

EXTENSION NOTES



RESTORING OLD-GROWTH FEATURES TO MANAGED FORESTS IN SOUTHERN ONTARIO

Most of the old-growth forests of southern Ontario were removed by logging, forest fires and European settlement between the mid-1700s and the early 1900s. The land is recovering from these catastrophic events and new forests cover much of Ontario. However, today's second-growth forests are less diverse than the original mixed-hardwood forests and provide habitat for fewer and different forms of life. Today's forests support more deer, but they provide fewer homes for warblers, wood ducks, saw-whet owls, blue-spotted salamanders, bats, wolves, grey foxes and many other species. Some species, like elk and woodland caribou, are no longer found in southern Ontario.

This Extension Note provides information on ways of restoring the diversity and increasing the number of old-growth features in managed forests, while maintaining their ability to provide timber, fuelwood, maple syrup, nuts and places for recreation.

THE BENEFITS OF RESTORING OLD-GROWTH FEATURES

Restoration is a long-term process. It takes several years to begin to see results, but the benefits are immense. By restoring diversity, we can provide habitat for many more species, including 28 birds and 18 mammals in southern Ontario that prefer old-growth habitat. Some of these species are now considered rare or endangered. These include the southern flying squirrel and the silver-haired bat.

Restoration can also increase the health of forests and their ability to regenerate naturally. By increasing the diversity of habitats and species in the forest, we help to increase genetic diversity — the level of genetic variation between members



of the same species. This, in turn, gives species a better chance of surviving diseases like the Dutch elm disease, which wiped out most of the elms in Ontario in the 1960s. A high level of genetic diversity also helps species survive

insect infestations and environmental changes, such as pollution or global warming.

RESTORATION BUILDS ON NATURAL PROCESSES

The easiest approach to restoration is to leave the forest alone and let natural processes take their course. Over a century or two, natural succession will transform second-growth into old-growth ecosystems. However, the composition of species in the new old-growth forest may be different than the original forest. As trees die, fall and decompose they will create habitat and return nutrients and energy to the soil where they can support new life. As organic matter builds on the forest floor it will retain moisture and transform the drier second-growth forest into a moister, old-growth environment.

For faster results in a managed forest, you can take a more active approach that involves thinning, cutting holes in the forest canopy, rebuilding a rich layer of decaying organic matter on the forest floor and protecting wildlife trees from harvest.

Before you begin, assess the condition of your forest and seek advice from forestry experts on how to increase the existing old-growth features.

SPEEDING SUCCESSION

The old-growth hardwood forests of southern Ontario had a complex, multi-layered structure with trees of all ages and sizes. Beginning at the top and descending toward the forest floor, the old-growth forest had several layers of vegetation. The structure was dominated by canopy trees that shaded the understorey trees, saplings and shrubs below. Frequently, tall pines poked above the canopy forming another layer called the supercanopy.

In addition to this complex structure, the old-growth forests had a diverse species-composition. Although most were dominated by sugar maple, beech and white pine, they also contained many other species of trees and shrubs.

The structure and composition of old-growth ecosystems was maintained by a cycle of natural disturbances that provided the conditions many different species needed to regenerate and grow to maturity. Fire, wind, ice storms, disease and insects created openings in the canopy where new growth could occur. Small canopy gaps, created by a falling tree or a group of trees, gave shade-tolerant understorey trees the room and sunlight they needed to grow quickly and capture a

place in the canopy. Larger openings gave mid-tolerant and intolerant species the chance to become established. The result was a highly varied forest, with stands in different stages of succession, trees of all sizes and ages, and many different species.

You can mimic natural disturbances and speed the process of natural succession by cutting small and large holes in the canopy. Periodically, make clearings in about half of one to



Old-growth features include trees of various sizes and species.

two per cent of the forest. Each hole in the canopy should be greater than six metres from one edge of the canopy to the next. Gaps that are six to 10 metres in diameter encourage the growth of tolerant species, such as maples, beeches and hemlocks. Larger gaps, in the range of 10 to 50 metres in diameter, favor the growth of mid-tolerant species, such as oaks, white ash and white pine. Large openings, greater than 50 metres in diameter, favor intolerant species, such as white birch, poplar and black cherry. However, large openings are not recommended in forested areas that are small and fragmented.

