

REMEDIAL ACTION PLAN UPDATE
for the
ST. LOUIS RIVER AREA OF CONCERN



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Wisconsin Department of Natural Resources
Office of the Great Lakes

**Remedial Action Plan Update
for the
St. Louis River Area of Concern**

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Disclaimer

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

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

EXECUTIVE SUMMARY

This Remedial Action Plan (RAP) Update is an interim document that has been produced by the Wisconsin Department of Natural Resources (WDNR), with input from Area of Concern (AOC) partners, to assist in providing direction in the short-term for overall statewide AOC coordination in Wisconsin.

The St. Louis River AOC is a bi-state AOC shared by Minnesota and Wisconsin. Staff from each state's natural resource agencies (WDNR, MPCA, and MDNR), along with representatives of the Fond du Lac Tribe and other partners, are working together to identify the actions needed to address the beneficial use impairments (BUIs). States' efforts in the AOC are assisted by the St. Louis River Alliance.

Minnesota obtained Great Lakes Restoration Initiative (GLRI) funding to support the development of an "Implementation Framework for Delisting the St. Louis River Area of Concern." The deliverable for the Implementation Framework project is a complete Stage 2 RAP that is supported by stakeholders. The Implementation Framework project is underway and has provided a helpful means of coordinating the efforts of AOC partners. The final Stage 2 RAP that results from this project is expected to be completed in 2013.

Beneficial Use Impairment Teams led by the St. Louis River AOC Coordinators and the St. Louis River Alliance created nine BUI Blueprints during winter 2011 and spring 2012. These Blueprints consist of background information on each BUI, actions that count toward removal of the BUI that have been taken since listing, data available for current conditions, and recommendations for priority actions that will lead toward removal of each BUI. Five site conceptual plans were also completed by the project contractor, LimnoTech, with input from the AOC Coordinators. The next phase of the Implementation Framework project is to create "removal packets" for each BUI. The packets will outline the information that is needed to remove the impairment, and identify where that information is available and where it is missing.

Even though a final bi-state Stage 2 RAP is not yet available, AOC partners agree that remediation of contaminated sediments continues to be a high priority for delisting the AOC. Updating and maintaining the existing sediment database will be necessary to prioritize and design projects. Wisconsin and Minnesota are working jointly on the database issue. A joint state Sediment Database Team began meeting in November 2011 to create an up-to-date sediment quality database for the AOC. Several new large sets of sediment data come from the Minnesota Pollution Control Agency (MPCA) recent sediment assessments, and WDNR sediment assessments in 2010. While a number of projects within contaminated slips may require remediation, other sites may require habitat restoration (aquatic habitat shoreline and bathymetry, marine debris removal), and other sites will be chosen for remediation to restoration (R2R).

Also in 2012, biological assessment of several R2R sites was completed, and Radio Tower Bay restoration Phase I removed several hundred old railroad trestle pilings. The piping plover habitat project reported the presence of adult plovers, but no nesting. The Clough Island restoration project began work. WDNR and MPCA cooperatively funded a project to sample "reference" sites for benthic community data in support of the Degradation of Benthos BUI. Staff from WDNR and MPCA participated in bimonthly conference calls on database and data system development, and GLRI funding to MPCA has resulted in the procurement of a consultant to facilitate this work. WDNR received funding from the U.S. Environmental Protection Agency's (USEPA's) Great Lakes National Program Office (GLNPO) for an AOC Habitat Coordinator to accelerate progress on the *Loss of Fish and Wildlife Habitat* BUI in Wisconsin. Also, extreme flooding in June 2012 caused bank erosion, and washed out culverts and bridges all along the river.

The focus areas for Wisconsin's St. Louis River AOC Coordinator in 2013 are expected to be as follows:

- Participating in appropriate Implementation Framework workgroups;
- Participating in the Sediment Database Team to produce a coordinated bi-state ability within the AOC to analyze and interpret data;
- Participating in site characterization and prioritization based on compilation of all current sediment data;
- Reviewing new information and assessing the implications of recent data for the AOC;
- Participating in site-specific project planning within the AOC; and,
- Assisting with technical expertise on contracts executed by the Wisconsin and Minnesota AOC Coordinators to address the following: a) Fish Tumor and Deformity assessment; b) SLRAOC Data System development; c) Interagency Leadership Group and Implementation Team; d) SLRAOC Sediment Technical Team work on a sediment contamination assessment; e) Sediment/Biotic Relationship Assessment; and f) Habitat rehabilitation/protection projects. These are all issues for which USEPA GLNPO awarded funding to the St. Louis River AOC.

Stakeholder engagement has been and will continue to be a priority for the AOC. The St. Louis River Alliance is an important partner for engaging the community in learning about and advocating for improvements to the river.

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List of Acronyms

AOC	Area of Concern
BUI	Beneficial use impairment
GLNPO	Great Lakes National Program Office
GLRI	Great Lakes Restoration Initiative
MDNR	Minnesota Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
R2R	Remediation to Restoration
RAP	Remedial Action Plan
SLRA	St. Louis River Alliance
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WDNR	Wisconsin Department of Natural Resources
WLSSD	Western Lake Superior Sanitary District

DEFINITIONS

Area of Concern (AOC)

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

Beneficial Use Impairment (BUI)

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

Delisting Target

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

Escherichia coli (E. coli)

A bacterium commonly found in natural bodies of water that serves as an indicator of the possible presence of other health risks in the water, such as bacteria, viruses, and other organisms.

Goal

Goals are broad ideas that may take a long time to achieve. They usually don’t change significantly over the life of a project. An example goal statement is, “*Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.*” The delisting targets for the impairments may also be considered the goal statements (in some cases they may be objectives).

Objective

Objectives are the detailed activities that are needed in order to meet goals. Objectives are normally accomplished in less time than goals. They are important because they provide a means of measuring progress toward plan implementation. Objectives should be SMART: Specific, Measurable, Achievable, Realistic, Time-Constrained.

Remedial Action Plan (RAP)

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

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

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

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 finally becoming the Alliance in 2009.

Total Maximum Daily Load (TMDL)

A TMDL is the amount of a pollutant a waterbody can receive and still meet water quality standards. It can be thought of as a pollution "budget" for a water body or watershed that establishes the pollutant reduction needed from each pollutant source to meet water quality goals.

PURPOSE STATEMENT

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

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

This Remedial Action Plan Update is an interim document that has been produced by the Wisconsin Department of Natural Resources, with input from Area of Concern partners, to assist in providing direction in the short-term for overall statewide Area of Concern coordination in Wisconsin. It builds on the 2011 RAP Update and is intended to be a concise summary of beneficial use impairment status and specific actions that will be important for reaching the delisting targets. "Actions" may include on-the-ground restoration projects, monitoring and assessment projects, and stakeholder engagement processes.

INTRODUCTION

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

The St. Louis River AOC is one of five Areas of Concern in Wisconsin (Figure 1). It includes the lower St. Louis River, the Nemadji River watershed and a portion of the southwest tip of Lake Superior. The St. Louis River begins at its headwaters in northeastern Minnesota, near Seven Bear Lake. The river flows south and east, and winds through clays and glacial deposits for nearly 100 miles, also running along the northern boundary of the Fond du Lac Reservation. Near the City of Thomson the channel narrows, and the river flows through a rocky rapid-filled gorge before curving to the northeast and widening into an estuary. The river channel in this area marks the Minnesota/Wisconsin state border and separates the cities of Duluth, Minnesota, and Superior, Wisconsin. From below the south western area of Duluth to its outlet at Lake Superior, the Lower St. Louis River is a 12,000-acre freshwater estuary. The lower estuary, protected from the waves of Lake Superior by a baymouth sand bar, was dredged to create the largest industrial port on the Great Lakes. The Nemadji River begins in Pine County, Minnesota, and runs 65 miles to its mouth at the St. Louis River in Superior Bay.

The St. Louis River is the second largest tributary to Lake Superior. The watershed consists of 3,634 square miles in northeastern Minnesota and 263 square miles in northwestern Wisconsin. The morphology of the St. Louis River drainage basin could be characterized as diverse. From its source at Seven Beaver Lake, the river flows in a southwesterly direction 179 miles to the estuary near Lake Superior. As the river approaches Duluth and Superior, it takes on the characteristics of a freshwater estuary. This approximately 12,000-acre estuary is characterized by numerous backwater areas and bays, as well as islands. Parts of the upper estuary are almost wilderness-like. The lower estuary is flanked by a number of industrial users interspersed with vacant or undeveloped tracts (RAP, 1992).

