

photo by Paul Sundberg



Palisade Head, Lake Superior, Tettegouche State Park, MN

### **General Description**

Lakeshore (LK) communities occur along the shorelines of lakes and ponds throughout Minnesota in the zone between annual low water level and the upper limit of storm waves and spring ice-scouring. Most LK communities are sparsely vegetated because of absence of well-developed soils and frequent disturbance by waves, ice, and wind. They are usually narrow, not more than a few meters wide, although width varies considerably depending on the nature of the water body and its basin. Small ponds in shallow basins where the water level declines greatly during the summer months have broad lakeshore zones. Along Lake Superior, powerful storm waves and ice-scouring produce relatively broad beaches and associated dune areas. Small lakes with relatively stable water levels have narrow shoreline communities, as do bays and other sheltered areas in large lakes. LK communities are common across much of the Laurentian Mixed Forest Province, the exception being landscapes with few lakes, such as the large poorly drained peatlands in MOP and the Tamarack Lowlands Subsection in MDL.

Substrates in LK communities range from organic mucks and silt to loose sand, gravel, and bare rock. In general, soil development is limited to accumulation of organic material in cracks and crevices in bedrock and spaces between cobbles and boulders. Storm waves and lake currents, especially along Lake Superior, reshape the distribution of substrate particles such as silt, sand, gravel, and even cobbles. Scouring by large pieces of ice pushed ashore during spring breakup can remove existing vegetation and push sand, gravel, and cobbles into beach ridges. During winter along Lake Superior, ice from spray and fog often coats vegetation, making woody twigs and branches brittle and subject to breaking in strong winds.

### **Patterns of Vegetation and Dynamics**

The strong influences of waves, ice, and wind produce characteristic zonal patterns in LK communities. Many LK communities have well-defined upper and lower zones. The upper zone is affected by waves or ice-scouring only during storms. On broad sand or gravel beaches, plants in the upper zone tend to grow in a series of linear aggregations, each containing a different assortment of species and each resulting from a different storm earlier in the growing season. On bedrock shores, plants are largely restricted to crevices in the rock or depressions with shallow soil deposits. The lower zone is con-

stantly washed by waves and generally lacks plants; however, in small, shallow lakes subject to drawdown, a series of lower zones are often present on exposed sediments and populated by plants that disperse quickly to the site or germinate from seeds buried in sediments. Zonation is especially pronounced on sand shores along Lake Superior, which characteristically have lower, middle, and upper zones. The lower zone, as in smaller lakes, is constantly influenced by waves and generally lacks vascular plants. The middle zone is washed by waves mainly during storms and is sparsely vegetated; its upper boundary is marked by a line of driftwood and other flotsam. The upper zone experiences wave action only during the most severe storms; it is more often exposed to spray and blowing sand. Grass- and shrub-dominated dune areas are present beyond the upper zone on Lake Superior sand beaches.

LK communities tend to be dynamic; they grow, shrink, shift, or even disappear as water levels change seasonally and over years and decades. These dynamics complicate the delineation of the upper and lower boundaries of LK communities, particularly their interface with aquatic communities dominated by emergent, submergent, and floating-leaved aquatic plants. The position of shoreline communities along small, shallow ponds varies annually with seasonal fluctuations in water. Spring-fed lakes on outwash plains in Minnesota experienced low water levels in the 1930s, exposing broad sand beaches that were inundated again in the 1950s as water levels rose to more typical levels. Even large lakes, especially those that are part of river systems, may experience significant changes in water level, both seasonally and over periods of several years.

Disturbances caused by waves, wind, ice, and fluctuation in water level cause dynamic changes in vegetation composition. Species common one year may be uncommon or absent the next, and sites that are rich in species one year may be barren the next. Such unpredictable and harsh disturbance regimes favor annual plants and perennials that develop from detached and floatable parts, including rhizomes and tubers. Because of frequent erosion and alternating inundation and exposure of sediments, many characteristic lakeshore species are weedy. LK communities in Minnesota are especially susceptible to being overrun by the invasive species reed canary grass (*Phalaris arundinacea*).

### Floristic Regions

The structure and floristic composition of LK communities vary according to geographic location as well as substrate. In this classification, LK communities are grouped into two "floristic" regions: the Inland Lake Floristic (LK<sub>i</sub>) Region and the Lake Superior Floristic (LK<sub>u</sub>) Region. The floristic composition of LK<sub>i</sub> communities has not been surveyed systematically in much of Minnesota. There are several vascular plant groups that appear to be well represented in LK<sub>i</sub> communities, including *Polygonum* species and members of the mint family (Lamiaceae). Additional surveys are needed to identify characteristic plant species and patterns of variation in species composition in LK<sub>i</sub> communities across Minnesota. LK<sub>u</sub> communities have vascular plant species that are rare or absent along inland lakeshores, including several rare arctic-alpine disjunct species. These species are butterwort (*Pinguicula vulgaris*), birds-eye primrose (*Primula mistassinica*), Hudson Bay eyebright (*Euphrasia hudsoniana*), alpine bistort (*Polygonum viviparum*), and pale sedge (*Carex pallescens*). The sand beach and dune communities on Minnesota Point along Lake Superior support several species that are rare or absent from LK<sub>i</sub> communities as well as the rocky or gravelly shores that characterize the rest of the Lake Superior shoreline in Minnesota. These species include beachgrass (*Ammophila breviligulata*), beach pea (*Lathyrus japonicus*), spike trisetum grass (*Trisetum spicatum*), and coast jointweed (*Polygonella articulata*). The shrub, ninebark (*Physocarpus opulifolius*), is common on rocky shores along Lake Superior but is rare along inland lakes.