# Calcareous Cliff Community

Calcareous cliff community

Photo credits: *Steve Young*

**System** Terrestrial

**Subsystem** Open Uplands

**Did you know?**
Cliff communities can harbor some of the oldest trees in the state. Because of the inaccessible nature of cliffs, the vegetation at these sites is often left undisturbed. In addition, the trees that reside on cliffs grow under stressful conditions, including drought, high wind, and low nutrient availability, often making them stunted, knobby, and undesirable for commercial lumber. The small size of these trees can be deceiving. Studies of the Niagara Escarpment, which extends from New York into Ontario, Canada, have found northern white cedar trees (Thuja occidentalis) that are 500 to 1000 years old!

## Summary


**Protection** Not listed in New York State, not listed federally.

**Rarity** G4, S3

A global rarity rank of G4 means: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S3 means: Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.

**State Ranking Justification**

There are several hundred occurrences statewide. Some documented occurrences have good viability and many are protected on public land or private conservation land. This community is limited to the calcareous regions of the state, and there are several large, high quality examples. The current trend of this community is probably stable for occurrences on public land, or declining slightly elsewhere due to moderate threats that include mineral extraction, recreational overuse, and invasive species.

# Conservation Issues

## Threats

Calcareous cliff communities are threatened by adjacent upslope development (e.g., residential, agricultural, utility ROWs, roads) and its associated run-off. Other threats include habitat alteration (e.g., mining, logging of adjacent forests). Recreational overuse in the form of concentrated or sustained rock climbing is a particular threat to this community. Relatively minor recreational overuse adjacent to cliffs is a lesser threat (e.g., ATVs, trampling by visitors, campgrounds, picnic areas, trash dumping). Several cliff communities are threatened by invasive species, such as black swallow-wort *(Cynanchum* spp.), Canada bluegrass *(Poa compressa)*, garlic mustard *(Alliaria petiolata)*, and tree-of-heaven *(Ailanthus altissima)*.

## Management Considerations

Where practical, establish and maintain a natural forested buffer to reduce storm-water, pollution, and nutrient run-off, while simultaneously capturing sediments before they reach the cliff face. Avoid habitat alteration along the cliff and surrounding landscape. Restore sites that have been unnaturally disturbed (e.g., from mining). Prevent the spread of invasive exotic species onto the cliff through appropriate direct management, and by minimizing potential dispersal corridors, such as trails and utility ROWs. Monitor rock climbing activity and develop a management plan for sites where recreational overuse is a concern.

## Inventory Needs

Need to survey for occurrences statewide to advance documentation and classification of calcareous cliffs. A statewide review of calacareous cliffs is desirable, perhaps using GIS modeling to locate new occurrences. Continue searching for large cliffs in good condition (A- to AB-ranked).

## Research Needs

Need to research the age of the trees growing on limestone cliffs.
Several-hundred-year-old northern white cedar *(Thuja occidentalis)* trees have been reported on similar cliffs in Ontario, Canada (Kelly and Larson 1997). Need to collect sufficient plot data to support the recognition of several distinct calcareous cliff types based on species composition (e.g., bryophytes) and physical characteristics. The current classification encompasses a wide range of calcareous bedrock (e.g., limestone, dolostone, calcite, or marble), including circumneutral bedrock (e.g., amphibolite), calcareous shales, and even acidic bedrock with large calcareous intrusions. Entire cliffs or portions of cliffs can be further classified along a moisture gradient (e.g., dry, moist, wet). These types may correspond to ecoregional distribution, specific limestone geology, and/or local hydrology.

## Short Term Trends

The number and acreage of calcareous cliffs in New York have probably declined slightly in recent decades as a result of mineral extraction and other development.

## Long Term Trends

The number and acreage of calcareous cliffs in New York have probably declined moderately from historical numbers as a result of mineral extraction and other development.