The history of the development of the Duluth-Superior area is well documented in the early Remedial Action Plan (RAP) documents. The shallow, natural harbor was dredged to accommodate shipping, the Duluth entrance was constructed in 1871 to provide an alternative entrance to the original Superior entrance. Logging changed the area as well, it is estimated that there were between 50 and 100 dams along the St. Louis River during the 1800s to serve the logging industry. Iron, ship building, and the grain trade were major industries in the 1880s. Other industries included brewing, railway cars, gas light fueled by acetylene, ice boxes and refrigerators, flax, shoes, cigars and cigarettes, and coke from Lake Erie coal. Superior became a major petroleum refining site. Duluth-Superior is now a regional hub for a variety of transportation modes; highway, rail, pipeline, air and waterborne shipping.

The AOC was listed due to beneficial use impairments (BUIs) related to historic habitat degradation and sediment contamination as well as water quality issues related to excess sediment and nutrient inputs. These sources of impairment led to designation of nine (of the possible fourteen) BUIs. St. Louis River AOC impairments and sources are summarized in Table 1. Impairment status is summarized in Table 2.

The majority of the BUIs for the St. Louis River AOC are tied to historic habitat loss from the extensive filling of wetlands and dredging of shallow aquatic habitat, and to releases of harmful chemicals that contaminated the sediments and water in the estuary. Since 1861, nearly 3,000 acres of wetlands have been filled, and 4,000 acres have been dredged or deepened for navigation (Lower St. Louis River Habitat Plan, p. 15). 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. Evidently, from analyses of river and harbor sediments, water samples, and soils, waste management was not a major concern. It has been established that a number of firms discharged directly and indirectly into the river or bay. The AOC also contains several sites that have been known historically to contain hazardous wastes and chemical contaminants.

Several of these contaminated sites are being addressed by regulatory and resource management programs for the states of Wisconsin and Minnesota, or federal programs. Three contaminated sites in the AOC have been or are being addressed by these programs, including the former site of Koppers Company Superior Plant and Hog Island Inlet/Newton Creek on the Wisconsin side, and the Superfund site of St. Louis River Interlake Duluth Tar (SLRIDT) and U.S. Steel Duluth Works on the Minnesota side.

Major improvements in water quality in the St. Louis River occurred in the early 1980s after improvements in wastewater treatment. More recent projects add to that improvement. The Cities of Superior and Duluth have done substantial work on stormwater overflow control. Sediment quality assessments are being carried out by both Wisconsin and Minnesota, with joint efforts at data management and database maintenance. Wisconsin has begun a ballast water program and several counties have aquatic invasive species coordinators to work on public education for prevention of the spread of aquatic invasive species. Both States manage beach monitoring programs. The Wisconsin Department of Natural Resources (WDNR), Minnesota Department of Natural Resources (MDNR), and the Fond du Lac Tribal Water Resources program cooperated under a U.S. Fish and Wildlife Service (USFWS) and U.S. Geological Survey (USGS) project in 2011 to collect 200 white suckers for analysis for neoplasms (data results pending). Habitat protection measures taken include the State of Wisconsin's creation of the St. Louis River Streambank Protection Area in 1995; the purchase of Clough Island in 2010 as a State Conservation Area; and Douglas County's restoration of Hog Island project. MDNR and the Minnesota Pollution Control Agency (MPCA) are working on remediation to restoration (R2R) projects with input from the WDNR, Fond du Lac Tribal staff, and other partners.

Today, priorities for delisting the AOC include continued remediation of contaminated sediments. Update and maintenance of the existing sediment database to prioritize and design remediation projects began in late 2011. Wisconsin and Minnesota are working jointly on the database issue. While a number of projects within contaminated slips may require remediation, other sites may require habitat restoration (aquatic habitat shoreline and bathymetry, marine debris removal), and other sites will be chosen for remediation to restoration.

In 2012, several projects were underway in Minnesota for R2R assessments (40th Ave W, 21st Ave W), while Wisconsin procured USFWS Contaminant program funding for assessment of the Pickle Pond. Several hundred pilings were removed from Radio Tower Bay, through a grant to MDNR from the National Oceanic and Atmospheric Administration (NOAA) Marine Debris Removal Program. Restoration activities on Clough Island are beginning. Four piping plovers were spotted on the Wisconsin Point Plover Habitat Restoration site. The Implementation Framework project has produced nine BUI Blueprints, and five site conceptual plans for R2R projects in both Minnesota and Wisconsin. The next phase of the Implementation Framework project is to create "removal packets" for each BUI. The packets will outline

the information that is needed to remove the impairment, and identify where that information is available and where it is missing.

Stakeholder Engagement

The two States, Wisconsin and Minnesota, which share this AOC have a long history of working together and with other stakeholders in the creation of the RAP documents and the 2008 Targets. In 2011 and 2012, WDNR, MDNR, MPCA and Fond du Lac Water Resources staff cooperated within the Minnesota Implementation Framework grant project to gather technical expertise and public participation for the creation of BUI Blueprints. These blueprints created measurable indicators and recommended actions and milestones leading to the removal of each BUI. These efforts have been facilitated by the St. Louis River Alliance, which has a mission to work with others to protect, restore and enhance the St. Louis River. The environmental firm LimnoTech has been contracted through the MPCA grant to assist in this effort. The Table of Contents for the Stage 2 RAP that will result from the Implementation Framework project is attached as Appendix A.

