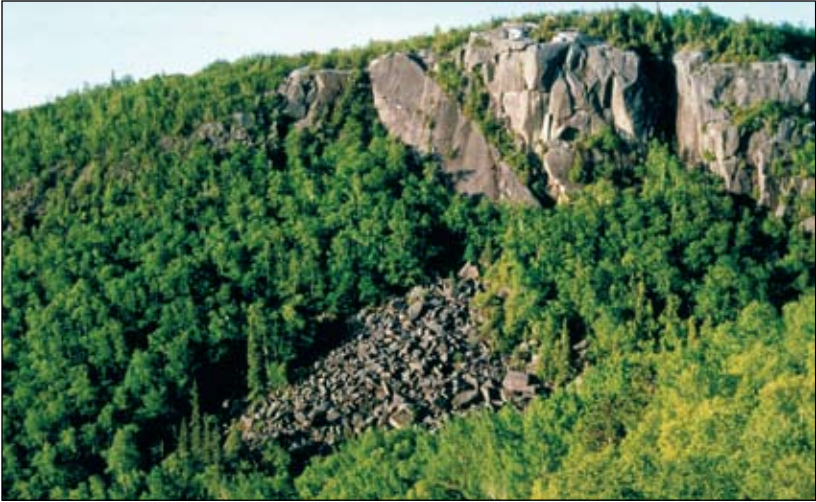




photo by M.D. Lee MIN DNR



Lake County, MN

General Description

Communities in the Cliff/Talus (CT) System are present on cliffs or talus slopes on steep-sided knobs, in river gorges, along lakeshores, 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 either from cliffs or from exposed bedrock on steep hillsides. The vegetation of CT communities is generally open. Lichens and mosses are 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 the major determinants of species composition. Cliff habitats range from warm and dry to cool and wet depending on cliff aspect, proximity to streams or lake shores, and presence of groundwater seepage on the cliff face. In the Laurentian Mixed Forest (LMF) Province, cliffs are formed most commonly of igneous bedrock, although cliffs on metamorphic rock are also common. Talus communities are classified according to amount of woody plant cover and moisture regime.

In the LMF Province, CT communities are restricted mostly to the North Shore Highlands and Border Lakes subsections in NSU, where Precambrian bedrock is frequently at or just below the surface and topography is often rugged. Scattered cliffs are present in WSU and are likely in the Laurentian Uplands Subsection in NSU and the Littlefork-Vermilion Uplands Subsection in Northern Minnesota & Ontario Peatlands MOP, primarily along lakes and streams where water has exposed the underlying bedrock.

In the landscape as a whole, CT communities are small features, rarely covering more than 10 acres (4ha). In the LMF Province, they are commonly surrounded by expansive upland forests, especially Fire-Dependent Forest/Woodland (FD) and Mesic Hardwood Forest (MH) communities. The disturbance regimes that shape these forest communities often affect CT communities. Major fires that originate in forests or woodlands 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 can have similar warming and drying effects.

Vegetation Structure and Composition

Typically, lichens or mosses cover rock surfaces in CT communities and colonize areas exposed by erosion. On cliffs, vascular plants are generally limited to crevices and ledges



es where soil has accumulated and roots are able to take hold, and cliffs composed of highly fractured bedrock tend to have highest plant cover. On wet cliffs, vascular plants may also root in thick mats of mosses and lichens that cover broad areas of bedrock. Most cliffs have less than 25% cover of trees or shrubs, although woody plant cover is variable, with some cliffs having nearly continuous tree canopy cover. On talus slopes, vascular plant cover is influenced by stability of talus and 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.

CT communities in the LMF Province provide habitat for several rare vascular plant species in Minnesota, including characteristically arctic or alpine species with disjunct populations in Minnesota, such as large-leaved sandwort (*Arenaria macrophylla*) and Norwegian whitlow grass (*Draba norvegica*) as well as several boreal species. These cold-climate species are most prevalent on sheltered cliffs along the Lake Superior shore and on large north-facing cliffs in other parts of northeastern Minnesota. Other rare plants have been documented on dry cliff and talus communities on warm, south- and west-facing exposures. These sites often have plants common in southern Minnesota, but generally rare in the LMF Province. Many CT communities, especially the drier ones, have plant species common also in Rock Outcrop (RO) communities.

Plant Adaptations and Growth Forms

Plants in CT communities are 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 mid-afternoon on sunny days. Limited availability of nutrients on many cliffs and talus slopes strongly influences community composition and slows growth rates of plants. Wind and gravitational stresses have a visible impact on the growth forms of trees and shrubs, causing stunting, stem die-back, and misshapen trunks. Characteristic wind-sculpted “krummholz” forms are common, especially on upper cliff faces and adjacent cliff tops where wind speeds are often high.

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. The combination of limited habitat for plant establishment and growth, low rates of natural disturbances, and prevalence of species that persist once established contribute to high levels of community stability over time. Fracturing of large pieces of rock from cliff faces are major, although rare, events that disrupt community equilibrium. Cliffs along streams and lakes—especially Lake Superior—may have high rates of erosion from currents and waves.

Floristic Regions

Communities in the CT System are divided into three regions based on geographic variation in climate, bedrock type, and plant species composition (Fig. CT-1). Two of the regions, the Northern Floristic (CTn) Region and the Lake Superior Floristic (CTu) Region, are entirely within the LMF Province. The third, the Southern Floristic (CTS) Region, is present to the south in the Eastern Broadleaf Forest and Prairie Parkland Provinces. Plants with high fidelity for the CTn and CTu Regions relative to the CTS Region include fragrant fern (*Dryopteris fragrans*), fragile fern (*Cystopteris fragilis*), black-fruited sedge (*Carex eburnea*), slender cliff brake (*Cryptogramma stelleri*), Appalachian firmoss (*Huperzia appalachiana*), nahanni oak fern (*Gymnocarpium jessoense*), Rocky Mountain woodsia (*Woodsia scopulina*), alpine woodsia (*W. alpina*), smooth woodsia (*W. glabella*), and common polypody (*Polypodium virginianum*). Cliff communities in



the CTu Region support an additional set of species that occur in Minnesota mainly along the Lake Superior shore and are therefore rare in the CTn Region. These plants include spike trisetum (*Trisetum spicatum*), Arabian whitlow grass (*Draba arabisans*), Hudson Bay eyebright (*Euphrasia hudsoniana*), ninebark (*Physocarpus opulifolius*), shrubby cinquefoil (*Potentilla fruticosa*) and encrusted saxifrage (*Saxifraga aizoon*).

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

