

III. The Landscape of Afton

The Afton area has a variety of geologic landforms. In the northwest portion of the City is the St. Croix Moraine and associated outwash deposits. Terraces of the St. Croix River dominate the northeast. In the south half of Afton, bedrock topography dominates with relatively little glacial overburden. Figure III.1 shows surficial geology for the City of Afton.

The St. Croix Moraine is found in the northwest corner of Afton. The St. Croix Moraine is the till and outwash deposits from the Superior Lobe (Late Wisconsin) glaciation). Some small areas of glacial till remain, but mostly it is sand and gravel outwash deposits created by melting glaciers. The topography of this area is characterized by steep hills pock-marked with deep depressions. Sandy-gravelly loams dominate soils on slopes and hilltops, while depressions, which are often occupied by small lakes and wetlands, contain peat deposits. The northwest corner of the City also includes Bissels Mounds, notable landmarks that are apparently remnant pieces of bedrock that were not completely eroded or covered by the glaciation. Bedrock topography features are discussed in more detail later in this section. Figure III.1 shows sand and gravel outwash areas denoted by "SO".

In the northeast corner of Afton (and in St. Mary's Point and Lake St. Croix Beach) are the terraces of the St. Croix River Valley. There are three terraces, each marking the location and elevation of the St. Croix River during various post-glacial periods. The upper terrace, which marks the crest of the St. Croix Valley, is over 200 feet above the present day river floodplain. The middle terrace is about 115 to 140 feet above the river floodplain. The lower terrace is from 10 to 30 feet above the river floodplain. Soils on the terraces range from sandy loam on lower-lying elevations of slopes to gravelly sand. The middle terrace contains a number of relatively level areas with significant ground water discharge. Figure III.1 shows the St. Croix River terraces denoted by "t1, t2, and t3". Where major stream system valleys meet the St. Croix River Valley (such as Valley Creek), terraces may extend up stream valleys some distance from the St. Croix River Valley.

Bedrock topography features dominate the south half of Afton. Soils above bedrock are often less than five feet thick. Some patches of glacial till from older (Pre-Late Wisconsin) glaciation also occur within this area. Areas where glacial till is present contain sandy to clay loam-textured soils and are denoted in Figure III.1 as "pkt, pso, or pst". An area where bedrock is either exposed or near the surface is denoted in Figure III.1 as "b". Although the soils are relatively thin, they support agriculture in the relatively flat areas above the river and stream valleys. The bedrock is fractured and weathered in areas exposed by glaciation or melt water runoff. Small streams form deep, steep sided valleys and ravines (i.e. the upper reaches of the South Branch of Valley Creek). The underlying bedrock is limestone and dolomite of the Prairie du Chien Formation or sandstone of the Jordan, Ironston, and Galesville Formations. The thin soils generally reflect the underlying bedrock and are often calcareous or sandy.

Influence of Landform on Vegetation Types

The relationship between landscape and natural communities is strong. Figure III.2 shows vegetation at the time of European settlement in the City of Afton. Within the Northwest part of the City, oak openings and barrens were common. To the east on the St. Croix River Terraces, prairie was more common. Within the southern portion of the City, a mixture of prairie and oak openings existed. The bedrock outcrops often contained bedrock bluff prairies. On the uplands dominated by glacial moraine deposits, where soils are generally more fertile and have greater water holding capacity, mesic oak forest, maple basswood forest and aspen forest were found.

Because topography is often steeply rolling in the uplands, slope and aspect can have a major influence on what plant communities dominate.

These relationships between geologic landforms and vegetation are subject to considerable variation depending on such factors as slope, aspect, soils and hydrology. For example, where slopes face the south, mesic forest communities may give way to dry forest, woodland and savanna. Where slopes face the north, maple basswood forest is commonly found. Historically, the north and east-facing terrace slopes contained oak woodland, while the more southerly facing slopes contained oak savanna and small sand gravel prairie openings. These plant communities are well adapted to the dry conditions present on these soils; however, periodic fires were required to keep brush and tree saplings from filling in the open tree canopy. With effective modern-day fire suppression, most of the oak savanna and prairie openings have succeeded to oak woodland and oak forest.

