

# St. Louis River Area of Concern

## 2016 Remedial Action Plan

Reflects amendments to the 2015 RAP

October 1, 2015 – September 30, 2016



*Photo by Dave Witt/Aero-Environmental Consulting; courtesy Duluth Seaway Port Authority*



## About this Document:

The 2013 Remedial Action Plan (RAP) was produced by LimnoTech (MPCA and WDNR, 2013), under contract to the Minnesota Pollution Control Agency and was funded by a USEPA Great Lakes Restoration Initiative Grant (Federal grant no. GL00E00556) and associated Minnesota and Wisconsin GLRI Capacity funding. Many organizations and individuals participated in a variety of ways as collaborators to the report. The document is amended by the St. Louis River Area of Concern Coordinators and Leaders annually.

Since the 2013 RAP, the St. Louis River Area of Concern RAP implementing agencies and partners have provided an annual update for review and comment to the organizations and individuals participating in the RAP process. A draft redlined version of the RAP, showing changes made for the fiscal year, is open for stakeholder and partner input for a two-week period. AOC Coordinators review and address the stakeholder and partner input before finalizing the RAP update and submitting to the Environmental Protection Agency – Great Lakes National Program Office. This [2016](#) RAP is the result of updates to the [2015](#) RAP and is current as of the federal fiscal year [2016](#) (October 1, [2015](#) – September 30, [2016](#)).

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This report, previous RAPs, and related appendices can be found on the following web sites:

- [Minnesota Pollution Control Agency](http://www.pca.state.mn.us/fhcuwfr) (<http://www.pca.state.mn.us/fhcuwfr>)
- [Wisconsin Department of Natural Resources](http://dnr.wi.gov/topic/greatlakes/st.louis.html) (<http://dnr.wi.gov/topic/greatlakes/st.louis.html>)
- [U.S. Environmental Protection Agency Great Lakes National Program Office](http://www.epa.gov/great-lakes-aocs) (<http://www.epa.gov/great-lakes-aocs>)

Disclaimer

The Great Lakes Water Quality Agreement (GLWQA) 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 are designed to meet beneficial use impairment (BUI) delisting targets for the St. Louis River Area of Concern and are not subject to enforcement or regulatory actions.

The actions identified in Remedial Action Plans (RAPs) are a prioritized list of projects that are directly related to BUI removal as outlined by the removal strategies; however, the list of actions is adaptive and changes are outlined in the annual RAP updates. Cost estimates provided in the action item tables have an inherent level of uncertainty and are for planning purposes only.

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# List of Acronyms

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AIS	Aquatic invasive species
AOC	Area of Concern
BUI	Beneficial use impairment
CPUE	Catch per unit effort
FDL	Fond du Lac Band of Lake Superior Chippewa
FFY	Federal Fiscal Year
GLDIVER	Great Lakes Data Integration Visualization Exploration and Reporting
GLRI	Great Lakes Restoration Initiative
HUC	Hydrologic Unit Code
Hg	Elemental symbol for mercury
IJC	International Joint Commission
MDNR	Minnesota Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
MS4	Municipal separate storm sewer system
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated biphenyl
RAP	Remedial Action Plan
R2R	Remediation to restoration
SAA	Sediment Assessment Areas
SLRA	St. Louis River Alliance
SOGL	Sustain Our Great Lakes (grant funding from the National Fish and Wildlife Foundation)
TSS	Total suspended solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WDNR	Wisconsin Department of Natural Resources
WLSSD	Western Lake Superior Sanitary District
WWTP	Wastewater treatment plant

## Definitions

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### **Area of Concern (AOC)**

Defined by Annex 1 of the 2012 U.S.-Canada Great Lakes Water Quality Agreement as amended:

Geographic area where significant impairment of beneficial uses has occurred as a result of human activities at the local level.

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 in the Annex, 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.

### **Delisting Target**

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

### **Remedial Action Plan (RAP)**

According to the 2012 U.S.-Canada Great Lakes Water Quality Agreement as amended, a RAP is a document that provides “a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern...” RAPs are required to be submitted to the International Joint Commission and periodically updated and implemented for each AOC. Stages in RAP development (i.e., Stages I, II, and III) have been consolidated into one inclusive RAP process.

Updating the Remedial Action Plan- An annual RAP update for the St. Louis River AOC will be led by MPCA and WDNR by amending the most recent RAP to incorporate BUI progress and changes that may occur. The RAP will be labeled with the year it has been updated and will be posted online.

### **St. Louis River Alliance (SLRA)**

St. Louis River Alliance, originating as the St. Louis River Citizen Advisory Committee, incorporating as a 501(c)3 in 1996, and has been doing business as the St. Louis River Alliance since 2009. The Alliance serves as the citizens’ advisory group to the St. Louis River AOC.



# Executive Summary

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## Background

This St. Louis River Area of Concern (AOC) 2015 Remedial Action Plan (RAP) presents a comprehensive plan outlining actions necessary for removing each of the remaining beneficial use impairments (BUIs) and a goal of delisting the St. Louis River AOC by 2025.

The St. Louis River AOC made substantial progress toward setting clear delisting goals with the development of the 2013 RAP, otherwise known as the Roadmap to Delisting. This [2016](#) RAP shows the continued progress made by describing BUI status and changes to action items and timelines. A draft redlined version of the RAP, showing changes made for the fiscal year, is open for stakeholder and partner input for a two-week period. AOC staff review and address the stakeholder and partner input before finalizing the RAP update and submitting it to the Environmental Protection Agency – Great Lakes National Program Office.

The purpose of this document is to serve as a Remedial Action Plan update. RAPs are required by Annex 1 of the Great Lakes Water Quality Protocol of 2012. The 2012 Protocol indicates that RAPs 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.

The RAP is a bi-state document produced by the RAP implementing agencies (Wisconsin Department of Natural Resources and Minnesota Pollution Control Agency) with input from AOC partners and stakeholders to document status and progress of BUI removal through the completion of “action items”. These actions may include on-the-ground restoration and remediation projects, monitoring and assessment projects, and stakeholder engagement processes.

The St. Louis River AOC, located on the western arm of Lake Superior and including the twin port cities of Duluth, Minnesota, and Superior, Wisconsin, was listed as one of 43 Great Lakes AOCs in 1987. Historical actions such as improper municipal and industrial waste disposal and unchecked land use

practices, including dredging and filling of aquatic habitat and damaging logging practices, contributed to the complex set of issues facing the AOC at the time it was listed. The Stage I Remedial Action Plan (RAP; MPCA and WDNR, 1992) determined that nine of 14 possible BUIs existed in the AOC including:

BUI 1: Fish Consumption Advisories

BUI 2: Degraded Fish and Wildlife Populations

BUI 3: Fish Tumors and Other Deformities

BUI 4: Degradation of Benthos

BUI 5: Restrictions on Dredging

BUI 6: Excessive Loading of Sediment and Nutrients

BUI 7: Beach Closings and Body Contact Restrictions

BUI 8: Degradation of Aesthetics – Removed in 2014

BUI 9: Loss of Fish and Wildlife Habitat

Of the 69 actions identified in this RAP, 96% of the projects are underway or complete. The St. Louis River AOC's goal to have all major actions completed by 2020 continues to remain on track with an overall goal of delisting the AOC by 2025. Table ES-1 describes the overall status of each BUI.

Beneficial Use Impairment	Beneficial Use Impairment Status	Summary of Status and Next Steps
Fish Consumption Advisories	Impaired	Three of the four action items are underway. The next step is to <u>develop a scope of work for action 1.02b in order to obtain GLRI funding. In 2016 the technical team revised the roadmap to reflect the BUI removal strategy going forward. This was approved by AOC leadership. Monitoring of a non AOC reference site will begin in 2017 and have multiple years of data for comparison.</u>
Degraded Fish and Wildlife Populations	Impaired	<del>All five</del> <u>Two</u> action items <del>were completed and three remaining actions</del> are underway. Biologists have seen improvements in fish populations, and removal objectives are being met for walleye and muskellunge. Juvenile sturgeon were observed in the 2014 and 2015 summer index surveys. <u>Ruffe populations have fallen. The semi-aquatic mammal study and historical avian populations comparison are complete and undergoing technical review of results. Feasibility and modeling</u> of the piping plover nesting habitat project at Shafer beach is underway.
Fish Tumors and Deformities	Impaired	<del>One action item complete and the other two action items are underway</del> <u>All three actions are completed.</u> More than 600 white suckers were sampled in 2011, 2013 and 2015. <u>A compilation report of all the tumor data is under review and the BUI removal package is being developed. A third round of sampling occurred in the spring of 2015; 250 white suckers were collected and analyzed. 2015 Data should be available in early 2016 and will be analyzed for tumor rate determination. The method of determining the reference population from the datasets will use a logistic regression model factoring habitat usage, sex and age.</u>
Degradation of Benthos	Impaired	Post construction monitoring is the one action item in this BUI and it will occur after aquatic habitat site construction is complete. Several aquatic restoration sites under the Degraded Fish and Wildlife Habitat BUI have been completed and others are currently in the design or construction phase. The RAP has linked the benthic improvement of 1,700 acres at the aquatic restoration sites to this BUI. The pre-construction biological data collection and analysis is near completion. This data <del>will be</del> <u>has been</u> used to establish a benthic metric to assess the outcomes of priority restoration projects. <u>Post construction monitoring scope of work will be developed by spring 2017. Clean up actions at remediation sites are ongoing.</u>
Restrictions on Dredging	Impaired	<del>Three</del> <u>Two</u> action items are complete and <del>16 of</del> the remaining <u>17</u> action items are underway. Two contaminated sites have been remediated and restored, and many are underway. <u>Slip 2 was remediated through a private development project.</u> Much of the harbor and estuary have been sampled for contaminants, but data gaps still exist on the WI side and efforts are <del>being taken</del> <u>underway</u> to address them. Sediment characterization in 2015 <u>and 2016</u> addressed some of these data gaps and <del>planning is underway for sampling the remaining areas in 2016</del> <u>analysis will be conducted in 2017.</u> Outstanding and recent datasets continue to be added to the sediment database. Long term data storage <u>and establishment of a user friendly data interface</u> is being addressed <u>through</u> the <u>implementation of the NOAA Great Lakes DIVER (Data Integration Visualization Exploration and Reporting)</u>
Excessive Loading of Nutrients and Sediments	Impaired	<del>Three</del> <u>Two</u> action items are complete and the remaining <del>three</del> <u>two</u> action items are underway. Upgrades to the Western Lake Superior Sanitary District and the City of Superior Wastewater Treatment plant resulted in major improvements in water quality since the 1970's. <u>Final results from three water quality studies are available and show improvements in water quality in the riverine portions of the AOC. Phosphorus trends in the nearshore areas have not shown improvement. WDNR will conduct monitoring of Wisconsin nearshore areas in 2017 to evaluate biological communities.</u> In addition, the Nemadji Basin assessment is underway <u>and will be completed by the end of 2017.</u>

Beach Closings and Body Contact	Impaired	<p><del>Three of the four</del><u>Five</u> action items are underway. Two contaminated sediment sites with historic body contact restrictions have been remediated and now allow for recreation. <del>A new action item has been added to this BUI. Action 7.05 will track the cleanup at Crawford Creek and determine when the “Warning” signs can be removed.</del> High <i>E. coli</i> exceedance rates continue to cause beach advisories. <u>The Barkers Island beach restoration design will begin in 2017.</u> A “no swimming” sign is still present at US Steel site and “warning” signs are still present at Crawford Creek. Bacterial source tracking project is underway and will be completed in 2017.</p>
Degradation of Aesthetics	Removed	<p>This BUI was removed in August of 2014.</p>
Loss of Fish and Wildlife Habitat	Impaired	<p><del>Four</del><u>Two</u> action items are complete and <del>the remaining 17 of the remaining 19</del> action items are underway. Several aquatic habitat restoration projects have been completed and many are in progress in an effort to reach a target of 1,700 acres of improved aquatic habitat. <del>Two action items</del><u>MDNR completed two aquatic habitat restoration projects in have been completed in 2015: Radio Tower Bay and Chambers Grove Park. Construction of Knowlton Creek will be complete in 2016, documentation of past habitat restoration and protection in Wisconsin and documenting control of invasive species in both Minnesota and Wisconsin. Under a Partnership Agreement with the MPCA, the USACE is providing aquatic habitat engineering design services (both in-house and contractually) to develop restoration designs at several AOC restoration sites.</u> Ongoing restoration includes project feasibility and proposals for several action items in Wisconsin and <u>plans and specifications for</u> construction of restoration sites in Minnesota.</p>

Table ES-1: St. Louis River Area of Concern Beneficial Use Impairments Status Summary



Since the Stage I RAP was written in 1992, significant work has been done to restore the AOC with well over \$420M invested since 1978 on infrastructure upgrades, remediation, and habitat restoration and protection in the AOC. Improved municipal wastewater treatment and significant progress on control of wet weather overflows have contributed to water quality improvement and returning fish and wildlife populations. Some contaminated sites have been remediated and/or restored, including Hog Island/Newton Creek in Wisconsin and the St. Louis River Interlake/Duluth Tar Superfund site in Minnesota (Figure ES-2). In addition, numerous habitat protection and restoration projects have been completed across the AOC. A few examples include:

- Protection of Clough Island
- Sturgeon spawning habitat creation in the St. Louis River followed by observations of young-of-the-year sturgeon
- Restoration of Tallas Island at the mouth of Knowlton Creek
- Protection of 6,500 acres of geologically sensitive habitat in the St. Louis/Red River Streambank Protection Area
- Colonial waterbird habitat creation at Wisconsin Point
- Protection of more than 4,500 acres in two Wisconsin State Natural Areas within the Pokegama River watershed

Despite this progress, legacy sediment contamination and lost wetland habitat remain significant stressors to ecosystem health of the St. Louis River estuary.

### Attributes of the AOC Delisting Roadmap

The Roadmap contained in the RAP 2013 was developed through the combined efforts of numerous AOC partners/stakeholders in addition to the AOC coordinators and leaders who represent the agencies responsible for BUI removal and AOC delisting. The Roadmap was developed to embody four key attributes:

**Inclusive** – It was developed with an extensive stakeholder involvement process with over 70 individuals from approximately 30 partner agencies, local units of government, research institutions, nongovernmental organizations, and stakeholder groups were involved in its development. Work completed by BUI teams and other supporting groups forms the basis of the Roadmap.

**Comprehensive and Targeted** – It addresses all nine BUIs and their interrelationships. For each BUI, targeted removal objectives, removal strategies, and actions still needed to achieve BUI removal along with associated timelines and estimated costs are provided. The plan also includes a management and decision-making framework necessary to sustain AOC-wide communication and implement the actions in the plan.

**Aggressive** – The ultimate goal of the Roadmap is delisting of the AOC by 2025. This will require coordination of state agencies and partners in an unprecedented fashion as they work to implement the identified actions and adapt to BUI removal needs as more information becomes available.

**Timely**– It allows the agencies and AOC partners to make the most of available funding sources that may not exist in the future, including the federal Great Lakes Restoration Initiative and Minnesota Clean Water, Land and Legacy funding.

## Outcomes

Implementation of the actions included in the RAP will result in:

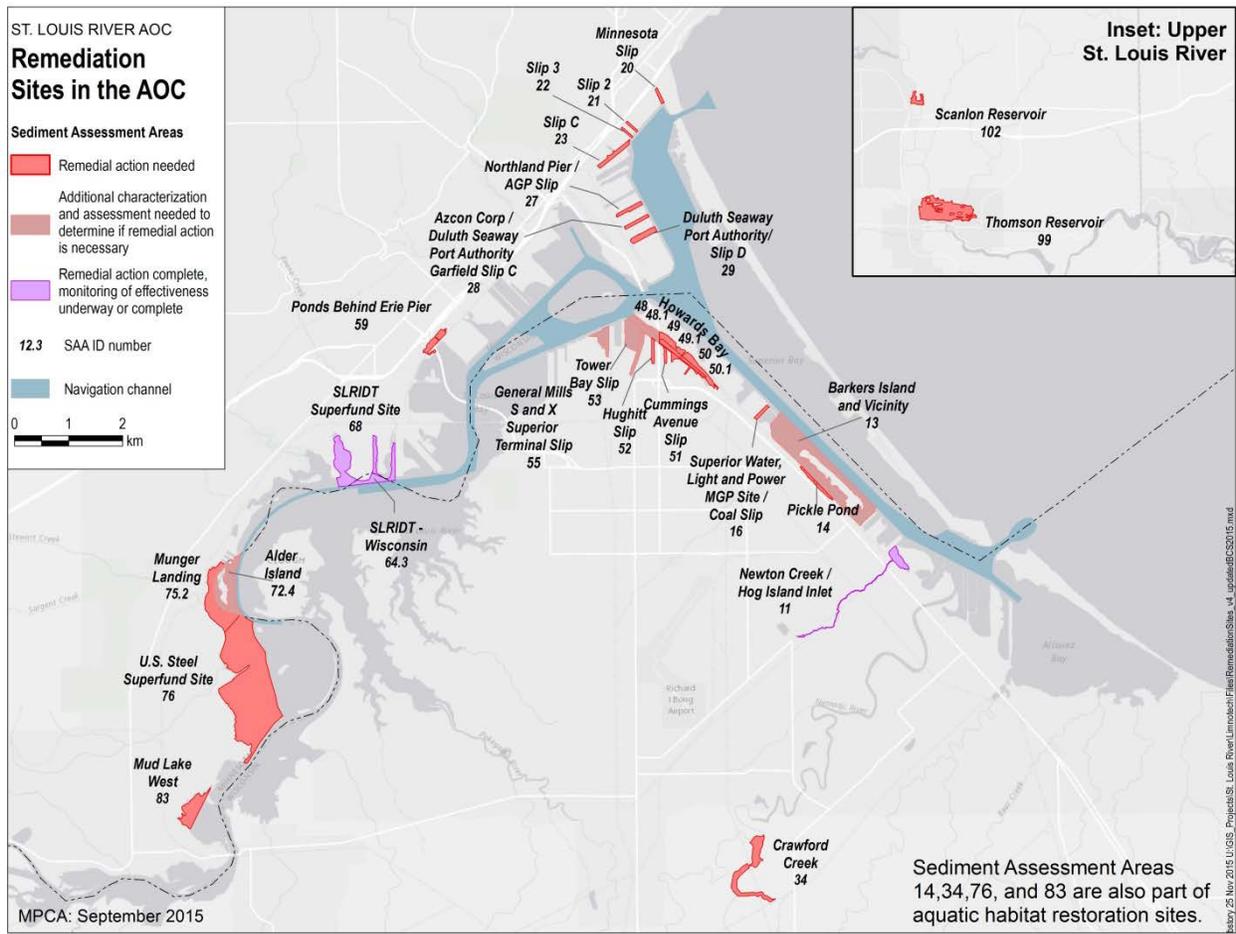
Restoration of more than 1,700 acres of aquatic habitat in the St. Louis River estuary (Figure ES-3).

Remediation of a minimum of 13 contaminated sites, including the U.S. Steel Superfund site and Minnesota Slip in Minnesota and Crawford Creek and Howard’s Bay in Wisconsin (Figure ES-2).

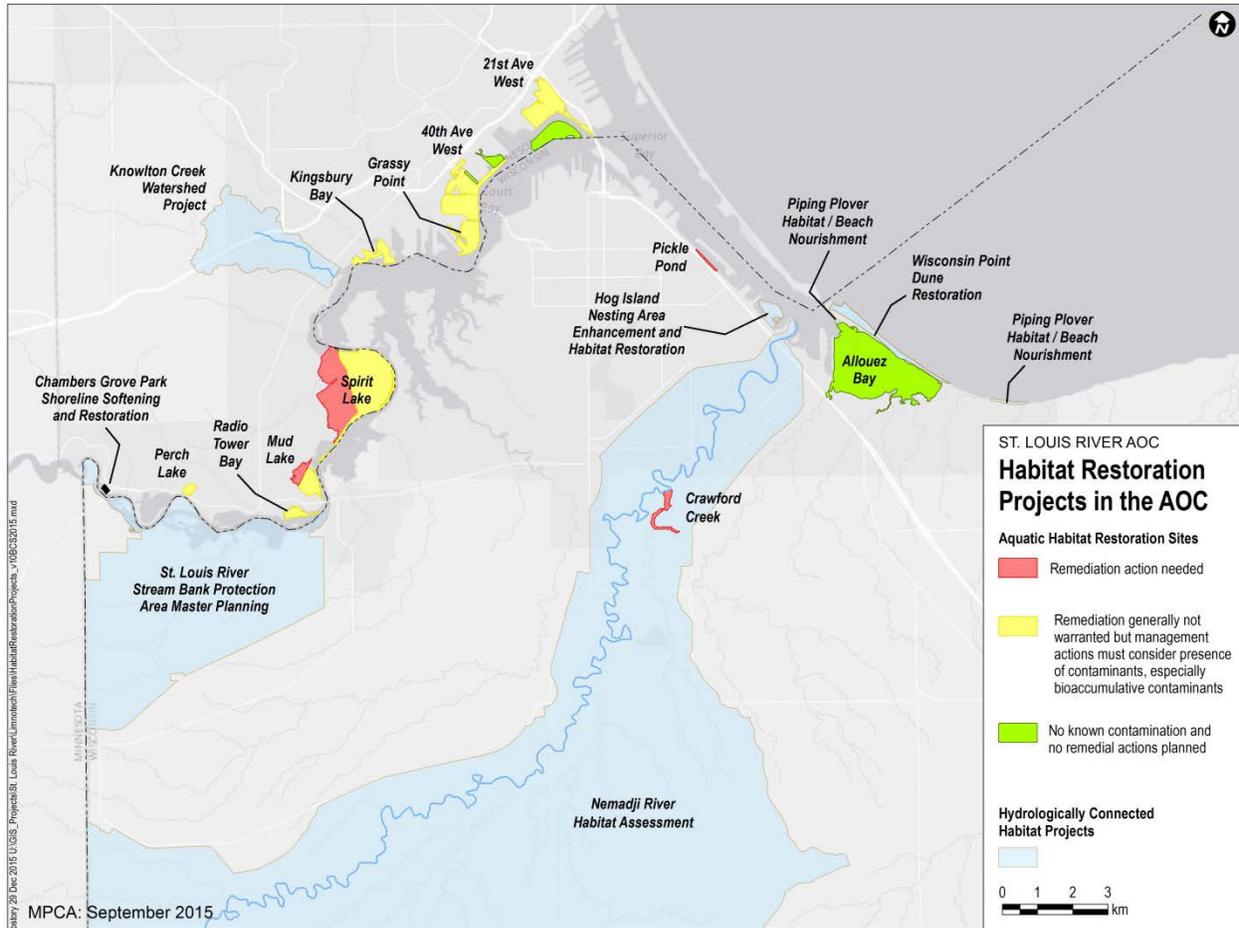
Restoration of hydrologically connected habitat, including creation of suitable nesting habitat for the endangered Piping Plover (Figure ES-4).

Removal of all BUIs and the AOC delisted by 2025 (Table ES-2).

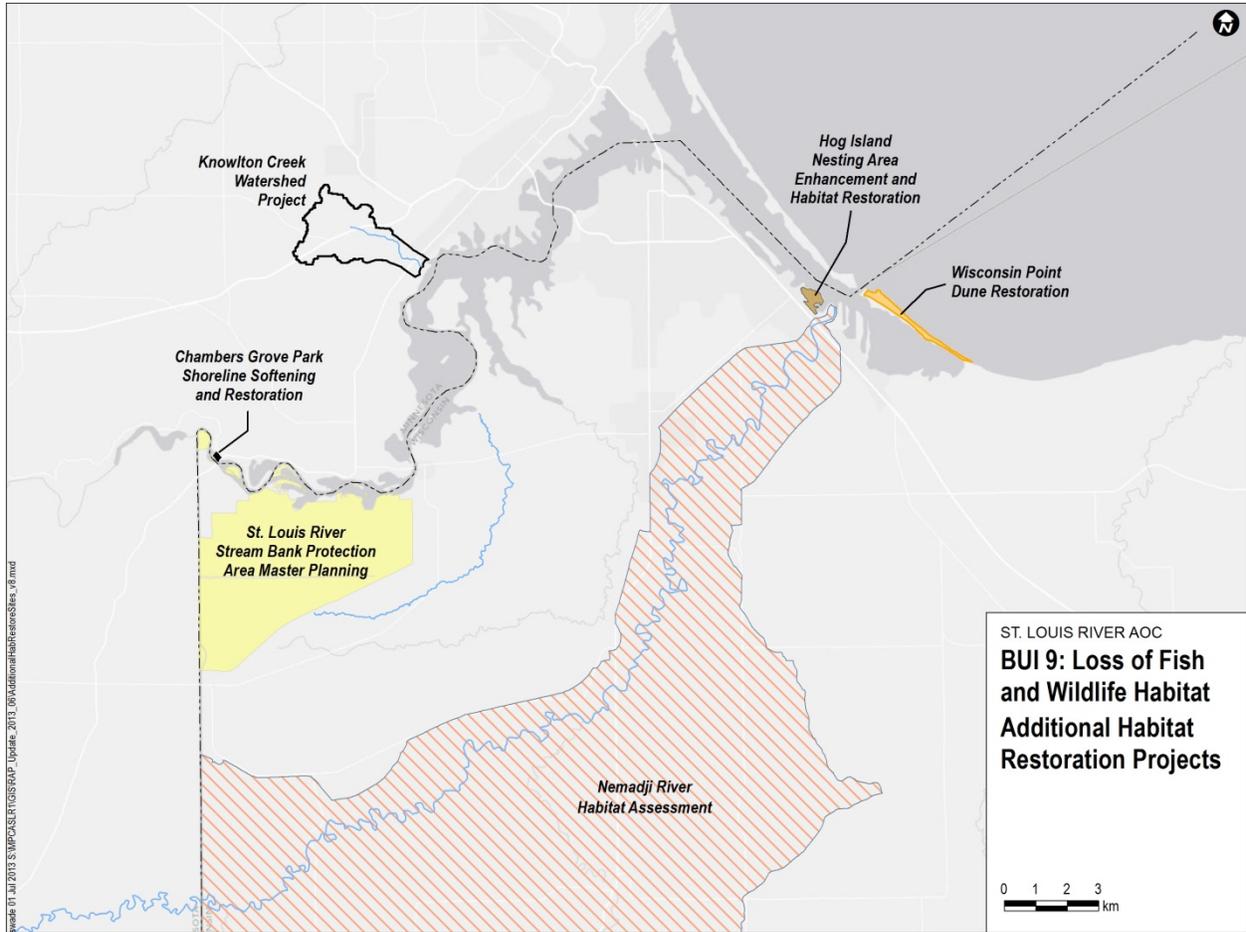
Support sustainable partnerships for managing the St. Louis River estuary into the future.



