

THE ST. LOUIS RIVER SYSTEM REMEDIAL ACTION PLAN

PROGRESS REPORT ◆ APRIL 1995

Minnesota Pollution Control Agency

Wisconsin Department of Natural Resources

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I. EXECUTIVE SUMMARY

This Progress Report summarizes the actions that have been taken since the Stage I Report (April, 1992) and the recommendations that have been developed to restore the impaired uses in the St. Louis River System Area of Concern (AOC). This will be a primary reference document for Stage II.

The environmental problems defined in the Stage I Report were assigned to work groups for development of solutions. Forty-five recommendations have been developed by the work group members to solve environmental problems. Forty-three of these recommendations have been approved by the Citizens Advisory Committee and are included in this report. The other two recommendations are being reworked and revised.

Implementation of recommendations (Stage III activities) has been taking place throughout Stage II of the RAP process. About 1/4 of the Stage II recommendations are already being implemented. In fact, implementation of some recommendations began as soon as the recommendation was approved by the Citizens Advisory Committee. By involving the implementors in each stage of recommendation development, the implementors have developed ownership of the recommendations and have sometimes pushed to begin implementation.

In addition to the formal RAP recommendations, many activities have been undertaken with the goal of restoring the impaired uses. Some of these activities include remediation at sites such as landfills, changes in industrial waste treatment operations to reduce contaminant loadings to the river, studies to clarify the extent of sediment contamination in the AOC, purchase of land and designation of a streambank protection area to protect valuable habitat and prevent additional red clay erosion, citizen clean-ups of shoreland, and creation of a waterfront recreation area.

Contaminated sediment is a very large problem in the AOC since it affects many of the impaired uses. As such, it is discussed in a separate section of the report prior to the discussion of each impaired use. Sediment studies over the past two years are now providing the information necessary to determine the extent of the problem. In addition, regulatory actions at some of the sediment "hotspots" will be leading to remediation of contaminated materials. Remediation of the contaminated sediment sites will help restore many of the impaired uses by eliminating major sources of contaminants to the AOC.

This Stage II Progress Report lists the impaired uses and environmental problems in the AOC, the recommendations developed and actions taken to restore these impaired uses, and future actions that are needed. It discusses the strategy for implementing recommendations and the progress that has been made towards meeting the RAP goals defined in Stage I. Many environmental problems that are mentioned in this report are discussed fully in the Stage I Report.

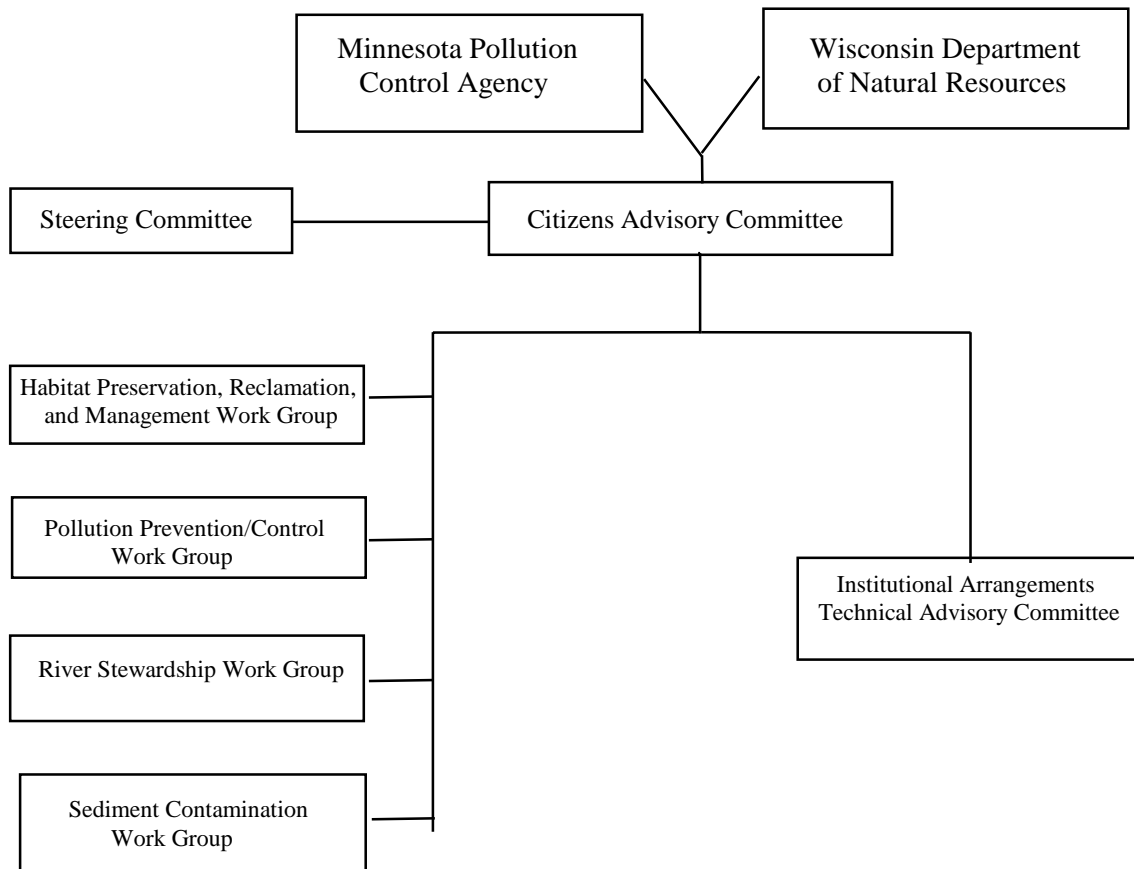
The 43 approved recommendations are included in their entirety in the appendix to this report so that this document can serve as the primary reference document for Stage II. However, not all of these recommendations are scheduled for implementation in 1994-95. Thus, they are not discussed in the tables showing timelines for 1994 and 1995. Future progress reports will update the status of recommendation development and implementation, define a monitoring plan for the lower St. Louis River, and assess progress on the restoration of impaired beneficial uses.

II. STAGE II PUBLIC PARTICIPATION PROCESS AND PARTICIPANTS

A. ORGANIZATIONAL STRUCTURE

The focus of Stage II is the development of recommendations to solve the environmental problems outlined in Stage I. As such, the organizational structure in Stage II is slightly different than that in Stage I. The Citizens Advisory Committee (CAC) and the CAC Steering Committee have continued into Stage II. The Institutional Arrangements Technical Advisory Committee (TAC) which became inactive at the end of Stage I, has been reconvened for Stage II. The four technical advisory committees that helped define the problems in Stage I, were disbanded and work groups have been formed to develop the recommendations. The Stage II organizational structure is shown in Figure 2-1.

Figure 2-1 Stage II Organizational Structure



The CAC formalized its procedures and activities by developing bylaws. The committee is composed of a maximum of 40 members representing a variety of stakeholder interests in the Area of Concern. As defined in the bylaws, the CAC's primary role consists of: "1) guidance [to the MPCA and the WDNR] on plan development with an ecosystem approach, 2) review of suggested actions and projects for consistency with RAP goals and the restoration of beneficial uses, and 3) the prioritization of such actions and projects." The CAC provides the final citizen review of recommendations developed in the

RAP. They created other RAP committees and work groups to assist with problem definition and recommendation development.

The Institutional Arrangements TAC was reconvened in November, 1993. The committee reviews recommendations in terms of social, political, institutional, and economic factors. They also are supposed to provide an analysis of how the recommendation could be implemented in the AOC. Beginning at the end of 1994, there was a trial period where the CAC and Institutional Arrangements TAC held joint meetings. It is believed that the joint meetings will facilitate better implementation of RAP recommendations.

The four new work groups created in Stage II are as follows: Habitat Preservation, Reclamation, and Management Work group; Pollution Prevention/Control Work group; River Stewardship Work group; and Sediment Contamination Work group. The purpose of the work groups is to develop recommendations to solve the environmental problems defined in Stage I. The work groups are each composed of 10-15 attending members and numerous resource management experts who attend meetings periodically to assist with recommendation development.

B. RECOMMENDATION DEVELOPMENT AND REVIEW PROCESS

In order to develop the recommendations, it was first necessary to list the environmental problems under each of the impaired uses. The work groups were given guidelines for developing recommendations to ensure consistency in recommendation format. These guidelines were based on the outline (Table 1) in the International Joint Commission's 1991 publication entitled Stage 2 RAP Remedial Action Plans: Content and Key Issues. The impaired use problems were divided among the work groups so that there would be no duplication of efforts. Each work group assisted in developing a work plan which defined the problems they should examine and the RAP goals which pertained to these problems.

The impaired use problems assigned to each work group are as follows:

<u>Use Impaired</u>	<u>Work Group Responsible for Recommendations</u>
-Fish Consumption Advisories	Sediment Contamination Work group
-Degraded Fish and Wildlife Populations	Habitat Work group
-Fish Tumors and Other Deformities	Miscellaneous Ad Hoc Work Groups
-Degradation of Benthos	Sediment Contamination Work Group
-Restrictions on Dredging	Sediment Contamination Work Group
-Excessive Loading of Sediments and Nutrients to Lake Superior	Pollution Prevention Work Group
-Beach Closings/Body Contact	Pollution Prevention Work Group
-Degradation of Aesthetics	River Stewardship Work Group
-Loss of Fish and Wildlife Habitat	Habitat & Sediment Contamination Work Groups

Impairment Not Clear

- Fish Tainting
- Bird or Animal Deformities or Reproductive Problems

Miscellaneous Ad Hoc Work Groups
Habitat Work Group

Not Impaired Currently

- Added Costs to Agriculture or Industry
- Degradation of Phytoplankton and Zooplankton

Habitat Work Group
Habitat Work Group

Recommendations are developed by the work group members with input from the implementors. This input occurs early in the development stage so that the implementor has ownership of the recommendation. Thus, the recommendations are a realistic plan of action that can be undertaken by the implementors.

After the recommendation is developed and approved by the work group, it is sent out for review to agencies, organizations, or individuals who may be impacted by or who may play a role in implementing the recommendation. This review period can take one month or more. After this review, comments are incorporated in the recommendation if they don't change the intent of the recommendation. Comments that change the intent are clipped on to the recommendation for further review and possible inclusion.

The reviewed recommendations are then sent to the CAC Steering Committee. Committee members decide if the recommendation should be sent to the Institutional Arrangements TAC for review and comment, directly to the CAC, or back to the work group for more work. If the Institutional Arrangements TAC reviews a recommendation, their comments are incorporated in the recommendation if the intent is not changed or clipped onto the recommendation if the intent is changed. The CAC is the final citizens committee that reviews the recommendation. They can approve it or send it back for further work. If the recommendation is approved, it is then ready to be submitted to the potential implementors. Figure 2-2 lists the guidance that was used for the recommendation development, review, and approval process.

Figure 2-2 Policies/Guidance for Stage II Recommendations

General Policies on Stage II Recommendations

- Recommendations can originate from within or outside of the work group process.
- It is necessary to consult with work group members, outside technical experts, agency staff and implementors before the recommendation is acted on by the Institutional Arrangements Technical Advisory Committee (IATAC) or the Citizens Advisory Committee (CAC).
- It is important to remember that all RAP recommendations are advisory in nature. Therefore, it is vital to work with organizations and implementors early on to achieve local buy-in or ownership of the recommendation.
- It is important that the agencies alert the work groups to complications, opportunities, and timetables impacting the development and implementation of recommendations.

Work Group Protocol for Stage II Recommendations

- The work groups develop or accept the concept of a recommendation. Work groups do the initial legwork and provide a general outline or format for the recommendation (the language and details may have to be modified based on continuing input).
- Work groups are not expected to be in unanimous agreement on recommendations. Well developed alternative scenarios and minority recommendations are acceptable and desirable. The development of these alternatives is the responsibility of the minority party.
- The work group's majority (consensus) recommendation and/or alternative recommendations could require additional review by implementors. Implementors may then develop their own recommendations or make specific comments on the existing recommendation. Comments submitted by these reviewers will be accommodated in a special section of the recommendation for use in the overall RAP review process. Any changes that do not impact the intent of the recommendation may be altered by the author at his or her discretion.

Steering Committee Protocol

- The Steering Committee, with input from the RAP Coordination Team¹, will determine whether a recommendation goes back to the work group Technical Lead² or recommendation author, to IATAC, or directly to the CAC.
- The Steering Committee will not modify or develop recommendations.

Institutional Arrangements Technical Advisory Committee (IATAC) Protocol

- The role of the IATAC is to review recommendations with respect to their social, political, economic, and institutional ramifications. IATAC may return the recommendation to a work group technical lead or recommendation author, recommend one of the alternatives, or simply provide an analysis of the recommendation. The recommendation should be run by the proposed implementor

as a courtesy. Comments and/or analysis of IATAC will be summarized and passed on to the CAC as part of the recommendation.

- The IATAC review process will not involve direct modification or development of recommendations.

Citizens Advisory Committee Protocol

- The Citizens Advisory Committee will determine whether a recommendation is accepted or returned for further analysis. Accepted recommendations will be passed from the CAC to the Steering Committee to begin the implementation process.

RAP Coordination Team's Role in Implementation

- Once recommendations are approved by the CAC, the RAP Coordination Team will be responsible for forwarding these recommendations to the implementors. As would be expected, these recommendations will be forwarded to implementors in consultation with Technical Leads, CAC Co-chairs, and CAC Liaisons³.
- A summary of the alternatives scenarios or recommendations will be reproduced as a part of the Stage II document.
- Tracking of recommendations, including implementation steps, will be maintained and reported on a biannual basis by the RAP Coordinators of the Minnesota Pollution Control Agency.

Press Releases for Stage II Recommendations

- Press releases will be issued twice a year by the St. Louis River System Remedial Action Plan through the Minnesota Pollution Control Agency to inform the public of progress and approved recommendations. In an effort to be fair and unbiased, such releases will report on each and every recommendation. Every effort will be made to make the RAP a mechanism to achieve implementation of recommendations that result in real environmental progress.
- Press releases will be timed so that implementors are not blind-sided. The reason for exercising sensitivity in the timing of these press releases is to help achieve implementation, instead of sabotaging it.

Notes:

¹ RAP Coordination Team - Minnesota and Wisconsin RAP Coordinators and other agency staff

² Technical Lead - Each work group had an individual who was assigned the task of writing, researching, and revising recommendations and providing staff support to keep up the momentum of the work group.

³ CAC Liaison - Each work group had an individual that was a member of the CAC and reported back to the CAC committee on work group activities.

C. LIST OF PARTICIPANTS

The following individuals have served on Stage II committees, have assisted in developing Stage II

RAP recommendations, or have been instrumental in taking actions in Stage II to restore the impaired uses:

Laurie Abler
Bernhard Abrahamsson, UW-Superior
William Andersen, Douglas Co. Conservation Coalition
Duane Anderson, MN Pollution Control Agency
Leonard Anderson
Dorothy Anway
Dale Baker, MN Sea Grant
Marlene Bartikoski, St. Louis River Board
Bruce Benson, Carlton County Zoning Department
Bob Bohm, Minnesota Power
Marianne Bohren, Potlatch Corporation
John Brazner, U.S. EPA - ERLD
Dianne Brooke, UW-Superior - LSRI
Bob Bruce, Lake Superior Center
Linda Culligan Bruce, Superior City Councilor
Marna Butler-Fasteland, CLWP/Cloquet Forestry
Pat Collins, MN Department of Natural Resources
Dan Conley, Northwood Greens
David Conley, Douglas County Board of Supervisors
Tim Dawson, ILS-SAIC
Naomi Detenbeck, Sierra Club
Phillip DeVore, Natural Resources Research Institute
George Downs, Duluth City Councilor
Pat Engelking, MN Pollution Control Agency
Edward Erickson, USG Interiors, Inc.
Jack Ezell, Western Lake Superior Sanitary District
Al Fenedick, U.S. Environmental Protection Agency
Douglas Finn, Douglas County Board of Supervisors
Brian Fredrickson, MN Pollution Control Agency
Tom Fitzpatrick, Georgia-Pacific Corp.
Jerry Fryberger, Hallett Dock Company
Jay Gallagher, WI Department of Natural Resources - Brule Office
Gary Garlie

Sally Gibson, MN League of Women Voters
Steve Gilbert, U.S. Coast Guard
Wayne Golly, MN Pollution Control Agency
Jeffrey Gunderson, MN Sea Grant
Bill Gustafson, Murphy Oil Inc.
Cindy Hagley, MN Sea Grant
Mark Hagley
Tim Hagley, Minnesota Power
Henry Hanka, Arrowhead Regional Dev. Commission
Cal Harth, Audubon Society
Dan Helwig, MN Pollution Control Agency
Keith Henson, Minnesota Power
Barbara Jean Hereid
Betty Hetzel, Superior Harbor Commission
Ann Holy, WI Department of Natural Resources
Harvey Hoven, WI Sea Grant
Jill Jacoby, MN Pollution Control Agency
Al Klein, U.S. Army Corps of Engineers
Steve Kopish, Minnesota Power
Mary Ann Koth, MN Pollution Control Agency
Mike Koutnik, WI Department of Natural Resources
Karen Kroll, MN Pollution Control Agency
Pat Labadie, U.S. Army Corps of Engineers
David Larson, Midwest Energy Resources Co.
Nancy Larson, WI Department of Natural Resources
George LaValley, DM & IR Railway Company
Chuck Ledin, WI Department of Natural Resources
Alden Lind, Izaak Walton League
Barb Liukkonen, MN Board of Soil & Water Resources
Jean Longenecker
Bill Majewski, Duluth Physical Planning
Will Mattson, St. Louis County Commissioner
J. Howard McCormick
Kathryn McKenzie
Paul Monson
Phil Monson
Tim Musick, MN Pollution Control Agency
Mark Nelson, MN Board of Soil & Water

Resources
Lowell Neudahl, Minnesota Power
Chuck Olson, WI Department of Natural
Resources
Arnold Overby, Save Lake Superior
Association
Roxanne Pawielski, Lake Superior Paper
Industries
John Pegors
Milton Pelletier, United Northern Sportsmen
Mike Peloquin, MN Dept. of Natural
Resources
Joel Peterson, Fond du Lac Reservation
Anne Pilli, Computer Sciences Corporation
Karen Plass, WI Department of Natural
Resources
John Powers, Klaers, Powers, & Associates
Paul Sandstrom, USDA Soil Conservation
Service
John Sasstrom, U.S. Army Corps of Engineers
Joe Schubauer-Berigan, Natural Resources
Research Institute
Mary Schubauer-Berigan, MN Pollution
Control Agency
Larry Schwarzkopf, Fond du Lac Reservation
Matt Seaman
Steve Simmer, MN Pollution Control Agency
Ray Skelton, Seaway Port Authority of Duluth
Bill Smith, WI Department of Natural
Resources
Mike Smith

Ted Smith, WI Department of Natural
Resources
Kurt Soderberg, Western Lake Superior
Sanitary District
John Sorensen, University of Minnesota-Duluth
Rich Staffon, MN Department of Natural
Resources
George Stefanyshyn, Superior Whitewater, Inc.
Craig Stepan, DM & IR Railway Company
Joseph Stepun, Western Lake Superior Sanitary
District
Nan Stokes
Fred Strand, WI Department of Natural
Resources
William Swenson, University of Wisconsin-
Superior
Thomas Syverud, UW Agricultural Research
Station
Debra Taylor, South St. Louis Soil and Water
Conservation District
John Thomas, MN Pollution Control Agency
Gary Tonkin, ARDC Metropolitan Interstate
Committee
Karen Vermillion, Great Lakes Indian Fish &
Wildlife Commission
Kim Walz, WI Department of Natural
Resources
Marshall Weems, City of Superior Planning
Department
Aivars Zakis, Bureau of Indian Affairs - Great
Lakes Agency

