CITY OF VERONA 2010 COMPREHENSIVE PLAN

CHAPTER FIVE—NATURAL AND CULTURAL RESOURCES

Adopted by the City of Verona Common Council
September 14th, 2009

Prepared by the City of Verona Comprehensive Plan Committee

City of Verona Comprehensive Plan—2010

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Section One—Introduction

The 'Natural and Cultural Resources' chapter of the Verona Comprehensive Plan will address the opportunities and threats that exist for these important Verona-area resources. Abundant natural resources exist in the Verona area—including rich soils for agricultural production (See Chapter 6…); excellent non-metallic mineral resources such as gravel; surface waters and wetlands; wooded areas that provide habitat for wild-life; and abundant ground water. Verona also has many cultural resources—including historically important Native American ceremonial mounds; buildings from early settlement by Europeans; and contemporary cultural resources such as performing arts groups and community festivals. These diverse natural and cultural resources are described in detail in the following chapter, as well as goals, objectives, policies, and programs for each. Please note that while most comprehensive plans in Wisconsin include agricultural information and plans in this chapter—the City of Verona views agriculture as an economic activity rather than as a natural or cultural activity, and so the Verona comprehensive plan addresses agricultural matters in Chapter 6—Economic Development and Agriculture.

NATURAL RESOURCES

The Natural Resources portion of this chapter will provide details regarding the following Verona Area natural resources:

1) Geology;
2) Landscape and topography ;
3) Soils;
4) Watersheds, drainage basins, and surface waters;
    a. Upper Sugar River
    b. Badger Mill Creek
    c. Dry Tributary to Badger Mill Creek
    d. Lakes and ponds
5) Flood plains;
6) Wetlands;
7) Ground water;
8) Steep slopes;
9) Climate;
10) Wildlife habitat
11) Wildlife and Threatened and Endangered Species
12) Parks and Open Space
13) Metallic and non-metallic mineral resources
14) Contaminated sites

Comprehensive Plan Survey Results

The surveys used to help create this comprehensive plan included 3 questions about natural resources and 1 question about cultural resources.

When asked "Should city tax dollars be used to purchase lands along the Sugar River to prevent development along this river", 54% responded "Yes, it is worthwhile to use city tax dollars to keep development away from this river" while 46% responded "No, development should be allowed near the Sugar River as long as it complies with environmental regulations."

When asked "To protect local rivers and streams, should the city use less salt to keep streets free of snow and ice in the winter", 58% of respondents chose "Yes—protecting the environment is important, even if roads are less safe", while 42% chose "No—roads must be free of ice and snow in the winter, even if it the salt hurts local rivers and streams."

When asked "Would you support limits on water usage—such as lawn watering limits—as a way to protect ground water resources?", 80% said 'Yes' while 20% said 'No'.

Regarding Cultural Resources, when asked "Should the City use tax dollars to prevent the demolition of Verona's few remaining historical buildings?" responses were evenly split with 50% stating "Yes, it is important to save the city's few remaining historical buildings" and 50% stating "No, the owners of these properties should be able to demolish these buildings and replace them with something new."

To see the complete surveys, survey responses, and analysis of survey responses, please see Appendix 1-F.

Section Two—Natural Resources

Geology

Verona is located at the eastern boundary of the unglaciated 'driftless area' of southwestern Wisconsin. Beneath the glacial till left behind by retreating glaciers, Verona is underlain primarily by sandstone bedrock, which is part of the St. Peter Formation along with other formations created during the Ordovician period. Fractured dolomite bedrock associated with the Eau Claire formation lies primarily to the west and further north. Depth to bedrock is generally 0 to 3 feet south and southwest of Verona beyond the terminal moraine. Depth to bedrock is generally 10 to 50 feet north of the city, and predominantly greater than 50 feet within the city and to the east. Depth to bedrock is also greater than 50 feet associated with the meltwater stream sediment deposited in the Upper Sugar River and Badger Mill Creek valleys. Depth to bedrock becomes very shallow again west of the Upper Sugar River, associated with the prominent ridge and valley topography of the driftless area.

Definition: Glacial till: the covering of an area, or the action on the area, by an ice-sheet or by glaciers.

Definition: Fractured dolomite bedrock: a semi-transparent crystalline mineral; often known as magnesium limestone, that was eroded by glacial action and weathering.

Definition: Terminal moraine: the feature formed, where the ice is melting from a glacier, all the debris which has been transported down is dropped. In the Verona Area, the terminal moraine is called the Johnson Moraine.

Definition: Driftless or Unglaciated Area: The area of Wisconsin that has never covered by a glacier or the last glacier to cover the state.

Caves

The glacial till that was left behind by retreating glaciers also produced some cave features in the Verona Area—although none as large as the Cave of the Mounds caverns near Blue Mounds to the west. 'Richardson Cave'—located on private property east of Shady Oak Lane—is an example. (See Map 5-1)

Section Two—Natural Resources

Landscape and Topography

When the glaciers retreated after reaching their furthest southern advance, "drift" deposits of sand, clay, and gravel were left behind. These deposits form the Johnson Moraine on which Verona is situated, creating the gently rolling topography that is indicative of the Verona area. (See Map 5-1) Elevations in the City of Verona generally range between 900 and 1000 feet above sea level with some higher areas, particularly in the northwest and southeast.

Unlike the stream valleys in most of the driftless area, which are narrow and steep, the valley of the Upper Sugar River is fairly broad and flat. The upper portion of the watershed—near Mt. Horeb—is of particular interest because it drains unglaciated, rougher terrain to the west while tributaries to the east drain glacial moraines and outwash.

Section Two—Natural Resources
Soils

The geologic history of Dane County is responsible for the agriculturally-productive soils found here. Clay and silt loams are found primarily in the glaciated portion of the county while shallower sandy loams are found in the driftless area. Soils in the driftless region are generally moderately to excessively well-drained soils that have a high mineral content and low organic matter. Farming has traditionally occurred on the ridge tops or in the stream valleys with the region's steep hillsides often left wooded. Streams in the driftless region have a higher gradient than those in other parts of southern Wisconsin. Wetlands usually only occur along stream and river margins, although isolated wetlands associated with glacial kettles and other depressions can be found in the Verona area.

Definition: Clay loam: a soil which contains 40% or more of an exceptionally fine-grained substance, very retentive of moisture.

Definition: Silt loam: a soil which contains 80% or more of a deposit laid down in a river, lake, etc. It is finer than sand but coarser than clay.

Soil type is an important indicator and determinant of the extent and form of development. See Maps 5-2 and 5-3 for soil-types in the Verona Area. The soils of the Verona area are of three primary soil associations, according to the United States Department of Agriculture's classification:

- Soils to the north and east of Verona are of the *Batavia-Houghton-Dresden Association*, characterized by soils formed in outwash material. The soils in this group mainly formed in outwash material near streams or adjacent to glacial moraines. These soils generally are loamy and are underlain by sand or gravel, or both. These soils have moderate permeability and medium available water capacity. Many of them are good sources of sand and gravel. Where these soils are well drained and gently sloping to sloping, they have slight to moderate limitations for most urban uses. The contamination of groundwater is a hazard where these soils are used for waste disposal.

  Overall, this association has a landscape that consists of outwash plains with depressions and old lake basins. The soil material was deposited by wind and by water from melting glaciers. The texture of the material in which the soils formed is variable, but it is dominantly silt, sand, or gravel. The drainage in the association is southwesterly.

- Soils southeast and northwest of Verona are of the *Dodge-St. Charles-McHenry Association.* This is the predominant soil classification in the area and is characterized by soils underlain by sandy loam glacial till. The soils in this group formed mainly by wind born deposits of silt loam underlain by sandy loam glacial till. The pattern of drainage is irregular, but it is generally southerly and westerly. Most of these soils have moderate permeability and high available water capacity. Most of them have slight to moderate limitations for urban use and for farming.

  Overall, this association has a varied landscape that is characterized by ground, end, and recessional moraines. The landscape is mostly gently sloping to sloping, but there are some areas on benches and in depressions and drainageways that are nearly level and a small acreage that is moderately steep to steep.

- Soils to the west of Verona are of the *Basco-Elkmound-Gale Association*, characterized by soils underlain by a depth less than 40 inches by sandstone, dolomite, or shale. The soils in this group formed mainly by wind born deposits of silt loam underlain by residuum derived from underlying bedrock. Most of these soils have moderate permeability and medium available water capacity.