**Figure ES-2: Remediation Sites in the St. Louis River AOC (Revised Sept 2015)**



**Figure ES-3: Habitat Restoration Projects Planned in the St. Louis River AOC (Revised Sept 2015)**



**Figure ES-4: Hydrologically Connected Habitat Restoration Sites in the St. Louis River AOC**

## BUI Removal and Timelines

Completed and anticipated BUI removal dates are listed in the table below. One anticipated BUI removal date was changed in FFY 2015: Beach Closings and Body Contact Restrictions BUI has been moved from 2018 to 2020.

**Table ES-2: Anticipated BUI Removal Timelines**

BUI Removal Timeline	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Degradation of Aesthetics (BUI 8)	√											
Fish Tumors and Deformities (BUI 3)			●	●								
Excessive Loading of Sediment & Nutrients (BUI 6)				●	●							
Degraded Fish and Wildlife Populations (BUI 2)					●							
Beach Closings and Body Contact Restrictions (BUI 7)							●					
Degradation of Benthos (BUI 4)									●			
Restrictions on Dredging (BUI 5)										●		
Fish Consumption Advisories (BUI 1)												●
Loss of Fish and Wildlife Habitat (BUI 9)												●

## Stakeholder Engagement

Stakeholder engagement has been and will continue to be a priority in the St. Louis River AOC. It is not described for each BUI unless a specific action or need has been identified. An extensive stakeholder process was undertaken during the BUI Blueprint and 2013 RAP development. Stakeholder outreach for the rollout of the 2013 RAP was coordinated with the assistance of the St. Louis River Alliance (SLRA). In addition, the 2013 RAP was presented to city and county governments, the FDL band, and the business community by AOC coordinators and SLRA staff. It is the intention of the AOC staff to continue to reach out to these organizations periodically and when input is needed on significant items. An AOC update is also part of the annual St. Louis River Summit where AOC staff have the opportunity to reach citizens, resource managers, and university and research staff.

A stakeholder input opportunity is a part of the annual RAP update process. The list of stakeholders compiled during development of the 2013 RAP is kept up to date by AOC staff as the primary list of partners, agencies, and citizens. Stakeholders will be notified of the annual RAP update and given a chance to review and comment on the RAP.

## Getting There

Initial costs associated with the implementation of the actions in the RAP and delisting the AOC are in the range of \$300-\$400M. In addition, agency support from U.S. EPA for AOC staff at MPCA, WDNR, MNDNR, and FDL is crucial for successful RAP implementation and management, BUI removal and ultimately AOC delisting. Completion of the actions identified in the RAP requires sustained program staff over the long term without interruption.

This RAP defines a reasonable and effective path forward to restoring the AOC, so the legacy of the St. Louis River estuary can be redefined for local residents and visitors in this generation and generations to come.



# Section 1: Introduction

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This Remedial Action Plan (RAP) update presents a comprehensive plan for delisting the St. Louis River Area of Concern (AOC). The AOC Delisting Roadmap (Roadmap) contained herein details the actions necessary to remove each of the nine beneficial use impairments (BUIs) identified for the St. Louis River AOC. The Roadmap was developed through the Implementation Framework Project funded by a U.S. EPA Great Lakes Restoration Initiative Grant awarded to the MPCA in 2011.

The two-year Implementation Framework Project (Framework) was led by AOC Coordinators from the Minnesota Pollution Control Agency (MPCA), Wisconsin Department of Natural Resources (WDNR), Minnesota Department of Natural Resources (MNDNR), the Fond du Lac Band of Lake Superior Chippewa (FDL), and the Executive Director of the St. Louis River Alliance (SLRA). An extensive stakeholder involvement process was undertaken for the project to develop this important AOC plan. The following partners were involved with its development:

- Minnesota Pollution Control Agency
- Wisconsin Department of Natural Resources
- Minnesota Department of Natural Resources
- Fond du Lac Band of Lake Superior Chippewa
- St. Louis River Alliance
- Harbor Technical Advisory Committee
- Port Authority
- Duluth-Superior Metropolitan Interstate Council
- U.S. EPA Mid-Continent Ecology Division (U.S. EPA MED)
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers Detroit District (USACE)
- City of Duluth, MN
- City of Superior, WI
- Western Lake Superior Sanitary District
- Douglas County, WI
- Douglas County Health Department
- Minnesota Department of Health
- Minnesota Land Trust
- West Wisconsin Land Trust
- National Oceanic and Atmospheric Administration (NOAA)
- Lake Superior National Estuarine Research Reserve
- University of Minnesota–Duluth (UMD)
- University of Wisconsin-Superior (UWS)
- University of Wisconsin-Superior Extension
- University of Minnesota Natural Resources Research Institute (NRRI)
- U.S. Department of Agriculture

- Audubon Minnesota
- Wisconsin Sea Grant
- AMI Consultants
- Barr Engineering
- LimnoTech
- Marine Tech
- Short, Elliot, Hendrickson

The RAP is organized in the following major sections:

Section 1: Introduction

Section 2: Background

Section 3: Overview of the Implementation Framework Project

Section 4: AOC Delisting Roadmap

Section 5: St. Louis River AOC Management and Decision-Making Framework

Section 6: References

Appendices for the 2013 RAP are provided under separate cover in Volume II and will not receive annual updates. Appendices can be accessed online at the websites listed on page ii of this document.

## Section 2: Background

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This section provides a brief background on the Great Lakes Water Quality Agreement (GLWQA), listing of the St. Louis River AOC, and a timeline of important AOC work products leading up to this St. Louis River AOC RAP Update.

### Great Lakes Water Quality Agreement

Initially signed in 1972, the GLWQA is a non-regulatory agreement between the U.S. and Canada that requires the governments to take specific steps to reduce discharge of conventional pollutants, and signals a commitment to reverse the progressive decline and deterioration of the Great Lakes ecosystem. The GLWQA reflects each country's commitment "to restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem" and includes a number of objectives and guidelines to achieve these goals.

There were noticeable improvements in Great Lakes water quality following the implementation of the GLWQA. An estimated nine billion dollars was spent toward controlling conventional pollutants through upgrades or construction of wastewater treatment plants. In the years following the 1972 GLWQA, continued monitoring and research showed that toxic chemicals in the environment presented a potentially greater threat than conventional pollutants. Consequently, the GLWQA was amended in 1978 to address toxic pollutants. It soon became clear, however, that the GLWQA generally lacked an effective means of implementation.

In 1987, the GLWQA was amended once again to strengthen the programs, practices, and technology described in the 1978 amendment, and to increase accountability for their implementation. As a result, timetables were developed for implementation of specific programs. The 1987 amendment also established the concept of "Areas of Concern" that represented the most severely impacted geographic areas around the Great Lakes Basin and set forth the remedial action plan (RAP) process to address them. The RAP process incorporated a systematic and comprehensive ecosystem approach that also included substantial citizen participation. The 1987 amendment required that RAP documents be submitted at three stages: I. Definition of the problem is complete; II. Remedial and regulatory measures have been selected; and III. Monitoring indicates that beneficial uses have been restored (and the AOC can be delisted). An amendment to the GLWQA signed in 2012 consolidated the previously described stages of the RAP process (i.e., Stages I, II, and III) into one inclusive RAP process. The St. Louis River AOC was identified as one of 43 AOCs across the Great Lakes. MPCA and WDNR are the regulatory agencies designated by U.S. EPA to address AOCs in their respective states.

## Listing of the St. Louis River AOC

The St. Louis River AOC is the single AOC in Minnesota and one of five AOCs in Wisconsin. The geographic, geological, hydrologic, and industrial historical contexts of the St. Louis River AOC are described in detail in the Stage I RAP (SLRCAC, 1992), Stage II RAP (MPCA and WDNR, 1995) and the Lower St. Louis River Habitat Plan (SLRCAC, 2002).

The geographic region outlining the St. Louis River AOC was initially defined as the St. Louis River below Fond du Lac Dam and including St. Louis Bay and Superior Bay. Consideration is to be given to “any factor within the St. Louis River watershed contributing to problems of the water resource” (SLRCAC, 1992). Later, the AOC was expanded to include the St. Louis River from upstream of the City of Cloquet downstream to Lake Superior, and the Nemadji River watershed (Stage II RAP; MPCA and WDNR, 1995). The current AOC boundary is defined as:

The AOC boundary includes the lower 39 miles of the St. Louis River, from upstream of Cloquet, Minnesota to its mouth at the Duluth/Superior Harbor, and that portion of the watershed; the Nemadji River watershed; and the western portion of Lake Superior defined on its eastern edge by a line drawn from the eastern HUC 12 Dutchman Creek watershed boundary in Wisconsin where it intersects the Lake Superior shoreline north to where the eastern HUC 12 Talmadge Creek watershed boundary in Minnesota intersects with the Lake Superior shoreline north to the intersection of the Cloquet River HUC 8 (Figure 1).

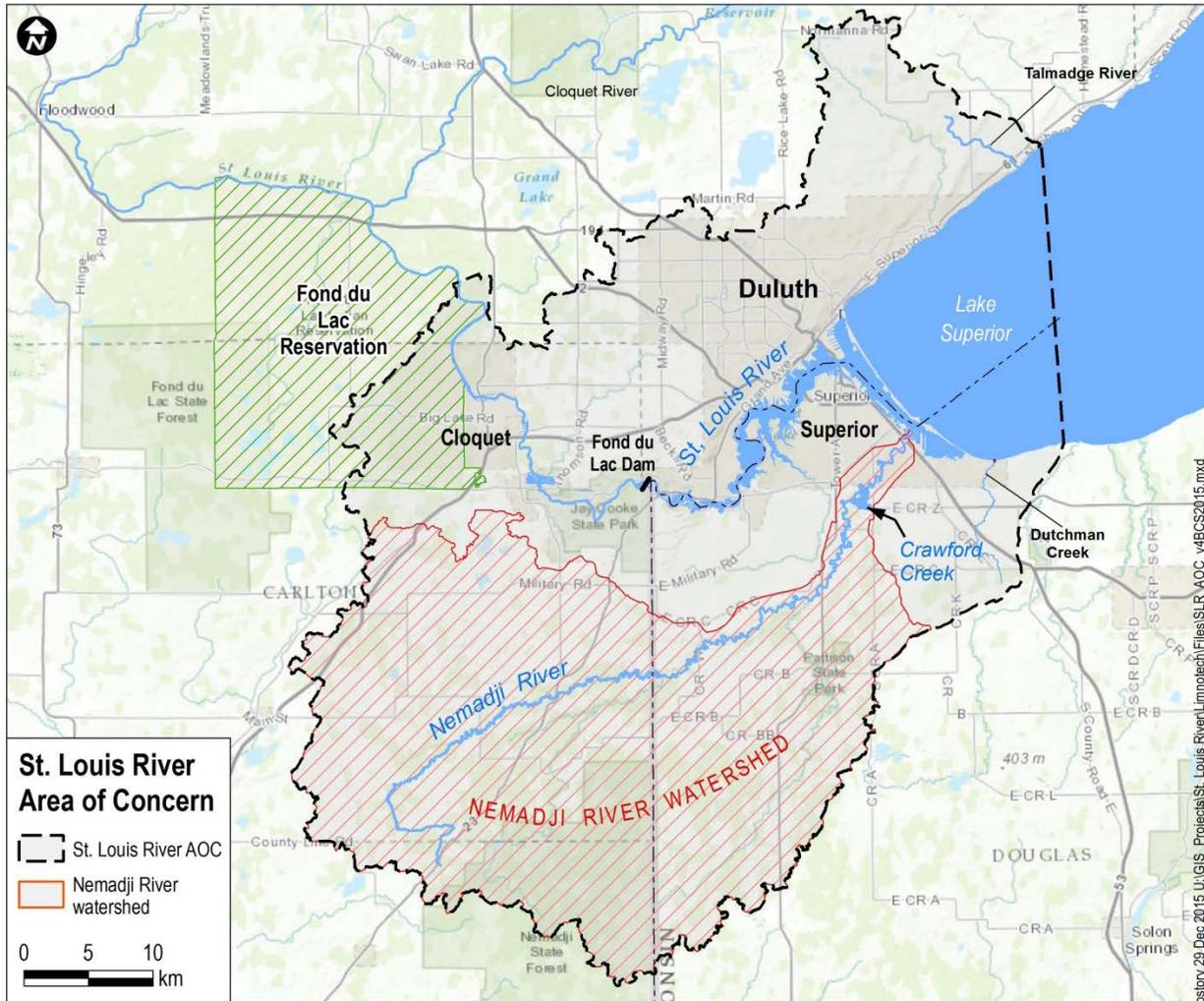


Figure 1: St. Louis River AOC Boundary

Most of the actions included in this St. Louis River AOC RAP focus on the St. Louis River below Fond du Lac Dam, Crawford Creek, and the Nemadji River watershed, as they represent those portions of the AOC most impacted by historical actions.

The St. Louis River was originally listed as an AOC in 1987 because of the large amount of suspended solids, nutrients, and biochemical oxygen demand discharged to the river from various industries and communities (SLRCAC, 1992). By the time the Stage I RAP was developed in 1992, much of these discharges were being treated as required by the Clean Water Act, and the primary concerns for the AOC were legacy contamination and historical habitat degradation, as well as excess sediment and nutrient inputs. These sources of impairment led to the designation of nine of the possible 14 beneficial use impairments (BUIs):

- BUI 1: Fish Consumption Advisories
- BUI 2: Degraded Fish and Wildlife Populations
- BUI 3: Fish Tumors and Other Deformities
- BUI 4: Degradation of Benthos
- BUI 5: Restrictions on Dredging
- BUI 6: Excessive Loading of Sediment and Nutrients
- BUI 7: Beach Closings and Body Contact Restrictions
- BUI 8: Degradation of Aesthetics – BUI Removed 2014
- BUI 9: Loss of Fish and Wildlife Habitat

The majority of the BUIs for the St. Louis River AOC are related to historical habitat loss from extensive filling of wetlands, dredging of shallow aquatic habitat, and inputs of harmful chemicals that contaminated the sediments and water in the estuary. Since 1861, approximately 3,400 acres of wetlands have been lost in the estuary through a combination of dredging and filling; this includes 1,700 acres of shallow, open-water aquatic habitat in St. Louis Bay and Superior Bay that was converted to deep shipping channels (Hollenhorst et al., 2013). There is no clear documentation on how the various constituent units of the Duluth-Superior area handled their solid and liquid wastes prior to the 1970s, but it has also been established that a number of industries discharged directly and indirectly into the river or bay. Consequently, a number of sites within the AOC contain legacy pollutants from historical contamination with chemicals or toxic waste products. Several of these contaminated sites have been or are currently being addressed by State or federal regulatory and resource management programs. Priorities for delisting the AOC are continued remediation of contaminated sediments and restoration of aquatic or hydrologically connected habitat.

## **Timeline of AOC Work Products**

The St. Louis River AOC Stage I RAP (SLRCAC, 1992) was developed as a collaborative effort between the MPCA and the WDNR. At that time, these agencies supported an extensive public participation process that resulted in the development of the Stage 1 RAP and the Stage 2 RAP Progress Report (MPCA and WDNR, 1995). Many efforts in association with the RAP have taken place since this time. These efforts and associated publications are briefly described chronologically in the following sections.

### **Stage I RAP (1992)**

The St. Louis River System Stage I RAP was published in 1992 (SLRCAC, 1992). A 32-member Citizen Advisory Committee (CAC) was formed to oversee development of the document, which was a collaborative effort between MPCA and WDNR. The Stage I RAP described the environmental problems in the St. Louis River AOC and presented 16 overall goals for the RAP process. These goals were intended to provide a framework for the development of recommendations to address BUIs. For each of the nine BUIs, the RAP details the rationale for listing, provides historical perspective, and describes the available data and supporting evidence used as the basis for impairment selection in the St. Louis River AOC.

### **St. Louis River Remedial Action Plan Progress Report (1995)**

A progress report containing recommendations to restore the beneficial uses in the AOC was published in 1995 by MPCA and WDNR (MPCA and WDNR, 1995). The document outlined 43 recommendations, approved by the CAC, to address the environmental problems identified in the Stage I RAP.

Implementation of these recommendations began immediately and continues today. Some recommended actions have been completed or are well underway, such as: (1) land acquisition, with 34,000 acres bordering the St. Louis River permanently protected by purchase or donation; (2) connection of the Fond du Lac neighborhood of Duluth, MN, responsible for a high percentage of failing septic systems, to the WLSSD; (3) programs to reduce sewage bypasses by keeping stormwater out of sanitary sewer systems; and (4) completion of a habitat plan for the lower St. Louis River.

### **Progress Report Update (2001)**

The 2001 Progress Report Update (MPCA and WDNR, 2001) outlines the 43 RAP recommendations from the 1995 Progress Report. The brief report details the up-to-date progress made toward implementing each recommendation, including the percent complete for each recommendation and an assigned grade for the level of implementation based on percent completion.

### **Lower St. Louis River Habitat Plan (2002)**

The Lower St. Louis River Habitat Plan (Habitat Plan; SLRCAC, 2002) was published in 2002. The plan was developed by the St. Louis River CAC and was funded by a grant through the U.S. EPA with additional support from the MNDNR Conservation Partners Program, the U.S. Fish and Wildlife Service, and The Nature Conservancy. The Habitat Plan was developed to “to facilitate protection of the ecological diversity of the Lower St. Louis River” (SLRCAC, 2002).

Conservation targets were developed to define the native species, plant communities, aquatic habitats, and ecological systems that are the focus for conservation in the Lower St. Louis River. The Habitat Plan presents 18 strategies to address the most significant identified threats to the conservation targets and to move toward achieving conservation goals.

### **Hog Island and Newton Creek Ecological Restoration Master Plan (2007)**

The Hog Island and Newton Creek Ecological Restoration Master Plan (Biohabitats, 2007) was developed to provide a plan for the restoration of natural communities and ecosystem processes for Newton Creek, the Hog Island Inlet, and Hog Island in Superior, Wisconsin. The plan incorporated specific recommendations of the Lower St. Louis River Habitat Plan and was intended to address a suite of AOC BUIs.

WDNR and U.S. EPA partnered to use Great Lakes Legacy Act (GLLA) funds to implement contaminated sediment remediation of the Newton Creek and Hog Island Inlet system in 2005. This work resulted in the removal of ecological and human health hazards. Following sediment remediation, additional work was completed at the site to provide habitat enhancements.

### **St. Louis River Area of Concern Complete Delisting Targets (2011)**

In 2008, the SLRA facilitated a process to combine delisting targets from Minnesota and Wisconsin. A list of targets describing desired outcomes for each BUI was provided to the U.S. EPA (MPCA and WDNR, 2008). In 2011, The Complete Delisting Targets document (MPCA and WDNR, 2011) was developed to include the 2008 delisting targets along with International Joint Commission (IJC) guidelines that were established for a particular BUI (“IJC Criteria”), the basis for listing nine of the fourteen possible BUIs in the St. Louis River AOC (“Rationale for Listing”), and the basis for the target chosen for a particular BUI (“Rationale for Removal”). The 2008 delisting targets are referred to as “BUI removal targets” in this RAP Update.

### **Lower St. Louis River Habitat Plan Appendix 9 Strategies Implementation Planning Worksheets (2011)**

Appendix 9 of the Lower St. Louis River Habitat Plan (SLRCAC, 2002) was published in 2011 (SLRCAC, 2011). As described above, the Habitat Plan was prepared to facilitate protection of the ecological diversity in the St. Louis River. Appendix 9 contains a set of project descriptions termed “Implementation Strategies Worksheets” associated with 15 of the 18 strategies included in the Habitat Plan. The projects were identified by AOC stakeholders to mitigate threats to the St. Louis River.

Each project worksheet includes background information, goals, a listing of BUIs addressed, project locations, relative project priority, anticipated duration, potential funding mechanisms, partnering organizations, estimated costs, any special considerations surrounding the project, and description of how success of the project will be measured.

Appendix 9 is updated and maintained by the SLRA Habitat Work Group. This group has worked to support implementation of the projects listed in the Implementation Strategies Worksheets. Numerous

habitat restoration projects listed under BUI 9: Loss of Fish and Wildlife Habitat (see Section 4) originated as Implementation Strategies Worksheets.

## **Stage 2 Remedial Action Plan Update for the St. Louis Area of Concern (2011)**

The 2011 Stage 2 Remedial Action Plan Update (WDNR, 2011) served as an update to the 1995 St. Louis River AOC RAP Progress Report. It was produced by the WDNR, with input from AOC partners, to provide short-term direction for overall statewide AOC coordination in Wisconsin. The document was intended to be a concise summary of BUI status and specific actions necessary for reaching the BUI delisting targets. Actions included on-the-ground restoration projects, monitoring and assessment projects, and/or stakeholder engagement processes. The 2011 Progress Update also identified challenges affecting progress on each BUI.

## **Remedial Action Plan Update for the St. Louis River Area of Concern (2012)**

The 2012 Remedial Action Plan Update (WDNR, 2012) was developed by WDNR, with input from AOC partners, as an interim document to assist in providing direction in the short-term for overall statewide AOC coordination in Wisconsin. The 2012 update followed the same format as the 2011 update, presenting the current status of each BUI, next actions identified, and issues affecting BUI progress.

## **Remedial Action Plan Implementation Framework: Roadmap to Delisting (2013)**

A comprehensive plan for delisting the AOC by detailing the actions necessary to remove BUIs identified for the AOC. The RAP will be amended annually by editing the 2013 RAP and naming the updated RAP according to the year it was updated (e.g., 201X RAP). Previous versions will be archived to track progress.

## **Remedial Action Plan Update for the St. Louis River Area of Concern (2014)**

The 2014 Remedial Action Plan Update was developed by WDNR and MPCA, with input from AOC partners and stakeholders. The 2014 update followed the same format as the 2012 update, presenting the current status of each BUI, next actions identified, and issues affecting BUI progress. This format has been combined with the 2013 RAP to capture and retain the additional information contained in the framework and the roadmap to delisting. This current format will be used going forward for updates to the RAP.

## **Remedial Action Plan Update for the St. Louis River Area of Concern (2015)**

The 2015 Remedial Action Plan Update was developed by AOC staff from WDNR, MPCA, MNDNR and FdL. A redlined document was used to show changes when the document was presented for review to AOC partners and stakeholders. All comments received a response and the final version was made available online and sent to USEPA GLNPO.



# Section 3: Overview of the Implementation Framework Project

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This section provides an overview of the 2013 Implementation Framework- Roadmap to Delisting RAP Update, including description of project goals and process, the stakeholder involvement process, BUI Blueprints, and the St. Louis River Area of Concern Remediation to Restoration Template.

## Goals and Process

The MPCA was awarded a competitive Great Lakes Restoration Initiative grant from U.S. EPA in 2011 for the “Implementation Framework” (Framework) project. The primary goal of the project was to support AOC coordinators for Minnesota, Wisconsin, and the Fond du Lac Band of Lake Superior Chippewa (FDL) in developing a plan for delisting the St. Louis River AOC. This goal was achieved through the development of BUI blueprints, which were subsequently used to design a roadmap to delist the AOC. A secondary goal of the project was to support restoration planning for priority sites through development of remediation to restoration (R2R) concept plans that could be used to seek funding for project implementation. This goal was achieved through development of an R2R Template that established a common understanding of the R2R process, as well as development of six concept plans for high-priority R2R sites.

The Framework project was supported by the MPCA contractor, LimnoTech, as selected by AOC coordinators from MPCA, WDNR, MNDNR, and FDL, and the Executive Director of the St. Louis River Alliance (SLRA; the AOC’s citizen action committee).

Beginning in June 2011, the four AOC coordinators and the SLRA Executive Director began meeting twice monthly for the Framework project with LimnoTech. This group was responsible for developing the coordinated bi-state approach for project completion. Their responsibilities included:

- Defining project deliverables and timelines
- Decision-making on AOC program direction
- Defining the stakeholder process that would be used throughout the project
- Review and approval of all project documents
- Decision-making regarding the necessary and sufficient actions to address each BUI
- Representation of their respective agency viewpoints on BUI removal objectives and strategies during development of the AOC Delisting Roadmap

The primary outcome of the Framework is the AOC Delisting Roadmap (Roadmap; Section 4), which defines the measurable targets, removal strategies, and action items for each of the nine BUIs in the St. Louis River AOC. The Roadmap contains the action items necessary to address each BUI based on the

current body of knowledge for each BUI. It is an adaptive management plan, and therefore will be updated annually by the AOC coordinators to incorporate new information and progress.

The Roadmap is based on the set of BUI blueprints created by the stakeholder process designed for the Framework project. The stakeholder involvement plan, BUI blueprints, and the St. Louis River AOC R2R Template are described briefly below and are provided in full in Appendices A, D, and E of the 2013 RAP. The AOC Delisting Roadmap is provided in Section 4. The management and decision-making framework for implementing the AOC Delisting Roadmap is provided in Section 5.

