

## Reference Natural Community Descriptions

The natural community descriptions below are included as a means of providing reference for some of the natural areas found among the study sites for this project. It is intended to provide a broader overview of these natural community types as they occur across a broad range of landscapes in Minnesota. These descriptions are adapted from the MLCCS Manual and The Key to Natural Communities (MN DNR), as well as other select sources cited within the text in this section. These descriptions are grouped based on their general community type (i.e. forest, prairie, wetland, etc.).

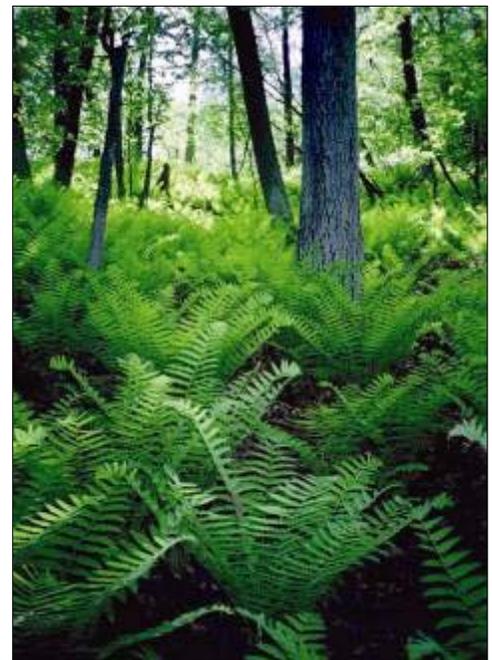
### Forest (Upland)

*Oak Forest (All subtypes) (MLCCS Code 32110, 32111, 32112, 32113)*

Northern red oaks (*Quercus rubra*), white oaks (*Quercus alba*), or bur oaks (*Quercus macrocarpa*) dominate mesic stands of oak forest. These stands occur on sites that had fewer severe fires before European settlement than the sites on which dry mixed oak forest occurs. Mesic stands most likely were always forest, rather than woodland or savanna. They have tall (> 20 meters), straight, single-stemmed trees that lack spreading lower branches. Commonly, mesic fire-sensitive tree species are present with the oaks in these stands, especially in the understory. These species include basswood (*Tilia americana*), green ash (*Fraxinus americana*), bitternut hickory (*Carya cordiformis*) big-toothed aspen (*Populus grandidentata*), and butternut (*Juglans cinerea*).

Dry oak forest tends to have pin oak (*Quercus ellipsoidalis*), bur oak (*Q. macrocarpa*), and white oak (*Q. alba*) more common as canopy trees. As well, the subcanopy of dry oak forests in Andover commonly support red maple (*Acer rubrum*.)

The shrub layer in mesic stands is sparser than in dry stands and, correspondingly, the forb layer is denser and



Oak Forest

more diverse and there are more graminoid species. Like the drier stands, however, there is little oak regeneration, and most mesic oak forests appear to be succeeding to maple-basswood forest. Heavy selective logging of the oaks in mesic stands may accelerate this trend, producing young stands of maple-basswood forest. The mesic stands often grade into drier stands of maple-basswood forest, but differ from them by having a somewhat denser shrub layer and the herbs woodrush (*Luzula acuminata*) and pointed-leaved tick-trefoil (*Desmodium glutinosum*) in their understory.

Natural stands of mesic oak forest are rare in Minnesota. In much of Minnesota, including Andover, drier stands are more common, in part because relative to the mesic forests they occur on sites with soils less suitable for cultivation.

### **Forests (Lowland)**

#### *Tamarack Swamps (MLCCS Codes 31210, 31213)*

Tamarack swamp is present throughout the deciduous forest-woodland and conifer-hardwood forest zones of Minnesota. It occurs on minerotrophic muck and shallow peat along rivers and in shallow lake basins, and on nutrient-poor, mildly-acidic to acidic peat in ice-block basins or large peatland systems. Tamarack is either the only canopy species or is mixed with black spruce (*Picea mariana*), paper birch (*Betula papyrifera*), yellow birch (*Betula alleghaniensis*), white pine (*Pinus strobus*), black ash (*Fraxinus nigra*), American elm (*Ulmus americana*), or red maple (*Acer rubrum*). The sedge *Carex stricta* is common under relatively open stands of



*Tamarack Swamp*  
Photo credit: MN DNR

tamarack; cyperus-like sedge (*Carex pseudo-cyperus*) and black chokeberry (*Aronia melanocarpa*) are often present on tear-drop islands in large peatland complexes.

In the absence of catastrophic disturbances, tamarack swamps may succeed shrub swamps, rich fens, poor fens, and possibly hardwood swamp forests. Fire, flooding, and insect

infestations (e.g., larch sawfly) often reverse this succession. Wind throw, disease, and selective cutting of tamaracks in dense stands help maintain tamarack cover by creating gaps in the canopy in which the very shade-intolerant tamarack seedlings and saplings are able to grow.

Tamarack swamp differs from mixed hardwood swamp in part by having at least 50% of its canopy cover formed by tamarack. Tamarack swamp differs from bog communities in the pH of its surface waters and by having minerotrophic species that do not occur in true bogs [such as bog birch (*Betula pumila*), several sedge species (*Carex leptalea*, *C. paupercula*, *C. tenuiflora*), swamp loosestrife (*Lysimachia thyrsiflora*), marsh cinquefoil (*Potentilla palustris*), willow (*Salix pedicellaris*), and northern white cedar (*Thuja occidentalis*)].

