



## Outcrops and Upland Meadows

Outcrops and upland meadows are anomalies in Vermont's largely forested landscape. In a region where trees dominate, these small, natural upland openings provide an unusual setting. They are sunny, dry, and mostly free of trees, offering alternatives to the moist shade of the forest floor. They are excellent places for reptiles to bask. They provide habitat for cliff-nesting birds such as peregrine falcon, raven, and turkey vulture. They provide competition-free habitat for some of Vermont's rarest plants such as orangeweed and Richardson's sedge. And for humans, they provide a visual contrast to the forested landscape and a place from which to view the world.

When 80 percent of Vermont's forest was converted to pasture and cropland in the 19th century, two things happened to our outcrops and upland meadows. For one thing, they became, in one sense, less unusual, as there was suddenly an abundance of open land. In fact, sunny, exposed outcrops increased in number and size during that time, as rocky hilltops were cleared and pastured intensively, depleting any soil and nutrients that had accumulated over the millennia. Some of the open outcrops we see today are results of that activity. Secondly, the outcrops, especially those at lower elevations near the best farmland, became magnets for the weeds that had evolved in the open agricultural lands of Europe and then arrived here with the settlers. Dandelion, ragweed, cypress spurge, Canada bluegrass, oxeye daisy, and many other non-native plants found a welcome home on the sunny, dry outcrops of New England.

Reforestation has made open places once again exceptional throughout much of Vermont, but just as the forests bear marks of previous settlement and agriculture, so do the upland openings. The dandelions persist, and probably will for a long time to come.

Nevertheless, the naturally open upland communities of Vermont are a very important piece of the region's overall physical and biological diversity. Although there are relatively few direct threats to them, they deserve special attention and protection because they are so uncommon.

Outcrops and Upland Meadows are naturally open uplands kept open by drought, lack of soil, high winds, or extreme cold temperatures. They are found on ridgetops, ledge crests, or other land where bedrock is close to the surface. Outcrops and upland meadows often occur together with cliff communities but are distinguished from them on the basis of slope: cliffs have slopes greater than 60 degrees, whereas outcrops and meadows are gentler, sometimes entirely flat. The most extreme (and the largest) upland meadows are Alpine Meadows, found on our highest mountains. Perhaps the most mundane, and among the smallest, are the many tiny ledge outcrops found in rocky pastures throughout Vermont. All of these have interesting features.

We classify outcrops and upland meadows based on climatic affinities and nature of the bedrock. Both of these factors have significant influences on the vegetation. Alpine Meadow and Boreal Outcrop occur in the coldest regions of the state. Serpentine Outcrop occurs mostly in cold climate areas, but the bedrock itself has a profound influence on the vegetation. Temperate Acidic Outcrop and Temperate Calcareous Outcrop occur throughout Vermont, at all but the highest elevations. Vegetation varies markedly with bedrock type, so here it makes sense to recognize both acidic and calcareous types.