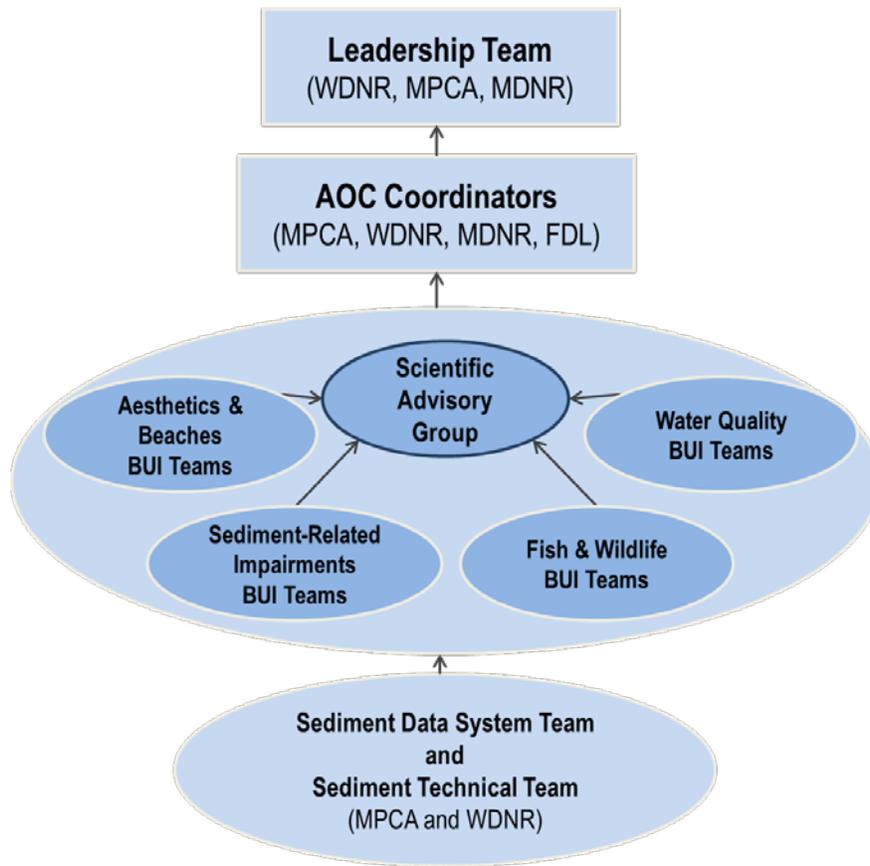
## Stakeholder Involvement

A stakeholder involvement plan (SIP) was developed at the start of the Framework project (Appendix A). The primary objective of the stakeholder process was to enable all AOC stakeholders, not only the State regulatory agencies, to take action to improve the AOC in a coordinated, cooperative, and directed manner. Therefore, the SIP resulted in comprehensive contributions to BUI removal objectives and provided a sense of ownership of the AOC Delisting Roadmap.

Because of the complexity of issues addressed in the Framework project, a key element for project success involved educating and informing stakeholders early on. Stakeholders were informed of how the project would proceed and the vision for the primary work products. In addition, given the significant knowledge and experience of the stakeholders in the AOC, the SIP was designed to involve stakeholder groups in meaningful ways throughout the project to maximize the value of their contributions.

The SIP identified key existing stakeholder groups (AOC Coordinators, SLRA, and the Harbor Technical Advisory Committee) to be involved in the project, and described additional groups that were formed for the project (BUI Teams, Scientific Advisory Group). The organization of the stakeholder groups is presented in Figure 2. Engagement was categorized as follows:

- **Inform** through presentations at regularly scheduled meetings.
- **Solicit comment** on project elements after providing documents for review or presentations at regularly scheduled meetings. Comments were considered for incorporation into final documents.
- **Direct input** was requested to develop project elements at task-specific workshops or meetings.
- **Review and approval** of documents for incorporation into final project deliverables.



**Figure 2: Organizational and Decision-Making Structure of AOC Stakeholders during the preparation of the 2013 RAP**

The two primary groups charged with developing the Roadmap were the AOC Coordinators and BUI Teams. A Science Advisory Group (SAG) reviewed project elements at key points in the process. Two additional teams, the St. Louis River AOC Data System Team and the Sediment Technical Team, were formed to provide technical support to the Framework project on sediment contaminant issues. Development of the stakeholder teams, including their roles and responsibilities, is described below.

### **BUI Teams**

BUI Teams were formed with the charge of developing BUI Blueprints (described in the following section) for each BUI. The intent of the AOC coordinators in forming and tasking the BUI Teams was twofold: 1) incorporate the wealth and breadth of local stakeholders' knowledge and expertise of AOC issues; and 2) align ongoing research and projects to better serve AOC delisting actions.

Four BUI Teams were formed to address the nine BUIs as follows:

#### **Aesthetics and Beaches** – Led by SLRA Executive Director

- Degradation of Aesthetics
- Beach Closings and Body Contact Restrictions

**Sediment-Related BUIs** – Led by WDNR AOC Coordinator

- Fish Consumption Advisories
- Fish Tumors and Deformities
- Restrictions on Dredging
- Degradation of Benthos

**Fish and Wildlife** – Led by MNDNR and FDL AOC Coordinators

- Degraded Fish and Wildlife Populations
- Loss of Fish and Wildlife Habitat

**Water Quality** – Led by MPCA AOC Coordinator

- Excessive Loading of Sediment and Nutrients

The BUI Team leader(s) were tasked with developing initial lists of possible members for their teams with a focus on bi-state and tribal representation. These lists were reviewed and refined by the AOC coordinators. Members of the SLRA Habitat Work Group, Harbor Technical Advisory Committee (HTAC), SLRA, local units of government, federal agencies, non-governmental organizations, private sector firms, and research institutions were invited to join one or more BUI Teams. AOC coordinators sent invitations to potential team members; volunteers were also accepted (no one was excluded from the BUI Teams). The resulting BUI Team participants are provided in Appendix B of the 2013 RAP. The nine teams consisted of over 50 individuals representing the breadth of AOC partners and stakeholders. The teams served an important role during the development of the framework. For RAP implementation many members are engaged in the annual RAP update process and participate on BUI Technical Teams or project teams for actions listed in the RAP.

**Scientific Advisory Group**

The SAG was formed to provide technical advice and peer review of the BUI Blueprints. The SAG was requested to review the scientific basis of the BUI Blueprints as well as specific components of the blueprints, such as source/stressor models and cause-effect relationships in the system. For RAP implementation many members are engaged in the annual RAP update process and participate on BUI Technical Teams or project teams for actions listed in the RAP.

A list of potential members for the SAG was developed by the AOC leadership team from MPCA and WDNR, with a focus on developing a bi-state and a tribal panel of experts that covered the breadth of topics involved with the nine BUIs. The list of nine SAG members is provided in Appendix B of the 2013 RAP.

**St. Louis River AOC Data System Team**

The St. Louis River AOC Data System Team was formed to oversee expansion and improvement of the AOC sediment contaminant database into an AOC Data System. The AOC Data System is being transferred to NOAA's Great Lakes Data Integration Visualization Exploration and Reporting (GL DIVER)

system and will incorporate many data types beyond sediment chemistry. The team is managing the transition and is led by staff from MPCA, WDNR and NOAA.

## Sediment Technical Team

The Sediment Technical Team consisted of staff from MPCA and WDNR responsible for developing protocols for assessing sediment contaminant data across the AOC (contained with the AOC data system), determining the need for remedial action at locations across the AOC, and supporting AOC coordinators and the leadership team in decision-making on necessary actions to address sediment contamination. For RAP implementation, a Sediment Technical Team may be called on to provide support for bi-state sediment topics in the AOC.

## BUI Blueprints

BUI Teams were tasked with developing blueprints following the BUI Team Charge (Appendix C, 2013 RAP), which served as a work plan for BUI Team tasks. Each team was provided with a preliminary BUI Blueprint prepared by LimnoTech to serve as a starting point. The complete blueprints developed by the BUI Teams were reviewed by the SAG. The BUI Teams considered SAG comments in finalizing the blueprints. The work began in November 2011, and the majority of BUI Blueprints were completed by June 2012.

BUI Team leaders developed their own meeting schedules and communication methods. A website was set up for the project to facilitate information and document sharing; the website also allowed online document editing. The team leaders convened bimonthly with LimnoTech to discuss issues arising from team efforts, processes, and format and to make project decisions. Assistance was provided by LimnoTech at BUI Team meetings and in finalizing team documents, as requested by the team leaders.

Each BUI Blueprint consists of the following major sections:

- **Summary Statement** - A summary documenting the BUI Team process, including important decisions regarding BUI delisting target interpretation and removal strategies.
- **Source/Stressor Model** - The source/stressor model, developed based on existing research and monitoring in the AOC, identifies the primary sources of each system stressor and the relationships between the sources and the nine BUIs. The intent of the conceptual model was to assist in identifying applicable BUI indicators, remaining legacy sources, and priority actions that affect multiple BUIs.
- **Measureable Indicators Specific to the BUI** – This includes the set of BUI-specific indicators, including status indicators and other measureable indicators that were selected by the BUI Team to measure BUI condition. Indicators were selected to provide measurable objectives for the Final Delisting Targets developed in 2008.
- **Rationale for Listing** - Historical conditions of stressors and sources are described in this section based on information from the Stage I RAP. The rationale focuses on the original basis for listing the BUI.

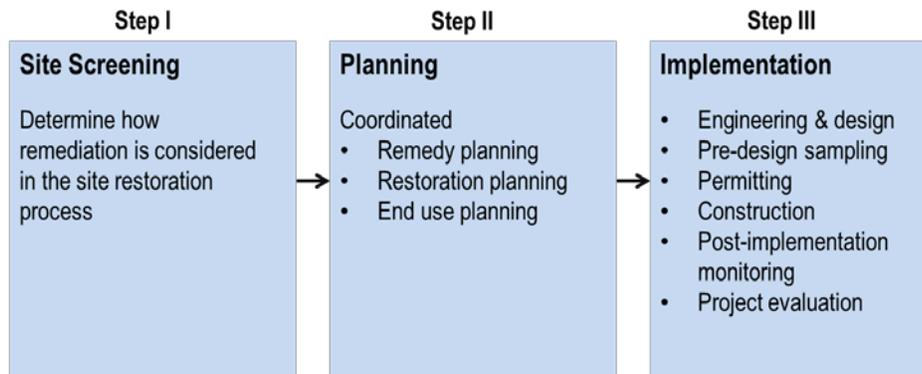
- **Statement of Current Conditions** - Current conditions of stressors and sources and measurable indicators are described based on the most recent available assessments of monitoring and research data, as reviewed and compiled by the BUI Team.
- **Information Gaps** - Information gaps on historical conditions, current conditions, stressors and sources, and measurable indicators are listed. Projects to address identified information gaps are included in the prioritized list of actions.
- **Sequential List of Prioritized Actions to Achieve BUI Removal** - A sequential list of prioritized actions was developed by BUI Teams based on several sources including action items defined to address any identified information gaps; priority R2R projects identified by stakeholder groups; and applicable projects already described in existing AOC plans (e.g., Lower St. Louis River Habitat Plan). Priorities were assigned by each BUI Team.
- **Permitting and Regulatory Process** - Listing of important regulatory process steps and permits that may be required to implement the actions to achieve BUI removal.
- **Resources Needed** - Identified partners, landowners, potential funding resources, etc., that may be required to implement identified action items/R2R projects.
- **Anticipated Timeline for Achieving BUI Removal** - Anticipated timelines for removing the BUI. The timelines were developed using best professional judgment of the BUI Team.
- **Costs** - Order of magnitude cost projections for implementing the identified action items using best professional judgment and information on-hand.
- **Ongoing Monitoring Needs** - Monitoring needs related to ongoing tracking of measureable indicators are described.
- **Future Issues or Concerns**- A “parking lot” section for upcoming issues identified by the BUI Team that may affect the BUI but were not part of the original rationale for listing.

The final BUI Blueprints, as developed and reviewed by stakeholder teams, are provided in Appendix D. These blueprints represent the final product of each BUI stakeholder process, and are therefore written with different voices and perspectives based on the varied history, knowledge, and status of a particular BUI. The blueprints served as the basis for the development of the Roadmap (Section 4).

## Remediation to Restoration (R2R) Template

The St. Louis River AOC has adopted a systematic approach for simultaneously addressing contaminated sediments and degraded habitat while incorporating desired environmental and economic outcomes. This approach has been termed Remediation to Restoration (R2R).

During the Framework project, the need to document the major steps in the R2R process to more effectively communicate it to AOC stakeholders and partners was identified. As a result, the St. Louis River Remediation to Restoration (R2R) Template (LimnoTech, 2012; Appendix E) was developed. The document describes the major steps in the R2R process, as indicated in Figure 3.



**Figure 3: Major Components of the R2R Process**

The R2R template is intended to create a common understanding throughout the decision-making and planning process for those elements that should be considered concurrently when undertaking restoration activities. A restoration plan for any R2R site guided by the template ensures that continuity and critical oversight are embedded with remediation recommendations, restoration objectives, and human use needs. The R2R process described in the template ensures compatibility among remediation targets, restoration objectives, and resulting human use services.

A draft of the R2R template was reviewed by a wide group of AOC partners, including MPCA, MNDNR, WDNR, FDL, HTAC, Minnesota Land Trust, U.S. Fish and Wildlife Service, U.S. EPA Great Lakes National Program Office, U.S. EPA Mid-Continent Ecology Division, U.S. Army Corps of Engineers Detroit District, and SAG. Comments from reviewers were carefully considered by a subset of AOC coordinators (MPCA and FDL) and the document was revised and finalized to reflect the body of comments received.

## St. Louis River AOC Data System and Sediment Characterization

Prior to and during the development of the 2013 RAP, the St. Louis River AOC sediment contaminant database (previously called the Phase IV database) underwent improvements to organize past, present and future data to serve the short- and long-term needs of the St. Louis River AOC. This effort included importing the extensive sediment contaminant datasets for the AOC from sampling efforts in 2010 and 2011 by U.S. EPA and USACE. The data system project was initiated when partners/stakeholders asked for a user-friendly and accessible tool that contained the data that had been collected over the years. This led to the conceptualization of the St. Louis River AOC Data System that would serve as a tool to help assess the various data on a site-by-site basis, inform resource management decisions, and evaluate and track implementation progress to inform BUI removal strategies. Data System improvement efforts were overseen by the Sediment Data System Team (as described above; Figure 2).

The St. Louis River AOC Data System is now designed to accept new data, standardize elements within the data for statistical analysis, calculate benthic macroinvertebrate community metrics, calculate sediment contaminant measures for comparison to consensus-based sediment quality guidelines established for the AOC, calculate additional sediment contaminant measures (i.e., sediment quality index or SeQI), assist in identifying data gaps, and act as a central data repository for the AOC. The Data

System currently includes sediment data (both physical and contaminant), benthic macroinvertebrate data, and sediment toxicity data. Additional data types important to the St. Louis River AOC delisting efforts may be incorporated into the database over time (e.g., bird surveys, water quality, and vegetation). Efforts are now underway to develop the Data System into a web-based system. This work is being conducted as the AOC Data System evolves (described below).

The sediment contaminant data contained in the St. Louis River AOC Data System was used to conduct an AOC-wide sediment characterization to support development of the 2013 RAP. This effort, which is described further in Section 4, was overseen by the Sediment Technical Team (as described above; Figure 2) and is documented in the *St. Louis River Area of Concern Sediment Characterization: Final Report* (LimnoTech, 2013; Appendix F).

### **St. Louis River AOC Data System Integration with NOAA's GL DIVER**

The National Oceanic and Atmospheric Administration (NOAA) selected the St. Louis River Estuary as a habitat focus area under NOAA's Habitat Blueprint program. The goal of this program is to increase the effectiveness of NOAA's habitat conservation science and management efforts to meet multiple habitat objectives on a watershed scale. Since the designation, NOAA will be completing an implementation plan for the St. Louis River Estuary (January 2016) to provide a forward looking framework for NOAA to think and act strategically with partner organizations to address the growing challenge of coastal habitat loss and degradation (NOAA, 2015, in progress). One of the outcomes of this program that is already underway is for NOAA's Office of Response and Restoration to act as the data repository for Great Lakes environmental data. To achieve this, NOAA is developing the Great Lakes Data Integration Visualization Exploration and Reporting (GL DIVER) system, a web-based data management and query application that builds upon NOAA's Query Manager data standard and query tools.

The St. Louis River AOC is the first AOC to work with NOAA to fully migrate its existing database into GL DIVER. Staff from NOAA, MPCA, and WDNR and their respective contractors have worked diligently for the successful transition of St. Louis River AOC data to GL DIVER. Since January 2015, the three agencies have established a communication network for data preparation, data system input and smooth transition from the current St. Louis River AOC Data System to GL DIVER by June 2016. The team has been meeting bi-weekly to ensure timely transition of all existing data and to ensure all types of future data such as histopathology (e.g., tumors, lesions), general population information (e.g., aquatic vegetation, fish, birds, mammals, benthic invertebrate), and bioassay data can be added to GL DIVER.

## Section 4: AOC Delisting Roadmap

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This section presents the AOC Delisting Roadmap (Roadmap) and is organized in the following sections:

- **Overview of the Roadmap** is intended to provide readers with a concise summary of actions and timelines and describes the organization, contents, and format of the Roadmap
- **Sediment Characterization and BUI Roadmaps** presents the Roadmap sections for sediment characterization and the nine BUIs

### Overview of the Roadmap

The BUI information contained in this section was originally developed based on information in the BUI Blueprints developed by the extensive list of stakeholders as described in Section 3. Using the BUI Blueprints as a basis, AOC coordinators and leaders worked to refine the BUI removal target interpretations, articulate BUI removal strategies, and develop the actions needed to achieve removal of each BUI. The removal strategies and actions selected through this process are intended to represent the work that is necessary to delist the AOC, while recognizing that the plan is a tool for management and must be adaptive as information becomes available and actions are completed. Status and progress of actions is updated annually.

Many efforts already underway throughout the AOC contribute directly to BUI removal as defined by the BUI removal strategies described in this Roadmap. These projects were not included as specific action items in the 2013 RAP because they were substantially underway and funded. Below are some examples of projects underway at the time of the 2013 RAP:

- Pre-construction biological monitoring at R2R Sites including benthic macroinvertebrate, avian and aquatic plant surveys.
- Bioaccumulation study to inform prioritization of R2R site restoration efforts based on bioavailability
- Clough Island conifer restoration, invasive species control and aquatic/terrestrial condition assessment. Management of Clough Island will be ongoing and included in master planning for the stream bank protection area.
- Common Tern surveys conducted by MNDNR and WDNR. This will be an ongoing effort and data will be used to support targets in the degraded fish and wildlife populations BUI.
- Piping Plover habitat maintenance, monitoring and outreach at Wisconsin Point and Schafer Beach lead by St. Louis River Alliance. This work supports targets for BUI 2 and parallels the priority restoration project 2.05.
- Communications and outreach to stakeholders and the community at large

The primary focus of the majority of “on the ground” action items is remediation of contaminated sediments and habitat restoration. Sediment contamination in the AOC contributes directly or indirectly

to eight of the nine BUIs (BUI 6: Excess Loading of Sediment and Nutrients is the exception); cleanup of contaminated sediments is an obvious focus of AOC restoration efforts, not only from an ecological standpoint but also from the standpoint of stakeholder concern. On the habitat front, recent estimates confirm that approximately 3,400 acres of aquatic habitat has been lost over time in the St. Louis River (Hollenhorst et al., 2013). A goal for AOC delisting is restoration of 50% of this lost habitat (1,700 acres).

Sites identified for remediation of contaminated sediments in the AOC are shown in Figure 4. Planned habitat restoration projects are shown in Figure 5, and include both aquatic habitat restoration sites and additional projects in important hydrologically connected habitats. In both figures, aquatic sites are color coded according to a scheme adopted by MPCA and WDNR to represent the level of remedial action necessary. The scheme and its development are described in the Sediment Characterization section to follow.

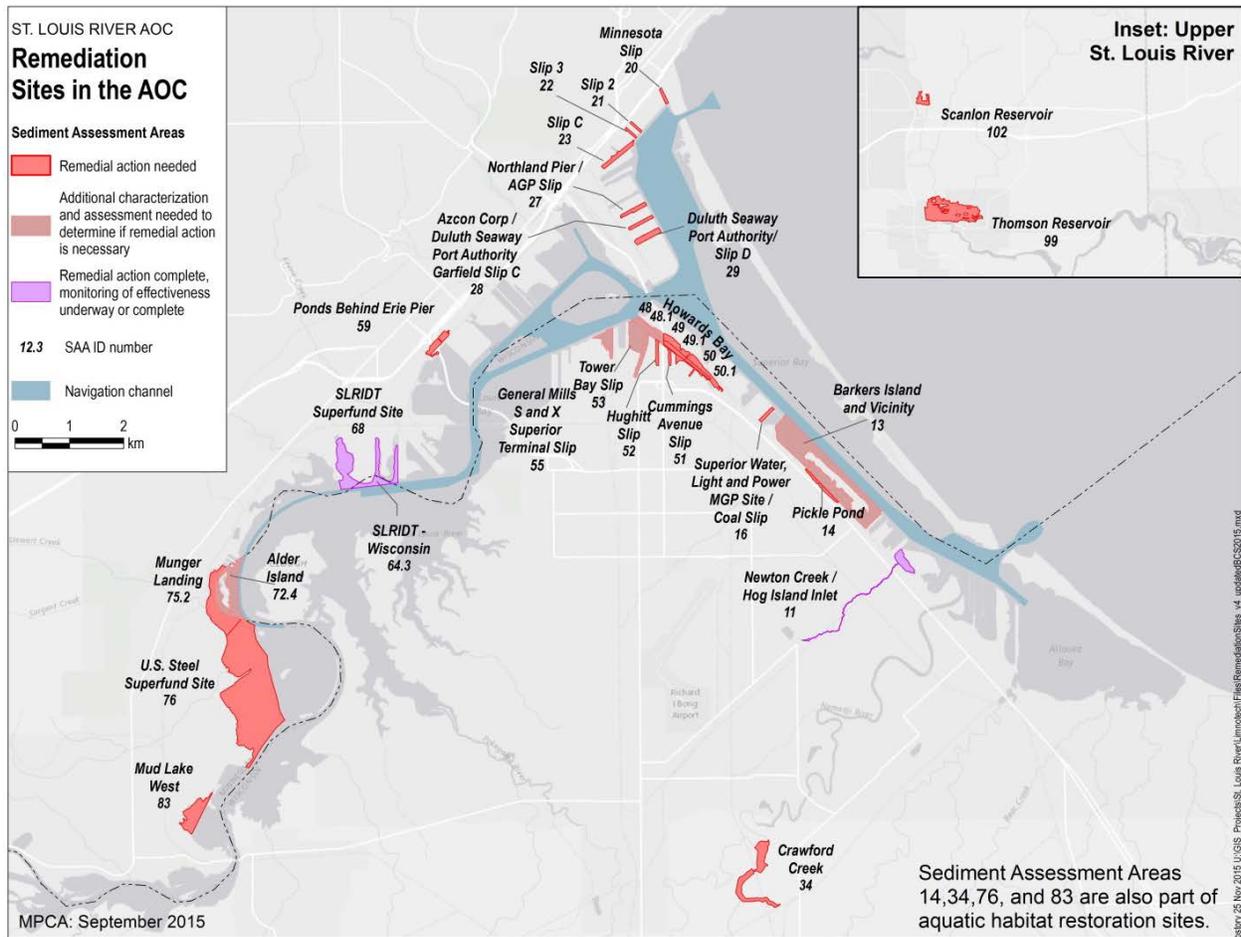


Figure 4: Remediation Sites in the St. Louis River AOC (Revised September 2015)

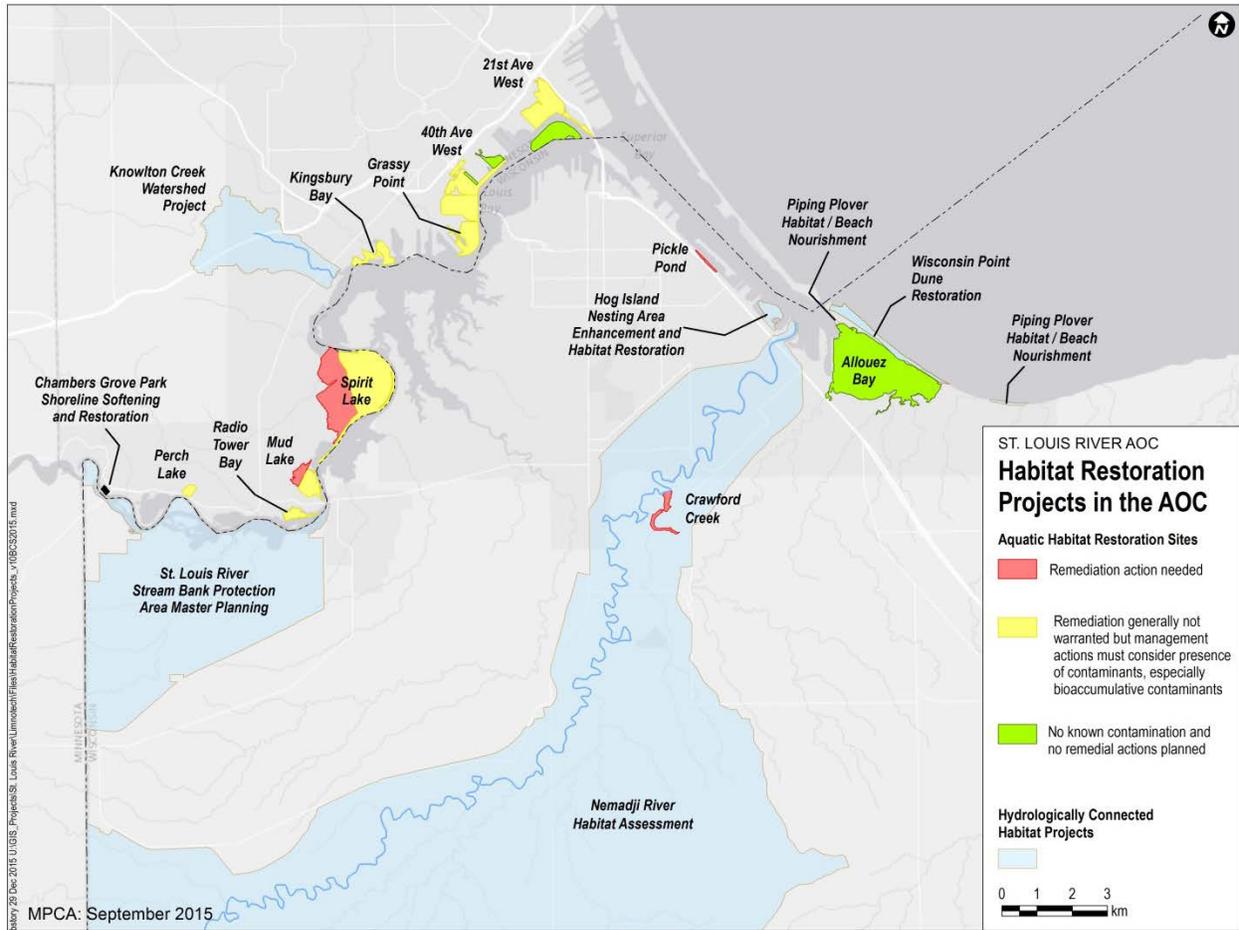


Figure 5: Habitat Restoration Projects Planned in the St. Louis River AOC (Revised September 2015)

A list of actions necessary to achieve removal is provided for each BUI. The tables include planning-level costs and dates for completion of each identified action item. Based on these lists of actions, anticipated BUI removal timelines are shown in Table 1. The target date for delisting the St. Louis River AOC is 2025.