Today, while Afton still contains remnants of natural communities present at the time of European settlement, the quality of these areas has suffered from over 150-years of human influence and impacts from such activities as logging, farming, road construction, and urban development.

Natural Communities of Afton

Following, is a summary of natural community types present within the City of Afton. Natural Community Descriptions are adapted from the MN DNR Publication, *Minnesota's Native Vegetation: A Key to Natural Communities, version 1.5*. Included at the end of descriptions for forest, woodland, prairie and wetland communities, is a brief overview of management issues common to that community type.

Forest Communities

Maple-Basswood Forest

Basswood, sugar maple, and (formerly) American elm, dominate the canopy of Maple-Basswood Forest. Other mesic trees, including northern red oak, bur oak, and green ash are sometimes dominant locally. The canopy is typically dense, with tall, straight, relatively narrow-crowned trees. The understory is multi-layered and patchy. It is composed of saplings and seedlings of the canopy species (especially sugar maple), along with ironwood, bitternut hickory, pagoda dogwood and occasionally butternut and black cherry.

Because the tree canopy permits so little light to reach the forest floor during the summer, Maple-Basswood Forests have a suite of forb species that bloom, produce seeds, and die back in May and early June before tree leaves are fully developed. These species -- the spring ephemerals and the winter annuals--include spring beauties, Dutchman's breeches, trout lilies and cleavers. Other typical forbs include sharp-lobed hepatica or liverleaf, wild ginger, woodland phlox, zig-zag goldenrod, bloodroot, lady's fern, maidenhair fern, and false Solomon's seal. Graminoids, such as sedge species, bottlebrush grass, and bearded short-husk grass are commonly present in the ground layer but usually not abundant. This is also the habitat where American ginseng, a state listed species, occurs. This community can provide excellent wildlife habitat, with high species diversity. Typical animals include a several species of flycatcher, wood thrush, vireos, ovenbird, and scarlet tanager, as well as deer, raccoon, white-footed mouse, chipmunk, and gray squirrel. The moist litter layer provides habitat for amphibians including blue-spotted salamander, toads, tree frogs, and wood frogs, among others.

Maple-Basswood Forest occurs only on protected sites, typically as small communities on steep, north-facing slopes in the project area, where forest fires were rare historically. It develops most commonly on well-drained loamy soils. It is a late-successional community that often develops into old-growth forest, because a) catastrophic disturbances are rare and b) the dominant tree species are long-lived (> 250 years).

White Pine-Hardwood Forest

The mixed white pine-hardwood forest typically occurs on sloping terrain, on dry to dry-mesic sites with well-drained sandy soils. The canopy structure usually consists of a “supercanopy” of white pine above an upper canopy of hardwoods. Typical hardwood species include northern pin oak and big-toothed aspen, with northern red oak, white oak, and sugar maple. Eastern red cedar also occurs in the shrub canopy of more disturbed areas. Understory species include much of the same common vegetation occurring in Maple-Basswood Forests and Mesic Oak Forests.

The White Pine-Hardwood Forest is a mid-successional community, but in protected areas can develop into old-growth forest. Otherwise, it generally grades into maple-basswood forests on dry to mesic sites, and mixed oak forest on drier sites.

Mesic Oak Forest

At least 30% of the tree canopy in a Mesic Oak Forest is made up of oak trees; typically northern red oaks, white oaks, and/or bur oaks. Aspen, paper birch, or black cherry trees make up the remainder of the canopy on drier sites, and on mesic, less fire-prone sites basswood, green ash, bitternut hickory, big-toothed aspen, and butternut are more common. Red maple is a common understory species on most sites, and Ironwood is common in areas with a history of heavy grazing. The actual composition of the community varies considerably in response to differences in soil moisture, soil type, fire history, and exposure, and a given forest may encompass both mesic and drier examples of the community type. Canopy species are typically tall (> 20 meters), straight, and single-stemmed trees that lack spreading lower branches.

