photo by D. Perleberg MN DNR

Cass County, MN

General Description

Wet Meadow/Carr (WM) communities are graminoid- or shrub-dominated wetlands that are subjected annually to moderate inundation following spring thaw and heavy rains and to periodic drawdowns during the summer. The dominant graminoids are broad-leaved species such as lake sedge *(Carex lacustris),* tussock sedge *(C. stricta)*, and bluejoint *(Calamagrostis canadensis).* Shrubs such as willows *(Salix* spp.) and dogwoods *(Cornus* spp.) are likely to be dominant on drier sites. Peak water levels are high and persistent enough to prevent trees (and often shrubs) from becoming established. However, there may be little or no standing water present during much of the growing season. As a result, the substrate surface alternates between aerobic and anaerobic conditions. Any organic matter that accumulates over time is usually oxidized during periodic drawdowns and may even burn during severe droughts. Soils range from mineral soils to muck and peat. Silt from flooding sometimes is intermixed with organic matter in muck or peat soils. Although WM communities can be present on deep peat, they are not “peat-accumulating” communities. Rather, the peat was usually formed previously in a peat-producing community, such as a Forested Rich Peatland, that was flooded by beaver activity and converted to a WM community. Deep peat may also be present in some WM communities because of debris that has been transported into the wetland, forming sedimentary peat. Because surface water is derived from runoff, stream flow, or groundwater, it is circumneutral (pH 6.0-8.0) and has high mineral and nutrient content. WM communities are present statewide and are common throughout the Laurentian Mixed Forest (LMF) Province in wetland basins, along streams and drainage ways, in drained beaver ponds, in shallow bays, or as semi-floating mats along sheltered lake shorelines.

Plant Adaptations

The characteristic plants of WM communities have adaptations that allow them to survive waterlogged conditions, although they are generally intolerant of prolonged inundation or high (>20in [50cm]) water levels. Like many wetland plants, they have stems, leaves, and roots that contain intercellular air spaces (aerenchyma) that store oxygen and transport it from above-water structures to roots during water-logged periods. In addition, some sedges and grasses (e.g., tussock sedge and bluejoint) form dense tussocks that elevate rootlets above the water surface. These tussock-formers account

for the hummocky topography characteristic of WM communities. Other species, such as willows, develop roots from stems or root collars (adventitious roots) that provide access to oxygen when other roots are submerged. Plants in WM communities must also minimize desiccation during periods of drawdown; this is accomplished by development of roots that extend deeply into permanently wet or moist substrates and by hard-walled cells (sclerenchyma) on outer surfaces of roots and rhizomes that reduce water loss. Although floating-leaved and submerged aquatic species may temporarily invade WM communities during periods of high water, they lack adaptations to prevent desiccation and are eliminated during low-water periods.

Because minerals and nutrients are plentiful in WM communities, growth of vegetation is typically luxuriant although not usually diverse. The characteristic sedges are wide-leaved species such as lake sedge that form monotypic stands and produce dense thatch. In WM communities with dense cover of lake sedge, regular oscillations in water level and thick thatch limit plant diversity by reducing habitats available for forb species. In comparison, WM communities dominated by tussock-forming species, such as tussock sedge, usually have higher vascular species diversity, with forbs growing on exposed root wads from uprooted tussocks.

Floristic Regions

Based on general differences in species composition, WM communities in Minnesota are grouped into three "floristic" regions: the Northern Floristic (WMn) Region, the Prairie Floristic (WMp) Region, and the Southern Floristic (WMs) Region (Fig. WM-1). Only the WMn Region is represented in the LMF Province. Within the Province, which is characterized by dependable precipitation and low evapotranspiration rates, WMn communities are present both in basins and along streams. West and south of the LMF Province, in areas of more sporadic precipitation and higher evapotranspiration, WMn communities occur on lakeshores or in areas that border marshes. Currently, only one Native Plant Community Class is recognized in the WMn Region. Future collection and analysis of environmental data along with vegetation data will likely lead to delineation of several Classes based on average or maximum water depth or length of inundation.

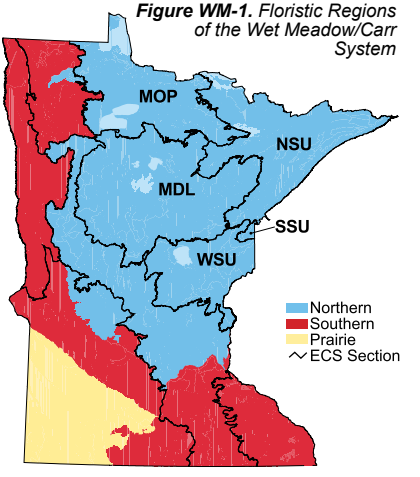

Figure WM-1. *Floristic Regions of the Wet Meadow/Carr System*

Succession

WM communities can develop from Wet Forest (WF) communities in areas flooded by beaver activity or from Forested Rich Peatland (FP) communities following catastrophic fires during severe droughts. WM communities can also develop from Marsh (MR) communities when siltation, accumulation of sedimentary peat, development of floating root mats, or lowering of water tables (commonly following disintegration of beaver dams) effectively lower the water level in relation to the substrate surface; this promotes invasion and dominance by sedges over emergent aquatic plants such as cattails *(Typha* spp.) or bulrushes *(Scirpus* spp.). In WM communities invaded by peat-producing bryophytes (particularly *Sphagnum*), nutrient levels decline and the dominant broad-leaved sedge species are replaced by fine-leaved sedges, causing conversion to Open Rich Peatland

(OP) communities. In some cases, invasion by *Sphagnum* occurs so quickly that the site appears to succeed directly from a WM community to an Acid Peatland (AP) community. This happens primarily when the dominant sedges, with the exception of the most deeply rooted, are eliminated by rapid expansion of level *Sphagnum* carpets that lack significant development of hummocks and hollows. In this situation, the characteristic OP plants do not become established on the site before water chemistry turns acidic and nutrient poor, favoring plants characteristic of AP communities. WM communities can also succeed to WF communities if hydrological changes result in lowering of the water table, followed by an increase in dominance of shrubs and eventual establishment of tree seedlings.