Make sure your gaps are more than 50 metres from each other and from the edge of the stand. To regenerate tolerant species, choose sites where tolerant saplings are already present and take care not to damage the saplings as you harvest. You can

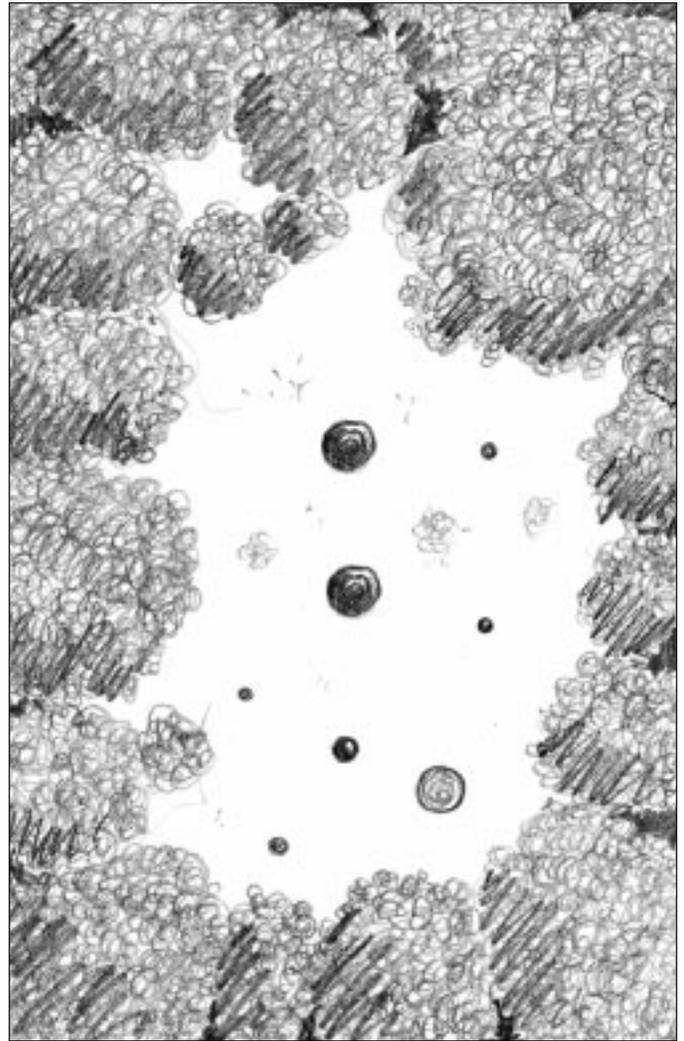
build on the small gaps created when individual trees fall by cutting several neighboring trees.

In addition to creating canopy gaps, you can increase the diversity of forests by protecting uncommon species from harvests so that they can provide seed for natural regeneration. Give special attention to conifers, particularly white pines and hemlock, which can grow for hundreds of year.

To make a six-metre gap, you need to remove two or three canopy trees that are between 60 and 80 years old.



Side view of a canopy gap. Canopy gaps speed the process of succession by encouraging the growth of trees and shrubs.



Aerial view of a canopy gap. Small canopy gaps encourage tolerant species of trees, medium gaps encourage mid-tolerant species and large openings encourage intolerant species.

REBUILDING THE FOREST FLOOR

The floor of an old-growth forest is a moist, fertile, rough and varied environment, with pits and mounds and enormous amounts of decaying wood, leaves and twigs and organic matter.

