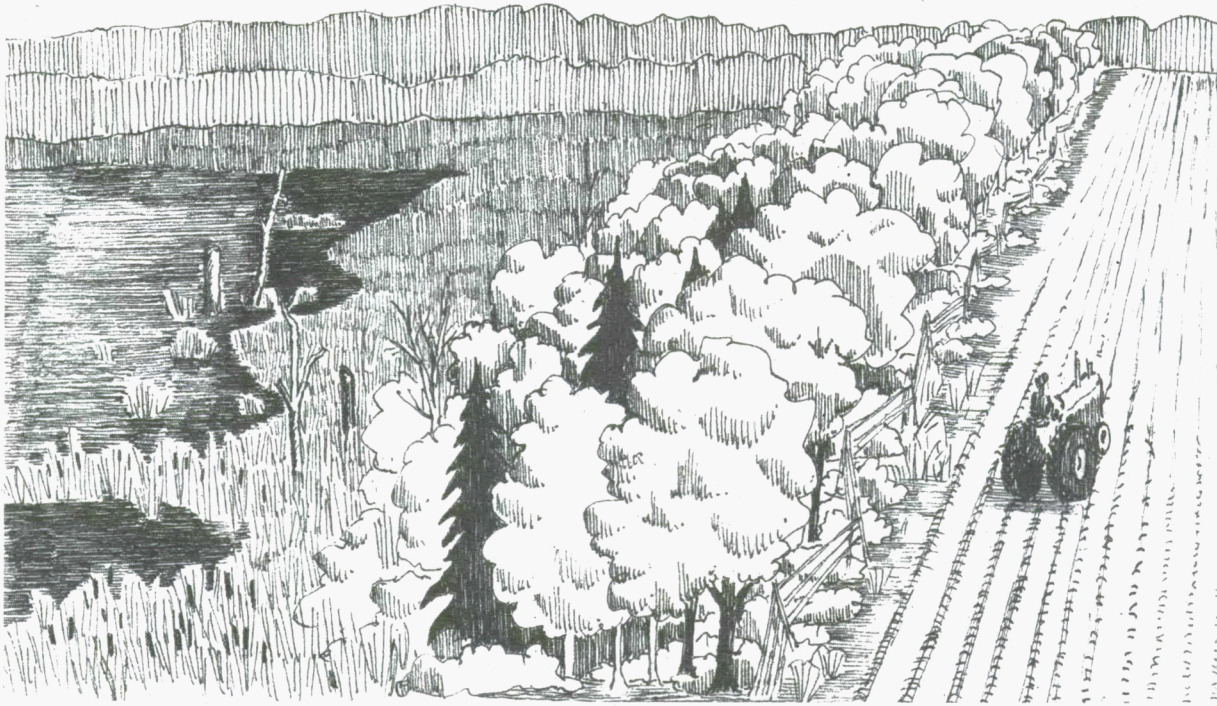
You can also increase the amount of suitable habitat by increasing the amount of *edge* on your property. An edge is where two different types of habitats meet. These areas are great for some wildlife because there is a greater variety of food and shelter for them to choose from. For instance, an abrupt 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 prefer-

able to have different ages and sizes of trees, shrubs and plants (i.e., open areas, a herbaceous zone, shrub-by 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.

Did you know that pesticides and other chemicals used near a wetland may travel through the soil and water to the wetland, where they are potentially dangerous to many wildlife species?

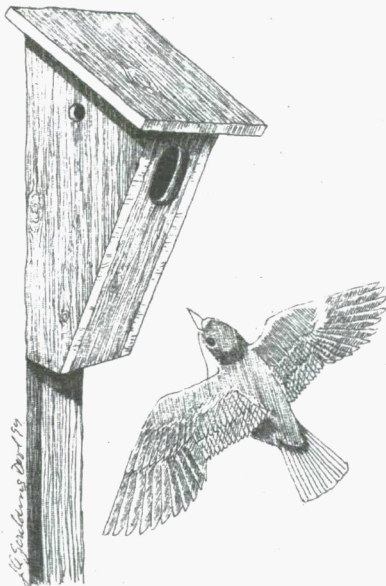




Other Management Options

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.*

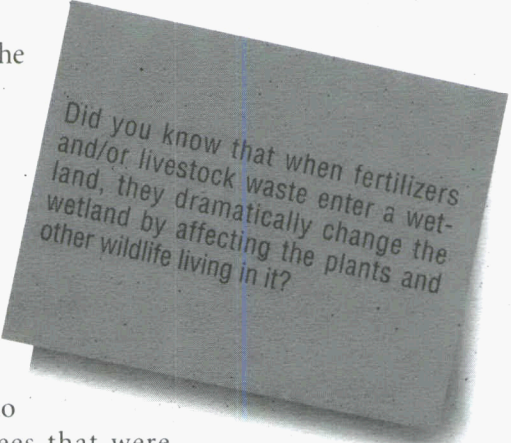
Why? Planting trees on your property will help to compensate for trees that were removed for farm clearing or for forestry operations. Plant tree and shrub species appropriate for wetland sites, or plant some of the same species that occurred prior to clearing. Leaving snags, "wolf" trees and naturally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



Did you know that when fertilizers and/or livestock waste enter a wetland, they dramatically change the wetland by affecting the plants and other wildlife living in it?