#### *Lowland Hardwood Forest (MLCCS Code 32220)*

Lowland hardwood forest is a wet-mesic forest that is present throughout Minnesota. It is transitional between the terrestrial and palustrine systems, occurring on sites with seasonally high water tables (within the tree-rooting zone) but do not flood regularly and have mineral rather than peat soils. In accordance with the poorly drained sites on which the lowland hardwood forests occur, species tolerant of periodic soil saturation dominate the tree canopy. American elms and black ashes are common canopy dominants, but most stands are mixed, with slippery elms (*Ulmus rubra*), rock elms (*U. thomasi*), basswoods, bur oaks, hackberries (*Celtis occidentalis*), yellow birches, green ashes (*Fraxinus pensylvanica*), black ashes, quaking aspens, balsam poplars (*Populus balsamifera*), and paper birches as important species. The tall-shrub layer is usually discontinuous and is composed of a mixture of upland and lowland shrubs. The ground layer is composed mostly of upland herbs that do not root to the water-table.

Lowland hardwood forest usually occurs in fire-protected areas, although even in unprotected areas the community burns infrequently because the woody vegetation is usually hydrated, especially in the spring. Lowland hardwood forest soils differ from hardwood swamp forest soils by being mineral rather than peaty and from the mineral soils of other mesic upland forest types by being seasonally saturated (at depths greater than 0.5 meters).

Lowland hardwood forest is often composed of late-successional species, but few stands in Minnesota have old canopy trees, presumably because of wind throw and infrequent episodes of killing floods. Lowland hardwood forest is topographically transitional between upland forests and forested peatlands and is best developed on flat terrain where such transition zones are broad (e.g., on river terraces above normal flood levels, on loamy ground moraine, and on drumlin fields).

*Floodplain Forests (MLCCS Codes 32210, 32211)*

Floodplain forest is a seasonally wet forest community that occurs throughout Minnesota on the active floodplains of major rivers and their tributary streams. The canopy of the community is dominated by deciduous tree species tolerant of inundation, abrasion, and other disturbances associated with flooding. The canopy is variable in composition, either composed of a mixture of tree species or strongly dominated by a single tree species.



*Floodplain forest*

The species composition of floodplain forests varies both geographically and in relation to such features as substrate type or flood cycles. In southern Minnesota, silver maples (*Acer saccharinum*), black willows (*Salix nigra*), and cottonwoods (*Populus deltoids*) are common canopy dominants. They occur either in nearly pure stands or in mixed stands. Scattered individuals or patches of river birch, American elm, slippery elm, green ash, and swamp white oak (*Quercus bicolor*) are also common in stands in southern Minnesota.

The tree canopy cover is highly variable within floodplain forests. The canopy is continuous in some stands while other stands have open areas caused by repeated erosion, ice-scouring, and soil and debris deposition, all of which prevent the growth of trees and shrubs.

In recent decades, Dutch elm disease has also caused significant canopy openings in floodplain forests in which mature American elm trees were abundant in the canopy. Areas beneath tree-canopy openings in the forests are either dominated by short-lived herbaceous plants or, where erosion and disturbance from flooding tend to be repeated and severe, remain unvegetated.

## Woodlands

### *Oak Woodland/Brushland (MLCCS Code 42120)*

These were generally moderate to good quality, with some concerns related to encroachment by brush, the absence of periodic fires, and other factors.

Oak woodland-brushland occurs on dry to mesic sites throughout the deciduous forest-woodland zone and locally in the prairie zone near the ecotone between the



*Oak Woodland-brushland in winter*

prairie zone and the deciduous forest-woodland zone. Oak woodland is floristically and structurally intermediate between oak savanna and oak forest, with a patchy tree canopy and an understory dominated by shrubs and tree saplings.

The principal species in the tree canopy are bur oak, northern pin oak, white oak, and northern red oak. Aspens may form up to 70% of the tree canopy cover. The brush layer ranges in density from sparse (with 10-30% cover), to an impenetrable thicket. It is often especially dense in openings between clumps or groves of trees. Most of the floristic diversity in the community exists in the brush layer, which most commonly is composed of blackberries and raspberries (*Rubus* spp.), gooseberries (*Ribes* spp.), dogwoods (*Cornus* spp.), cherries (*Prunus* spp.), hazelnuts (*Corylus* spp.), prickly ashes (*Zanthoxylum americanum*), and sprouts of oak (*Quercus* spp.) and quaking aspen. Prairie vegetation, if present, occurs only in small openings in the tree or shrub canopy. Except in these scattered prairie openings, the

herbaceous layer is sparse and floristically poor. It is usually composed of woodland species capable of surviving in the dense shade beneath the brush layer.

Oak woodland-brushland is a fire-maintained community. It is most common on rich sites where trees and shrubs grow well but where recurrent fires prevent the formation of true forest. Historically, Oak Woodland-Brushland was probably one of the most extensive community types in Minnesota, comprising much of the vegetation described as oak barrens, brushland, and thickets by the early surveyors. The fires that maintained oak woodland-brushland usually started on nearby prairies. Following the conversion of these prairies to agricultural land, oak woodland-brushland burned less frequently and rapidly succeeded to oak forest. Oak woodland-brushland is defined broadly enough here to also include communities in which the predominant cover is oak brush or oak-aspen brush (that originated following fire or limited human disturbance) instead of a well-developed tree canopy. There are four geographic sections of oak woodland-brushland in Minnesota. These sections may be modified in the future as more information becomes available.

In southeastern and central Minnesota, oak woodland-brushland is present on southwest-facing slopes on the blufflands and on outwash terraces of the Mississippi River and its tributaries. It generally occurs on more gentle slopes than bluff prairie or on lower slopes below bluff prairies. Bur oaks are common canopy dominants and northern red oaks are common associates. Northern pin oaks, basswoods, and black cherries may also occur in the canopy. White oaks are rare and aspens typically are absent. Chokecherries are common in the shrub layer, with shrub cover averaging 30-50%. On droughty sites with thin soils or steep slopes these woodlands may persist even in the absence of fire.

In the Big Woods Section of Minnesota, oak woodlands are dominated by white oak in areas with coarse-textured soils, such as on kames or eskers, or in areas prone to occasional fires. Natural woodlands are now extremely rare in this section because of logging, grazing, and fire suppression.