III. CONTAMINATED SEDIMENT IN THE ST. LOUIS RIVER SYSTEM AOC

A. BACKGROUND

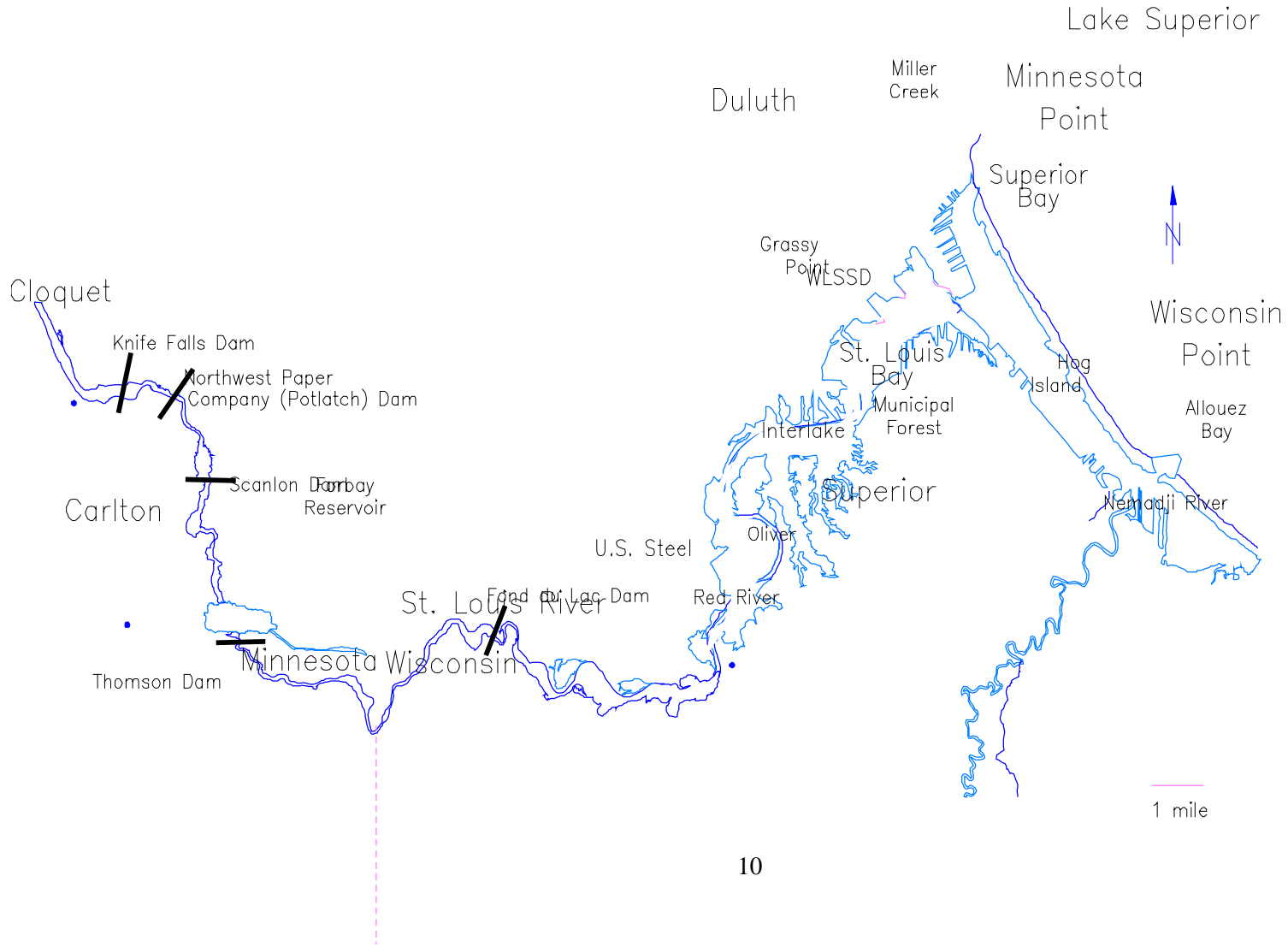
Sediment contamination is the major cause of many known and suspected impaired uses in the St. Louis River estuary. The sediment is a sink for pollutants from current and past activities in the watershed. The polluted sediments have serious detrimental effects on many aspects of the ecosystem including: ambient water quality; health, diversity and abundance of benthic and aquatic organisms; human health from exposure to toxic organic compounds that bioaccumulate in the food chain; and disposal options for dredge spoils from harbor maintenance projects. Thus, restoration of many of the impaired uses is tied to the clean-up of contaminated sediments which is discussed below.

The Stage I RAP work summarized knowledge of sediment contamination in the St. Louis estuary as of 1991, and clarified the information needed for a more complete and accurate assessment. Several contaminated "hotspots" were identified during Stage I using existing sediment data. These "hotspots," along with other less contaminated areas, act as a continual sources of pollutants to the water column and biota. The full extent of this problem is just beginning to be defined.

The majority of historic data is from the shipping channels, rather than from shallow, biologically productive areas where sediment deposition most likely occurs. Data used in Stage I had been collected by numerous organizations with varying objectives, and degrees of quality and reliability. Acquisition of quality sediment data was identified as a priority for the next stage of RAP work. Information is needed to characterize known hotspots, survey areas of suspected contamination, and better assess sediment contamination in the AOC as a whole. Studies need to be designed to produce data that can be used to make and support decisions on remediation needs and management options. Ultimately, the RAP is charged with developing a plan to restore the impaired uses. Good quality data is a prerequisite for such a plan.

Many research efforts are currently underway to further our understanding of the extent and sources of the sediment contamination problems. Known "hotspots" are being further defined by areal and vertical distribution of the pollutants. Pollutants carried by tributaries, storm water discharges and other non-point sources are also being studied. The map in Figure 3-1 provides a geographic reference for the sites discussed in the following pages.

The St. Louis River System Area of Concern



B. SEDIMENT PROGRAM

In 1993, the Minnesota PCA and Wisconsin DNR committed to a three-part sediment program for the AOC. This program includes assessment, management, and monitoring of contaminated sediments as shown below. The Sediment Assessment Plan is summarized in the following pages and is one current aspect of RAP sediment related efforts. Many of the components of the sediment program are future activities.

Sediment Assessment Plan

- Review existing sediment data from the studies described previously. The GIS will be utilized to analyze existing data for contaminant trends, extent of contamination and data sufficiency, and to illustrate areas requiring further investigation.
- Determine "background" levels (i.e., reference conditions) with respect to sediment quality, fish, wildlife and benthic communities, toxicity, and water quality.
- Collect additional sediment data in the AOC where needed and further identify soft sediment deposits.
- Map the extent of contamination to determine the quantity of material to be remediated.

Sediment Management Plan

- Complete a remedial investigation/feasibility study for each confirmed problem area in the AOC.
- Develop clean-up goals for site specific remediation efforts. Clean-up guidelines for specific parameters may be based on water quality standards, toxicity, fish, wildlife and benthic communities health, human health and/or background conditions. The triad approach, which looks at the interactions within the ecosystem, will most likely be used in establishing clean-up guidelines.
- Explore potential funding sources for sediment clean-up and site investigation work.
- Develop pollution reduction/prevention measures for point sources as well as non-point sources. Investigate air pollution and storm water as continuing pollution sources. Use available monitoring tools to screen for sources and pollutants of concern.
- Develop and implement remedial options.

Sediment Monitoring Plan

- Monitor for environmental trends. Develop a plan to measure changes over time by establishing a historical data base for monitoring changes in the sediment, fish, wildlife and benthic communities and water quality.
- Once major sources of pollutants have been eliminated, we can begin monitoring to update and supplement earlier studies. This task need not be done all at once, but instead should be performed in logical steps.

- Evaluate progress toward our goal of removal of impaired uses.

C. SEDIMENT ASSESSMENT PLAN

1. Purpose

The purpose of this Sediment Assessment Plan is to develop a strategy for evaluating the sediment contaminant levels throughout the AOC. Based on these contaminant levels and toxic effects on benthic organisms, and/or the potential for sediments to cause bioaccumulation of persistent toxicants in fish and wildlife populations, the sites will be prioritized for remediation or other management and pollution control measures. Identification and elimination of contaminant sources and development of programs to reduce and eliminate non-point source loadings should be accomplished prior to sediment remediation.

2. Sediment Characterization

Information should be collected to characterize AOC sediment deposits according to geographic location, areal extent, thickness and total sediment volume, average depths of water overlying the deposit, chemical constituents, total organic content and the grain size of materials in the deposit. Initial mapping and physical characterizations of sediments should be performed in those areas where existing information indicates elevated levels of contaminants and potentially related effects to benthic organisms. Background concentrations of sediments should be determined for comparison using "clean" reference sites within the AOC.

Post-Stage I sediment assessment to date consists of the 1993-94 estuary-wide sampling using the U.S. EPA *Mudpuppy*, Hog Island Inlet/Newton Creek characterization, Cloquet reservoirs sampling and sediment assessment effects associated with site cleanup activities at two Minnesota Superfund sites, the U.S. Steel and Interlake sites, and Fraser Shipyard and Koppers Company in Wisconsin. These and other studies that address RAP objectives are described below.

Mudpuppy Sampling

In 1993 and 1994, the Minnesota PCA and the Wisconsin DNR conducted sediment surveys with the use of the U.S. EPA's research vessel, *Mudpuppy* under a grant from the Great Lakes National Program Office. In September 1993, a reconnaissance survey of sediments in depositional zones and areas of known or suspected contamination in the Duluth/Superior harbor was undertaken. A survey of 40 sites throughout the AOC was done to determine sediment "hotspots." The sites included: U.S. Steel and Interlake Superfund sites, shallow backwaters, boat slips in the harbor, mouths of tributaries, and adjacent to material stockpiles and industrial facilities. Sediment chemical analyses and toxicity tests were done on one foot core sections with total core lengths of five feet. A draft report of this survey will be available in the Spring of 1995.

In 1994, another *Mudpuppy* study was conducted to further characterize seven of the most contaminated sites and two possible background sites by doing location-specific chemical assessments, benthic surveys and mapping of sediment deposits. This study further defines the known contaminated sites and will help prioritize the areas where sediment remediation is needed. The sites include: WLSSD embayment, ML Hibbard power plant, the area near the Superior WWTP, Howards Bay, Superwood Slip, Minnesota Slip,

East of Erie Pier, DM&IR Loading Facility, and Billings Park (uncontaminated background site).
Contact: Dan Helwig, MPCA, (612)296-7215.

Contaminated Sediment "Hotspots"

The five known "hotspots" identified in Stage I are all actively being addressed through additional monitoring and characterization, which is necessary for evaluation of future remediation and/or management alternatives.

U.S. Steel Superfund Site

Contaminated Sediments: In the 1993 *Mudpuppy survey*, sediments were collected in the St. Louis River near the outfalls of the Wire Mill Pond and Un-named Creek. Surficial sediments from one Wire Mill Pond site had phenanthrene (a polynuclear aromatic hydrocarbon (PAH) compound) concentrations more than 250 times greater than the U.S. EPA 1992 draft criteria levels, and acenaphthene and fluoranthene (PAH compounds) concentrations more than 100 and 50 times greater, respectively, than EPA criteria levels. Out of the eleven cores collected from the river near these outfalls, eight showed PAH concentrations in the surface sediments in excess of the EPA's criteria levels. In contrast, none of the surficial sediments collected at 37 locations in the rest of the Duluth/Superior harbor exceeded the EPA's criteria for these PAHs. Metals analyses showed extremely elevated concentrations of lead, cadmium, copper, chromium, zinc and mercury at most of the outfall sampling sites. These samples had the highest concentrations of metals in all the sampling sites. Finally, some sediment samples at these sites were found to be acutely toxic to the benthic organism *Chironomus*, and to the bacterium *Photobacterium phosphoreum*. Due to this high level of contamination, the MPCA has asked U.S. Steel to reassess contaminated sediments. U.S. Steel will be collecting additional sediment data this winter and will propose a response.

Wire Mill Pond: The wire mill pond discharges to the St. Louis River. The pond received oily wastes from the U.S. Steel wire mill, and its sediment is heavily contaminated with oil, low levels of mercury, and other compounds related to wire fabrication processes. Cyanide and mercury have been detected in the discharge but need to be confirmed. An oily sheen has been observed on the surface and in the effluent. Although an oil trap and booms are present, Minnesota PCA believes that this is not a sufficient treatment system, especially during the winter months.

The Minnesota PCA has informed U.S. Steel that they must apply for a National Pollutant Discharge Elimination System (NPDES) permit for the discharges from the Wire Mill Pond. The effluent from the pond is in violation of both federal and state effluent limits and requirements to obtain a permit. An alternative to a NPDES permit for the wire mill pond would be to eliminate the discharge. An August 1994, letter from the Minnesota PCA to U.S. Steel outlines the tentative effluent limits for the site. The letter discusses removal of the contaminated sediments and the potential need for monitoring after the sediments are removed. U.S. Steel is collecting additional data before a final decision a response is made. U.S. Steel has been informed that the discharge cannot continue as it is at the present.

Settling Basin: From 10,000 to 40,000 cubic yards of coal tar contaminated sediment lie within a creek which runs adjacent to the site. The creek then runs into the St. Louis River. Monitoring has not shown high levels of PAHs in the creek prior to entering the St. Louis River. However, sheens on the creek are visible near the site. U.S. Steel has proposed four alternatives which include: 1. a slurry wall system which is clearly keyed into a deeper confining unit; 2) a slurry wall and cap containment system in

combination with in situ (in place) vapor extraction; 3) in situ (in place) stabilization; and 4) hydraulic containment in a funnel and gate system.

Minnesota PCA will be seeking input from various RAP members and the public prior to making any final decisions on response actions for sediments, the wire mill pond, and the settling basin.. Contact: Frank Wallner, Superfund Project Manager, MPCA-St. Paul, (612)296-7443.

Interlake Steel/Duluth Tar Superfund Site

Remedial actions at the Interlake site became a priority in 1983 when the site was placed on the National Priorities List. The Remedial Investigation at the site was completed in January 1990 and is summarized in the Stage I Report. The responsible parties have been determined, some clean-up work has been undertaken at the site, and remedial actions and investigations are continuing.

There are three "operable units" or types of contamination at the Interlake site: tar seeps, contaminated soils, and contaminated sediment.

Tar Seeps: In September, 1992 two hundred cubic yards of fuel-grade tar were excavated from tar seeps in two areas by the boat slip and from the end of the 48-inch outfall at the end of the 54th Avenue Peninsula. Most of the fuel-grade tar seeps are believed to be cleaned up. Any future seeps that are discovered will be handled under the category of contaminated soils and will be tied to remedial actions to clean up the soils.

Contaminated Soils: The Final Remedial Investigation reports and Remedy Alternatives Screening reports for the contaminated soil were completed in Fall of 1994. Now that the extent of contaminated soil is known, a Feasibility Study is being undertaken to determine the best clean-up technology and the level of clean-up that will be required.

Contaminated Sediment: Sediment investigations were first conducted at the site in 1979 when the Minnesota PCA detected PAHs in the Stryker Embayment sediments. A more thorough sediment analysis was completed by Malcolm Pirnie in 1990 (see Stage I Report, Appendix D). Sediments were collected from the St. Louis River including the Stryker Embayment and Keene Creek as part of the 1993 Mudpuppy sampling. The 1993 sampling found PAH concentrations that were higher, for the most part, than the PAH levels found in the 1990 study. This may be attributable to how the samples were analyzed (i.e. composite samples in 1990 versus segmented samples in 1993). Nonetheless, it confirms the high levels of PAHs that were found in earlier studies. The Remedial Investigation work is continuing so that the extent of sediment contamination can be determined.

Contact: Brenda Winkler, Superfund Project Manager, MPCA-St. Paul, (612)296-7813.

Hog Island Inlet/Newton Creek Contaminated Sediment Demonstration Project

The Wisconsin DNR has initiated a contaminated sediment remediation demonstration project at this site. To facilitate investigation and remediation of this site, Wisconsin DNR has used state funds and obtained grants from U.S. EPA to carry out site investigation and feasibility study components of the project. Field work for a first phase site characterization study was completed between May and July, 1993. A draft report and executive summary on the first phase results was completed in April, 1994. Conclusions from the draft executive summary are as follows:

- Sediments in various areas of the Newton Creek system are significantly contaminated with a variety of pollutants, toxic to aquatic organisms, and support only an impaired benthic macroinvertebrate community.

- Visual and olfactory evidence indicate the presence of petroleum-related contamination in sediments from Newton Creek Impoundment, Newton Creek, and Hog Island Inlet. Laboratory analyses show concentrations of petroleum hydrocarbons (measured as diesel range organics -- DRO -- and oil and grease), lead, ammonia, polynuclear aromatic hydrocarbons (PAHs), mercury, cyanide, cadmium, and zinc enriched above reference site concentrations in various parts of the Newton Creek system. Sediment toxicity and benthic macroinvertebrate community status measurements show severe biological impacts in Newton Creek Impoundment, and significant, but lesser effects in Newton Creek and Hog Island Inlet.

- Surface water in the Newton Creek system is contaminated with PAHs to the extent that the waters of Hog Island Inlet exceed Wisconsin's water quality standards. The load of PAHs delivered to Hog Island Inlet from Newton Creek during baseflow conditions is estimated to be 0.03 to 0.2 g/day. Loads are likely greater during storm events when increased flows in the stream resuspend and transport contaminated sediments in the creek and storm water runoff may deliver additional contaminants to the creek.

- The sediment contaminants of greatest concern in the Newton Creek system (i.e., contaminants that are present in relatively high levels and are associated with biological and toxicological effects) are DRO, oil and grease, lead, and ammonia. The identification of these parameters of concern and the visual and olfactory evidence of sediment contamination of Newton Creek Impoundment, Newton Creek, and Hog Island Inlet strongly implicate petroleum and/or petroleum products as the primary source of sediment contamination problems in the system. Sources of petroleum and petroleum product releases to the aquatic system of the Newton Creek system include:
 - the Murphy Oil refinery wastewater effluent discharge and spills and other accidental releases from the Murphy Oil refinery;
 - spills and other accidental releases from the bulk storage facilities south of Newton Creek at 21st Street;
 - spills and other releases from residential and commercial activities throughout the watershed of Newton Creek and historical combined sewer overflows;
 - releases and spills from railroad facilities and operations; and

- historical releases from shipping and oil transfer activities at the Lakehead Dock.

-The observed petroleum contamination in Hog Island Inlet appears to be primarily attributable to releases from the Murphy Oil refinery (down Newton Creek) and the Lakehead Pipe Line Company activities at Lakehead Dock. Given that the entire extent of Newton Creek from its headwaters to its juncture with Hog Island Inlet is contaminated to various degrees with petroleum, the Wisconsin DNR has concluded that petroleum has been transported through the creek and into Hog Island Inlet. The contamination of the sediments of Newton Creek Impoundment and Newton Creek appears most attributable to releases from the Murphy Oil refinery. The presence of petroleum saturated materials in the surface sediments of the impoundment suggest that releases to the impoundment are continuing. The oil transfer and shipping activities by the Lakehead Pipeline Company at the Lakehead Dock may also have released significant quantities of petroleum to the environment, including Hog Island Inlet and Superior Bay.

Supplementary site characterization field work was conducted from May to August, 1994. Sediment chemical analysis results were reported in October, 1994. An overall site characterization report (using both 1993 and 1994 data) should be completed in draft stage by April, 1995 and a final report by July, 1995.

A feasibility study is underway and will be completed in Summer, 1995. The product of the feasibility study process will be a report analyzing remedial alternatives and a letter from the contractor recommending a specific remedial alternative for implementation.

Wisconsin DNR staff and administrators have been in regular communication with Murphy Oil USA, Inc. regarding contaminated sediment study plans, results, and conclusions. Murphy Oil has conducted parallel (and limited split) sampling at the majority of sites in the DNR's sampling program in 1993 and 1994 and has developed its own project report for the 1993 effort. Wisconsin DNR staff have also initiated discussions with representatives of Lakehead Pipe Line Co. regarding contaminated sediment study plans, results, and conclusions.

