Sheboygan River AOC: Pathway to Delisting Beneficial Use Impairments

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I.A Project Overview

Since October 2010, the Sheboygan River Area of Concern (AOC) Fish and Wildlife Technical Advisory Committee (TAC) has been in the process of planning habitat restoration projects for delisting degradation of fish and wildlife populations and loss of fish and wildlife habitat Beneficial Use Impairments (BUIs) as well as projects that address restrictions on fish and wildlife consumption, degradation of benthos and degradation of phytoplankton and zooplankton populations BUIs. This proposal seeks funding for nine projects that have been identified in this planning process that address these five BUIS.

The TAC has accelerated its efforts to address the BUIs in response to an accelerated timeline for sediment remediation projects within the Sheboygan AOC (See Figure 1: Sheboygan AOC). The TAC has focused on project identification while relying on a project framework of broad conservation targets to guide project selection and planning. The benefit of this approach is that the TAC's efforts will align critical BUI delisting restoration projects (i.e., Tier 1 projects; see "Project Identification Process" section below) with the remedial action.

One outcome of the earlier TAC efforts was a successful application for Great Lakes Restoration Initiative (GLRI) funds to assess the current status of fish and wildlife populations within the AOC (*Sheboygan AOC Pathway to Delisting Habitat BUIs– Survey and Assessment*). The field work needed for this project is occurring in 2011. Because the TAC is planning habitat projects concurrent with monitoring and assessment work, some of the projects will be informed and refined based on data being collected now. Project planning has been completed with adaptive management in mind and the project scope reflects that needed adaptability component. Habitat projects require time for the resource to respond to restoration activities. Data will be collected to evaluate the projects' success prior to delisting. During that time, the BUIs will be listed as "In Recovery."

Because of their close connection to the fish and wildlife population and habitat impairments, this proposal also includes projects that address restrictions on fish and wildlife consumption, degradation of benthos and degradation of phytoplankton and zooplankton populations.

I.B Project Framework

The TAC has been guided by the Fish & Wildlife Population and Habitat goals and objectives stated in *The Sheboygan River Remedial Action Plan* (1989):

Ecosystem Goals and Objectives for Restoration of Impaired Uses [Excerpt]

II. Maintain and enhance a diverse community of terrestrial and aquatic life and their necessary habitat

In order to achieve these goals and restore beneficial uses (see Chapter IV), the following objectives must be met through the RAP process:

1. *Maintain a diverse resident fishery…(Goal II)*
2. *Protect natural areas (green space) along the waterway and enhance habitat for aquatic and terrestrial communities (Goals II, III, and IV)*

These goals and objectives were reiterated in the Remedial Action Plan Update (1995), which also included recommendations for population- and habitat-related "assessment & monitoring" projects and "specific actions." The RAP implementation recommendations included watershed-wide projects and initiatives. This proposal focuses the recommendations further, identifying projects and actions that fall within the AOC boundary. The AOC boundary for the purposes of this proposal is defined as the Sheboygan River downstream of the Sheboygan Falls Dam, and the harbor and near-shore waters of Lake Michigan.

With the goals from the RAP in mind, the TAC has identified the following broad categories as significant targets for conservation efforts within the Area of Concern:

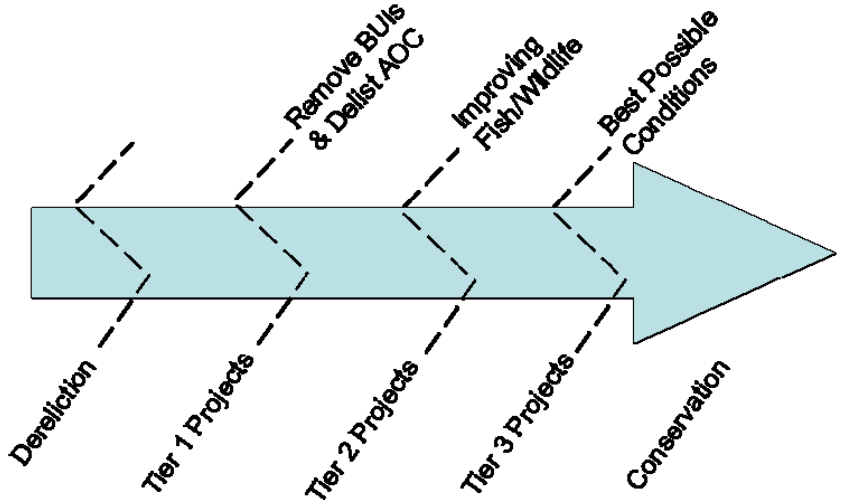
1. Migratory Bird Stopover Habitat
2. Shorebird Stopover and Breeding Habitat
3. Resident Breeding Bird Habitat
4. Warmwater Fisheries Community Habitat
5. Herptile Habitat
6. Riparian Emergent Wetlands
7. Riparian Forested Floodplains

Fish and wildlife restoration efforts within the AOC will focus on restoring, enhancing, or protecting the connectivity, quality and quantity, of these habitat and plant community types. The connectivity, quality and quantity of these habitat and plant community types are threatened similarly by erosion (and resultant sedimentation), fragmentation, urban development, invasion by non-native plants, storm water runoff, and vegetation loss/removal. The fundamental strategies for addressing these threats are restoring and enhancing connectivity, protecting high quality habitats, restoring habitat along riverbanks and riparian areas, reducing erosion and sedimentation, creating and restoring in-river habitat, controlling invasive plant species and enhancing native vegetation. Projects identified in this proposal were selected to implement these strategies. The current GLRI monitoring project will deepen the TAC's understanding of the species assemblages and relative abundance within these habitat and plant community types. Using these findings, the TAC will refine the project conservation targets as it develops a Fish & Wildlife Habitat Management and Restoration Plan.

I.C Project Identification Process

In September 2010, TAC members canoed the entire AOC as a preliminary reconnaissance survey of habitat improvement projects. During subsequent planning meetings, the TAC prioritized the projects identified during the reconnaissance survey, based on land available, project location within the AOC, feasibility, partnerships and need for habitat work, and produced a list of seven Tier I projects. Additional habitat projects (Tier 2 and 3) were also identified that will further restore the Sheboygan River after the contaminated sediment is removed. These are important habitat restoration projects that will build upon those needed to meet the delisting threshold. Only the Tier 1 projects are presented in this proposal. The diagram below represents the planning process for projects and the difference between Tier I, II and III projects for the purposes of restoring the Sheboygan River.

Sheboygan River AOC Project Planning Process and Criteria



I.D Project Approach

Delisting projects will be implemented with community involvement and collaboration between the TAC partners, landowners, WDNR and EPA. The Wisconsin Great Lakes program positions supported by the GLRI are critical for DNR to coordinate and implement this work on the Sheboygan River. To meet the aggressive timeline and coordinate the restoration work with the remedial actions we will be contracting out for design and implementation of the restoration services. This will enable us to complete projects necessary to delist efficiently and effectively. An ancillary but important benefit will be that these projects will provide jobs to the local community.

I.E Project Targets and Budget

An overview of the individual project budget, BUIs addressed, targets and figure references is found in *Table 1: Project Overview*. Detailed information on cost estimates for each project is included in the Budget section. The tentative timelines for each of the projects are included in the attached *Table 2: Long Term Project Planning Schedule*. The success of the fish and wildlife habitat projects will first be measured in terms of the habitat created or restored and other primary impacts such as decrease in soil erosion. The award timeframe is too short to measure species-specific goals, such as increase in populations. The Results – Outcomes and Objectives section addresses the specific success measures for the projects. These projects have ambitious goals and success may need to be measured over the long term. While the projects will not achieve their full potential environmental benefits in the short term, they will lead to achieving goals of the GLRI Action Plan for BUI and AOC delisting.

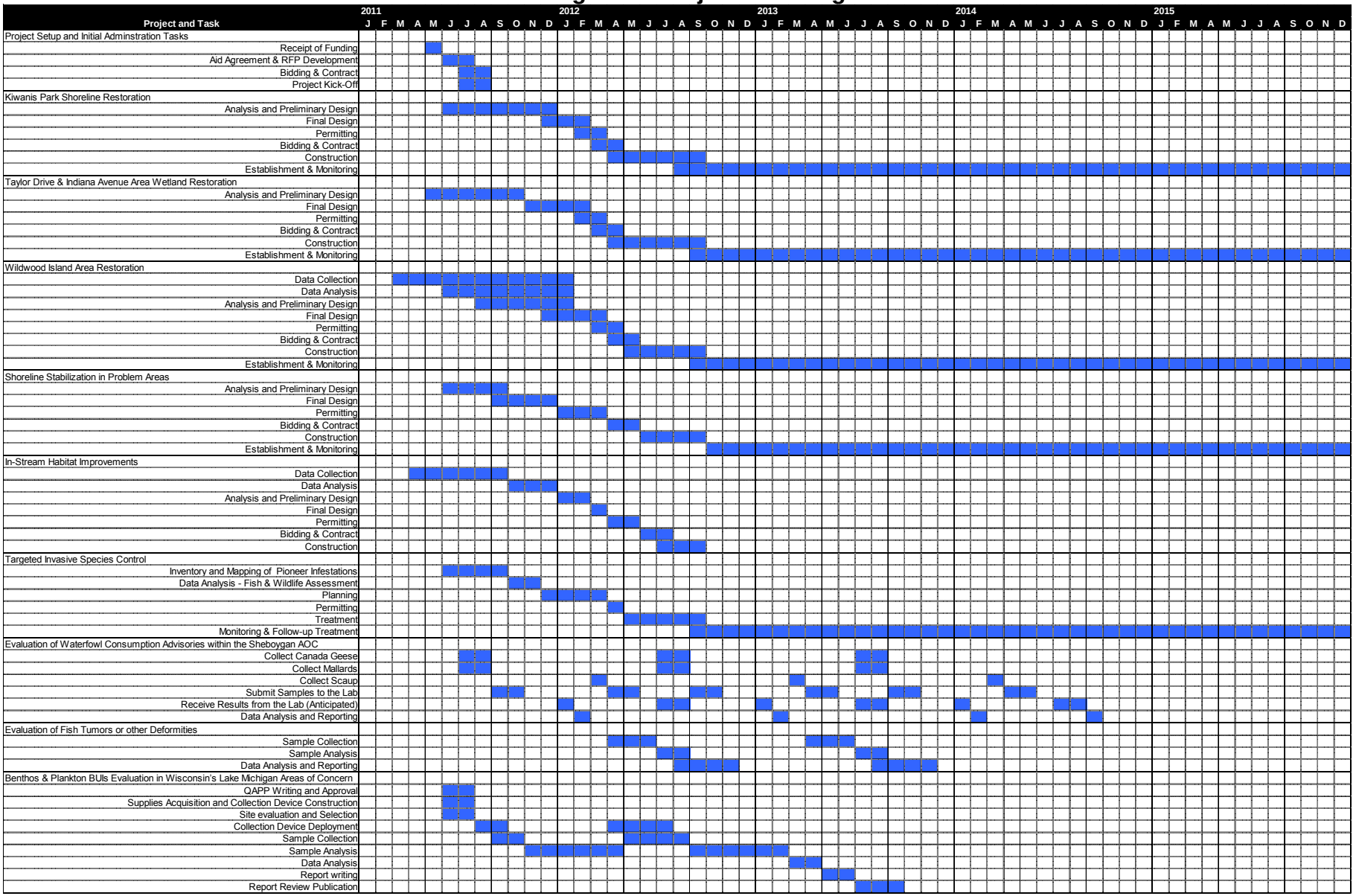
Table 1: Project Overview

Project Name	Project Cost	BUI(s)* Addressed	Approximate Amount of Habitat Restored, Protected or Enhanced	Project Conservation Targets*	Figures
Kiwanis Park Shoreline Restoration	$2,115,000	1, 2	3/4 mile of shoreline habitat	1, 2, 3, 4, 5	Figures 2-6
Taylor Drive & Indiana Avenue Area Wetland Restoration	$795,000	1, 2	10 acres of wetland, shoreline and riparian habitat	1, 2, 3, 4, 5, 6	Figures 7-9
Wildwood Island Area Restoration	$790,000	1, 2	1500 feet of shoreline and 15 acres of island and riparian habitat	1, 2, 3, 4, 5, 6	Figures 10-21
Shoreline Stabilization in Problem Areas	$292,000	1, 2	1000 feet (over 10,000 square feet) of shoreline and riparian habitat	1, 2, 3, 4, 5	Figures 22-27
In-Stream Habitat Improvements	$141,000	1, 2	up to 1 mile of warmwater fish community habitat	4	
Targeted Invasive Species Control	$116,500	1, 2	up to 12 acres of invasive species controlled	1, 2, 3, 5, 6, 7	
Evaluation Waterfowl Consumption Advisories in the AOC	$136,000	3			
Evaluation of Fish Tumors or other Deformities	$168,500	6			
Benthos & Plankton BUIs Evaluation in Wisconsin's Lake Michigan AOCs	$451,500	4, 5			
UWEX Education and Outreach	$83,000	1, 2, 3, 4, 5, 6			

