

2015 REMEDIAL ACTION PLAN UPDATE
for the
SHEBOYGAN RIVER AREA OF CONCERN



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Wisconsin Department of Natural Resources
Office of the Great Lakes

**2015 Remedial Action Plan Update
for the
Sheboygan River Area of Concern**

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Cover Photo: Wildwood Island in 2015, Camille Bruhn, WDNR

Disclaimer

The Great Lakes Water Quality Agreement is a non-regulatory agreement between the U.S. and Canada, and criteria developed under its auspices are non-regulatory. The actions identified in this document as needed to meet beneficial use impairment (BUI) delisting targets are not subject to enforcement or regulatory actions.

The actions identified in this Remedial Action Plan Update do not constitute a list of preapproved projects, nor is it a list of projects simply related to BUIs or generally to improve the environment. Actions identified in this document are directly related to removing a BUI and are needed to delist the Area of Concern.

EXECUTIVE SUMMARY

Sheboygan River Area of Concern (AOC) partners built momentum throughout 2011 by planning multiple dredging and habitat restoration projects. The City of Sheboygan, Sheboygan County, Wisconsin Department of Natural Resources (WDNR), U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USEPA) worked closely together to plan both Great Lakes Legacy Act Dredging and Strategic Navigational Dredging projects. The WDNR, City, County and members of the Fish and Wildlife Technical Advisory Committee (TAC) worked on the “Pathway to Delisting Beneficial Use Impairments” project, which set the stage for the seven habitat restoration projects to occur while also providing for characterization of multiple impairments.

In 2012, the AOC partners, agencies and responsible parties worked together with private contractors to remove approximately 400,000 cubic yards of contaminated sediment from the Sheboygan River, construct the priority habitat projects identified by the TAC, and conduct studies to assess the status of the wildlife consumption, fish tumors, benthos, and plankton impairments. In 2013, AOC partners collaborated with the Legacy Team to complete some minor dredging near the Pennsylvania Ave Bridge and place 6 inches of sand cover over selected areas in the river. We continued to work with our contractors to conduct maintenance activities, repair damage to habitat areas caused by flooding, and treat invasive plants along the river riparian areas. A draft AOC verification monitoring plan was developed and initial work began on a final AOC Fish and Wildlife Plan. In 2014, follow-up actions were completed for the sediment remediation projects, maintenance and monitoring of habitat restoration projects continued, and oversight was provided to observe contractor’s work on invasive species’. A removal package was prepared for the “Restrictions on Dredging Activities” beneficial use impairment (BUI). The U.S. Geological Survey (USGS) evaluated preliminary data from the first year of the study, *Assessment of Benthos and Plankton in Wisconsin’s Lake Michigan Areas of Concern*, to assess the status of the benthos and plankton impairments. The first year of verification monitoring for the fish communities, benthic macroinvertebrate communities, mink, and fish habitat surveys was completed. The USGS study continued to collect tree swallow data, which are being used to assess the “Bird or Animal Deformities or Reproduction Problems” BUI. A second year of engaging stakeholders through citizen science programs was also completed.

In 2015, WDNR implemented the following actions in the Sheboygan River AOC to continue to achieve AOC goals:

- Removed the “Restrictions on Dredging Activities” BUI following a public informational meeting and a public comment period (in 2014). The final removal recommendation gained the concurrence of USEPA’s Great Lakes National Program Office (GLNPO) in August, 2015.
- Removed the “Eutrophication or Undesirable Algae” BUI after holding a TAC meeting, receiving input from key stakeholders, and a public comment period. The final recommendation gained the concurrence of USEPA’s GLNPO in November, 2015.
- Completed a second year of verification monitoring for the fish communities, benthic macroinvertebrate communities, mink, and fish habitat surveys.
- Conducted monitoring for the Sport Fish Contaminant Monitoring Program as an action for the “Restrictions on Fish and Wildlife Consumption” BUI.
- Continued maintenance and monitoring of seven habitat restoration projects.
- Continued to provide oversight of invasive species’ contractor’s work.
- Continued to work with Camp-Y Koda to conduct citizen monitoring of the AOC biological communities and on AOC outreach projects.

- Continued coordination with USGS on plankton and benthos studies.

In 2016, we hope to make the following progress in the Sheboygan AOC:

- Finalize the Fish and Wildlife Plan which will document actions taken, measures of success, future monitoring, and other habitat work that could complement the AOC Tier 1 priority actions.
- Conduct an overall evaluation of the seven habitat restoration projects and invasive species treatment to determine if they meet criteria stated in the Fish and Wildlife Plan.
- Make a determination on the status of the “Degradation of Benthos” and “Degradation of Phytoplankton and Zooplankton Populations” BUIs based upon USGS Interpretive Reports for the study, *Assessment of Benthos and Plankton in Wisconsin’s Lake Michigan Areas of Concern* (and potentially other lines of evidence).
- Use the USGS analysis of the 2010-2014 tree swallow study to inform the status of the “Degradation of Fish and Wildlife Populations” and “Bird or Animal Deformities or Reproduction Problems” BUIs.
- Continue verification monitoring for the fish communities, benthic macroinvertebrate communities, mink, and fish habitat surveys to address the “Degradation of Fish and Wildlife Populations,” “Loss of Fish and Wildlife Habitat,” and “Bird or Animal Deformities or Reproduction Problems” BUIs.
- Perform repeat verification monitoring studies of herptile, breeding bird, bat, and mussel populations to address the “Degradation of Fish and Wildlife Populations” and “Loss of Fish and Wildlife Habitat” BUIs.
- Complete final year of maintenance and monitoring of the habitat restoration projects as a cooperative effort between WDNR, the City of Sheboygan, and the habitat project contractors.
- Complete final work with contractors on invasive species management.
- Work with WDNR fish toxicologist on evaluating data from the 2015 fish sampling effort to assess fish consumption advisories as part of the “Restrictions on Fish and Wildlife Consumption” BUI.

This Remedial Action Plan (RAP) Update builds upon the work that was carried out in recent years and concisely lists the current status of each beneficial use impairment, the next actions needed, potential issues, and stakeholder outreach needs associated with each. Citizen engagement has been an integral component of the AOC program. We will continue to engage local citizens, local municipalities, conservation groups, and our technical advisors as additional actions are identified and implemented.

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List of Acronyms

AOC	Area of Concern
BUI	Beneficial use impairment
CHL-a	Chlorophyll-a
DO	Dissolved oxygen
GLNPO	Great Lakes National Program Office
GLRI	Great Lakes Restoration Initiative
LOEL	Lowest observed effect level
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
RAP	Remedial Action Plan
TAC	Technical Advisory Committee
TP	Total phosphorus
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UW-Extension	University of Wisconsin-Extension
WDNR	Wisconsin Department of Natural Resources

DEFINITIONS

Area of Concern (AOC)

Defined by Annex 2 of the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement as “geographic areas that fail to meet the general or specific objectives of the Agreement where such failure has caused or is likely to cause impairment of beneficial use of the area’s ability to support aquatic life.” These areas are the “most contaminated” areas of the Great Lakes, and the goal of the AOC program is to bring these areas to a point at which they are not environmentally degraded more than other comparable areas of the Great Lakes. When that point has been reached, the AOC can be removed from the list of AOCs, or “delisted.”

Beneficial Use Impairment (BUI)

A "beneficial use" is any way that a water body can improve the quality of life for humans or for fish and wildlife (for example, providing fish that are safe to eat). If the beneficial use is unavailable due to environmental problems (for example if it is unsafe to eat the fish because of contamination) then that use is impaired. The International Joint Commission provided a list of 14 possible beneficial use impairments in the 1987 Great Lakes Water Quality Agreement amendment.

Bioaccumulative

An adjective that describes a substance that builds up within the tissues of organisms.

Delisting Target

Specific goals and objectives established for beneficial use impairments, with measurable indicators to track progress and determine when BUI removal can occur. Targets should be locally derived.

Remedial Action Plan (RAP)

According to the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement, a RAP is a document that provides “a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern...” RAPs were required to be submitted to the International Joint Commission at three stages:

- Stage 1: Problem definition
- Stage 2: When remedial and regulatory measures are selected
- Stage 3: When monitoring indicates that identified beneficial uses have been restored

Note that a renegotiated Great Lakes Water Quality Agreement was signed in 2012 by the U.S. and Canada which removed the “stage” terminology from the AOC Annex, and simply requires Remedial Action Plans to be “developed, periodically updated, and implemented for each AOC.”

PURPOSE STATEMENT

The purpose of this document is to serve as a Remedial Action Plan Update. Remedial Action Plans are required by Annex 1 of the Great Lakes Water Quality Protocol of 2012 (which replaced the 1987 Protocol amending the Revised Great Lakes Water Quality Agreement of 1978). The 2012 Protocol indicates that Remedial Action Plans must include the following elements:

1. Identification of beneficial use impairments and causes;
2. Criteria for the restoration of beneficial uses that take into account local conditions and established in consultation with the local community;
3. Remedial measures to be taken, including identification of entities responsible for implementing these measures;
4. A summary of the implementation of remedial measures taken and the status of the beneficial use; and
5. A description of surveillance and monitoring processes to track the effectiveness of remedial measures and confirm restoration of beneficial uses.

This Remedial Action Plan Update was prepared by the Wisconsin Department of Natural Resources in consultation with its partners and is intended to be a concise summary of beneficial use impairment status and specific actions that will be important for reaching the delisting targets. "Actions" may include on-the-ground restoration projects, monitoring and assessment projects, and stakeholder engagement processes. It is also a tool for documenting and communicating progress to agency partners and technical stakeholders. The Remedial Action Plan will be updated as needed to incorporate new information that may become available.

