

BMPs FOR HABITATS

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.

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 – Examine and select options

Ask yourself...

- do options conflict with farming or other goals?
- 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 – Design and implement

Seek help...

- 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 – Reassess the plan

Evaluate...

- 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.

BMPs FOR HABITATS

G E N E R A L

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 well-vegetated. 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 OWLS	SONGBIRDS OF UPLANDS AND TREED SWAMPS	MARSH BIRDS: bittern, grebe, coot, rail, marsh wren, etc.	WATERFOWL: dabbling ducks, wood ducks	CAVITY NESTERS: chickadees, nuthatches, woodpeckers	BOBWHITE QUAIL
PLANTS						
HEMLOCK	C	C	C		FC	
WHITE PINE	C	FC	FC		FC	C
RED PINE	C	FC			F	
WHITE AND NORWAY SPRUCE	C	C	C		F	C
WHITE CEDAR	C	FC	FC			C
TAMARACK	C	FC	C			
POPLAR AND ASPEN	C	FC	FC		FC	C
WHITE BIRCH	C	FC	FC		FC	
RED AND SILVER MAPLE	C	C	C	C	C	C
SUGAR MAPLE	C	C		C	C	
RED AND WHITE OAK	C	C		FC	C	FC
HICKORY, BEECH	C			C	C	
PIN CHERRY, SERVICEBERRY		F			F	F
WILD APPLE		F				
ALDERS (green-spangled)		F	C		F	
WILLOWS (shrub species)		FC	C	C	FC	
RED CEDAR		FC				
JUNIPER		FC				
SUMAC		F				FC
DOGWOOD		FC	FC			FC
BUTTONBRUSH				FC		
HIGHBUSH CRANBERRY (American)		FC			F	
HAWTHORN		FC				F
RASPBERRY, BLACKBERRY		FC			FC	
CURRANTS, ELDERBERRY		FC	F		FC	F
WILD GRAPE		FC			FC	C
VIRGINIA CREEPER						
<i>UPLAND GRASSES (non-native):</i> CLOVER, TIMOTHY, ALFALFA, TALL FESCUE		C		C		FC
<i>UPLAND GRASSES (native):</i> SWITCHGRASS, BIG BLUESTEM, INDIAN				C		C
<i>LOWLAND GRASSES/ SEDGES:</i> REED CANARY GRASS BLUEJOINT, SEDGE SPECIES			FC	C		
<i>EMERGENT (above water) AQUATIC PLANTS:</i> BULRUSH, CATTAIL, ARROWHEAD, WILD RICE			FC	FC		
<i>SUBMERGENT (below water) AQUATIC PLANTS:</i> PONDWEED, WILD CELERY, BLADDERWORT			F	F		
<i>FLOATING-LEAVED AQUATIC PLANTS:</i> WATER LILY						
<i>FREE-FLOATING AQUATIC PLANTS:</i> DUCKWEED, WATERMEAL, 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			FC	
C	C	C	C	FC	FC		C	
		C		FC			C	
C	C		C	FC	C		C	
C	C	C	C	F	FC		FC	
	C				FC		C	
C	FC	C	C		FC	FC	FC	
	FC	C	C		F	FC		
C	C	C			F	FC	FC	
C	FC			FC	C		F	
F	F	FC		F			F	
		FC		FC			F	
F	F	F	C		FC		F	
F	F	F	C		F	F	F	
	F		FC		F	F	C	
			C		C	F	C	
	C		C		FC		C	
FC	F	F	C		FC		FC	
FC	F	F	C		FC	F	F	
			C					
F	F							
F	FC	F	C		C		FC	
F	F	F	FC		FC		F	
F	F	F			F			
FC	FC	F			FC			
	F			C	C			
F		F	C	C	C		F	
C		F		C	FC		F	
C		F		C	FC		F	C
C						F	C	C
						F		C
						F		C
						F		C

BMPs FOR HABITATS

G E N E R A L

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.

