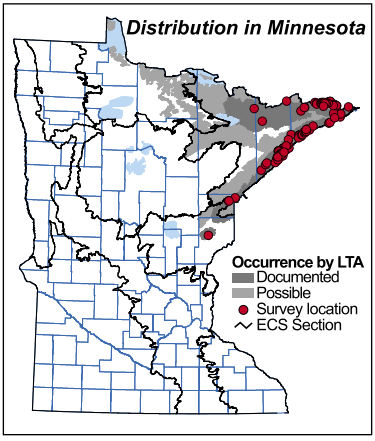
Northern Mesic Cliff

Open plant communities on dry-mesic to mesic, northwest- to east-facing, shaded cliffs in rugged terrain in northeastern and, rarely, eastcentral Minnesota. Vascular plants are largely restricted to crevices and ledges.

Vegetation Structure & Composition

Description is based on summary of plant species lists and field notes from 131 cliffs.



- **Lichen, bryophyte, and algal cover** is high. Exposed bedrock is dominated by lichens. Mosses, liverworts, and algae are common but usually less abundant than lichens.
- **Herbaceous plant** cover is sparse to patchy (5-50%). Characteristic species include harebell *(Campanula rotundifolia),* northern and Appalachian firmoss *(Huperzia selago, H. appalachiana,* and hybrids), fragile fern *(Cystopteris fragilis),* common and Nahanni oak fern *(Gymnocarpium dryopteris* and *G. jessoense),* and rough bent-grass *(Agrostis scabra).* Plants from adjacent forests are also often present on cliffs. Several rare plants, including Rocky-mountain woodsia *(Woodsia scopulina)* and smooth woodsia *(W. glabella)*, are sometimes present in the community.
- **Tree** and **shrub** cover on cliff face ranges from absent to fairly dense but most often is sparse to patchy (5-50%), with canopy, subcanopy, and shrub layer poorly differentiated when present. Characteristic tree species include white cedar, mountain ash, and heart-leaved birch. Characteristic shrub species include green alder *(Alnus viridis).* Trees, especially white cedars, are often short and deformed and may be very old. Trees at top and base of cliff often shade large parts of the cliff face.

Landscape Setting & Soils

CTn32 is most common on upper portions of steep slopes in rugged, bedrock-controlled terrain in landscapes dominated by Superior and Rainy lobe till deposits. The community is occasionally present in river gorges and on small, intermittent bedrock exposures in landscapes with rolling topography. Common rock types include diabase, basalt, gabbro, diorite, granite, and graywacke, with the cliff face sometimes composed of multiple rock layers. Veins of nutrient-rich calcite or other intrusive rock are often present. True soil development is minimal, with soil mostly confined to narrow ledges and crevices and consisting of thin organic deposits from decomposing plant and animal remains. Certain areas such as slides and chutes may have somewhat greater soil accumulation.

Natural History

Species in cliff communities are subjected to greater environmental extremes than species in surrounding terrestrial communities, including rapid fluctuations in substrate temperature, limited nutrient availability, and gravitational stresses on plants growing outward from steep or vertical surfaces. Growth forms of woody species are commonly affected by wind, with stunting, stem dieback, and misshapen trunks prevalent on cliffs. Wind-swept “krummholz” growth forms are especially common among trees and shrubs on upper cliff faces and adjacent cliff tops, where exposure to wind is most severe. The absence of soil on much of the cliff limits opportunities for colonization by vascular plants, which are generally restricted to crevices or small patches of soil that have accumulated on ledges. The amount of vascular plant cover is strongly related to the amount of fracturing of the bedrock; bedrock exposures with few fractures (such as anorthosite cliffs) are often nearly devoid of vascular plants. Fracture of large pieces of rock from

the cliff face is a major, although rare, event that can disrupt cliff communities and set back succession. In general, erosion rates are higher on cliffs composed of sedimentary rocks than on cliffs composed of igneous or metamorphic rocks.

Similar Native Plant Community Classes

The upper parts of cliffs are generally dry, regardless of aspect; the classification of any cliff should be based more on conditions on the lower two-thirds of the cliff face than on the upper third.

- **CTu22 Lake Superior Cliff**

CTu22, in the rare instances where it occurs on shaded, north- to east-facing cliffs protected from scouring by storm waves and ice (see CTu22c, Sheltered Mafic Cliff [Lake Superior]), can be similar to CTn32. By definition, however, all cliff communities along the immediate shore of Lake Superior are classified as CTu22.

▶ ***CTu22***—Characterized by species rarely present away from the immediate shore of Lake Superior, including Hudson Bay eyebright *(Euphrasia hudsoniana),* spike trisetum *(Trisetum spicatum),* ninebark *(Physocarpus opulifolius),* encrusted saxifrage *(Saxifraga aizoon),* and shrubby cinquefoil *(Potentilla fruticosa).* Because of the cool, moist microclimate on sheltered cliffs along Lake Superior, mosses and algae are dominant on rock surfaces, typically forming thick mats.

