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for the Library Bay Committee
of the Beaver Dam Lake Management District
in conjunction with the City of Cumberland

Library Lake
Lake Management Plan

Draft for DNR Review: March 1, 2010

water | ecology | community

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Special thanks to Lake District volunteers, Library Lake Committee members, and DNR staff who provided information.

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LIBRARY LAKE DESCRIPTION

General Description

Library Lake is a shallow, 12.8-acre lake located in the city of Cumberland (T35N R13W S7) in Northwest Wisconsin (WBIC 2081500). A map of the project area is shown as Figure 1. Library Lake is connected to Beaver Dam Lake by a box culvert under Grove Street. Aquatic plants cover nearly the entire lake bottom with emergent plants along the shoreline and in shallow water; floating plants at moderate depths; and submerged vegetation in the deepest water. The maximum lake depth is approximately 20.5 feet at normal water levels.

The lake is entirely surrounded by urban development with Highway 63 on it south side, homes on the west and north side, and parking lots and businesses on the east. The east parking area is a major connection to downtown Cumberland serving the newly remodeled public library, taverns and restaurants, retail establishments, and the Department of Natural Resources offices.

Lake History

Cumberland residents and visitors recall Library Lake in the 1960s as an open water lake where boating and water skiing were possible. Boating is now greatly limited on the lake.

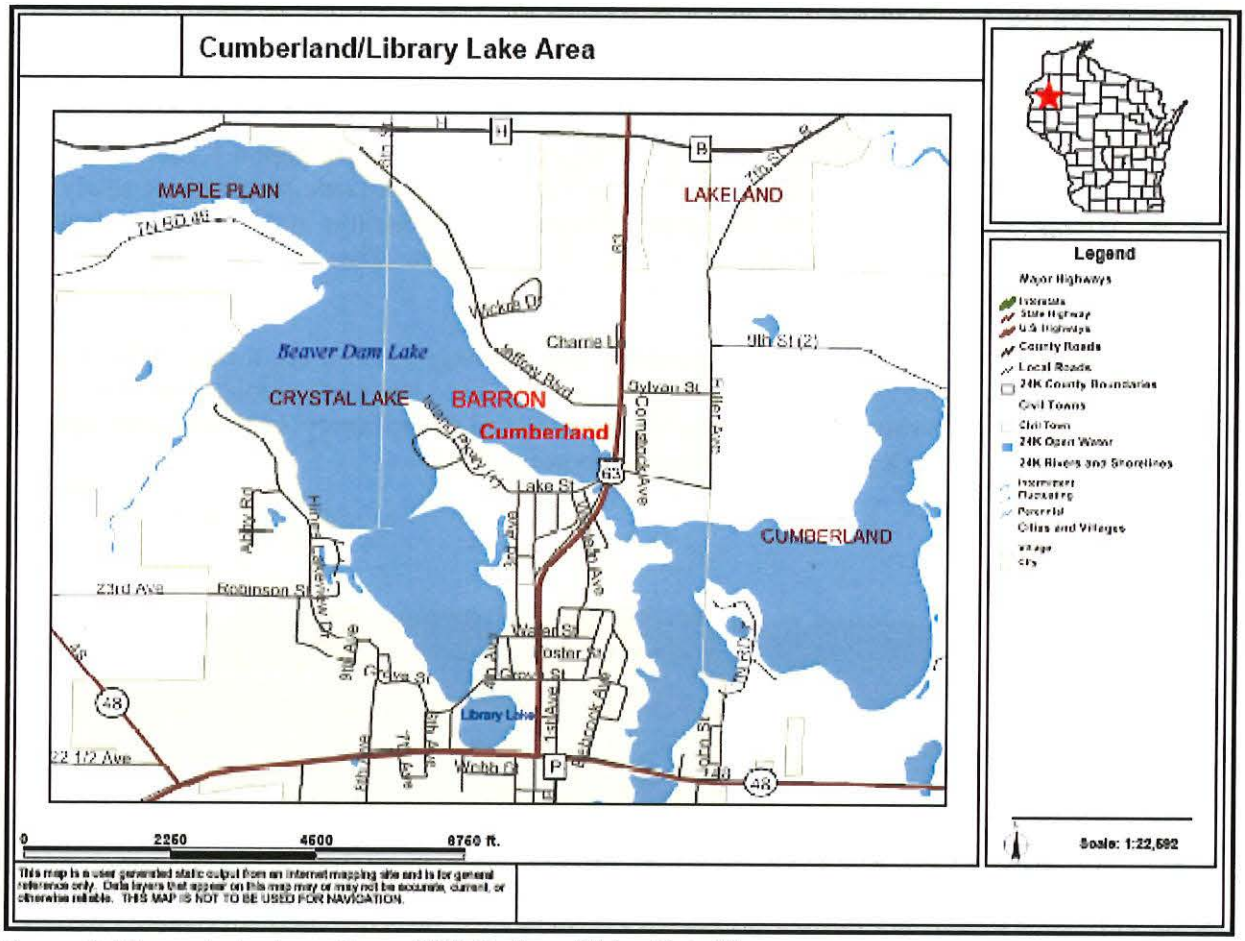


Figure 1. Library Lake Area. From DNR Surface Water Data Viewer

Historical Water Flow Patterns

The map below (Figure 2), dating back to 1888, indicates an outlet from Library Lake to Collingwood Lake. The outflow of Library Lake was blocked with the construction of State Highway 63/48. With this blockage, there is no natural flushing of sediments from Library Lake and no ability to control flood levels in high water years.

Beaver Dam Lake currently has only one outlet – on County Highway P on the south end of the lake. Beaver Dam Lake also receives water from Duck Lake via a channel that was created in the early 1900's. This channel routed additional water into the Beaver Dam Lake system and has increased the potential for flooding. Future flood analysis will gather information on upstream inflows, dam outlet control, cross-sections, and additional data to better understand this concern and an appropriate remediation method.[1]

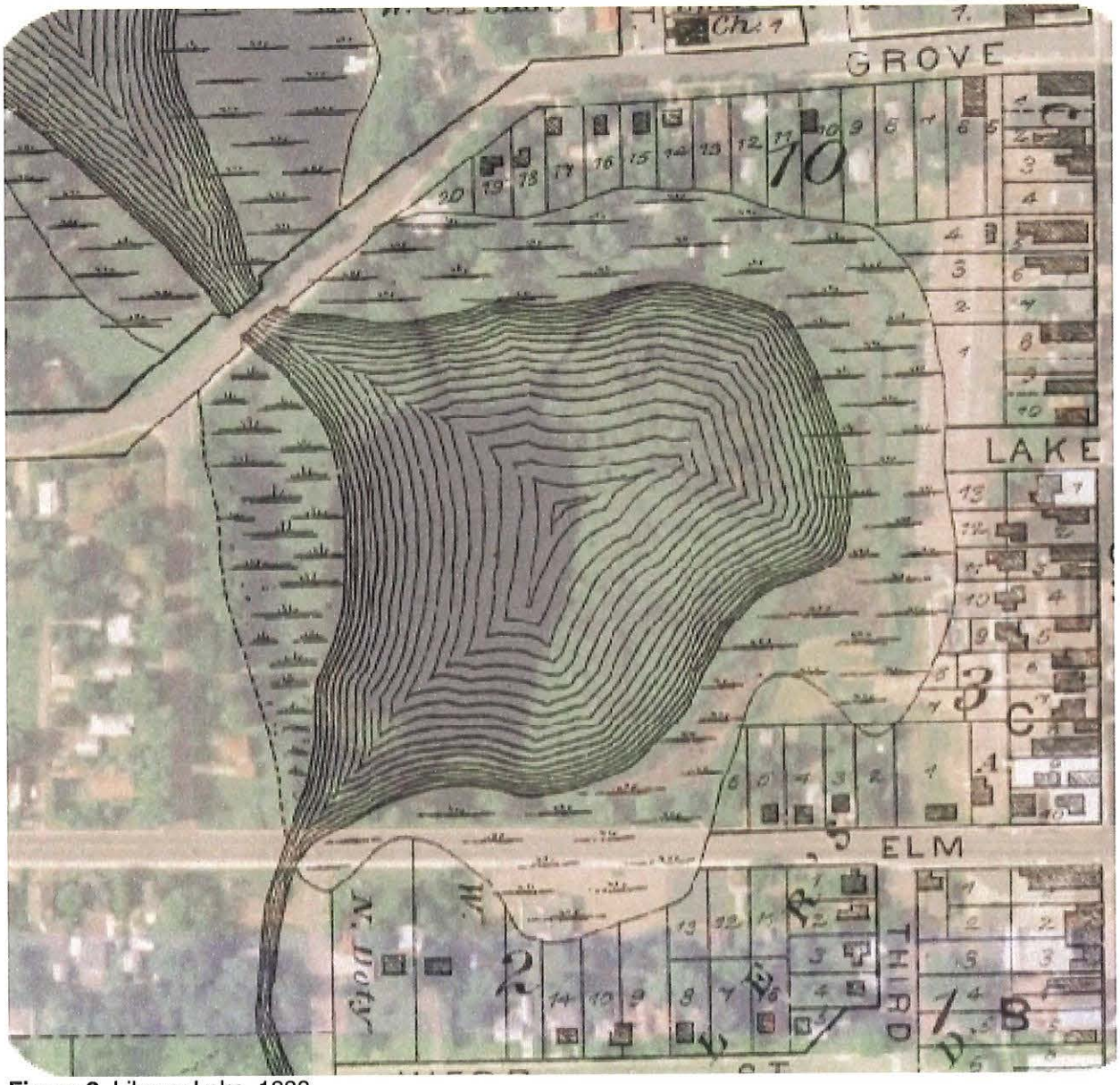


Figure 2. Library Lake, 1888

[1] Beaver Dam Lake Management District. June 2008.

Lake Water Quality

Library Lake is mesotrophic with minor aesthetic impacts due to algae growth. Volunteer lake monitor, Nancy Bentz, collected lake monitoring data off and on from 1992 until 2009 in Library Lake. Nancy collected data periodically from late May until late September. The most common measurement taken was Secchi depth. The Secchi depth reported is the depth at which the black and white Secchi disk is no longer visible when it is lowered into the water. Greater Secchi depths occur with greater water clarity. Secchi depths average 9.5 feet. The maximum lake depth is 20.5 feet at normal water levels. The few chlorophyll a samples at the surface averaged about 2.5 micrograms per liter in June and July of 2007. These values and Secchi measurements place Library Lake in a mesotrophic or moderate nutrient status classification.

Lake Watershed

The watershed or land that drains to Library Lake is located entirely within the city limits of Cumberland. A series of maps (Figure 3 through Figure 5) illustrates the land use, drainage areas, storm sewers and culvert outfalls within the drainage areas. The mapped information was used to estimate, through mathematical modeling, the amount of pollutants that are carried in runoff water through storm sewers to the lake. Table 1 outlines the land use types found within the Library Lake watershed (mapped in Figure 3) and the respective pollutant loads. The User's Manual for PLOAD, a simplified model used to calculate pollutant loads for watersheds, provides a set of export coefficients by land cover type based on the scientific literature (USEPA, 2001). This data was used to estimate the loading generated from each land use category.

Table 1. Land Cover Statistics and Pollutant Load by Land Cover Type

Land Cover Type	Acres	Percent	Total Phosphorus		Total Suspended Solids	
			Export Coeff. (lb/yr/ac)	Annual Load (lb/yr)	Export Coeff. (lb/yr/ac)	Annual Load (lb/yr)
Commercial	13.84	27%	1.0	14	400	5500
Residential (1/4 acre lots)	9.55	19%	1.0	10	85	810
Open Space	12.10	24%	0.03	0.36	2.6	31
Residential (1/2 acre lots)	3.96	8%	0.80	3.2	80	320
Residential (1 acre lots)	2.86	6%	0.47	1.3	35	100
Road	9.1	18%	1.05	9.6	560	5100
TOTAL*	**51.4**	**100%**		**38**		**11900**

* Contributions to the lake excluding the lake itself which is 14.6 acres.