*Mesic Oak Savanna (MLCCS Code 62130)*

The characteristic trees of mesic oak savanna are bur oaks and to a lesser extent northern pin oaks. Northward, quaking aspens were probably common in moister parts of mesic oak savannas. The stature and spacing of the oaks in the community probably varied considerably, primarily with differences in fire history, which were themselves related to differences in soils, landforms, and climate. Grubs and small, gnarly, open-grown trees were probably also common.

The distribution of trees ranged from evenly spaced to strongly clumped. Shrub cover, likewise, was probably quite variable. The shrub layer included chokecherries (*Prunus virginiana*), low juneberries (*Amelanchier humilis*), gray-bark dogwoods (*Cornus racemosa*), wolfberries (*Symphoricarpos occidentalis*), and on lighter soils, prairie willows (*Salix humilis*), New Jersey tea (*Ceanothus americanus*), and American hazelnuts (*Corylus americana*). Leadplant (*Amorpha canescens*) was always present. The herbaceous vegetation was dominated by species typical of mesic prairie, but herbs typical of oak woodland and oak forest were probably present as well, especially beneath tree or shrub canopies.

Mesic oak savanna is rare throughout Minnesota. Historically, it occurred in the prairie and deciduous forest-woodland zones. Mesic oak savanna occurred on dry-mesic to mesic, gently undulating to moderately sloping sites. These sites were on glacial till or outwash, with soil texture ranging from clay loam to sandy loam. Mesic Oak



*Dry-mesic oak savanna*

Savanna generally occurred on sites where fire was frequent enough to prevent trees and shrubs from forming closed canopies, thereby permitting heliophilous sun-loving prairie herbs to dominate the ground layer. However, fire frequencies were lower than in prairies on similar topography and soils.

Native grazing and browsing animals may also have helped maintain the open character of mesic oak savanna. Within the deciduous forest-woodland zone, where landscape character reduced fire frequency on a large scale, mesic oak savanna often covered larger areas. With settlement and the suppression of prairie fires, savannas in the deciduous forest-woodland zone that escaped clearing and cultivation quickly succeeded to woodland unless heavily and continuously grazed. No high quality examples are known to remain in Minnesota.

*Dry Oak Savanna – (MLCCS Codes 62120, 62122)*

Dry Oak Savanna occurs on the same kinds of landforms as Dry Prairie, except for bedrock bluffs. The barrens subtype of dry savanna occurs on the same kinds of sand deposits as the Barrens Subtype of Dry Prairie. On dune blankets it tends to be favored over prairie in areas of sharper relief. Bur oaks are generally the prevalent trees, but northern pin oaks are also common.



*Dry oak savanna/barrens prairie*

Small, gnarly, open-grown trees are most common, although in moister spots, or in heavier soils, larger trees are sometimes more common. Trees range in spacing from sparse and evenly spaced to strongly clumped. The shrub layer is usually sparse; the most common species in the shrub layer are oaks (in the form of grubs), chokecherry, American hazel, smooth sumac, prairie willow, bush juniper (*Juniperus communis*) and New Jersey tea (*Ceanothus americanus*) are usually present. The herbaceous vegetation present in open areas is similar to that of the Barrens Subtype of Dry Prairie.

The presence of savanna rather than prairie indicates a lower fire frequency or intensity (or both) than in prairie. Dry Oak Savanna requires less frequent fire than Mesic Savanna for

maintenance. However, in the complete absence of fire, woodland will eventually replace Dry Oak Savanna. Grazing and browsing animals may also have had a role in the maintenance of Dry Oak Savanna. Because Dry Oak Savanna occurs on sites that are not as suitable for cultivation as Mesic Savanna sites, and because succession in the absence of fire is not as rapid, more examples remain of Dry Oak Savanna than of Mesic Oak Savanna.

## **Shrublands**

### *Wet Meadow - Shrub Subtype (MLCCS Code 52420)*

This wet shrub meadow type is found in the northern prairie-forest border area within Minnesota. Stands may occur along stream courses or adjacent to lakes or in upland depressions. Soils are wet mineral, muck, or shallow peat (<0.5 m). Standing water is present in the spring and after heavy rains, but the water table draws down by mid-summer. Seepage areas may also occur. Shrub cover is at least 25 percent but does not become thick. Dominant species include red-osier dogwood (*Cornus sericea*), Bebb's willow (*Salix bebbiana*), pussy willow (*Salix discolor*), slender willows (*Salix petiolaris*), and meadowsweet (*Spiraea alba*). Herbaceous species are typical of wet herbaceous meadows, and include several species of sedges (*Carex aquatilis*, *C. atherodes*, *C. haydenii*, *C. lacustris*, *C. lanuginosa*, *C. rostrata*, and *C. stricta*), or grasses such as Canada blue joint (*Calamagrostis canadensis*) and reedgrass (*Calamagrostis stricta*). Forbs include swamp milkweed (*Asclepias incarnata*), lance-leaved aster (*Aster lanceolatus*), New England aster (*A. novae-angliae*), swamp aster (*A. puniceus*), turtlehead (*Chelone glabra*), joe-pye weed (*Eupatorium maculatum*), and common mint (*Mentha arvensis*).

Wet meadow shrub subtype is a wetland community comprised of 50-70% cover by tall shrubs where peat is <0.5m deep and gaps are not dominated by emergent species >1m tall. The leaves of typical grasses and sedges within this community are >3mm wide (such as Canada blue joint (*Calamagrostis canadensis*), lake sedge (*Carex lacustris*), and tussock sedge (*C. stricta*)).