INTRODUCTION

Areas of Concern (AOCs) are severely degraded geographic areas within the Great Lakes. The areas – 43 within the Great Lakes region – were designated as AOCs primarily due to contamination of river and harbor sediments by toxic pollutants (sometimes referred to as “legacy” pollutants due to the historical industrial development that often was the source of the pollution). Cleaning up these severely degraded areas is a first step toward restoring the chemical, physical, and biological integrity of the lakes as required by the Great Lakes Water Quality Agreement. When the areas have been cleaned up to the point where they are not more degraded than other, comparable non-AOC areas, they are “delisted” as AOCs; they are then considered to be part of the Lakewide Action and Management Plan (LAMP) program, a “whole lake” program that is also set forth in the Agreement. The Agreement provides the framework for the U.S. and Canada to work together to restore the chemical, physical, and biological integrity of the lakes.

The Sheboygan River AOC encompasses the Lower 14 miles of the Sheboygan River downstream from the Sheboygan Falls dam including the entire harbor and is one of five Areas of Concern in Wisconsin (Figure 1). It was designated as an AOC primarily due to polychlorinated biphenyl (PCB) and polycyclic aromatic hydrocarbon (PAH) contamination in Sheboygan River sediments. One primary source of PCBs was an industrial facility operated by Tecumseh Products Company; a primary source of PAHs was a manufactured gas plant (MGP) operated by Wisconsin Public Service Corporation (WPSC). The Kohler Landfill was historically a source of various pollutants, including volatile organic compounds and heavy metals. The Sheboygan River Remedial Action Plan (RAP; WDNR, 1989) and Remedial Action Plan Update (RAP Update; WDNR, 1995) also identified nutrients and solids as significant pollutants for the AOC.

These sources of impairment led to designation of nine of the possible fourteen beneficial use impairments (BUIs) as applicable to the AOC. Sheboygan River AOC impairments and sources are summarized in Table 1. Impairment status is summarized in Table 2.

Since designation as an AOC, much progress has occurred to address legacy pollutant sources. Efforts to improve the Sheboygan River accelerated in 2010 when the U.S. Environmental Protection Agency (USEPA) selected the Sheboygan River AOC as a focus for BUI removal. A number of actions were implemented in 2012 to remove contaminated sediments and enhance navigation through dredging, enhance habitat, and assess the status of selected BUIs. Efforts shifted toward maintenance and monitoring of habitat projects and fish and wildlife populations in 2014, along with the removal of the “Restrictions on Dredging Activities” BUI. Work in 2015 focused on removing the “Eutrophication or Undesirable Algae” BUI, continuing with verification monitoring of fish and wildlife populations, and maintaining the habitat project areas.

Because of the dedicated resources made available through the Great Lakes Restoration Initiative (GLRI), AOC staff and partners are addressing the BUIs more aggressively than what the AOC delisting targets call for (e.g., sampling fish and examining them for tumors rather than only tracking complaints of tumors; more sediment remediation than just the Superfund projects, etc.). Implementation has moved at a faster pace than was anticipated when the targets were written.

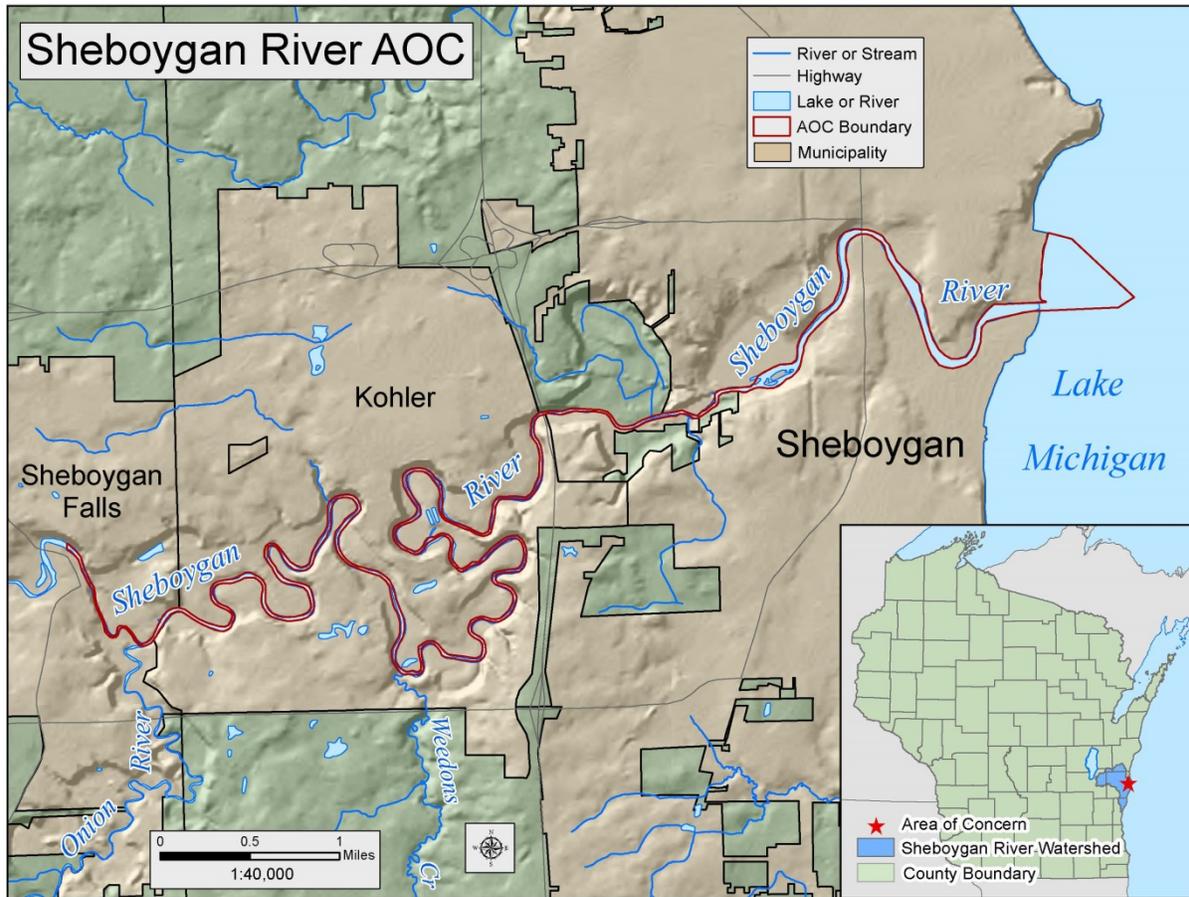


Figure 1. Boundaries of the Sheboygan River Area of Concern

Table 1. Sheboygan River Area of Concern Beneficial Use Impairments Summary

Impaired Beneficial Use	Contaminated Sediments	Non-point Source Pollution (sedimentation, excessive nutrients)	Physical Alteration (dams, urbanization, agriculture)	Invasive or Exotic Species
Restrictions on Dredging Activities	X			
Restrictions on Fish and Wildlife Consumption	X			
Degradation of Benthos	X			
Degradation of Fish and Wildlife Populations	X	X	X	X
Loss of Fish and Wildlife Habitat	X	X	X	X
Bird or Animal Deformities or Reproduction Problems	X			
Fish Tumors or Other Deformities	X			
Degradation of Phytoplankton and Zooplankton Populations	X	X		
Eutrophication or Undesirable Algae		X	X	

Table 2. Sheboygan River BUI Status Summary (refer to Appendix A for additional details)

Beneficial Use Impairment	Beneficial Use Status	Summary Status
Restrictions on Dredging Activities	Removed	Dredging for the two Superfund dredging projects, the Great Lakes Legacy Act Dredging project and the Strategic Navigational Dredging project, has been completed. In 2014, documentation and maps were developed and made available in a public informational meeting to demonstrate that goals for removing this BUI have been satisfied. Based on the completion of all known management actions, and with completion of the post-dredging documentation and public input, WDNR submitted the BUI removal package to USEPA. USEPA's Great Lakes National Program Office (GLNPO) concurred with the proposal to remove the BUI, which was officially removed in August of 2015.
Restrictions on Fish and Wildlife Consumption	Impaired	The four contaminated sediment remediation projects have been completed. Data collected in 2011 does not support removing fish consumption advisories at this time. Fish monitoring occurred again in 2015, in accordance with standard procedures for the Fish Consumption Advisory Program; data will be available in 2016 to re-evaluate fish consumption advisories. A summary of the waterfowl tissue data collected in 2011 and 2012 does not support the removal of the wildlife consumption advisories. WDNR recommends reassessing wildlife consumption advisories beginning in 2017.
Degradation of Benthos	Impaired	The four contaminated sediment remediation projects have been completed. The <i>Assessment of Benthos and Plankton in Wisconsin's Lake Michigan Areas of Concern</i> project was conducted in 2012 and preliminary data indicate that the Sheboygan River AOC is not degraded overall for the benthic community. A second round of sampling occurred in 2014, with data expected to be available early in 2016. The results will also be evaluated in 2016, which will determine if further steps need to be taken. If the results of both studies show that the target has been met, WDNR would anticipate proposing this BUI for removal in 2017.
Degradation of Fish and Wildlife Populations	Impaired	The four contaminated sediment remediation projects have been completed. The projects and activities identified in the Fish and Wildlife Plan are being implemented and monitored to evaluate population goals. Verification monitoring began in 2014 for the three-year studies of fish, macroinvertebrates, and mink. The remaining verification monitoring surveys for birds, bats, mussels, and herptiles will be conducted in 2016, so the data needed to assess the population BUI status will be available in 2017.
Loss of Fish and Wildlife Habitat	Impaired	The four contaminated sediment remediation projects have been completed. The seven Tier 1 habitat restoration projects outlined in the Fish and Wildlife Plan were completed in 2012 and maintenance and monitoring of those projects has been extended one year and will therefore continue through 2016. Additional studies for aquatic habitat and macrophytes began in 2014 and will also continue through 2016. The waters of the Sheboygan River AOC are currently not listed on the 303(d) list for aquatic toxicity, and results from the <i>Assessment of Benthos and Plankton in Wisconsin's Lake Michigan Areas of Concern</i> project will determine if there is a need for any further action. A habitat assessment will be performed in 2016 and if habitat sites have been documented to be successfully established, the BUI may be proposed for removal in 2017.