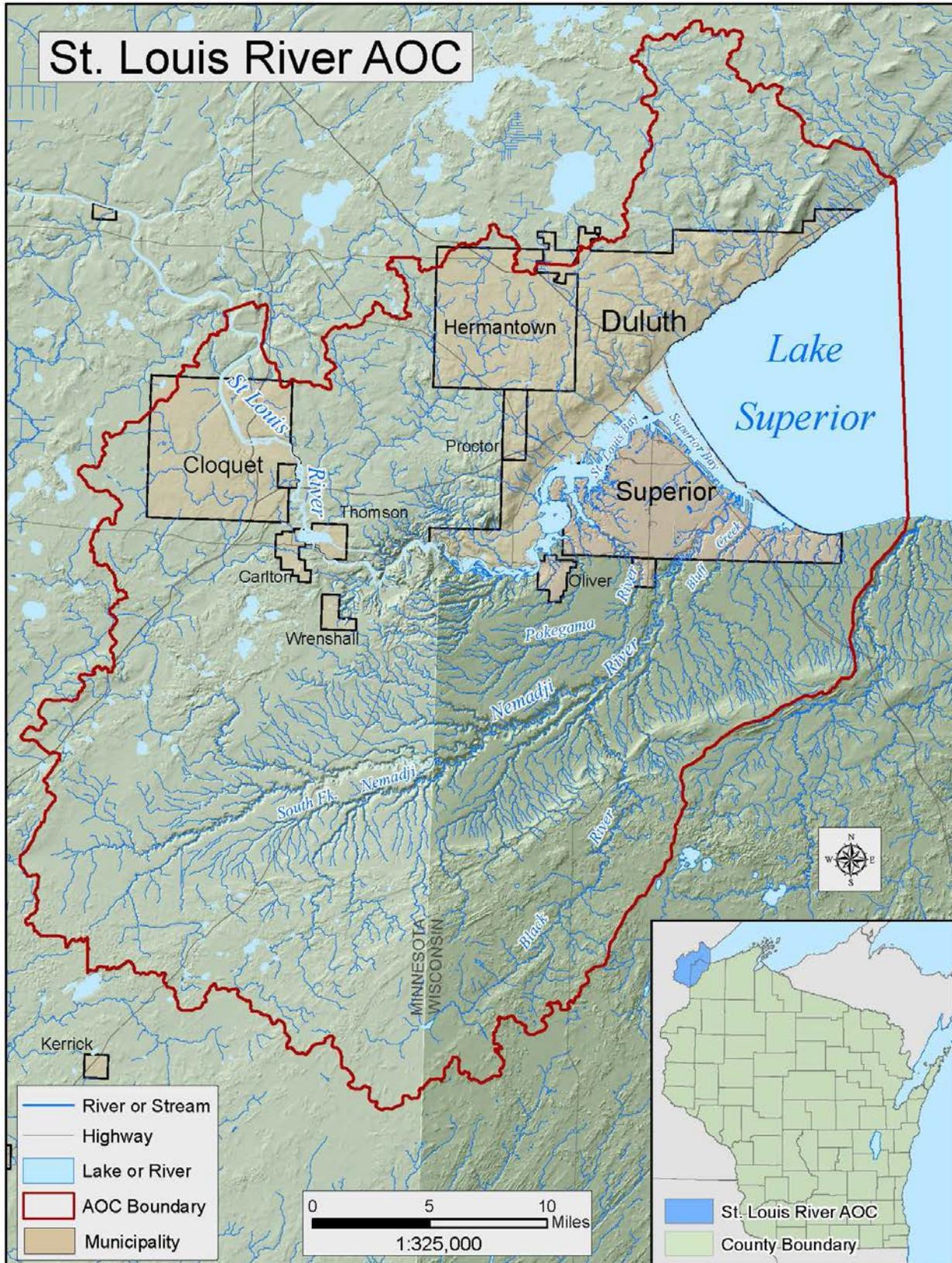


Figure 1. The boundaries of the St. Louis River Area of Concern

Table 1. St. Louis River Area of Concern Beneficial Use Impairments Summary

Impaired Beneficial Use	Physical Habitat alteration	Legacy Sediment Contamination	Nonpoint Source Pollution	Point Source Pollution
Fish Consumption Advisories		X	X	X
Degraded Fish and Wildlife Populations	X	X		
Fish Tumors and Other Deformities		X		X
Degradation of Benthos	X	X	X	X
Restrictions on Dredging		X		
Excessive Loading of Nutrients and Sediments			X	X
Beach Closings/Recreational Restrictions		X	X	X
Degradation of Aesthetics		X	X	X
Loss of Fish and Wildlife Habitat	X	X		

Table 2. St. Louis River Area of Concern Beneficial Use Impairment Status Summary (refer to Appendix B for more detail)

Beneficial Use Impairment	Beneficial Use Remains Impaired	Summary of Status and Next Steps
Fish Consumption Advisories	Yes	WI and MN regularly sample fish tissue and issue advisories; Compile current and historic fish tissue data and compare to surrounding areas. Preliminary comparison of data from northeast MN to the St. Louis River was completed, next step is to utilize data from WI as well.
Degraded Fish and Wildlife Populations	Yes	Fish populations have seen improvements including the sturgeon. There is no consolidated data on wildlife populations, therefore a next step is to compile and review current status data (to begin in Winter 2012/2013).
Fish Tumors and Deformities	Yes	200 white suckers sampled in Spring 2011, awaiting data (expected to be available winter 2012); analyze and interpret data. Funding accessed for second round of sampling in 2013.
Degradation of Benthos	Yes	Several contaminated sites have been remediated, habitat restoration on-going. Large scale sediment assessments have been completed on the WI and MN sides of the River. Remaining contaminated sediments must be addressed prior to removing this BUI. Reference locations sampled for benthic community in the St. Louis River, June 2012, awaiting final identification data.
Restrictions on Dredging	Yes	Several contaminated sites have been remediated; a major portion of the estuary has been sampled for contaminants. In 2007, Erie Pier was converted to a reuse and recycling dredged materials facility. The next steps are to update the sediment database with recent sediment quality assessments (update and maintenance of the existing sediment database to prioritize and design remediation projects began in late 2011); review data; and, collect existing information from sediment samplings during dredging operations and materials management. GLRI funding to MPCA has resulted in the procurement of a consultant to facilitate this work.
Excessive Loading of Nutrients and Sediments	Yes	Major wastewater and stormwater improvements by the Western Lake Superior Sanitary District and the Cities of Superior and Duluth; higher nutrients and excess erosion remain a problem. The next action needed is to compile existing water quality data and compare it to surrounding non-AOCs.
Beach Closings and Body Contact	Yes	Several contaminated sites have been remediated and now allow recreation; <i>E.coli</i> causing beach closings, University of Minnesota-Duluth Natural Resources Research Institute (NRR) initial DNA fingerprinting study indicates major source is waterfowl. The next action needed is to compile current status data for <i>E.coli</i> and for contaminated sediment sites in relation to recreational areas.
Degradation of Aesthetics	Yes	Data on current status is needed. In 2011, the SLRA began distributing surveys to recreational river users for their observations. This preliminary information will be used within the Implementation Framework process to develop a systematic approach to collecting data for assessing BUI status.
Loss of Fish and Wildlife Habitat	Yes	253 acres habitat restored in last several years (Hog Island, Tallas Island), several on-going projects are in progress (Grassy Point, Radio Tower Bay, Knowlton Creek, 40 th Ave W, Pickle Pond) The next actions needed are to complete data validation and analyses and update the sediment database. The use of the updated sediment database will allow resource managers to determine which sites are in need of remediation alone, which sites are ready for restoration and which sites are candidates for remediation to restoration (completion expected 2013). Also, WDNR AOC Habitat Coordinator will be hired and will begin developing project plans and funding proposals.

BENEFICIAL USE IMPAIRMENT UPDATES

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

2008 Target and Status

Beneficial Use Impairment Name	Status
The 2008 St. Louis River AOC delisting targets (WDNR, 2008) are listed here as separate target components on each row to clearly show status of each part of the target.	May be: <ul style="list-style-type: none"> - "Complete" - "Partly Complete" - "Partly Implemented" - "Not Complete" - "Unknown"

Note: may list one or more of the following:

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

Rationale for Listing

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

Summary of key remedial actions since the 2011 RAP Update and current status

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

Next action(s) needed

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

Issues (challenges, risks) affecting progress on this BUI

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

FISH CONSUMPTION ADVISORIES**2008 Target and Status**

Fish Consumption Advisories	Status
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.	Not Complete

Rationale for Listing

Fish samples taken from the St. Louis River and Lake Superior exceed standards established by Minnesota and Wisconsin for the unrestricted consumption of sport fish. Each of the two states issues 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). Fish tissue residues of mercury and PCBs also exceed 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.

Summary of key remedial actions since the 2011 RAP Update and current status

Wisconsin and Minnesota periodically collect fish tissue samples for use in updated fish consumption advisories. The data is shared but each state's Department of Health publishes the actual advisory. Both states published updated advisories in 2011.

According to data available from Minnesota's statewide Total Maximum Daily Load (TMDL; approved by USEPA in 2007), the sources of mercury are primarily atmospheric. TMDL modeling for mercury is in progress through a USEPA grant to MPCA. The project partners for this effort are WDNR, MPCA and the Fond du Lac Tribe. We expect the modeling effort will help define the relative contributions of different sources of mercury to the Fish Consumption Advisory BUI.

MPCA staff analyzed fish tissue data from northeastern Minnesota in comparison with the St. Louis River fish tissue samples and found that the St. Louis River fish have significantly higher mercury tissue concentrations. However, Wisconsin data were not included in this preliminary data comparison, therefore we intend to do a more complete analysis in the upcoming months. The analysis will include 2012 fish tissue samples jointly taken by MDNR and WDNR for the states' fish consumption advisory data as soon as those results are available.

Next action(s) needed

The actions that are needed include the following:

- Compilation of current and historic fish tissue data, and comparison to surrounding areas;
- Determination of the extent of atmospheric deposition as a contributor;
- Analysis of fish tissue data for mercury and PCBs based on the methods recommended by the Implementation Team; and,
- Remediation of remaining contaminated sediments.

Issues (challenges, risks) affecting progress on this BUI

Contaminated sediments, air deposition and wastewater discharges all potentially add to mercury and PCB concentrations in fish tissue. There are projects underway by WDNR and MPCA to broadly assess contaminants in sediment in the AOC. Updating and managing the sediment database for remediation needs and prioritization of site work is critical for developing effective BUI removal strategies.

DEGRADED FISH AND WILDLIFE POPULATIONS**2008 Target and Status**

Degraded Fish and Wildlife Populations	Status
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.	Not complete

Rationale for Listing

1. Fish Populations – Since 1979, fish populations have been recovering because of improved water quality that resulted from more complete wastewater treatment after formation of the Western Lake Superior Sanitary District (WLSSD), construction of the WLSSD wastewater treatment plant, and improvement of City of Superior wastewater treatment. However, fish populations are still adversely affected by alterations and loss of habitat, proliferation of exotic species, and possibly by exposure to toxic substances (for further detail, refer to Stage One RAP, 1992, pp. IV-18-26).
2. Wildlife Populations – Little population data is available for wildlife with the exception of colonial nesting birds, herons, and gulls. Populations of the common tern and the piping plover (threatened and endangered species) have declined, the heron population has been declining, and gulls and mallards have experienced die-offs in the recent past. These problems are due to alterations or loss of habitat and possibly toxic contamination (for further detail, refer to Stage One RAP, 1992, pp. IV-23-28).

