



Lowland Spruce-Fir Forests

Habitat Stewardship Series

NEW HAMPSHIRE WILDLIFE ACTION PLAN

Recognizing

lowland spruce-fir forests

New Hampshire's lowland spruce-fir forests usually occur at elevations between 1,000 and 2,500 feet on poor soils such as wet flatlands, cool river valleys, and rocky ridgelines. Red spruce and balsam fir are the dominant trees, often mixed with yellow and paper birch. Hobblebush and blueberry are common in the understory, along with bunchberry and trillium on the forest floor. On sites where the soil is very poorly drained, such as in peat bogs, black spruce is common.



Although they contain many of the same tree species, **lowland spruce-fir forests** differ from high elevation spruce-fir forests, which grow at elevations above 2,500 feet. The lowland forests are less stressed by the cold and dry conditions of higher elevations, and support larger trees and a more diverse community of plants and animals.

The tree canopy in mature lowland spruce-fir forests tends to be patchy, with areas of dense young trees,

standing dead trees, and areas of large trees with an open understory. This patchy character is the result of wind storms, naturally-occurring insect outbreaks, and openings created by beaver impoundments.

Where are New Hampshire's lowland spruce-fir forests?

Lowland spruce-fir forests cover nearly 10% of the state, mostly in Coos and Grafton Counties. A band of lowland spruce-fir forest is also found in the southwestern highlands in Sullivan, Cheshire, and parts of Hillsborough Counties. Public lands containing extensive examples of lowland spruce-fir include parts of the White Mountain National Forest, Lake Umbagog National Wildlife Refuge (NWR), Pondicherry NWR, and the Randolph Community Forest.

Many of New Hampshire's lowland spruce-fir forests remain unfragmented by development and roads, making them an important ecological refuge for plants and animals. Lowland spruce-fir forests have been the focus of many conservation efforts, resulting in a third of these forests being permanently protected from development.



Why are lowland spruce-fir forests important?

New Hampshire lies at the southern edge of the range of spruce-fir forests in North America. As a result, New Hampshire's lowland spruce fir forests support over 50 wildlife species that do not occur in most other parts of the eastern U.S.



Winter wildlife cover

Lowland spruce-fir forests are a great source of cover and food for wildlife. Both spruce and fir trees have thick, low-hanging branches that provide winter cover for white-tailed deer, moose, ruffed grouse, and other wildlife. During winter, deer in northern New Hampshire require dense stands of mature spruce and fir for protection from cold temperatures and deep snow. Some historic deer wintering areas or "deer yards" have been used by large congregations of deer for more than 50 years.

Complex forest structure

Windthrown trees are common in the shallow, wet soils of lowland spruce-fir forests, adding to the complexity and diversity of these forests. While red spruce trees can live for 400 years, balsam fir is shorter-lived, and begins to decay after 60+ years and won't live beyond 200 years. The resulting standing dead trees, or "snags," are a rich source of insects and provide tree cavities for wildlife such as black-backed and three-toed woodpeckers. The complex forest structure – trees of different ages and sizes, fallen logs, and dead trees – also creates excellent habitat for reclusive species such as spruce grouse, as well as for small mammals and snowshoe hares. Both the American marten (threatened in New Hampshire) and Canada lynx (endangered in New Hampshire) rely heavily on small mammals and snowshoe hares to survive.

Threats to lowland spruce-fir habitats

Unsustainable timber harvesting practices

Spruce and fir have been valued as timber for over 100 years, and have been harvested extensively over that time. With their shallow and wet soils, partial harvests of spruce-fir forests are more susceptible to windthrow, so forest management has favored clearcutting. Young forests created through clearcutting can be beneficial to some species, particularly snowshoe hares and thus lynx, which prey on hare. However, extensive clearcutting has produced an imbalance of tree ages that affects the habitat for other species. Today's lowland spruce-fir forests are very young, with over 70% of the trees measuring less than 2" in diameter. Less than 2% of the trees are larger than 10" in diameter. These young lowland spruce-fir forests usually lack important habitat features such as standing dead trees and logs on the forest floor and areas of large trees.