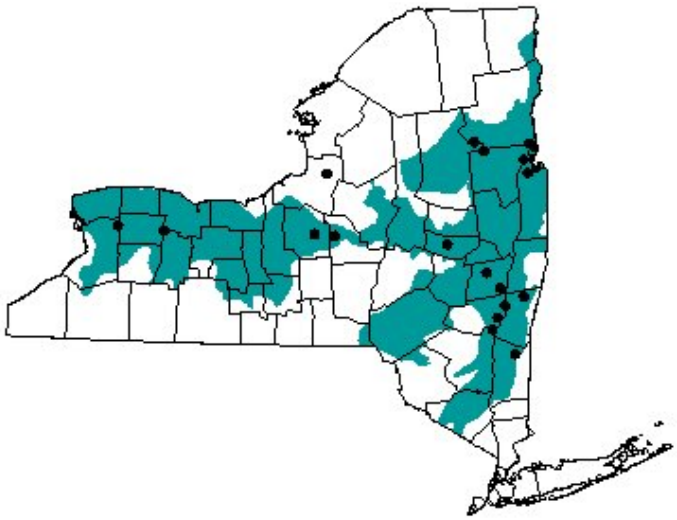
## Development Considerations

A natural (usually forested) buffer around the cliff face will help it maintain the characteristics that make it unique. It may be desirable to close portions of cliffs for various durations in order to protect rare cliff nesting birds and rare plant habitat.

## Rare Species

Indiana Bat (*Myotis sodalis*)
Smooth Cliff Brake (*Pellaea glabella ssp. glabella*)
Tawny Emperor (*Asterocampa clyton*)
Peregrine Falcon (*Falco peregrinus*)
Back's Sedge (*Carex backii*)
Handsome Sedge (*Carex formosa*)
Timber Rattlesnake (*Crotalus horridus*)
Butterwort (*Pinguicula vulgaris*)
Bird's-eye Primrose (*Primula mistassinica*)
Yellow Mountain-saxifrage (*Saxifraga aizoides*)
Woolly Lip-fern (*Cheilanthes lanosa*)
Hart's-tongue Fern (*Asplenium scolopendrium var. americanum*)
Canadian Single-spike Sedge (*Carex scirpoidea ssp. scirpoidea*)
Hair-like Sedge (*Carex capillaris*)
Elk Sedge (*Carex garberi*)
Golden Corydalis (*Corydalis aurea*)
Ram's-head Ladyslipper (*Cypripedium arietinum*)
Rock-cress (*Draba arabisans*)
Smooth Rock-cress (*Draba glabella*)
Eastern Small-footed Myotis (*Myotis leibii*)
Northern Monk's-hood (*Aconitum noveboracense*)
Roseroot (*Rhodiola rosea*)
Downy Wood-mint (*Blephilia ciliata*)
Green Rock-cress (*Boechera missouriensis*)
Drummond's Rock-cress (*Boechera stricta*)
Side-oats Grama (*Bouteloua curtipendula var. curtipendula*)
Carolina Whitlow-grass (*Draba reptans*)

# Range



The map shows the known locations for calcareous cliff community (black dots) based on the New York Natural Heritage Program database . A general approximation of the potential range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

## Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)

## Best Places to See

Chittenango Falls State Park (Madison County)
Devils Hole State Park (Niagara County)
East Bay Wildlife Management Area (Washington County)
Hudson River National Estuarine Research Reserve (Columbia County)
John Boyd Thacher State Park (Albany County)
Lake George Wild Forest, Adirondack Park (Essex, Warren Counties)
Whirlpool State Park (Niagara County)

## New York State Distribution

This community is widespread throughout upstate New York, north of the North Atlantic Coast Ecoregion, where the bedrock is calcareous. This community is currently known from western New York within the Erie and Ontario Lake Plain (Niagara Escarpment), in central New York north of the Finger Lakes, and in the Mohawk and upper Hudson Valley (Helderberg Escarpment) and Taconic Foothills. Calcareous cliffs are also known from the Central Adirondack Mountains and Eastern Adirondack Low Mountains (Lake George Valley). Additional occurrences may be located elsewhere in the state where similar environmental conditions exist.

### Global Distribution

This physically broadly-defined community may be worldwide, where the bedrock is calcareous. Examples with the greatest biotic affinities to New York occurrences are estimated to span north to southern Canada, west to Minnesota, southwest to Indiana and Tennessee, southeast to North Carolina, and northeast to Nova Scotia.

# Identification Comments

Calcareous cliff communities occur on vertical expanses of calcareous bedrock, such as dolomite or limestone. Soils are shallow, and the vegetation, which can include any of a large variety of tree, shrub, and herbaceous species, is very sparse. Plant species present are somewhat dependent on the microclimate conditions, which can range from shady and moist to sun-exposed and dry. Vegetation often inhabits shallow pockets of soil that accumulate on ledges, and in cracks and crevices within the cliff wall (Edinger et al. 2002).

