Oak-Pine-Northern Hardwood Forest Formation

Forests of Vermont's Warmer Climate Areas

The Oak-Pine-Northern Hardwood Forest Formation is a group of forest types with affinities to forests of the so-called Central Hardwood Region, that part of the great Eastern Deciduous Forest that Braun (1950) describes as stretching from Massachusetts and the lower Hudson Valley south to the mountains of Georgia. In the Central Hardwoods, oaks and hickories are common, along with tulip tree, beech, sugar maple, white ash, and formerly American chestnut.

Our Oak-Pine-Northern Hardwood Forest Formation is transitional in many ways between the Central Hardwoods and the Northern Hardwoods, and indeed this formation is called "Transition Hardwood Forest" by the Society of American Foresters and by many ecologists. Oaks, hickories, and pines mix in this formation with the ubiquitous northern hardwood species such as sugar maple, red maple, yellow birch, and beech. These forests are found in the warmer climate areas of Vermont: the Champlain Valley, the lower elevations of the Taconic Mountains, the Vermont Valley, and river valleys in the Southern Vermont Piedmont. Certain tree species, such as chestnut oak, shagbark hickory, and pitch pine, are restricted to this formation, while others, like northern white cedar, are actually more common in northern forests but find unusual niches here in this formation.

The Oak-Pine-Northern Hardwood Forest Formation is difficult to map on a broad scale: forests in this formation are sometimes found only locally as small patches within Northern Hardwood Forests. These small patches are common in the foothills of the Champlain Valley, for example, where Northern Hardwood Forest is the dominant community, but where forests with more southern affinities occur on dry, south-facing slopes and ridgetops. The same phenomenon occurs in the Taconic Mountains and in the Southern Vermont Piedmont.

In some areas of the state, however, the Oak-Pine-Northern Hardwood Forest Formation is dominant. The lower elevations of the Champlain Valley, though mostly agricultural today, were probably dominated by Oak-Pine-Northern Hardwood Forests prior to European settlement. Addison County in particular must have had large areas of Valley Clayplain Forest, while the sandy soils of Chittenden County had significant areas of Pine-Oak-Heath Sandplain Forest.

In spite of the name, Oak-Pine-Northern Hardwood Forest Formation, the communities that make up this group are diverse in their species composition – not all have oaks as dominant species. Instead, they are held together as an ecological group because they all have species that occur in warmer climate areas, or in local situations where soil moisture is low, such as south-facing rocky ridges.

How to Identify

Oak-Pine-Northern Hardwood Forest Formation Natural Communities

Read the four substrate headings and choose the substrate type that best matches the site. Then read the short descriptions that follow and choose the community that fits best. Then go to the page indicated to confirm your decision.

▸ *Substrate: Shallow-to-bedrock soils with deeper soils interspersed, often but not always on ridgetops or knobs.*

Red Pine Forest or Woodland: Maintained by fire, these small areas are dominated by red pine, have very shallow soils, and have blueberries and huckleberries in the understory. They are widespread, and often surrounded by Northern Hardwood Forests. Go to page 155.

Pitch Pine-Oak-Heath Rocky Summit: These are fire-adapted communities on dry, acidic ridgetops where red oak, white oak, pitch pine, scrub oak, and white pine are characteristic trees. Heath shrubs are abundant. Go to page 158.

Limestone Bluff Cedar-Pine Forest: Northern white cedar dominates these areas of shallow soils over calcareous bedrock. Red pine, white pine, hemlock and hardwoods are also present. Characteristic herbs are ebony sedge and rock polypody. Go to page 160.

Red Cedar Woodland: These are open glade-like communities on ledge crests, where red cedar is native and persistent, and grasses and sedges dominate the ground layer. Go to page 163.

Dry Oak Woodland: These are very open areas with trees of low stature on dry, south facing hilltops. Grasses and Woodland sedge are dominant on the forest floor. Go to page 165.

Dry Oak Forest: These forests occur on rocky hilltops with very shallow, infertile soils. Red oak, chestnut oak, white pine, and white oak can all be present; usually other tree species are absent. Heath shrubs dominate the understory. Go to page 167.

▸ *Substrate: Mostly till-derived soils. Clay may be present, and bedrock exposures are found occasionally.*

Dry Oak-Hickory-Hophornbeam Forest: These forests occur on till-derived soils, but they are often found on hilltops, and bedrock exposures are common. Soils are well drained but are more fertile than in Dry Oak Forests. Red oak, sugar maple, hophornbeam, and shagbark hickory are variously dominant. Sometimes sugar maple is the dominant tree, sometimes it is oak and hickory. Woodland sedge forms lawns. Go to page 169.

Mesic Maple-Ash-Hickory-Oak Forest: Sugar maple, white ash, hickories, and red and white oak are present in varying abundances. This community needs better documentation. Go to page 171.

▸ *Substrate: Soils that are mostly derived from lake or marine sediments, either clay or sand. Bedrock exposures may be found scattered within these areas.*

Valley Clayplain Forest: Found on the clay soils of the Champlain Valley, this forest is variously dominated by white oak, swamp white oak, bur oak, hemlock, red maple, and shagbark hickory. Soils are poorly drained. Go to page 174.

White Pine-Red Oak-Black Oak Forest: These forests are found on coarse-textured soils. Red and black oak co-dominate along with white pine. Beech and hemlock are also common. Heath shrubs are common in the understory. Go to page 177.

Pine-Oak-Heath Sandplain Forest: This is a rare community type, found on dry sandy soils in warmer areas. Characteristic species are white pine, pitch pine, black oak, and red oak with an understory dominated by heath shrubs. Go to page 180.

▸ *Substrate: Boulders or rock fragments on a steep slope.*

Transition Hardwood Talus Woodland: These talus woodlands are found in warmer areas, often on limestone but occasionally on slate, schist, granite, gneiss, or other rock. Some characteristic species are red oak, basswood, white ash, sweet birch, bitternut hickory, northern white cedar, hackberry, bulblet fern, and Canada yew. Go to page 184.

Red Pine Forest or Woodland

Distribution/ Abundance

Small examples are found locally at low to moderate elevations (to 2,000 feet) throughout the state, although they are more frequent in the northern half of the state.

Ecology and Physical Setting

Red Pine Forests or Woodlands are among Vermont's most attractive natural communities. Perched as they so often are on rocky ridgetops, surrounded by Northern Hardwood Forest, they are especially striking in autumn when crimson huckleberry leaves make a sharp contrast with the wintergreen's shiny evergreen leaves and green pine needles stand out against the surrounding orange and yellow landscape.

Red Pine Forests or Woodlands are uncommon in Vermont and almost always occur as very small patches in the landscape. They are most common on dry rocky ridgetops or lake bluffs where competition from other species is minimal because of fire, shallow soils, acidity, and drought. Soils are usually shallow podzols; bedrock is often exposed at the surface. A few examples are known from sandy glacial outwash areas in northeastern Vermont. In most cases in Vermont, Red Pine Forests or Woodlands are believed to be fire-maintained communities. Without fire, many red pine stands would eventually succeed to more shade-tolerant species.

This community type does not fit easily into the Oak-Pine-Northern Hardwood Forest Formation since its distribution has more to do with soil conditions than with climate. It is widely distributed and occurs in some of the colder areas of Vermont, including the Northeastern Highlands. It is included in this formation because of its similarity to other communities treated here.

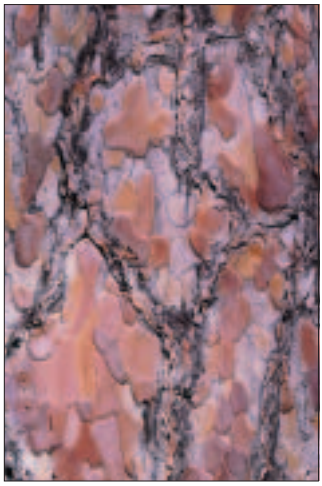
Red pine has been planted extensively throughout Vermont, and red pine plantations should not be confused with natural Red Pine Forests or Woodlands.

Vegetation

Red Pine Forests or Woodlands have open to closed canopies dominated by red pine. Although forests and woodlands are segregated and described separately in most places in this book, we combine them here because red pine forests and red pine woodlands are usually intermixed at any given site, and

all red pine stands are so small that distinguishing between open and closed canopy areas is impractical. Vegetation is similar in both. Heath shrubs dominate the understory where soil is available. Where bedrock is exposed or soil is very thin, mosses such as windswept moss and haircap moss are common. Where the canopy is dense, the understory vegetation tends to be sparse.

Red pine itself, the dominant species in these forests, is especially well adapted to fire. Its bark is thick and resistant to burning. It is not unusual to find two or three separate fire scars, indicating different fires in different years, at the base of a single red pine trunk. Red pine seeds germinate best in a mineral soil seedbed, so a burned ridgetop provides a good place for the species to get established. And red pine can withstand drought much more effectively than most hardwood species that would become established on a rocky ridge, so over time it will survive while species like red maple and shagbark hickory will succumb to severe droughts.



The thick patterned bark of red pine is resistant to fire.

Red pines can reach ages of 275 years in Vermont, but most trees are less than 120 years old. In red pine stands that have been studied in northern Vermont, fires occur every 20 to 100 or more years. These are the times when seeds germinate and new pines become established.

ANIMALS

Most examples of this community are very small and are surrounded by Northern Hardwood Forest. The animals that occur in that community travel through Red Pine Forests or Woodlands. Hermit thrushes can almost always be heard in these forests during their breeding season.

SUCCESSIONAL TRENDS

This community is maintained by periodic small wildfires. In the absence of fire, white pine, red spruce, red oak, red maple, and beech may become more abundant.

RELATED COMMUNITIES

Pitch Pine-Oak-Heath Rocky Summit: This community is similar in soils and ecological processes but is found in warmer climate areas and is therefore dominated by species with more southern affinities, including pitch pine and scrub oak.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

A number of good examples of this community are found on public lands. On private lands, the greatest threat may be fire suppression. This threat grows as more communications towers are built on rocky hilltops.

PLACES TO VISIT

Roy Mountain Wildlife Management Area, Barnet. Vermont Department of Fish and Wildlife

Bristol Cliffs, Bristol, Green Mountain National Forest

Deer Leap, Bristol, The Nature Conservancy (TNC)

Black Mountain Natural Area, Dummerston, TNC

SELECTED REFERENCES AND FURTHER READING

Engstrom, F. Brett. 1988. Fire ecology in six red pine *(Pinus resinosa* Ait.) populations in northwestern Vermont. Master of Science project, University of Vermont.

