photo by Fred Harris, MN DNR

Blue Earth River, Blue Earth County, MN

General Description

River Shore (RV) communities occur along the shorelines of rivers and streams throughout Minnesota in the zone between the annual low-water level and the upper limit of impacts from currents and ice scouring. RV communities are inundated during annual spring flooding and sporadically following heavy rains at other times during the year. Most RV communities are sparsely vegetated, at least seasonally, because of absence of well-developed soils and frequent disturbance from flooding, ice scouring, and strong currents. River shores are often narrow, not more than a few yards wide, but can be wider along large rivers with distinct floodplains. Substrates range from silt to loose sand, gravel, cobbles, and bedrock. In addition to plant communities on river shorelines, the RV System includes communities on slumping river embankments well above high-water levels and on dry streambeds of intermittent streams. RV communities occur (or at least occurred historically) throughout the Prairie Parkland (PPA) and Tallgrass Aspen Parklands (TAP) provinces.

Structure and Disturbance Regime

The vegetation of RV communities is zonal, usually with distinct upper and lower zones. These zones are produced by differences in severity of erosion and by differences in timing of exposure of sediments as river levels fluctuate during the growing season. The upper zone is often severely eroded by ice scouring and strong currents during spring breakup and flooding. As a result, perennial plant species cover is typically sparse in upper zones, consisting of only a few species tolerant of inundation and physical fragmentation. Annual species, however, can become common on exposed sediments in upper zones after floodwaters recede. The lower beach zone, which is exposed later in the growing season (by mid-August in average years), supports terrestrial forms of perennial aquatic species and other species, especially annuals, that can survive long periods of inundation or have seeds that remain viable buried in river sediments. It is the lower beach zone that supports many of the more characteristic RV System plants.

The most common pattern of natural disturbance in RV communities is repeated erosion and deposition of materials by flowing water. This process generally results in removal of organic matter and nutrients from substrates along river shores, and burial of organic

matter by new deposits of silt or sand. Normal erosion also commonly removes existing shoreline vegetation, leaving bare sediment for recolonization by plants. Clearing or other alteration of native vegetation on uplands adjacent to river shore communities can lead to greatly increased erosion of riverbanks. The roots of perennial species, especially trees and shrubs, stabilize and protect substrates along rivers much more effectively than annual species such as those commonly planted as crops.

Most rivers and streams in the PPA and TAP provinces have been heavily influenced by changes to the land in surrounding watersheds, with corresponding effects on river shore communities. Major portions of most watersheds in the two provinces have been converted from native grassland to cropland, non-native pasture, urban land, and other uses. This conversion, along with an extensive network of ditches that has drained over 90% of the wetlands in the prairie regions of Minnesota, has resulted in greatly increased rates of runoff and soil erosion, as well as disruption of natural seasonal cycles of flooding and drawdown. Without the buffering effect of native grasslands and wetlands, precipitation now moves off the landscape quickly, causing prairie rivers and streams to rise and fall much more rapidly than before intensive Euro-American settlement. At present, rivers and streams in the PPA and TAP provinces are commonly deeply cut, with steep-sided silt banks, and often lack the mudflats and sand or gravel bars typical of natural river bottoms.

Natural disturbance regimes have been further altered along many rivers by dams. Downstream from dams, flooding can be markedly reduced, especially the flooding that typically follows heavy summer rains. Upstream from dams, river shore communities often have disturbance regimes more similar in many respects to communities of the Lakeshore (LK) System, with less fluctuation in water level and increased wave action. Dammed rivers can be managed to restore some of the natural flooding regime through timed releases of water that mimic normal flood cycles downstream. In some areas along major rivers, RV communities have been increasingly exposed to erosive wave action over the past few decades. This is a fairly recent phenomenon caused by increasing boat traffic, especially from larger and faster boats and other watercraft. Channel dredging, stream channelization, and mining of gravel bars have also had major impacts on streams in the PPA and TAP provinces.

Plant Adaptations

Plant species in RV communities are adapted to annual cycles of major natural disturbance. Characteristic species include perennial forbs and graminoids tolerant of erosion and inundation, annual herbaceous species that germinate on exposed sediments, emergent aquatic plants, and floating-leaved or submerged aquatic plants tolerant of stranding. Perennial plants are generally limited to a few species extremely tolerant of inundation and physical fragmentation. These species tend to have well-developed root systems that help to anchor plants during physical stress from strong currents or erosion. They also may have adaptations that allow them to survive long periods of low oxygen during inundation. A number of perennial species are capable of generating roots from fragments of vegetative tissue that break off from the plant and are dispersed to new habitats by floodwater. Vegetative reproduction through adaptations like adventitious rooting is exemplified by species such as sandbar willow *(Salix exigua)* and other willow species, which seem especially well adapted to river shore settings. Annual plant species such as creeping lovegrass *(Eragrostis hypnoides)* and awned umbrella sedge *(Cyperus squarrosus)* are common and often abundant in river shore habitats. These species tend to be good at colonizing newly exposed sediments along river shorelines. Many produce seeds that can remain viable buried in sediments for long periods until conditions are suitable for germination and growth. These include species such as beggarticks *(Bidens* spp.) and smartweeds *(Polygonum* spp.) that germinate rapidly and profusely on recently exposed substrates. Others produce floating seeds that are transported by floodwater to other sites favorable for growth of the plant. In

addition to various adaptations for surviving inundation, many plants in RV communities must withstand the droughty conditions common on coarse sandy or gravelly substrates after water levels drop over the course of the growing season. As in LK communities, the repeated cycles of natural disturbance in RV communities allow establishment of many invasive plants, and aggressive invaders such as reed canary grass *(Phalaris arundinacea)* are now abundant along shorelines of many rivers.

Floristic Regions and RV Community Classes in the PPA and TAP Provinces

RV communities have not been extensively surveyed in Minnesota, and unlike other ecological systems in this classification, the RV System is not divided into floristic regions. Surveys of RV communities have been especially limited in the PPA and TAP provinces. Three plant community classes are recognized in the RV System. Two of these—Sand/Gravel/Cobble River Shore (RVx32) and Clay/Mud River Shore (RVx54)—are likely present throughout most of the PPA and TAP provinces. The third—Rocky River Shore (RVx43)—is rare in the PPA Province and has not been recorded in the TAP Province.