## ▶ HOW TO IDENTIFY

### Outcrop and Upland Meadow Natural Communities

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

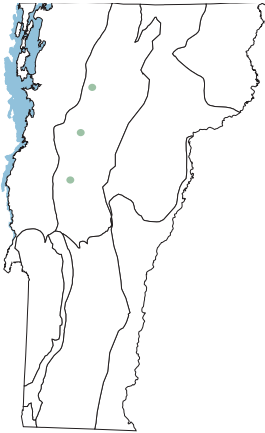
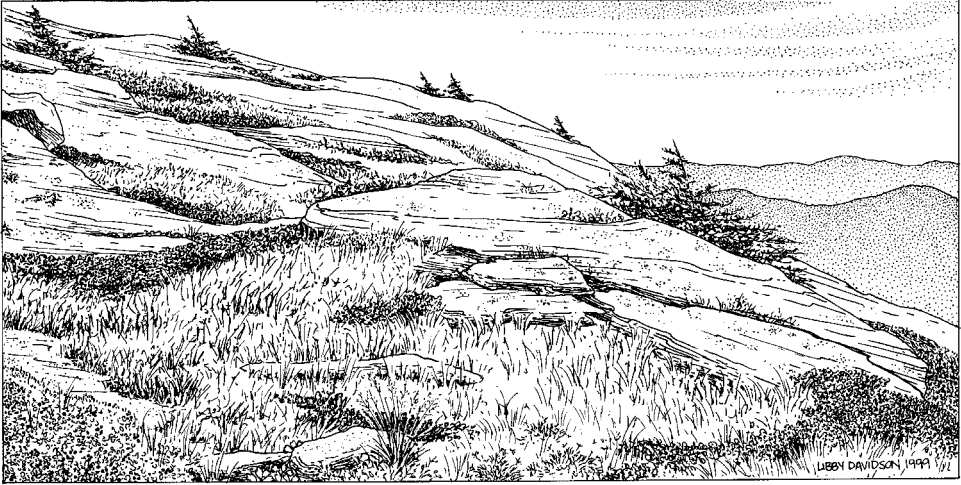
**Alpine Meadow:** Alpine Meadows are open areas on Vermont's highest peaks, generally above 3,500 feet elevation, where cold temperatures and high winds favor a community of plants that can tolerate those conditions. Characteristic species are Bigelow's sedge, alpine bilberry, highland rush, mountain sandwort, and stunted individuals of black spruce and balsam fir. Go to page 211.

**Boreal Outcrop:** These outcrops are found at elevations generally above 1,800 feet but below 3,500 feet. They can experience cold temperatures and high winds, but conditions are not extreme. Scattered trees include red spruce, balsam fir, American mountain-ash, and paper birch. Characteristic shrubs and herbs, and bryophytes are velvetleaf blueberry, sheep laurel, hairgrass, and hair-cap moss. Go to page 214.

**Serpentine Outcrop:** These are outcrops on serpentine bedrock where the chemical composition of the rock favors a specialized, but low-diversity, community. Characteristic plants are large-leaved sandwort, Aleutian maidenhair fern, Green Mountain maidenhair fern, common juniper, and hairgrass. Go to page 216.

**Temperate Acidic Outcrop:** Found at lower-elevations (generally below 1,800 feet), these outcrops of acidic rock support communities of low species diversity, characterized by plants that are well adapted to nutrient poor conditions. Characteristic plants are white pine, red maple, low sweet blueberry, huckleberry, and poverty grass. Go to page 218.

**Temperate Calcareous Outcrop:** These low elevation (below 1,800 feet) outcrops are composed of limestone, marble, dolomite, or calcium-bearing quartzite. Scattered trees include northern white cedar, eastern red cedar (which can also occur on acidic sites), yellow oak, and shagbark hickory. Characteristic shrubs and herbs include downy arrowwood, snowberry, longleaf bluet, Seneca snakeroot, and balsam ragwort. Go to page 220.



## DISTRIBUTION/ABUNDANCE

Alpine Meadows are extremely rare in Vermont. Three examples are known, on the summits of Mount Mansfield, Camels Hump, and Mount Abraham. The Alpine Meadow of Mount Abraham is very small and highly disturbed. More extensive Alpine Meadows are found in New York's Adirondack Mountains, the White Mountains of New Hampshire, and the higher mountain ranges of Maine.

## ECOLOGY AND PHYSICAL SETTING

Alpine Meadows are open, exposed ridgetops over 3,500 feet where high winds are common, fog is frequent, precipitation is abundant, temperatures are low, and solar radiation can be intense. Soils are thin and mostly organic and are restricted to low pockets in the otherwise exposed bedrock. In some areas, the bedrock breaks down into small, gravel-like fragments through freezing and thawing, and soil can begin to accumulate in these places.

The climate poses special challenges to vegetation in Alpine Meadows. Wind-driven ice particles can damage plant tissues. Snow loading can break branches. Even in the absence of snow, rime ice forms on plants as supercooled clouds sweep over mountaintops. The weight of this ice as it falls can bring leaves and twigs with it. Very low temperatures can cause ice crystals to form inside the plant as well, damaging cell membranes and dehydrating the cells. Furthermore, the short growing season means that plants have little time to photosynthesize. And intense sun can cause plants to lose too much water.

