Planning for Protection in **SE Wisconsin**

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Planning for Protection: Southeastern Wisconsin's Mukwonago River Basin

A Hidden Gem

The Mukwonago River, a tributary stream to the Illinois-Fox River, is a hidden gem in the rapidly urbanizing landscape of southeastern Wisconsin. With significant portions of this river system designated as Outstanding and Exceptional Resources Waters under Wisconsin's Administrative Code, the Mukwonago River represents a rare resource in the metropolitan-Milwaukee area. From its spring-fed headwaters in Walworth County, through Lulu, Eagle Spring, and Phantom Lakes, to its discharge into the Illinois-Fox River near the Village of Mukwonago in Waukesha County, the Mukwonago River fulfills a variety of ecosystem services, ranging from provisioning and regulating services to cultural services. While there has been varying emphases on specific ecosystem services over time, the net outcome of the recognition of the value of the Mukwonago River environment has been the protection and preservation of a unique system within the urbanized metropolitan Milwaukee region.

The river links a number of communities, in both Walworth and Waukesha Counties (Figure 1). These communities include the Villages of East Troy, Eagle, North Prairie, and Mukwonago, and the Towns of Eagle, East Troy, Genesee, LaGrange, Mukwonago, Ottawa, Palmyra, Troy, and Vernon. While the towns remain largely rural in character, the Villages have traditionally served as centers of commerce and trade. Incorporated around 1900, the majority of the Villages are located in proximity to the river, whose waters served to power the mills