### *Willow Swamp (MLCCS Code 52430)*

Willow swamp is a minerotrophic wetland with a canopy of medium to tall (>1m) shrubs dominated by willows (especially pussy willow, slender willow, and Bebb's willow) and red-

osier dogwood. Other shrubs, such as speckled alder (*Alnus rugosa*), bog birch, poison sumac (*Rhus vernix*), and alder buckthorn (*Rhamnus alnifolia*) may be common in the tall shrub layer, although speckled alder is never the most abundant species present. Herbaceous species (especially graminoids) characteristic of wet meadow/fen communities are common in the more open occurrences of the community. However, in willow swamps, unlike wet meadow/fen communities, these graminoid-dominated patches are poorly separated from clumps of shrubs. The most common herbs are tussock sedge (*Carex stricta*), prairie sedge (*Carex prairea*), lake-bank sedge (*Carex lacustris*), broad-leaved cattail (*Typha latifolia*), Canada blue-joint grass, northern marsh fern (*Thelypteris palustris*), and jewel-weed (*Impatiens capensis*).

Willow swamps dominated by bog birch are closely related to the shrub subtype of rich fen but have more minerotrophic indicator species [such as speckled alder, holly (*Ilex verticillata*), jewel-weed, and horehound (*Lycopus uniflorus*)] than are present in Rich Fens. Following fire in conifer swamps or in the shrub subtype of rich fens there may be initially a dense cover of willows (usually balsam willow and bog willow), but these stands are best classified as successional stages of conifer swamp or rich fen rather than as willow swamp. The dense groves of sand-bar willow or juvenile black willow that occur on sand bars along rivers are not considered shrub swamp communities but instead river beach communities, as they occur on mineral rather than peat or muck substrates.

Willow swamp occurs on seasonally flooded soils with <30% tree cover and >50% cover by tall shrubs (not dwarf-shrubs), where <50% of the shrubs are alders and gaps are dominated by emergent species >1m tall.

#### *Alder Swamp (MLCCS Codes 52410 and 52350)*

Alder Swamp is a minerotrophic wetland with a canopy of tall shrubs dominated by speckled alder, often mixed with other shrub species such as willows, bog birch, poison sumac, or alder buckthorn. Common understory species in the community are tussock sedge, prairie sedge, lake-bank sedge, broad-leaved cattail, Canada blue-joint, northern marsh fern, jewel-weed, and a species of sphagnum moss, *Sphagnum squarrosum*. The shrub canopy is usually continuous and dense, but may be interrupted, especially as a result of flooding. The

understory graminoid cover tends to be sparse wherever the shrub canopy is especially dense. Graminoid-dominated openings are not distinctly separated from shrub clumps as in Wet Meadow or Fen communities. Trees, including northern white cedars, tamaracks, black ashes, and paper birches, are occasionally present in Alder Swamps, but have less than 30% cover.

### **Herbaceous Wetlands**

#### *Cattail Marsh (MLCCS Codes 61510, 61610, 61710, 61810)*

For the purposes of this project, cattail marshes do not include monotypic (i.e. single species) stands of the nonnative narrow-leaf cattail with very low species diversity. Wetlands within Andover comprised primarily of narrow-leaf cattail (*Typha angustifolia*) and reed canary grass (*Phalaris arundinacea*) were considered non-native dominated herbaceous wetlands (MLCCS codes 61330, 61480, 61530, and 61630). Several large cattail/reed canary grass monotypes were observed within the city, as well as numerous medium to small disturbed basins containing a monotype or combination of invasive species.

Cattail marsh is an emergent marsh dominated by cattails including broad leaved cattail *Typha latifolia* and less frequently narrow leaved cattail, and very often their hybrids (*T. glauca*). Cattail marshes occur most commonly along lake margins and in shallow basins, although they are sometimes also present in river backwaters. Lacustrine cattail marshes typically have a muck-bottom



zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots do not contact the bottom but instead the plants grow suspended in a buoyant peaty mat. Associated species vary widely, but some of the most common ones are sedges of the genus *Carex* (Water sedge (*C. aquatilis*), beaked sedge (*C. rostrata*), and wooly sedge (*C. lanuginosa*), bulrushes ( American bulrush (*Scirpus americanus*), hardstem bulrush (*S. acutus*), and slender bulrush (*S. heterochaetus*)), and broad-leaved herbs such as northern marsh fern (*Thelypteris palustris*), swamp milkweed, jewel-weed, broad-leaved

arrowhead (*Sagittaria latifolia*), mad-dog skullcap (*Scutellaria lateriflora*), marsh skullcap (*Scutellaria galericulata*), and blue vervain (*Verbena hastata*).



*Wet Meadow (MLCCS Code 61420, 61540)*

The ground layer of wet meadow communities are composed of dense, closed stands of predominately wide-leaved sedges (e.g., lake sedge, tussock sedge, water sedge (*Carex aquatilis*), beaked sedge (*C. rostrata*), and Hayden's sedge (*C. haydenii*) or grasses (e.g., Canada blue joint grass, Northern reed grass (*Calamagrostis inexpansa*)). Forb cover and

diversity usually are high. Forbs such as spotted joe-pye weed (*Eupatorium maculatum*), common mint (*Mentha arvensis*), turtlehead (*Chelone glabra*), and swamp milkweed are conspicuous. Shrub cover in wet meadows ranges from 0 to 70% and is composed of Bebb's willows and pussy willows. Mosses are rare or absent.

Wet meadow occurs on wet mineral soil, muck, or shallow peat (<0.5 m). Standing water (generally stagnant) is present in the spring and after heavy rains, but the water table is generally below the soil surface for most of the growing season. The drawdown of the water table as the growing season progresses enables the oxidation of dead organic matter that has accumulated on the ground surface from previous years. This process makes available nutrients for some of the nutrient-demanding species present in the community. Occurrences of wet meadow along stream courses or adjacent to lakes often have fairly constant water levels relative to wet meadows in depressions or basins. On these sites siltation may be important in maintaining high nutrient levels.

Wet meadow tends to succeed to shrub swamp communities in the absence of fire. Water-table lowering caused by drought or by ditching promotes succession of wet meadow to shrub swamps. Wet meadows on organic soils, like other communities that occur on organic soils, recover very slowly, if at all, once altered by artificial flooding or draining.