* BUI's
1. Loss of Fish and Wildlife Habitat
2. Degradation of Fish and Wildlife Populations
3. Restrictions on Fish and Wildlife
4. Degradation of Benthos
5. Degradation of Phytoplankton & Zooplankton Populations
6. Fish Tumors and Other Deformities

* Project Conservation Targets
1. Migratory Bird Stopover Habitat
2. Shorebird Stopover and Breeding Habitat
3. Resident Breeding Bird Habitat
4. Warmwater Fisheries Community Habitat
5. Herptile Habitat
6. Riparian Emergent Wetlands
7. Riparian Forested Floodplains
8. Coldwater Fisheries Community Habitat

Table 2: Long Term Project Planning Schedule



I.F Project Summaries

I.F.1 Kiwanis Park Shoreline Restoration

Causes of Habitat Impairment within AOC Addressed by Project
The causes of habitat impairment within the AOC that are addressed by this project include shoreline/stream bank erosion, sedimentation, fragmentation, invasion by non-native plants, urban land use, storm water runoff and vegetation removal.

Site Specific Habitat and/or Population Target for Species
Habitat for migratory bird stopover, shorebird stopover and breeding, resident bird breeding, herptiles, and the warmwater fisheries community will be enhanced and restored. These targets will be further refined in the Fish & Wildlife Habitat Management and Restoration Plan. These improvements will better nearshore habitat for both fish and wildlife populations. Specific fish species that would benefit from improvements for cover and nursery habitat include spottail shiner, bluntnose minnow, white sucker, bullhead, rock bass, bluegill, largemouth bass, smallmouth bass and northern pike.

Project Goals
- Restore ¾ mile of riparian and shoreline habitat in the Kiwanis Park area.
- Naturalize the shoreline, replace unnatural rip-rap material and retrofit storm water outfalls to reduce erosive flows.
- Re-establish habitat and provide a native vegetation buffer along the shoreline.
- Extend connectivity between habitat areas along the river.
- Complete one of the seven Tier I projects necessary to delist Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife Populations BUIs.

Project Coordination
This project will be completed in partnership with the City of Sheboygan. The needs for habitat restoration will be meshed with urban setting of the city park. There will be input from all stakeholders involved during the design phase, including WDNR, City of Sheboygan, their Board of Park and Forestry Commissioners and the TAC. The design of this project will be informed by the GLRI monitoring project work for birds, wildlife and the Rapid Ecological Assessment as well as assessment work by USGS.

Project Activities
The shoreline and habitat of the Sheboygan River along Kiwanis Park in Sheboygan have been degraded by erosion, vegetation removal, non-native species and placement of unnatural materials such as concrete rubble (see Figures 2-6 and photos 1-8). Good quality tree and shrub habitat and quality riparian buffers are missing from the landscape along the Sheboygan River. This type of habitat is beneficial to many bird species for nesting and brood rearing, as well as for general water quality and is one of the most used habitat types during migration. The Lake Michigan shoreline is a heavily used migration route for songbirds, diurnal and nocturnal raptors, shorebirds and waterfowl. The proximity to Lake Michigan makes this area crucial for migratory habitat.

The existing stream substrate is primarily a monotypic bed of small gravel, sand, and silt. Macrophyte growth is absent, possibly due to scour from high stream flows and increased turbidity during the growing season. The shoreline is developed with little vegetated buffer and some bank erosion. As a result, nearshore fish and wildlife habitat is significantly degraded.

The park is the largest tract of shoreline available in the lower AOC for this type of holistic riparian and shoreline community restoration work. Replacing the existing degraded shoreline with quality habitat that will benefit birds, fish and other wildlife will also benefit the river's water quality. This restoration will create ¾ of a mile of continuous native vegetation buffer. It will also provide ancillary benefits to the park aesthetics and recreational activities.

The project will require a design phase (in 2011) and an implementation phase (in 2012). The design phase will address the physical changes necessary to remedy the degradation as well as the biological aspects of the habitat design. There are several aspects to this project which will be addressed, including stabilization of eroded areas, retrofit/replacement of unnatural shoreline structures and rip-rap and re-vegetation with native species appropriate to the type of habitat being restored. As this stretch of shoreline has different reaches that will require different approaches to restoration, the project has been broken into five zones, where different combinations of work will be performed (see Figure 6). The following are descriptions of desired restoration activities that will take place in one or more of these zones.

- Invasive shrubs and dead woody debris will be removed and replaced with native plants appropriate to the type of habitat being restored. It will likely be a combination of areas of trees/shrubs and grasses/wildflowers. When complete this will form a diverse vegetated buffer along the entire ¾ mile of shoreline that will provide habitat to a wide range of species and reduce the impact of non-point storm water runoff.
- Three growing seasons of maintenance and monitoring of vegetation during establishment will be performed following installation. This maintenance is crucial in assuring re-establishing the habitat and restoration activities.
- Emergent and floating-leaved macrophytes will be planted in several of the shallow, shoreline areas. This could include arrowhead, bulrushes, floating-leaved pondweed, white water-lily, giant bur-reed, pickerelweed and *Carex* sp.
- Nearshore, shoreline and riparian areas will be re-graded to stable slopes in certain areas. Areas which have active erosion will be stabilized using naturalized, rather than structural, techniques when possible.
- Several storm water outfalls will be retrofitted. These create erosive flows along the river, especially the largest outfall that flows against the river current and has formed a high-energy scour hole at the river bend. They are significant unnatural and unsightly structures along this reach (see photos 1-8). The outfalls will be retrofitted to control erosion in a manner that creates as little habitat disturbance as possible.

- In combination with the stabilization of eroding areas and areas where unnatural rip-rap such as concrete and asphalt ruble exists, toe erosion structures will be installed or replaced. The new toe erosion structures will be designed with natural materials that will provide habitat to fish and other organisms. Encroaching right-of-way lines and roadways, in combination with existing steep slopes and drop-offs, will make this particularly challenging in some areas.

I.F.2 Taylor Drive & Indiana Avenue Area Wetland Restoration

Causes of Habitat Impairment within AOC Addressed by Project
The causes of habitat impairment within the AOC that are addressed by this project include shoreline/stream bank erosion, excessive flows, sedimentation, fragmentation, invasion by non-native plants, urban land use and storm water runoff and pollutants.

Site Specific Habitat and/or Population Target for Species
The following habitats are targeted for restoration at this site: migratory bird stopover habitat, shorebird stopover and breeding habitat, resident breeding bird habitat, warmwater fisheries community habitat, herptile habitat, riparian emergent wetlands.

Project Goals
- Create connectivity between the Sheboygan River and riparian wetlands.
- Improve fish and wildlife habitat within the wetland complex.
- Address storm water impacts to the wetland.
- Complete one of the seven Tier I projects necessary to delist Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife Populations BUIs.

Project Coordination
This project will be completed in partnership with Sheboygan County. The project will be informed by data from the GLRI monitoring project, specifically bird and fisheries studies. USGS will provide the same in-river assessment work that they will be performing for the other AOC restoration sites as well as additional analysis of the wetland areas.

Project Activities
This project will improve the habitat at an existing wetland complex at the intersection of Taylor Drive and Indiana Avenue. Construction of Taylor Drive fragmented this wetland complex, leaving an emergent wetland and a navigable tributary to the Sheboygan River to the east and an expanded mitigation wetland to the west (see Figures 7-9). There is also a riparian area on the northeast corner of the intersection, where the tributary stream outlets into the Sheboygan River. These areas provide several possibilities for restoration (see Photos 9-14). Some of these possibilities include: connecting or improving the connections of these wetlands to the river, improving habitat in the mitigation wetland and improving water quality in the mitigation wetland. Any of these actions will enhance wetland function for fish and wildlife.

The existing habitat in the mitigation wetland is degraded and has been significantly impacted by storm water runoff, flash flooding, and is heavily used by resident Canada goose populations. The existing habitat in the eastern wetland appears to be good, but is not connected well to the river because of fish/aquatic organism passage barriers formed by the culvert under Indiana Avenue and connecting it to the navigable tributary stream. The riparian area next to the outlet of the stream is commonly used by fisherman as an access point to the river. This area has little cover and some invasive vegetation. Adjacent riparian emergent wetland habitats are rare in the lower portions of the Sheboygan River; therefore, restoring this type of habitat will increase fish and wildlife use at various life stages.

The purpose of this project is to restore connectivity of one or both of these wetlands to the Sheboygan River and enhance the habitat for a variety of organisms including fish, waterfowl and herptiles. A goal of the project, if possible, would be creating additional spawning area for northern pike. This project will be completed in two phases. A hydrologic and hydraulic analysis with feasibility study to determine the options for connectivity and restoration will be preformed first. This will address runoff to the mitigation wetland, feasibility of connections and an analysis of the options. The second phase would be engineering and then implementation of the selected restoration option. This two phase approach is necessary due to the complex hydrology at this site. If either connectivity project cannot be carried out, other restoration activities at the site will still proceed that will enhance the degraded wetland and riparian habitats. These restoration activities will include removing invasive vegetation from the mitigation wetland and restoring native species, creating a native vegetation buffer around the wetland and along riparian areas that create habitat for target species groups, improving the habitat for target species groups along the shoreline area to the northeast of the intersection, altering the mitigation wetland to create more diverse habitats and improve the water quality. Following the implementation of the restoration design, three seasons of vegetation monitoring and management will be completed.

I.F.3 Wildwood Island Area Restoration

Causes of Habitat Impairment within AOC Addressed by Project
The causes of habitat impairment within the AOC that are addressed by this project include shoreline/stream bank erosion, sedimentation, fragmentation and invasion by non-native plants.

Site Specific Habitat and/or Population Target for Species
Habitats that are targeted for restoration at this site: migratory bird stopover habitat, shorebird stopover and breeding habitat, resident breeding bird habitat, warmwater fisheries community habitat, herptile habitat, riparian emergent wetlands. Specific fisheries habitats targeted are forage fish habitat and spawning habitat.

