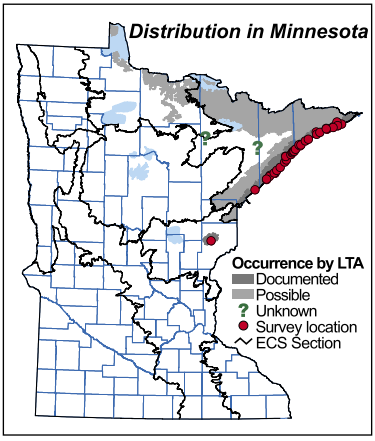
Northern Wet Cliff

Open plant communities on cool, wet, shaded, northwest- to east-facing cliffs in deep, narrow river gorges in northeastern and, rarely, eastcentral Minnesota. Vascular plants are restricted to crevices, ledges, and moss mats.

Vegetation Structure & Composition

Description is based on summary of plant species lists and field notes from 44 cliffs.



- **Bryophyte, lichen, and algal** cover is high. Exposed bedrock is dominated by mosses, liverworts, and algae, which often form thick mats. Lichens are common on exposed bedrock, although they are usually less abundant than mosses and liverworts.
- **Herbaceous plant** cover is sparse to patchy (5-50%). Characteristic species include slender cliff brake *(Cryptogramma stelleri)*, fragile fern, *(Cystopteris fragilis),* bulblet fern *(C. bulbifera),* harebell *(Campanula rotundifolia),* and the rare species alpine woodsia *(Woodsia alpina)*. Herbaceous plants from adjacent forests are also frequent on cliff face.
- **Tree and shrub** cover on cliff face ranges from sparse to fairly dense but most often is patchy (25-50%). Tree canopy, subcanopy, and shrub layer are poorly differentiated. Characteristic tree species include white cedar, mountain ash, and heart-leaved birch. Trees, especially white cedars, are often short and deformed and may be very old.

Landscape Setting & Soils

CTn42 has been documented in deep, narrow river or stream gorges along the North Shore of Lake Superior. CTn42 is most common on basalt bedrock and rarely on rhyolite bedrock. Cliff faces are sometimes composed of multiple rock layers, with veins of nutrient-rich calcite or other intrusive rock often present. Soils are mostly confined to narrow ledges and crevices and consist of thin organic deposits from decomposing plant and animal remains. Slides and chutes may have greater soil accumulation.

Natural History

The deep, narrow gorges where CTn42 occurs are cooler and moister than the surrounding landscape. Direct sunlight rarely reaches the bottoms of the deepest and narrowest gorges, and gorges are bathed by cool air draining from adjacent uplands and by air moving inland from Lake Superior. The cool, moist air in the gorges minimizes desiccation of rock faces. Groundwater seepage commonly provides additional moisture on parts of the gorge walls; seepage ranges from barely detectable flows emanating from crevices to water visibly dripping or cascading over the rock face. The rate of seepage flow can also vary depending on annual precipitation levels and groundwater recharge rates. Some of the wettest cliff areas are in the spray or mist zone below large waterfalls, which are often present at the upstream ends of gorges. Wet cliffs in river gorges are somewhat more buffered from the extremes of temperature, moisture, and wind prevalent on mesic and dry cliffs. However, limited nutrient availability and stresses on plants growing outward from vertical surfaces are still important influences on the composition and structure of vegetation in the gorges.

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, when present on shaded, north- to east-facing cliffs protected from scouring by storm waves and ice (see CTu22c, Sheltered Mafic Cliff [Lake Superior]), often has zones of seepage and can be similar to CTn42. The cool, moist microclimate on sheltered cliffs along the Lake Superior shoreline promotes growth of mosses and algae, which form thick mats similar to those present in CTn42.

▶ ***CTu22***—Present along the immediate shore of Lake Superior. Much more likely to have Hudson Bay eyebright *(Euphrasia hudsoniana),* spike trisetum *(Trisetum spicatum),* ninebark *(Physocarpus opulifolius),* encrusted saxifrage *(Saxifraga aizoon*), and shrubby cinquefoil *(Potentilla fruticosa),* most of which are rarely present away from the shore of Lake Superior.

▶ ***CTn42***—Present in deep, narrow river gorges or other sites away from the Lake Superior shore.

● **CTn32 Northern Mesic Cliff**

CTn32 can be similar to and grade into CTn42. Distinguishing the two classes is 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 the amount of the cliff face that is continuously wet from seepage: if <30% of the cliff is wet, it is classified as CTn32; if >30% of the cliff is wet, it is classified as CTn42. Borderline examples outside of river gorges are classified as CTn32 or as a complex of CTn32 and CTn42, while intermediate examples in river gorges are classified as CTn42.

▶ ***CTn32***—Most common on escarpments in rugged upland terrain. Lichens are dominant on rock surfaces, while moss and algal mats are generally small or absent.

▶ ***CTn42***—Most common in deep, narrow river gorges. Because of the cool microclimate in river gorges, mosses and algae are abundant on rock surfaces, commonly forming thick mats. More likely to have slender cliff brake and alpine woodsia.

Native Plant Community Types in Class

Plant species composition has not been systematically sampled across the range of CTn42, but composition likely varies with pH and nutrient availability. Therefore, the community types in CTn42 at present are based on broad bedrock categories reflecting bedrock pH and nutrient properties.

● **CTn42a Wet Mafic Cliff (Northern)**

Open communities on moist, cool, circumneutral to moderately alkaline cliffs composed most often of basalt but also potentially of diabase, gabbro, diorite, andesite, anorthosite, or greenstone, or of sandstone derived from these rock types. CTn42a is the primary habitat for alpine woodsia, slender cliff brake, and bulblet fern in northeastern Minnesota. CTn42a occurs mainly in deep, narrow river gorges and is the predominant moist cliff type in the North Shore Highlands Subsection, and possibly also the Border Lakes Subsection, in NSU.

● **CTn42b Wet Rove Cliff (Northern)**

Open communities on moist, cool, circumneutral to slightly alkaline cliffs composed of shale, argillite, and graywacke 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 form a band at the base of a cliff beneath a much more erosion-resistant diabase cap, resulting in complexes of CTn42b and CTn42a. CTn42b is likely to be present on exposures of the Rove and Gunflint Iron Formations in the northeastern end of the North Shore Highlands Subsection, and in the eastern part of the Border Lakes Subsection, in NSU.

● **CTn42c Wet Felsic Cliff (Northern)**

Open communities on moist, cool, weakly to moderately acidic cliffs composed most often of rhyolite but also potentially of granite, granodiorite, or granophyre. Rhyolite cliffs have lower vascular plant species diversity than the other wet cliff types, with vascular plants often rare or absent. CTn42c is uncommon and occurs in deep, narrow gorges in the North Shore Highlands Subsection in NSU.

● **CTn42d Wet Sandstone Cliff (Northern)**

Open communities on moist to wet, moderately acidic cliffs composed of quartz sandstone. Birds-eye primrose *(Primula mistassinica)* and shrubby cinquefoil are present on the one known occurrence of CTn42d, on outcrops of Hinckley Sandstone along the Kettle River in Banning State Park in WSU.