Great Lakes Ridge and Swale Complex

Overview: Abundance, Environmental Setting, Ecological Processes

Ridge and swale complexes are restricted to Great Lakes shoreline areas and are the result of multiple post-Pleistocene water level changes (Paull and Paull 1977, Dott and Attig 2004). These lake level changes left behind narrow, linear, parallel sand ridges separated by wet swales. The vegetation mosaic can be extremely complex and includes marsh, sedge meadow, shrub swamp, hardwood swamp, and several conifer swamp communities. The sandy ridges may support open dune vegetation closest to the Great Lakes, then a shrub dune, followed by xeric forests of pine, oak, and birch, dry-mesic forest of eastern white pine-red pine and various hardwoods, and farthest from the lake, more mesic forests of eastern hemlock, pine, American beech (Lake Michigan only), red maple, and sugar maple.

At a few sites, e.g., Long Island, on Lake Superior in Ashland County, the wet swales are filled with acid peatland vegetation, and the communities present include open bog, muskeg, and conifer swamps composed of black spruce or tamarack, with some representation in the seedling and sapling classes by pines from the adjoining upland ridges.

Natural Community Mosaic

Great Lakes Ridge and Swale Complex features narrow linear sandy ridges alternating with wet swales. All examples occur on the shores of the Great Lakes but are best developed along Lake Michigan. Ridge and swale complexes parallel the coastlines and offer complex and diverse interconnected habitats for wetland, upland, and Great Lakes shoreline vegetation. The sandy ridges may support open dune vegetation, shrubs, or various forest associations similar to boreal, northern mesic, or northern dry-mesic forest communities. Water depth is a controlling environmental factor in the swales, and the vegetation there may run the gamut from open wetlands of marsh, sedge meadow, or fen, to shrub swamps of speckled alder (Alnus incana), dogwoods (Cornus spp.), willows (Salix spp.), and bog birch [Betula pumila], to various types of forest communities. Swamps dominated by tamarack (Larix laricina), northern white-cedar (Thuja occidentalis), or black ash (Fraxinus nigra) are prominent in these lowland forests.

The vegetation on the sandy ridges may change from open beach and dune communities, to shrub-dominated dunes, to xeric forests of pine, oak, and birch, and then to more mesic forests of eastern hemlock (Tsuga canadensis), eastern white...
pine (*Pinus strobus*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), northern red oak (*Quercus rubra*), northern white-cedar, and along Lake Michigan only, American beech (*Fagus grandifolia*). Depending on the age, complexity, and disturbance history of these ecosystems, some communities may be entirely absent or recur in repeating assemblages.

Note that parts of the Chiwaukee Prairie-Illinois Beach State Park complex in the southeastern corner of Wisconsin and northeastern corner of Illinois also feature ridge-and-swale topography, but it is very subdued, and the mosaic of natural communities is almost entirely different. The vegetation at Chiwaukee-Illinois Beach is composed of prairie, rich fen, southern sedge meadow, and oak savanna, with a few scraps of beach and dune vegetation along the Lake Michigan shoreline.

**Conservation and Management Considerations**

Among the major factors contributing to the ecological significance of the Great Lakes Ridge and Swale Complexes are geographic location on a Great Lakes shore, a diverse array of natural communities, the varied and unusual types of habitat offered, and the significant scale of most sites supporting ridge and swale features. To illustrate the last factor, along Lake Michigan, the ridge and swale complexes represent some of the largest remaining blocks of undeveloped habitat in regions that are otherwise heavily developed, severely disturbed, and significantly fragmented. In addition to their unique attributes, these features are now of extraordinarily high importance to native biota, including migratory and resident birds, herptiles, invertebrates, and plants.

As the ridge and swale ecosystems are landform and hydrology dependent, important threats include hydrological disruption, the introduction and spread of invasive plants, logging (except when used as a potential restoration tool), and encroaching residential development, its associated infrastructure, habitat fragmentation, and secondary disturbances. The loss of connectivity between natural communities may diminish the capacity of these complexes to support the full range of species inhabiting such areas and the processes upon which they depend. Fire is potentially appropriate for some of the pine- and oak-dominated forests, but its use must be carefully planned and implemented to avoid losing populations of key species and key habitat structures—horizontally as well as vertically—that may be scarce or absent in the surrounding landscape.

Excellent examples of Great Lakes Ridge and Swale Complexes open to public visitation occur at the privately owned Ridges Sanctuary on the Door Peninsula just north of Bailey’s Harbor and at Point Beach State Forest north of the city of Two Rivers in Manitowoc County.

**Additional Information**

For additional information, see the natural community descriptions for Great Lakes Dune, Emergent Marsh, Northern Sedge Meadow, Open Bog, Muskeg, Black Spruce Swamp, Tamarack Swamp, Hardwood Swamp, Northern Wet-mesic Forest, Northern Dry Forest, Northern Dry-mesic Forest, Boreal Forest, and Northern Mesic Forest. The U.S. National Vegetation Classification did create a place for ridge-and-swale systems as follows: Great Lakes Wooded Dune and Swale Complex CECX002000 (Faber-Langendoen 2001).


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

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