

EXTENSION NOTES



THE OLD-GROWTH FORESTS OF SOUTHERN ONTARIO

The forests that covered southern Ontario before European settlement were a patchwork of forest environments in different stages of succession. They included large, unbroken tracts of mature forest, which we call old-growth, as well as younger stands, meadows, prairies, savannas, wetlands and openings of various sizes.

When we think of the old-growth stands within this varied landscape, we sometimes imagine vast park-like expanses of old trees. However, the old-growth forests in southern Ontario contained trees of all ages and sizes. These wild and diverse ecosystems also contained more tree and shrub species than today's forest and provided habitat for more and different forms of life, including several species that are now considered rare or endangered.

This Extension Note provides information on the characteristics of old-growth forests and the many species that depend on these features for survival.

THE LOSS OF OLD GROWTH

Most of southern Ontario's old-growth forests were destroyed by logging, forest fires and settlement between the mid-1700s and the early 1900s. Loggers took the best pines and oaks to supply the European market. Many of the remaining forests burned in the accidental fires that swept through Ontario after the cuts. Settlers also burned the forest to clear the land for farming or to make potash. Then they pulled out the stumps and cultivated the soil, removing the last traces of the presettlement forest's rugged forest floor.

Today, only a few old-growth stands remain in southern Ontario. However, in many areas the land is slowly recovering from these major disturbances. If left alone for a century or two, today's forests could become more like the presettlement,



old-growth ecosystems and provide habitat for the many species that need large, undisturbed tracts of mature forest.

WHAT DID SOUTHERN ONTARIO'S OLD-GROWTH FORESTS LOOK LIKE?

By examining pollen in lake sediments, the writings of the early pioneers, the notes and diaries of the land surveyors and the few remaining old-growth stands, we know that the presettlement forests in southern Ontario were more diverse in structure and composition than today's forests.

THE STRUCTURE OF THE OLD-GROWTH FORESTS

Structure describes a forest's physical components and layers of life. The old-growth forests of southern Ontario had a complex, multi-layered structure, with trees of all ages and sizes. Beginning above the canopy and descending to the forest floor, the forest contained:

1. SUPERCANOPY TREES

Tall pines poke through the canopy, providing landmarks, nesting sites and resting places for birds, as well as refuges for bear cubs escaping predators.

2. CANOPY TREES

Mature trees form a continuous ceiling that shades the layers below.

3. UNDERSTOREY TREES

Small trees grow beneath the canopy. Sometimes as old as canopy trees, the growth rate of understorey trees is limited by the lack of sunlight.

4. SHRUBS AND SAPLINGS

Shrubs and saplings grow in the shade of mature canopy trees and in open areas.

5. DECAYING WOOD

Decaying trees and branches on the ground create habitat for fungi, reptiles, amphibians, invertebrates and bacteria. As wood decays, it returns nutrients to the forest soil and creates the fertile, moist conditions yellow birches, hemlocks and cedars needed to grow.

6. GROUND COVER

Mosses, fungi, bacteria, flowers, ferns, shrubs and tree seedlings form a carpet of life on the forest floor.

7. ORGANIC LITTER

Leaves, dead wood and small branches decompose on the ground, enriching the soil with nutrients and providing habitat for many life forms. This layer also acts like a sponge to help retain moisture in the soil.



Most of southern Ontario's old-growth forests were destroyed by logging, forest fires and settlement.

