



Softwood Swamps

Softwood swamps are dominated by coniferous trees. Our softwood swamp natural communities are primarily found in the higher elevations and cooler regions of the state. Northern White Cedar Swamps are typically associated with areas of carbonate-rich bedrock and receive groundwater seepage that has relatively high concentrations of dissolved calcium. Spruce-Fir-Tamarack Swamps are more likely to be associated with acidic bedrock types, although some mineral enrichment may occur. Black Spruce Swamps are typically the most acidic of our softwood swamp types. They occur over acidic bedrock or on peat of sufficient depth to effectively isolate the swamp surface from significant mineral enrichment.

Hemlock Swamps, in contrast, are found in the lower elevations and warmer regions of Vermont and are typically associated with some mineral enrichment.

The dense evergreen canopy of most softwood swamps creates a dark, moist forest interior. The low light levels result in a sparse cover of herbaceous plants. These conditions are ideal for bryophytes, which typically form a nearly continuous carpet over hummocks and hollows. Most of our softwood swamps occur on organic soils that are saturated throughout the year and do not experience seasonal flooding.



A Northern White Cedar Swamp in the Northeastern Highlands.

▶ HOW TO IDENTIFY

Softwood Swamp Natural Communities

Read the short descriptions that follow and choose the community that fits best. Then go to the page indicated and read the full community profile to confirm your decision.

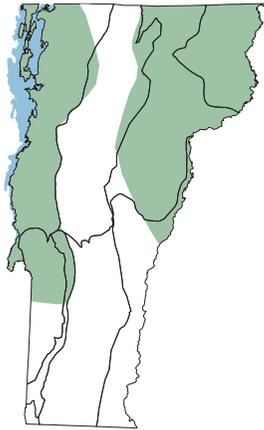
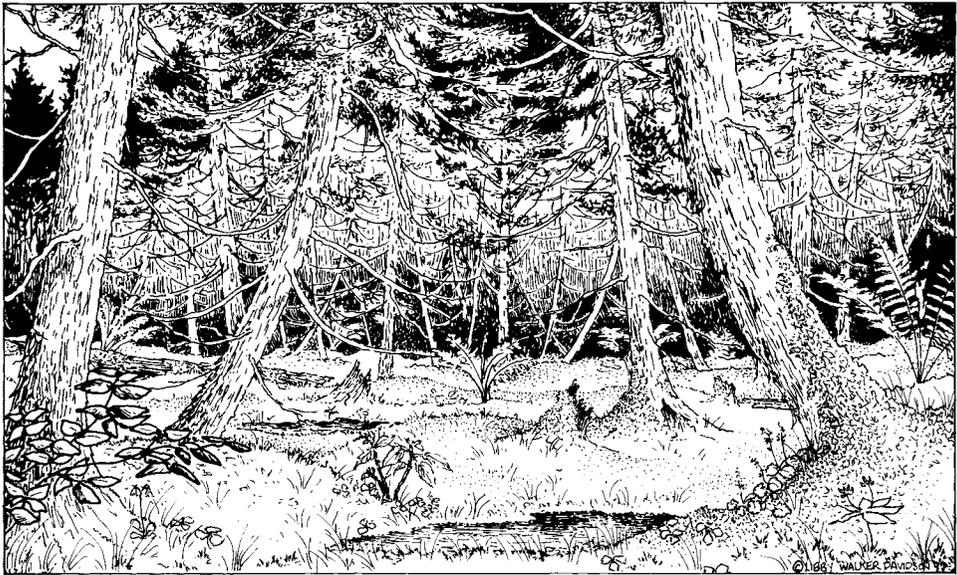
Northern White Cedar Swamp: Northern white cedar dominates these swamps, but balsam fir and black ash may be abundant. Stair-step moss and shaggy moss are characteristic. Most commonly found in areas of calcareous bedrock. Soils are permanently saturated and are typically organic. Go to page 288.

Spruce-Fir-Tamarack Swamp: Red spruce, black spruce, balsam fir, or tamarack vary in their dominance of this cold climate community. Tall shrubs are abundant, especially mountain-holly and wild raisin. Sphagnum moss covers the hummocky ground. Saturated organic soils are shallow. Go to page 293.

Black Spruce Swamp: A dense canopy of black spruce and a ground cover of sphagnum moss, Schreber's moss, three-seeded sedge, goldthread, and creeping snowberry characterize the vegetation of this cold climate community. The saturated organic soils are relatively deep and the water very acidic. Go to page 296.

Hemlock Swamp: Although hemlock is dominant, yellow birch, black ash, and red maple may all be common in the canopy. Cinnamon fern and sphagnum moss are dominant. Soils are typically saturated woody mucks. This community occurs in warmer climate areas of the state below 1,800 feet elevation. Go to page 299.

NORTHERN WHITE CEDAR SWAMP



DISTRIBUTION/ABUNDANCE

Northern White Cedar Swamps occur from the Great Lakes states across northern New York, Vermont, New Hampshire, and Maine, and north into Ontario, Québec, and the maritime provinces. In Vermont, they occur in the Northeastern Highlands, Northern Vermont Piedmont, and the northern Champlain Valley. They do not occur in the Green Mountains.