Engstrom, F. Brett and Daniel H. Mann. 1991. Fire ecology of red pine (*Pinus resinosa)* in northern Vermont, U.S.A. *Canadian Journal of Forest Research* 21: 882-889

Characteristic Plants

Trees

Abundant Species

Red pine – *Pinus resinosa*

Occasional to Locally Abundant Species

White pine – *Pinus strobus*
Red maple – *Acer rubrum*
Beech – *Fagus grandifolia*
Red spruce – *Picea rubens*
Paper birch – *Betula papyrifera*
Red oak – *Quercus rubra*

Shrubs

Abundant Species

Black huckleberry – *Gaylussacia baccata*

Occasional to Locally Abundant Species

Shadbush – *Amelanchier* spp.
Striped maple – *Acer pensylvanicum*
Low sweet blueberry – *Vaccinium angustifolium*
Late low blueberry – *Vaccinium pallidum*

Herbs

Abundant Species

Wintergreen – *Gaultheria procumbens*

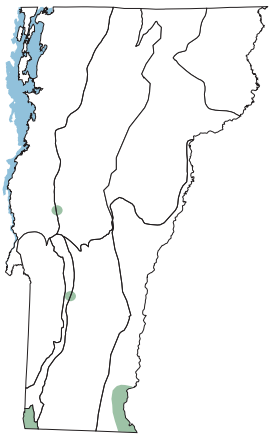
Occasional to Locally Abundant Species

Canada mayflower – *Maianthemum canadense*
Bracken fern – *Pteridium aquilinum*
Sarsaparilla – *Aralia nudicaulis*
Starflower – *Trientalis borealis*
Trailing arbutus – *Epigaea repens*

Rare and Uncommon Plants

Douglas' knotweed – *Polygonum douglasii*

Pitch Pine-Oak-Heath Rocky Summit



Distribution/Abundance

Rare statewide; known only in Vernon, Dummerston, and Pownal in the extreme southern part of the state, in Wallingford in Rutland County, and in the Mount Moosalamoo region near Salisbury.

Ecology and Physical Setting

Pitch Pine-Oak-Heath Rocky Summits in southern Vermont show a striking affinity to woodlands found in southern and coastal New England, with their abundance of pitch pine and the occasional appearance of more southern species such as scrub oak and mountain laurel. In other respects, especially in soil conditions and ecological processes, they are very much like Red Pine Woodlands. Pitch Pine-Oak-Heath Rocky Summits are restricted to dry, open, rocky ridges on acidic bedrock, in the warmer climate areas of the state. Fire almost certainly plays an important role in the maintenance of these communities and dry soils keep many hardwood species from becoming established.

Vegetation

This community is a true woodland, with a canopy cover of less than 60 percent and often closer to 30 percent. Trees are scattered and low growing. Pitch pine is the most common tree. Red and white pine can be common as well, along with oak and red maple. The ground layer is often very sparse, consisting of low grasses and forbs along with scattered low shrubs. Overall species diversity is very low, with heath shrubs dominating.

Pitch pine reaches its northern range limit in Vermont and is restricted almost exclusively here to Pitch Pine-Oak-Heath Rocky Summits and to Pine-Oak-Heath Sandplain Forest. It is a fire-adapted tree, with heat-resistant bark, seeds that germinate well on mineral soil rather than organic soil, and cones that open when subjected to heat. It is also a drought-tolerant tree. This combination of attributes makes it successful in this community.

ANIMALS

Since this is a rare community in Vermont, we have not studied its fauna well. Songbirds and mammals that are common in the adjacent forests, whether they are Northern Hardwood Forests, Dry Oak-Hickory Hophornbeam Forests, or Red Pine Woodlands, use this type of community as well.

SUCCESSIONAL TRENDS

These communities are maintained by occasional fires that keep some deciduous trees from becoming prominent.

VARIANTS

None recognized at this time.

RELATED COMMUNITIES

Red Pine Forest or Woodland: This community is similar ecologically but rarely has pitch pine or scrub oak.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

This is a fire-adapted community, so natural fires should be allowed to burn on hilltops where this community occurs.

PLACES TO VISIT

Black Mountain Natural Area, Dummerston.
The Nature Conservancy

Scrub oak is rare in Vermont and is found primarily in the warm, dry, and shallow soils of Pitch Pine-Oak-Heath Rocky Summits.

CHARACTERISTIC PLANTS

TREES

Abundant Species
Pitch pine – *Pinus rigida*
White pine – *Pinus strobus*
Red pine – *Pinus resinosa*
Red oak – *Quercus rubra*
Red maple – *Acer rubrum*
Occasional to Locally Abundant Species
Eastern hemlock – *Tsuga canadensis*
Paper birch – *Betula papyrifera*
Gray birch – *Betula populifolia*
Black oak – *Quercus velutina*
Scrub oak – *Quercus ilicifolia*
American beech – *Fagus grandifolia*

SHRUBS

Abundant Species
Low sweet blueberry – *Vaccinium angustifolium*
Huckleberry – *Gaylussacia baccata*
Occasional to Locally Abundant Species
Witch hazel – *Hamamelis virginiana*
Black chokeberry – *Aronia melanocarpa*
Low red shadbush – *Amelanchier sanguinea*
Mountain laurel – *Kalmia latifolia*

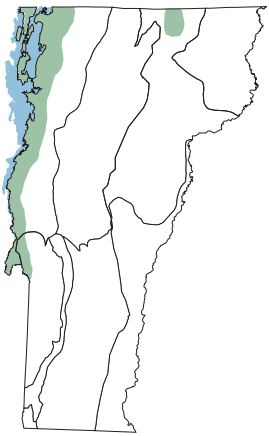
HERBS

Abundant Species
Poverty grass – *Danthonia spicata*
Occasional to Locally Abundant Species
Canada mayflower – *Maianthemum canadense*
Starflower – *Trientalis borealis*
Sarsaparilla – *Aralia nudicaulis*
Hairgrass – *Deschampsia flexuosa*

RARE AND UNCOMMON PLANTS

Scrub oak – *Quercus ilicifolia*
Mountain laurel – *Kalmia latifolia*

Limestone Bluff Cedar-Pine Forest



Distribution/Abundance

Rare statewide. Most common on calcareous bluffs along Lake Champlain, but there are also small examples on Lake Memphremagog. This community occurs on the New York side of Lake Champlain as well, and likely into Québec. Very similar communities are found along the Niagra Escarpment in Ontario.

Ecology and Physical Setting

These are dark, mostly coniferous forests dominated by northern white cedar, which often has twisted or upswept trunks. The community occurs on limestone or dolomite bluffs and outcrops or on outcrops of other calcareous rock. The most typical situations for this community type are the rocky headlands of Lake Champlain. In these situations, the community usually occupies a narrow band along the top of the bluff, although it may extend several hundred feet inland. Occasionally, these specialized forests occur away from the lake as well, on calcareous clifftops or ridges.

Cedars on these bluffs grow very slowly and are rarely straight or tall. Growth rings are often less than 1/16 inch wide, in contrast to the normal rings of white pine, which are up to 1/2 inch wide. On headlands in Malletts Bay, cedars reach ages of 300 years or more. In similar communities on the Niagra Escarpment in Ontario, cedars exceeding 1000 years in age have been documented.

Soils in Limestone Bluff Cedar-Pine Forests are very shallow to nearly absent and have a high organic content. Because this soil does not hold moisture well and because rainfall is naturally low in these places (less than 32 inches – low for Vermont), soils are very dry.

Vegetation

Small, twisted trees of northern white cedar are dominant and provide dense shade along the edge of the cliff of bluff. Often the trees are no more than 20 feet tall. Red pine, white pine, hophornbeam, and hemlock are other trees that are common here in varying amounts. Because of the dense shade, the understory is sparse and of low diversity, although high diversity forests can be close at hand. Ebony sedge is probably the most characteristic herb of this community.

ANIMALS

The animals of these forests have not been well studied.

SUCCESSIONAL TRENDS

Limestone Bluff Cedar-Pine Forest is believed to be the persistent community on the limestone and dolomite bluffs of Lake Champlain, and our observations suggest that the community replaces itself almost immediately when disturbed. Cedar regenerates well on open bedrock, whether the opening is natural or caused by humans.

VARIANTS

None recognized at this time.

RELATED COMMUNITIES

Transition Hardwood Limestone Forest, a variant of Mesic Maple-Ash-Hickory-Oak Forest: This community is often found adjacent to Limestone Bluff Cedar Pine Forest, and grades into it. The two communities share many species in common.

Temperate Calcareous Outcrop Community: Small openings within Limestone Bluff Cedar Pine Forest are very similar to Temperate Calcareous Outcrop, and the two communities share many species in common.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

This is a rare community in Vermont, and because it occurs on lake bluffs most commonly, it is vulnerable to clearing for views and lake access, as well as to logging near the lake. It is also susceptible to encroachment by non-native exotic species although the impact of such encroachment is unknown. Fortunately, some very fine examples of this community are protected on public and private conservation lands. Owners of bluffs where this community occurs can aid in its protection by keeping cutting of cedar to a minimum, by maintaining a natural forested buffer to the community, and by removing invasive exotic species such as buckthorn and honeysuckle.

PLACES TO VISIT

Kingsland Bay State Park, Ferrisburgh, Vermont Department of Forests, Parks and Recreation.

Limestone Bluff Cedar-Pine Forest on the calcareous rock of Providence Island in Lake Champalin.

CHARACTERISTIC PLANTS

TREES

Abundant Species

Northern white cedar – *Thuja occidentalis*

Occasional to Locally Abundant Species

White pine – *Pinus strobus*
Red pine – *Pinus resinosa*
Eastern hemlock – *Tsuga canadensis*
Hophornbeam – *Ostrya virginiana*
Red oak – *Quercus rubra*
Shagbark hickory – *Carya ovata*
White ash – *Fraxinus americana*
Sugar maple – *Acer saccharum*
Basswood – *Tilia americana*
Eastern red cedar – *Juniperus virginiana*

SHRUBS

Snowberry – *Symphoricarpos albus*
Bush-honeysuckle – *Diervilla lonicera*

HERBS

Abundant Species

Ebony sedge – *Carex eburnea*
Harebell – *Campanula rotundifolia*
Wild columbine – *Aquilegia canadensis*
Rock polypody – *Polypodium virginianum*

Occasional to Locally Abundant Species

Intermediate wood fern – *Dryopteris intermedia*
Marginal wood fern – *Dryopteris marginalis*