8. PITS AND MOUNDS

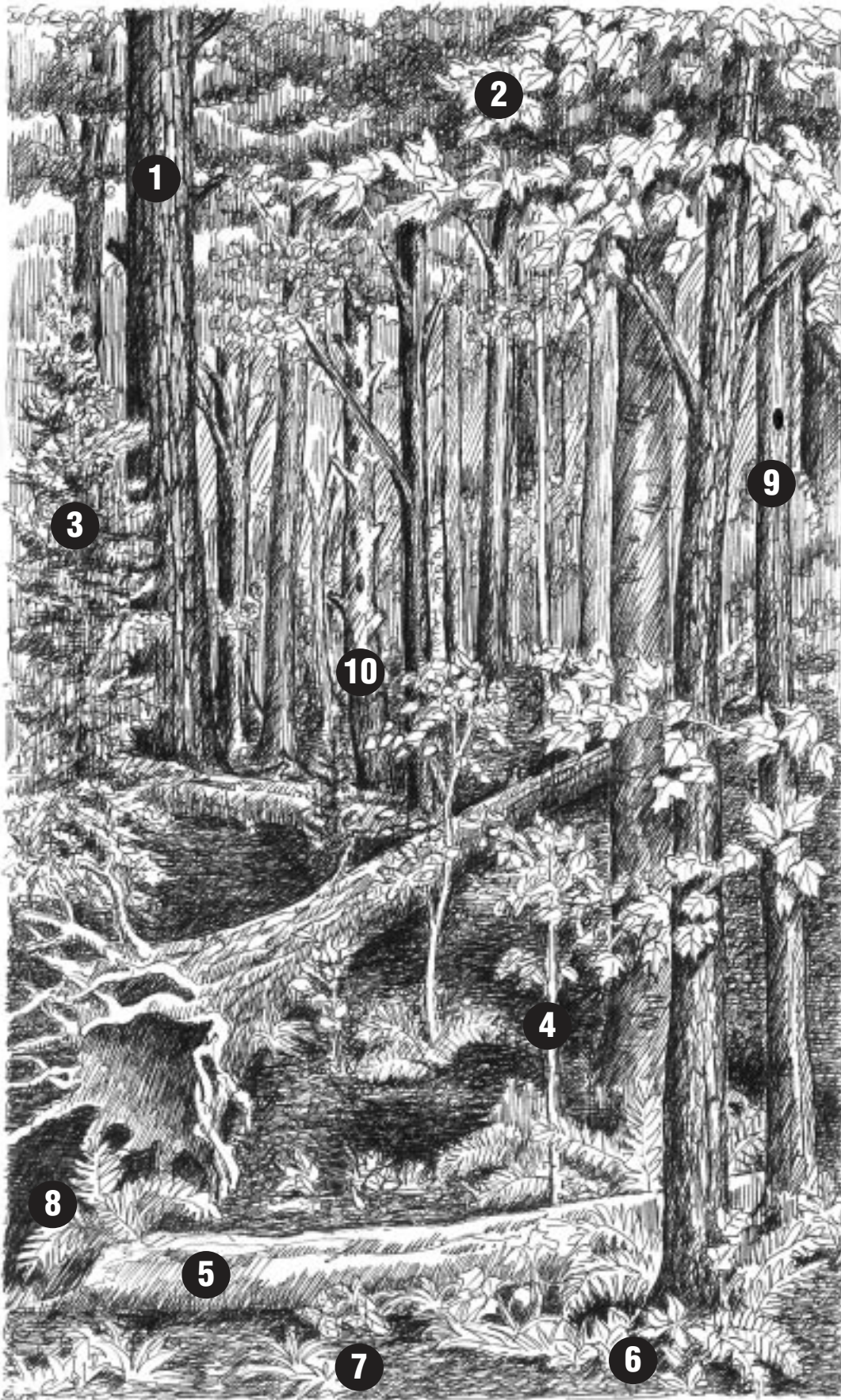
Pits and mounds are formed when large trees are uprooted. The pits form when the roots and clinging soil are pulled from the ground. The mounds form as the roots decay. Together, the pits and the mounds give the forest floor a rugged appearance and provide a great diversity of drier and wetter habitats. The exposed mineral soil in the pits provides the dry conditions that red oaks, white pines and basswoods need to germinate. The moist mounds of decaying matter and rich soil are home to fungi, lichen, bacteria, invertebrates, amphibians and plants. Settlers levelled the pit-and-mound topography when they cultivated the land.

9. CAVITY TREES

Cavity trees are living or dead trees with holes that mammals and birds use for nesting or denning, feeding and escaping. Primary cavity-users like woodpeckers, black-capped chickadees and nuthatches make feeding and nesting cavities in live trees. These excavated cavities, as well as cavities created by decay and broken branches, are used by birds and mammals that can't make cavities of their own. These secondary cavity-users include saw-whet owls, barred owls, nuthatches, porcupines and ermines.