**Table 1: Anticipated BUI Removal Timelines**

BUI Removal Timeline	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Degradation of Aesthetics (BUI 8)	√											
Fish Tumors and Deformities (BUI 3)			●	●								
Excessive Loading of Sediment & Nutrients (BUI 6)				●	●							
Degraded Fish and Wildlife Populations (BUI 2)					●							
Beach Closings and Body Contact Restrictions (BUI 7)							●					
Degradation of Benthos (BUI 4)									●			
Restrictions on Dredging (BUI 5)										●		
Fish Consumption Advisories (BUI 1)												●
Loss of Fish and Wildlife Habitat (BUI 9)												●

Best professional judgment based on currently available information and level of planning indicates that contractual costs for implementation of the BUI removal strategies and associated actions included in the RAP could range from \$300-\$400M. As refined cost estimates become available for identified actions, they will be incorporated in future RAP updates. It is important to note that these are estimated funds needed to implement future actions and do not include costs already expended on the significant efforts already made towards AOC delisting. Preliminary estimates indicate that more than \$420M has been invested since 1978 on infrastructure upgrades, remediation, and habitat restoration and protection in the AOC.

**Roadmap Organization**

The Roadmap is organized into ten sections, including a section on sediment characterization followed by nine individual BUI roadmaps.

The sediment characterization section describes the work done by MPCA and WDNR to evaluate sediment contaminant levels across the AOC based on data contained in the St. Louis River AOC Data System. This section also describes additional sediment characterization needs identified by MPCA and WDNR that are necessary to support the removal strategies and actions described in this RAP Update.

The individual BUI roadmaps include the following sections:

- **Rationale for Listing** – The rationale for listing as stated in the Stage I RAP.

- **BUI Removal Target** – The BUI delisting targets established in 2008 (MPCA and WDNR, 2008). It includes definitions of terms and interpretations of the BUI, presented as specific removal objectives, as refined for the purposes of this RAP Update. An emphasis was placed on defining measurable and achievable removal targets for each BUI.
- **BUI Removal Strategy** – The strategy developed to meet the BUI removal target based on the BUI removal objectives and interpretations of the removal target. Major steps necessary to reach the BUI removal target are described.
- **BUI Summary of Key Remedial Actions, Current Status, and Next Steps Needed** – Provides a summary of action item status and any BUI decisions.
- **BUI Actions Still Needed to Achieve Removal** – The table includes a list of projects needed for BUI removal. Actions included for each BUI stem from the BUI Blueprints and were further refined by roadmap development process. Final projects were selected based on their measurable contribution to BUI removal. Details for each action include:
  - *Project number*: a unique number given to a project
  - *Project name*
  - *Project description*: a brief description of the project intent
  - *In-house/contractual* : indication of who will conduct the work
  - *Date to be completed*
  - *Estimated project cost*: costs provided are planning-level estimates
- **Anticipated Timeline to Remove BUI** – The year in which the BUI is anticipated to be removed, based on successful completion of the BUI removal strategies and actions.
- **Issues Affecting Progress** - Issues that may delay BUI removal (e.g., action items, targets, funding) and what is being done to address the issue(s).

## Sediment Characterization

Legacy sediment contamination in the AOC contributes directly or indirectly to eight of the nine BUIs. This section describes the sediment characterization work conducted in the St. Louis River AOC to provide information for the development of action items that support BUI removal strategies and define where additional sediment contaminant sampling is needed.

To support development of the RAP Update, MPCA (with GLRI funds) sponsored an AOC-wide sediment characterization project in 2012 to support analysis of the sediment contaminant data contained in the St. Louis River AOC Data System (described in Section 3). The data were analyzed to provide a planning-level view of the status of sediment contamination across the AOC. The Sediment Technical Team (described in Section 3), consisting of staff from MPCA and WDNR, directed analyses and presentation of the data for their respective states. The AOC-wide characterization work is documented in the *St. Louis River Area of Concern Sediment Characterization: Final Report* (LimnoTech, 2013; Appendix F).

To establish a common framework for assessing and displaying sediment contaminant data, the AOC was divided into sediment assessment areas (SAAs). Each SAA was given an individual number and unique name. Maps showing the SAAs within each are provided in Appendix G of the 2013 RAP.

The primary goal of the sediment characterization project was to support MPCA and WDNR staff in designating SAAs according to remedial action needs. The SAA remedial needs were categorized as follows:

1. SAAs in need of remediation;
2. SAAs needing further sediment contaminant sampling to determine remedial designation; and
3. SAAs that may need some form of remediation before habitat restoration occurs.

Note: remediation and/or restoration sites can be comprised of multiple SAAs, each with an SAA-specific remedial designation. The color scheme adopted for each SAA designation is given in Table 2.

**Table 2: Sediment Assessment Area Color Designations**

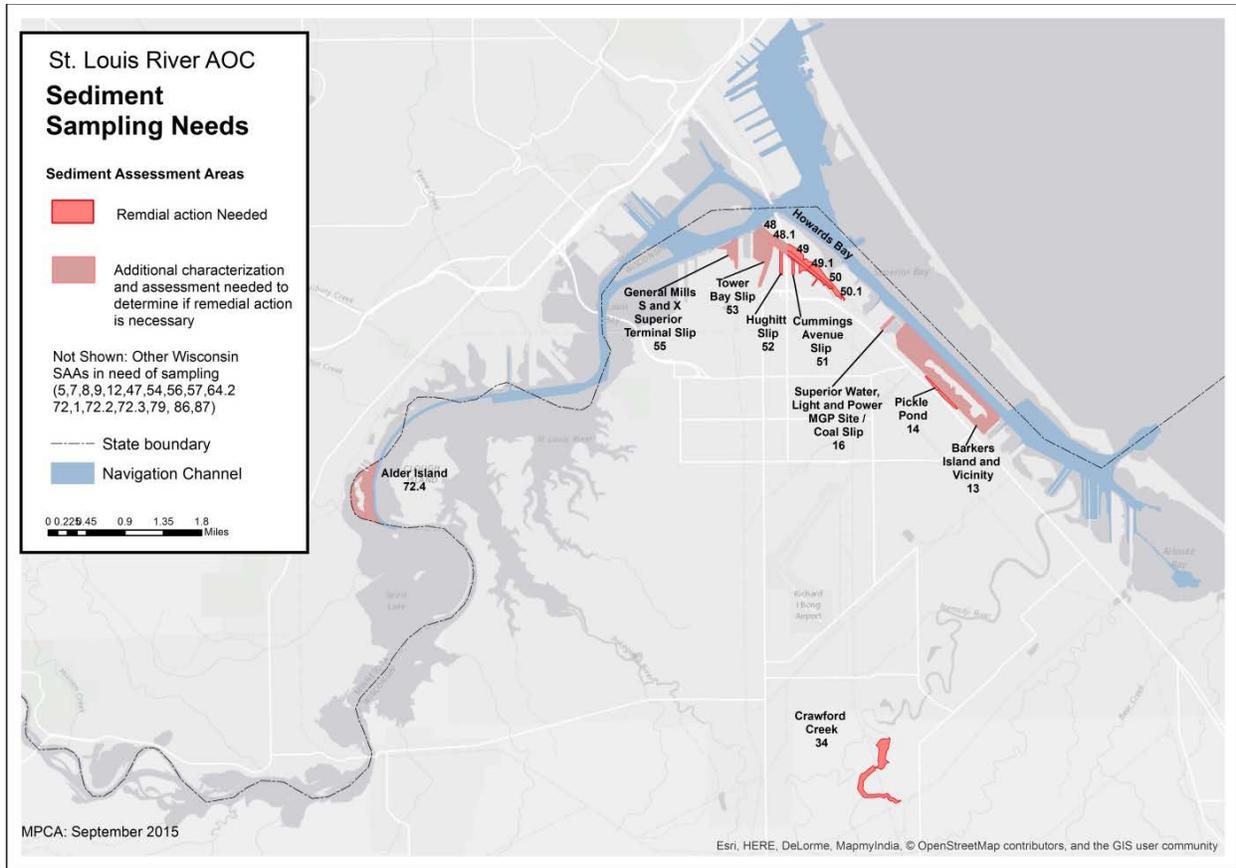
SAA Remedial Designation	Definition
Purple	Remedial action complete, monitoring of effectiveness underway or complete.
Red	Remedial action needed.
Red-gray	Additional characterization and assessment needed to determine if remedial action is necessary.
Yellow	Remediation generally not warranted, but action items must consider the presence of contaminants, especially bioaccumulative contaminants.
Green	No known contamination. No remedial actions planned.

The color scheme for remedial designations defined in the table above is used throughout the RAP. The SAAs designated as red constitute the sites in need of remediation as shown on Figure 4. Many of the aquatic habitat restoration sites (Figure 5) contain SAAs designated as yellow. In these locations, consideration will be given to the presence of contamination when planning for restoration actions at the site, but full site remediation is not warranted.

An important outcome of the AOC-wide sediment assessment and data review was identification of SAAs in need of further sediment contaminant sampling to confirm their remedial designation. ~~Of particular interest are SAAs designated as red-gray. For these locations~~The sampling priority in 2015 and 2016 was to adequately sample the red-grey areas, if a remedial designation of red is confirmed, the sites will be added to the list of remediation sites to be addressed in the RAP. ~~Figure 6 indicates the red and red-gray SAAs in need of further sediment contaminant sampling; these SAAs are the priority sampling areas for the AOC. Sediment contaminant data on the Wisconsin side of the AOC are limited spatially compared to available data for the Minnesota side. Consequently, the need for targeted sampling at additional Wisconsin SAAs with remedial designations other than red-gray was also identified (SAAs include 5, 7, 8, 9, 12, 47, 54, 56, 57, 64.2, 72.1, 72.2, 72.3, 79, 86, 87).~~It should be noted that further sediment characterization may be needed at remediation or aquatic habitat restoration sites based on site objectives and for feasibility and design purposes.

~~Sediments~~ sampling for Minnesota's red-gray sites was completed in 2014. Minnesota determined six of the eight sites need more investigation and were determined to be red sites. The other two sites did not require further remedial actions for contaminated sediment (Figure 4, Table 8).

~~Sediment~~ sampling for Wisconsin's red-grey sites and some additional areas with data gaps was completed in 2015 and 2016; analysis is underway and planning is underway for sampling the remaining areas (SAA's listed above) in 2016. Sediment samples were also collected in 2015 to support the design of the Howards Bay remediation project. Minnesota completed sampling and analysis for red-gray sites in 2015 and assigned SAA remedial designation to several sites. The MPCA determined six of the eight sites needing more investigations in Minnesota may need sediment remediation. The MPCA determined that two remaining sites do not require further remedial actions for contaminated sediment (Figure 4, Table 8). The remedial designation and SAA colors depicted in maps and figures will be updated as necessary to incorporate results of additional sediment characterization and assessment.



**Figure 6: Sediment Assessment Areas Designated as Red and Red-Gray in Need for Further Sediment Sampling (Revised September 2015)**



## BUI 1: Fish Consumption Advisories

The individual roadmap for BUI 1: Fish Consumption Advisories is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Summary of Key Remedial Actions, Current Status, and Actions Still Needed
- Anticipated Timeline for BUI Removal
- Issues Affecting Progress

### BUI 1 Rationale for Listing

Historically, fish samples taken from the St. Louis River and Lake Superior exceeded standards established by Minnesota and Wisconsin for the unrestricted consumption of sport fish. The two States issue consumption advisories for various population groups based on fish species and size classes. Advisories are collectively issued for the presence of mercury and polychlorinated biphenyls (PCBs). At the time of AOC listing, fish tissue residues of mercury and polychlorinated biphenyls exceeded the 0.5 mg/Kg and 0.1 mg/Kg standards established in the 1978 Great Lakes Water Quality Agreement for the protection of aquatic life and fish-consuming birds.

### BUI 1 Removal Target

The Target for this BUI, as established by stakeholders in 2008, is:

*There are no Area of Concern-specific fish consumption advisories issued for the St. Louis River by the State of Minnesota or the State of Wisconsin. Tissue concentrations of contaminants of concern in representative samples of resident fish are not significantly elevated from regional background samples.*

The two contaminants of concern are mercury and PCBs, as those are the reasons for current consumption advisories in the AOC.

Removal of the Fish Consumption BUI will be justified when:

There are no fish consumption advisories issued for the St. Louis River AOC concern by the State of Minnesota or the State of Wisconsin that are more stringent than advice given for other waterbodies in the region; or

Tissue concentrations of contaminants of concern in representative samples of resident fish are not significantly different than reference samples. ~~elevated from regional background samples by a statistically significant amount.~~

The BUI may be removed on either basis, and a different basis may apply for each contaminant of concern. For purposes of this BUI removal target, the definition of “reference site” is as follows: The current definition of “regional background” (which may be revised based on forthcoming review and analysis of available fish tissue data) is as follows:

Mercury – Waterbody(ies) in northwest Wisconsin and/or northeast Minnesota with conditions (e.g., water chemistry, hydrogeomorphology) similar to that of the St. Louis River Estuary. lakes and rivers in northwest Wisconsin and northeast Minnesota

PCBs - St. Louis River upstream of Cloquet and/or Lake Superior

The target established for removal of this BUI is not intended to include consumption advice that may be established for subsistence fishing by the Fond du Lac Band of Lake Superior Chippewa (FDL) within the St. Louis River.

### **BUI 1 Removal Strategy**

The strategy for BUI removal will focus on fish tissue concentrations (FTCs) of mercury and PCBs. This revised strategy (2016) removes specific actions related to fish consumption advisories (FCAs). The decision was based on the complications with comparing FCAs in different waterbodies and states, and the better likelihood of a meaningful comparison of the AOC and reference site(s) using FTCs. However, should the MN Department of Health and WI Department of Natural Resources (WDNR) revise the FCAs stating the FCA in the AOC is no more stringent than FCAs at a reference site similar to the St. Louis River Estuary, BUI removal will be supported.

The strategy for BUI removal includes the actions listed in Table 3. Two of the actions are comparisons of FTCs in the AOC to a reference site(s) for PCBs and mercury. An additional action for mercury includes studies underway that are assessing the contribution of legacy mercury contamination to present-day methyl-mercury residues in biota. The last action, if needed, is continued monitoring to evaluate recovery of contaminants in fish tissue. The strategy for BUI removal currently includes four actions listed in Table 3. A BUI Technical Team has been formed and is meeting on an as needed basis. The team is currently working on a decision tree and evaluating if and how the actions should be updated to best reflect the removal target. At this time, The strategy for removal of this BUI is as follows:

#### **Action Item 1.01 for PCBs**

1. The reference location has been determined to be the St. Louis River upstream of Cloquet because this is upstream of known sources of legacy contamination.
  - a. The fish species collected from each site (to the extent possible) will include Walleye, Northern Pike, Yellow Perch, Black Crappie, Smallmouth Bass, and Channel Catfish. A multi-species approach has been adopted. First, the fish represent multiple diet habits (benthic, pelagic) and trophic levels (prey fish, predators), which is necessary to diagnose changes throughout the food web. Second, the fish have different growth rates and longevity, and thus will respond to remediation at different rates (for example, a relatively short-lived species such as Yellow Perch will respond faster than

Walleye, which lives much longer). Third, these species are common monitoring targets for contaminants, and thus comparable data can be found for other waterbodies, which is necessary to develop an appropriate comparison with the reference location.

2. FTC analysis may include PCB congeners and/or total Aroclors when needed for data comparison and to help identify PCB sources between a reference location and the AOC and the contribution of legacy PCB sources to present-day residue in biota.
3. Remediate sites in the AOC associated with PCB contaminated sediments, if necessary. Use a BUI decision tree to determine if BUI removal is justified. Decision tree(s) for the BUI are in development by the technical team.

#### **Action Item 1.02a and 1.02b for Mercury**

1. Use existing studies underway to assess if high sediment mercury concentrations are associated with higher than average mercury in biota.
2. Use existing data to evaluate and select a reference location(s) and fish species for comparison of mercury FTCs. The reference locations for mercury should follow the reference site definition above.
  - a. A multi-species approach will be followed. The fish species collected from each site (to the extent possible) will include Walleye, Northern Pike, Yellow Perch, Black Crappie, Smallmouth Bass, and Channel Catfish.
3. Remediate sites in the AOC associated with legacy mercury contaminated sediments, if necessary. Use a BUI decision tree to help make the determination.

#### **Action Item 1.03 for Recovery Monitoring**

Develop a long-term monitoring program as appropriate to determine whether existing routine FTCs are in recovery for legacy-related AOC purposes. If FTCs are not recovering as anticipated, continue to monitor and study bioaccumulation in the estuary to better understand factors that are driving mercury and/or PCB accumulation in the system, and to determine if it is AOC-related.

- ~~• Evaluate candidate river and lake systems in northeast Minnesota and northern Wisconsin for which the external source of mercury and PCBs is limited to atmospheric deposition to determine habitat settings that are comparable to the St. Louis River (to be included in actions 1.01-1.03).~~
- ~~• Compare consumption advice between background sites and the St. Louis River downstream of Cloquet (the AOC). If similar consumption advice exists for background areas as the AOC, then complete a more thorough assessment of consumption advice for species that are co-occurring (action 1.01 and 1.03). If the advice is the same, consider whether it is also necessary to evaluate tissue concentrations (action 1.02).~~
- ~~• If consumption advice or fish tissue concentration comparisons indicate that mercury and/or PCB concentrations are elevated in AOC fish:
 
  - ~~— Identify and remediate sites in the AOC with mercury and PCB contaminated sediments, incorporating available bioaccumulation research into site selection.~~~~

- ~~— Determine whether existing routine fish tissue contaminant monitoring programs are sufficient to evaluate recovery. Consider the necessity of more intensive post-remediation fish contaminant monitoring to evaluate fish tissue contaminant trends. Develop a long-term monitoring program as appropriate.~~
- ~~— If fish tissue contaminant levels are not recovering as anticipated, study bioaccumulation in the estuary to develop an understanding of factors that are driving mercury and PCB accumulation in the system, and to determine if it is AOC related. Note: a bioavailability study is currently being conducted in the estuary by Nate Johnson of University of Minnesota-Duluth. The goal of the study, which is funded by the U.S. Army Corps of Engineers, is to develop a protocol for prioritizing restoration sites in the AOC based on site-specific bioavailability considerations.~~

## **BUI 1 Summary of Key Remedial Actions, Current Status, and Actions Still Needed**

The status of actions needed to remove this BUI is as follows:

### **Action 1.01 - Study PCB fish tissue concentrations**

EPA MED Lab staff will conduct a comparison between fish collected in the AOC and the reference location on the St. Louis River upstream of Cloquet. Approximately, \$50,000 is needed to analyze reference site fish collected in 2015 for PCBs (congener specific); FDL Band staff will age the fish. The fish collected in the AOC in 2013 have been analyzed for PCBs. Drs. Joel Hoffman and Lawrence Burkhard (EPA ORD) are developing biota-sediment accumulation factor (BSAF) models for various fish species to examine potential sediment sources of PCBs in fish tissue. These models will be used to help support remediation decisions about PCBs as outlined in the BUI decision tree.

### **Action 1.02a - Study sources of mercury in fish tissue**

Studies underway to better understand the contribution of legacy mercury contamination to present-day methyl-mercury residues in biota include:

- Dr. Dave Krabbenhoft, USGS Wisconsin Water Science Center, and Charles Madenjian, USGS Great Lakes Science Center, were awarded GLRI funds to fingerprint primary sources of mercury (sediments, runoff, and air deposition) through stable isotopic signatures and compare with fish samples to provide direct and quantitative measure of the relative source contributions. This three-year study will be done in the St. Louis River and Fox River AOCs. Dr. Joel Hoffman and Bruce Monson are collaborators on this project.
- WDNR has completed a project in the AOC below the Fond du Lac Dam that entails the development of surface area weighted means for mercury and methyl-mercury in benthic invertebrates (primary target: hexagenia spp.; secondary target: isopods). The project sampled invertebrates at 51 randomly distributed sites as well as 27 known mercury sediment or biota hot spots from previous studies. Isopods were sampled and tested for mercury at some sites where Hexagenia was not present. This information will document the current Hexagenia population in the SLRE and will contribute toward an understanding of mercury bioaccumulation

in the SLRE food chain. A final report is available in the SWIMS database or by contacting WDNR. <http://dnr.wi.gov/topic/surfacewater/swims/>

- Fond du Lac, MPCA and Minnesota Power have been collecting water quality data and young-of-year perch mercury concentration data in all the Minnesota Power reservoirs (mainstem St. Louis River and Cloquet River) for the past six years, including two reference (non-reservoir) lakes within the watershed. This study may provide key information regarding the relative mercury bioaccumulation rate and methylmercury contribution of the managed reservoirs in the watershed.
- Dr. Nathan Johnson, UMD Civil Engineer Department has a grant from MN Sea Grant to better understand methylmercury production and bioavailability in the St. Louis River Estuary. The researchers will collect water, sediment and biota from a variety of locations in the estuary and analyze them for total mercury and methylmercury. The goal is that this work will help inform decisions concerning beneficial use of dredging materials, habitat restoration and consumption advisories.

**Action 1.02b –Characterize fish for mercury**

- 1. Kakagon River Reference Site** - The Kakagon River and sloughs on the Bad River Reservation near Ashland, WI exhibits similar estuary-like conditions and does not have legacy mercury contributions. This site is proposed as a reference location because of its geographic proximity and similar water quality and hydrogeomorphic conditions to the St. Louis River Estuary. Target fish species will be collected and mercury concentrations compared to the St. Louis River Estuary. Early coordination with the Bad River Band of Lake Superior Chippewa has been initiated.
- 2. Reservoirs** – Target fish species will be collected and analyzed in the reservoirs above the Fond du Lac dam and within the AOC.

~~BUI 1 actions are under evaluation using ongoing research studies and the most recent data at possible reference locations and within the estuary. The next step is to continue to discuss actions and come to consensus with the BUI Technical Team on a decision tree that best meets the needs of the AOC targets. This includes finalizing a reference location(s) and indicator fish species, comparing reference fish data to estuary fish data, and monitoring tissue concentrations as needed over time after remediation and restoration actions in the AOC are complete. The technical team will work to have a decision tree in place in 2016. There are a number of mercury source, contaminant availability and bioaccumulation research studies ongoing in the St Louis River AOC. The BUI Technical Team will stay informed about the progress of these studies and use the results of these studies to inform the BUI actions.~~

**Table 3: Actions Still Needed to Achieve Removal of BUI 1**

Project No.	Project Name	Project Description	In-house/ Contractual	Date to be Completed
1.01	<u>Evaluate Consumption Advice for Hg and</u>	<u>Compare fish tissue PCB concentrations for selected fish species at reference locations to fish collected in</u>	<u>In-house WDNREPA-MED and</u>	<u>TBD2018</u>

Project No.	Project Name	Project Description	In-house/ Contractual	Date to be Completed
	<del>PCBs Study PCB Fish Tissue concentrations</del>	<del>the AOC. Identify candidate waterbodies and indicator fish species for comparison of Hg and PCB consumption advice.</del>	MPCA	
1.02a	<del>Study of AOC Fish Tissue vs Regional Background Study sources of mercury in fish tissue</del>	<del>Use studies underway to demonstrate a contribution of legacy mercury to present-day methyl-mercury residues in biota. Compare Hg and PCB fish tissue concentrations in the estuary to fish in regional background areas.</del>	<del>GLRI funded projects (WDNR, UW-Madison, MN/WI Sea Grant, Fond du Lac Band, MPCA, MN Power)</del> In-house: Preliminary study being conducted by Bruce Monson of MPCA	<del>TBD 2018</del>
1.02b	<del>Study of AOC Consumption Advice vs. Regional Background Characterize fish for mercury</del>	<del>Compare fish tissue mercury concentrations for selected fish species at a reference location to fish collected in the AOC. Include reservoirs in comparison. Using information from Project 1.01, compare Hg and PCB consumption advice for the AOC to that of identified candidate waterbodies.</del>	<del>EPA-MED to Begin work in 2017 and perform over multiple years</del>	<del>TBD 2023</del>
1.03	Recovery Monitoring of Consumption Advice	Monitor fish consumption advice over time after remediation in AOC.	In-house MPCA and WDNR (supplemental monitoring to be determined)	Ongoing until BUI removal
This BUI relies on remediation of sites contaminated with mercury and PCBs.				

### Anticipated Timeline to Remove BUI 1

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
												●

### BUI 1 Issues Affecting Progress

The AOC will continue to work with programs, researchers, and state and tribal health departments to implement the removal strategy and stakeholder outreach and education. Monitoring FTCs for Action 1.03 is currently happening through routine state and tribal FCA monitoring. This action may require additional monitoring (intervals, species, and sample sizes) as determined through Actions 1.01, 1.02a, and 1.02b. In the meantime, actions continue to be pursued through other BUIs that will contribute to the remediation of mercury and PCBs in the AOC.