NON-NATIVE PLANTS

Canada bluegrass – *Poa compressa*

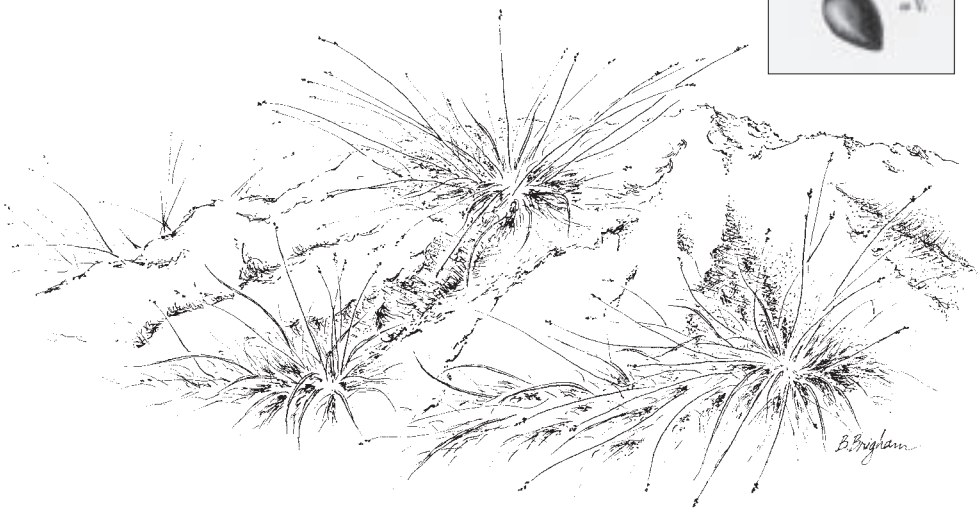
INVASIVE NON-NATIVE PLANTS

Morrow's honeysuckle – *Lonicera morrowii*
Tartarian honeysuckle – *Lonicera tatarica*
Japanese barberry – *Berberis thunbergii*
Common buckthorn – *Rhamnus cathartica*
European buckthorn – *Rhamnus frangula*

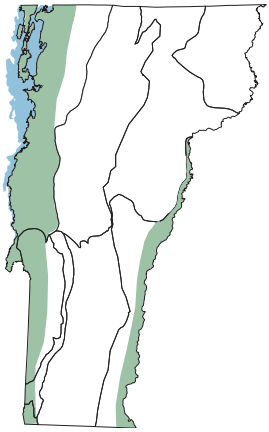
RARE AND UNCOMMON PLANTS

Ram's head lady's-slipper – *Cypripedium arietinum*
Purple clematis – *Clematis occidentalis*
Four-leaved milkweed – *Asclepias quadrifolia*
Yellow oak – *Quercus muehlenbergii*
Buffalo-berry – *Shepherdia canadensis*
Walking fern – *Asplenium rhizophyllum*

Ebony sedge – *Carex eburnea*



Red Cedar Woodland



Distribution/Abundance

This community is found on clifftops in the warmer regions of the state, including the Taconic Mountains, where it is most abundant, the Champlain Valley, and the Southern Vermont Piedmont. It is known from southern New England as well. Since the conditions that support this community (exposed clifftops) usually occur as small patches, examples of Red Cedar Woodland are themselves small and widely scattered.

Ecology and Physical Setting

Red Cedar Woodlands are narrow areas of scattered trees found on south or west facing clifftops in the warmer regions of the state. The bedrock in these sites is usually not calcareous; schists and related rocks are the most common substrate. Soils are extremely shallow and well drained, and only the most drought-tolerant plants are able to persist under these conditions. This community typically grades into Dry Oak-Hickory-Hophornbeam Forest or other dry oak-dominated communities further back from the edge of the cliff.

Vegetation

Red cedar dominates this sparse woodland community. Red Cedar Woodland is the only community documented in Vermont where red cedar maintains itself as a dominant species in a mid- to late-successional setting. (Interestingly, red cedar is an early-successional old field tree in many parts of the region, especially on clay soils and shallow-to-bedrock soils of the Champlain Valley. These successional areas should not be confused with Red Cedar Woodland.) The red cedars typically hug the cliff edge and have windswept branches that reflect the dominant wind direction. There is a sparse shrub layer. Grasses and other herbaceous plants, along with bryophytes and lichens, may be abundant between areas of exposed bedrock.

Animals

Where it occurs, eastern timber rattlesnake uses these communities for basking.

SUCCESSIONAL TRENDS

It is possible that fire plays a role in maintaining these communities, but this needs investigation. It appears that droughty conditions are the major factor that keeps these communities open and prevents shade-tolerant species from becoming dominant.

VARIANTS

None recognized at this time.

RELATED COMMUNITIES

Temperate Calcareous Outcrop: Although Red Cedar Woodland is typically not found on calcareous bedrock, it can be on ***circumneutral*** or mildly calcareous rock, and when it is, it can grade into Temperate Calcareous Outcrop. The two communities share ecological attributes, such as droughty soils, and a few species, such as red cedar itself and downy arrowwood.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

This community is not especially vulnerable to human-induced change since it contains no marketable timber and is generally undevelopable. Owners of this natural community can protect it by allowing natural ecological processes to take place, including an occasional fire, and by refraining from cutting trees.

PLACES TO VISIT

Helen W. Buckner Memorial Preserve at Bald Mountain, West Haven, The Nature Conservancy

CHARACTERISTIC PLANTS

TREES

Abundant Species

Eastern red cedar – *Juniperus virginiana*
Hophornbeam – *Ostrya virginiana*

Occasional to Locally Abundant Species

Shagbark hickory – *Carya ovata*
White pine – *Pinus strobus*
Red oak – *Quercus rubra*
Red pine – *Pinus resinosa*
Black cherry – *Prunus serotina*
White oak – *Quercus alba*
Chestnut oak – *Quercus prinus*

SHRUBS

Occasional to Locally Abundant Species

Downy arrowwood – *Viburnum rafinesquianum*
Pasture rose – *Rosa blanda*
Low red shadbush – *Amelanchier sanguinea*
Low sweet blueberry – *Vaccinium angustifolium*
Choke cherry – *Prunus virginiana*

HERBS

Abundant Species

Woodland sedge – *Carex pensylvanica*
Poverty grass – *Danthonia spicata*
Cow-wheat – *Melampyrum lineare*
Little bluestem – *Schizachyrium scoparium*
Spreading dogbane – *Apocynum androsaemifolium*

OCCASIONAL TO LOCALLY ABUNDANT PLANTS

Field pussytoes – *Antennaria neglecta*
Rusty woodsia – *Woodsia ilvensis*
Rock sandwort – *Arenaria stricta*
Common pinweed – *Lechea intermedia*
Common woodrush – *Luzula multiflora*

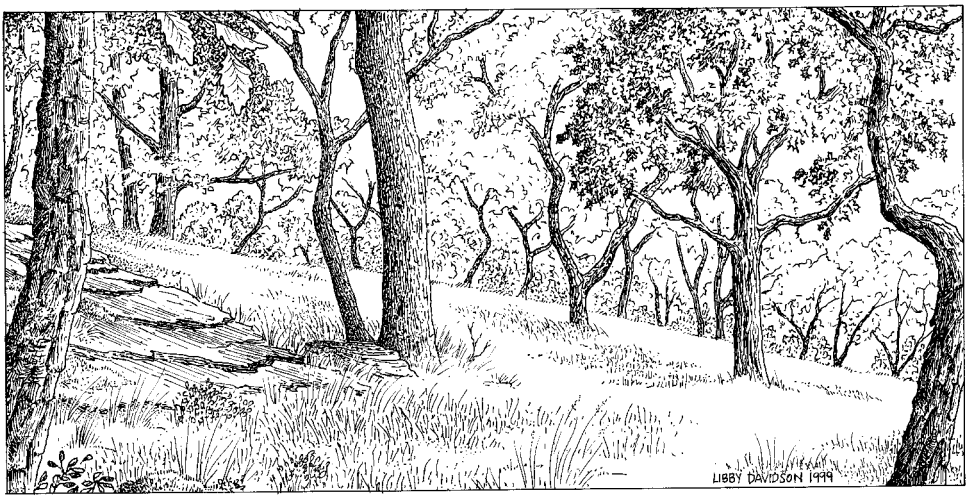
NON-NATIVE PLANTS

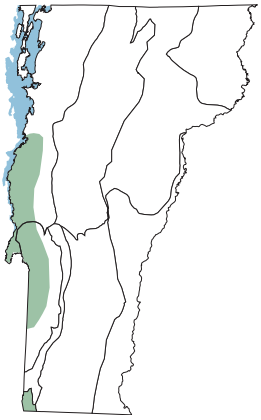
Canada bluegrass – *Poa compressa*
Butter-and-eggs – *Linaria vulgaris*

RARE AND UNCOMMON PLANTS

Longleaf bluet – *Hedyotis longifolia (Houstonia longifolia)*
Downy arrowwood – *Viburnum rafinesquianum*
Bronze sedge – *Carex foenea*

Dry Oak Woodland





Distribution/Abundance

This community is rare statewide. It is locally common in the hills of the Taconic Mountains, and there are scattered occurrences on Cheshire Quartzite in the Champlain Valley. These woodlands are usually less than 20 acres in extent.

Ecology and Physical Setting

These distinctive woodlands, sometimes referred to as elfin oak woodlands, occur on south-facing upper hillslopes in southwestern Vermont. Soils are acidic, excessively drained silt loams with abundant rocky fragments. These woodlands are southern in character with a prevalence of oaks. The overstory oaks are short in stature, and the crowns frequently appear gnarled. The trees are farther apart than in typical forests, and the canopy is more open. Midstory or understory trees and shrubs are widely scattered. The ground flora is dominated by sedges, grasses, and heath shrubs, interspersed with oak seedlings, forbs, mosses, bedrock, and bare ground.

Vegetation

These woodlands are open and park-like, resembling savannah. Trees are abnormally short, often half or less the height they can reach in moist soils, and they are widely scattered. Low shrubs such as huckleberry, low sweet blueberry, and the stoloniferous low red shadbush are present, but drought-tolerant sedges and grasses tend to dominate the ground layer.

Animals

Ring-neck snakes frequent these woodlands, often spending days coiled beneath decaying wood. Uncommon birds encountered in this woodland type may include tufted titmouse and yellow-billed cuckoo.

Successional Trends

It is possible that fire plays a role in keeping these woodlands open, but this needs verification.

Variants

None recognized at this time.

Related Communities

Dry Oak Forest: A community with similar species composition but with a closed canopy and taller trees. Heath shrubs are more abundant in Dry Oak Forest.

Conservation Status and Management Considerations

This is a rare and poorly understood natural community, though threats to it are minimal. A few examples are protected. This community needs more study to determine whether it is maintained by fire, and if so, whether prescribed fire should be used to help maintain conserved examples. Owners of hills where this natural community occurs can protect the community by keeping hills free from towers and other structures so that natural fires can burn without threatening human property.

Places to Visit

North Pawlet Hills Natural Area, Pawlet, The Nature Conservancy

The deep, coarse furrows of chestnut oak bark are distinctive.