Bird or Animal Deformities or Reproductive Problems	Impaired	The four contaminated sediment remediation projects have been completed. A study design was developed in 2013, and a monitoring plan was funded for assessments that began in 2014. Preferred study species are tree swallows and mink. The tree swallow study was conducted by the USGS and began in 2010. The data from 2010-2014 is currently being analyzed and should be available by early 2016. Mink rafts were deployed in 2014 and 2015 to track footprints and trap live mink for obtaining blood samples, but no live mink were trapped either year. The mink study will be continued through 2016.
Fish Tumors or Other Deformities	Impaired	The four contaminated sediment remediation projects have been completed. A Fish Tumor BUI Evaluation study was conducted in 2012 and data showed that the target is not met. Reference site sampling occurred in 2013 and results show the tumor incidence rate in the AOC is significantly different than the reference site. Therefore, the study will be repeated in 2017, allowing for more recovery time following sediment remediation work.
Degradation of Phytoplankton and Zooplankton Populations	Impaired	The four contaminated sediment remediation projects have been completed. The <i>Assessment of Benthos and Plankton in Wisconsin's Lake Michigan Areas of Concern</i> project was conducted in 2012 and preliminary data indicate that the Sheboygan River AOC is not degraded overall for phytoplankton and zooplankton communities. A second round of sampling occurred in 2014, with data expected to be available by early 2016. The results for this study will also be evaluated in 2016, which will determine if further steps need to be taken. If the results of both studies show that the target has been met, WDNR would anticipate proposing this BUI for removal in 2017.
Eutrophication or Undesirable Algae	Removed	The target referring to the "most recent Wisconsin Impaired Waters list" was clarified in 2014 to include more specific criteria, and the Sheboygan River within the AOC meets total phosphorus (TP), dissolved oxygen (DO), and chlorophyll-a (CHL-a) goals that were established for this BUI. Historical and recent data was analyzed and a BUI removal package was completed. After holding a TAC meeting, receiving input from key stakeholders, and a public comment period, the "Eutrophication or Undesirable Algae" BUI was submitted for removal. USEPA's GLNPO concurred with the recommendation to remove the BUI which was officially removed in November of 2015.

STAKEHOLDER ENGAGEMENT

Sheboygan River AOC stakeholder engagement has been a top priority for the Wisconsin Department of Natural Resources (WDNR) throughout the history of the AOC program. The first Sheboygan River AOC RAPs were written with the input of a variety of technical and community advisors. More recently, from 2011 through 2015, the University of Wisconsin-Extension (UW-Extension) received GLRI funding from USEPA for stakeholder outreach and education to develop public awareness of AOC projects and issues. There are two groups through which stakeholders provide input and guide AOC progress as well as a number of opportunities aimed at engaging the community.

Stakeholder Groups

The Sheboygan River AOC does not have a Community Advisory Committee (CAC). A variety of citizens and community leaders are engaged by being invited to provide input on AOC issues. Community members are informed through a regular newsletter that was prepared and distributed by UW-Extension with input from partners. With UW-Extension's GLRI grant concluding at the end of June 2015, the newsletters are now developed and distributed by WDNR's Office of the Great Lakes. Community members are also invited to attend public informational meetings scheduled by WDNR for significant decisions (for example, when proposing to remove a BUI). WDNR also consults with local municipalities and the Sheboygan River Basin Partnership to seek input on decisions and to request letters of support for BUI removal documents.

Another important avenue for stakeholder engagement is the Fish and Wildlife Technical Advisory Committee (TAC). With leadership and facilitation from WDNR and UW-Extension, the group has met regularly since 2009 to provide technical input on the fish and wildlife related BUIs. The TAC contributed greatly, both in time and expertise, to the development of the "Pathway to Delisting" project and to the assessment projects which laid the foundation for it. The TAC has been an important group moving forward on BUI removals, developing a final Fish and Wildlife Plan, and coordinating verification monitoring work and reviewing results.

Public Information, Education & Outreach

The information sharing, education, and outreach campaign that has been undertaken by our outreach team in 2015 is detailed in Table 3. Efforts transitioned in 2013 to focus more on citizen science programs and opportunities continued through 2015 to volunteer for bird walks, nest box monitoring, bat monitoring, mussel monitoring, frog and toad surveys, native plant walks, and invasive plant pulls. An annual River Clean Up Day is held every spring to encourage community members of all ages to become engaged with the river's habitat. A rain garden was also installed along the river by the Glas coffee house in order to demonstrate the benefits of native habitat restoration and show that such habitat can be created on property of businesses or in the backyards of private homeowners. The goal of these activities is to build a local support network to continue efforts to improve the river once it is no longer an AOC. Newsletters, interpretive exhibits, and canoe trips have kept the local community updated on and aware of projects and volunteering activities happening within the AOC.

Table 3. Sheboygan River AOC Information/Education/Outreach 2015

Media	Target Audience	Messages	Implementer	Collaborators	Funded By
Group facilitation of Technical Advisory Committee	Technical stakeholders from a variety of agencies/municipalities and conservation interests	Local engaged stakeholders value the opportunity to provide input related to AOC decision making	WDNR, UWEX (until June 2015)	Citizens, SRBP, Glacial Lakes Conservancy, multiple conservation groups, City of Sheboygan, Sheboygan County, USGS, BLM, USF&W service, USEPA	WDNR-GLRI
Periodic newsletters	General public, residents, river businesses, tourists, project partners. Distributed via GovDelivery	Project updates and news, Education and volunteer opportunities	WDNR, UWEX (until June 2015)	USEPA, WDNR, UWEX (until June 2015)	WDNR-GLRI
Sheboygan AOC web page	General public, residents, river businesses, tourists, project partners	Sheboygan AOC info and resources, more in-depth than newsletter	WDNR, UWEX (until June 2015)	USEPA, WDNR, UWEX (until June 2015)	WDNR-GLRI
Canoe trips	General public	Sheboygan AOC story and river awareness and appreciation – sense of place	Camp Y-Koda	Camp Y-Koda, WDNR, UWEX (until June 2015)	WDNR-GLRI, monitoring grant
Citizen Based Monitoring programs and field outings.	General public, agency staff	Various AOC topics: Birds, frogs and toads, bats, mussels, invasive plants, native plants	Camp Y-Koda, UWEX (until June 2015)	Camp Y-Koda, WDNR, USEPA, City, County	WDNR-GLRI, monitoring grant
Photo contest	General public	Get in touch and take notice of YOUR Sheboygan River	WDNR	WDNR	WDNR-GLRI
Litter clean-up May 23, 2015	General public	You can help improve the health of the Sheboygan River	Camp-Y-Koda	Camp Y-Koda, SRBP, WDNR, UWEX (until June 2015)	WDNR-GLRI, monitoring grant
Permanent exhibits along river	General public	The Sheboygan is a HEALING River; what happened, what is next.	UWEX (completed by June 2015)	UWEX, WDNR, IL/IN Sea Grant	UWEX-GLRI, WDNR

BENEFICIAL USE IMPAIRMENT UPDATES

The following pages summarize the current status of each Beneficial Use Impairment using the format below. An explanation of each section is provided after the heading.

2008 Target and Status

Beneficial Use Impairment Name	Status
The 2008 Sheboygan River AOC delisting targets (WDNR, 2008) are listed here as separate target components on each row to clearly show status of each part of the target.	May be: - "Complete" - "Addressed by Current Projects" - "Not Complete" - "Unknown"

Note: may list one or more of the following:

- potential concerns about the target, particularly if the target is not specific enough to define a measurable endpoint for the BUI
- if revisions are anticipated and how such changes might be approached including responsible party and timeline
- if the 2008 target was modified and details of any changes

Rationale for Listing

The section briefly summarizes the reason the BUI was known or suspected at the time of listing. If sources contributing to the impairment have been identified since listing, those are included in this section as well.

Summary of key remedial actions since the 2014 RAP and current status

"Key remedial actions" are those that directly contributed to the current status of the BUI. A table may be included as an appendix to capture a detailed list of past projects. The narrative here explains and leads to the "Next action needed."

Next actions needed

This section is a narrative listing of assessments, on-the-ground projects, and stakeholder engagement processes that are clearly delineated and directly address the specific BUI. Plans for verifying achievement of delisting targets are listed here if known.

Issues (challenges, risks) affecting progress on this BUI

This section lists project contingencies (i.e., one thing has to happen before another can occur), funding obstacles and any other considerations that could affect the timeline for delisting.

