BEST MANAGEMENT PRACTICES

Fish and Wildlife Habitat Management





Agriculture and Agri-Food Canada

Solution Ontario Ministry of Agriculture, Food and Rural Affairs



What is a Best Management Practice or "BMP"?

► a proven, practical and affordable approach to conserving soil, water and other natural resources in rural areas

Who decides what qualifies as a BMP?

► a team that represents many facets of agriculture and rural land ownership in Ontario, including farmers, researchers, natural resource managers, regulatory agency staff, extension staff and agribusiness professionals

What is the BMP Series?

innovative, award-winning books presenting many options that can be tailored to meet your particular environmental concern and circumstances

A Phosphorus Primer Application of Municipal Sewage Biosolids to Cropland Buffer Strips Controlling Soil Erosion on the Farm Cropland Drainage Deadstock Disposal Establishing Tree Cover Farm Forestry and Habitat Management Field Crop Production Fish and Wildlife Habitat Management Greenhouse Gas Reduction in Livestock Production Systems Horticultural Crops Integrated Pest Management Irrigation Management Livestock and Poultry Waste Management Managing Crop Nutrients Manure Management Nutrient Management Planning No-Till: Making It Work On-Farm Energy: A Primer Pesticide Storage, Handling and Application Soil Management Streamside Grazing Water Management Water Wells Woodlot Management

How do I obtain a BMP book?

- Online at www.publications.serviceontario.ca
- By phone through the ServiceOntario Contact Centre Monday–Friday, 8:30 am – 5:00 pm
 - 416-326-5300
 - 416-325-3408 TTY
 - 1-800-668-9938 Toll-free across Canada
 - 1-800-268-7095 TTY Toll-free across Ontario
- ► In person at ServiceOntario Centres located throughout the province or at any OMAFRA Resource Centre

HOW TO DETERMINE WHETHER A BMP IS SUITABLE FOR AN AREA ON YOUR PROPERTY

This booklet describes best management practices (BMPs) that may apply to one, some or all potential habitat areas on your property. Use the chart below to identify appropriate BMPs for your goals and circumstances.

		F A R	MLA	N D S	
BEST MANAGEM PRACTICE and page number	IENT CROPLANDS	PASTURES	ODD AND Abandoned Areas	FARMSTEADS	WINDBREAKS, SHELTERBELTS AND TREED FENCEROWS
Maintain the habi you have, p.26	tat 📕	•	•	•	A
Plant vegetation f wildlife, p.27	for 🔳	A	•	•	A
Create piles of sto and/or brush, p.30	ones)	•	•		A
Provide nesting structures, p.31	A	•	A	A	A
Adopt cropland conservation techniques, p.33	^	•		-	•
Select and use pesticides with care, p.35	A	•	•	•	•
Establish, protect enhance windbre shelterbelts and fencerows, p.37	or 🔺	•	•	•	A
Rotate grazing, p.	39	A			
Delay haying or us flushing bars, p.40	se 🔺				•
Provide feeding structures, p.41				•	
Manage woodlan p.43	ds,				
Manage plantatio p.45	ns, (marginal and fragile lands)	(marginal lands)	•		A
Maintain wildlife t and shrubs, p.48	rrees (marginal and fragile lands)	•	•	•	•
Manage wetlands p.50	s, 📕 (sheetwater)	(sheetwater)	-		
Establish, protect enhance vegetate buffers, p.54	or e	-	-		
Restrict livestock.	, p.57				
Provide alternative p.57	e watering,				
Improve in-water habitat, p.64		****			
Control bank, char and shoreline erosion, p.69	nnel				
Maintain drains, p	.72 🔺	•			

- very appropriate
 appropriate and/or indirectly benefits habitat

WOUDLANDS	UUULANUS INANSIIIUNAL		AUUAIIC		
WOODLOTS AND Plantations	WETLANDS	STREAMBANKS AND SHORELINES	WATERCOURSES	LAKES AND PONDS	
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•	•	•	•	(shorelines and wetlands)	
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BEST MANAGEMENT PRACTICES . FIGH AND WILDLIFE HABITAT MANAGEMENT

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LIST OF	ABBREVIATIONS
BMP	Best Management Practice (refers both to remedial measures and the series of booklets)
CA	Conservation Authority
CWS	Canadian Wildlife Service – Environment Canada
DUC	Ducks Unlimited Canada
EFP	Environmental Farm Plan
MOEE	(Ontario) Ministry of Environment and Energy
OFAH	Ontario Federation of Anglers and Hunters
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
OMNR	Ontario Ministry of Natural Resources
OSCIA	Ontario Soil and Crop Improvement Association

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Encountering wildlife up close is an unforgettable experience. Whether we're age four or 94, it's awe-inspiring to see a red fox dart across a concession road, hear a midnight chorus of frogs, watch a fish struggle to overcome a barrier on its upstream migration, or follow a hawk as it soars.

If you read no further, remember to take a little time out of your schedule to enjoy nature and the fish and wildlife in it. Your life, and the lives of your children, will be a little richer.

This booklet explains how to create, restore, maintain and enhance fish and wildlife habitats on rural lands. It also provides management tips for dealing with problem wildlife. Some of the best management practices (BMPs) relate solely to farming. Most are easy to implement and involve doing things that are very familiar to you – working with plants, animals and water. Many offer economic benefits. All are voluntary.

We begin with some background to habitat management, and 10 rules-of-thumb that underlie the BMPs described later in the booklet.

The next section (page 8) gives an overview of each habitat type to help you identify which habitats are, or could be, on your property. The following section (page 24) describes the BMPs that are appropriate to each habitat. The final section (page 76) describes techniques to help you deal with nuisance wildlife.

In most cases, wildlife and agriculture can be compatible. This Hillsburgh-area farmer used his know-how in soil and water management to restore habitat:

When I was quite young, I would see all kinds of wildlife – a hawk landing in an old tree, deer jumping the fence...very graceful creatures. But as our operation grew, we used up more scrubland and took out fencerows – had to for feeding cattle and broilers. After that you didn't see much wildlife. Recently, though, we've made some improvements – planted trees on the steep slopes and improved the pond and wetland for ducks. Wildlife have returned. It's a lot nicer than just walking out there and it being barren and quiet.

GUY GARDHOUSE

The term **wildlife** includes wild organisms such as mammals, birds, reptiles, amphibians, fish, invertebrates (e.g., insects, worms, crayfish) and plants. In this booklet, we focus on mammals, birds, fish, reptiles and amphibians.

Raptors, such as owls and hawks, are predatory birds. They can help control some problem bird and rodent species around farms. In rural Ontario, the barred owl can be found in mature deciduous woodlands.



Children have a natural interest in wildlife.

Fish and wildlife need living space, or **habitat**. They can only survive if the habitat available to them meets their four basic needs: food, shelter, water and space. An understanding of the habitat requirements of different species allows us to do things to either encourage or discourage them. This is called **habitat management**.

All habitats play important roles in sustaining wildlife. Habitats, the animals that dwell within them, and the actions of people are inseparably linked. Management actions that improve a habitat or control problem wildlife in one area may affect that species or others in the same area, in other parts of your property – and beyond.

Traditional wildlife management focuses on maintaining "game" species that could be hunted, trapped or fished, such as white-tailed deer, beaver and trout. In recent years, the focus has shifted to conserving all species within an ecosystem, a concept known as **biodiversity**.

Biodiversity refers to the variety of life on Earth. It's based on the idea that all plant and animal species, their habitats and ecosystems, and the relationships among them, are valuable and worth preserving and managing. When habitats are lost, so are species and biodiversity. When a species becomes extinct, it's gone forever!





This booklet considers the habitat needs of Ontario's mammals, birds, fish, reptiles and amphibians. Shown here (clockwise from bottom left) are a cottontail, a black rat snake, a pumpkinseed (sunfish) and a green frog.





NUMBER OF SPECIES

mammals	85
birds	300
fish	160
reptiles, amphibians	50
trees, shrubs,	
grasses,	
wildflowers	3000
mosses, lichens,	
fungi, algae,	
micro-organisms,	
insects, other	
invertebrates	Countless!

RESTORING HABITATS IN SOUTHERN ONTARIO

Most habitats in southern Ontario occur on private land. Landowners play an important role in ensuring the survival, diversity and health of Ontario's fish and wildlife.

Prior to European settlement, 85 percent of southern Ontario was covered in forest. In the past 200 years, urban development and farm practices, such as land-clearing and drainage, have fragmented habitats and populations. In some areas, many species are now forced to live in small, isolated "patches", rather than the vast tracts of forests or wetlands to which they are best adapted.

Other species, such as the once-plentiful passenger pigeon and blue walleye, are now extinct. Those that were once common in the south, such as the eastern cougar, marten, fisher, lynx, bobcat, timber wolf, black bear and red-shouldered hawk, are either no longer

found there, or are found only rarely. Depending on rarity, a number of plant and animal species have been identified as vulnerable, threatened or endangered (VTEs). See page 5 for some examples.

Some species have adapted well to habitat fragmentation. These include white-tailed deer, fox, groundhog and raccoon.

Despite the significant loss of habitat, we are fortunate in Ontario. This province still offers diverse existing and potential habitats, from the boreal forests of the north, where agriculture is confined to a few small areas, to the mixed forests of the Great Lakes – St. Lawrence region in the south and the Carolinian zone in the southwest.

In some intensively farmed areas, there are many opportunities for improving habitat while meeting farm business objectives. Modern farming practices, such as the use of cropland conservation techniques, Integrated Pest Management and the reforestation of marginal lands, are playing important roles in re-establishing habitats – but much more can be done.

> Natural habitats have been fragmented in agricultural areas.



About 10 species of animals and 40 species of plants are thought to have been eliminated from Ontario since European colonization. An additional 25 animal and 190 plant species are now vulnerable. Unless steps are taken to protect or restore habitats, more species risk extinction, and biodiversity will be diminished.



When European settlers arrived in the 18th and 19th centuries, about 85% of what we now know as agricultural Ontario was forest or wooded swamp.



The barn owl is a vulnerable species in Canada.

ADVANTAGES

By taking remedial measures to help fish and wildlife habitat, you can reap many benefits.



Carefully managed farm woodlots can generate revenues through the sale of firewood, timber products, poles and maple syrup.



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Hawks, owls, foxes, coyotes and other predators feed on rodents and other small mammals. This goshawk is feeding on a rabbit.



Changes in some fish and wildlife species populations can and have provided humans with early warnings of potential threats to human health. Fish, such as brook trout, can be a barometer of our environment's health.

Anglers, hunters and other wildlife enthusiasts may pay to use natural areas on your farm.

ADVANTAGES OF FISH AND WILDLIFE TO FARMERS AND RURAL LANDOWNERS

ECONOMIC

ENVIRONMENTAL

SOCIAL

production gains

- less soil loss with windbreaks, buffers and fenced water bodies
- improved herd health by keeping livestock out of water
- better insect and rodent control using natural predators

increased revenue

- fees from hunting/angling and naturalist groups
- sale of woodlot products (timber, fuelwood and maple products)
- increased tourist activity in the community
- reduced operating costs, e.g., lower drain maintenance costs due to improved erosion control from buffers

property improvement

- · trees add property value
- fences built, trails maintained etc. through agreements with hunters, anglers and naturalists

improved quality and quantity of ground and surface waters

 natural vegetation and vegetated buffers around water bodies, drains and wetlands filter out contaminants and sediments, and absorb excess nutrients

improved air quality

 trees and plants absorb carbon dioxide and pollutants, and release oxygen

future genetic resources

 all species provide potential genetic resources for medicines and food crops

early warnings

 problems with individual species can alert us to threats to human health, e.g., recent declines in amphibian populations throughout the world are thought to be related to climate change

improved farmland quality

 habitats created by retiring fragile and marginal lands to trees and shrubs will reduce erosion

Plant a tree! Besides providing shade, habitat and wood products, two to three mature trees help offset the amount of carbon dioxide produced by one person in a year. Trees use sunlight to convert CO₂ into oxygen.

improved quality of life

 in 1991, 90% of Canadians took part in wildlife-related activities, such as hiking, canoeing, birdwatching, hunting, fishing, studying plants and animals, and other forms of recreation

recreation

 Ontario's wildlife-dependent recreation and tourism industry is worth several billion dollars annually

education

 youth have a natural interest in wildlife – the foundation of a conservation ethic

EXAMPLES OF VTEs

Vulnerable

- red-shouldered hawk
- · spotted turtle
- · prairie white-fringed orchid
- southern flying squirrel

Threatened

- Henslow's sparrow
- · eastern spiny softshell turtle
- ginseng
- Kentucky coffee tree

Endangered

- blue racer
- karner blue butterfly
- loggerhead shrike
- cucumber tree



BEST MANAGEMENT PRACTICES - FISH AND WILDLIFE HABITAT MANAGEMENT

INTRODUCTION

DISADVANTAGES

Human activities have provided favourable habitat for some species while discouraging others. In local situations, their numbers can become high, and measures to control problem animals may be necessary. Typical wildlife-related problems are:

- crop damage by deer, other mammals, birds and insects
- ▶ flooding of fields, lanes and roads by beaver
- preying on livestock by coyotes, coy-dogs and stray dogs in the south and wolves in the north
- ▶ risk of rabies transmission to livestock and humans from fox and skunk
- ▶ contamination of grain storages and other crop inputs by bird droppings.



Beaver dams can cause significant financial loss due to flooding of farm fields and roads.



Geese are responsible for damaging many hectares of cropland each year in Ontario.

TEN RULES-OF-THUMB

The following general principles underlie fish and wildlife habitat management. Keep these in mind as you consider making changes to your property:

- bigger is better because so little natural habitat remains in some parts of rural Ontario, and because the areas that remain are so small, it's good to provide as big a natural area as you can: more species will have their needs met
- areas connected to one another by vegetation or structures such as treed fencerows or valleylands are normally more valuable to fish and wildlife than isolated habitats – connections between habitats act as "corridors", which allow animals to move from one area to another
- edges are good for many species edges occur where woodlots meet open fields, along shorelines and fencerows, or any other place where different habitats meet; habitats with lots of edge are more diverse and support more species than those with less edge
- areas that provide the four basic habitat needs (food, water, shelter and space) are more useful than areas that don't
- native plant species are usually preferred over non-native species they tend to be less invasive and are usually better suited to the wildlife they support
- protecting sensitive areas such as streams, shorelines, drains and wetlands with vegetated buffers is a good idea – the wider, the better
- consider leaving a habitat alone if it's healthy or if you can't implement BMPs
- control of problem animals may be necessary when they are in the wrong place at the wrong time – tolerate losses where possible, manage habitats to minimize problems, but exercise control when economic losses to crops and livestock are significant
- managing habitats for certain species, such as grouse or wood duck, often makes sense and will usually benefit other species, but remember that your management actions may negatively affect other species that share the habitat
- communicate and cooperate with your neighbours the actions you take on your land may affect your neighbours' properties.

If you farm but choose not to manage habitats directly, you can still help fish and wildlife and improve the long-term viability of your farming operation at the same time. Consider adopting many of the BMPs for soil and water conservation described in this booklet and others in the BMP series. Titles are listed on the front page. Species such as interior forest birds will only use a woodlot if it's large enough.

The wider the corridor, the better.

A word of caution: creating too much edge in habitats used by species that require large blocks of similar habitat may result in the loss of these species.

Hunting and trapping can help control the numbers of some species that cause damage.

Most rural properties have several habitat types within their boundaries. In this booklet, they are grouped as follows:

FARMLANDS

- Croplands
- Pastures
- Odd and Abandoned Areas
- Farmsteads
- · Windbreaks, Shelterbelts and Treed Fencerows
- Plantations

WOODLANDS

TRANSITIONAL

- Wetlands
- Streambanks and Shorelines

AQUATIC

- Watercourses (streams and drains)
- Lakes and Ponds

This section describes each of these types to help you identify which ones exist, or could exist, on your property. A chart on pages 22-23 identifies animal species commonly found in each one. Things you can do to improve habitat quality are described in the next section (beginning page 24).

Remember, in most cases it is the habitat you manage - through protection, restoration, creation or disturbance - not the wildlife itself. The exception is nuisance wildlife, e.g., white-tailed deer can be directly managed through hunting to reduce habitat destruction and conflict with humans.

In agricultural areas, fish and wildlife often need more than one type of habitat to obtain food, water, shelter and space. Some habitats meet more of these requirements than others. Some are more suitable for certain species. All habitats contribute to sustainable farm operations and wildlife populations, and all are part of larger ecosystems.

Actions you take in one area may affect habitat in other areas. Consider tile drains. When you increase peak flows in a stream as a result of tile drainage, you may increase erosion. Erosion in turn will degrade aquatic habitats within your property and downstream.

The illustration on pages 10-11 depicts habitat types within a typical rural landscape.



In agricultural areas, streams, creeks and drains are common aquatic habitats.

· Woodlots and



Fish and wildlife often require more than one habitat to fulfill their needs for food, water, cover and space.

FARMLANDS

CROPLANDS

Croplands are areas planted to grains and oilseeds, forages, tree fruits (orchards), other horticultural crops and/or specialty crops.

Fragile croplands may be profitable to farm in the short term, but run a high risk of soil loss through water and wind erosion, compaction and/or flooding. This will eventually reduce land capability.

Marginal croplands aren't profitable to farm. They may be too steep and dry, or have soils that are too shallow, stony, or very poorly drained.



Steeply sloping croplands are vulnerable to erosion. These fragile lands are more suitably retired to trees, shrubs and grasses.



Stony fields usually aren't profitable to farm. Such marginal lands are better suited to wildlife habitat plantings.

Some steeply sloping lands are too marginal for crop production and, if left alone, may provide good habitat.



Seasonally flooded cropland makes excellent habitat for migrating birds. During their spring migration through southern Ontario en route to nesting areas in the Northwest Territories, tundra swans feed on waste grain.