They generally have severe limitations for residential development and severe to moderate limitations for farming, because they have a shallow to moderate depth to bedrock.

Overall, this association has a driftless landscape that is gently sloping to very steep. The soils in this association are underlain mainly by sandstone bedrock and are below the dolomite uplands and above the large drainageways and valleys. The runoff from the dolomite uplands flows through this association to the valleys and streams below.

- Soils further west of Verona in the Sugar River Valley are of the *Otter-Orion-Troxel Association*, characterized by soils formed in alluvium. These soils are dominantly 'somewhat poorly drained' to 'poorly drained' and are subject to flooding. These soils have sever limitations for urban use, because they have a seasonal high water table and are subject to flooding

  Overall, this association has a landscape made up mainly of drainageways, stream bottoms, adn flood plains. The soils of the association formed in recently deposited alluvium. They are in the lowest positions on th landscape and are nearly level to gently sloping. This association is made up of many, long, narrow, irregularly shaped areas. These areas delineate the major watercourses in the county.

Hydric soils and soils with hydric inclusions are typically associated with existing or former (i.e., drained) wetlands. Hydric soils with potential for wetland restoration lie along the Sugar River, Badger Mill Creek, and dry tributaries (See 'Wetlands' section below…) Hydric soils include Orion (Or), Otter (Ot), Elburn (Eg), Radford (Ra), Troxel (Tr), and Virgil (Vw) soils. Depths to water table in these areas are generally 0 to 3 feet. In the area between the Upper Sugar River and Badger Mill Creek on the southwest side of the city, water table depths are generally 10 to 25 feet. In the rest of the city and areas north, water table depths are generally 25 feet or greater. See Map 5-2 for the location of hydric soils in the Verona Area.

Table 5-1: Soils Characteristics	
Soil Type	**Description**
Basco silt loam; BaB2/C2/D2/E2	Moderately deep, well drained and moderately well drained, gently sloping to steep soils on side slopes and at the tops of ridges in the high uplands. Poses severe to very severe limitations for development due to erodibility. A prime farm soil.
Batavia Silt Loam; BbA/B	Deep, well drained soils on high benches formed on loamy outwash. Soils have high fertility and moderate permeability. Poses slight to moderate limitation for development. 150-155 Bu/acre corn yield. A prime agricultural soil.
Chaseburg silt loam; ChB	Deep, well drained and moderately well drained prime farm soil in drainageways, streams, and low sides of steep hills. High fertility, moderate permeability. Poses moderate to severe limitation for development due to flooding. 150 Bu/acre corn yield.
Dodge silt loam; DnB/C2	Deep well drained soils on glaciated uplands formed over sandy loam glacial till. Soils have high fertility, moderate permeability, and moderate to severe hazard of erosion. Slight to moderate limitation for development. 110-120 Bu/acre corn yield. A prime agricultural soil <6%.
Dresden silt loam; DsC2	Formed in stream valley benches. Moderately deep. Medium fertility. Substratum has rapid permeability. Moderate limitation for development.
Dunbarton silt loam, eroded; DuB2/C2	Shallow, well drained soils on uplands. Soils have low fertility and moderately slow permeability. Poses moderate to very severe limitations for development due to shallow depth to bedrock.
Elburn silt loam, gravelly substratum; EgA	Deep, somewhat poorly drained soils underlain by outwash sand and gravel at a depth of 44 to 880 inches. Soils have high fertility and moderately slow permeability in the subsoil. Poses moderate to severe limitation for development due to seasonal high water table. 160 Bu/acre corn yield. A prime agricultural soil.
Huntsville silt loam; HuB	Deep, well drained and moderately well drained soils in drainageways and small draws. Soils have high fertility and moderate permeability. Poses severe limitation for development due to flooding. 130 Bu/acre corn yield. A prime farm soil.
Kidder loam; KdC2/D2	Deep, well drained soils formed on glaciated uplands. Medium fertility. Moderate permeability and severe hazard of erosion. Substrate is moderately rapidly permeable. Poses moderate to severe limitation for development due to slope.
Kegonsa silt loam; KeA/B	Moderately deep, well drained soils on benches on outwash plains. Soils have medium fertility. A prime agricultural soil... Permeability is moderate in the subsoil and rapid in the substratum.125 Bu/acre corn yield. Slight to moderate limitation for development
Kidder, eroded; KrE2	Deep, well drained soils formed in glacial till on drumlins and terminal and recessional moraines. Moderate permeability and severe hazard of erosion. Severe limitation for development due to slope.
McHenry silt loam; MdC2/D2	Deep, well drained soils on glacial uplands. Soils have medium fertility and moderately rapid permeability. Moderate to severe limitations for development due to slope and permeability.
New Glarus silt loam, eroded; NeB2/C2/D2	Moderately deep, well drained soils on uplands. Soils have medium fertility and moderate to moderately slow permeability. Poses moderate to severe limitations for development due to dolomite bedrock at shallow depth. 115 Bu/acre corn yield. A prime agricultural soil <6%.
Orion silt loam; Or	Deep, somewhat poorly drained soils on flood plains. Soils have high fertility and moderate permeability. Poses very severe limitations for development due to flooding. 145 Bu/acre corn yield. A prime agricultural soil.
Pecatonica silt loam; PeC2	Deep, well drained soils on glaciated uplands and high benches in stream valleys. Soils have high fertility and moderate permeability. Poses moderate limitations for development due to slope.
Plano silt loam, gravelly sub.; PoA	Deep, well drained soils underlain by sand and gravel outwash at a depth of 44 to 70 inches. Substrate has rapid permeability. Slight to moderate limitations for development. 155 Bu/acre corn yield. A prime agricultural soil.
Port Byron silt loam; PrC	Deep, moderately well drained soils on valley sides. Soils have high fertility. Permeability is moderate in the subsoil and moderately slow in the underlying material. Poses moderate limitations for development due to low bearing capacity.
Radford silt loam; RaA	Deep, somewhat poorly drained soils in low drainageways and stream channels. High fertility and moderate permeability. Very severe limitation for development due to high water table and flooding. 145 Bu/acre corn yield. A prime agricultural soil.
St. Charles silt loam; ScB	Deep, well drained and moderately well drained soils on glaciated uplands. Soils have high fertility and moderate permeability. Slight to moderate limitations for development. 145 Bu/acre corn yield. A prime agricultural soil.
Troxel silt loam; TrB	Deep, well drained to moderately well drained soils formed in drainageways. Subject to seasonal flooding of short duration. Poses severe limitation to development due to flooding. 145 Bu/acre corn yield. A prime agricultural soil.
Virgil silt loam, gravelly sub.; VwA	Deep, somewhat poorly drained soils on low benches on uplands and in stream valleys, underlain by sand and gravel outwash. Soils have high fertility and moderately slow permeability. Severe limitations for development due to seasonal high water table. 150 Bu/acre corn yield. A prime agricultural soil.
Westville silt loam, eroded; WvC2/D2	Deep, well drained soils on glaciated uplands and high benches in stream valleys. Soils have medium fertility and moderate permeability. Poses moderate to severe limitations for development due to slope and low bearing capacity.

Section Two—Natural Resources
Watersheds, Drainage Basins, and Surface Waters

The City of Verona is located within the Upper Sugar River watershed, which is located in southwestern Dane County and has a drainage area of approximately 110 square miles, including all or parts of the cities of Verona, Madison, and the villages of Mt Horeb and Belleville. See Map 5-4—Upper Sugar River Watershed. The Upper Sugar River watershed is one of 15 other topographically-defined hydrologic units, which together comprise the Sugar-Pecatonica River basin of southwestern Wisconsin. The Sugar-Pecatonica is one of four other river basins in Dane County along with the Wisconsin, the Yahara, and Rock River basins.

The Upper Sugar River begins along the eastern edge of the unglaciated "driftless area," in the vicinity of Mt. Horeb. This area is characterized by thin soils over bedrock, steep wooded slopes, and narrow stream valleys with alluvial deposits, few wetlands, and no natural lakes or impoundments. Streams are typically fed by groundwater from bedrock outcrops exposed along hillsides. After leaving this unglaciated area, the Upper Sugar River then meanders through a broad, flat floodplain area before arriving at Lake Belle View at the southern border of Dane County. The Upper Sugar River continues south through Green and Rock Counties where it eventually joins the Pecatonica River from the west before joining with the Rock River in northern Illinois, which ultimately empties into the Mississippi River near Moline, Illinois.