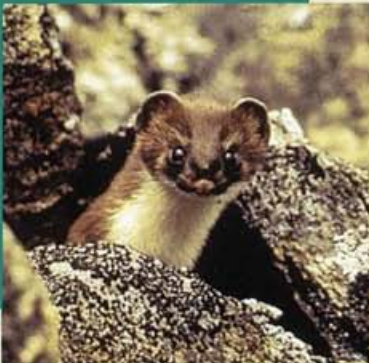
Choose natural materials over man-made ones, where possible.

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.



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.



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.

BMPs FOR HABITATS

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.

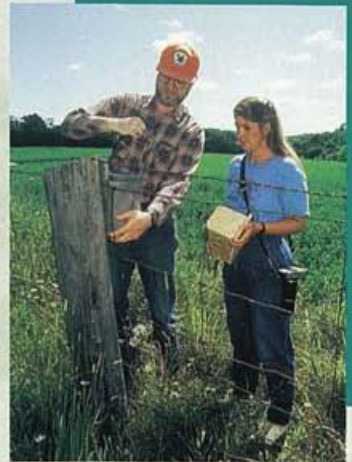
Like natural nesting habitat, artificial structures must meet the following basic requirements:

- ▶ 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.



Erect bat boxes in the farmstead area. Bats help control insects, including the ones that cause crop loss.



Place wood duck boxes on metal poles in water near the shore or edge of the wetland. Make openings oval and use baffles to prevent raccoon predation.



Mallards will use nesting tunnels.

BMPs FOR HABITATS

G E N E R A L

BMPs FOR NESTING STRUCTURES

	FARMLANDS AND WOODLANDS	WETLANDS, STREAMS, SHORELINES AND PONDS
STRUCTURE	<ul style="list-style-type: none"> • nest boxes, brush/rock piles 	<ul style="list-style-type: none"> • nest boxes, baskets, cones, platforms, islands, tunnels
WILDLIFE THAT BENEFIT	<ul style="list-style-type: none"> • songbirds, cavity-nesting birds, bats, squirrels, rabbits, snakes 	<ul style="list-style-type: none"> • wood duck, hooded merganser, goldeneye, flycatchers, osprey, owls, grackle, mallard
TIPS	<ul style="list-style-type: none"> • use wood that resists weathering (softwoods, especially cedar) • place so that nest boxes are protected from the sun (where possible); turn the entrance away from the usual direction of wind and rain • match size of hole, size of nesting structure, and habitat to meet species' needs • drill a few holes below the roof overhang and in the floor of box near the walls to allow ventilation and drainage • protect boxes from predators: place on poles well away from trees and shrubs; locate duck boxes on poles in water near shore; make entrance oval to discourage raccoon predation; install predator guards or baffles on nest box poles • change nest box material in early spring (not in fall) just before birds return from southern wintering grounds – waiting until spring will allow beneficial wasps, which pupate (over winter) in old nesting materials, to kill nest box parasites 	

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.

BMPs FOR HABITATS

F A R M L A N D S

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*.

Farmers who've been using conservation tillage for several years notice more wildlife on their land – as well as improved soil conditions and reduced soil erosion.

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.

BMPs FOR HABITATS

F A R M L A N D S

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.



Red clover cover crop under cereal.



No-till.



Grassed waterway.



Contour strip cropping.

BMPs FOR HABITATS

F A R M L A N D S

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.

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.

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.



BMPs FOR HABITATS

F A R M L A N D S

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.



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

F A R M L A N D S

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.

BMPs FOR HABITATS

F A R M L A N D S

BMPs FOR PLANNING EFFECTIVE WINDBREAKS, SHELTERBELTS AND FENCEROWS

SUITABLE PLANTS

WINDBREAKS, SHELTERBELTS AND FENCEROWS

- 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.

BMPs FOR HABITATS

F A R M L A N D S

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.



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.

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.



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.

BMPs FOR HABITATS

F A R M L A N D S

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.



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.



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.