ECOLOGY AND PHYSICAL SETTING

The dark, cool interior of a Northern White Cedar Swamp is an intriguing place. Mossy hummocks, water-filled hollows, the occasional sound of water gurgling just below the surface, and the chance of finding a rare plant or beautiful orchid have long attracted naturalists to these swamps.

The typical Northern White Cedar Swamp in Vermont is a closed canopy conifer swamp associated with mineral-enriched groundwater seepage. These swamps occur in a variety of physical settings, including wetland basins, lakesides, and valley bottoms adjacent to streams. These settings are predominantly in areas with calcareous bedrock or calcareous glacial deposits, although to the north, Northern White Cedar Swamps occur in non-calcareous conditions as well. Northern White Cedar Swamps range in size from several acres to over 100 acres, although the majority are less than 40 acres.

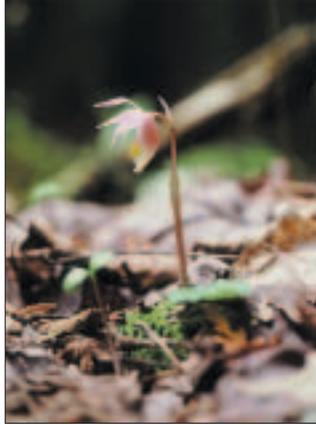
Northern White Cedar Swamps have organic soil horizons that are shallow to moderately deep (1 to 18 feet). These organic soils are primarily well-decomposed (sapric) muck, often with wood fragments throughout. Surface waters in these swamps are circumneutral to slightly acidic (pH ranges from 5.9 to 7.6) and originate from seeps and springs at the edges of the swamps as well as from overland flow. Although Northern White Cedar Swamps occur in stream valleys and adjacent to lakes and ponds, seasonal flooding is not characteristic.

NORTHERN WHITE CEDAR SWAMP

VEGETATION

The generally closed canopy of Northern White Cedar Swamps creates a dark, cool forest floor. Leaning trees and blowdowns are common in more mature swamps, resulting in well-developed hummocks and hollows. Hollows often contain shallow standing water. The low light levels in most Northern White Cedar Swamps result in low abundances of shrubs and herbaceous plants, but these conditions, as well as high moisture levels, are ideal for mosses and liverworts that often carpet the ground. Overall, Northern White Cedar Swamps have a rich flora.

Northern white cedar usually dominates the low, closed canopy of these swamps, and in some areas cedar may be the only tree species present. Northern white cedar is a long-lived species. It is not uncommon to find cedars growing in swamps that are 100 years old and individuals over 200 years old have also been documented in Vermont. Balsam fir is the most common canopy associate. Occasional taller white pine, red spruce, and tamarack emerge above this low canopy. The tall and short shrub layers are generally very sparse, although several species are very characteristic, including the creeping dwarf raspberry, Canada honeysuckle, alder-leaved buckthorn, Canada yew, and mountain maple. In most swamps, seedling and sapling regeneration of cedar and balsam fir is abundant, and these species may form dense thickets in areas where the canopy has been opened by blowdowns and more light reaches the forest floor. When live cedar trees are blown down, it is common to see one or more of their branches become the next generation of trees.



The delicate fairy-slipper is one of the many orchids found in Northern White Cedar Swamps.

The herbaceous layer of Northern White Cedar Swamps is also sparse and is typically made up of fine-leaved sedges and low herbs scattered over mossy hummocks and hollows. Bryophytes thrive in the cool, moist, shaded conditions of cedar swamp interiors and often form nearly complete carpets over the hummocks and the hollows without standing water. Groundwater seeps are common at the edges of cedar swamps and are often dominated by golden saxifrage and several species of bryophytes. Northern White Cedar Swamps provide habitat for an impressive number of rare plants, largely due to the calcium-rich waters that flow through them. Some of the beautiful orchids that are found in Northern White Cedar Swamps include fairy-slipper, ram's head lady's slipper, small yellow lady's slipper, and showy lady's slipper.

ANIMALS

Several species of birds are commonly associated with Northern White Cedar Swamps during the spring breeding season, including yellow-bellied flycatcher, winter wren, northern waterthrush, Canada warbler, yellow-rumped warbler, white-throated sparrow, and northern parula. Northern White Cedar Swamps provide important winter cover and a food source for white-tailed deer. Masked shrew, deer mouse, short-tailed shrew, and red-backed vole have all been shown to use Northern White Cedar Swamps in Vermont. Beaver are often present in Northern White Cedar Swamps that are associated with perennial streams. Their impoundments are an important form of natural disturbance.

VARIANTS

Northern White Cedar Sloping

Seepage Forest: This community variant differs from the typical Northern White Cedar Swamp in that it occurs on a gentle slope and has shallow (0.3 to 2 feet), highly decomposed muck soils. Groundwater seeps are often evident and water can be seen or heard moving just below the soil surface. Yellow birch is more common and is mixed with the dense cedar canopy. Herbaceous plants that are more typical of upland conditions are common, including intermediate wood fern, oak fern, long beech fern, lady fern, foamflower, common wood sorrel, sarsaparilla, peduncled sedge, and shining clubmoss. There is low bryophyte cover and the ground surface is generally flat with many areas of bare soil.