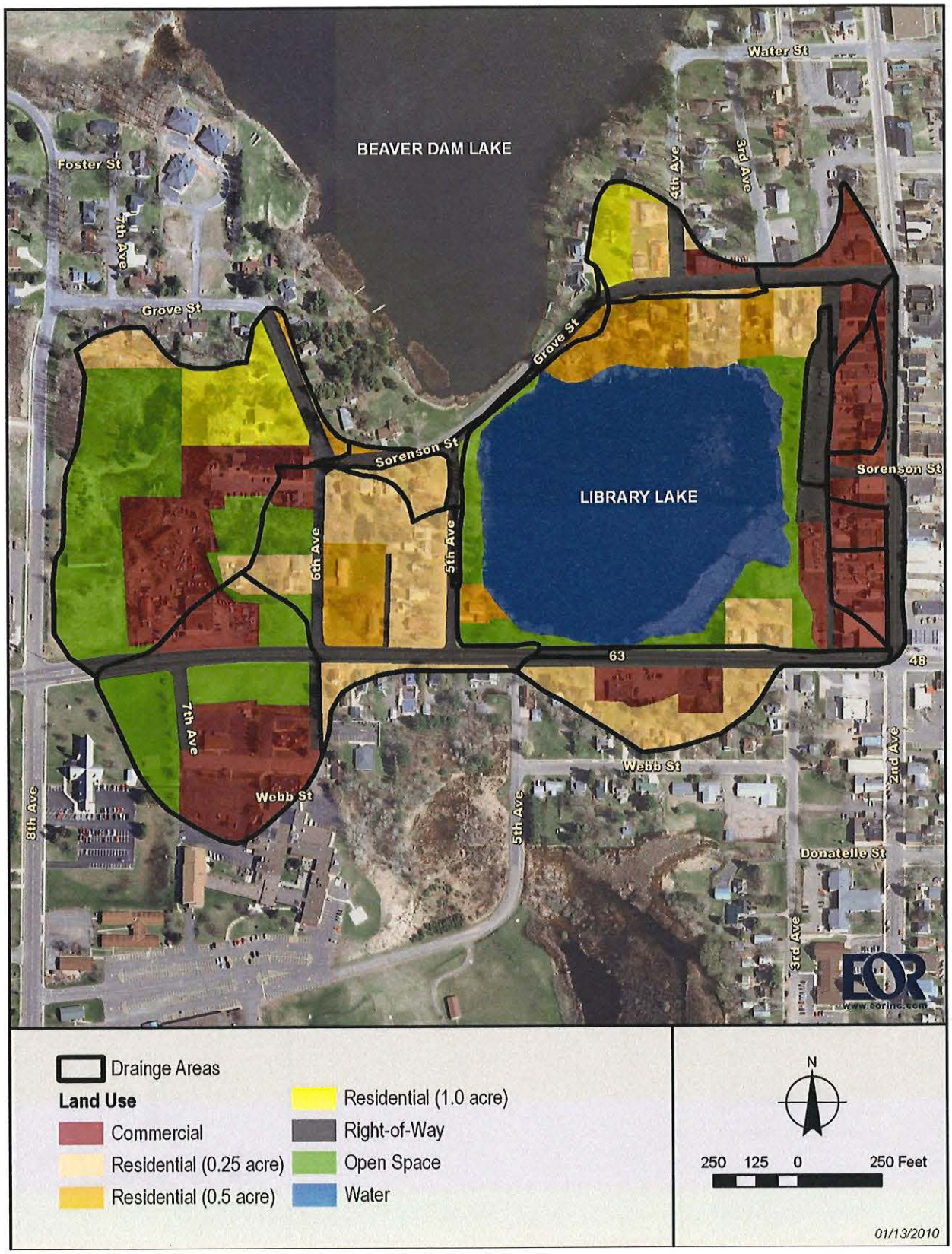


Figure 3. Land Uses in Library Lake Drainage Areas

Figure 4. Drainage Areas with Stormsewers Indicated

Pollutant modeling using Program for Predicting Polluting Particle Passage thru Pits, Puddles & Ponds (P8) (Walker, 2007) was used to determine the loading [total phosphorus (TP) and total suspended solids (TSS)] generated at each stormsewer outfall as labeled in Figure 5. Average annual loading for existing and proposed conditions are based on model results using 50 years of historic climate data. The results of this modeling are reported in Table 2 and Table 3. For comparison purposes, drainage areas and loading for each outfall represents proposed routing of stormwater (e.g. Outfall 2 includes a 0.81 subwatershed which, under existing conditions, discharges directly to Library Lake but discharges to a regional pond under proposed conditions). Overall these tables represent a 73% reduction in TP loading to Library Lake and an 86% reduction in TSS loading.

Table 2. Outfall Summary Data – Average Annual Phosphorus Loading

Outfall	Drainage Area	Existing Average Annual Load	Projected Average Annual Load	Change	Percent Change
	ac	*lb/yr*	*lb/yr*	*lb/yr*	*%*
1	3.63	3.32	0.70	-2.62	79%
2	1.94	1.88	1.20	-5.39	82%
3	1.77	2.90			
4	0.53	0.80			
5	0.81	1.01			
6	4.11	3.83	1.05	-2.78	73%
7	15.32	12.78	2.45	-10.33	81%
8	0.10	0.07	0.02	-0.05	71%
9	0.65	0.20	2.84	-3.03	52%
10	12.49	5.33			
11	0.57	0.34			
Direct	9.47	5.86	2.12	-3.74	64%
TOTAL	**51.4**	**38**	**10**	**-28**	**73%**

Table 3. Outfall Summary Data – Average Annual Total Suspended Solids Loading

Outfall	Drainage Area	Existing Average Annual Load	Projected Average Annual Load	Change	Percent Change
	ac	*lb/yr*	*lb/yr*	*lb/yr*	*%*
1	3.63	1025.76	83.89	-941.87	92%
2	1.94	583.12	105.11	-1934.76	95%
3	1.77	897.43			
4	0.53	246.65			
5	0.81	312.67			
6	4.11	1185.15	176.38	-1008.77	85%
7	15.32	3954.13	385.39	-3568.74	90%
8	0.10	22.14	2.70	-19.44	88%
9	0.65	60.66	480.13	-1341.93	74%
10	12.49	1654.82			
11	0.57	106.58			
Direct	9.47	1811.68	437.58	-1374.10	76%
TOTAL	**51.4**	**11900**	**1700**	**-10200**	**86%**

Table 4 summarizes information for each of the culvert outfalls illustrated in Figure 5. The information includes the drainage area in acres, existing peak flow, and projected peak flow with stormwater management practices installed. Drainage areas for each outfall represents existing routing of stormwater (e.g. Outfall 2 acreage and existing peak flow excludes a 0.81 subwatershed which, under existing conditions, discharges directly to Library Lake but discharges to a regional pond under proposed conditions). These calculations are for the 100-year, 24-hour storm – a 5.8 inch rain event.

Table 4. Outfall Summary Data – 100-Year, 24-Hour Storm

Outfall	Drainage Area	Existing Peak Flow	Projected Peak Rate	Change
	ac	*cfs*	*cfs*	*cfs*
1	3.63	6.89	5.86	-1.03
2	1.13	5.20	19.06	-1.87
3	1.77	9.03		
4	0.53	2.68		
5	0.81	4.02		
6	3.98	7.56	4.71	-2.85
7	15.32	25.41	19.86	-5.55
8	0.10	0.40	0.24	-0.16
9	0.65	1.56	5.71	-2.39
10	12.49	5.51		
11	0.57	1.03		

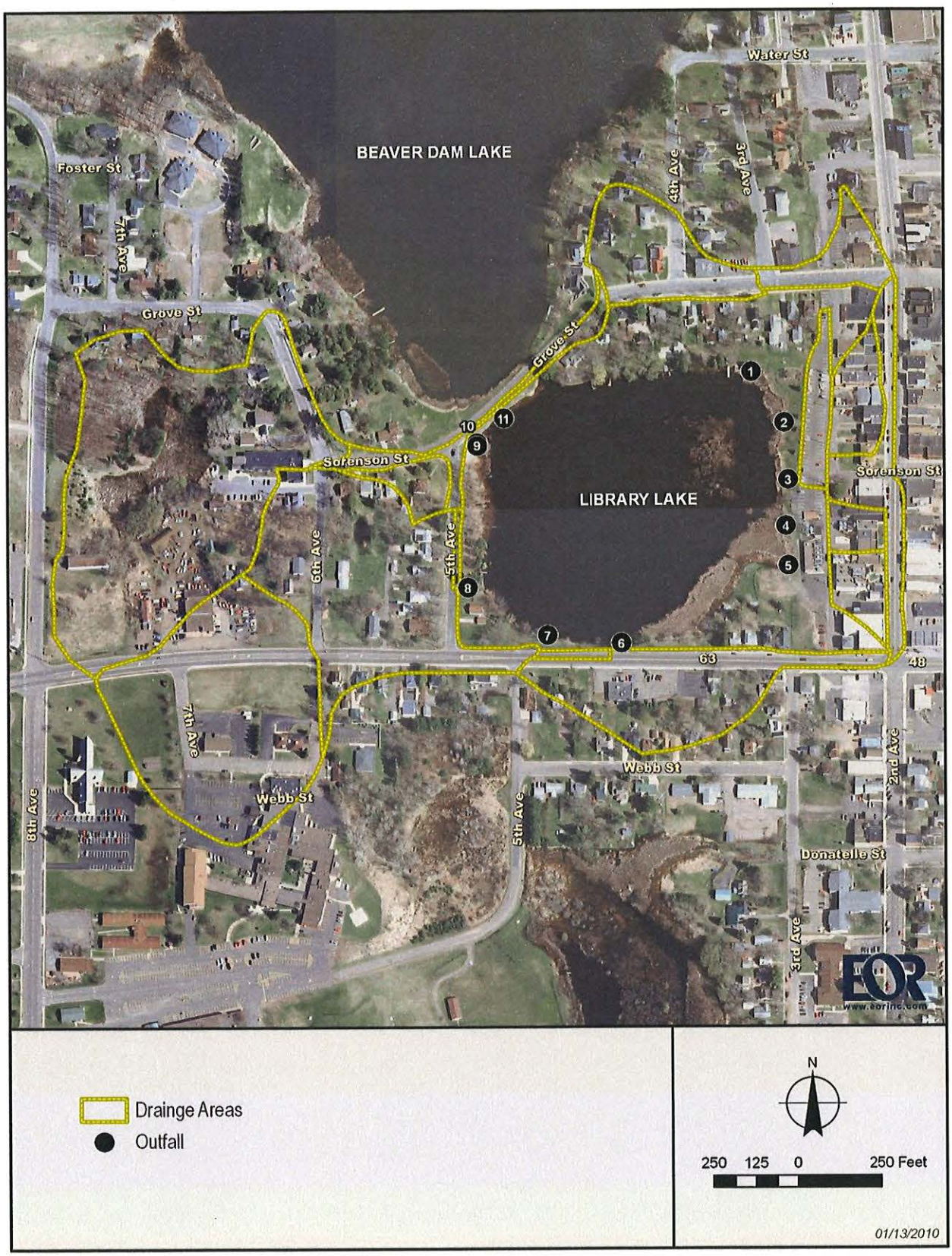


Figure 5. Drainage Areas with Stormsewer Outfalls

WATER QUALITY PROBLEMS AND THREATS

Stormwater Runoff

Stormwater runoff is the primary source of nonpoint source pollution to Library Lake. There are eleven storm sewers that discharge into the lake. These storm sewers drain a 41.3 acre watershed to this 12.8 acre[2] lake. With no existing stormwater treatment, storm sewers carry significant quantities of sediment, phosphorus, salt, and petroleum products to the lake. Lake modeling from the early 1990's indicated that urban runoff sources contributed 86 percent of the phosphorus loading on an annual basis (SEH 1992). There are no point sources that flow to Library Lake.[3] Point sources are direct discharges through a pipe from sources such as factories or waste water treatment plants.

Habitat Impacts

Habitat conditions have certainly been altered over the years with changes in water flow, discharges from storm sewers, and development around the lake. Resulting sediment accumulation has changed Library Lake from a partially open water system to one nearly entirely covered by emergent, floating, and submerged aquatic plants. While aquatic plants in the lake provide fish and wildlife habitat, stabilize lake sediments, tie up nutrients, and create more clear water conditions; they also limit the ability for navigation and create aesthetic concerns. In some areas of the lake, accumulated sediments have resulted in greatly simplified monocultures of aquatic plants. Native vegetation has been almost completely removed from shoreline areas.

Sediment Accumulation

Accumulated sediments have clearly changed water depth and vegetative growth in Library Lake over time. Lake Restoration, Inc. completed a sediment probing study for the Beaver Dam Lake Management District in October 2007. The study found that soft sediment depths varied from 1 to 15 feet.

Open Water Extent

Historical aerial photos indicate significant changes in the extent of open water in Library Lake over the years. Figure 6 indicates the extent of open water from the year 1939 to 2005. In that time period, there have been steady decreases in the extent of open water in the summer. The lake's open water area has been reduced from approximately 90 percent to 23 percent of the 1939 lake surface area through 2005. Changes are a result of sediment additions through stormwater runoff and accumulated decayed plant material in lake sediment.

[2] Lake acreage from DNR Surface Water Data Viewer.
[3] Sheri Snowbank, DNR. Personal communication via email. January 11, 2010.