The Upper Sugar River is a dominantly spring-fed system with extensive riparian wetlands, possessing the most diverse fishery in southern Wisconsin. The Badger Mill Creek begins in a wetland west of Goose Pond between Madison and Verona before traversing the east side of the City of Verona before it empties into the Upper Sugar River just south of the City of Verona. The 'Dry Tributary to Badger Mill Creek' originates north and west of the City of Verona and traverses the west side of Verona before contributing to Badger Mill Creek just south of the city near Highway 69 at USH 18-151.

The present condition of the Upper Sugar River and its contributing watershed is dramatically different from pre-European settlement times and continues to be altered. The Upper Sugar River watershed has been profoundly affected by agricultural activities, indicated by the large amount of silt, significant channelization, and lateral ditching within large areas of the watershed. Runoff from farm fields and barnyards; intense grazing adjacent to the stream; and stream bank erosion from cows are each adding sediments and pollutants to the stream and degrading habitat and water quality. Agricultural use of the land now dominates where prairies and scattered oak savanna once ruled. Many wetland acres that once filled the river bottoms have been ditched and drained for cropland. The river channel has been dredged and straightened. Removal of stream-bank trees to increase agricultural areas has increased water temperatures. The Badger Mill Creek is affected much less by agricultural practices, primarily because most of the watershed for this creek is located within an urbanized area. The City of Verona is supportive of storm water management and surface-water protection regulations for agriculture similar to those that are imposed on cities such as Verona, especially if such agricultural regulations will 'protect the investment' the City of Verona has made to protect water quality through our extensive storm water management and surface-water protection systems.

Impacts from urbanization are increasing as well, as both low-intensity urban development outside of cities and high-intensity urban development continues within cities such as Madison, Middleton, Verona, and Mount Horeb. The Upper Sugar River and Badger Mill Creek also need to be protected in the face of increasing urban development, particularly in the headwaters near Verona and Madison. The Badger Mill Creek watershed is already primarily urbanized. Prior to the implementation of storm water management practices in the past decade, runoff from streets and parking lots and from construction sites were adding sediments and pollutants to the creek and degrading habitat and water quality. The City of Verona will continue to comply with storm water management and other surface-water protection regulations to do our part to protect the water quality of the Badger Mill Creek and the Sugar River.

The primary water quality problems are the result of "nonpoint" or diffuse sources of pollution, particularly from agricultural operations and urban runoff, as opposed to "point" sources of pollution which discharge from an identifiable point (such as a wastewater treatment plant outfall). Other problems include excessive populations of rough fish, hydrologic modifications resulting from dams, stream straightening, and ditching, draining or other alterations of wetlands. It is not too late to prevent the anticipated decline of quality for surface waters within the Upper Sugar River Watershed. Point source pollution is being brought under control in the Upper Sugar River Watershed as is non-point urban storm water run-off through the implementation of storm water management regulations.

Definition: Point-Source Pollution: contamination from a specific site of a pollution source, such as a manufacturer, processor or a municipal wastewater site.

Definition: Non Point-Source Pollution: contamination from area drainage from a land disturbing activity, such as agriculture, mining or grading.

Fragmentation of natural communities and ecological systems from both agriculture and urban development also needs to be addressed. In this regard, the resource holds tremendous potential for protection, restoration, and enhancement that can greatly add to the quality of life we currently enjoy. The City of Verona is supportive of efforts to prevent the fragmentation of ecological systems and natural communities.

Section Two—Natural Resources
Surface Waters

There are numerous valuable surface water resources in the Upper Sugar River Watershed and around the City of Verona. The Sugar River basin has more than 58 miles of streams. About 31 miles of those streams are designated as Cold Water Sport Fishery (trout waters), 4 miles are designated as Warm Water Sport Fishery (e.g., panfish, northern pike, smallmouth bass etc.), and another 4 miles are designated as Warm Water Forage Fish community (e.g., minnows and forage fish). The biological uses of the remaining streams which have not been determined are codified as the default Warm Water Sport Fishery category for water quality standard purposes.

Agriculture has had a tremendous negative effect on the surface waters in and around the City of Verona and has altered these surface waters substantially. Additionally, the location of these surface water's headwaters on the edge of Madison and Verona makes them susceptible to urban impacts on water quality beyond what damage has already been caused by agricultural practices. The introduction of pollutants, nutrients, and sediment load due to runoff from developing areas into the headwaters of the river poses a concern for all parts of the river downstream.

Surface waters within the Upper Sugar River Watershed have been profoundly affected by human activities. Runoff from farm fields and barnyards, intense grazing adjacent to the stream, and stream bank erosion from cattle are each adding sediments, nutrients, and other pollutants to the stream and degrading habitat and water quality. The river also needs to be protected from increased urban run-off from roof-tops, streets and parking lots, and construction sites, particularly in the headwaters near fast-growing Verona and Madison. The City of Verona is supportive of limiting the impact of new residential development on surface waters by promoting dense development, which minimizes impervious surface *per housing unit.* Furthermore, the City of Verona is supportive of regulations and requirements for agricultural land-uses to lessen their impacts on surface waters—such as detention and infiltration basins—similar to what is required for urban areas. Lastly, The City of Verona will continue to minimize urban impacts on surface waters through use of storm water management systems within the city. (See Chapter 4—Utilities and Community Facilities—for more information.)

Upper Sugar River

The Upper Sugar River in Dane County runs from the headwaters of the river northeast of Mt. Horeb to the dam at Belleville. See Map 5-4. The Upper Sugar River is a valuable resource providing opportunities for recreation (fishing and canoeing); wildlife habitat (including rare and endangered species, declining native plant communities, and natural areas); flood protection; and scenic beauty, among others. The Sugar River also serves as the principal water source to Belleville's Lake Belle View and the river lies adjacent to the Military Ridge and Ice Age Trails, which provides excellent access for the public to appreciate and enjoy the extensive wetland and river complex.

The Upper Sugar River supports a cold water sport fishery from its headwaters to the Frenchtown Road bridge above Lake Belle View. The portion of the river below Frenchtown Road is classified as warm water sport fishery (WWSF) primarily due to the influence of the Lake Belle View millpond.

Overall, the river has good dissolved oxygen concentrations, enough to support both a warm and cold water fishery. Biotic indices have revealed "good" to "very good" water quality conditions for the Upper Sugar River. The entire Upper Sugar River has been designated an "Exceptional Resource Water" through the state's anti-degradation policy (NR 207). This classification affects the amount of pollutants allowed in wastewater discharge to the stream. (Note—In 1997, Verona stopped discharging treated wastewater directly to the Upper Sugar River and began sending wastewater to the Nine Springs regional waste water treatment plant. Treated effluent from Nine Springs is then returned to the Badger Mill Creek. See Chapter 4—Utilities and Community Facilities—for more information.)

The Upper Sugar River is located on the outskirts of the expanding Madison metropolitan urban area including the City of Verona. Though historically (and still) predominantly agricultural, this portion of the watershed is experiencing a gradual change in land use. Since this area encompasses the headwaters of the Sugar River, changes in land use, hydrology, and sediment transport here will have particularly pervasive impacts on all areas downstream. Urbanization presents the opportunity to improve water quality—especially as compared with some agricultural practices—through the continued use of rigorous storm water management programs such as the City of Verona already uses.

Ask anyone their first impression of the Upper Sugar River and chances are good that many will mention the fact that the water seems very turbid. This is despite the unexpectedly low levels of suspended solids measured in the Upper Sugar River (generally less than 50 mg/l). The sediments that are in the Upper Sugar River are fine grained in nature, and these fine grained sediments do not settle as quickly and also diffuse much more light than coarser grained materials of equal mass. The cloudiness of the water has two perceptional effects: the water is aesthetically unattractive; having the appearance of a polluted, degraded stream, and the river's potential as a fishery is reduced.

Definition: Turbid: having sediment stirred up; muddy or cloudy.

The Upper Sugar River, due to its large inputs of cold spring water, remains cool year-round, especially in its upper reaches. The high degree of turbidity in the water, however, is detrimental to trout. Although a small population of brown trout does manage to survive in its upper reaches, the river does not support naturally reproducing populations along most of its length. A decrease in the turbidity of the Sugar River could be all that is needed to restore viable trout populations to the river. Restoration of the aquatic ecosystem, including adjacent wetlands, will also increase the population of aquatic insects and baitfish used as food for trout populations. Naturally reproducing populations of rainbow, brown and brook trout could be attained in the river if restoration efforts were successful.