Summary of key remedial actions since the 2011 RAP Update and current status

Recovery of native fish populations has continued to improve since the early 1980s. The recovery has been fueled by natural re-colonization and re-introductions by state fish and wildlife management agencies. Currently, all fish species that were historically present are healthy and naturally reproducing. The most recent accomplishment was the documentation of the first natural reproduction for the rehabilitated lake sturgeon population in 2011. Introduction of exotic fish species has slowed considerably since enactment of requirements that international ship traffic must exchange ballast water in the ocean. Habitat projects to encourage piping plover are on-going.

Next action(s) needed

The actions that are needed include the completion of a process between pertinent natural resource professionals to determine the current status of fish and wildlife populations and determine where fish and wildlife populations are in relation to recovery status. That process will occur during the winter of 2012/2013 as part of the AOC Implementation Framework workplan to produce removal packets for each BUI. Quantitative evaluation of certain key wildlife populations is needed, especially for plover and tern populations and for aquatic mammals, for which no current data exists.

Issues (challenges, risks) affecting progress on this BUI

It is understood by AOC partners that once data gaps identified in the BUI Blueprints are addressed, resource professionals will be able to reach consensus on the status of removing this BUI. It was emphasized by the BUI Blueprint Team that although fish and wildlife populations could be identified as “in recovery” relatively soon, reaching the ultimate potential for each population would require the remediation of contaminated sediments and restoration of impaired habitat. Ultimately, the maximum potential for fish and wildlife populations would be less than pre-European status.

FISH TUMORS AND DEFORMITIES**2008 Target and Status**

Fish Tumors and Deformities	Status
Incidence rates of contaminant-related internal and external tumors and deformities in resident benthic fish species, including neoplastic or preneoplastic liver tumors, do not exceed incidence rates from unimpaired areas elsewhere in the Great Lakes basin.	Not complete – data gathered Spring 2011

Rationale for Listing

Observations suggested that fish tumors and deformities represented an impaired use in the St. Louis River Estuary. However, at listing, there were no studies that documented the incidence rates of tumors in fish. Additional work has been needed to fully determine the incidence of fish tumors and deformities in the AOC.

Summary of key remedial actions since the 2011 RAP Update and current status

In spring of 2011, staff from WDNR, MDNR, and the Fond du Lac Tribal Water Resources Program collected 200 white suckers in conjunction with the US Fish and Wildlife Service. The white suckers are being analyzed by fish tumor experts at the USGS for skin and liver histopathology. St. Louis River tumor incidence rates will be compared to incidence rates for white suckers found in Lake Superior reference sites. The work plan for this project is attached as Appendix C.

Next action(s) needed

The next actions that are needed are data analyses and interpretation once final data is received from the USGS (winter 2012). Decisions on any further next steps will be made once these actions have been completed. BUI Blueprint Team participants agreed that three sampling rounds in which the fish tumor incident rate was equal to or less than the Lake Superior reference site, Mountain Bay, will be necessary to remove this BUI. MPCA has secured USEPA GLNPO funds for a second round of sampling to occur in 2013.

Issues (challenges, risks) affecting progress on this BUI

MPCA received funding for a contractor to update the current sediment quality database in the short-term. Staff capacity is needed to develop a bi-state process for managing and interpreting data in the long-term. A large quantity of sediment data is available and data interpretation will take some time. Validation and entry of the most recent data sets are nearing completion. Remediation of contaminated sediment sites, especially polycyclic aromatic hydrocarbon (PAH) contaminated sites, as research has made a link between skin and liver neoplasms and PAHs.

DEGRADATION OF BENTHOS**2008 Target and Status**

Degradation of Benthos	Status
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.	Not complete

Rationale for Listing

Reduced benthic invertebrate density, diversity, and species richness have been reported in areas of the estuary that are subject to physical disturbance or in close proximity to known contaminated sites. In some studied areas, the benthic community is dominated by oligochaetes and chironomids, which are relatively tolerant of organic pollution (Stage One RAP, 1992, pp. IV-29 to IV-35). In evaluating sediment quality throughout the AOC, WDNR and MPCA have used the triad approach that combines the sediment chemistry, toxicity tests and *in situ* benthic diversity to give a composite picture of the overall sediment "health." The triad approach has demonstrated that the benthic community has been degraded, as evidenced by the lack of species diversity and preponderance of pollutant-tolerant species.

Summary of remedial actions since the 2011 RAP Update and current status

This BUI is dependent upon both the remediation of contaminated sediment sites and habitat restoration. Several habitat restoration projects are on-going in Minnesota (Radio Tower Bay, Tallas Island/Knowlton Creek, design for 21st Ave W and 40th Ave W). St. Louis River sediment characterization samplings have been completed in both Minnesota and Wisconsin, and the data is being validated and assessed (note that not all data is in the database at the time of writing).

A joint Minnesota and Wisconsin Sediment/Biotic Relationship Assessment project was carried out in June 2012 and involved sampling the benthic community at "reference" sites within the St. Louis River AOC. MPCA contracted with LimnoTech for field work, while WDNR wrote the Quality Assurance Project Plan (QAPP) and funded the laboratory analyses. Results (expected in January 2013) will be used in remedial site decisions, restoration objectives and AOC-wide to determine the status of the Degraded Benthos BUI.

Next action(s) needed

The next action needed is to complete identifications of samples and analyze data on benthic communities at reference sites. Data is expected to be available early in 2013. The AOC Coordinators will analyze the results and appropriate metrics will be chosen with review by the BUI Removal Team members.

Issues (challenges, risks) affecting progress on this BUI

Remediation of contaminated sediments is a priority. This BUI cannot be removed until contaminated sediment cleanups are completed. Benthic communities are expected to recover once a site is remediated and restored but this can take time. Funding for long-term monitoring will be necessary.

RESTRICTIONS ON DREDGING**2008 Target and Status**

Restrictions on Dredging	Status
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.	Not Complete

Rationale for Listing

Restrictions on dredging is a use that can be clearly identified as impaired in the St. Louis River AOC. Sediments in many parts of the AOC exceed guidelines developed by regulatory agencies to characterize in-place sediments and contain a variety of toxic, bio-accumulative contaminants that have been shown to cause adverse effects to aquatic and terrestrial organisms. Serious economic and social consequences are also imposed upon some resource users through special dredging requirements and obligations for long-term sediment containment.

Summary of remedial actions since the 2011 RAP Update and current status

Sediment characterization and site prioritization projects are underway in both Minnesota and Wisconsin. The States are working together via a Sediment Database Team to update the St. Louis River Phase IV Sediment Database that will allow future maintenance of this database and sharing between states and local and federal partners. The charge to the Sediment Database Team is attached as Appendix D. The maintenance and analyses of AOC-wide data is important to determining site remediation priorities and BUI status. MPCA has utilized capacity funding to contract LimnoTech for sediment database updates, and sediment characterization mapping by June 30, 2013. This information will be used by the Sediment Teams to determine remediation and restoration needs, as well as the current status of this BUI.

In developing and reviewing the BUI Blueprint, the Harbor Technical Advisory Committee (HTAC) and BUI Blueprint Team agreed that "navigation" for the purposes of interpreting the 2008 target refers to all movements of boats and is not restricted to the Federal navigation channel.

Erie Pier, the primary facility for handling sediments, was converted from a confined disposal facility (CDF) to a reuse and recycling facility in 2007. This transition was made to enhance Erie Pier's long-term capacity for handling dredged material. Excessively contaminated sediments cannot be accepted at Erie Pier, therefore handling restrictions and economic consequences exist for dredging projects in the contaminated areas.

Next action(s) needed

The next actions needed are as follows:

- Update the sediment database with recent sediment quality assessments;
- Review data;
- Review LimnoTech Sediment Summaries ("dashboards"); and,
- Collect existing information from sediment samplings during dredging operations and materials management.

Issues (challenges, risks) affecting progress on this BUI

Not all sediment assessment data has been analyzed or updated to the sediment database. Once the database updates are completed, contaminated sites can be compared to the locations of navigation channels, operating slips and marinas. The BUI Blueprint Team agreed that the term “navigation” as used in the 2008 Target refers to all movement of boats. Contacts have been made within the U. S. Army Corps of Engineers (USACE) in order to obtain navigation channel sediment data. It will be important to sustain sediment management options for future dredging projects. Material handled at Erie Pier should be beneficially reused to the extent possible, to create capacity for additional sediments. Also, it is important to maintain each state’s capacity for overseeing contaminated sediment remediation projects.