## VEGETATION

All these stresses are apparent in the structure of the vegetation. Trees are rare. Shrubs and herbs are typically very low, and some species assume a "cushion" growth form, with leaves and branches packed tightly together to minimize wind and ice damage.

The variability apparent in Alpine Meadow vegetation reflects variability in environmental stresses, as well as in soil depth and moisture. Sedge-dominated meadows are typically interspersed with low shrub communities and areas of lichen-covered bedrock. Trees grow in the most protected places, where winds are less intense and deep snow protects them from freezing.

Although many of the species found in Alpine Meadows (Bigelow's sedge, for example) are rare in Vermont, they can be found commonly in lowland tundra, a similar community, hundreds of miles to our north. Many common Vermont species can be found in Alpine Meadows, too. These include bunchberry, goldthread, and Canada mayflower.

## ANIMALS

Bicknell's thrush is a rare bird that breeds in Subalpine Krummholz. It can sometimes be seen in Alpine Meadows as well.

## VARIANTS

None recognized at this time in Vermont. In areas of the northeast where Alpine Meadow is more extensive, scientists have recognized several variants of the community. Further study of Vermont's alpine and subalpine communities would surely reveal meaningful variants based on exposure, soil development, and other physical factors.

## RELATED

### COMMUNITIES

#### *Subalpine*

**Krummholz:** This community is the most closely related to Alpine Meadow and occurs immediately adjacent to it. Here, black spruce and balsam fir form a stunted, dense canopy.

**Boreal Outcrop:** This community is very similar to Alpine Meadow and shares many species in common with it, but it occurs at lower elevations, has less severe climatic conditions, and lacks the specialized alpine flora.

**Alpine Peatland:** This wetland community occurs in depressions within the Alpine

Meadow where water accumulates. Sphagnum moss and heath family shrubs dominate.

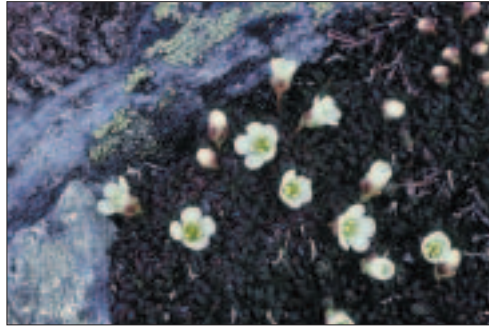
## CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

Nearly all areas of Alpine Meadow have shallow soils and so are very vulnerable to disturbance by

humans. All of Vermont's examples have suffered vegetation and soil loss this way. Hikers have a heavy impact, as do more

dramatic and long lasting disturbances such as buildings (Mount Mansfield once had a hotel on its summit!) and communications towers. Fortunately, Mount Mansfield, Camel's Hump, and Mount Abraham are all on public land, managed by agencies that understand the significance and

vulnerability of the Alpine Meadow community. Still, protection requires constant vigilance and education of visitors to these fragile communities.



*Diapensia* has a "cushion" growth form to minimize wind and ice damage.



*Bilberry* is a member of the heath family and is abundant in Alpine Meadows.

## PLACES TO VISIT

Mount Mansfield, Stowe, and Underhill,  
 Mount Mansfield State Forest, University  
 of Vermont and Vermont Department of  
 Forests, Parks and Recreation (VDFPR)  
 Camels Hump, Duxbury, Camels Hump  
 State Park, VDFPR

## SELECTED REFERENCES AND FURTHER READINGS

Bliss, L. 1963. Alpine plant communities of  
 the presidential range, New Hampshire.  
*Ecology* 44:678-697.

Sperduto, Daniel D. and Charles V. Cogbill.  
 1999. Alpine and subalpine vegetation of  
 the White Mountains, New Hampshire.  
 New Hampshire Natural Heritage  
 Inventory.