1. -

1 Croplands

10

- 2 Pastures
- 3 Odd and Abandoned Areas
- 4 Farmsteads
- 5 Windbreaks, Shelterbelts and Treed Fencerows
- 6 Woodlots and Plantations
- 7 Wetlands
- 8 Streambanks and Shorelines
- 9 Watercourses

10 Lakes and Ponds

BEST MANAGEMENT PRACTICES ► FISH AND WILDLIFE HABITAT MANAGEMENT



11

FARMLANDS

PASTURES

Pastures are lands used regularly for livestock grazing. Most permanent pastures are established on lands that are:

- ► poor quality
- ▶ impractical to crop
- ▶ near livestock housing, or
- ▶ near water sources.

Some pastures on highly productive lands are also used for hay. Pasture is often combined with cereal-forage rotations.

Fragile pastures, which may include the shorelines of lakes and ponds and the banks along watercourses, may be prone to compaction or erosion. **Marginal pastures** are too wet, shallow or stony to be very productive.

There are two types of grazing on pasture:

- extensive: low-density grazing on unimproved marginal lands not usually reserved, fertilized, or with weeds controlled
- intensive: high-density grazing, often rotational usually reseeded, fertilized and treated for weed control.



Extensively grazed pastures are commonly associated with cow-calf or sheep operations on marginal lands. Some waterfowl and many species of songbirds build their nests on the ground in these areas. Delaying haying and keeping livestock out of nesting areas – ideally until mid July – gives many young birds the chance to fledge and leave the nest. Ideally, buffers around wetlands should be fenced and periodically clipped to control shrub growth and maintain good nesting cover.



Intensively grazed pastures, such as this one, should be managed to prevent animal waste from entering water bodies or wetlands. Use fencing to keep livestock out of these sensitive areas.

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ODD AND ABANDONED AREAS

RMLANDS

Odd and abandoned areas offer habitat between croplands and natural areas.

Odd areas include small uncropped areas, field corners, farmstead ruins, very steep slopes and/or wet spots.

Abandoned farmlands are often former croplands or pastures that are too fragile or marginal to farm.





Field corners can provide a wide range of food and cover for many species of insects, birds, mammals and reptiles.

Woodcock use odd and abandoned areas for nesting, cover and feeding.

FARMSTEADS

The farmstead can provide the best opportunity for enjoying certain kinds of wildlife. It usually includes the home, lawn and gardens, barn, drivesheds, other buildings, lanes, the farmyard, farm ponds, exercise yards and paddocks.





Trees around the farmstead increase property values and offer you, livestock and wildlife some shelter from the elements.

FARMLANDS

WINDBREAKS, SHELTERBELTS AND TREED FENCEROWS

Windbreaks, shelterbelts and treed fencerows are strips of permanent vegetation located around croplands, orchards, pastures and farmsteads. They protect crops, livestock and the farmstead from the elements. They also provide valuable wildlife corridors that connect habitat types such as woodlands and wetlands, allowing wildlife to move more easily between them.



Windbreaks are trees planted along the edges of fields, and range from one to five rows in width. They help control soil erosion caused by wind or water. Conifers, such as these white cedars, and poplars are commonly used.



Shelterbelts are planted trees (usually conifers) around farmsteads and along roadways. Normally more than five rows wide, they reduce heat loss by wind, and provide shade in summer.



Treed fencerows are strips of trees and shrubs, three to 10 metres wide (10-33 ft), planted or naturally seeded from nearby woodlots. They provide food and cover for wildlife, and connect different habitats on the farm.



Fencerows provide important habitat for species like the bluebird, which eat cropdamaging insects.

WOODLANDS

Woodlands are any continuous part of the farm landscape dominated by forest tree cover and other forest vegetation. Trees can be either:

- hardwood broadleaved (deciduous) trees that lose their leaves in the fall such as maple, beech, ash and oak, or
- conifer cone-bearing, evergreen trees such as pine, spruce, cedar and hemlock. Most conifers retain their needles year-round; however, tamarack and the non-native European and Japanese larches lose their needles in the fall.

WOODLOTS AND PLANTATIONS

Natural woodlots include upland woodlands and lowland forests, such as cedar valleys or wooded swamps. They are naturally vegetated and, in southern Ontario, usually consist of hardwood or mixed hardwood and conifer species.

Plantations are reforested areas often located on erosion-prone land and/or on marginal cropland. They may contain conifers (for use as polewood, nursery stock or Christmas trees), hardwoods (for nut crops, timber or nursery stock) or a combination of both. Over time, plantations convert to mixed-forest vegetation.

Winter Migration

Canadian and tropical landscapes have changed dramatically in the last century, leaving less habitat for migrant songbirds such as the ruby-throated hummingbird, wood thrush, bobolink and many species of warblers. Conservation of both the summer and winter habitats in Canada and the tropics is critical to the survival of these birds.

Natural woodlands on southern Ontario farms consist mostly of hardwood (deciduous) trees.





Gray treefrogs live in woodlands where they feed on many kinds of insects. They hibernate in crevices of tree trunks and in leaf litter. You may have trouble seeing them – they change colour to blend with their surroundings. Their toes have suction cups to help them climb.



Poor quality lands can be planted to conifers like pine and spruce because they can tolerate the extreme growing conditions of open fields. This kind of plantation is of limited value to wildlife. As other plants move in over time, habitat value will increase.



The 20th century has seen a substantial decline in woodland birds due to habitat loss. Since 1965, across eastern North America, there have also been declines of grassland and shrubby habitat birds. This is due partly to the switch from pasture to row-cropping, and the removal of treed fencerows. You can help improve breeding success for several species, such as this scarlet tanager, by implementing BMPs.

Global Recognition of the Importance of Wetlands

In 1971, the Convention on Wetlands of International Importance was signed in Ramsar, Iran. The Convention provides a framework for international cooperation for the conservation of wetland habitats. Canada has over 30 Ramsar sites, five of which are in Ontario. Three more Ontario sites are under consideration.



The woodland in the upper photo is actually a wooded swamp – a type of wetland. Wet in spring and dry in summer, wooded swamps provide terrific habitat for many wildlife species, and can be managed for fuelwood and other timber products. Cardinal flowers are often found along the edges of wooded swamps in late summer.

COMMON HABITATS IN AGRICULTURAL ONTARIO

TRANSITIONAL

Transitional habitats separate terrestrial (upland) habitats from aquatic habitats. For example, marshes that separate pastures from lakes, or ravines that separate croplands from streams, are transitional. Well-vegetated transitional habitats are essential to the health of lakes, rivers, streams and the hundreds of fish and wildlife species that use them. They also act as buffers, protecting aquatic habitats from the effects of land use practices.

There are two major types: wetlands and streambanks and shorelines.

WETLANDS

Wetlands are Ontario's most diverse and productive habitat. Hundreds of fish and wildlife species depend on them – some for their entire life cycles, others periodically or at critical stages. Without wetlands, many species wouldn't survive. Some of Ontario's rarest plant and animal species are found only in wetlands.

Wetlands share these characteristics:

- seasonally or permanently covered by shallow water
- ▶ water tables at or near the surface for most of the growing season
- ▶ water-saturated soils, often consisting of layers of muck (organics)
- ▶ water-tolerant or water-loving plants such as cattails, rushes, white cedar or silver maple.

There are four main types:

swamps

- vegetation dominated by trees or shrubs
- periodically or permanently flooded some swamps are so dry in late summer that many landowners don't recognize them as wetlands (see photo on left)

marshes

- ▶ vegetation dominated by rushes, reeds, cattails, sedges, etc.
- ▶ periodically or permanently flooded

bogs

- vegetation dominated by sphagnum moss, and sometimes low shrubs, sedges and black spruce
- ▶ peat-filled depressions with stable water levels, usually fed by rainwater or snowmelt

fens

- ▶ vegetation dominated by sedges, mosses, grasses, reeds and low shrubs
- usually located where ground water discharges to the surface.

Swamps and marshes are the most common wetland types remaining in southern Ontario; bogs and fens are rare.

TRANSITIONAL





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Wildflowers like this pitcher plant are found in bogs. This flower is one of Ontario's few carnivorous plants.

Many species of birds, such as this black tern, use marshes for all their habitat needs.

The round-leaved sundew is commonly found in fens. Like the pitcher plant, the sundew is carniverous – obtaining nitrogen from the insects it consumes.

TRANSITIONAL

STREAMBANKS AND SHORELINES

These transitional habitats, often called **riparian zones**, are sloping strips of land that separate streams, lakes and ponds from dry uplands. Along shorelines they extend from the water's edge up to the high water mark. Around rivers and streams, the riparian zone includes the entire floodplain.

In intensively farmed areas, cropland often marks the dry edge of these zones. If they're stable and well-vegetated, streambanks and shorelines act as buffers, helping protect aquatic habitats from adjacent land uses.

Vegetated streambanks and shorelines offer habitat, shade and sources of food for hundreds of terrestrial, aquatic and semi-aquatic wildlife species.



Grassed buffer strips along watercourses can provide good habitat for ground-nesting birds – if they're wide enough. Wider buffers offer superior water quality protection and habitat.



Shown here is a river flowing through a well-forested riparian valley.

I C A U T

WATERCOURSES

Watercourses are bodies of flowing water, and include the following:

streams and creeks

- smaller watercourses that empty into rivers or lakes
- ▶ often fed by springs, overland flow or small ponds/wetlands

rivers

- ► larger watercourses that empty into larger rivers or lakes
- ► fed mostly by lakes, other rivers, or streams and creeks

drains

- channelized streams or creeks, or excavated channels
- designed to remove water efficiently from lands
- ▶ fed mostly by overland flow and from tile drains.

Based on summer water temperatures, watercourses can provide cold-, cool- and/or warm-water habitats. All three types can be present along the length of a watercourse. Knowing the temperature characteristics of a watercourse will help you determine which fish and wildlife species to manage for, and which BMPs to use.



Cold-water streams usually have gravel bottoms and are fast flowing. They are home to sport fish such as brown trout.



Large shallow bays in rivers are similar to lakes. They provide habitat for muskellunge, pike, sunfish, and largemouth bass as

Well-designed municipal drains, when shaded and carefully maintained, can provide habitat for species such as northern pike and even brook trout.



COLD WATER

- temperatures rarely exceed 18°C during summer months
- often spring-fed; often found in headwater areas; usually well-shaded
- rich in oxygen, low in nutrients; swift flowing; coarse-textured bottom
- little aquatic plant growth, except in margins
- formerly widespread, but now limited, particularly in southern Ontario
- preferred by rainbow, brook and brown trout, spawning salmon, and aquatic insects such as mayflies and stoneflies

COOL WATER

- temperatures rarely exceed 18-24°C during summer months
- often found in midsections of streams, rivers and drains
- intermediate levels of oxygen and nutrients
- some were cold-water streams prior to being degraded as a result of loss of shade trees and increased runoff
- widespread in Ontario
- used by northern pike, muskellunge, yellow perch, walleye, minnows

WARM WATER

- summer water temperatures often reach 24-30°C
- often found in lower sections of watercourses
- many were previously cold- or coolwater streams that have been degraded; some are badly polluted; many are poorly shaded
- often have low levels of oxygen and high levels of nutrients
- bottom materials can range from mud to gravel or rock
- may contain heavy growth of cattails, rushes, algae, pondweeds, etc.
- used by largemouth bass, rock bass, sunfish, minnow species; if severely degraded few sport fish will be present
- widespread in Ontario, particularly in urbanized and agricultural areas

LAKES AND PONDS

Lakes and ponds are standing water bodies that provide cold-, cool- and/or warm-water fish habitat as described previously. Lakes are usually greater than eight hectares in area; ponds are smaller.

The most productive part of a lake or pond is the **littoral zone**, where sunlight can reach the bottom – usually in shallow, near-shore areas. This zone contains diverse habitats used by many species of fish, waterfowl, shorebirds, mammals, amphibians, reptiles and aquatic insects. These near-shore areas are easily degraded by human activities, and are the focus of BMP activity.

Most lakes and ponds are either rich or poor in nutrients. Some lakes can have areas with both characteristics. Nutrient-rich lakes and ponds tend to have moderate to dense aquatic plant growth. Nutrient-poor lakes and ponds have limited aquatic plant growth.

QUATIC

There are five basic pond types:

in-stream (online)

created by damming natural, permanently flowing watercourses

► normally not approved by OMNR

bypass

- located beside watercourses
- ▶ fed and drained by separate channels connected to the watercourse
- > properly managed, bypass ponds can be useful to fish and wildlife

impoundment

- created by damming intermittent streams, draws or valleys
- ► can be valuable to wildlife

isolated or dugout (no inflow or outflow)

- usually fed by springs or surface water runoff, or by pumping from wells or water bodies
- ▶ tend to have fewer impacts on natural water bodies
- ► can provide good habitat for some fish and wildlife species

sheetwater (temporary)

- occur in cultivated fields in spring and fall
- can provide important breeding habitat for amphibians, and important migration and feeding habitat for waterfowl.

For more information on ponds and their management, see the BMP booklets, Water Management and Irrigation Management.

Even small ponds can provide all the habitat needs for amphibians like the bullfrog, Ontario's largest frog. The male bullfrog's low-pitched "jug-o-rum" mating call is heard in late spring. Adult bullfrogs are voracious, and will eat anything they can catch.





In many parts of Ontario, like the Rideau Lakes area, farms back onto lakeshores. Where sustainable farming practices are used, and where vegetated buffers are adequate, these lakes and their shorelines can provide habitat for many species of fish and wildlife. This shoreline could be improved by planting a vegetated buffer.

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ANIMALS YOU MIGHT SEE ON YOUR PROPERTY

TYPICAL ANIMALS			FARMLANDS		
	Croplands	Pastures	Odd and Abandoned Areas	Farmsteads	Windbreaks, Shelterbelts and Fencerows
BIRDS					
of Farmlands: e.g., flicker American goldfinch					
of Woodlands: e.g., veery, Eastern wood-peewee				-	
of Open Areas: e.g., Eastern		-			
of Wetlands: e.g., red-winged					
IERONS					
Shorebirds: e.g., killdeer, snipe ALCONS, HAWKS AND OWLS			-		
VILD TURKEY RUFFED GROUSE/WOODCOCK					-
UNGARIAN PARTRIDGE HARP-TAILED GROUSE					
ALLARD VOOD DUCK		-			-
CANADA GODSE					
NAMMALS					
ATS	1	-		-	
ROUNDHOG/MICE/VOLES					
EAVER					
IUSKRAT					
ABBIT AND HARES					
ORCUPINE	1000				
ACCOON					
KUNK					
VEASELS/ MARTEN					
MINK/ OTTER					
EER					
NOOSE	R. S.				
COYOTE					
ED FOX					
VOLF					
LACK BEAR					
MPHIBIANS AND REPTILES			-		
HUGS/ TUADS			-		
ALAMANUERS/ NEVV15					
ZANUS (E.g., SKINK)					
NAVEO	-	-		-	
IVARES		-	-		
1011	1				
SI				01	
HOUT/SALMON				Ponds	
IKE					
ARGEMOUTH BASS/ SUNFISH				Ponds	
MALLMOUTH BASS				Ponds	
ELLOW PERCH				Ponds	
IALLEYE					
IUSKELLUNGE					
IINNOW SPECIES				Ponds	

Some species like the wolf, otter and bear are not found in the extreme southwestern part of the province, while skink (Ontario's only lizard) occur in limited areas. Some northern species like the sharp-tailed grouse and marten are also included.

WOODLANDS		TDA	INSITIONAL	ADUATIC		
WOODCAINDS		IKA	TRANSTIONAL		ALUATIC	
Woodlots	Plantations	Wetlands Swamps (s), Marshes (m), Bogs (b) and Fens (f)	Streambanks and Shorelines (riparian)	Watercourses	Lakes and Ponds	
					-	
	•	∎ s				
		s,m,b,f				
(colonies)		∎s,m ∎smbf	-		-	
		s,m,b,f				
		S				
		s,m				
		s,m				
		,				
		s,m				
	-	S				
Inverse		S				
(swampy)		S,III	-	-		
		s,iii		-	-	
		-0				
		s.m				
		- opin			-	
		s,m				
		s s				
		s,m,b				
		S				
		S				
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		sinion S			-	
		■ smhf				
		s, in, b, i			-	
		••••••••••••••••••••••••••••••••••••••	-			
				WATER TEMPERATUR	RE PREFERENCE:	
				Cold	Cold	
		s,m	 (floodplains in spring) 	Cool	Cool	
		m		Warm	Warm	
				TTUTT	wonth	

s,m

■ m ■ s,m,f

23

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Cool Warm Cold>Warm

(shallow bays in spring)

Cool

Warm Cold>Warm

An appropriate BMP is one that suits the habitat and your goals and circumstances.

When planning, be sure you understand the factors that are limiting the abundance of desired species, or contributing to the overabundance of nuisance animals.

BMPs FOR HABITATS

Now that you've identified which habitats exist, or could exist, around your property, it's time to identify appropriate BMPs. This section describes each BMP – the principles, tips and considerations.

All 19 BMPs are also listed in a chart on the first pages of this booklet. The chart links each BMP to suitable habitat types.

In this section, the first four BMPs – "Maintain the Habitat You Have" through to "Provide Nesting Structures" – have been grouped under "General", since they can apply to many habitats. The rest of the BMPs, some of which are applicable to a variety of habitats, have been grouped under "Farmlands", "Woodlands", "Transitional" or "Aquatic".

PLANNING

Before you implement any BMP, it's best to do some planning. This will help you set realistic goals, and ensure the long-term compatibility of your operation with the needs of wildlife.