*Poor fen (MLCCS Codes 61450)*



Poor fen

Poor Fen is most common in the conifer-hardwood forest zone, with scattered occurrences in the deciduous forest-woodland zone. The ground cover of the community is typically dominated by wiregrass sedge (*Carex lasiocarpa*) or few-seeded sedge (*C. oligosperma*). Mud sedge (*C. limosa*), creeping sedge (*C. chordorrhiza*), beaked-sedge (*Rhynchospora alba*), tufted club-rush

(*Scirpus cespitosus*), scheuchzeria (*Scheuchzeria palustris*), and ericaceous shrubs are present in most Poor Fens as associates of the dominant sedges. Poor Fens have at least 50% cover by sphagnum mosses and up to 70% cover by shrubs and small trees, most commonly bog birches and stunted tamaracks.

Poor Fen occurs on deep peat (>1.0m) that receives minimal nutrient-rich run-off from surrounding uplands. In Minnesota's large patterned peatlands, Poor Fen often is present on sites with water infiltration from adjacent raised bogs. Less frequently, Poor Fen occurs in the interiors of small basins that are relatively isolated from run-off. This is the case for fens in Andover. The surface water of Poor Fen is slightly acidic (pH 4.1 - 5.9) and nutrient poor ( $[Ca^{2+}] < 13$  mg/l). Poor Fen is transitional between Rich Fen and Open Bog and commonly grades into these communities on the landscape.

There are four subtypes of Poor Fen, a Sedge Subtype, a Shrub Subtype, a Scrub Tamarack Subtype, and a Patterned Subtype.

Key-based definition: A saturated wetland on peat >0.5m deep where grasses and sedges, such as *Carex lasiocarpa* and *C. chordorrhiza*, are mostly <3mm wide and there is <50% cover by shrubs, including dwarf-shrubs. The community does not occur on the floating mat at the edge of a shallow lake and lacks the complex patterned topography of strings and flarks. The following species are NOT common: livid sedge (*Carex livida*), Buxbaum's sedge

(*C. buxbaumii*), swamp lousewort (*Pedicularis lanceolata*), flat stem spikerush (*Eleocharis compressa*), spiked muhly grass (*Muhlenbergia glomerata*), and Kalm's lobelia (*Lobelia kalmii*.)

*The National Vegetation Classification System description of a more narrowly defined*

*community is given here as well:* *This graminoid poor fen community is found in the Great Lakes region of the United States and Canada, as well as elsewhere in central Canada, ranging from Ontario to Manitoba, south to Iowa, and east to Illinois. Stands are found in peatlands with low exposure to mineral-rich groundwater, including basin fens, shores above the level of seasonal flooding and larger peatlands. Water hydrology is saturated, and surface water is slightly acidic and nutrient poor. The vegetation is dominated by graminoids, with up to 25 percent shrub cover, and scattered trees. The dominant graminoid is Carex lasiocarpa, and typical associates include Carex chordorrhiza, Carex limosa (mud sedge), Carex oligosperma (few-seeded sedge), Rhynchospora alba, Scirpus cespitosus, and Scheuchzeria palustris. Forbs include Dragon-mouth (Arethusa bulbosa), northern bog aster (Aster borealis), grass pink (Calopogon tuberosus), rose pogonia (Pogonia ophioglossoides), pitcher plant (Sarracenia purpurea), and bog goldenrod (Solidago uliginosa). The low-shrub layer contains bog rosemary (Andromeda polifolia), bog birch (Betula pumila), leatherleaf (Chamaedaphne calyculata), Larix laricina, Salix discolor, Salix pedicellaris, and dwarf cranberry (Vaccinium oxycoccos). The moss layer is virtually continuous, and is dominated by species of sphagnum mosses including Sphagnum capillifolium, Sphagnum fuscum, and Sphagnum magellanicum. Diagnostic features include the dominance of graminoids, particularly Carex lasiocarpa, the almost continuous layer of Sphagnum peat, and few minerotrophic indicators.*

*Rich Fen (MLCCS Code 61460, 61461, and 61462)*

No occurrences of rich fen were documented in Andover during the NRI. However, since the NRI generally focused on upland communities rather than wetland communities, some wetland community types which are typically identified during field review (vs. during aerial photo review) may have been overlooked in the NRI. Because of differences between MnRAM and MLCCS, some rich fens may have been classified as mixed emergent marshes, sedge meadows, wet meadows or other plant community types during the wetland inventory. Because they are likely to occur in the city, a description of the community type is provided below.

The ground layer of rich fens is dominated by wiregrass sedge (*Carex lasiocarpa*), brown sedge (*Carex buxbaumii*), livid sedge (*Carex livida*), bluejoint grass (*Calamagrostis neglecta*), or bog reed-grass (*Calamagrostis inexpansa*). Although generally open communities, rich fens may have up to 70% cover of woody shrubs, especially bog birches, sage-leaved willows, and shrubby cinquefoils. Mosses range from scarce to abundant in the community. Where mosses are abundant, the dominant species are species other than sphagnum mosses (*Sphagnum* spp.).

Surface waters within the community are slightly acidic to circumneutral (pH 5.8 - 7.8) with moderate nutrient levels. Rich fen may grade into poor fen but is distinguishable from poor fen by its higher species diversity and by the more frequent occurrence and greater abundance of minerotrophic indicator species, including livid sedge (*Carex livida*), brown sedge (*C. buxbaumii*), swamp lousewort (*Pedicularis lanceolata*), spike-rush (*Eleocharis compressa*), marsh muhly (*Muhlenbergia glomerata*), and Kalm's lobelia (*Lobelia kalmii*).

Rich fen occurs in the conifer-hardwood forest and deciduous forest-woodland zones. There are two geographic sections of rich fen, a Transition Section and a Boreal Section. In the Boreal Section (i.e. northern Minnesota), rich fen usually occurs on deep peat and contains characteristically northern species such as bog-rosemary (*Andromeda glaucophylla*) and other ericaceous shrubs, the bulrush *Scirpus hudsonianus*, and pitcher-plant (*Sarracenia purpurea*).