- 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.*

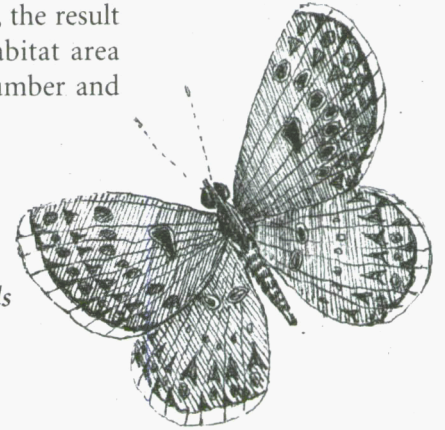
Why not? Phosphates, bleaches, household cleaning products, and old paints are all toxic substances which harm the environment if disposed of carelessly.

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.



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.

20 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

Assistance Available

Further Reading

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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.

acid precipitation	sulphur dioxide (SO ₂) interacts with water vapour to produce dilute sulphuric acid (H ₂ SO ₄)	decompose	to decay
biological diversity	the variety of species and ecosystems on earth and the ecological processes of which they are a part	DNA	carrier of genetic information of cells
biomass	total weight of all organisms (or some group of organisms) living in a particular habitat or place	ecosystem	the organisms associated in a given natural area and the environment with which they interact
buffer zone	a section of natural vegetation between a natural area and an area of human activity	edge	a zone where two habitat types meet
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.	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
carbon cycle	worldwide circulation and reuse of carbon atoms, chiefly due to processes involving living organisms	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

Glossary



<i>habitat</i>	the place in which individuals of a particular species can be found	<i>proteins</i>	compounds that occur in all living matter and are essential for the growth and repair of animal tissue
<i>hedgerow</i>	section of natural vegetation along a boundary such as a field	<i>respiration</i>	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
<i>herbaceous</i>	any nonwoody plant		
<i>lipid</i>	one of many organic substances that are insoluble in water; lipids include fats, oils, waxes, etc.	<i>sediment</i>	very fine particles of solid matter suspended in liquid or settling to the bottom
<i>native</i>	a species that originally occurred in an area (i.e., not introduced by human activity)	<i>siltation</i>	settling of sediments
<i>niche</i>	the physical space occupied by an organism and its functional role in the community	<i>snag</i>	standing dead tree
<i>organic</i>	of, or formed from, living organisms	<i>soil erosion</i>	the wearing away of soil
<i>pathogen</i>	any disease-producing organism	<i>succession</i>	the gradual process by which the mix of species in a natural area changes
<i>photosynthesis</i>	the process in a leaf by which the sun's energy is used to create sugar, oxygen and water	<i>threatened</i>	a species likely to become endangered in Canada if the factors affecting its vulnerability are not reversed
<i>perennial</i>	a plant that persists in whole or in part from year to year and usually produces seeds in more than one year	<i>vulnerable</i>	a species particularly at risk because of low or declining numbers, small range or for some other reason, but not a threatened species
<i>predators</i>	organisms that eat other living organisms	<i>"wolf" tree</i>	tree that has a large crown and many branches

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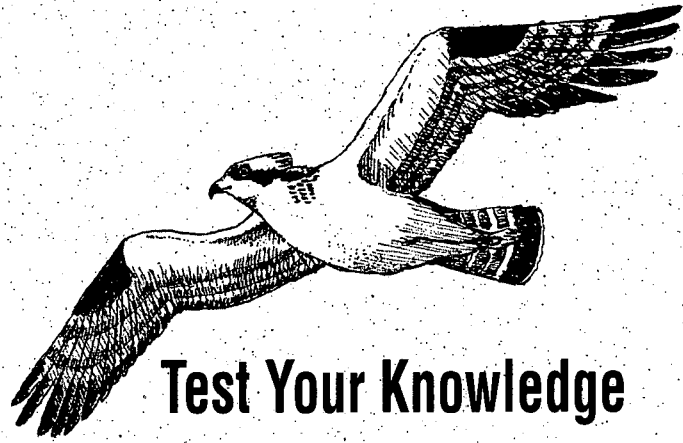
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The following is a list of True or False questions about the information contained in this booklet. The answers to these questions are found below, with a reference to the subheading where the topic is discussed in the booklet.



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 uses over the last 200 years. Wetland Loss.
2. True. Over 14% of wetlands in Canada have been converted to other land.
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.