Boreal Acidic Northern White Cedar Swamp: This variant has moderately decomposed organic soils, well-developed hummocks and hollows, and generally more acid surface waters. Black spruce and balsam fir share the canopy with northern white cedar. Additional shrubs include velvetleaf blueberry, Labrador tea, and sheep laurel. Several species of sphagnum moss carpet the swamp floor, especially *Sphagnum girgensohnii*, *Sphagnum centrale*, and *Sphagnum angustifolium*.

Hemlock-Northern White Cedar

Swamp: Near the southern range limit of northern white cedar in Vermont (Orange, Windsor, and Rutland Counties), hemlock may be a codominant in the canopy of these swamps.

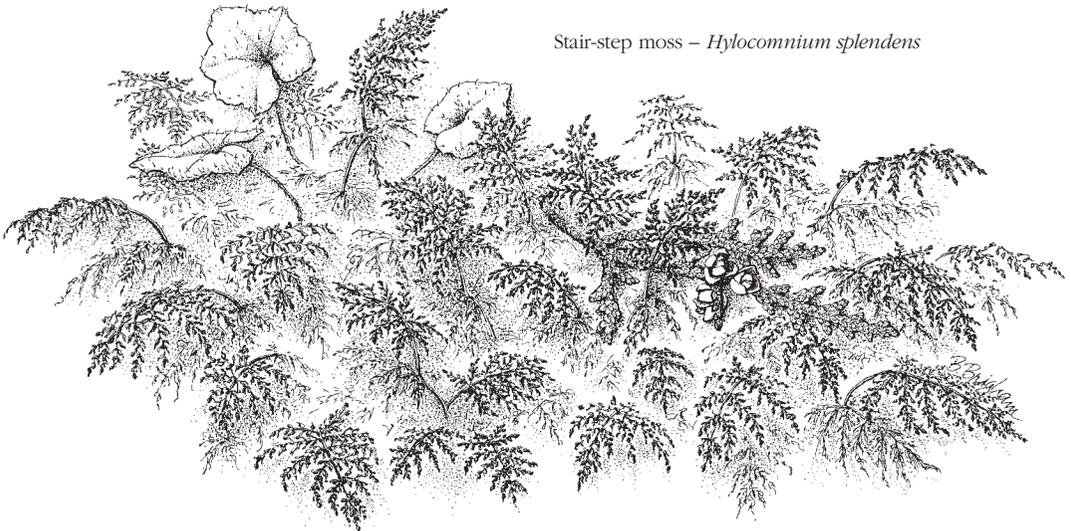
RELATED COMMUNITIES

Rich and Intermediate Fens: Northern White Cedar Swamps may be adjacent to open fen communities, and because of the mineral-rich groundwater source, the two communities have a number of species in common. There are often small fen openings in cedar swamps.

Red Maple-Northern White Cedar

Swamp: Northern White Cedar Swamps may grade into Red Maple-Northern White Cedar Swamps, especially in the Champlain Valley. The presence of significant amounts of red maple or black ash in the canopy and seasonal flooding from adjacent rivers or due to basin and watershed morphology distinguish these swamps from Northern White Cedar Swamps.

Spruce-Fir-Tamarack Swamp and Black Spruce Swamp: Northern White Cedar Swamps often occur with and may grade into Spruce-Fir-Tamarack Swamps and Black Spruce Swamps, both of which generally occur in more acidic conditions. The Boreal Acidic Northern White Cedar Swamp is more likely to be associated with Black Spruce Swamps.



Stair-step moss – *Hylocomnium splendens*

Limestone Bluff Cedar-Pine Forest:

Northern white cedar also occurs in upland forests. The Limestone Bluff Cedar-Pine Forest of the Champlain Valley occurs on limestone and dolomite bluffs. Cedar may also form dense early-successional forests on abandoned agricultural land with calcareous soils, but this community may not persist.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

Northern White Cedar Swamps are an uncommon wetland community in Vermont. Because of the value of cedar wood for shingles and posts, logging has occurred in most cedar swamps and there are very few in an undisturbed condition. Northern white cedar cannot tolerate extended flooding, and artificial impoundments have reduced or eliminated cedar from some swamps. Many good examples of Northern White Cedar Swamps are located and protected on state and private conservation lands.



Stair-step moss detail

PLACES TO VISIT

Long Pond Preserve, Greensboro, The Nature Conservancy
Roy Mountain Wildlife Management Area, Barnet, Vermont Department of Fish and Wildlife (VDFW)
Dolloff Ponds and Marl Pond, Willoughby State Forest, Sutton and Westmore, Vermont Department of Forests, Parks, and Recreation (VDFPR)
Victory Basin Wildlife Management Area, Victory, VDFW
Pine Mountain Wildlife Mangement Area, Topsham, VDFW
Stoddard Swamp, Groton State Forest, VDFPR
Bliss Pond Cedar Swamp, Calais, Calais Town Forest

SELECTED REFERENCES AND FURTHER READING

Sorenson, E., B. Engstrom, M. Lapin, R. Popp, and S. Parren. 1998. Northern white cedar swamps and red maple-northern white cedar swamps of Vermont. Vermont Nongame and Natural Heritage Program.