Project Goals

- Stabilize approximately 1,500 linear feet of sloughing banks on and adjacent to the island to protect existing riparian habitats.
- Remove target invasive species (phragmites, purple loosestrife, and buckthorn) from approximately 15 acres to improve wildlife habitat.
- Establish approximately 3 acres of emergent vegetation to enhance northern pike spawning habitat.
- Improve habitat for resident and migratory birds including waterfowl, terns, black-crowned night heron, green heron, songbirds and raptors.
- Complete one of the seven Tier I projects necessary to delist Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife Populations BUIs.

Project Coordination

This project will be completed in partnership with the City of Sheboygan and the US Dept. of the Interior Bureau of Land Management, both landowners in this project. The City will lead the project through a joint agreement with BLM. The design of this project will be informed by the USGS in-river assessment, as well as work on the islands. The GLRI monitoring project will also provide valuable information on both in the in river, island and riparian habitats.

Project Activities

The Wildwood Island complex is the only undeveloped island feature in the AOC. The island complex and adjacent riparian areas are publically owned (by BLM and the City) and consist of approximately 20 acres of aquatic and riparian floodplain habitat (see Figures 10-13 and Photos 15-19). This complex provides a natural refuge for fish and wildlife due to its isolated location and backwater setting, which is unique in the AOC, especially the urbanized segment. Significant erosion exists along the banks of the island and adjoining riparian lands, resulting in riparian habitat loss, degradation of fish spawning areas and sedimentation. This erosion appears to have an accelerated rate since upstream development occurred (see Figures 14-21 for historical documentation of erosion patterns). The riparian areas are also degraded with invasive plant species (buckthorn, purple loosestrife, and phragmites) and other low-quality tree species (box elder, willow, and cottonwood), reducing the overall habitat value for the target wildlife species.

The purpose of the project is to stabilize the banks to reduce sedimentation and loss of riparian habitat, to control invasive species, and to improve fish and wildlife habitat within the riparian floodplain. A goal of the project is to use bioengineered bank stabilization techniques (rather than hardened structures) to stabilize approximately 1,500 linear feet of eroding banks. Approximately 15 acres of invasive species will be removed using herbicide treatment. Undesireable tree species (box elder, willow, and cottonwood) will be cut and stumps treated with herbicide to control regrowth. Treated areas will be replanted by seeding native wetland to mesic plant species and planting areas with native fruiting trees and shrubs. Another goal of the project is to improve the in stream fisheries habitat. If possible, an approximately three acre backwater complex will be enhanced for waterfowl and northern pike spawning habitat. Currently this area

lacks emergent vegetation. Native emergent plants will be planted on the periphery of this area to provide food and cover for fish and wildlife and suitable aquatic vegetation to increase northern pike spawning success. An additional three years of monitoring and management is proposed to promote establishment of the desired plant communities. Management is expected to include 1-year replacement of planted materials and spot herbicide treatment of the target invasive species.

I.F.4 Shoreline Stabilization in Problem Areas

Causes of Habitat Impairment within AOC Addressed by Project

The causes of erosion at these sites are the result of both natural and man-made conditions. The steepness of the existing river banks as well as the instability of the bank soils (layers of clay and sand) is the reason for accelerated erosion at these sites. Changes in development and land use within the upper watershed have contributed to a greater "flashiness" of the river during rainfall events. This increases the rate of erosion at the toe of the slope adding to more rapid bank failure. In turn this causes of habitat impairment within the AOC. The impairments that are addressed by this project include sedimentation, disturbance by erosion or displacement of native plant communities.

Site Specific Habitat and/or Population Target for Species

Habitat for migratory bird stopover, shorebird stopover and breeding, resident bird breeding, herptiles, and the warmwater fisheries community will be enhanced and restored. These targets will be further refined in the Fish & Wildlife Habitat Management and Restoration Plan. These improvements will better shoreline habitat for both fish and wildlife populations.

Project Goals

- Reduce or eliminate bank and soil erosion in several problem areas throughout the AOC.
- Stabilize these riparian areas in a manner that creates suitable habitat.
- Complete one of the seven Tier I projects necessary to delist Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife Populations BUIs.

Project Coordination

This project will be implemented in cooperation and coordination with Sheboygan County Planning and Conservation Department and local landowner(s). Initial contact with landowners has been made. The county has successful erosion control and buffer programs. We would work through this existing framework to provide funding to private landowners. The GLRI monitoring project will identify high quality areas and species that may be targeted by the restoration work. Design work would be completed by a contracted engineering firm, rather than Sheboygan County Planning and Conservation Department.

Project Activities
This project will address sedimentation from large sections of unstable and eroding riverbanks that are adversely impacting aquatic communities (fish and benthos) and associated wildlife populations in the Sheboygan River AOC. Eroding soil is a significant source of degradation to rivers. The eroded soil impacts water quality, transports excess nutrients into the river and smothers benthic organisms. In the Sheboygan River AOC, several areas have considerable erosion issues (see Photos 22-24).

The F&W TAC have preliminarily identified five problem areas with significant erosion issues during a reconnaissance survey in September of 2010 (see Figures 22-27). Estimates indicate that these five have erosion rates between 32 tons/year to 94 tons/year. Collectively, these areas contribute an estimated 307 tons of sediment per year to the Sheboygan River. (Estimates are based on the lateral recession method similar to that used in the Wisconsin Priority Watershed Project Inventories. For each erosion site, the method estimates the volume and tons of sediment lost on a yearly average. This is done by measuring the length, height and recessional rate of each erosion site. Recession rates were determined based on the physical characteristics of the eroded site. This volume of sediment was then multiplied by the density of the sediment to obtain the tons of soil loss from the site.

In order to remove this source of sedimentation, these areas are targeted for restoration. The first step will be a survey of the priority sites in the AOC to determine exact locations and extents of the erosion. Next, evaluation of river hydrology and site conditions will provide information necessary for engineering designs. Based on initial observations by technical staff, it has been determined that various stabilization techniques will be required. Three sites will need large rip-rap placed to prevent toe erosion. Two of the sites are the result of overbank gully erosion. All of the sites involve some type of obstruction removal, bank shaping, tree revetments and bank re-vegetation. Coordination with the designers will ensure that the erosion control solutions will provide appropriate habitat types and vegetative communities to meet the goals for shoreline and nearshore habitat restoration. Three seasons of monitoring and maintenance of vegetation would follow the implementation of the restoration design to assure that the sites are stable.

I.F.5 In-Stream Habitat Improvements

Causes of Habitat Impairment within AOC Addressed by Project
Loss and degradation of fish habitat are causes of habitat impairment that are addressed by this project. This loss and degradation have occurred due to development, dams, and sedimentation.

Site Specific Habitat and/or Population Target for Species
Sedimentation can be reduced and habitat complexity increased through the implementation of restoration design of in-stream scour and cover structures. There is a clear need for increased habitat complexity and scour, however, the extent of the

impairment and precise locations of remaining quality habitat as well as degraded habitat has not been adequately quantified. Prior to the establishment of population level targets, information on aquatic habitat availability for species of interest is needed. Carrying capacity of any particular system is determined by quantity and quality of habitat. Potential habitat impairments may exist for fish populations for which there is a paucity of relative density information (e.g. adult lake sturgeon were noted in the Sheboygan River in 2001. A comprehensive habitat survey will be of great utility in this regard.

Project Goals

- Survey fish habitat limitations in Sheboygan River AOC.
- Design and construct habitat improvements aimed at increasing habitat quality and complexity within the Sheboygan River AOC.
- Complete one of the seven Tier I projects necessary to delist Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife Populations BUIs.

Project Coordination

This project will be led by WDNR staff. Habitat surveys and mapping will be completed by UW-Green Bay using side scan sonar. This project will also be informed by surveys included in the GLRI funded monitoring project and will give a more current view of fish populations in the project area.

Project Activities

The key to success in any habitat improvement project is to first identify and then improve the characteristics of the habitat that are limiting to the fish populations of interest. Identification of specific limiting habitat characteristics is often difficult and requires detailed quantitative data on the physical and biotic characteristics of the stream prior to improvement. Based on these needs, a historic and current inventory of the habitat and aquatic communities in the project area is necessary. A quantitative habitat survey will be performed as the first step in this project. Additional information on macroinvertebrates and fish is being gathered as part of the GLRI funded monitoring project. The habitat survey will provide the information necessary to locate and design habitat improvements. Once the habitat mapping is completed, designs will be drafted and implementation of those designs will follow in 2012.

The in-stream habitat improvements will likely be aimed at improving habitat in sedimented areas and replacing lost structure. Sediment reduction can be achieved through the placement of scour structures. A common practice is to place large boulders as scour structures to speed water flow and increase turbulence in a localized area thus increasing the rate that fine sediment is scoured away from that area. Greater scour deepens the channel and exposes habitat.

Often coupled with the placement of scour structures is the addition of in-stream cover. Cover is a term that describes characteristics of or objects in a stream that provide shelter or hiding places for fish. Abundance and biomass of warmwater game fish in a section of stream tend to be positively related to the amount of cover present. Any

number of objects can be cover for fish, but in this instance, local fish managers recommend logs and large woody debris to keep with natural aesthetics and functionality. Logs and large woody debris would need to be pinned in place by the boulders installed as scour structures or otherwise secured to the riverbanks to prevent unwanted movement downstream. Depending on habitat enhancement locations, riparian landowner permission may be needed to carry out habitat work. A floodplain analysis would also be required to ensure negative upstream effects would be avoided.

I.F.6 Targeted Invasive Species Control

Causes of Habitat Impairment within AOC Addressed by Project
The causes of habitat impairment within the AOC that are addressed by this project include invasion by non-native plants and disturbance by erosion or displacement of native plant communities.

Site Specific Habitat and/or Population Target for Species
As no specific sites have been determined for this project, targets for the habitat types are not yet known. Due to the types of habitat already found in the AOC it is likely that habitat for migratory birds, shorebirds, resident birds, warmwater fisheries community, herptiles, riparian emergent wetlands and riparian forested wetlands will be enhanced and restored. Inventory and mapping will occur in summer 2011. These targets will be further refined in the Fish & Wildlife Habitat Management and Restoration Plan. This project will control targeted invasive species populations in order to restore a native plant community.

Project Goals
- Use the inventory, mapping and treatment strategy developed with FY2009 funding to implement invasive species control.
- Monitor success of invasive species eradication.
- Complete one of the seven Tier I projects necessary to delist Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife Populations BUIs.

Project Coordination
This project will be led by the WDNR. Inventory, mapping and treatment plan development will be contracted in summer 2011 using FY2009 GLRI funding. A certified pesticide applicator will be contracted to perform treatment over 4 growing seasons. Project activities will be coordinated with private landowners if treatment is needed on their property and the F&W TAC. Existing or new partnerships with stakeholder groups concerned with invasive species may also be incorporated into the project. Data recently gathered by River Alliance of Wisconsin through their Project RED and upcoming inventory work by the Bureau of Endangered Resources through the GLRI monitoring project will also be used to identify locations of the targeted invasive species. Potential project partners include the U.S. Fish & Wildlife Service, WDNR, F&W TAC, Sheboygan River Basin Partnership, River Alliance of Wisconsin, Sheboygan County, City of Sheboygan, and the Kohler Company.

Project Activities

This project will control populations of targeted invasive species within the AOC. The targeted species are those that pose the greatest threat to fish and wildlife habitat within the AOC, including Japanese Knotweed (*Polygonum cuspidatum*), Giant Reed Grass (*Phragmites australis*), Garlic Mustard (*Alliara petiolata*), and Buckthorn (*Rhamnus spp*.). Populations of these invasive species are dispersed throughout the entire AOC as well as adjacent wetland and floodplain habitats (see Photos 20-22).