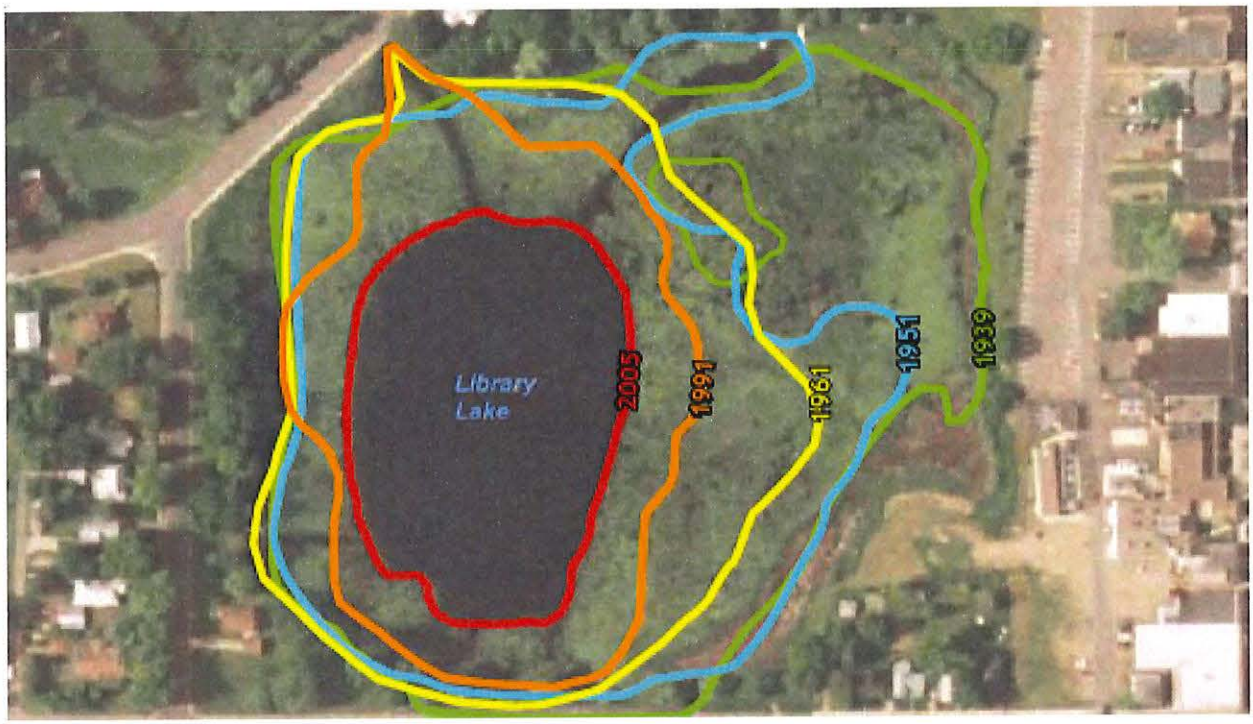


Figure 6. Changes in Library Lake Open Water Extent.
Source: Barr Engineering Company. Note that the 1939 photo was taken in May when aquatic plant growth was likely minimal; all other years' photos were taken in the summer.

Shoreline Vegetation

Existing native shoreline vegetation is currently very limited around Library Lake. Lawn grasses are present around the south, east, and northern shores of the lake. The west side of the lake includes undeveloped property which may have some remnant native vegetation.

FISHERY AND AQUATIC HABITATS

Aquatic Plants

The Beaver Dam Lake Management District commissioned a point intercept study of aquatic plants in Library Lake and Beaver Dam Lake in 2009. Endangered Resource Services sampled 139 points to complete this survey under subcontract with Barr Engineering. Previous plant surveys used transects to collect data or used a less dense grid of sample points. Plants grew to a depth of 15.5 feet in 2009. Thirty-nine different plant species were found. In addition to the plants listed in Table 3, aquatic moss and filamentous algae were recorded.

The Department of Natural Resources completed a survey of aquatic plant and other aquatic habitat features for Beaver Dam Lake (including Library Lake) in 2007. Plants found in the 2007 DNR survey are also indicated in Table 3.

The floristic quality index rating (FQI) from the 2009 survey was 34.29. The FQI was well above the mean FQI of 20.9 for the Northern Central Hardwood Forests Region (Nichols 1999).

***The Floristic Quality Index** (FQI) is an index developed by Dr. Stanley Nichols of the University of Wisconsin-Extension. This index is a measure of the plant community response to development and human influence on the lake. It takes into account the species of aquatic plants present and their tolerance for changing water quality and habitat characteristics. A plant's tolerance is expressed as a coefficient of conservatism (C). Native plants in Wisconsin are assigned a conservatism value between 0 and 10. A plant with a high conservatism value has more specialized habitat requirements and is less tolerant of disturbance and/or water quality changes. Those with lower values are more able to adapt to disturbed or changing conditions, and can therefore be found in a wider range of habitats.*

The FQI is calculated using the number of species present and these plants' conservatism values. A higher FQI generally indicates a healthier aquatic plant community.

A general description of aquatic plant zones is shown in Figure 7 below. This survey was completed by EOR staff in July 2009.

While the island is indicated as a "purple loosestrife zone," it also may provide a location for waterfowl nesting, according to DNR biologist Kevin Morgan.[4] It is important to note that habitat diversity of the island is limited by the presence of a large stand of purple loosestrife (*Lythrum salicaria*). Purple loosestrife is a nonnative, invasive plant.

[4] Project Design Review Meeting Notes Harmony Environmental. 10/21/09.

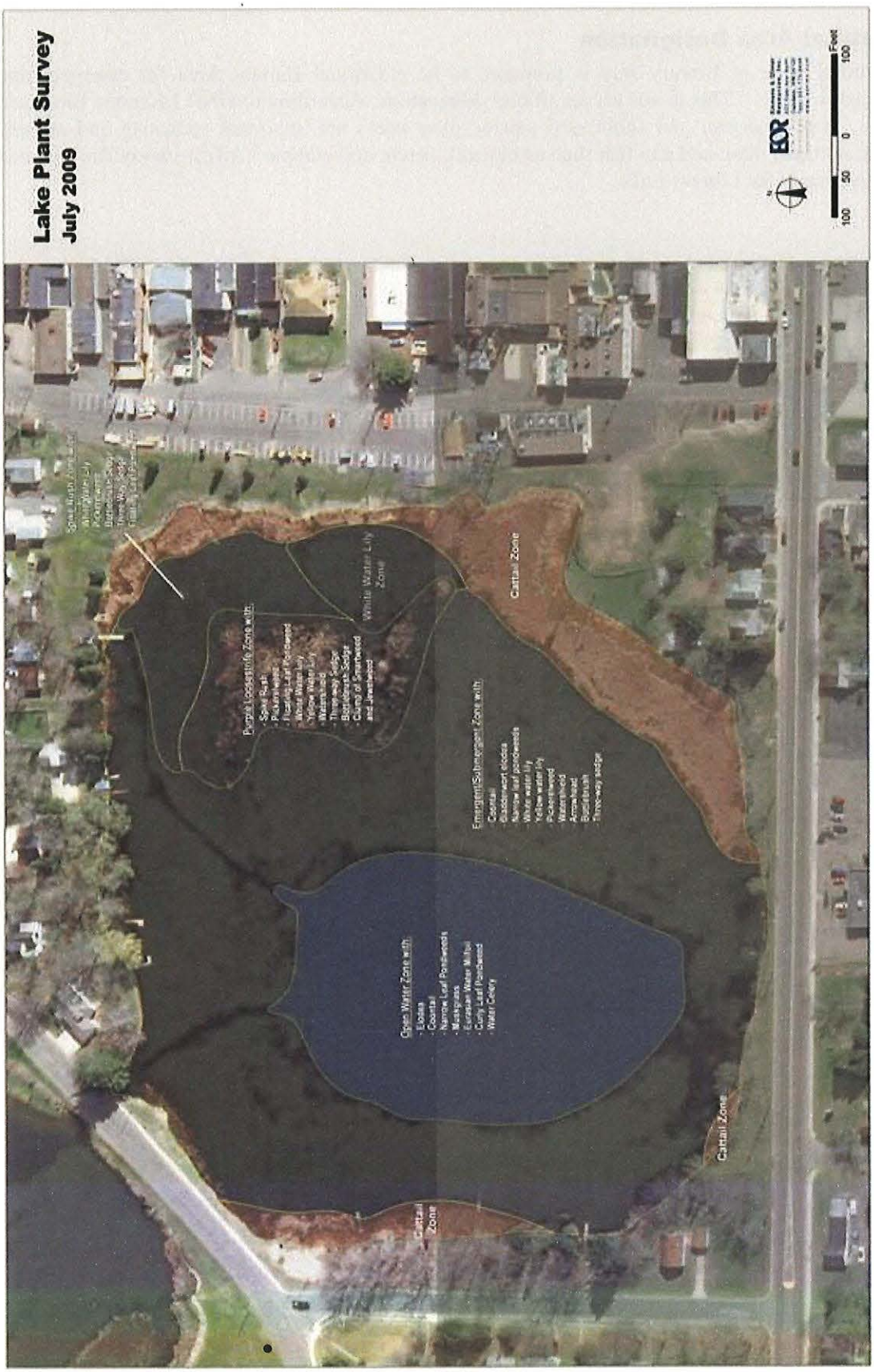


Figure 7. Aquatic Plant Zones of Library Lake. July 2009

Critical Habitat Area Designation

The entire littoral zone of Library Bay is proposed to be a Critical Habitat Area for emergent and submersed aquatic plants.[5] This is not yet an official designation. According to DNR Fisheries Biologist, Heath Benike, these emergent and submersed aquatic plant areas are important spawning and nursery areas for bass; northern pike; and pan fish such as bluegill, perch, and crappie.[6] A fish survey has not been completed specifically for Library Lake.

The Wisconsin Department of Natural Resources completes critical habitat area surveys and reports and has the authority to protect these areas. The *critical habitat* area designation provides a framework for management decisions that impact the ecosystem of the lake. *Critical habitat* areas include sensitive areas and *public rights features*. Sensitive areas offer critical or unique fish and wildlife habitat (including seasonal or life stage requirements) or offer water quality or erosion control benefits to the area (Administrative code 107.05(3)(1)(1)). *Public rights features* are areas that fulfill the right of the public for navigation, quality and quantity of water, fishing, swimming, or natural scenic beauty. DNR protection of these areas generally occurs through aquatic plant management and water regulations permit review and project oversight.

[5] Alex Smith, DNR Biologist. Email communication. 9/11/09.
[6] Project Design Review Meeting Notes Harmony Environmental. 10/21/09.

Table 5. Aquatic Plant Species Present in Library Lake

Species	Common Name	2009 Point Intercept Survey – including visuals (ERS)	2007 Critical Habitat Area Survey (DNR)[7]
Brasenia schreberi	Watershield	X	X
Calla sp.	Water arum		X
Carex comosa	Bottle brush sedge	X	
Ceratophyllum demersum	Coontail	X	X
Chara sp.	Muskgrass	X	
Dulichium arundinaceum	Three-way sedge	X	
Eleocharis acicularis	Needle spikerush	X	
Eleocharis erythropoda	Red-footed spikerush	X	
Eleocharis robbinsii	Robbins spikerush	X	
Elodea canadensis	Common waterweed	X	
Heteranthera dubia	Water star-grass	X	
Lemna minor	Small duckweed	X	
Lemna trisulca	Forked duckweed	X	
Ludwigia palustris	Marsh purslane	X	
Lythrum salicaria	Purple loosestrife	X	X
Myriophyllum spicatum	Eurasian water milfoil	X	
Najas flexilis	Bushy pondweed	X	
Nitella sp.	Nitella	X	
Nuphar variegata	Spatterdock	X	
Nymphaea odorata	White water lily	X	X
Pontederia cordata	Pickerelweed	X	X
Potamogeton amplifolius	Large-leaf pondweed		X
Potamogeton crispus	Curly leaf pondweed	X	
Potamogeton foliosus	Leafy pondweed	X	
Potamogeton friesii	Frie's pondweed	X	
Potamogeton gramineus	Variable pondweed	X	X
Potamogeton illinoensis	Illinois pondweed	X	X
Potamogeton pusillus	Small pondweed	X	
Potamogeton natans	Floating-leaf pondweed		X
Potamogeton praelongus	White-stem pondweed		X
Potamogeton robbinsii	Robbins (fern) pondweed	X	X
Riccia fluitans	Slender riccia	X	
Sagittaria latifolia	Common arrowhead	X	X
Schoenoplectus subterminalis	Water bulrush	X	
Schoenoplectus tabernaemontani	Softstem bulrush	X	X
Scirpus sp.		X	
Sparganium emersum	Narrow-leaved bur-reed	X	
Spirodela polyrhiza	Large duckweed	X	
Typha latifolia	Broad-leaved cattail	X	X
Utricularia gibba	Creeping bladderwort	X	
Utricularia vulgaris	Common bladderwort	X	X
Valisneria americana	Wild celery		X

[7] Results from a draft survey list. Survey sheets for critical habitat area study do not include all species on the point intercept survey list.