Wisconsin DNR is investigating sediment remediation approaches with hopes that design of a selected remedy will occur in 1996. Contact: Scott Redman, WDNR-Madison, (608)264-8964.

WLSSD Embayment

Sediments in St. Louis Bay near the Western Lake Superior Sanitary District discharge were samples as part of the 1994 *Mudpuppy* study. Results of the sampling are not yet available.

Crawford Creek Wetland

In 1992, WDNR conducted sediment sampling in the Crawford Creek wetland. Results were used to require sediment sampling by the Koppers Co. as part of the RCRA (Resource Conservation and Recovery Act) Corrective Action work. The company will be doing a workplan for an off-site assessment in 1994 that will include some sediment monitoring in Crawford Creek. Possible contaminants are related to the wood treatment processes used at the site. This includes the historic use

of creosote, pentachlorophenol and other wood preservatives. Contact: Cynde English, WDNR-Bureau of Solid & Hazardous Waste, (608)266-7017 and Steve LaValley, WDNR-Superior, (715)392-7831.

Reservoir Sediment Sampling

Thomson, Forbay, and Fond du Lac Reservoirs Study

In 1992-93, the Minnesota PCA undertook a sediment remediation study on the Thomson, Forbay, and Fond du Lac. The study examined sedimentation rates in the reservoirs, the levels of mercury, PCBs, and 2,3,7,8-TCDD (dioxin) in sediment and fish, and the toxicity of the sediment to the freshwater amphipod, *Hyalella azteca*. One bedrock-depth sediment core was collected in each reservoir for chemical analysis. Several short sediment cores were taken at each reservoir for the toxicity tests. Fish were collected in each reservoir with the use of gill nets.

Sediment: The following sedimentation rates were estimated for the reservoirs by using Cesium dating:

	Thomson Res.	Forbay Res.	Fond du Lac Res.
1908-1954	2.7 cm/yr	2.9 cm/yr	4.3 cm/yr
1954-1964	2.8 cm/yr	2.8 cm/yr	8.4 cm/yr
1964-1992	5.0 cm/yr	1.9 cm/yr	7.6 cm/yr

Mercury levels in the deep sediment cores for Thomson, Forbay, and Fond du Lac peaked in the 1960's (1.95 mg/kg, 0.92 mg/kg, and 1.31 mg/kg respectively) and have since stabilized at lower levels. Peak concentrations of mercury occurred at sediment depths of 150 cm, 70 cm, and 160 cm in Thomson, Forbay, and Fond du Lac respectively. PCB distribution in the cores was similar to that of the mercury with the highest concentrations in the middle of the cores (1960's). For all the reservoirs, dioxin was undetectable in surface and bottom strata and reached maximum concentrations in the mid-1940's or mid-1950's strata.

Fish: Mercury was detected in all the fish sampled at levels ranging from 0.03 mg/kg - 0.63 mg/kg. PCBs levels ranging from 25 ug/kg - 62 ug/kg were detected in several fish from the two reservoirs. Dioxin was not detected in any of the fish.

Toxicity: Survival of *Hyalella* was significantly lower for the deep core sections from Thomson and Forbay reservoirs than for the control sediments. Surficial sediments from the reservoirs were not acutely toxic. The PCBs and dioxin are not considered to be the cause of the observed toxicity in the deep cores. It may be from mercury or from some other unknown contaminants. Contact: Dan Helwig, MPCA, (612)296-7215.

Fond du Lac Reservation Study

The Fond du Lac Reservation is leading a study to determine mercury bioaccumulation pathways in the St. Louis River reservoirs. Since the Minnesota PCA 1992-93 study showed high mercury levels in sediment layers that were covered with a meter of cleaner sediment, the question arose as to how fish in the reservoirs are bioaccumulating mercury. In the summer of 1994, reservation technicians took approximately 75 sediment cores in the Knife Falls, Potlatch Dam, Scanlon, Thomson, Forbay, and Fond du Lac Reservoirs. These cores will be analyzed to determine if sediment highly contaminated with mercury is found at the surface and thus is contributing mercury to fish in the reservoirs. In 1995, the

reservation will be collecting benthic organisms and analyzing them for mercury levels. Contact: Larry Schwarzkopf, Fond du Lac Reservation, (218)878-2633.

Additional AOC Contaminated Sediment Work

Fraser Shipyard, Superior

The Fraser Shipyard is located in Howards Pocket, an inlet of St. Louis Bay. In 1993-94, the Wisconsin DNR and Fraser Shipyard conducted investigations of the sediments in the slip area to determine if there is a contaminant problem. The sediment contained elevated levels of lead, with an average of 215 mg/kg and a range of 39-503 mg/kg. No volatile organic chemicals were detected. Fraser has submitted a partial closure report that contains a proposed sediment sampling plan and clean-up strategy. The report is still in the development stage. Contact: Steve LaValley, WDNR-Superior, (715)392-7831.

Lakehead Dock Closure

This site is located on Superior Bay adjacent to Hog Island Inlet. Lakehead Pipeline Company had a petroleum transshipment facility at this site. During removal and demolition of the ship loading facilities in 1991-92, Lakehead discovered that a storage tank for the bilge water oil skimmer had leaked oil into the ground water and surrounding soil. They contacted the Wisconsin DNR and began clean-up operations which are ongoing.

As part of Wisconsin DNR's investigation at Hog Island Inlet, a few sediment samples were taken from the boat slip where Lakehead Pipeline Company had loaded ships. These samples contained high levels of PAHs. Lakehead is presently conducting additional sampling at this site to determine the extent of the contamination. Contact: Steve LaValley, WDNR-Superior, (715)392-7831.

Contaminated Sediment Bioassay (Toxicity Tests), Study of Wisconsin Great Lakes Coastal Harbors and Tributaries

Sediment samples from contaminated sites were used in laboratory tests of acute and chronic toxicity and bioaccumulation tests. Samples were collected using a petite ponar dredge to insure collection of surface sediment. Sites in the St. Louis River System AOC include: Hallett coal dock #6, north of Minnesota Power and Light dock, northeast of WLSSD outfall, and Allouez Bay (reference site). Contact: Linda Talbot, Christin Campbell, & David Smith, WDNR - Bureau of Water Resources Management. Report date - February 1992.

In Situ Bioaccumulation Study of Lake Superior and Green Bay Coastal Sediments

The availability of sediment associated contaminants for biological uptake by aquatic organisms was studied as well as the utility of in situ and in vitro bioaccumulation tests in sediment quality assessment and monitoring. Sites in the AOC include: north of Minnesota Power and Light dock, northeast of WLSSD outfall, Stryker Embayment, and Allouez Bay (reference site). Contact: Christin Campbell & Linda Talbot, WDNR - Bureau of Water Resources Management. Report date - January 1993.

Contaminated Sediment Assessment of Macroinvertebrate Community Structure

Survey of the benthic macroinvertebrate communities at the same sites as the chemical analysis, toxicity and bioaccumulation testing which was done in the previous two studies. The study includes benthic

macroinvertebrate surveys to assess changes in community structure and function at the trophic level of biota nearest to the sediment. Contact: Christin Campbell & Linda Talbot, WDNR - Bureau of Water Resources Management. Report available - January 1995.

Regional Environmental Monitoring and Assessment Program (R-EMAP) Proposal

Additional sediment assessment work is being planned for 1995. The purpose of the R-EMAP proposal is to develop a set of generic environmental indicators based on biological and chemical measures for long-term assessment of AOCs using the EMAP-Great Lakes and EMAP Surface Water indicators. The indicators will consist of benthic community assemblages, sediment toxicity, and surficial sediment chemistry. The R-EMAP project will determine, at a known confidence level, the percentage of area within each of the three identified habitat classifications that is sub-nominal with respect to sediment chemistry, sediment toxicity or mutagenicity, or benthic community structure. Then there will be a statistical exploration of the relationship between measured contaminants and toxicity or impaired benthic community at sites identified as sub-nominal. Contact: Dan Helwig, MPCA, (612)296-7215.

3. Timetable of Actions

Action	1994	1995	Future dates
<i>Mudpuppy</i> sampling	After the 1993 study, some sites were revisited in 1994.		
U.S. Steel Superfund site	MPCA requires NPDES permit for discharges - Summer, 1994		
Interlake Superfund site	Tar seeps were cleaned up - 1992 Soil and sediment plans being developed - 1994 and 1995		
Hog Island Inlet/Newton Creek site	Draft report for 1993 study completed - April, 1994 Additional sampling in May-August, 1994	Feasibility study being developed	

WLSSD Embayment site	Sampling - 1993 & 1994		
Crawford Creek wetland site	U.S. EPA required a new Quality Assurance program for sediment analysis - 1994	Off-site assessment of sediment may occur in 1995	
Reservoirs study	Final report - Summer, 1994		
Fond du Lac Reservation study	Sediment cores taken - 1994	Collection of benthic organisms - 1995	
Fraser Shipyard	Sediment investigations - 1993 & 1994		
Lakehead Dock	Soil clean-up near completion - 1994	Sediment investigation - Jan. - Feb., 1995	
R-EMAP Project		Project begins - June, 1995	

4. Sediment Data Base

The development of a data base to track historical data, as well as data generated from current and future sediment assessment projects is underway. The data base will be used to develop sediment contour maps of the AOC and analyze data to determine significant depositional areas on which to focus future efforts. These maps will provide additional information for making management decisions about contaminated sediment issues and evaluating remediation options.

In 1990, a sediment data base was constructed by the Arrowhead Regional Development Commission under contract with Minnesota PCA. The purpose was to assemble all available sediment data for the AOC. Dr. Dianne Dorland, UMD, Toxics TAC Chair, developed initial geographic information system (GIS) maps for use by the committee. In 1991, staff from Wisconsin DNR and the UW-Superior Lake Superior Research Institute corrected entries for mercury and PCBs, added data from 13 additional studies, and incorporated PAH (polycyclic aromatic hydrocarbons) and dioxin data into the data base. Minnesota PCA staff used the corrected and expanded data base to develop GIS maps that were used in the Stage I RAP document (1992).

The data base included all available sediment information (31 studies) from the early 1970's to 1990, from a variety of sources: the U.S. Army Corps of Engineers, U.S. EPA, state agencies, contractors and university researchers. No attempt was made to evaluate these studies' quality control or quality assurance, due to lack of resources. Limits of detection and quantification varied considerably between studies. Accurate location information was not available for most of the data.

Following completion of Stage I in 1992, Minnesota PCA and Wisconsin DNR obtained U.S. EPA funding for studies to acquire needed sediment data. These studies followed known quality assurance and control procedures, and were designed to provide information needed to make judgments and decisions leading to remediation or other management options. New data will be placed in a data base that accounts for these attributes and is compatible with other systems. Data which now resides in the

Stage I data base will be evaluated for quality assurance/quality control (QA/QC) and transferred to the new data base as resources allow.

Wisconsin DNR and Minnesota PCA will use a joint sediment data base system so data can be shared between the two agencies and with other management agencies. The data will contain all QA/QC verified information which has been collected since 1991. Data collected prior to this will be transferred to the new system as time and resources allow it to be verified for QA/QC.

The sediment data base being used is specific to the St. Louis River AOC and will be compatible with other data systems (D-Base 4, Oracle, etc.) and the proposed Contaminant Data Base System which is currently being developed by the Wisconsin DNR, Bureau of Water Resources. It will be important to be able to link other data to the sediment information to develop the overall picture of the status of the AOC.

5. Geographic Information System (GIS)

To characterize the extent of sediment contamination in the AOC, the GIS will be used to map existing and newly collected sediment data. Chemical and physical sediment data, along with geographic locations will allow creation of maps to illustrate spatial distribution of contaminants within the AOC. Data from the 1992-94 studies and future studies which meet QA/QC criteria will be included in the database. Historical data will be added after it is validated to the extent possible and qualified as to the QA/QC of the study.

The GIS system will contain chemical and physical sediment data along with coring location and water and sediment depths. Sediment maps will be produced, with soft sediment deposits identified. These maps will provide the sediment volume information needed to develop and evaluate remediation alternatives.

6. Sediment Quality Criteria

Sediment quality criteria provide a rational basis for dividing sediment into "clean" and "contaminated" fractions. Sediment quality criteria may be either chemical-specific numerical values, or narrative descriptions implemented through biological testing criteria. Biological effects may be considered by integrating sediment toxicity/bioaccumulation, contaminant concentrations, and in situ responses of biota. Background concentrations may also be determined for comparison using "clean" reference sites.

Sediment quality guidelines and criteria developed by other regulatory agencies should be used in developing screening-level clean-up objectives for the AOC. These guidelines include Ontario Sediment Quality Guidelines, National Oceanic and Atmospheric Administration (NOAA) - Status and Trends, State of Washington Sediment Standards, Netherlands Sediment Quality Objectives, the U.S. EPA Proposed Sediment Quality Criteria, and the Canadian Marine Sediment Quality Guidelines. Once a site is selected, site-specific, biologically-based criteria can be developed to refine sediment quality objectives.

Because of uncertainties regarding what a safe and appropriate level is for a particular contaminant in sediment, much time has passed and will continue to pass before a set of standards is published. The most appropriate response for RAP participants may be to embrace and acknowledge this uncertainty and compare sediment concentrations to a range of "acceptable" concentrations.

By comparing sediment concentrations to a range of reported effects, a cost estimate can be generated for various levels of clean-up. This allows for consideration of the economic implications of a remediation alongside the expected benefits.

For example, for a particular deposit, \$1 million of remediation may provide clean up down to 1 ppm PCB, but for an additional \$3 million the site can be cleaned up down to 0.05 ppm PCB. The reality is that spending \$4 million dollars may not be realistic in order to clean up a site to 0.05 ppm. An assessment must be made of whether cleaning up a site to 1 ppm PCB will still move us towards RAP goals.

Economics and technical feasibility are not the only factors influencing the clean-up goals for a specific sediment deposit. The position of the deposit within the system is also a key factor. A sediment quality objective of "background" makes sense when there are no upstream or continuing sources of contaminants, other than the sediment itself. Using that as a criteria for sites further downstream within the system may be of little value.

7. Future Goals for Sediment Assessment

There is significant interest in sediment studies and sediment loadings to the AOC. The information gathered from all of the sources will provide valuable insights into the overall contamination of sediments within the AOC. Many of the studies are looking at the area-wide problems in depositional zones which previously were not evaluated. Other studies will provide insight into loadings from non-point source pollution and their impact on the AOC. The site specific documentation of known sediment "hotspots" will enable us to evaluate options for remediation.

All of these studies have not yet been thoroughly reviewed and integrated into one data base, and many of these studies are ongoing or in the initial planning stages. When studies are completed, the information needs to be reviewed for QA/QC and incorporated into the computer data base system for the AOC. This data base system needs to be developed to track historical data, as well as data generated from current and future sediment assessment projects. The data base will be used to develop sediment contour maps of the AOC and analyze data to determine significant depositional areas on which to focus future efforts.

A long term Trends Monitoring Plan also needs to be developed by the state agencies for the AOC to measure the success of efforts to clean up the St. Louis River and harbor. This Trends Monitoring Plan is in the early development stage. It will look at ways of measuring and assessing the long term changes in the entire ecosystem: benthic communities, fish health, diversity of species, water quality, and sediment quality.

8. Developing and Implementing Remedial Options

When an area of contamination has been identified and adequately characterized and upstream contamination sources controlled, remedial options will be considered. Because of the unique characteristics of different sediment deposits, remediation techniques may need to be chosen on a site specific basis.

Thorough work performed during sediment characterization and sampling will lead to efficient evaluation and implementation of these options. For example, knowing the approximate depth of contamination will help to avoid removing more sediment than necessary. This can greatly reduce the

costs of remediation, considering the high cost of removal and treatment. Limited options exist for the remediation of contaminated sediments. Since this is a relatively new field, the effectiveness of some options has yet to be verified.

9. Future Activities

The sediment program outlined previously will be followed by the Wisconsin DNR and the Minnesota PCA. The Sediment Assessment Plan is moving ahead and some of the actions are currently underway. But the items in the Management Plan and Monitoring Plan sections are just beginning to be addressed. For example under the Management Plan, as enough information is gathered at a specific site, a feasibility study will be done to determine what the remedial options are for the site. The Monitoring Plan is tied to a bigger issue of trends monitoring and biomonitoring and work has not begun on this plan, but it will be addressed in 1995.

Another component of future activities will be a continued efforts to determine contaminated sediment hotspots. Complementary to this effort is the need to develop a disposal plan for contaminated sediments since the present dredged material disposal facility is nearing capacity. This issue is discussed further in section IV.A.5. Restrictions on Dredging.

IV. USE IMPAIRMENTS

A. IMPAIRED USES IN THE AREA OF CONCERN

Recommendations have been developed and actions have been taken to address these use impairments. The Citizens Advisory Committee has approved and selected recommendations for implementation. All the recommendations are included in their entirety in Appendix A at the end of this report. However, only the recommendations which are scheduled for implementation in 1994-95 are included in the tables which list the time frame for actions.

<u>IJC Criteria</u>	<u>Reason</u>	<u>Comments</u>
Fish Consumption Advisories	Advisories issued by MN and WI	PCBs, Mercury, Dioxin (MN), Chlordane (WI)
Degraded Fish and Wildlife Populations	Impact of ruffe (exotic fish species)	-
	Decline in threatened and endangered wildlife species	-
Fish Tumors and Other Deformities	Observations in 1991 (harbor) and 1985 (Crawford Creek)	Data on incidence of tumors and deformities needed
Degradation of Benthos	Documented at Stryker Bay and Hog Island/Newton Creek	Surveys are needed to document extent of problem in AOC
Restrictions on Dredging	Contaminated sediment	Data lacking for many parts of AOC
Excessive loading of sediments and nutrients to Lake Superior	High sediment/nutrient load from AOC to Lake Superior	-
Beach Closings/Body Contact	Sewage bypasses	Probable site specific bacterial problems from bypasses, spills, etc.
Degradation of Aesthetics	Aesthetics of water degraded by oily materials at Stryker Bay/Interlake and at Hog Island/Newton Creek	Other areas may have aesthetic impairment
Loss of Fish and Wildlife Habitat	Documented loss of habitat at Stryker Bay and Hog Island due to contamination	Continuing loss of physical habitat limits populations

¹ Adaptation of IJC criteria to fit local conditions

1. Fish Consumption Advisories

IJC Listing Criteria: *When contaminant levels in fish or wildlife populations exceed current standards, objectives, guidelines, or public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must be due to contaminant input from the watershed.*

Is the Beneficial Use Impaired? *Yes*

a. Problems Defined Under This Use Impairment

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. Advisories have been issued by both states for fish in the St. Louis River and Lake Superior. The advisories are due to unacceptable levels of mercury, PCBs, dioxin (MN), and/or chlordane (WI) in certain size fish. However, the Minnesota and Wisconsin fish advisories differ in terms of the species and size of fish and the acceptable consumption levels listed in the advisories. Since the advisories are for the same bodies of water, they can be confusing to individuals wanting to consume fish from these waters (Stage I Report, pps. IV-3 to IV-11).

b. Recommendations Developed and Actions Taken Towards Use Restoration

1) Elimination of Fish Consumption Advisories

Sediment Contamination Studies

The Stage I Toxics Technical Advisory Committee identified sediments as a major source of contaminants to fish. They recommended that more information be gathered on the location of contaminated sediment hot spots and contaminant profiles with depth. Section III. Contaminated Sediment in the St. Louis River System AOC lists the sediment sampling that has been undertaken since the Stage I Report was completed.

Sediment Quality Guidelines

The Great Lakes Sediment Task Force was formed by the U.S. EPA Region V to look at contaminated sediments and the impact of these contaminants on benthic and water column organisms, bioaccumulation in fish, and uptake through the food chain to humans. The Task Force is composed of resource management agency staff from around the Great Lakes. Their goal is to develop sediment quality criteria for contaminants and sediment clean-up goals for sites around the Great Lakes.