~~Fish consumption advisories fall within other agency programs and projects as well as the AOC program. The AOC will continue to work with these programs, researchers, and state and tribal health departments to implement the removal strategy and stakeholder outreach and education. The implementing agencies are also pursuing actions through other BUIs that will contribute to the remediation of Hg and PCBs in the AOC.~~

~~Monitoring fish tissue for project 1.04 is currently happening through routine state and tribal monitoring. This action may require additional monitoring (intervals, species, and sample sizes) as determined through actions 1.01-1.03. PCB fish tissue data analysis is a funding need in both the AOC and possible reference locations~~

Stakeholder engagement and education will be critical for removal of this BUI. Clearly explaining how the AOC fits into fish consumption advisories and the scientific basis for BUI removal will be important. Coordinating BUI removal with federal, tribal and state entities is a priority.

## BUI 2: Degraded Fish and Wildlife Populations

The individual roadmap for BUI 2: Degraded Fish and Wildlife Populations is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Summary of Key Remedial Actions, Current Status, and Actions Still Needed
- Anticipated Timeline for BUI Removal
- Issues Affecting Progress

### BUI 2 Rationale for Listing

During the period of severe organic pollution before 1979, fish populations were degraded and fish kills were common. Fish populations have been recovering from that era because of improvements in wastewater treatment. Fish populations were also adversely affected by the proliferation of the ruffe in the early 1990s. The potential impacts on fish population health from toxic substances in the AOC are largely unknown. At the time of AOC listing, loss of physical habitat threatened populations; the loss of wetland habitat and the infestation of the invasive plant purple loosestrife were also believed to contribute to declining fish and wildlife populations. Little population data were available for wildlife, with the exception of colonial nesting birds in the AOC. Populations of the Common Tern and the Piping Plover (threatened and endangered species, respectively) had declined, likely caused by a combination of local and regional factors.

### BUI 2 Removal Target

The BUI Removal Target, as established by stakeholders in 2008, is:

*In consultation with their federal, tribal, local, and nonprofit partners, state resource management agencies concur that diverse native fish and wildlife populations are not limited by physical habitat, food sources, water quality, or contaminated sediments.*

Removal of the Degraded Fish and Wildlife Populations BUI will be justified when it is shown that key native species populations of fish (walleye, muskellunge, sturgeon) and wildlife (Piping Plover, Common Tern, Great Blue Heron, and Bald Eagle) are present and not limited by physical habitat, food sources, water quality, or contaminated sediments as evidenced by the removal objectives listed below.

### Fish

The BUI removal objectives for fish are based on goals established in the MNDNR St. Louis River Estuary Fisheries Management Plan (MNDNR, 2012) for three indicator fish species (walleye, muskellunge, and sturgeon). The objectives, which must be demonstrated with fish survey data, are as follows:

**Walleye**

*Gillnet catch per unit effort (CPUE) is maintained at or above 5.0 per lift with a proportional stock density (PSD) greater than 50 in at least 50% of years surveyed since 2000.*

**Muskellunge**

*Trapnet CPUE is maintained at or above 1.0 per lift in at least 50% of years surveyed since 1997.*

**Lake Sturgeon**

*Document an increasing trend of 2 to 5 year old fish captured in summer index nets, with at least 2 index values greater than 2.0 per gillnet lift.*

**Wildlife**

The wildlife species represented in the BUI removal objectives below were selected by AOC resource managers based on their importance for developing consensus among resource managers that wildlife species are no longer limited by physical habitat, food sources, water quality, or contaminated sediments. The removal objectives for target wildlife species (Piping Plover, Common Tern, Great Blue Heron, Bald Eagle, wetland bird species, and semi-aquatic mammals) and invasive species are as follow:

**Piping Plover**

*Piping plover populations may be restricted by factors operating outside of the estuary; however, to support the USFWS recovery goal of 150 breeding pairs for the Great Lakes Piping Plover population, efforts are being made to create suitable nesting habitat within the St. Louis River AOC. In order to remove this BUI, implementation of the Piping Plover habitat project (action item 2.05) in this Roadmap is necessary.*

**Common Tern**

*Maintenance of a viable Common Tern colony of 100 nesting pairs in the estuary in at least 50% of years surveyed since 1997 is necessary for BUI removal.*

**Great Blue Heron**

*Removal of this BUI is not dependent on the establishment of a Great Blue Heron rookery, but the recorded presence of the species in the estuary during nesting season since 1997 will provide additional evidence for BUI removal.*

**Bald Eagle**

*Recovery of the Bald Eagle and the recorded presence of the species in the estuary during nesting season since 1997 is an indicator for BUI removal.*

**Wetland Bird Species**

*Removal of this BUI is not dependent on populations of wetland-associated wildlife species. An AOC-wide bird follow-up survey to compare to work done in 1979 is necessary evidence for BUI removal.*

**Invasives**

*An analysis of historical data that shows the ruffe is not inhibiting the native fish population is required to remove this BUI.*

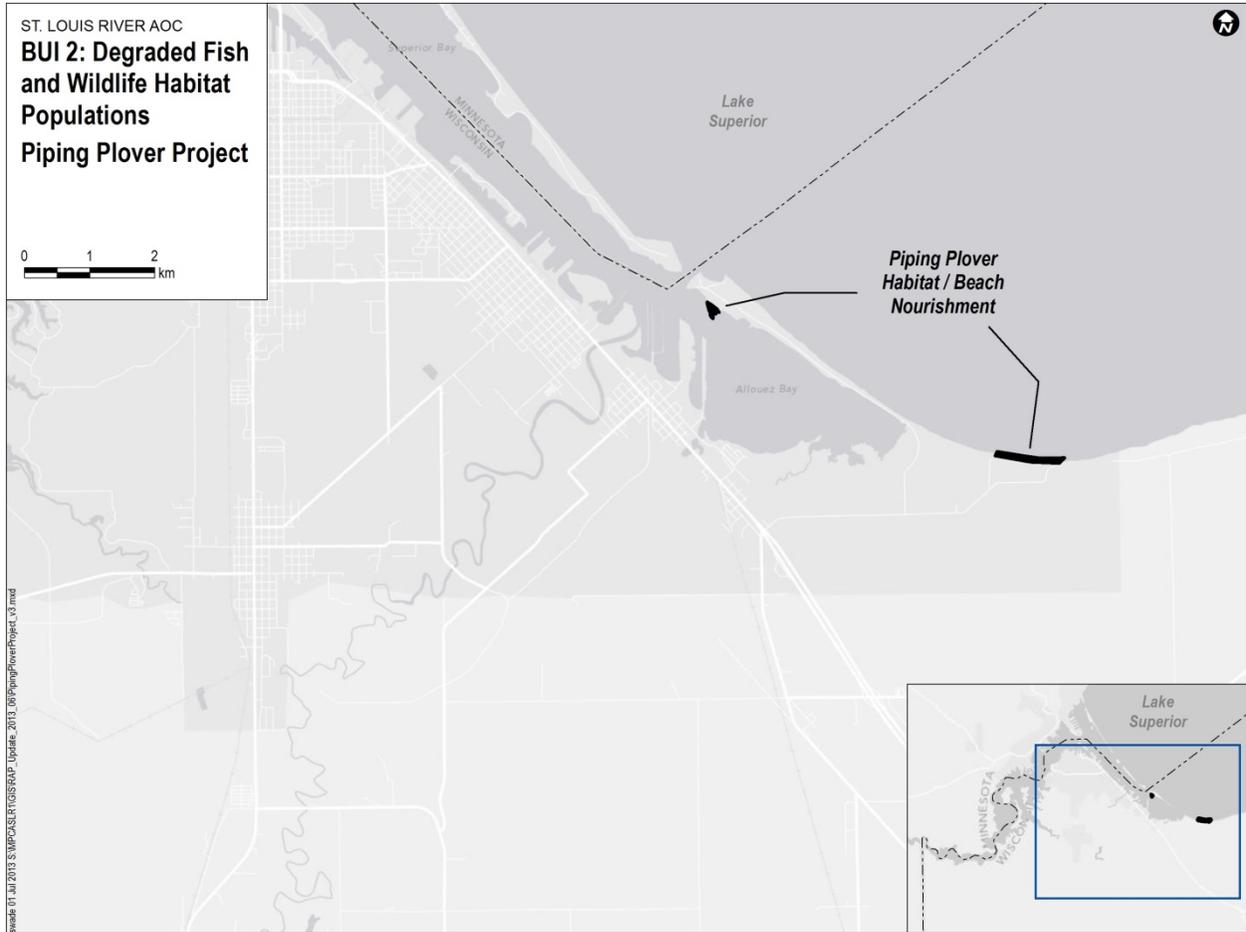
**Semi-Aquatic Mammals**

*Removal of this BUI is not dependent on specific semi-aquatic mammal population numbers. However, to support development of concurrence among state resource management agencies, a semi-aquatic mammal survey will be conducted in the estuary to verify that populations are not limited by physical habitat, food sources, water quality, or contaminated sediments.*

**BUI 2 Removal Strategy**

The strategy for BUI removal includes five actions needed for BUI removal listed in Table 4. ~~All~~ Three actions are underway; two have been completed. Anticipated BUI removal is in calendar year 2018. The strategy for removal of the Degraded Fish and Wildlife Populations BUI is as follows:

- Complete a thorough inventory and assessment of populations of the selected target species of birds (as listed above in the removal objectives) across the estuary. Available data on additional bird species from historical and recent monitoring may also be used to assess the overall status of the bird populations (action item 2.01). Action completed in 2016
- Continue routine MNDNR and WDNR fish population monitoring and reporting to confirm continued health of walleye and muskellunge and continued recovery of lake sturgeon. Lake sturgeon populations that meet the objectives above must be documented for two index periods (action item 2.02).
- Complete an analysis of historical fish population data to confirm that ruffe are not inhibiting the native fish population (action item 2.03). Note that the prevention and control of other invasive flora and fauna are addressed under the Loss of Fish and Wildlife Habitat BUI.
- Complete an estuary-wide semi-aquatic mammal survey (action item 2.04). Action completed in 2016.
- Increase available Piping Plover nesting habitat within areas identified in Figure 7 (action item 2.05).



**Figure 7: Piping Plover Habitat Enhancement Project Location**

## BUI 2 Summary of Key Remedial Actions, Current Status, and Actions Still Needed

Bird inventory and assessment project 2.01 ~~is contracted and underway and the avian monitoring has been funded through an~~ was completed through an ecological monitoring project at restoration sites: *St. Louis River AOC R2R Support Projects: Ecological Monitoring and Assessment (CR#6403) Final Report (Bracey, Chatterton and Niemi, University of Minnesota Duluth)*. ~~The project completion date has been moved to 2017 to allow for completion of a comparison with historical data.~~ The analysis will be used to evaluate the scope of the habitat enhancement project 9.16. An avian species team will meet to form consensus on the status of avian removal objectives.

Data collected from the nesting colony of common tern on Interstate Island indicates that the population target established for BUI removal is being met. Collection of nesting information and management of Interstate Island occur through Minnesota and Wisconsin DNR wildlife management programs. Efforts to enhance this nesting colony will be documented in applicable BUI removal packages.

Routine fish population monitoring and reporting will continue through the capacity of MDNR and Wisconsin Department of Natural Resources (WDNR) fisheries programs. These monitoring data show that walleye and muskellunge population targets have been met. Formal documentation is needed to show that AOC population targets have been met for walleye and muskellunge. Routine monitoring of fish populations will continue to assess lake sturgeon as part of project 2.02. Completion of this action item will depend on recovery of the lake sturgeon population. Enhancement of lake sturgeon and walleye spawning habitat is part of action 9.10, Chambers Grove Park restoration.

Ruffe population data in the St. Louis River estuary have been collected for many years. Long term data from annual USFWS surveys indicate ruffe populations have declined and are of little impact to native fish populations. Project 2.03 is underway and USEPA and USFWS personnel are in the process of preparing a paper on the results of those surveys. The completion date has been moved to ~~2016~~ 2017 to allow time for documentation of the status of ruffe in relation to native fish populations in the estuary.

An estuary-wide semi-aquatic mammal survey has been ~~funded and is underway as action 2.04 completed.~~ The project ~~is being contracted was completed~~ by WDNR with University of Wisconsin researchers. ~~Field observations will be collected through early 2016 with data interpretation and reporting completed by June, 2016. A report: *Status of Semi-Aquatic Mammals in the St. Louis River Area of Concern* (Evans, University of Wisconsin) was issued in September 2016 and a mammal species technical team is reviewing the results.~~

A feasibility study ~~has been initiated~~ is ongoing for a piping plover nesting habitat restoration project at Shafer Beach (project 2.05). WDNR is the project sponsor for the feasibility study portion of the project, and the ACOE began modeling of a beach nourishment project at the site. project will be implemented on Douglas County land. The project completion date has been moved to 2018 to allow for implementation.

**Table 4: Actions Still Needed to Achieve Removal of BUI 2**

Project No.	Project Name	Project Description	In-house/ Contractual	Date to be Completed
2.01	Bird Inventory and Assessment	Conduct an estuary-wide bird inventory for target species to be combined with existing inventory data available. Complete an AOC-wide assessment of bird population status using the combined dataset.	Contractual	2016 <u>completed</u>
2.02	Fish Population Monitoring <u>and Assessment</u>	Continue regular MNDNR and WDNR fish population monitoring and evaluate to track current status of target fish species against the BUI removal objectives. <u>Provide annual reports to the AOC.</u>	In-house: Sampling conducted by MNDNR, WDNR, and other partners	Yearly
2.03	Ruffe Assessment	Document ruffe populations in relation to native fish populations within the estuary.	In-house MNDNR and WDNR	2017 <del>6</del>
2.04	Semi-Aquatic Mammal Survey	Conduct an estuary-wide semi-aquatic mammal survey.	Contractual	2016 <u>completed</u>
2.05	Piping Plover Habitat / Beach Nourishment	Increase available nesting habitat within area designated critical habitat.	COE, SLRA, LSRI, FWS, County, City, WDNR	2018

**Anticipated Timeline to Remove BUI 2**

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
					●							

**BUI 2 Issues Affecting Progress**

This BUI relies on recovery of fish and wildlife populations to meet the established population targets. Lake sturgeon populations that meet the objectives above must be documented for two index periods. If the population targets are not being met, BUI removal may be delayed.

## BUI 3: Fish Tumors and Other Deformities

The individual roadmap for BUI 3: Fish Tumors and Other Deformities is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Summary of Key Remedial Actions, Current Status, and Next Actions Needed
- Anticipated Timeline for BUI Removal
- Issues Affecting Progress

### BUI 3 Rationale for Listing

Observations at the time of AOC listing suggested that fish tumors and deformities represented an impaired use in the St. Louis River estuary. However, no studies documenting the incidence rates of tumors in fish were available at the time.

### BUI 3 Removal Target

The BUI Removal Target, as established by stakeholders in 2008, is:

*Incidence rates of contaminant-related internal and external tumors and deformities in resident benthic fish species, including neoplastic or pre-neoplastic liver tumors, do not exceed incidence rates from unimpaired areas elsewhere in the Great Lakes Basin.*

Removal of the Fish Tumors and Other Deformities BUI will be justified when the liver tumor incidence rates in the AOC, as seen in three consecutive samplings of at least 200 white suckers, are statistically similar to, less than, or trending towards the reference site(s) in a six-year period. Comparisons will be made using the variation of tumor incidence rates observed in the reference site(s).

### BUI 3 Removal Strategy

The strategy for BUI removal includes three actions listed in Table 5. One action has been completed since the 2014 RAP. The strategy for removal of the Fish Tumors and Other Deformities BUI is as follows:

- Determine if Mountain Bay is an applicable reference site for the St. Louis River AOC based on results from planned 2013 Canadian AOC sampling. If information indicates that fish in Mountain Bay are mostly living in Lake Superior versus in the bay, then they are not representative of the reference site, and a more appropriate reference site must be established (action item 3.02).

Status: This action was completed in 2015. It has been determined that Mountain Bay, Ontario is not an acceptable reference site for the St. Louis River AOC. White sucker from Western Lake Superior will be used as the reference population. This decision was made based on the small

sample size, lack of isotope data to show migration information, and no tumors found in white sucker in Mountain Bay in 2006.

- Determine appropriate method for determining residency. Fish tagging methods could be used as a substitute for residency time estimates if stable isotope measures are not acceptable (action item 3.03). In 2015, the BUI Technical Team decided the stable isotope method described by Blazer et al. (2014) will be used to determine the Lake Superior reference population. A logistic regression model factoring habitat usage, sex and age will be used to determine the Lake Superior reference population after the final round of data is available in 2016.
- Evaluate St. Louis River AOC white sucker liver tumor incidence rate (action item 3.01):
  - If AOC tumor incidence rate is within the range of tumor incidence rates of the reference site(s), then sample two more times within six years, with the intent to remove this BUI if acceptable tumor incidence results continue.
  - If AOC tumor incidence rate exceeds the range of tumor incidence rates found at the reference site(s), conduct another round of representative sampling in two years. If two rounds of representative sampling fail to meet the reference range, discontinue sampling until at least two remediation projects are conducted at sites contaminated with polycyclic aromatic hydrocarbons (PAHs). Following significant remediation progress, resume fish sampling in two- to three-year intervals. Fish tumor incidence similar to the reference site, as evidenced by data from three sampling rounds, will be assessed for BUI removal.

### **BUI 3 Summary of Key Remedial Actions, Current Status, and Actions Still Needed**

Action 3.01 ~~has been completed. The last of three rounds of sampling white suckers for external and liver tumors and deformities was conducted in the spring of 2015. Data from 2011, 2013 and 2015 were combined and a final report summarizing all data is under review.~~

Action 3.02 has been completed. The method for determining a reference population has been developed by researchers using white sucker migrating into the estuary from Lake Superior as the reference population. The Lake Superior fish are from a nearby, unimpaired location and are subject to the same regional environmental quality. Lake Superior itself can serve as a reference site because Lake Superior sediments exhibit relatively low levels of contamination (Marvin et al. 2004).

The stable isotope method described by Blazer et al. (2014) will be used to determine the Lake Superior reference population as a medium-term (approximately 2 year), diet-based indicator for movement. The stable isotope analysis will be able to provide some insight into where fish have spent their recent life history by indicating the percentage of diet from the St. Louis River estuary and percentage from Lake Superior. This is necessary because there is no relationship between recent habitat use and where white sucker are captured during the spawning run (Blazer et al. 2014).

A logistic regression model factoring habitat usage, sex and age has been used to compare tumor incidence with these factors. The residency method (action 3.03) will be finalized when the 2015 data can be incorporated into the model and the BUI technical team can meet to review results. has been completed. The timeline for action 3.02 has been moved to 2016 to reflect this.

The goal is to be as conservative as possible when comparing river fish to reference fish from the lake and yet be statistically significant for comparison. As a result, an additional 50 white suckers (sample size totaling 250) were collected in 2015. The 2015 fish have been analyzed for specific tissue contaminants to confirm contamination exposure risk and gene expression data to look for viral sequences. This will help assess the cause of the low level tumors found thus far. Final results and a report are under review and BUI removal will be advanced after the review is complete.

**Table 5: Actions Still Needed to Achieve Removal of BUI 3**

Project No.	Project Name	Project Description	In-house/ Contractual	Date to be Completed
3.01	Fish Sampling	Conduct representative sampling from the entire AOC.	Contractual	<del>3<sup>rd</sup> round Sampling complete in 2015</del> Analysis in <del>2016</del> Complete
3.02	Reference Site Determination	Evaluate if Mountain Bay is an acceptable reference site for the St. Louis River AOC. If not, establish a more appropriate reference site. The western end of Lake Superior has been chosen as the reference location.	In-house – U.S. EPA MED	Complete
3.03	Residency Determination	Determine appropriate methods for fish residency determination (i.e., fish tagging or stable isotopes).	In-house – U.S. EPA MED	<del>2016</del> Complete

**Anticipated Timeline to Remove BUI 3**

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
			●									

**BUI 3 Issue Affecting Progress**

~~It is anticipated that the tumor data will be compiled from all three rounds and an incidence rate for the estuary population and Lake Superior reference population can be determined by 2016. If these data indicate that the AOC is not meeting the incidence rate target for BUI removal, the anticipated BUI removal date may be extended until certain contaminated sediment sites have been remediated or further monitoring can show that removal targets have been met. The BUI removal packet will be drafted in late 2016.~~



## BUI 4: Degradation of Benthos

The individual roadmap for BUI 4: Degradation of Benthos is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Summary of Key Remedial Actions, Current Status, and Next Actions Needed
- Anticipated Timeline for BUI Removal
- Issues Affecting Progress

### BUI 4 Rationale for Listing

At the time of AOC listing, reduced benthic macroinvertebrate density and species richness were reported in areas subjected to habitat alteration, physical disturbance, or in close proximity to known contamination. Benthic communities in disturbed areas were dominated by organic tolerant taxa (Oligochaeta, Chironomidae; Diptera) and exhibited an overall lack of species diversity.

### BUI 4 Removal Target

The BUI removal target, as established by stakeholders in 2008, is:

*The benthic community in historically degraded areas (e.g., chemically, biologically, or physically degraded areas) of the AOC does not significantly differ from unimpacted sites of comparable characteristics within the AOC. Benthic communities' characteristics including native species richness, diversity, abundance, and functional groups will be considered when comparing sites.*

Removal of the Degradation of Benthos BUI will be justified when benthic community survey results associated with the prioritized remediation to restoration (R2R) project sites (approximately 1,700 acres of aquatic habitat restored to meet the Loss of Fish and Wildlife Habitat BUI target) are not significantly different from a St. Louis River AOC reference condition. Appropriate reference conditions will be selected using habitats comparable to each project site. For contaminated sites undergoing remediation, the benthic community will be in recovery once remedial actions are implemented and ecological enhancements complete, if applicable.

### BUI 4 Removal Strategy

The strategy for BUI removal includes one action item needed for BUI removal (Table 6). This action item has not been started, but pre-project biological data has been collected at remedial and restoration sites for post-project comparison. A funding need is anticipated for [federal fiscal year 2017](#) to begin action item 4.01. The strategy for removal of the Degradation of Benthos BUI is as follows:

- Identify appropriate reference condition and determine useful benthic community diversity metrics used for comparisons.

- Determine the pre-construction biological community condition by monitoring aquatic habitat restoration sites. Aquatic habitat restoration sites are listed in the RAP for BUI 9: Loss of Fish and Wildlife Habitat and shown on Figure 10. Note that the area associated with the sites exceeds 1,700 acres of aquatic habitat; however, the BUI removal objectives for Degradation of Benthos will be achieved when a total of 1,700 acres from any combination of these sites or portions of these sites is not significantly different from selected reference conditions.
- Identify and implement remedial actions as necessary and then complete habitat restoration at prioritized restoration sites. The remedial actions at “red” sites identified under other BUIs are in various stages of implementation. Remedial actions in non-priority benthic habitat locations (e.g. industrial slips) will be considered complete under BUI 4 following implementation of clean-up actions and, where needed, the placement of any cover layer that would allow recolonization by benthos. In general, post-construction benthic macroinvertebrate monitoring at remediation sites will not be necessary for removal of this BUI, though the need for such monitoring is expected to be determined on a case-by-case bases depending on site specific remedial action objectives.
- Conduct post-construction biological monitoring at prioritized sites and compare to pre-construction biological metrics, or compare to metrics from a St. Louis River AOC reference site to evaluate status (action item 4.01).
- Assess biological condition by implementing a long-term monitoring plan until the benthic community shows increasing improvement or meets a reference site condition.

## **BUI 4 Summary of Key Remedial Actions, Current Status, and Next Actions Needed**

The St. Louis River Estuary has an extensive benthic data set collected from 1993 to 2015. Researchers at the EPA Mid-Continent Ecology Division have analyzed portions of these data in progress reports to develop metrics for addressing BUI 4 removal. The reports include: *A Benthos-based Multimetric Index for Use in the St. Louis River Area of Concern*, Draft Progress Report (USEPA, August 2015) and *Defining benthos reference condition for a Great Lakes Area of Concern* (USEPA, May 2016 draft). These reports describe data analysis methods for developing biological indicators that are being used to assess Minnesota sites, or are being considered for use throughout the estuary to assess benthic community health to both inform project design decisions and support progress towards removing this BUI. No single metric or set of metrics can be expected to apply across the entire estuary and its diverse habitats. Therefore, flexibility will be maintained for the use of site-specific measures of success where appropriate on a case-by-case basis.

- The membership of a BUI Technical Team was updated and includes representatives from MPCA, WDNR, and USEPA with periodic input from other subject experts when necessary.
- To reduce the error introduced when selecting a reference site for comparison, the least-impaired condition for evaluating success of priority restoration efforts will be determined using the expected condition for the Geomorphic Zone (e.g. Spirit Lake and St Louis Bay) where the restoration project lies. Other considerations may be needed for project sites in Superior Bay,

Allouez Bay, Pokegama Bay, and the Upper River since the model is not as fully developed for those areas.

- Pre-construction biological community data from prioritized project sites in Minnesota was delivered in 2016 (NRRRI progress report). WDNR will consider the need for other precondition monitoring on a case-by-case basis as projects for other remediation and restoration sites develop.
- The BUI Technical team will generate a post-construction sampling and analysis plan by spring 2017 for funding consideration that would be implemented to evaluate BUI 4 progress at each restoration site.

The St. Louis River Estuary is fortunate to have an extensive benthic data set collected from 1993 to 2014. Researchers at the EPA Mid-Continent Ecology Division are analyzing a portion of these data (577 ponar samples from 1993-2013) and a draft report – *A Benthos-based Multimetric Index for Use in the St. Louis River Area of Concern, Draft Progress Report – August, 2015* (USEPA Mid-Continent Ecology Division) contains the progress on data analysis to develop an indicator that can be used to assess the benthos in support of delisting this BUI. This data set includes data collected for the *St. Louis River AOC Benthic Community Reference Sites 2012* (MPCA and WDNR, 2013b). AOC staff will pursue forming a Technical Team for this BUI in 2016. The BUI Technical Team will meet as needed to evaluate methods for assessing BUI metrics and evaluate BUI progress.

Removal of this BUI relies on benthic recovery of 1,700 acres from aquatic habitat sites listed under BUI 9: Loss of Fish and Wildlife Habitat. Many of the action items in BUI 9 are underway.