The sedge subtype rich fen does not occur on the floating mat at the edge of a shallow lake and lacks the complex patterned topography of strings and flarks. Rich fen – floating-mat subtype occurs on the floating mat at the edge of a shallow lake, In both community types there is no discharge of calcareous groundwater, and the following species are often common: *Carex livida*, *C. buxbaumii*, *Pedicularis lanceolata*, *Eleocharis compressa*, *Muhlenbergia glomerata*, and *Lobelia kalmii*.

#### *Mixed Emergent Marsh (MLCCS Code 61520, 61620)*

Within most of the mixed emergent marsh remnants in the study area, reed canary grass (*Phalaris arundinacea*) is a common invasive species. This is especially true adjacent to agricultural lands that have high sediment and nutrient load in their runoff.

Mixed emergent marsh is a broad community type, encompassing all marshes dominated by species other than cattails. Bulrushes are the most common dominants, especially hard-stemmed bulrush (*Scirpus acutus*), river bulrush (*Scirpus fluviatilis*), softstem bulrush (*Scirpus validus*), *Scirpus americanus*, and *Scirpus heterochaetus*. Common reed grass (*Phragmites australis*), spike rushes (*Eleocharis* spp.), and (in some river backwaters) prairie cord grass (*Spartina pectinata*) are less common dominants.

In general, mixed emergent marsh tends to occur on harder pond, lake, or river bottoms than cattail marsh and is less likely to contain the forbs that grow on the floating peat mats present in many cattail marshes. Broad-leaved arrowhead (*Sagittaria latifolia*) and aquatic macrophytes are the most common non-graminoid associates. Many mixed emergent marsh species are sensitive to fertilizer run-off and other artificial disturbances, and disturbed mixed emergent marshes (especially in the Prairie Zone) tend to convert to cattail marshes or become strongly dominated by reed canary grass (*Phalaris arundinacea*) or common reed grass (*Phragmites australis*), species that increase in abundance with disturbance.

## **Upland Grasslands**

### *Upland Prairie*

Upland prairie occurs primarily in the prairie zone, with scattered occurrences in the deciduous forest-woodland zone. It is dominated by grasses. The tall grasses, big bluestem (*Andropogon gerardii*) and Indiangrass (*Sorghastrum nutans*), are the major dominants on moist sites. Prairie dropseed (*Sporobolus heterolepis*) is common on both dry and moist sites. Forbs typically are abundant (but subdominant to the grasses) and may have high local diversity. Forb species composition varies with site moisture, although some forb species occur on almost all sites, moist or dry. Several low shrub or sub-shrub species are common on Upland prairie; the most characteristic is leadplant (*Amorpha canescens*). Taller brush and trees are absent or scattered, however brush or woodland areas may be interspersed with prairie, usually in association with topographic and aquatic features that provide protection from fire.

The most important cause of variation in species composition in prairie communities is variation in soil moisture. The local soil moisture regime is determined by slope, aspect,

proximity to the water table, and soil texture. On a regional scale, variation in species composition is primarily caused by climatic variation (i.e., the westward decline in precipitation and northward decline in temperature in Minnesota).

Upland prairies occur on a range of landforms in the prairie zone, from nearly flat glacial lake plains to steep morainic slopes. In the deciduous forest-woodland zone, prairies occur on droughty, level outwash areas and steep south- and west-facing slopes. The pre-European settlement distribution of prairie was related to the interaction of local fire frequency with growth rates of woody species: where conditions were favorable for rapid growth, more frequent fires were necessary to maintain prairie over savanna, woodland, or forest. Fragmentation of upland prairie since European settlement has reduced fire frequency throughout the prairie and deciduous forest-woodland zones, and most prairie remnants have more brush and trees than were present in the past.

It is important to note that plantings of prairie species, typically referred to as "prairie restorations" are invariably less species rich than native prairie remnants, mimic only a small fraction of the function of a remnant prairie, and are often fraught with exotic weed species such as smooth brome (*Bromus inermis*) and Kentucky blue grass (*Poa pratensis*) among others. These prairie plantings are typically dominated by a handful of native grasses, including big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*), with little blue stem (*Schizachyrium scoparium*) seldom used.

#### *Mesic Prairie (MLCCS Code 61110)*

Mesic prairie is a dry-mesic to wet-mesic grassland that occurs mainly in the prairie zone in southern and western Minnesota and sporadically in the deciduous forest-woodland zone. Mesic prairie is dominated by grasses. Big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and prairie dropseed (*Sporobolus heterolepis*) are the major native species on most sites, with little bluestem (*Schizachyrium scoparium*) and porcupine grass (*Stipa spartea*) important on drier sites, and switchgrass (*Panicum virgatum*) and prairie cordgrass (*Spartina pectinata*) common on wetter sites. The introduced grass Kentucky bluegrass (*Poa pratensis*) is present at most sites; it is a function of the site's disturbance history.