This project will benefit habitat for fish and wildlife species such as northern pike, migratory birds, and amphibians, specifically in the near-shore, floodplain, and wetland areas throughout the AOC. Phragmites outcompetes native vegetation, alters the water regime through increased evaporation and trapping of sediments, and results in loss of food and shelter for wildlife. Japanese knotweed inhabits banks and shorelines, creating an impenetrable wall of vegetation, reducing plant diversity, and leaving banks vulnerable to erosion during the winter months when it dies back. Garlic mustard and buckthorn have primarily invaded the forested floodplains adjacent to the Sheboygan River.

During the 2011 field season the satellite and pioneer colonies of the above listed invasive species will be inventoried and mapped within the AOC. This inventory work is funded by FY 2009 GLRI funding, and is not included in this project budget. Preliminary locations of Japanese Knotweed have also been supplied by River Alliance of Wisconsin. The Bureau of Endangered resources will inventory and map high priority natural areas in 2011 and likely supply the location of some satellite populations as well. These surveys together will provide a comprehensive overview of the frequency and size of terrestrial invasive species populations within the entire AOC. Mapping of the locations will follow the inventories.

An invasive species treatment plan will be developed by the contractor in cooperation with WDNR staff and the F&W TAC based on the inventory and mapping. Development of the treatment plan is also funded by FY 2009 GLRI and not included in this budget. Treatment sites will focus on restoration project locations, high priority natural areas, and satellite populations that pose a threat to further spread within the AOC. Without a comprehensive inventory, it is currently difficult to quantify the number of acres or miles of shoreline that will be treated. We have estimated our requested funding will treat 10-12 acres. Permission for treatment on private property will be secured during the development of the treatment plan. Any necessary permits will also be obtained. The plan will make contingencies for replacement of vegetation if necessary in treatment areas.

In the summer and fall of 2012 the treatment plan will be implemented. Continued monitoring and mapping will be used to determine the treatment success and any follow up actions or alterations to the treatment plan. The treatment of the targeted invasive species will continue throughout 2013, 2014 and 2015. A total of four growing seasons of treatment, monitoring and maintenance are included in the project, as it is well

recognized that successive treatments are necessary to ensure control of invasive plants.

I.F.7 Evaluation of Waterfowl Consumption Advisories within the AOC

Causes of Habitat Impairment within AOC Addressed by Project
Historic industrial pollution within the AOC has led to contamination of fish, waterfowl and other wildlife. Elevated PCB levels in sediments and in turn, waterfowl resulted in two waterfowl consumption advisories being enacted in the Sheboygan River and Harbor. This project does not seek to correct any habitat impairment, but rather assess if a beneficial use impairment exists.

Site Specific Habitat and/or Population Target for Species
Determine if waterfowl consumption advisories can be lifted for mallard duck and lesser scaup in the Sheboygan River AOC.

Project Goals
- Assess waterfowl for contamination to determine if current consumption advisories can be repealed.
- Fulfill one of the required steps identified in the Sheboygan AOC Delisting Targets towards delisting the fish and waterfowl consumption advisories BUI. (Successful outcomes from the completion of the scheduled remedial actions and Legacy project will fulfill the other).

Project Coordination
This project will be coordinated with work done under another GLRI waterfowl consumption advisory project, if that project is funded. The review of consumption advisories will be coordinated with the Wisconsin Department of Health Services.

Project Activities
Waterfowl consumption advisories have been in place along the Sheboygan River since 1987. These advisories are the result of contamination from persistent, bioaccumulative, and toxic chemicals, primarily polychlorinated biphenyls (PCBs). However, these consumption advisories have not been re-evaluated since their inception. Therefore, we propose to re-examine the state of the advisories and determine if any of the existing advisories and subsequent BUIs can be removed or if any additional advisories are warranted. This is the first step necessary to work toward delisting this BUI. In order to delist the wildlife consumption BUI, the floodplain cleanup that is part of the Superfund cleanup must be implemented, all other known sources of bioaccumulative contaminants of concern (PCBS, mercury, pesticides, and PAHs) have been identified and controlled or eliminated and the waters within the Sheboygan River AOC are no longer listed as impaired due to wildlife consumption advisories listed in the annual Wisconsin Migratory Bird Regulations.

Advisories currently in place for the Sheboygan River AOC include an advisory not to eat Mallards from the Sheboygan River from Sheboygan Falls downstream to the river's mouth at Lake Michigan. In addition, an advisory not to eat Lesser Scaup from Sheboygan Harbor is in place.

The sampling protocol is based on recommendations from the Protocol for a Uniform Great Lakes Fish Advisory. While this document does not deal with waterfowl, the recommendations are still valid. This protocol requires three years of "clean" data in order to remove consumption advisories. For this reason, the project will extend beyond the 2012 completion date for some of the other projects. An update on the project status and to-date findings can be provided at the end of 2012 if requested.

Based on historical data, we will sample species similar to those collected during the WDNR's original contaminants monitoring program conducted in the 1980's. A dabbler species (Mallard) and a diving species (Scaup) will be collected at each section of the river where advisories are currently in place. In addition, we will collect samples from resident Canada Geese. Ten samples of each species from each location will be collected each year for three consecutive years.

The difficulty regarding the issuance of consumption advisories for waterfowl has been considered in planning this project. Because they are mobile and migratory, it is difficult to pinpoint whether waterfowl have accumulated contaminants from outside WI or the United States or from a location in the state other than the area where they are harvested. To address this issue, we will focus on collecting adult Mallards and Canada Geese known to be members of a resident flock and/or juvenile birds known to have been hatched in Wisconsin. In addition, we will also try to collect migrating mallards in order to determine if a difference exists in the level of contamination between resident and migrant mallards.

Samples for analysis will be submitted to the WI State Lab of Hygiene (SLOH). Samples will be analyzed for legacy contaminants (PCBs, Pb, Hg, DDT/DDE, OC pesticides) as well as emerging contaminants such as PBDEs, PFOS, and PFOA. Analysis of this suite of contaminants will provide information on known contaminants as well as others that may be causing problems for fish and wildlife in the AOC.

WDNR Wildlife Health will evaluate and interpret sample results from the SLOH. This process will include consultation with the Department of Health Services (DHS) on the interpretation of results.

I.F.8 Evaluation of Fish Tumors or other Deformities

Causes of Habitat Impairment within AOC Addressed by Project

Historic industrial pollution within the AOC has led to contamination of fish, waterfowl and other wildlife. The fish tumors or deformities have been associated with chemical

contaminants. This project does not seek to correct any habitat impairment, but rather assess if a beneficial use impairment exists.

Site Specific Habitat and/or Population Target for Species
This project will assess the rate of tumors or other deformities found in fish in the Sheboygan River AOC to determine if a beneficial use impairment exists. White sucker (*Catostomus sp.*) is the species that will be sampled.

Project Goals
- Determine tumor incidence rate in the Sheboygan River AOC for potential consideration of delisting the Sheboygan AOC relative to the fish tumor BUI.
- Fulfill one of the required steps identified in the Sheboygan AOC Delisting Targets towards delisting this BUI.

Project Coordination
This project will be led by the WDNR. Samples will be analyzed at the USGS Leetown Science Center and UC-Davis Isotope Lab. If possible collection of fish for sampling will be coordinated with other fish sampling in the AOC. This project will at the very least provide a basis for quantitative comparison to reference sites in other AOCs if a comparison study is necessary.

Project Activities
We will collect up to 200 white suckers age-3 and older to and determine tumor incidence rates using methodology developed by Blazer et al. (Blazer, V.S., J.W. Fournie, J.C. Wolf, and M.J. Wolfe. 2006. Diagnostic criteria for proliferative hepatic lesions in brown bullhead *Ameiurus nebulosus*. Disease of aquatic Organisms 72:19-30). In addition, Carbon-13 isotope (13C) content from the collected fish will be analyzed in order to help determine their relative residence time within the Sheboygan River AOC.

Choice of the appropriate indicator fish species to sample was determined by IJC guidance and likelihood of reaching the intended sample size. Both bullheads (*Ameiurus sp.*) and suckers (*Catostomus sp.*) are specifically mentioned in the IJC 1991 BUI definition and have demonstrated increased tumor rates in association with contaminants. The incidence of brown bullhead is likely low in the Sheboygan AOC and therefore white suckers will be targeted for sampling. However, since white suckers are less resident than bullhead, we plan to attempt to determine the temporal utilization of AOC using isotope analysis.

Fish tumors do not develop instantaneously. As such there has been a demonstrated relationship with factors such as fish age and length (which themselves are obviously correlated) and tumor incidence. Similarly, resident fish species will have longer exposures to contaminated sediments than transient fish species. As such, all fish collected for tumor examination will be age-3 or older as this is the age of maturity for many species of fish present in AOC. White suckers collected will be measured prior to sample collection, aged after sample collection to confirm the age of each fish, and

stable isotope information collected in order help determine relative temporal presence within the AOC.

The IJC 1991 BUI definition also included the presence of neoplastic and pre-neoplastic tumors as being evidence for impairment. We will only include neoplastic tumor rates for delisting purposes as defined by Blazer et al. (2006) since factors other than contamination such as viral infection and parasites have been shown to elicit external and pre-neoplastic tumor responses.

Our strategy for statistically determining if the fish tumor BUI can be delisted is a two stage approach. First, intensive sampling within the AOC to determine, with a known level of certainty (outlined above), whether the tumor incidence rate is below established target levels for the appropriate fish species (outlined above). Second, if the intensive sampling results suggest that tumor incidence rates may be above target rates, white sucker collection at an appropriate reference site will be conducted if data from an appropriate reference site does not currently exist. If data collected in the first stage determines that the incidence rate of tumors is below the established target, the intensive sampling will not be necessary to delist this BUI.

Understanding the extant tumor rate within the Sheboygan AOC is the first priority in determining whether the fish tumor BUI should be delisted once sufficient remediation has occurred. We view a tumor incidence of 5% or lower with a 95% certainty as a threshold for delisting, as outlined in the delisting targets (see Table 3*)*. If sufficient sampling suggests that the extant fish tumor rate is below 5% we believe that the fish tumor BUI may be considered for delisting. Our sampling target is 200 fish. If the 200 fish sample yields below 5% within the 95% confidence interval (i.e. 5 or fewer tumors out of 200) we will consider delisting the fish tumor BUI. Similarly, if fewer fish are captured, we will consider delisting the fish tumor BUI if the 95% confidence interval of the tumor incidence rate is less than or equal to 5%.

If results from the intensive AOC sampling suggest that the upper 95% confidence limit of the tumor incidence rate is not below 5%, we will compare data obtained from the AOC with data collected from a suitable reference site. Again a target of 200 fish will be used. We acknowledge that with a 200 fish sample, $\alpha = 0.05$ (i.e. there is a 1 in 20 chance that we will incorrectly state that the reference is lower than the AOC), and a power of 0.80 (i.e. there is a 1 in 5 chance that we will incorrectly state that the reference and the AOC are the same) we can expect to detect the similarities or differences between about 10% in the reference and 18% in the AOC using a two-sample proportions test (R Core Development Team 2010) for example. Actual detection probabilities will depend on the values obtained from sampling.

I.F.9 Benthos & Plankton BUIs Evaluation in Wisconsin's Lake Michigan Areas of Concern

Causes of Habitat Impairment within AOC Addressed by Project

The impairments addressed by this project are degradation of benthos, phytoplankton and zooplankton populations. This project does not seek to correct any habitat impairment, but rather assess if a beneficial use impairment exists.

Site Specific Habitat and/or Population Target for Species
This project will compare the benthic, phytoplankton and zooplankton communities of the Sheboygan River, Menominee River, Lower Green Bay and Fox River and Milwaukee Estuary with other non-AOC Lake Michigan riverine systems to determine if they are significantly different.