Stakeholder Engagement

This section is included only if BUI-specific stakeholder engagement activities are anticipated in the next year. General AOC education, outreach, and stakeholder engagement activities conducted in 2015 are addressed in Table 3 on page 7.

RESTRICTIONS ON DREDGING ACTIVITIES**2008 Target and Status**

Restrictions on Dredging Activities	Status
1) All remediation actions for contaminated sediments are completed and 2) Monitored according to the approved remediation plans.	Complete
A dredging alternatives plan is developed that includes an evaluation of the following: <ul style="list-style-type: none"> ▪ 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 	Complete

BUI Removed

The development of a dredging alternatives plan was listed as a delisting target. Rather than a plan, a technical memorandum was provided which included a summary of actions and the process through which the restrictions were addressed; it also documented the condition of the river after these projects were completed. This technical memorandum can be found as an attachment to the 2014 RAP Update.

Rationale for Listing

Contaminated sediments were present throughout the Sheboygan River AOC, which shares the same boundaries with the Sheboygan River and Harbor Superfund site. PCBs were the contaminants of concern throughout the Superfund site. (Note that although heavy metals were present, they were not the contaminant that was driving sediment remediation plans or work). Two additional Superfund sites were present within the AOC: Kohler Landfill and Camp Marina (a former manufactured gas plant). While contaminated sediments were not associated with the Kohler Landfill site, there were contaminated sediments at the Camp Marina site. The major contaminant of concern in this area was coal tar by-products known as PAHs.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

Following completion of all dredging activities (refer to 2014 RAP Update for details), WDNR prepared a BUI removal document in 2014 that was reviewed by state agency staff, external partners, and USEPA staff. Copies of the draft BUI removal document, fact sheets, and maps of water depths and post-dredging contaminant levels were available for the public to review in an open house public informational meeting held on September 16, 2014 at the Mead Public Library in Sheboygan. Comments submitted during the public comment period from September 16, 2014 to September 30, 2014 were reviewed and responded to. No concerns were expressed in opposition of the BUI removal. A final removal package was sent to USEPA in July, 2015 and with the concurrence of USEPA, the BUI was formally removed in August, 2015. The final BUI removal document can be found on WDNR's Sheboygan River AOC web page under the ["Impairments" tab](#). Complete details regarding sediment removal projects can be found in Table 4 of the 2014 RAP Update (RAP Update; WDNR, 2014).

Next Actions Needed

No further actions are necessary for this BUI.

Issues Affecting Progress on this BUI

There are currently no issues affecting progress on this BUI.

RESTRICTIONS ON FISH AND WILDLIFE CONSUMPTION**2008 Target and Status**

Restrictions on Fish and Wildlife Consumption	Status
Fish Consumption	
The Superfund PCB cleanup and Manufactured Gas Plant cleanup have been implemented.	Complete
All other known sources of bioaccumulative contaminants of concern (PCBs, mercury, pesticides, and PAHs) have been identified and controlled or eliminated.	Complete
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 Complete
Wildlife Consumption	
The floodplain cleanup action that is part of the Superfund Cleanup is implemented.	Complete
All other known sources of bioaccumulative contaminants of concern (PCBs, mercury, pesticides, and PAHs) have been identified and controlled or eliminated.	Complete
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.	Not Complete

Rationale for Listing

The Sheboygan River has fish and waterfowl consumption advisories due to PCB contamination. Fish consumption advisories were issued for the Sheboygan River due to PCBs in 1979 and waterfowl consumption advisories were issued due to PCBs in 1987. Currently there is a “do not eat” advisory for all resident fish, mallards and lesser scaup from the river and a “remove all skin and visible fat prior to cooking” advisory on Canada geese using the river. It is not known whether the Sheboygan River is the only source of the PCBs in the waterfowl.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

As described in the “Restrictions on Dredging” section of the 2014 RAP Update, all sediment remediation projects are now complete (RAP Update; WDNR, 2014). Dredging of contaminated sediments in the river and cleanup of floodplain soils were completed in 2013.

Sport fish have been monitored for contaminants for the Sport Fish Contaminant Monitoring Program and the Superfund Program, so evidence supports the current advice. WDNR has sampled fish each year from 1976-1997 and in 1999, 2000, 2004 and 2011. These fish have been tested for PCBs and a subset for other contaminants, which confirms that the Sheboygan River should remain on the Impaired Waters (303(d)) list for fish consumption advisories. While the goal of WDNR’s monitoring program is to resample fish from PCB advisory waters every five years, the schedule was revised and sampling of fish in the Sheboygan River was completed in 2015. Advisories are expected to be updated in 2016 and the BUI will be evaluated once the analyses are completed and updates are available. If needed, fish consumption advisories will again be reassessed in 2020.

Due to lack of information on the waterfowl in the AOC, WDNR pursued and received GLRI grant funding for a three-year study of contaminants in waterfowl in the Sheboygan River AOC to assess the status of this BUI. The project was initiated in fall 2011 and was scheduled to continue through fall 2014. WDNR collected mallard, scaup and Canada geese in 2011 and 2012 and analyzed them for legacy contaminants (PCBs, lead, mercury, DDT/DDE, organochlorine pesticides) as well as emerging contaminants such as polybrominated diphenylethers (PBDEs), perfluorooctane sulfonate (PFOS), and perfluorooctanoic acid (PFOA). The results from the *Contaminant Concentrations in Waterfowl from the Sheboygan River Area of Concern Update: 2012 Samples* project suggest that contaminants in waterfowl

currently exist at levels that are too high to pursue a change in consumption advice and as such additional collection efforts were suspended for 2013 (Strom, 2014). These samples confirm that the consumption advice should remain in the annual Wisconsin Migratory Bird Regulations pamphlet (WDNR, 2015).

Next Actions Needed

1) *Monitor contaminants in fish and wildlife populations for recovery to assess consumption advisories.* After the 2015 fish data is analyzed, consumption advice will be re-evaluated using the *Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory* (Great Lakes Sport Fish Advisory Task Force, 1993) for PCBs.

Given recent sediment remediation activities, it is anticipated that contaminant concentrations in waterfowl tissue will decrease. Therefore, WDNR anticipates resuming waterfowl collection for contaminant monitoring in 2017 in accordance with guidance provided by WDNR's Wildlife Toxicologist and Great Lakes Monitoring Coordinator. Three years of data are required to remove the BUI. At the conclusion of the renewed study, consumption advice will be reevaluated. Therefore the earliest that this BUI may be removed is likely to be 2020. If the data does not support lifting the consumption advisory, additional sampling should be repeated at an interval determined in consultation with the WDNR's Wildlife Toxicologist and Great Lakes Monitoring Coordinator.

Issues Affecting Progress on this BUI

Fish and waterfowl sampling that occurred in 2011 and 2012 documented that levels of PCBs remain high such that AOC-specific advisories remain in place. Updated fish consumption advice will be published in 2016. Sample collection and evaluation of waterfowl will be conducted again in 2017 because of high levels of PCBs in the sample population in 2011 and 2012.

Stakeholder Engagement

WDNR will work with the Wisconsin Department of Health Services (WDHS) to provide information and education to the community regarding any changes in consumption advisories that may occur.

DEGRADATION OF BENTHOS**2008 Target and Status**

Degradation of Benthos	Status
Known contaminant sources contributing to sediment contamination and degraded benthos have been identified and control measures implemented.	Complete
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.	Complete
The benthic community within the site being evaluated is statistically similar to a reference site with similar habitat and minimal sediment contamination.	Addressed by Current Projects

Rationale for Listing

Due to the contaminated sediments that were present in the river, there was concern that benthos populations might be negatively impacted, but little evidence existed to show that they were actually degraded. A subsequent study, the Aquatic Ecological Risk Assessment (EVS and NOAA, 1998), found that macroinvertebrate populations in sediment depositional areas of the AOC were degraded due to chemical contamination.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

As described in the "Restrictions on Dredging" section of the 2014 RAP Update, all Superfund and contaminated sediment remediation projects are now complete (RAP Update; WDNR, 2014). Dredging of contaminated sediments in the river and cleanup of floodplain soils was completed in 2013.

Due to lack of information on the benthic and planktonic communities in the Sheboygan River compared to reference sites, WDNR received GLRI grant funding for a comparison study. This study, *Assessment of Benthos and Plankton in Wisconsin's Lake Michigan Areas of Concern*, is being carried out by the United States Geological Survey (USGS) for WDNR and includes all four of the Lake Michigan AOCs and six reference sites. Benthos, phytoplankton and zooplankton communities were sampled and assessed in each of the AOCs and in the reference sites in 2012 (*Benthos and plankton community data for selected rivers and harbors along Wisconsin's Lake Michigan shoreline, 2012*, Scudder-Eikenberry, 2014). Because 2012 was an unusual drought year, it was necessary to repeat the study in 2014 to ensure that data are representative of average conditions. Preliminary analysis of 2012 samples indicate that the Sheboygan River is not considered to be degraded for benthic communities when compared to two non-AOC reference sites. Samples collected in 2014 are currently being processed and analysis should be complete early in 2016. This study will be used to evaluate the status of this BUI in the Sheboygan River AOC.