Characteristic Plants

Trees

Abundant Species

Chestnut oak – *Quercus prinus*
Red oak – *Quercus rubra*
White oak – *Quercus alba*

Occasional to Locally Abundant Species

Red pine – *Pinus resinosa*
Pitch pine – *Pinus rigida*

Shrubs

Occasional to Locally Abundant Species

Low red shadbush – *Amelanchier sanguinea*
Black huckleberry – *Gaylussacia baccata*
Low sweet blueberry – *Vaccinium angustifolium*
Late low blueberry – *Vaccinium pallidum*

Herbs

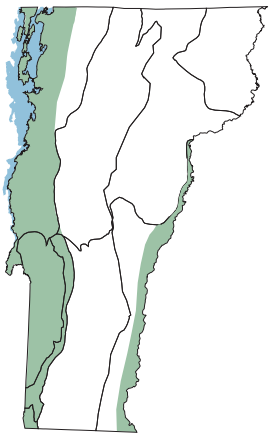
Common Species

Hairgrass – *Deschampsia flexuosa*
Woodland sedge – *Carex pensylvanica*
Cow-wheat – *Melampyrum lineare*

Rare and Uncommon Plants

Rattlesnake-weed – *Hieracium venosum*
Slender wheatgrass – *Elymus trachycaulus*
Downy arrowwood – *Viburnum rafinesquianum*
Panicled tick trefoil – *Desmodium paniculatum*
Douglas' knotweed – *Polygonum douglasii*
Forked chickweed – *Paronychia canadensis*

Dry Oak Forest



Distribution/Abundance

Dry Oak Forest is occasionally found on acidic ridgetops in the Champlain Valley and in the Taconic Mountains. Similar communities are found more commonly to our south on rocky ridges. Black oak becomes a common component of this community further south; it is apparently not present, or at least not common, in the Vermont examples.

Ecology and Physical Setting

This community is found on rocky ridgetops of acidic or circumneutral bedrock at low elevations. Most of the time, they occur as small patches within larger areas of Dry Oak-Hickory-Hophornbeam Forest or Northern Hardwood Forest, so they provide a welcome break from the ordinary when they are encountered after a hike up one of the hills or small mountains of the Champlain Valley or Taconic Mountains.

In Dry Oak Forest, bedrock is close to the surface, soils are dry, and nutrients are limited. The low rainfall in the biophysical regions where this community occurs, along with the low moisture-holding capacity of the soils, makes these very dry places. Fire may play a role in this community, but this possibility needs more study. Gypsy moth can affect these forests, as they thrive in oak forests.

Vegetation

Overall diversity in these forests is quite low. Red oak and white oak are mixed in the canopy, often with white pine. Chestnut oak can be abundant in southern regions. Heath shrubs dominate the understory, with huckleberry the most abundant. Trees are poorly formed, but the canopy is nearly continuous.

Animals

Dry Oak Forests are good habitat for turkey and grey squirrel.

Successional Trends

We know little about successional trends in this community. Future studies should determine the role that fire plays in its maintenance.

VARIANTS

None recognized at this time.

RELATED COMMUNITIES

Dry Oak-Hickory-Hophornbeam Forest: Soils are perhaps more nutrient rich, and diversity is higher. Maple and hickory are mixed in with the oaks. Chestnut oak is absent from this community.

Dry Oak Woodland: This community is almost identical in terms of species composition, but the increased droughtiness of the soils reduces tree height and canopy cover significantly.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

This community is somewhat uncommon in Vermont, but a few good examples are found on protected lands. Dry Oak Forests are not threatened by development, but logging may threaten some examples.

PLACES TO VISIT

Snake Mountain, Addison, Vermont
Department of Fish and Wildlife
North Pawlet Hills Natural Area, Pawlet,
The Nature Conservancy

CHARACTERISTIC PLANTS

TREES

Abundant Species
Red oak – *Quercus rubra*
White oak – *Quercus alba*
Occasional to Locally Abundant Species
White pine – *Pinus strobus*
Chestnut oak – *Quercus prinus*

SHRUBS

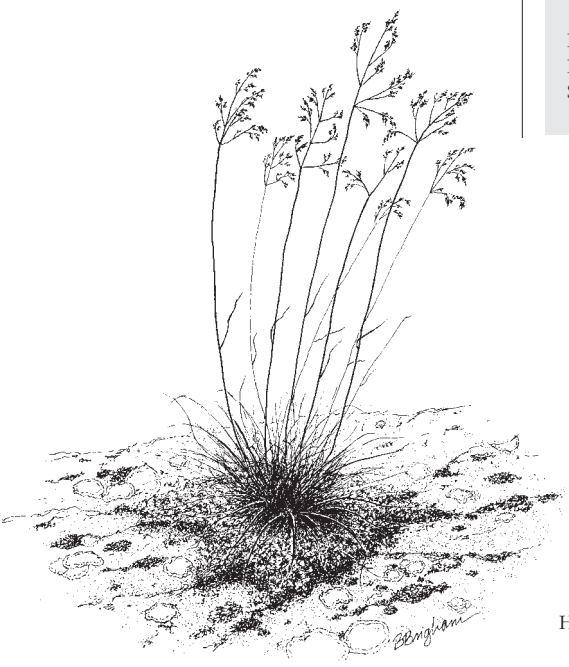
Abundant Species
Huckleberry – *Gaylussacia baccata*
Low sweet blueberry – *Vaccinium angustifolium*
Occasional to Locally Abundant Species
Fragrant sumac – *Rhus aromatica*
Witch hazel – *Hamamelis virginiana*

HERBS

Abundant Species
Poverty grass – *Danthonia spicata*
Hairgrass – *Deschampsia flexuosa*
Occasional to Locally Abundant Species
Cow-wheat – *Melampyrum lineare*
White snakeroot – *Eupatorium rugosum*
Wide-leaved sedge – *Carex platyphylla*
Bottle-brush grass – *Elymus hysterix*

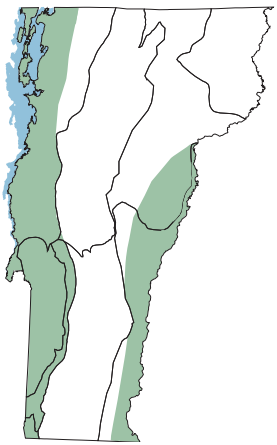
RARE AND UNCOMMON PLANTS

Rattlesnake-weed – *Hieracium venosum*
Slender wheatgrass – *Elymus trachycaulus*
Downy arrowwood – *Viburnum rafinesquianum*
Panicled tick trefoil – *Desmodium paniculatum*
Four-leaved milkweed – *Asclepias quadrifolia*
Squawroot – *Conopholis americana*



Hairgrass – *Deschampsia flexuosa*

Dry Oak-Hickory-Hophornbeam Forest



Distribution/Abundance

This community has southern affinities and is found in the warmer parts of Vermont as well as in other states to our south and west. Most examples are in the Champlain Valley and Taconic Mountains, although the community is known from the Southern Vermont Piedmont and on south-facing slopes in the Northern Vermont Piedmont.

Ecology and Physical Setting

These are open, park-like forests where shrubs are sparse and one can see a long distance through the woods. Such open forests are uncommon in Vermont, and most people who visit them find them exceptionally beautiful. They are found in the warmer parts of the state on hilltops or other places where bedrock is close to the surface or is covered by shallow till. Warm climates combined with relatively shallow soils contribute to droughty conditions. Trees do not grow as well as they do on deeper, more fertile soils, and understory vegetation is sparse. Many forests of this type are found on the rocky portions of Champlain Valley farms. In most cases they were never cleared for pasture or crops but were often used as woodland pasture. Both natural and anthropogenic disturbances probably contribute to the structure of Dry Oak-Hickory-Hophornbeam Forests, but the relative importance of each type of disturbance is difficult to know.

Vegetation

The canopy is somewhat open, and trees do not reach great height. The shrub layer is very sparse. The ground layer is often dominated by lawns of woodland sedge, with other herbs scattered about. In spite of the name of this community, sugar maple can be a canopy dominant, especially in areas of calcareous bedrock.

Animals

Common mammals of these forests include white-tailed deer and gray squirrel. Characteristic birds are white-breasted nuthatch, scarlet tanager, and turkey. Rare reptiles include black rat snake, five-lined skink, and timber rattlesnake.

Successional Trends

We know very little about successional trends in this

community. Sugar maple, oaks, hickory, and hophornbeam are all likely late-successional canopy components.

VARIANTS

Sugar Maple-Hophornbeam Forest: This variant is found on calcareous soils. In structure, soil moisture, and dominant herbaceous plants it is like other Dry Oak-Hickory Hophornbeam Forests, but because of the more fertile soils, oak is uncommon and sugar maple is abundant.

RELATED COMMUNITIES

Dry Oak Forest: This is a forest type that is more nutrient-poor or has bedrock closer to the surface, or both. Red oak, white oak , and chestnut oak dominate, and heath shrubs are common in the ground layer. Woodland sedge may be common in these forests as it is in Dry Oak-Hickory-Hophornbeam Forest.

Mesic Maple-Ash-Hickory Forest: This forest type is found on lower slopes, where soils are deeper and moisture is more available to plants. The two communities often grade into each other.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

Dry Oak-Hickory-Hophornbeam Forest is an uncommon community when the whole state is considered, with only a handful of extensive, natural examples known. Small patches of this community type are moderately common in the Champlain Valley.

PLACES TO VISIT

Shaw Mountain Natural Area, Benson, The Nature Conservancy.

CHARACTERISTIC PLANTS

TREES

Abundant Species

Red oak – *Quercus rubra*
Hophornbeam – *Ostrya virginiana*
Shagbark hickory – *Carya ovata*

Occasional to Locally Abundant Species

White oak – *Quercus alba*
Sugar maple – *Acer saccharum*
White ash – *Fraxinus americana*

SHRUBS

Occasional to Locally Abundant Species

Canada honeysuckle – *Lonicera canadensis*
Maple-leaf viburnum – *Viburnum acerifolium*

HERBS

Abundant Species

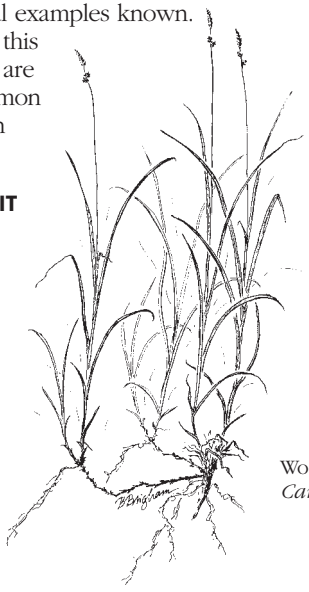
Woodland sedge – *Carex pensylvanica*

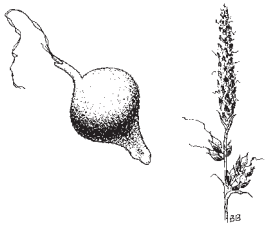
Occasional to Locally Abundant Species

Hog peanut – *Amphicarpaea bracteata*
Bottlebrush grass – *Elymus hysterix*
Blue-stemmed goldenrod – *Solidago caesia*
Pedunculate sedge – *Carex pedunculata*
Wide-leaved sedge – *Carex platyphylla*
Wild oats – *Uvularia sessilifolia*
Furry brome – *Bromus pubescens*
Blunt fescue – *Festuca obtusa*
Broad-leaved ricegrass – *Oryzopsis racemosa*

RARE AND UNCOMMON PLANTS

Yellow oak – *Quercus muehlenbergii*
Four-leaved milkweed – *Asclepias quadrifolia*
Wood lily – *Lilium philadelphicum*
Hitchcock's sedge – *Carex hitchcockiana*
Forked chickweed – *Paronychia canadensis*
Allegheny crowfoot – *Ranunculus allegheniensis*
Early blue violet – *Viola palmata*
Deerberry – *Vaccinium stamineum*
Hound's tongue – *Cynoglossum boreale*
Hairy honeysuckle – *Lonicera hirsuta*
Rue anemone – *Anemonella thalictroides*
Back's sedge – *Carex backii*
Sprout-bearing muhlenbergia – *Muhlenbergia sobolifera*
Slender-flowered muhlenbergia – *Muhlenbergia tenuiflora*



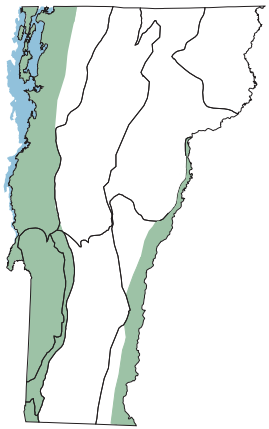


Woodland sedge – *Carex pensylvanica*

Mesic Maple-Ash-Hickory-Oak Forest

Distribution/ Abundance

This is an uncommon community in Vermont, restricted to mesic sites in the Champlain Valley, Taconic Mountains, and Southern Piedmont. It has affinities with forest communities that are more common to our south.