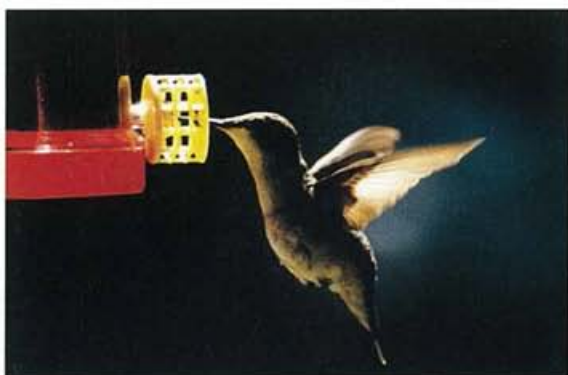
BMPs FOR HABITATS

F A R M L A N D S

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.



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.

BMPs FOR HABITATS

F A R M L A N D S

TIPS

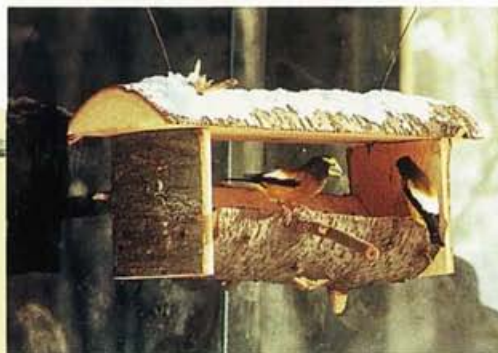
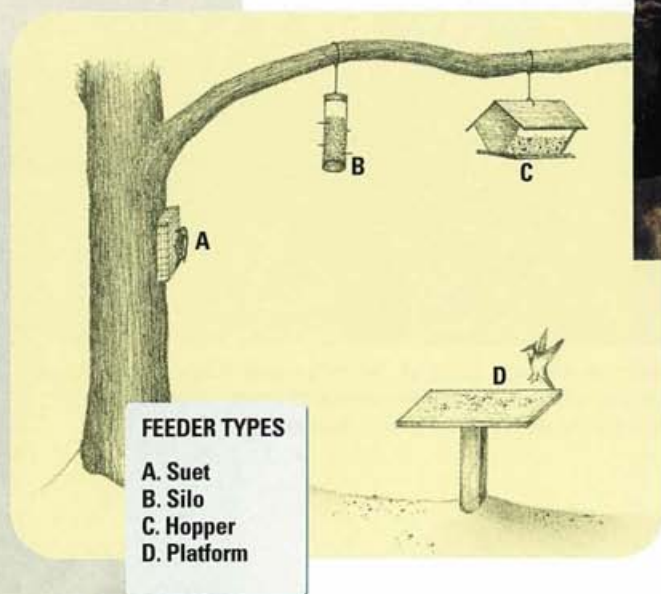
Optimize appeal and opportunities for viewing without disturbing wildlife:

- ▶ 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.

BMPs FOR HABITATS

W O O D L A N D S

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.



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.

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.



The selection system creates the least disturbance to farm woodlots and to woodland species, such as white-throated sparrow.

BMPs FOR HABITATS

WOODLANDS

BMPs FOR WOODLANDS

FEATURE	SELECTION	SHELTERWOOD	PATCH OR STRIP CUTTING
SYSTEM DESCRIPTION	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> small patches or parallel strips are clearcut throughout the stand shade-intolerant species can regenerate in full sunlight conditions of cut areas
SUITABLE FOR	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> get help from forestry experts at your local OMNR, CA or Stewardship Council, or through OMAFRA's Agroforestry Program control livestock access: intensive pasturing destroys woodland habitats leave wildlife trees and shrubs: see page 48 harvest trees from wooded swamps when surface is frozen keep out of streams during harvest avoid tree blowdown: don't harvest heavily in treed swamps leave some or all of tops from harvested trees and poor quality logs to provide 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.

BMPs FOR HABITATS

W O O D L A N D S

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.

Young conifer plantations provide habitat for some wildlife species. Wild turkey commonly use these areas. Successfully reintroduced into southern Ontario in 1984, wild turkeys now number more than 10,000. Their diet consists of mast (acorns, beech nuts), insects, vegetation, and waste corn and grains.



BMPs FOR HABITATS

W O O D L A N D S

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
- **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



A mature, well-managed plantation will consist of a dense undergrowth of natural trees and shrubs, as well as the conifer nurse crop.