STEP #1 – Conduct an inventory	 Draw a map, showing soil, drainage, slope habitat types as outlined in previous chapter wildlife use and surrounding land use you may wish to use an aerial photograph or an Ontario Base Map 	 Personal considerations time costs and potential returns work schedule personal use, markets value placed on environmental improvement, wildlife, recreation, property improvement, appearance materials and equipment available 		
STEP #2 Interpret	 Set priorities look for opportunities, both short- and long-term, for habitat improvement consider limitations seek advice identify your needs and objectives 			

BMPs FOR HABITATS

STEP #3 -	Ask yourself				
Examine and	 do options conflict with farming or other goals? 				
select options	 are they consistent with my EFP? 				
	• are options suitable for land, soil and climate conditions?				
	 can I afford the time and money? are there options that cost nothing? are funding sources available? 				
	• is the approach practical?				
STEP #4 -	Seek help				
Design and implement	 get technical expertise along the way – through a CA office, Stewardship Council, OMNR, CWS, OMAFRA, DUC, OSCIA, conservation club, private consultants, other BMP booklets and EFP Infosheets 				
	 you may also need a permit – check with one of the agencies above to be sure 				
	 implement as time and resources permit 				
STEP #5 -	Evaluate				
Reassess the plan	 review your options and priorities each year, with a major assessment every five years 				

An Environmental Farm Plan (EFP) is a document voluntarily prepared by a farm family. It helps them identify their operation's environmental strengths and weaknesses, and set realistic goals to improve environmental conditions according to their own timetable.

Don't think about what you don't have. Rather, think of what you can do with what you have.

It takes careful planning to keep the business of farming and the interests of wildlife compatible. Completing an EFP will help you develop an effective action plan.



Sometimes the plan may need another opinion. Advice is available from a host of agencies and groups.

BEST MANAGEMENT PRACTICES . FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

GENERAL

BMP - MAINTAIN THE HABITAT YOU HAVE

If you own rural property, chances are it has some type of valuable habitat on it, such as woodlands, wetlands or water bodies. Many landowners choose not to manage these areas intensively, whether for products like fuelwood or timber, or for fish and wildlife. What's most important is that you keep the habitat you've got — this is good for wildlife and the environment. It's especially important in southern Ontario, where remaining habitat is limited.

Managed or unmanaged, habitats are always changing. Existing vegetation grows, and new plants seed in. Wildlife move in and out. Although BMPs accelerate habitat improvement, or can be used to change habitat in particular ways, management isn't necessary in all cases.

Some terrestrial habitats can be left alone. Others, such as eroded banks and gullies, may be so severely damaged that some form of management may be required to prevent further degradation.

Transitional habitats such as wetlands and shorelines may be best left alone if they're wellvegetated. Often, the best way to protect these diverse and productive areas is to manage the surrounding lands wisely. BMPs for cropland conservation and buffers are described later in this section.

The health of an aquatic habitat is determined by the health of the water body and surrounding land use practices. Shorelines or banks should be stable, usually through natural or well-established planted buffers. The water should be fairly clear of silt and excess algae, and free of barriers. Remember that even intermittent watercourses can provide critical habitat for many species. If the banks or water quality aren't what they should be, you may need to re-evaluate current farm practices, and consider implementing some of the BMPs described later in this booklet.



Great blue herons nest in colonies,

with pairs building nests of sticks in large trees. Try to keep all

activity at least 300 metres (1,000 ft)

from the colony until the young

herons have left the nest.



Left alone, the abandoned field on the left will eventually become a woodland. Fox do well in southern Ontario where woodlots are interspersed with abandoned areas. They benefit farmers by consuming small rodents. However, like skunk, fox are a major vector for rabies.

BMPs FOR HABITATS

GENERAL

BMP – PLANT VEGETATION FOR WILDLIFE

Wildlife require cover from predators and the weather. Where habitat doesn't exist or is insufficient, plantings can provide cover as well as food. This involves establishing and maintaining native trees, shrubs, vines, ground cover, wildflowers and grasses.

Food and cover may be provided directly in the form of seeds, fruits, nuts, leaves, woody materials and roots, or indirectly by providing habitat for insects and other small animals.

For help in determining the wildlife species that benefit from specific wildlife plants, please see the chart on page 28-29. The chart can also help you identify plants that may be attractive to nuisance wildlife – depending on local conditions, you might wish to avoid them.

Planting vegetation can benefit people and livestock too by providing shade and cover. If planted adjacent to or in transitional areas, vegetation can reduce erosion and help filter contaminants and excess nutrients from surface water.

Note that some plant species require many years of growth before they will provide food or cover.

TIPS

Use native species wherever possible: some non-native species can displace native species, and native species are usually favoured by wildlife.

Consult foresters, nursery staff and wildlife specialists when planning your planting: try for more than one benefit, e.g., shade for livestock and cover for songbirds.

Choose low-maintenance plants (ground covers): they're more valuable to wildlife than high-maintenance plants (lawns).

Use cuttings from woody plants such as dogwood, willows and poplars: this is an inexpensive, effective means of propagating wildlife plants.

Collect seeds and roots of preferred species and plant them.

Match plants to site conditions: consider shade, exposure, soil and moisture.

Prepare site: debris may have to be moved, or soil worked up.

Control weeds to ensure plant survival and avoid conflicts with neighbours: use mulches where practical to reduce competition from weeds.

Avoid planting during hot, dry or cold conditions: early spring and mid fall are best for most perennials and seedling stock.

Water to ensure survival of new plants.

Install fencing around livestock yard and plantings in pasture to prevent trampling and browsing.



Consider planting wildlife shrubs and vines, like serviceberries (right) and wild grapes. They are well-suited to odd and abandoned areas, as well as retired marginal and fragile farmlands.



Native grasses like this Canada wild rye provide superior cover for wildlife. Unlike tame grasses such as timothy and brome, wild rye doesn't mat down over winter. As such, it provides shelter for ground-dwelling animals.



Grouped plantings of evergreens can provide many layers of cover for birds and small mammals, offering protection from predators and harsh weather.

PLANTS THAT PROVIDE FOOD (F) AND COVER (C) FOR WILDLIFE IN RURAL HABITATS

ANIMALS HAWKS AND OWL	SONGBIRDS OF LS UPLANDS AND TREED SWAMPS	MARSH BIRDS: bittern, grebe, coot.	WATERFOWL:	CAVITY NESTERS:	BOBWHITE QUAIL	
		rail, marsh wren, etc.	wood ducks	chickadees, nuthatches, woodpeckers		
PLANTS						
HEMEDEK	C	C		F,C		
WHITE PINE C	F,C	F,C		F,C	C	
RED PINE C	F.C			F		
WHITE AND NORWAY SPRUCE C	C	C		F	C	3
WHITE CEDAR C	F,C	F,C			C	
TAMARACK C	F.C.	C				
POPLAR AND ASPEN C	F,C	F,C		F,C	C	1
WHITE BIRCH C	F.C	F.C		F,C		
RED AND SILVER MAPLE C	C	C	C	C	C	
SUGAR MAPLE C	C		C	C		
RED AND WHITE OAK C	C		F,C	C	F,C	
HICKORY, BEECH C			C	C		
PIN CHERRY, SERVICEBERRY	F	***********************************		F	F	
WILD APPLE	F				••••••••••••••••••••••••••••••••••••	
ALDERS (green-speckled)	F	C		F		
WILLOWS (shrub species)	F,C	C	C	F,C		
RED CEDAH	F,C					
JUNIPER	F.C.					
SUMAC	F				F,C	
DOGWOOD	F,C	F,C			F,C	
BUTTONBRUSH			F,C			
HIGHBUSH CRANBERRY (American)	F,C			F		
HAWTHORN	F,C				F	
RASPBERRY, BLACKBERRY	F,C			F,C		
CURRANTS, ELDERBERRY	F,C	F		F,C	F	1
WILD GRAPE	F,C			F,C	C	
VIRGINIA CREEPER						
UPLAND GRASSES (non-native) CLOVER, TIMOTHY, ALEALEA TALL FESCUE	c		C		FC	
UPLAND GRASSES (native)						
SWITCHGRASS, BIG BLUESTEM, INBIAN			C		C	
LOWLAND GRASSES/ SEDGES: REED CANARY GRASS BLUEJOINT, SEDGE SPECIES		F,C	C			
EMERGENT (above syster) AQUATIC PLANTS: BULRUSH, CATTAIL, ABROWHEAD, WILD RICE		F,C	F.C			
SUBMERGENT below wetwi AQUATIC PLANTS: PONDWEED, WILD CELERY, BLADDERWORT		F	F			
FLOATING-LEAVED ADUATIC PLANTS: WATER LILY						
FREE-FLOATING AQUATIC PLANTS: DUCKWEED, WATERIMEAL, ALGAL SPECIES		F	F			

	RING-NECKED PHEASANT	RUFFED GROUSE	WILD TURKEY	WOODCOCK	CHIPMUNK AND SQUIRRELS	HARE AND RABBITS	BEAVER	DEER	FISH: pike, muskellunge largemouth bass, sunfish, perch
		C	C		C			F,C	
	C	C	C	C	F,C	F,C		C	
			C		F,C			C	
	C	C		C	F,C	C		C	
	C	C	C	C	F	F,C		F,C	
		C				F,C		C	
	C	F,C	C	C		F,C	F,C	F,C	
		F,C	C	C		F	F,C		
	C	C	C			F	F,C	F,C	
	C	F,C			F,C	C		F	
	F	F	F,C		F			F	
			F,C		F,C			F	
	F	F	F	C		F,C		F	
	F	F	F	C		F	F	F	
		F		F,C		F	F	C	
				C	•••••••••••••••••••••••••••••••••••••••	C	F	C	
					•••••••••••••••••••••••••••••••••••••••			F,C	
		C		C	••••••	F,C	••••••	C	
	F.C	F	F	C		F.C	•••••	F.C	
_	EC	F	F	C		EC	F	F	
				C				••••••	
	F	F						•••••	
	F	FC	F	C.		C		FC	
	F	F	F	FC		FC		F	
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	F		F	C	C	C		F	
	c		F		c	F.C		F	
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	C						F	C	C
							F		C
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							F		C

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There are 16 species of snakes in Ontario – the garter snake being the most common and widespread. Garter snakes live in many habitats, and make use of rock and brush piles.



Weasels are nocturnal, and are rarely seen during the day. They use abandoned burrows of other animals, or den under rocks, in crevices and brush piles. Feeding mainly on rodents, weasels may stockpile dead mice in "larders" for the winter.

BMPs FOR HABITATS

GENERAL

BMP – CREATE PILES OF STONES AND/OR BRUSH

Materials around your property can be used to create habitat where cover is sparse. Make piles with brush and other woody debris from woodland management activities, stones picked from cropland, old fenceposts, twigs from orchard pruning and concrete materials from old foundations.

Weasels, mink, red fox, rabbits, hare, snakes, songbirds and gamebirds are among the wildlife that will benefit from your efforts.

TIPS

Use largest materials for construction of base so that openings are maintained after materials are piled.

Place large materials in centre of pile and use small material (branches, twigs) on the outside – stabilize the pile with heavy limbs or boulders.

Check for surrounding cover: wildlife won't use stone or brush piles if they are too far from cover.

Locate stone piles on north shore of pond or watercourse to maximize exposure to sunlight: this will help stones heat up quickly, making good basking sites for wildlife.

Transplant vines around edges of piles.

Choose natural materials over man-made ones, where possible.

Don't use hazardous wastes (treated woods, solvents, tires, oil barrels, glass, wires, etc.) as materials for piles.

Inquire about permits before creating stone or brush piles in or alongside water bodies: contact your local CA or OMNR office.





Hare and other small mammals use brush piles as cover in woodlands and open areas. Piles can be created with branches from orchard and woodlot management activities.

GENERAL

BMP – PROVIDE NESTING STRUCTURES

Artificial nesting structures are useful when natural nesting sites either aren't available, or are in short supply. If located properly, these structures can improve natural habitats. They may take two or more nesting seasons to attract the intended inhabitants, e.g., bluebirds.

Like natural nesting habitat, artificial structures must meet the following basic requirements:

- ▶ be relatively undisturbed throughout the entire nesting season
- have nearby sources of food and water
- ▶ provide adequate cover.

Most structures are simple, inexpensive to construct, easy to maintain, and require very little space. They provide wildlife viewing and fishing opportunities, and encourage nature appreciation. Some of the wildlife species that will be attracted can help control pest problems.

Artificial nesting structures can also be useful interim measures while natural habitat improvement activities are underway, such as tree and shrub plantings, buffer establishment and watercourse enhancement.

On the downside, some structures may be used by unwanted species such as starlings, or may increase pressure from wildlife populations (e.g., geese) on adjacent croplands.



Erect two bluebird boxes close to each other – this reduces competition from other birds, especially sparrows and tree swallows. Locate them at least 50 metres (165 ft) from the closest bush to reduce competition from wrens.









Mallards will use nesting tunnels.

BEST MANAGEMENT PRACTICES . FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

GENERAL

BMPs FOR NESTING STRUCTURES

	FARMLANDS AND WOODLANDS	WETLANDS, STREAMS, SHORELINES AND PONDS
STRUCTURE	• nest boxes, brush/rock piles	 nest boxes, baskets, cones, platforms, islands, tunnels
Nildlife That Senefit	 songbirds, cavity-nesting birds, bats, squirrels, rabbits, snakes 	 wood duck, hooded merganser, goldeneye, flycatchers, osprey, owls, grackle, mallard
TIPS	 use wood that resists weathering (softw. place so that nest boxes are protected for the usual direction of wind and rain match size of hole, size of nesting structure drill a few holes below the roof overhand and drainage protect boxes from predators: place on point poles in water near shore; make entrain guards or baffles on nest box poles change nest box material in early spring grounds – waiting until spring will allow to materials, to kill nest box parasites 	roods, especially cedar) rom the sun (where possible); turn the entrance away from ure, and habitat to meet species' needs g and in the floor of box near the walls to allow ventilation noles well away from trees and shrubs; locate duck boxes ance oval to discourage raccoon predation; install predator (not in fall) just before birds return from southern wintering beneficial wasps, which pupate (over winter) in old nesting

For more information, contact OMNR, CWS, your local CA, Long Point Bird Observatory, Federation of Ontario Naturalists, DUC, OFAH, local Stewardship Councils, the public library or a local bookstore.

FARMLANDS

BMP - ADOPT CROPLAND CONSERVATION TECHNIQUES

Cropland conservation techniques are those that help you meet production goals and conserve soil and water resources. They minimize damage to, and sometimes even enhance, fish and wildlife and their habitats.

By practising cropland conservation, you can also reduce expenditures on crop protection agents and fertilizers, application and tillage. Remember that individual practices will perform best when they're part of a planned management system. Look at your whole operation to determine what options most suit your cropland.

For more detailed information, see other BMP booklets: *Soil Management, Field Crop Production, Horticultural Crops, Nutrient Management* and *Integrated Pest Management*.

TIPS

Reduce pesticide use through Integrated Pest Management: see page 35 for more information.

Assess nutrient needs by testing soil and manure to optimize production, minimize additional applications and expenses, and minimize pollution.

Rotate crops to boost production, curb erosion, improve soil structure, and reduce insect, weed and disease problems. Crop rotation uses a diversity of crops, which helps diversify the types of wildlife. Leave one or two outside rows of grain or oilseed to provide food for wildlife.

Plant cover crops to build soil structure, reduce erosion, and tie up excess nutrients to keep them from leaching to ground water:

- maintain cover crops on all land at all times
- try to select grasses and legumes that benefit desired wildlife, e.g., winter wheat and clover provide food for deer, wild turkey and blue-winged teal.



Individual practices will perform best when they are part of a planned management system.

Farmers who've been using

conservation tillage for several years notice more

wildlife on their land -

erosion.

as well as improved soil

conditions and reduced soil

FARMLANDS

Manage crop residues:

- try to leave at least 30 percent of the surface covered with the previous crop's residue after the crop is planted
 - >dropped grain and weed seeds are food for birds, deer and small mammals
 - >old crop stalks and leaves provide cover for feeding animals
- ► reduce tillage to limit the possibility of destroying nests
- > no-tilled fields support a greater number and variety of birds than clean-tilled fields.

Use contour strip cropping:

alternating crop strips creates numerous field edges, which will attract wildlife such as pheasants for feeding and nesting.

Create cropland erosion control structures:

- create structures such as grassed waterways and terraces that offer permanent vegetative cover – see also "Establish, protect or enhance windbreaks, shelterbelts and fencerows" on page 37, and "Restrict livestock" on page 57
- Keep mowing of grassed waterways to a minimum. Excessive or untimely mowing reduces wildlife cover, increases disturbance and discourages insects that are used by wildlife for food.



No-till.



Contour strip cropping.



3 4

Red clover cover crop under cereal.



FARMLANDS

BMP – SELECT AND USE PESTICIDES WITH CARE

Pesticides are important tools for controlling pests and sustaining crop production. However, certain pesticides can be a concern for human health, environmental quality, and fish and wildlife – particularly if improperly stored, handled or applied.

Fish and wildlife can become sick, exhibit reproductive problems or die as a result of pesticide exposure.

Direct exposure happens when birds eat pesticide granules or treated seeds, when frogs absorb pesticides through their skin, when fish absorb pesticides through their gills, or when wildlife breathe in pesticide vapours/sprays.

Indirect exposure occurs through consumption of contaminated food or water. For instance, hawks that prey on birds and rodents poisoned by pesticides, or waterfowl and grouse that feed on contaminated foliage and insects, are indirectly exposed.

Food sources can also be affected by pesticide use. Insecticides can kill enough insects to starve nesting adult and young birds. In turn, fewer insect- and seed-eating birds can lead to elevated insect pest and weed problems.

Some insecticides can affect soil organisms such as bacteria, fungi, earthworms, beetles and ants, many of which play roles in soil improvement, crop pollination and insect control.

Some pesticides can also degrade habitat. Fencerows treated with herbicides can reduce the habitat's ability to provide cover and food to beneficial wildlife.

Manage pesticides wisely to reduce impacts on soil and water resources, as well as on beneficial species such as bees. You'll also increase the effectiveness of pest management strategies and reduce input costs.