CHARACTERISTIC PLANTS

TREES

Abundant Species

Northern white cedar – *Thuja occidentalis*
Balsam fir – *Abies balsamea*

Occasional to Locally Abundant Species

Black ash – *Fraxinus nigra*
Yellow birch – *Betula alleghaniensis*
White pine – *Pinus strobus*
Tamarack – *Larix laricina*
Red spruce – *Picea rubens*
Black spruce – *Picea mariana*
White spruce – *Picea glauca*
Red maple – *Acer rubrum*
Paper birch – *Betula papyrifera*
Eastern hemlock – *Tsuga canadensis*

SHRUBS

Abundant Species

Dwarf raspberry – *Rubus pubescens*
Canada honeysuckle – *Lonicera canadensis*
Alder-leaved buckthorn – *Rhamnus alnifolia*

Occasional to Locally Abundant Species

Canada yew – *Taxus canadensis*
Mountain maple – *Acer spicatum*
Winterberry holly – *Ilex verticillata*
Mountain-holly – *Nemopantibus mucronatus*
Wild raisin – *Viburnum nudum* var. *cassinoides*
Red-osier dogwood – *Cornus sericea*
Speckled alder – *Alnus incana*

HERBS

Abundant Species

Three-seeded sedge – *Carex trisperma*
Two-seeded sedge – *Carex disperma*
Delicate-stemmed sedge – *Carex leptalea*
Peduncled sedge – *Carex pedunculata*
Naked miterwort – *Mitella nuda*
Bunchberry – *Cornus canadensis*
Goldthread – *Coptis trifolia*
Twinflower – *Linnaea borealis*
Common wood sorrel – *Oxalis acetosella*
Starflower – *Trientalis borealis*

Occasional to Locally Abundant Species

Swollen sedge – *Carex intumescens*
Fowl mannagrass – *Glyceria striata*
Cinnamon fern – *Osmunda cinnamomea*
Oak fern – *Gymnocarpium dryopteris*
One-sided pyrola – *Pyrola secunda*
Dewdrop – *Dalibarda repens*
Long beech fern – *Thelypteris ptegopteris*
Crested wood fern – *Dryopteris cristata*
Foamflower – *Tiarella cordifolia*

Broad-lipped twayblade – *Listera convallarioides*
One-flowered pyrola – *Moneses uniflora*
Creeping snowberry – *Gaultheria hispida*
Golden saxifrage – *Chrysosplenium americanum*

BRYOPHYTES

Abundant Species

Stair-step moss – *Hylocomnium splendens*
Shaggy moss – *Rhytidiadelphus triquetrus*
Liverwort – *Bazzania trilobata*
Moss – *Sphagnum warnstorffii*
Common fern moss – *Thuidium delicatulum*

Occasional to Locally Abundant Species

Moss – *Trichocolea tomentella*
Moss – *Sphagnum squarrosum*
Moss – *Sphagnum subtile*
Moss – *Sphagnum centrale*

Wet Hollow Species

Moss – *Calliargon cordifolium*
Moss – *Calliargon giganteum*
Moss – *Mnium punctatum*
Moss – *Rhytidiadelphus squarrosus*
Moss – *Amblystegium riparium*
Starry campylium – *Campylium stellatum*

RARE AND UNCOMMON PLANTS

Sheathed sedge – *Carex vaginata*
Swamp valerian – *Valeriana uliginosa*
Fairy-slipper – *Calypto bulbosa*
White adder's mouth – *Malaxis monophyllos*
Ram's head lady's slipper – *Cypripedium arietinum*
Sweet coltsfoot – *Petasites frigidus* var. *palmatum*
Pink pyrola – *Pyrola asarifolia*
Bog aster – *Aster nemoralis*
Drooping bluegrass – *Poa saltuensis*
Small yellow lady's slipper – *Cypripedium calceolus* var. *parviflorum*
Showy lady's slipper – *Cypripedium reginae*
Swamp thistle – *Cirsium muticum*
Swamp fly honeysuckle – *Lonicera oblongifolia*
Mountain fly honeysuckle – *Lonicera caerulea* (*L. villosa*)
Moss – *Calliargon richardsonii*
Moss – *Calliargon obtusifolium*
Moss – *Meesia triquetra*



DISTRIBUTION/ ABUNDANCE

Spruce-Fir-Tamarack Swamps occur throughout northern New York and New England, southern Québec, and the Maritime Provinces. Similar communities also occur in the Appalachian Mountains to the south. In Vermont, these swamps are found in the cooler climate areas, including the Green Mountains, the northern part of the state, and in cold depressions.



ECOLOGY AND PHYSICAL SETTING

Spruce-Fir-Tamarack Swamps are one of Vermont's boreal swamp types, occurring in the colder regions of the state. These swamps are typically found in topographic basins that have little surface water movement. They may occur in isolation from other wetland types or as part of larger wetland complexes. When occurring in streamside wetland complexes, Spruce-Fir-Tamarack Swamps occupy portions of these wetland basins that do not receive flooding or nutrient enrichment from the streams. Spruce-Fir-Tamarack Swamps range in size from just a few acres to over 100 acres.

Spruce-Fir-Tamarack Swamps have organic peat soils that are generally saturated throughout the year due to impeded drainage from the basin. The organic soils are relatively shallow, overlying mineral soils of various types. These swamps are acidic, but may receive some mineral enrichment from surface water runoff or from groundwater seepage near the swamp margins. Spruce-Fir-Tamarack Swamps are associated with acidic bedrock and surficial deposits. The relative abundance of tamarack and red spruce in these swamps is likely related to the degree of mineral enrichment, with abundant tamarack indicating more mineral enrichment. Tamarack is also very shade intolerant and may be more abundant in early to mid-successional examples of this community type. Spruce-Fir-Tamarack Swamps commonly grade into Black Spruce Swamps as peat becomes deeper, and there is greater isolation from surface runoff and the underlying mineral soils.