Project Goals
- Compare the benthic and plankton communities of AOC and non-AOC sites to determine if they are significantly different.
- Determine if the degradation of benthos BUI and degradation of phytoplankton and zooplankton populations BUI can be delisted in the Sheboygan River AOC.

Project Coordination
This project will be a partnership between USGS and WDNR Office of the Great Lakes. The USGS will execute the sampling project and will work with WDNR to determine if the Degradation of Benthos and Degradation of Phytoplankton and Zooplankton populations can be removed. The Office of the Great Lakes will coordinate with the AOC stakeholders on BUI removal.

Project Activities
Benthos (benthic invertebrate) and plankton (phytoplankton/zooplankton) communities in Wisconsin's four Lake Michigan Areas of Concern (AOCs; Menominee River, Lower Green Bay and Fox River, Sheboygan River, and Milwaukee Estuary) and six non-AOCs will be quantified. The inclusion of non-AOC sites is critical to enable comparison of AOC sites to relatively un-impacted or less impacted control sites with natural physical and chemical characteristics that are as close as possible to that of the AOCs. Comparison to less-impacted control sites as site pairs and as a group is consistent with the approaches used by other Great Lakes states, such as Michigan and Ohio. The community data within and between the AOCs and non-AOCs will be analyzed and the differences and similarities will assist in determining the status of the communities and, when appropriate, support delisting of the "Degraded Benthos" and "Degradation of phytoplankton / zooplankton populations" beneficial use impairments in each AOC. This project is a cooperative agreement between the Wisconsin Department of Natural Resources (WDNR) and the US Geological Survey (USGS). More detailed information on this project is provided in the Appendix.

I.G Connection to the Great Lakes, Immediacy & Timeliness

The immediacy and timeliness of these projects could not be greater. Contaminated sediment removal projects are being completed in the AOC under Superfund, Superfund Alternative and Legacy Act actions in the next two years. The timing of

these habitat projects will coincide with the sediment removal, following this disturbance of the river with habitat restoration projects. It not only provides an ecological benefit to the river, but may also provide an economic benefit in combining services and efforts to accomplish restoration in the Sheboygan River and work toward delisting of several BUIs. As the timeline indicates, there is a lot of work to be done within the project timeframe, including concept planning, final design and implementation of the restoration designs. This is an ambitious goal, but WDNR is committed to do what it can and make every effort to meet this goal. The Great Lakes positions supported by GLNPO as part of the GLRI have been critical to the development of this Sheboygan Project proposal and will be the means to see it to success.

This set of evaluation and habitat restoration clearly works toward protecting and restoring the Great Lakes. These projects all have results that directly benefit Lake Michigan by improving the water quality, habitat, and fish and wildlife populations. The protection and restoration projects and associated activities are supported by the goals and objectives of many overarching, comprehensive plans. These regional, state and local plans include the following:

- Delisting Targets for the Sheboygan River AOC (2008)
- Sheboygan River Remedial Action Plan (1995 Update)
- WDNR Sheboygan River State of the Basin Report (2001)
- Wisconsin's Great Lakes Strategy (2009 Update)
- WDNR Lake Michigan Integrated Fisheries Management Plan (2003-2013)
- WDNR Fish, Wildlife and Habitat Management Plan (2007-2013)
- Sheboygan County Natural Areas and Critical Resources Plan (2004)
- Sheboygan County Outdoor Recreation and Open Space Plan (2007)
- Lake Michigan Lakewide Management Plan (2008)

I.H Comprehensive Plan Protection & Restoration Potential

The following is a summary of the goals and objectives from each plan that supports the fish and wildlife habitat restoration projects. The projects will work toward achieving the goals set out in these plans. Discussion of how the projects are supported by local AOC planning documents (Delisting Targets, Remedial Action Plan) is provided in the next section. A Stage 2 RAP has not been developed for the Sheboygan River. Parallel to the implementation of the projects in this proposal, a Stage 2 RAP and Fish and Wildlife Habitat Restoration and Management Plan will be developed.

I.H.1 WDNR Sheboygan River State of the Basin Report (2001)

<u>Sheboygan River Basin Objectives for the Future</u>

- The Department continues to work with the U.S. EPA, NOAA, USFWS, and the principle responsible parties to effect sediment clean-up activities in the Sheboygan River Area of Concern/Superfund Site.

- Water Resources managers should continue to assess the bioavailability of contaminants in the Sheboygan River Area of Concern (AOC).
- Wildlife biologists should continue to collect waterfowl, small mammals, turtles, and swallows, for tissue analyses to determine toxic contaminant levels and health effects associated with the Sheboygan River Superfund Site.
- Water quality biologists should continue to assist the Sheboygan County Land Conservation Department staff in obtaining stream bank buffers along all of the streams in the watershed.
- Water quality biologists should continue to conduct water quality assessments on the Sheboygan River at Esslingen Park as part of the Trend Monitoring project for streams.
- Fish and aquatic biologists should conduct water and sediment quality and fish surveys on the Sheboygan River impoundments.
- Water quality biologist should evaluate the distribution of zebra mussels in the Sheboygan River downstream of Big Elkhart Lake and the impacts to native mussels in the lake and river.
- Department biologists should collect and analyze fish for PCBs, pesticides, and mercury throughout the watershed.
- The Department should continue to work with the City of Sheboygan to maintain and enhance fishing opportunities in the Sheboygan Harbor and riverfront.
- Encourage riparian landowners to maintain and/or establish riparian buffers.
- Continue work with community, including UW-Extension, Public Health Departments, professional and environmental organizations, to comprehensively address local needs for information, education, technical assistance and to support the public's ability to knowledgeably participate in making decisions regarding their natural environment.
- Continue to work with individuals and local communities to plan projects with an environmental awareness.
- Form partnerships with agencies, environmental groups and citizens that wish to work on Great Lakes issues such as beach monitoring, coastal wetlands, enhancements, erosion and floodplain mapping.

<u>General Surface Water Recommendations</u>

- Support county Land Conservation Departments and work with riparian owners to establish buffers along all waterways to reduce nutrient and sediment loadings.
- Protect and restore wetlands throughout the Sheboygan River Basin.
- Improve angling, hunting, and nature enthusiast opportunities in the Sheboygan River Basin.
- Identify the presence of exotic species on land and in water, limit their spread and work towards eradicating them.
- Improve public access for nature recreation along Lake Michigan in the Sheboygan River Basin.
- Reduce inputs of nutrients suspended solids (i.e. soil) from tributaries to Lake Michigan.
- Coordinate with and support local partners in developing and applying for River Planning and Protection Grant Programs for each watershed in the Sheboygan

Basin. Specific projects could include stream habitat restoration, dam removals, and stormwater management projects.

Fisheries Objectives

- Increase the smallmouth bass population in the Sheboygan River, particularly above Johnsonville; pursue habitat improvement projects, where feasible.
- Identify the presence of exotic species on land and in water, limit their spread and work towards eradicating them.

Objectives for Recreational Lands in the Sheboygan River Basin

- The WDNR and other organizations should continue to acquire recreational lands within the Sheboygan River Basin in accordance with project acquisition goals, where feasible.

I.H.2 Wisconsin's Great Lakes Strategy (2009 Update)

Aquatic Invasive Species

Goals – Prevent new introductions of nuisance exotic species; prevent newly introduced nuisance exotic species from becoming naturalized or spreading to new areas; and minimize the impacts of existing invasive species.

Habitat and Species

Goals – Conservation of biological diversity through rehabilitation of native fish populations, species, communities, and their habitats has a high priority.

Recommended Actions

- Restore at least eight tributaries in the combined Lake Michigan and Lake Superior Basin areas.
- Protect and restore 55,000 acres of coastal, riparian, and wetland habitat and associated uplands in Wisconsin
    - Support other coastal wetlands and shoreline protection and restoration efforts to restore regional hydrology and adjacent habitats and to manage and/or emulate hydrology in wetlands and adjacent habitats. Shorelines include those along lakes, streams and wetlands
- Action Plan Recommendations for the Lake Michigan Basin area:

1) Priority areas for coastal, riparian and wetland habitat protection and restoration
    - Fish spawning and wildlife nesting habitats
2) Priority areas for tributary restoration and protection
    - Sheboygan River
    - Willow Creek

Coastal Health

Recommended Actions

- Work with local governments and the WI Department of Commerce to reduce biological contamination from nonpoint sources of runoff.
    - Support Best Management Practices that would include riparian, floodplain, and wetland restoration

Areas of Concern/Contaminated Sediments

Goals – Develop delisting targets for each AOC in Wisconsin, a reasonable timeline for achieving delisting goals, and monitor and report on progress towards delisting of

targets. Expand AOC Legacy projects to include related habitat improvements and expand clean up activities on non-AOC sites.

Recommended Actions

- Set priorities for funding and implementation of remedial actions to meet AOC-specific BUI delisting goals for the five AOCs in Wisconsin. Priority actions differ for each AOC but address elements such as:
  - Complete delisting targets
  - Evaluate and delist BUIs when monitoring demonstrates that targets have been met
  - Use the strategy to support resource requests for AOC clean up and habitat restoration
- Educate and engage local communities in implementation of AOC remediation plans and actions.
  - Engage local communities in each AOC in development of implementation priorities for the actions listed in the AOC delisting targets
  - Use outreach and education activities to maintain a well-informed and motivated network of citizens that understand the benefits of “taking back” their river; these individuals could be deployed to move agencies and responsible parties to action
- Participate in the Federal-State AOC Coordinating Committee to ensure Wisconsin needs are addressed.
  - Monitor progress in delisting of BUI targets established for each AOC
  - Seek funding for restoration of sites after remediation if restoration is a priority need
- Action Plan Recommendations

1) AOC- specific priorities for funding and implementation of remedial actions to meet BUI delisting goals: Sheboygan River AOC:
   - Evaluate and delist BUIs when monitoring demonstrates that targets have been met

<u>Non-point Pollution</u>

Recommended Actions

- Expand wetland restoration to preserve and restore wetlands functionality and wetland protection to reduce loss of watershed water storage capacity.
  - Coordinate wetlands preservation, restoration and protection for nonpoint source management with wetland habitation and species strategies
- Control soil erosion and sediment delivery to streams from croplands.
  - Manage runoff in locations of concentrated flow through establishment of grassed waterways and other management practices. In the Lake Michigan basin, focus on critical geographic areas including Green Bay, the nearshore of Lake Michigan, and Areas of Concern (AOC)

I.H.3 WDNR Lake Michigan Integrated Fisheries Management Plan (2003-2013)

GOAL I. A diverse, balanced, healthy ecosystem.

- Objective A. Protect, maintain, and enhance habitat for game and non-game fish species.
  "We must seek to protect undisturbed habitat, maintain functioning habitat, and, if possible, improve or create habitat beneficial to both game and non-game species."
- Objective B. Protect and restore native species.
  "Human activities in the Lake Michigan basin, through water quality degradation, habitat modification, intentional and unintentional introduction of non-indigenous species, and sport and commercial fishing, have had profound effects on native fish populations. The Lake Michigan system as a whole has been sufficiently altered that it is not feasible to completely restore the pre-settlement native fish community. However, rehabilitation of populations of some native species could promote diversity and stability within the ecosystem, while also, in some cases, providing additional sport or commercial opportunities."

I.H.4 WDNR Fish, Wildlife and Habitat Management Plan (2007-2013)

Strategic Goal II: Sustaining Ecosystems

A. Maintain Wildlife Habitat and Biodiversity

A.1. General Goals and Objectives

b. Identify, protect and restore critical habitat in each administrative area with priorities determined for each ecological landscape.

c. Identify, investigate, and conduct research on the causes of habitat loss or impairment and take corrective actions in each administrative area.