AQUATIC PLANT MANAGEMENT

Eurasian Water Milfoil

Barr Engineering guided recent aquatic plant management (APM) for Beaver Dam Lake and Library Lake that focused on controlling Eurasian Water Milfoil (EWM). The 2009 draft APM plan recommends approximately 5 acres of ongoing early season Endothall (1 mg/L) and 2,4-D (0.5 mg/L) treatment for then non native species EWM and curly leaf pondweed in Library Lake. This treatment also occurred in 2008. The plan reports the following EWM coverage: 3.72 acres in 2008, 1.73 acres in 2009, and an additional 1.24 acres that had EWM in both years. An expanded treatment area (beyond the area where EWM was present) was recommended to allow for dilution of herbicide. These treatments do not appear to negatively impact native plant density or diversity. (Barr February 2009 and December 2007). Diver and hydraulic dredging for EWM control are not recommended in the APM plans (Barr 2006).

Eurasian water milfoil control has also involved biological control. The Department of Natural Resources supplemented a native weevil population by stocking milfoil weevils in Library Lake in June and July of 1996. Weevil density did not appear to increase over the next year. The EWM plants did show weevil damage. However, EWM increased overall, and the plants were healthy below where weevil damage occurred.

Navigation Channels

Navigation channel treatment to Library Lake and under Grove Street Bridge is suggested in a 2007 navigation channel map (Barr December 2007). Harvesting and herbicide (glyphosate) treatment were proposed for Library Bay in 2006 to reduce pondweed and water lily growth (Barr 2006).

Purple Loosestrife[8]

Management efforts that target purple loosestrife – which is abundant on the floating bog/island – are not discussed in the Barr management plans. Volunteers and Department of Natural Resources staff have used and monitored purple loosestrife biological control using beetles on Library Lake since the mid 1990's. The Department of Natural Resources used the Library Lake floating bog as one of the early release sites for the beetles (*Galerucella calmariensis* and/or *G. pusilla)* in the 1990s when the beetles were first approved for use.

DNR staff worked with a (now retired) teacher in the Cumberland schools to set up a beetle rearing station in 1998. Beetle rearing stations are established by collecting wild purple loosestrife plants and releasing a stock of beetles on the plants to allow them to multiply. Dave Blumer (former DNR staff) reports that the purple loosestrife rootstock collected from Library Lake already had abundant beetles. This was very good evidence of a well established beetle population on the bog in Library Lake. Library Lake was then used as a collection location for starter beetles for the Cumberland rearing program. Cumberland Middle and High School students assisted with rearing and distributing beetles to other locations on Beaver Dam Lake through the early 2000's.

[8] Email communications. January 14, 2010. Dave Blumer, S E H Scientist (formerly with the Department of Natural Resources) and Brock Woods, DNR.

By 2003, beetles were found throughout the Beaver Dam Lake system, and the beetle rearing and transfer program ended. Purple loosestrife was still present, but had decreased significantly compared to the abundance levels of the 1990's. The beetles were well established and continue to keep purple loosestrife in check to this day. Purple loosestrife growth fluctuates from year to year as expected with normal fluctuations in beetle populations.

The Library Lake bog continues to serve as a nursery for spring collection of beetles. However, accessing the bog is difficult due to the instability of the floating mat of vegetation. Native plant species are reported to be mixed with the purple loosestrife growing on the island. A survey of the vegetation of the floating bog would help to assess the density of native vegetation and the potential need for planting native plant seeds or seedlings. The Department of Natural Resources has volunteer monitoring programs to support such efforts.

THREATENED AND ENDANGERED RESOURCES

The following species are currently listed in the area (T35N R13W): wood turtle (*Glyptemys insculpta*), least darter (*Etheostoma microperca*), bald eagle (*Haliaeetus leucocephalus*), and bull frog (*Lithobates catesbeianus*).

A special concern species, Robbins spikerush (*Eleocharis robbinsii*) was found in Library Lake in the 2009 plant survey. Robbins spikerush grows from moist shorelines to water over a meter deep. Stems, rhizomes, and nutlets are consumed by a variety of waterfowl. Muskrats also graze on stems and rhizomes. The fine submersed stems offer habitat for invertebrates and small fish.[9] The plant is found in an area where no management as part of the Library Lake project is planned.

WETLANDS

Wetlands are mapped in the DNR wetland inventory which is available on line on the Wisconsin DNR Surface Water Data Viewer (see Figure 8). DNR mapped the wetlands based on 1978 aerial photography and soil survey information. The Barron County wetland maps have not been orthorectified. Wetlands do not appear to be in the correct location on this map. There are two wetlands noted in and near Library Lake. A wetland is noted on the west side of the lake (Type A3L) in an area that is currently paved and on the north side of the lake near the Grove Street Bridge (Type A3/W4L). The mapping locations appear to be inaccurate (wetland layer shifted to the east over the aerial photo) as the wetland types indicated are in-lake aquatic wetlands with rooted and floating plants in standing water.

[9] Borman et al. 1997.

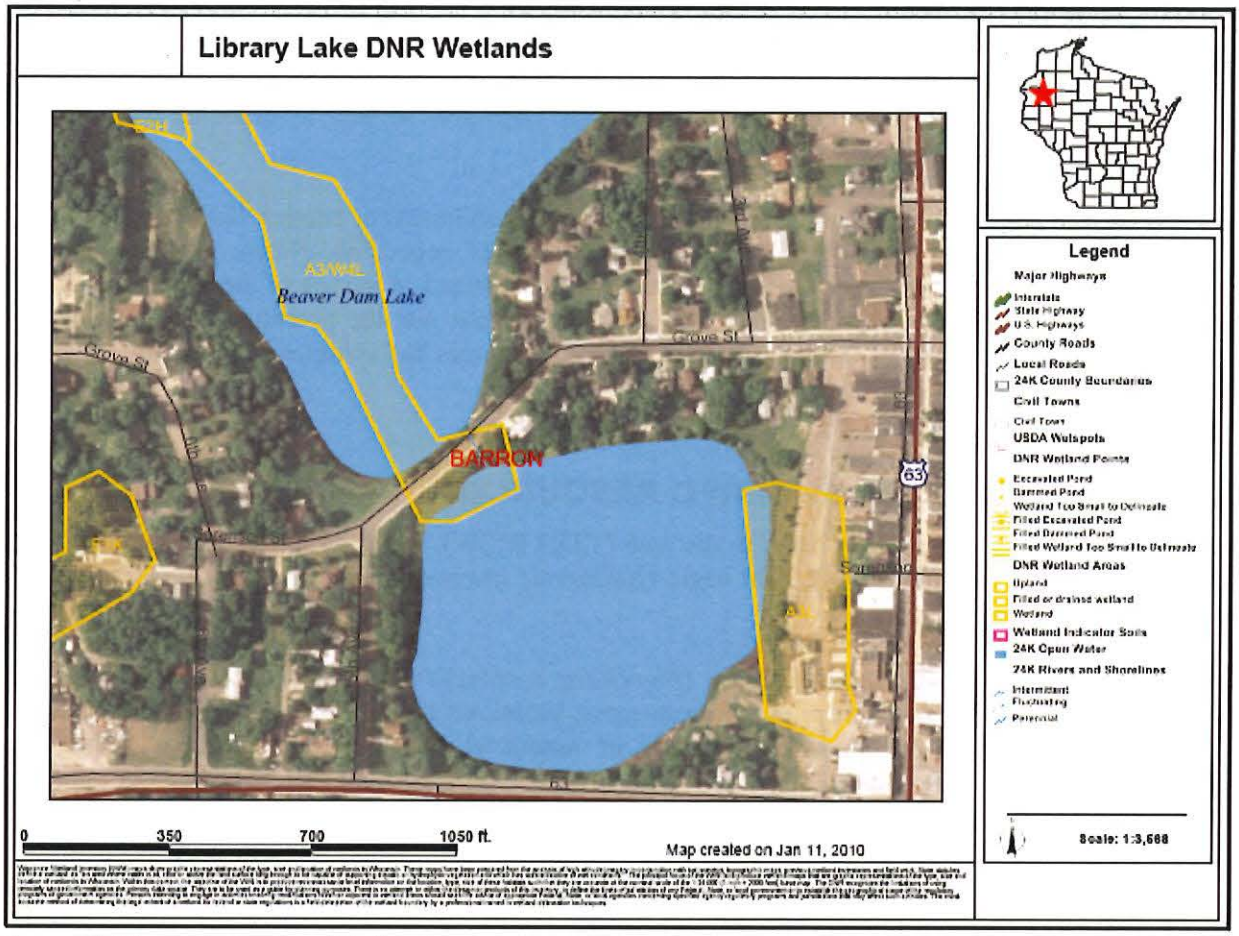


Figure 8. Library Lake Area Wetlands

HUMAN USE AND AESTHETICS

Aesthetics are an important consideration for the management of Library Lake and surrounding area. Library Lake marks an entrance to the downtown from the water and highway, and any management activity needs to function at a high aesthetic level for the sake of commerce as well as civic identity.

The importance of Library Lake and surrounding area was emphasized in Library Lake Committee member Seth Bailey's Landscape Architecture capstone project while he was a student at UW Madison. His thoughts, quoted below, help frame the human-centered aspects of this project.[10]

Urban Waterfronts

As a small city located on an island in Northwestern Wisconsin, the City of Cumberland and its residents identify strongly with two things, their community and the body of water that defines it, namely, Beaver Dam Lake. 2nd Avenue is Cumberland's "main street". This is the city's societal core, the businesses that line it being the location where many social interactions take place. Great opportunity exists in a place where a city's social corridor meets its most beloved resource. In Cumberland, that place is the Rutabaga Fairgrounds; home to the Rutabaga Festival for one week out of the year, oversized parking lot for the rest. In an area where an underutilized parking lot is bounded on one side by a lakefront, and on the opposite, a chain of main street businesses, not only does opportunity exist, much of the infrastructure needed for a successful waterfront does, as well.

Boat Access to Downtown

The arrival of 'seasonal tenants' to open lake cabins, along with the more conventional tourists, marks the beginning of summer in Cumberland. Being one of the area's premier bodies of water, Beaver Dam Lake draws heavy usage from visitors and residents, alike. Boating is particularly prevalent on the lake, especially on holidays and weekends. These activities, often times, will occupy the whole day. With this in mind, it's surprising how few businesses cater to the needs of the boating community. While current conditions prevent direct nautical access to the city's main street, the proposed dredging of the channel that connects Library Lake to greater Beaver Dam would provide the additional depth that is needed for most vessels [to] navigate. This would, in effect, expose main street businesses to an additional client base, one that is begging to be served.

Library Lake is the only portion of Beaver Dam Lake with a direct connection to Cumberland's downtown business district.

[10] Bailey, 2008.

REGULATORY AND PLANNING FRAMEWORK

All of the Library Lake drainage area is within the Cumberland city limits. An overview of city plans and ordinances follows.[11] The existing city ordinance protects the water resources of Cumberland as described below. However, there are no specific ordinance chapters which focus on construction site erosion control or stormwater management – important controls for lake and river protection. These additions will be considered in the City of Cumberland Stormwater Management Plan which is currently under development.

CITY ORDINANCE NO. 618

Chapter 14. Building Code.

Adopts Chapters COMM 20-25 (Wisconsin Uniform Dwelling Code). This code includes construction site erosion control requirements for 1 and 2-family dwellings. The city building inspector enforces the Uniform Dwelling Code.

Chapter 17. Zoning Code.

The zoning code establishes zoning districts and specifies allowable uses, lot dimensions, and building specifications within each district. The official zoning map is kept at the office of the city clerk. Among the purposes of the ordinance is to "Protect and conserve the natural resources of the City including agricultural, forests, wetlands and surface and groundwater by conserving most appropriate use of land."

Special regulations for Shoreland Areas are detailed in Chapter 17.36. Shoreland areas include land within 1,000 feet of lakes, ponds, or flowages and within 300 feet of navigable rivers or streams. These areas have special requirements for lot sizes depending upon whether or not they are served by a public or private sewer system. Setback requirements are established for septic tanks, buildings and other structures, and boat houses. There are limits on the amount of shore cover (trees and shrubbery) that can be removed near the water. Filing and grading requires a conditional use permit. Permits may require erosion control and stormwater management conditions such as minimizing disturbance, establishing temporary groundcover, and creating diversions and silting basins to capture sediment.

Chapter 18. Subdivisions

The subdivision chapter regulates the division of land. While stormwater drainage facilities are covered in section (18.08(7)), the focus is on the ability of facilities to safely accommodate the maximum potential volume of flow - not to reduce or treat stormwater pollutants.