Ecology and Physical Setting

These forests share much in common with Northern Hardwood Forests, but they have some striking affinities with the Central Hardwood Forests of the Appalachians to our south. Sugar maple, white ash, and red maple are common trees, but more southern species, such as oaks and hickories, are present as well. Found in the warmer climate areas of Vermont, these forests see higher-than-average temperatures and lower-than-average rainfall. Mesic Maple-Ash-Hickory Forests have soils that are typically somewhat drier than those in the average Northern Hardwood Forest. These soils are probably well drained to somewhat excessively drained. Topography is gentle to rolling. Parent materials are glacial tills. Bedrock can be close to the surface locally, but shallow bedrock usually creates such extreme conditions that other, drought-tolerant communities develop.

This is a poorly understood community in Vermont. More data on vegetation, soils, and land use history will help us to better understand the relationship between these forests and others in the state and region.

Vegetation

The variation in this community, though poorly understood, is likely to be analogous to the variation in Northern Hardwood Forests. Moister sites in coves and hollows will have higher productivity and a greater abundances of sugar maple and white ash.

We can make some generalizations about vegetation, though. The canopy tends to be a mix of northern hardwood species such as beech, yellow birch, white ash, sugar maple, and red maple, with central hardwoods such as shagbark hickory, bitternut hickory, pignut hickory, white oak, and red oak present in smaller numbers. The shrub layer in these forests is sparse to well-developed, depending on the light available. Herbs are low and rather sparsely distributed.

These forests can provide habitat for species that are common to our south, reaching their northern range limits in southern Vermont. Examples include flowering dogwood and round-leaved tick trefoil. Tulip tree, the classic species of the central hardwoods, was reported growing in forests in the Connecticut Valley in the 1940s, but it is unclear whether it was growing naturally, or if it had been planted. Today there are no known native populations of this tree.

ANIMALS

The mammal community found in these forests is probably quite similar to that found in Northern Hardwood Forests. White-tailed deer are common, and small mammals include deer mouse, white-footed mouse, woodland jumping mouse, and chipmunk. Gray squirrel are more abundant here than in Northern Hardwood Forests. Breeding songbirds include eastern wood pewee, red-eyed vireo, ovenbird, black-throated blue warbler, and scarlet tanager. Turkeys are also abundant and rely on the mast-producing trees found in these forests. Amphibians and reptiles include Jefferson's salamander, gray treefrog, four-toed salamander, and brown snake.

The smooth, gray bark of young shagbark hickory quickly develops into the shaggy, long, curling plates that give this tree its name.

SUCCESSIONAL TRENDS

White pine, paper birch, gray birch, and bigtooth aspen are among the early-successional trees that can dominate these forests following disturbance.

Throughout much of Vermont, we think of the oaks as early- to mid-successional species, disappearing from forests where there is no natural or human disturbance, such as fire or agriculture. In Mesic Maple-Ash-Hickory-Oak Forest, oak is probably more persistent over time because it responds well to the more droughty conditions and warmer temperatures. White pine may also be a fairly persistent member of this community.

VARIANTS

Transition Hardwoods Limestone Forest: This community is found in the warm climate areas of Vermont, where bedrock is calcareous and is close to the surface. The calcareous bedrock is expressed in the vegetation: typical herbs are bulblet fern, maidenhair fern, white baneberry, blunt-lobed hepatica, wild ginger, early meadow rue, large-flowered trillium, downy yellow violet, Dutchman's breeches, wide-leaved sedge, and common sweet-cicely. There is much overlap between this community and Rich Northern Hardwood Forest, but warm-climate species such as shagbark hickory and an abundance of oaks distinguish it.

Early-successional variants can be dominated by white pine, paper birch, gray birch, or bigtooth aspen, or combinations of these species.

RELATED COMMUNITIES

Dry Oak-Hickory-Hophornbeam Forest: This is the closest relative to Mesic Maple-Ash-Hickory-Oak Forest. It differs in being drier, and its overall range may be larger in Vermont.

Northern Hardwood Forest: This is a closely related community, but in general it is moister and lacks the oaks and hickories that are characteristic of Mesic Maple-Ash-Hickory-Oak Forest.

Mesic Red Oak-Hardwood Forest: This is also quite similar, but again lacks the hickories and other southern species.

Limestone Bluff Cedar-Pine Forest: This community occurs adjacent to the Transition Hardwoods Limestone Forest variant of Mesic Maple-Ash-Hickory-Oak Forest. The two communities share several species in common, but northern white cedar dominates limestone Bluff Cedar-Pine Forest.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

The distribution of this community is poorly known, and therefore its conservation status is unclear. A few examples are known on public land.

PLACES TO VISIT

Bomoseen State Park, Castleton. Vermont Department of Forests, Parks, and Recreation

CHARACTERISTIC PLANTS

TREES

Occasional to Locally Abundant Species

Red oak – *Quercus rubra*
White oak – *Quercus alba*
Red maple – *Acer rubrum*
Sugar maple – *Acer saccharum*
Eastern hemlock – *Tsuga canadensis*
White pine – *Pinus strobus*
Paper birch – *Betula papyrifera*
Shagbark hickory – *Carya ovata*
Hophornbeam – *Ostrya virginiana*
White ash – *Fraxinus americana*
Basswood – *Tilia americana*

SHRUBS

Maple-leaf viburnum – *Viburnum acerifolium*
Shadbush – *Amelanchier* spp.
Striped maple – *Acer pensylvanicum*
Witch hazel – *Hamamelis virginiana*

HERBS

Marginal wood fern – *Dryopteris marginalis*
White snakeroot – *Eupatorium rugosum*
Common sweet-cicely – *Osmorbiza claytonii*
Large-flowered trillium – *Trillium grandiflorum*

INVASIVE NON-NATIVE PLANTS

Morrow's honeysuckle – *Lonicera morrowii*
Tartarian honeysuckle – *Lonicera tatarica*
Japanese barberry – *Berberis thunbergii*
Common buckthorn – *Rhamnus cathartica*
European buckthorn – *Rhamnus frangula*

RARE AND UNCOMMON PLANTS

Pignut hickory – *Carya glabra*
Flowering dogwood – *Cornus florida*
Round-leaved tick trefoil – *Desmodium rotundifolium*
Minnesota sedge – *Carex albursina*
Four-leaved milkweed – *Asclepias quadrifolia*
Squawroot – *Conopholis americana*
Handsome sedge – *Carex formosa*
Yellow oak – *Quercus muehlenbergii*
Broad beech fern – *Thelypteris hexagonoptera*
Hitchcock's sedge – *Carex hitchcockiana*
Spicebush – *Lindera benzoin*
Perfoliate bellwort – *Uvularia perfoliata*
Short-styled snakeroot – *Sanicula canadensis*

Valley Clayplain Forest

Distribution/Abundance

This community is known from the Champlain Valley of Vermont, and perhaps New York and Québec. It is unknown whether it occurs to the west in the clay soils adjacent to the Great Lakes.

Ecology and Physical Setting

This is the forest that dominated the clay and silt soils of the Champlain Valley prior to European settlement and the subsequent conversion of forest to agricultural land. Today this forest community is extremely rare. The clay soils were deposited in the Champlain Valley during and following the Pleistocene glaciation, both when the valley was flooded by a large freshwater lake, and later when salt water invaded the basin from the north. The soils are deep and fertile, and make ideal agricultural soils, especially when drained. Moisture in these soils varies with soil texture and topographic position, and the most well drained areas were the ones preferentially cleared for agriculture. The Valley Clayplain Forest remnants that are left are generally on the moister sites, though they typically contain a mosaic of wet and less-wet areas. In some areas, thin lenses of sand lie over the clay. It is unknown how these areas differ from places without sand. Lapin (1998) described Clayplain Forests and the variations within them, and much of this information is taken from his study.

This natural community is a mesic, or less wet, clayplain forest. Wet Clayplain Forest is considered a variant and is typically a wetland community. These two variants are found together, however, and from a practical standpoint are difficult to separate. Mesic Clayplain Forest has moderately well drained to somewhat poorly drained soils but pools and wet hollows (Wet Clayplain Forest) are scattered throughout. In both, soil fertility is high. Because of the wet soils, trees are typically shallow-rooted and are easily blown over during heavy winds. Tip-up mounds are therefore a common sight in these forests.

VEGETATION

The canopy in Clayplain Forests is a diverse mixture of trees, including most commonly white oak, red oak, red maple, white pine, shagbark hickory, and white ash. Associated species include hemlock, sugar maple, beech, swamp white oak, and bur oak. The shrub layer is typically well developed, and the herb layer can be quite dense and very diverse. Characteristic species include barren strawberry and grove sandwort. Slight changes in microtopography yield changes in species composition. Mounds within level sites may have dry-site species such as low sweet blueberry and woodland sedge, while hollows harbor wet site species such as winterberry holly and Bailey's sedge.

The small yellow flowers of barren strawberry are a common spring sight in Valley Clayplain Forests.

ANIMALS

Characteristic mammals in this community are gray squirrel, eastern chipmunk, beaver (in wet areas), raccoon, and the ubiquitous white-tailed deer. Common birds are wood thrush, eastern wood pewee, ovenbird, northern oriole, and downy woodpecker. Typical amphibians are blue spotted salamander, American toad, wood frog, and grey treefrog. In the vernal pools within these forests, one can find caddis flies, predaceous diving beetles, and horsehair worms.

SUCCESSIONAL TRENDS

White pine seems to dominate some early-successional areas. Green ash and quaking aspen are also common early-successional species, along with eastern red cedar, red maple, bur oak, and white ash.

VARIANTS

Wet Clayplain Forest: This variant has soils that are somewhat poorly to poorly drained and is classified as a wetland. It is found as small to medium-sized inclusions within the Mesic Clayplain Forest and is very closely allied with it, hence its inclusion here. The canopy is dominated by swamp white oak, red maple, and green ash or white ash. White oak, shagbark hickory, white pine, American elm, and black ash are also present. Musclewood is the dominant small tree. The shrub layer is dense, and wetland plants such as sensitive fern, water hemlock, and water horehound are present along with the sedges listed above.