A.2. Aquatic Communities – General

b. Continue to work with local units of government to further protect and restore shore lands.

c. Restore forests, grasslands and wetlands in watersheds to enhance water quality in streams and lakes.

A.3. Wetlands

b. Identify and prioritize wetlands in need of protection, restoration and enhancement in each ecological landscape or administrative area.

d. Protect wetlands with high value through acquisition, incentives and other innovative strategies together with federal, state and local government and conservation organization partners.

e. Restore degraded wetlands on public and private lands to recapture ecosystem function and value and in certain areas enhance migratory waterfowl habitat.

A.9. Urban and Suburban Areas

a. Protect and enhance birds using urban environments, e.g., Bird City USA, green space planning, and National Wildlife Federation backyards for wildlife, with special attention to corridors and riparian habitats.

b. Work with municipal parks to develop demonstration projects.

c. Work with urban governments to improve water quality in associated rivers and lakes.

e. Promote use of native species for urban habitat plantings.

A.11. Exotic and Invasive Species

a. Prevent, control where feasible, or contain priority non-native invasive plant species.

b. Identify invasive species that will be a priority for Department control and then identify priority sites for invasive control in each administrative area.

Strategic Goal III: Protecting Public Health and Safety

A. Monitor Diseases and Environmental Contaminants in Wildlife

A2. Contaminant Monitoring

a. Continue contaminant monitoring in identified geographic areas, species of concern, e.g., fish-eating birds and insectivores, or habitats of concern, e.g., northern wetlands.

g. Initiate contaminant monitoring of wildlife species regularly consumed by humans.

Strategic Goal IV: Providing Outdoor Recreation

B. Land Management – Fishery Lands

b. Improve access to sport fishing opportunities.

I.H.5 Sheboygan County Natural Areas and Critical Resources Plan (2004)

I. Natural Resources Goals, Objectives, Policies

- Goal 2: Conserve and restore riparian areas (corridors adjacent to waterways) in the Milwaukee and Sheboygan River Basins.
  - Objective 2.1: Combine public and private efforts to restore riparian stream buffers for water quality and wildlife.
  - Objective 2.2: Conserve and restore wetland functions and values in the basin.
  - Objective 2.3: Restore environmental integrity and recreation values in the lower Sheboygan River Basin.
- Goal 3: Acquire sufficient public lands and manage for multiple uses.
  - Objective 3.1: Promote public land acquisitions that protect natural areas and provide recreational opportunities.
- Goal 5: Educate Citizens on the Importance of Natural Resources in the Basin. Objective
  - 5.1: Improve public outreach for education of land and water issues in the Sheboygan and Milwaukee River Basins.
- Goal 6: Protect the coastal resources of Lake Michigan.
  - Objective 6.1: Promote wise land use decisions within the “coastal corridor” (between Lake Michigan and Interstate 43).
  - Objective 6.2: Work toward eliminating invasive species within the “coastal corridor”.
- Goal 7: Identify, protect, and preserve the County’s significant natural scenic and open space areas for enjoyment by its residents and visitors for present and future generations.
  - Objective 7.1: Maintain and improve the quality of ground water and surface waters within the Milwaukee and Sheboygan River Basins.
  - Objective 7.2: Identify and Preserve high quality wetlands.

- Objective 7.4: Preserve and protect the unique geological features that exist in the County.
- Objective 7.6: Encourage provision of natural corridors for species exchange between major environmental land holdings.

II. Agricultural and Open Space Development/Preservation

- Goal 1: To provide an aesthetically pleasing, relaxing, rural atmosphere in the County.
  - Objective 1.1: Preserve and create environmental corridors that screen developed areas and provide for the integration of natural habitat into the County.
  - Objective 1.2: Set aside open space in the County to be maintained for the preservation of natural vistas.

III. Historic and Cultural Resources

- Goal 4: Identify, protect, and preserve significant natural, historic, scenic, and open spaces for enjoyment by residents and visitors for present and future generations.
  - Objective 4.1: Encourage and support interested parties and stakeholders in efforts in preserving the County's cultural resources.
  - Objective 4.2: Preserve and protect the unique geological and natural resources holding significant historic value throughout the County.

I.H.6 Sheboygan County Outdoor Recreation and Open Space Plan (2007)

- Objective 1.4: Provide coordination of public park and open space lands with other uses of land, in order that each may enhance the other.
- Objective 2.6: Preservation of the lowlands, natural waterways, marshes, and adjacent contributing uplands in their natural state should receive special attention to ensure their maintenance as wildlife and fish habitats, as natural drainage areas, as areas for passive recreation and outdoor recreation, and as reservoirs, for sediment, where appropriate.
- Analysis and Recommendations for Town of Sheboygan: The Town of Sheboygan is experience a lot of growth, much higher than the rate experienced in other areas of the County. Special considerations should be made for future parkland and bicycle and pedestrian trails as new residential development is proposed.

I.H.7 Lake Michigan Lakewide Management Plan (2008)

4. Are all habitats healthy, naturally diverse, and sufficient to sustain viable biological communities?
5. Does the public have access to abundant open space, shorelines, and natural areas, and does the public have enhanced opportunities for interaction with the Lake Michigan ecosystem?
6. Are land use, recreation, and economic activities sustainable and supportive of a healthy ecosystem?
7. Are sediment, air, land, and water sources or pathways of contamination that affect the integrity of the ecosystem?
8. Are aquatic and terrestrial nuisance species prevented and controlled?

9. Are ecosystem stewardship activities common and undertaken by public and private organizations in communities around the basin?
10. Is collaborative ecosystem management the basis for decision-making in the Lake Michigan basin?

I.I Achieving Delisting Targets

The projects identified will work toward delisting the following BUIs:

- degradation of fish and wildlife populations
- loss of fish and wildlife habitat
- degradation of benthos
- degradation of phytoplankton and zooplankton populations
- restrictions on wildlife consumption
- fish tumors and other deformities

The delisting targets below show the criteria and actions necessary for delisting the impairments in the Sheboygan River AOC. A complimentary and important component that will need to be completed in addition to the habitat projects is a fish and wildlife habitat management and restoration plan. Due to the expedited timeline for achieving these projects, the TAC has already begun the process of planning restoration projects. These habitat projects will fulfill some of the actions necessary to delist these BUIs.

Table 3: Delisting Targets and Status for Sheboygan AOC BUIs

Delisting Targets – Loss of Fish and Wildlife Habitat	
This BUI can be considered for delisting when:	Status
• A local fish and wildlife habitat management and restoration/rehabilitation plan has been developed for the entire AOC that accomplishes the following: Defines the causes of all habitat impairments within the AOC, Establishes site-specific habitat and population targets for fish and wildlife species within the AOC, Identifies primary and secondary habitat restoration goals, management activities, and projects that would adequately restore or rehabilitate fish and wildlife habitat within the Sheboygan River AOC; and	Not Completed – In Progress Soon
• All primary habitat restoration goals, management activities, and projects identified in the fish and wildlife management and restoration plan are implemented, and modified as needed to ensure continual improvement; and	Partially Addressed by Projects
• Waters within the Sheboygan River AOC are not listed as impaired due to aquatic toxicity in the most recent Clean Water Act 303(d) and 305(b) Wisconsin Water Quality Report to Congress (submitted to U.S. EPA every two years)	Not Completed
Actions	
• Form Sheboygan River AOC fish and wildlife habitat committee that includes key stakeholders such as WDNR, US Fish and Wildlife Service, local fish and wildlife groups, and other partners/stakeholders.	Completed
• Committee decides on an approach and process to establish a fish and wildlife habitat management and restoration/rehabilitation plan including timetable, decision making, obtaining planning funds, and plan adoption.	In Progress
• Implement primary projects and actions identified in the plan.	Addressed

	by Projects
• Monitor and evaluate for established habitat goals.	Not Completed
Delisting Targets – Degradation of Fish and Wildlife Populations	
This BUI can be delisted when:	
• Approved remedial actions (Superfund and RCRA) for contaminated sediment and floodplains have been fully implemented; and	In Progress
• A local fish and wildlife management and restoration plan has been developed for the entire AOC that: Defines the causes of all population impairments within the AOC, Establishes site specific local population targets for native indicator fish and wildlife species within the AOC, Identifies all fish and wildlife population restoration programs/activities within the AOC and establishes a mechanism to assure coordination among all these programs/activities including identification of lead and coordinative agencies, Establishes a time table, funding mechanism, and lead agency responsibility for all fish and wildlife population restoration activities needed within the AOC.	Not Completed – In Progress Soon
• The programs necessary to accomplish the recommendations of the fish and wildlife management and restoration plan are implemented.	Addressed by Projects
• Populations of native indicator fish/wildlife species are statistically similar to populations in reference sites with similar habitat but little to no contamination.	Not Completed
Actions	
• Determine population trends for native fish/wildlife species in the AOC.	In Progress
• Determine the extent of improvement that can be achieved within the areas of the AOC that were historically or currently modified and dredged for commercial navigation.	In Progress
Delisting Targets – Degradation of Benthos	
This BUI can be delisted when:	
• Known contaminant sources contributing to sediment contamination and degraded benthos have been identified and control measures implemented; AND	In Progress
• All remediation actions for contaminated sediments are completed and monitored according to the approved plan with consideration to using consensus based sediment quality guidelines and equilibrium partitioning sediment benchmarks; AND	In Progress
• The benthic community within the site being evaluated is statistically similar to a reference site with similar habitat and minimal sediment contamination.	Addressed by Projects
Actions	
• Incorporate benthic macroinvertebrate evaluations into sediment management actions within the AOC.	In Progress
• Determine suitable reference sites for the different habitat areas within the AOC in conjunction with the WDNR. For some areas this may mean evaluating upstream sites within the same water bodies. For the depositional areas this may mean looking for other sites with similar characteristics but limited sediment contamination.	Addressed by Projects
• Determine appropriate sampling locations within the AOC based on historical sampling locations and sites of known impact.	Addressed by Projects
Delisting Targets – Degradation of Phytoplankton and Zooplankton Populations	
This BUI can be delisted when:	
• Sources causing nutrient enrichment to the outer harbor and near shore waters are identified and controlled if nutrients are the main contributor;	Not Completed

OR • Sources resulting in ambient water toxicity in the outer harbor and near shore waters are identified and controlled if toxicity is the main contributor.	
• Additionally, phytoplankton or zooplankton bioassays confirm no toxicity in ambient waters and the community structure is diverse and contains species indicative of clean water; and	Partially Addressed by Projects
• The phytoplankton and zooplankton communities within the site being evaluated are statistically similar to a reference site with similar habitat and minimal sediment contamination.	Addressed by Projects
Actions	
• Work with U.S. EPA on possibly establishing a reference site or reference sites for all Lake Michigan AOCs.	Addressed by Projects
• Identify the appropriate species and community structure that should exist in the Sheboygan River AOC under non-impaired conditions.	Addressed by Projects
Delisting Targets – Restrictions on Fish and Wildlife Consumption	
This BUI can be considered for delisting when:	
Fish Consumption	
• The Superfund PCB cleanup and Manufactured Gas Plant cleanup have been implemented; and	In Progress
• All other known sources of bioaccumulative contaminants of concern (PCBs, mercury, pesticides, and PAHs) have been identified and controlled or eliminated; and	In Progress
• Waters within the Sheboygan River AOC are no longer listed as impaired due to PCB fish consumption advisories in the most recent Impaired Waters (303(d)) list.	Not Completed
Wildlife Consumption	
• The floodplain cleanup action that is part of the Superfund Cleanup is implemented; and	Not Completed
• All other known sources of bioaccumulative contaminants of concern (PCBS, mercury, pesticides, and PAHs) have been identified and controlled or eliminated; and	In Progress
• Waters within the Sheboygan River AOC are no longer listed as impaired due to wildlife consumption advisories listed in the annual Wisconsin Migratory Bird Regulations.	Addressed by Projects
Actions	
• Implement monitoring program to determine trends in contaminant concentrations in fish/wildlife within the AOC as cleanup programs are initiated/completed	Addressed by Projects
Delisting Targets – Eutrophication or Undesireable Algae	
This BUI can be considered for delisting when:	
• In-river total phosphorous concentrations meet Wisconsin criteria when promulgated; and	Not Completed
• There are no violations of the minimum dissolved oxygen concentrations established in NR 102 within the AOC due to excessive sediment deposition or algae growth; and	Not Completed
• No water bodies within the AOC are included on the list of impaired waters due to nutrients or excessive algal growths in the most recent Wisconsin Impaired Waters list submitted to U.S. EPA every two years.	Not Completed
Actions	
• Develop a scientifically based monitoring program to establish when targets have been met.	Not Completed