Chapter 19. Shoreland-Wetland Zoning

Shoreland-wetland zoning applies within shoreland areas as defined above. Within wetland areas in this zone, there are limits on building and limited uses and special protections for wetlands. Conditional use permits may require erosion control and landscaping and planting screens among other conditions.

[11] Municipal Code of the City of Cumberland. Ordinance No. 618. Adopted 11/06/09. http://library6.municode.com.

STATE OF WISCONSIN REGULATIONS

State of Wisconsin regulations which apply within the city of Cumberland also provide lake and river protection.

Chapter 30, Wisconsin Statutes – Navigable Water.[12] DNR provides oversight for this important program. Chapter 30 permits are required for a myriad of activities on navigable water bodies. These activities include (among others) dredging, shoreline stabilization, grading, intake/outfall structures, stream crossings, boat ramps, and buoys.

Dredging Regulations (Sec 30.20 Wis. Stats.)[13]
A general permit or an individual permit is required to dredge material from the bed of a navigable waterway. Library Lake is designated as an "Area of Special Natural Resource Interest" by the DNR. Library Lake is designated as an ASNRI water because it is smaller than 50 acres and has a special concern species present. Beaver Dam Lake is designated as an ASNRI water because wild rice is present in the lake. Because of this designation, an individual permit is required for in-lake dredging. This permit requires submitting the proposed dredge area and shoreline cross sections, where spoils will be deposited, and floodplain and wetland boundaries. The cross sections must include the normal water level and a profile of the existing bottom and proposed dredged bottom. Sediment testing for hazardous materials may be required. Permit review may take three months or longer. Local zoning permits and U.S. Army Corps of Engineers permits may also be required.

NR 216, WI Admin. Code

The NPDES program is designed to require stormwater management plans and erosion control plans for sites larger than one acre as required under the EPA's Clean Water Act. The intent is to keep water leaving construction sites clean through filters, sediment basins, and diversions and to plan for long term stormwater management. DNR stormwater specialists work with local land conservation and zoning departments to implement this program. Under subchapter III of NR 216, Wis. Adm. Code, a notice of intent shall be filed with the DNR by any landowner who disturbs one or more acres of land. This disturbance can create a point source discharge of storm water from the construction site to waters of the state.

Phosphorus Use

Wisconsin law prohibits application of fertilizer with phosphorus to turf beginning April 2010. Phosphorus can be used on first-year lawns and phosphorus-poor soils. Retailers will be barred from displaying fertilizer with phosphorus. Phosphorus runoff contributes to algae growth in state waters.

Aquatic Plant Management (NR107 and NR109)

The Department of Natural Resources regulates the removal of aquatic plants when chemicals are used, when plants are removed mechanically, and when plants are removed manually from an area greater than thirty feet in width along the shore. The requirements for chemical plant removal are described in ***Administrative Rule NR 107 – Aquatic Plant Management.*** A permit is required for any aquatic chemical application in Wisconsin. Additional requirements exist when a lake is considered an ASNRI (Area of Special Natural Resource Interest).[14]

[12] More information about water regulations requirements is found online at http://www.dnr.state.wi.us/waterways.
[13] Information from http://dnr.wi.gov.org/water/fhp/waterway/dredging.
[14] Data from WDNR Surface Water Data Viewer: http://dnrmaps.wisconsin.gov.

The requirements for manual and mechanical plant removal are described in ***NR 109 – Aquatic Plants: Introduction, Manual Removal & Mechanical Control Regulations.*** A permit is required for manual and mechanical removal except for when a riparian (waterfront) landowner manually removes or gives permission to someone to manually remove plants (with the exception of wild rice), from his/her shoreline up to a 30-foot corridor. A riparian landowner may also manually remove the invasive plants Eurasian water milfoil, curly leaf pondweed, and purple loosestrife along his or her shoreline without a permit. Manual removal refers to the control of aquatic plants by hand or hand–held devices without the use or aid of external or auxiliary power.[15]

CITY OF CUMBERLAND PLANS

City of Cumberland Stormwater Plan (Draft 2009)

The city of Cumberland is currently working on a stormwater management plan under contract with Emmons and Olivier Resources. The plan will guide the city's actions for the protection and improvement of its surface water resources including Library Lake, Beaver Dam Lake, Collingwood Lake, and the Hay River. The first phase of the plan will include the following:

- Plan Goals and Identified Needs
- Surface Water Resource Data Collection & Analysis and Drainage Area Mapping
- Surface Water Model and Pollutant Loading
- Stormwater Management Recommendations.

Phase 2 of the stormwater plan will review financing options for stormwater management; discuss options for new development including ordinances, treatment options, and runoff reduction methods; and recommend public outreach, information, and education. Later phases may develop financing options and ordinances and conduct engineering feasibility studies for stormwater treatment.

City of Cumberland Comprehensive Plan (2006)

The city contracted with Short, Elliot Hendrickson Inc. to prepare a comprehensive plan as part of the Barron Area Multi-Jurisdictional Comprehensive Planning Project. Several areas of the plan cover areas of focus related to this management plan.

Transportation

Goal: The future transportation system should be flexible and multi-modal and provide for the needs of the City of Cumberland.

Objective: Support efforts to expand walking, bicycling, and other modes of transportation.

a. *Work with local organizations interested in walking, bicycling, and other modes of transportation.*
b. *As demand grows for multi-modal transportation services the City of Cumberland should designate routes for trails and transit corridors within the community.*

[15] More information regarding DNR permit requirements and aquatic plant management contacts is found on the DNR web site: www.dnr.state.wi.us.

Utilities

Goal: Implement a Stormwater Management Plan

Objective: The City of Cumberland will require necessary stormwater best management practices for new development and develop solutions to keep pace with evolving water quality regulations.

Objective: Implement a stormwater utility if necessary to help pay for improvements for stormwater management.

Objective: The City of Cumberland will develop a stormwater management plan in the future, with its apparent need or regulatory requirements.

Objective: Work with the Lake Association [sic] to create awareness about water quality issues in Cumberland.

Goal: Maintain and enhance community facilities and services, which contribute to the quality of life for area residents.

Objective: Promote use of existing facilities and encourage development of public facilities, such as new parks, green spaces, and trails (e.g. walking, biking, skiing and snowmobile trails).

Natural resources

Goal: Conserve, protect, manage, and enhance the City's natural resources, including but not limited to, lakes, rivers/streams, wetlands, groundwater, forestlands, and other wildlife habitats in order to provide the highest quality of life for the City of Cumberland's citizens and visitors.

Objective: Identify City stormwater inlets to lakes within the City and monitor for quality and quantity of runoff.

Objective: Promote the establishment and maintenance of natural buffers along water resources. Encourage Barron County and the Wisconsin Department of Natural Resources to fund buffer strips along streams and the lakeshores.

Objective: Educate the public on best management practices that will ensure the protection of natural resources.

Objective: Protect and manage local forested areas and other wildlife habitats. Work and cooperate with local land trust and similar organizations on forest and wildlife habitat protection, management, and preservation.

Economic development

Objective: Support downtown Cumberland as a distinct opportunity for commercial and service establishments and housing. Encourage a variety of retail services for area residents.

The zoning district map below (Figure 9) reinforces the important commercial district on the east side of Library Lake in the city of Cumberland. The future land use map in the city's comprehensive plan shows an even greater density of commercial development in the downtown core.

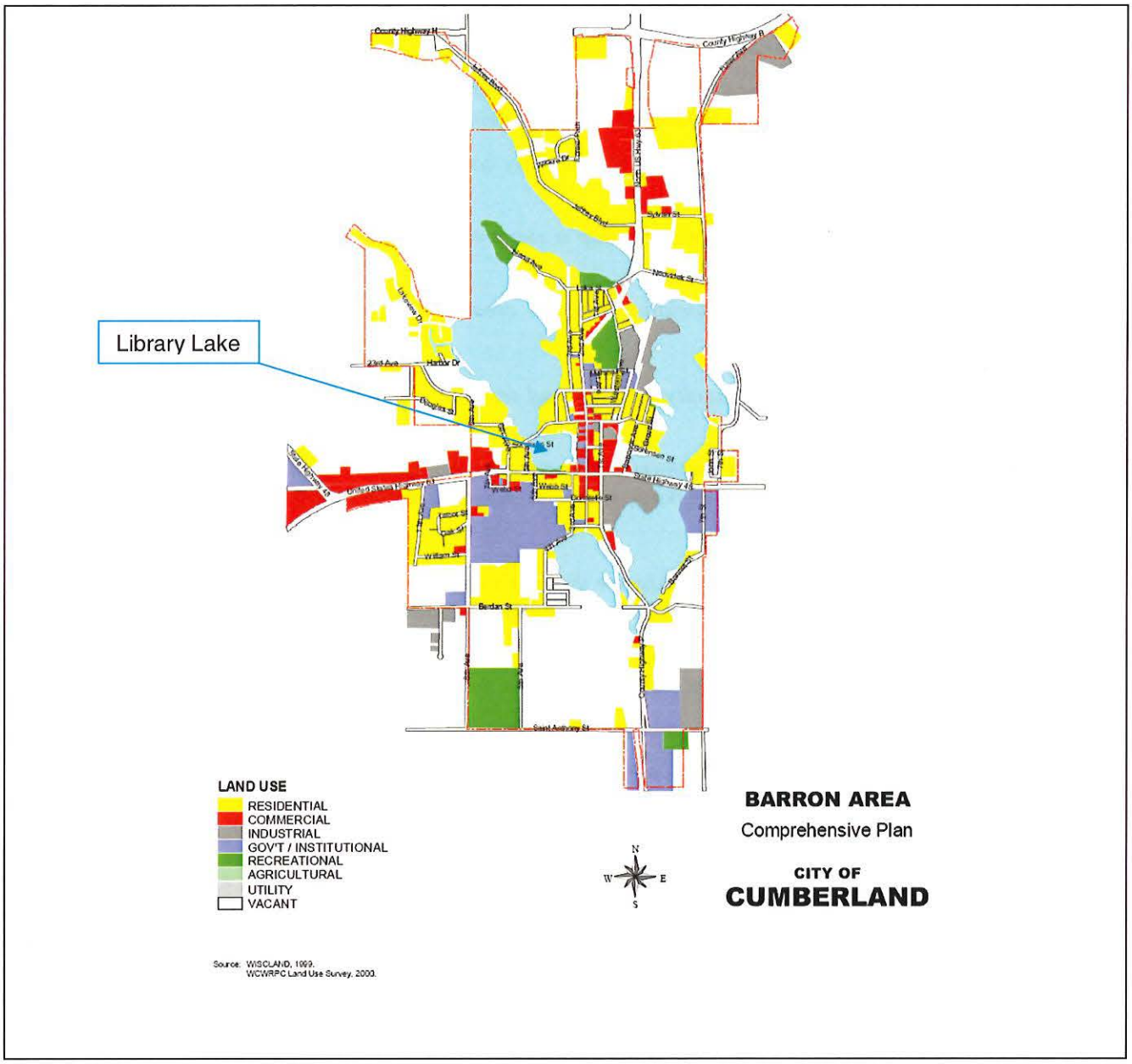


Figure 9. City of Cumberland Zoning Map

IDENTIFIED RESOURCE AND HUMAN USE CONCERNS

As described in the resource inventory above, the following are resource concerns for Library Lake:

1) Significant sediment loading from stormwater outfalls.
2) Lack of native habitat/vegetation surrounding the lake.
3) Significant increases in monotypic stands of cattail (*Typha latifolia*) near stormwater outfalls.
4) Presence of invasive aquatic plant species: Eurasian water milfoil, curly leaf pondweed and purple loosestrife.
5) Lack of natural lake flushing and flood control because of altered hydrology.

The following is a list of human use concerns in this area which is central to the city of Cumberland downtown business district:

1) Very limited navigation to, from, and within Library Lake.
2) Unsafe pedestrian and non-motorized vehicle access to nearby schools, businesses, and residential areas.
3) Limited areas for social gatherings on the waterfront (the Rutabaga Festival is an annual exception).
4) No features to enhance enjoyment of the wildlife and natural beauty of Library Lake.
5) The view along the central highway corridor in the city of Cumberland to the south of Library Lake.

A Successful Place...
...provides a range of things to do *(uses and activities)*; is easy to get to and connected to the surrounding community (*access and linkages*); is safe, clean, and attractive (*comfort and image*); and, is a place to meet other people (*sociability*).

From Project for Public Spaces 2005.

MANAGEMENT ACTIONS IN PROGRESS

Library Lake Project Committees

The Beaver Dam Lake Management District formed the Library Lake Committee to support the restoration of Library Lake in September 2007. The committee subsequently formed two subcommittees: the Library Lake Marketing and the Library Lake Fundraising subcommittees. These subcommittees meet regularly, and currently (January 2010) meet jointly on a monthly basis.