Next Actions Needed

- 1) *Complete data evaluation for the 2014 Assessment of Benthos and Plankton in Wisconsin's Lake Michigan Areas of Concern project.*

Results from 2014 sampling are expected by early 2016. If enough data are analyzed in 2016 and results indicate that the benthic communities in the Sheboygan River are similar to non-impacted reference sites, the BUI may be able to be considered for removal in either 2016 or 2017 after all data analyses are complete. If the data from 2012 and 2014 indicate that the benthic communities are not similar to reference sites, then more data should be collected in the future when more time has been allowed for recovery after contaminated sediment removal.

Issues Affecting Progress on this BUI

If 2014 results indicate that the Sheboygan River is degraded for benthos, the study will need to be repeated or other further steps may need to be considered.

DEGRADATION OF FISH AND WILDLIFE POPULATIONS**2008 Target and Status**

Degradation of Fish and Wildlife Populations	Status
Approved remedial actions (Superfund and RCRA) for contaminated sediment and floodplains have been fully implemented; and	Complete
A local fish and wildlife management and restoration plan has been developed for the entire AOC that <ul style="list-style-type: none"> • 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. 	Complete
The programs necessary to accomplish the recommendations of the fish and wildlife management and restoration plan are implemented.	Addressed by Current Projects
Populations of native indicator fish/wildlife species are statistically similar to populations in reference sites with similar habitat but little to no contamination.	Addressed by Current Projects

Rationale for Listing

The reasons for listing this BUI that were identified in the 1989 RAP include concern that fish populations might be negatively impacted by exotic species, sedimentation, and dams. The 1995 RAP update also raises the possibility that contaminants may impact fish populations and their forage base. Although fish populations appeared to be good, all of these issues were present in the AOC and it was thought that they could be having a negative effect. There was concern that some wildlife species, such as mink, kingfishers and swallows were at lower-than-normal population levels in the AOC for the habitat available. Contaminants in the food chain were suspected as the cause of the low population levels.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

As described in the "Restrictions on Dredging" section of the 2014 RAP Update, all Superfund and contaminated sediment remediation projects are now complete (RAP Update; WDNR, 2014). Dredging of contaminated sediments in the river and cleanup of floodplain soils was completed in 2013. Sediment load reduction and erosion control actions were also implemented.

Baseline information collected in 2011 was used to produce a list of seven Tier I projects that were necessary to implement before the habitat and population BUIs can be removed. The seven Tier 1 habitat projects that were implemented in 2012 include: Kiwanis Park Shoreline Restoration, Wildwood Island Area Restoration, Taylor Drive and Indiana Avenue Wetland Restoration, Shoreline Stabilization in Problem Areas, In-Stream Habitat Improvements, Targeted Invasive Species Control, and Schuchardt Property Conservation Planning. Maintenance and monitoring of all habitat sites continued in 2015.

The verification monitoring identified within the Fish and Wildlife Plan includes assessments of the Fish and Wildlife Populations BUI that were approved for GLRI funding in 2014. The plan includes both aquatic community assessments (evaluating fish and benthic macroinvertebrate communities) and riparian wildlife assessments (evaluating birds, bats, mussels, herptiles, mink populations, and tree swallows). The first of the three-year studies for fish and macroinvertebrates began in 2014 and continued in 2015. A mink study was also conducted in 2014 comparing the number of footprints tracked on mink rafts located in both the Sheboygan River AOC and a reference site. Sample sizes were low throughout both sites in 2014 and thus two additional survey years were added so the mink surveys will

continue through 2016. Tracking numbers were higher in 2015, with 15 mink tracks found in the AOC and 16 tracks found in the Control Area. Tree swallows were also monitored in 2010 through 2014 by USGS and results from the study are expected in early 2016.

Next Actions Needed

1) Complete the Fish and Wildlife Plan.

In order to fulfill the delisting targets developed in 2008, a Fish and Wildlife Management and Restoration Plan was developed that contains the following information for the Degradation of Fish and Wildlife Populations BUI:

- 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.

The Fish and Wildlife Plan is being updated. After revisions have been made, the TAC will have the opportunity to review the plan and make any final suggestions and comments. The final plan should be completed before the 2016 summer assessments begin.

2) Projects and activities identified in the Fish and Wildlife Plan are implemented and monitored to evaluate habitat goals.

The summary of projects and activities identified to evaluate habitat goals is echoed in #2 of next actions needed for "Loss of Fish and Wildlife Habitat" section (refer to page 16).

3) Projects and activities identified in the Fish and Wildlife Plan are implemented and monitored to evaluate population goals.

The verification studies to assess fish, macroinvertebrates, and mink began in 2014 and will continue through 2016. The USGS tree swallow study was also completed in 2014 and results and analysis should be provided to WDNR early in 2016. An evaluation of the results will be performed in 2016. The remaining surveys for birds, bats, mussels, and herptiles will be conducted in 2016 as well, so the data needed to assess the populations BUI status should be available in 2017.

Issues Affecting Progress on this BUI

There are currently no issues affecting progress on this BUI.

Stakeholder Engagement

The TAC will provide input and guidance on the Fish and Wildlife Plan before it becomes finalized.

LOSS OF FISH AND WILDLIFE HABITAT**2008 Target and Status**

Loss of Fish and Wildlife Habitat	Status
A local fish and wildlife habitat management and restoration/rehabilitation plan has been developed for the entire AOC that accomplishes the following: <ul style="list-style-type: none"> • 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. 	Complete
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.	Addressed by Current 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 USEPA every two years).	Addressed by current projects

Rationale for Listing

The reasons for listing this BUI that were identified in the 1989 RAP included concern that fish habitat was being degraded by sedimentation, dams, and contaminants. There was also concern that agricultural and urban development had resulted in the loss of wildlife habitat, placing a greater importance on the remaining habitat.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

Actions have been taken to decrease sediment loads to the AOC. On-going programs that implement actions to decrease sediment loads include a Sheboygan County buffer program and municipal ordinances for construction site erosion control and storm water management in the cities of Sheboygan Falls and Sheboygan.

Baseline information collected in 2011 was used to produce a list of seven Tier I projects that were necessary to implement before the habitat and population BUIs can be removed. The seven Tier 1 habitat projects that were implemented include: Kiwanis Park Shoreline Restoration, Wildwood Island Area Restoration, Taylor Drive and Indiana Avenue Wetland Restoration, Shoreline Stabilization in Problem Areas, In-Stream Habitat Improvements, Targeted Invasive Species Control, and Schuchardt Property Conservation Planning.

Monitoring and maintenance of all habitat restoration areas started in 2013 and continued through 2015 with one additional year of monitoring and maintenance approved to be completed in 2016. The Targeted Invasive Species Control project continued through 2015 as well. Invasive Species sites were treated and seeding was performed to implement stabilization of specific erosion prone sites. Oversight of all sites was performed throughout the treatment and seeding period. Aquatic habitat and macrophyte community data were also collected in 2014 and 2015 as part of the three-year verification monitoring studies.

Next Actions Needed

1) *Complete the Fish and Wildlife Plan.*

In order to fulfill the delisting targets developed in 2008, a Fish and Wildlife Habitat Management and Restoration/Rehabilitation Plan was developed that contains the following information for the Loss of Fish and Wildlife Habitat BUI:

- 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.

The Fish and Wildlife Plan is being updated. After revisions have been made, the TAC will have the opportunity to review the plan and make any final suggestions and comments. The final plan should be completed before the 2016 summer assessments begin.

2) Projects and activities identified in the Fish and Wildlife Plan are implemented and monitored to evaluate habitat goals.

The habitat restoration projects listed above were completed in 2012 and the required three-year maintenance for those projects began in 2013. An additional year of monitoring and maintenance was approved, with the final year of actions being completed in 2016. Assessments to evaluate aquatic habitat include fish habitat assessments and aquatic macrophyte surveys, which began in 2014 and will continue through 2016.

Measures of success for both riparian habitat projects and aquatic habitat assessments were recently incorporated into the Fish and Wildlife Plan. These include measuring the amount of restored habitat area and the quality of the improved habitat. An overall habitat remediation project evaluation is scheduled to occur in 2016 to document and evaluate success of all habitat remediation efforts.

3) Waters of the Sheboygan River AOC are not listed as impaired due to aquatic toxicity in the most recent 303(d) or 305(b) lists.

The results from the *Assessment of Benthos and Plankton in Wisconsin's Lake Michigan Areas of Concern* project will determine the next steps for this BUI. Data analysis and the interpretive report for this study should be completed by early 2016. If the plankton community is found to be degraded following evaluation of the results, further assessment will be needed to determine if aquatic toxicity may be a cause of this impairment. The waters of the Sheboygan River AOC are not currently listed on the 303(d) list for aquatic toxicity. We are evaluating possible next steps which will likely include water column toxicity testing in the summer of 2016 to assess this issue.

Issues Affecting Progress on this BUI

If the habitat restoration projects are verified to be successfully established in 2016, this BUI will be proposed for removal in 2017.

BIRD OR ANIMAL DEFORMITIES OR REPRODUCTION PROBLEMS

2008 Target and Status

Bird or Animal Deformities or Reproduction Problems	Status
Superfund and RCRA sediment and floodplain remedial actions have been implemented.	Complete
Studies conducted in the AOC indicate that the beneficial use should not be considered impaired; or	Not Complete
If studies conducted in the AOC determine that this use is impaired, then two approaches can be considered for delisting:	Not Complete
<p>Approach 1 – Observational Data and Direct Measurements of Birds and other Wildlife</p> <ul style="list-style-type: none"> • 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 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). 	Addressed by Current Projects
Where data from direct observation of wildlife and wildlife tissue data are not available, the following approach should be used:	1
<p>Approach 2 – Fish Tissue Contaminant Levels as an Indicator of Deformities or Reproductive Problems</p> <ul style="list-style-type: none"> • 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. 	2 Not Complete

Note that LOELs (cited in Approach 1 of the target) may not exist for all species and/or all contaminants.