The shrub layer in mesic oak forests is relatively sparse and, correspondingly, the forb layer is dense and relatively diverse, with various graminoid species. Oak regeneration is often poor, and most mesic Oak Forests appear to be succeeding to Maple-Basswood Forest. Typical shrubs include American hazelnut, prickly ash, gooseberry, red-berried elder, and raspberry. The ground layer usually includes river grape, pointed-leaved tick-trefoil, sweet cicely, and lady fern, as well as some species found in Maple-Basswood forests. Oak forest provide good wildlife habitat, and typical species include several species of flycatcher, blue jays, chickadee, white-breasted nuthatch, gray squirrel, raccoon, chipmunks, and white-tail deer.

Lowland Hardwood Forest

Lowland Hardwood Forest is a wet-mesic forest that is present throughout Minnesota. It is transitional between terrestrial and palustrine systems, occurring on sites with seasonally high water tables (within the tree-rooting zone) that do not flood regularly and that have mineral rather than peat soils. Species tolerant of periodic soil saturation dominate the tree canopy of Lowland Hardwood Forest. American elm historically was a common canopy dominant, but today has been largely decimated by Dutch Elm Disease. Dominant canopy species now include: basswood, bur oak, hackberry, butternut, black ash, box elder, eastern cottonwood and green ash. The tall-shrub layer is usually discontinuous and is composed of a mixture of upland and lowland shrubs. The groundlayer is composed mostly of upland herbs that do not root to the water-table, and commonly includes dense stands of wood nettle. Other typical forbs include jack-in the pulpit and cut-leaved sunflower.

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. Within the Carver County project area, it occurs primarily along the stream corridor in the upper and lower ravine reaches.

Woodland and Savanna Communities

Oak Woodland – Brushland

Oak Woodland-Brushland occurs on dry to mesic sites in the project area. It 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.

Within the project area, the canopy is typically dominated by bur oak, with occasional pin oak, white oak, aspen, or paper birch. Canopy species are relatively short, with a wide, spreading canopy and heavy, low branches. 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. Historically, most of the floristic diversity in the community exists in this brush layer, which most commonly was composed of blackberries, raspberries, gooseberries, dogwoods, cherries, hazelnuts, prickly ashes, and sprouts of oak and quaking aspen. Today, the shrub layer typically is limited to the thorny species among those listed, and often includes thick stands of Eastern red cedar. 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.

Historically, this fire-dependent community was one of the most common community types in Washington County. Following European settlement, Oak Woodland-Brushland burned less frequently and rapidly succeeded to Oak Forest. Remnants today persist on dry, exposed south or southwest facing slopes, as well as at former savanna sites that are becoming overgrown.

Oak Savanna

Oak Savanna communities are intermediate between prairie habitats and woodlands and forest. The Carver County sites are characterized by widely spaced to clumped stands of large, spreading bur oak over a ground layer dominated by brome grass and Kentucky bluegrass. On wet sites, wet meadow forbs may occur as well. Historically, prairie species would have dominated the ground layer and shrub layer, with the specific composition determined by soil characteristics.

Historically, both fire and grazing activities by bison and elk helped to maintain the savanna character, by limiting the establishment of trees and brush. In the absence of these controls, savannas rapidly succeed to Oak woodland-brushland, and, where conditions are right, to Oak Forest. Livestock grazing today can help maintain the savanna character, and, additionally, can create a savanna-like landscape in formerly forested areas. Today, sites identified as Savanna often are simply large, open-grown bur oak in a field of pasture grasses. Since these areas lack prairie vegetation in the ground layers they are not true savannas, but, since they possess some of the woody plant characteristics associated with savanna, they provide both a visual impression of a savanna and an opportunity for restoration.

Aspen Woodland

In Aspen Woodland, trembling aspen dominates the canopy, with bur oak, paper birch, and green ash as common associates. Aspen Woodland communities have either dense canopies of even-

aged immature trees, irregular canopies of mixed young and old trees, or tall, even canopies of mature trees. The woody understory in the community is well developed, with 40-90% cover. The understory may be an indistinct mixing of height classes, with seedling, shrubs, saplings, and young trees of various species, or it may have a well-defined shrub layer. On drier sites, hazelnut, gray-bark dogwood, chokecherry, downy arrowwood, wild roses, and raspberry and blackberry brambles are common understory shrubs. The ground layer within the MWMO project area includes typical grazing increasers, such as Pennsylvania sedge, as well as species found in oak forest and oak woodland.