Delisting Targets – Fish Tumors or Other Deformities	
This BUI can be delisted when:	
• All known sources of PAHs and chlorinated organic compounds within the AOC and tributary watershed have been controlled through issuance of the appropriate regulatory control document or eliminated.	In Progress
• The Superfund PCB cleanup and Manufactured Gas Plant cleanup have been implemented.	In Progress
• There have been no reports of external Deformities, Lesions, and Tumors (DLTs) or internal organ/system impacts that have been verified by qualified WDNR personnel to have been caused by chemical contaminants for a period of five years.	Not Completed
• A fish health survey of resident benthic fish species such as white suckers finds incidences of tumors or other deformities at an incidence rate of less than 5 percent.	Addressed by Project
• OR, in cases where any tumors have been reported a comparison study of resident benthic fish (e.g., brown bullhead or white suckers) of comparable age and at maturity (3 years), or of fish species which have historically been associated with this BUI, in the AOC and a non-impacted control site indicates that there is no statistically significant difference (with a 95% confidence interval) in the incidence of liver tumors or deformities.	Addressed by Project
Actions	
• Work with U.S. EPA on possibly establishing a reference site or reference sites for all Lake Michigan AOCs	Addressed by Project
• Determine baseline for existence of BUI	Addressed by Project
• Establish routine monitoring for this BUI	Addressed by Project
• Establish a complaint/report receipt and tracking process/procedure	Not Completed
• Determine species that will be used for studies and comparison studies	Addressed by Project
• Establish comparison site(s) if needed	Addressed by Project
• Track changes in tumor/deformity incidents over time	Addressed by Project
• Track contaminant levels in sediment for related chemicals	In Progress
Delisting Targets – Bird or Animal Deformities or Reproduction Problems	
This BUI can be delisted when:	
• Superfund and RCRA sediment and floodplain remedial actions have been implemented.	In Progress
• Studies conducted in the AOC indicate that the beneficial use should not be considered impaired; or	Partially Addressed by 2010 GLRI Project
• If studies conducted in the AOC determine that this use is impaired, then two approaches can be considered for delisting:	
• Approach 1 – Observational Data and Direct Measurements of Birds and other Wildlife Evaluate observational data of bird and other animal deformities for a minimum of two successive monitoring cycles in indicator species identified in the initial studies as	Partially Addressed by 2010

exhibiting deformities or reproductive problems. If deformity or reproductive problem rates are not statistically different from those at minimally impacted reference sites (at a 95% confidence interval), or no reproductive or deformity problems are identified during the two successive monitoring cycles, then the BUI can be delisted. If the rates are statistically different from the reference site, it may indicate a source from either within or outside the AOC. Therefore, if the rates are statistically different or the data are insufficient for analysis, then Evaluate tissue contaminant levels in egg, young and/or adult wildlife. If contaminant levels are lower than the Lowest Observable Effect Level (LOEL) for that species for a particular contaminant and are not statistically different from those at minimally impacted reference sites (at a 95% confidence interval).	GLRI Project
• Where data from direct observation of wildlife and wildlife tissue data are not available, the following approach should be used: Approach 2 – Fish Tissue Contaminant Levels as an Indicator of Deformities or Reproductive Problems If fish tissue concentrations of contaminants of concern identified in the AOC are at or lower than the LOEL known to cause reproductive or developmental problems in fish eating birds and mammals, the BUI can be delisted, or If fish tissue concentrations of contaminants of concern identified in the AOC are not statistically different from those found in Lake Michigan (at 95% confidence interval), then the BUI can be delisted. Fish of a size and species considered prey for the wildlife species under consideration must be used for the tissue data	Partially Addressed by 2010 GLRI Project
Actions	
• Determine appropriate indicator species	Partially Addressed by 2010 GLRI Project
• Determine appropriate comparison site(s) if necessary	Partially Addressed by 2010 GLRI Project
• Design sampling/observation program	Partially Addressed by 2010 GLRI Project
Delisting Targets – Restrictions on Dredging Activity	
This BUI can be delisted when:	
• All remediation actions for contaminated sediments are completed and monitored according to the approved remediation plans.	In Progress
• A dredging alternatives plan is developed that includes an evaluation of the following: • Restrictions that must remain in place to protect human health and the environment • Restrictions that must remain in place due to Superfund or RCRA requirements that are based upon state and federal law • Priority areas for navigational use • Priority areas where dredging is needed for other purposes (i.e. utilities) • Costs associated with removing dredging restrictions in priority areas • Funding available to address removing dredging restrictions in priority areas	Addressed by ACOE Project
Actions	
• Determine the degree of contamination in the sediment and track trends in the level of	In Progress

contamination as remediation efforts proceed throughout the AOC.	
• To the extent feasible, planning and implementation steps to meet this delisting target should be coordinated with Superfund remediation planning and implementation efforts.	In Progress

This project also follows some of the recommendations from the Sheboygan River Remedial Action Plan (October 1995). Work associated with these projects implement the following recommendations:

- Conduct fish community analysis.
- Assess wildlife tissue contamination.
- Monitor bioaccumulative toxicants.
- Conduct a phytoplankton/zooplankton degradation assessment.
- Protect and restore critical wetlands tributary to the Sheboygan River.

I.J Timeframe for Achieving Project Objectives

While the timeline for each of these projects presented in Table 2 demonstrate that time will be of the essence in achieving the project objectives within the award timeframe, it is possible for all of the projects to be completed, the implementation of the restoration designs, schedules and weather permitting. We expect that all planning services can be completed by spring 2012. We hope to have the implementation of the restoration designs completed by the end of 2012, weather permitting. Monitoring and maintenance of these projects will continue for three consecutive growing seasons following installation. For the monitoring based projects, all sample collection will occur in the two year award timeframe, except the Waterfowl Consumption Advisory Evaluation, which requires three consecutive years of data.

Achieving the objectives within the award timeframe will require concerted effort and diligence by all parties involved, first and foremost, in the funding award and sub award to contractors who can begin the planning work. Working collaboratively with all partners to coordinate efforts will allow progress and be key in meeting the project goals.

II. Results – Outcomes and Outputs

The following are the outputs and outcomes of this project:

- Outputs
  - Kiwanis Park Shoreline Restoration – Design and implementation of the restoration design of shoreline habitat improvements, bank stabilization and storm water outfall retrofits along the Kiwanis Park shoreline.

- Taylor Dr. and & Indiana Ave. Area Wetland Restoration – Design and implementation of the wetland restoration design, shoreline and habitat improvements in this corridor.
- Wildwood Island Area Restoration – Design and implementation of spawning habitat near Wildwood Island, stabilization of the upstream end of the island and adjacent riparian riverbanks and habitat improvements on the island and adjacent riparian areas.
- Shoreline Stabilization in Problem Areas – Design and implementation of the restoration design of shoreline and riverbank stabilization in problem areas of erosion and re-establishment of habitat in these areas.
- In-Stream Habitat Improvements – Inventory, mapping and analysis of habitat needs in the AOC leading to design and the implementation of the habitat restoration design of in-stream improvements.
- Targeted Invasive Species Control – Inventory and control targeted invasive species infestations within the AOC.
- Floodplain analysis and hydrologic analysis of each necessary project area (Kiwanis Park, Wildwood Island, Taylor Drive Wetlands, Shoreline Stabilization Problem Areas, Smallmouth Bass Habitat Improvement).
- Evaluation of Waterfowl Consumption Advisories within the AOC – Collect data necessary and analyze to determine if the two waterfowl consumption advisories within the Sheboygan AOC can be eliminated.
- Evaluation of Fish Tumors or other Deformities – Collect data necessary and analyze to determine if this BUI can be removed.
- Benthos & Plankton BUIs Evaluation in Wisconsin's Lake Michigan AOCs – Collect data necessary and analyze to determine if both or either of these BUIs can be removed.
- Providing intensive education and outreach to key audiences and the community for the project included in this proposal as well as the Sheboygan River AOC in general.

- Outcomes
  - Kiwanis Park Shoreline Restoration
    - Restoring ¾ mile of shoreline habitat.
    - Managing invasive plants and restoring riparian and emergent vegetation.
    - Establishment of a buffer along the Kiwanis Park shoreline.
    - Stabilizing shoreline and retrofitting at least three major and several minor stormwater outfalls to improve habitat and decrease erosive flows.
  - Taylor Drive & Indiana Avenue Area Wetland Restoration
    - Restoring approximately 10 acres of wetland and associated shoreline habitat near the Taylor Drive/Indiana Avenue intersection.
    - Restoring connectivity of the wetland to the river, allowing fish and aquatic organism passage.
    - Addressing the stormwater issues impacting the Taylor Drive wetlands.
  - Wildwood Island Area Restoration
    - Stabilizing 1500 feet of riparian and island shoreline.
    - Managing invasive species and restoring 15 acres of wildlife habitat on Wildwood Island and surrounding riparian areas.

    - Establishing three acres of emergent vegetation suitable for fish spawning habitat.
- Shoreline Stabilization in Problem Areas
    - Stabilizing approximately 1000 feet (over 10,000 square feet) of river bank at several sites throughout the AOC.
    - Replacing lost habitat in the eroded areas with suitable native vegetation cover.
    - Preventing approximately 307 tons per year of sediment from eroding into the Sheboygan River.
- In-Stream Habitat Improvements
    - Creating or improving up to one mile of warmwater fisheries habitat.
- Targeted Invasive Species Control
    - Removing or controlling approximately 12 acres of targeted invasive species within the AOC.
- Evaluation of Waterfowl Consumption Advisories within the AOC
    - Determining if wildlife (waterfowl) from the AOC are safe to eat.
- Evaluation of Fish Tumors or other Deformities
    - Determining if this BUI can be delisted.
- Benthos & Plankton BUIs Evaluation in Wisconsin's Lake Michigan AOCs
    - Determining if these two BUIs can be delisted.