Forbs are abundant (but usually subdominant to grasses) and have high local diversity. Forb species-composition also varies locally with soil moisture. There is greater regional variation among forbs than among grasses. Common forb species include purple prairie-clover (*Petalostemon purpureum*), white prairie-clover (*P. candidum*), ground-plum (*Astragalus crassicaarpus*), prairie-turnip (*Psoralea esculenta*), rough blazing-star (*Liatris aspera*), Canada goldenrod (*Solidago canadensis*), stiff goldenrod (*S. rigida*), Missouri goldenrod (*S. missouriensis*), prairie thistle (*Cirsium flodmani*), smooth aster (*Aster laevis*), stiff sunflower (*Helianthus rigidus*), Maximilian sunflower (*H. maximilianii*), smooth rattlesnake-root (*Prenanthes racemosa*), white sage (*Artemisia ludoviciana*), wood lily (*Lilium philadelphicum*), white camas (*Zigadenus elegans*), heart-leaved alexanders (*Zizia aptera*), prairie larkspur (*Delphinium virescens*), downy phlox (*Phlox pilosa*), hoary puccoon (*Lithospermum canescens*), tall cinquefoil (*Potentilla arguta*), alum-root (*Heuchera richardsonii*), wood-betony (*Pedicularis canadensis*), northern bedstraw (*Galium boreale*), prairie bird-foot violet (*Viola pedatifida*), oval-leaved milkweed (*Asclepias ovalifolia*), and showy milkweed (*A. speciosa*). Purple coneflower (*Echinacea angustifolia*) is common on drier sites in the western part of the community's range. Leadplant, prairie rose, sand cherry, wolfberry, and prairie willow are common low-shrub or sub-shrub species. Fragrant false indigo is common on moister sites. Trees and taller brush often occur along the margins of wetlands adjacent to mesic prairies.

Mesic prairie is a fire-dependent community. In the absence of fire, occurrences of mesic prairie are invaded by brush and trees. In the prairie zone, mesic prairie occurs on nearly level glaciolacustrine and glaciofluvial deposits, and on flat or gently rolling morainic landforms. In southeastern and, to a lesser extent, southwestern Minnesota, the glacial deposits are overlain by loess. Bedrock subtypes of mesic prairie exist in a few areas where bedrock is within about one-and-one-quarter meters of the ground surface and there are numerous small patches of exposed rock. Within the deciduous forest-woodland zone, mesic prairie usually occurs on level outwash areas or on broad, sandy river terraces.

The soils in mesic prairie are predominantly mollisols with thick, dark mineral surface layers that have high base saturation and dominantly bivalent cations. They range in texture and drainage from silty and somewhat poorly drained to sandy and somewhat excessively drained, with moderately well-drained to well-drained, loamy soils being most common. Mesic prairie

grades into wet prairie on moister sites and into the hill and sand-gravel subtypes of dry prairie on drier sites. Separation of mesic prairie from other prairie types is based primarily on landform or substrate characteristics rather than on species composition, as floristic boundaries between mesic prairie and other prairie types are not well defined.

*Dry Prairie – (MLCCS Code 61210, 61211, 61213)*

Dry Prairie is a type of Upland Prairie, which occurs primarily in the prairie zone, with scattered occurrences in the deciduous forest-woodland zone. They are dominated by grasses. The tall grasses, big bluestem (*Andropogon gerardii*) and Indiangrass (*Sorghastrum nutans*), are the major dominants on moist sites. Prairie dropseed (*Sporobolus heterolepis*) is common on both dry and moist sites. Forbs typically are abundant (but subdominant to the grasses) and may have high local diversity. Forb species composition varies with site moisture, although some forb species occur on almost all sites, moist or dry. Several low shrub or sub-shrub species are common on Upland Prairie; the most characteristic is leadplant (*Amorpha canescens*). Taller brush and trees are absent or scattered, however brush or woodland areas may be interspersed with prairie, usually in association with topographic and aquatic features that provide protection from fire.

Dry Prairie is a dry to dry-mesic herbaceous community dominated by grasses and sedges. It occurs throughout the prairie zone and sporadically in the deciduous forest-woodland zone. Dry Prairie has considerable variation in species composition, reflecting interactions among geography (namely climate), soils, and topography. In general, Dry Prairies have a greater component of Great Plains species than Mesic Prairies, especially in prairies in the western part of Minnesota. Big bluestem (*Andropogon gerardii*) is always present in the community and usually important, but it does not achieve the dominance it typically has in Mesic Prairie. Indiangrass (*Sorghastrum nutans*) is more limited in occurrence, generally appearing only where conditions approach mesic. Mid-height and short grasses and sedges are usually dominant in Dry Prairie. Among the more common are porcupine grass (*Stipa spartea*), little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), prairie June-grass (*Koeleria macrantha*), and sun-loving sedge (*Carex heliophila*).

Forb variation within the community is more pronounced. Some widespread, characteristic species are dotted blazing star (*Liatris punctata*), pasque flower (*Pulsatilla nuttalliana*), prairie golden-aster (*Heterotheca villosa*), stiff sunflower (*Helianthus rigidus*), silky aster (*Aster sericeus*), green milkweed (*Asclepias viridiflora*), stiff goldenrod (*Solidago rigida*), gray goldenrod (*Solidago nemoralis*), Missouri goldenrod (*Solidago missouriensis*), and narrow-leaved puccoon (*Lithospermum incisum*). Dry Prairies share many forb species with Mesic Prairies, including rough blazing star (*Liatris aspera*), buffalo-bean (*Astragalus crassicaarpus*), tooth-leaved evening primrose (*Calylophus serrulatus*), silverleaf scurfpea (*Psoralea argophylla*), thimbleweed (*Anemone cylindrica*), Louisiana sagewort (*Artemisia ludoviciana*), prairie larkspur (*Delphinium virescens*), heart-leaved alexanders (*Zizia aptera*), purple prairie-clover (*Petalostemon purpureum*), hoary puccoon (*Lithospermum canescens*), prairie smoke (*Geum triflorum*), and wood lily (*Lilium philadelphicum*).

Three sub-shrubs--leadplant (*Amorpha canescens*), prairie rose (*Rosa arkansana*), and wolfberry (*Symphoricarpos occidentalis*)--typical in Mesic Prairies are also generally present in Dry Prairie. Soil-encrusting lichens and the fern-ally rock-spikemoss (*Selaginella rupestris*) are often common in Dry Prairie. Brush, and sometimes trees, may be present in hollows and draws. Bur oak (*Quercus macrocarpa*), chokecherry (*Prunus virginiana*), wild plum (*Prunus americana*), and smooth sumac (*Rhus glabra*) are the most widespread woody species. Other woody species more limited in distribution in the community are northern pin oak (*Quercus ellipsoidalis*), black oak (*Quercus velutina*), and hazel (*Corylus americana*).