Badger Mill Creek

Badger Mill Creek is a tributary to the Upper Sugar River, beginning in a wetland west of Goose Pond between Madison and Verona. See Map 5-4. The creek runs west through the southeastern part of Verona and joins the Upper Sugar River southwest of the city. The creek's drainage area includes much of the southwest side of Madison as well as most of Verona. Wastewater discharges during the 1970s negatively impacted water quality in Badger Mill Creek. Since more significant water-quality protections were instituted in the mid 1980s and since wastewater discharges were removed in 1997, water quality and species diversity in the creek has improved. Currently, Badger Mill Creek is designated a Cold Water Fishery from its confluence with the Sugar River upstream to the Lincoln Street bridge. From the bridge to the MMSD wastewater treatment plant outfall the Creek is designated as a Warm Water Forage Fish community with trout potential. Springs, seeps and watercress in Badger Mill Creek indicate groundwater upwelling in the stream and indicate that there is tremendous potential to first protect and then enhance water resources found here.

The water quality of Badger Mill Creek has been significantly improved through the implementation of storm water management systems in both the City of Verona and the City of Madison. Nonetheless, non-point source pollution from construction site erosion and run-off from rooftops and pavement continues to threaten the Creek. Agricultural practices are less harmful to the Badger Mill Creek because much of the Creek's watershed is not used for agricultural purposes. The City of Verona will continue to control the erosion of sediment from construction sites and will continue to control the quantity and quality of stormwater being washed off impervious surfaces like roads, driveways and parking lots as methods to protect the Badger Mill Creek.

The continuing urbanization of the Madison metropolitan area has also led to increased pumping of groundwater for its water supply which has lowered water table levels (See below for more information about Groundwater…). Groundwater and surface waters are intimately inter-connected, and so the pumping of groundwater can lower base flows in streams and rivers such as the Upper Sugar River and the Badger Mill Creek, as well as diminishing base flows to the wetlands and springs associated with such rivers and creeks. In August 1998, MMSD began returning treated wastewater to Badger Mill Creek equal to the amount of water generated/pumped out of the basin (See Chapter 5—Utilities and Community Facilities—for more information). This effort is expected to help restore the water balance between the Upper Sugar River and Yahara River watersheds. This imbalance was the result of pumping ground water out of the Upper Sugar River watershed; using it for residential, commercial, or industrial purposes; and then pumping the wastewater to the Nine Springs regional treatment plant, which discharges to Badfish Creek in the Yahara River watershed. This 'treated effluent return' project has had widespread public support, at considerable additional expense by MMSD. (Note, however, while this is intended to restore the base flow in Badger Mill Creek it does not address the long-term reductions in water table levels and drawdown due to the concentrated pumping and cone of depression beneath and surrounding the Madison metropolitan area.)

Dry Tributary to Badger Mill Creek

The Dry Tributary to Badger Mill Creek is a dry ravine that provides drainage for much of the west side of the City of Verona during rain events. Water that is channeled by this Dry Tributary is discharged to the Badger Mill Creek just south of 18-151 at Highway 69.

Lakes and Ponds

In addition local rivers and creeks in the Verona Area, there are three flooded quarries; one along CTH 'M' (Tsunehiro) and one on either side of Paoli Street (Cleary and Fireman's Park). Whereas the Tsunehiro and Cleary quarries are privately owned, the Fireman's Park quarry is owned by the City of Verona. There are also other open water areas associated with the wetlands in the headwaters of Badger Mill Creek and some scattered other ponds—such as Morse Pond adjacent to the University Golf Course in the northwest quadrant of the intersection of CTH's 'M' and 'PD'—in the Verona Area.

Shoreland Zoning

As this City of Verona comprehensive plan is being finalized in 2009, Dane County is considering new land-use regulations to protect surface waters in Dane County. These regulations would be modifications to existing regulations known as 'Shoreland Zoning', and they would be applicable to development within the City of Verona. While the City of Verona is supportive of efforts to protect water quality and water quantity for local surface waters—the City also believes that regulations must balance these environmental protection goals with good urban planning goals such as promoting compact development—especially in urban areas such as the City of Verona. The City will seek to work with Dane County to insure that any new Shoreland Zoning regulations that may get adopted—and which would be applicable within the City of Verona—accomplish this balance. See Chapter 7—Intergovernmental Cooperation—for additional information.

Section Two—Natural Resources
Floodplains

Flood plains are generally those areas that are most likely to flood after a large rainfall. Technically, flood plains are areas calculated to have a 1% chance of flooding at or above 100 year average levels in any single given year. '100-year' floodplain boundaries are mapped by the Federal Emergency Management Agency (FEMA) and represent those areas most susceptible to flooding and therefore present significant limitations to development. (See Map 5-5)

Floodplains in the Verona area exist along the Upper Sugar River to the west and southwest of the city, and along Badger Mill Creek running through the city and along U.S. Highway 151 northeast of Verona. Smaller floodplain areas exist along the Dry Tributary to Badger Mill Creek and around scattered glacial 'kettles' throughout the area. The Upper Sugar River floodplains, the largest in the area, present the greatest limitation to the growth of the City of Verona to the west and southwest.

The City of Verona administers federal floodplain management regulations through implementation of the city's Floodplain Zoning ordinance. The City of Verona requirements for development adjacent to floodplains complies with state and federal minimums, which require any building constructed adjacent to a flood plain to have its lowest exposed level be at least 2 feet above the 100 year flood elevation. The City of Verona will continue to administer federal floodplain management regulations, including requiring the lowest exposed level to be at least 2 feet above the established 100-year flood plain for all construction within the City of Verona.

Section Two—Natural Resources
Wetlands

Wetlands play a critical role in the hydrology of river basins. Wetlands are valuable because of their effect on flood control, their ability to cleanse surface water of contaminants such as sediment, heavy metals and pesticides, as well as their many biological and scenic values. As the landscape in the Upper Sugar River watershed continues to be transformed from rural development such as agriculture and from urban growth such as residential development, these wetland functions will become even more important, particularly as they relate to storm water management and wildlife habitat.

Significant areas of larger wetlands exist southwest of the City of Verona along the Upper Sugar River, as well as along Badger Mill Creek (See Map 5-2). Furthermore, a concentration of wetlands of less than 2 acres identified by the Wisconsin Department of Natural Resources is located outside the southeastern edge of the city, as well as in the northern part of Verona and to the east. Wetlands pose numerous constraints to development. County and municipal zoning prohibits development in wetland areas of 2 acres or greater, while other wetlands are regulated by state and federal laws.

There are several types of wetlands in the upper Sugar River valley, including sedge meadows, wet-prairies, fens, and marshes. Unlike some other wetlands in Dane County, the wetlands in the upper Sugar River basin do not exhibit significant accumulations of sedge peat, except an area south of U.S. Hwy 18/151. (See Map 5-2) This fact is primarily due to the characteristics of wetlands in the driftless area, largely because of the variations in flow, annual fluctuations in water table levels, and almost constant deposition of sediment.

The area just south of U.S. Hwy 18/151 is described as a Group I Wetland (Bedford, et. al., 1974) containing sedge meadows, low prairie, and shallow marshes (See Map 5-2). It also contains a calcareous fen, a special type of wetland. Group I wetlands are among the best in the county and, in some cases, the most valuable in southern Wisconsin. Although showing signs of disturbance they remain virtually intact. These sites provide important reference sites in designing restoration projects in other areas. Every effort should be made to protect them.

Group II wetlands generally possess good quality and indicate that alterations have not had a profound effect. These wetlands should be protected to maintain their quality, and it is certainly possible to improve or enhance their condition. There are no Group II Wetlands in the immediate vicinity of Verona.

Nor are there any Group III Wetlands in the Verona area. Group III wetlands have been substantially altered, although they do receive wildlife use, provide open space and enhance the environment overall.

Most of the lowland areas along the Upper Sugar River north of U.S. Hwy 18/151 and Badger Mill Creek East of Verona have been described as Group IV Wetlands. Group IV wetlands are wetlands that have been altered but which maintain some function for temporary periods of time (such as migratory waterfowl use or protection from flooding). The fact that they can be considered wetlands after many decades of agricultural drainage indicates that they are not well suited for agriculture. Their best use appears, then, to be enhanced or restored for one or more wetland values and functions, rather than continued attempts at drainage.

