

## **2. EXISTING RESOURCES**

### **2.1 Resource History**

The Upper Sugar River watershed above Lake Belle View is approximately 172 square miles, with two branches joining immediately upstream of the lake. The majority of this watershed occurs within the driftless area of southwestern Wisconsin, an area unaffected by glaciation. The soil in this area is characterized as loess, which is easily eroded, forming deep cut valleys and narrow river channels (UW 1995). When the area was settled in the 1800's, land was cleared for agriculture and homes. Since then, much of the watershed has been heavily farmed, resulting in increased erosion and nutrient runoff within the watershed. In addition to heavy agricultural land use within the watershed, areas of the eastern watershed are experiencing rapid urban growth.

Prior to settlement, the Sugar River Valley was an untouched, riverine ecosystem abundant with forests. The first settlers were drawn to its rich natural resources. Historic maps from 1861 show that the river formed an oxbow, or closely looping stream meander, in the Belleville area. John Fredrick first dammed this oxbow at Belleville in 1845 for the purpose of powering a sawmill. Lake Belle View was formed in 1920 by the construction of the existing dam at the narrow neck of the oxbow for the purpose of hydroelectric power. Fredrick went on to found the Village of Belleville in 1851, naming it after his birthplace of Belleville, Ontario.

The discussion below provides additional information on existing conditions within Lake Belle View and the adjacent Sugar River. Information for this summary originates from UW 1995; data provided by the Wisconsin Department of Natural Resources (WDNR); and additional field data collected by the Rock Island District of the U.S. Army Corps of Engineers (Corps).

### **2.2 Land Use and Infrastructure**

The Village, straddling the Dane-Green County line with the majority of the Village falling in Dane County, was recently named the most livable Madison suburb. In 1926, the Village developed a 12-acre park on a peninsula extending toward the center of the lake. Since that time, the Village has grown around the lake, as have the townships of Montrose to the north and Exeter to the south. Two river channels (Sugar River and West Branch Sugar River) converge several miles upstream of Lake Belle View. The Sugar River watershed is highly agricultural and experiencing rapid urban growth. The project area includes a lake, floodplain forest, and various wetland communities totaling about 133 acres. Bordering the project area are a park, residences, roads, and farmland (see Figure 2.1 and Table 2.1).

Within the project study area, the following infrastructure of note occurs: the Belleville Dam, the millrace, and the Bross Circle Bridge. The dam is a concrete structure approximately 15 feet high and 150 feet long. The dam was constructed in 1920; most recent repairs occurred in 2000. On the south side of the dam are two 6-foot-long lift gates. The dam impounds water to an elevation of 857.4 feet NGVD, with two emergency spillways. Located approximately 600 feet northeast of the Belleville dam on the southeast corner of Lake Belle View is the millrace. The millrace allows minimal flow to pass from the lake to the Sugar River. This represents the former location of the mill. A stoplog structure regulates flow through the millrace. The Bross Circle Bridge is located directly above the entrance of the millrace. It connects the peninsula park to the mainland. The existing Bross Circle Bridge is 20 feet wide with one 16-foot-wide traffic lane.



**Table 2.1: Master Planned Land Uses in the Belleville Urban Service Area  
(Total Development of the Urban Service Area)**

Land Use Category (acres)	Existing 2000	Future Land Use	Land Use Plan Map	Percent of Total	Potential Impact of Developed Land Use			
					Housing	% Total	Pop.	Students
<b>Residential</b>	<b>188.5</b>	<b>249.5</b>	<b>438</b>	<b>52.1%</b>	<b>1,892</b>	<b>100.0%</b>	<b>4,604</b>	<b>959</b>
Low Density, One Family	166.5	197.5	364	43.3%	1,274	67.4%	3,312	764
Medium Density, 2 Family	7.0	42.0	49	5.8%	368	19.4%	845	147
High Density, Multifamily	8.0	8.0	16	1.9%	160	8.5%	320	48
Elderly, Multifamily	7.0	2.0	9	1.1%	90	4.8%	126	0
Street Right-of-Way	109.8	87.2	197	23.4%	<b>Overall Residential Density 4.3 Housing Units/Acre</b>			
Transportation & Utilities	8.8	1.2	10	1.2%				
Gov't & Institutional	43.5	2.5	46	5.5%	Potential Employees		Annual Payroll (in Millions)	
Park & Open Space	43.4	3.6	47	5.6%				
Commercial	20.9	3.1	24	2.9%	288		\$7.362	
Industrial	49.1	29.9	79	9.4%	790		\$47.400	
<b>TOTAL</b>	<b>464.0</b>	<b>377.0</b>	<b>841</b>	<b>100.0%</b>	<b>1,078</b>		<b>\$55.032</b>	
<i>ASSUMPTIONS: Residential Density</i>	<i>Units/Acre</i>	<i>Persons/ Hsng Unit</i>	<i>Students/ Hsng Unit</i>		<i>Business Use</i>	<i>Employee s per Acre</i>	<i>Annual Payroll per Employee</i>	
<i>Low Density</i>	<i>3.50</i>	<i>2.60</i>	<i>0.60</i>		<i>Commercial</i>	<i>12</i>	<i>\$26,500</i>	
<i>Medium Density</i>	<i>7.50</i>	<i>2.30</i>	<i>0.40</i>		<i>Industrial</i>	<i>10</i>	<i>\$60,000</i>	
<i>High Density</i>	<i>10.00</i>	<i>2.00</i>	<i>0.30</i>					
<i>Elderly Housing</i>	<i>10.00</i>	<i>1.40</i>	<i>0.00</i>		<i>Revised 4/02</i>		<i>Adopted 8/94</i>	

