photo by D.S. Wovcha MN DNR

Wabasha County, MN

General Description

Communities of the Marsh (MR) System are tall forb- and graminoid-dominated wetland communities that have standing or, in the case of riverine marshes, slow-flowing water present through most of the growing season. The vegetation is characterized by perennial emergent plants such as cattails *(Typha* spp.), bulrushes *(Scirpus* spp.), and arrowheads *(Sagittaria* spp.), mixed with annual forbs during low-water periods when substrates are exposed, and floating-leaved and submergent aquatic plants in settings with persistent standing water. MR communities occur statewide and are common throughout the Eastern Broadleaf Forest (EBF) Province in wetland basins, along sheltered lakeshores, near stream mouths, and in river backwaters or sluggish streams. The maximum water depth is typically sustained at 20–60 inches (50–150cm) but may be higher, especially in marshes where the vegetation is rooted on floating mats. Water levels are fairly stable in settings supplied by significant groundwater inputs and variable where water is supplied predominantly by precipitation and surface runoff. If water-level drawdown occurs, it coincides with drought cycles and is not seasonal as in Wet Meadow/Carr (WM) communities.

Nutrient levels are typically high in MR communities, particularly following drawdowns, which allow for oxidation of organic material in sediments and release of nutrients. Because most of the EBF Province is underlain by calcareous glacial deposits, the pH of water in MR communities in the province is typically circumneutral to basic with high dissolved mineral content. Substrates in MR communities range from mineral soil to sedimentary peat to floating peaty root mats. Organic matter can be abundant in substrates not exposed regularly to wave action, river currents, ice scouring, or drawdowns and episodes of oxidation.

Plant Adaptations

The dominant plants in MR communities are tolerant of persistently deep water levels. Like many wetland plants, they have stems, leaves, and roots that contain intercellular air spaces (aerenchyma) that store oxygen and diffuse it from above-water structures to roots during waterlogged conditions. Variation in species composition over time is common in marshes in response to changes in hydrological conditions. Many marsh

species germinate only when seeds buried in sediments are exposed following water-level drawdowns. These include annuals such as beggarticks *(Bidens* spp.) and smartweeds *(Polygonum* spp.) that germinate rapidly and profusely on freshly exposed substrates. Reflooding of exposed substrates, however, usually eliminates annuals from the site—either drowning them if water levels rise high enough or preventing them from germinating on sites that remain inundated—or restricts them to floating mats. Perennial emergent species, once established at a site, can expand rapidly by extensive rhizomes as water levels rise. Therefore, the dominant plants in most marshes are emergent species, especially those with vegetative and flowering structures that extend well above the water level and can withstand short periods of abnormally high water. These species include cattails *(Typha* spp.), bulrushes *(Scirpus* spp.), and arrowheads *(Sagittaria* spp.). Persistently high water levels typically eliminate shorter emergent species not able to remain above the water level, and favor floating species such as duckweeds *(Lemna* spp. and *Spirodela polyrhiza)* and common white water-lily *(Nymphaea odorata).* With sustained high water levels, submerged species such as bladderworts *(Utricularia* spp.), common coontail *(Ceratophyllum demersum)*, and Canadian elodea *(Elodea canadensis)* become more frequent. These plants have little resistance to desiccation, however, and are usually eliminated during the next cyclic drawdown. In settings where water levels are stable because of steady inputs of groundwater, MR communities often become dominated by a single species, and species diversity declines.

Floristic Regions

MR communities in Minnesota are grouped into three floristic regions, the Northern Floristic (MRn) Region, the Lake Superior Floristic (MRu) Region, and the Prairie Floristic (MRp) Region (Fig. MR-1). Only the MRn Region is represented in the EBF Province. In general, differences in species composition among the floristic regions are subtle, with regional climatic influences appearing to be less important than differences in water chemistry, especially in MR communities with deeper water levels where differences in alkalinity (i.e., hard water versus soft water) may cause greater variation in species composition among marshes within a given floristic region than are observed between floristic regions. Additional data are needed to understand the most important factors in regional variation among MR communities.

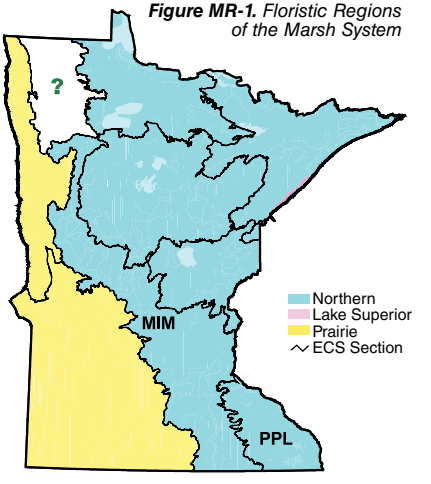

Figure MR-1. *Floristic Regions of the Marsh System*

The MRn Region is characterized by relatively high precipitation, low evaporation rates, and infrequent drought, so marshes in the region can be present in basins fed by precipitation and surface runoff as well as by groundwater. (In comparison, in the MRp Region to the south and west, relatively low precipitation, high evaporation rates, and more frequent drought cause marshes to be more restricted to settings with steady inputs of groundwater.) There are two plant community classes in the MRn Region, Northern Mixed Cattail Marsh (MRn83) and Northern Bulrush-Spikerush Marsh (MRn93). There is much variability in species composition within these two classes, while floristic differences between the classes are subtle. They are distinguished from one another mainly by differences in dominant plant species, which appear to be

correlated with degree of exposure to wave action. MRn83 typically occurs in ponds, bays of lakes, or sluggish streams where vegetation is at least partially protected from wave action or strong currents. MRn83 is dominated by cattails and sedges *(Carex* spp.) and has forb species such as star-duckweed *(Lemna trisulca),* common bladderwort *(Utricularia vulgaris),* and marsh bellflower (*Campanula aparinoides*). MRn93 occurs along wave-washed lakeshores, on sandbars, and in stream channels and is dominated by bulrushes *(Scirpus* spp.), spikerushes *(Eleocharis* spp.), broad-leaved arrowhead *(Sagittaria latifolia)*, and grasses such as northern manna grass *(Glyceria borealis)*. Water depth may also be important in distinguishing the two classes, but there are not enough data on marshes in the MRn Region to assess the influence of water depth on species composition

Succession

Marshes can develop from submerged or floating-leaved aquatic communities if water depth is reduced by deposition of sedimentary peat, siltation, or draining, which enables persistent emergent plants to become established at the site. Conversely, marshes are converted to aquatic communities in settings where water levels increase for sustained periods, drowning emergent species and favoring submerged or floating-leaved species. Increases in water level are caused most often by increased precipitation and runoff or by construction of beaver dams. Muskrats also commonly decimate marsh vegetation, leading to areas within marshes that are open and aquatic in character. If water levels drop within marsh communities and they are subjected to regular seasonal drawdowns, characteristic emergent marsh species such as cattails are replaced in dominance by sedges, and affiliated submerged and floating-leaved species are eliminated, resulting in conversion to WM communities. Marshes can develop from wet forests, peatland communities, or even upland forests in areas flooded by beaver impoundments. The creation and eventual draining of beaver ponds often result in formation of wetland complexes that contain MR communities mixed with transitional stages of other wetland communities, especially WM and aquatic communities. MR communities also sometimes develop following fire in peatlands, where peat “burn-outs” leave depressions that fill with standing water.