The quality of these wetlands depends on the varying degree of agricultural use to which they have been subjected to (such as for pasture, cultivation, or mowed land). Low disturbance wetlands featuring native wet prairie and sedge meadow species cover several hundred acres in the watershed but are in danger of fragmentation. Medium and high disturbance wetlands are characterized by an abundance of reed canary grass and varying degrees of ditching or hydrologic alteration. Many have a high potential for restoration, particularly those where native species remnants exist. Additional wetland areas further south along the Upper Sugar River and Badger Mill Creek have not been assessed and should be used to help direct future restoration, protection, and enhancement efforts.

Group V Wetlands no longer exist or function as wetland ecosystem. Agricultural practices such as ditching, draining, or filling have destroyed all the functions and values. It may be possible, however, to restore them by reversing the action(s) that destroyed them in the first place. These areas present significant opportunities to restore wetland acreage that has been lost over the last century.

Map 5-2 indicates hydric soils that should be primary considerations for wetland restoration projects. Soils with hydric inclusions have also been indicated for additional consideration (e.g., possible expansion of primary sites, corridor connections between wetlands, storm water management, etc.). The fact that they show the effects of soil saturation (oxygen depletion) makes them good indicators of potential opportunities for restoring wetlands or storm water management. For example, a good plan for an upland water quality pond might be to release water to a manmade wetland in one of these areas, providing additional storm water polishing and nutrient capture. Several wetland restoration opportunities exist along the Sugar River and Badger Mill Creek. These could be incorporated into storm water management plans thereby helping mitigate the impacts of development on surface water features, as well as providing additional wildlife habitat.

Connectivity is an important aspect of providing water quality improvement and biodiversity. Vegetated corridors connecting wetlands provide opportunities for wildlife movement and safety from predators. Also, wetlands located near upland habitat typically support a large variety of bird species. Wetland biological quality is largely affected by position in the watershed. Wetlands low in the watershed tends to receive larger and more frequent pulses of nutrient-rich runoff, which limits these wetland's ability to support biodiversity. In fact, nutrient-rich runoff typically pushes a wetland's plant community into monocultures of aggressive, invasive plants such as reed canary grass and cattails. Alternatively, wetlands positioned high in a watershed are spared the large pulses of nutrient-laden runoff. They can more easily avoid infestations of invasive species and are able to develop a more diverse, wildlife-supporting plant community.

To protect wetlands, the City of Verona will continue to administer its existing wetland-shoreland zoning ordinance, as provided in City Ordinance Title 13—Chapter 3. Furthermore, the City will consider the use of wetland buffers to complement efforts to improve water quality and biodiversity in wetlands. Buffers surrounding wetlands are valuable not only for the protection they afford against the impacts of agriculture and urbanization, but also for the ecosystem services they provide. Vegetated buffers in the uplands adjacent to wetlands serve as transitional habitat zones and are often rich in plant and wildlife species. Additionally, wetland buffers enhance the ability of natural wetland systems to perform their functions by slowing runoff into the wetland, pre-treating it, and allowing infiltration of water. The most effective vegetative cover for a wetland buffer is a diverse mix of trees, shrubs, and ground-cover to maximize infiltration, soil stabilization, reduced energy flow, and nutrient uptake. Furthermore, the City will consider wetland enhancement projects for improving the existing wetlands associated with the Upper Sugar River and Badger Mill Creek, such as consultation with a wetland ecologist to establish reasonable wetland improvement goals and objectives for each site, as well as protecting these as public conservation/open space areas. Wetland management goals will attempt to accomplish the following general measures: Conserving and managing existing high quality natural areas; Improving wetland areas that have been impacted by agriculture or other activities; and Creating buffer areas adjacent to wetlands to provide a protective zone around them.

Section Two—Natural Resources
Groundwater

As rainfall reaches the ground, a substantial portion evaporates. The remainder either infiltrates into the ground or flows 'down-gradient' as storm water runoff. The portion that infiltrates into the ground enters the groundwater system or emerges 'down gradient' as groundwater discharge (springs) to nourish rivers, lakes, wetlands and streams. This ground/surface water balance can be upset by human activities such as agricultural irrigation, which affects both the quality and quantity of our ground and surface water resources.

Shallow groundwater, deep groundwater, and surface water—such as rivers and creeks, are intimately inter-connected. Almost all groundwater in Dane County originates with rain that falls within the county. Groundwater that is withdrawn and used in Verona is for the most part recharged locally from infiltration of precipitation. Most lakes and streams are discharge points for groundwater where the water table intersects the land's surface. In general, the water table is a subdued reflection of the land topography (**Map 5**). The depth to groundwater ranges from zero at the fringes of lakes, streams, and wetlands to over 200 feet beneath the ridges in the driftless area.

Groundwater represents the source of almost all water supplies throughout Dane County, and so protection and management of this important natural resource is crucial.

Groundwater Quality

Groundwater supplies nearly all of the water for residential, commercial and industrial uses in Dane County and in the City of Verona. Although there is a relatively unlimited supply of groundwater for these purposes, it is critically important that the *quality* of groundwater be protected. Once groundwater becomes contaminated it is very expensive and difficult to return it to its original condition. Groundwater is also very important in providing base flow discharge to wetlands and streams, which supports these resources especially during periods of dry weather.

In rural areas water supplies are drawn from the upper sandstone and unconsolidated (glacial) aquifers via private wells. The depth of these private wells typically extends between approximately 100 and 400 feet.

In urban areas deep municipal wells draw water from the deep sandstone (Mt. Simon) aquifer. The depth of these public wells typically extends between approximately 800 to 1200 feet. The shallow and deep aquifers are separated by the Eau Claire shale formation, a semi-confining unit. The shallow groundwater system is of primary importance in questions of groundwater quality. Since much of the Upper Sugar River watershed is located in the driftless area, the bedrock surface is not covered with a layer of glacial till (deposits of sand silt and clay), as it is in most other regions of Wisconsin. The shallow aquifer is therefore more vulnerable to surface contamination, since water can move more easily through the fracture systems within the rock. Shallow domestic wells are particularly at risk, compared to deeper municipal wells which are drilled many hundreds of feet to the deep aquifer.

While groundwater *quality* in the Verona Area is generally good, there have been localized instances of contamination from nearby pollution sources, particularly in the upper or shallow aquifer affecting shallow private wells. Water supply concerns relate to potential increases in nitrates, dissolved salts, and volatile organic compounds (VOCs), which could also affect the deep aquifer from which the City of Verona's municipal water supplies are withdrawn. Public water supplies in Verona and other municipalities are regularly sampled and tested. The quality is quite high and safe for use. Customers of all public water systems—including the City of Verona—receive annual Consumer Confidence Reports from their water supplier. The report is mandated by the federal Safe Drinking Water Act and Environmental Protection Agency rules. The reports provide consumers with clear, concise, and

accurate information about the quality of their drinking water. Please see Appendix 4-I for a copy of the most recent City of Verona Consumer Confidence Report for municipal water.

Many communities have also defined wellhead protection areas and associated regulations to help protect their wells from direct or inadvertent contamination. The City of Verona plans to investigate creating and implementing a Wellhead Protection Plan for the City of Verona—See Chapter 4—Utilities and Community Facilities for more information.

Groundwater Quantity

Ground water *quantities* are affected by two basic factors—the amount of water put into the ground and how much is taken out of the ground. Quantities are reduced through pumping for agricultural irrigation and for private and municipal wells. Pumping or withdrawal of groundwater from one location and then returning it to another location can significantly alter the local ground and surface water balance. These impacts can be particularly pronounced in rural areas where irrigation is practiced and in urban areas with municipal wells. In either case, concentrated pumping of groundwater lowers the water table, which in turn reduces base flow contributions to streams and lakes. In the City of Verona, after ground water is pumped out of the ground (in the Upper Sugar River Watershed…) and used for residential, commercial, and industrial uses, the resulting wastewater is collected in the city's sanitary sewer system and then sent to the MMSD Nine Springs Treatment Plant in Madison (in the Yahara River Watershed…). Prior to 1998, the treated wastewater was subsequently discharged to Badfish Creek (in the Yahara River Watershed…). The result of this arrangement essentially removed the water from the Upper Sugar River watershed and sent it to the Yahara River Watershed. In 1998 MMSD completed a 5 million dollar project to return the treated wastewater effluent from the Nine Springs treatment plant *back to* the Badger Mill Creek in the Upper Sugar River Watershed near the USH 18/151 interchange via a return pipe. See Map 4-4 for the location of this treated waste water outfall to the Badger Mill Creek just east of the City of Verona. The return of treated effluent to Badger Mill Creek has addressed this water imbalance. Only the amount of wastewater generated in the Upper Sugar River Watershed is returned from the Nine Springs treatment plant. The innovation here is treating wastewater as a resource and not simply as something that is flushed down the drain. Note, however, that this arrangement does not address the issue of water table declines and base flow reductions in the Upper Sugar River watershed above its confluence with the Badger Mill Creek.