### The Best Time to See

From mid to late spring, red columbine (Aquilegia canadensis) comes into bloom, making calcareous cliff communities that harbor this species very scenic. Throughout the summer, other attractive wildflowers, such as herb-robert (Geranium robertianum), American harebell (Campanula rotundifolia), and ferns such as bulblet fern (Cystopteris bulbifera), can be seen.

### Characteristics Most Useful for Identification

Different types of calcareous cliffs may be distinguished based on exposure and moisture. Under shaded conditions bryophyte diversity is high, and cool, moist cliff faces can support a variety of plant species similar in composition to the surrounding forest. Exposed cliffs are more sparsely vegetated and plants are typically found rooted in small amounts of soil that accumulates on ledges, or in cracks and crevices. Characteristic calcareous cliff species include purple cliff brake (Pellaea atropurpurea), bulblet fern (Cystopteris bulbifera), early saxifrage (Saxifraga virginiensis), mountain maple (Acer spicatum), northern white cedar (Thuja occidentalis), and eastern red cedar (Juniperis virginiana)

### Elevation Range

Known examples of this community have been found at elevations between 0 feet and 1640 feet.

### Similar Ecological Communities

**Shale cliff and talus community:** Shale cliff and talus communities occur on vertical, and nearly vertical exposures of shale bedrock, and include areas of talus. Limestone shale cliffs support species associations that are very similar to the calcareous cliff community.

**Cliff community:** Cliff communities have shallow soils and sparse vegetation, but they occur on vertical exposures of non-calcareous bedrock types, such as quartzite, sandstone, or schist.

## Characteristic Species

### Trees >5m
Sugar Maple (*Acer saccharum*)
Pignut Hickory (*Carya glabra*)
White Ash (*Fraxinus americana*)
Hophornbeam (*Ostrya virginiana*)
Red Oak (*Quercus rubra*)
Northern White Cedar (*Thuja occidentalis*)
American Basswood (*Tilia americana*)

### Shrubs 2-5m
Common Hackberry (*Celtis occidentalis*)
Wild Black Cherry (*Prunus serotina*)

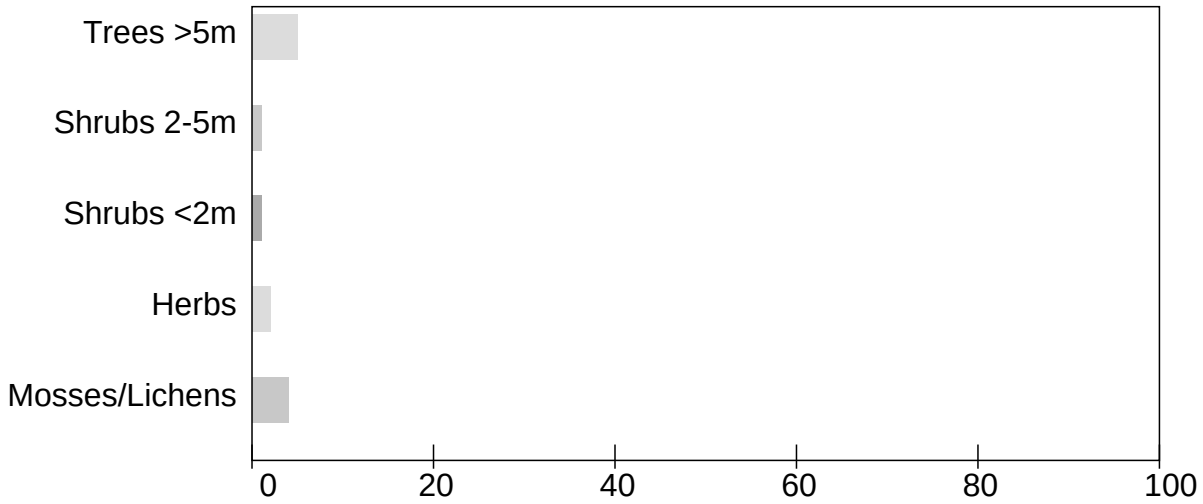
### Shrubs <2m
Roundleaf Dogwood (*Cornus rugosa*)
*Dasiphora floribunda*
Red Cedar (*Juniperus virginiana*)
Fragrant Sumac (*Rhus aromatica*)
Prickly Gooseberry (*Ribes cynosbati*)
Purple Flowering Raspberry (*Rubus odoratus*)
American Bladdernut (*Staphylea trifolia*)
Canada Yew (*Taxus canadensis*)
Downy Arrow-wood (*Viburnum rafinesquianum*)