BMPs FOR HABITATS

W O O D L A N D S

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.

BMPs FOR HABITATS

W O O D L A N D S

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.

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.

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 MAINTAINING WILDLIFE TREES AND SHRUBS

	SNAGS	DOWNED LOGS
DESCRIPTION	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • most tree species, but generally those with wide crowns • beech, ash, oak, basswood, pine, hemlock, yellow birch, maple, poplar, cedar 	<ul style="list-style-type: none"> • larger logs and stumps form better habitat • beech, ash, oak, basswood, pine, hemlock, yellow birch, maple, poplar, cedar
WILDLIFE THAT BENEFIT	<ul style="list-style-type: none"> • over 20 species of birds <ul style="list-style-type: none"> ◦ chickadee, woodpeckers, Eastern bluebird, nuthatch, great blue heron, screech owl, osprey, other hawks • 10 species of mammals, including squirrels and chipmunk 	<ul style="list-style-type: none"> • 20 species of mammals • many birds, e.g., grouse, wild turkey, woodpeckers • salamanders and snakes • insects and other invertebrates
TIPS	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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

BMPs FOR HABITATS

W O O D L A N D S



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



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.

MAST 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

- oak: white, bur, red
- hickory: bittersweet, shagbark
- black walnut, butternut
- American hazelnut
- beech

- white-tailed deer, black bear, raccoon, grey squirrel
- wild turkey, wood duck, pheasant, ruffed grouse, bobwhite quail

- 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

CATKIN TREES AND SHRUBS

- trees and shrubs that produce catkins (flowers)
- most catkin species are shade intolerant – they require full sunlight to thrive

- birch: white, gray, yellow
- alder: speckled, green
- poplar: trembling aspen, balsam, largetoothed aspen, cottonwood

- 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 catkin-species in stand: do not remove

BMPs FOR HABITATS

TRANSITIONAL

BMP – MANAGE WETLANDS



Birds like the least bittern are wetland-dependent.

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.



BMPs FOR HABITATS

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.

BMPs FOR HABITATS

TRANSITIONAL

- ▶ ensure water levels are constant over winter, which helps muskrat, fish and amphibian populations
- ▶ allow occasional drawdowns to recirculate nutrients, revegetate basins and provide temporary mudflats for shorebirds.

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.



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.



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.

BMPs FOR HABITATS

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, water-level control structures can be used to manage vegetation and optimize habitat conditions for waterfowl and other wildlife.

BMPs FOR HABITATS

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.

BMPs FOR HABITATS

TRANSITIONAL

BMPs FOR PLANNING EFFECTIVE BUFFERS

	BUFFER STRIPS FOR STREAMBANKS, DRAINS AND SHORELINES	BUFFERS FOR WETLANDS
SUITABLE PLANTS	<p>Grasses/ Legumes</p> <p><i>Dry Sites</i></p> <ul style="list-style-type: none"> timothy, fescues, big and little bluestem*, switchgrass*, trefoil <p><i>Wet Sites</i></p> <ul style="list-style-type: none"> switchgrass*, prairie cordgrass*, Canada wild rye*, blue-joint, trefoil, clovers, orchard grass <p>Shrubs</p> <ul style="list-style-type: none"> red osier dogwood, willow, cranberry, nannyberry, raspberry <p>Trees</p> <ul style="list-style-type: none"> black walnut, ash, silver maple, tamarack, cedar, spruce, birch, willow 	<p>Grasses/ Legumes</p> <p><i>Dry Sites</i></p> <ul style="list-style-type: none"> timothy, big and little bluestem*, fescues, Indian grass*, switchgrass*, trefoil <p><i>Wet Sites</i></p> <ul style="list-style-type: none"> switchgrass*, prairie cordgrass*, Canada wildrye, blue-joint, trefoil, clovers, orchard grass <p>Shrubs</p> <ul style="list-style-type: none"> dogwood, willow, viburnum, chokeberry, sumac <p>Trees</p> <p><i>Wet Sites</i></p> <ul style="list-style-type: none"> ash, silver maple, cedar, tamarack, white spruce <p><i>Dry Sites</i></p> <ul style="list-style-type: none"> black walnut, oak and pine
SPECIES THAT BENEFIT	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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.