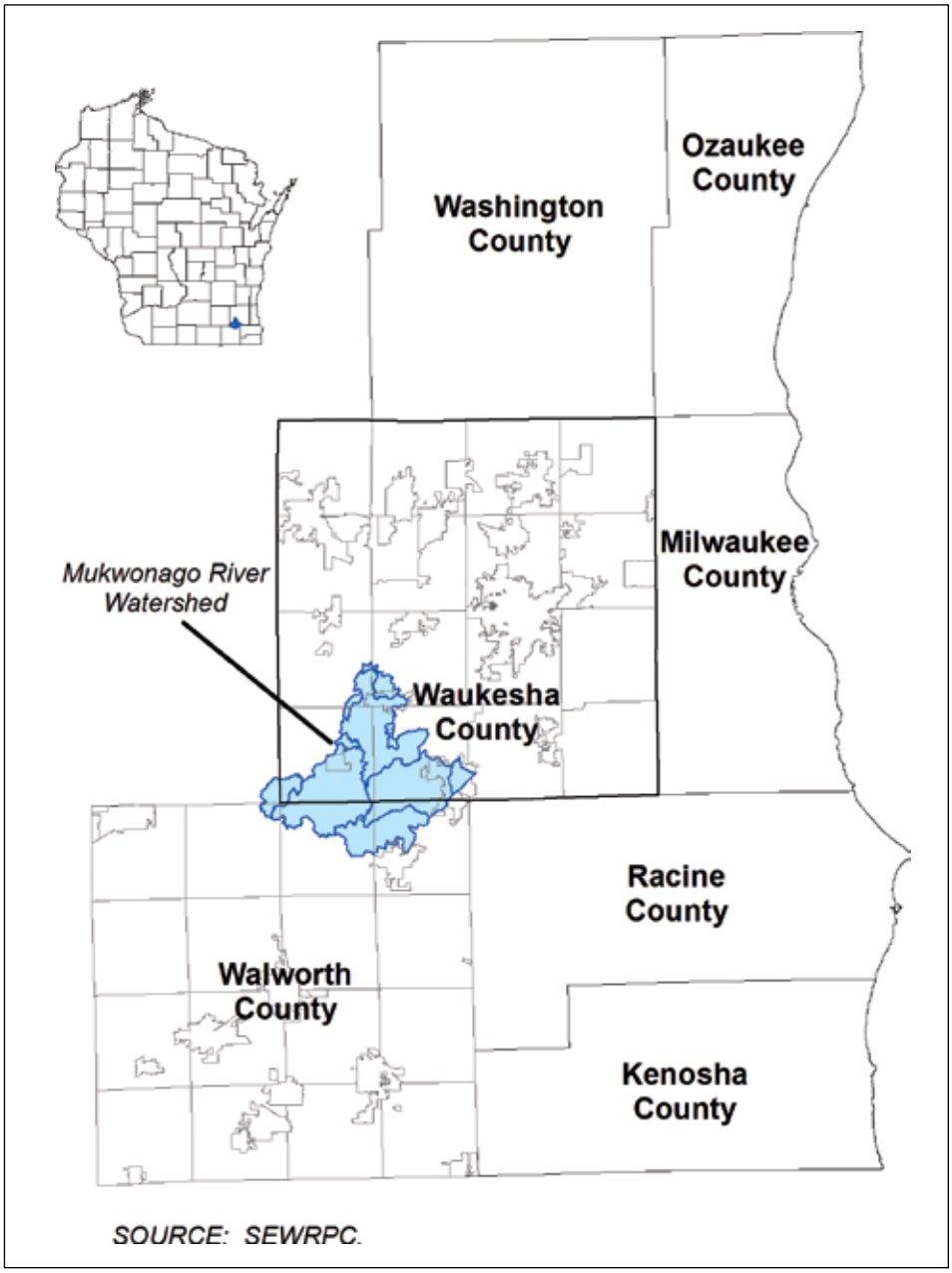

Figure 1. Project location map showing the position of the Mukwonago River watershed within the Greater Milwaukee region, Wisconsin, USA.

The United Nation's Millennium Ecosystem Assessment introduced the concept of ecosystem services that has been widely adopted as a mechanism to link our human uses of the ecosystem to the natural resources. Four levels of services have been generally defined, including:

- Provisioning services — those attributes of the natural environment that support fisheries, provide irrigation water, and otherwise provide the basis for the supply of food and water to our communities;
- Regulating services — those attributes of the natural environment that regulate floods, contribute to the "self-purification" of our waters, and benefit human societies;
- Cultural (and aesthetic) services — those attributes of the natural environment that inspire poets and authors, artists, and sculptors, and provide the natural beauty that we all admire; in the case of water resources these attributes also include the waters of life vital to many of the world's religions; and,
- Sustaining services — that encompass those attributes relating to the existence of the natural world, including the creation of soils and occurrences of minerals and other elements.

associated with the dams that were built to impound Eagle Spring Lake, Beulah Lake, and (Lower) Phantom Lake. In the words of the *World Lake Vision*, these waterbodies form "the pearls along a chain of river."

Over time, the working lakes gave way to their current roles as recreational waters. During this transition, these waterbodies largely avoided the fates of other lakes in the region and remained relatively natural in character (aside from the impoundments that augmented their volumes). The relatively low population densities of this portion of southeastern Wisconsin limited the human impacts associated with the waste and stormwater discharges that degraded so many of the larger lakes located closer to the major urban centers – Madison, Milwaukee, and Chicago – that are all located within an hour or two of these lakes.

Changing Roles

This is not to say that the lakes and the river that links them have always been free of human disturbances. Reference to 1940 aerial photographs shows that there was considerable agricultural development along the Mukwonago River, much of it in close proximity to the stream. This development, as well as subsequent development of recreational facilities such as the Rainbow Springs Golf Course and Resort, led to some of the ditching and straightening of the stream course that characterizes so many of the streams in this region. However, for reasons that remain obscure, much of this agricultural activity gave way to less intensive land uses and the reestablishment of the riparian corridor than can be seen today, as depicted in the 2005 aerial photography (Figure 2). This withdrawal of human activities from the riverbanks has undoubtedly contributed to the resurgence of native vegetation, restoration of natural habitat, and protection of water quality in the stream that has led to the exceptional and outstanding resource water classifications.

An abundance of groundwater, linked in part to the deep bedrock valley in which the river basin sits also has minimized the warming of the waters of this stream and has sustained the populations of brook trout that contribute to the high values of

Figure 2. Land use adjacent to the mainstem of the Mukwonago River downstream of Eagle Spring Lake showing conversion of agricultural lands in 1941 to naturally vegetated riparian corridor in 2005. Source: SLWRPC.

the Index of Biotic Integrity reported from sampling sites along this stream system. Almost 50 species of fish are found in this system, including five species considered to be endangered, threatened, or of special concern: the lake chubsucker, pugnose shiner, greater redhorse, longear sunfish, and starhead topminnow (Figure 3). More than 25 species within any given reach of a stream is considered to be exceptional. The groundwater inflows may also sustain the high population of mussels found in this river system. Sixteen species of native mussels have been found, including the only known remaining viable population of the rainbow shell mussel.