Project Status

The Library Lake Committee developed project phases for the restoration of Library Lake prior to the development of this lake management plan. Project phases are outlined below. A request for proposals to hire an engineering firm to develop detailed project designs, obtain permits, and assist in seeking financial support was distributed in June 2009. Emmons & Olivier Resources, Inc. (EOR) was selected as the project consultant with Harmony Environmental as a subconsultant in early July.

Project Phases

Phase 1	**Stormwater Improvements and Park Development:** acquire land and construct stormwater practices and park.
Phase 2	**Lake and Shoreline Restoration:** remove accumulated sediments.
Phase 3	**Restore Hydrology:** restore Library Lake outlet under highway 63/48.
Phase 4	**Community Connections:** create non-motorized trail passage over highway 63/48 and in the city of Cumberland.
Phase 5	**Grove Street Bridge:** raise and widen the Grove Street Bridge to accommodate boat traffic safely.

Permitting

Library Lake Committee representatives and project consultants met with DNR staff in September and October 2009 to discuss potential concerns regarding the project. Significant modifications were made to the original project proposal to address DNR staff concerns. Additional meetings, data gathering, and design details will continue as the project progresses.

Land Acquisition

Some of the land around Library Lake is already owned by the city of Cumberland. Other parcels are privately owned – some with houses on them. The committees and consultants identified parcels needed for stormwater and park improvements. The city of Cumberland agreed to seek grants to support property purchase and ultimately own the property. The city budgeted $50,000 in its 2010 budget as seed money for the project.

Dave Evenson, of the Beaver Dam Lake Management District, is leading negotiations with owners of the identified parcels. He is assisted by committee members, project consultants, and Rick Remington of the West Wisconsin Land Trust. As of December 2009, all property owners had agreed to allow an appraisal of their parcels. Craig Solum, of Spooner, WI, is completing appraisals that will meet DNR grant requirements under contract with the city.

LAKE GOALS AND OBJECTIVES

Reduce stormwater runoff volume and treat runoff to remove pollutants to maintain Library Lake in mesotrophic status.

1. Treat a minimum ½-inch, 24-hour storm event to remove the first flush of stormwater pollutants.
2. Reduce phosphorus loading to Library Lake by 65%
3. Reduce sediment loading to Library Lake by 80%
4. Remove at least 1/4 acre of impervious surface
5. Continue on-going Secchi depth monitoring

Improve navigation and access to and from Library Lake.

1. Remove lake sediments accumulated from stormwater runoff
2. Establish safe boat traffic (Phase 5 – Grove Street Bridge expansion)
3. Improve public and private access to and within Library Lake

Preserve, restore, and improve native aquatic and shoreland habitats.

1. Consider habitat impacts with park, navigation, and stormwater improvements
2. Monitor and control the growth of purple loosestrife and other invasive species
3. Protect special concern species, threatened, and endangered species
4. Restore native shoreline habitat

Establish a park setting to provide nature-based recreation adjacent to Library Lake.

1. Construct handicapped fishing and path access
2. Provide a range of things for small groups to do (provide seating)
3. Provide a safe, well lit, clean, and attractive park
4. Provide a social outdoor gathering place

Improve outdoor education opportunities for the public.

1. Create an outdoor laboratory for students
2. Construct facilities for canoe and kayak safety education

Provide safe walking, bicycling, and snowmobile routes to and from Library Lake. (Phase 4)

1. Construct pedestrian/bicycle bridge over US HWY 63/ State HWY 48
2. Create access to and from the hospital, assisted living residences, schools, hockey rink, churches, the baseball park, and the industrial park
3. Improve the safety of snowmobile access to Library Lake from Grove Street
4. Investigate abandoned rail route through Cumberland as a possible addition to the Wisconsin State Trail System

Stimulate commerce in nearby businesses.

1. Encourage new and expanded business opportunities in downtown Cumberland
2. Improve the appearance of the area around Library Lake

Restore native hydrology to provide natural water flow and reduce flooding.

1. Protect US Highway 63 from flood damage
2. Enhance highway safety by avoiding flooding hazards

PUBLIC INVOLVEMENT FOR THE LAKE MANAGEMENT PLAN

Public Meetings and Information

The proposed phases of the Library Lake project have been widely publicized within the city of Cumberland. In particular, a full-page newspaper advertisement provided project information along with public notice for an August 22, 2009 public meeting regarding the project. A copy of the notice is included in the appendix (see page 44, *Appendices: Cumberland Advocate Newspaper Article and Public Notice*). At the meeting, project information was presented, and meeting attendees were asked to respond to a questionnaire. The results of the questionnaire are included as an appendix (see page 45 *Appendices: Public Comments*). Attendees were overwhelmingly in support of the project given adequate funding.

Multiple presentations have been provided for the Cumberland City Council. All Library Lake and Beaver Dam Lake District meetings are open to the public.

This lake management plan was reviewed by the Library Lake Committee and comments were provided at a meeting January 19, 2010. The meeting focused on review of plan goals and objectives and the process for public involvement. The plan is available to the public for review at the Cumberland Public Library and the Cumberland City Hall beginning February 1, 2010. The plan is also available on the web site www.librarylakerestoration.com. A public notice of plan availability will be published in the Cumberland Advocate the week of February 1. The plan will go before the Cumberland City Council for approval on March 2, 2010 and the Beaver Dam Lake Management District on February 24, 2010.

Ongoing Public Involvement

The public will be informed about the project as project phases are implemented. Information will be provided at committee, city council, and lake district meetings; in the newspaper; and on the web site: librarylakerestoration.com.

Mayor's Endorsement

In a letter from mayor of the city of Cumberland to the voters upon his reelection, Mayor Carl S. Bents identifies five goals for the city. His third goal is for the restoration of Library Lake. He writes the following (see page 47 of the Appendix for the full letter):

A third goal is to clean-up Library Lake, a goal every citizen in Cumberland should agree with. One of Cumberland's greatest assets is our chain of lakes that makes us the "Island City." Library Lake is the signature view that we see from main street and highways going through Cumberland. It should be restored.

ALTERNATIVE AND SELECTED MANAGEMENT ACTIONS

Alternative management actions are currently focused on Project Phases 1 and 2 – stormwater treatment and sediment removal. The selection of a preferred alternative is largely related to the following considerations:

- ✓ Parcels available for stormwater treatment and park development
- ✓ Location and extent of navigation channels to create boat access to homes and businesses
- ✓ Methods to be used for sediment removal
- ✓ Location of public piers and boardwalks
- ✓ Available funding.

Feedback from Department of Natural Resources staff during permit scoping meetings late in 2009 greatly influenced the Library Lake Committee's selection of alternatives. These changes led to a more environmentally-focused project with significant reductions in proposed dredging of lake sediments. DNR concerns included:

- ✓ Potential impacts to shallow water fish spawning areas
- ✓ Preservation of wildlife habitat provided by the island
- ✓ Maintaining diverse aquatic vegetation on the west side of the lake
- ✓ Potential adverse impacts to native aquatic plants and fish with a proposed drawdown to six foot (or even four foot) water depth
- ✓ Riparian rights of adjacent landowners. If property boundaries do not reach the water, owners do not have riparian rights, and sediment removal is unlikely to be permitted.

Suggestions for the project from DNR staff included:

- ✓ Stormwater treatment is a great benefit for the lake, and should be encouraged.
- ✓ Cattail monoculture has formed in areas of accumulated sediment from stormwater outfalls. This could be an appropriate location for dredging.
- ✓ Removal of sediments to allow passage under the Grove Street Bridge was supported.
- ✓ A boardwalk might be used to access a fishing pier and dock. However, concerns were later raised about human disturbance to wildlife that might be caused by a boardwalk.
- ✓ Aerate the lake to reduce the impacts of a winter drawdown. A 2 foot drawdown is acceptable.

The Phase 1 and 2 master plan is shown in Figure 10 through Figure 13 on following pages (dated January 18, 2009).

The Phase 1 and 2 master plan has many important components.

New ***stormwater infrastructure*** will intercept existing stormsewer outfalls and direct water to best management practices (BMPs). These BMPs will include ***stormwater wetlands, rain gardens, swales, and water features***. BMPs will be designed to capture the first ½-inch flush of runoff from stormsewer outfalls removing a significant percentage of pollutants currently entering Library Lake. Native plants will be used in BMP design and planted along the Library Lake shoreline.

Improved navigation will result from dredging to remove accumulated sediments and vegetation management using herbicides. Sediments will also be removed to alter areas of cattail monoculture and replace cattails with lower-stature native emergent aquatic plants.

The ***boardwalk*** is an attractive feature that will provide access to the floating bog and piers from the park and main street businesses. It will be a central feature of the park development and is an important component of nature-based recreation. The boardwalk is situated to minimize the disturbance and fragmentation of the bog. An additional dock and parking area are situated at the

southeast corner of the lake to provide another point of ***public access and park area.*** Another dock near the Grove Street bridge is under consideration.

The current master plan (dated January 18, 2009) presents two options that include the characteristics described above. The major difference between the options is the lake access provided to riparian owners on the north shore of the lake. Option A uses dredging to establish a channel for private dock access. Option B uses a shared private dock for north shore property owner access. Option A is currently preferred by the Library Lake Committee. Public input is being sought on these alternatives during plan review. Any selected alternative cannot be finalized until undergoing permit review and approval by the Department of Natural Resources.

Additional figures (Figure 14 through Figure 16) illustrate other alternatives that were considered, but modified. The major changes that impacted project design:

- ✓ Limits on dredging in special aquatic plant zones
- ✓ Minimizing the overall amount of dredging
- ✓ Preliminary confirmation of riparian rights and resulting navigation rights of property owners on north shore[16]
- ✓ Concerns regarding bisecting island

Phase 1 - Stormwater Improvements and Park Development

Stormwater Improvements

Artificial wetlands, with forebays to allow sediment removal, are the primary method that will be employed to treat stormwater. Infiltration practices will be used where soil permeability and land area is sufficient.

Park Development

Native plantings and natural ecosystems will be integrated into the park development as much as possible to create and enhance aquatic and terrestrial habitat, as well as providing year round aesthetic interest. Because of the park's proximity to downtown, it will be a highly utilized landscape by the pedestrian, boat, bicycle, and vehicular traffic that will pass through and around. The park will display the character of the project's natural components and be an intentional, cared for public space.

A naturalistic approach to planting and design will be framed with structures and turf grass to blend into the surrounding neighborhood and create an ordered look that people most commonly associate with traditional parks. The landscaping will be functional as well as beautiful, treating stormwater as well as forming the structure of the park. Nature-based education will be an important goal of the park master plan. The park will provide a naturalistic landscape and existing natural ecosystems for environmental education that will be supplemented with interpretive signage.

Phase 2 - Lake and Shoreline Restoration (Sediment Removal)