RELATED COMMUNITIES

Mesic Maple-Ash-Hickory-Oak Forest: This forest type is found on non-clay soils in the warm climate regions of the state and shares many species in common with the drier examples of Clayplain Forest.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

This is certainly one of the most severely altered communities in Vermont. Its present size is a small fraction of its presettlement extent, and the exact nature and composition of the presettlement Clayplain Forest are not known. The remaining examples are all under one hundred acres and are separated from one another by large areas of agricultural land, making plant and animal dispersal between sites very difficult. A few good examples are protected on state and private conservation lands, but the remaining examples need protection badly. The long-term protection of the clayplain landscape will require not only protection of the remaining examples but also restoration of some agricultural land back to Clayplain Forest, an exciting and challenging proposition.

CHARACTERISTIC PLANTS

PLANTS OF MESIC CLAYPLAIN FOREST

TREES

Common Species

White oak – *Quercus alba*
Red oak – *Quercus rubra*
Red maple – *Acer rubrum*
Shagbark hickory – *Carya ovata*
White pine – *Pinus strobus*

Occasional to Locally Abundant Species

Swamp white oak – *Quercus bicolor*
Bur oak – *Quercus macrocarpa*
White ash – *Fraxinus americana*
Sugar maple – *Acer saccharum*
Eastern hemlock – *Tsuga canadensis*
Basswood – *Tilia americana*
Hophornbeam – *Ostrya virginiana*
American Beech – *Fagus grandifolia*
Musclewood – *Carpinus caroliniana*

SHRUBS

Common Species

Maple-leaf viburnum – *Viburnum acerifolium*
Carolina rose – *Rosa carolina*
Witch hazel – *Hamamelis virginiana*

Occasional to Locally Abundant Species

Low sweet blueberry – *Vaccinium angustifolium*

HERBS AND TRAILING SHRUBS

Barren strawberry – *Waldsteinia fragarioides*
Grove sandwort – *Arenaria lateriflora*
Wild oats – *Uvularia sessilifolia*
Wild geranium – *Geranium maculatum*
Bearded shorthusk – *Brachyelytrum erectum*
Large enchanter's nightshade – *Circaea lutetiana*
Graceful sedge – *Carex gracillima*
Loose sedge – *Carex laxiculmis*
Rosy sedge – *Carex rosea*
Woodland sedge – *Carex pensylvanica*
Dwarf raspberry – *Rubus pubescens*
Swamp dewberry – *Rubus hispidus*

PLANTS OF WET CLAYPLAIN FOREST

TREES

Swamp white oak – *Quercus bicolor*
American elm – *Ulmus americana*
Bur oak – *Quercus macrocarpa*

SHRUBS

Winterberry holly – *Ilex verticillata*
Northern arrowwood – *Viburnum dentatum* var. *lucidulum*

HERBS

Lakeshore sedge – *Carex lacustris*
Slender sedge – *Carex tenera*
Swollen sedge – *Carex intumescens*
Blunt broom sedge – *Carex tribuloides*
Marsh fern – *Thelypteris palustris*
Bailey's sedge – *Carex baileyi*

INVASIVE NON-NATIVE PLANTS

Morrow's honeysuckle – *Lonicera morrowii*
Tartarian honeysuckle – *Lonicera tatarica*
Japanese barberry – *Berberis thunbergii*
Common buckthorn – *Rhamnus cathartica*
European buckthorn – *Rhamnus frangula*

RARE AND UNCOMMON PLANTS

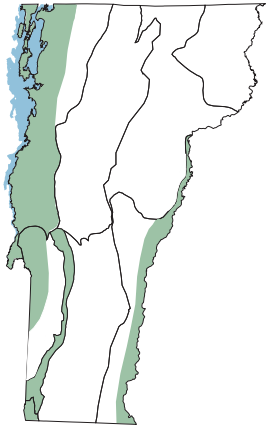
Short-styled snakeroot – *Sanicula canadensis*
Harsh sunflower – *Helianthus strumosus*
Buxbaum's sedge – *Carex buxbaumii*
Leafy bulrush – *Scirpus polyphyllus*
Grove sandwort – *Arenaria lateriflora*
Loose sedge – *Carex laxiculmis*
Yellow bartonia – *Bartonia virginica*
American hazelnut – *Corylus americana*
Drooping bluegrass – *Poa saltuensis*
Umbellate sedge – *Carex umbellata*
Rough avens – *Geum laciniatum*
Broad beech fern – *Thelypteris hexagonoptera*
Minnesota sedge – *Carex albursina*
Gray's sedge – *Carex grayi*
Folliculate sedge – *Carex folliculata*
Handsome sedge – *Carex formosa*
Stout woodreed – *Cinna arundinacea*
Fragrant sumac – *Rhus aromatica*
Spicebush – *Lindera benzoin*

White Pine-Red Oak-Black Oak Forest

Distribution/ Abundance

White Pine-Red Oak-Black Oak Forest is an uncommon community in Vermont, found only in the warmest climate areas and on coarse or shallow-to-bedrock, well-drained soils.

This community is common to our south.



Ecology and Physical Setting

Southern New England is the real home of this community. Oaks and pines are the dominant vegetation in much of eastern Massachusetts and southern New Hampshire, where glacial outwash prevails and where historically land use has had a significant impact on the forests. The parts of Vermont that have affinities with those places are where we are likely to find White Pine-Red Oak-Black Oak Forest.

Both red oak and white pine, the dominant species in this forest, do best in well-drained soils where the climate is more temperate than boreal. For Vermont, this means the Champlain Valley and the Southern Vermont Piedmont – especially the Connecticut Valley. In these parts of the state, the growing season is 130 days or more and the average annual rainfall does not exceed 42 inches or so. These are also regions where coarse outwash soils are common. Similar conditions can be found in the Taconic Mountains and Vermont Valley, too, and in river valleys that penetrate other biophysical regions. In general, though, this community is not found above 1,400 feet in elevation. Soils are well drained to excessively well drained, and parent materials are either outwash or shallow till over bedrock.

Vegetation

We have no known undisturbed examples of this forest type, so it is difficult to fully understand its natural vegetation. But historical information together with our studies of some younger examples suggest that mature White Pine-Red Oak-Black Oak Forests will have white pine, red oak, black oak, red maple, and hemlock as common members of the canopy. The shrub layer is a mixture of tall shrubs like witch hazel and smooth shadbush, and low shrubs of the heath family. Herbs are sparse, and overall plant diversity is low.

Animals

The animals of this natural community have not been well studied, but mammals that are commonly seen include white-tailed deer, gray squirrel, and eastern chipmunk.

Successional Trends

When we see white pine and red oak, we tend to think about land use history and disturbance. Both species do well in disturbed areas such as old fields and logged lands. So one always needs to ask whether this community will persist where we see it today, or whether it will be replaced over time by more stable species, such as hemlock or beech. This is a site-by-site question: we cannot generalize. There are places where oak and/or pine dominate now because of past disturbance, but will be replaced over time if natural or human disturbance is absent. In other places, the two species "trade places" in the canopy over time — oak dominating for a number of decades, to be replaced by pine that persists for a few more, giving way once again to oak. This situation may go on for a very long time if soil and climate conditions are right, and in these cases we consider White Pine-Red Oak-Black Oak Forest to be the stable natural community for the site.

Fire may play a role in the maintenance of this community, but we know little about the historical role of fire.

Where White Pine-Red Oak-Black Oak Forest is the natural community, natural disturbances such as fire and wind storms can change the species composition temporarily. Common early-successional species are gray birch, paper birch, black cherry, aspen, hophornbeam, sweet birch and white pine.

Variants

None recognized at this time.

Related Communities

Pine-Oak-Heath Sandplain Forest: This community is very closely related to White Pine-Red Oak-Black Oak Forest. The main difference is soil moisture. Pine-Oak-Heath Sandplain Forest occupies drier sites within large areas of deltaic sand deposits, while White Pine-Red Oak-Black Oak Forest is on slightly moister – though still well drained – sites. The two communities are thus often juxtaposed and inte-fingering. A sandplain that is incised by streams, for example, may have Pine-Oak-Heath Sandplain on the level plains and White Pine-Red Oak-Black Oak Forest on the slopes of the stream valleys.

Conservation Status and Management Considerations

We know of no mature examples of this community. A few examples are conserved on protected lands. Because this is an uncommon and restricted community, mature examples should be sought and a few protected by conservation easements. Timber management should consider natural ecological processes and should encourage the regeneration of the species that would naturally grow on these sites.

Places to Visit

Centennial Woods, Burlington, University of Vermont

Sunny Hollow Natural Area, Colchester, Town of Colchester

Bellows Falls Village Forest, Rockingham, Town of Rockingham

Wilgus State Park, Weathersfield, Vermont Department of Forests, Parks, and Recreation

CHARACTERISTIC PLANTS

TREES

Common Species

White pine – *Pinus strobus*
Black oak – *Quercus velutina*
Red oak – *Quercus rubra*

Occasional to Locally Abundant Species

White oak – *Quercus alba*
Eastern hemlock – *Tsuga canadensis*
Red maple – *Acer rubrum*
White ash – *Fraxinus americana*
Red pine – *Pinus resinosa*
American beech – *Fagus grandifolia*

SHRUBS

Common Species

Witch hazel – *Hamamelis virginiana*
Beaked hazelnut – *Corylus cornuta*
Smooth shadbush – *Amelanchier laevis*
Maple-leaf viburnum – *Viburnum acerifolium*

Occasional to Locally Abundant Species

Low sweet blueberry – *Vaccinium angustifolium*
Late low blueberry – *Vaccinium palladium*
Sheep laurel – *Kalmia angustifolia*
Mountain laurel – *Kalmia latifolia*

HERBS

Common Species

Starflower – *Trientalis borealis*
Sarsaparilla – *Aralia nudicaulis*
Canada mayflower – *Maianthemum canadense*
Woodland sedge – *Carex pensylvanica*
Bracken fern – *Pteridium aquilinum*

Occasional to Locally Abundant Species

Wintergreen – *Gaultheria procumbens*
Pipsissewa – *Chimaphila umbellata*
Running pine – *Lycopodium clavatum*
Pink lady's slipper – *Cypripedium acaule*
Spotted wintergreen – *Chimaphila maculata*