## CHARACTERISTIC PLANTS

### TREES

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

### SHRUBS

Alpine bilberry – *Vaccinium uliginosum*  
 Black crowberry – *Empetrum nigrum*  
 Mountain blueberry – *Vaccinium boreale*

### HERBS

Bigelow's sedge – *Carex bigelowii*  
 Hairgrass – *Deschampsia flexuosa*  
 Highland rush – *Juncus trifidus*  
 Mountain sandwort – *Arenaria groenlandica*  
 Three-toothed cinquefoil – *Potentilla tridentata*  
 Cutler's goldenrod – *Solidago cutleri*  
 Alpine bentgrass – *Agrostis mertensii*  
 Canada mayflower – *Maianthemum canadense*  
 Three-leaved false solomon's seal – *Smilacina*  
*trifolia*

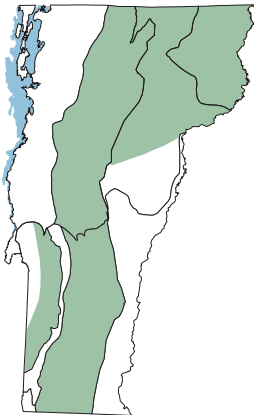
### RARE AND UNCOMMON PLANTS

Alpine bentgrass – *Agrostis mertensii*  
 Black-scaled sedge – *Carex atratifformis*  
 Bigelow's sedge – *Carex bigelowii*  
 Diapensia – *Diapensia lapponica*  
 Black crowberry – *Empetrum nigrum*  
 Alpine sweet grass – *Hierochloa alpina*  
 Highland rush – *Juncus trifidus*  
 Small-flowered woodrush – *Luzula parviflora*  
 Mountain fir clubmoss – *Lycopodium*  
*appalachianum*  
 Mountain sandwort – *Arenaria groenlandica*  
 Fernald's bluegrass – *Poa fernaldiana*  
 Boott's rattlesnake-root – *Prenanthes boottii*  
 Bearberry willow – *Salix uva-ursi*  
 Balsam willow – *Salix pyrifolia*  
 Alpine bilberry – *Vaccinium uliginosum*  
 Mountain cranberry – *Vaccinium vitis-idaea*  
 Cutler's goldenrod – *Solidago cutleri*



## DISTRIBUTION/ ABUNDANCE

This is a widespread community in the cooler regions of Vermont, especially at higher elevations. Most examples are quite small. Similar communities are common throughout the region.



## ECOLOGY AND PHYSICAL SETTING

This community occupies open bedrock areas, often on low mountain summits above 1,800 feet, in the cooler regions of the state. Surrounding forests are usually of the Spruce-Fir Northern Hardwoods Formation, dominated by red spruce, balsam fir, and yellow birch. The outcrops are generally small, convex areas on hilltops. They are kept naturally open because of persistent drought, exposure to wind, loss of soil resulting from past fires or other disturbance, or a combination of these influences.

## VEGETATION

Boreal Outcrops are very sparsely vegetated, with scattered low trees and sometimes abundant low shrubs and vascular plants scattered in small areas of soil accumulation. Bryophytes and lichens are usually abundant in these communities. In pockets where moisture accumulates, the moss *Sphagnum russowii* can form small peaty mounds.

## ANIMALS

We know little about the animals that occur specifically in this community, but likely mammals are red squirrels and red-backed voles. Blackpoll warbler, yellow-rumped warbler, red-breasted nuthatch and ruby-crowned kinglet are birds that nest in adjacent forests and may be heard or seen in Boreal Outcrops.

## VARIANTS

None recognized at this time.

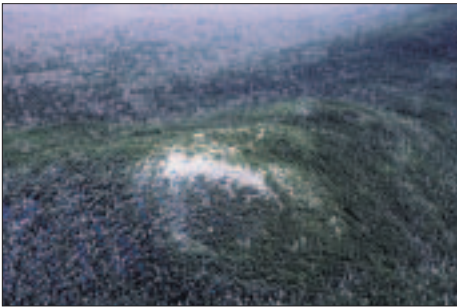
## RELATED COMMUNITIES

**Alpine Meadow:** This community occurs above treeline, generally above 3,500 feet. Alpine Meadows have a characteristic set of plants that are adapted to their colder, wetter climate.

**Boreal Acidic Cliff:** This community has slopes greater than 60 degrees, but shares many species in common with Boreal Outcrop.

## PLACES TO VISIT

Mount Hunger, Worcester, Putnam State Forest, Vermont Department of Forests, Parks, and Recreation



This Boreal Outcrop on Mount Abraham contrasts with the surrounding Montane Spruce-Fir Forest.