Rationale for Listing

Bird and animal deformities or reproductive problems were listed as a BUI because the levels of contamination present in the AOC were known to be high enough to cause these types of impairments in wildlife. While no deformities had been reported, reproductive problems were suspected. One example is mink populations in the AOC whose populations were low or non-existent despite available habitat. PCBs are known to impact mink reproduction (Aulerich and Ringer, 1977; Leonards et al., 1995).

¹ Pending Results of Approach 1 Implementation

² Approach 1 is being Implemented by Current Projects: Approach 2 may not be Needed

Since the 1995 RAP Update was written, several studies have been completed that documented contaminant levels in the food chain high enough to cause reproductive problems. Tree swallow (Patnode et al., 1998a) and snapping turtle (Patnode et al., 1998b) reproduction studies documented impaired hatching success. The Aquatic Ecological Risk Assessment (EVS and NOAA, 1998) determined that mink and great blue heron were likely to suffer adverse reproductive effects from eating Sheboygan River small mammals, fish, and crayfish. The Terrestrial Ecological Risk Assessment (Chapman, 1999) determined that robins were likely to suffer adverse reproductive effects from foraging in contaminated sections of the floodplain.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

As described in the “Restrictions on Dredging” section of the 2014 RAP Update, all Superfund and contaminated sediment remediation projects are now complete (RAP Update; WDNR, 2014). Dredging of contaminated sediments in the river and cleanup of floodplain soils was completed in 2013.

A monitoring plan that includes assessment of the Bird or Animal Deformities or Reproduction Problems BUI has been developed by WDNR and the TAC and received GLRI funding in 2014. The plan includes a riparian wildlife assessment to evaluate tree swallow and mink populations, the two species that have been selected as appropriate indicators of potential impairment for this BUI in this AOC. The tree swallow project conducted by USGS began in 2010. The USGS collected tree swallow eggs, nestlings, and diet samples from tree swallow box arrays along the Sheboygan River in 2010 and found high concentrations of PCBs. Additional box arrays were added along the Sheboygan River from 2011-2014 and USGS is currently analyzing the results and writing a report to summarize findings. Mink populations were assessed by using floating mink rafts designed to track footprints placed throughout the Sheboygan River AOC and reference site in 2014. If prints are found, a live trap is set in an effort to obtain a blood sample. However, low numbers of mink were tracked in 2014 and no live mink were trapped in the AOC or the reference site in 2014. Plans have changed and two additional survey years were added to account for potential differences related to annual species populations, sampling techniques, or other factors throughout the AOC and reference site. Mink tracking numbers were higher in 2015 in both the AOC and reference site, but still no live mink were trapped. It is difficult to determine if reproductive problems are an issue without blood samples, so hopefully the third year of surveys in 2016 will prove to be successful in mink trapping to obtain blood samples.

Next Actions Needed

1) *Complete study to determine if BUI is no longer impaired.*

Continue implementing the Bird or Animal Deformities or Reproduction Problems monitoring plan. Specifically,

- Complete evaluation of tree swallow study results.
- Pursue live mink trapping to obtain blood samples.
- Continue mink tracking.

Issues Affecting Progress on this BUI

If no live mink are trapped to obtain blood samples, another species will be considered for the study or fish tissue will be examined according to Approach 2 in the delisting target.

FISH TUMORS OR OTHER DEFORMITIES**2008 Target and Status**

Fish Tumors or Other Deformities	Status
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.	Complete
The Superfund PCB cleanup and Manufactured Gas Plant cleanup have been implemented.	Complete
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.	Addressed by Current Projects
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 Current Projects
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 Current Projects

Rationale for Listing

Due to the high levels of contamination that were known to be present in the AOC when it was listed, it was assumed that these levels were high enough to cause fish tumors or deformities, although none had been observed. A study of white suckers in the Sheboygan River (Schrack et al., 1997) found hepatic (liver) lesions in the white suckers, and at least some were preneoplastic. In addition, the Aquatic Ecological Risk Assessment (EVS and NOAA, 1998) evaluated health effects based on chemical concentrations and a review of the literature for reproductive effects. Potential reproductive effects from PCBs exist, especially for smallmouth bass. Reproductive effects from PAHs are less certain.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

As described in the "Restrictions on Dredging" section of the 2014 RAP Update, all Superfund and contaminated sediment remediation projects are now complete (RAP Update; WDNR, 2014). Dredging of contaminated sediments in the river and cleanup of floodplain soils was completed in 2013.

Due to lack of information on the fish tumor incidence rate in the AOC, WDNR assessed this BUI via a study funded through GLRI. The study, *Evaluation of Fish Tumors or Other Deformities*, began in spring 2012. The 2012 sampling and analysis was carried out by University of Wisconsin-Madison and University of West Virginia/USGS Cooperative Science Center. The Sheboygan River Fish Tumor Evaluation project describes how white suckers from the Sheboygan River AOC were collected for tumor incidence rate as well as stable isotope analysis to determine residency patterns. While data was collected related to other lesions and carcinomas, the liver neoplasm rate is the metric used to assess the BUI. Results of this 2012 sampling show that neoplasms of the liver occurred in 8.3% of the suckers collected (Blazer and Mazik, 2012 and UW-Center for Limnology, 2013a). Since the rate was above the 5% target, a second year of reference site sampling was done in 2013. The Fish Tumor Assessment for the Milwaukee River Area of Concern and the Kewaunee River Reference Site project conducted in 2013 found the rate of neoplasms of the liver in the Kewaunee River occurred in only 3.5% of the suckers collected (Blazer, 2014 and UW-Center for Limnology, 2013b). More time for recovery is needed and the study will be repeated again in 2017.

Next Actions Needed

1) *Complete the Evaluation of Fish Tumors or Other Deformities study and repeat if necessary.*
Since 2013 data from the reference site sampling were significantly different from the Sheboygan River AOC, the study will be repeated in 2017, allowing for more recovery after the completed contaminated sediment remediation.

Issues Affecting Progress on this BUI

There are currently no issues affecting progress on this BUI.

DEGRADATION OF PHYTOPLANKTON AND ZOOPLANKTON POPULATIONS

2008 Target and Status

Degradation of Phytoplankton and Zooplankton Populations	Status
Sources causing nutrient enrichment to the Outer Harbor and near shore waters are identified and controlled if nutrients are the main contributor; 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.	Addressed by Current Projects
Phytoplankton or zooplankton bioassays confirm no toxicity in ambient waters and the community structure is diverse and contains species indicative of clean water.	Addressed by Current 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 Current Projects

Rationale for Listing

Due to the known contaminated sediments present in the river and associated toxicity, there was concern that plankton populations might be negatively impacted. Also, there was a concern that excess nutrients might be affecting these populations. However, there was little or no evidence that the populations were actually degraded. Prior to 2012, no phytoplankton or zooplankton studies had been conducted within the AOC to assess this BUI, so it was not known whether their populations are degraded or, if they are, what the cause might be.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

As described in the “Restrictions on Dredging” section of the 2014 RAP Update, all Superfund and contaminated sediment remediation projects are now complete (RAP Update; WDNR, 2014). Dredging of contaminated sediments in the river and cleanup of floodplain soils was completed in 2013.

Due to lack of information on the benthic and planktonic communities in the Sheboygan River compared to reference sites, WDNR received GLRI grant funding for a comparison study. This study, *Assessment of Benthos and Plankton in Wisconsin’s Lake Michigan Areas of Concern*, is being carried out by USGS for WDNR and includes all four of the Lake Michigan AOCs and six reference sites. Benthos, phytoplankton and zooplankton communities were sampled and assessed in each of the AOCs and in the reference sites in 2012 (*Benthos and plankton community data for selected rivers and harbors along Wisconsin’s Lake Michigan shoreline, 2012*, Scudder-Eikenberry, 2014). Because 2012 was an unusual drought year, the study was also repeated in 2014 to increase data rigor. Preliminary analysis of 2012 samples indicate that the Sheboygan River is not considered to be degraded for phytoplankton and zooplankton communities when compared to two non AOC reference sites. USGS is currently analyzing the results of the 2014 samples and a report should be complete early in 2016. This study will be used to evaluate the status of this BUI in the Sheboygan River AOC.

Next Actions Needed

- 1) Complete data analysis for the 2014 *Assessment of Benthos and Plankton in Wisconsin’s Lake Michigan Areas of Concern*.

This project assessed the benthic, phytoplankton and zooplankton communities of the river and will be used to assess this BUI. Because 2012 was an anomalous year for weather conditions, it was necessary to repeat the study in 2014 to ensure that data are representative of average conditions. Results from sampling completed in 2014 are expected by early 2016. If 2014 results indicate that the plankton communities in the Sheboygan River are similar to non-impacted reference sites, the BUI can be considered for removal in 2017, after results are evaluated. If the data from 2014 indicate that the

plankton communities are not similar, then further steps may need to be considered. These could include: collecting more plankton data in the future when more time has been allowed for recovery after contaminated sediment removal, evaluating prior bioassay study results, or considering the impacts of invasive species on the plankton communities.