Study of Treatment of Contaminated Sediments

Researchers at the U.S. EPA Environmental Research Laboratory - Duluth (ERL-D) have been investigating ways to minimize mercury accumulations in the food chain. Using littoral enclosures (corralled areas of a lake), they have tried some of the following methods to reduce mercury uptake by fish: adding clean sand over mercury contaminated sediment, adding vegetation which takes up the mercury, aerating the water, and adding chemical compounds that bind up the mercury. The micronutrient addition, sodium selenite pentahydrate, has been most successful in reducing the levels of

mercury in test fish. This work is ongoing. Funding proposals have been submitted by the U.S. EPA Lab to continue the research into 1997. Contact Gary Glass, U.S. EPA Lab, 218-720-5526 for more information.

2) Varying Fish Consumption Advisories by State

The Great Lakes Sport Fish Consumption Advisory Task Force, composed of resource management and health department staff from around the Great Lakes, is attempting to develop a uniform sport fish consumption advisory protocol applicable to all the Great Lakes for PCBs. The Task Force meets once or twice each year to share environmental sampling results, coordinate future sampling protocols, and review the appropriateness of the placement of fish in each Lake's advisory. The Michigan Science Board is presently coordinating a review of the protocol which will be complete by Spring, 1995. Minnesota has already adopted the proposed protocol developed for Lake Superior; however, this protocol does not cover tributary waters of Lake Superior.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
U.S. EPA mercury research with sediments	Project is ongoing through 1995	Proposals have been submitted for funding through 1997.	
Great Lakes Sediment Task Force	Work is ongoing to develop sediment criteria and clean-up goals		
Great Lakes Sport Fish Consumption Advisory Task Force	Negotiations are ongoing. MN adopted Lake Superior protocol - Summer, 1994	Review of protocol complete - Spring, 1995	

d. In the Future

The fish consumption advisories are a long term problem since it is believed that the contaminated sediment in the harbor is the source of many of the contaminants in the fish. The numerous sediment quality studies that are being undertaken will give resource managers the information they need on the extent of sediment contamination. When the Great Lakes Sediment Task Force guidelines and criteria are completed, they will be considered along with other factors in making management decisions about clean-up of contaminated sediments.

The work of the U.S. EPA lab could provide a cost effective mechanism whereby the contaminated sediment is not removed from the harbor, but the contaminants in the sediment are no longer available for uptake by aquatic life. This study is expected to continue into 1997.

Until the contaminant sources in the harbor are reduced or eliminated, this impaired use will not likely be restored. However, the varying consumption advisories by states may eventually be eliminated as the

states work together through the Great Lakes Sports Fish Consumption Advisory Task Force. To be helpful in the St. Louis River AOC though, the Task Force will also need to address mercury, dioxin, and chlordane (Lake Superior only) and the states of Minnesota and Wisconsin must agree to extend the protocol to tributary waters of Lake Superior.

2. Degraded Fish and Wildlife Populations

IJC Listing Criteria: *When fish and wildlife management programs have identified degraded fish or wildlife populations due to a cause within the watershed. In addition, this use will be considered impaired when relevant, field validated, fish or wildlife bioassays with appropriate quality assurance/quality controls confirm significant toxicity from water column or sediment contaminants.*

Is the Beneficial Use Impaired? *Yes*

a. Problems Defined Under This Use Impairment

1) Fish Populations

Since 1979, fish populations have been recovering due to formation of the Western Lake Superior Sanitary District (WLSSD) and construction of the WLSSD wastewater treatment plant which resulted in improvements in water quality. However, fish populations are still adversely affected by alterations and loss of physical habitat, proliferation of exotic species, and possibly by exposure to toxic substances.

-Operation of the Fond du Lac dam has adversely affected walleye spawning success. Stranding and mortality of spawning adults and eggs has been observed under erratic flow conditions. Specific flow requirements for the St. Louis River species of interest are not adequately defined (Stage I Report, pps. IV-18 to IV-19).

-Lake sturgeon populations in the St. Louis River have plummeted since the 1800's when the fish were commercially harvested. The population reduction may be due to bad water quality in the past, overharvesting, or dam construction. At the present, there are no spawning lake sturgeon in the river (Stage I Report, PP. IV-19).

-The population of ruffe, an exotic fish first found at Minnesota Point in July 1987, now surpasses populations of native fish. In July 1990, ruffe was the second most abundant species found in U.S. Fish and Wildlife Service trawls of the St. Louis estuary. In 1991, ruffe was the most abundant species in the trawls (Stage I Report, pps. IV-20 to IV-21).

-Purple loosestrife, an exotic plant from Europe, has infested the estuary and has the potential to degrade fish and wildlife populations. The plant crowds out native vegetation yet provides little or no food or habitat for waterfowl and other animals. The thick growth of loosestrife can choke off or eliminate access to fish spawning grounds (Stage I Report, pps. IV-22, IV-24, IV-69).

-In 1991 and 1992, Envirovet trawls in the Duluth-Superior harbor turned up fish with significant pathological alterations (Stage I Report, pp. IV-26).

-A number of fish sampled on Crawford Creek (tributary to the Nemadji River) in 1985 had spinal deformities and possibly tumors (Stage I Report, pp. IV-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 alteration or loss of physical habitat and possibly toxic contamination.

-The piping plover, a federally endangered species, has not nested in the estuary since 1985 due to loss of suitable breeding habitat. Human development of historical nesting sites, natural succession of vegetation, rapid increases in competing colonial species, and human disturbance have all contributed to the demise of the piping plover in the AOC (Stage I Report, pp. IV-23).

-The population of great blue herons at the rookery near Billings Park on the Wisconsin shore has been declining in recent years. This decline is likely due to human disturbance from housing developments on the shore (Stage I Report, pp. IV-24).

-The common tern has had low reproductive success in the St. Louis River estuary since the mid-1970's. Factors such as lack of suitable rearing and nesting habitat, chemical contamination, human disturbance, predation, inclement weather, and competition with ring-billed gulls for breeding habitat may be responsible for their decline (Stage I Report, pp. IV-23).

-Over the last 10 years, die-offs of immature ring-billed gulls and adult mallards have been noted in the harbor. Investigations by Minnesota DNR and the U.S. Fish Service found no conclusive reasons for the die-offs (Stage I Report, pp. IV-24).

-Common tern chicks with cross-bills have been found at Interstate Island (Stage I Report, pps. IV-27 to IV-28).

-Bald eagles around Lake Superior exhibit lower reproductive success than those nesting inland (Stage I Report, pps. IV-24 to IV-25, IV-28).

-A pilot study with wing-clipped mallards showed that ducks on Erie Pier accumulated PCBs in the 2.5 month period of the study. Therefore, resident bird populations may be accumulating unhealthy levels of contaminants at this facility.

b. Recommendations Developed and Actions Taken Towards Use Restoration

1) Fish Populations

Loss of Habitat

Recommendation 11 - FISH STRANDING asks that Minnesota Power continue to improve operating procedures at dams on the St. Louis River to prevent stranding of fish and fish eggs. In addition, Minnesota Power and the Minnesota DNR should develop ramping rates which reduce the potential for fish stranding at the Thomson and Fond du Lac dams. Minnesota Power has already taken action to reduce strandings of fish due to low water from dam operations.

Recommendation 12 - DAM RELICENSING provides a list of questions and concerns that the RAP would like to see addressed in the Environmental Impact Statement (EIS) being prepared by the Federal

Energy Regulatory Commission for the relicensing of dams on the St. Louis River. The recommendation puts the RAP Citizens Advisory Committee in an intervenor role in the permitting process. The recommendation was sent to the FERC on May 16, 1994. A public hearing on the draft EIS was held on August 11, 1994. The final EIS has not yet been issued.

The Wisconsin and Minnesota DNRs have been stocking lake sturgeon in the St. Louis River in an attempt to establish a naturally reproducing population in the river. Preliminary results indicate these fish are surviving well. After leaving the river, the fish move eastward along the Wisconsin shore. They are becoming more abundant between Superior and the Apostle Islands. The stocking program has been put on hold pending results from genetic studies. The RAP members have not yet considered whether they will develop a recommendation dealing with this issue.

Exotic Species

Recommendation 9 - RUFFE suggests that no action be taken to eradicate the ruffe. Rather, the state management agencies should continue to improve the health of the aquatic ecosystem and continue research on the basic biology and behavior of the ruffe in order to discover possible control measures.

The Seaway Port Authority of Duluth led an effort to develop rules for ballast water exchange for ships that take on ballast in the Duluth/Superior harbor. The ships exchange their ballast water with Lake Superior water at some point west of a line from Grand Portage, MN to Ontonogan, MI. This will help prevent the spread of ruffe out of the Duluth/Superior area.

Recommendation 34 - PURPLE LOOSESTRIFE asks that approved biological control organisms be released in the Area of Concern to control loosestrife and that small localized populations be eliminated by applying herbicides. In addition, the Departments of Agriculture should expand their public education campaign and determine the need for additional inspections of horticultural outlets. A proposal to fund this recommendation was sent to the Great Lakes National Program Office in September, 1994.

In the Spring of 1994, UW-Extension staff in Superior completed production of a 25-minute educational video on exotic species. The video highlights the lamprey problem in the Great Lakes and also provides information on problems due to the zebra mussel, spiny water flea, purple loosestrife, Eurasian watermilfoil, and ruffe. The development of an exotic species video was recommended in Stage I of the RAP.

Toxic Substances

The potential effects of toxic substances on fish population health in the AOC is largely unknown. See the write-up for Fish Tumors and Deformities which describes the proposed fish pathology study.

2) Wildlife Populations

Insufficient Habitat or Loss of Habitat

The recommendation 28 - PIPING PLOVERS recommends that no habitat management efforts be undertaken for piping plovers. However, the Minnesota and Wisconsin DNRs should continue to monitor plover populations in the event that plovers return to the AOC. If this occurs, management alternatives should be reconsidered.

The recommendation 29 - COMMON TERNS asks that the Minnesota and Wisconsin DNRs continue to provide high quality nesting habitat for common terns. Vegetation control should be continued and efforts to reduce competition for nest sites by ring-billed gulls should be expanded. New nesting sites should be developed on reservoir islands in the St. Louis watershed and the DNRs and other management agencies should investigate the option of creating islands in the harbor from uncontaminated dredged material.

The Wisconsin DNR recently completed construction of a nesting crib for common terns. The crib is a wooden structure filled with sand located on the spit of land next to Allouez Bay within the bird management area. In the past, common tern nests on the spit of land were destroyed due to high water and waves.

Recommendation 10 - HERONS calls for management actions to retain at least one great blue heron rookery in the Area of Concern. The current rookery should be located and protected and other areas should be managed to encourage colonization by herons. It is believed that the herons are nesting in a new location in the Superior Municipal Forest.

The Superior Municipal Forest Committee, composed of volunteers representing different forest uses, has spent the past two years updating and revising the 1979 Superior Forest Management Plan. The Committee presented the new plan to the Superior City Council in March, 1995. The plan was approved by the City Council. One component of the plan calls for the designation of approximately 1/2 of the forest as a state natural area. The city will begin working with the Wisconsin DNR to develop a management plan for the portion of the forest in the state natural area. Recommendation 10 - HERONS should be included in that management plan.

Toxic Substances

The recommendation 26 - WATER BIRDS deals with coordinating available information on birds affected by toxic contaminants and monitoring uptake of contaminants in the food web. See the write-up on Bird or Animal Deformities or Reproductive Problems for more information.

Recommendation 27 - RAPTORS calls for coordinated monitoring efforts and consolidation of data to evaluate factors limiting raptor population growth. See the write-up on Bird or Animal Deformities or Reproductive Problems for more information.

A recommendation is being developed that calls for a waterfowl bioaccumulation study on the resident duck population at the Erie Pier dredged disposal facility.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
11 - FISH STRANDING recommendation	Changes in dam operations are already occurring		
12 - DAM RELICENSING recommendation	Mailed to FERC - 5/16/94 Public hearing on draft EIS - 8/11/94		
Voluntary ballast water exchange on western Lake Superior	This is ongoing		
Exotics species video	Production completed - Spring, 1994		
Construction of common tern nesting crib	Completed - Fall, 1994		
Superior Forest Management Plan		Updated plan approved by City Council - March, 1995	

d. In the Future

In the future, specific objectives need to be developed that can be used to measure the success of remedial actions. Some general objectives have been outlined in the existing recommendations for aquatic life, wildlife and habitat. However, many of these objectives need to be further defined to include measurable objectives. Following is a list of the objectives outlined to date and questions that may need to be addressed in the future:

Objective

Fish and fish eggs should not be stranded due to operation of the dams.

Aquatic habitat should be protected by providing adequate stream flows through operation of the dams.

Tolerate a population of ruffe in the AOC and prohibit their transfer out of the AOC.

Purple loosestrife populations should be reduced to ecological insignificance.

Questions that need to be addressed

Define "adequate stream flows". This will likely be decided through the FERC relicensing process.

Is there a population of ruffe that cannot be tolerated? When will eradication measures will be needed?

Define "ecological insignificance". What percent of wetland area would be allowed to have purple loosestrife? Would removal methods again be used if loosestrife exceeded the acceptable level?

Objective

Questions that need to be addressed

Establish 1-3 additional nesting sites for common terns.

What population of breeding terns and/or what number of fledged young per nest should be defined as the goal?

There should be at least one great blue heron rookery in the AOC and human encroachment should not cause premature rookery abandonment.

Define "premature rookery abandonment"?
What is the life span of a rookery?

The fish populations were severely stressed by the poor water quality prior to construction of the WLSSD treatment plant in 1979. As water quality improved, fish populations increased. However, the introduction of exotic species in the past 15 years has destabilized the fish populations. Fish managers are now attempting to monitor fish populations until the system has reached an equilibrium point. After this has been reached, it should be possible to develop specific management objectives such as numbers of spawning walleyes or northern pike.

3. Fish Tumors and Deformities

IJC Listing Criteria: *When the incidence of fish tumors or other deformities exceed rates at unimpacted control sites or when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers.*

Is the Beneficial Use Impaired? *Yes*

a. Problems Defined Under This Use Impairment

Observations suggest that fish tumors and deformities represent an impaired use in the St. Louis River estuary. While there is some data from the Envirovet program and the Crawford Creek study, there are no studies which conclusively document the incidence rates of tumors in fish.

- In 1991 and 1992, Envirovet trawls in the Duluth-Superior harbor turned up fish with significant pathological alterations. Eighty percent of the fish taken from the harbor showed significant lesions, fibrosis, hemorrhagic liver tissue, clubbing in the gill lamellae with noticeable hemorrhaging, and alterations in serum proteins that are consistent with a stress-induced acute phase response. This is in contrast to the fish taken from the Apostle Islands (outside the AOC) which exhibited normal organ structures and minimal or no signs of stress (Stage I Report, pp. IV-26).

- At present, the Envirovet data on fish tumors and deformities is insufficient to conclusively prove that this use is impaired. The Stage I Report stated that "Additional work is needed to fully determine the incidence of fish tumors and deformities in the Area of Concern" (pp. IV-25).

- A number of fish sampled on Crawford Creek (tributary to the Nemadji River) in 1985 had spinal deformities and possibly tumors. Sediments in the creek contain phenanthrene, pyrene, and other polynuclear aromatic hydrocarbons (PAHs). The creek receives drainage from a contaminated wetland below Koppers Company (Stage I Report, pp. IV-26).

While this impairment is still not conclusively proved, the contaminated sediment in the AOC could be a source of stress to fish. Tumor incidence in Great Lakes fish has been shown to increase near areas contaminated by chemical compounds such as PAHs and PCBs (Baumann, 1984). Sediment polluted with PAHs are found at Crawford Creek, Hog Island Inlet¹, U.S. Steel Superfund site, and Interlake Superfund site. Sediments that are moderately polluted with PAHs are found throughout the harbor. Sediments contaminated with PCBs are found throughout the harbor. Definitions of sediment pollution levels are found in the Stage I Report, pps. IV-44 and IV-50, and Figures IV5.b and IV.7b.

¹~~Hog Island Inlet was initially listed as a PAH contaminated area. However, 1993 and 1994 WDNR studies indicated that PAHs are not the primary problem at Hog Island Inlet as once indicated. See Section III. Contaminated Sediment in the St. Louis River System AOC for an update on sediment quality at Hog Island Inlet.~~

b. Recommendations Developed and Actions Taken Towards Use Restoration

1) Extent of the Problem

Liver Watch Study

The St. Louis River Watch program has undertaken a "Liver Watch" study of bullhead livers taken from fish captured at various locations in the harbor. The fish were captured by the U.S. Fish and Wildlife Service and the Great Lakes Indian Fish and Wildlife Commission in the summer of 1993 as part of their work on the ruffe. The fish livers were removed and placed in Bouin's fixative, a preserving solution. Thin sections slides of the liver were examined by Nan Stokes, a retired U.S. EPA lab employee. The results of this study will be available by Winter, 1994. This data will provide useful preliminary information on the health of bullheads in the harbor.

Fish Pathology Study

The Envirovet data is preliminary information that indicates that fish in the harbor are under stress. To elaborate on this data, the recommendation (5 - FISH PATHOLOGY) suggests that a pathological/histological study of non-migratory fish populations be undertaken in the St. Louis River/harbor. This study should be part of a comprehensive long term monitoring program. The goal of the study is to determine the health of the fish populations and the environmental stressors that may be impacting these populations. The study would consist of sampling at control sites and within the harbor and river at contaminated sediment sites. A Health Assessment Index would be used to analyze the health of the fish and other detailed studies would be undertaken, if necessary, to determine environmental factors that are stressing the fish.

2) Relation to Contaminated Sediments

Crawford Creek

The Wisconsin DNR is attempting to address the PAH problem at the Crawford Creek wetland where the deformed fish were found. A sediment assessment will be done as part of a Resource Conservation and Recovery Act facility investigation. See Section III. Contaminated Sediment in the St. Louis River System AOC for a summary of actions taken to date.

Mudpuppy Sediment Sampling

1993 sediment sampling around the harbor by the U.S. EPA vessel, the *Mudpuppy*, located other highly contaminated areas besides the hotspots listed in the Stage I Report. These areas are now being investigated further and more data is being collected in order to determine the severity and geographical extent of the contaminated sediments. This information will be helpful in determining the exposure of fish to contaminants in the AOC. See Section III. Contaminated Sediment in the St. Louis River System AOC for more information.

Sediment Contamination Workshop

The Wisconsin DNR and the Minnesota PCA hosted a workshop in July, 1994, of state agency staff, U.S. EPA staff, and academic researchers to examine methods to develop clean-up guidelines for PAH contaminated sediments in the AOC with emphasis on the U.S. Steel and Interlake Superfund sites..

Based on the Ontario Ministry of the Environment sediment quality guidelines, there is no level of PAHs that has "no effect" to benthic organisms. Thus workshop participants will be examining methods to determine acceptable clean-up levels of PAH contaminated sediments.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
Liver Watch Study	Completion - Winter, 1994		
5 - FISH PATHOLOGY recommendation		Possible funding by U.S. EPA for 1995	
PAH Workshop	Summer, 1994		

d. In the Future

First, there has to be a final determination of use impairment. The Liver Watch study should provide preliminary information on fish stress in the harbor. This information will be considered when designing and conducting the proposed fish pathology study. After the fish pathology study is conducted, there should be enough information to determine if there is a fish tumor and deformity problem in the AOC.

If there is no documented problem, this use impairment can be removed from the impairment list.

If the studies prove that fish in the AOC are stressed and have tumors or deformities, then the sources of the stress to fish health need to be determined. Some of this information will be ascertained through the fish pathology study.

