

Great Lakes Alkaline Rockshore (Global Rank G3; State Rank S2)

Overview: Distribution, Abundance, Environmental Setting, Ecological Processes

Great Lakes Alkaline Rockshore is a rare, sparsely vegetated natural community of limited distribution in Wisconsin. It occurs only along the Lake Michigan shores of the Door Peninsula and Grand Traverse Islands on horizontal exposures (“pavements”) of dolomitic bedrock. The rock is of Silurian age (417 to 443 million years old), part of the same geologic formation that underlies much of the Door Peninsula and is responsible for the steep slopes and cliffs that comprise the Niagara Escarpment on the western edge of the Peninsula and to the northeast throughout the Grand Traverse Islands. The continental range of this community is restricted to exposures of calcareous sedimentary rock adjacent or in close proximity to the Great Lakes, in Wisconsin, Michigan, Ontario, New York, and Vermont.

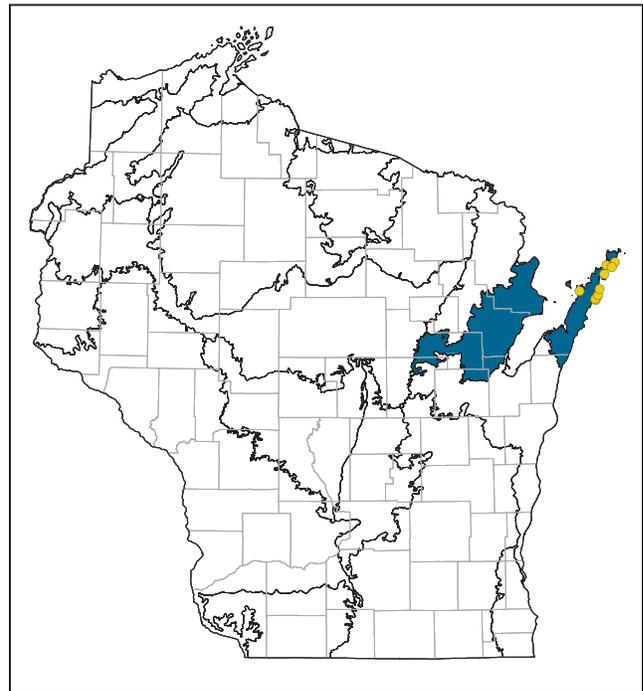
The sparse plant cover is low in stature and often discontinuous, but specialists may be present, including species endemic to Great Lakes shoreline environments. Areas of bare rock occur, and these are sometimes extensive. Lichens and mosses are important members of the flora.

The amount of bedrock exposed varies with Lake Michigan water levels; during low water periods, large expanses of alkaline rockshore are prominent shoreline features. When water levels are high, the exposures may be severely limited or disappear altogether. Wave spray, fog, high wind, wave action during storms, accumulations of snow, and ice scour contribute to the conditions that maintain the structure and floristic composition of the community over time. The amount of exposure, aspect at a given location, and morphology of the lake bottom affect the impacts of wind, waves, and ice as some sites receive partial protection from these environmental forces by reefs, islands, or shoreline configuration and are also less subject to buffeting by prevailing winds.

Unless a ridge of gravel, cobbles, or boulders occurs on the areas of exposed bedrock farthest from the water, the upper margins transition abruptly into forest. This is most likely to be either Northern Mesic Forest, composed of mixed hardwoods, sometimes with a component of eastern hemlock (*Tsuga canadensis*) and/or eastern white pine (*Pinus strobus*), or the unusual and highly localized Lake Michigan variant of Boreal Forest, in which species such as northern white-cedar (*Thuja occidentalis*), white spruce (*Picea glauca*), balsam fir (*Abies balsamea*), white birch (*Betula papyrifera*), and balsam poplar (*Populus balsamifera*) are present.

Community Description: Composition and Structure

The floristic composition of Great Lakes Alkaline Rockshore is quite variable, among sites and over time, owing to annual and decadal changes in water levels and the amount of exposed and temporarily stable substrate suitable for growth of and



Locations of Great Lakes Alkaline Rockshore 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.

colonization by plants, distance between stands and source populations of species adapted to these conditions, longshore currents, and the length of time elapsed since ice or wave action last removed vegetation from a given stand.

Vascular plants and some mosses grow primarily in cracks, hollows, fissures, and irregularities in the bedrock surface where a little soil has accumulated. Splash pools are sometimes present. Lichens and mosses may grow on the bare rock, or in pockets of limy soil atop the rock.

The herbaceous component of the flora is made up of interesting mixtures of characteristic Great Lakes beach plants (among them several Great Lakes endemics), calciphiles occurring only in habitats of high pH, a few boreal species, and weedy generalists (Judziewicz 2001). Characteristic plants include silver-weed (*Argentina anserina*), Arctic rush (*Juncus arcticus*), narrow-panicle rush (*J. brevicaudatus*), Lindheimer's panic grass (*Dichanthelium acuminatum* var. *lindheimeri*), slim-stem reed grass (*Calamagrostis stricta* ssp. *inexpansa*), golden sedge (*Carex aurea*), Indian paintbrush (*Castilleja coccinea*), grass-leaved goldenrod (*Euthamia graminifolia*), variegated scouring rush (*Equisetum variegatum*), American water-horehound (*Lycopus americanus*), balsam ragwort (*Packera paupercula*), brook lobelia (*Lobelia*

kalmii), fen grass-of-Parnassus (*Parnassia glauca*), and northern bog violet (*Viola nephrophylla*).