Conversion of spruce-fir habitat

In some areas that have traditionally supported spruce-fir forests, clearcut forests have re-grown into northern hardwood or mixed forests. In many cases, spruce and fir trees will eventually re-colonize the converted hardwood forests. However, with so little mature spruce-fir forests at low elevation, wildlife dependent on this habitat type can't linger during the 70+ years it may take for spruce-fir to become dominant.

Insect outbreaks

New Hampshire's spruce-fir forests are susceptible to naturally-occurring outbreaks of spruce budworm. Despite their name, these insects prefer to feed on mature balsam fir, causing damage which kills trees. Today's even-aged, young spruce-fir forests may be setting the stage for large insect outbreaks as our spruce-fir forests mature in the future. In the meantime, without mature trees on which to feed, there are few low-level insect outbreaks to create snags and cavity trees for wildlife.

Stewardship Guidelines

for lowland spruce-fir forests

- **Focus land conservation on lowland spruce-fir forests.** Be aware that because of past practices, spruce-fir may be a minor component in today's forest stands. Seek professional advice to determine if the property can develop into lowland spruce-fir.
- Focus conservation on **large forest ownerships**, which allow for landscape-scale management that can incorporate non-timber objectives such as wildlife habitat.
- Use management practices that develop **mature forest characteristics** such as:
 - large trees (>18" diameter) for **future snags and den trees** — American marten require den trees larger than 20" in diameter
 - **existing snags** for insect food sources and den sites
 - **cavity trees** as nest and den sites
 - **closed canopies** for such species as spruce grouse, bay-breasted warbler, American marten, northern goshawk (which require large areas of mature forest with an open understory).
- In areas susceptible to windthrow, such as on ridges, **set aside areas where damaged trees are not salvaged.** The resulting snags, downed woody material, and cavity trees will help younger stands develop and mimic old-growth forest characteristics that help a variety of prey and predator species.
- Retain a **mature forest canopy** (more than 50% closed tree canopy) in low-elevation spruce fir habitats, to ensure habitat suitability for such species as American marten and spruce grouse. Some patches of forest should be allowed to grow old and start to die, allowing for a range of tree ages within the forest.
- Within mature forest, **patchy openings** are beneficial to such species as three-toed woodpeckers and snowshoe hare, as long as patches contain re-growing spruce-fir.
- Plan for **timber harvest rotations longer than 70 years** in lowland spruce-fir habitats, to allow for mature forest characteristics and natural disturbances such as windthrow and low-level insect outbreaks in the forest. Low levels of spruce budworm infestation are an important ecological disturbance in spruce-fir forests, and a key food source of many birds. Recognize and **encourage bird species that are effective predators** on spruce budworm, such as: blackburnian warbler, golden-crowned kinglet, yellow-rumped warbler, red-breasted nuthatch, Nashville warbler, white-throated sparrow, blacked-capped chickadee, magnolia warbler, and solitary vireo.
- Before conducting a timber sale within spruce-fir forest, contact your regional Fish & Game biologist to determine if the area is a known or **potential deer wintering area.** Biologists will provide site-specific stewardship recommendations for maintaining deer wintering areas on your land. Best winter cover for deer is provided by spruce-fir stands with trees that are at least 35 feet tall and have at least 70% closed tree canopy.
- **Re-growing spruce-fir after a timber harvest requires careful pre-harvest planning** and is critical for the viability of lowland spruce-fir habitats. Foresters can use a variety of silvicultural techniques to re-grow spruce-fir forests, mimicking natural disturbance patterns and avoiding conversion to northern hardwood or mixed-wood stands.
- Always **consult a licensed New Hampshire forester** before conducting a timber harvest on your property. Understand and follow all laws pertaining to the harvesting of trees near wetlands and waterbodies. Follow established Best Management Practices, and harvest timber near wetlands only when the soils are either frozen (winter) or very dry (summer).