EXCESSIVE LOADING OF NUTRIENTS AND SEDIMENTS**2008 Target and Status**

Excessive Loading of Nutrients and Sediments	Status
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:	Not Complete
1. All federal, state, and local point sources and nonpoint source discharge permits in the Area of Concern are in compliance with regard to controlling sources of nutrients (particularly nitrogen and phosphorus), organic matter, and sediment, and	Unknown
2. Total phosphorus concentrations in the Lake Superior portion of the AOC do not exceed 0.010 mg/L (upper limit of the oligotrophic range); and	Unknown
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 loading from wastewater overflows into the St. Louis River; and	Partly complete
4. Total phosphorus concentrations within the St. Louis River portion of the AOC do not exceed an interim guide of 0.030 mg/L (upper limit of the mesotrophic range) or the most restrictive water quality standards. This ensures that anthropogenic sources and activities in the St. Louis River Area of Concern do not result in excessive productivity and nuisance conditions within the St. Louis River Estuary.	Unknown

Rationale for Listing

Prior to improvements in wastewater treatment in the late 1970s in this area, water quality and biological investigations characterized the St. Louis River Estuary as eutrophic. At this time the WLSSD treatment plant was built and the Superior wastewater treatment plant was upgraded. Since that time, many indicators of trophic status have shown improvements. For instance, concentrations of total phosphorus, ammonia, and organic nitrogen have decreased in the St. Louis Bay. The loading of phosphorus to the estuary from point sources has been reduced substantially. Further work is 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 remain at levels where eutrophic conditions might be expected. However, algal biomass has been lower than would be expected given these high phosphorus concentration. Chlorophyll-a concentrations measured in the estuary have been similar to levels found in mesotrophic or oligotrophic waters. Several investigators have proposed that reduced light penetration due to turbidity and color may be a limiting factor for algal growth in the estuary. Although persistent water quality problems associated with eutrophication are not observed currently in the estuary, the high levels of nutrients and sediments being delivered to Lake Superior is an important concern. Therefore, the RAP will use a modification of the International Joint Commission's eutrophication criterion to reflect local conditions.

Summary of remedial actions since the 2011 RAP Update and current status

Millions of dollars have been spent on improvements to stormwater control, landowner workshops, wetlands protection and land conservation by the State of Wisconsin, City of Superior, Douglas County and West Wisconsin Land Trust. Projects focus on "slow the flow" to reduce erosion and sedimentation.

A TMDL for turbidity has been completed for the Nemadji River in Minnesota. TMDL implementation has begun and will be important for controlling erosion in the Nemadji River.

Next action(s) needed

The next action needed is to compile existing water quality data and compare it to surrounding non-AOCs. Recommendations for data analysis will emerge from the Implementation Framework. The BUI Blueprint Team identified many projects to control stormwater overflows in both Duluth and Superior. Several data sets for water quality indicators were identified. Discussions were begun about needs for a broad-based monitoring network to confirm current conditions. Discussions are needed on how to resolve discrepancies between the BUI listing rationale, the 2008 Targets and current state nutrient regulations.

The Implementation Framework will also provide recommendations for specific projects to meet BUI goals. It is anticipated that Douglas County's "slow the flow" projects will be identified by the Implementation Framework as critically important for addressing this BUI and they are recommended for funding.

Issues (challenges, risks) affecting progress on this BUI

The AOC is partly in the Lake Superior Red Clay Plain. Due to geological history, the soils in this area are more susceptible to erosion in different regions. The history of logging across the region has significantly altered the historic hydrology and erosion/sedimentation patterns.

BEACH CLOSINGS AND BODY CONTACT**2008 Target and Status**

Beach Closings and Body Contact	Status
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.	Partly Complete
There are no body contact advisories due to the presence of harmful chemicals at contaminated site.	Unknown
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.	Not Complete

Rationale for Listing

Water quality data indicate that improvements have been made in the St. Louis River and bay since the late 1970s. However, there are still sources of potential microbial contamination. Sewage bypasses have occurred into the AOC in both Minnesota and Wisconsin during storm events. In addition, localized problems with microbial contamination could occur due to discharge of inadequately treated wastewater by marine traffic. Because of the sewage bypasses in both Minnesota and Wisconsin, body contact recreation is an impaired use.

Summary of remedial actions since the 2011 RAP Update and current status

Millions of dollars have been put toward improvements in storm water control by the City of Superior. Two contaminated sites have been remediated, for example the “No Swimming” sign has been removed from Hog Island Inlet since remediation. Beach closings due to *E. coli* continue to occur. Both Wisconsin and Minnesota have *E. coli* monitoring programs for beach health advisories. More work is needed on defining the source of *E. coli* (human waste water, water fowl and wildlife), and remediation of contaminated sediments.

Next action(s) needed

The next action needed is to compile current status data for *E. coli* sources and for contaminated sediment sites in relation to recreational areas. In Wisconsin, the University of Wisconsin - Oshkosh has completed sanitary surveys for a number of 303(d) listed beaches. One of these is Wisconsin Point; that information will be used to determine next steps at this site.

Issues (challenges, risks) affecting progress on this BUI

The sediment database is currently being updated. Once the database is completed, sediment quality in and adjacent to recreational sites will be assessed as it relates to this BUI.

DEGRADATION OF AESTHETICS**2008 Target and Status**

Degradation of Aesthetics	Status
There are no verified persistent occurrences of objectionable properties in the surface waters of 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.	Unknown

Rationale for Listing

The three major aesthetic problems defined on the St. Louis River in the 1995 RAP Progress Report were as follows: 1) oil, chemical, and tar residues are polluting the river at Superfund sites and other areas with contaminated sediment, 2) grain and grain dust is blowing into the river during ship loading operations, and 3) large accumulations of foam are occurring on the river downstream of Cloquet.

The aesthetic values of the St. Louis River AOC remain impaired in some locations. A systematic collection of evidence and data is recommended to determine the specific locations of degraded areas and the sources and types of degrading materials (i.e., 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 have repeated reports of oil, chemical, and tar residues on the water's surface. Complaints have also been registered about smells emanating from the sediments and water of Newton Creek and Hog Island Inlet (MPCA, WDNR Complaint Logs 1980-1990). Shoreline aesthetics will be addressed separately and will be remediated through actions taken with riparian interests.

Summary of remedial actions since the 2011 RAP Update and current status

Regulations for industrial harbor materials management have been established since the first RAP was written. Both Hog Island/Newton Creek and the Stryker Bay site have been remediated. Data is needed on the other occurrences in the estuary and river that may be due to controllable sources. In 2011, the St. Louis River Alliance (SLRA) began distributing surveys to recreational river users to record their observations.

Next action(s) needed

The next action needed is to collect current status data. The Implementation Team will use the 2011 SLRA survey information to develop recommendations for further refining the approach to assessing the status of this BUI.

Issues (challenges, risks) affecting progress on this BUI

The AOC is quite large (over 12,000 acres). Also, many observational sites are only accessible by boat.

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

Loss of Fish and Wildlife Habitat	Status
State resource management agencies concur, in consultation with their federal, tribal, local, and nonprofit partners, that a reasonable amount 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. The following benchmarks could be used as an interim guide.	Not Complete
1. All contaminated sediment hotspots within the AOC have been identified, implementation actions to remediate contaminated sites have been completed; and	Not Complete
2. Programs are in place to discourage further proliferation and to prevent further introduction of non-native invasive species; and	Partly Implemented
3. At least 50% of known degraded aquatic habitat acreage (approx. 1700 acres) is rehabilitated through implementation of projects, such as those outlined in the <u>Lower St. Louis River Habitat Plan</u> (SLRCAC, 2002), Appendix 9 – <u>Habitat Plan Implementation Strategy Worksheets</u> (SLRCAC, 2009); and	Not Complete
4. Additional aquatic or hydrologically connected habitat throughout the AOC watershed has been successfully protected and rehabilitated sufficiently to maintain healthy fish and wildlife populations through implementation of projects, such as those outlined in the <u>Lower St. Louis River Habitat Plan</u> (SLRCAC, 2002), Appendix 9 – <u>Habitat Plan Implementation Strategy Worksheets</u> (SLRCAC, 2009).	Not Complete

Rationale for Listing

Fish and wildlife habitat in the AOC is threatened by development and by exotic vegetation. In addition, the contaminated sediments in the river and estuary and the high sedimentation rates in the AOC may contribute to the loss of habitat (for further detail, refer to the Stage One RAP, 1992, pp. IV-66 to IV-72).