10. SNAGS

Snags are standing dead trees. Owls, woodpeckers, flycatchers, warblers, tree swallows, bats, raccoons and other species rely on them for habitat.



THE STRUCTURE OF THE OLD-GROWTH FORESTS

1. supercanopy trees
2. canopy trees
3. understory trees
4. shrubs and saplings
5. decaying wood
6. ground cover
7. organic litter
8. pits and mounds
9. cavity trees
10. snags

THE COMPOSITION OF THE OLD-GROWTH FOREST

Composition describes the species of trees and the proportions of each species in a forest.

The old-growth forests of southern Ontario contained more tree species and different proportions of each species than today's second-growth forests.

Sugar maple, beech, and hemlock dominated the mature forests of the Great Lakes-St. Lawrence Forest Region, which covers much of southern Ontario. Depending on the soil and growing conditions, the old-growth stands in this region also contained oaks, ashes and basswood, as well as the conifers: red and white pines, white spruce and balsam fir. White cedar, white birch and trembling aspen were also abundant.

The old-growth forests in the Deciduous Forest Region, which covers the warmer, drier parts of southern Ontario, contained fewer conifers and more hardwoods. These forests also contained a variety of hickories and oaks, plus American chestnut. It also included some Carolinian species, such as tulip-tree, Kentucky coffee-tree and cucumber-tree, which are more common in southern climates.

Old-growth forests throughout southern Ontario contained an abundance of mast trees and shrubs, which provided food for wildlife. Mast is a generic term for the fruit or seeds of plants. Hard mast species, like oak, beech, butternut, hazel and



Forest Regions of Ontario

hickory, have a hard-shelled fruit. Soft mast species, like black cherry, pin cherry and mountain ash, have a soft fruit.

NATURAL DISTURBANCES SHAPED THE OLD-GROWTH FOREST

The presettlement forests of southern Ontario depended on large- and small-scale, natural disturbances to regenerate.

Frequent small-scale disturbances, caused by ice storms, wind, insects and disease, renewed old-growth stands and perpetuated the structure and the composition. As individual trees or small groups of trees died and fell, they created holes in the canopy. These canopy gaps stimulated renewal of the forest by allowing sunlight to penetrate the canopy and created room for trees in the understorey to grow.

Periodic large-scale forest fires or wind storms destroyed forests and launched the cycle of succession. These infrequent events created large openings in the forest canopy where intolerant and mid-tolerant species could invade and grow. If you could have travelled through a presettlement landscape you would have seen many different environments:

- Old-growth stands dominated by tolerant hardwoods or white pines, with some mid-tolerant species in the canopy
- Medium-aged stands dominated by mid-tolerant species

- Young stands dominated by intolerant species, sometimes composed of one or a few species
- Grassy meadows with shrubs and intolerant saplings, prairies and savannas
- Stands of dead trees, killed by flooding, fire, insects or diseases
- Tangles of decomposing trees that were blown down by the wind
- Wetlands and seasonal streams



Canopy gaps are created when small groups of trees die from old age or disease.



Cerulean warbler

THE IMPORTANCE OF DIVERSITY

Southern Ontario's old-growth forests were more diverse than some of today's forests. They contained a wider variety of trees and shrubs and provided habitat for many more species, including about 28 birds and mammals that prefer old-growth habitat. The changes in southern Ontario's forests have created more habitat for wildlife species, like the white-tailed deer, that prefer open lands and young growth. However, the absence of large, undisturbed tracts of mature forest has caused many other species to decline or disappear. Several species of birds, including the cerulean warbler, are considered rare or endangered. Wolves, grey foxes, elk, woodland caribou and passenger pigeons can no longer be found in southern Ontario forests.

The loss of old-growth forests has also reduced the level of genetic diversity within individual species and their ability to adapt to stresses. Genetic diversity is a measure of the genetic variation between members of the same species. A high level of genetic diversity gives a species a greater chance of adapting to and surviving insect infestations like the forest tent caterpillar, diseases like the butternut canker or environmental changes like pollution and global warming.