**Table 6: Actions Still Needed to Achieve Removal of BUI 4**

Project No.	Project Name	Project Description	In-house/ Contractual	Date to be Completed
4.01	Post-Construction Biological Monitoring	Establish post-construction biological community characteristics evaluation SLR estuary-wide	Contractual	2022
This BUI relies on benthic recovery of 1,700 acres from aquatic habitat sites listed under BUI 9: Loss of Fish and Wildlife Habitat <b>and the cleanup of “red” sites identified in BUI 5: Restrictions on Dredging (Figure 4).</b>				

### Anticipated Timeline to Remove BUI 4

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
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### BUI 4 Issue Affecting Progress

There are no issues affecting this BUI at this time, ~~but if restoration projects contributing to the 1,700 acre goal are delayed it may be necessary to also delay monitoring the recovery of benthic organisms.~~



## BUI 5: Restrictions on Dredging

The individual roadmap for BUI 5: Restrictions on Dredging is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Summary of Key Remedial Actions, Current Status, and Next Actions Needed
- Anticipated Timeline for BUI Removal
- Issues Affecting Progress

### BUI 5 Rationale for Listing

At the time of AOC listing, restrictions on dredging was a use that was clearly identified as impaired in the St. Louis River AOC. Sediments in many parts of the AOC exceeded guidelines developed by regulatory agencies to characterize in-place sediments and contained a variety of toxic, bioaccumulative contaminants, which have been shown to cause adverse effects to aquatic and terrestrial organisms. In addition, serious economic and social consequences were thought to be imposed upon some resource users through special dredging requirements and obligations for long-term sediment containment.

### BUI 5 Removal Target

The BUI removal target, as established by stakeholders in 2008, is:

*All contaminated sediment hotspots within the AOC have been identified and implementation actions to remediate contaminated sites have been completed. There are no special handling requirements of material from routine navigational dredging due to contamination originating from controllable sources within the AOC.*

The following terms have been defined for the purposes of interpreting the 2008 target:

**Restriction on Dredging** – additional costs on a dredging project due to the levels of contaminants in the sediment. Contaminant levels could impact the method of dredging (e.g. hydraulic or environmental bucket vs. clam shell), depth of dredging, best management practices, or disposal options (e.g. landfill vs. beneficial reuse). Note: Restrictions on in-water placement of dredge material based on contaminant levels should not be considered a restriction under this BUI; only land based disposal/reuse options may contribute to restrictions.

**Sediment Assessment Areas (SAAs)** - The AOC was divided into SAAs to establish a common framework for assessing and displaying sediment contaminant data. Each SAA was given an individual number and unique name. SAAs are categorized by color (Table 7). AOC remediation and restoration sites that are depicted on maps are color coded based on the remedial designation of SAAs.

**Table 7: Sediment Assessment Area Color Designations**

SAA Remedial Designation	Definition
Purple	Remedial action complete, monitoring of effectiveness underway or complete.
Red	Remedial action needed.
Red-gray	Additional characterization and assessment needed to determine if remedial action is necessary.
Yellow	Remediation generally not warranted, but action items must consider the presence of contaminants, especially bioaccumulative contaminants.
Green	No known contamination. No remedial actions planned.

**Hotspots** - sediment assessment areas (SAAs) where sediment data have shown that contamination poses a human health or ecological risk at a level that requires management action as determined through review by MPCA or WDNR SAAs designated “red” are considered hotspots.

**Navigation** - refers to all movements of boats (recreation and commercial) and is not restricted to the federal navigation channel.

**Dredge Alternatives Plan for the AOC includes:**

- Restrictions that must remain in place to protect human health and the environment
- Restrictions that must remain in place due to Superfund, RCRA or other 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

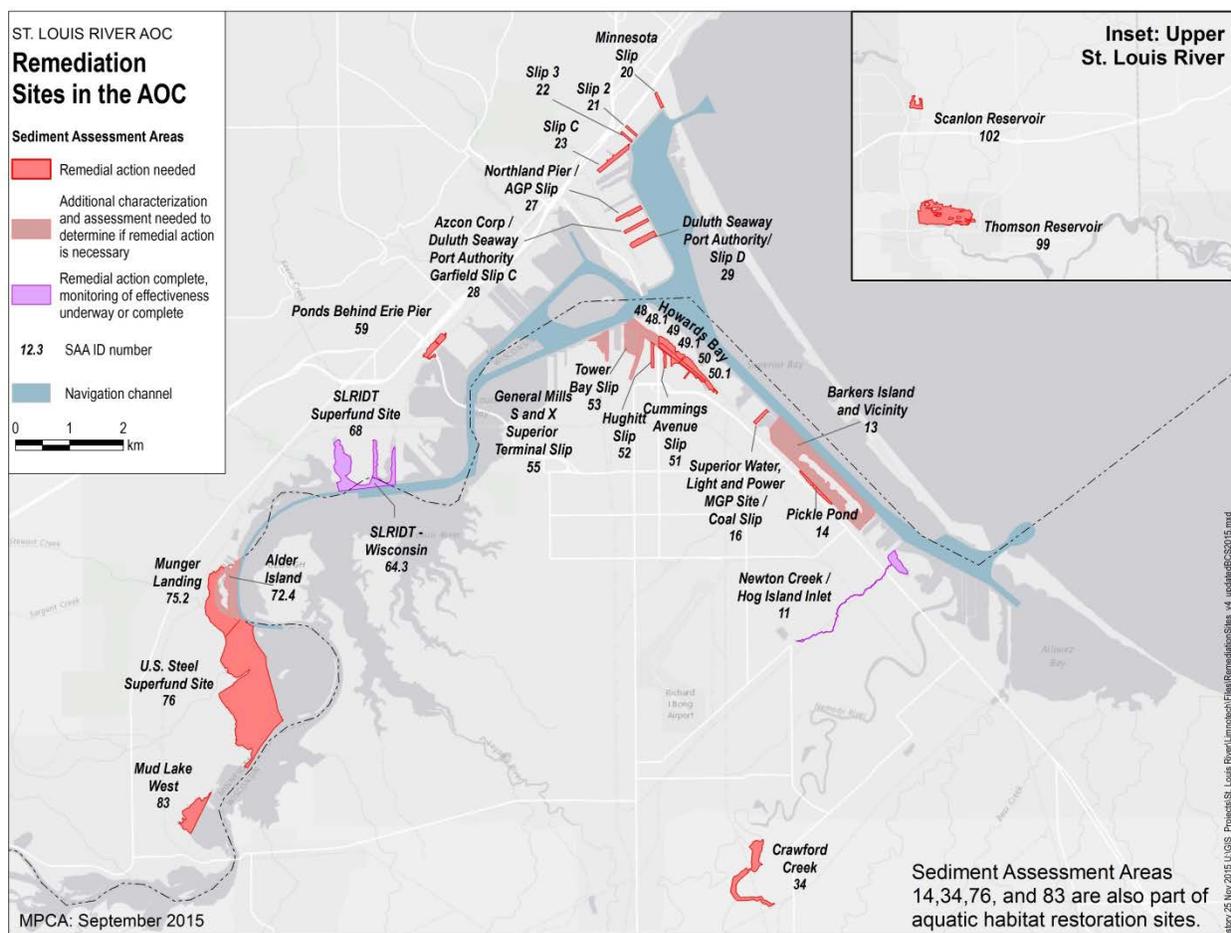
**Special handling requirements** - any requirements that are above and beyond the normal procedures for handling sediments in a working river or harbor where contaminated sediments do not exist. In some cases, agencies may determine it is acceptable to leave contaminants in place if it has been determined that they do not pose a human health or ecological risk. Such areas would be identified in the dredging alternatives plan.

Removal of the Restrictions on Dredging BUI will be justified when SAAs designated as red are remediated to their respective State’s cleanup criteria and the other actions identified below are completed. Normal navigational dredge material testing, permitting, and certification processes are not considered restrictions. Note: Any dredging activity, whether proposed within or outside these routine navigational corridors, requires State regulatory permits as regulated by each State resource agency.

## BUI 5 Removal Strategy

The strategy for BUI removal includes twenty actions listed in Table 8. Sediment quality at eight sites in Minnesota has been evaluated based on 2014 sediment characterization and these sites have been added to Table 8 as action items. The strategy for removal of the Restrictions on Dredging BUI is as follows:

- Identify long term housing and maintenance of the St. Louis River Sediment Database and ensure inclusion of current and future partner and USACE data sets (Action Item 5.01).
- Remediate contaminated sediments in SAAs that have been designated as red as shown in Figure 8 and listed below in Table 8; develop any necessary dredge alternative plans for the sites (Action Items 5.02-5.09 and 5.13-5.20).
- Conduct additional sediment characterization where needed to confirm remedial designations as described in the Sediment Characterization section. If any of the SAAs located within navigable portions of the St. Louis River AOC are determined to be red, remediate contaminated sediments at these locations, and develop any necessary dredge alternative plans for the site(s) (Action Item 5.12).
- Develop a ~~communication strategy~~/dredging alternatives plan to identify places where dredging restrictions may remain after actions are implemented and how this relates to beneficial use of dredge material in the AOC. All site specific dredging alternatives plans and ~~dredging history~~sediment characterization maps will be incorporated in an AOC-wide dredging alternatives plan (Action Item 5.10).
- ~~• Identify and document a bi-state strategic approach to contaminated sediment disposal from remediation sites in Minnesota and Wisconsin (Action Item 5.11).~~
- Minnesota and Wisconsin will work within the state agencies, the port authorities, and local communities to investigate the need for a bi state strategic approach. This approach may include a dredge disposal and/or reuse facility for contaminated sediments. (Action Item 5.11).
- ~~• Assist with the identification/citing of on-land disposal and reuse options for material dredged from hotspots (Action Item 5.11).~~
- ~~• Determine and map the dredging history of the area subject to this BUI (to be included in Action Items 5.10 and 5.11).~~



**Figure 8: Remediation and characterization sites in the St. Louis River AOC (Revised Sept 2015)**

## BUI 5 Summary of Key Remedial Actions, Current Status, and Next Actions Needed

Action item 5.01 is operation of the St. Louis River AOC Database. Inclusion of backlog datasets for Minnesota has been funded and is underway. WDNR is addressing a backlog of Wisconsin datasets and developing automated tools to build agency capacity to prepare data for database inclusion. The National Oceanic and Atmospheric Administration (NOAA) will house and maintain data in their new data warehouse, query, and visualization tool called GL DIVER (Great Lakes Data Integration Visualization Exploration and Reporting). [Development of GL DIVER is nearly complete and training workshops were held throughout the fall of 2016 on uploading and extracting data from the data system.](#) These datasets are being used to develop cleanup objectives, remedial designs and for development of dredge alternatives plans for BUI removal.

Action items 5.02-5.09 and 5.13-5.20 are contaminated sediment cleanup sites ([“red” sites](#)) where [actions may need to be completed to address restrictions on dredging activity.](#) All of these actions are underway in different stages of remedial action. [Site costs are estimated in Table 8, and funding needs will be expected to vary based on each site and are influenced in part by the cooperation and participation of any responsible or recruited parties.](#) [Remedial investigation activities by the responsible](#)

~~party are in progress at the Superior Water Light & Power MGP Site (5.03). Feasibility studies have been or are being completed for Slip C (5.06), Northland Pier/AGP Slip (5.07), Azcon Corp./DSPA Garfield Slip (5.08), Munger Landing (5.09), Ponds Behind Erie Pier (5.13), Slip 3 (5.14), Mud Lake (5.18), Thomson Reservoir (5.19), and Scanlon Reservoir (5.20). Feasibility studies, partner recruitment and remedy selection have been completed for Howards Bay (5.02) and Minnesota Slip (5.04) and remedial design work has begun for these sites. The design is complete and remedial construction work is underway for the DSPA Garfield Slip D site (5.17). Based on additional sediment characterization work at “red-grey” sites in 2014, MPCA remediation staff determined that remedial actions are not needed at the Slip near 21st Ave W (5.15) and End of Rice’s Point Off-Channel East (5.16). Conversely, MPCA remediation staff determined that remedial action for sediments may be warranted at the following “red” sites: Ponds Behind Erie Pier (5.13), Slip 3 (5.14), DSPA Garfield Slip D (5.17), Mud Lake (5.18), Thomson Reservoir (5.19), and Scanlon Reservoir (5.20). at these sites are moving forward.~~

~~A BUI technical team is being formed and will include members from MPCA, WDNR, DSPA, and Sea Grant. No action items required the team to meet this year. The technical team is expected to be more active in future years when action items 5.10 and 5.11 begin. Action 5.10 is being changed from a “Communication Strategy” to a “Dredging Alternatives Plan” to be consistent with the BUI removal strategy. A map of locations where engineering controls or restrictions may remain after cleanup of all the “red” sites is a critical component of the dredging alternatives plan. To date the contaminated sediment disposal approach under action 5.11 has been applied in Minnesota and Wisconsin on a case-by-case basis using exiting state guidance. For example, landfill disposal or on-site consolidation and containment options have been used or are being considered at contaminated sediment sites. This action will be reviewed to determine if it is complete or if it should be modified to include beneficial use of dredge material. Continued support for adding datasets to GL DIVER under action 5.01 is also important for completing actions 5.10 and 5.11.~~

Sediment characterization action item 5.12 is ~~underway largely complete~~ for the Wisconsin sites labeled as “red-grey” (Figure 8) and also in areas that have little or no sediment chemistry data. ~~Data collected in the summer of 2015 will be analyzed in late 2015 and early 2016. A second round of characterization on the Wisconsin side is anticipated during the 2016 field season to complete this action. Additional sediment sampling at 234 locations was completed in Wisconsin during 2015 and 2016. The data are in preparation and will be used to prioritize sites for remediation or determine if additional assessment is needed.~~ Baseline sediment characterization in Minnesota was completed in 2014 ~~and MPCA determined that remedial actions are not needed at the Slip near 21<sup>st</sup> Ave W (action item 5.15) and the End of Rice’s Point Off-Channel East (action item 5.16).~~ It should be noted that additional characterization work may be needed to support feasibility and design efforts at “red” sites or to help identify potential project partners or responsible parties. ~~In 2016, additional data gap collection was started for Mud Lake (action item 5.18), Thompson Reservoir (action item 5.19), and Scanlon Reservoir (action item 5.20) for use in remedy selection. Several slips in Wisconsin may also require further data collection and assessment before a final determination can be made regarding the remedial designation of those areas.~~

**Table 8: Actions Still Needed to Achieve Removal of BUI 5**

Project No.	Project Name*	Project Description	In-house/ Contractual	Date to be Completed
5.01	Data System Operations	Include current and future partner and USACE data sets into St. Louis River database; provide web interface to access, query, and download data	Contractual Transitioning to NOAA's GL DIVER	<u>on-going</u>
5.02	Howard's Bay (including Hughitt and Cummings Slips) SAAs 49, 49.1, 50, 50.1, 51, 52	Remediate contaminated sediments	Contractual	2018
5.03	Superior Light & Power MGP Site/ Coal Slip (SAA 16)	Remediate contaminated sediments	Contractual	2020
5.04	Minnesota Slip (SAA 20)	Remediate contaminated sediments	Contractual	2017 <del>8</del>
5.05	Slip 2 (SAA 21)	Remediate contaminated sediments	Completed by Voluntary Party	2016
5.06	Slip C (SAA 23)	Remediate contaminated sediments	Contractual	20 <del>20</del> 19
5.07	Northland Pier/ AGP Slip (SAA 27)	Remediate contaminated sediments	Contractual	2019
5.08	Azcon Corp/ Duluth Seaway Port Authority Garfield Slip C (SAA 28)	Remediate contaminated sediments	Contractual	2019
5.09	Munger Landing (SAA 75.2)	Remediate contaminated sediments; restoration	Contractual	2020
5.10	<del>Communication Strategy</del> <u>Dredging Alternatives Plan</u>	Develop a <del>communication strategy</del> <u>Dredging Alternatives Plan</u> to inform partners and <del>the</del> public about <u>where restrictions on dredging may remain after remedial actions are completed</u>	In-house MPCA and WDNR	<u>on-going</u>
5.11	Bi-state Contaminated Sediment Disposal Approach	Identify and document a bi-state strategic approach for disposal of contaminated sediment from remediation sites.	In-house MPCA and WDNR	201 <del>6</del> 22
5.12	Additional Sediment Characterization	Characterize estuary sediments that have been identified as red-gray or with limited or no data	Contractual	2017
5.13	Ponds Behind Erie Pier (SAA 59)	Remediate contaminated sediments	Contractual	2020
5.14	Slip 3 (SAA 22)	Remediate contaminated sediments	Contractual	202 <del>0</del> 19
5.15	Slip near 21st Ave W (SAA 37)	Was characterized as remediation, but after further analysis, no further action is needed	N/A	N/A

5.16	End of rice's Point Off Channel East (SAA 30)	Was characterized as remediation, but after further analysis, no further action is needed	N/A	N/A
5.17	DAPA Garfield Slip D (SAA 29)	Remediate contaminated sediments	Contractual	2020
5.18	Mud Lake (SAA 83)	Remediate contaminated sediments	Contractual	2020
5.19	Thomson Reservoir (SAA 99)	Remediate contaminated sediments	Contractual	2020
5.20	Scanlon Reservoir (SAA 102)	Remediate contaminated sediments	Contractual	2020

\*SAA refers to sediment assessment areas. See Appendix G of the 2013 RAP for SAA location maps.

### Anticipated Timeline to Remove BUI 5

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
										●		

### BUI 5 Issues Affecting Progress

The most significant need in the St. Louis River AOC is securing resources to ensure timely progress on the remedial actions. ~~additional sediment characterization on the Wisconsin side. This information is needed to identify unknown contaminated sediment sites and allow any additional sites to be added to the RAP. Minnesota completed sediment characterization and have made remedial determinations for “red-grey” sites. These sites are shown in Table 8.~~

~~This BUI relies on remediation of contaminated sediment sites and the development of a dredge alternatives plan for the AOC. If remedial projects are delayed or if remediation of additional sites is needed, the BUI removal timeline may need to be adjusted.~~ The timeline for BUI removal has allowed for recovery and monitoring the success of remedial action. At this time the actions are on track for BUI removal in 2023.

## BUI 6: Excessive Loading of Sediment and Nutrients

The individual roadmap for BUI 6: Excessive Loading of Sediment and Nutrients is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Summary of Key Remedial Actions, Current Status, and Next Actions Needed
- Anticipated Timeline for BUI Removal
- Issues Affecting Progress

### BUI 6 Rationale for Listing

Prior to the improvements in wastewater treatment in the late 1970s, water quality and biological investigations characterized the St. Louis River estuary (SLRE) as low in dissolved oxygen and high in total phosphorus and total suspended solids. At that time, the Western Lake Superior Sanitary District (WLSSD) treatment plant was built and the Superior wastewater treatment plant was upgraded. Since then, many indicators of trophic status have shown improvements. For instance, concentrations of total phosphorus have decreased and dissolved nitrogen has shown variable decline in St. Louis Bay. The loading of phosphorus to the estuary from point sources has been reduced substantially. At the time of AOC listing, further work was needed to ascertain the effects of nonpoint source loadings to the system and to Lake Superior. Despite the reductions in point source loadings, phosphorus concentrations in the estuary remained at levels where eutrophic conditions might be expected. Algal biomass was lower than would be expected, however, given these high phosphorus concentrations. Chlorophyll *a* concentrations measured in the estuary were similar to levels found in mesotrophic or oligotrophic waters. Several investigators proposed that reduced light penetration caused by turbidity and color may be a limiting factor for algal growth in the estuary. Although persistent water quality problems associated with eutrophication were not observed in the estuary, the high levels of nutrients and sediments being delivered to Lake Superior were determined to be an important concern. Therefore, the RAP used a modification of the International Joint Commission eutrophication criterion to reflect local conditions.

### BUI 6 Removal Target

The BUI removal target, as established by stakeholders in 2008, is:

*Nutrient and sediment levels have not been shown to impair water quality and habitat, and do not restrict recreation, including fishing, boating, or body contact in the estuary and within western Lake Superior based on the following criteria:*

1. *All federal, state, and local point source and nonpoint source discharge permits in the AOC are in compliance with regard to controlling sources of nutrients (particularly nitrogen and phosphorous), organic matter, and sediment; and*
2. *Total phosphorus concentrations in the Lake Superior portion of the AOC do not exceed 0.010 mg/l (upper limit of oligotrophic range); and*

3. *There are no exceedances of the most protective water quality standard for either state in the western basin of Lake Superior due to excessive inputs of organic matter or algal growth attributed to loadings from wastewater overflows into the St. Louis River; and,*
4. *Total phosphorus concentrations within the St. Louis River portion of AOC do not exceed an interim guide of 0.030 mg/l (upper limit of mesotrophic range) or the most restrictive water quality standards. This ensures that anthropogenic sources and activities in the St. Louis River AOC do not result in excessive productivity and nuisance conditions within the St. Louis River Estuary.*

The 2008 delisting target was based on total phosphorus data in available reports from Minnesota, Wisconsin, and the IJC. At that time, several studies were in progress via a variety of local agency and university researchers involving the estuary and the western arm of Lake Superior, and portions of the St. Louis River and Nemadji River watersheds. Consequently, more information is currently available to better assess the delisting target and its application to the removal of this BUI.

Removal of the Excessive Loading of Sediment and Nutrients BUI will be justified when:

1. All federal, state, and local point source and nonpoint source discharge permits in the AOC are in compliance with regard to controlling sources of nutrients (particularly nitrogen and phosphorus), organic matter, and sediment.
2. Assessment of current water quality data for the Lake Superior and the St. Louis River estuary portions of the AOC indicate that water quality meets the water quality goals established by the strategy below.
3. Watershed management objectives for the Nemadji River watershed, as established by the Nemadji Basin Plan (NRCS, 1998), have been adopted and progress towards implementing the objectives is being made.

Total phosphorus alone will not provide the level of confidence needed to show that nutrient and sediment levels do not impair water quality and habitat, and do not restrict recreation, including fishing, boating, or body contact in the estuary. Therefore, to protect and restore the condition of the AOC related to the listing of this BUI, a thorough review of historical data and a statistical analysis of the current water quality condition based on the recommended seven status indicators listed below are necessary. These analyses will provide the basis to develop water quality goals and assess the trends and current condition of the St. Louis River estuary in relation to BUI removal. The seven status indicators include:

- *Chemical* - total phosphorus, un-ionized ammonia, dissolved oxygen
- *Biological* – chlorophyll *a*
- *Physical* - total suspended solids (TSS) and turbidity or other loading metric based on tons of sediment
- *Watershed* –progress toward management objectives to reduce runoff rates and sediment delivery in the Nemadji River watershed

This work is not intended to set or replace State water quality standards, but to develop BUI removal objectives agreeable to both States and FDL that are consistent with intent of the BUI removal target. The BUI removal objective water quality goals are to protect the riverine and estuarine portions of the AOC from a eutrophic classification and to protect the Lake Superior portion of the AOC from a mesotrophic classification as well as achieve desired levels of sediment and nutrient loading to Lake Superior.

### **BUI 6 Removal Strategy**

The strategy for BUI removal includes five action items listed in Table 9. Actions [6.01](#), 6.02 and 6.03 are complete. All remaining actions are underway. The strategy for removal of the Excessive Loading of Sediment and Nutrients BUI is as follows:

- Develop the water quality goals necessary to establish reference conditions (eutrophic limit for riverine and estuarine portions, mesotrophic limit for Lake Superior portion of the AOC). Results from the four steps below will be used to define current water quality conditions and place them in a broader spatial and historical context. The water quality conditions and watershed management objectives will be used to establish a set of measurable targets for BUI removal. The water quality goals may not necessarily involve all six status indicators (TP, NH<sub>3</sub>, DO, Chl-a, TSS, Turbidity).
1. Continue to perform area-wide water quality analyses in the St. Louis River estuary based on the monitoring protocols in Bellinger et al. (2012) (action item 6.01). The objective of this project is to work with AOC program staff and other groups responsible for monitoring and assessing conditions in the St. Louis River estuary by identifying data needs, developing a sampling design to meet those needs, and evaluating the relevancy of the results. Analysis of the water quality indicators will be used to estimate conditions within zones and/or estuary-wide. Results will be used to report whether the St. Louis River estuary is trending toward or has reached the reference condition or range of conditions considered reasonable for the estuary. Understanding changes in water quality and associated biological conditions that meet BUI removal objectives is the focus of the work in 2013 and 2014. This work will include all six water quality status indicators to help address the following:
    - a. Provide a summary of the six water quality indicators for a period of two to three years.
    - b. Assess and verify relevance of all six status indicators within the St. Louis River estuary or by geographic zone if necessary as a means to determine if the estuary is impaired for these parameters based on agreed-upon reference conditions and accounting for any unique conditions.
  2. Perform an expanded historical data set analysis based on methodologies used in Hoffman (2011) to evaluate long-term trends in water quality as it relates to the six status indicators (action item 6.02). Determine the appropriate water quality goals for the reference condition of any or all of the status indicators appropriate for the St. Louis River estuary and

western portion of Lake Superior that will meet approval by Minnesota and Wisconsin as appropriate for the AOC.

3. Perform a paleolimnological investigation of the St. Louis River estuary to reconstruct the algal and geochemical history for approximately the last 300 years (action item 6.03). Diatom-based (microfossil algae) models will be applied to identify historical temporal and spatial variations in biological (chlorophyll, algal load), chemical (phosphorus, ammonia) and physical (TSS, turbidity) water quality indicators. Combined with the results of the monitoring data and trend analyses in 1 and 2 above, the paleolimnological data will provide quantitative and qualitative reconstructions of the important physical, chemical and biological trends that have resulted from natural and anthropogenic drivers. ~~This information will then be used to make recommendations regarding past remedial success and future expectations (action item 6.04).~~
  4. Document progress toward watershed management objectives from the Nemadji Basin Plan (NRCS, 1998) as an indicator of sediment loading to the AOC. The Nemadji plan established watershed objectives to reduce runoff rates and sediment delivery from the Nemadji River watershed into AOC (action item 6.05).
- Once the work above is complete, assess the status of the St. Louis River estuary in relation to BUI removal:
    1. For the water quality indicators:
      - a. If the assessments show the current conditions have been sustained and the water quality has improved to where it meets the water quality goals, then removal targets have been met.
      - b. If the assessments show the current conditions have not been sustained and water quality is not meeting the water quality goals, then removal targets have not been met. Determine possible sources and develop an action plan to address the source(s). Then, re-evaluate annually until it can be shown that water quality meets applicable water quality goals for two consecutive years.
    2. For the watershed indicator:
      - a. If watershed management objectives for the Nemadji watershed are met or progress over time to meeting the objectives can be demonstrated, this information will help support removal of the sediment loading aspect of this BUI.