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.



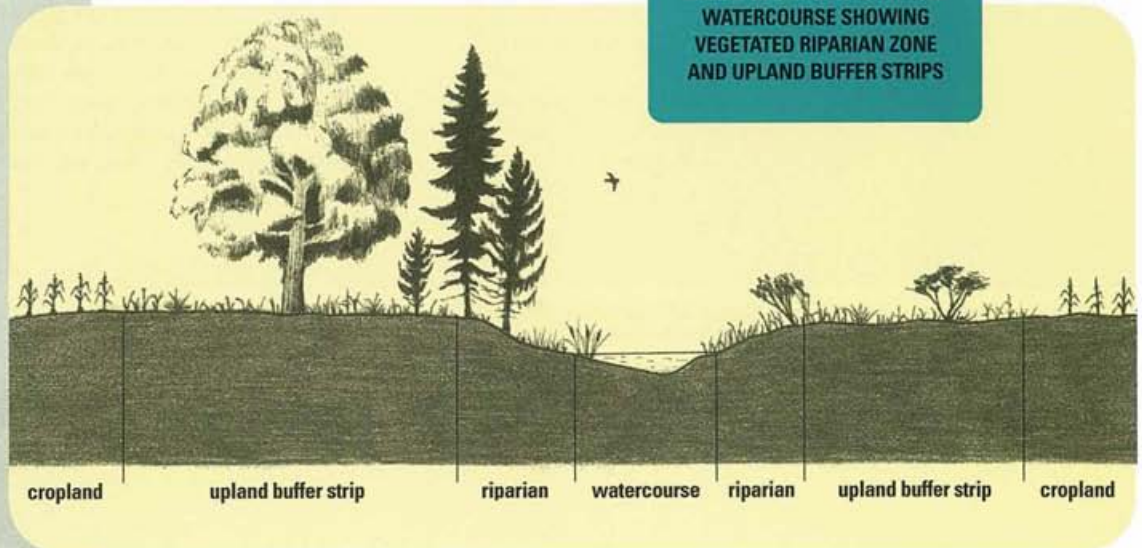
The buffer around this pond nicely separates the natural features from the intensive cropping activity.



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.

If they're wide enough, riparian zones that are well-vegetated may be all that's required to protect water bodies from the effects of land use practices. Where riparian zones are narrow, however, vegetated buffer strips on adjacent upland areas may also be useful.

CROSS-SECTION OF A TYPICAL WATERCOURSE SHOWING VEGETATED RIPARIAN ZONE AND UPLAND BUFFER STRIPS



BMPs FOR HABITATS

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.



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	<ul style="list-style-type: none"> • 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 	<p><i>Permanent fencing options:</i></p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • all fish and wildlife that live in sensitive areas 	<ul style="list-style-type: none"> • all fish and wildlife that live in sensitive areas
TIPS	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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.

BMPs FOR HABITATS

TRANSITIONAL

LIVING FENCES	LIVESTOCK/ MACHINERY CROSSINGS	ALTERNATE WATERING FACILITIES
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<p><i>Choice of systems:</i></p> <ul style="list-style-type: none"> • mechanically-driven pumps – nose; in-stream water; hydraulic ram; windmill • electrically-driven pumps – solar-powered and batteries; hydro-generated; wind-generated • gravity systems
<ul style="list-style-type: none"> • all fish and wildlife that live in sensitive areas 	<ul style="list-style-type: none"> • fish and wildlife that depend on aquatic habitat 	<ul style="list-style-type: none"> • herd health improves • fish and wildlife that depend on aquatic habitats
<ul style="list-style-type: none"> • complement with temporary fencing in early years to form immediate livestock barrier • living fences may take many years to achieve effectiveness 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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

