



Olmsted County, MN

General Description

Communities in the Cliff/Talus (CT) System are present on cliffs and talus slopes on steep-sided bluffs, along streams, on margins of bedrock ridges, and in other settings with sheer bedrock exposures. Often, cliffs and talus slopes are associated with one another because talus slopes are composed of rock fractured from either cliffs or smaller areas of exposed bedrock on steep hillsides. The vegetation of CT communities is generally open. Lichens and mosses are often the dominant life-forms, with vascular plants sparse or patchy because of scarcity of soil. In this classification, cliff communities are grouped by moisture and light regimes and by bedrock type, which are major determinants of species composition. Cliff habitats range from warm and dry to cold and wet depending on cliff aspect, proximity to streams or lakeshores, and presence of groundwater or cold air seepage on the cliff face; in the Eastern Broadleaf Forest (EBF) Province, cliffs are formed most commonly of sedimentary bedrock. Talus habitats vary from rather warm and very dry to cold and moist.

In the EBF Province, CT communities are abundant in the Blufflands Subsection in the PPL, where bedrock is typically at or near the surface, and topography is rugged. The bedrock is sedimentary, of Cambrian and Ordovician (Paleozoic) origin. Exposures of limestone, dolomite, and sandstone are all common. Scattered cliffs are present on similar bedrock formations in the Rochester Plateau Subsection in the PPL, the St. Paul–Baldwin Plains and Moraines Subsection in the MIM, and very locally in the Oak Savanna Subsection in the MIM, primarily along streams where water has exposed the underlying bedrock.

Vegetation Structure and Composition

Lichens, mosses, and liverworts cover rock surfaces in CT communities and colonize areas exposed by erosion. On cliffs, vascular plant cover is strongly correlated with the amount of fracturing of bedrock, with plants generally limited to crevices and ledges where soil has accumulated and roots can take hold. As a result, cliffs composed of highly fractured bedrock tend to have higher plant cover than those with few fractures. On wet cliffs, vascular plants may also root in thick mats of mosses and liverworts that cover the bedrock. Most cliffs have less than 25% cover of trees or shrubs, although



woody plant cover is variable. On talus slopes, vascular plant cover is influenced by the stability of talus and the amount of soil accumulated between talus blocks. Because of shifting substrates, woody cover is usually less than 50%, and many talus slopes have no trees or shrubs.

Plant Adaptations

Plants in CT communities are generally tolerant of greater environmental extremes than species in surrounding terrestrial communities. Many plants on cliffs and talus slopes are well adapted to desiccation because of low moisture-holding capacities of substrates and exposure to direct sunlight and strong winds. They must also withstand rapid fluctuations in substrate temperatures, which are significantly colder at night than in surrounding forests and, in some settings, much warmer during midafternoon on sunny days. Limited availability of nutrients on many cliffs and talus slopes strongly influences community composition and growth rates of plants. Wind and gravitational stresses have a visible impact on the growth forms of trees and shrubs, causing stunting, stem dieback, and misshapen trunks. Vascular plant species in CT communities commonly reproduce by vegetative structures such as rhizomes, runners, or stolons and tend to persist from year to year once established at a site; species that disperse and propagate primarily by seed are less common.

CT communities in the EBF Province provide habitat for several rare vascular plant species, some of which are boreal species with disjunct populations in Minnesota. On shaded moist cliffs with cool microclimates in the PPL these species include Leedy's roseroot (*Sedum rosea* var. *integrifolium*), montia (*Montia chamissoi*), and Arabian whitlow grass (*Draba arabisans*). Cool, moist talus slopes in the PPL support rare cold-loving plants such as Iowa golden saxifrage (*Chryso-splenium iowense*) and moschatel (*Adoxa moschatellina*). These talus slopes also support populations of plants that, although common in northern Minnesota, are generally uncommon in the EBF Province, including naked miterwort (*Mitella nuda*), panicked bluebells (*Mertensia paniculata*), northern oak fern (*Gymnocarpium robertianum*), northern black currant (*Ribes hudsonianum*), dwarf alder (*Rhamnus alnifolia*), and balsam fir. Other rare plants have been documented on shaded mesic cliffs and on sunny dry cliff and talus communities throughout the southern portions of the EBF Province. Many CT communities, especially the drier ones, have plant species that occur also in Rock Outcrop and Upland Prairie (UP) communities. Moister cliffs often have species that are common in Mesic Hardwood (MH) Forest communities.

Landscape Setting and Disturbance Regime

In the broader landscape, CT communities are small features, rarely covering more than 5 acres (2ha). In the EBF Province, they are commonly surrounded by upland forests, especially Fire-Dependent Forest/Woodland and MH communities, and occasionally by UP communities. The disturbance regimes that shape these forests, woodlands, and prairies often affect CT communities. Fires that originate in forests, woodlands, or prairies may scorch cliff vegetation. Removal of forest canopies by fire often leaves cliffs or talus slopes more exposed to sunlight, causing warmer and drier conditions. Major windstorms or logging in forests adjacent to CT communities causes similar warming and drying effects. Fracturing of large pieces of rock from cliff faces are major, although rare, events that disrupt community equilibrium. Cliffs along streams may have higher rates of erosion, especially those that experience periodic high-water events. In general, cliff communities are fairly stable over time as a result of fairly low rates of natural disturbances, combined with limited habitat for plant establishment and growth and prevalence of species that persist once established.

Cliff and talus communities are some of the least human-disturbed habitats in Minnesota and are likely present today in most of the locations where they have existed over the past 10,000 years. Since the late 1800s, some cliff and talus communities have been



destroyed or altered by quarrying for building stone, construction aggregate, agricultural lime, or rip-rap material. In recent years, increased human foot traffic along trails and near scenic vistas and campsites, especially in popular areas such as state parks, has become a threat to some cliff communities. Other threats include rock climbing, erosion from upslope areas that have been developed or otherwise cleared, and pollution of the groundwater that sustains some of the rarer cliff and talus communities.

Floristic Regions

Communities in the CT System are divided into three floristic regions based on geographic variation in climate, bedrock type, and plant species composition (Fig. CT-1). The Southern Floristic (CTs) Region occurs in the EBF and Prairie Parkland Provinces. The other two floristic regions, the Northern Floristic (CTn) Region and the Lake Superior Floristic (CTu) Region, occur entirely within the Laurentian Mixed Forest Province.

Plants with high fidelity for the CTs Region relative to the CTn and CTu regions include cliff goldenrod (*Solidago sciaphila*), smooth cliff brake (*Pellaea glabella*), slender lip fern (*Cheilanthes feei*), bulblet fern (*Cystopteris bulbifera*), walking fern (*Asplenium rhizophyllum*), jeweled shooting star (*Dodecatheon radicans*), northern bedstraw (*Galium boreale*), reniform sullivantia (*Sullivantia renifolia*), plains muhly (*Muhlenbergia cuspidata*), alumroot (*Heuchera richardsonii*), miterwort (*Mitella diphylla*), sharp-lobed hepatica (*Hepatica acutiloba*), zigzag goldenrod (*Solidago flexicaulis*), and wild ginger (*Asarum canadense*).

Figure CT-1. Floristic Regions of the Cliff and Talus System