2) *Determine if “bioassays to confirm that no aquatic toxicity is present in the river” are necessary based on results of current assessment project.*

Data gathered by the current *Assessment of Benthos and Plankton in Wisconsin’s Lake Michigan Areas of Concern* project will be used to determine if plankton communities are degraded. If these communities are not found to be degraded, no bioassays will be necessary to determine if aquatic toxicity is an issue or cause of population degradation. If they are found to be degraded, further evaluation will be needed to determine if aquatic toxicity is the cause of this impairment. Data from 2014 samples is expected to be available by early 2016.

Issues Affecting Progress on this BUI

If results from 2014 indicate that the Sheboygan River is degraded for plankton communities, other aspects of the environment may need to be evaluated to determine if additional influences may be affecting the plankton communities, such as invasive species.

EUTROPHICATION OR UNDESIRABLE ALGAE**2014 Target and Status**

Eutrophication or Undesirable Algae	Status
In-river total phosphorus concentrations meet Wisconsin AOC target criteria with a 95% level of confidence; and	Complete
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	Complete
The Wisconsin AOC target criteria will be considered to have been met when the sample population does not exceed nutrient targets or evidence indicates the lack of biological impairment (as determined by fish and macroinvertebrate Indicators of Biological Integrity, or IBIs).	Complete

BUI Removed

The 2008 target referenced the Wisconsin Impaired Waters List (WDNR, 2008). In 2014, WDNR clarified the target to separate the AOC water quality target set in 2008 from the regulatory process used to add or remove waterways from Wisconsin's Impaired Waters List. The details of the target clarification and associated stakeholder review process were included with the 2014 RAP Update (RAP Update; WDNR, 2014).

Rationale for Listing

When the AOC was listed, both phosphorus and nitrogen concentrations in the river were elevated due to excessive nutrient loads and undesirable algal blooms were occasionally seen. The source of the nutrients was assumed to be nonpoint source pollution from upstream sources and developing urban areas.

Summary of Key Remedial Actions since the 2014 RAP & Current Status

Historically, many actions have been taken to decrease nutrient loads to the AOC. The Sheboygan River Priority Watershed Project, which ended in 2003, resulted in significant reductions in phosphorus contributed by agricultural areas. Sheboygan County continues to run its own buffer strip program. The Cities of Sheboygan Falls and Sheboygan have adopted construction site erosion control ordinances. The City of Sheboygan Storm Water Management Plan was completed in 1998. The City also adopted a Storm Water Management Ordinance and Erosion Control Ordinance in 2006. In addition, wastewater treatment plant upgrades have been made and numerous wetland restorations and enhancements have been completed in the Sheboygan River watershed.

WDNR staff summarized present and historical water quality data for total phosphorus (TP), dissolved oxygen (DO), and chlorophyll-a (CHL-a) to evaluate the status of the Eutrophication or Undesirable Algae BUI relative to the 2014 target. The data indicated that the target was being met and therefore WDNR decided to propose removing the BUI. The removal document was prepared and reviewed by state agency staff, external partners, and USEPA staff. A public comment period was offered to gain input from the community and comments received were addressed. No concerns were expressed in opposition of the BUI removal. A final removal package was sent to USEPA in September, 2015 and with the concurrence of USEPA, the BUI was officially removed in November, 2015. The final BUI removal document can be found on WDNR's Sheboygan River AOC web page under the "[Impairments](#)" tab.

The results of this analysis are not meant to indicate that further improvements with regard to TP, DO, CHL-a or eutrophication in general cannot or should not be made. The BUI removal is an indication that the legacy issues have been addressed; maintenance and further improvement of the health of the

watershed will require continued efforts through ongoing improvements via storm water, wastewater, erosion, and runoff improvements.

Next Actions Needed

No further actions are necessary for this BUI.

Issues Affecting Progress on this BUI

There are currently no issues affecting progress on this BUI.

CONCLUSION

With the final stages of sediment remediation complete, the establishment of new habitat complete, and the continued improvements in nutrient reduction, the Sheboygan River continues to recover. Efforts in 2013, 2014, and 2015 have shifted towards BUI removal and monitoring of populations and habitat. The public responded positively to documentation supporting the removal of the “Restrictions on Dredging Activities” and the “Eutrophication or Undesirable Algae” BUIs. Both removal packages were submitted to USEPA, which concurred with the recommendation to remove each of the suggested BUIs. A second year of verification monitoring was completed, which included sampling fish communities, benthic macroinvertebrate communities, and fish habitat. These surveys will continue for another year. The final report will be finished in early 2016 for the *Assessment of Benthos and Plankton in Wisconsin’s Lake Michigan Areas of Concern* study. Citizen science programs led by Camp Y-Koda have continued to set the stage for the local community to lead river protection efforts when the AOC is eventually able to be delisted. Also scheduled for the upcoming year is a final evaluation for the constructed habitat restoration projects, which coincides with the closing of maintenance and treatment that began in 2013. The Sport Fish Contaminant Monitoring Program sampled fish again in 2015 to evaluate fish consumption advisories and the results should be completed by 2016. The tree swallow study is complete and results should be available by early 2016 as well. The mink study was extended and will continue for another year to evaluate the “Degradation of Fish and Wildlife Populations” and “Bird or Animal Deformities or Reproduction Problems” BUIs. Additional surveys for birds, bats, mussels, and herptiles will also be performed in 2016.

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APPENDICES

Appendix A Sheboygan River AOC BUI Tracking Matrix

Appendix B Sheboygan River AOC BUI Removal Timeline Gantt Chart

Appendix A

Sheboygan River AOC BUI Tracking Matrix

Note that projects listed in the table below represent the action steps that were identified by WDNR in collaboration with AOC partners and stakeholders to make progress toward delisting the AOC. This list may not reflect all actions that will ultimately be needed to remove impairment.

Sheboygan River AOC Tracking Matrix 2015

Project Name	BUI Addressed	Project Type	Action Type	Action Phase	Project Status	Project Start Date	Project End Date	Project Cost	Funding Sources	Project Lead Organization
Assessment of Benthos and Plankton in Wisconsin's Lake Michigan Areas of Concern	BUI 6, BUI 13	Fish and Wildlife	Assessment	Reporting	In Progress	2013	2016	\$414,300	USGS	USGS
Benthos & Plankton BUIs Evaluation in Wisconsin's Lake Michigan Areas of Concern	BUI 6, BUI 13	Fish and Wildlife	Assessment	Reporting	In Progress	2011	2015	\$451,500	USGS	USGS
Camp Marina Superfund Alternative Dredging	BUI 1, BUI 3 BUI 4, BUI 5 BUI 6, BUI 7 BUI 14	Sediment	Remediation	Confirmation Monitoring & Reporting	Completed	2011	2011	\$10,000,000	Responsible Party	USEPA
Dredging Technical Memo	BUI 7	Sediment	Remediation	Confirmation Monitoring & Reporting	Completed	2012	2014	Unknown	Great Lakes Legacy Act	CH2M Hill
Education and Outreach UW-Extension	BUI 1, BUI 3 BUI 4, BUI 5 BUI 6, BUI 7 BUI 8, BUI 13 BUI 14	Community Involvement	Education	Reporting	Completed	2011	2012	\$83,000	USEPA	UW-Extension
Evaluate Eutrophication BUI	BUI 8	Nonpoint	Assessment	Reporting	Completed	2013	2015	In Kind	WDNR	Wisconsin DNR
Evaluation of Fish Tumors or Other Deformities	BUI 4	Fish and Wildlife	Assessment	Reporting	Completed	2012	2013	\$139,485	USEPA	Wisconsin DNR
Evaluation of Waterfowl Consumption Advisories within the AOC	BUI 1	Fish and Wildlife	Assessment	Reporting	Completed	2011	2013	\$66,437	USEPA	Wisconsin DNR
Exposure to PCBs of tree swallows nesting along the Sheboygan River, WI	BUI 3 BUI 5	Fish and Wildlife	Assessment	Reporting	In Progress	2012	2015	\$18,920	USEPA	USGS
Fish & Wildlife Habitat Restoration and Management Plan	BUI 3 BUI 14	Fish and Wildlife	Assessment	Implementation	In Progress	2012	2016	In Kind	WDNR	Wisconsin DNR
Fish Contaminant Monitoring and Advisory Program	BUI 1	Fish and Wildlife	Assessment	Implementation	In Progress	1980		In Kind	WDNR	Wisconsin DNR
In-Stream Habitat Improvements	BUI 3 BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	\$144,083	USEPA	Wisconsin DNR
Kiwanis Park Shoreline Restoration	BUI 3 BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	\$2,115,000	USEPA	Wisconsin DNR
Plankton Verification/Bioassays	BUI 13	Fish and Wildlife	Assessment	Planning	Proposed	2015		Unknown		Wisconsin DNR
Raising Community and CAC Awareness through "Explore and Restore the Sheboygan River" Initiative	BUI 1, BUI 3 BUI 4, BUI 5 BUI 6, BUI 7 BUI 8, BUI 13 BUI 14	Community Involvement	Education	Reporting	Completed	2011	2014	\$51,689	USEPA	Camp Y-Koda
Schuchardt Property Conservation Planning	BUI 3 BUI 14	Fish and Wildlife	Assessment	Reporting	Completed	2011	2012	\$40,000	USEPA	Wisconsin DNR

