Wet Cliff

Previously called "Moist Cliff" and "Shaded Cliff" on the Wisconsin Natural Heritage Working List

Overview: Distribution, Abundance, Environmental Setting, Ecological Processes

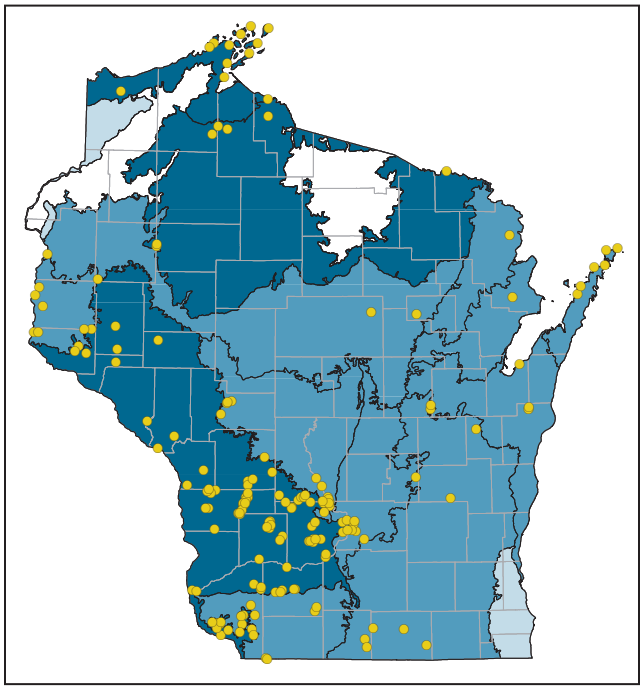
The most common cliff-forming rock types in Wisconsin are sedimentary, primarily sandstones and dolomites. However, locally significant cliff exposures of igneous or metamorphic rocks such as quartzite, granite, gneiss, and basalt are also present. Wet Cliff is a geological feature characterized by vertical bedrock exposures that are constantly damp or saturated due to factors that may include permeable pore structure (e.g., sandstones), fractures (dolomites), wave splash or spray, frequent fogs, high humidity, close proximity to a permanent waterbody, and heavy shading due to aspect or dense, overhanging foliage. Many, though not all, Wet Cliffs have a northern or eastern aspect, meaning that growing conditions are relatively cool and moist, and exposure to direct sunlight and drying summer winds is minimal.

Wet cliffs are moderately common features in southwestern Wisconsin's Driftless Area, especially on eroded bedrock-cored ridges that have been undercut by streams. Cliffs are prominent landscape features along the shores of the Great Lakes, in association with some rivers and landforms, or where the terrain is heavily influenced by bedrock such as the Penokee-Gogebic Range of northwestern Wisconsin and along the Niagara Escarpment in the east central and northeastern parts of the state. Elsewhere, cliffs are more localized.

Dripping cliffs, sometimes termed "weeping" cliffs, are prominent in a few areas such as the lower Kinnickinnic River valley in western Pierce County, in some sandstone gorges in the Western Coulees and Ridges Ecological Landscape, where examples occur along the upper Kickapoo, Baraboo, and Pine rivers, in central Wisconsin along the Wisconsin River and some of its tributaries, and in the lowermost reaches of several Black River tributaries on the western edge of the Central Sand Plains Ecological Landscape.

"Madicolus" cliffs feature thin sheets or films of water running over rock faces covered by saturated mosses. Diatoms, algae, and several groups of aquatic insects also frequent such habitats, which are apparently rare in Wisconsin. Though not yet recognized as distinct community types or tracked by Wisconsin's Natural Heritage program, the madicolus cliffs possess unique attributes and harbor unusual biotic assemblages that include rare habitat specialists.

"Maderate Cliffs" have not yet been identified in Wisconsin, but this cliff community occurs in Minnesota's portion of the Driftless Area and is well described in Minnesota (MDNR 2005a). These rare features share some traits with the highly distinctive Algific Talus Slopes, but differ geologically in having vertical bedrock exposures and talus is absent.



Locations of Wet Cliff in Wisconsin. The deeper hues shading the ecological landscape polygons indicate geographic areas of greatest abundance. An absence of color indicates that the community has not (yet) been documented in that ecological landscape. The dots indicate locations where a significant occurrence of this community is present, has been documented, and the data incorporated into the Natural Heritage Inventory database.