Initially, learning about Integrated Pest Management (IPM) and other means of selecting and using pesticides takes time, and may mean no longer using some pest control agents.

In the 1960s and 70s, the populations of several bird species including bald eagle (shown here), peregrine falcon, osprey, cormorants, and others were almost driven to extinction due to reproductive failure resulting from widespread DDT use. Many of the species that were affected were at the top of the food chain. Although its use was discontinued more than 20 years ago, DDT or its breakdown products continue to affect fish and wildlife. Today's chemicals are much safer. Low concentrations of certain commonly used insecticides can affect the reproduction and growth of many species: shorebirds, raptors (hawks and owls), quail, ducks, some mammals, amphibians, reptiles and fish.



BEST MANAGEMENT PRACTICES . FISH AND WILDLIFE HABITAT MANAGEMENT



Sprayer boom adjustment could have prevented vegetation kill on this wetland buffer strip.



Beneficial insects such as bees and other pollinators can be killed when directly exposed to certain insecticides.

BMPs FOR HABITATS

FARMLANDS

TIPS

Practise IPM:

- use an entire "tool kit" of pest management techniques chemical, biological and cultural
- be sure you know what pest to control, what method to use and when to apply it
- ▶ for more information, see the BMP booklet, Integrated Pest Management.

Timing is everything:

- time pesticide use to minimize impacts on fish, wildlife and their habitats where possible, avoid spraying during critical life stages of beneficial insects and other desired wildlife species
- avoid runoff and waste don't spray if rain is predicted.

Consider placement of pesticides:

- incorporate granular insecticides into soil to minimize exposure to birds
- ► clean up granule spills at the end of rows and in rough terrain
- use bait stations to control rodents with rodenticides.

Use full rates more effectively:

- adhere to IPM principles to reduce the overall amount of pesticides used, through better timing and fewer applications
- don't reduce pesticide use by reducing rates this can lead to the development of pesticide resistance by targeted pests. Follow instructions on the label.

Avoid non-target habitats:

don't apply pest control agents in or near ponds, watercourses, wetlands, woodlands, fencerows or buffer strips – this can directly destroy habitat, food sources and wildlife.

Ensure safe storage and handling:

unused pesticides should be stored and handled using facilities and techniques that reduce spills and contact with people and wildlife – apply what you've learned at the Grower Pesticide Safety Course.

Rotate crops:

to reduce pest buildup, rotate crops and/or plant pest- or mildew-resistant crops where practical.

FARMLANDS

BMP – ESTABLISH, PROTECT OR ENHANCE WINDBREAKS, SHELTERBELTS AND FENCEROWS

As noted on page 14, windbreaks, shelterbelts and fencerows are strips of permanent vegetation (usually trees), either natural or planted, located around croplands, orchards, pastures and farmsteads.

Their benefits are many. They provide habitat and act as corridors for numerous wildlife species, some of which control crop pests. They also reduce soil erosion caused by wind and water, and sand-blasting of crops. Livestock seek shelter near them. Depending on what species you plant, they can provide timber, fuelwood and fruits such as apples and raspberries, or even nuts. Around the farmstead they can save energy and improve aesthetics.

Plants such as raspberry can be used to create living fences, which can help contain livestock and discourage trespass. They also provide excellent food and cover for wildlife.

Establishing effective windbreaks, shelterbelts and fencerows takes planning. Try to connect large, existing habitat areas, such as woodlands, wetlands, and odd and abandoned areas. Plant a wide range of species to produce varied height, density of foliage and width of strips.

Use the following chart to help select the management practice you need, the wildlife that you wish to benefit, and the appropriate plant species.

Windbreaks have five or fewer rows.

Shelterbelts have six or more rows.

Treed fencerows are strips of trees and shrubs, three to 10 metres (10-35 ft) wide.



The quality of fenceline habitat is enhanced by trees, shrubs, grasses and wildflowers.



Field windbreaks protect valuable crops from drying winds and sand-blasting. They will also provide more nesting and feeding areas and act as corridors, allowing wildlife to move from one area to another.

FARMLANDS

BMPs FOR PLANNING EFFECTIVE WINDBREAKS, SHELTERBELTS AND FENCEROWS

	WINDBREAKS, SHELTERBELTS AND FENCEROWS
SUITABLE PLANTS	 spruce: white, Norway pine: white, red, Scots, jack, Austrian white cedar poplar, ash, oak, maple, butternut juniper, dogwood, viburnum, lilac, elderberry, raspberry
WILDLIFE THAT BENEFIT	 60 species of birds including songbirds, pheasants, wild turkey, owls, woodpeckers 25 species of mammals including hare, rabbits, raccoon, skunk, squirrels, chipmunk, mice, coyote and fox amphibians and reptiles
TIPS	 connect other wildlife habitats when designing windbreaks consider planting windbreaks of more than one row of trees: select wildlife trees and shrubs for additional rows control weeds and provide water until plantings are "free to grow" protect plantings from livestock, machinery, and girdling by rodents control weeds without herbicides by tending, tree shelters, mulches, cover crops and sheep grazing where possible

For more information, see Farm Forestry and Habitat Management, a BMP booklet.



Shelterbelts reduce energy costs, increase property value, and provide habitat for small mammals and birds, such as this American goldfinch.

FARMLANDS

BMP - ROTATE GRAZING

Rotational grazing is the practice of dividing pasturelands into smaller paddocks, and intensively managing grazing in relation to forage growth.

Rotational grazing offers:

- ▶ increased forage quality and more efficient use by livestock
- lower-cost weight gain
- ▶ improved herd health
- increased nesting success of ground-nesting wildlife such as rabbit, hares, songbirds (e.g., meadowlarks), and waterfowl such as mallard and blue-winged teal
- ▶ increased stocking rates
- reduced erosion caused by overgrazing.

Pheasants, partridge, grouse, ducks and songbirds are among the wildlife that benefit. Fish and amphibians benefit too, because reduced erosion rates on fragile pastures and permanent vegetative cover along shorelines and streambanks will improve water quality.

TIPS

Plan the rotation so that paddocks adjacent to wetlands are grazed last in the spring:

- move livestock out by September 1 to allow regrowth in fall this improves nesting cover the following spring
- delay access to rough pasture as long as possible in the spring this allows upland nesters some undisturbed time during nesting.

Use electric fencing:

take advantage of the many designs of electric fence – it's relatively low-cost and can be easily moved in a short time.

If required, provide alternate sources of water and shade for livestock to complete the system:

wherever possible, locate livestock feed, water, mineral and salt sources away from wetlands and other sensitive areas.

For more information, contact your local OMAFRA office, DUC or the Ontario Cattlemen's Association.





If areas are overgrazed in summer months, there may not be sufficient pasture regrowth to provide nesting cover the following spring. Also, the pasture will be less productive and more subject to erosion.



The loggerhead shrike, an endangered species, benefits from pasture that is well-grazed or mowed, but not bare. It uses lookout points like shrubs or small trees interspersed among pasture to spot prey such as mice in open areas.

Overgrazing, particularly in or adjacent to sensitive areas such as streambanks, shorelines and wetlands, can lead to erosion and water quality problems, and habitat degradation. BEST MANAGEMENT PRACTICES . FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

FARMLANDS

BMP – DELAY HAYING OR USE FLUSHING BARS

Nesting ducks, upland birds, deer and small mammals are attracted to hayfields adjacent to wetlands and watercourses. Fawns will often bed down in hayfields as a means of hiding from predators, and will not normally run away when machinery approaches. Occasionally some are killed. For birds, nesting is generally completed by mid July; however, haying operations normally carried out in June/early July can destroy nests, young birds and even parent birds, which sometimes won't fly to safety.

Where possible, delay the first cut of hay in fields adjacent to wetlands until mid July. If this is impractical, consider using a flushing bar to scare hens off the nest.

These techniques are most applicable, and critical, to areas adjacent to wetlands (especially marshes). Wetlands are significant waterfowl production habitat.

Species that will benefit include ducks (mallard, blue-winged teal, green-winged teal), pheasants, Hungarian partridge, wild turkey, bobwhite quail, sharp-tailed grouse, meadowlark, bobolink and savannah sparrow. White-tailed deer and small mammals such as rabbit and hare will also be helped.

Technical and financial assistance may be available through organizations such as DUC, OFAH, OMNR and local Stewardship Councils.



Mallards nest in and along marshes, ponds and swamps, and in grassy fields up to 300 metres (1,000 ft) from the water's edge. Delaying mowing in this area will improve waterfowl nesting success. Mount a flushing bar on your tractor (as shown) to flush female ducks off the nest.



In the spring, mallard pairs feed in small, temporary wet spots, like sheetwater ponds. The female relies on aquatic insects from these wet areas and wetlands to meet her high nutritional demands.



FARMLANDS

BMP – PROVIDE FEEDING STRUCTURES

Feeding structures are intended to supplement, *not replace*, natural food sources. Their main function is to attract wild birds and provide viewing opportunities for people. Use them only around the farmstead.

There are a few concerns with feeders. Birds can become dependent on them – once you start feeding, you have to continue all winter. Also, feeding can encourage birds to stay north of their natural range. This can cause mortality if severe weather conditions persist.



During summer, consider a nectar feeder for hummingbirds near the flower garden at your house.



4 1

Cardinals (shown here), blue jays, American goldfinches and mourning doves are all common visitors to farmstead feeders. A mixture of high quality bird seed will attract a variety of songbirds all winter long.

FARMLANDS

TIPS

Optimize appeal and opportunities for viewing without disturbing wildlife:

- provide food where natural sources are limited or nonexistent
- ▶ place feeders a few metres away from cover (low shrubs) where cats can hide
- ► locate, where possible, near a source of shallow water (birdbath, standing pools)
- ▶ situate within view of a window
- place in sunny, protected areas
- ▶ install feeder guards to discourage squirrels, raccoons and other animals.

Clean out old, wet food periodically: rake area beneath feeder to prevent salmonella bacteria outbreak.

Keep well-stocked throughout winter: once birds find your feeder, it becomes part of their daily search for food.

Concentrate on suet, finch and nectar feeders if you want to avoid attracting and supporting large numbers of invasive birds, such as starlings, pigeons, grackles, cowbirds and house sparrows.





Hopper spreaders will attract perching birds like jays, cardinals, chickadees, and these evening grosbeaks.

WOODLANDS

BMP - MANAGE WOODLANDS

Traditionally, the primary goal of woodland management was to optimize timber production and revenue in the short term. Today, harvesting should be carefully planned to achieve the combined goals of profit, forest growth, soil and water resource protection, recreational use and diversified habitat.

By removing poor quality and marketable trees, space is created and more light reaches the forest floor. A variety of plants will grow to fill these spaces, thereby supplying food, cover and space for many species of wildlife.

Three forest management systems are considered BMPs for woodland habitats: **selection**, **shelterwood**, and **patch or strip cutting**. Each system is most suited to a specific range of forest plants and wildlife.

The Canadian Census of Agriculture (1991) ranked the top 10 counties that together produce 50% of the forest products sold on Ontario farms. From one to 10, they are: Renfrew, Huron, Grey, Simcoe, Bruce, Haldimand-Norfolk, Waterloo, Lanark, Middlesex and Perth.





A well-managed farm woodlot can do triple duty: provide revenue, protect soil and water resources, and provide habitat for a broad range of wildlife species – including bats and bees.



The shelterwood system of woodlot management favours the growth of valuable trees like oak, ash, walnut and pine. It also creates habitat for gamebirds like wild turkey and ruffed grouse.

WOODLANDS

BMPs FOR WOODLANDS

FEATURE	SELECTION	SHELTERWOOD	PATCH OR STRIP CUTTING
SYSTEM DESCRIPTION	 trees are selected based on maturity, quality, spacing and potential trees are harvested (partially cut) at regular intervals (10-20 years) to create small openings for the growth of young trees habitat disturbance is minimal due to the small amount of wood harvested and the need to reduce damage to future crop trees 	 mature trees are removed over 50-80 years in 2-4 harvests first harvests encourage regrowth in partial shade final cuts encourage regrowth in full sunlight 	 small patches or parallel strips are clearcut throughout the stand shade-intolerant species can regenerate in full sunlight conditions of cut areas
SUITABLE FOR	 woodlands (e.g., maple bush) with mostly shade-tolerant hardwood (e.g., beech) and/or conifer tree species maple sugar production animals that prefer larger forested areas, e.g., ovenbird, pileated woodpecker, wood frog, broad- winged hawk, southern flying squirrel, marten 	 woodlands with trees intermediate to intolerant of shade, e.g., Carolinian deciduous forests, red and white pine stands crossbills, red squirrel, saw-whet owl, white-tailed deer, bald eagle, hairy and downy woodpeckers 	 lowland mixed bush, cedar bush, old field poplar-birch-alder stands species that require a combination of trees, shrubs and openings, e.g., wild turkey, woodcock, ruffed grouse, moose, song sparrow, indigo bunting, garter snake, red fox
TIPS	 get help from forestry experts at your lo Agroforestry Program control livestock access: intensive pas leave wildlife trees and shrubs: see pa harvest trees from wooded swamps will keep out of streams during harvest avoid tree blowdown: don't harvest here leave some or all of tops from harvest 	ical OMNR, CA or Stewardship Coun turing destroys woodland habitats ge 48 hen surface is frozen avily in treed swamps d trees and poor quality logs to provi	cil, or through OMAFRA's de cover



Bears benefit from forest management practices that increase the diversity of plants.



The saw-whet owl is one of many birds and mammals that competes for nesting space in tree cavities.

WOODLANDS

BMP - MANAGE PLANTATIONS

Plantations are forests typically planted in rows of conifers (cone-bearing evergreens), hardwoods (broadleaved), or combinations of trees and shrubs. These areas are planted for timber, wildlife habitat, environmental protection, aesthetics and/or recreation.

There are three main types of plantings: **conifer**, **hardwood** and **mixed plantations**. Mixed plantations provide the most diverse habitat for wildlife. **Intercropping**, where trees are planted between rows of crops, could be considered a fourth type of plantation.

Plantation management offers increased farm income from more marketable wood products, as well as the use of wood products on-farm. Plantations can also provide habitat for various wildlife species and can be used to connect isolated natural areas.

Typically, plantations are established on marginal, fragile, odd or abandoned areas, or at the edges of woodlands and wetlands. Conifers are commonly used because of their ability to survive on and stabilize poor sites.

Management generally involves a series of thinnings. As trees grow, their crowns close over, reducing both the amount of sunlight that reaches the ground and competition from weeds. Between 20 to 35 years of age, the stands should be thinned – this means the removal of every second or fourth row for pulp or palettes, or leaving them as downed, woody material. Trees selected to reach maturity can be pruned at this time.

A series of thinnings of complete rows over many years, and/or removal of single, marketable trees, allows light to penetrate the plantation. This enables native woodland species or other forest species to become established. Over time, the mature forest is highly diverse and may consist of evergreens, hardwoods, and other native woodland species. In this way, conifers act as a "nurse" crop for the regeneration of other forest tree species.

Management should not emphasize short-term profit and production at the expense of wildlife habitat and poor quality forests. Seventeen species of woodland birds are cavity nesters. They depend on woodpeckers and chickadees to construct cavities in dead and dying trees. Birdboxes can offer a substitute for cavity-nesting birds to raise their young.

The size of the wooded area will influence the wildlife that live there. The bigger the area, the more species whose needs will be met.

In most situations, native species are preferable. However, non-native, non-invasive trees (e.g., European larch, Japanese larch and Norway spruce) outperform native species on eroded agricultural lands.





BEST MANAGEMENT PRACTICES . FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

WOODLANDS

BMPs FOR PLANTATIONS

FEATURE	CONIFERS	HARDWOODS
DESCRIPTION OF PLANTATION	 block plantings of pine, spruce, larch and cedar planted at close spacings, i.e., 2.0-2.5 metres (6-8 ft) between trees and rows designed for quick establishment, self-pruning, and ease of maintenance and timber management hardwoods and other woody species can seed in over time in managed conifer plantations 	 block plantings of valuable hardwoods such as red and white oak, white and green ash as well as dual-purpose trees (nuts and timber), black walnut, heartnut planted at 2.0-2.5 metres (6-8 ft) spacings between trees and rows to allow for maintenance of established plantings by machinery
TREES AND SHRUBS TO USE (depending on site conditions)	 white, red and jack pine Norway and white spruce white cedar, tamarack European and Japanese larch the following species will seed in: ash, oak, hickory, cherry, maple, sumac, elderberry, viburnum 	 black walnut, heartnut red, bur and white oak white and green ash black cherry silver and sugar maple basswood the following species will seed in: grasses, goldenrod, sumac, red osier dogwood, apple
TIPS	 control weeds until trees are free from competition (remove) poor quality trees if spacing bet leave snags the more you thin, the more space and light improves habitat prune remaining "crop" or valuable trees: few at harvest improve habitat further leave some downed trees build ponds or wetlands where feasible 	etition tween trees or rows is too dense for best growth are provided for natural regrowth, which wer branches mean fewer knots and higher value • erect nesting structures • create brush piles from pruning work and stone piles from old fencerows
	Ar ma wi un tre	mature, well- anaged plantation Il consist of a dense dergrowth of natural es and shrubs, as ell as the conifer

nurse crop.

WOODLANDS

INTERCROPPING

- refers to growing field, forage or horticultural crops with tree crops at the same time on the same land
- trees are planted 10.0-13.0 metres (30-40 ft) apart in rows to allow crop production between rows
- also known as alley crops if trees are at close spacings within rows
- black walnut, white ash, red oak, silver maple, butternut, shagbark hickory
- heartnut, English walnut, carpathian walnut, Chinese walnut, hazel-filbert hybrids, pecan, almond

MIXED PLANTATIONS

- plantings of conifer, hardwood, nut trees, mast trees, catkin-bearing plants, wildlife shrubs and native grasses or herbs
- plantings can be arranged in blocks of species, rows of alternate species or planted randomly throughout the field
- see Conifers column; also
 Eastern hemlock, Austrian pine
 see Hardwoods column; also white
- and grey birch, alder, poplar
- the following species will seed-in: apple, hawthorn, dogwood, willow, grasses, wildflowers
- control weeds until trees are free from competition
- thin (remove) poor quality trees if spacing between trees or rows is too dense for best growth
 leave snags
- the more you thin, the more space and light are provided for natural regrowth, which improves habitat
- prune remaining "crop" or valuable trees: fewer branches mean fewer knots and higher value at harvest
- · improve habitat further
- · leave some downed trees
- build ponds or wetlands where feasible
- · erect nesting structures
- create brush piles from pruning work and stone piles from old fencerows



Plantations like this could be thinned to make space for better quality trees, and to improve habitat conditions.