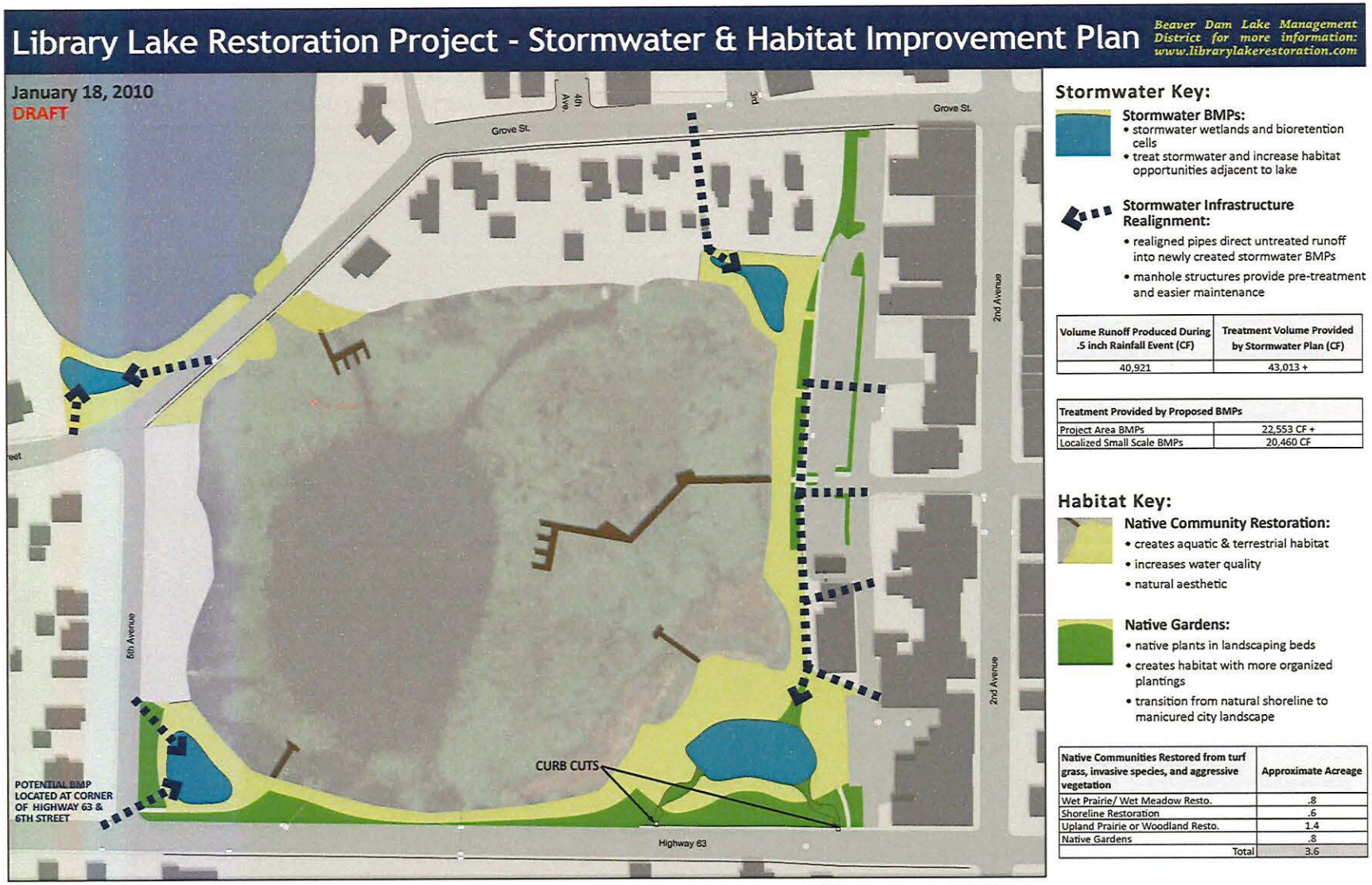
Sediment removal within selected areas will provide navigation channels to support boating within the lake while protecting the lake's fish spawning habitat. Three methods of dredging were researched. Suction dredging, dragline dredging, and winter excavation. Winter excavation is the selected method for sediment removal in part because less unnecessary disturbance results and more accurate finish grades are possible. The other methods of dredging pollute the water and don't provide precise bottom sensing.

[16] Note that riparian rights on the north shore are still under investigation, and documentation is being sought by the Library Lake Committee.

The most economical and precise way to selectively dredge Library Bay is to dam the Grove Street Bridge and pump to reduce lake levels in the fall. To minimize recreational and aquatic disturbance, a maximum of two feet of drawdown below the normal water level will be limited to the months of November through March. Winter drawdown and excavation is proposed. This period of operation allows sediments to compact, thus lessening the volume of excavation and associated disturbance. Furthermore, winter dredging limits the suspension of sediments and potential deposition.

The majority of the proposed dredging is concentrated around the eleven stormwater discharge points to Library Lake. These stormwater-deposited sediments will be removed from shore via an excavator and properly disposed. The remaining dredging will also primarily be completed from shore. An aerator will be installed to ensure adequate oxygen supply to fish during the drawdown if the DNR determines that fish are present and oxygen level is insufficient. Sediment curtains installed around the excavation area will limit drift of sediment to other areas of the lake.

Figure 10. Library Lake Restoration Project – Master Plan (January 18, 2010)



Volume Runoff Produced During .5 inch Rainfall Event (CF)	Treatment Volume Provided by Stormwater Plan (CF)
40,921	43,013 +

Treatment Provided by Proposed BMPs	
Project Area BMPs	22,553 CF +
Localized Small Scale BMPs	20,460 CF

Native Communities Restored from turf grass, invasive species, and aggressive vegetation	Approximate Acreage
Wet Prairie/ Wet Meadow Resto.	.8
Shoreline Restoration	.6
Upland Prairie or Woodland Resto.	1.4
Native Gardens	.8
Total	3.6

Figure 11. Library Lake Restoration Project – Stormwater & Habitat Improvement Plan (January 18, 2010)

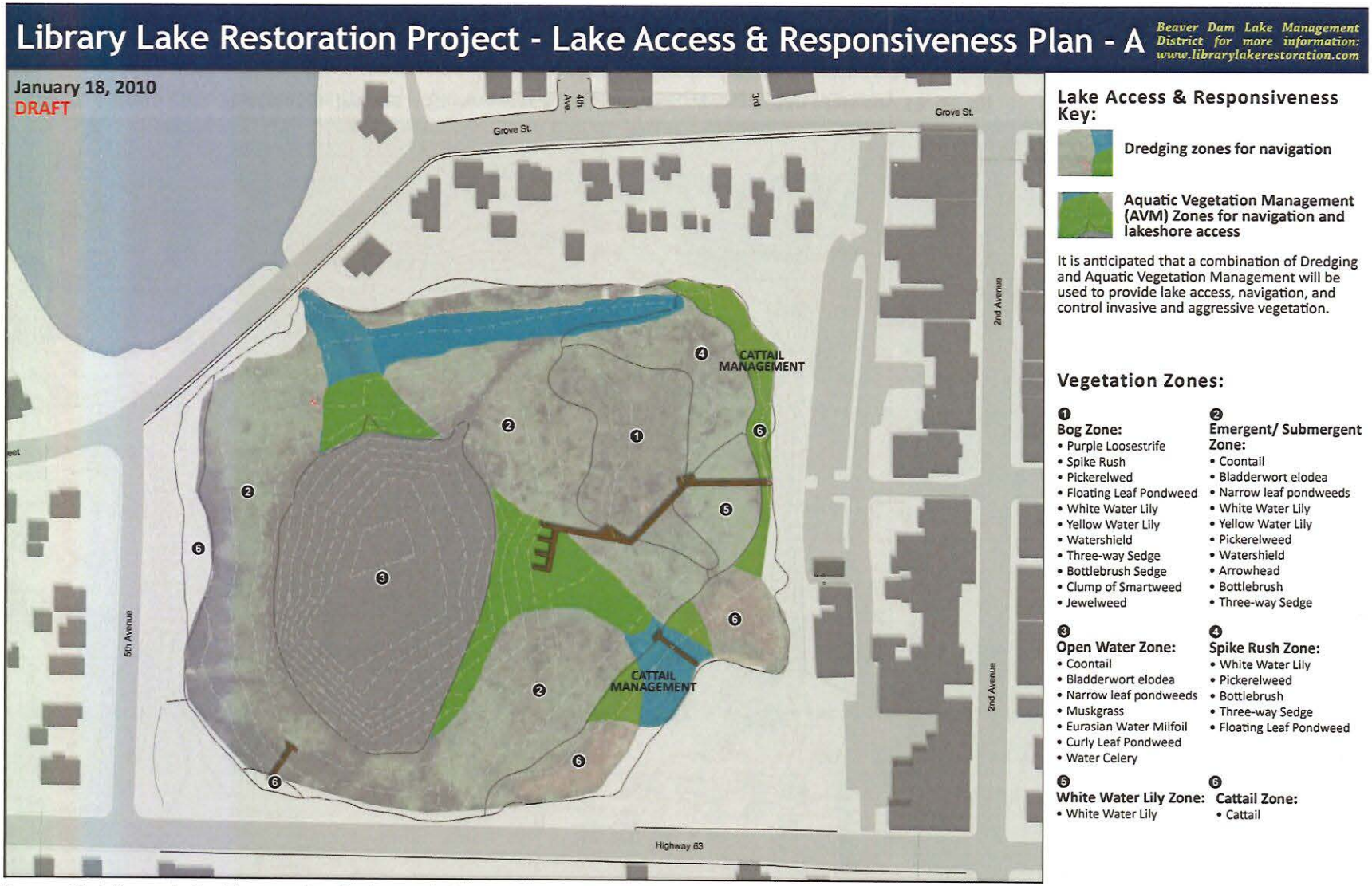


Figure 12. Library Lake Restoration Project – Lake Access & Responsiveness Plan -A (January 18, 2010)

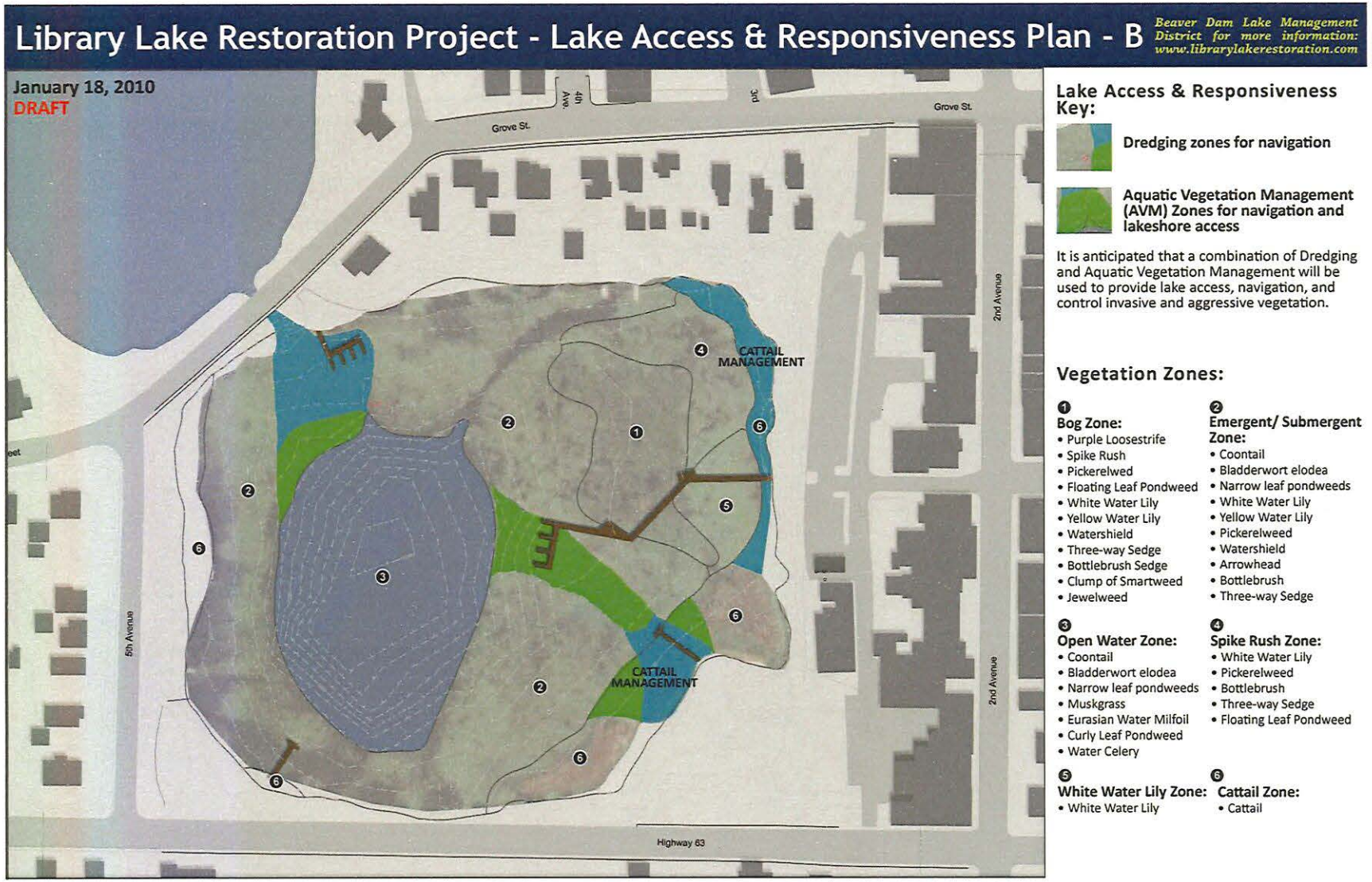


Figure 13. Library Lake Restoration Project – Lake Access & Responsiveness Plan – B (January 18, 2010)

Figure 14. Library Lake Restoration Project – Master Plan (October 20, 2009)