RESTORING OLD-GROWTH

Restoring old-growth forest on lands cleared for agriculture could take several hundred years or more. However, many old-growth features can be restored more quickly. One of the easiest ways to restore old-growth features is to leave the forest alone. In a hundred years or so, it will become more like the wild, damp and shaggy place it once was. As trees decline and die, they will become nesting and denning sites for birds and mammals. Dead wood, decomposing on the forest floor, will create habitat for many of the less visible species in the forest and provide energy and nutrients to support new life. Eventually, the species composition will become more like that of the presettlement forest.

If you are managing a forest for wood products or recreation, you may need to take a more active approach to restoration. The following steps will help you increase the diversity, health and number of old growth features in a managed forest, while maintaining its ability to provide timber, maple syrup, nuts or places for recreation:

1. NURTURE MAST TREES

As you harvest, avoid cutting mast trees, which provide food for wildlife and seeds for regeneration.

2. PROTECT CAVITY TREES AND SNAGS

As you harvest, leave as many cavity trees and snags as possible. Remove only those that are safety hazards.

3. CREATE CANOPY GAPS

Support the forest's natural cycle of regeneration by creating large and small canopy gaps. This will speed succession and create areas where young trees can grow in sunlight.

4. ENCOURAGE THE GROWTH OF NATIVE PLANT SPECIES

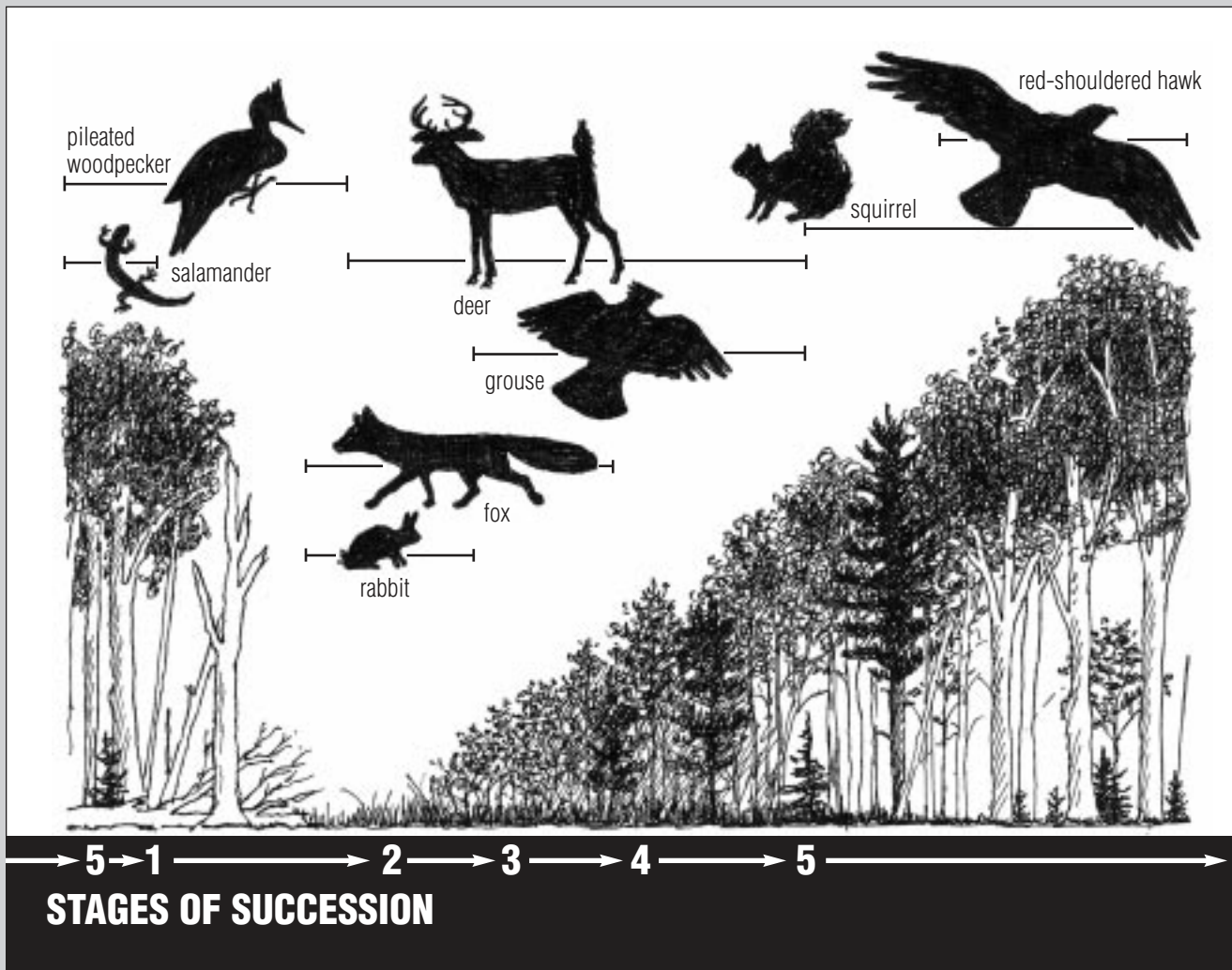
Limit the disturbance to the forest floor to encourage the establishment of native plant species that were an