Figure 3. Selected fish and mussel species found within the Mukwonago River. Source: SLWRPC.

In fact, the mussel populations were historically so abundant that prior to 2006, when the mussel fishery was closed, an almost unlimited number of these shellfish could be removed from the waters of the state.

Notwithstanding, the river and its lakes have not been free of human interferences. As previously noted, three of the five natural lakes along the river have been impounded to augment their water levels, while Eagle Spring Lake has been modified further by the creation of two new bays that were formerly wetland. All of the lakes have had some level of development, although Lulu Lake upstream of Eagle Spring Lake is probably the least disturbed and is now in the protective ownership of The Nature Conservancy and the State of Wisconsin. Many areas of the lake shorelines have been hardened to minimize the erosional effects of a regulated water level, and the buildable shorelines developed for residential (and some commercial) uses. Yet these disturbances are highly localized, and the extensive conservancy lands offset these human intrusions into the natural environment to a large extent.

That said, the Mukwonago River and its lakes are actively utilized for a wide variety of active and passive recreational uses. The larger lakes – Lulu, Eagle Spring, Beulah, Upper Phantom, and Lower Phantom Lakes – are heavily utilized for recreational boating during the open water season and support considerable vehicular traffic during the ice-bound season. Angling is an important year-round activity, and numerous local and state natural areas and recreational lands surround the river and its lakes (Figure 4).

Figure 4. The Mukwonago River system supports a variety of recreational activities.

Individual and Collective Stewardship

Perhaps because of this convergence of high-value natural landscape and intensive human activity, the communities in the watershed have sought to provide protections for this valuable set of resources. Individual citizens, the landowners, have taken it upon themselves to locate residences and other domestic buildings away from the riverbanks, allowing for the resurgence of the natural vegetation that defines the river's course. Their stewardship is acknowledged, and recognized by the testimony of the high quality environmental lands within this watershed. In addition, the creation of voluntary governmental bodies – public inland lake protection and rehabilitation districts – around Eagle Spring, Beulah, and Upper and Lower Phantom Lakes speaks loudly of the recognition by the citizens of the unique quality of this watershed. These lake districts have proven instrumental in controlling, to the extent possible, the occurrences of nonnative species in the lakes as well as limiting the contamination of the lake waters. Long before onsite sewage system inspections became the law, the lake districts were contracting with county government to conduct annual inspections of such systems to ensure their adequate functioning to protect lake water quality. In addition, local governments supported these citizen-led efforts through adoption of building standards requiring setbacks and open space. Notably the Town of Mukwonago, as an example, voluntarily limited further urban density growth within the Town for the expressed purpose of protecting and preserving the quality of life represented by the natural environmental corridors and good water quality around and in the streams and lakes. In this same vein, the Village of Mukwonago water utility has been working with the local lake organizations to develop a water supply strategy that is cognizant of the ecosystem values inherent in the aquatic environment of the Mukwonago River and its lakes.

While each of the public inland lake protection and rehabilitation districts has worked independently to formulate and implement lake management plans for the lakes within their jurisdictions, the joint efforts of the three lake districts, in concert with the efforts of The Nature Conservancy and the Wisconsin Department of Natural Resources, have led to the creation of the Mukwonago River Partnership, a citizen-led initiative conducted in partnership with the Friends of the Mukwonago River, that is dedicated to protecting and preserving the entire river system. This effort, while recognizing the presence of humans on the landscape, is designed to minimize the environmental footprint of the people, while promoting and protecting the human use of this unique environment. This unusual combination of organizations has created a unique cooperative framework within which the Southeastern Wisconsin Regional Planning Commission has been able to formulate a strategic plan to guide the communities in their efforts. One outcome of this effort has been the recognition of the fact that the river is a

system, linking the lakes located along its course into a cascade of waters sharing an interconnection that, during the regional floods of 2008, resulted in actions being taken by the Eagle Spring Lake community to reduce floodwater flows through the Eagle Spring Dam in an (successful) effort to protect the impoundment on Lower Phantom Lake which was in danger of being washed away by the high runoff volumes created by the 1:250 year or greater recurrence interval river flows.