### Vines
Climbing Bittersweet (*Celastrus scandens*)
Eastern Poison Ivy (*Toxicodendron radicans*)

### Herbs
Wild Columbine (*Aquilegia canadensis*)
Walking-fern Spleenwort (*Asplenium rhizophyllum*)
Wall-rue Spleenwort (*Asplenium ruta-muraria*)
Maidenhair Spleenwort (*Asplenium trichomanes*)
American Harebell (*Campanula rotundifolia*)
Bristleleaf Sedge (*Carex eburnea*)
Broad-leaved Sedge (*Carex platyphylla*)
Bulblet Fern (*Cystopteris bulbifera*)
Wavy Hair Grass (*Deschampsia flexuosa*)
Herb-robert (*Geranium robertianum*)
Kalm's Lobelia (*Lobelia kalmii*)
Canada Moonseed (*Menispermum canadense*)
*Oligoneuron album*
Purple-stem Cliff-brake (*Pellaea atropurpurea*)
Smooth Cliff-brake (*Pellaea glabella*)
Canada Bluegrass (*Poa compressa*)
Virginia Saxifrage (*Saxifraga virginiensis*)
Purple Oat (*Schizachne purpurascens*)
Broad-leaved Goldenrod (*Solidago flexicaulis*)

Early Meadow-rue (*Thalictrum dioicum*)
Windflower (*Thalictrum thalictroides*)

**Mosses/Lichens**
*Anomodon attenuatus*
*Anomodon rostratus*
*Encalypta procera*
*Gymnostomum aeruginosum*
*Tortella tortuosa*




This figure helps visualize the structure and "look" or "feel" of a typical calcareous cliff community. Each bar represents the amount of "coverage" for all the species growing at that height. Because layers overlap (shrubs may grow under trees, for example), the shaded regions can add up to more than 100%.

## International Vegetation Classification System Associations

This New York natural community encompasses all or part of the concept of the following International Vegetation Classification (IVC) natural community associations. These are often described at finer resolution than New York's natural communities. The IVC is developed and maintained by NatureServe.

Near-Boreal Alkaline Cliff (CEGL006526)

Temperate Alkaline Cliff (CEGL006527)

## NatureServe Ecological System Associations

This New York natural community falls into the following ecological system(s). Ecological systems are often described at a coarser resolution than New York's natural communities and tend to represent clusters of associations found in similar environments. The ecological systems project is developed and maintained by NatureServe.

Laurentian-Acadian Calcareous Cliff and Talus (CES201.570)

# Additional Resources

## References


Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2002. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review). New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Kelly, P. E., and D. W. Larson. 1997. Dendroecological analysis of the population dynamics of an old-growth forest on cliff-faces of the Niagara Escarpment, Canada. Journal of Ecology 85:467-478.

Keys, Jr.,J.; Carpenter, C.; Hooks, S.; Koenig, F.; McNab, W.H.; Russell, W.;Smith, M.L. 1995. Ecological units of the eastern United States - first approximation (cd-rom), Atlanta, GA: U.S. Department of Agriculture, Forest Service. GIS coverage in ARCINFO format, selected imagery, and map unit tables.

Larson, D.W. 1989. Effects of disturbance on old-growth Thuja occidentalis at cliff edges. Can. J. Bot. 68:1147-155.

Larson, D.W., U. Matthes, and P.E. Kelly. 2000. Cliff Ecology: Pattern and Process in Cliff Ecosystems. Cambridge University Press, New York, NY.

NatureServe. 2005. NatureServe Central Databases. Arlington, Virginia. USA

Reschke, Carol. 1990. Ecological communities of New York State. New York Natural Heritage Program, NYS Department of Environmental Conservation, Latham, NY. 96 pp + xi.

Van Diver, Bradford B. 1985. Roadside Geology of New York. Mountain Press Publishing Company, Missoula, MT.


---


**New York Natural Heritage Program**
625 Broadway, 5th Floor,
Albany, NY 12233-4757
Phone: (518) 402-8935
acris@nynhp.org



This project is made possible with funding from:
- New York State Department of Environmental Conservation Hudson River Estuary Program
- Division of Lands & Forests, Department of Environmental Conservation
- New York State Office of Parks, Recreation and Historic Preservation

Information for this guide was last updated on Feb 06, 2008