Sheboygan River AOC Tracking Matrix 2015

Project Name	BUI Addressed	Project Type	Action Type	Action Phase	Project Status	Project Start Date	Project End Date	Project Cost	Funding Sources	Project Lead Organization
Schuchardt Property Invasive Species Mngt Planning	BUI 3 BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	Completed	2011	2012	\$85,000	USACE	USACE
Sheboygan AOC Pathway to Delisting Habitat BUI's--Survey and Assessment - actually 11 projects	BUI 3 BUI 14	Fish and Wildlife	Assessment	Reporting	Completed	2010	2012	\$202,181	USEPA	Wisconsin DNR
Sheboygan Harbor Navigational Improvement Dredging	BUI 7	Sediment	Navigational Dredging	Confirmation Monitoring & Reporting	Completed	2012	2012	\$20,797,000	USEPA	USEPA
Sheboygan River & Harbor Superfund Dredging-Lower River Dredging	BUI 1, BUI 3 BUI 4, BUI 5 BUI 6, BUI 7 BUI 14	Sediment	Remediation	Confirmation Monitoring & Reporting	Completed	2011	2012	\$13,500,000	Responsible Party	USEPA
Sheboygan River & Harbor Superfund Dredging-Upper River Dredging	BUI 1, BUI 3 BUI 4, BUI 5 BUI 6, BUI 7 BUI 14	Sediment	Remediation	Confirmation Monitoring & Reporting	Completed	2006	2007	\$9,000,000	Responsible Party	USEPA
Sheboygan River Great Lakes Legacy Act Project	BUI 1, BUI 3 BUI 4, BUI 5 BUI 6, BUI 7 BUI 14	Sediment	Remediation	Confirmation Monitoring & Reporting	Completed	2011	2012	\$32,776,000	USEPA	USEPA
Shoreline Stabilization in Problem Areas	BUI 3 BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	\$292,000	USEPA	Wisconsin DNR
Small Mammal Contaminant Monitoring in the Sheboygan River AOC	BUI 3 BUI 5	Fish and Wildlife	Assessment	Reporting	Completed	2011	2012	\$16,768	USEPA	Wisconsin DNR
Supporting & Developing A Sheboygan AOC Community Advisory Committee	BUI 1, BUI 3 BUI 4, BUI 5 BUI 6, BUI 7 BUI 8, BUI 13 BUI 14	Community Involvement	Capacity	Reporting	Completed	2011	2012	\$28,655	USEPA	Sheboygan River Basin Partnership
Targeted Invasive Species Control	BUI 3 BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	\$132,500	USEPA	Wisconsin DNR
Taylor Dr & Indiana Ave Riparian Area and Wetland Restoration	BUI 3 BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	\$795,000	USEPA	Wisconsin DNR
Verification Monitoring - Bird, bat, mussel, and herptiles study	BUI 3 BUI 14	Fish and Wildlife	Assessment	Planning	Established	2016	2016	\$50,000	USEPA	Wisconsin DNR
Verification Monitoring - Fish Community Assessment	BUI 3 BUI 14	Fish and Wildlife	Assessment	Implementation	In Progress	2014	2016	\$120,000	USEPA	Wisconsin DNR
Verification Monitoring - Macroinvertebrates and Fish Habitat Assessment	BUI 3 BUI 14	Fish and Wildlife	Assessment	Implementation	In Progress	2014	2016	\$27,882	USEPA	Wisconsin DNR

Sheboygan River AOC Tracking Matrix 2015

Project Name	BUI Addressed	Project Type	Action Type	Action Phase	Project Status	Project Start Date	Project End Date	Project Cost	Funding Sources	Project Lead Organization
Verification Monitoring - Mink Survey and Contaminant Monitoring	BUI 3 BUI 5	Fish and Wildlife	Assessment	Implementation	In Progress	2014	2016	\$127,500	USEPA	Wisconsin DNR
Wildwood Island Area Restoration	BUI 3 BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	\$790,000	USEPA	Wisconsin DNR

BUI Number Key

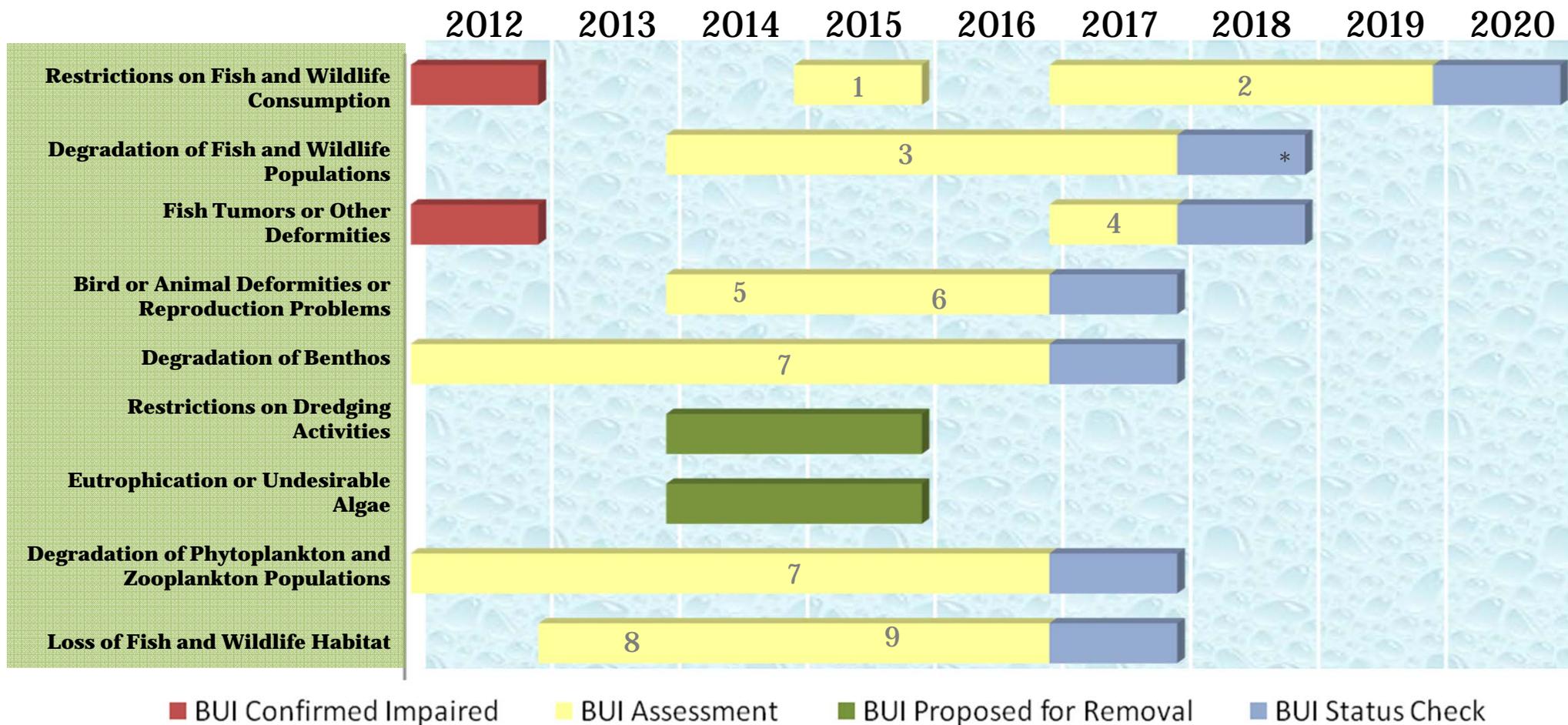
BUI #	BUI Name	BUI#	BUI Name
BUI 1	Restrictions on Fish and Wildlife Consumption	BUI 8	Eutrophication or Undesirable Algae or Excessive Loading of Sediments and Nutrients
BUI 2	Tainting of Fish and Wildlife Flavor	BUI 9	Restrictions on Drinking Water Consumption or Taste and Odor Problems
BUI 3	Degraded Fish and Wildlife Populations	BUI 10	Beach Closings and Body Contact Restrictions
BUI 4	Fish Tumors and Other Deformities	BUI 11	Degradation of Aesthetics
BUI 5	Bird or Animal Deformities or Reproductive Problems	BUI 12	Added Costs to Agriculture or Industry
BUI 6	Degradation of Benthos	BUI 13	Degradation of Phytoplankton and Zooplankton Populations
BUI 7	Restrictions on Dredging Activities	BUI 14	Loss of Fish and Wildlife Habitat

Appendix B

Sheboygan River AOC BUI Removal Timeline Gantt Chart

Note that this timeline is subject to change. The chart lists key tasks that need to be completed to remove BUIs. Unexpected results of data from verification monitoring and other studies may delay removing BUIs.

Sheboygan River Area of Concern Beneficial Use Impairment Removal Timeline



Projects and Milestones

The Sheboygan River AOC has made significant progress towards BUI removal since its priority year in 2012. With all management actions complete, the focus is on monitoring to assess the status of each BUI as well as allowing time for the impairments to recover. Key tasks to complete for BUI removal are listed here.

1. Monitor contaminants in fish and evaluate consumption advisories (2015)
 2. Monitor contaminants in waterfowl and evaluate consumption advisories (2017-2019)
 3. Conduct fish and wildlife verification monitoring and data analysis (2014-2017)
 4. Repeat fish sampling to evaluate fish tumor rate (2017)
 5. Conduct mink monitoring for reproductive problems (2014-2016)
 6. Complete analysis of tree swallow contaminant study (2015)
 7. USGS benthos and phytoplankton study and data analysis (2012-2015)
 8. Maintenance and verification of completed habitat projects (2013-2016)
 9. Complete fish habitat assessments and aquatic macro-invertebrate surveys (2014-2016)
- * Conservative estimate to allow adequate time for data analysis