Wind is the primary source of natural disturbance to the shallow-rooted trees of the swamp canopy, resulting in canopy openings of various sizes. As with other forested wetlands that may occur near streams, beaver impoundments may inundate portions of Spruce-Fir-Tamarack Swamps.

SPRUCE-FIR-TAMARACK SWAMP

VEGETATION

The interiors of Spruce-Fir-Tamarack Swamps have a distinct structure. The straight, vertical trunks of red and/or black spruce, balsam fir, and tamarack dominate the relatively closed canopy. There is a well-developed tall shrub layer of mountain-holly and wild raisin, and a sparser low shrub layer that typically includes sheep laurel. In more boggy conditions, rhodora, Labrador tea, bog laurel, or leatherleaf may be present.

The low hummocks and shallow hollows are carpeted by mosses, including several species of sphagnum moss, knight's plume moss, windswept mosses, and the ubiquitous moss of the north, Schreber's moss. The hollows seldom contain standing water. Scattered delicate herbs mix with tall ferns on the mossy hummocks. Three-seeded sedge, poor sedge, cinnamon fern, three-leaved false solomon's seal, and creeping snowberry are among the characteristic species.



Mountain-holly is abundant in the tall shrub layer of Spruce-Fir-Tamarack Swamps.

ANIMALS

Some breeding birds of Spruce-Fir-Tamarack Swamps and Black Spruce Swamps of northeastern Vermont include olive-sided flycatcher, spruce grouse (rare), black-backed woodpecker (rare), boreal chickadee, gray jay (rare), Nashville warbler, northern parula, magnolia warbler, and ruby-crowned kinglet. This community also provides habitat for the masked shrew, red squirrel, red-backed vole, and southern bog lemming (uncommon). The dense coniferous canopy of this community also provides winter cover for white-tailed deer. Four-toed salamanders may be found in these sphagnum-rich swamps.

VARIANTS

Red Spruce-Hardwood Swamp:
Red spruce is abundant but red maple,

yellow birch, black ash, or gray birch are a significant component in the relatively open canopy of this swamp variant. Mountain-holly, winterberry holly, and highbush blueberry are the dominant shrubs and cinnamon fern is abundant over the sphagnum-dominated hummocks and hollows. Organic soils of various depths are present.

RELATED COMMUNITIES

Black Spruce Swamp: Spruce-Fir-Tamarack Swamps commonly occur adjacent to and may grade into Black Spruce Swamps, which are dominated by black spruce and typically have deeper organic soils and less mineral enrichment.

Northern White Cedar Swamp:

Northern White Cedar Swamps occur where there is groundwater seepage that is richer in dissolved calcium and magnesium. Northern white cedar dominates these swamps and the bryophyte layer is distinctly different.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

Most of the larger Spruce-Fir-Tamarack Swamps in Vermont have been logged repeatedly for the high quality softwoods they can produce. Several high quality examples occur on state and private conservation land.

PLACES TO VISIT

Wenlock Wildlife Management Area,
Ferdinand, Vermont Department of Fish and Wildlife (VDFW)
Victory Basin Wildlife Management Area,
Victory, VDFW
Bear Swamp, Wolcott, Center for Northern Studies

CHARACTERISTIC PLANTS

TREES

Abundant Species

Black spruce – *Picea mariana*
 Red spruce – *Picea rubens*
 Balsam fir – *Abies balsamea*

Occasional to Locally Abundant Species

Tamarack – *Larix laricina*
 Red maple – *Acer rubrum*
 Yellow birch – *Betula alleghaniensis*
 Paper birch – *Betula papyrifera*

SHRUBS

Abundant Species

Mountain-holly – *Nemopanthus mucronatus*
 Wild raisin – *Viburnum nudum* var. *cassinoides*
 Sheep laurel – *Kalmia angustifolia*
 Creeping snowberry – *Gaultheria bispidula*

Occasional to Locally Abundant Species

Rhodora – *Rhododendron canadense*
 Labrador tea – *Ledum groenlandicum*
 Bog laurel – *Kalmia polifolia*
 Leatherleaf – *Chamaedaphne calyculata*

HERBS

Abundant Species

Three-seeded sedge – *Carex trisperma*
 Cinnamon fern – *Osmunda cinnamomea*
 Three-leaved false solomon's seal – *Smilacina trifolia*
 Canada mayflower – *Maianthemum canadense*

Occasional to Locally Abundant Species

Poor sedge – *Carex paupercula*
 Bluebead lily – *Clintonia borealis*
 Crested wood fern – *Dryopteris cristata*
 Whorled aster – *Aster acuminatus*
 Twinflower – *Linnaea borealis*
 Bunchberry – *Cornus canadensis*