Aspen Woodland is a short-lived, early successional community intermediate between Upland Prairie and Aspen or Oak Forests. Before European settlement, Aspen Woodland probably was maintained by fire and occurred in association with Oak Forest, Aspen Forest, and some pine forests. With the advent of European settlement and fire suppression, original Aspen Woodlands have succeeded to Aspen forest or Oak forest. Aspen Woodland communities present in the project area today developed after logging, and represent a community in transition to another forest type.

These generally will occur on a somewhat sheltered site, and may be immediately adjacent to forested communities. At these sites, follow the management strategies described under "Stewardship Strategies for Forest Communities."

Wetland Communities

Mixed Emergent Marsh

Mixed Emergent Marsh is a broad community type, encompassing all marshes dominated by species other than cattails. Most of the Emergent Marshes within the project area are small and occur in shallow depressions within the forested areas. A few larger marsh systems occur in fields and pastures. The marshes may be ephemeral, with little to no standing water late in the season and significant amount of exposed mud flat, or perennial, with shallow water persisting on the site throughout the season. Graminoids form the dominant cover, and fowl manna grass, giant manna grass, rice cut-grass, bottlebrush sedge, 3-way sedge, woolly bulrush, and green bulrush are typical, and prairie cord grass may occur. Forb species such as marsh milkweed, boneset, arrowhead, and mud plantain are common, as are fringed loosestrife and bulb-bearing water hemlock. Purple loosestrife is common at a few open sites, but is generally absent from the small wetlands within the forested area. Beggar-ticks and jewelweed often colonize mudflat areas. Giant bur-reed occurs sporadically. Depending on topography, a narrow fringe of woody species tolerant of wet conditions may occur around the marsh perimeter. Raspberry and blackberry brambles are common, with occasional winterberry, steplebush, or red-osier dogwood.

Many Mixed Emergent Marsh species are sensitive to fertilizer run-off and other artificial disturbances, and disturbed Mixed Emergent marshes tend to convert to Cattail Marshes or become strongly dominated by reed canary grass or common reed grass as storm water-borne nutrients are discharged into the wetland.

Wet Meadow

Wet meadows occur within shallow basins throughout the City of Afton or as part of wetland complexes. They may also occupy the transition zone between upland communities and marsh communities. Standing water is often present early in the growing season, and the hummocky soils are generally saturated and mucky.

Wet meadow vegetation consists of dense growing, medium to broad-leaved sedges and grasses. The most common species include tussock sedge, lake sedge and blue joint grass. Common forbs include blue vervain, blue flag iris, marsh fern and Joe-pye weed. Reed canary grass dominates sites that have a history of grazing, or that have been impacted by draining or other disturbance, and where present, forms dense stands that may choke out native species.

Rich Fen

Rich Fen is a type of shallow wetland community dominated by sedges and grasses, on a deep (> 2 feet) peat substrate. The groundlayer is dominated by wiregrass sedge, brown sedge, livid sedge, *Calamagrostis neglecta*, or bog reed-grass. 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. In the southern portions of its range, wet prairie species are also likely to occur, including grass-leaved goldenrod, Kalm's lobelia, Sartwell's sedge, and wooly sedge.

Rich fens are groundwater-dependent communities that occur where springs discharge. Usually, rich fens are associated with river terraces along the St. Croix River and less often, at the base of valley slopes within stream valleys discharging to the St. Croix River. Rich fens may also occur within glacial moraine depressions where groundwater discharges occur. Unlike calcareous fens, which are fed by high pH ground water discharging through limestone bedrock, and poor fens, which are fed by low pH groundwater that has recently fallen as precipitation, rich fens generally are fed by circumneutral pH groundwater.

Shrub Swamp

Like many other wetland communities in the project area, shrub swamp occurs primarily within the stream corridor of creeks within the project area, where groundwater maintains a wet to saturated soil. The dominant shrub species in these communities include speckled alder, willows (especially pussy willow, slender willow, and Babb's willow), and red-osier dogwood. Grassy openings are not distinctly separate from shrub clumps. Historically, these openings would have been dominated by wet meadow grasses and forbs, but Carver County sites today typically contain patches and scattered communities of native species amidst dense cover of redbud, bluegrass, and other pasture species.