Dry Prairies are maintained by fire but require less frequent fires than mesic and wet prairies because the droughty conditions within Dry Prairies slow or prevent the growth of woody species. Dry Prairie occurs on a variety of landforms, including sand dune blankets of mid-Holocene origin, glacial lake beach ridges, outwash deposits, ice-contact features (kames, eskers), morainic hills, erosional slopes in glacial drift, and bedrock-cored bluffs. Soils range from nearly pure sand with little profile development, to mollisols, although the latter have a much thinner organic-rich surface horizon than the soils of Mesic Prairie. All overlie deep glacial drift except for those of the bedrock-cored bluffs, which are formed in a thin layer of loess or residuum. Soils are well drained to excessively drained. Depending upon the degree of slope, the slope aspect, and the soil composition, Dry Prairie intergrades with Mesic Prairie.

### **Other Plant Assemblages (MLCCS Semi-natural Community Types)**

There are a number of plant assemblages in the study area that do not have sufficient species composition, three-dimensional structure, or overall function to be considered natural communities as described in *Minnesota's Native Vegetation: A Key to Natural Communities* (MN DNR 1993). These communities were assigned community names according to the protocols of the Minnesota Land Cover Classification System. These were included in the inventory as a way of creating a more complete picture for the permanent habitats within the city. Although they are not natural areas by definition, they possess one or several characteristics that contribute to overall function of natural areas at a landscape-level due to proximity to other natural areas, good restoration potential back to natural area, or they may represent the only large block of habitat in the area, or others.

The names assigned to these MLCCS communities are standardized, descriptive in nature, and give an indication of the structure of an area, as well as the hydrologic regime. Some examples of common semi-natural MLCCS community type names included in this report are:

#### *Altered/Nonnative Deciduous Forest (MLCCS Code 32170)*

This upland deciduous forest classification is reserved for sites which do not meet the definition of other, native community types. In other words, oaks, aspens, balsam poplars (*Populus balsamifera*), paper birches, yellow birches (*Betula alleghaniensis*), sugar maples, or basswoods are not dominant, and, if present, are only minor components of the community. Instead, boxelder (*Acer negundo*), green ash, and cottonwood (*Populus deltoides*) are typical canopy dominants, sometimes together and sometimes singly. Elms are common associates. Hackberries, aspens, oaks, and basswoods may also be present. The shrub layer is often dominated by buckthorn and Tartarian honeysuckle (*Lonicera tatarica*), but gooseberries (*Ribes spp.*) and elderberries (*Sambucus spp.*) can also be common. The ground layer is also dominated by species tolerant of disturbances, including white snakeroot (*Eupatorium rugosum*), motherwort (*Leonurus cardiaca*) and garlic mustard (*Alliaria petiolata*). Occasionally, when higher quality forests are nearby, the understory can be more diverse.

*Disturbed Deciduous Woodland (MLCCS Code 42130 and 43110)*

These upland areas have 10-70% tree cover. Aspens comprise <70% of tree cover, and oaks comprise <30%. Herbaceous species comprise <30% of the non-tree cover. Boxelder, green ash, and cottonwood are typical canopy dominants, sometimes together and sometimes singly. Elms are common associates. Hackberry, aspens, oaks, and basswoods may also be present. The shrub layer is often dominated by buckthorn and Tartarian honeysuckle, but sumacs, gooseberries and elderberries can also be common. The ground layer is also dominated by species tolerant of disturbances, including white snakeroot, motherwort, and garlic mustard. Occasionally, when higher quality forests are nearby, the understory can be more diverse.

*Tall or Medium tall non-native grassland, with or without sparse trees (MLCCS Codes 61120, 61220, 62140, and 62220)*

These are often plantings of smooth brome grass like those planted for the Conservation Reserve Program in the 1980's, or some other nonnative pasture grass. This upland grassland is generally <1m tall, with <25% tree cover and <50% shrub cover, and is dominated by non-native species, such as brome, Kentucky bluegrass, reed canary grass (*Phalaris arundinacea*), and spotted knapweed (*Centaurea maculosa*).

*Saturated to Seasonally flooded nonnative dominated wetland vegetation (MLCCS Codes 32240, 52220, 52330, 52440, 61330, 61480, 61530, 61630 )*

These wetland areas are typically disturbed by one of several human activities such as draining and/or planting of nonnative grasses, as well as grazing. These areas typically occur in the same settings that native wetland communities occur (see descriptions, above) and tend to be dominated by non-natives including reed canary grass, giant reed grass, European buckthorn, narrow leaved cattail, and/or purple loosestrife, or the native, disturbance adapted species such as boxelder.

*Grassland with sparse deciduous trees – nonnative dominated (MLCCS Code 62140)*

These areas may occur in former oak savannas where the ground cover was planted to nonnative pasture grasses (as in Sunfish Lake Oak Savanna), or more commonly abandoned agricultural fields planted to perennial nonnative grasses and later colonized by pioneer tree species. This upland vegetation has 10-70% cover by trees (of which <25% is conifer), where >30% of non-tree cover is herbaceous and dominated by non-native species. The ground layer is often dominated by brome or Kentucky bluegrass. Common shrubs include sumac and Tartarian honeysuckle. Almost any tree species can be found here, but elms, cottonwoods, green ashes, boxelders, and bur oaks are common.

*It is important to note that while these plant assemblages do not meet the criteria developed by the MN DNR Natural Heritage Program as remnant natural communities, they can still provide valuable habitat for wildlife. They can also be important in the landscape, providing buffers from developed and intensively farmed areas. In some cases, such as in some "Grassland with sparse deciduous trees" areas (which may be oaks over non-native grasslands); there may be opportunity to easily restore a natural community such as Mesic Oak Savanna that is exceptionally rare in the Upper Midwest. Additional information about these and other communities is available in the MLCCS Manual.*