## CHARACTERISTIC PLANTS

### TREES

Red maple – *Acer rubrum*  
Paper birch – *Betula papyrifera*  
Red spruce – *Picea rubens*  
Balsam fir – *Abies balsamea*  
American mountain-ash – *Sorbus americana*

### SHRUBS

Velvetleaf blueberry – *Vaccinium myrtilloides*  
Bush-honeysuckle – *Diervilla lonicera*  
Sheep laurel – *Kalmia angustifolia*

### HERBS

Poverty grass – *Danthonia spicata*  
Hairgrass – *Deschampsia flexuosa*  
Canada mayflower – *Maianthemum canadense*  
Bracken fern – *Pteridium aquilinum*  
Sarsaparilla – *Aralia nudicaulis*

### BRYOPHYTES AND LICHENS

Reindeer lichen – *Cladonia* spp.  
Lichen – *Cladonia* spp.  
Haircap moss – *Polytrichum* spp.  
Moss – *Sphagnum russowii*

### NON-NATIVE PLANTS

Sheep sorrel – *Rumex acetosella*  
Canada bluegrass – *Poa compressa*

### RARE AND UNCOMMON PLANTS

Bigelow's sedge – *Carex bigelowii*  
Alpine bilberry – *Vaccinium uliginosum*  
Mountain fir clubmoss – *Lycopodium appalachianum*



## ECOLOGY AND PHYSICAL SETTING

Serpentine Outcrops are areas of exposed serpentine bedrock. This unusual rock, also known as ultramafic rock, takes on different forms in Vermont. Serpentinite is a greenish, fibrous rock that is mined for asbestos, and Dunite is a brownish rock that is more common than serpentinite. Chemically, these rocks are very different from other Vermont rocks. Serpentine rock originated deep in the earth's mantle, so it has more in common chemically with that layer of the earth than with the crust. Iron and magnesium are abundant, as are nickel and chromium, minerals that are toxic to plants in high concentrations. At the same time, important plant nutrients such as calcium, nitrogen, phosphorus, potassium, and molybdenum are all but absent in the soils that develop on serpentine. This particular chemical environment creates challenges for many plants and makes Serpentine Outcrops quite different from other kinds of outcrops. Indeed, in other parts of the country where serpentine occurs, the habitat has fostered the evolution of serpentine-adapted species, plants that apparently can grow nowhere else. In Vermont and adjacent Québec, the effect of serpentine is mostly to create a harsh habitat where many common plants cannot survive.

## VEGETATION

Serpentine Outcrops, like other kinds of outcrops and cliffs, are sparsely vegetated communities, with scattered plants growing in the soil that accumulates in the cracks in the rock. Grasses and herbs are most common, but shrubs and occasional trees are present as well. The overall diversity of species is low, because of the limited number of plants that can tolerate the specialized habitat. Several rare plants are restricted to this community in Vermont. The Green Mountain maidenhair fern grows only on serpentine soils, and its overall distribution is limited to northern Vermont and southern Québec.

## DISTRIBUTION/ ABUNDANCE

In Vermont, Serpentine Outcrops are found mostly in the Green Mountains, somewhat east of the main ridge. Significant areas are found in the north, in the towns of Troy, Lowell, and Westfield, and in the south in the town of Dover. Serpentine rock outcrops occur in small patches all along the Appalachians, from Newfoundland south to Georgia.





## ANIMALS

We know little about the animals that occur in this community. Since occurrences of Serpentine Outcrops are small, their animal communities likely reflect those of the surrounding forests.

## VARIANTS

None recognized at this time. This community type encompasses quite a bit of variability, and further study would likely reveal variations based on latitude, elevation, aspect, and exact chemical composition of the bedrock.

## RELATED COMMUNITIES

**Temperate Acidic Outcrop:** Very similar in structure and composition but lacking the serpentine specialists.

**Boreal Acidic Outcrop:** Very similar in structure and composition but lacking the serpentine specialists.

## CONSERVATION STATUS AND MANAGEMENT CONSIDERATIONS

Serpentine rock is the source of asbestos and also verde antique, an architectural stone. Although quarrying for these products can create additional habitat for some of the rare plants associated with serpentine rock, it disrupts the functioning of the natural community. One important Serpentine Outcrop is protected by The Nature Conservancy.