important component of the presettlement forest. When these plants mature, they will provide seeds for regenerating their species.

SUCCESSION

Succession is the natural process of change that occurs in a forest over time as one community of living organisms replaces another. In southern Ontario, the cycle of succession usually begins when a major disturbance, (1) like a fire or a wind storm, destroys a stable ecosystem. Pioneer species, which are best able to live in harsh conditions, take hold first (2). These shade intolerant species change the environment as they grow, creating the shaded, moister

conditions that more shade-tolerant species need to grow (3). As conditions improve, mid-tolerant and tolerant species move in and, over time, create a mixed forest with a high component of mid-tolerant species (4). As the forest reaches the later stages of succession, shade-tolerant species begin to dominate (5). The cycle of succession slows when the forest reaches the climax stage. In southern Ontario forests, the climax stage is an old-growth forest.



TOLERANCE

Tolerance is a measure of how much shade and competition a tree species can survive.

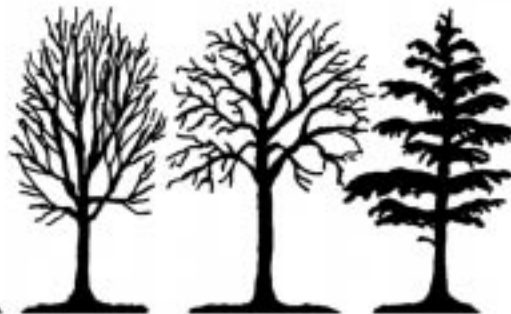
Tolerant species can survive in the shade beneath the forest canopy for decades. When an opening appears in the canopy, they grow quickly to fill it. This ability gives them a competitive advantage over more intolerant species.

Mid-tolerant species need some sunlight throughout their lives to germinate, grow and develop.

Intolerant species need full sunlight to survive. In clearings and fields, where trees are exposed to full sunlight, intolerant species can outcompete more tolerant species.



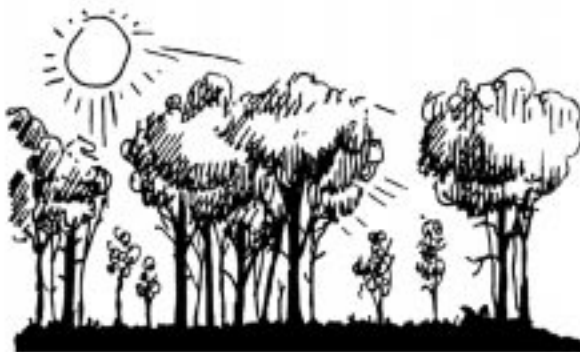
Shade tolerant species can survive in the shade beneath the forest canopy for decades. When an opening appears in the canopy, they grow quickly to fill it.



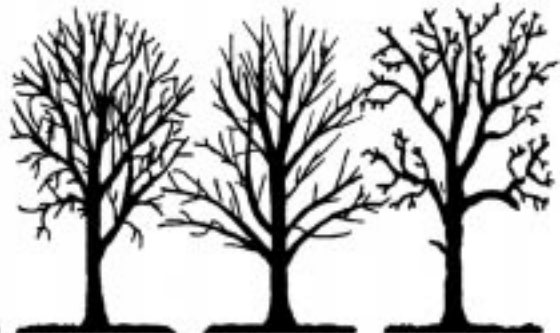
Sugar maple

Beech

Hemlock



Mid-tolerant species need sunshine for at least part of the day to survive.