Floodplain Forest

Floodplain forests occur along the floodplain terraces of the St. Croix River and large streams, in areas which experience heavy spring flooding. Within the watershed, this community type exists primarily along the St. Croix River.

The plant species present are tolerant of the erosion, sedimentation, and abrasion that occur during the spring floods. The forest canopy is generally dominated by large, mature silver maple, with cottonwood and black willow sometimes co-dominant. Other mesic forest species, such as green ash, hackberry, basswood, and boxelder may be present as well. The understory and shrub layers are usually quite sparse, lending a spacious feel to the forest.

Vines including wild grape, Virginia creeper, wild cucumber, and moonseed are often abundant, and may cover supporting vegetation especially along sunny, exposed riverbanks. The common grasses are those adapted to disturbance, including Virginia wild-rye and rice cut-grass. Similarly, typical forb species are those that are well adapted to disturbance. Many are annual species that produce abundant seed and can colonize quickly after flooding, including wood nettle

and clearweed. The ground layer may also include dense patches of canopy species seedlings, as well as stands of reed canary grass in clearings.

Mixed Hardwood Seepage Swamp

Mixed Hardwood Seepage Swamps are found where groundwater seeps from the base of slopes. In the St. Croix River Valley, most hardwood seepage swamps occur on terraces of the St. Croix River and to a lesser degree, along the base of slopes within ravines. There are also occasional mixed hardwood seepage swamps where groundwater discharge occurs within postglacial lakebeds and outwash plain depressions. Mixed hardwood seepage swamps are characterized by a mixed canopy of hardwoods, including paper birches, yellow birches, American elms, black ash, quaking aspens, and green ashes. Black ashes, although commonly present, never form more than 50% of the canopy cover in the community. The tree canopy cover ranges from sparse to dense, with the density of the shrub cover varying inversely with the density of the tree canopy. The groundlayer in seepage-type Hardwood Swamps commonly contains skunk cabbage and dense tussocks of the fine-bladed sedge, *Carex bromoides*.

Basswood often is present in the tree canopy. The Seepage Subtype is habitat for two rare species, bog bluegrass (*Poa paludigena*) and water-pennywort (*Hydrocotyle americana*). Mixed Hardwood Seepage Swamps are long-lived communities, with old-growth potential.

Prairie and Grassland Communities

Dry Prairie--Sand-Gravel Subtype

Sand-Gravel type Dry Prairies are dominated by grasses and sedges, with a good diversity of forb species. Typical grasses include little bluestem, side-oats grama and hairy grama, prairie junegrass, needle grass, plains muhly, prairie dropseed, Wilcox's panic grass, blue grama, hairy grama, and sand reedgrass.

Some widespread, characteristic forbs include dotted blazing star, pasque flower, prairie golden-aster, stiff sunflower, silky aster, stiff goldenrod, gray goldenrod, Missouri goldenrod and narrow-leaved puccoon, as well as rough blazing star, buffalo-bean, silverleaf, Louisiana sagewort, prairie larkspur, hoary puccoon, prairie smoke, and wood lily. Three sub-shrubs - leadplant, prairie rose, and wolfberry - are also generally present. Brush, and sometimes trees, may be present in hollows and draws. Bur oak, chokecherry, wild plum and smooth sumac are the most widespread native woody species.

Historically, periodic fire limited thatch build-up and woody plant establishment on dry prairie sites. The sandy, well-drained soils also slowed or prevented the growth of woody species. Dry Prairies within the region occur primarily on erodible outwash deposits, especially on exposed, south or southwest facing slopes of St. Croix River Terraces and St. Croix Moraine Outwash Plains.

Dry Prairie-Bedrock Bluff Subtype

Bedrock Bluff Prairies are associated with areas of the City where shallow bedrock is exposed on south-southwest facing slopes. This grassland community occurs on thin soils, often with extensive areas of ledgerrock or outcrop where lichens may be the only vegetation present. Common grasses include little bluestem, big bluestem, side oats grama, prairie dropseed and plains muhley. Common forbs include thimbleweed, dotted blazing star, purple prairie clover. Sky-blue aster, grey goldenrod, stiff goldenrod, heath aster and western spiderwort.