BMPs FOR HABITATS

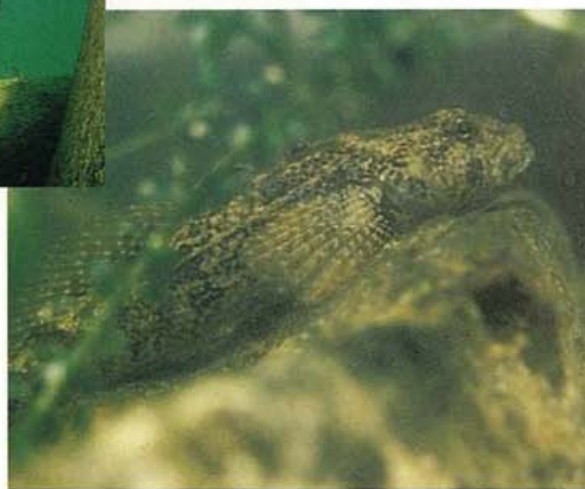
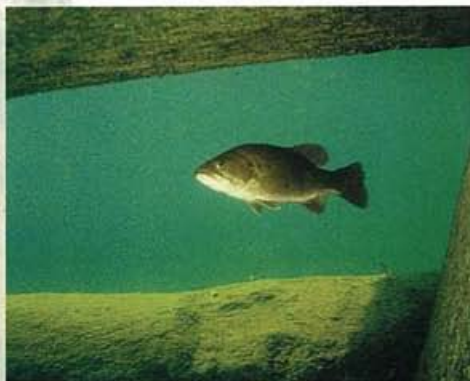
A Q U A T I C

MANAGING AQUATIC HABITATS – AN OVERVIEW

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

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.

BMPs FOR HABITATS

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
- ▶ **land 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
- ▶ **land 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.



BMPs FOR HABITATS

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 water-taking 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.

BMPs FOR HABITATS

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.



Cropping right to the bank edge and removing streamside vegetation will increase turbidity and water temperature, and reduce habitat diversity.

BMPs FOR HABITATS

A Q U A T I C

BMP – IMPROVE IN-WATER HABITAT

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

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 log 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.

BMPs FOR HABITATS

A Q U A T I C

NON-STRUCTURAL BMPs FOR IMPROVING IN-WATER HABITAT

	FLUSH EXCESS SEDIMENTS <i>from channels or near-shore areas</i>	REMOVE EXCESS WOODY DEBRIS <i>from watercourses and shorelines</i>	CREATE EDGE <i>in all water bodies</i>
DESCRIPTION AND PRINCIPLES	<ul style="list-style-type: none"> • sand, silt and clay can cover bottom substrates and degrade fish habitat • aim to improve substrate quality <ul style="list-style-type: none"> ◦ 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • edge occurs between weedy and open-water 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
SPECIES THAT BENEFIT	<ul style="list-style-type: none"> • species that prefer clean sediments, e.g., trout, salmon, smallmouth bass, walleye, rock bass, sunfish • aquatic insects upon which fish feed 	<ul style="list-style-type: none"> • trout and salmon • fish that migrate upstream to spawn, e.g., pike, walleye, trout • landowner may benefit through improved drainage 	<ul style="list-style-type: none"> • fish, including pike, muskellunge, walleye, perch, largemouth bass • other wildlife, including waterfowl, other birds, amphibians, reptiles and some mammals
TIPS	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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

BMPs FOR HABITATS

A Q U A T I C

STRUCTURAL BMPs FOR IMPROVING IN-WATER HABITAT

	INSTALL BOTTOM-DRAW OUTLETS <i>in ponds</i>	PLACE BOULDERS <i>in ponds, watercourses and shorelines</i>	BUILD RIFFLES AND POOLS <i>in watercourses</i>
DESCRIPTION AND PRINCIPLES	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • salmon and trout and other cool and cold-water species 	<ul style="list-style-type: none"> • many fish species, their prey, and some amphibians (e.g., mudpuppies) 	<ul style="list-style-type: none"> • salmon and trout are common target species, but pike, bass, sunfish and other wildlife also benefit
TIPS	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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.