BRYOPHYTES

Abundant Species

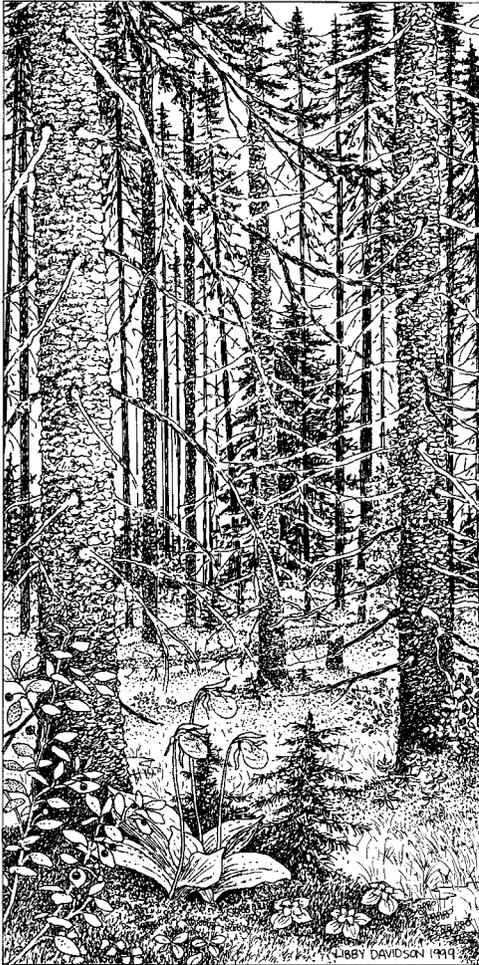
Moss – *Sphagnum girgensohnii*
 Moss – *Sphagnum angustifolium*
 Schreber's moss – *Pleurozium schreberi*

Occasional to Locally Abundant Species

Knight's plume moss – *Ptilium crista-castrensis*
 Moss – *Sphagnum wulfianum*
 Windswept mosses – *Dicranum* spp.
 Liverwort – *Bazzania trilobata*
 Moss – *Aulacomnium palustre*

RARE AND UNCOMMON PLANTS

Mountain fly honeysuckle – *Lonicera caerulea*
 (*L. villosa*)
 Yellow bartonia – *Bartonia virginica*



ECOLOGY AND PHYSICAL SETTING

Black Spruce Swamps are dark and cool. The dark-trunked spruce trees grow straight but not especially tall and have many small, dead, low branches. Although well shaded, the green, mossy hummocks and hollows are a sharp and lively contrast.

Black Spruce Swamps occur in the coldest regions of Vermont, commonly in topographic depressions that receive cold air drainage. They occupy large and small basins with impeded surface water movement. This community is often considered transitional between Black Spruce Woodland Bogs and Spruce-Fir-Tamarack Swamps, and it may occur in association with either or both of these communities. Black Spruce Swamps range in size from 10 to over 100 acres.

The organic soils may range in depth from less than three feet to over ten feet. They also vary in their degree of decomposition but are generally made up of partially decomposed wood fragments and sphagnum moss. The peat is saturated throughout the year. Black Spruce Swamps are one of the most acidic of our swamp types and are found in areas of the state with acidic bedrock or in basins that have developed peat of sufficient depth to isolate the surface of the swamp from any significant mineral enrichment from ground or surface waters.

The primary form of natural disturbance in Vermont's Black Spruce Swamps is wind, which continually creates canopy gaps and occasionally creates large areas of toppled trees.

VEGETATION

Black spruce dominates the canopy of these swamps that have low vascular plant diversity. The canopy varies substantially in the degree of closure from swamp to swamp, with the boggy examples having open canopies and the more enriched examples having closed canopies. Scattered tamarack may be present in some swamps, typically growing substantially taller than the black

DISTRIBUTION/ ABUNDANCE

Black Spruce Swamps are found throughout the colder regions of Vermont. Similar swamps occur throughout the boreal forest zone of the northern hemisphere and extend south into the lake states and New England, where they are commonly associated with bogs in cold depressions.



BLACK SPRUCE SWAMP

spruce canopy. Tall shrub cover is sparse and usually includes mountain-holly and wild raisin. Red maple, balsam fir, and paper birch may also occur in the tall shrub layer, along with black spruce regeneration of all sizes. Low shrubs can be abundant and include common bog species such as Labrador tea, bog laurel, and sheep laurel. Creeping snowberry is also usually present.

Mosses form a green carpet over the low hummocks and the shallow hollows, most of which do not contain standing water. Several species of sphagnum moss dominate the mossy carpet, along with Schreber's moss. Three-seeded sedge is abundant and other common herbs include bluehead lily, three-leaved solomon's seal, goldthread, poor sedge, pink lady's slipper, and bunchberry.

ANIMALS

Some breeding birds of Black Spruce Swamps of northeastern Vermont include olive-sided flycatcher, spruce grouse (rare), black-backed woodpecker (rare), boreal chickadee, gray jay (rare), Nashville warbler, northern parula, magnolia warbler, bay-breasted warbler, and ruby-crowned kinglet. This community also provides habitat for the masked shrew, red squirrel, red-backed vole, and southern bog lemming (uncommon). The dense coniferous canopy provides winter cover for white-tailed deer. Four-toed salamanders may be found amidst the sphagnum moss in these swamps.

VARIANTS

None recognized at this time.

RELATED COMMUNITIES

Spruce-Fir-Tamarack Swamp: The canopy of these swamps may include red spruce, balsam fir, and tamarack along

with black spruce. Peat depths tend to be shallower, and there is typically more mineral enrichment than in Black Spruce Swamps.