Many bedrock-bluff prairies are disappearing as woody vegetation gradually takes over in the absence of fire and grazing. In particular, oak species, smooth sumac, prickly ash, eastern red cedar and buckthorn are incroaching on the remaining bluff prairies.

Plantations (Coniferous, Deciduous)

Most plantations occur on low productivity sites including sandy, excessively well drained terrace slopes of the St. Croix River (e.g., sandy slopes). Based on typical tree ages, most of the plantations were established during the Work Program Administration (WPA) era in the 1930's and 1940's. These plantations were likely established on farms that failed during the drought years of the 1930's. Row cropping and grazing on steep slopes coupled with the severe drought probably contributed greatly to this failure. During subsequent decades, significant acres of additional plantations were established as windbreaks, wildlife plantings and Christmas tree farms.

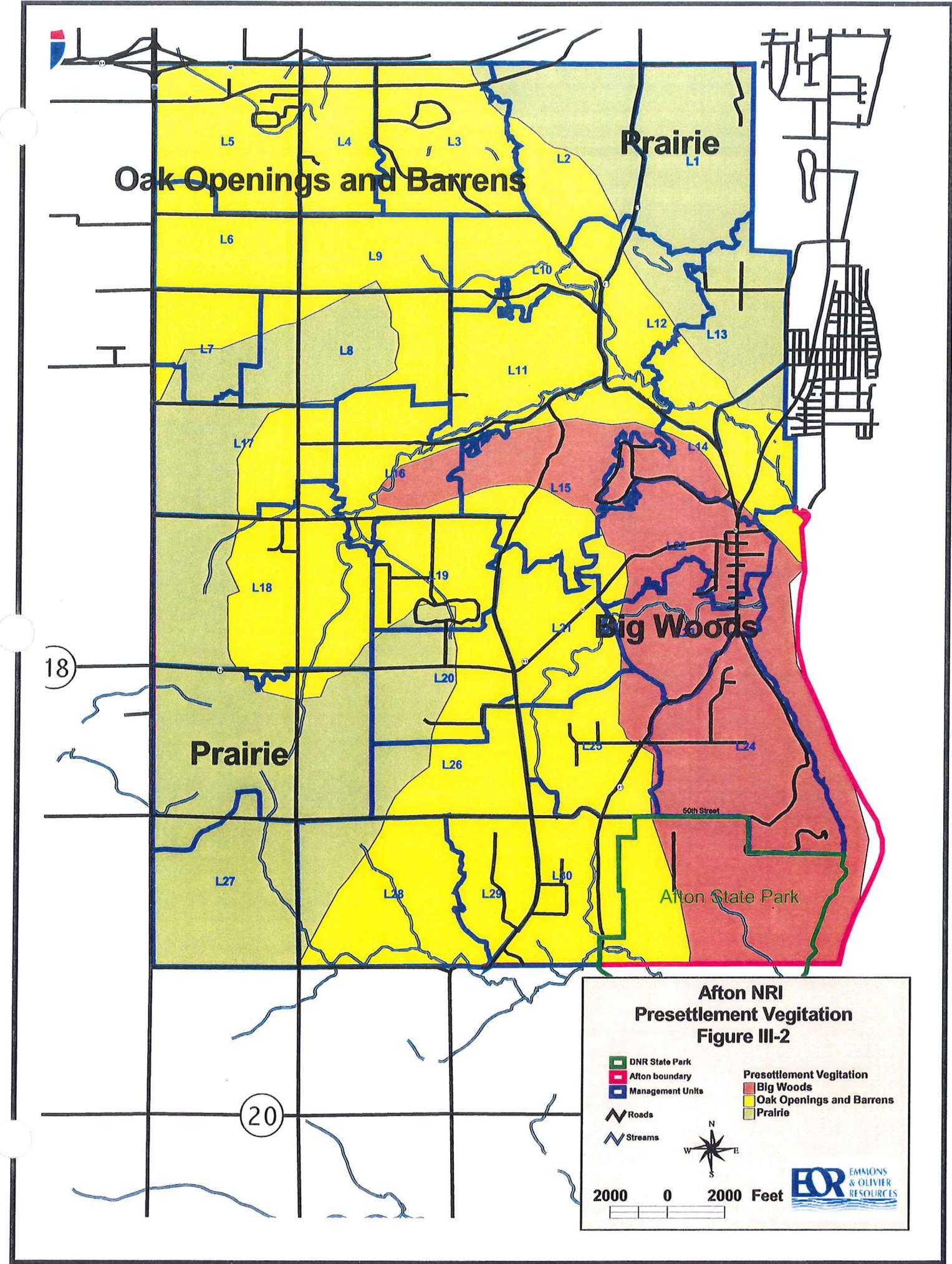
The majority of plantations consists of single species or mixed conifers, which occasional plantings of deciduous species such as black locust. Coniferous species include red pine, scotch pine, jack pine, white pine, white spruce, black spruce, blue spruce, white cedar, Austrian pine and ponderosa pine. Deciduous trees include green ash, black walnut and black locust. Although many of these tree species are native, they are often cultivars that appear quite different from native stock. In a few cases, tree plantings are mixed in with native trees, especially along the St. Croix River, where scattered tracts of white pine-hardwood forest still remain.