Curtis (1959), who along with his colleagues examined 38 stands of cliff vegetation (25 wet, 13 dry), felt that moisture availability was generally more important that rock type in characterizing and classifying cliffs. Certainly there are some exceptions to this, e.g., in the affinity some calciphiles have shown for alkaline rock types such as dolomites or limestones. Note that general terms such as "wet" or "dry" may not always apply to an entire bedrock exposure. There are many examples of cliffs having both wet and dry stretches in the same exposure.

In addition to the normal erosional processes that affect all cliffs, outcroppings along the Great Lakes shores may be subject to significant wave and ice action.

Assemblages of plants and animals are difficult to characterize meaningfully or with a high degree of precision for features as restricted, variable, scattered, and isolated as cliffs. Survey data are incomplete and have often focused on a limited number of taxa or on species thought or known to be rare rather than on more comprehensive statewide status surveys.

Community Description: Composition and Structure

Dense shade, cool temperatures, high humidity, and groundwater seepage are characteristics of cliffs associated with conifers, especially eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), balsam fir (*Abies balsamea*), and northern white-cedar (*Tsuga canadensis*). In southern Wisconsin, wet cliffs frequently, though not invariably, have northern or eastern exposures and are therefore somewhat protected from intense sunlight and desiccation by their relatively cooler and more moist aspects. Other woody plants associated with wet cliffs include yellow birch (*Betula alleghaniensis*), Canadian yew (*Taxus canadensis*), red-berried elder (*Sambucus racemosa*), mountain maple (*Acer spicatum*), showy mountain-ash (*Sorbus decora*), and northern bush-honeysuckle (*Diervilla lonicera*).

Widely distributed herbs characteristic of wet, moist, damp, or heavily shaded cliff habitats in Wisconsin include harebell (*Campanula rotundifolia*), Canadian clearweed (*Pilea pumila*), orange jewelweed (*Impatiens capensis*), yellow jewelweed (*I. pallida*), wild columbine (*Aquilegia canadensis*), wild sarsaparilla (*Aralia nudicaulis*), smooth rock-cress (*Arabis laevigata*), tall forked chickweed (*Paronychia canadensis*), white-lettuce (*Prenanthes alba*), and swamp saxifrage (*Saxifraga pensylvanica*). Ferns are prominent members of the cliff flora, and they are represented by species such as northern fragile fern (*Cystopteris fragilis*), slender cliff brake (*Cryptogramma stelleri*), common oak fern (*Gymnocarpium dryopteris*), and various wood ferns (*Dryopteris* spp.). Bulblet bladder fern (*Cystopteris bulbifera*) may be abundant and form dense cover where the bedrock is calcareous, constant groundwater seepage is available, and site humidity is high. Talus may be present at the base of cliffs featuring dense beds of bulblet bladder fern.

Some cliffs support habitat specialists that are not only rare but of extremely local distribution. Among the rare plants of wet cliff habitats from Wisconsin's glaciated regions are green spleenwort (*Asplenium trichomanes-ramosum*), common butterwort (*Pinguicula vulgaris*), and fir club-moss (*Huperzia selago*). In the unglaciated Driftless Area, wet cliffs support jeweled shooting-star (*Dodecatheon amethystinum*), muskroot (*Adoxa moschatellina*), Sullivant's cool-wort (*Sullivantia sullivantii*), rock clubmoss (*Huperzia porophila*), the U.S. and Wisconsin Threatened northern monkshood (*Aconitum noveboracense,* listed as Columbian monk's-hood, *Aconitum columbianum,* by the Wisconsin State Herbarium), and the extraordinarily disjunct and Wisconsin Endangered Lapland azalea (*Rhododendron lapponicum*). The endemic Wisconsin Threatened cliff cudweed (*Pseudognaphalium saxicola*) is known from a very small number of cliffs, both wet and dry, along the Kickapoo and Wisconsin rivers.

Several unexpected species have been noted on moist sandstone cliff habitats in southwestern Wisconsin, including Labrador-tea (*Ledum groenlandicum*), an ericaceous shrub usually found in acid peatland habitats across northern Wisconsin, and shrubby cinquefoil (*Pentaphylloides floribunda*), a calciphile associated most strongly with open wetlands, including Calcareous Fen and low prairies.