### 2.3 Aquatic Resources

The initial impoundment of Lake Belle View resulted in an abundance of deep, lentic habitat. These types of areas provided habitat that favored lentic fish species, including centrarchid species such as bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), and black crappie (*Pomoxis nigromaculatus*). However, Lake Belle View currently suffers from ecological problems typically associated with artificial impoundments on river systems. These include shallow depths, elevated turbidity and nutrient levels, abundant rough fish, and little aquatic vegetation. In addition to problems within Lake Belle View, the dam creating the impoundment presents an impassable barrier to upstream migration of fisheries resources.

Currently, Lake Belle View has an average depth of less than 2 feet and a maximum depth of less than 10 feet immediately behind the dam. Lake bathymetry is highly uniform, with depths throughout most of the lake only varying between 1 and 2 feet. Lake substrates are composed almost entirely of fine clays, underlain by sands at greater depth.

Previous observations by UW (1995) suggest aquatic vegetation is extremely limited within the lake. Species observed include curly-leaved pondweed (*Potamogeton crispus*), sago pondweed (*Potamogeton pectinatus*), leafy pondweed (*Potamogeton foliosus*), coontail (*Ceratophyllum demersum*), and *Elodea*.

However, UW (1995) estimated only 6% to 7% of the lake bottom was covered with vegetation. During the summer of 2001, Lake Belle View was drawn down for dam repairs. This drawdown allowed for physical observation of the exposed lakebed. However, during the drawdown, almost no submergent or emergent aquatic vegetation was apparent. In addition to a lack of vegetation, only 1% to 2% of the lakebed included submerged trees, brush, or other physical habitat.

## 2.4 Terrestrial and Wetland Resources

Areas adjacent to Lake Belle View include existing terrestrial wetland areas, as well as developed areas. Existing wetlands include riparian zones of the project area that largely include floodplain forest habitat, with the area of the peninsula along the west side of the lake existing as sedge meadow/wet prairie (UW 1995). Tree types observed within the floodplain forest include common species such as species of ash (*Fraxinus* spcs.), willow (*Salix* spcs.) and maples (*Aceraceae*). Those types observed within the sedge meadow/wet prairie include species such as sedges (*Carex* spcs), asters (*Aster* spcs), and reed canary grass (*Phalaris arundinacea*). Areas along the north shore of the lake include several private homes. The eastern shore abuts immediately against State Highway 69, with the southern shore and peninsula consisting of a village park.

## 2.5 Fishery Resources

Lake Belle View's fishery resource can be characterized based on anecdotal observations, as well as a fishery survey performed by the WDNR in 1969. Lake Belle View's fishery resource is dominated by common carp (*Cyprinus carpio*), as well as various species of catostomids (suckers and redhorse) and ictalurids (catfish and bullheads). The lake contains a low abundance of desirable fish species such as largemouth bass, bluegill, and black crappie. The lack of desirable fish is a direct result of the shallow lake depths, high turbidity levels, and low amounts of aquatic vegetation. In addition to being preferred recreational fishes, these species can be indicative of a healthier river backwater habitat.

Lake Belle View currently represents ideal common carp habitat, including shallow depths, turbid waters, and fluctuating water quality conditions. Common carp are an exotic species originally introduced to the United States in the 1800's. They are undesirable and often have an adverse effect on aquatic resources. Common carp feed on aquatic vegetation and re-suspend fine sediments, both of which further exacerbate poor water quality and suppress desirable fish species. Lake Belle View serves as a nursery for common carp fry and juveniles that eventually populate the Sugar River both above and below Lake Belle View.