With few exceptions, the shrub and groundcover of plantations is depauperate. This is probably due to intensive farming and grazing prior to establishment of the plantations coupled with severe erosion. These impacts left little in the way of top soil and today only species that thrive in a dry, semi-shaded environment that is low in nutrients can survive. In addition, the needle duff creates acidic soil, a condition that most native grasses and forbs are ill suited for. For these reasons, few species generally coexist with conifers in plantations.

Old Field

While not a "natural community," "old field" is a common type of land cover and warrants further description. Generally, the term refers to former cropland, hay fields, or pastures that have lain fallow for at least several years, and are dominated by a mix of planted nonnative grasses and various forbs.

Typically, the dominant grasses are brome grass and Kentucky blue grass, although foxtail, redtop, and timothy are usually common as well. Forbs often include dense clonal stands of Canada goldenrod and old field goldenrod, horseweed, ragweed, sweet everlasting, and sometimes bull or Canada thistle. At sites that were formerly prairie, remnant populations of more disturbance-tolerant species may persist. This may include clumps of big bluestem or little bluestem, bee balm, prairie bush clover, grass-leaved goldenrod, brown-eyed Susans, and New England aster on wetter sites. Shrubs such as smooth or staghorn sumac may be present, and clumps of Siberian elm or boxelder may be common. If the surrounding areas are wooded, saplings of forest species may begin to establish around the field perimeter.



Oak Openings and Barrens

Prairie

Big Woods

Prairie

Afton State Park

**Afton NRI
Presettlement Vegetation
Figure III-2**

DNR State Park	Big Woods
Afton boundary	Oak Openings and Barrens
Management Units	Prairie
Roads	
Streams	

2000 0 2000 Feet

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IV. Natural Resource Inventory Methodology

Geographic Context

The approach used to inventory natural resources in the City of Afton stressed an evaluation of the physical and ecological characteristics of the project area from a landscape perspective. To facilitate discussion of natural resources within the project area, the City was subdivided into thirty separate landscape units, with each landscape unit delineated on the basis of geomorphic features, biological features, and to a lesser degree, past and existing land use. Landscape units are established with the idea that natural resource management generally is carried out over multiple natural communities that often encompass numerous parcels. This approach is used because most plant and animal communities are not independent, but rather depend on interaction with other plant and animal communities. While we have evaluated individual natural communities as part of this project, our evaluation is based on the landscape unit.

Identification of Natural Areas

Existing natural resource data pertinent to the project was collected from the DNR County Biological Survey Rare Features Database, Phase II Forest Inventory, Fisheries Surveys, Belwin Foundation and Afton State Park. In addition, City residents volunteered information on natural resources, especially with respect to wildlife sightings. Stereo pairs of infrared aerial photos were used to delineate boundaries of natural communities on mylar overlays. Upon field verification, these boundaries were then digitized onto GIS, Digital Ortho Quad Base Maps.