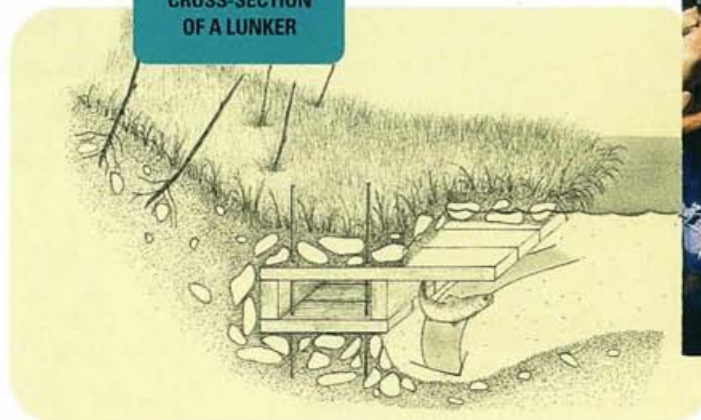
Carefully placed boulders provide protection from currents, hiding places for small fish, and ambush sites for large fish.

BMPs FOR HABITATS

A Q U A T I C

INSTALL LUNKER STRUCTURES <i>in all water bodies</i>	CREATE/IMPROVE SPAWNING SITES <i>in ponds, watercourses and shorelines</i>	INSTALL TREE AND BRUSH SHELTERS <i>in all water bodies</i>
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • trout, bass and other species • overhead vegetation also provides habitat for other wildlife and for insects upon which fish feed 	<ul style="list-style-type: none"> • trout, salmon, smallmouth bass, rock bass, sunfish and walleye, as well as bottom-dwelling organisms upon which fish feed 	<ul style="list-style-type: none"> • in streams – most fish species • in lakes/ponds – perch, bass, sunfish, pike, muskellunge, walleye
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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

**CROSS-SECTION
OF A LUNKER**



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

BMPs FOR HABITATS

A Q U A T I C

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

DESCRIPTION AND PRINCIPLES

CREATE WATER-LEVEL CONTROL STRUCTURES

where water can be impounded

- 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



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.

BMPs FOR HABITATS

A Q U A T I C

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.



BMPs FOR HABITATS

A Q U A T I C

BMPs FOR CONTROLLING CHANNEL AND SHORELINE EROSION

	INSTALL ROCK RIP-RAP <i>along all water bodies</i>	INSTALL LOG RIP-RAP AND LOG CRIB STRUCTURES <i>along all water bodies</i>
DESCRIPTION AND PRINCIPLES	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> fish species that prefer stable shorelines, clear water and clean substrates small species/young fish that hide/feed in crevices between rocks 	<ul style="list-style-type: none"> species that prefer stable banks and shorelines, clear water, clean substrates, and good riparian vegetation species that prefer fast flows
TIPS	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 labour-intensive. 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.

BMPs FOR HABITATS

A Q U A T I C

INSTALL VORTEX WEIRS

for watercourses

- consists of boulders placed in an upward-pointing "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

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



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

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

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



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.

BMPs FOR HABITATS

A Q U A T I C

BMP – MAINTAIN DRAINS

CONSTRUCTING NEW DRAINS

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.

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.

BMPs FOR HABITATS

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 lunger 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.

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	<ul style="list-style-type: none"> selectively remove <i>excess</i> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> fish species that require clear water and clean substrates remaining vegetation provides habitat for wildlife and insects – an important food source for fish 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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.

BMPs FOR HABITATS

A Q U A T I C

TIME MAINTENANCE TO MINIMIZE IMPACTS ON AQUATIC LIFE

- 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

- all fish and wildlife species

- 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

REMOVE DEBRIS AND EXCESS VEGETATION FROM BOTTOM OF DRAIN

- 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

- species that require clear water and clean substrates
- species that use drains as migratory corridors

- 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

CONSIDER BOTTOM CLEANOUTS TO MINIMIZE DISTURBANCE

- 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

- species that require clear water and clean substrates
- species that use drains as migratory corridors
- other wildlife that use bank vegetation

- 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

RELOCATE EXCAVATED SOIL PROPERLY

- place excavated soil where it won't wash back into the drain
- spread excavated soil out and stabilize with vegetation as soon as possible

- species that require clear water and clean substrates

- excavated material can be used to fill 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.