



photo by R.P. Dana MN DNR

Fuglie Waterfowl Production Area, Clay 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.¹ MR communities occur statewide; the wetland settings that support MR communities are common throughout much of the Prairie Parkland (PPA) and Tallgrass Aspen Parklands (TAP) provinces in wetland basins, along sheltered lakeshores, near stream mouths, and in river backwaters or sluggish streams. However, many of these wetlands have been affected by anthropogenic disturbances such as sediment-, nutrient-, and salt-laden runoff from surrounding uplands and artificial changes in water level. As a result, intact, high-quality MR communities are rare in the two provinces. The maximum water depth in MR communities is typically sustained at 20–40 in (50–100 cm) 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 calcareous glacial deposits underlie most of the PPA and TAP provinces, the pH of water in MR communities in the provinces 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.

¹Although floating-leaved and submergent aquatic plants may be present as components of some of the MR communities described in this classification, deeper-water aquatic communities dominated by floating-leaved or submergent plant species have not been included in the classification and are not described in this field guide.



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 species 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 polyrrhiza*) and common white water-lily (*Nymphaea odorata*). With sustained high water levels, submerged species such as pondweeds (*Potamogeton* spp.) 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.

Invasion of marshes by the non-native species narrow-leaved cattail (*Typha angustifolia*) and hybrids of narrow-leaved and broad-leaved cattails (*T. angustifolia* x *T. latifolia* = *Typha* x *glauca*) has profoundly altered the species composition of MR communities throughout the prairie and deciduous forest regions of Minnesota. When narrow-leaved and hybrid cattails invade marshes, they typically outcompete and displace the native broad-leaved cattail (and most other native species). Marshes in the PPA and TAP provinces are likely predisposed to invasion by narrow-leaved and hybrid cattails because of the high mineral content of the calcareous substrates typical in these provinces. Invasion is further promoted in many basins by inputs of silt from eroding uplands and by fertilizer- and road salt-laden runoff. Narrow-leaved and hybrid cattails are more tolerant than broad-leaved cattail of water-level changes brought about by ditching and land cover conversion. They also tend to form taller and denser cover than broad-leaved cattail, thereby displacing or eliminating other native understory species from MR communities. Narrow-leaved and hybrid cattails have replaced broad-leaved cattails to such an extent that marshes dominated by native cattails are rare in the prairie regions of Minnesota, as well as in much of the deciduous forest regions to the east. Non-native cattails are also problematic invaders of bulrush-dominated marshes and of WM communities in Minnesota.

Floristic Regions

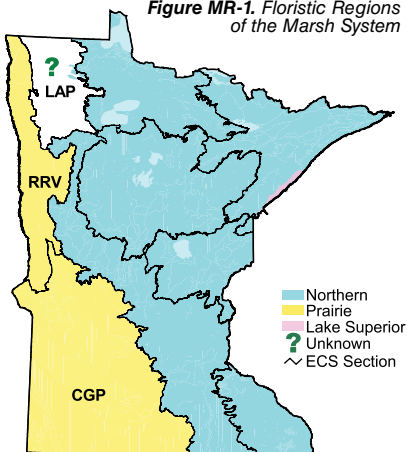
MR communities in Minnesota are grouped into three floristic regions, the Northern Floristic (MRn) Region, the Lake Superior Floristic (MRu) Region, and the Prairie Floristic (MRp) Region (Fig. MR-1). Communities of the MRn Region have been documented in the TAP Province, but very little data are available for these occurrences; communities of the MRp Region are present in the PPA Province. 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.

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. At present, by convention the floristic regions in the MR System are delineated using province boundaries; collection of additional data will likely provide a better understanding of the most important factors in regional variation among MR communities and lead to realignment of floristic region boundaries.

Figure MR-1. Floristic Regions of the Marsh System



Plant Community Classes in the PPA and TAP Provinces

Four MR community classes are present in the PPA and TAP provinces: Northern Mixed Cattail Marsh (MRn83), Northern Bulrush-Spikerush Marsh (MRn93), Prairie Mixed Cattail Marsh (MRp83), and Prairie Bulrush-Arrowhead Marsh (MRp93). These classes can be divided into two groups based largely on differences in dominant species, which appear to be correlated with degree of exposure to wave action or differences in water depth, although other factors such as the amplitude of water-level changes may also be important. The classes in the first group—MRn83 and MRp83—are dominated by cattails and sedges (*Carex* spp.) and have forb species such as star-duckweed (*Lemna trisulca*), common bladderwort (*Utricularia vulgaris*), and marsh bellflower (*Campanula aparinoides*). MRn83 and MRp83 typically occur in shallow basins, ponds, bays of lakes, or sluggish streams where vegetation is at least partially protected from wave action or strong currents. In comparison, MRn93 and MRp93 are dominated by bulrushes (*Scirpus* spp.), spikerushes (*Eleocharis* spp.), broad-leaved arrowhead (*Sagittaria latifolia*), and grasses such as northern manna grass (*Glyceria borealis*), and occur in deep wetland basins, in shallow wetlands that are adjacent to large areas of open water and are subject to wave action, along wave-washed lakeshores, on sandbars, and in stream channels.

Succession

Marshes can develop from submerged or floating-leaved aquatic communities if water depth is reduced by deposition of sedimentary peat, siltation, or draining, and persistent emergent plants then become established in the shallower waters that characterize 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, which commonly remove large patches of vegetation in marshes, can also create 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 (*Carex* spp.), and affiliated submerged and floating-leaved species are eliminated, resulting in conversion to WM communities. 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.

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