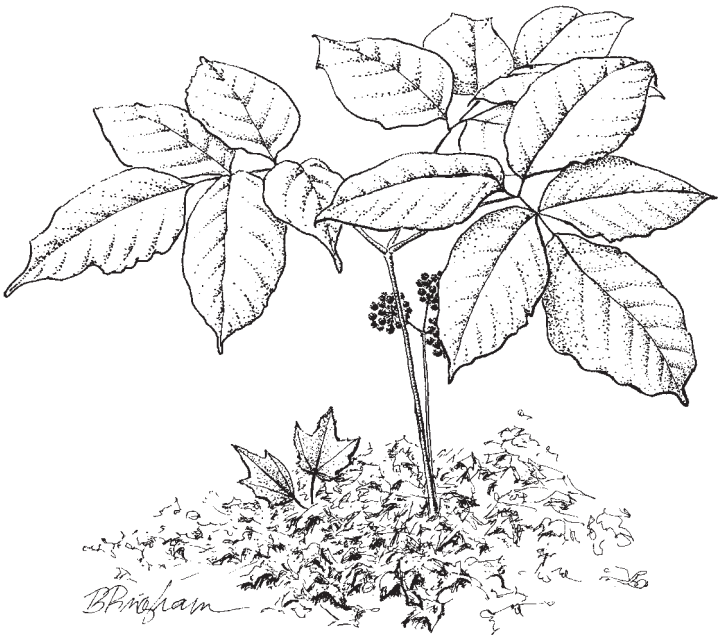
INVASIVE NON-NATIVE PLANTS

Norway maple – *Acer platanoides*
Morrow's honeysuckle – *Lonicera morrowii*
European buckthorn – *Rhamnus frangula*

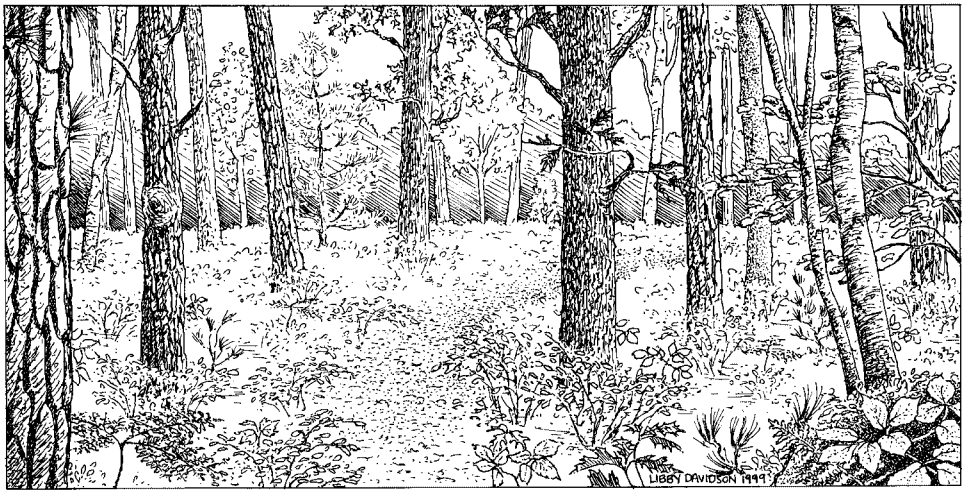
RARE AND UNCOMMON PLANTS

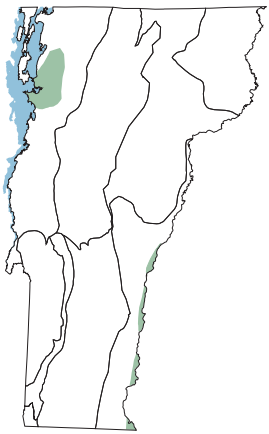
Scarlet oak – *Quercus coccinea*
Slender mountain-rice – *Oryzopsis pungens*
Yellow panic grass – *Panicum xanthophysum*
Mountain laurel – *Kalmia latifolia*
Spotted wintergreen – *Chimaphila maculata*

Sarsaparilla – *Aralia nudicaulis*



Pine-Oak-Heath Sandplain Forest





Distribution/Abundance

In Vermont, this community is restricted to sands in the warmer biophysical regions: the Champlain Valley and the Southern Vermont Piedmont. The most significant areas of Pine-Oak-Heath Sandplain Forest are in western Chittenden County, on the state's largest sand deposits, but small remnant sites are found in the Connecticut River valley in Windsor and Windham Counties.

Ecology and Physical Setting

Pine-Oak-Heath Sandplain Forests are one of Vermont's rarest – and certainly one of its most threatened – communities. Soils in this community are well drained to excessively well drained sands, varying locally in coarseness and moisture holding capacity. They are acidic and nutrient-poor. The Champlain Valley sands were deposited postglacially, as large, sediment-filled rivers of glacial meltwater emptied into glacial Lake Vermont or, later, into the Champlain Sea. Where the rivers entered the lake or sea, coarse sediments were deposited first, in great fan-shaped deltas. These deltas form our present-day sandplains, primarily near the mouths of the Winooski, Lamoille, and Missisquoi Rivers. Similar events took place in the Connecticut Valley, though on a smaller scale.

The present-day deltas are incised by small streams, and so are complex areas of flat terrain cut by deep gullies. The flat areas have the best Pine-Oak-Heath Sandplain Forests, but locally low areas, even on the tops of the deltas, can be quite moist or even wet, supporting red maple swamps, vernal pools, or small open wetlands. The slopes of the gullies are often slightly moister than the generally dry tops and therefore support White Pine-Red Oak-Black Oak Forest. The nature of the gully bottoms depends on the local soil conditions. Often clay underlies sand and is exposed near gully bottoms, supporting moist forests or wetlands. Underlying bedrock can influence vegetation, too, although its effect is usually masked by the sand above it, which can be more than 30 feet deep.

Like the larger pine barrens of Albany, New York, and Concord, New Hampshire, these forests are fire-adapted communities. Ours are not, however, true pine barrens: they probably never had extensive open areas with stunted trees and parched windblown sand, as true pine barrens have.

But Vermont's sandplains almost certainly burned occasionally prior to European settlement, and likely had more of a "barrens" feel then. Pitch pine, one of the important components of this community, is especially well adapted to fire. Its bark protects the trees from light fires that can kill other species. Additionally, pitch pine seeds germinate most successfully in the bare mineral soil that is left after a fire burns away the leaf litter. Other plants probably benefited from the natural fires, too. A number of the rare and uncommon plants of this community require open, dry areas that would be common where fires were frequent. Ecologists believe that fire was important in Vermont's sandplains and that these communities have, in the last two centuries, lost much of their original character as a consequence of fire suppression and development.

VEGETATION

The canopy in these forests is fairly open. Pitch pine, red maple, and black oak are the most common canopy species. Tall shrubs are scattered. The ground layer is often very sparse, composed of low herbs and scattered low shrubs, most of them members of the heath family. Heaths as a group are especially well adapted to acidic conditions. Overall plant diversity is low, although Pine-Oak-Heath Sandplain Forests have a disproportionately high number of rare species, perhaps more than any other natural community. Many of these species are at their range limits in Vermont and are more common elsewhere. The warm climate and sunny openings of our sandplains provide good habitat for them.

ANIMALS

Pine warbler is a characteristic breeding bird in this community. The most characteristic fauna are invertebrates.

SUCCESSIONAL TRENDS

When fire and other disturbances are absent from this community for a time, the duff layer will build up. Under these conditions, pitch pine seeds are inhibited from germinating while other species germinate and persist. Thus pitch pine is likely to decrease in importance, the canopy is likely to become more closed, and hemlock, white pine, red oak, black oak, and red maple are likely to become more abundant, with hemlock and white pine ultimately becoming most abundant. The many rare plants that rely on openings are likely to decrease in number as well. Presettlement Pine-Oak-Heath Sandplain Forests had occasional openings, and some pitch pine, but white pine was probably more abundant.

VARIANTS

None recognized at this time.

RELATED COMMUNITIES

White Pine-Red Oak-Black Oak Forest: This community is very similar to Pine-Oak-Heath Sandplain Forest, but its soils are less dry. Trees therefore grow taller and form a more closed canopy, and openings are less frequent. Fire can play a role in both communities, however. White Pine-Red Oak-Black Oak Forest is often found associated with Pine-Oak Heath Sandplain Forest in slightly moister areas such as slopes and low areas.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

Pine-Oak-Heath Sandplain Forest is a very threatened community in Vermont. With their deep, well-drained soils, areas occupied by this community are in great demand for residential and industrial development, as well as for sand extraction. Of the original acreage in Chittenden County prior to European settlement – estimated at 15,000 acres based on the presence of suitable soils – we now have only about 650 acres, or about 4.5 percent of the original total. Much of the rest has been converted to housing developments,

Fires have been purposely ignited in some controlled settings to study the effects of this natural disturbance of Pine-Oak-Heath Sandplain Forest.

airports, commercial areas, pine plantations, and agricultural fields. One very small example of this natural community is in a town park, and another much larger example is under excellent ecological management, including the use of prescribed fire. No example has permanent legal protection.

Owners of good examples of this natural community can help maintain them by allowing natural ecological processes to function and by encouraging the growth of pitch pine and other species that are native to the community.

PLACES TO VISIT

Sunny Hollow Natural Area, Colchester, Town of Colchester

SELECTED REFERENCES AND FURTHER READINGS

Howe, C.D. 1910. The reforestation of sand plains in Vermont: A study in succession. *Botanical Gazette* 49:126-149

Siccama, Thomas G. 1971. Presettlement and present forest vegetation in northern Vermont with special reference to Chittenden County. *American Midland Naturalist* 85:153-172

Engstrom, F. Brett. 1991. Sandplain natural communities of Chittenden County, Vermont: A report to the Vermont Department of Fish and Wildlife concerning the management and viability of a threatened habitat in Vermont. Vermont Nongame and Natural Heritage Program.