Field Inventory of Natural Communities

Ground surveys were conducted for identified natural areas. Within each area, dominant tree, shrub and ground cover grasses and forbs were identified, as well as populations of "problem" species such as European buckthorn, Tartarian honeysuckle, or purple loosestrife. Where suitable habitat for threatened and endangered species was found, an informal search for those species was conducted as part of the natural community inventory.

Natural Community Disturbance Indicators were evaluated as well. Information on disturbance indicators including invasive and/or exotic species, as well as impacts from urban development, grazing practices, logging, stormwater runoff, erosion, sedimentation and other land use practices were noted

Finally, the field inventory identified sites of critical concern from a natural resources perspective. Critical sites might include major gullies, major exotic species infestations, or natural communities, which if restored, could provide major benefits to the citizens of Afton and the surrounding areas.

Classification and Qualitative Ranking of Natural Communities

All natural communities were classified in accordance with *Minnesota's Native Vegetation, A Key to Natural Communities* (MN DNR Biological Report NO. 20, 1993).

The communities were then assigned a qualitative ranking (EO rank) in accordance with *Element Occurrence Ranking Guidelines* (MN DNR Natural Heritage Program). This ranking system (which ranges from A to D), is based primarily on species composition and diversity, ecological structure and disturbance indicators. A natural community that exists in pre-settlement condition would be given an "A", while a severely degraded natural community would be given a "D".

One criterion that was not used for this project is minimum size standard.

Minnesota Land Cover Classification System (MLCC)

This system was developed by the MN DNR as a way to map all land cover types in the state; the hierarchical system can be applied at varying degrees of detail, depending on the level of specificity desired. Using this system provides compatibility between this report and similar planning efforts around the state and metro area, by establishing a uniform set of definitions and categories for cover types. The system encompasses the DNR Natural Heritage Program natural community classifications but differs in that it does not provide a qualitative assessment. It does, however, include non-native communities and human created cover types that are omitted from the Natural Heritage system. All of the sites surveyed were assigned the appropriate MLCC code; the cover types codes used in this project are summarized below. For portions of the City within the Valley Creek Watershed (hydrologic boundaries), MLCCS mapping was completed to a level 4/5 as part of a combined mapping and inventory effort with this project.

Stewardship Recommendations

This section summarizes any significant problems or assets that a site or reach contains, and may include management ideas for a site. It includes a discussion of any Critical Concern sites noted during the field inventory. Examples of the types of information included here include stream water quality impacts, erosion problems, exotic species infestations, or potentially high quality communities that could be significantly enhanced with minor restoration efforts.

Landscape Unit Rankings

Landscape Unit Rankings provide an ideal geographic unit for carrying out land use planning efforts as well as natural resource management efforts. Each management unit was ranked using the following criteria.

Ecological Ranking

<u>Value</u>	<u>Criteria</u>
High	Several natural communities with EO rank of BC or higher - good diversity of different natural communities and/or locally unique/rare natural community.
Moderate	At least one natural community with EO rank of BC or higher - moderate diversity of natural communities. Natural communities present are not locally unique or rare.
Low	All natural communities with EO rank of C or lower - large proportion of site consist of human created environments (e.g., agricultural land) - low diversity of natural communities.

Wildlife Habitat Ranking

<u>Value</u>	<u>Criteria</u>
High	High diversity of good quality natural communities within local or regional corridors (e.g.) Mississippi River Flyway) and/or sites containing critical or unusual habitat (e.g., native prairie, waterfowl feeding areas). Observations and records indicate high abundance and diversity of species.

- Moderate Good diversity of natural communities within local corridors. Habitat most suitable for Habitat-generalist-type species (e.g., deer and raccoons). Observations and records indicate good abundance of wildlife.
- Low Low diversity and quality of natural communities with poor connectivity to other wildlife habitat areas. Generally, areas of intensive agricultural or urban land use.

Rare Features Ranking

The following criteria were used in conjunction with Minnesota County Biological Survey Data on rare species, to determine Threatened and Endangered Species Potential for a site.

<u>Value</u>	<u>Criteria</u>
High	Documented endangered species and/or natural communities within site boundaries.
Moderate	Documented endangered species and/or natural communication adjacent to site - high potential for endangered species to be present on site due to good quality habitat.
Low	No documented endangered species and/or natural communities within site boundaries - low potential for occurrence of endangered species.