## 2.6 Historic and Cultural Resources

To meet the Corps' requirements promulgated under Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) and the implementing regulations 36 CFR Part 800: "Protection of Historic Properties," the Corps conducted research and investigations for historic properties within the project and Area of Potential Effect (APE). This research and investigation was conducted to determine effects to sites eligible for, or listed on, the National Register of Historic Places. Although no previously recorded or reported historic properties are located within the project area, prehistoric occupations were documented in the general vicinity.

The Corps developed a list of consulting parties and invited by letter (May 23, 2000, Appendix A), those on the distribution list to comment on the project and the Corps' recommendation for a Phase I Intensive (Archeological) Survey on all land surfaces proposed for construction, dredged material placement and along any bankline proposed for widening by excavation (APE). By copy of the May 23, 2000, correspondence, interested parties, which desired to continue to be consulted on future topics relevant to compliance concerning this project, were asked to reply or comment on the Corps' recommendation.

Allowing for tribal and other consulting parties review and comment on the project and proposal for a Phase I survey and investigations contributes to fulfilling Corps' obligations as set forth in the NHPA (PL 89-665), as amended; the National Environmental Policy Act of 1969 (PL 91-190); Executive Order (EO) 11593 for the "Protection and Enhancement of the Cultural Environment" (Federal Register, May 13, 1971); the Archaeological and Historical Preservation Act of 1974 (PL 93-291); the ACHP "Regulations for the Protection of Historic and Cultural Properties" (36 CFR, Part 800); and the applicable National Park Service and Corps regulations.

Responses and comments on the May 23, 2000, Corps correspondence were received from the Menominee Indian Tribe of Wisconsin, Keshena, Wisconsin (May 31, 2000, Appendix A); State Historical Society of Wisconsin (SHSW), Madison, Wisconsin (June 7, 2000, Appendix A); and the Forest County Potawatomi Community, Crandon, Wisconsin (July 19, 2000, Appendix A). These tribes and the SHSW expressed an interest in the potential for archeological resources within the project, and their support for the proposed Phase I archeological survey. These parties desired continued consultation and coordination and are included on all distribution lists on topics relevant to compliance concerning this project.

The Village, SHSW, and consulting parties were notified that the Phase I (Archeological) survey would be conducted along the shoreline and other terrestrial areas, including potential eroded lands, the community park, potential dredged material containment areas, and adjacent architectural buildings, structures, and remains, identified as the former mill/hydroelectric race and building foundations, including an architectural survey of the residence at 47 River Drive Street. Portions of the land containing this residence may be within the potential APE. Areas not proposed for architectural and archeological survey within the APE are the aquatic dredged cuts/excavation channels/berms, armored overtopping and riffle structures, aquatic fish passage structures, and the 109 acres of aquatic habitat. The Corps contracted the Phase I Archeological, Historic Architectural, and Geomorphological survey and investigations during the summer of 2002, meeting all state and Federal guidance and regulations.

All consulting and interested parties on Corps distribution lists must be aware that the specific locations of historic and archeological properties are subject to protection through nondisclosure under Section 304 of the National Historic Preservation Act. All maps subject to public review/access shall not contain any information on archeological sites. This information is not to be released in order to protect the resources at the sites. Any request for site location information, planning documents with site location information, and archeological site reports must contain the comment from the State Historic Preservation Officer, State Historical Society of Wisconsin, Madison, Wisconsin.

## **2.7 Water Quality**

Evaluation of existing water quality of the area is best described by delineating the lake and the river.

**2.7.1 Lake.** Because Lake Belle View is a shallow, flow-through lake, water temperature and dissolved oxygen conditions are often similar throughout the lake. Although limited, existing data suggest that summer lake water temperatures may average between 22°C and 26°C (72 to 79°F), with maximum daily temperatures as high as 30°C (86°F). During the summer, Lake Belle View has a warming effect on Sugar River temperatures. Continuous temperature data collected during the month of August 2000 demonstrated an average river inflow temperature of 20°C (68°F) and an average outflow temperature of 22°C (72°F).

Existing, limited data suggest that dissolved oxygen (DO) levels generally remain above 5 mg/L. During the summer, DO levels can exceed saturation levels during daylight levels due to the photosynthetic action of blue green algae. Although the existing data have not shown anoxic (devoid of oxygen) conditions during the summer in Lake Belle View, such conditions often occur on eutrophic (nutrient

enriched) lakes as a result of respiration. However, due to its shallow depth, wind and wave action, and river inflow (and subsequent short retention time), such conditions may not be expected to occur frequently within the lake.