While pumping reduces groundwater quantities, infiltration increases quantities. Ground water *quantities* are reduced in rural areas where drain tile has been installed—preventing rainfall to infiltrate into the ground and instead sending it directly to local streams and creeks and thereby substantially reducing local infiltration. Similarly, ground water *quantities* are reduced in urban areas as a result of increased paving and impervious areas which also prevent rainfall from infiltrating into the ground and instead send it directly to local streams and creeks unless it is first detained and allowed to infiltrate. In urban areas over the last decade—significant and costly regulations have been imposed on urban development to reverse this trend and increase the amount of rain water that infiltrates to replenish ground water supplies. Unfortunately, comparable detention and infiltration requirements have yet to be adopted for rural land-uses such as agriculture. Long term, the City of Verona believes that detention and infiltration requirements should be applied to both urban and non-urban areas. Until such time, the City of Verona will continue to do our part by implementing storm water management programs to promote ground water recharge through the creation and maintenance of storm water detention, retention, and infiltration basins and the promotion of rain gardens and similar methods.

Areas with naturally high infiltration should be used to recharge the groundwater to the greatest extent possible. Map 5-6 indicates natural infiltration areas within the Verona area. Storm water run-off generated in these areas could be reduced on site through the use of methods such as 'rain gardens'.

As Map 5-6 indicates, there are many opportunities for enhancing infiltration throughout Verona. This map highlights areas that the City of Verona will consider during the review of site development plans, so that they may be more fully utilized for water quality protection and groundwater recharge. While this map does not replace the need for more in-depth analysis for a particular site, it does provide a useful planning tool to encourage the incorporation of storm water management practices into future urban developments.

Map 5-7 presents areas with opportunities for enhanced infiltration that could result from engineering practices tapping into deeper sand and gravel deposits. These areas may be prime locations for regional storm water facilities that could be used to infiltrate storm water generated in other parts of the watershed. These facilities would need to be adequately sized to accommodate the rates and volumes of storm water generated by the proposed development. Groundwater quality protection measures should also be taken into consideration. Directing clean rooftop runoff to infiltration trenches and basins would be one way of dealing with this. There are also significant opportunities for retrofitting previously developed and redeveloping areas.

One area where the City of Verona will investigate the possibility of creating such a retro-fitted storm water detention and infiltration area is in the downtown. Specifically, the City will investigate the possibility of creating storm water detention and infiltration areas underneath municipal surface parking lots. See Chapter 8—Land Use for more information. The City will also investigate alternative solutions for storm water management and infiltration in the downtown area, such as the potential of creating a public, regional infiltration area to serve the downtown area. Either of these solutions will help eliminate the need for multiple, small and private infiltration basins, which are not desirable in the downtown area.

Although there is no shortage of groundwater available for future supply needs, this clear and cold groundwater flowing from numerous springs and seeps does provide an extremely important source of water to nourish surface resources. This input of cold water into local rivers and creeks keeps water temperatures low, enhancing oxygen retention, which favors habitat for trout and other oxygen-demanding species. Maps 5-6 and 5-7 promote various opportunities and strategies that can be used to help minimize the impacts of future urban development and possibly retrofit previously developed areas.

Steep Slopes

Typical definitions for steep slope in Wisconsin vary from 12% to 20% (and greater). Increased slope provides a number of development-related concerns and difficulties. A significant concern is that developments on steep slopes increase erosion and storm water runoff. This is problematic as it can adversely affect water quality as debris and excess sediment eroded from the hillside is deposited into surface waters. It is broadly recommended that areas identified as having a slope in excess of 12% be avoided for development. If development is to happen on these areas, it is recommended that the developer prepare detailed erosion control plans to address the challenges. The City of Verona will review all proposed developments in areas with slopes with over 12% grade and take necessary steps to protect surface waters in such areas.

Slopes having a greater than 12% grade in the City of Verona and surrounding areas is provided on Map 5-8. These slopes are often wooded and—in addition to presenting development challenges—they provide opportunities to protect existing natural areas and wildlife habitats.

Section Two—Natural Resources

Climate

The climate of Verona and Dane County is typical of the Great Lakes states. Winters tend to be long, cold and snowy, while summers are short and sometimes humid. The temperature ranges from an average of 17 0F in January to 700F in July. Average annual precipitation is 31 inches, with 60 percent falling from May through September. June is the wettest month with over four inches of precipitation, and February is the driest with about one inch. Months with significantly heavier rainfalls are not uncommon, such as the recent months of May of 2004, August of 2007 and June of 2008. Snowfall averages 40 inches per year—although over 100 inches of snow fell on the Verona Area during the winter of 2007-2008. The ground usually begins to freeze at the end of November and thaws in mid-April. Maximum frost depth averages over 18 inches. Severe storms often occur from late fall through mid-spring. The potential for runoff and severe erosion is often high in March and early April, when heavy rainstorms and snowmelt occur on ground that is sparsely covered by dead vegetation or that is bare due to fall plowing.

Habitat loss and fragmentation are the main concerns for wildlife in the Upper Sugar River watershed. Habitat continues to be degraded, simplified, fragmented or destroyed by various land and water use practices, policies and agricultural and urban development decisions. The Upper Sugar Rivers watershed's fish and wildlife, the continued enjoyment of hunting and fishing, the tourism industry and our quality of life depend on maintaining, protecting, and restoring high quality natural habitat.

Oak Savanna

Oak savanna (also known as oak opening) was by far the most widespread and abundant plant association in the Upper Sugar River watershed at the time of the original land surveys (Ellarson 1949). Oak savannas are characterized by open grassland areas interspersed with trees, especially oaks. Savannas, historically found in southern and western Wisconsin, were the transition between the great prairies and the eastern deciduous forests. In the early to mid-19th century, the oak savanna as an ecosystem was thoroughly fragmented and nearly totally destroyed throughout its range from agricultural practices. Oak savanna now shares equal billing with tall grass prairie as the most threatened plant community in the Midwest and among the most threatened in the world. Intact examples of oak savanna vegetation are now so rare that less than 500 acres are listed in the Wisconsin's Natural Heritage Inventory as having a plant assemblage similar to the original oak savanna. This is less than 0.01% of the original 5.5 million acres in the state. Oak savanna differs from oak woods in that the trees are rather widely and evenly spaced so that sufficient sunlight reaches the ground to sustain the undergrowth of prairie grasses and forbs. Following settlement, fires were largely suppressed allowing woody plants to invade the oak openings to eventually form oak woods. A Native Prairie Remnant/Oak Savanna site has been identified in the Sugar River Valley north of USH 18/151.

There are an untold number of acres of private land in the Upper Sugar River watershed—much of it both overgrazed and overgrown—with retrievable oak savanna. Much of this land, especially low productivity agricultural sites, could be restored within a decade simply by tree thinning, brushing and burning. Some plant reintroduction may be necessary, but much can be accomplished with fire alone. Light grazing may also have potential as a savanna management tool and as a means of maintaining the open habitat required by many savanna vertebrates.

Significant areas of woodlands are located southeast of the Verona, as well as in the northern part of the city north and south of Cross Country Road and east of North Nine Mound Road (Map 5-9). Significant woodland also exists in the southern part of Verona, north of Highway 18/151 and west of Paoli Street. These areas are important to the natural beauty of Verona, and provide important habitat for wildlife species, outdoor recreation, education, and appreciation.

Existing forested areas within the planning area also include:

- Scheidigger Forest
- Madison School Woods
- Miscellaneous Wooded areas, including what is referred to as the Terminal Moraine
- Stewarts Woods
- Ice Age Trail

Grassland/prairie

The other community frequently mapped in this watershed is high (tall-grass) prairie. Tall-grass prairie was found to occupy the broad level ridges and the level valley bottoms of the watershed. The treeless condition of these prairie areas is attested to by the fact that, instead of marking witness trees to indicate section and quarter-section corners, the surveyors were forced to build mounds of earth and sod to locate

these points. Original land survey records of the 1830's indicate there were 3.1 million acres of treeless grassland in Wisconsin or 9% of the total land cover. Tall-grass prairie and related oak savanna are now the most decimated and threatened plant communities in the Midwest and in the world. Wisconsin has only .5% (13,000 acres) of its original grassland ecosystem remaining in a relatively intact condition and much of this remnant acreage has been degraded to some degree by livestock grazing or woody invasion. Over 80% (11,000 acres) of this remaining acreage is sedge meadow and the rest (2,000 acres) is native prairie. A prioritized Grassland/Prairie Management Area site has been established southwest through northwest of Verona (CARPC).