## PLACES TO VISIT

Haystack Mountain, Lowell, Long Trail State Forest, Vermont Department of Forests, Parks, and Recreation

## SELECTED REFERENCES AND FURTHER READING

Dann, Kevin T. 1988. *Traces on the Appalachians*. Rutgers University Press.

## CHARACTERISTIC PLANTS

### TREES

Red spruce – *Picea rubens*  
Gray birch – *Betula populifolia*

### SHRUBS

Common juniper – *Juniperus communis* var. *depressa*

### HERBS

Harebell – *Campanula rotundifolia*  
Field chickweed – *Cerastium arvense*  
Hairgrass – *Deschampsia flexuosa*  
Rock sandwort – *Arenaria stricta*  
Marginal wood fern – *Dryopteris marginalis*  
Poverty grass – *Danthonia spicata*

### NON-NATIVE PLANTS

Canada bluegrass – *Poa compressa*

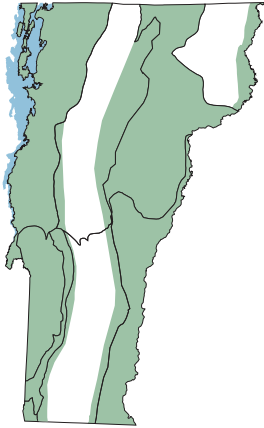
### RARE AND UNCOMMON PLANTS

Green Mountain maidenhair fern – *Adiantum viridimontanum*  
Serpentine maidenhair fern – *Adiantum aleuticum*  
Large-leaved sandwort – *Arenaria macrophylla*  
Marcescent sandwort – *Arenaria marcescens*  
Deer-hair sedge – *Scirpus cespitosus*  
Black crowberry – *Empetrum nigrum*



*Green Mountain maidenhair fern is a rare fern restricted to Serpentine Outcrops of northern Vermont and southern Québec.*

# TEMPERATE ACIDIC OUTCROP



## DISTRIBUTION/ABUNDANCE

This is a common community type in Vermont at lower elevations and in the warmer regions of the state. Most examples are quite small. Similar communities are found throughout the northeast.

## ECOLOGY AND PHYSICAL SETTING

Scattered throughout Vermont on low hilltops of granite, quartzite, sandstone, and schist below 1,600 feet elevation, one can find small exposures of acidic bedrock. On these Temperate Acidic Outcrops, soil is shallow, water is scarce, nutrients are limited, and summer heat can be intense. Most of these places are elevated above the general landscape and were therefore sheared clean when glaciers passed over them during the Pleistocene ice age. In many of these places, soil has not developed since the retreat of the glaciers. Other sites may have accumulated some soil since the glaciers retreated but much of it was lost again when humans came to Vermont to farm, bringing their grazing animals with them. Sheep can have a dramatic influence on a hilltop, clearing and trampling the vegetation, and causing soil erosion and compaction.

When they occur on hilltops, Temperate Acidic Outcrops can be vulnerable to lightning strikes and may therefore be maintained to some extent by occasional natural fires.

## VEGETATION

Temperate Acidic Outcrops, whether entirely natural or partly influenced by humans and their livestock, are stressful environments for plants. Trees are low and poorly formed. Shrubs, grasses, sedges, and other herbs grow in the cracks where soil has accumulated. Mosses can be abundant, forming large patches, and lichens are found throughout on the bare rock.

## VARIANTS

None recognized at this time.

## RELATED COMMUNITIES

**Temperate Calcareous Outcrop:** This community is similar in vegetation structure but has several species that are restricted to calcareous bedrock.

**Boreal Outcrop:** This community is similar in structure and vegetation but because of lower temperatures and higher atmospheric moisture, it has species such as red spruce, balsam fir, and even *Sphagnum russowii* in crevices that hold water.