A snag is a standing dead tree, often used as a nesting site for birds and small mammals. Gnawing, claw marks, fur, and worn areas around the entrance are evidence of use.

48

A valuable den tree has a cavity for nesting birds and mammals, and provides food, e.g., nuts for wildlife. Den sites near water are especially valuable to wildlife.

Other preferred features include: a healthy crown, potential for surviving at least through the next cutting cycle, and an entrance facing southeast to keep rain out.

BMPs FOR HABITATS

WOODLANDS

BMP – MAINTAIN WILDLIFE TREES AND SHRUBS

Certain trees and shrubs are particularly valuable for wildlife. Some nut and catkin (flowering) trees also produce valuable timber. Because shrubs are low, they can sometimes be planted along drains to provide habitat while not

interfering with maintenance. Along streambanks and shorelines, trees and shrubs help stabilize banks, and provide shade and food.

Some wildlife trees may require large openings in woodlands to ensure regeneration.

The ruffed grouse is found across most of Ontario. In spring, males often stand on downed logs and rapidly beat their wings to make a drumming sound, which attracts females. During winter, these birds feed heavily on catkins of aspen, white birch and ironwood.





BMPs FOR MAINTA	INING WILDLIFE TREES AND SHRUB	S
 	SNAGS	DOWNED LOGS
DESCRIPTION	 dead or partly dead trees with a minimum diameter of 10 centimetres (4 in) and minimum height 1.8 metres (6 ft) cavities (or nesting sites) are formed by fungus, insects, woodpeckers, fire or wind 	 dead trees on the ground – natural or felled and left during woodland harvest include stumps, full logs, root masses, branches and tops nature and quality of habitat changes as they rot
TREE / SHRUB SPECIES	 most tree species, but generally those with wide crowns beech, ash, oak, basswood, pine, hemlock, yellow birch, maple, poplar, cedar 	 larger logs and stumps form better habitat beech, ash, oak, basswood, pine, hemlock, yellow birch, maple, poplar, cedar
 WILDLIFE THAT BENEFIT	 over 20 species of birds chickadee, woodpeckers, Eastern bluebird, nuthatch, great blue heron, screech owl, osprey, other hawks 10 species of mammals, including squirrels and chipmunk 	 20 species of mammals many birds, e.g., grouse, wild turkey, woodpeckers salamanders and snakes insects and other invertebrates
TIPS	 leave/create snags – 12 small and 6 large per hectare (per 2.5 ac) create snags by girdling poor quality trees if necessary trees with cavities in both the trunk and limbs are particularly valuable to wildlife 	 aim for 5 downed trees per hectare (2/ac) aim to leave a range of species and diameters trees with cavities in large limbs are especially valuable to wildlife, offering better protection from predators than cavities in the main trunk

WOODLANDS



In the autumn, acorns are an excellent food source for white-tailed deer, as well as wild turkey, wood duck, squirrels and chipmunk.

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Red-tailed hawks have benefitted from the clearing of forests for farmland. These friends of the farmer are often seen perched in trees overlooking pastures, hayfields or scrubland, searching for mice or rabbits. Although some fly south for winter, many remain in southern Ontario all winter long.

The factor of the second se		
MAST TREES AND SHRUBS	CATKIN TREES AND SHRUBS	
 trees and shrubs that produce nuts and acorns, which are high in energy and protein are essential to the survival of some wildlife species during fall and winter 	 trees and shrubs that produce catkins (flowers) most catkin species are shade intolerant – they require full sunlight to thrive 	
 oak: white, bur, red hickory: bitternut, shagbark black walnut, butternut American hazelnut beech 	 birch: white, gray, yellow alder: speckled, green poplar: trembling aspen, balsam, largetoothed aspen, cottonwood 	
 white-tailed deer, black bear, raccoon, grey squirrel wild turkey, wood duck, pheasant, ruffed grouse, bobwhite quail 	 ruffed grouse, woodcock, songbirds white-tailed deer, black bear, moose, snowshoe hare ruffed grouse, woodcock, songbirds 	
 cut 1 hectare (2.5 ac) openings in woodlands; disturb forest floor to expose bare soil; leave beech plant nut trees in areas of full sunlight 	 cut 1 hectare (2.5 ac) openings in woodlands; disturb forest floor to expose bare soil leave catkin-species in stand: do not remove 	



Birds like the least bittern are wetland-dependent.

TRANSITIONAL

BMP - MANAGE WETLANDS

If you have some form of wetland on your property, you can maintain it in its present form, enhance it, or rehabilitate it if it's been degraded. You may also wish to restore (re-create) wetlands that have been destroyed. Because wetlands provide such productive habitat, many species will benefit from your efforts.

Ducks, marsh birds (e.g., bitterns), osprey, frogs, turtles, muskrat and some fish depend on wetlands for their survival. Others use wetlands, in addition to other habitats, for food, cover and/or water. These include deer, mink, pheasant, snakes, and many songbirds.

Besides providing habitat, wetlands perform several key functions:

- improve water quality by filtering sediments, nutrients, contaminants and bacteria from surface water
- ▶ recharge ground water supplies
- ▶ reduce flood damage and stabilize stream flows by releasing stored water slowly
- ► stabilize shorelines
- provide a renewable source of fuelwood and timber (wooded swamps)
- offer recreational opportunities.

This section describes specific measures for wetlands. If you farm, remember that many other BMPs will also help wetlands thrive. Conservation cropping, establishing buffers and restricting livestock are just a few examples. The tips on the next page will give you some more ideas, as will other booklets in the BMP Series. In short, if a practice benefits soil and water resources, it benefits wetlands.

Financial assistance may be available to help you implement some of the BMPs that follow. As an incentive to landowners, the Province of Ontario provides a tax rebate to landowners who agree to protect or manage "provincially significant" wetlands on their property. Costs for large-scale water control structures may be borne or shared by government partnerships or privately sponsored programs.

Long-term stewardship agreements with groups such as DUC or Wildlife Habitat Canada can provide financial benefits to landowners. Contact these agencies, your local Stewardship Council, MOEE, OMNR or CWS for more information.



A word of caution: **some wetland enhancement or restoration activities may require a permit.** Contact your local Stewardship Council, OMNR or CA.

Buffer strips around wetlands should be wide enough to provide sufficient upland nesting area and cover so that waterfowl can breed successfully. On this site, the wetland and a portion of the surrounding upland have been fenced and retired from pasture. While this buffer provides good water quality protection, a wider buffer would benefit waterfowl nesting.

TRANSITIONAL

MAINTAIN EXISTING WETLANDS

Maintain your existing wetlands. Don't drain or fill them. Instead, recognize their value, practise informed land stewardship, and enjoy their many uses.

TIPS

Restrict cutting of conifers in swamps, particularly clumps of hemlock or cedar, where deer overwinter.

Selectively harvest trees in winter to minimize wildlife impacts and reduce damage to soils.

Leave several dead trees standing per acre in swamps for use by cavity-nesting birds such as wood duck, woodpeckers and tree swallow; leave some over-mature trees for future dead snags. (See also page 48.)

Keep or add downed trees/logs and rocks – these provide habitat for many species such as turtles, fish, amphibians and birds. (See also pages 30 and 48.)

Maintain a wetland buffer of high, dense grasses and shrubs to discourage Canada goose and encourage other ground-nesting birds that need tall vegetation for nesting cover. (See also page 54.)

Install beaver bafflers through beaver dams to prevent beavers from re-flooding areas or to limit the amount of flooding to acceptable amounts.

ENHANCE WETLANDS

Wetland enhancement improves degraded wetlands, or enlarges wetlands into surrounding unproductive land. It can also mean managing existing wetlands to increase species diversity or to improve their value for certain groups of species, such as waterfowl or fish.

TIPS

Install water control structures, from simple berms and spillways to engineered structures, in order to:

- allow manipulation of water levels, which can be used to create openings in dense cattail stands or in shrub vegetation, improving conditions for many species including waterfowl, other marsh birds, fish, amphibians, reptiles and other wetland plant species
- control or prevent flooding of woodlots and crop fields



Painted turtles can be found in marshes, sluggish streams and shallow bays. They have bright markings on the upper and lower surfaces of their shells. Their days are spent basking in the sun on logs, and looking for food – insects, crayfish, snails, carrion and vegetation.



Managing wetlands for waterfowl will benefit many other species.



Cutting channels through dense cattail stands creates more edge between plants and open water. Fish, waterfowl and other species will benefit.

Manipulating water levels in marshes can be used to create open water areas in dense cattail stands. In addition to benefitting many wildlife species, this encourages a greater diversity of aquatic plants.

BMPs FOR HABITATS

TRANSITIONAL

ensure water levels are constant over winter, which helps muskrat, fish and amphibian populations

TION

MANAGENENT

allow occasional drawdowns to recirculate nutrients, revegetate basins and provide temporary mudflats for shorebirds.

CTICES

Improve habitat diversity by cutting openings in dense cattail stands in late summer:

- construct/excavate level ditches, ponds or deep-water channels in overgrown or shallow wetlands
- create openings in wooded swamps.

Control nuisance species such as purple loosestrife and carp. Loosestrife is an invasive exotic plant of little value to wildlife. Carp is an introduced fish species that damages marsh habitats.

Perform over-ice mowing in the winter, then control water levels to help manage cattail and purple loosestrife:

best used when water levels can be lowered before freeze-up and then raised 0.3-0.45 metres (12-18 in) above the cut stems the following spring.

Encourage muskrat when building lodges ("pushups"): they create openings in dense cattail stands, which in turn benefit ducks, turtles, amphibians and fish.

Plant marsh vegetation to increase diversity of species and provide food for wildlife.

Provide waterfowl nesting structures (boxes, cylinders, cones, rafts) with predator guards, and logs or rock piles for use as loafing sites by waterfowl, shorebirds, frogs and turtles.

Create vegetated hummocks for spawning pike.



The spotted turtle is Canada's smallest turtle, not exceeding 12 centimetres (5 in) in length. Once abundant in southern Ontario, it's now rare, due to the loss of bogs, ponds and marshes.



Purple loosestrife aggressively competes with other vegetation in a wetland. Without control, it can be disastrous for the wildlife that depend on the plant species it displaces.

TRANSITIONAL

RESTORE WETLANDS

Wetland restoration (re-creation) involves re-establishing wetlands that were converted to other uses. This often requires restoring high water tables and encouraging revegetation with native wetland plants.

TIPS

Direct your efforts toward lowlands that were wetlands prior to drainage or clearing:

success will depend on topography, water supply, soils, existing drainage and surrounding land management.

Assess the degree of action required:

- in some cases, it may be preferable to use no or few structural means to restore wetlands – blocking a failed tile drain or trapping runoff may be all that's required
- ▶ some projects will require dykes and water-level control structures.

Re-establish native wetland plants:

- ► this will sometimes occur naturally when an area is re-flooded
- if an area has been dry for many years, it may be necessary to import a source of native plant seeds from nearby wetlands – this can be as simple as bringing in a few loads of muck
- plant by hand if necessary.

Combine restoration efforts with other BMPs, such as establishing buffers, practising cropland conservation and restricting livestock access.



During summer, muskrats build platforms – called "pushups" – of aquatic plants for resting and feeding. Pushups are usually found in areas of open water in marshes – in fact, by building them, muskrats help create open water areas. After they've been abandoned, they are used as nesting sites by water birds.



Fields that are so wet that crop production is unreliable may be good sites for conversion back to wetland.



We have 10 species of salamanders and newts in Ontario. Many need woodlands adjacent to wetlands to complete their life cycles. You can sometimes see salamanders if you turn over stones or rotting logs. Be sure to replace stones or logs the same way you found them. Shown here is a blue-spotted salamander.



In wetlands and ponds, waterlevel control structures can be used to manage vegetation and optimize habitat conditions for waterfowl and other wildlife.

TRANSITIONAL

BMP – ESTABLISH, PROTECT OR ENHANCE VEGETATED BUFFERS

Buffers are strips of naturally seeded or planted vegetation – usually grasses, trees and/or shrubs. They can be found on upland (dry) areas adjacent to water bodies, such as field edges adjacent to drains, and along sloping transitional or riparian areas, such as streambanks and shorelines (see graphic on page 56). In many cases, buffers will include both upland and riparian areas.

Vegetated buffers, whether natural or planted, are essential to the quality of water bodies and wetlands – and the health and survival of species that use them. Riparian areas should always be vegetated.

Where streambanks, shorelines or drain banks are steep, the resulting riparian zones are narrow. Even when well-vegetated, these narrow zones may not provide adequate protection for adjacent water bodies or wetlands. In these cases, vegetated buffers are recommended on adjacent uplands.

In addition to filtering out sediments and absorbing excess nutrients, contaminants and bacteria, vegetated buffers provide shade, helping keep the waters cool. The vegetation provides habitat for many species of wildlife, including insects, which are an important food source for fish.

Plant/maintain/protect vegetative buffers.

TIPS

Locate buffers:

- along shorelines surrounding lakes and ponds
- ► along watercourses
- in upland areas surrounding wetlands.

Replace damaged vegetation, or replant where it has been removed.

Widen buffers where necessary:

- a minimum of 3-metre (10-ft) wide permanent buffers is recommended on uplands to provide some water quality protection adjacent to steeply sloping streambanks, shorelines and drains
- buffers often need to be wider than 18 metres (60 ft) to provide reasonable water quality protection – many species of wildlife will benefit
- buffers of 50 metres (165 ft) or more adjacent to wetlands are recommended where possible – mallard ducks commonly nest up to 300 metres (1000 ft) from wetland edges.

Establishing effective buffers takes careful planning. Use the following chart to get you started.

Before planting trees or shrubs along a drain, be sure to contact the drainage superintendent at your local municipal office.

TRANSITIONAL

BMPs FOR PLANNING EFFECTIVE BUFFERS

	BUFFER STRIPS FOR STREAMBANKS, DRAINS AND SHORELINES	BUFFERS FOR WETLANDS	
SUITABLE PLANTS	Grasses/ Legumes Dry Sites • timothy, fescues, big and little bluestem*, switchgrass*, trefoil Wet Sites • switchgrass*, prairie cordgrass*, Canada wild rye*, blue-joint, trefoil, clovers, orchard grass Shrubs • red osier dogwood, willow, cranberry, nannyberry, raspberry Trees • black walnut, ash, silver maple, tamarack, cedar, spruce, birch, willow	Grasses/ Legumes Dry Sites • timothy, big and little bluestem*, fescues, Indian grass*, switchgrass*, trefoil Wet Sites • switchgrass*, prairie cordgrass*, Canada wildrye, blue-joint, trefoil, clovers, orchard grass Shrubs • dogwood, willow, viburnum, chokeberry, sumac Trees Wet Sites • ash, silver maple, cedar, tamarack, white spruce Dry Sites • black walnut, oak and pine	
SPECIES THAT BENEFIT	 waterfowl, pheasants, shorebirds, hawks herons, swallows, songbirds muskrat, mink, deer, coyote frogs, salamanders, turtles, snakes insects many fish species, including trout, bass and pike see also species listed under Windbreaks, Shelterbelts and Fencerows, page 38 	 waterfowl, pheasants, shorebirds, hawks herons, marsh wren, swallows, songbirds muskrat, mink, deer, coyote frogs, salamanders, turtles, snakes insects many fish species, including largemouth bass and pike 	
TIPS	 if mowing is planned, space trees to make maintenance easy erect nesting boxes select plant species that will benefit desirable wildlife see tips for Windbreaks, Shelterbelts and Fencerows, page 38 if planning buffers around drains, see Maintain Drains, page 72 and Control Bank, Channel and Shoreline Erosion, page 69 	 a buffer > 50 metres (165 ft) wide provides habitat for many species of wildlife, and decreases predation on nests of ducks and other birds try to mimic nature – use native species; arrange shrubs and trees in thickets or clumps plant buffer to mostly grasses, allowing the area to seed in naturally will take longer and promote weeds if you mow to maintain grasses, delay mowing until mid July, so that nesting waterfowl and other birds can rear young – note that mowing may attract geese 	

* Warm-season native grasses shouldn't be planted in a mix with cool-season tame species. Note: Alfalfa won't do well on wet sites and could be of little use if not cut or harvested.

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BEST MANAGEMENT PRACTICES ► FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

TRANSITIONAL



This wetland could benefit from a wider buffer. Buffers improve water quality in many ways: reducing bank and shoreline erosion, filtering contaminants, and keeping farm machinery away from water bodies.



The buffer around this pond nicely separates the natural features from the intensive cropping activity.



Vegetated buffers along watercourses help protect water quality and quantity, and provide habitat for a variety of fish and wildlife species. Around drains such as this one, buffers can reduce maintenance costs.



TRANSITIONAL

BMP – RESTRICT LIVESTOCK AND PROVIDE ALTERNATE WATERING

Grazing livestock need protection from sun, wind and cold, as well as access to water. However, unrestricted access to fragile areas such as woodlands, wetlands, watercourses and highly erodible streambanks and shorelines can be harmful to livestock, and the fish and wildlife that live in these habitats.

Unrestricted access can:

- ► impair water quality
- ▶ reduce the value of timber
- destroy wildlife habitat
- ► compromise herd health.