▶ ***CTn32***— Much more likely to have firmosses *(Huperzia* spp.). Lichens are dominant on rock surfaces; moss and algal mats are absent or small.

- **CTn42 Northern Wet Cliff**

CTn42 often grades into CTn32, although CTn42 is most common in deep, narrow river gorges rather than on escarpments in rugged upland terrain (the more common setting for CTn32). Distinguishing between the communities is most difficult on large, predominantly mesic cliffs that have small, wet areas of groundwater seepage. In these settings, a rough guideline for differentiating the two is based on the amount of the cliff face that is continuously wet from seepage: if >30% of the cliff is wet, it is classified as CTn42; if <30% of the cliff is wet, it is classified as CTn32.

▶ ***CTn42***—Because of the cool microclimate in river gorges, mosses and algae are dominant on rock surfaces, often forming thick mats.

▶ ***CTn32***—Lichens are dominant on rock surfaces; moss and algal mats are absent or poorly developed.

- **CTn11 Northern Dry Cliff**

Distinguishing CTn11 from CTn32 is most difficult on west- or east-facing cliffs, where sunlight exposure and moisture levels can be intermediate between those that characterize dry versus mesic cliffs.

▶ ***CTn11***—Typically present on sunny, south- to west-facing cliffs. Exposed bedrock surfaces are almost entirely dominated by lichens, with few mosses and algae.

▶ ***CTn32***—Typically present on shaded north- to east-facing cliffs. Exposed bedrock surfaces are often dominated by lichens but also have significant cover of moss and algae. More likely to have harebell, fragile fern, and firmosses.

Native Plant Community Types in Class

Plant species composition has not been systematically sampled across the range of CTn32, but composition likely varies with pH and nutrient availability. Therefore, the community types in CTn32 at present are based on broad bedrock categories reflecting bedrock pH and nutrient properties.

- **CTn32a Mesic Mafic Cliff (Northern)**

Open communities on mesic, circumneutral to moderately alkaline cliffs composed of diabase, basalt, gabbro, diorite, andesite, anorthosite, or greenstone, or of sandstone derived from these rock types. Characteristic vascular plants include northern and Appalachian firmoss (and hybrids), harebell, and the rare plants smooth woodsia and encrusted saxifrage. CTn32a represents the most common mesic cliff type in the North Shore Highlands and much of the Border Lakes subsections in NSU. On cliffs in the Rove Landtype Association in the eastern Border Lakes Subsection, CTn32a often occurs as a cap of erosion-resistant diabase above a more erodible layer of shale, argillite, or graywacke (see CTn32b).

● **CTn32b Mesic Rove Cliff (Northern)**

Open communities on mesic, circumneutral to slightly alkaline cliffs composed of shale, argillite, and graywacke bedrock of the Rove Formation, which are slightly metamorphosed sedimentary rocks deposited in thin, highly erodible layers. The lower parts of the Rove Formation and upper parts of the underlying Gunflint Iron Formation tend to be calcareous. Often, the Rove Formation rocks are present as a band at the base of a cliff beneath a much more erosion-resistant diabase (mafic) cap. Such cliffs are often mapped as complexes of CTn32b and CTn32a. A number of rare plants occur in Minnesota only in CTn32b, and several others occur primarily in this community. These include Rocky Mountain woodsia, encrusted saxifrage, and prairie-dweller sedge *(Carex praticola)*. CTn32b is present in the eastern part of the Border Lakes Subsection and the northeastern end of the North Shore Highlands Subsection in NSU.

● **CTn32c Mesic Thomson Cliff (Northern)**

Open communities on mesic, circumneutral or possibly slightly acidic cliffs composed of slate and graywacke of the Thomson Formation. These metamorphosed sedimentary rocks are exposed in a small area along the St. Louis River in the vicinity of Jay Cooke State Park in the northeastern corner of WSU. Plant species that have been recorded on the three known occurrences of CTn32c include firmosses and hairy goldenrod *(Solidago hispida)*. No rare plants have been recorded on these cliffs.

● **CTn32d Mesic Felsic Cliff (Northern)**

Open communities on mesic, weakly to moderately acidic cliffs composed either of rhyolite, granite, granodiorite, granophyre, or tonalite. CTn32d appears to have lower vascular plant species diversity than CTn32a, CTn32b, or CTn32c, and very rarely supports rare plants. CTn32d is present occasionally in the Border Lakes and North Shore Highlands subsections in NSU.

● **CTn32e Mesic Sandstone Cliff (Northern)**

Open communities on mesic, moderately acidic cliffs composed of quartz sandstone. Several localized examples are present along the Kettle River in the vicinity of Banning State Park in WSU, and possibly on Fond du Lac Sandstone along the lower St. Louis River in southwest Duluth in SSU. There are few records available on the plant species composition of CTn32e.

photo by W.R. Smith MN DNR

Encrusted saxifrage *(Saxifraga aizoön)*