Black Spruce Woodland Bog: This open canopy woodland has well-developed hummocks and hollows, deep peat, and is transitional between Black Spruce Swamps and Dwarf Shrub Bogs.



This handsome spruce grouse struts his stuff in the Black Spruce Swamps of the Northeastern Highlands.

CONSERVATION STATUS AND MANAGEMENT

CONSIDERATIONS

The primary threat to this community is repeated heavy logging, which can have significant long term effects on species composition and successional trends. Natural disturbance by wind creates tip-ups of individual trees or small

groups of trees. This process leads to creation of hummocks and hollows and creates canopy openings that provide habitat for some animal species. Even selective logging will not create the microtopography that is characteristic of this and other forested swamps. Operation of heavy machinery can create ruts that may persist for many years and that alter surface water hydrology. There are some excellent examples of this community protected on state-owned land.

PLACES TO VISIT

Alburg Dunes State Park, Alburg, Vermont
Department of Forests, Parks, and Recreation
Yellow Bogs of the Nulhegan Basin, Lewis,
U.S. Fish and Wildlife Service
Wenlock Wildlife Management Area,
Ferdinand, Vermont Department of Fish
and Wildlife (VDFW)
Victory Basin Wildlife Management Area,
Victory, VDFW
Lost Pond Bog, Mount Tabor, Green
Mountain National Forest

CHARACTERISTIC PLANTS

TREES

Abundant Species

Black spruce – *Picea mariana*

Occasional to Locally Abundant Species

Tamarack – *Larix laricina*

Red maple – *Acer rubrum*

Balsam fir – *Abies balsamea*

Paper birch – *Betula papyrifera*

SHRUBS

Abundant Species

Mountain-holly – *Nemopanthis mucronatus*

Wild raisin – *Viburnum nudum* var.
cassinoides

Labrador tea – *Ledum groenlandicum*

Bog laurel – *Kalmia polifolia*

Occasional to Locally Abundant Species

Low sweet blueberry – *Vaccinium*
angustifolium

Velvetleaf blueberry – *Vaccinium myrtilloides*

Rhodora – *Rhododendron canadense*

HERBS

Abundant Species

Three-seeded sedge – *Carex trisperma*

Goldthread – *Coptis trifolia*

Creeping snowberry – *Gaultheria bispidula*

Occasional to Locally Abundant Species

Poor sedge – *Carex paupercula*

Bluebead lily – *Clintonia borealis*

Three-leaved false solomon's seal – *Smilacina*
trifolia

Pink lady's slipper – *Cypripedium acaule*

Indian pipes – *Monotropa uniflora*

Bunchberry – *Cornus canadensis*

Wintergreen – *Gaultheria procumbens*

BRYOPHYTES

Abundant Species

Moss – *Sphagnum girgensohnii*

Moss – *Sphagnum angustifolium*

Schreber's moss – *Pleurozium schreberi*

Occasional to Locally Abundant Species

Moss – *Sphagnum magellanicum*

Moss – *Sphagnum capillifolium*

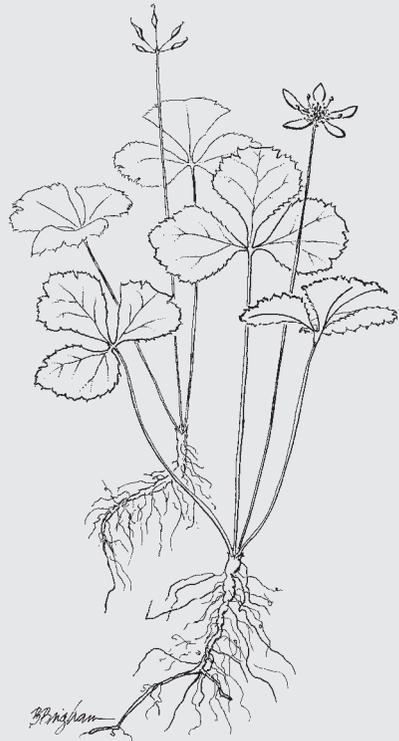
Moss – *Sphagnum wulfianum*

Moss – *Sphagnum russowii*

Windswept moss – *Dicranum undulatum*

RARE AND UNCOMMON PLANTS

Moose dung moss – *Splachnum ampullaceum*

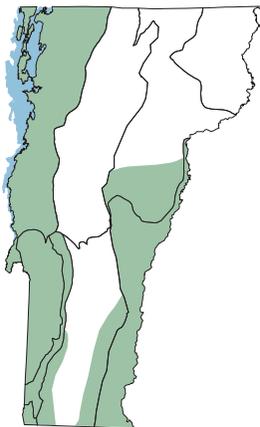


Goldthread – *Coptis trifolia*



DISTRIBUTION/ ABUNDANCE

Hemlock Swamps are found in the warmer regions of Vermont, generally below 1,800 feet elevation. They occur throughout the southern portion of New England. Related Hemlock Swamps that include tuliptree and rhododendron extend south to Georgia.



ECOLOGY AND PHYSICAL SETTING

The Hemlock Swamps of Vermont have received little detailed study and are therefore poorly understood. The following descriptions are based on study of only a few swamps in the state.