In **intensive-grazing** situations, where many livestock are confined to relatively small areas, highly erodible areas should be fenced to exclude livestock.

In **extensive-grazing** situations, access to vulnerable areas may be acceptable for short periods of time. However, if signs of overgrazing, erosion, tree damage, trampling or fouled water are detected, access needs to be further restricted or livestock should be moved to another area altogether.

Restricting access may mean you'll have to supply alternate watering facilities, fencing and stream crossings. Permits could be required for some crossings.

Consider planting buffer strips or providing shade trees within the pasture. The practice of planting shade trees in pastures, known as silvipasture, will encourage livestock to stay on pastures, helping to keep them out of sensitive areas. Silvipasture can also provide habitat for wildlife while providing an additional source of revenue. See *Farm Forestry and Habitat Management*, a BMP booklet.

In addition to the booklets in this series, consult the Ontario Cattlemen's Association, OMAFRA factsheets and CA literature. Financial and technical help may be available through a variety of programs and local groups.

> Silvipasture practices allow for controlled livestock grazing in treed pastures. It promotes livestock comfort and growth through provision of shelter from sun and wind. Here, sheep make effective use of grass in a Christmas tree plantation.



BEST MANAGEMENT PRACTICES . FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

TRANSITIONAL

The following chart summarizes some practical options for restricting livestock.

BMPs FOR RESTRICTING LIVESTOCK ACCESS TO SENSITIVE AREAS

	EXTENSIVE GRAZING	FENCING
DESCRIPTION AND PRINCIPLES	 limit numbers of livestock to short periods of time minimize pasturing during winter or early spring – vegetation is vulnerable to overgrazing during these periods confine grazing to least sensitive parts of natural areas 	 Permanent fencing options: page wire, barbed wire, high- tensile with or without electricity, rail fences, etc. provides excellent habitat when combined with stone piles and tree and shrub plantings
SPECIES THAT BENEFIT	 all fish and wildlife that live in sensitive areas 	 all fish and wildlife that live in sensitive areas
TIPS	 rest sensitive areas: rotate grazing times restrict livestock access when birds are nesting/fish spawning situate livestock watering facilities, and salt and mineral licks well away from vulnerable areas 	 provides instant protection recovery time for protected areas will vary



In intensive-grazing situations, areas like this pond and its surrounding buffer should be fenced to prevent livestock access. Herd health and productivity are enhanced by a clean and easily accessed alternate water supply.

TRANSITIONAL

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LIVING FENCES	LIVESTOCK/ MACHINERY CROSSINGS	ALTERNATE WATERING FACILITIES
 plant selected species of trees and shrubs close together to form a barrier to livestock living fences themselves provide excellent cover and nesting sites for many species 	 low-level or bed crossings are constructed with concrete or gravel – good for machinery crossings mid-level crossings allow low flows to pass through culverts and/or under surface of structure, and high flows to pass over 	Choice of systems: • mechanically-driven pumps – nose; in-stream water; hydraulic ram; windmill • electrically-driven pumps – solar-powered and batteries; hydro- generated; wind-generated • gravity systems
 all fish and wildlife that live in sensitive areas 	 fish and wildlife that depend on aquatic habitat 	 herd health improves fish and wildlife that depend on aquatic habitats
 complement with temporary fencing in early years to form immediate livestock barrier living fences may take many years to achieve effectiveness 	 crossings are limited to watercourses of up to 6 metres (20 ft) wide crossings allow fish to move up and down a channel crossings are less expensive than bridges or large culvert crossings crossings that destroy fish habitat or limit the ability of fish to move upstream or downstream will not be permitted 	 provide a solid, dry pad for good footing shade tanks to cool water and control algae growth add lime to reduce algae assess whether system will be year- round or seasonal test water quality periodically

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Declines or other changes in the abundance of fish and amphibians can provide humans with early warnings of environmental problems.

BMPs FOR HABITATS

A Q U A T I C

MANAGING AQUATIC HABITATS – AN OVERVIEW

What's done in and around the aquatic areas on your property will have some impact on their quality as habitat for fish and other wildlife. Measures that are good for fish are also good for wildlife such as herons, osprey, ducks, salamanders, turtles, muskrat and beaver. Your family and neighbours can also benefit from improved water quality and recreational opportunities.

Like the miner's canary, fish provide an early warning of environmental problems. When the fish populations in a water body are healthy, then the aquatic habitat is also likely to be healthy. When the fish species change from those such as trout that require clean water, to those that are more tolerant of degraded conditions, such as suckers, chub or shiners, then there's a good chance that water quality or habitat quality has been degraded.



To manage aquatic habitats for game species, such as largemouth bass (left), you must also consider the needs of their prey species, such as this sculpin.

A Q U A T I C

AGRICULTURE AND AQUATIC HABITATS

Some of the impacts of agriculture on aquatic habitats can be related to past management practices:

- in fields cropland erosion, which can deposit nutrients and sediments into water bodies (reducing clarity) and contaminate surface and ground waters with pesticides and bacteria
- around farmsteads improperly handled manure, contaminated runoff, spills and milkhouse waste
- near water uncontrolled livestock access, unprotected tile outlets, and destruction of natural bank or shoreline vegetation can lead to elevated water temperatures, reduced bank stability, and a reduced supply of terrestrial insects that fish eat
- in water poor drain maintenance; in-stream ponds; poorly designed erosion control structures and excessive water-taking for irrigation
- water crossings poorly designed livestock and machinery crossings
- Iand clearing up to the water's edge can create erosion problems; even the clearing of forests well away from the water's edge affects the water cycle
- Iand drainage of wetlands or other low areas with tile drainage or other systems will affect adjacent water bodies.

Most of the BMPs that are good for farming are also good for fish. Soil and water conservation practices, such as reduced tillage, use of cover crops, manure and milkhouse waste management, and retirement of fragile lands, will reduce erosion and runoff to surface waters. For more information, see other booklets in the BMP Series.

Even intermittent watercourses, including some drains, can provide habitat for fish, amphibians, reptiles, and other animals. For example, streams that may be dry in late summer may have enough flow in spring floods to allow species like pike to spawn.

Erosion and runoff from croplands can take a toll on fish. Eroded soil can muddy waters, making them intolerable for some fish, aquatic insects and plants. Runoff may contain organic materials, nutrients, pesticides and bacteria. Nutrient runoff can lead to excessive aquatic plant growth. As these plants die, oxygen levels may drop to lethal levels for fish. Pesticides can be toxic to many aquatic species. Cropland conservation techniques help prevent these problems.



A Q U A T I C

PRINCIPLES OF AQUATIC HABITAT MANAGEMENT

Fish and other aquatic wildlife species have the same four habitat requirements as terrestrial wildlife: food, water, cover and space. Fish also need good water quality. The following principles address these needs, directly or indirectly.

Reduce turbidity. Turbidity refers to the amount of suspended material in the water. Some fish species, like brook trout, require clear water. Others, like walleye, can tolerate turbid water. Turbid water limits the depth to which sunlight penetrates, affecting the growth of aquatic plants – an important component of the habitat for fish and for other species upon which fish depend. Turbid water can also reduce the ability of fish to feed and "breathe".

Reduce temperature. Excessively warm water temperatures can kill fish and other aquatic species that require cold or cool water.

Reduce pesticide and nutrient loading. Excessive inputs of pesticides can cause fish and wildlife to become sick or die. Excessive nutrient inputs can reduce water quality and cause excessive algae growth.

Improve substrate quality. Substrate is the material in the "bed" of lakes, ponds and streams. Different fish species have different substrate preferences. When coarse substrates are smothered with silt or sand, habitat quality for species like brook trout is reduced.

Increase habitat diversity on banks, along shorelines and in the water. Diverse habitats contain more "edge" and a wider range of "micro-habitat" types, making them suitable for a broader range of species and life stages.

Maintain streamflows and water levels as close to natural as possible. Minimize watertaking by adopting irrigation BMPs. Time water-takings to minimize impacts. Conserve wetlands. Drain lands only when absolutely necessary, and maintain drainage systems carefully.



Walleye, also known as pickerel, spawn in rivers but prefer to live in shallow, turbid waters of lakes.

A Q U A T I C

If you're interested in making improvements to fish habitat, make sure you identify the factors that are affecting fish habitat quality and focus your efforts on them. If you live along a watercourse, improving habitat quality may depend on improving land use practices upstream. You may need to work with your neighbours.

ADVICE AND APPROVALS

If, after reading this section, you see opportunities for your property, remember these steps.

Seek expert advice. Implementation requires a great deal of care. Aquatic habitats are fragile and mistakes can be costly. Improperly placed structures can do more harm than good. Remember that the things you do on your property can affect your neighbour's property. Begin by contacting one of the following agencies:

OMNR Stewardship Councils Landowner Resource Centres OFAH Drainage Superintendent (municipal drains) CAs Trout Unlimited Muskies Canada ...other volunteer groups.

Obtain necessary permits. Permits are required before most of the following BMPs can be implemented. Where permits are not required, habitat modifications must be undertaken with caution. Key legislation is listed at the end of this booklet.

Focus on habitat. You may choose to restore, enhance or protect fish habitats, or even create new ones.

You may choose to protect or enhance existing fish habitats, to restore habitats that have been destroyed, or to create new ones. Remember to focus on the habitat needs of the fish species you want to encourage.



A healthy riparian zone reduces soil erosion, improves water quality, and provides a better home for many wildlife species, including river otter. Due to habitat loss, river otter are now uncommon in the south.



Bioengineering involves the use of living and non-living natural materials to stabilize banks or shorelines.

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BMPs FOR HABITATS

A Q U A T I C

BMP - IMPROVE IN-WATER HABITAT

There are three approaches to in-water habitat improvement:

- non-structural techniques, such as the selective removal of excess vegetation along a bank
- structural techniques that involve placing structures, such as boulders, brush piles or lunker structures in a water body, or the use of bioengineering techniques
- ► active management techniques, such as the manipulation of water levels.

Some of the techniques are simple and inexpensive. Degraded habitats will usually respond quickly to your efforts. Others are expensive and labour-intensive, but financial assistance and volunteer labour may be available.

As well as benefitting existing fish populations, new species may be attracted. Habitat for many other species that need water will be improved.

Remember, expert advice is recommended, and permits are usually required.

AQUATIC

NON-STRUCTURAL BMPs FOR IMPROVING IN-WATER HABITAT

	FLUSH EXCESS SEDIMENTS from channels or near-shore areas	REMOVE EXCESS WOODY DEBRIS from watercourses and shorelines	CREATE EDGE in all water bodies
DESCRIPTION AND PRINCIPLES	 sand, silt and clay can cover bottom substrates and degrade fish habitat aim to improve substrate quality flush sediments downstream by increasing current speeds or wave patterns, or using pumps/ high pressure hoses collect excess sediments in streams or drains with sediment traps 	 debris includes branches, trees and brush that have fallen into water body in proper amounts, debris diversifies habitat and provides important cover excess amounts can restrict flows, create barriers to fish movement, and create erosion and sedimentation problems remove excess debris if appropriate 	 edge occurs between weedy and openwater areas; along shorelines; between deep and shallow water areas; between areas of fast and slow currents; between sheltered areas and areas exposed to waves edge increases habitat value by increasing habitat diversity create edge where appropriate by cutting channels through submerged aquatic plants or cattails; see also pages 51-52
PECIES THAT SENEFIT	 species that prefer clean sediments, e.g., trout, salmon, smallmouth bass, walleye, rock bass, sunfish aquatic insects upon which fish feed 	 trout and salmon fish that migrate upstream to spawn, e.g., pike, walleye, trout landowner may benefit through improved drainage 	 fish, including pike, muskellunge, walleye, perch, largemouth bass other wildlife, including waterfowl, other birds, amphibians, reptiles and some mammals
rips	 control source of sediments – otherwise benefits will be short-lived in watercourses, current speeds can be increased by narrowing channels sediment traps aren't effective at collecting fine materials such as clay 	 don't remove too much debris – different species require different amounts when clearing excess debris, don't allow it to block upstream movement of fish 	 removal of too much vegetation can reduce habitat quality for species that prefer large tracts of dense vegetation – it can also destabilize shorelines and cattail mats remove vegetation after cutting and dispose on land

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A Q U A T I C

STRUCTURAL BMPS FOR IMPROVING IN-WATER HABITAT

	INSTALL BOTTOM-DRAW OUTLETS in ponds	PLACE BOULDERS in ponds, watercourses and shorelines	BUILD RIFFLES AND POOLS in watercourses
DESCRIPTION AND PRINCIPLES	 ponds can become very warm during hot weather water bodies that receive water from these ponds can become too warm for species such as trout warm waters can prevent some fish species from migrating upstream or downstream install bottom-draw structures in ponds that drain into streams to release deeper, cooler water 	 boulders increase habitat diversity and edge boulders provide shelter from fast currents, cover for small fish, and ambush sites for large fish the fast flows that develop around boulders help create important pool habitat place appropriately sized boulders, as singles or clusters, in watercourses, lakes or ponds 	 most natural watercourses contain riffles and pools riffles and pools increase habitat diversity create/improve riffles to increase oxygen levels and food organism production, and to improve spawning conditions for fish create pools to provide resting, rearing and winter habitat for fish riffles and pools can be incorporated into drains
SPECIES THAT BENEFIT	 salmon and trout and other cool and cold-water species 	• many fish species, their prey, and some amphibians (e.g., mudpuppies)	 salmon and trout are common target species, but pike, bass, sunfish and other wildlife also benefit
TIPS	 ensure bottom-draw provides sufficient flow to maintain downstream temperatures in desired range plant trees/shrubs around pond to provide shade and help keep water cool 	 consider peak flows and ice when determining boulder size don't allow area occupied by boulders to exceed 20% of stream width if placed incorrectly, boulders can cause erosion 	 many techniques are available – can be expensive deflectors placed on one or opposing sides of a watercourse can be used to create alternating riffles and pools incorrect installation can create erosion problems

Riffles are shallow areas with coarse substrates and high flows. Pools are deep areas with fine sediments and low flows.

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Carefully placed boulders provide protection from currents, hiding places for small fish, and ambush sites for large fish.

C U T I A A 0

in all water bodies	CREATE/IMPROVE SPAWNING SITES in ponds, watercourses and shorelines	INSTALL TREE AND BRUSH SHELTERS in all water bodies
 lunkers are submerged structures designed to provide fish with overhead cover and protection from currents/waves usually covered with rock and other material to encourage revegetation create lunkers where cover is lacking, especially on the outside banks of eroding watercourses 	 many fish species spawn over gravel or cobble create/improve spawning sites by adding gravel/cobble in shallow water along the shoreline or in the channel create/improve only where spawning sites are in short supply or where they're degraded 	 install tree and brush shelters to provide cover, feeding and spawning habitat for fish anchor floating log structures, downed trees stumps or root wads to banks or shorelines install root wads and other shelters along the outside banks of watercourses to stabilize banks and provide fish habitat
 trout, bass and other species overhead vegetation also provides habitat for other wildlife and for insects upon which fish feed 	 trout, salmon, smallmouth bass, rock bass, sunfish and walleye, as well as bottom-dwelling organisms upon which fish feed 	 in streams – most fish species in lakes/ponds – perch, bass, sunfish, pike, muskellunge, walleye
 natural materials like rock or wood are preferred over artificial materials often incorporated into bank stabilization works shipping pallets can be used many designs are available – some are suitable for drains 	 work and investment can be lost if the added gravel is washed away or buried with silt most effective in streams if combined with riffle and pool construction different species prefer different- sized substrates 	 work and investment can be lost if shelters are washed away by high flows or wave action place shelters where structure is lacking if placed incorrectly, tree and brush shelters can create erosion problems





Lunkers are typically placed along eroding outside banks of streams. The overhangs that are created provide excellent cover for fish. They can also be placed in drains or along shorelines

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EST MANAGEMENT PRACTICES ► FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

A Q U A T I C

BMPs FOR IN-WATER HABITAT IMPROVEMENT – ACTIVE MANAGEMENT TO CONTROL WATER LEVELS

	CREATE WATER-LEVEL CONTROL STRUCTURES where water can be impounded
DESCRIPTION AND PRINCIPLES	 water levels can be controlled throughout the year to benefit fish, waterfowl, other species, or simply to create/improve wetland or floodplain habitats suitable in some watercourses, ponds and wetlands where conditions are appropriate, impoundments can be constructed at relatively low cost see also Wetlands, page 51
SPECIES THAT BENEFIT	 many fish (e.g., pike, muskellunge, largemouth bass, sunfish), wildlife (waterfowl, mammals, reptiles, amphibians, etc.), and plant species will benefit
TIPS	 contact OMNR or your CA before impounding any water body where impoundments already exist, consider other management objectives before changing strategies to benefit fish design structure to allow fish passage



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Fallen trees can be winched back to the shore and chained to the outside bank. They can provide good cover and feeding sites, and also help to stabilize the banks.



Water-level control structures in floodplains can benefit both fish and waterfowl. Pike spawn in flooded grass areas in late March. Spawning success can be enhanced by keeping water levels high for a few weeks after spawning.



Water level management can be used to create habitat, which is ideal for waterfowl, bass and pike. At the same time, as shown here, the diversity of plants can be increased.

AQUATIC

BMP - CONTROL BANK, CHANNEL AND SHORELINE EROSION

There are many techniques for controlling soil erosion and sedimentation in and along waterways, ponds and lakes. Techniques are most effective if they're part of a larger erosion control system.

In agricultural landscapes, erosion control techniques fall into three categories:

- cropland conservation techniques, outlined on page 33, and in Field Crop Production
- bank and shoreline stabilization techniques, as well as techniques for filtering sediment from runoff before it enters water bodies – buffers are described on page 54; for information on tile outlet protection, rock chutes, etc., see Water Management and Field Crop Production
- structures/techniques used in channels or along shorelines at water level some provide excellent habitat for fish and other wildlife.

This section focuses on the last category. Some of the techniques described can be used to "fix" small problem areas. Others are more suited to larger areas.