Summary of remedial actions since the 2011 RAP Update and current status

Between Tallas Island, Stryker Bay, and Hog Island Inlet 15% of the 1700-acres have been remediated and/or restored. Douglas County and the WDNR continue to work on programs to prevent the spread of aquatic invasive species. Clough Island and the Red River Breaks areas are under conservation by the State of Wisconsin. Restoration of Clough Island was begun in 2012; native forest cover will be encouraged to decrease erosion of the banks; inventory of the natural resources of the island and surrounding wetlands will be completed for utilization in future planning. The State of Minnesota has secured funding from state and federal sources to implement restoration of aquatic habitat as part of six site-specific projects over a surface area of approximately 1,100 acres in the next few years. The projects include 21st Ave W, 40th Ave W, Grassy Point, Knowlton Creek and Radio Tower Bay which all have had either assessment work done or the beginnings of ecological designs, and Perch Lake and Mud Lake at which no work has as yet been done or completely planned.

Next action(s) needed

AOC partners need to continue their participation in the AOC Implementation Framework Project, which will result in the development of a “Roadmap” for delisting the AOC and individual draft BUI removal packets for each BUI during the winter of 2012/2013.

Additionally, AOC partners are working with a consultant to complete data validation and procedures involved with updating the sediment database. The use of the updated sediment database will allow resource managers to determine which sites are in need of remediation alone, which sites are ready for restoration, and which sites are candidates for remediation to restoration.

Wisconsin and Minnesota partners will identify the key habitat and watershed “slow the flow” projects and AOC partners should determine how habitat protection projects will count toward meeting habitat restoration goals. Wisconsin has secured funding for a Habitat Coordinator project position to identify habitat restoration opportunities, document past conservation and restoration projects, and assist partners with moving to implementation on future wildlife inventory and habitat restoration projects.

Funding is needed for development of management plans for properties purchased for habitat protection in the AOC, such as the St. Louis River Streambank Protection Area and Clough Island which together total approximately 6,000 acres. Protected public lands also present the potential for habitat restoration.

The USFWS Contaminants Program selected the Pickle Pond for a 2013 project. USFWS will assess sediment type, depth, and contamination; pond bathymetry, fish, vegetation and biology. Most field work will be done by USFWS or USFWS-contracted personnel. The project result will be an Ecological Design based on assessment data for remediation to restoration.

Issues (challenges, risks) affecting progress on this BUI

Recognition that the AOC is the largest working harbor within the Great Lakes, and that not all potential habitat will be restored.

CONCLUSION

Many of the BUIs in the St. Louis River AOC are related to contaminated sediment from historic discharges or alteration of the estuary ecosystem by filling, damming and dredging. Water quality and fish populations have greatly improved since the late 1970s when waste water treatment facilities were brought on-line or upgraded. Several known contaminated sediment sites within the AOC and watershed have been remediated.

Targets for BUI removal were created by the two states and their many partners in 2008. Currently, the states and partners are working together on the AOC Implementation Framework Project which has created BUI Blueprints and which will result in 1) a "Roadmap" for actions and measureable indicators in order to achieve the delisting targets and 2) draft individual BUI removal packets. The final product will be a complete Stage 2 RAP (see Appendix A for outline) for use in moving forward on removal of BUIs. This document is expected to be finalized in 2013.

Several of the BUIs will require compilation and interpretation of existing data. Others will require data collection. It is the priority of the WDNR to update the existing sediment database and create a long-term maintenance and management plan for sediment data within the AOC. Data from past and current sediment assessments is critical to moving forward with contaminated sediment site remediation prioritization and planning. Remediation of contaminated sediments is critical for removal for a majority of the BUIs.

The focus areas for Wisconsin's St. Louis River AOC Coordinator in 2013 are expected to be as follows:

- Participating in appropriate Implementation Framework workgroups;
- Participating in the sediment database workgroup to produce a coordinated bi-state ability within the AOC to analyze and interpret data;
- Participating in site characterization and prioritization based on compilation of all current sediment data;
- Reviewing new information and assessing the implications of recent data for the AOC;
- Participating in site-specific project planning within the AOC; and,
- Assisting with technical expertise on contracts executed by the Wisconsin and Minnesota AOC Coordinators to address the following: a) Fish Tumor and Deformity assessment; b) SLRAOC Data System development; c) Interagency Leadership Group and Implementation Team; d) SLRAOC Sediment Technical Team work on a sediment contamination assessment; e) Sediment/Biotic Relationship Assessment; and f) Habitat rehabilitation/protection projects. These are all issues for which USEPA GLNPO awarded funding to the St. Louis River AOC.

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Wisconsin Department of Natural Resources. 2011. Stage 2 Remedial Action Plan Update for the St. Louis River Area of Concern.

APPENDICES

Appendix A - Stage II RAP outline (Implementation Framework project)

Appendix B - Detailed beneficial use impairment status summary

Note that projects listed in the table are the next clearly delineated action steps that have been identified by WDNR in collaboration with AOC partners and stakeholders to make progress toward delisting the AOC. This list does not necessarily reflect all actions that will ultimately be needed to remove impairments, and will be updated as more information is collected and as actions are completed.

Appendix C - St. Louis River Area of Concern Fish Tumors BUI Assessment Statement of Work

Appendix D - SLRAOC Sediment Database Team Charge, Draft December 8, 2011

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Appendix A

Stage II RAP Outline (Implementation Framework Project)

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Comparison of Causes Identified in Stage I RAP to Actions in the AOC Delisting Roadmap and BUI Blueprints (as appropriate)

Appendix B

Detailed Beneficial Use Impairment Status Summary

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St. Louis River AOC BUI Status Summary

December 2012

Beneficial Use Impairment Name	Status assessment needed? If yes, is it scheduled? (If yes, provide dates)	Actions/Tasks Needed	Funding Source; estimated cost if known	Action status: In progress, Completed, Not started	Project type*	Project Lead	Timeframe for Project Completion	Comments
BUI 1: Fish Consumption Advisories	Yes 2011-2012	1) Compilation of existing data and 2) comparison to other sites	1)Current project 2) unknown	1) In Progress 2) Started	2	WDNR, MDNR, state Depts of Health	2013	Implementation Framework project Decisions are needed on how to pick out "AOC Specific" Advisories from the existing data
BUI 2: Degraded Fish and Wildlife Populations	Yes 2011-2012	1) Current status interpretation 2) Fill data gaps for birds and aquatic mammals	1) Current project 2) unknown	1) In Progress 2) Not Started	2	WDNR, MDNR	2013	Implementation Framework project
BUI 3: Fish Tumors and Deformities	Yes Study #1 underway (samples collected in 2011); Study #2 scheduled for 2013.	1) completion of analysis of fish from 2011 study 2) analyses and interpretation of data from 2011 study	1) USFWS and USGS project 2) USFWS and USGS project, BUI Blueprint Team	1) In progress 2) In Progress	1	WDNR, MDNR, Fond du Lac Water Program	2012	This data collection effort will result in current status definition; decisions on next step will be made when data is returned and analyzed. At least three sampling rounds will be required to remove BUI. Results from study #1 are expected to be available early in 2013. Samples for study #2 will be collected in spring 2013 through an MDNR project funded by GLRI. Funding for study #3 needs to be secured for 2015 sampling.
BUI 4: Degradation of Benthos	Yes 2012	1) get data on benthic communities at reference sites 2) utilize info in assessment and restoration	Project joined MPCA and WDNR funds	"Reference" sites sampled in 2012.	1	WDNR and MPCA	2012	Benthic community data in reference sites collected in 2012. Data expected to be available early in 2013. BUI cannot be removed until contaminated sediment remediations are completed.
BUI 5: Restrictions on Dredging	Yes 2011 to 2012	1) Data being returned for MPCA and WDNR sediment assessments 2) Jointly updating St. Louis River Sediment database (long-term plan)	1) current project 2) on-going	In progress	2	WDNR and MPCA	2013	Implementation Framework project AOC Sediment Database Management planning includes WDNR, MPCA, NOAA, and USACE SLRAOC Sediments Technical team will develop maps showing areas needing feasibility studies or remediation in 2013.