## **BUI 6 Summary of Key Remedial Actions, Current Status and Next Actions Needed**

Actions 6.01, ~~6.02~~, and 6.03 are complete. ~~Water quality sampling for projects action items 6.01 and 6.02 was performed in 2012 and 2013 by the U.S. Environmental Protection Agency Mid Continent Ecological Division (EPA-MED). Final reports are being developed. The next step is to use this information to complete action item 6.04. These studies have been summarized in reports and published papers. In addition, this work has been vetted with the AOC partners and technical team in light of the~~

BUI removal strategy and objectives. The summary of the findings has been drafted and will be used as part of the BUI removal strategy after completion of actions 6.04 and 6.05.

Action item 6.03 is underway. Sediment cores were collected at eight sites in 2014, and are being analyzed; results will be available starting in late 2015. The project will be completed in 2016.

Action item 6.04 is underway using available water quality data and results from projects 6.01 and 6.02. Completion of project 6.03 will be necessary to complete this action.

The recently completed paleolimnological study identified improvements in water phosphorus concentrations, as inferred from paleo-diatom analyses from mid-channel cores in the SLRAOC over the past 40 years. The study also found increasing phosphorus concentrations exceeding the BUI removal objective in nearshore areas. Some of these nearshore coring locations indicate that phosphorus concentrations were likely above the removal objective prior to European influence. The study stated that increasing nutrients in nearshore areas may be associated with recent development and the continued presence of industry along with issues such as climate change and internal phosphorus loading.

Based on the recent findings, WDNR will conduct biological monitoring of nearshore areas within Wisconsin in 2017. The data will be used to investigate trends in water quality and the biota of the nearshore areas. The results of the monitoring may be used to support BUI removal.

The technical team will meet to review what future work may be appropriate to further understand nutrient loading (i.e. phosphorus) in nearshore areas of the St. Louis River and Nemadji River watersheds outside of the AOC program.

As part of a Action item 6.05 includes a multipronged approach to document progress towards Nemadji River watershed management objectives as follows:

1. Assess the Current and Historic Sediment Loading in the Nemadji River Watershed. Assess pre-settlement, peak agriculture, and modern sediment loading using an existing HSPF model. Complete in 2016.
2. Assess current sediment loading compared to sediment loads calculated based on 1970's data and reported in the Nemadji Basin Plan (NRCS, 1998). To be completed March 2017.
3. Assess the health of natural biological communities in the Nemadji River in Wisconsin through a fish, macroinvertebrate, and water quality sampling effort. This is complete and includes three final reports:
  - Nemadji River Tributaries Water Quality Assessment (Roesler, 2014)
  - Lower Nemadji River Water Quality and Macroinvertebrate Community Assessment, 2015 (Roesler, 2015)
  - Lower Nemadji River – Douglas County 2015 Fish Community Survey Summary (Nelson, 2016)

Final reports are available in the SWIMS database or by contacting WDNR.

<http://dnr.wi.gov/topic/surfacewater/swims/>

4. Meet watershed management objectives identified in the Nemadji Basin Plan (NRCS 1998) through an implementation planning effort aimed at educating citizens and local government officials in the Nemadji basin and identifying landowners to implement BMPs on their property. To be completed December 2017.

BUI removal justification will be based on these multiple lines of evidence. Portions of action 6.05 have been completed. Contractual work is scheduled for completion by December 2017. The BUI removal package process is scheduled for early 2018.

~~WDNR (through the Great Lakes Protection Fund) and Carlton County, MN funded a GIS based open lands assessment in the Nemadji River Watershed. A comparison of previous years to the 2014 analysis showed that open land objectives in the Nemadji River Basin Plan have not been met. Based on the results of the open lands assessment action item 6.05 has been modified to assess the impairment in the Nemadji River using biological, water quality, and sediment monitoring. As part of action 6.05, in 2015 WDNR was funded to complete the project "Addressing excess sedimentation impairments in the Nemadji River Basin" The project will evaluate changes in sediment loading in the Nemadji River through a sediment loading assessment and use of a hydrologic and water quality model. This project will evaluate results of the work that has been implemented since the Nemadji River Basin Plan was completed and determine if any additional actions are necessary for this BUI.~~

**Table 9: Actions Still Needed to Achieve Removal of BUI 6**

Project No.	Project Name	Project Description	In-house/ Contractual	Date to be Completed
6.01	Perform Area-wide Water Quality Sampling and Analyses	Identify data needs, develop sampling design based on Bellinger et al. (2012) and evaluate results.	In-house - U.S. EPA MED	2015 Complete
6.02	Perform Expanded Historical Data Analysis	Conduct a thorough review of current and historical data and a statistical analysis of the six water quality indicators (TP, NH <sub>3</sub> , DO, chlorophyll <i>a</i> , TSS and turbidity) and evaluate long-term trends in water quality.	In-house - U.S. EPA MED	2015 Complete
6.03	Paleolimnological Investigation	Perform a paleolimnological investigation of the St. Louis River Estuary to reconstruct the algal and geochemical history and develop models to characterize trends in natural and anthropogenic drivers in water quality.	Contractual	2016 <u>Complete</u>
6.04	Compilation of 6-1, 6-2, and 6-3	Determine appropriate water quality goals for the reference condition of biological, chemical and physical indicators of water quality.	<u>In-house U.S. EPA MED (reviewed by MPCA and WDNR) MPCA and WDNR</u>	<u>2016/2017</u>
6.05	Assessment and Implementation Planning in the Nemadji River Basin	Assess sediment impairments through biological, water quality, and sediment monitoring, and HSPF modelling of historic sediment loads. Support implementation of the Nemadji Basin project recommendations to reduce sedimentation through stakeholder and landowner planning efforts.	In-house WDNR and MPCA Contractual	2017

**Anticipated Timeline to Remove BUI 6**

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
				●	●							

**BUI 6 Issues Affecting Progress**

~~There are no issues affecting this BUI in 2015. If assessment and implementation planning (Action 6.05) indicate that additional actions are necessary for this BUI, the BUI removal timeline may need to be adjusted. Increasing phosphorus trends in nearshore areas were observed in the water quality studies and paleolimnology study. Monitoring of nearshore areas in Wisconsin will be conducted in 2017 to assess the biological integrity of these areas. The BUI removal timeline was adjusted to 2018 to allow for completion of 6.05 and to complete Wisconsin's nearshore monitoring.~~

~~2014 Issue(s) affecting progress and the strategy used to address the issue(s):~~

The <40% open lands objective in the Nemadji Basin, included in part four of the removal strategy, was assessed in 2014 and this objective is not being met. While land use trends have an impact on peak flows and erosion in the basin, there are several caveats to using this objective in the RAP. The “open land” classification includes urban, agriculture, grasslands, hay fields, shrublands, and young forest; but each of these land cover types influences peak flows differently (Verry 1976, Verry et al. 1983, Verry 1986). Verry’s work found that at moderate percentages (40–60%) open lands, snowmelt peak flows were desynchronized and thus reduced. Because of this desynchronization and the differences in water uptake among different types of open lands, there is a lack of consensus among resource managers about what the appropriate percent open lands target should be. Also, because “slow the flow” efforts are not limited to reforestation (but also include wetland restoration, ditch plugging, elimination of unused roads, field borders, filter strips, etc.), using the percent of open lands in the basin as the target metric does not accurately assess physical results of efforts that have been implemented to reduce sediment in the Nemadji River. In fact, initial assessments of fish and macroinvertebrates at several sites on the Nemadji in Wisconsin do not indicate there is an impairment due to sediment (Roesler, 2014).

Therefore, the <40% open lands objective has been removed from the BUI removal strategy. Action item 6.05 has been adapted to assess the biological condition of the Nemadji River and to determine if excessive sediment is an impairment. The project is intended to justify BUI removal based on historical sediment load modeling and biological condition, and implementation of the Nemadji Basin Plan through stakeholder and landowner planning workshops in the Nemadji River Basin. The planning component will include communication of the results of the open lands assessment to stakeholders and landowners in the Nemadji Basin.



## BUI 7: Beach Closings and Body Contact Restrictions

The individual roadmap for BUI 7: Beach Closings and Body Contact Restrictions is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Summary of Key Remedial Actions, Current Status, and Next Actions Needed
- Anticipated Timeline for BUI Removal
- Issues Affecting Progress

### BUI 7 Rationale for Listing

Water quality data available at the time of AOC listing indicated that improvements had been made in the St. Louis River and bay since the Late 1970s. However, sources of potential microbial contamination still existed, namely sewage bypasses into the AOC in both Minnesota and Wisconsin during storm events. Discharge of inadequately treated wastewater by marine traffic was also a concern. Because of the sewage bypasses in both Minnesota and Wisconsin, body contact recreation was deemed a Beneficial Use Impairment. In addition to bacterial contamination, high chemical contaminant levels in the St. Louis River AOC sediments were believed to present a health risk for recreational uses. Cleanup and sediment remediation at Hog Island Inlet in Wisconsin and Stryker Bay in Minnesota have led to the removal of “No Swimming” signs at these locations, although a “No Swimming” sign remains at the US Steel site in Minnesota.

### BUI 7 Removal Target

The BUI Removal Target, as established by stakeholders in 2008, is:

*Sources of stormwater and wastewater discharge to the St. Louis River Area of Concern have been identified and measures to reduce the risk of human exposures to disease causing microorganisms have been implemented.*

*There are no body contact advisories due to the presence of harmful chemicals at contaminated sites.*

*No water bodies within the AOC are included on the list of non-attaining waters due to controllable sources of disease causing microorganisms or chemicals in the most recent State of Wisconsin and State of Minnesota Section 303(d) programs.*

For the purposes of interpreting the 2008 target, “controllable sources” is defined as sources of pathogens of human origin.

Removal of the Beach Closings and Body Contact Restrictions BUI will be justified when the following objectives are met:

### **Beach Closings**

No water bodies within the AOC are included on the list of non-attaining waters due to contamination with pathogens from sewer overflows (defined as sanitary sewer overflows or combined sewer overflows) in either State's most recent Clean Water Act Water Quality and Pollution Control Section 303(d) and 305(b) Integrated Report, or

In cases where the water bodies within the AOC are on the list of non-attaining waters due to the presence of sewer overflows originating within the AOC, this BUI will be considered restored when sewer overflows have been eliminated, are being treated, or are otherwise being managed as follows:

- a) Municipalities and municipal wastewater treatment plants within the AOC are in compliance with NPDES wastewater discharge permit conditions or are otherwise entered into an agreement or order addressing sewer overflows, and
- b) Municipalities within the AOC are in compliance with their municipal separate storm sewer (MS4) NPDES permit conditions.

### **Body Contact Restrictions**

No water bodies within the AOC have posted "No Swimming" or "Warning" signs due to chemical contamination that poses a health risk due to body contact, as determined by Public Participation Rules (NR 714.07) in Wisconsin and by Health Departments in Minnesota or Wisconsin, or

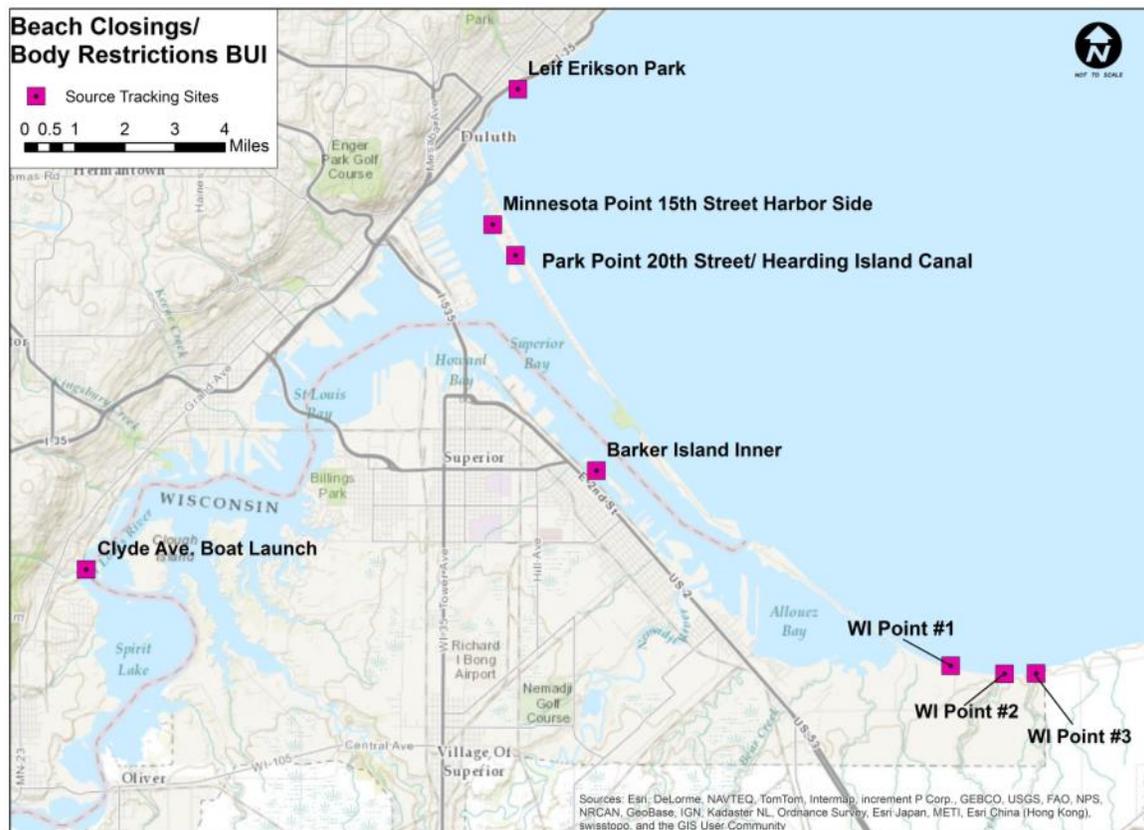
In cases where the water bodies within the AOC are on the list of non-attaining waters due to the presence of chemical contamination (such as at the US Steel or Crawford Creek site), this BUI will be considered restored when significant progress has been made to reduce chemical contamination to allow for the removal of the "No Swimming" or "Warning" signs.

### **BUI 7 Removal Strategy**

The strategy for BUI removal includes five actions listed in Table 10. One action item, 7.05 Koppers Inc. RCRA site, has been added to the BUI removal strategy as an action item. The bacterial source tracking project is underway. The strategy for removal of the Beach Closings and Body Contact Restrictions BUI is as follows:

- Document compliance status of municipal wastewater treatment and MS4 discharge permits within the AOC (action item 7.01).
- For four impaired AOC beaches (Figure 9) as listed on the 2012 Wisconsin 303(d) list (Barker's Island Inner Beach, Wisconsin Point Beach #2) and as proposed to be listed on the 2014 Minnesota 303(d) list (Clyde Avenue, Leif Erickson Park), conduct microbial source tracking to identify whether pathogens are of human origin. Sand and sediment will be included, in addition to water in beach testing, as they can harbor pathogenic populations (to be used for action items 7.02 and 7.03). This project includes beaches within the AOC that have been added to WI and MN 303(d) lists in 2014.

- If pathogens are of a human origin, conduct beach restoration to address human sources.
- If pathogens are not of a human origin, the beach impairment will not be considered an AOC issue.
- Track cleanup progress of US Steel and Crawford Creek sites. Once sufficient progress has been made to remove the “No Swimming” or “Warning” signs at the sites, coordinate sign removal (action item 7.04 and 7.05).



**Figure 9: Beaches to be addressed for BUI 7: Beach Closings and Body Contact Restrictions (updated September 2015)**

## BUI 7 Summary of Key Remedial Actions, Current Status, and Next Actions Needed

Staff are working to compile historic improvements in wastewater and stormwater infrastructure in the AOC. This information, along with permit compliance, will be used to complete action item 7.01. It will be necessary to capture permit compliance until this BUI can be removed (anticipated in 2020).

Design and implementation of Barkers Island beach restoration project 7.02 is awaiting results from the bacterial source tracking action item 7.03. Project design and implementation funding will need to be requested in 2017/secured. Project design is anticipated to begin in 2017 after qPCR results can be reviewed.

~~Year one~~Two years of data collection for bacterial source tracking at impaired beaches, action 7.03, has been completed. Year two e. coli exceedances are being sent to a lab for DNA analysis. Data are being quality checked and a report will be developed after all DNA results are returned. ~~and year two sampling is being adapted to adequately sample suspected sources. qPCR data should be available in early 2016 and~~ will be used to evaluate potential source mitigation at Barkers Island ~~impaired beaches where human pathogen sources are identified.~~ The project timeline has been extended to 2017 to allow for data analysis.

Action item 7.04 has no changes. Stakeholder and community engagement for this project will be coordinated for the “No Swimming” sign removal.

Action item 7.05 ~~has been added in 2015.~~ has no changes. Warning signs posted at Crawford Creek R2R site are considered a Body Contact Restriction within the Area of Concern. Stakeholder and community engagement for this project will be coordinated for the “Warning” sign removal. Adding this action item has moved the anticipated BUI removal date to 2020.

**Table 10: Management Actions Still Needed to Achieve Removal of BUI 7**

Project No.	Project Name	Project Description	In-house/ Contractual	Date to be Completed
7.01	Document Permit Compliance Status	Document compliance status of municipal WWTP and MS4 discharge permits in the AOC.	In-house WDNR and MPCA	<del>2018</del> <u>on-going</u>
7.02	Barkers Island Beach Restoration	Design a beach restoration that addresses the stormwater, trash, debris and sources identified in the sanitary survey.	Contractual	2018
7.03	Conduct Microbial Source Tracking at Impaired Beaches	Conduct microbial source tracking at the four impaired AOC beaches to determine if pathogens are of human origin (i.e. controllable).	Contractual	<del>2016</del> <u>2017</u>
7.04	Track US Steel Superfund Cleanup Process	Track the cleanup process at the US Steel site to determine when the “No Swimming” sign can be removed. Coordinate sign removal.	In-house MPCA	2018
7.05	Track Koppers Inc. RCRA Site Cleanup Process	Track cleanup of contaminated sediment and floodplain soils in Crawford Creek to determine when the “Warning” signs can be removed. Coordinate sign removal.	RP	2020

**Anticipated Timeline to Remove BUI 7**

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
							●					

**BUI 7 Issues Affecting Progress**

One potential issue with this BUI is the addition and removal of beaches within the AOC from the 303(d) lists in MN and WI. Bacterial source tracking project 7.02 was designed for the 2012 303(d) lists and was

adapted for the 2014 303(d) lists. Additional target clarification or change may need to be considered in the future to address the BUI removal target being linked to the 303(d) list.

~~Results from the first year of bacterial source tracking (action item 7.03) will be used to help evaluate the need and design of beach restoration (action item 7.02). At this time, it is anticipated a beach restoration project can be implemented and BUI removal can occur by 2020.~~

If bacterial source tracking shows that pathogens of human origin are impairing beaches within the AOC, additional management actions may be needed to control the sources of human pathogens before BUI removal.

At this time, it is anticipated that cleanup of the US Steel Superfund Site and Crawford Creek will have progressed to justify removal of the “No Swimming” and “Warning” signs by 2020. If the cleanup is delayed or progress has not been made to justify removal of the “No Swimming” or “Warning” signs, BUI removal could be delayed.

Stakeholder engagement will be important when results of the source tracking project are known. The City of Superior will be a critical stakeholder for this BUI relating to the Barkers Island beach restoration project and wastewater and storm sewer permit compliance documentation. Engaging staff from WLSSD will also be important to capture the historic improvements to infrastructure and document compliance.



## BUI 8: Degradation of Aesthetics – BUI Removed

The individual roadmap for BUI 8: Degradation of Aesthetics is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Status
- BUI Actions Implemented to Achieve BUI Removal
- Timeline for BUI Removal

### BUI 8 Rationale for Listing

The rationale for listing the Degradation of Aesthetics BUI included in the Stage I RAP described the aesthetic values of the St. Louis River AOC as impaired at some locations. A systematic collection of qualitative and quantitative data was recommended at that time to determine visual or odiferous locations that are degraded and the sources and types of those degradations (e.g., oil slicks, chemical and tar residues, taconite pellets on shorelines, rotting grain scum on water surface, etc.). Hog Island Inlet and Stryker Bay are two areas that historically had repeated reports of oil, chemical, and tar residues on the water's surface. Complaints were also registered about smells emanating from the sediments and water of Newton Creek and Hog Island Inlet. Shoreline aesthetics were to be addressed separately through actions taken with riparian interests.

### BUI 8 Removal Target

The BUI Removal Target, as established by stakeholders in 2008, is:

*There are no verified persistent occurrences of objectionable properties in the surface waters of the St. Louis River Estuary during the previous five year period. "Persistent occurrences" are defined as objectionable properties that occur more than two times per year and are greater than ten days in duration.*

For the purpose of interpreting the 2008 target, objectionable properties mean a nuisance condition. A nuisance condition is defined as the presence of significant amounts of floating solids, scum, visible oil film, material discoloration, obnoxious odors, deleterious sludge deposits, oil slicks, chemical and tar residues, taconite pellets on shorelines, decomposing grain scum on the water surface, or other offensive or harmful effects.

Removal of the Degradation of Aesthetics BUI will be justified when complaint logs and files for the AOC have been reviewed and compiled, regulations pertaining to aesthetics are documented, and actions to address the oil sheens at the US Steel site are complete.

## **BUI 8 Removal Strategy**

The strategy for BUI removal included five actions listed in Table 11. All actions have been completed, and the BUI was formally removed on August 14, 2014. The public input process included a 15 day comment period, public open house meeting, and press releases from WDNR and MPCA. The final removal package with USEPA approval can be viewed under the impairments tab at <http://dnr.wi.gov/topic/greatlakes/st.louis.html>.

- Review and compile existing complaint logs and files to assess existence of persistent occurrences of objectionable properties in the previous five-year period.
- Demonstrate improvements in federal and state aesthetic regulations through documentation of:
  - Federal vessel discharge regulations and status of upcoming NPDES Vessel General Permit
  - NPDES regulations and discharge permits
  - Water quality standards related to aesthetics
  - Air quality regulations related to air particulates
  - Best management practices (BMPs) to reduce particulates at the ore docks and grain elevators. A comparison of air quality data may be conducted to document improvements in air particulates since AOC listing.
- Control oil sheens at US Steel site. Plans are underway to remove this nuisance by 2014. This BUI can be removed once the oil sheens at US Steel are addressed.
- Prepare a justification document related to the reported odors at Hog Island/Newton Creek remediation site using existing data and reports to verify this site does not pose a human health or ecological risk.  
Meet with the SLRA Board of Directors and any concerned stakeholder groups on the BUI removal strategy. If there is concern about the strategy, additional actions may be necessary

## **BUI 8 Actions Implemented to Achieve BUI Removal**

All actions are complete and the BUI was removed August 14, 2014 (Table 11).

**Table 11: Actions Completed to Achieve Removal of BUI 8**

Project No.	Project Name	Project Description	In-house/ Contractual	Date to be Completed
8.01	Complaint File Review and Compilation	Compile and review logs and complaint files within the AOC to provide information suggesting that there have been no nuisance complaints on aesthetics-related issues greater than ten days in duration and occur more than twice a year.	In-house MPCA and WDNR	2014 Completed
8.02	Documentation of Aesthetics-Related Regulations	Demonstrate improvements in federal and state aesthetic regulation through documentation. This effort may include an evaluation of trends in air particulates over time.	In-house MPCA and WDNR	2014 Completed
8.03	US Steel Site Aesthetics Action	Track progress of oil sheen control.	In-house MPCA	2014 Completed
8.04	Hog Island/Newton Creek Documentation	Prepare a justification document related to the reported odors at Hog Island/Newton Creek remediation site using existing data and reports to verify this site does not pose a human health or ecological risk.	In-house WDNR	2014 Completed
8.05	Present BUI Removal Strategy to Stakeholders	Meet with SLRA Board of Directors to present BUI removal strategy	In-house MPCA and WDNR	2014 Completed

**Anticipated Timeline to Remove BUI 8**

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
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## BUI 9: Loss of Fish and Wildlife Habitat

The individual roadmap for BUI 9: Loss of Fish and Wildlife Habitat is presented below and is organized in the following sections:

- Rationale for Listing
- BUI Removal Target
- BUI Removal Strategy
- BUI Summary of Key Remedial Actions, Current Status, and Next Actions Needed
- Anticipated Timeline for BUI Removal
- Issues Affecting Progress

### BUI 9 Rationale for Listing

At the time of AOC listing, fish and wildlife habitat was threatened by water quality impairment and physical habitat loss. Water quality impairment included inadequately treated municipal and industrial wastes, contaminated sediments, degraded benthic communities, and high sedimentation rates resulting in turbidity. Physical habitat impairment included loss through dredging and filling activities and decline in the quality of wetlands from invasion of non-native vegetation.