Managed use of fire, removal of trees and shrubs, light grazing, control of exotics, and prairie grass plantings will aid prairie restoration. Establishing surrogate grassland habitat on both private and public lands can restore populations of grassland mammals and birds.

Wetlands

Wetland communities were abundant in Wisconsin before Euro-American settlement and occupied an estimated ten million of the state's 35 million acres. Wetlands have been subjected to intense modification and use and have greatly decreased in numbers since Euro-American settlement. At present, Wisconsin has lost nearly half of its original ten million acres. Nearly all remaining wetlands have suffered the effects of simplification, fragmentation, and urban or rural runoff. Open marsh in the Upper Sugar River watershed has been primarily limited to lands immediately adjacent to the streams in the valley bottoms and is now found primarily in the narrow valleys.

Wetlands are noted for their abundance of plant and animal life. Currently 32% of the state's threatened and endangered plants and animals are wetlands dependant. Since wetlands are so interspersed among the other major community types in the state, the benefits of protecting, restoring, and enhancing wetlands will contribute to the ecological health of these communities as well.

Wetland-filling will continue to be an increasing threat as pressures for agricultural and nonagricultural land use become more intense. Wetlands will continue to be affected by agriculture through grazing, barnyard and feedlot runoff, pesticide and fertilizer runoff, sedimentation from nonpoint sources and drainage. Urban wetlands will continue to be affected by polluted run-off from paved areas, although the City of Verona has zoning regulations as well as extensive storm water management facilities to protect local wetlands.

The invasion of wetlands by exotic plant and animal species is also a significant problem. Reed canary grass has been an extremely aggressive invader of sedge meadows. It has significantly displaced native species on many thousands of acres of sedge meadow and shrub carr in the southern part of the state. Similarly, purple loosestrife is rapidly invading many wetlands throughout the state. It is an exotic species, first released in this country by nurseries and gardeners, and it crowds out native species.

State Natural Area

Map 5-10 also shows the location of The Sugar River Wetlands, which is owned by the DNR and which was designated a 'State Natural Area' in 1996. State Natural Areas (SNAs) protect outstanding examples of Wisconsin's native landscape—which are often the last refuge for rare plants and animals. Wisconsin's 560 State Natural Areas are valuable for research and educational use, the preservation of genetic and biological diversity, and for providing benchmarks for determining the impact of use on managed lands. The Sugar River Wetlands feature a diverse wetland complex including sedge meadow, calcareous fen, emergent aquatic, shrub-carr, and wet-mesic prairie. Located within the Upper Sugar River Watershed, this extensive wetland harbors numerous rare plant and animal species and contains the most diverse fishery in southern Wisconsin. The area is part of a larger grassland habitat restoration complex along the Sugar River, which seeks to establish landscape management areas for the benefit of declining grassland birds and animals, vegetation communities, and invertebrates that depend upon native vegetation. As developments are proposed adjacent to this State Natural Area, the City of Verona will encourage development practices that minimize impacts upon this area.

Wildlife

Some of the remaining animal wildlife in the Verona area includes deer, fox, a variety of birds including ducks, geese, pheasant, and owls. Local rivers and streams are also home to a variety of fish species, while amphibians and reptiles such as snakes, frogs, turtles, and toads can be found in local wetlands, surface waters, and upland areas. Remaining plant wildlife in the Verona area includes native grasses and tree species.

Threatened and Endangered Species

Wisconsin's Natural Heritage Inventory (NHI) is maintained by the WDNR Bureau of Endangered Resources. NHI programs focus on locating and documenting occurrences of rare species and natural communities, including state and federal threatened and endangered species. Map 5-10 shows the locations of rare species in the Verona Area. Information in the NHI is sensitive because rare species are very vulnerable to collection as well as destruction. Publication of exact locations may threaten their continued existence. It is for this reason that the NHI data are exempt from the Wisconsin Open Records Law. The generalized Map 5-10 is intended for information and general planning purposes rather than regulatory or site-specific decision making. More detailed information and recommendations for protection can be obtained from the DNR Bureau of Endangered Resources. The NHI is a statewide inventory of *known* locations and conditions of rare and endangered species. Users need to recognize that parts of the state have not yet been inventoried. Thus an "absence of evidence is not evidence of absence," nor does the presence of one element imply that other elements were surveyed for but not found. Despite these limitations, the NHI is the state's most comprehensive database on biodiversity and is widely used.

The City of Verona, the surrounding area, and the Upper Sugar River Watershed in general have a diverse array of streams, wetlands, ponds, woodlands, and grassland habitats which give rise to numerous wildlife species, some of which are either threatened or endangered. 'Endangered' species are in jeopardy of becoming extinct based on scientific evidence, while 'threatened' species are likely to become endangered in the foreseeable future. 'Special concern' species are those which could become 'threatened' in time. The Wisconsin NHI includes endangered, threatened species and species of concern **(Table 5-2)** in the Upper Sugar River watershed.

The loss and fragmentation of habitat are the major threats to most of the species included in Table 5-2.

- The Ornate Box Turtle is strictly a prairie relict, found only in sandy, dry prairies and oak savannas, primarily on southern and western exposures.
- Blanding's Turtles prefer shallow and deep marshes, shallow, slow moving streams and rivers, and backwater sloughs with soft bottoms and aquatic vegetation.
- Purple milkweed, kittentails, roundstem foxglove, and yellow gentian are oak savanna species whose rarity is associated with the extreme rarity of intact oak savanna.
- Prairie parsley is a mesic prairie species that persists in open areas that were once savannas.
- Small White Lady's Slipper is found in calcareous fens and wet prairies.
- The Ellipse is a small mussel that is particularly vulnerable to siltation and pollution from agricultural and urban runoff because it inhabits small streams and headwaters.

Table 5-2: Endangered, Threatened and Special Concern Species		
Endangered	**Threatened**	**Special Concern**
Reptiles and Amphibians	**Reptiles and Amphibians**	**Mammals**
Ornate Box Turtle	Blandings Turtle	Prairie Vole
Plants	**Mussels**	**Fish**
Purple Milkweed	Ellipse	Redside Dace
		Banded Killifish
	Plants	**Plants**
	Kittentails	Glade Mallow
	Prairie Parsley	Innocence
	Roundstem Foxglove	One-flowered Broomrape
	Small White Lady's Slipper	Pomme-de-Prairie
	Yellow Gentian	Prairie False-dandelion
		Smooth-sheathed sedge
		Wilcox panic grass

Habitat protection and water quality improvements would benefit these species. Continued agricultural practices and increased urban development along waterways are of particular concern for the continued existence of these species. The City of Verona will consider habitat fragmentation in the review and approval of development proposals in an effort to minimize such fragmentation to the extent possible.

Section Two—Natural Resources
Parks and Open Space

Note: See Chapter 4—Utilities and Community Facilities—for more detailed information regarding the City of Verona's Parks and Open Space Plan. The following section—as part of the 'Natural Resources' portion of Chapter 5—Natural and Cultural Resources—focuses exclusively on parks and open space matters in the Perimeter Planning Area for this City of Verona Comprehensive Plan.

Dane County plays a special role in the partnership of state, county, local units of government, as well as private groups in meeting the outdoor recreational needs of its citizens. The *Dane County Parks and Open Space Plan* is available in Appendix 5-A. This plan defines the County's role and recommendations for how Dane County can work as a partner with other governmental units and the private sector. Adoption of the plan and acceptance by DNR enables the county to participate in state and federal outdoor recreation grant programs. The Plan indicates various Natural Resource Areas, existing and proposed land and water trails, recreational parks, and forests as the focus of these efforts, including:

- Sugar River Natural Resource Area
- Badger Mill Creek Natural Resource Area
- Ice Age Trail Junction Natural Resource Area
- Ice Age Trail Corridor
- Badger Prairie County Park.
- Prairie Moraine County Park
- Scheidegger Forest
- Madison School Forest
- Military Ridge Bicycle Trail
- Proposed Sugar River Land and Water-Based Trails

Badger Prairie County Park

At the time this comprehensive plan is being written/adopted, Dane County is finalizing its Master Plan for the Badger Prairie County Park. See Appendix 5-B for a draft map of this Master Plan.