Small-scale techniques can be applied to specific problem areas like eroding banks or shorelines. Some techniques are well-known, such as **rip-rap**. Others, such as **bioengineering**, which uses both living and non-living natural materials to stabilize banks or shorelines, are less familiar. Bioengineering is becoming popular because maintenance requirements are low, the results are natural-looking and it provides good habitat.

Large-scale techniques can be applied to large sections of watercourses or to entire floodplains. One approach, **natural channel design**, which can be used to reconstruct large sections of degraded watercourses, is based on an understanding of the processes that determine the shape of natural channels. Applied correctly, it will result in channels that are stable, healthy, productive and self-maintaining.

Another large-scale technique is **floodplain management.** Floodplains provide important habitat for many species. Damaged floodplains can be reconstructed using natural channel design or other techniques. Healthy floodplains can be modified to improve habitats for many species through creation of wetlands, ponds or side channels.

As a landowner, you will likely focus on small-scale techniques. The type and amount of erosion control work undertaken will depend on the severity of the problem, the characteristics of the shoreline or bank (e.g., slope, soil, drainage, etc.), and your own preferences. Some techniques may be expensive initially, and you should seek expert advice. Permits will likely be required.

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EST MANAGEMENT PRACTICES ► FISH AND WILDUIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

A Q U A T I C

BMPs FOR CONTROLLING CHANNEL AND SHORELINE EROSION

	INSTALL ROCK RIP-RAP along all water bodies	INSTALL LOG RIP-RAP AND LOG CRIB STRUCTURES along all water bodies
 DESCRIPTION AND PRINCIPLES	 erosion of bank/shoreline can reduce substrate and water quality, and reduce channel/ shoreline stability install rip-rap against banks to reduce erosion can also be used to narrow channels, increasing velocities and reducing sediment deposition 	 in watercourses, place log walls parallel to eroding banks to stabilize them, narrow channels, and create/improve fish habitat along shorelines, log rip-rap can be used to reduce erosion caused by waves infill behind structures, then plant with vegetation
 SPECIES THAT BENEFIT	 fish species that prefer stable shorelines, clear water and clean substrates small species/young fish that hide/feed in crevices between rocks 	 species that prefer stable banks and shorelines, clear water, clean substrates, and good riparian vegetation species that prefer fast flows
 TIPS	 relatively high installation costs but low maintenance costs – self-healing properly-sized materials are essential naturalize by planting vegetation between rocks use filter cloth beneath rock to prevent soil from washing out 	 suitable only in sites with low to moderate slopes and firm substrates ensure access for heavy equipment low maintenance costs, but some upkeep required



Trout like cold, clear, well-oxygenated water with summer water temperatures no higher than 20°C. Keeping or planting trees on the banks of streams and rivers will help shade the water during summer, keeping it cold. Streams with abundant cover, like woody debris, logjams and undercut banks, provide a variety of hiding places for trout and other species.



Construction of log rip-rap can be labourintensive. After logs are placed, the area behind the logs must be backfilled, then planted or seeded.



Trout and many other species need some instream/overhead cover as shown immediately above. Too much debris, as shown in the top photo, can impede fish movement and degrade habitat quality.

A Q U A T I C

INSTALL VORTEX WEIRS

for watercourses

- consists of boulders placed in an upwardpointing "V" shape
- reduces erosion by concentrating flows in the centre of the channel, away from banks
- · can create important pool habitat
- many fish species benefit, but most commonly installed for trout

USE BIOENGINEERING

for watercourses, ponds and shorelines

- uses natural materials (rocks and plants) to stabilize banks/shorelines
- plant materials include grass/sod, root wads, logs and live cuttings from willow, alder, etc.
- plant materials create a natural appearance, improve habitat quality

provides excellent habitat for many fish species
many wildlife species utilize bank/shoreline vegetation

- allow easy passage of fish
- high flows between boulders help move sediments downstream

- can be labour-intensive
- relatively low-cost materials
- use bioengineering wherever possible



Pools created on the downstream side of vortex rock weirs provide feeding and nesting sites for fish.



Here, live staking is done with willow whips.



This bioengineering technique involves the placement of bundles of shrub willow or dogwood in trenches along eroding banks. Over time, the banks will look completely natural.

Whether there is little or no flow at some times of the year, drains can still offer habitat potential for some fish species. During spring floods, for example, pike will often migrate up even very small drains in search of spawning areas.

Traditional drain cleanouts usually involved the re-excavation of the channel, resulting in complete removal of bank and bottom vegetation.

BEST MANAGEMENT PRACTICES . FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

A Q U A T I C

BMP - MAINTAIN DRAINS

CONSTRUCTING NEW DRAINS

Historically, most drains were constructed and maintained with the single purpose of moving water off the land as rapidly as possible. Any impacts on fish and wildlife, which were often substantial, were secondary to this drainage purpose. Impacts were felt both in the streams that were channelized and in the habitats downstream, including rivers and lakes.

Today, in some situations, innovative drain designs that require less maintenance can provide comparable performance, while providing much better habitat for fish and wildlife. This is done by incorporating natural channel features into drain design. Incorporating vegetated buffer strips into drainage design is a good first step.

If you're interested in innovative drain designs, contact your local OMNR office, CA, or drainage superintendent. Remember that you cannot perform any work on municipal drains without the approval of your local municipality.

MAINTAINING DRAINS

Drains, whether municipal or private, need maintenance when their ability to move water is impaired. This usually results from filling-in with vegetation, sediment and debris due to:

- erosion of topsoil from adjacent fields
- drain designs that don't adequately transport sediments out of the system
- excessive growth of vegetation along banks or in the drain bottom
- excessive slumping and erosion along banks caused by banks that are too steep or that lack bank vegetation, or by livestock/machinery access
- ► failure of outlet structures
- ► beaver activity.

Drain maintenance increases the ability of channels to move water. However, unlike natural channels, drains are usually not self-maintaining.

If they're not maintained, many drains "naturalize" over time. The naturalization process results in:

- changes in the channel's shape, which increase habitat diversity
- increased plant growth and diversity on the banks
- ▶ increased shade and cover provided by bank vegetation
- ▶ increased numbers of aquatic plants.

However, naturalization can reduce a drain's ability to convey water – hence the need for maintenance or for alternative drain designs.

A Q U A T I C

Planning and timing are key. Improperly timed or planned maintenance can:

- ► destroy fish and their eggs, as well as other aquatic life and their habitat
- reduce habitat diversity by eliminating pools, riffles, overhanging banks and bank vegetation
- cause water quality problems from erosion and sedimentation following removal of bank vegetation.

Alternative maintenance techniques that reduce the impacts on aquatic habitats are presented in the next few pages. Many species of fish and wildlife that require clear water and clean substrates will benefit from your efforts. So will your pocketbook: several of the techniques are less expensive than traditional ones.

Some of the BMPs identified in the previous sections may also be applied to drains, e.g., addition of spawning gravel or rip-rap, or installation of lunker structures. Remember too that conservation cropping, establishing buffers between cropped fields and drains, and planting to provide shade trees along drains will go a long way to reducing future drain maintenance requirements and improving habitats for a range of species.

The chart on pages 74-75 offers suggestions for drain maintenance. Some are applicable to other waterways. **Most can only be performed under the supervision of the drainage superintendent.** Permits may be required. Check with your drainage superintendent and OMNR.



Minimize disturbance by cleaning drains from one side only. In the drain shown here, rip-rap has been added to the outside bend to reduce erosion.



Establish buffer strips of grasses, trees or shrubs.

BEST MANAGEMENT PRACTICES . FISH AND WILDLIFE HABITAT MANAGEMENT

BMPs FOR HABITATS

A Q U A T I C

BMPs FOR MAINTAINING DRAINS

	SELECTIVELY REMOVE EXCESS BANK VEGETATION	REVEGETATE BARE BANKS	INSTALL SEDIMENT TRAPS
DESCRIPTION AND PRINCIPLES	 selectively remove excess bank vegetation to increase drain's ability to move water and to ensure machinery access for maintenance bank vegetation helps keep water cool, stabilizes banks and provides habitat for many species bank vegetation also helps remove nitrates from surface and ground water and filters sediments from surface water 	 some bank vegetation is important – revegetate exposed banks to stabilize them and provide habitat grasses and shrubs provide excellent erosion protection and habitat, and they don't restrict machinery access use native grasses where possible – they may be more difficult to establish but last longer tame grasses and legumes offer good erosion control but are less attractive to ground-nesting birds than native species 	 excavate depressions in the bottom of drains to create sediment traps sediment traps can lower maintenance costs and time requirements by reducing the need for full drain cleanouts and focussing maintenance on the trap area use sediment traps during cleanouts to reduce effects of stirred-up sediments traps can be temporary or permanent
SPECIES THAT BENEFIT	 fish species that require clear water and clean substrates remaining vegetation provides habitat for wildlife and insects – an important food source for fish 	 fish species that require clear water and clean substrates bank vegetation provides habitat for many wildlife species and insects – an important food source for fish 	 species that require clear water and clean substrates sediment traps provide important pool habitat for fish and help maintain habitat spacing quality in other parts of the drain
TIPS	 don't use herbicides to control or eliminate bank vegetation – they destroy habitat, may harm some wildlife and present a water quality risk where possible, minimize vegetation removal by confining maintenance operations to one side where possible, retain trees/tall shrubs, especially on the side that provides shade remove cuttings to prevent down- stream damming avoid exposing/leaving soil bare 	 replant as soon as possible after maintenance, preferably early in growing season use mulches to reduce erosion when maintenance occurs outside the growing season use a cover crop of spring or winter cereal crop to help prevent erosion until permanent grasses establish keep tree/shrub plantings above the drain's high water mark – ensure access for maintenance equipment by keeping trees 5 metres (18 ft) back on one side choose trees/shrubs with leaves that decompose rapidly – too much leaf litter can kill the grasses that provide bank stability 	 useful only in sand and sandy loam soils; not effective in clays where possible, include traps as part of engineers' reports on municipal drain projects ensure traps don't destroy critical fish habitat – if well-placed, they can be attractive to fish



Excessive vegetation in the channel can be removed to allow more efficient flow. In some cases, this will even improve habitat value.

AQUATIC

TIME MAINTENANCE TO MINIMIZE IMPACTS ON AQUATIC LIFE	REMOVE DEBRIS AND EXCESS VEGETATION FROM BOTTOM OF DRAIN	CONSIDER BOTTOM CLEANOUTS TO MINIMIZE DISTURBANCE	RELOCATE EXCAVATED SOIL PROPERLY
 maintain drains early in the growing season to maximize vegetation regrowth – be careful to avoid critical spawning periods for fish, critical nesting periods for birds, or critical periods for other wildlife species 	 excess debris/vegetation on drain bottom can obstruct flow, trap sediments and create barriers to fish movement remove excess debris or vegetation from drain bottom either mechanically or by hand cutting channels through bottom vegetation may allow enough flow to keep drain open 	 bottom cleanouts can restore a drain's ability to move water while minimizing habitat disturbance, maintaining bank cover/stability and water quality, and reducing sediment deposition bottom cleanouts can be cheaper than full drain cleanouts 	 place excavated soil where it won't wash back into the drain spread excavated soil out and stabilize with vegetation as soon as possible
all fish and wildlife species	 species that require clear water and clean substrates species that use drains as migratory corridors 	 species that require clear water and clean substrates species that use drains as migratory corridors other wildlife that use bank vegetation 	 species that require clear water and clean substrates
 if possible, maintain drains when flows are low complete maintenance as quickly as possible OMNR can identify critical times for fish and wildlife in your area 	 debris removal may eliminate need for more expensive cleanouts removing too much debris may harm fish habitat moving rocks/logs can eliminate barriers and improve fish habitat 	 practise good sediment control techniques during cleanouts where possible, incorporate natural channel features into drains during bottom cleanouts use bottom cleanouts instead of full drain cleanouts when possible 	 excavated material can be used to fil gullies or elevate drain banks wherever overland flow has caused erosion along banks



A bottom cleanout removes sediments only. The banks remain untouched and stable. Some wildlife problems can be prevented or minimized by managing habitats carefully. Others can be reduced by hunting or trapping.



Some damage is unmistakable. Other cases will require more investigative work. This tree has been felled by beaver activity.

WILDLIFE CONTROL

Wild animals can become a nuisance when they're in the wrong place at the wrong time. Wildlife populations in the fragmented habitat of southern Ontario are sometimes "out of balance" with natural sources of food, their habitat, or the number of predators. When this happens, the species most likely to thrive are "generalists", those able to feed on many types of foods — including your crops and livestock — and able to live in a variety of habitats including your property and buildings.

This section describes how to deal with wildlife problems. The steps range from tolerance of some damage, to preventive measures like habitat alteration and hunting and trapping, to the killing of nuisance animals. It's important to follow these steps in sequence before deciding what action to take – especially if you're not certain what is causing the damage. Skipping ahead to more severe measures may mean you'll replace one nuisance animal problem with another. For example, killing several coyotes in your area might lead to nuisance groundhog, rabbit and mice populations.

If the cause of the problem is obvious, and the losses intolerable, you may wish to implement control measures immediately.

1. VERIFY THE PROBLEM.

For control measures to work, you must be sure you're targeting the right species. Unless you see the animal at work, or the damage is unmistakable (e.g., a beaver has plugged a culvert), you have some investigative work to do.

Try to see or find:

- ► the animal itself
- dens, burrows, excavations, roosting areas, bedding areas or nests
- tracks or droppings (scats)
- ► trails, especially at outer edges of fields and adjacent to forest cover
- ▶ evidence of feeding such as gnawing, tooth and claw marks, pattern of bites and pecking.

Ensure you correctly identify the problem species before you act. Consult:

- ▶ field staff at OMNR, CWS and OMAFRA
- ► the public library for wildlife field guides
- ▶ your local Stewardship Council, naturalist clubs, conservation clubs, rod and gun clubs, trappers and your neighbours.

2. DETERMINE WHETHER THE PROBLEM IS TOLERABLE.

Before deciding what action to take, take a careful look at the problem. Ask yourself:

- ▶ what is the nature and extent of the damage?
- how much is the damage costing me now, and what is the potential for the problem to worsen, lessen or disappear?
- ▶ what is the cost of preventive and/or control methods?
- could the problem wildlife provide any benefits? e.g., if deer are causing damage, encourage hunting
- ▶ by solving one problem, will I create another for myself or my neighbours?
- ▶ is the problem wildlife protected by legislation/regulation?

If the problem is tolerable, enjoy the wildlife while ensuring it doesn't become a problem for you or your neighbours.



After verifying that deer have caused this damage, ask yourself: how much is the problem costing now? What is the potential for the problem to worsen? Is it tolerable?



This orchard stock shows signs of severe mouse damage.

3. IF THE PROBLEM IS INTOLERABLE, CONSIDER REMOVAL AND PREVENTIVE MEASURES.

Your first goal is to remove the problem animal(s) from a given area. The second is to prevent their re-entry. The following pages describe how to deal with nuisance animals in farmstead buildings, around livestock, in crops and on surrounding lands.

REMOVING AN ANIMAL FROM A BUILDING

This can take longer than you might think. The following steps encourage animals to leave closed quarters, like attics:

- install bright lights and play loud music
- place strong-smelling products, such as mothballs or cotton balls soaked in ammonia around the enclosed area, or
- ▶ set live traps.

If the animal has nested or is raising a litter, i.e., early spring to midsummer, wait until the young are able to move about and leave the building.

Always wear gloves when working around wild animals, and thoroughly wash equipment afterward.

SEALING THE BUILDING

The only way to prevent further damage to your buildings is to prevent re-entry.

If you have recently evicted animals, confirm that all animals have left the building, and then seal the last entrance. Watch for droppings, nesting areas, gnawing or clawmarks, and listen for odd noises. If an animal is still inside, re-open the hole and allow it to escape. Otherwise, you risk new problems, e.g., a mother desperate to re-enter can damage your building, and if an animal trapped inside dies, odours and insects may result.

The following techniques address all species. They are inexpensive and go hand-in-hand with good property maintenance:

- fix all holes and cracks, screen all vents, cap chimneys, replace all loose shingles and rotted wood
- seal openings with concrete, galvanized sheet metal, or heavy-gauge hardware cloth 6-12 millimetre (1/4-1/2 in) mesh

Carefully placed poison bait stations in tree orchards and plantations help control harmful rodents.



Protect your investment in tree seedlings by using tree shelters. These and other systems (like mulch covers) may require higher investment upfront, but will get the trees off to a quicker start and reduce maintenance costs.



- store food and garbage properly and keep buildings tidy
- ▶ keep doors to sheds, barns and garages closed
- ▶ trim tree limbs away from buildings so animals can't use them for access
- clean away and dispose of all nesting material carefully wear gloves and mask, and sanitize the area if necessary.

DISCOURAGING WILDLIFE FROM LIVESTOCK, CROPS AND SURROUNDING PROPERTY

When deciding on the best deterrents, consider cost, damage, economic loss (past and future), time of year, number of nuisance animals, and length of time that animal(s) must be kept away from crops or livestock.

The following techniques work best when used in combination. The earlier they're used, the better:

- use fences and barriers to keep animals out
- ► use scare techniques but check with municipality for noise bylaws
- use repellents to make food sources or perimeter fences smell or taste bad – this is a short-term measure, and requires continual reapplication
- ▶ plant susceptible crops away from areas used by problem animals
- plant lure crops away from crops that need protecting but more animals may be attracted in the long term
- remove food sources where possible
- ► encourage natural predators
- ► cooperate with local hunters
- *as a last resort*, remove denning sites and cover (brush piles, rock piles and hollow trees) in the areas used by problem animals. Bear in mind, this will also affect animals that aren't causing a nuisance.

The foregoing are general techniques that can be applied to a number of species. The chart on pages 82-83 presents more specific measures.

If control measures aren't in place, white-tailed deer can rapidly damage orchards and cost farmers significant crop loss.