Several species of rare animals, many of them invertebrates such as land snails (terrestrial gastropods) are strongly associated with wet cliff habitats. Though not applicable just to wet cliff environments, when caverns, overhangs, or fissures are present, bats, reptiles (especially snakes), and even a few birds such as Turkey Vulture (*Cathartes aura*) and Peregrine Falcon (*Falco peregrinus*) may find important hibernating, roosting, or nesting habitats on cliffs.

Conservation and Management Considerations

Conservation concerns include direct destruction from activities such as quarrying or other types of mining, right-of-way construction, rock climbing, or more indirect impacts due to hydrological disruption and the alteration of water flow

Several high-gradient, coldwater streams have partially cut their way through the bedrock of the Penokee Range in northwestern Wisconsin. The adjacent cliffs are kept constantly cool and wet by the fine spray of mist and support an interesting mix of boreal plants and bedrock specialists. Copper Falls State Park, Ashland County, North Central Forest Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.

Jeweled shooting-star typically inhabits moist, often alkaline, cliffs within the hardwood forests of southwestern Wisconsin. Its North American range is limited to the Driftless Area of the Upper Midwest and a disjunct area farther east, in the Appalachian Mountains. Western Coulees and Ridges Ecological Landscape. Photo by Thomas Meyer, Wisconsin DNR.

Butterwort is a rare carnivorous plant that reaches its extreme southern range limits on sandstone cliffs on the margins of several of the Apostle Islands. The cliffs are kept moist by wave spray, fog, shading, and perhaps by the porous nature of the underlying bedrock. Apostle Islands National Lakeshore, Ashland County, Superior Coastal Plain Ecological Landscape. Photo by Wisconsin DNR staff.

through or around cliffs. The siting of commercial wind facilities may have both direct and indirect effects, including negative impacts on bats and birds as well as on site hydrology. Logging on or around cliffs can alter light and humidity regimes, affect moisture retention, and may accelerate erosion.

More systematic surveys of cliff biota are desirable, perhaps organized by bedrock distribution, bedrock type, and ecological landscape. Madicolus and maderate cliffs should be sought and described in appropriate Driftless Area locations. Certain taxonomic groups, including lichens, mosses, and invertebrates (including, but not limited to, the terrestrial gastropods) warrant more survey attention than they have received to date.

It is likely that these groups will include members that are highly specialized and of limited geographic distribution. Securing the services of biologists who are well versed in rappelling and other means of dealing efficiently and safely with vertical environments would be a great asset to such a project.

The degree to which Wisconsin's current classification of these bedrock features is up to the task of identifying the most important species assemblages and conservation priorities is a somewhat open question, but this is an issue that needs to be addressed in the future. In the absence of a more refined cliff classification scheme, the consideration of protection priorities should identify the best or most representative occurrences from various ecological landscapes, environmental settings, and rock types and with species assemblages that include habitat specialists and rarities.

Additional Information

For additional information, see descriptions in this chapter for Dry Cliff, Bedrock Glade, Bedrock Shore, Great Lakes Alkaline Rockshore, Algific Talus Slope, Talus Forest, Hemlock Relict, Pine Relict. The U.S. National Vegetation Classification (US NVC) has sometimes used bedrock type and dominant vascular plants as the basis for defining cliff communities.

Examples of US NVC types that may be applicable to the "Wet Cliff" occurrences potentially include, but are not limited to, CEGL002503 Great Lakes Sandstone Cliff and CEGL002504 Great Lakes Shore Limestone – Dolostone Cliff (Faber-Langendoen 2001).

For the time being, we will continue to classify cliffs based on moisture availability (though this is not as straightforward as it might seem due to variable moisture presence on the rock surface). In addition, there are cliffs composed of multiple bedrock types in some settings (e.g., quartzite and conglomerate in the Baraboo Hills of south central Wisconsin; sandstone and dolomite at scattered Driftless Area sites). Also, it is possible that a subset of nonvascular species, especially lichens, may have greater significance for classification efforts than the vascular plants used in parts of the U.S. National Vegetation Classification, some of which are widespread, common, not bedrock specialists, and are not dependent on certain rock types.

Also see:
Crum (2004)
MDNR (2005a)

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For a list of terms used, please visit the **Glossary.**

For a reference list, please see the **Literature Cited.**