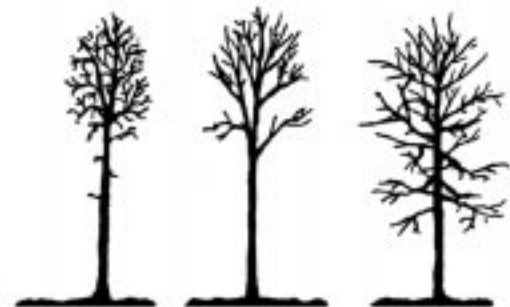
Yellow birch

White ash

Red oak



Intolerant species need full sunlight to survive. In open areas they can out compete more tolerant species.



Trembling aspen

White birch

Black cherry

LIFE IN THE OLD-GROWTH FOREST

FOREST BIRDS

- **American kestrel**
a secondary cavity-user
- **Red-breasted nuthatch**
excavates cavities in snags and the stubs of the dead limbs of living trees
- **White-breasted nuthatch**
a secondary cavity-user
- **Brown creeper**
usually nests behind loose bark, but sometimes in used cavities
- **Wood duck**
uses natural cavities and cavities made by pileated woodpeckers
- **Barred owl**
chooses natural cavities in large trees
- **Saw-whet owl**
nests in snags and living cavity trees
- **Great-crested flycatcher**
a secondary cavity-user
- **Pileated woodpecker**
makes its own nesting and feeding cavities in snags and living trees
- **Downy and Hairy woodpeckers**
excavates nests in snags and living trees



Brown creeper

- **Acadian flycatcher**
lives in canopy gaps within large tracts of mature, undisturbed forest
- **Cerulean warbler**
feeds in the canopies of mature, hardwood forests and needs large undisturbed areas
- **Hooded warbler**
needs dense vegetation found in canopy gaps within large tracts of undisturbed forest
- **Louisiana waterthrush**
nests in stumps and stream banks near water
- **Hermit thrush**
nests in dense shrubs at the forest edge
- **Wood thrush**
nests in dense understory, usually with lots of decaying wood on the forest floor
- **Ovenbird**
nests on the ground, usually in more open parts of the forest floor

MAMMALS

- **Silver-haired bat**
roosts in snags
- **Hoary bat**
roosts in snags



Silver-haired bat

- **Small-footed bat**
roosts in snags
- **Redback vole**
nests in snags and dead trees on the ground
- **Southern flying squirrel, raccoon, fisher, marten**
dens in cavities and lives on hickories, oaks and other mast species
- **Porcupine**
dens in cavity trees, snags and dead trees on the ground
- **Ermine**
lives in dense understorey

AMPHIBIANS

- **Blue-spotted salamander**
- **Red-backed salamander**
- **Spotted salamander**
lives in dead wood on the forest floor
- **Spring peepers**
- **Four-toed salamander**
lives in moist dead wood and bogs
- **Gray treefrog**
lives in living trees
- **Wood frog**
lives in dead trees and branches on the ground



Blue-spotted salamander

REPTILES

- **Red-bellied snake**
lives in dead trees on the ground



Red-bellied snake

- **Northern ringneck snake**
lives in dead trees on the ground and eats red-backed salamanders

PLANTS

- **Baneberry**
- **Bloodroot**
- **Blue cohosh**
- **Canada mayflower**
- **Dutchman's breeches**
- **Foamflower**
- **Hepatica**
- **Solomon's seal**
- **Spring beauty**
- **Squirrel corn**
- **Toothwort**
- **Trilliums**
- **Trout lily**
- **Violets**
- **Ferns**
- **Wild sarsaparilla**



squirrel corn



Bloodroot

The following Extension Notes will further assist you to understand the features of old-growth forests:

- *Restoring Old-Growth Features to Managed Forests in Southern Ontario*

- *Managing Regeneration in Conifer Plantations to Restore a Mixed, Hardwood Forest*
- *Cavity Trees are Refuges for Wildlife*

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