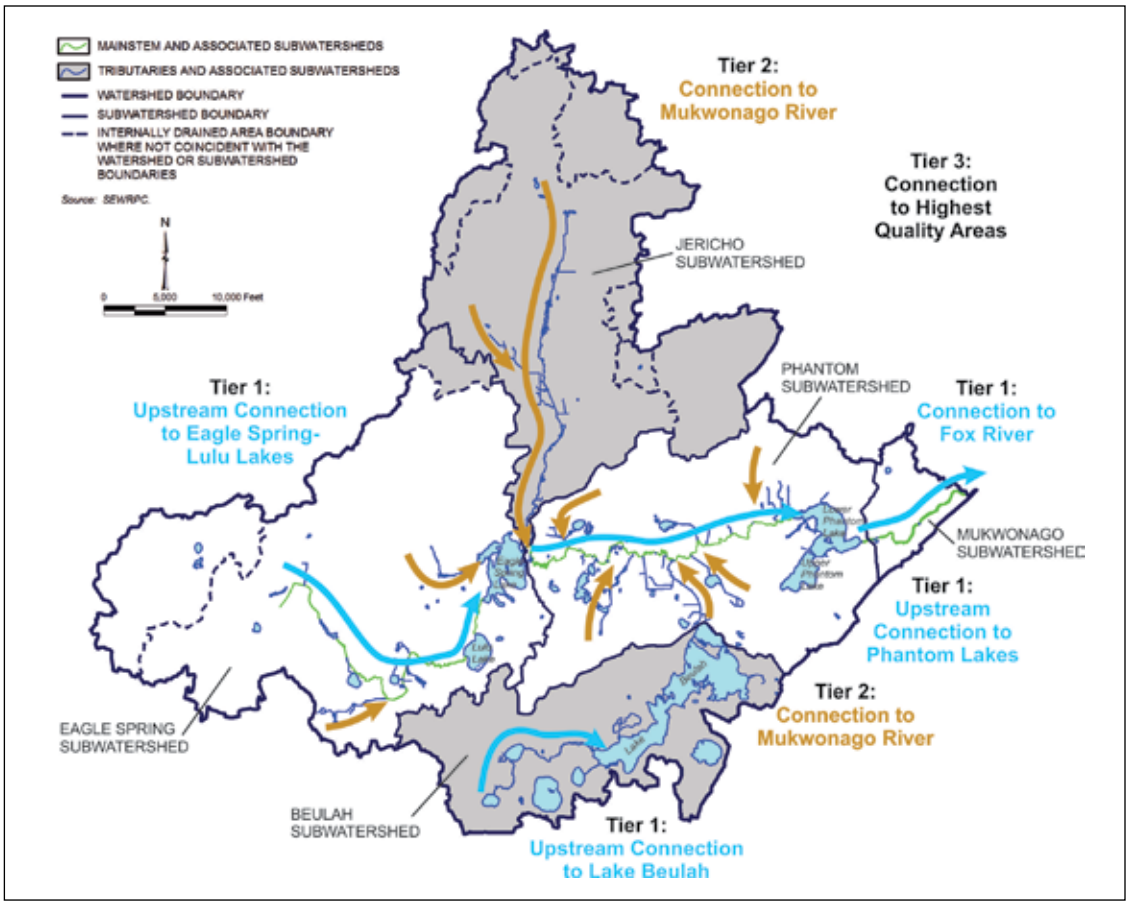

Figure 5. Three-tier prioritization strategy within the Mukwonago River watershed.

The Mukwonago River Watershed Protection Plan

The strategic plan is based upon three primary concepts, namely, restoring connectivity along the main stem of the Mukwonago River, restoring and maintaining connectivity of the tributary streams to the main stem of the Mukwonago River, and protecting and expanding riparian buffers (Figure 5).