If the contaminated sediments in the harbor are linked to the fish tumors and/or deformities, then sediments will need to be cleaned up to eliminate this impaired use. Some remediation work is occurring at present. However, progress is slow due to the legalities involved in determining responsible parties (at Superfund sites) and the need to determine the geographic extent of the sediment contamination. Investigative work is in progress at the more severely contaminated sites, i.e. Crawford Creek, the U.S. Steel Superfund site, and Interlake Superfund site. Some clean-up work has been undertaken at the Interlake site. There has been no remediation work at the Hog Island Inlet/Newton Creek site since the study of this site is not yet complete.

If this use is found to be impaired, and if contaminated sediments are found to be the main cause of this impairment, this use will not be restored until the sediments are cleaned up. This may be a long term use impairment since remediation of sediment contamination is an expensive and time consuming process.

4. Degradation Of Benthos

IJC Listing Criteria: *When the benthic macroinvertebrate community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity (as defined be relevant, field validated, bioassays with appropriate quality assurance/quality controls) of sediment associated contaminants at a site is significantly higher than controls.*

Is the Beneficial Use Impaired? *Yes*

a. Problems Defined Under this Use Impairment

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 discharges or hazardous waste sites. The benthic community is dominated by oligochaetes and chironomids, which are relatively tolerant of organic pollution (Stage I Report, pps. IV-29 to IV-35).

In evaluating sediment quality throughout the AOC, the Wisconsin DNR and Minnesota PCA have used the triad approach which combines sediment chemistry, toxicity tests and in situ benthic diversity to give a composite picture of 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.

b. Recommendations Developed and Actions Taken Towards Use Restoration

River Watch

From 1992 to the present, the River Watch participants have been sampling benthic macroinvertebrates as part of their water quality monitoring on the St. Louis River. Students and their teachers conduct sampling on the river in May, July, and October. Samples are taken from the harbor upstream to Forbes, Minnesota. Benthic macroinvertebrates are collected with kick nets and through the use of artificial substrates. Preliminary data showed the following:

- 1) Throughout the river the most common organisms found were the flatheaded mayfly, the water boatmen, net-spinning caddisfly, midges, aquatic worms, sowbugs, and scuds.
- 2) In sites upstream of Cloquet, armored mayflies and primitive minnow mayflies were found, both of which prefer clean water.
- 3) The harbor area contains organisms that are pollution tolerant and adaptable to muddy-silty substrate. Organisms include sowbugs, chironomids, and oligochaetes. This is consistent with findings reported in the Stage I Report.

Mudpuppy Benthic Study

In an effort to better understand the interaction between benthic organisms and sediment quality, several studies are currently underway. In the 1993 *Mudpuppy* survey of the AOC (see Section III. Contaminated Sediment in the St. Louis River System AOC), 40 sites were targeted based on suspected sources of contamination. The sediments from each site were analyzed for concentrations of targeted pollutants, as well as toxicity to the benthic organisms *Hyaella azteca* and *Chironomus tentans*, and the bacterium *Photobacterium phosphoreum* (MicrotoxR and MutatoxR). This study laid the ground work for another study to be done in the fall of 1994 in which eight of the most contaminated 1993 sites and one reference site ("clean site") will be analyzed for sediment contamination, toxicity to benthic organisms, and benthic community structure. This information will enable us to begin establishing a data base to evaluate long term trends related to benthic community structure at various pollutant levels.

Hog Island Study

The community of benthic organisms observed in Hog Island Inlet is significantly less diverse (measured as taxonomic richness and Shannon-Weaver Diversity Index) than the community observed at a non-contaminated reference site. Relatively pollution-tolerant tubificid worms and nematodes dominated the three sites studied in Hog Island Inlet (i.e., 68 to 94 percent of total number of organisms observed) but comprised less than one-third of the organisms observed at the reference site. Similarly, benthic communities observed in Newton Creek and Newton Creek Impoundment are less diverse (measured via Shannon-Weaver index) than the community observed in a reference creek.

In addition to the observation of impairment of the resident benthic community, laboratory tests showed that sediments of the system are toxic to benthic and water column organisms. When exposed to sediments from Hog Island Inlet, *Daphnia magna* experienced increased mortality and *Hyaella azteca* and *Chironomus tentans* experienced decreased growth relative to exposures to sediments from non-contaminated reference sites. Exposure to sediments of Newton Creek Impoundment caused increased mortality of *Daphnia magna* and *Chironomus tentans*. Organisms exposed to sediments from Newton Creek did not experience increase mortality, but did show limited growth relative to organisms exposed to reference site sediments.

Regional Environmental Monitoring and Assessment Program

A program for long-term monitoring of sediment quality, toxicity and benthic community status in the St. Louis River AOC called the Regional Environmental Monitoring and Assessment Program (R-EMAP) is planned for 1995. This study will monitor 120 sites for sediment toxicity, chemical contaminant concentration and benthic community structure. See Section III. Contaminated Sediment in the St. Louis River System AOC for more information.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
River Watch benthic macroinvertebrate surveys	Ongoing survey	Expected to continue through 1995	

<i>Mudpuppy</i> Benthic Study	Studies undertaken in 1993 and 1994. Data available on 1993 study - Winter, 1994-95		
Hog Island Study	Draft report for 1993 study completed - April, 1994. Additional sampling in May-August, 1994.		

d. In the Future

The studies that are currently being done in the AOC are moving us closer toward understanding the benthic communities in the St. Louis River AOC and the factors that affect them, such as sediment quality, water quality, and habitat. As more information is gathered, those aspects which are most crucial to a healthy and diverse benthic community will determine which clean-up efforts are critical to restore this impaired use. Many studies in the AOC involve triad assessments, which evaluate sediment chemistry, toxicity and benthic community structure at each location that is monitored to determine the interactions occurring in the system. Triad information will aid in the selection of clean-up levels and remediation alternatives.

Due to the close association between sediment quality and degradation of benthic communities, the removal of this impairment could be a lengthy process since remediation of sediment contamination is an expensive and time consuming process.

5. Restrictions On Dredging

IJC Listing Criteria: *When contaminants in sediments exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.*

Is this beneficial use impaired? *Yes*

a. Problems Defined Under This Use Impairment

Dredging is required to maintain water depths in navigational and docking channels to accommodate large ships. Therefore, the disposal and reuse of dredged material is an important issue. Approximately 150,000 cubic yards of sediment are dredged from the harbor annually to maintain shipping channels (Stage I Report, pp. IV- 52). This material is disposed of in the Erie Pier confined disposal facility. The life of this facility has recently been extended for a few more years by increasing storage capacity and the reuse of clean dredged materials. However, these are only a short term solutions for the dredge disposal problem.

Contaminated sediments located in pools behind the five dams of the lower St. Louis River contribute to contamination in the estuary and harbor. Glass et al. (1990) found mercury ranging from 0.04 mg/kg to 0.96 mg/kg. The Corps of Engineers estimates that there are 4.6 million cubic yards of sediment/sludges trapped behind these dams (Stage I Report, pps. IV-48 to IV-51).

The Stage I Report also listed five areas within the harbor with clearly elevated levels of contaminants (Stage I Report, pps. IV-35 to IV-48). However, since these sediments are located in backwater areas outside the navigation channels and docking channels, they are not considered to be affecting maintenance dredged material disposal.

The five hotspots and the sediments in the reservoirs are being addressed through additional monitoring and characterization. See Section III. Contaminated Sediment in the St. Louis River System AOC for more information.

b. Recommendations Developed and Actions Taken Towards Use Restoration

Erie Pier Facility

The disposal of dredged material in the harbor has been the topic of much discussion over the years. The cost of replacing Erie Pier with a new facility is estimated at \$20 million, a cost that would have to be borne by the Twin Ports community. Since this cost is prohibitive, other options are being evaluated by the Harbor Technical Advisory Committee (TAC) of the Metropolitan Interstate Committee. Some of the options being considered include recycling clean sediment (sand fraction) from Erie Pier, constructing shallow water areas and islands, filling in deep holes in the harbor with clean material, and constructing a lined cell in Erie Pier for highly contaminated material.

Recommendation 40 - ERIE PIER CAPACITY states that the life of Erie Pier should be extended indefinitely by processing and reusing as much dredged material as possible, and if necessary, relocating non-reusable dredged materials to an inland disposal facility.

Recommendation 41- HABITAT ENHANCEMENT states that the need for processing and disposing of dredged materials should be reduced by utilizing suitable dredged materials to restore, enhance, and recreate fish and wildlife habitat. It asks that the Army Corps of Engineers continue to work with the Habitat Creation Subcommittee of the Harbor TAC to develop habitat projects.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
Harbor Technical Advisory Committee	Discussing disposal alternatives - 1993 to undetermined date		

d. In the Future

Sediment contamination will likely continue to cause sediment disposal restrictions until all major sources of contamination are brought under control and the heavily contaminated sediments are remediated. Since this will likely not occur in the near future, there must be disposal facilities for the dredged sediment. The work of the Harbor Technical Advisory Committee is an important first step towards developing a dredged material disposal plan for the AOC.

Since the restrictions on dredging are correlated to overall sediment quality, it is necessary to continue to characterize the sediments within the AOC and better understand contaminant locations and their sources. The information gathered from current and past research will provide valuable insights into the overall contamination of sediments within the AOC. Other studies will provide insight into loadings from non-point source pollution and their impact on the AOC. The site specific documentation of known sediment hotspots will enable us to evaluate options and alternatives for remediation. The projects proposed for the next year will enhance this sediment data base and fill in data gaps. This is needed to make necessary management decisions about sediment issues. See Section III. Contaminated Sediment in the St. Louis River System AOC for more information.

The next step listed in the Sediment Assessment Plan is to develop a sediment data base for all data from historical, current and future sediment studies. Wisconsin DNR and Minnesota PCA are currently working on this data base. As new data are available they can be entered into the system; historical data will be entered as time and resources allow. Maps of the AOC can be drawn using these data and a Geographic Information System (GIS). These maps will provide additional information for making management decisions about contaminated sediment and evaluating remediation options.

As more information is gathered about the sediments in the harbor area, pollution sources will be eliminated and remediation will occur where necessary. Contamination will be reduced through elimination of point sources (i.e. sediment hotspots and direct discharges to the system) and non-point sources (i.e. erosion control and storm water control) making it possible to remove the restrictions on dredging.

6. Excessive Loading of Nutrients and Sediments

IJC Listing Criteria: *When there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication.*

Is the Beneficial Use Impaired?

No, not by a literal interpretation of the IJC criterion. 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 IJC eutrophication criterion to reflect local conditions.

Adaptation of IJC Eutrophication Criterion to Fit Local Conditions: *High nutrient and sediment levels in the St. Louis River estuary lead to excessive loadings to Lake Superior, although these high nutrient levels do not seem to be expressed as eutrophication in the Area of Concern.*

Is the Beneficial Use Impaired? *Yes*

a. Problems Defined Under This Use Impairment

Phosphorus concentrations in the estuary are at levels where eutrophic conditions might be expected. Chlorophyll a concentrations measured in the estuary have been similar to levels found in mesotrophic or oligotrophic waters. Phosphorus availability and transport through the system may be connected to the high sediment loading in the river and 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 are important concerns.

-The 1972 National Eutrophication Survey (U.S. EPA, 1975) estimated that 50% of the phosphorus inputs to Superior Bay were from non-point sources. Cook and Ameal (1983) found that 90% of nutrient loadings to St. Louis Bay were from non-point sources. However, there is little or no current information on non-point loadings of nutrients to the Area of Concern (Stage I Report, pp. V-32).

-High sediment loading, especially of red clay, may contribute to the phosphorus load through the phosphorous that is adsorbed onto the sediment. In addition, the sediment load is a problem due to the cost of dredging the sediment to maintain the shipping channel. Based on data in the Stage I Report (pps. V-32 to V-35 and Appendix L), the Nemadji River is believed to contribute nearly half the material dredged from the Duluth-Superior harbor. Based on recent sediment budgets being developed for the watershed, the watershed may not be contributing as much sediment as previously thought.

b. Recommendations Developed and Actions Taken Towards Use Restoration

1) Nutrient Loading

Agricultural Activities

The recommendation 16 - FEEDLOT WASTE deals with waste from livestock operations. It recommends that the South St. Louis County and Carlton County Soil and Water Conservation Districts and the Ashland-Bayfield-Douglas-Iron Counties Land Conservation Department increase their efforts to assist farmers with feedlot management and animal waste control. They should encourage livestock operators to install agricultural waste management systems and teach them to use the manure efficiently. To do this, the conservation departments should pursue funding or reallocate funds for additional positions.

Storm Water

Miller Creek Storm Water Study

In 1993, the Minnesota PCA led an investigation of the impact of storm water to Miller Creek in Duluth. The purpose of the study was to: 1) evaluate the impact of urban storm runoff on Miller Creek, 2) rank land uses according to the toxicity of runoff coming from each land use, and 3) evaluate the pollutant loading contribution of Miller Creek to the St. Louis Bay. Flow meters and samplers were positioned to collect samples of runoff (storm water and snowmelt) from four storm sewers and from one location on Miller Creek. Samples were tested for nutrients, metals, solids, organic compounds, mercury and toxicity to aquatic organisms.

Samples of runoff from a commercial/industrial and a commercial site were toxic. Toxicity at the commercial site was due to a high concentration of chloride; toxicity at the other site was likely due to high concentrations of metals and/or PAHs. State water quality maximum standards for trout streams were exceeded for copper, lead and zinc from several of the sites. The study concluded that 1) specific storm sewer basins have the potential for significant impact on Miller Creek, 2) commercial/industrial land uses generally have a greater impact on receiving water than residential land uses, and 3) Miller Creek is a significant source of sediment to the bay - loading from the creek can exceed maximum daily loading reported by the largest point source to the bay.

Recommendations based on study results include the following: 1) develop a comprehensive construction site erosion and sediment control ordinance; 2) re-assess current zoning and development restrictions within the Miller Hill corridor commercial area; 3) implement best management practices more frequently within commercial areas; 4) conduct education and outreach to citizens regarding storm water; and 4) develop a comprehensive storm water management plan for the Miller Creek watershed, and ultimately for all of Duluth. For a copy of the study contact John Thomas, MPCA- Duluth, at (218)723-4928.

Urban Storm Water Demonstration Project

The Lake Superior Urban Storm Water Demonstration Project is alerting citizens about significant storm water pollution problems and providing technical assistance to strengthen local preventive actions. The tri-state project focuses on the following communities: Duluth, Hibbing, Virginia and Cloquet,

Minnesota; Marquette, Houghton/Hancock, Ishpeming, Sault Ste. Marie, Negaunee and Ironwood, Michigan; and Ashland, Superior and Hurley, Wisconsin.

The project is composed of the following components:

- Monitoring - Monitoring of storm water of urban sites in nine of the project communities and at four storage piles was completed in the fall of 1994. Additional monitoring will continue through 1995 in two communities. Preliminary results indicate that storm water at many of the test sites often exceeds water quality standards for pollutants such as bacteria, heavy metals and PAHs.
- Pilot management plans - Project staff are working with city officials in Duluth to complete by September, 1995, storm water management plans to protect 10 trout streams. In Superior, the project is helping the city prepare for 1996, when Wisconsin law will require storm water permits for cities in Great Lakes Areas of Concern.
- Sewershed and land use maps - Maps are now complete for the 14 project cities. The maps provide land use data and help cities identify problem areas.
- Pollution totals - Data from the maps and monitoring are being used to determine "loadings" or total amounts of storm water and pollutants that wash into water bodies from the 14 project cities. The calculations were completed in 1994 and are available.
- Information and education - Public service announcements and printed materials inform citizens about storm water pollution problems. Spring 1995, is the date set for distribution of a manual on storage pile best management practices and for production of a teacher's packet of ideas for encouraging high school students to get involved in storm water issues.

The Urban Storm Water Demonstration Project, which is part of the Lake Superior Binational Program, is funded by a grant from the U.S. EPA and managed by the Wisconsin DNR in cooperation with the Michigan DNR, the Minnesota PCA, the U.S. Geological Survey, Lake Superior Center and Hurley High School.

For more information, contact Anne Holy, WDNR-Superior, (715) 392-0805; or John Thomas, MPCA-Duluth, (218)723-4928. The project coordinator is Jeff Prey, Bureau of Water Resources Management, WDNR-Madison, (608)267-9351

Stockpile Runoff

An inventory of bulk storage piles in the AOC is currently being compiled as part of the Urban Storm Water Demonstration Project (see the above project description). In addition, samples of runoff have been taken from several storage piles to characterize the quality of storm water runoff after contact with specific materials. The findings will be used to develop control methods for these sites and develop a manual of Best Management Practices (BMPs) to minimize contaminant transport to receiving waters.

25 - STOCKPILES recommendation deals with NPDES (National Pollutant Discharge Elimination System) storm water permits for stockpile facilities in the AOC. The Minnesota PCA and the Wisconsin DNR should require NPDES storm water permits for material handling facilities in the Twin Ports regardless of the use of the stored materials. They should also encourage companies to use storage pile

BMPs. Both the Wisconsin DNR and the Minnesota PCA are beginning to address this issue through their permitting programs.

Lawn Care

The recommendation 7 - LAWN EDUCATION suggests that the following education efforts be undertaken: the "Don't Dump" program of labeling storm sewers should be completed in Duluth and pursued in Superior and an education effort should be started to educate citizens about the proper "disposal" of yard wastes and the proper use and application of lawn chemicals.

Consistent with recommendation 7 - LAWN EDUCATION, the RAP Stewardship Work Group is planning a "Paint the Town Week" for the week of May 15, 1995. The preliminary plans are to have school students, civic organizations, and businesses volunteer to stencil storm drains in Minnesota and Wisconsin communities on the St. Louis River. "Don't Dump" brochures would be handed out in neighborhoods where the storm drains are stenciled.

Wisconsin's Environmental Decade Institute received funding from the Great Lakes Protection Fund to conduct a project entitled "The Green Thumb Project: Alternative Turf Management for Schools, Parks, and Homes" in 1995. The project will be undertaken in five Areas of Concern including the St. Louis River System, and will be a cooperative effort with the Western Lake Superior Sanitary District. The project is a 2-year effort focusing on schools and parks in the first year, and individual homeowners in the second year. Turf demonstration areas will be developed on school grounds and city parks showing pesticide free turf versus chemically treated turf. This program will then be expanded to homeowners through a major education and media campaign. The RAP is collaborating on this effort and a RAP Citizens Advisory Committee member (Nan Stokes) is serving on the project's advisory committee.

The recommendation 3 - GOLF asks the University Extension offices in Minnesota and Wisconsin to coordinate turf management education efforts and to provide more information on the alternatives to and environmental implications of using pesticides and fertilizers.

Protection of Buffer Zones

A recommendation is being developed that calls for protection of wetlands and riparian vegetation along the river. This will preserve habitat but also help to reduce phosphorus loading.

2) Sediment Loading

Loading and Land Use Studies

Pollutant Loading Study

The RAP Toxics Technical Advisory Committee stressed that inputs of contaminants from point and nonpoint sources must be eliminated in order to stop the continuing contamination of sediment. As a response to this, in 1994, the Minnesota PCA and the Wisconsin DNR began the St. Louis River Loading Study. The objectives of the study are 1) to determine annual loads of persistent contaminants from the St. Louis River to the Area of Concern and to Lake Superior, 2) identify contaminants of concern for follow-up regulatory activities within existing pollution control programs, and 3) provide a baseline-contaminant load to use as a measure of progress in the Area of Concern and Lake Superior.