Creating brush and rock piles is an excellent way to create habitat. You must locate them carefully to avoid creating nuisance wildlife problems.



Carefully designed fences are an effective deterrent to problem animals, but can be expensive to construct.



Clipped and maintained grass around this pond is a welcome mat for Canada geese. A good deterrent is to plant and maintain a buffer strip around the pond or wetland with tall grasses and dense shrubs.

You may wish to allow licensed hunters and trappers on your property. Careful resource use can alleviate or prevent nuisance wildlife problems.





The American kestrel, Ontario's smallest hawk, is often seen hovering as it looks for mice, small birds and grasshoppers. It perches on top of trees, fences or wires, and nests in tree cavities.



When used only during times of severe crop depredation, scare guns or "bird bangers" can discourage harmful feeding habits by flocks of birds.

Many scare techniques have proven effective in the short term, but can lose their effectiveness over time. Some techniques are noisy, and can lead to complaints from neighbours.

BMPs FOR DISCOURAGING NUISANCE WILDLIFE					
SPECIES	BARRIERS	REPELLENTS/ POPULATION CONTROL			
RODENTS	 install tree guards to prevent "girdling" use a 75 centimetre (30 in) band of flashing around telephone poles and tree trunks to discourage climbing erect a fence to discourage rabbits and groundhogs 	 use taste repellents on tree trunks odour repellents are effective in short term, but need frequent reapplication dust susceptible garden crops with equal parts cayenne pepper and flour: reapply after each rain cats may be effective 			
RACCOON	 erect chicken wire fences around gardens and coops: supplement with electric fences lay chicken wire on lawn around garden 	 brightly illuminate garden and play loud music at night (a short-term solution) plant pumpkin vines among sweet corn dogs may be effective encourage hunting and trapping by licensed individuals 			
SKUNK, FOX, OPOSSUM	 fence gardens: supplement with electric fences install fencing around base of buildings and sheds to prevent animals from denning drive a series of nails into boards and place face-up at the entrances of beehives 	 sprinkle naphthalene flakes (mothballs) under buildings (a short-term solution) brightly illuminate garden at night, or play loud music (a short-term solution) dogs may be effective encourage hunting by licensed hunters 			
COYOTE, WOLF, BEAR	 use solid fences around farm yards, up to 2 metres (6 ft) high use electric wire fences around pastures: contact Ontario Sheep Marketing Agency for advice apiaries can be protected from bears by by electric fence a woven wire fence with mesh less than 5 x 15 centimetres (2 x 6 in) can deter coyotes and wolves 	 dogs, donkeys and llamas can be very cost-effective for livestock protection in some situations check herds or flocks frequently during high-risk times like calving/lambing try scare devices like strobe lights and noisemakers in small areas (a short-term solution) odour and taste repellents have worked to deter coyotes from sheep encourage hunting and trapping by licensed individuals 			
DEER	 a variety of fences can be constructed around susceptible areas: e.g., single-strand electric fence baited with peanut butter or molasses; 5-6 strand high tensile electric fences; 2 fencelines running parallel with 3 wires of electric fence at varying heights; high fences of small mesh up to 2.5 metres (8 ft) in height place a 1.5 metre (4.5 ft) cage of welded mesh to enclose single small valuable trees 	 taste and odour repellents usually work for short periods of time; they must be applied before the damage begins, and usually reapplied after each rain firecrackers, flares, pie plates, tinsel, paper and scarecrows can protect crops for 1-2 weeks bangers and noisemakers can work if moved often and set in a staggered firing sequence tethered dogs may be used to frighten deer, but don't allow them to run at large – owners may be charged under the <i>Game and Fish Act</i> if dogs are found chasing deer encourage hunting by licensed hunters 			
BIRDS	 use netting to protect small areas of valuable crops place porcupine wire on ledges to discourage roosting 	 for migratory birds protected by federal law, scare permits must be obtained from CWS; some species are provincially protected, others not at all noisemakers include propane bangers, firecrackers, "screamer" shells, and tape-recorded distress calls of birds scare kites and flagging tape may visually frighten birds scaring must be done at first appearance of birds tethered dogs can be used to frighten birds from crops 			
CANADA GOOSE	 plant and maintain a border of dense shrubs or high grasses around wetlands, ponds and watercourses 	 scare permits must be obtained from CWS in early spring, use bangers or dogs to disturb nesting pairs before the nest is built in the fall, encourage hunting by licensed hunters 			

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FOOD REMOVAL	MODIFY HABITAT
 don't leave food waste in areas accessible to rodents keep rodent-prone areas tidy 	 remove trees or branches that rodents use to access buildings remove cover; control weeds and brush from around buildings and bases of orchard trees install perches for hawks and owls near buildings or around sensitive croplands, e.g., orchards
 don't leave food waste in areas accessible to raccoons raccoon-proof garbage cans by using a tie-down lid keep poultry safely cooped 	 eliminate access points like overhanging tree branches to sheds, barns, porches, etc.
 secure possible food sources, including dog food and livestock feed don't let garbage accumulate elevate beehives to .6 metre (2 ft) off ground to keep skunks out 	• eliminate denning sites near buildings by removing rock and brush piles
 where practical, move sheep and cattle into pens or lighted corrals at night if possible, move ewes or cattle into paddocks or indoor facilities during lambing or calving season properly dispose of deadstock, and remove/bury placentas from lambing areas 	clear brush and small trees from pasture to remove hiding places for predators
• avoid planting susceptible crops like winter wheat and orchards near deer winter yards	 remove field windbreaks or treed fencerows near orchards – however, this may also remove nesting sites for beneficial insect-eating birds read pages 37-38 on fencerows before considering this option
 remove spilled food and water at livestock facilities use bird-proof feeders and storage facilities to prevent contamination by droppings lower water levels in waterers so birds cannot reach water from edge, but keep it deep enough that they can't stand in it if hawks are a problem, confine fowl to a woven-wire fenced and covered enclosure house poultry at night to protect them from owls 	 since some raptors (hawks and owls) hunt from snags, remove large standing dead trees within 100 metres (110 yds) of areas where fowl roam freely ask the telephone company to cap telephone poles with sheet metal cones to eliminate perching spots for raptors
 do not feed overwintering birds between December and March in summer, consider providing lure crops to keep birds out of high value crops 	 don't create nesting islands in wetlands don't provide mowed grass near wetlands or around ponds; don't fertilize grass surrounding wetlands

FERAL CATS, FERAL DOGS AND COY-DOGS

Feral animals are domesticated animals, such as dogs, cats and horses, that have gone wild.

Less fearful of humans than coyotes or foxes, feral dogs prey on rabbits, hare, deer, livestock and many other species.

Dogs can interbreed with coyotes, creating cross-breeds called coy-dogs. Coy-dogs can be very aggressive and are less afraid of humans, lights and buildings than coyotes. They are usually 9-11 kilograms (20-25 lbs) heavier than coyotes, and can take down larger prey (e.g., calves). Unlike coyotes, which mate once a year, coy-dogs can mate twice annually.

In one Ontario study of trapped coyotes, 25% were deemed coy-dogs.

Responsible pet ownership by everyone will go far to limit populations of unwanted animals. Neuter your cats and dogs. Never abandon or release them to fend for themselves in the countryside – take them to an animal shelter or find them alternative homes. Don't let animals, especially dogs, roam. In southern Ontario, coyotes, coy-dogs and feral dogs cause considerable loss in the sheep industry. In northern farm areas, wolves and bears occasionally kill livestock.



In some parts of Ontario, particularly northern rural areas, black bears can be nuisance animals, occasionally killing livestock and damaging apiaries. Electric fencing can be an effective barrier.





Coyotes like this one are often mistaken for the larger timber (gray) wolf. Coyotes benefit farmers by eating mice, voles, groundhogs and rabbits. During times of stress, however, such as in the spring when they're feeding young and during winter, coyotes may feed on unattended livestock.

4. IF PREVENTIVE MEASURES DON'T WORK, USE NON-LETHAL AND LETHAL CONTROL METHODS.

Control measures include live trapping and removal, lethal trapping, shooting and poisoning. Before you take any action, call OMNR to ensure your plans are legal. If the problem involves migratory birds, call CWS. Check with your municipality periodically for the status of discharge of firearms and other relevant bylaws. A list of relevant legislation appears at the end of this booklet.

NON-LETHAL

LIVE-TRAPPING

Live-trapping is usually done in buildings by animal-control specialists who release animals elsewhere on the property or nearby. The "do-it-yourself" approach is risky: handling live animals requires experience. Diseases can be transmitted from animals to you, and you can harm the animals.

Out of sight, out of mind?

Live-trapping and relocating an animal may appear to be a humane solution, but you may simply be moving the problem to someone else's property. Unless you can release the animal on the same property on which it was caught, the alternative of humanely destroying the animal should be considered.

Moving animals any distance from their home area can be ineffective for the following reasons:

- ▶ animals already living there may defend their territory and kill newcomers
- ▶ animals may return to the area where they were caught
- ▶ shortages of unoccupied denning sites and food may result in starvation
- ▶ relocating animals could contribute to the spread of disease
- ▶ you may simply give the problem to someone else.

Before release on your property, take appropriate preventive measures described on the chart on pages 82-83.

LETHAL

Under the *Game and Fish Act*, a person can destroy, by means that do not cause unnecessary suffering, any animal on his/her land (except for deer, elk, moose, or caribou) if it is damaging or is about to damage property. The *Act* describes the methods available to farmers. Contact your local OMNR office.

By making the area on your property less attractive to nuisance animals, you may reduce the need to use the following methods.

TRAPPING



Courses on fur management are available at your local OMNR office. If you intend to sell the pelts of furbearers, you'll need a "Farmers' License to Sell Pelts or Carcasses", available at your local ministry office. For removal of problem wildlife, trapping is quick and effective in the short term. However, if attractive habitat remains, new animals may move in. Review the preventive measures presented earlier in this section for a long-term solution.

Trapping species like raccoon and muskrat on a regular basis can also help control populations before they reach nuisance proportions. In defense of their property, farmers can trap animals using humane techniques.

Only farmers and licensed trappers are allowed to use body-gripping traps under the Game and Fish Act. A landowner can:

- hire a licensed trapper to humanely kill nuisance animals
- grant permission to a local trapper to access your land.

Contact OMNR for a list of local trappers and details regarding trapping agreements.

SHOOTING

In defence of property, farmers and other landowners may be allowed to shoot nuisance animals, provided local discharge of firearms bylaws are observed. Shooting is a practical method to control animals like groundhog, raccoon and coyote. Remember, animals protected by the *Endangered Species Act* cannot be killed – they're also unlikely to cause problems.

RING-NECKED	RUFFED	WILD TURKEY	WOODCOCK	CHIPMUNK	HARE AND	BEAVER	DEER	FISH: pike, muskellund
PHEASANT	GROUSE			AND SQUIRRELS	RABBITS			largemouth bass, sunfi perch
	C	C		C	••••••		F,C	
C	C	C	C	F,C	F,C		C	
		C		F,C			C	
C	C		C	F,C	C		C	
C	C	C	C	F	F,C		F,C	
	C				F,C		C	
C	F,C	C	C		F.C	F,C	F,C	
	F,C	C	C		F	F,C		
C	C	C			F	F,C	F,C	
C	F,C			F,C	C		F	
F	F	F,C		F			F	
		F,C		F,C			F	
F	F	F	C		F,C		F	
F	F	F	C		F	F	F	
	F		F.C		F	F	C	
			C		C	F	C	
							F,C	
	C		C		F,C		C	
F,C	F	F	C		F,C		F,C	
F.C	F	F	C	•••••••••••••••••••••••••••••••	F,C	F	F	
			C	••••••	•••••			
 F	F							
 F	F,C	F	C		C		F,C	
 F	F	F	F.C		F.C	••••••	F	
 F	F	F			F	••••••		
EC	EC	F			F.C			
	F			c	C		••••••	
			c	c	c			
C		F		С	F,C		F	
L					F,G		F	
C						F	C	C
						F		c
						F		C
					••••••			

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Rabies in Ontario

Rabies is a disease spread among wildlife, people, domestic animals and livestock by contact with infected saliva through a bite, or contact with membranes of eyes, nose or mouth. In Ontario, the main vectors are fox and skunk.

If you need to shoot an animal you suspect is rabid, remember that diagnosis of rabies requires analysis of brain tissue. Avoid head shots if possible.

Prevention – by vaccinating pets and prize livestock and not handling wild animals – is the best approach to controlling rabies. If you do come in contact with a suspect animal, immediately wash any bites or scratches with soapy water and seek emergency medical treatment. Contact your local public health unit.

POISONS

There are limitations and risks to the use of poison around the farmstead:

- it is illegal to use poisons to control wildlife other than small rodents such as mice, rats and groundhogs
- place rodent poisons so that children, livestock, family pets and non-target species cannot consume the baits
- ▶ some poisons require applicator training and a pesticides license
- ► contact a pest control company or local farm supply outlet for information on poisons
- poisons can travel up the food chain, e.g., scavengers/predators can consume poisoned animals and may themselves be affected. Dispose of carcasses properly.

Raccoon rabies is now posing a threat to Ontario. Don't keep raccoons as pets, and discourage them from denning or feeding near your buildings.



MAKING IT WORK

This booklet provides enough detail to help you identify options that can be customized to suit your property and goals. If you're interested in implementing some BMPs, remember these golden rules:

- ► fish and wildlife communities are inseparable from the rural landscapes in which they live - the long-term goal is compatibility
- what's good for soil and water resources is good for farming and fish and wildlife if you've already adopted many of the BMPs described in other booklets, you're already taking positive steps for fish and wildlife habitat enhancement...and your bottom line
- although some of the BMPs may not provide immediate and tangible economic benefits, they are the "right thing" to do
- seek expert advice the information in this booklet will help you identify BMPs: agencies that can help you implement and/or fund some of your plans are listed on the back cover
- discuss your plans and experiences with your neighbours. Some of the most effective projects are cooperative ones. Keep it fun.



There are many volunteer community groups willing to help landowners enhance fish and wildlife habitats. Funding assistance is often available, and expert advice can be obtained from a number of sources.





A chickadee resting on a piece of abandoned machinery – one of the simple pleasures of rural living.

LEGISLATION

LEGISLATION WITH IMPLICATIONS FOR FARMERS AND OTHER RURAL LANDOWNERS

LAW / GUIDELINE CONTACT GOAL		RELEVANCE TO LANDOWNERS
OMNR	• to protect fish and fish habitat	 prohibits destroying fish and discharging deleterious substances that would harm fish or fish habitat general prohibitions against harmful alterations to fish habitat
CA	• to regulate conditions that affect watersheds and the flow of flood waters in them	• permits are required to fill or build in floodplains
OMAFRA	• to regulate the construction and improvement of land drainage	allows farmers to drain land
MOEE	• to regulate the emission and discharge of contaminants	 requires the operation of waste management systems
OMNR	 to manage and protect the wildlife resources of Ontario to regulate access to fish and wildlife resources 	 allows farmers to destroy some nuisance wildlife licenses may be required for hunting – contact OMNR
OMNR	• to regulate alterations to lakes and rivers	 any work that forwards, holds back, or diverts water must receive prior approval from OMNR
CWS – Environment Canada	 to conserve and manage certain species of migratory birds to regulate hunting by establishing bag limits and seasons 	 landowners can hunt migratory birds only during the appropriate open season and location with a Migratory Game Bird Hunting Permit and a Wildlife Habitat Conservation Stamp provides for the issuance of damage permits to farmers for scaring and/or killing certain nuisance, migratory species contact CWS
	CONTACT OMNR CA OMAFRA MOEE OMNR OMNR CWS- Environment Canada	CONTACTGOALOMNR• to protect fish and fish habitatCA• to regulate conditions that affect watersheds and the flow of flood waters in themOMAFRA• to regulate the construction and improvement of land drainageMOEE• to regulate the emission and discharge of contaminantsOMNR• to regulate the emission and discharge of contaminantsOMNR• to regulate access to fish and wildlife resourcesOMNR• to regulate alterations to lakes and riversCWS- Environment Canada• to conserve and manage certain species of migratory birds • to regulate hunting by establishing bag limits and seasons

LEGISLATION

LEGISLATION WITH IMPLICATIONS FOR FARMERS AND OTHER RURAL LANDOWNERS (cont.)

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 LAW / GUIDELINE	CONTACT	GOAL	RELEVANCE TO LANDOWNERS
Municipal Bylaws	local municipality	 bylaws pertain to many aspects of municipal government 	 may restrict/prohibit discharge of firearms must consider natural heritage, environmental protection and hazard policies
Occupiers Liability Act	Ontario Provincial Police	 defines the responsibilities of landowners and tenants towards all who enter their premises 	• defines the different duties of care landowners and tenants owe to guests, fee-paying entrants or trespassers
Ontario Water Resources Act	MOEE	 protects the quality and quantity of Ontario's surface and ground water resources 	• Permit to Take Water is required for more than 50,000 litres (10,000 lmp gal) per day
Planning Act	Ministry of Municipal Affairs and Housing	 to ensure orderly development and growth by regulating land use change on private land 	 provides a mechanism by which policies, representing matters of provincial interest, are considered when land use changes are proposed key policy areas include the protection of: prime agricultural lands, natural heritage features and areas, the quality and quantity of surface water and ground water, natural hazards, etc.
Public Lands Act	OMNR	• to protect and perpetuate public lands and waters for the citizens of Ontario	 requires landowners to obtain work permits for activities on shorelands adjacent to navigable waters shorelands include public or private lands, as well as areas that are seasonally inundated with water beds of navigable waters (below high water mark) are considered Crown Lands
 Trees Act	local municipality	• conserves woodlands	 requires landowners to obtain permits for the removal or clearing of trees under some circumstances
Trespass to Property Act	Ontario Provincial Police	 gives landowners and tenants control over who they allow to enter and use their premises 	 landowners may post their land to restrict access

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Service











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