photo by B.C. Delaney

Cedar Creek Natural History Area, Anoka County, MN

General Description

Lakeshore (LK) communities occur along the shorelines of lakes and ponds throughout Minnesota in the zone between the 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. LK communities are usually narrow, sometimes not more than a few yards 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 larger lakes, powerful storm waves and ice scouring produce relatively broad beaches and occasionally associated dune areas. Small lakes with relatively stable water levels have narrow shoreline communities, as do bays and other sheltered areas in large lakes. Within the Eastern Broadleaf Forest (EBF) Province, LK communities are most common in the MIM, where geologic processes during the last glaciation created numerous basins in pitted glacial moraines, outwash plains, and other glacial landforms. LK communities are uncommon in the PPL, which was not as widely affected by glacial processes during the last glaciation and has few natural lake basins.

Substrates in LK communities range from organic mucks and silt to loose sand, gravel, and bare rock. Storm waves and lake currents, especially along larger lakes, reshape deposits 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 bulldoze sand, gravel, and cobbles into beach ridges. When present, these ice-thrust ridges occur in ecotones between LK communities and adjacent terrestrial communities. In forested landscapes, they are often covered by trees and forest shrubs, herbs, and graminoids.

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. Upper zones are 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. Lower zones are constantly washed by waves and generally lack 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 the largest lakes, which may have lower, middle, and upper zones. The lower zone, as in smaller lakes, is constantly influenced by waves and has few vascular plants. The middle zone is wave washed 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 may be present beyond the upper zone on some large lakes.

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, producing 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 from 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 floating parts, including rhizomes and tubers. Because of frequent erosion and alternating inundation and exposure of sediments, many characteristic lakeshore species are opportunistic, and adapted to colonizing recently exposed sites. LK communities share many species with communities of the River Shore (RV) System. Despite the rather different natural disturbance regimes responsible for shaping LK and RV communities, they produce habitats with a number of similarities.

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 (LKi) Region and the Lake Superior Floristic (LKu) Region, with only the LKi Floristic Region present in the EBF Province. The floristic composition of LKi communities has not been systematically surveyed in much of Minnesota. There are several vascular plant groups that appear to be well represented in LKi communities, including members of the mint family and of the *Cyperus, Eleocharis, Juncus, Polygonum, Bidens, Sagittaria,* and *Mimulus* genera. Surveys are in progress to identify and better understand the characteristic plant species and patterns of variation in species composition in LKi communities across Minnesota and will likely lead to revision in classification of these communities.