Hemlock Swamps occupy small to moderate sized basins that receive some mineral enrichment from surface water runoff or groundwater seepage. The amount of mineral enrichment varies with the characteristics of the associated bedrock and surficial deposits. Water at or near the soil surface is generally acidic. Soils are saturated woody mucks that vary in depth from less than two feet to over four feet. In some swamps, the water table fluctuates seasonally, with standing water in hollows in the spring and a drier soil surface in the summer. Under such conditions organic material is more exposed to air and more readily decomposed, resulting in a shallow surface organic soil horizon. It is unlikely that Hemlock Swamps flood, as hemlock is not flood tolerant. Although many Hemlock Swamps may be only several acres, swamps of up to 50 acres are also known.

Hemlock Swamps are more abundant in the warmer regions of Vermont. It is interesting to note that there is not much overlap in the distribution of Northern White Cedar Swamps and Hemlock Swamps in the state. Hemlock Swamps become much more abundant in the southern half of the state, where there is little northern white cedar. A few swamps with both hemlock and cedar have been documented in Orange and Rutland Counties.

VEGETATION

The dense, nearly closed canopy of hemlock allows little light to penetrate to the forest floor, resulting in an open understory with few shrubs, abundant ferns and a ground cover of mosses. Yellow birch, red maple, and black ash are common associates in the canopy. In mature Hemlock Swamps, downed trees are common. Decomposing, moss-

covered logs and stumps provide ideal germination sites for hemlock and yellow birch. Hemlock is extremely shade tolerant and is commonly the dominant woody species in both the tall and short shrub layers. Winterberry holly and Canada honeysuckle are common shrubs. Highbush blueberry may be present in warmer parts of the state. The presence of alder-leaved buckthorn in some swamps indicates mineral enrichment.

Cinnamon fern is the dominant herbaceous plant, growing primarily on the low hummocks. Other herbs on the hummocks include goldthread, Canada mayflower, and partridgeberry. The moist, moss-covered hollows contain three-seeded sedge and scattered sensitive fern and royal fern. Mosses and liverworts may form nearly 100 percent cover, including several species of sphagnum moss, common fern moss, and Schreber's moss. The occasional water-filled hollows provide habitat for *Calliargon cordifolium*.

ANIMALS

Brown creepers and winter wrens are birds that breed in Hemlock Swamps. Hemlock Swamps may also provide winter cover for white-tailed deer. Additional study is needed to identify animal species that utilize these swamps.

VARIANTS

Hemlock-Hardwood Swamp: These are mixed forests in which red maple, yellow birch, and black ash co-dominate the canopy with hemlock. Cinnamon fern and sphagnum moss may be abundant. Additional study of this community is needed.

RELATED COMMUNITIES

Northern White Cedar Swamp: Cedar swamps are typically easily distinguished from Hemlock Swamps by their canopy dominants. Across the central part of Vermont, however, hemlock and cedar may occur together in swamps.

Red Maple-Black Gum Swamp: Red maple-black gum swamps may contain significant amounts of hemlock in the canopy. Similar to Hemlock Swamps, they typically occur in small basins with accumulations of organic soils and have a ground cover dominated by Sphagnum mosses.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

There are only a few high quality examples of this community known in the state, with only one swamp known on public land. It is unknown whether hemlock regenerates in swamps that have been heavily cut. A statewide inventory of these and other softwood swamps is needed.

PLACES TO VISIT

Jamaica State Park, Jamaica, Vermont
Department of Forests, Parks, and Recreation

CHARACTERISTIC PLANTS

TREES

Abundant Species

Eastern hemlock – *Tsuga canadensis*

Occasional to Locally Abundant Species

Yellow birch – *Betula allegheniensis*

Red maple – *Acer rubrum*

Black ash – *Fraxinus nigra*

White pine – *Pinus strobus*

Red spruce – *Picea rubens*

SHRUBS

Occasional to Locally Abundant Species

Winterberry holly – *Ilex verticillata*

Canada honeysuckle – *Lonicera canadensis*

Alder-leaved buckthorn – *Rhamnus alnifolia*

Hobblebush – *Viburnum alnifolium*

Highbush blueberry – *Vaccinium corymbosum*

HERBS

Abundant Species

Cinnamon fern – *Osmunda cinnamomea*

Occasional to Locally Abundant Species

Goldthread – *Coptis trifolia*

Canada mayflower – *Maianthemum canadensis*

Three-seeded sedge – *Carex trisperma*

Two-seeded sedge – *Carex disperma*

Delicate-stemmed sedge – *Carex leptalea*

Sensitive fern – *Onoclea sensibilis*

Royal fern – *Osmunda regalis*

Partridgeberry – *Mitchella repens*

Dwarf raspberry – *Rubus pubescens*

Rein orchids – *Habenaria* spp.

BRYOPHYTES

Abundant Species

Moss – *Sphagnum palustre*

Moss – *Sphagnum girgensohnii*

Common fern moss – *Thuidium delicatulum*

Schreber's moss – *Pleurozium schreberi*

Liverwort – *Bazzania trilobata*

Occasional to Locally Abundant Species

Moss – *Sphagnum squarrosum*

Moss – *Sphagnum angustifolium*

Moss – *Sphagnum capillifolium*

Moss – *Mnium punctatum*

Moss – *Calliergon cordifolium*