

## Southern Dry Cliff

Open, lichen-dominated plant communities on dry, sunny south- to west-facing cliffs in rugged terrain, primarily in southeastern Minnesota. Vascular plants are sparse and restricted to crevices and ledges.

### Vegetation Structure & Composition

Description is based on summary of plant species lists and field notes from approximately 500 cliffs (almost entirely in PPL).

- **Lichen and bryophyte** cover is high, often 75% or greater. Exposed bedrock on cliff face is dominated by crustose and foliose lichens. Mosses and liverworts are uncommon to occasional, and algae are absent to rare. Mosses that may be present include the widespread species *Brachythecium acuminatum*, *Ceratodon purpureus*, and *Plagiomnium cuspidatum*, and species more restricted to growing on rock, including *Hedwigia ciliata* and *Gymnostomum aeruginosum*.

- **Herbaceous plant** cover is sparse (5–25%). Characteristic species include cliff goldenrod (*Solidago sciaphila*), smooth cliff brake (*Pellaea glabella*), slender lip fern (*Cheilanthes feeii*), tall wormwood (*Artemisia campestris*), nodding wild rye (*Elymus canadensis*), columbine (*Aquilegia canadensis*), and occasionally purple cliff brake (*Pellaea atropurpurea*). Plants characteristic of dry prairies, such as plains muhly (*Muhlenbergia cuspidata*), alumroot (*Heuchera richardsonii*), and harebell (*Campanula rotundifolia*), are often common.

- **Climbing plants and vines** such as Virginia creeper (*Parthenocissus* spp.) are often present.

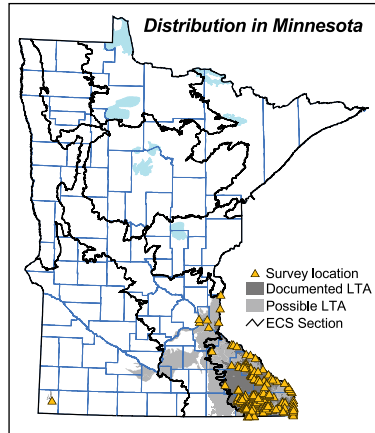
- **Tree and shrub** cover on cliff face ranges from absent to sparse (0–25%); when present, tree canopy, subcanopy, and shrub layer are poorly differentiated. Red cedar and bush juniper (*Juniperus communis*) are common—especially at tops of cliffs—and occasionally shade portions of cliffs. Trees are often short and deformed and may be very old. White pine is associated with some occurrences.

### Landscape Setting & Soils

- **Steep stream-dissected bedrock bluffs**—Common. Present in dissected bedrock terrain where little of the original plateau remains as interfluvies between stream valleys. Most common on steep slopes with south to west aspects. Common rock types include limestone, dolomite, and sandstone. Cliff face sometimes is composed of multiple rock layers. 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. Local areas such as slides and chutes may have somewhat greater soil accumulation. (PPL, St. Paul–Baldwin Plains and Moraines in MIM)

### Natural History

Species in dry cliff communities are exposed to greater environmental extremes than species in surrounding terrestrial communities. Dry cliff plants must withstand high rates of desiccation because of low substrate moisture-holding capacity and exposure to direct sunlight and strong winds. Dry cliff species are also subjected to rapid fluctuations in substrate temperatures, which are typically much higher than in surrounding woodlands and forests during midafternoon on sunny days and significantly colder at night. Nutrients are limited on dry cliffs, which influences both plant community composition and plant growth rates. The absence of soil on much of the cliff also limits opportunities for colonization by vascular plants, which are generally restricted to crevices or small



patches of soil that accumulate on ledges. The overall amount of vascular plant cover is strongly related to the amount of fracturing of the bedrock; bedrock exposures with few fractures (especially sandstone 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 sandstone and highly fractured limestone than on cliffs composed of slightly fractured limestone or dolomite.

### **Similar Native Plant Community Classes**

#### ● **CTs33 Southern Mesic Cliff**

CTs33 often grades into CTs12, and distinguishing the two can be difficult, especially on partially shaded west- or east-facing cliffs, where sunlight exposure and moisture levels can be intermediate between those that characterize mesic versus dry cliffs. In CTs33, 75% or more of the cliff face is shaded by trees or because of aspect (generally north to east). Mosses and algae are common on exposed rock and widely distributed across the cliff face, and CTs33 is more likely to have fragile fern (*Cystopteris fragilis*), bulblet fern (*C. bulbifera*), walking fern (*Asplenium rhizophyllum*), hairy rock cress (*Arabis hirsuta*), common poison ivy (*Toxicodendron rydbergii*), jeweled shooting star (*Dodecatheon radicans*), and species of Mesic Hardwood Forest communities such as miterwort (*Mitella diphylla*), sharp-lobed hepatica (*Hepatica acutiloba*), zigzag goldenrod (*Solidago flexicaulis*), and wild ginger (*Asarum canadense*). In CTs12, less than 50% of the cliff face is shaded, and the aspect is generally south to west. Lichens dominate areas of exposed rock, mosses are uncommon, and algae are absent or rare. CTs12 is also more likely to have slender lip fern, cliff goldenrod, nodding wild rye, bush juniper, and species common in dry prairies, such as plains muhly and alumroot.