CHARACTERISTIC PLANTS

TREES

Common Species

Pitch pine – *Pinus rigida*
White pine – *Pinus strobus*
Black oak – *Quercus velutina*
Red oak – *Quercus rubra*
Red maple – *Acer rubrum*

Occasional to Locally Abundant Species

Paper birch – *Betula papyrifera*
Gray birch – *Betula populifolia*
American beech – *Fagus grandifolia*

SHRUBS

Common Species

Low sweet blueberry – *Vaccinium angustifolium*
Late low blueberry – *Vaccinium pallidum*
Black huckleberry – *Gaylussacia baccata*
Witch hazel – *Hamamelis virginiana*
Smooth shadbush – *Amelanchier laevis*
Beaked hazelnut – *Corylus cornuta*
Sheep laurel – *Kalmia angustifolia*
Sweetfern – *Comptonia peregrina*

HERBS

Abundant Species

Canada mayflower – *Maianthemum canadense*
Sarsaparilla – *Aralia nudicaulis*
Bracken fern – *Pteridium aquilinum*
Wintergreen – *Gaultheria procumbens*

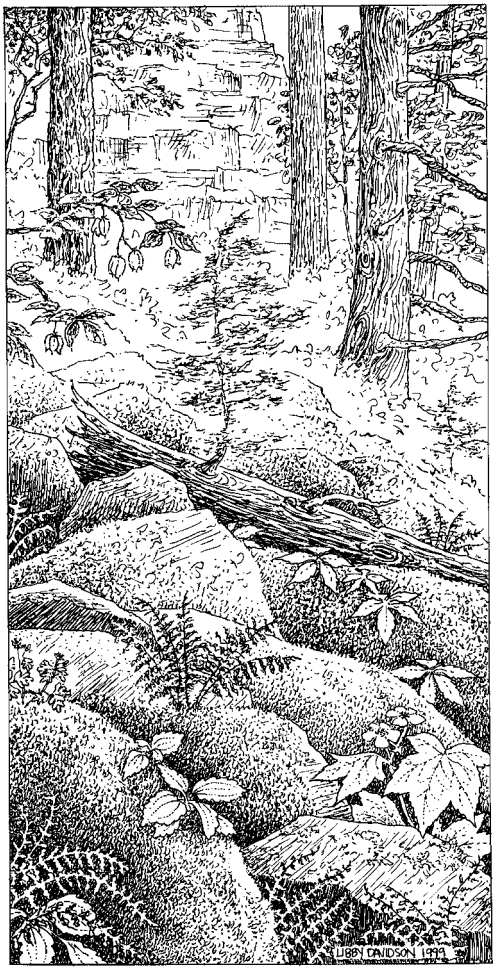
Occasional to Locally Abundant Species

Starflower – *Trientalis borealis*
Whorled loosestrife – *Lysimachia quadrifolia*
Pink lady's slipper – *Cypripedium acaule*
Bastard toadflax – *Comandra umbellata*
Cow-wheat – *Melampyrum lineare*
Pipsissewa – *Chimaphila umbellata*

RARE AND UNCOMMON PLANTS

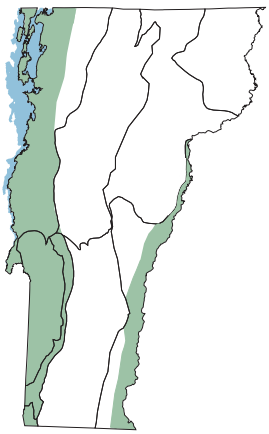
Yellow panic grass – *Panicum xanthophysum*
Blunt-leaved milkweed – *Asclepias amplexicaulis*
Hairy lettuce – *Lactuca hirsuta*
Plains frostweed – *Helianthemum bicknellii*
Houghton's cyperus – *Cyperus houghtonii*
Low bindweed – *Calystegia spithamea*
Canada frostweed – *Helianthemum canadense*
Harsh sunflower – *Helianthus strumosus*
Wild lupine – *Lupinus perennis*
Slender mountain-rice – *Oryzopsis pungens*
Hay sedge – *Carex siccata*
Muhlenberg's sedge – *Carex muhlenbergii*
Large whorled pogonia – *Isotria verticillata*
Sweet goldenrod – *Solidago odora*
Long-spiked three-awn – *Aristida longespica*
Yellow wild-indigo – *Baptisia tinctoria*
Silver-flowered sedge – *Carex argyrantha*
Fernald's sedge – *Carex meritt-fernaldii*
Wild sensitive plant – *Chamaecrista nictitans*
Lace love-grass – *Eragrostis capillaris*
Few-flowered panic grass – *Panicum oligosanthes*
Racemed milkwort – *Polygala polygama*
Whorled milkwort – *Polygala verticillata*
Slender knotweed – *Polygonum tenue*
Scarlet oak – *Quercus coccinea*
Wood lily – *Lilium philadelphicum*

Transition Hardwood Talus Woodland



Distribution/ Abundance

Uncommon in Vermont, restricted to the warm climate areas of the state.



Ecology and Physical Setting

In the agricultural landscape of lowland Vermont, these places are wild havens of jumbled rocks, dense shrubs, rare ferns, odd trees, and fascinating wildlife. Although they tend to be small (less than 10 acres in most cases) and are often near agricultural areas, they can seem very far away from the cultivated landscape, because with their unstable rocky soils, they have nearly always been left alone by farmers, sheep, cows, and loggers.

Transition Hardwood Talus Woodlands are rockfall slopes below cliffs in the warmer regions of the state. They are as variable as the bedrock of those regions, but they share in common a species composition that reflects their relatively warm climate. The rock that makes up the talus has moved downslope from the cliffs above, and the size and shape of the boulders reflects the nature of the bedrock making up the cliff. Limestone, dolomite, and marble usually break into fairly large blocky fragments but weather easily, allowing soil to form between the rocks over time. The rocks tend to be more or less stable once they are in place, and when weathered they produce nutrient-rich soils. Shale and slate break into platy fragments that are small and inherently unstable, and produce nutrient-poor, droughty soils. Gneiss, granite, and acidic quartzite break into large fragments that are stable once they are in place and do not weather easily. Open talus is common where these rock types are prominent. Schists and phyllites are variable, sometimes behaving like slate and shale, other times behaving more like limestone.

Vegetation

Vegetation in Transition Hardwood Talus Woodlands varies with the nature of the bedrock. Although the community is a woodland, meaning it has a canopy cover of less than 60 percent, there are local areas where the canopy is more dense, so technically forest and woodland are intermixed. Because all occurrences of this community are small,

making the distinction is sometimes impractical and is usually not necessary from a management perspective.

Many of these woodlands are characterized by an unusual diversity of trees, some of which are nearly restricted to this community type, a dense and diverse shrub layer, and a high diversity of herbaceous species, including many rare species. Spring wildflowers and ferns are especially abundant.

Transition Hardwood Talus Woodlands are curiously like some floodplain forests in that they share a few key species. Hackberry and bladdernut are two species that share these two communities – and almost no others – in common. The similarity must lie in the continual input of new soil and nutrients, in one case as a result of colluvial process, in the other as a result of alluvial processes.

ANIMALS

Black rat snake, a rare animal in Vermont, lives and breeds in this community along with the common garter snake. Other animals of this community need further study.

SUCCESSIONAL TRENDS

Slope instability and downslope movement are the processes that create and maintain openings in this community. Canopy gaps and slides create local areas of early-successional habitat, where mountain maple and other species that do well in disturbed areas can thrive.

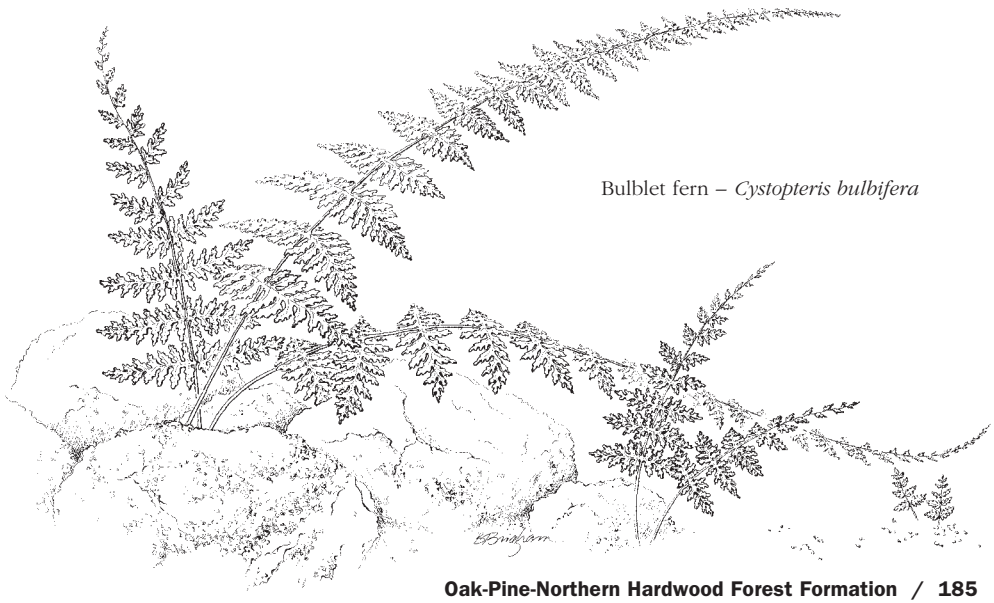
VARIANTS

Transition Hardwood Limestone Talus Woodland: These woodlands are found on limestone, dolomite, or marble and are characterized by the calciphilic species listed above. Northern white cedar is often abundant.

RELATED COMMUNITIES

Mesic Maple-Ash-Hickory-Oak Forest: This community has a canopy closure over 60 percent and has well-developed, stable soils. Steeper, richer examples of this community may be very similar to Transition Hardwood Talus Woodland, and the two may occur side by side.

Rich Northern Hardwood Forest: Where the canopy is dense and soils are more stable, Rich Northern Hardwood Forests may be found adjacent to Transition Hardwood Talus Woodlands. The two communities share several uncommon or rare species.



Bulblet fern – *Cystopteris bulbifera*

Northern Hardwood Talus Woodland: This is a similar community, but lacks the warm climate species like shagbark hickory, sweet birch, and bitternut hickory.

CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

This is an uncommon community in Vermont. Where logging is possible, it should be done with care to avoid erosion, and should be restricted to single tree harvest conducted in winter.

PLACES TO VISIT

Shaw Mountain Natural Area, Benson,
The Nature Conservancy
Mount Independence, Orwell, Vermont
Division of Historic Preservation
Snake Mountain, Addison, Vermont
Department of Fish and Wildlife

Bulblet fern detail

CHARACTERISTIC PLANTS

TREES

Abundant Species
Butternut – *Juglans cinerea*
Basswood – *Tilia americana*
Northern white cedar – *Thuja occidentalis*
White ash – *Fraxinus americana*
Sugar maple – *Acer saccharum*
Red oak – *Quercus rubra*
Shagbark hickory – *Carya ovata*
Bitternut hickory – *Carya cordiformis*
Occasional to Locally Abundant Species
Hophornbeam – *Ostrya virginiana*
Eastern hemlock – *Tsuga canadensis*
Hackberry – *Celtis occidentalis*
Sweet birch – *Betula lenta*

SHRUBS

Abundant Species
Mountain maple – *Acer spicatum*
Occasional to Locally Abundant Species
Bladdernut – *Staphylea trifolia*
Canada yew – *Taxus canadensis*

HERBS

Abundant Species
Herb Robert – *Geranium robertianum*
Bulblet fern – *Cystopteris bulbifera*
Occasional to Locally Abundant Species
Climbing fumitory – *Adlumia fungosa*
Wild ginger – *Asarum canadense*
Rusty woodsia – *Woodsia ilvensis*
Pellitory – *Parietaria pensylvancia*
Clearweed – *Pilea pumila*
White snakeroot – *Eupatorium rugosum*
Purple clematis – *Clematis occidentalis*

RARE AND UNCOMMON PLANTS

White-flowered leafcup – *Polymnia canadensis*
Upland boneset – *Eupatorium sessilifolium*
Goldie's wood fern – *Dryopteris goldiana*
Black maple – *Acer nigrum*
Climbing fumitory – *Adlumia fungosa*
Hairy wild rye – *Elymus villosus*
Northern stickseed – *Hackelia deflexa* var. *americana*
Back's sedge – *Carex backii*
Sprout-bearing muhlenbergia – *Muhlenbergia sobolifera*
Slender-flowered muhlenbergia – *Muhlenbergia tenuiflora*