Water samples will be collected in the St. Louis River at the Fond du Lac dam, the mouth of the Nemadji River, the Duluth Entry, and the Superior Entry. Loadings will be determined for conventional parameters such as chlorophyll-A and phosphorus and for the following parameters:

- Polychlorinated biphenyls (PCBs)
- Metals including mercury, cadmium, copper, chromium, lead and zinc
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (Dioxin)
- Toxaphene
- Hexachlorobenzene
- Chlordane
- Octachlorostyrene
- p,p'-dichlorodiphenyl-trichloroethane (DDT)
- p,p'-dichlorodiphenyl-dichloroethylene (DDE) and metabolites
- Dieldrin
- Herbicides including atrazine and metabolites, metolachlor (Dual), and cyanazine
- Total polynuclear aromatic hydrocarbons (PAHs)

In addition, as part of this study, the suspended solids load from 10 different tributaries to the St. Louis River will be examined. Contact: Gerald Flom, MPCA, (612)296-8382.

Nemadji River Basin Project

One of the recommendations from Stage I was that "the Nemadji River watershed should be the subject of a basin project to reduce erosion and sedimentation. This project should have a watershed- wide focus, determine the extent and causes of the nonpoint problems in the watershed, and formulate strategies to implement practices to reduce erosion and sedimentation." The Nemadji River Basin Project is now a reality. The project began in October 1993 and should be completed by Spring, 1996. The effort is led by the Natural Resources Conservation Service which applied for the funds with local sponsors (Carlton County Board, Douglas County Board, Carlton County Soil & Water Conservation District, Duluth/Superior Metropolitan Interstate Committee).

This project will recommend remedial actions and best management practices that can be implemented to restore beneficial uses to the Nemadji River System. It will suggest long-term forestry management and land use practices to reduce runoff and thus erosion and sedimentation. This is an important part of restoring beneficial uses to the AOC by reducing sediment loading and therefore contaminant transport to the estuary. A detailed sediment budget will be developed for the watershed as part of the project.

Recommendation 8 - NEMADJI deals with securing funding to implement recommendations of the Nemadji River Basin Project. It asks the Wisconsin DNR to consider making the Nemadji River watershed a Priority Watershed so that cost-share funds are available for nonpoint source reduction projects.

Recommendation 20 - MAILING LIST suggests that a mailing list be developed of the riparian owners along the Nemadji River and the St. Louis River. As time and money allow, this list should be expanded to include other landowners in the watershed. As part of the Nemadji River Basin Project, staff completed a computerized mailing list that includes all property owners in the Nemadji River watershed.

Agricultural Activities

Recommendation 17 - LIVESTOCK ACCESS deals with enactment of county ordinances on livestock access to waterbodies. Carlton, Douglas, and St. Louis counties should enact ordinances requiring that any pasturing or watering of livestock on the banks of a stream be addressed in an approved conservation plan.

Recommendation 22 - AGRICULTURE EROSION calls for continuation and expansion of education efforts and development of ordinances to reduce nonpoint source nutrient loading and sediment loading from agricultural activities. Resource management plans should be implemented fully and ordinances should be developed where necessary for implementation.

Construction Activities

In Stage I, the Sediment and Erosion Technical Advisory Committee developed a recommendation that stated that " An erosion control ordinance should be adopted and implemented by the cities of Duluth, Superior, Cloquet, Hermantown, and Proctor. The ordinance would require an approved erosion and sediment control plan for land disturbance activities. Several model ordinances have been compiled for use by the municipalities." The South St. Louis County Soil and Water Conservation District approached the Minnesota cities and began to assist them in adopting an erosion control ordinance. Proctor has adopted such an ordinance and Hermantown has passed a resolution requiring sediment and erosion control plans. The City of Duluth Planning Office is presently reviewing the feasibility of adopting an ordinance. The Superior city councilors examined the adoption of this type of ordinance, but discovered that due to a new state law, they cannot adopt a stricter ordinance covering an activity that is already addressed in state law. Thus, they cannot adopt the type of ordinance that was recommended by the RAP. Recommendation 23 - CONSTRUCTION EROSION discusses this issue in more detail.

Recommendation 23 - CONSTRUCTION EROSION deals with erosion from earth moving activities. Local government and land use agencies should be involved in implementation and enforcement of construction site erosion control. In addition, BMP education efforts should be continued and expanded.

Recommendation 24 - DITCH MAINTENANCE deals with erosion from ditch construction and maintenance. It recommends that the local conservation departments work with state and local governments to educate state, county, township, and city highway department staff and private contractors on the importance and benefits of using BMPs for erosion control. Part of this recommendation has been implemented. A BMP workshop was organized in Duluth in August 1994 and was attended by 80 individuals from private and government organizations in Minnesota and Wisconsin.

Forestry Activities

Recommendation 18 - SHORELINE FORESTRY deals with education efforts about shoreland ordinances in regard to forestry practices and vegetative cutting. Carlton, Douglas, and St. Louis counties have shoreland ordinances dealing with cutting of vegetation. However, these ordinances are apparently not well known to the general public.

Recommendation 19 - FOREST DIVERSITY asks foresters to manage forests on a subwatershed basis and diversify age classes and species to reduce peak flows in streams and rivers.

Recommendation 13 - SILVICULTURAL BMPs suggests that silvicultural best management practices (BMPs) be promoted and that the Minnesota DNR and the Wisconsin DNR continue and expand their audits of BMP compliance.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
Miller Creek Storm Water Study	Report completed- Spring, 1994		
Urban Storm Water Demonstration Project	Monitoring of urban storm water complete - Fall, 1994 Calculation of pollutant loads completed - Winter, 1994 Public education begins - October, 1994 Sampling at stockpiles begins - Summer, 1994	Storm water plans complete - July, 1995 Stockpile runoff BMP manual developed - 1995 Continue storm water monitoring and storm water planning - 1995 Develop loading projections - 1995	
"Don't Dump" stenciling week		Scheduled for the week of May 15, 1994	
Green Thumb project		Planning, team building, networking - Jan - March 1995 Phase I at schools and parks - Apr. to Oct., 1995	Phase II with homeowners - 1996
Pollutant Loading Study	Sampling begins - Fall, 1994	Sampling continues - 1995	
Nemadji River Basin Project	Project began - October, 1993		Project complete - Spring, 1996

Nemadji River watershed mailing list	List completed - December, 1994		
24 - DITCH MAINTENANCE recommendation	Erosion control BMP workshop - August 1994		

d. In the Future

The RAP members have developed numerous recommendations dealing with the issue of reducing nutrient and sediment loading to the St. Louis River System. Most of these recommendations require changes in land use over time since most of the nutrients and sediment are believed to be from non-point sources.

Some of the actions that have been taken such as the Miller Creek Storm Water Study, the Nemadji River Basin Project, the Urban Storm Water Demonstration Program, and the Pollutant Loading Study are providing valuable information on the source of nutrients, sediment, and other pollutants to the AOC. For example, a University of Minnesota GIS study of nine subwatersheds along the Nemadji River showed a correlation between the amount of forest cover in a watershed and the turbidity of the stream. Watersheds with less forested land experienced more erosion and more stream turbidity. This type of information can be used to target the non-point sources that are the largest contributors of nutrients and sediment.

The monitoring plan that is being developed for the St. Louis River AOC should include sampling for nutrients and sediment so that progress over time can be measured. The Nemadji River has often been cited as the main contributor of sediment to the Duluth/Superior harbor. However, this information has not been quantified. Steps should be taken to determine the tributaries that contribute the most sediment to the river. Erosion reduction efforts could then target these tributaries.

7. Beach Closings and Body Contact

IJC Listing Criteria: *When waters, which are commonly used for total body contact recreation, exceed standards, objectives, or guidelines for such use.*

Is the Beneficial Use Impaired? *Yes*

a. Problems Defined Under This Use Impairment

The 1994 Minnesota 305(b) Water Quality Report lists the portion of the St. Louis River under the I-535 (Blatnik) bridge as not supporting the swimmable use due to high fecal coliform levels. Nineteen of the 79 samples taken in the past 10 years (1985-1994), exceeded the 200 mpn/100 ml fecal coliform standard that is used for body contact recreation. The other reaches of the river had acceptable fecal coliform levels and supported the swimmable use.

Fecal coliform samples are taken on a regular basis only at designated beaches with a lifeguard. Since there are no designated beaches on the St. Louis River or in the harbor, there have been no beach closings. However, in the past several years, the St. Louis County Health Department has sporadically posted No Swimming signs at Boy Scouts Landing because of the general unsuitability of the area for swimming and the high fecal coliform levels in the water (pers. communication, Roger Bard).

While there are no designated beaches in Superior, people swim on the shore side of Barkers Island. In 1992 and 1994, the city sampled river water for fecal coliform bacteria at 10 separate locations (shore side and bay side of Barkers Island and the wastewater treatment plant outfall) on three different dates. Based on the geometric mean, there were no exceedances of the 200 mpn/100 ml fecal coliform standard (pers. communication, Mary Morgan).

There are, however, numerous sources of bacteria to the AOC. Sewage bypasses and overflows in Superior and Duluth, discharge of inadequately treated wastewater from on-site septic systems and marine vessels, and drainage waters from feedlots are sources of microbial contamination in the St. Louis River. In addition, portions of the St. Louis River AOC are not suitable for swimming due to contamination of sediments by toxic substances.

-The Superior sewer system cannot handle the volume of sewage and storm water during moderate storm events. Past problems have included back-ups in basements and flows into the St. Louis River and Superior Bay. In Duluth, 62 spills of sewage and/or wastewater from WLSSD have been reported since 1980 (Stage I Report, pps. IV-59 to IV-60). From March to July 1993, 11 overflow episodes were reported involving a total of seven different pumping stations (City of Duluth, MPCA, and WLSSD bypass records, 1993).

-Both Duluth and Superior have sewage overflows and bypasses due to infiltration and inflow (I/I) problems. Infiltration is the leakage of ground water into the sanitary sewers through old or defective pipes. Inflow occurs when rainwater is channeled into the sanitary sewer rather than the storm water system. Roof drains, footing drains, and sump pumps on many homes and businesses are connected to the sanitary sewer.

-The communities of Fond du Lac, MN and Oliver, WI are not served by wastewater treatment plants. The Fond du Lac community in the western end of Duluth has problems with septic systems sited in areas with a high water table, discharge of waste to the St. Louis River without any treatment, and possible storm sewer/sanitary sewer connections. The Village of Oliver is situated in a red clay area where there is inadequate drainage and problems with septic drainfields (Stage I Report, pps. V41 - V42).

-It is estimated that statewide 70% of the on-site septic systems in Minnesota are failing (MPCA, 1994). Thus, it is possible that many of the septic systems in St. Louis and Carlton county are failing. In Douglas County, much of the soil is red clay, which has very poor drainage properties. Septic systems in this soil are very likely not operating properly.

-Based on U.S. Coast Guard studies, approximately 51% of the ships in the harbor likely discharge inadequately treated wastewater with high fecal coliform levels (Stage I Report, pps. V-42 to V-44).

-The main source of nutrients from agricultural operations is animal waste runoff from livestock and poultry operations and fertilizer runoff. Based on 1991 U.S. Department of Agriculture data, the following acreage of land in Douglas County, WI, and Carlton County and St. Louis County, MN is devoted to livestock: cattle - 37,051; hogs & pigs - 5,452; poultry - 2,106; sheep & lambs - 2,134 (Stage I Report, pp. V-36).

-Local Duluth residents used to swim in Stryker Bay despite the fact that the site had been designated as a Superfund hazardous waste site due to contaminated sediment, soils, and ground water (Stage I Report, pps. V14 to V-17).

-Appendix D (pp. 87) of the Stage I Report listed high contaminant levels in sediment from Newton Creek and Hog Island Inlet. In 1993 and 1994, researchers from the Wisconsin DNR, the U.S. EPA Research Laboratory, and the UM - Duluth Natural Resources Research Institute conducted studies at the site. Based on the results of the environmental studies, health agencies determined that sediments in Newton Creek and Hog Island Inlet may present a risk associated with recreational uses such as swimming and wading.

b. Recommendations Developed and Actions Taken Towards Use Restoration

1) Sewage Bypasses and Overflows

Duluth Infiltration/Inflow

Recommendation 14 - DULUTH INFILTRATION/INFLOW deals specifically with Duluth homeowners since it is estimated that private homes contribute 70% of the inflow. The recommendation states that the City of Duluth should 1) amend the building codes to require that existing homes be brought up to current plumbing codes, 2) prioritize neighborhoods to define areas with the most severe inflow problems, immediately begin to eliminate the problem with the available resources, and pursue funding to help with retrofitting costs, 3) set up a mechanism to discourage homeowners from disconnecting legal connections, and 4) continue its efforts to maintain the sanitary sewer system to minimize infiltration.

On August 22, 1994 the Duluth City Council passed an ordinance which sets up the mechanism to eliminate storm water discharges to the sanitary sewer system. The Duluth Public Works Department

developed a seven-year plan of inspection and enforcement of footing drains and applied for a low interest loan program to assist homeowners with the retrofitting costs. However, this ordinance was withdrawn and a citizens task force was appointed to look at this problem after the Minnesota PCA extended the city's deadline for correcting the problem to December 1994. The citizens task force reported back to city officials in January 1995, and requested that the roof drains from downtown commercial buildings be removed and that storm sewers be repaired before private homeowners are asked to disconnect their foundation drains from the sanitary system.

Superior Infiltration/Inflow

Recommendation 39 - SUPERIOR INFILTRATION/INFLOW deals with the infiltration/inflow (I/I) problems in Superior. The recommendation states that the City of Superior should 1) continue to develop a Facilities Plan to eliminate the Category I bypasses (due to rainfall from a ≤ 5 -year storm event), and 2) in the long term, develop solutions to minimize Category II bypasses (due to rainfall from a >5 -year storm event). This plan is presently being developed and must be approved by the Wisconsin DNR.

The City of Superior recently secured a \$5.5 million bond to fund projects outlined in the Facilities Plan. Increased operations and maintenance budgets are pledged to accomplish many of the actions recommended in the Facility Plan. To this end, sewer use charges were increased for each of the past three years in anticipation of these costs. A partial Facilities Plan was submitted on January 7, 1994, and portions of the plan (including many of the I/I provisions) were approved on September 19, 1994.

2) Inadequate On-site Treatment Systems

Fond du Lac and Oliver Septic Problems

The recommendation 36 - FOND DU LAC SEPTIC deals with the problem of inadequate on-site septic systems in the Fond du Lac, MN community and Oliver, WI. The recommendation lists seven options to correct the problem in Fond du Lac and recommends continuation of plans in Oliver to connect to the Western Lake Superior Sanitary District.

A public meeting on the Fond du Lac issue was held on June 22, 1994 and was attended by 82 Fond du Lac residents and representatives from the city, the county health department, and the Minnesota PCA. Fond du Lac residents have since formed a citizens committee to work on this issue and have completed a door-to-door survey of the septic systems in the area. They have also been working with the county health department to distribute brochures on issues such as proper septic system maintenance and private well water testing. Since the public meeting, the county has issued permits for five new holding tanks to be installed along Water Street. City and county staff are examining the cost of conducting a sanitary system survey and discussing possible solutions to the problem.

In September, 1993, the Oliver Village Board hired an engineering firm to reexamine a 1980 feasibility study for a wastewater treatment plant. In March, 1994, the village residents agreed to have a new feasibility plan developed dealing with a municipal sewage collection system. In April, 1994, an engineering firm was hired to examine the feasibility of connecting the Village of Oliver to the Western Lake Superior Sanitary District. In October, 1994, the village hired a consultant to write a grant proposal to the Wisconsin Department of Development to provide funds for a sewage collection system. The RAP Citizens Advisory Committee submitted a letter of support for this effort. Material from the RAP Stage I Report and Stage II recommendations was included in the proposal. In January, 1995, the Wisconsin

Department of Development awarded the Village of Oliver a \$750,000 Community Development Block Grant to help pay for the \$1.3 million municipal sewage collection system. Since then, the village has hired an engineering firm to develop the Design Plan. The plan development and Wisconsin DNR approval are expected to take approximately six months. Construction of the collection system could begin in /Fall, 1995.

Other Septic Problems

Recommendation 30 - SEPTIC addresses the problem of inadequately treated waste from on-site septic systems in Douglas (WI), Carlton (MN), and St. Louis (MN) counties. The recommendation calls for development and adoption of a point of sale ordinance for septic systems. This would require inspection and upgrading of systems if necessary prior to a property transfer or issuance of a permit or variance for improvements on the property.

Present activities of the Minnesota legislature are consistent with this recommendation. In 1994, the Minnesota Legislature enacted the Individual Sewage Treatment System Law (MN Laws 1994, Chapter 617). This law requires the seller of a property to disclose to the buyer, the status and location of an individual sewage treatment system upon property transfer. A buyer could demand that the system be inspected and upgraded before signing the purchase agreement. A seller is held responsible for providing this disclosure information for two years after the sale. Another provision of this law requires certified inspectors to conduct septic system inspections prior to issuance of a building permit or variance for new construction or replacement of a septic system. The disclosure provision is effective August 31, 1994. The inspection provision is effective December 31, 1995.

3) Commercial Vessel Wastewater Discharges

The recommendation 4 - SHIP WASTE recommends that the U.S. Coast Guard enforce and expand the wastewater standards for commercial vessels. It suggests that they develop an on-board sampling plan to determine if the ship wastewater meets the existing fecal coliform and suspended solids standards. In addition, it recommends making the suspended solids standard stricter and adding additional standards for total BOD (biochemical oxygen demand), pH, and total phosphorus.

This recommendation was sent to the U.S. Coast Guard in April, 1994. The Coast Guard is organizing a pilot effluent sampling study in the Duluth/Superior harbor in 1995. The Coast Guard staff will board commercial vessels and take a sample of the marine sanitation device effluent for fecal coliform and suspended solids analysis. The pilot study will determine the feasibility of instituting an effluent sampling program across the nation.

4) Feedlot Waste

The recommendation 16 - FEEDLOT WASTE deals with waste from livestock operations. See the Excessive Loading of Nutrients and Sediments section for more information.

In the 1994 Minnesota legislative session, a bill was passed expanding the state feedlot management program and providing funds to hire additional staff. The Duluth Minnesota PCA office staff requested funding for one Pollution Control Specialist to deal with feedlots in the northeast region. This application was denied.

When two SWCD technician positions at the South St. Louis County Soil and Water Conservation District in the northeast region were to expire on August, 1994 and March, 1995, there would have been less technical assistance in this region dealing with this issue. The RAP sent a letter to the St. Louis County Board in November 1994, asking that the board support the staff positions at the District. The county board did provide another year of funding for the South St. Louis County Soil and Water Conservation District. However, this is only short term funding. Resource management agencies in northeast Minnesota plan to continue their efforts to get more permanent funding for feedlot management in this region.

5) Contaminated Sites

Since the designation of Stryker Bay as a Superfund site was not evident at the site, the RAP led an effort to post No Swimming signs at Stryker Bay. The signs which say "No Swimming - Site and Water Contaminated With Toxic Chemicals" were posted by the St. Louis County Health Department in 1992. Remediation work at Stryker Bay is continuing. See Section III. Contaminated Sediments in the St. Louis River System AOC for more information.

The recommendation 1 - SIGN requested that No Swimming signs be placed at Newton Creek and Hog Island Inlet to deter children and adults from swimming at these sites. The signs should carry warnings about the contamination problems present in these areas. After much deliberation, in August 1994, the Douglas County Health Board posted one No Swimming sign at the mouth of Newton Creek. The sign says "No Swimming By Order of the Douglas County Health Department". Work is ongoing to determine the quality of the sediments at these sites. See Section III. Contaminated Sediments in the St. Louis River System AOC for more information.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
Duluth I/I elimination	Ordinance passed - Summer, 1994 Ordinance withdrawn and citizen task force appointed - Summer, 1994	Inspection & enforcement scheduled to begin	Planned completion of disconnection project - 2002
Superior I/I elimination	Partial Facilities Plan submitted - 1/7/94 Portions of the plan approved by WDNR - 9/19/94	Addendums and updates are to be submitted in the future.	