#### ● **CTn11 Northern Dry Cliff**

CTn11 typically occurs on the Canadian Shield in northeastern Minnesota, well outside the range of CTs12. There is, however, a southern outlier of CTn11 on Precambrian basalt along the St. Croix River at Taylors Falls in Chisago County, while CTs12 has been recorded on Paleozoic sandstone less than 10 miles downstream. Little data exist on the flora of cliffs along this part of the St. Croix River.

#### ● **ROs12 Southern Bedrock Outcrop**

In southeastern Minnesota, ROs12 shares a number of species with CTs12. This is especially true in the Blufflands Subsection in the PPL where Paleozoic sandstone, limestone, and dolomite are the predominant bedrock. Here the difference between ROs12 and CTs12 is often largely a matter of scale. The larger a bedrock exposure is, the more likely it is to have distinctive cliff species. By definition, vertical exposures greater than 6ft (2m) tall are classified as cliffs, although the floristic differences between a 6-foot cliff (especially a dry cliff) and a 4-foot outcrop are often insignificant. Species such as rock spikemoss (*Selaginella rupestris*) and the rare rock sandwort (*Arenaria stricta* var. *dawsonensis*) are more commonly restricted to horizontal bedrock surfaces (i.e., ROs12), while cliff specialists such as slender lip fern, cliff goldenrod, and smooth cliff brake are more common on vertical bedrock (i.e., CTs12).

#### ● **UPs13 Southern Dry Prairie**

UPs13 shares a number of species with CTs12. In addition to obvious differences in substrate, differentiating the two classes is based on the presence of typical dry cliff plants such as smooth cliff brake, slender lip fern, and cliff goldenrod. The larger the cliff, the more likely it is to have specialized cliff species. In southeastern Minnesota, sandstone and limestone-dolomite cliffs (CTs12a and CTs12b) are frequently surrounded by dry bedrock bluff prairies (UPs13c), and some areas mapped as UPs13c contain inclusions of dry cliffs. In southwestern Minnesota, there are currently no data on how the cliff flora from the one documented example of CTs12 on Sioux Quartzite (CTs12c) differs from dry prairies in the area.



### **Native Plant Community Types in Class**

Plant species composition has not been systematically sampled across the range of CTs12, but composition appears to vary with pH and nutrient availability. Therefore, the community types in CTs12 at present are based on broad bedrock categories reflecting pH and nutrient properties.

#### • **CTs12a Dry Sandstone Cliff (Southern)**

CTs12a is occasional, with most examples occurring in the PPL. There are also local occurrences in the lower St. Croix River valley and along the Mississippi River valley in the Twin Cities metropolitan area. The most common bedrock layers include the St. Peter, Jordan, Franconia, Ironton, and Galesville formations. Cliff faces are often mostly devoid of crevices, and vascular plants are often largely absent. Lichens predominate on more stable areas.

#### • **CTs12b Dry Limestone - Dolomite Cliff (Southern)**

CTs12b is common, with most examples occurring in the PPL. There are also local occurrences in the lower St. Croix River valley and along the Mississippi River valley in the Twin Cities metropolitan area. The most common bedrock layers include the Galena Group (Stewartville, Prosser, and Cummingsville formations), Prairie du Chien Group (Oneota and Shakopee formations), and St. Lawrence, Maquoketa, Dubuque, and Platteville formations. Shales of the Decorah and Glenwood formations are also included. Cliff faces vary from highly fractured with abundant rooting places for vascular plants in some of the limestone formations to moderately fractured in some of the dolomite formations.

#### • **CTs12c Dry Sioux Quartzite Cliff (Southern)**

CTs12c is very rare, occurring only at Blue Mounds State Park (and possibly at Pipestone National Monument) in the Prairie Parkland Province in southwestern Minnesota. The bedrock is Sioux quartzite, a metamorphic sandstone. Little floristic data exist for this south- to east-facing cliff, which rises as much as 100 feet high.



photo by C. K. Converse MN DNR

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