This application and its activities are based on the *Delisting Targets for the Sheboygan River Area of Concern* (2008). While the *Delisting Targets* call for a fish and wildlife habitat management and restoration/rehabilitation plan, there has not been time to develop such a plan. However, preliminary planning has been done in conjunction with preparation of this proposal and the habitat projects here reflect those that are minimally necessary for delisting the degradation of fish and wildlife populations and loss of fish and wildlife habitat BUIs. The projects also address recommendations from the 1995 RAP Update. These projects will accomplish the following actions needed to delist the Sheboygan River AOC:

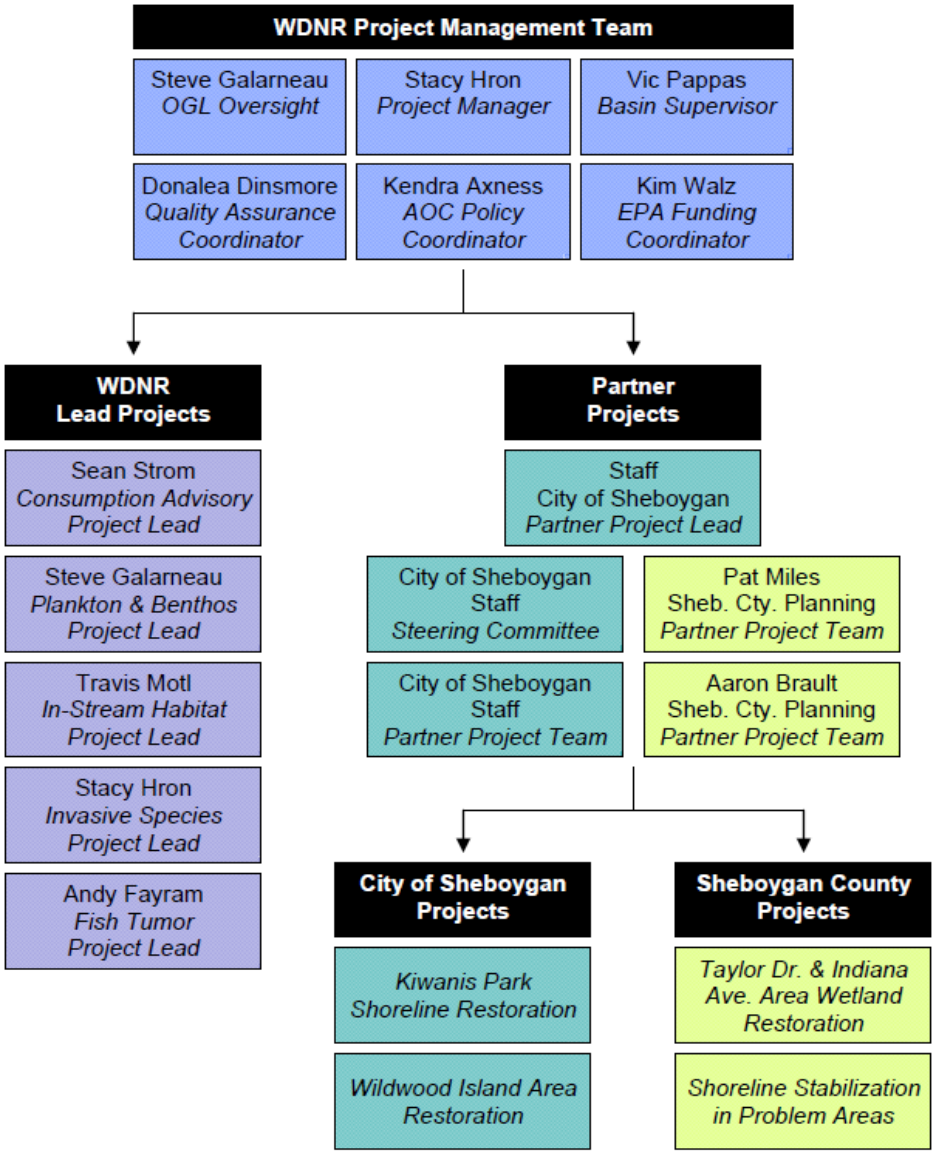
1. Will work toward delisting six BUIs.
2. Will start nine projects working toward delisting BUIs.
3. Will work toward delisting two habitat related BUIs.

III. Collaboration, Partnerships, and Overarching Plans

This project is the result of many partnerships including the TAC, Sheboygan River Basin Partnership, WDNR, UWEX and the City of Sheboygan. WDNR will lead the partnership as award recipient and work with our partners to make sub-awards (see project organizational chart below). Through our planning process, we have already discussed options for the implementation process and the input that all parties will want to have. We fully expect all partners to be engaged in the process and that collaboration will materialize and continue throughout the project. We will be implementing education and outreach initiatives to grow the partnerships further as part

of the project. These initiatives and plans are discussed in the next section. Our partners have worked together thus far to plan projects that will benefit the Sheboygan River AOC and the community.

First and foremost, this project complements sediment remediation work that is being done by Superfund and Legacy Act actions. The habitat restoration will closely follow this disturbance of the river with restoration of habitat. This project also coordinates with, and is complemented by, our GLRI AOC monitoring project "Sheboygan AOC Pathway to Delisting Habitat BUIs–Survey and Assessment". This monitoring work will help inform decisions we are making in the project planning process. It will also form a basis for our fish and wildlife habitat management and restoration plan. This plan will include the Tier I projects aimed at AOC delisting included in this proposal, as well as Tier II and III projects that will be pursued in the future.



IV. Data Quality and Quality Assurance Program Plans (QAPP)

Project leads are responsible for developing appropriate project plan documentation. WDNR's Quality Assurance Coordinator (QAC) will evaluate each project within this proposal to determine whether a QAPP is necessary and consult with EPA to obtain agreement on these assessments. WDNR's Quality Assurance Coordinator will review and approve QAPPs for proposed projects and provide appropriate documentation to EPA.

V. Budget

Table 4: Cost Estimate for Project Budget details the budget for each of the individual projects.

Kiwanis Park Shoreline Restoration	
Project Management & Administration	$55,000
Design, Permitting, Bidding & Contracting	$270,000
Implementation of Restoration Design	$1,730,000
Maintenance & Monitoring (3 growing seasons)	$60,000
Project Total	$2,115,000
Taylor Dr. & Indiana Ave. Riparian Area & Wetland Restoration	
Project Management & Administration	$59,500
Analysis & Preliminary Design	$75,500
Design, Permitting, Bidding & Contracting	$100,000
Implementation of Restoration Design	$500,000
Maintenance & Monitoring (3 growing seasons)	$60,000
Project Total	$795,000
Wildwood Island Area Restoration	
Project Management & Administration	$75,000
Design, Permitting, Bidding & Contracting	$115,000
Implementation of Restoration Design	$535,000
Maintenance & Monitoring (3 growing seasons)	$60,000
Aquatic Inventory (Additional Sites for current GLRI funded surveys)	$5,000
Project Total	$790,000
Shoreline Stabilization in Problem Areas	
Project Management & Administration	$30,000
Analysis & Preliminary Design	$15,000
Design, Permitting, Bidding & Contracting	$33,000
Implementation of Stabilization Plan	$154,000
Maintenance & Monitoring (3 growing seasons)	$60,000
Project Total	$292,000
In-Stream Habitat Improvements	
Project Management & Administration	$11,000

Inventory, Mapping & Analysis	$40,000
Analysis & Preliminary Design	$5,000
Design, Permitting, Bidding & Contracting	$10,000
Implementation of Habitat Restoration Design	$75,000
Project Total	$141,000
Targeted Invasive Species Control	
Project Management & Administration	$23,500
Treatment (labor & materials)	$63,000
Maintenance & Monitoring (3 growing seasons)	$30,000
Project Total	$116,500
Evaluation of Waterfowl Consumption Advisories within the Sheboygan AOC	
Labor & Salaries	$3,340
Materials and Travel	$3,150
Laboratory Analysis	$129,510
Project Total	$136,000
Benthos & Plankton BUIs Evaluation in Wisconsin's Lake Michigan Areas of Concern	
Supplies	$7,300
UW-Superior - Laboratory Analysis	$30,500
WDNR - Laboratory Analysis	$17,200
WSLOH - Laboratory Analysis	$11,500
USGS Contract - Project Management, Labor and Analysis	$385,000
Project Total	$451,500
Evaluation of Fish Tumors & Other Deformities	
Laboratory Analysis & Data Analysis	$153,500
Sample Collection	$15,000
Project Total	$168,500
UW-Extension Education & Outreach	
Education & Outreach for All Projects	$83,000
Project Total	$83,000
Total Cost Estimate for Project Budget	**$5,088,500**

VI. Education/Outreach

The education and outreach initiatives for the Sheboygan River AOC will utilize the experience of the University of Wisconsin – Extension (UWEX) in implementing USEPA projects and staff funded by the GLRI in the Office of the Great Lakes. It will also draw from current work by UWEX through a 2010 GLRI grant project implemented through 2013 by UWEX, which has 20% FTE allocated for Sheboygan River AOC. For the next 18 months, this funding request will expand the education and outreach effort for the Sheboygan River AOC to 80% FTE. Key audiences targeted through individual and collaborative statewide AOC education and outreach initiatives include:

- Sheboygan River Public Advisory Committee
- Sheboygan River Fish and Wildlife Technical Advisory Committee
- WDNR AOC staff
- WDNR Office of Great Lakes staff

- Sheboygan River AOC stakeholders (riparian landowners, tenants, businesses, etc.)
- General public
- Elected officials
- Local government staff

Specific initiatives include:

- Supporting WDNR AOC coordinator with the delisting process; e.g., providing delisting strategy examples, developing a tool for assessing progress delisting, building the capacity of local advisory committees to advance delisting
- Crafting and testing key AOC community education messages
- Coordinating training for AOC staff
- Facilitating the development of Wisconsin AOC and GLRI economic impact figures
- Facilitating communication within and among the Sheboygan TAC and PAC
- Developing web-based media to facilitate AOC information exchange
- Coordinating the local PAC
- Coordinating the local TAC
- Advising local partner education programs and events
- Developing AOC-specific interpretive publications and displays

This targeted education and outreach effort is designed to advance steps in the delisting process in Sheboygan, helping to ensure that key input is included and necessary connections among agencies and individuals are made. The initiatives identified above will be connection points for the many pieces of this complex project and will help stakeholders understand and be engaged in the projects and processes.

Appendix

Site Photos

Figures

Photo 1: Shoreline in Kiwanis Park where vegetation has been removed and active erosion is occurring.

Photo 2: Kiwanis Park Shoreline.

Photo 3: Kiwanis Park shoreline.

Photo 4: Kiwanis Park Shoreline

Photo 5: Concrete Slab and Asphalt Rip-Rap.

Photo 6: A damaged stormwater outfall, concrete and other rip-rap along shoreline.

Photo 7: Largest stormwater outfall at Kiwanis Park, which creates a large scour hole.

Photo 8: Another stormwater outfall along the shoreline that has been cemented in place due to erosion.

Photo 9: Mitigation wetland at the southwest corner of the intersection of Taylor Drive and Indiana Avenue.

Photo 10: Looking south across the wetland at the southeast corner of the intersection of Taylor Drive and Indiana Avenue.

Photo 11: The tributary stream and culvert connecting to the southeast wetland.

Photo 12: The upstream end of the culvert under Indiana Avenue.

Photo 13: The downstream end of the culvert under Indiana Avenue. Note the recently collapsed wing wall.

Photo 14: The riparian area at the northeast corner of the intersection of Taylor Drive and Indiana Avenue.

Photo 15: The largest island in the Wildwood Island complex.

Photo 16: The downstream end of the largest island.

Photo 17: The largest island on the left and the downstream end of the 2nd largest on the right.

Photo 18: The upstream end of the 2nd largest island on the left and smaller islands on the right.

Photo 19: The 2nd largest island in the left foreground, one of the smaller islands in the right foreground and the largest island in the background. Note the severe erosion on the large island.

Photo 20: One of the targeted invasive species, Japanese Knotweed, growing in a crack between the riverwalk and seawall in the inner harbor.

Photo 21: A riparian area in the middle river portion of the AOC taken over by Japanese Knotweed.

Photo 22: Area of severe shoreline erosion and pioneer *Phragmites* infestation.

Photo 23: Area of shoreline erosion.

Photo 24: Area of shoreline erosion. Note the woody debris dam across the river formed by mature trees that fell in when the bank failed.