Virtually no data exist for total suspended solids within Lake Belle View. However, the lake can certainly be considered a turbid system. UW (1995) did collect some secchi depth measurements (a measure of water transparency) with depth observations of less than 2 feet. Other observations by UW (1995) include conductivity measurements ranging between 437 and 682 :S/cm, and pH measurements that fell between 7.5 and 8.7.

UW (1995) also collected point measurements for total phosphorous within Lake Belle View during June and July of 1995. Total phosphorous within the lake averaged 0.31 mg/L, with a range of 0.138 to 1.04 mg/L (N = 16). Total phosphorous also was measured upstream within the Sugar River. Total phosphorous concentrations averaged 0.41 mg/L, with a range of 0.146 to 0.636 mg/L (N = 6). These observations would identify Lake Belle View as a highly eutrophic system, relative to other lakes (Wetzel 1983).<sup>2</sup> The water quality traits exhibited by Lake Belle View are consistent with degraded systems.

**2.7.2 River.** The dam at Lake Belle View currently serves as an impassable barrier to upstream movement for fisheries and aquatic resources. As such, it divides the upper watershed from the river below Lake Belle View. Watershed characteristics of the Sugar River near Lake Belle View have briefly been described above. Above Lake Belle View, the Sugar River first branches into two main forks (West Branch Sugar River and Sugar River) and eventually out into numerous tributaries that form the upper watershed. Above Lake Belle View is approximately 218 miles of main stem and tributary stream habitat. Habitat types are variable, ranging from cold-water headwater streams, to warm-water forage fishery tributaries, to the main stem Sugar River that supports warm, cool, and cold-water fishery resources. The current WDNR stream classification for the Sugar River's fish and aquatic life community is "cold" from its headwaters downstream to French Town Road, which is 5 miles above Lake Belle View. Overall habitat quality for the upper watershed varies between high-quality streams to low-quality areas that serve as little more than drainage ditches. However, recent improvements in land-use practices have resulted in better overall water quality and in-stream habitat conditions within the Sugar River. Within the last 20 years, various streambank restoration projects have helped to improve stream habitat conditions. Currently, water quality in the upper Sugar River is generally considered to be good (Sugar-Pecatonica Rivers Water Quality Management Plan, March 1995, Wisconsin DNR). The entire stretch of the Sugar River within this upper watershed is classified as Exceptional Resource under the State of Wisconsin's anti-degradation rules, NR 102 and NR 207.

Fishery surveys of the upper Sugar River performed in 1974 and 1992 resulted in the collection of 31 and 28 species of fish, respectively (UW 1995; Wisconsin DNR unpublished data and personal communications). This includes collection of the mottled sculpin, a fish that is generally an indicator of good water quality. Other species collected include both smallmouth bass (a cool-water species) and brown trout (a cold-water species). The 1992 survey also collected high numbers of yearling carp at several stations. These undesirable fish most likely originated from Lake Belle View.

Below Lake Belle View, the Sugar River flows freely downstream before encountering the next impassable dam at Albany, approximately 22 miles downstream. Although available fishery data are limited, the Sugar River main stem in this stretch supports both cool- and warm-water fishery resources. The dam creating Lake Belle View affects downstream water quality and fishery resource communities. As mentioned above, the lake increases average daily water temperatures during summer months. Downstream flows also may be more turbid as a result of resuspended sediments within the lake.

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<sup>2</sup> Wetzel, Robert G. 1983. *Limnology*. Second Edition. Michigan State University. CBS College Publishing.

Moreover, young of year carp originating from the lake likely augment common carp populations in the lower river.

## 2.8 Endangered Species

Four federally listed endangered or threatened species from Dane County, Wisconsin, are known and listed in Table 2.2. However, none are believed to occur in the project area.

**Table 2.2. Species listed, or proposed for listing, as threatened or endangered under the Federal Endangered Species Act of 1973 (as amended) that are known to occur within Dane County, Wisconsin.**

Common Name	Scientific Name	Status	Habitat
Bald eagle	<i>Haliaeetus leucocephalus</i>	threatened	Wintering along open water
Prairie bush-clover	<i>Lespedeza leptostachva</i>	threatened	Dry to mesic prairies with gravelly soil
Eastern prairie fringed orchid	<i>Platanthera leucophaea</i>	threatened	Wet grasslands
Higgins' eye pearly mussel	<i>Lampsilis higginsi</i>	endangered	Lower Wisconsin River

## 2.9 Hazardous, Toxic, and Radioactive Waste (HTRW)

A hazardous, toxic, and radioactive waste (HTRW) compliance assessment was conducted. The project area is located in an area that primarily is used and has historically been used for agricultural use. There is little evidence that the land has been used for other purposes. There were no obvious indications of potential contamination sources or migration pathways from surrounding properties. It does not appear that there is a risk of HTRW contamination within the project area. See Appendix D for a copy of the HTRW Documentation Report.