While the plan does not suggest removal of the main stem dams, creating Lower Phantom Lake and Eagle Spring Lake, consideration of fish and aquatic organism passage is proposed at such time as the structures are repaired or replaced. The studies associated with the formulation of the plan clearly documented the occurrence of populations of aquatic organisms scattered throughout the watershed which might benefit from connection with other populations both up and down stream. In this regard, SEWRPC staff noted that species dependent upon the numerous springs discharging into the Mukwonago River may be limited in their distribution by water temperatures, so due cognizance must be given to these constraints. However, the Illinois-Fox River forms a diverse end point for the Mukwonago system as well as a natural reservoir of aquatic species native to the region. To this end, as has been noted, the protection of groundwater recharge and discharge areas is of paramount importance for maintaining the biodiversity along the main stem of the river.

An important finding of this planning project was that Jericho Creek, long thought to be of minor importance, actually plays a major role in maintaining the ecological health of the system. Currently, the riparian land owners have individually worked to preserve the stream corridor that buffers the Creek from surrounding development. At the headwaters of this Creek, the Village of North Prairie should be recognized as having taken direct action to preserve the important riparian buffers, and ensure adequate setbacks from the watercourse. Upstream of this confluence, The Nature Conservancy and Wisconsin Department of Natural Resources have worked cooperatively to acquire, restore, and reconnect tributary waters to the river, most recently removing two small constructed ponds that had been used for fish rearing in the mid-1900s. Downstream of this confluence, the Lake Beulah Management District, in cooperation with the Town of East Troy, has been tireless in their efforts to protect groundwater. Research associated with their groundwater protection efforts has highlighted the important role that groundwater inflows play in regulating available phosphorus concentrations in Lake Beulah and in moderating other aspects of the lake environment.

The Value of Ecosystem Services is Recognized and Realized

The individual and combined actions of all of the stakeholders present in and surrounding the river have been the key ingredients in protecting and preserving this exceptional and outstanding resource water. While an unconventional example of the Payments of Improving Ecosystem Services in the Watershed, these efforts have resulted in investments in ecosystem protection being made by stakeholders both within and without the watershed. State government has invested in the acquisition of the Rainbow Springs Golf

Course and Resort, now the Mukwonago River Unit of the Kettle Moraine State Forest. This acquisition made with public funds has provided the opportunity to remove obstructions to organism passage and navigation along a major portion of the middle reaches of the Mukwonago River. Likewise, The Nature Conservancy, through dedicated donations, membership fee investments, and use of State and other grants, has invested in acquisition and restoration projects in the headwater areas of the river system. In this regard, the activities of the many volunteers who work with The Nature Conservancy staff and the Friends of the Mukwonago River should be recognized for their "sweat equity" invested in protecting and restoring key areas within the watershed. Their work has real value both in accomplishing the protection aspects of the strategic plan as well as in informing and engaging citizen and governmental stakeholders in the process of watershed protection. These contributions often are overlooked.

Beyond these organizational efforts, the actions of individual landowners, as previously noted, have been and remain essential for maintaining and improving the state of the waters. Historically, these actions have been engaged through the three public inland lake protection and rehabilitation districts that exist around Eagle Spring Lake, Lake Beulah, and the Phantom Lakes. For reasons of geography, these three special purpose governmental units are strategically located in the upper, middle, and lower reaches of the river system; the Lake Beulah district being located on a tributary stream that enters the middle reaches of the river. These districts have played a major role in informing the public about nonnative species, control of aquatic invasive species, and lake-friendly shoreland living. In addition, these districts have undertaken active programs of aquatic plant and fisheries management, notably associated with the control of introduced carp, as well as onsite sewage system inspection and management. Much of the water quantity, water quality, and ecological monitoring undertaken in this watershed has been at the initiative of, and coordinated by, the lake districts and their respective commissioners, landowners, and electors (registered voters living in the district but not necessarily owning property). Such actions are a direct and dedicated investment in this resource.

A Bright Future

The heightened awareness of the quality of the Mukwonago River and its watershed created as an outcome of the planning project has resulted in an engaged and active citizenry, and a recognition of the river and its lakes as a valuable resource, both in terms of traditional economic systems of valuation and in terms of ecological importance in an increasingly urbanized area of Wisconsin. The river protection plan has supported the formation of both governmental and nongovernmental mechanisms to ensure the longevity and continuity of this high quality natural resource. For this reason, the Mukwonago River, its multiple lakes, and geographic basin, including the people for whom this river has real and spiritual value, is likely to remain rare and precious gem in the landscape.

For Further Reading

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