Species Focus

of conservation concern

American marten

American marten is listed as a state-threatened species in New Hampshire. These mammals, residents of NH's north country, require mature conifer forests with many stumps, logs, and fallen trees. Marten use this habitat for denning in winter and they hunt in and around fallen logs for prey such as mice, voles, and squirrels. Marten will also eat berries, birds, eggs, and nuts when available. They will not use young forests or forest edges, but will use partially-harvested stands where large snags, large trees, and a significant percentage (30-60%) of the forest canopy is intact. Marten have been documented recently as far south as Wolfeboro, NH.



American marten

Three-toed woodpecker

Three-toed woodpeckers are listed as a state-threatened species in New Hampshire. They live in northern New Hampshire, in moist, mature spruce-fir forests and bogs with abundant snags. They feed on spruce budworm and bark beetles, insects which are most abundant in dead and dying trees. Protecting existing snags, and allowing (where practical) natural disturbances such as wind, insect infestations, fire, or beaver activity to kill mature trees in lowland spruce-fir forests will help create conditions to support three-toed woodpeckers. In mature stands, lengthening timber harvest rotations to greater than 70 years will also allow natural tree death to occur (especially of fir) and create snags.



Three-toed woodpecker

Spruce grouse

Spruce grouse are found in northern New Hampshire in dense conifer forests and bogs, especially those that include forest openings containing blueberries, trees with live branches touching the ground, bog edges, and sparse ground cover. They cannot be hunted in New Hampshire. Young stands of lowland spruce fir forest can be managed to improve conditions for spruce grouse. In young stands of spruce-fir, practices such as thinning to promote growth of branches close to the ground will provide singing areas for males. In older stands, a closed tree canopy will protect spruce grouse from predators, and creating small openings to foster dense cover and blueberry bushes for feeding will also promote habitat conditions for spruce grouse.



Spruce grouse

Wildlife found in lowland spruce-fir forests

These wildlife species are closely associated with lowland spruce-fir habitats. Be on the lookout for them and follow stewardship guidelines to help maintain or enhance the habitat for these and other wildlife that use lowland spruce-fir forests. Species of conservation concern--those wildlife species identified in the Wildlife Action Plan as having the greatest need of conservation--appear in **bold** typeface.

- **American marten***
- **Bald eagle***
- **Bay-breasted warbler**
- Black-backed woodpecker
- Black bear
- **Canada lynx*****
- Cape May warbler
- **Cooper's hawk**
- **Hoary bat**
- **Mink frog**
- Moose
- **Northern bog lemming**
- **Northern goshawk**
- **Purple finch**
- **Rusty blackbird**
- **Spruce grouse**
- **American three-toed woodpecker***
- White-tailed deer
- **Wood turtle**

* state-threatened species

*** state-endangered, and federally-threatened species

Where to get help

If you have information about a wildlife species of conservation concern, contact NH Fish & Game's Wildlife Division at 603-271-2461. Contact the UNH Cooperative Extension Wildlife Specialist at 603-862-3594 for technical assistance for landowners or your community.

Publications and assistance on forestry and wildlife topics are available through the UNH Extension Educators in Forest Resources in each county. Contact information for each UNH Cooperative Extension office is provided below. Additional publications, contact information, resources, and web versions of all brochures in the Habitat Stewardship Series are available on the UNH Cooperative Extension website at: nhwoods.org.

Belknap County	603-527-5475	Grafton County	603-787-6944	Rockingham County	603-679-5616
Carroll County	603-447-3834	Hillsborough County	603-641-6060	Strafford County	603-749-4445
Cheshire County	603-352-4550	Merrimack County	603-225-5505	Sullivan County	603-863-9200
Coos County	603-788-4961				

Authorship

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About the Habitat Stewardship Series

Much of the land in New Hampshire is privately owned. These individuals are the primary stewards of our wildlife and forests, and also our clean water, scenic views, fresh air, natural and cultural heritage, and recreational resources. The Habitat Stewardship Series has been created to help landowners and land managers recognize the habitats critical for wildlife species at risk, and to illustrate the role private landowners can play in sustaining those species through conservation, management, and sound land stewardship.

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