**Temperate Acidic Cliff:** This is similar in many respects and grades into Temperate Acidic Outcrop.

**Dry Oak Woodland:** This may have areas of Temperate Acidic Outcrop within it but has regularly spaced trees and a more uniform cover of shrubs and herbs.

**Pitch Pine-Oak-Heath Rocky Summit:** This woodland community, with a canopy cover greater than 25 percent, can have areas of Temperate Acidic Outcrop within it, and the two communities can occur together.

**Red Pine Forest or Woodland:** This community often has areas of Temperate Acidic Outcrop within it and near it.

## PLACES TO VISIT

Snake Mountain, Addison, Snake Mountain Wildlife Management Area, Vermont Department of Fish and Wildlife (VDFW)  
 Black Mountain Natural Area, Dummerston, The Nature Conservancy  
 Little Ascutney Mountain, Weathersfield, Little Ascutney Wildlife Management Area, VDFW



*Low sweet blueberry is a common shrub on dry, acidic outcrops.*

## CHARACTERISTIC PLANTS

### TREES

Red maple – *Acer rubrum*  
 Paper birch – *Betula papyrifera*  
 Gray birch – *Betula populifolia*  
 White pine – *Pinus strobus*  
 Pitch pine – *Pinus rigida*

### SHRUBS

Low sweet blueberry – *Vaccinium angustifolium*  
 Late low blueberry – *Vaccinium pallidum*  
 Bush-honeysuckle – *Diervilla lonicera*  
 Huckleberry – *Gaylussacia baccata*  
 Shadbush – *Amelanchier* spp.

### HERBS

Poverty grass – *Danthonia spicata*  
 Hairgrass – *Deschampsia flexuosa*  
 Cow-wheat – *Melampyrum lineare*  
 Bastard toadflax – *Comandra umbellata*  
 Field pussytoes – *Antennaria neglecta*  
 Little bluestem – *Schizachyrium scoparium*  
 Wild columbine – *Aquilegia canadensis*  
 Bristly sarsaparilla – *Aralia hispida*  
 Silverrod – *Solidago bicolor*  
 Rand's goldenrod – *Solidago randii*  
 Pale corydalis – *Corydalis sempervirens*

### BRYOPHYTES AND LICHENS

Haircap moss – *Polytrichum piliferum*  
 Haircap moss – *Polytrichum juniperinum*  
 Windswept moss – *Dicranum flagellare*  
 Windswept moss – *Dicranum scoparium*  
 Windswept moss – *Dicranum montanum*  
 Moss – *Bryum lisae*  
 Liverwort – *Ptilidium pulcherrimum*  
 Reindeer lichens – *Cladina* spp.

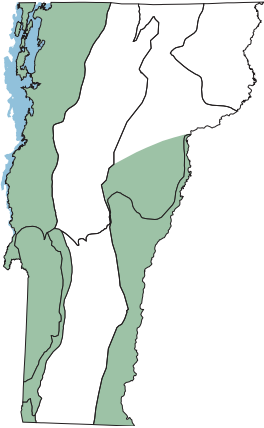
### NON-NATIVE PLANTS

Sheep sorrel – *Rumex acetosella*  
 Canada bluegrass – *Poa compressa*

### RARE AND UNCOMMON PLANTS

Douglas' knotweed – *Polygonum douglasii*  
 Dwarf chinquapin oak – *Quercus prinoides*  
 Prickly rose – *Rosa acicularis*

# TEMPERATE CALCAREOUS OUTCROP



## DISTRIBUTION/ABUNDANCE

This community is most abundant in the Champlain Valley and Vermont Valley biophysical regions but is also found occasionally in the Taconic Mountains and Southern Vermont Piedmont. All examples are below 2,000 feet elevation, and all examples are small.

## ECOLOGY AND PHYSICAL SETTING

These outcrops are found in the warmer regions of the state, on summits and other natural openings on calcareous bedrock such as limestone, dolomite, marble, or calcareous schist, usually below 2,000 feet elevation. Some of these rock types are vulnerable to weathering and so can develop deep fissures where water seeps into cracks and enlarges them over millennia. These fissures add to the overall droughtiness of these areas, draining water away very quickly. Weathering also releases nutrients held in the calcareous bedrock. Lime-loving plants thus characterize these outcrops.