Fond du Lac, MN septic system corrective measures	Public meeting - June, 1994 Residents conduct door-to-door survey and distribute informational brochures - Summer, 1994 Five new holding tanks permits were issued for Water Street homes - Summer, 1994		
Oliver, WI septic system corrective measures	Consultant hired - Spring, 1994 Funding applications sent to WI state agencies - September, 1994	\$750,000 grant received from WI Dept. of Development - January, 1995	
30 - SEPTIC recommendation	Part of recommendation may be implemented through MN Individual Sewage Treatment Law		
MN Individual Sewage Treatment System Law	Disclosure provision effective - 8/31/94	Inspection provision effective - 12/31/95	
4 - SHIP WASTE recommendation	Sent to U.S. Coast Guard - 4/22/94	Pilot effluent sampling study planned for Duluth/Superior harbor - Summer, 1995	
Feedlot program staff	Funds requested by regional MPCA staff for 1 staff position . Request denied - Summer, 1994		
No swimming sign at Hog Island Inlet	Sign posted - August, 1994		

d. In the Future

A determination needs to be made on the criteria that will be used to determine when this use is restored. Since there are no designated beaches on the river, beach closings cannot be used as a criteria. Except for fecal coliform exceedances at the I-535 bridge and occasional problems at Boy Scouts Landing, fecal coliform levels fall within acceptable levels. Thus, the criteria to determine restoration of this use impairment may simply be when the main sources of fecal coliform are eliminated.

Based on our data to date, these sources are:

- 1) sewage bypasses and overflows in Duluth,
- 2) flows of sewage and storm water into the river from Superior,
- 3) inadequate septic systems at Fond du Lac, MN and Oliver, WI, and
- 4) inadequately treated wastewater from commercial vessels.

All of these sources are presently being addressed as follows:

- 1) Duluth should soon begin implementing a 7 1/2 year program to disconnect home storm water drains from the sanitary sewer system.
- 2) Superior has begun construction and repair of sewer lines and building drainage systems per the Facility Plan.
- 3) Some Fond du Lac, MN residents on Water Street have installed holding tanks and the county is working with the residents to determine the extent of the problem.
- 4) Oliver, WI residents have received funds from the Wisconsin Department of Development so that they can begin activities necessary for hooking up to WLSSD.
- 5) The Minnesota Individual Sewage Treatment Law is taking effect and inadequate septic systems will be replaced over time.
- 6) The U.S. Coast Guard is examining the changes to the marine sanitation device standards as proposed by the RAP and the need for stricter enforcement measures through a pilot effluent sampling study.

One action that could negatively affect fecal coliform levels in the long term is the pilot project being undertaken by WLSSD to eliminate chlorination of their wastewater year-round. (See Section D. Sources of Pollution/Contaminants section for more information). Recommendation 37 - CHLORINATION supports this effort by WLSSD since many organic compounds, some carcinogenic, are produced by the treatment plant. However, it is important that fecal coliform bacteria levels fall within the acceptable range for human body contact recreation. These levels are being closely monitored by WLSSD, which will discontinue the pilot project if high fecal coliform levels are found.

8. Degradation of Aesthetics

IJC Listing Criteria: *When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum).*

Is the Beneficial Use Impaired? *Yes*

a. Problems Defined Under This Use Impairment

Three major aesthetic problems have been defined on the St. Louis River: 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.

-There are repeated reports of oil, chemical, and tar residues on the water's surface at Hog Island Inlet and Stryker Bay. Complaints have also been registered about smells emanating from sediments and the water at Newton Creek and Hog Island Inlet (Stage I Report, pp. IV- 60). In addition, there are oil sheens on the water surface of the Wire Mill Pond on the U.S. Steel Superfund site.

-As part of ship loading operations, grain and grain dust is blowing into the water of the St. Louis and Superior Bays. Grain has been found in a layer of decomposing black, anaerobic sediment on the bottom of the bay. Grain has also washed up on the shore. It is very evident at the newly created Connors Point Recreational Area. This problem can be an air quality problem due to dust, a water quality problem as the grain decomposes on the bottom of the bay, and an aesthetic problem on the shoreline.

-Accumulations of foam are found on the river near the community of Fond du Lac and at other locations downstream of Cloquet, Minnesota. There is a public perception that the foam is caused by pollution.

b. Recommendations Developed and Actions Taken Towards Use Restoration

1) Oil, Chemical and Tar Residues

Hog Island Inlet

The Wisconsin DNR has conducted a study of sediment quality and the health of benthic organisms at Hog Island Inlet and Newton Creek. See Section III. Contaminated Sediment in the St. Louis River System AOC for more information.

In response to the RAP recommendation 1 - SIGN, Douglas County Health Department installed a No Swimming sign at the mouth of Newton Creek. See the Beach Closings/Body Contact section for more information.

Stryker Bay/Interlake Superfund Site

Clean-up work is continuing at Stryker Bay and the Interlake Superfund site. See Section III. Contaminated Sediment in the St. Louis River System AOC for more information.

U.S. Steel Superfund Site

The Minnesota PCA is requiring that U.S. Steel apply for a NPDES permit to discharge water from the Wire Mill Pond. Since the permit will set limits on the discharges from this pond, U.S. Steel will likely have to conduct remediation of the contaminated sediments in the pond in order to meet the permit limits. This clean-up would eliminate the oil sheens that emanate from this site. See Section III. Contaminated Sediment in the St. Louis River System AOC for more information.

Boating Practices

The recommendation 15 - BOATING PRACTICES recommends that education and inspection activities be implemented to inform the public about environmentally safe boating practices that will keep oil, gasoline, and cleaning solvents out of the water. Signs would be posted at marinas and boat launches asking boaters not to discharge oily bilge water into the river. Educational brochures listing information such as alternatives to petrochemical cleaners and use of oil absorbent pads would be distributed to boaters. Marinas would be asked to provide facilities for proper disposal or recycling of boating related wastes. Finally, the recommendation supports education and inspection efforts of the U.S. Coast Guard.

The U.S. Coast Guard Auxiliary is undertaking the following activities in the 1994 and 1995 boating seasons:

- Using the Coast Guard booth and pamphlets at boat shows and other locations, they will educate boaters on requirements to keep oil out of the environment.
- Using Auxiliary boats, they will conduct harbor patrols, especially in the marinas, to ensure that recreational boaters are not pumping oily waste into the water or throwing garbage over the side.
- They will work with marina owners to ensure that they are providing required trash receptacles for their customers.

2) Grain Problems

Recommendation 35 - GRAIN suggests a three-pronged approach to eliminate the problem of grain blowing in the water. First, Wisconsin DNR staff should visit grain elevators during loading operations and issue citations if air quality permit limits are not met. Second, a sampling project should be undertaken to determine the geographic extent of grain in bottom sediments. Third, an education program should be developed to demonstrate to the grain elevator owners and operators, the problems caused by grain and grain dust in the water.

3) Foam Problems

Recommendation 21 - FOAM sets up a sampling scheme to determine the cause of large accumulations of foam on the St. Louis River below Cloquet. If the foam is naturally occurring, the Minnesota PCA should issue a press release stating this information. If the foam is from manmade sources, the sources should be determined and eliminated. The Minnesota PCA is presently looking into taking foam samples in Spring, 1995 if they can find a lab that will analyze samples gratis.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
Education and inspection to ensure environmentally safe boating practices	Coast Guard efforts begin - Summer, 1994	Efforts continue into 1995 if funding remains	
21 - FOAM recommendation		MPCA may take foam samples - Spring, 1995	

d. In the Future

The aesthetic problems at the two Superfund sites and at Hog Island Inlet/Newton Creek will be alleviated when these areas are cleaned up. There have been clean-up efforts at the Interlake site, but only investigative work at the other sites. Alleviation of these problems will take time but should occur as contaminated sediment is removed from the sites.

The problem of grain and grain dust blowing into the river is being addressed through the new permits that are required by the reauthorized Clean Air Act. However, based on discussions with some grain elevator operators, they perceive that there is no problem. Thus, the suggested education efforts in recommendation 35 - GRAIN will be an important step in solving this problem.

The proposed analysis of foam samples in Spring, 1995, should help resolve this issue or point towards further work that must be undertaken.

9. Loss of Fish and Wildlife Habitat

IJC Listing Criteria: *When fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to a perturbation in the physical, chemical, or biological integrity of the Boundary Waters, including wetlands.*

Is the Beneficial Use Impaired? *Yes*

a. Problems Defined Under This Use Impairment

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.

-Wetlands, shorelands, and near-shore areas have been filled or altered. Historically, an estimated 3000+ acres of marsh and open water in the lower estuary below the former Arrowhead Bridge have been filled. Most of the original shoreline has been altered to accommodate industrial and commercial purposes. Between 1981-1991, the net wetland loss in the St. Louis River watershed was 438 acres. The only large remaining wetland in the lower estuary is Allouez Bay (Stage I Report, pps. IV-66 to IV-72).

-Purple loosestrife, an exotic plant from Europe, has infested the estuary and has the potential to reduce fish and wildlife habitat. The plant crowds out native vegetation yet provides little or no food or habitat for waterfowl and other animals. The thick growths of loosestrife can choke off or eliminate access to fish spawning grounds (Stage I Report, pps. IV-22, IV-24, IV-69).

-Contaminated sediments at Stryker Bay (St. Louis River) and Newton Creek/Hog Island Inlet (Superior Bay) have impaired the benthic communities and thus the fish and wildlife communities at these sites. The degree and extent of fish and wildlife habitat loss or impairment at other regions of the AOC due to contaminated sediments is not known because the full extent and spatial distribution of contaminated sediments has not been fully determined (Stage I Report, pp. IV-67).

-High rates of sedimentation in the estuary with the ensuing turbidity and reduced light penetration limit macrophyte growth and may inhibit shoreland wetland communities thus limiting fish and wildlife habitat. However, the limited information on aquatic vegetation and wetland habitat is not sufficient to demonstrate degradation (Stage I Report, pp. IV-67).

b. Recommendations Developed and Actions Taken to Restore Use Impairment

1) Development Pressures

Land Acquisition

In response to RAP recommendation 2 - LAND ACQUISITION, the Wisconsin DNR has designated the watershed of the Red River as the St. Louis and Red Rivers Streambank Protection Area. As part of this program, the state purchases property to protect water quality and in-stream fisheries. The protection area encompasses approximately 7000 acres including five miles of the St. Louis River shoreline downstream of the Highway 23 bridge. The Wisconsin governor approved the protection designation in May 1994. WERCO Wisconsin, the owner of much of the land in protection area, agreed to sell more than 6000 acres to the Wisconsin DNR. The governor of Wisconsin signed the purchase agreement in December, 1994 and the land ownership was transferred to the Wisconsin DNR in January, 1995.

Recommendation 2 - LAND ACQUISITION also supports efforts of the St. Louis River Board to purchase shoreland of the St. Louis River upstream of Cloquet. The Board has received funds from the Minnesota legislature for this purpose. This action is necessary since Minnesota Power, a major landowner along the river, has recently begun selling off their property.

Preservation Plans

NERRS Reserve

A Stage I recommendation called for establishment of a National Estuarine Reserve Research System (NERRS) reserve in the St. Louis River estuary. This program, administered by the National Oceanic and Atmospheric Administration (NOAA) is designed to preserve estuarine ecosystems. Staff at NOAA were contacted in 1993, but before action could be taken the U.S. Congress decided not to designate any new reserves. The RAP has unsuccessfully tried other ways to establish a preserve on the St. Louis River.

City Wetland Plans

Both Superior and Duluth have been developing plans dealing with wetland preservation and development.

-For the past four years, the City of Superior has been developing a Special Area Management Plan (SAMP) for wetlands. Since much of the city contains wetlands, many commercial and residential projects have been delayed or have been involved in legal battles over destruction of wetlands. In order to plan for orderly development on some of the lower value wetland sites, the city has been developing the SAMP. In the initial stages of planning, the wetlands were identified and their values were determined. Different development scenarios were then developed ranging from no-growth in Superior to the maximum projected growth based on optimistic estimates. The plan then showed the impact of development for a range of wetland preservation scenarios from maximum wetlands preservation to maximum development. The city has chosen the combination preservation-development land plan which will preserve approximately 97% of Superior's existing wetlands. Required mitigation measures for the lost wetlands will be developed as part of the plan. In addition, in order to minimize wetland losses, an analysis will be made of available upland sites that are suitable for development. SAMP

committee members reviewed the draft plan and ordinance in the Fall of 1994, and it is anticipated that a permit application will be submitted to the Corps of Engineers in early 1995.

-In 1993, the Minnesota DNR, City of Duluth, and the Seaway Port Authority of Duluth completed the Duluth Comprehensive Port Plan for the Duluth harbor. The plan is designed to preserve critical wetlands and open water areas from further development while designating specific sites for future harbor and waterfront development. However, the plan has no mechanism to assure protection of critical habitat areas.

Area Habitat and Wetlands Preservation Plans

RAP members feel that a more concerted effort is needed to preserve wetland habitat.

-Recommendation 38 - HABITAT PLAN calls for the development of a habitat biodiversity plan for the St. Louis River and estuary. The recommendation delineates eight different habitat zones which will require different management strategies. As part of this planning, the 21 critical habitat parcels identified in the Stage I Report Appendix G should be examined and prioritized for their habitat value. The plan should address preservation needs and mechanisms for implementation. A proposal was submitted to the U.S. EPA Great Lakes National Program Office in September, 1994, to acquire funds to develop the habitat plan.

-Recommendation 13 - POINT attempts to begin this planning process by requesting that Duluth and Superior protect the undeveloped and natural areas on Minnesota and Wisconsin Points (two of the habitat zones) and manage them for wildlife habitat. The cities should consider state programs such as the State Natural Areas Program that could provide state protection for the sand ecosystem on the points. They should also restore wildlife habitat and educate the public on the unique nature of these sand bar ecosystems.

A development project has been proposed on Minnesota Point on one of the few remaining undeveloped parcels of land. Some Minnesota Point residents have been looking at mechanisms to preserve this land. Due to the size (approximately 7 acres), geologic history (highly disturbed), and vegetative community (regenerating aspen) the area does not fit within the MN Scientific and Natural Areas program. Other mechanisms such as wetlands preservation programs or threatened and endangered species preservation programs do not appear to be adequate to protect the land. Since the land is tax-forfeit riparian land, an act of the Minnesota legislature is required before the land can be sold and developed. Before the legislature can approve the sale, the Minnesota DNR would have to approve the change in land use. It is hoped that the DNR will concur with the RAP recommendation to preserve undeveloped land on Minnesota Point.

-RAP members are developing recommendations dealing with the problem of wetland loss. These recommendations will outline actions that should be taken in addition to the habitat biodiversity plan that is proposed in 38 - HABITAT PLAN. The recommendation for wetland losses in Minnesota will deal with the following issues: setting up a land trust to protect AOC riparian lands and their associated wetlands, strengthening wetland mitigation requirements for the lower St. Louis River area, revising agency fee schedules to create stronger incentives to discourage destruction of wetlands, and levying greater civil fines and citations for violations of the Wetlands Conservation Act or the Protected Waters program.

2) Exotics

Recommendation 34 - PURPLE LOOSESTRIFE asks that approved biological organisms be used to control purple loosestrife in the AOC. See the Degraded Fish and Wildlife Populations section for more information.

3) Contaminated Sediments

The sediment quality and health of benthic organisms in the estuary is being determined through the numerous sediment and benthic studies being undertaken. See the Degradation of Benthos section and Section III. Contaminated Sediment in the St. Louis River System AOC for more information.

4) Sedimentation and Turbidity

There have been no macrophyte surveys in the AOC since the survey conducted by Koch in 1976. This survey found that turbidity, limited light penetration, and physical disturbance have affected macrophyte growth. The RAP has not yet addressed this issue since it has not been considered a high priority.

Aquatic vegetation work is being undertaken by the Fond du Lac Reservation which is attempting to reintroduce wild rice into the St. Louis River below the Fond du Lac dam. They began the project in Fall of 1993 by seeding three areas near Boy Scouts Landing. Some of the rice has come up, however, there have been problems with waterfowl eating the rice. The reservation technicians will be seeding larger areas in the coming years and will be gathering information on factors that may be affecting the success of the reintroduction.

c. Sequencing/Time Frame of Recommendations and Actions

Action	1994	1995	Future dates
Red and St. Louis Rivers Streambank Protection Area	WERCO WI accepts option from WDNR - September, 1994 Governor signs purchase agreement for ≈6000 acres - December, 1994	Wisconsin DNR accepts ownership - January, 1995	
St. Louis River Board land acquisitions	MN legislature authorizes \$2.2 million to purchase lands along the river - Winter, 1994	Additional acreage to be purchased will be determined in 1995	
Superior Special Area Management Plan	Draft plan review - Fall, 1994	Plan acceptance and permit application - anticipated in 1995	

Development of habitat plan	GLNPO funding request submitted - September, 1994		
Preservation efforts on Minnesota Point	Citizens group is actively pursuing preservation designations - 1993 & 1994		
Wild rice reintroduction study	Begun in 1993 and expanded in 1994	Continued into 1995	

d. In the Future

As discussed in the Degraded Fish and Wildlife Populations section, specific fish and wildlife management objectives need to be developed for the lower St. Louis River and estuary. These objectives should deal with habitat management and preservation. Examples of objectives that could be developed include: preservation of a specific number of wetland acres, restoration of a certain acreage of wetlands, percent of shallow water habitat in the estuary, percent of undeveloped lands in the lower river and estuary, or acreage of a specific type of vegetation.

The following information should be considered while setting habitat management and preservation objectives: objectives in the Duluth Port Plan and the Superior Special Area Management Plan, the DNRs' list of protected wetlands, and the RAP goal for wetlands. The RAP goal is as follows:

- Identification of remaining wetlands.
- Protection of remaining wetlands including a program of no further loss of wetlands in or along the St. Louis River or estuary, no loss of critical wetlands or wetland functions, no net loss of wetlands in the drainage basin.
- An overall policy of restoring and/or enhancing diminished or drained wetlands.
- Compensation for any unavoidable wetland losses by establishment of replacement wetlands of equal value on a two for one basis.

Some of the RAP wetland goal is being met. The Minnesota DNR has incorporated the goal of no net loss of wetlands into their review of projects that adversely affect wetlands. They have cited this RAP goal when requesting replacement for wetlands that are to be destroyed. The City of Superior Special Area Management Plan will list the remediation measures that must be taken if a wetland area is destroyed. Wetland "banks" have already been proposed in the Municipal Forest. These banks are wetland areas that will be created or restored by a developer as part of their remediation requirements.

The habitat management objectives could be developed as part of the habitat plan that is recommended in recommendation 38 - HABITAT PLAN. Critical habitats need to be

identified and prioritized and action needs to be taken to manage or protect these habitat areas. Once specific habitat objectives have been determined, the objectives can be used to track progress toward restoring this impaired use.

B. IMPAIRMENT NOT CLEAR

<u>IJC Criteria</u>	<u>Reason</u>	<u>Comments</u>
Fish Tainting	Historical problem, currently conflicting evidence	Clarify existence or extent of problem in Stage II
Bird or Animal Deformities or Reproductive Problems	Low reproductive success in common terns - reasons not clear. Potential factors include toxics, competition, physical habitat loss.	Additional data on toxics in terns and other species needed.

1. Fish Tainting

IJC Listing Criteria: *When ambient water quality standards, objectives, or guidelines, for the anthropogenic substance(s) known to cause tainting, are being exceeded or when survey results have identified tainting of fish or wildlife flavor.*

Is the Beneficial Use Impaired? *Inconclusive*

a. Problems Defined Under This Use Impairment

Informal surveys of fish and wildlife personnel, area game wardens, and recreational users, suggest that fish tainting problems in the St. Louis River are no longer pervasive or widespread. However, a fish tasting study and survey conducted in the 1980s raises questions as to whether this problem was simply transferred from upper river sites, where paper mill wastes were formerly discharged, to areas near the mixing zone of the WLSSD.

b. Recommendations Developed and Actions Taken Towards Use Restoration

Technicians with the Fond du Lac Reservation cited problems with abnormally smelly fish while sampling fish in the Thomson and Fond du Lac Reservoirs in 1992. This occurrence was not corroborated by either the Minnesota DNR or the Minnesota PCA staff who were sampling fish in this area at the same time. Therefore, recommendation 6 - TAINING suggests that no action be taken on this issue unless problems with abnormally smelly fish occur again and can be thoroughly investigated.

c. Sequencing/Time Frame of Recommendations and Actions

No action is recommended at this time.