Mature woody plants are limited to the uppermost portions of the community and have limited ability to persist in areas that will eventually be subject to the effects of severe storms and ice scour, especially during periods of high water when inundation is likely. Among the characteristic or common shrubs are red osier dogwood (*Cornus stolonifera*), mountain maple (*Acer spicatum*), ninebark (*Physocarpus opulifolius*), Kalm's St. John's-wort (*Hypericum kalmianum*), and shrubby cinquefoil (*Pentaphylloides floribunda*). Trees commonly bordering the uppermost margins of the open rockshores include northern white-cedar, eastern white pine, white birch, balsam poplar, and balsam fir.

Numerous rare plants are associated with this community, included a federally threatened Great Lakes endemic,

dwarf lake iris (*Iris lacustris*). Other rarities, several of which are relatively common in this community, are low calamint (*Calamintha arkansana*), beautiful sedge (*Carex concinna*), elk sedge (*C. garberi*), tufted hair grass (*Deschampsia cespitosa*), lesser fringed gentian (*Gentianopsis procera*), Bird's-eye primrose (*Primula mistassinica*), false asphodel (*Triantha glutinosa*), small-flowered grass-of-Parnassus (*Parnassia parviflora*), Ohio goldenrod (*Solidago ohioensis*), and white camas (*Zigadenus elegans* ssp. *glauca*).

Some calciphilic lichens are only found on limestone or dolomite cliffs and pavements, including *Collema fuscovirens* and *Agonimia tristicula*. While these lichens also occur at a few localities elsewhere in the state, *Cladonia magyarica* has only been found on limey soils over limestone at Toft Point on Lake Michigan in the northeastern part of the Door Peninsula. In addition, several more common species, in the genera



Great Lakes alkaline rockshore, coastal ponds, and mixed boreal x northern hardwoods forest. Newport State Park, Door County, Northern Lake Michigan Coastal Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.



Aerial shot of Great Lakes alkaline rockshore on the Lake Michigan coast of the Door Peninsula. Such sites may be partially or totally inundated when Great Lakes water levels are high or during severe storms. Northern Lake Michigan Coastal Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.



Northeastern tip of the Door Peninsula supports an upland forest of mesic hardwoods mixed with boreal conifers. The immediate Lake Michigan shoreline is characterized by level exposures of dolomitic bedrock, a habitat that hosts many unusual plants. Newport State Park, Northern Lake Michigan Coastal Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.



An extensive dolomite pavement—Great Lakes alkaline rockshore—occurs between Moonlight Bay of Lake Michigan and the conifer-dominated boreal forest in the background. Northeastern Door Peninsula, Northern Lake Michigan Coastal Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.



Great Lakes alkaline rockshore, Grand Traverse Islands, Door County, Northern Lake Michigan Coastal Ecological Landscape. Photo by Emmet Judziewicz.

Xanthoria and *Caloplaca*, are also restricted to limestone bedrock near water where they are very noticeable due to their bright orange coloration.

Raptors, including species such as Merlin (*Falco columbarius*), Northern Harrier (*Circus cyaneus*), and Bald Eagle (*Haliaeetus leucocephalus*), hunt along these open shorelines, which also attract migrating shorebirds and passerines. The more densely vegetated margins of the open rockshore communities are sometimes used as nesting cover by waterfowl.

Conservation and Management Considerations

Key factors potentially posing threats to Great Lakes Alkaline Rockshore communities include stabilization of Great Lakes water levels, infestations of invasive species, residential developments, construction of seawalls, and incompatible recreational activities. Water level stabilization would either permanently inundate periodically exposed bedrock habitats, or create conditions that would favor permanent occupancy by rank herbs, and ultimately, shrubs and trees. Habitat for many of the more specialized and sensitive plant species would be reduced or eliminated.

Off-road vehicles, mountain bikes, and heavy foot traffic can directly damage plant life, and also provides means by which invasive plants would gain entry or spread.

Invasive plants known to be problems in the rockshore communities at this time include common reed (*Phragmites australis*), reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), and European swamp thistle (*Cirsium palustre*). Both native and non-native strains of common reed have been documented in open rockshore communities, and both can aggressively displace other native plants. As deemed necessary by site managers, control efforts (e.g., the judicious use of herbicides) at sites with high conservation values have sometimes targeted all stands of common reed, irrespective of the strain involved.

Maintaining or restoring forests on the upland margins will help protect adjoining borders from runoff that may contain excess sediments, nutrients, pollutants, or the propagules of invasive plants. At the interface with the lake waters, avoid developments that would disrupt natural shoreline dynamics.

Better documentation and characterization of the non-vascular plant component of the community is needed, and further study of invertebrates potentially using these habitats is also warranted.

Additional Information

For additional information, see the natural community descriptions for Alvar, Bedrock Shore, Great Lakes Beach, Interdunal Wetland, Emergent Marsh, and Calcareous Fen. The U.S. National Vegetation Classification community most closely matching Great Lakes Alkaline Rockshore is CEG002506 Great Lakes Limestone – Dolostone Shore (Faber-Langendoen 2001). CEG005169 Great Lakes Limestone Cobble – Gravel Shore has been noted at a few locations along Lake Michigan, for example in northern Milwaukee and southern Ozaukee counties. Occurrences in Wisconsin have little or no vascular plant cover and should not be characterized by their vascular flora. Some shorebirds, such as Ruddy Turnstone and Sanderling among others, forage in such habitats during their migrations.

Also see:

Albert et al. (1997)

FROM: Epstein, E.E.. Natural communities, aquatic features, and selected habitats of Wisconsin. Chapter 7 in *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management*. Wisconsin Department of Natural Resources, PUB-SS-1131H 2017, Madison.

For a list of terms used, please visit the [Glossary](#).

For a reference list, please see the [Literature Cited](#).