PITS AND MOUNDS

Pits and mounds are formed in the forest soil when trees are uprooted. The pits form when the roots and clinging soil are pulled from the ground. The mounds form as the roots decay. Together, the pits and mounds give the forest floor a rugged appearance and provide a wide range of dryer and wetter habitats. The exposed mineral soil in the pits provides the conditions that red oak, white pine and basswood need to germinate. The moist mounds of decaying matter and rich soil are home to fungi, lichens, bacteria, invertebrates, amphibians and plants.

Settlers levelled the pit and mound topography when they cultivated the land. To restore this rough terrain, let declining and dead trees fall naturally. Cut only those that are safety hazards or are selected for harvest.

DECAYING WOOD

Decaying logs, also known as deadfall, provide habitat for bacteria, fungi, mosses, ferns, wildflowers and trees. They are also home to invertebrates, amphibians and reptiles.

Decaying logs absorb and retain moisture, even during periods of severe drought. As they decompose, they add organic matter and nutrients to the soil. They also provide the conditions yellow birch, hemlock and cedar need to germinate and grow.

Leave at least ten fallen logs in each hectare of forest. The logs should be greater than two metres in length and 60 centimetres in diameter. If you don't have enough, let snags fall naturally or cut down some unsafe, defective, undesirable or unhealthy trees. Leave or cut some logs every few years. This will ensure that there are logs in various states of decay, from solid to fully decomposed. Also leave a variety of species. The stump ends (called sawlog butts) of defective, harvested trees are a good source of decaying material.

Build the organic litter by allowing leaves, twigs, branches and piles of brush to decompose on the ground. This provides habitat for many life forms, including cottontail rabbits and wood frogs.

GROUND COVER

Mosses, fungi, bacteria, flowers, ferns, shrubs and tree seedlings grow in the organic litter and the soil of the forest floor. Many of these forms of life are vulnerable to



Pits and mounds



Decaying wood



Ground cover

disturbances, particularly livestock grazing. Protect the ground cover during harvests and build as few skid trails and interior roads as possible. If possible, log during the winter when the snow provides a protective cover for ground vegetation.

CREATING AND PROTECTING WILDLIFE TREES

Old-growth forests have a greater number of wildlife trees than second-growth forests. Wildlife trees are trees and shrubs that are particularly important for providing birds and mammals with food, shelter, roosting sites and havens from predators. The many kinds of wildlife trees include cavity trees, snags, mast trees and supercanopy trees.

CAVITY TREES

Cavity trees are living or dead trees with holes for nesting or denning, feeding and escaping. Woodpeckers, black-capped chickadees and red-breasted nuthatches make cavities in live trees for feeding and nesting. These excavated cavities, as well as cavities created by decay and broken branches, are later used by birds and mammals that can't make cavities of their own. Ready-made cavities provide habitat for saw-whet owls, barred owls, nuthatches, wood ducks, southern flying squirrels, porcupines, martens, and fishers.

Leave at least six living cavity trees greater than 25 centimetres dbh (diameter at breast height or 1.3 metres from the ground) in each hectare of forest. At least one of these should be greater than 50 centimetres dbh. Select a mix of species, keeping in mind that bigger cavities are better because they provide homes for a greater number of species. Choose some mast species to provide food for wildlife. Select some sugar maple and oaks, which live for a long time. Also select basswood, ashes, beeches and conifers, which have softer wood and are easier than other species for birds to excavate cavities in.

Keep in mind that any trees that are a safety hazard must be cut down (*Occupational Health and Safety Act RSO 1990.*)

SNAGS

Snags are standing dead trees. Barred owls, pileated woodpeckers, hairy woodpeckers, silver-haired bats, raccoons, insects, amphibians, fungi and other life forms rely on them for food and shelter. When snags fall over, they add to the level of decomposing wood on the ground.

Leave as many snags as possible. Aim for a minimum of four smaller snags (less than 50 centimetres dbh) and one larger snag (greater than 50 centimetres dbh) for a total of five in every hectare of forest.



Saw-whet owls take advantage of cavities excavated by pileated woodpeckers.