Section Two—Natural Resources
Metallic and Nonmetallic Mineral Resources

Map 5-11 shows potential mineral extraction sites throughout the planning area. Mineral extraction sites with high potential have deposits of either ice contact stratified glacial material or coarse outwash and have the best potential for providing an economically viable source of high quality aggregate.

Low potential sites have deposits of either pitted outwash or finer outwash and are much less likely to contain an economically viable source of high quality aggregate. There are five active quarrying sites in the Verona area—with all but one located on North Nine Mound Road on the City's northeast side. These four North Nine Mound facilities are all identified on Map 5-11 and are:

- Pollow Pit (Hammersley)
- Fassbind (Keleny)
- Maurer (Wingra)
- Wingra/Payne & Dolan

The fifth active quarry site—the Herfel Pit—is located on the east side of S.T.H. 69 south of Manhattan Drive approximately a half-mile south of the current City of Verona city limits and is not shown on Map 5-11. Other existing (but not active) mineral extraction areas include an area west of Paoli Street (Cleary Pond), an area just east of Badger Mill Creek in the center of the city (Tsunehiro Pond), and Fireman's park swimming hole. Mineral extraction operations are eligible uses under the Dane County Zoning Ordinance as a conditional use in agricultural zoning as identified in County ordinance Sections 10.12 through 10.123. County ordinance Section 10.191 establishes procedures and standards of operation for mineral extraction operations. High potential for mineral extraction exists along the Sugar River southwest of Verona. This high potential area lies within a floodplain and has a significant presence of wetlands. The City of Verona considers quarrying to be a 'rural' land use and one that is appropriate in unincorporated areas—although as explained in Chapter 8—Land Use—the City of Verona will consider rules which would allow quarrying operations within the city limits. See Chapter 8—Land Use—for more information about policies regarding Metallic and Non-metallic Mineral Extraction land-uses.

Section Two—Natural Resources
Contaminated And Regulated (Brownfield) Sites

Wisconsin Department of Natural Resources lists contaminated soil and groundwater sites. DNR's web-based mapping system provides information about contaminated properties and other activities related to the cleanup of contaminated soil or groundwater in Wisconsin. The DNR's "Remediation and Redevelopment Sites Map" is part of the department's *Contaminated Lands Environmental Action Network (CLEAN*). Maps are provided on the Wisconsin Department of Natural Resources website at:

http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=brrts2.

See Chapter 6—Economic Development and Agriculture—for additional information about the location of these 'brown-field' sites and the DNR's Remediation and Redevelopment program.

Open City of Verona remediation and redevelopment sites—which have ongoing cleanup activities—include:

- Ellis Manufacturing Company;
- Kettle Café Union 76;
- Suburban Motors Mobil, and
- Zurbuchen Oil Company.

Closed sites, which have completed cleanup, include:

- Badger Prairie Health Care, Dane County - Verona Road,
- Dane County Salt Shed,
- Danco FS Coop,
- Kubehl property,
- Himner property,
- Carnes Company,
- Heiliger property,
- Verona Wastewater Treatment plant,
- Verona Town Garage,
- Town & Country Ford Tractor,
- Verona Middle School,
- Wisconsin DOT and
- Verona Quik Trip.

See Table 6-15 for additional information.

Section Three—Cultural Resources

Verona has a rich history and culture. Prior to the arrival of European settlers in the mid 19th century—the area supported Native American communities including primarily the Ho-Chunk, or *Hocak* ("People of the Big Voice"), a Siouan-speaking people formally known by European-Americans as the Winnebago. The Central Wisconsin area was ceded to the Ho-Chunk in 1829, 1832 and 1837. The first ceded area included what later became Dane County after Wisconsin became a state in 1848.

These Native Americans left an array of burial and ceremonial mounds—including the namesake for Nine Mound Road. Native American burial, encampment or other sites are cataloged by Wisconsin Historical Society and the exact locations are not publicly-available to protect these sites. The sites are also protected through exemptions from the Wisconsin Open Records Law.

Following federal Indian-removal efforts in the early 19th century, European settlers began arriving in what is now the Verona area in the mid-19th century. These settlers were primarily German, English, Swiss, and Scandinavian, although settlers from many other countries and cultures also came. The arrival of the Chicago and Northwestern Railroad Company in 'Verona Crossings' in 1893 secured the economic viability of Verona, and the Village of Verona soon became a small but vibrant community anchored by the rail line and serving the local agricultural community. Some of the first buildings that were constructed in Verona remain to this day as historical and cultural reminders of the community's past, including buildings at:

1) 101 North Main (Matt's House)
2) 113 South Main Street (Insurance Agency)
3) 119 South Main Street (Avanti's)
4) 125 South Main Street (Sow's Ear)
5) 201 South Main (Methodist Church)
6) 100 Railroad Street (The Inn at the Auditorium)
7) Residential buildings in the area originally developed, such as 324 South Main and others.

Many other buildings have been torn-down over the years to make way for newer development, including the Sharpe House (currently Park Bank); the grain elevators and stock yards (currently Veteran's Park); the lumber yard (currently the Railroad Street/Depot Drive project); and the original city hall building (currently Walgreens), among others. As this plan is being written—Dane County intends to raze the 100-year old Badger Prairie Health Care Center building at 1100 East Verona Avenue to accommodate a newer, larger and more modern health care facility.

Other interesting historical resources in the Verona Area include:

1) The Potter's Cemetery along East Verona Avenue;
2) The remaining portions of the Dane County Farm at East Verona Avenue and Old CTH 'PB';
3) The remains of the leper cemetery south of the City on CTH 'PB';

Due to its proximity to Madison—Verona relies on Madison for many cultural resources such as museums, theaters, and sporting activities and venues. Nonetheless, a number of cultural resources and activities are available in the City of Verona, including:

- The City Library
- Verona Area Community Theater
- Verona Area Performing Arts Series
- Rhapsody Arts Center
- Hometown Days festival

Section Four—Goals, Objectives, and Policies for Chapter 5: Natural and Cultural Resources

Based on community surveys, community open houses, comment cards received, testimony during 'public comment' periods during meetings of the Comprehensive Plan Committee, and a review of past trends and current conditions in the City of Verona—and in consultation with the Plan Commission and Common Council during a January, 2009 review of the draft comprehensive plan—the Comprehensive Plan Committee developed the following Goals, Objectives, Policies, and Programs for Chapter 5—Natural and Cultural Resources:

N&C-R Goal One: Protect the Natural Environment.

Objective 1-A: Continue to comply with Natural Preservation and Environmental Protection regulations.

Policy: Protect environmental corridors; wetlands, floodplains, natural springs, and other natural resources.

See Also: Chapter 8—Land-Use.

Objective 1-B: Protect the quantity and quality of local surface waters and resources.

Policy: Protect the water quality of local surface water bodies—including the Badger Mill Creek and the Sugar River—through compliance with applicable environmental protection requirements.

Policy: Promote the use of rain-gardens and other 'mirco-measures' to protect local surface waters.

Objective 1-C: Protect the quantity and quality of local ground water resources.

Policy: Protect the quality and quantity of local ground water sources through compliance with applicable environmental protection requirements.

Policy: Investigate the establishment of well-head protection areas and regulations.
Policy: Promote the use of rain-gardens and other 'mirco-measures' to promote the recharging of local aquifers through increased storm water infiltration.

See Also: Chapter 4—Utilities and Community Facilities.

Objective 1-D: Communicate with the citizens of Verona regarding proposed environmental protection regulations that will affect Verona—including regulations from units of government *other than* the City of Verona—such as FEMA flood map revisions and proposed Dane County shoreland zoning regulations.

Policy: Continue to monitor proposed regulations from other units of government that will impact Verona to provide input and communicate with Verona residents.

See Also: Chapter 8—Land-Use.

N&C-R Goal Two: Support local Historical and Cultural Resources

Objective 2-A: Historical Society

Policy: Provide support to the Verona Historical Society.

Objective 2-B: Theatrical/Performance Art Groups

Policy: Provide support to local theatrical and performance arts groups.

Objective 2-C: Historic Preservation

Policy: Support efforts to identify local buildings and sites of local historic significance and support public education (such as signage) for such buildings/sites.