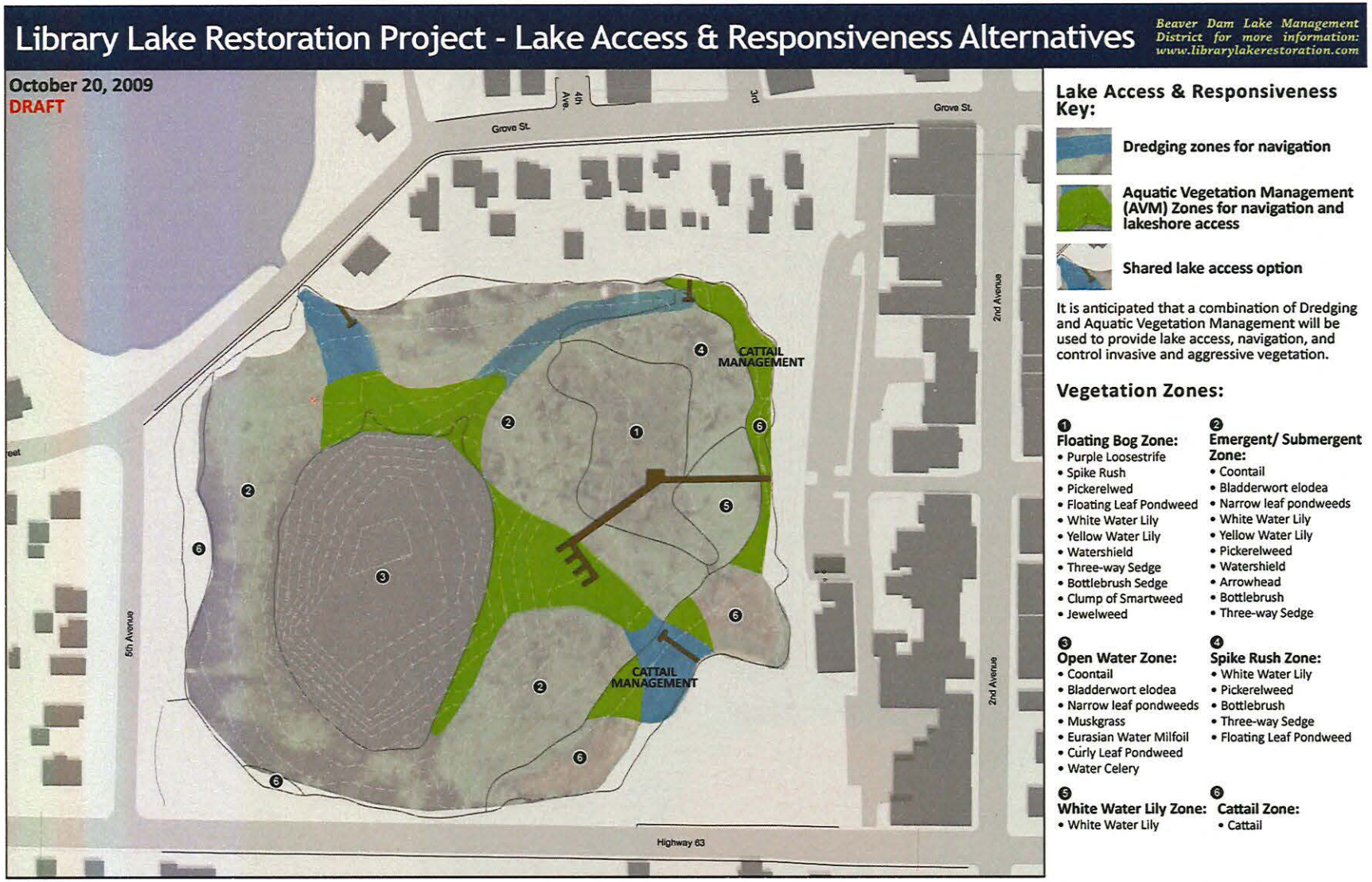


Figure 15. Library Lake Restoration Project – Lake Access & Responsiveness Alternatives (October 20, 2009)

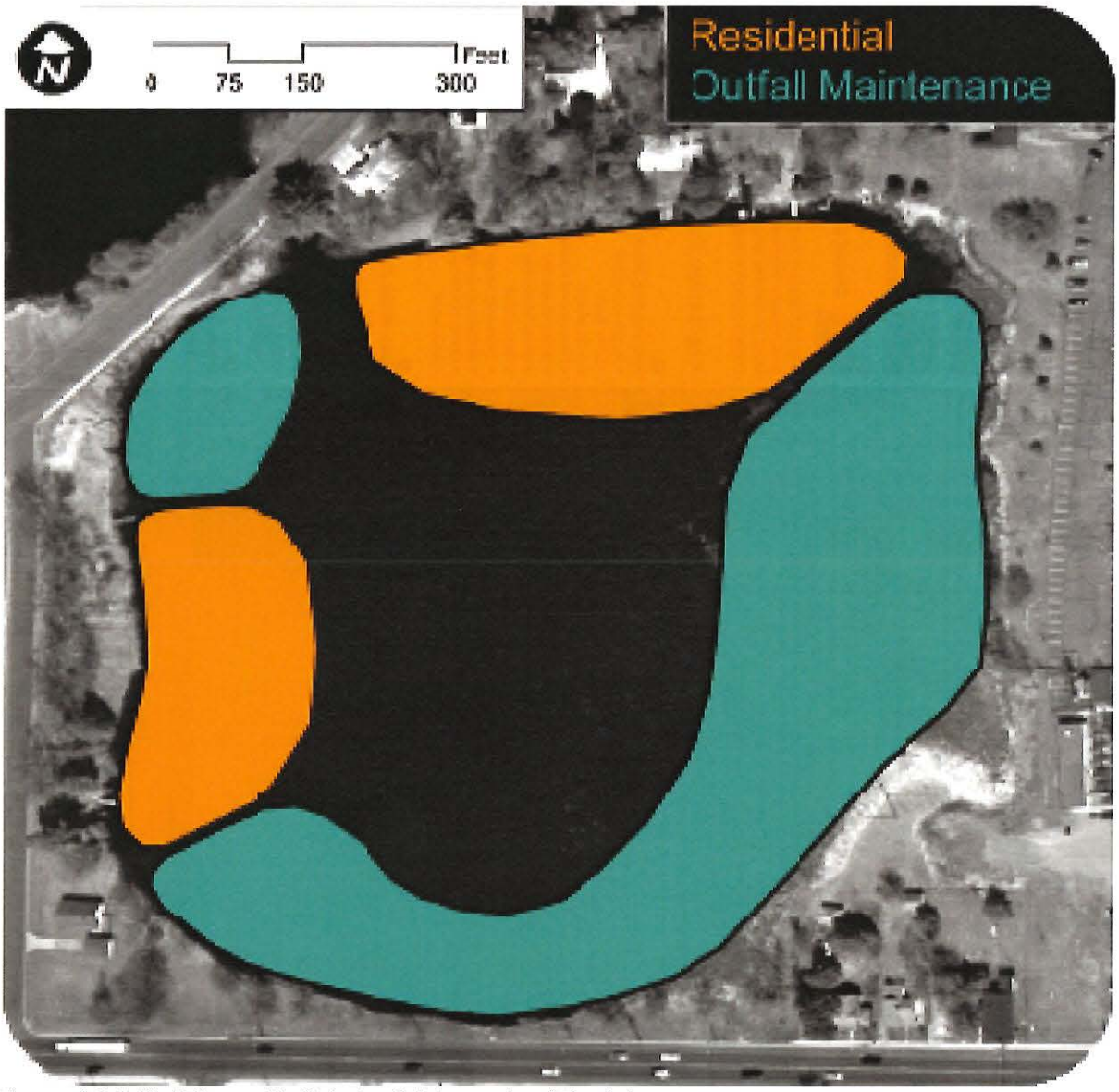


Figure 16. Initial Plans with Substantial Amounts of Dredging

The master plan also illustrates restoration of natural outflow of the lake, the park and trail system, and improvements to the Grove Street Bridge.

Phase 3: Restore Hydrology

Restoring the southwest outlet shown in the 1888 historical map would establish a second control station and increase flow through Collingwood Lake to the Hay River. Following storm events, increased water flow through Library Lake will benefit the lake by displacing high nutrient stormwater in Library Lake with lower nutrient waters from upstream portions of Beaver Dam Lake. Outlet restoration will also reduce "bounce" after storms by bringing the lake's water level to normal more quickly following storm events. Restoration of the southwest outlet and channel corridor will result in Library Lake flood improvements. The existing flood elevation (i.e., 100 year event) for Library Lake is 1,233 feet NGVD29 (vertical datum).

Phase 4: Community Connections

Phase 4 is to link the Wisconsin State Trail System to the city of Cumberland by way of remnant railroads. The Turtle Lake to Spooner connection via Cumberland, Barronett, and Shell Lake would be a welcome addition for both the State of Wisconsin and the towns that the trail serves.

Figure 17. Wisconsin State Trail System near Cumberland, WI

This phase involves investigating a trail route through the city of Cumberland. A trail through Cumberland would provide pedestrian and bicycle connections to the high school, middle school, elementary school, hospital, main street (Second Avenue), Eagle Point, and the city beach. The Cumberland trail will go across a newly built pedestrian bridge across Highway 48/63 and through the newly created Library Lake Park.

Phase 5: Grove Street Bridge

Phase 5 entails raising, widening, and moving the Grove Street Bridge. The Grove Street Bridge is the only water access capable of servicing the businesses on Cumberland's main street. Access to downtown via Library Lake gives the city of Cumberland and Beaver Dam Lake huge appeal to tourists and people purchasing real estate on the lake. The current bridge is satisfactory for small fishing boat access but does not accommodate the boats that bring revenue into downtown Cumberland - namely, pontoons. The existing grade of the road does not allow the bridge to simply be raised. Doing so would cause problems with the curb, gutter, and driveway interfaces to the east of the bridge, especially along the Young property. There is elevation to work with to the west of the Grove Street Bridge. Moving the bridge to the west allows it to be constructed with a bounding window of 24 feet wide by 10 feet over the mean water level. This size bridge will accommodate boat traffic safely.

TRACKING, EVALUATION, AND PLAN REVISIONS

Plan implementation will be supervised and tracked by the Library Lake Committee of the Beaver Dam Lake District. Various project phases will be led by the City of Cumberland Public Works Department. An implementation table outlines project phasing, responsible parties, and potential project budget. This chart will be updated regularly (at least on an annual basis) to assist with project planning and budgeting. The annual implementation table updates will be approved by the Library Lake Committee of the Beaver Dam Lake District and the City of Cumberland and will be considered an update to this management plan.

Project costs are estimates only. Actual costs will be determined by more detailed designs and action plans. City and lake district budgets are developed and approved on an annual basis according to required procedures. City and lake district procurement and bidding procedures will also be followed in plan implementation.

STRUCTURAL MANAGEMENT PRACTICES

Twenty-five year operation and maintenance plans will be developed for each structural management practice. Project maintenance responsibilities will be negotiated as these management plans are developed, but are likely to be held by the city of Cumberland.

IMPLEMENTATION PLAN AND SCHEDULE[17]

Task	Timeframe	Estimated Cost	Responsible Parties	Funding Source(s)	Comments
Project Coordination	July 2009 – December 2013		LLFC LLMC BDLMD		
Project Fundraising	August 2009 – December 2013	$50,000 (annually)	LLFC EOR	BDLMD CITY	
Phase 1: Stormwater and Park Installation					
Land acquisition appraisals and offers to purchase	Jan.- April 2010	$8,500 (appraisals – 4 owners)	BDLMD CITY	City 2010 budget (to be reimbursed by lake protection grant)	Additional acquisition work will be required beyond April 2010
Land acquisition – purchases and structure removal	July 2010 – October 2010	$286,200 (assessed valuation w/structures)	BDLMD CITY	Lake protection grant (5/01/10) Stewardship grant (5/01/11)	Grant limit = $200,000 with $67,000 match required Structure acquisition and removal not included in acquisition grant.
Stormwater practice – final design	July 2010 (90% design)	$50,000 (annually)	EOR	Lake planning grant (2/01/10)	
Stormwater practice – permitting	October 2010		CITY		
Stormwater practice – installation	July 2010 – October 2011	$1,270,582		Lake protection grant (5/01/10)	Grant limit = $200,000 with $67,000 match required

[17] Responsible Parties

Library Lake Fundraising Committee	LLFC
Library Lake Marketing Committee	LLMC
Beaver Dam Lake Management District	BDLMD
City of Cumberland	CITY
Consultant	EOR

Task	Timeframe	Estimated Cost	Responsible Parties	Funding Source(s)	Comments
Stormwater practice – administration and construction oversight	July 2010 – October 2011	$108,000		Lake protection grant (5/01/10)	
Park infrastructure installation	?	$1,129,295		DNR Acquisition and Development of Local Parks	50% grant
Park infrastructure – administration and construction oversight	?	$110,388		DNR Acquisition and Development of Local Parks	50% grant
Phase 2: Sediment Removal					
Preliminary designs and project scoping	August 2009 – May 2010		EOR DNR (review)	BDLMD CITY	
Design (90%)	July 2010				
Permits	October 2010				
Dredging and erosion control - construction	Fall/Winter 2010	$907, 465			
Dredging and erosion control – administration and construction oversight	Fall/Winter 2010	$88,704			
Phase 3: Restore Hydrology		$531,600			
Watershed modeling	2011				
Restore water flow					
Phase 4: Community Connections	2012	$1,870,200			
State trail expansion					
Overpass construction					
Phase 5: Grove Street Bridge Expansion	2013	$1,879,300			

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