### BUI 9 Removal Target

The BUI removal target, as established by stakeholders in 2008, is:

*State resource management agencies concur, in consultation with their federal, tribal, local, and nonprofit partners, that a reasonable amount, as quantified in the benchmarks, of fish and wildlife habitat, given the presence of industrial development in the estuary, that is currently degraded is enhanced, rehabilitated, and protected against further loss of habitat.*

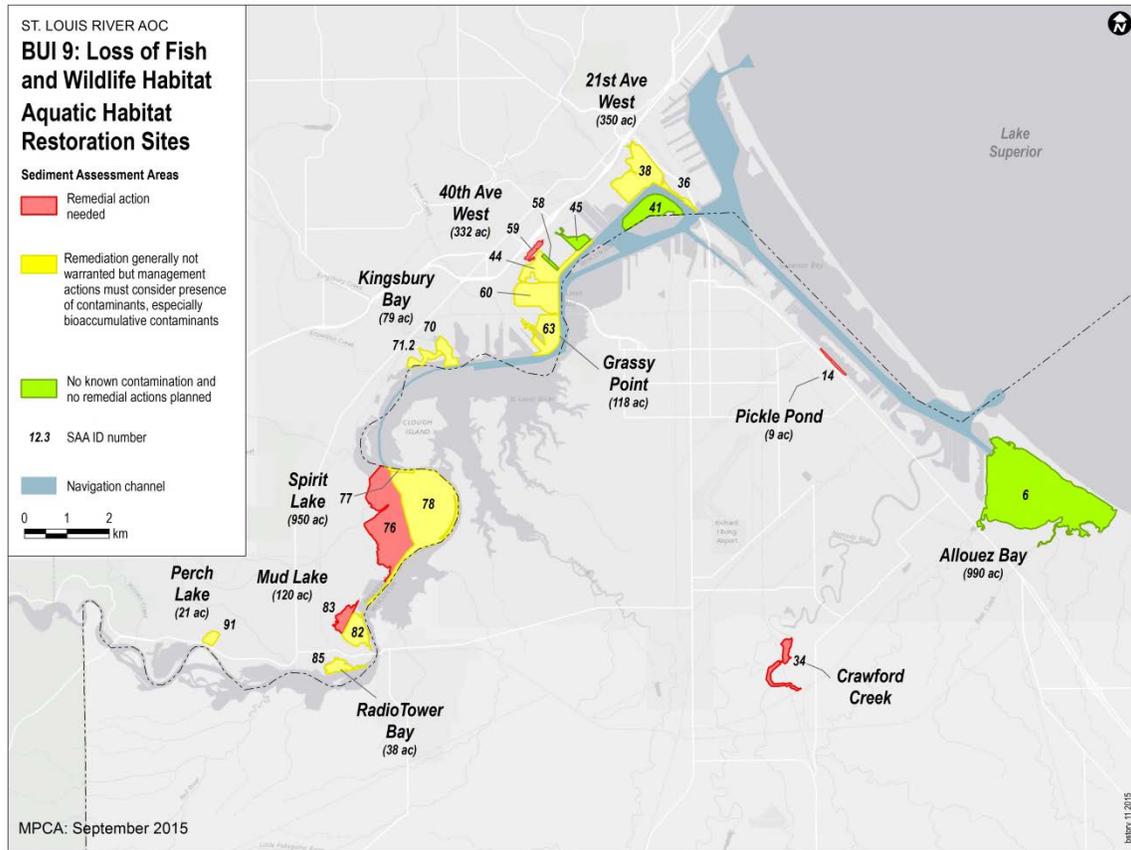
Removal of the Loss of Fish and Wildlife Habitat BUI will be justified when:

1. Remediation of contaminated sediment at identified sites within the AOC has been completed (see BUI #5 Restrictions on Dredging for list of sites).
2. Programs are in place to discourage further proliferation and further introduction of non-native invasive species.
3. At least 50% of known degraded aquatic habitat acreage (1,700 acres) is rehabilitated through implementation of projects in accordance with a restoration site (Figure 10). The number of acres restored will be equivalent to the area of a restoration site, since the restoration work will be designed and constructed with an overall goal to provide for fish and wildlife habitat for the entire site as a whole.
4. Additional aquatic or hydrologically connected habitat throughout the AOC watersheds has been successfully protected and rehabilitated sufficiently to maintain healthy fish and wildlife populations through implementation of projects at prioritized restoration sites (Figure 11).

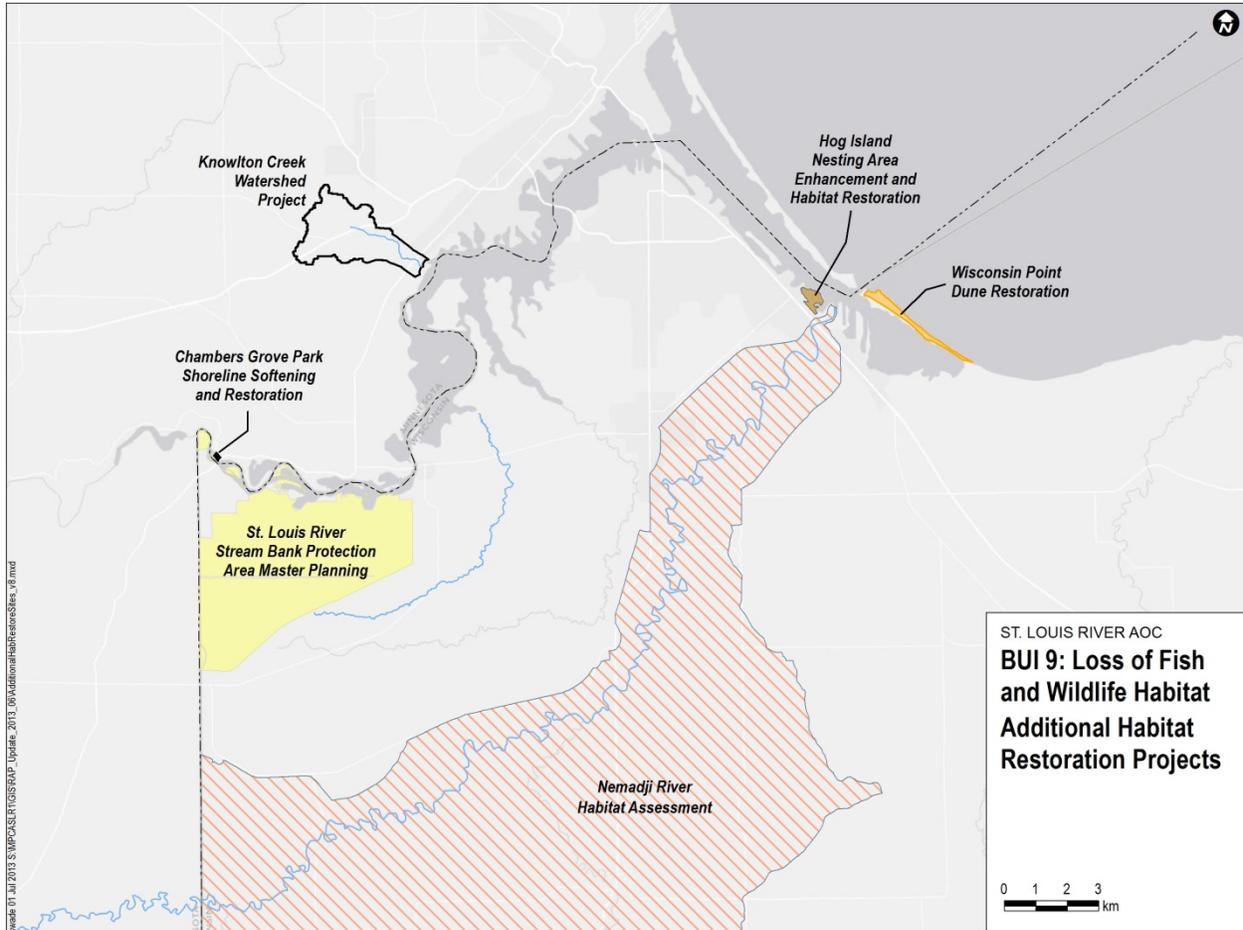
## **BUI 9 Removal Strategy**

The strategy for BUI removal includes 21 actions listed in Table 12. Two actions were completed in 2015: Actions 9.18 and 9.20. All remaining actions are in progress. Anticipated BUI removal date is 2025. The strategy for removal of the Loss of Fish and Wildlife Habitat BUI is as follows:

- Complete remediation of contaminated sediments at prioritized sites. Prioritized sites include those SAAs that are to undergo remediation as listed in the Roadmap for BUI 5: Restrictions on Dredging shown on Figure 8, and the SAAs designated as red and yellow within the prioritized R2R sites listed in Table 11 and as shown in Figure 10. Apply the St. Louis River Area of Concern Remediation to Restoration (R2R) Template (LimnoTech, 2012) at sites within the AOC that are impaired by contaminated sediments and do not have identified responsible parties.
- For the US Steel Superfund site, work cooperatively with the responsible government agencies to complete the remedial process. Integration of AOC and Superfund processes will ensure that restoration and mitigation associated with implementing the selected remedy will also achieve outcomes that are consistent with the AOC Delisting Roadmap and R2R Template. AOC partners have already submitted the Spirit Lake Concept Plan, which will assist with the Superfund decision-making process.
- Provide information that shows that ongoing actions to control invasive species are being implemented in the AOC through the statutory authority of the States of Wisconsin and Minnesota and are reflective of recommendations in the LaMP Lake Superior Aquatic Invasive Species Complete Prevention Plan.
- Complete restoration of aquatic habitat at the prioritized R2R sites listed below in Table 11 and totaling at least 1,700 acres (Figure 10).
- Protect and rehabilitate additional aquatic or hydrologically connected habitat throughout the AOC watersheds to maintain healthy fish and wildlife populations. Completion of the actions at sites listed in Table 11 and shown on Figure 11 will result in achievement of this criterion.



**Figure 10: Aquatic Habitat Restoration Sites for BUI 9: Loss of Fish and Wildlife Habitat and BUI 4: Degradation of Benthos (Revised September 2015)**



**Figure 11: Hydrologically Connected Habitat Restoration Sites for  
BUI 9: Loss of Fish and Wildlife Habitat**

## BUI 9 Summary of Key Remedial Actions, Current Status, and Next Actions Needed

The actions needed to complete the BUI removal strategy given above are listed in the Table 12. A column describing project status and notes has been added to document progress in RAP updates.

**Table 12: Actions Still Needed to Achieve Removal of BUI 9**

Project No.	Project Name*	Project Description	In-house/ Contractual	Date to be Completed	Project Status and Notes
9.01	Spirit Lake (Worksheet 2-7; SAAs 76, 77, 78)	Remediate contaminated sediments and restore emergent wetlands	Contractual	2020	<p><u>REMEDATION: USEPA and US Steel in partnership with USEPA and stakeholders plans to have a preliminary design by June 2017, with final design by end of 2017.</u></p> <p><u>RESTORATION: Both Spirit and Mud Lake areas will be evaluated using existing site data to determine current condition. The proposed remediation design features will be evaluated using existing biological models to determine expected conditions based on comparisons to AOC-wide restoration targets. These comparisons will help inform where further restoration activities are needed.</u></p>
9.02	40th Avenue West R2R Project (Worksheet 2-9; SAAs 44, 45, 58, 59, 60)	Remediate contaminated sediments and restore habitat	Contractual	2020	<p><u>Evaluating BUI metrics, along with final engineering design and permitting underway. On track to have design and environmental review complete by Jan 2017. Permit applications underway.</u></p>
9.03	Radio Tower Bay (Worksheet 2-11; SAA 85)	Remove non-native material and restore optimum bathymetry	Contractual	<del>2016</del> Complete	<p><u>Under construction. Completion by 2016. Construction completed.</u></p>
9.04	Grassy Point Restoration (Worksheet 2-27; SAA 63)	Remove non-native material and restore optimum bathymetry	Contractual	201 <del>9</del> 8	<p><u>MNDNR implementing design and environmental review with Kingsbury in 2017. Evaluating BUI metrics, along with final engineering design and permitting underway.</u></p>
9.05	21st Avenue West R2R Project (Worksheet 2-28; 36, 38, 41)	Remediate contaminated sediments and restore habitat.	Contractual	2018	<p><u>Placement to 21<sup>st</sup> Ave design specifications completed at the Embayment and WLSSD flats. Contract to complete design features at Interstate Flats will conclude July 2017. Engineering plans and specifications completed, permitting in process completed, and construction underway in 2016.</u></p>

Project No.	Project Name*	Project Description	In-house/ Contractual	Date to be Completed	Project Status and Notes
9.06	Kingsbury Bay Restoration (Worksheet 2-31; SAA 70, 71.2)	Restore wetland complex at the mouth of Kingsbury Creek to pre-1961 condition	Contractual	201 <del>9</del> <sup>8</sup>	<a href="#">MNDNR implementing design and environmental review with Grassy Point in 2017</a>
9.07	Knowlton Creek Watershed Project (Worksheet 8-1)	Reduce runoff and sediment transport within watershed and restore cold-water stream habitat	Contractual	2016	Construction <a href="#">Underway to be completed late 2016</a>
9.08	Mud Lake (Worksheets 2-8 and 2-26; SAAs 82, 83)	Remediate contaminated sediments, establish more vital hydrologic connection and restore wetland habitat including wild rice; establish deep water	Contractual	2020	<a href="#">REMEDATION: Feasibility study completed in SFY16, preferred alternative to be selected by August 2017 and site design scheduled to begin through MPCA USACE RAP PA in September, 2017</a> <a href="#">RESTORATION: Both Spirit and Mud Lake area will be evaluated using existing site data to determine current condition. The proposed remediation design features will be evaluated using existing biological models to determine expected conditions based on comparisons to AOC-wide restoration targets. These comparisons will help inform where further restoration activities are needed.</a>
9.09	Perch Lake (Worksheet 2-12; SAA 91)	Revitalize biological connection between estuary and Perch Lake and restore optimum bathymetry	Contractual	2018	<a href="#">MNDNR implementing design and environmental review.</a>
9.10	Chambers Grove Park	Soften and restore shoreline in City of Duluth park	Contractual	2016	Completed
9.11	Allouez Bay (Worksheets 1-2, 1-3, 2-24, SAA 6)	Vegetation restoration including removal of AIS and re-establishment of wild rice. Upstream sediment control outreach.	County, City, LSRI, FDL, GLIFWC, WDNR	2017	Douglas Co. implementing this project. Wild Rice seeded in 2015 <a href="#">and 2016</a> . Sediment control not included in this project. <a href="#">Invasive species control in 2017.</a>
9.12	Crawford Creek Habitat Restoration (SAA 34)	Remediate contaminated sediments and restore habitat within stream, wetland, and floodplain	Contractual	2020	USEPA contracted site characterization in 2014. <a href="#">Project partners continue discussions with RP.</a>

Project No.	Project Name*	Project Description	In-house/ Contractual	Date to be Completed	Project Status and Notes
9.13	Nemadji River Watershed (Worksheets 1-3, 2-24, 9-1)	Conduct habitat assessment and evaluation to determine priority locations for conifer restoration, land protection, and AIS control.	County, City, NERR, WWLT, LSRI, WDNR	2017	Funded and underway. <a href="#">Lidar completed in 2016. Habitat assessment underway.</a>
9.14	Pickle Pond (SAA 14)	Habitat enhancement as warranted by R2R evaluation	Contractual	2018	<a href="#">Feasibility Study completed</a> by USFWS. <a href="#">Project partners will begin design in 2017. Design will need to be funded and contracted in 2016.</a>
9.15	Wisconsin Point Dune Restoration (Worksheets 2-1, 2-2, 2-3)	Development of appropriate public access infrastructure to protect dunes and conduct dune restoration and invasive species control.	Contractual	2018	NOAA <a href="#">received</a> partial project funding in 2016. <a href="#">Partners are working to implement the project in 2017.</a> NOAA has requested 2017 funding to complete this project.
9.16	Hog Island (Worksheet 2-16)	Nesting area enhancement, habitat restoration	In-house WDNR, County	<del>2018</del> 2020	Project on hold until results from estuary wide bird survey are known <a href="#">and avian species team meets.</a>
9.17	Fish Passage Culverts (Worksheet 12-2)	Replace or retrofit a minimum of two perched culverts to allow for fish passage and other aquatic organism passage.	Contractual	2018	Stream crossing assessment and project design on WI side of AOC is a <a href="#">2016 funding request underway. Design in 2017 and implement in 2018.</a>
9.18	Wisconsin Habitat Protection & Rehabilitation	Document existing WI habitat protection and rehabilitation projects since 1989 AOC designation and prepare a map(s) showing locations of these projects.	In-house WDNR	Completed	Action complete. Initial document finished in 2015 with updates as needed until BUI removal.
9.19	St Louis River Stream Bank Protection Area	Initiate WDNR master planning including natural and undisturbed ecosystem management plan for islands and bays.	In-house WDNR	<del>2016</del> On-going as state planning can proceed	NERR completed regional and property analysis. WDNR will conduct master planning based on statewide priority. NOAA requested 2017 funding for this project.

Project No.	Project Name*	Project Description	In-house/ Contractual	Date to be Completed	Project Status and Notes
9.20	Document actions taken to control invasive species	Document the appropriate area-specific plans relative to invasive species control in the AOC and incorporate it into an information tool to provide a joint MN/WI view of the ongoing invasive species control efforts. Distribute the information to help provide for efficient and expedited efforts in the AOC	In-house WDNR and MNDNR	Completed	This action was completed by WDNR Habitat Coordinator. Report is included with project 9.18. Documentation of project completion will be ongoing.
9.21	Wild Rice Plan and Associated Restoration Sites	Develop a plan that identifies the high priority restoration sites and provides a process for restoring those sites. Restoration of 275 acres of wild rice.	Contractual	2019	Plan has been completed in 2014. <del>121-216</del> acres seeded <del>in-as of 2015</del> 2016.

\*Note: Where given, "worksheet" and number refer to the Lower St. Louis River Habitat Plan Appendix 9 Implementation Strategies Worksheet number (SLRA, 2011); SAA refers to the sediment assessment areas addressed with the listed project (see Appendix G for SAA location maps).

### Anticipated Timeline to Remove BUI 9

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
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### BUI 9 Issues Affecting Progress

At this time there are no issues affecting the projected removal of the BUI in 2025.

Stakeholder engagement is being pursued through each Restoration Site Team. As part of the communication plan developed with the 2013 RAP, each restoration site has a Restoration Site Team that includes partners and stakeholders involved in the technical aspects of the project design and implementation process. These teams are led and coordinated by agency staff and other stakeholders are updated and brought in to the team as needed.

# Section 5: St. Louis River AOC Management and Decision-Making Framework

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Management of the St. Louis River AOC is complex not only because of its large size and large number of BUIs, but also because of the numerous partner agencies involved in decision-making, funding, contracting, and project management. To implement this RAP Update, a coordinated management and decision-making plan that outlines the roles and responsibilities of the partner agencies is needed. This section presents an overview of the management and decision-making framework that is in development for the St. Louis River AOC.

## Partner Agencies and Organizations

The management and decision-making framework for the St. Louis River AOC will build on the complex agency involvement process that was developed first for the RAP Update process as the AOC moves into site-specific and AOC-wide on-the-ground projects, a variety of groups and resources will need to be engaged at different stages. The roles and responsibilities of each group will be further defined as this management and decision-making framework is finalized.

The following groups are responsible for implementing actions for this RAP Update:

**Interagency Manager's Team** - MPCA and WDNR are the state agencies responsible for implementing the AOC program, including reviewing, approving and submitting BUI removal and SLRAOC delisting requests, and reporting to U.S. EPA. Managers from these two agencies make up the Interagency Manager's Team and will coordinate outcomes and progress with the U.S. EPA.

**Leadership Team** - In Minnesota, MNDNR is a sister agency to the MPCA with responsibilities for fish and wildlife population management, invasive species control, and habitat restoration, protection, and management. The AOC Leadership Team includes leaders from MPCA, WDNR, and MNDNR.

**AOC Coordinator Team** – The AOC Coordinator Team includes a representative from MPCA, WDNR, MNDNR, and FDL. While FDL does not have regulatory obligations associated with the AOC, they are a key stakeholder and partner in implementing restoration and action items.

**Site Teams** – Site teams will be formed with the partners, expertise, and skills necessary to manage and implement projects at remediation and/or restoration sites. Site teams may include people from each of the teams/agencies listed here as well as other

stakeholder organizations (i.e., property owners, researchers). Different people may be involved in different phases of projects occurring at the site.

**St. Louis River Alliance (SLRA)** – The SLRA, an independent 501(c)(3) organization, is the citizen’s advisory committee for the AOC. They are an important partner in AOC outreach, education, and communication efforts.

**Partner Agencies** – The federal agencies of the USACE, U.S. EPA, USFWS, and NOAA are current partners in the AOC RAP process. These agencies provide funding for BUI action items, technical expertise, implement and manage contractual work, and in some cases provide in-house services to implement projects.

**Stakeholder Groups** – Stakeholders involved in the implementation of the RAP Update include the Harbor Technical Advisory Committee, local units of government (e.g., Duluth, Superior), nongovernmental organizations (e.g., SLRA, Minnesota Land Trust), and research institutions (e.g., UMD, UWS, NRRI, U.S. EPA-MED). These partners provide technical feedback related to data collection and analysis. In addition, they provide important collaboration related to funding, outreach, and project support.



## State Agency Coordination and Management

In order to enable MPCA and WDNR to effectively carry out the responsibility for implementing the AOC program, AOC coordinators and leaders have agreed that maintenance of a centralized method of information gathering and communication connected to these agencies is essential. Complex external partnerships may in some cases involve the development of more detailed communications plans

related to specific spheres of responsibility, but these will be connected to the locally based process and developed in coordination with the implementing agencies.

The AOC coordinators forum has served to date as a key point of contact and this group will continue to meet monthly to:

- Discuss overall AOC-related issues;
- Stay informed of project progress and issues on a site-by-site basis; and
- Direct challenges and concerns to state agency leaders for their bi-monthly meetings or sooner if the need arises.

Meeting coordination, which includes scheduling, agenda develop, and preparation and distribution of meeting minutes, will rotate through the AOC Coordinators month to month.

State agency leaders will meet formally every two months or quarterly to:

- Review monthly meeting minutes from the AOC coordinators and hear from other project managers;
- Address and resolve challenges and concerns;
- Evaluate policy implications and identify strategic opportunities;
- Ensure appropriate allocation of financial and human resources; and
- Document and distribute meeting decisions to AOC coordinators and others as necessary.

Meeting coordination, which includes scheduling, agenda development, and preparation and distribution of meeting minutes, will alternate among the RAP implementing agencies (MPCA, WDNR).

## **Community Involvement and Outreach/Education**

The SLRA currently provides community involvement and outreach/education opportunities through its regular programming, as well as for specific projects they are involved with in the AOC. For the RAP process, MPCA and WDNR will work with partners to develop a community involvement and outreach/education plan specifically for the elements included in this RAP Update. An important aspect of this plan will be a process to ensure dissemination of coordinated, accurate, timely and consistent messaging reflective of the shared vision this document represents and of progress toward achieving identified goals.

An annual stakeholder input opportunity will be announced when AOC coordinators and leadership have amended the RAP. A draft version will be available for input before changes are made final.

## **Adaptive Management**

The BUI removal strategies and actions still needed to achieve removal contained in the Roadmap (Section 4) were developed based on the current body of knowledge for each BUI. A number of ongoing

sampling efforts, studies, modeling efforts, and other assessments will provide valuable information for the AOC in the coming months and years. AOC coordinators and leaders recognize the importance of putting forth a comprehensive plan for delisting the AOC while still acknowledging the value and need to incorporate new information as it becomes available.

The Roadmap is considered a plan developed based on the principles of adaptive management: it puts forth a solid set of actions to be implemented now and will be updated to incorporate new information and lessons learned as the RAP moves forward. At this time, AOC leaders have agreed that AOC coordinators will prepare an updated Roadmap once per year for the purpose of officially documenting progress and updates to the St. Louis River AOC RAP. The draft plan will be reviewed and revised as necessary by the state agency leaders and, upon approval, will be sent to the U.S. EPA as an official RAP Update. The most recent RAP will be titled with the year it was produced.

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## Section 6: 2016 BUI Technical Teams

BUI technical teams provide expertise and recommendations to AOC staff and leaders on BUI goals, removal strategies, and the scientific interpretation of the BUI status. BUI technical teams were originally formed during the RAP 2013 process. Since then, these teams have changed depending on technical expertise and interest. The BUI Leaders manage these teams and call them as needed for their feedback on particular BUI actions. Core team members are listed here; however these teams are not exclusive and other experts may be invited as needed.

### Fish Consumption Advisories: Matt Steiger and Diane Desotelle

<u>Nancy Schuldt</u>	<u>Fond du Lac Band</u>
<u>Patricia McCann</u>	<u>Minnesota Department of Health</u>
<u>Ling Shen</u>	<u>Minnesota Department of Natural Resources</u>
<u>Donalea Dinsmore</u>	<u>Wisconsin Department of Natural Resources</u>
<u>Joel Hoffman</u>	<u>US Environmental Protection Agency</u>
<u>Bruce Monson</u>	<u>Minnesota Pollution Control Agency</u>
<u>Amy Mucha</u>	<u>US Environmental Protection Agency</u>
<u>Dave Krabbenhoft</u>	<u>US Geological Survey</u>

### Degraded Fish and Wildlife Populations (three species teams): John Lindgren, Rick Gitar and Matt Steiger

#### Avian Species Team: Lead TBD

<u>Rick Gitar</u>	<u>Fond du Lac Band</u>
<u>Sumner Mateson</u>	<u>Wisconsin Department of Natural Resources</u>
<u>Annie Bracie</u>	<u>UMN Natural Resources Research Institute</u>
<u>Gerald Niemi</u>	<u>UMN Natural Resources Research Institute</u>
<u>Steve Choy</u>	<u>US Fish and Wildlife Service</u>
<u>Fred Strand</u>	<u>retired avian expert</u>
<u>Martha Minchak</u>	<u>Minnesota Department of Natural Resources</u>
<u>Kris Eilers</u>	<u>St. Louis River Alliance</u>

#### Fish Species Team: John Lindgren

<u>Brian Borkholder</u>	<u>Fond du Lac Band</u>
<u>Paul Piszczek</u>	<u>Wisconsin Department of Natural Resources</u>
<u>Joel Hoffman</u>	<u>US Environmental Protection Agency</u>
<u>Deserae Hendrickson</u>	<u>Minnesota Department of Natural Resources</u>
<u>Chris Kavanaugh</u>	<u>Minnesota Department of Natural Resources</u>
<u>Darren Vogt</u>	<u>1854 Treaty Authority</u>
<u>Gary Czynski</u>	<u>US Fish and Wildlife Service</u>

**Mammal Team: Rick Gitar**

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A tech team has not been identified for this BUI.

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