## 2.10 Sedimentation

River sediments have been accumulating in Lake Belle View since its creation. River flows from the Sugar River enter Lake Belle View, at which point water velocities decrease and suspended sediments fall from the water column. Over time, sedimentation has reduced lake depths and overall habitat quality. Sedimentation of the lake has slowed over recent years, reaching equilibrium. It is estimated that 0.1 inch of sediment is accumulating per year and that an average of 5 feet of sediment has been deposited in the lake.

## 2.11 Habitat Needs Assessment

The majority of the lake is considered to be poor quality wetland habitat due to its lack of vegetation and depth diversity. The lake also suffers from poor water quality and an abundance of rough fish. The river above and below the lake is affected by increased water temperature and rough fish populations. The area needs more free flowing river habitat, higher quality wetlands, and improved lake habitat.

## **2.12 Related Studies and Efforts**

The restoration of the Lake Belle View area began as an organized effort in 1982. The Village of Belleville and the Township of Montrose co-founded the Sugar River Reservoir Association. The community leaders realized that the lake was starting to deteriorate. Efforts were initiated to begin a project that would restore the lake and the Sugar River. In 1995, the University of Wisconsin at Madison undertook an extensive study of the lake. Under the direction of Dr. Ken Potter, the 1995 Water Resources Management Workshop published “Lake Belle View: Research Findings and Alternatives for the Future.” This study conducted several surveys of the lake, including vegetation and invertebrates. The results showed that the lake lacks species diversity. However, downstream of the dam there is a more diverse macroinvertebrate population as would be expected with hard substrate and flowing water. The report summarized the typical problems that the lake experiences. This study effort has served as a backbone for the restoration project.

The Upper Sugar River Initiative (USRI) is a project developed by the WDNR, which was funded by a U.S. EPA grant to join local government, natural resources agencies, private organizations, community groups, and volunteers. The effort serves to analyze the watershed’s pressing ecological issues, identify solutions to those issues, and develop an action plan that addresses priority issues such as sedimentation, habitat restoration, or growth and land use impacts in the watershed. The USRI identified and prioritized water resource concerns in the watershed to develop an action plan. The Upper Sugar River Initiative Coordinating Committee (USRICC) was developed to oversee the implementation of the USRI Action Plan. The goals are to protect the Upper Sugar River water quality through innovative strategies that capitalize on existing stakeholder involvement; improve habitat for terrestrial and aquatic life; increase water-based recreational activities; investigate methods of improving groundwater infiltration to protect base flows in Badger Mill Creek; and educate students about local water resources issues.

Sponsored by the USRI, the Upper Sugar River Watershed Association (USRWA) serves as a forum for the preservation and enhancement of the watershed resources through an impartial partnership among diverse community interests. The USRWA is a formal group that consists of those who live, work, or play in the watershed, has a board of directors, has a paid membership, and has their own funds. The group’s areas of concern include education and outreach; stormwater management and construction site erosion control; soil and water quality issues; riparian zone issues; environmental, conservation, and institutional issues; and recreation.

Through the funds provided by the EPA grant, the USRICC sponsored many projects related to the watershed problems. The most relevant efforts to this project include: providing funding for water quality studies at Lake Belle View, working with the cities of Madison and Verona and the village of Mount Horeb in the development of the comprehensive stormwater management plan, and working with Belleville, Verona and Mount Horeb high schools to develop environmental education curricula emphasizing water quality in the watershed. Although the EPA grant is nearing its end, these efforts will continue.

Dane County funded study efforts by MSA Consultants and commissioned by the Village. These efforts included hydrologic, water quality, and floodplain studies and development of a lake base map. The hydrologic study, which focused on the recharge capability of the lake when separated from the river, indicated that recharge would occur. These studies provided a valuable base for the start of the feasibility study.

DESIGN Dane is an initiative coordinated by Dane County with the goal of improving the human and natural environment while sustaining intelligent growth. The Land Use Action Plan supported by DESIGN Dane outlines ways that local cities and villages can partner with the county. The plan specifically mentions preserving lands, such as wetlands, that have irreplaceable functions.