## VEGETATION

Typically, Temperate Calcareous Outcrops are sparsely vegetated, but they can have well vegetated areas in pockets where soil has developed. In some cases they are dominated by grasses, sedges, and bryophytes; in other cases they are shrub-dominated. Still other outcrops have little vegetation, and forbs may dominate locally. There are often scattered trees, but in many cases (as on all outcrop communities) trees are stressed by periodic drought, and so do not reach great size. Many of the plants are, at least in our area, restricted to calcareous soils.

## VARIANTS

None recognized at this time.

## RELATED COMMUNITIES

***Temperate Calcareous Cliff:*** This community shares many species in common with Temperate Calcareous Outcrop but is less diverse in general and has slopes greater than 60 degrees.

***Temperate Acidic Outcrop:*** This community shares some species and many ecological processes with Temperate Calcareous Outcrop, but species diversity is lower and species composition differs. There are intermediates between the two, on neutral to slightly acidic bedrock.

***Red Cedar Woodland:*** This community is usually adjacent to open outcrop areas, whether calcareous or not.

## PLACES TO VISIT

Shaw Mountain, Benson, The Nature Conservancy



*The early summer flowers of hairy beardtongue, a plant of dry rocky woods, including Temperate Calcareous Outcrops.*

## CHARACTERISTIC PLANTS

### TREES

White ash – *Fraxinus americana*  
 Eastern red cedar – *Juniperus virginiana*  
 Northern white cedar – *Thuja occidentalis*  
 Red oak – *Quercus rubra*  
 White oak – *Quercus alba*  
 Yellow oak – *Quercus muehlenbergii*  
 Shagbark hickory – *Carya ovata*  
 Hophornbeam – *Ostrya virginiana*

### SHRUBS

Downy arrowwood – *Viburnum rafinesquianum*  
 Pasture rose – *Rosa carolina*  
 Shrubby cinquefoil – *Potentilla fruticosa*  
 Smooth shadbush – *Amelanchier laevis*  
 Snowberry – *Symphoricarpos albus*

### HERBS

Cow-wheat – *Melampyrum lineare*  
 Ebony spleenwort – *Asplenium platyneuron*  
 Purple clematis – *Clematis occidentalis*  
 Rock sandwort – *Arenaria stricta*  
 Snowy aster – *Solidago ptarmicoides*  
 Little bluestem – *Schizachyrium scoparium*  
 Kalm's brome grass – *Bromus kalmii*  
 Ebony sedge – *Carex eburnea*  
 Woodland sedge – *Carex pensylvanica*  
 Longleaf bluet – *Hedyotis longifolia* (*Houstonia longifolia*)

Seneca snakeroot – *Polygala senega*  
 Common pinweed – *Lecbea intermedia*  
 Woodland sunflower – *Helianthus divaricatus*  
 Poverty grass – *Danthonia spicata*  
 Wild columbine – *Aquilegia canadensis*  
 Field chickweed – *Cerastium arvense*  
 Balsam ragwort – *Senecio pauperculus*  
 Rock spike-moss – *Selaginella rupestris*

### NON-NATIVE PLANTS

Canada bluegrass – *Poa compressa*

### RARE AND UNCOMMON PLANTS

Richardson's sedge – *Carex richardsonii*  
 Hairy honeysuckle – *Lonicera hirsuta*  
 Lyre-leaved rock cress – *Arabis lyrata*  
 Creeping juniper – *Juniperus horizontalis*  
 Purple clematis – *Clematis occidentalis*  
 Snowy aster – *Solidago ptarmicoides*  
 Bronze sedge – *Carex foenea*  
 Smooth false-foxglove – *Aureolaria flava*  
 Harsh sunflower – *Helianthus strumosus*  
 Downy arrowwood – *Viburnum rafinesquianum*  
 Four-leaved milkweed – *Asclepias quadrifolia*  
 Silver-flowered sedge – *Carex argyrantha*  
 Hairy beardtongue – *Penstemon hirsutus*  
 Yellow oak – *Quercus muehlenbergii*  
 Fragrant sumac – *Rhus aromatica*