BUI 6: Excessive Loading of Nutrients and Sediments	Yes 2011-2012	1) Compilation of existing data and 2) comparison to other sites 3) Implement watershed projects to prevent erosion	1)Current project 2) unknown 3) unknown	1) In Progress 2) Not Started 3) In progress	2	WDNR, MPCA, Carlton Co (MN), St. Louis Co (MN), Douglas Co (WI)	2013	Implementation Framework project Funding is needed to implement watershed projects (e.g., Nemadji TMDL and “slow the flow” projects)
BUI 7: Beach Closings and Body Contact	No WI and MN currently have Beach monitoring programs	1) Compilation of existing data 2)Work on source determination may be necessary	1)Current project 2) unknown	1) In Progress 2) Started not complete	2	WI and MN	2013	Implementation Framework project Other work by local universities has been done in the past on source assessment – needs completion and planning according to results
BUI 8: Degradation of Aesthetics	Yes Observational surveys begun 2011	1) Compilation of current status data begun by SLRA; 2) Development of a systematic approach for collecting data	1) Grant through WDNR 2) Current project	In progress	1, 2	WDNR, MPCA, SLRA	2013	Implementation Framework project Implementation Framework project
BUI 9: Loss of Fish and Wildlife Habitat	NO	Continue assessment, remediation and restoration projects by both WI and MN	Various	On-going	2, 3, 4, 5	WDNR, MPCA, MDNR and others	unknown	Habitat Coordinator, in collaboration with the Implementation Framework project, will identify relevant indicators and restoration projects and determine how habitat protection projects will count toward meeting habitat restoration goals

*Project types:

- 1 Baseline assessment through data gathering
- 2 Compile & analyze existing data
- 3 On-the-ground remediation or restoration project
- 4 Stakeholder engagement and/or community education & outreach
- 5 Verification of target achievement through monitoring or other documentation
- 6 BUI Status Change Process

Implementation Framework = in this table refers to a grant through the MPCA in which the state’s and their partners are creating milestones and measureable indicators to reach removal for each BUI. The WDNR AOC Coordinator is working directly with this project as well as others cooperative projects in the AOC.

Appendix C

St. Louis River Area of Concern Fish Tumors BUI Assessment Statement of Work

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St. Louis River Area of Concern

Incidence Rates of Fish Tumors and Deformities in the St. Louis River Area of Concern: A Preliminary Assessment

Statement of Work

March 1, 2011

Project: This project, developed by consensus among the four St. Louis River AOC Coordinators, is an effort to gather data necessary to remove the “Fish Tumors and Deformities” Beneficial Use Impairment (BUI) in the St. Louis River AOC. Conditions in the AOC have improved in many respects since listing. It is important to establish the current rate of “Fish Tumors and Deformities” in order to move forward in removing this BUI.

Background

Under the Great Lakes Water Quality Agreement, 43 sites around the Great Lakes were listed as Areas of Concern (AOCs) because they experienced negative changes in biological, chemical and physical integrity. A list of fourteen potential Beneficial Use Impairments (BUIs) was created to evaluate anthropogenic degradation at each AOC. When the Stage 1 Remedial Action Plan (RAP) for the St. Louis River AOC (Minnesota Pollution Control Agency and Wisconsin Department of Natural Resources, 1992) was completed, one of the BUIs listed was “Fish Tumors and Deformities”. At that time, observational data and known sediment contamination and water quality issues led to the potential for a fish tumor elevated incidence rate. The goal is to restore the beneficial uses, and therefore protect the biological, chemical and physical integrity of the Great Lakes, by removing the impairments.

The target for “Fish Tumors and Deformities” in the St. Louis River is that:

“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.”

The International Joint Commission definition of the Fish Tumors and Deformities BUI defines bullheads and suckers as suitable benthic species for evaluating this BUI. These delisting guidelines imply several key elements for fish tumor monitoring, including;

1. Using bullhead or suckers as an indicator species
2. Comparing tumor or other deformity rates in fish from AOCs to appropriate reference sites.
3. Using liver neoplasms or pre-neoplasm rates, as verified by histopathological analysis, as biomarkers of environmental exposure.

In the 1960's and 1970's, water quality in the St. Louis River was extremely poor due to inadequate wastewater treatment and unregulated industrial use. Fish tumors have been shown to be related to contaminants (Baumann, et al, 1996), especially poly-aromatic hydrocarbons (PAHs) associated with petroleum products and coal tar as is found in the St. Louis River. The Fish Tumors and Deformities BUI was included in this AOC due to observations of external tumors and lesions, and the presence of contaminated sediments. During the development of the Stage 1 RAP, no data were available to establish tumor and deformity incidence rates. Since that time wastewater treatment has been improved dramatically. Two major contaminated sediment areas, known to have elevated levels of PAHs, have been remediated. There continues to be no information available on the incidence rates of tumors in benthic fish in the St. Louis River. To move toward de-listing the St. Louis River as an AOC by removing this BUI, we need to develop this information by gathering data on fish tumors and deformities. Without this information we will be unable to remove the BUI and delisting the AOC will not occur. The Fish Tumors and Deformities BUI is inextricably tied to contaminated sediments, therefore, we would expect to see (and other AOCs, Presque Isle and Jackfish Bay, have seen) a lowering in rates of tumor and deformity incidences as AOC contamination is remediated. Therefore, we expect this proposed project to be the first, on which we base subsequent samplings for fish tumors and deformities.

Objective: Determine the current incidence rate of fish tumors and deformities in the St. Louis River and compare that to the rate in a relatively unimpaired waterbody on Lake Superior. Histopathological

methods will be utilized to distinguish tumors that may be contaminant related from viral or parasitological related deformities.

Methods: In the early 2000s there was a series of conferences on Fish Tumors and Deformities held in Erie, Pennsylvania focusing fish tumor studies on bullheads to assist the Presque Isle AOC. That series of conferences better defined the use of neoplasms as an indicator and refined methodologies for studies of fish tumors. It was also agreed that information on reference sites was required, though “unimpaired” was probably not possible and “least impaired” sites should be researched. Baumann, et. al., 1996 stated that bullheads were used for this type of study more frequently in the lower Great Lakes, while white suckers were used in the upper lakes. The Presque Isle AOC on Lake Erie has utilized brown bullheads, while the Jackfish Bay AOC on Lake Superior has utilized white suckers to evaluate tumor and deformity rates.

Fish biologists working in the St. Louis River agree that there is a higher probability of getting sufficient numbers of white suckers than bullheads to determine incidence rates of fish tumors and deformities in this ecosystem. We, therefore, propose to collect and analyze 50 white suckers in each of four evaluation areas in the St. Louis River AOC. Tumor incidence rates in the AOC will be compared to incidence rates of reference sites established for other AOCs within Lake Superior (Jackfish Bay and others as appropriate).

White suckers will be collected while they are congregating prior to spawning from the following areas;

- 1) Superior Bay -- from Lake Superior to Rice's Point bridge
- 2) St. Louis Bay -- Rice Point bridge to Grassy Point bridge (includes 21st Ave and 40th Ave sites)
- 3) Middle Estuary -- Grassy Point Bridge to Fond du Lac Dam
- 4) Upper Estuary -- Fond du Lac Dam to upstream reach of the AOC

Fish will be taken from several sites within these areas in order to sample the AOC as a whole, while retaining information on industrial lower estuary areas to compare to results from upper areas.

Fish tissue plugs for 13C analysis will be taken and analyzed to assist in data interpretation. The 13C values would provide information on whether these fish are largely Lake Superior fish (diet derived from Lake Superior) or more broadly have mixed use of the riverine/lake habitats. White suckers' actual annual movements within the AOC are unknown at this time.

Fish collection crews will consist of staff from Minnesota DNR, Wisconsin DNR, Fond du Lac Tribe, USEPA-MED, and USFWS. White suckers will be sampled early to mid-May while the USFWS staff are in the St. Louis River near 21st and 40th Ave sites for a Contaminants of Emerging Concern study. The white suckers collected by cooperators will be added to those collected by the USFWS CEC study for histopathology. Cooperators will work with the USFWS to ensure standardized sample handling.

Analysis parameters will consist of: liver histopathology, external lesion examination with histopathology follow-up for observed lesions and deformities (Blazer, et al, 2006). Additional data on fish age/size, gender, sample location and 13C will be tracked for each fish.

Histology:

The pieces of liver, kidney, spleen, gill, gonad and any lesions collected in the field and preserved will be used for histopathology which provides a cellular-level evaluation of fish health. These methods can be diagnostic. For instance, histopathology is necessary to determine if observed raised lesions are tumors versus proliferative inflammatory responses.

Liver and Skin Tumors

Due to the observations of liver and skin tumors in brown bullheads and other species in many areas around Lake Erie (Baumann 1992; Rafferty et al., 2009), tumors have been evaluated at many sites over the years and there are extensive historical observations to which this study can be compared.

Sections will be cut from 3 to 5 liver pieces, depending on the size of the liver, fixed in the field. Multiple pieces (number dependent on size of the lesion) of all raised skin lesions, melanistic spots and other areas of discoloration will be sampled. Tissue slides and blocks from all tissues examined will be archived at the Leetown Science Center, USGS. Due to the recognized importance of liver pathology, including neoplasia in evaluating contaminant effects on fish, a set of criteria for liver lesions has been established for small laboratory fish species such as fathead minnows (Boorman et al. 1997), as well as brown bullhead (Blazer et al. 2006) and will be followed in this study. Histopathological diagnosis will include altered foci, bile duct proliferation, neoplasms, macrophage aggregates, parasites and other observed abnormalities. A description of these criteria, as well as the skin lesion criteria are presented in the Manual for the Microscopic Diagnosis of Proliferative Liver and Skin Lesions in the Brown Bullhead (*Ameiurus nebulosus*).