Some cavities are created when decaying branches break off.

If you don't have enough snags, create a few by removing a strip of bark from around a tree. This process, called girdling, kills the tree. Girdle a variety of species, choosing trees that are defective and at least 2.5 metres tall and 10 centimetres in diameter. Be sure to select some conifers, which remain standing longer than other species. To ensure that there are snags in various stages of decay, girdle a few trees every few years or during logging operations.

In maple syrup operations, avoid girdling trees that will someday present a hazard to pipelines. Cut down snags that are safety hazards under the *Occupational Health and Safety Act* (RSO 1990).



Choke cherry is a sun-loving shrub that thrives in canopy gaps.

MAST TREES

Mast is the fruit or seed of trees and shrubs. It's an important food for wildlife. Hard mast species, like oak, beech, butternut, hazel and hickory, have a hard-shelled fruit. Soft mast species, like black cherry, pin cherry, choke cherry, and mountain ash, have a soft fruit. Leave at least seven mast trees in each hectare.



Large elm trees become good snags after dying from disease.



LARGE TREES

The presence of large trees is one of the most attractive features of an old-growth forest. In each hectare, leave at least three large trees greater than 50 centimetres dbh.



SUPERCANOPY TREES

Tall white and red pines and other conifers often tower above the canopy to form the supercanopy layer. They provide nesting and resting places for birds, refuges for young bear cubs escaping predators and landmarks for songbirds. Leave at least one cluster of pines, hemlocks or spruces in every four hectares of forest. Leave at least three trees in the cluster. Give special protection to pines, hemlocks or spruces near wetlands, which provide habitat for eagles and ospreys. Also protect tall conifers in early successional forests as sources of seed for natural regeneration.

FEATURES FOR A HEALTHY, DIVERSE FOREST

CANOPY GAPS

- Promote an uneven canopy in your forest by creating canopy gaps through natural processes or by cutting
- Cut gaps greater than six metres in diameter in approximately half of one to two per cent of a stand every year
- Gaps should be 50 metres from each other and the edge of the forest

PITS AND MOUNDS

- Let dead and dying trees fall naturally if they are not safety hazards



FALLEN LOGS

- Let fallen logs lie on the ground
- Cut trees to ensure there are at least ten per hectare
- Should be more than two metres in length and 60 centimetres in diameter



GROUND COVER

- Let branches and other organic matter decay on the ground



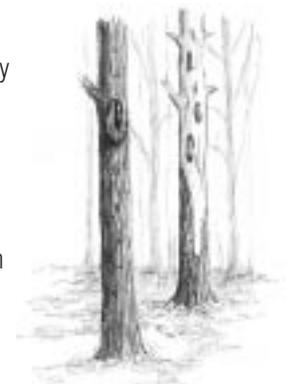
- Avoid disturbing the ground
- Build as few skid trails and roads as possible

CAVITY TREES

- Leave at least six living cavity trees in each hectare

SNAGS

- Leave at least five in each hectare
- Give preference to hemlocks and pines



FEATURES FOR A HEALTHY, DIVERSE FOREST CONTINUED

MAST TREES

- Leave at least seven in each hectare
- Protect a variety of species to provide food for wildlife and seed for regeneration



LARGE TREES

- Leave at least three trees larger than 50 centimetres in diameter in each hectare

SUPERCANOPY TREES

- Leave one cluster of conifers in each four hectares of forest
- Protect tall conifers near wetlands and in areas that need conifer seed for regeneration



CHECKLIST FOR A HEALTHY, DIVERSE FOREST

- | | | | | | |
|----------------------------|------------------------------|-----------------------------|-----------------------|------------------------------|-----------------------------|
| Canopy gaps present? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | Large trees? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Pits and mounds? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | Mast trees | | |
| Fallen logs? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | • Oak? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Rich ground cover? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | • Hickory? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Cavity trees? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | • Ironwood? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Snags? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | • Black cherry? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

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