Budget: \$76,600
External lesion and liver histopathology analyses, 200 white suckers - \$50,000.
 In conjunction with Contaminants of Emerging Concern study
Data management, interpretation and reporting - \$25,000
 Contractual
13C analysis - \$8/fish, 200 fish - \$1,600
 Analysis by MED Lab

Sample collection – in-kind \$4,500
 MDNR, middle estuary area, 3 days, 2 people plus equipment use - \$1,500
 Fond du Lac Tribe, upper estuary – \$1,500
 WDNR, Superior Bay - \$1,500

Outcome: The first comprehensive documentation of fish tumor incidence rates in the St. Louis River Estuary, on which to base future actions related to the removal of this BUI.

Literature Cited

Baumann, P. C. I. R. Smith, and C. D. Metcalfe. 1996. Linkages Between Chemical Contaminants and Tumors in Benthic Great Lakes Fish. *J. Great Lakes Res.* 22(2):131-152.

Minnesota Pollution Control Agency and Wisconsin Department of Natural Resources. 1992. The St. Louis River System Remedial Action Plan: Stage One. Minnesota Pollution Control Agency, St. Paul, MN, and Wisconsin Department of Natural Resources, Madison, WI.

Blazer, VS, Fournie, JW, Wolf, JC, Wolfe, MJ, Manual for the Microscopic Diagnosis of Proliferative Liver and Skin Lesions in the Brown Bullhead (*Ameirus nebulosus*), February, 2007.

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Appendix D

SLRAOC Sediment Database Team Charge, Draft, December 8, 2011

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ST. LOUIS RIVER ESTUARY
Area of Concern to Area of Recovery
A Framework for Delisting
SLRAOC Database Session
November 9-10, 2011

SLRAOC Sediment Database Team Charge
Draft December 8, 2011

Recommend system design for data management in the SLRAOC to allow geospatial evaluation that supports development of a contaminated sediment strategy. Develop a pilot system that can be used in other AOCs to evaluate contaminated sediment data in ways that lead to delisting.

1. Work with NOAA to get WI and MN data entered into NOAA Query Manager (QM) database. Identify road blocks to input existing data into QM, and make recommendations for sustainable systems of data entry into the system.
2. Evaluate how to use QM to achieve our objectives and research other systems, tools, and protocols to help meet the AOC needs. Develop a consistent process / system (bridge) to extract data from QM and analyze it to answer the questions needed for the AOC. Assess how the data management system meets the needs of the agencies working on AOC delisting.
3. Identify and agree on nomenclature, schema, and structure.
4. Identify Quality Management issues to ensure usability of out-puts.
5. Identify options to house and maintain data types (such as benthic macroinvertebrate data) that are not included in the QM structure, but may be important to a sediment triad or weight of evidence approach for the AOC. These data may be needed to track progress for BUI delisting as well.
6. Work within a 90 day time frame and report progress in 30, 60, and 90 days. Identify additional resources needed. Report to AOC coordinators and agency managers.
7. Identify critical data management tasks that will need to continue past the 90 day time frame of this team.
8. The work of this team will feed into the sediment technical team, which will develop the contaminated sediment strategy categorizing geographical areas

in the AOC based on the need for remediation. This work will feed into the Delisting Framework project.

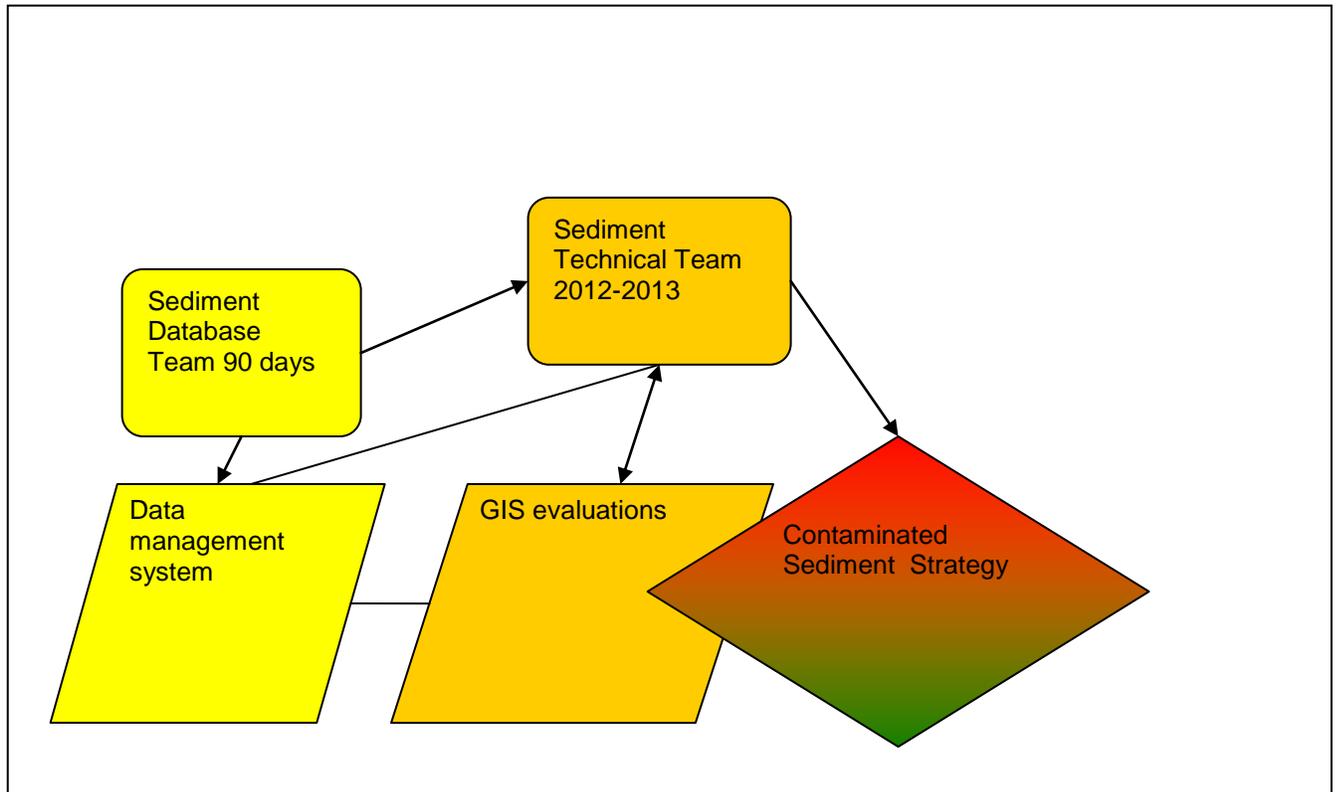


Figure 1. St. Louis River Sediment Database and Contaminated Sediment Technical Teams and Outputs

Following is a summary of the team charge discussion from the Nov 9-10 2011 St. Louis River database meeting.

SLRAOC Sediment Database Development Team Charge Notes from the Nov 9-10 meeting

- Develop a set of tools that uses sediment data to be used for BUI removal and delisting
- Agree on Framework (database design) and get data in
- Assess what we have and what we need – gap analysis
- Evaluating Query Manager & Phase IV (or is it now Phase V) database
- What are the data elements we need and the set of nomenclature
- ID the desires for assessment
- Interact with Sediment Technical Team (not yet formed) to give them what they need
- Serve SLRAOC Implementation Team (AOC Coordinators)
- ID short term needs (90 days)
 - **Get sediment data into a system we can all use to prioritize.**

- Should there be a formal memorandum of understanding between organizations?
- Develop a Team Charge and appoint team members by December 1, 2011
- Set course for 30-60-90 day rapid development effort

Skill Sets Desired for SLRAOC Database Team

- Keep the overarching picture of agency restrictions in mind
- Understands the possibilities – data in and data out
- Understand the universe of tools – database and assessment
- Team charge and objectives
- Understands decision-making based on tools
- Quality assurance
- Knowledge of Phase IV and Query Manager
- Understand how to build relational databases
- Have invested need for product
- BUI delisting – what are we after?
- Technical sediment knowledge
- How to develop database tools
- Spatial and GIS tool knowledge
- Seek outside professional help – consultant with special applied knowledge