2. Bird or Animal Deformities or Reproductive Problems

IJC Listing Criteria: *When wildlife survey data confirm the presence of deformities (e.g. cross-bill syndrome) or other reproductive problems (e.g. egg shell thinning) in sentinel wildlife species.*

Is the Beneficial Use Impaired? *Potential impairment - more information is needed.*

a. Problems Defined Under This Use Impairment

Common terns and bald eagles in the AOC experience low reproductive success. Evidence linking poor reproduction in these species to toxic contaminants in the food chain is not conclusive at this time.

-Numbers of common tern breeding pairs in the estuary has decreased from 200 from 1977- 1981 to approximately 85 from 1987-1989. Occasional cross-billed chicks have been observed at Interstate Island and Ashland Pier. A 1984 U.S. Fish and Wildlife Service study found mercury, selenium, PCBs, DDE, and dieldrin in tern eggs (Stage I Report, pps. IV-27 to IV-28).

-A 1986 study (Niemi) of organochlorine residues in ring-billed gulls, herring gulls, and terns found higher residues in pre- and post-fledge terns than in gulls (Stage I Report, pps. IV-27 to IV-28).

-Bald eagles nesting along the shore of Lake Superior experience lower reproductive success than those nesting inland. Migrating bald eagles concentrate at Fond du Lac dam in early spring since this is the first open water. There is concern over the effects from eagles eating contaminated fish during this period (Stage I Report, pp. IV-28).

b. Recommendations Developed and Actions Taken Towards Use Restoration

1) Common Terns and Other Waterbirds

The recommendation 26 - WATER BIRDS deals with coordinating information on birds affected by toxic contaminants and monitoring uptake of contaminants in the food web. The Wisconsin DNR, in cooperation with Minnesota and federal agencies, should evaluate the potential for resampling gull and tern contaminant levels to compare historical and current data. Based on this evaluation, they should develop and implement a monitoring program for periodic resampling and assessment of bird contaminant data. Finally, they should evaluate the potential of initiating a monitoring program to assess uptake of chemicals in birds.

2) Bald Eagles

The recommendation 27 - RAPTORS calls for coordinated monitoring efforts and consolidation of data to evaluate factors limiting raptor population growth. Resource management agencies should investigate routes of chemical contaminant uptake and assess strategies to minimize eagle exposure to sources of contamination. The Minnesota and Wisconsin DNRs should support implementation of the Great Lakes Bald Eagle Biosentinel Protocol.

c. Sequencing/Time Frame of Recommendations and Actions

Neither of the recommendations is scheduled for implementation in 1994-95.

d. In the Future

Progress on this impaired use will occur through pollution prevention efforts that are underway throughout the basin. Ongoing studies and monitoring of bird and wildlife populations by the state, federal, and tribal agencies will continue. However, there are no plans to implement these recommendations in 1994-95.

C. NOT CURRENTLY IMPAIRED

<u>IJC Criteria</u>	<u>Reason</u>	<u>Comments</u>
Wildlife Consumption Advisories	No advisories issued	Limited data
Restrictions on Drinking Water Consumption	Drinking water not taken from AOC	Concerns for spills
Eutrophication or Undesirable Algae ¹	High nutrient levels but no evidence of eutrophication	High nutrient loading to Lake Superior is of concern
Added Costs to Agriculture or Industry	No impairment currently	Zebra mussel could cause problems
Degradation of Phytoplankton and Zooplankton	No evidence of impairment	Future impairment possible due to exotics

¹ IJC eutrophication criterion not impaired; see "Excessive Loadings" criterion

The use impairments "Added Costs to Agriculture or Industry" and "Degradation of Phytoplankton and Zooplankton" are not presently impaired in the AOC, but there is a potential for these uses to be impaired due to the recent introduction of new exotic species. To eliminate this possibility, the RAP work groups developed several recommendations.

The recommendation 32 - BALLAST WATER requests the acceleration of research to assess potential technologies to prevent the introduction and spread of undesirable exotic species within the Great Lakes via ballast water. This information should then be used to develop federal regulations requiring "Best Available Technology" to eliminate introduction of exotics.

The recommendation 33 - EXOTICS TRANSPORT calls for increased and coordinated efforts to educate users of the St. Louis River System about the importance of preventing the spread of ecologically harmful exotic species from this river system. In addition, regulatory measures to restrict the transport of these species into uninfested areas should be evaluated and enacted if feasible.

The recommendation 42- EXOTIC MUSSELS (ZEBRA) IMPORTATION calls for continuation of efforts to find ways to eliminate importation of zebra mussels into the Area of Concern and continuation of public education efforts dealing with transport of exotic mussel species.

D. SOURCES OF POLLUTION/CONTAMINANTS

The Stage I Report listed numerous potential point and nonpoint sources of pollution to the St. Louis River AOC. The point sources include NPDES permitted dischargers, historical industrial dischargers, historical municipal sewage treatment plants, and national Priority List (Superfund) hazardous waste sites. Some of these facilities are likely to pollute the river or have been shown to be a source of pollution. These point sources are discussed below along with the actions that have been taken to eliminate or minimize the pollutant input.

The nonpoint sources include many different sources, most of which have been discussed previously under the impaired use sections. Three issues (lack of nonpoint data, spills, and atmospheric deposition) have not been discussed yet in the RAP.

1. POINT SOURCES

Source: The **Arrowhead Refinery** site in Hermantown, a designated Superfund site, was depositing contaminants into Rocky Run Creek, a tributary to the St. Louis River. Contaminants at the site include volatile organic chemicals, lead, and PAHs (Stage I Report, pp. V-26).

Action: In the 1980's the U.S. Coast Guard ditched the area around the contaminated Arrowhead Refinery wetland so that water no longer ran through the wetland before entering Rocky Run Creek. This eliminated the direct input of contaminants to the St. Louis River from this site.

The Minnesota PCA and U.S. EPA have been working with the court system to negotiate a settlement with the responsible parties for the site. A mixed work settlement is expected to be filed in federal court in May, 1995. Hundreds of individuals and companies have been named as responsible parties and must help pay the cleanup costs. The settlement contains the following clean-up provisions:

1. Approximately 6,000 to 9,000 cubic yards of sludge, filter cake and oil saturated peat will be excavated from the wetland area by the responsible parties. This material will be treated using a chemical dilution and settling process developed by a company called 7 & 7 Inc. An oil product produced by this process will be suitable for burning as fuel. Solids produced by the process will be treated and disposed of by the U.S. EPA.
2. Excavation and disposal of approximately 27,000 cubic yards of contaminated soil and sediments. These materials will be shipped to a non-hazardous waste landfill. The U.S. EPA will pay for and conduct this portion of the cleanup.
3. Cleanup of contaminated ground water. The state is paying for the removal and treatment of the contaminated ground water. A French drain system (similar to drainage tiles) collects the ground water which is then sent to WLSSD treatment plant. The Record of Decision requires that the collection and treatment of the contaminated ground water beneath the site continue until it is clean.

Source: The **Duluth Air Force Base** (DAFB) was placed on the MPCA Permanent List of Priorities. Monitoring and analysis have shown ground water, surface water, and soil to be contaminated by volatile organic compounds, pesticides, organic solvents, petroleum, PCBs, and low level radioactivity (Stage I Report, pp. V-27).

Action: This site is actually composed of a number of different areas at the base which are characterized by a unique set of hydrogeologic and contaminant conditions. There are a total of 26 different "sites" at DAFB. Of these, 21 sites fall under Site Response (Superfund) jurisdiction, whereas five sites fall under Hazardous Waste (RCRA) jurisdiction. Because of the relatively large number of sites at DAFB, numerous projects are ongoing and are at various stages of investigation and/or remediation (clean-up). A very brief summary of each site is provided below.

U.S. Air Force Sites

Sites 1, 5, and 6: Drum removal operations were performed in 1992. Subsequent analytical sampling results have indicated that no further action is necessary at these sites. Following Minnesota PCA review and approval, a No Further Action (NFA) Document will be prepared for these sites.

Site 7: Removal of contaminated soil was completed at this site in 1992. Additional investigation of the magnitude and extent of ground water contamination is planned. Concurrent with this investigation will be a preliminary analysis of remedial options for ground water clean-up. Following its completion, preliminary design of a ground water remediation system will be performed.

Site 9: Analytical sampling results have indicated that no further action is necessary at this site. Following Minnesota PCA review and approval, a NFA Document will be prepared.

Sites 11, 12, 13, 14, 15, and 16: Additional information is pending for these sites. Following submittal of this information, evaluation of the need for soil or ground water remediation at these sites will be performed.

Air National Guard Sites

Site 2: Removal of contaminated soil has been completed. The Feasibility Study Report (FS) for this site is currently being finalized. Following its completion, the need for additional evaluation and remedial design work for ground water clean-up will be evaluated.

Site 3: The Design Report for the proposed ground water remediation system has been submitted to the Minnesota PCA and is currently being reviewed. Following approval of the report, the construction and installation of the ground water remediation system will proceed. The FS for this site is also being finalized.

Site 4: Additional information regarding Site 4 is being gathered by National Guard staff. In addition, the FS for this site is currently being finalized. Following submittal of

this information, evaluation of the need for soil and ground water remediation will be performed.

Site 8: The FS for this site is currently being finalized. However, based on results of previous investigations, it has been determined that no further action is necessary. As a result, a NFA document was issued for the site.

Site 10: A ground water sampling program is currently being set up for this site. In addition, the FS for this site is being finalized. Following submittal of this information and receipt of analytical sampling results, evaluation of the need for various remedial options to address soil and ground water contamination will be performed.

Sites 17, 18, 19, 21, and 22: These five sites are within an area covered by a RCRA hazardous waste storage permit. The permit requires the investigation of actual or possible releases to the environment. A RCRA Facility Investigation, evaluating the soil and ground water, has been completed and a Corrective Measures Study, assessing the need for remediation, should begin early in 1995.

Site 20: Additional information regarding site 20 is being gathered by National Guard staff. Following submittal of this information, evaluation of the need for soil or ground water remediation will be performed.

Sites 23 and 24: Removal and treatment (soil roasting) of contaminated soil has been completed. Submittal of a Final Soil Excavation and Treatment Report is pending.

Sites 25 and 26: A Preliminary Assessment Report for Sites 25 and 26 will be submitted shortly. Subsequent Site Investigations to evaluate soil and ground water contamination are tentatively planned for sometime in 1995.

Source: Monitoring wells at the **Engineers Realty Demolition Landfill** in Gary-New Duluth showed ground water contaminated with arsenic, lead, manganese, and mercury. The landfill is 3,000' northeast of the St. Louis River and is likely leaking contaminants to the river through the ground water or through nearby Sargent Creek (Stage I Report, pps. V-27 to V-28).

Action: The Minnesota PCA issued a closure consent decree for this facility in May 1991 and a modified consent decree (containing stricter requirements) in April 1993. The facility is being closed in three 14-month phases. In each phase, the owner/operator can accept 40,000 yards of demolition debris and cover material. The first phase ended in July 1994. The landfill will be closed at the latest by November 1996. The three closure phases allow for cost-effective reclamation of the landfill which presently has a large area that needs to be filled in and leveled off. During the closure, the Minnesota PCA staff are conducting regular inspections to ensure compliance with the consent decrees.

The consent decree requires the owner to put a clay cap over the landfill and reroute surface water to a detention pond where the sediment can settle out before the water is

discharged to Sargent Creek. They have constructed additional monitoring wells to sample in Sargent Creek.

Contaminants are still showing up in the monitoring wells. However, there is some question as to the source of the contaminants since there may be an abandoned arsenic pesticide dump upgradient of the landfill. In addition, ground water samples collected the past several years have not had significant detections of mercury. After the clay cap is installed on the landfill, agency staff will be noting if there is a change in the level of contaminants in the ground water. This information may provide for a more accurate determination of the source of the contaminants.

Source: **Murphy Oil Refinery** discharges processed wastewater to the headwaters of Newton Creek. Aquatic toxicity data indicate that the discharge from the Murphy Oil Refinery has a significant potential to cause acute toxicity effects to the fish and aquatic life community of Newton Creek. The potential for sublethal adverse impacts from the effluent is also significant (Stage I Report, pps. V-2 to V-3, V-6).

Action: In 1991, the Wisconsin DNR filed a referral for violations of multiple permits with the Wisconsin Department of Justice due to violations of the air and water quality permits for the refinery. This eventually led to the issuance of new, stricter permits for air emissions and wastewater discharges.

Two major improvements have been made at the refinery to improve the quality of the air emissions. The sulfur plant was rebuilt to improve efficiency of this operation. This led to a significant decrease in sulfur dioxide emissions. The fluid catalytic cracking unit process was changed so that the unit operates at a higher temperature. This reduces emissions of toxic organics and carbon dioxide. They also installed an electrostatic precipitator which removes more of the particulates from the emissions.

The new wastewater permit was issued in 1993 after numerous public hearings and meetings. Due to permit variances requested by Murphy Oil, the permit was revised and reissued in 1994. To meet the stricter permit limits, Murphy Oil is building a new wastewater treatment plant. A dissolved air flotation unit will remove the oils which can then be recycled back into the refinery. A biological treatment unit will reduce BOD (biochemical oxygen demand) and remove organics from the wastewater. An air stripping unit will remove ammonia. Finally, sand filters will be installed to filter out the suspended solids and, thus, any substances attached to the solids. The permit also requires them to evaluate new technology and run pilot studies with treatment methods such as carbon adsorption (to reduce metals). The new permit standards are much stricter than the old standards since the effluent must meet the chronic toxicity standards for both a cold (Lake Superior) and warm water (Newton Creek) fishery. Construction of the treatment plant was completed in October, 1994.

Source: The **Potlatch Industrial Landfill** (Cloquet) has leaked volatile organic chemicals into the St. Louis River and there is a potential for dioxin migration from the site. An application to expand the existing facility has been filed (Stage I Report, pp. V-28).

Action: Potlatch has conducted two Remedial Investigations (RI), one for the West Zone expansion and one for the entire landfill. The West Zone RI pertained to Potlatch's request to line the top of the existing older landfill in the West Zone and place a new landfill on top of this material. They evaluated the physical properties of the waste being capped/lined in terms of compaction and stability and determined that the material had sufficient stability to support a landfill cell. They installed a clay cut-off wall to eliminate ground water migration from the new West Zone cell. The ground water is directed to a collection pipe and is eventually sent to WLSSD for treatment. This expansion was approved by the Minnesota PCA in 1993.

The second RI was required as part of the Minnesota PCA permit for the entire landfill. Potlatch must determine if the landfill is having an impact on the St. Louis River. They have installed monitoring wells in and around the landfill to determine if the landfill is contaminating the surrounding ground water and the St. Louis River. They've done a chemical characterization of the waste to determine the potential for leaching of toxics to the environment. In addition, they've installed a collector at an existing seep. The ground water/leachate mixture from this seep is sent to WLSSD for treatment.

The RI Report was completed in November, 1994, and approved by the Minnesota PCA in March, 1995. The major areas of concern identified in the report included erodible wastes located outside the perimeter road along the St. Louis River and flowing seeps. Potlatch has presented a proposal to take interim measures to minimize the potential erosion of this waste and to conduct a focused feasibility study so implementation of a permanent remedy could begin during the 1995 construction season. These proposals have been approved by the Minnesota PCA. The approved interim measures will be implemented in April, 1995, with the overall goal of beginning the implementation of a permanent remedy by July 1, 1995.

Source: The **Rice Lake Landfill** has been placed on the MPCA Permanent List of Priorities. A leachate collection system collects leachate and ground water which are conveyed to the treatment facility. Ground water monitoring has revealed the presence of volatile organic chemicals, benzene, and cadmium. Ground water is currently being monitored to determine the extent of contamination (Stage I Report, pps. V-28 to V-29).

Action: The Rice Lake Landfill was capped and closed during the summer of 1994. Monitoring wells were installed in and around the site and a leachate collection system was installed around the perimeter of the facility. Collected leachate is sent to WLSSD for treatment.

Source: **Superior Fiber Products (now Georgia-Pacific)** had a WPDES permit for the discharge of treated wastewater into Superior Bay. Since they had no treatment for BOD (biochemical oxygen demand), there were exceedances of this standard (Stage I Report, pp. V-3, V-6).

Action: Georgia Pacific has discontinued their discharge of process water to Superior Bay. In July 1993, they began trucking their process water to the Superwood facility in Duluth

for treatment. Superwood runs the water through an evaporator and creates a concentrated material that is used as animal feed grade molasses (binder for cattle food pellets). In July, 1994, they eliminated the treatment ponds. The sludge in the ponds was removed and was land spread in Carlton County. The ponds were filled in and seeded with grass.

Source: The **Superior-Wisconsin Point Landfill** has leaked volatile organic compounds and heavy metals into the ground water, and contaminant levels in some monitoring wells have increased over time. The landfill is unlined and is located on the shoreline of Lake Superior. Input of contaminants to Lake Superior and Allouez Bay probably occurs, but the magnitude of this input is not known (Stage I Report, pp. V-29).

Action: The City of Superior has contracted with a private consulting firm to develop a monitoring plan for the landfill. Past and present monitoring data will be used to determine the number and location of additional monitoring wells that should be installed at the site to determine the direction and extent of leachate migration from the site. The plan will also propose a waste characterization study to determine the type and location of waste in the landfill. The plan should be completed by the spring of 1995.

Source: The **USG Cloquet #1 Industrial Landfill** may be a source of mercury to the St. Louis River. In a 1970 survey performed by the Federal Water Quality Association, mercury was detected at very high levels (66 mg/kg) in the sediment of the river at this facility. Mercury was also detected at high levels (15 mg/kg) in sediments downstream from this site at the Minnesota Highway 33 bridge in Cloquet. The only known discharge between USG and the Highway 33 bridge in the 1970's was the outfall from the USG plant. However, this outfall is far enough downstream from the landfill that it is an unlikely source of the mercury (MPCA, 1994).

Action: The USG Landfill is reaching its existing permitted capacity and the company plans to close the facility in the near future. USG would like the closure of the landfill to coincide with the start-up of plant equipment and procedures which would result in the recycling of a majority of their waste stream. The installation of this equipment began in mid-January. Minnesota PCA staff will be meeting with USG officials to identify a specific closure date and to discuss other issues such as final cover design, long term monitoring requirements, and post-closure care. The final capping of the facility will occur in 1995.

USG is in the process of completing a waste characterization study for the facility. Initial laboratory results from the waste characterization study have been reviewed by the Minnesota PCA. Additional lab results and information is expected.

Ground water monitoring includes sporadic monitoring for metals and other inorganic parameters and occasional monitoring for volatile organic chemicals. Monitoring results show no releases of contaminants from the facility at this time. The adequacy and reliability of this data will be evaluated as part of the closure proceedings.

Source: The **Western Lake Superior Sanitary District (WLSSD)** is discharging organic chemicals to the St. Louis River. A 1982 U.S. EPA study of the WLSSD waste stream found a total of 461 organic chemicals: 271 organic chemicals in the WLSSD influent and 190 organic chemicals in the effluent. Of the chemicals in the effluent, 70% were not found in the influent. They could be breakdown products or could be created at the WLSSD facility (Stage I Report, pps. V-1 to V-2, V-5).

Action: Recommendation 37 - CHLORINATION supports efforts of WLSSD to conduct a pilot study to determine if chlorination can be eliminated or reduced at the treatment plant. Because of the high organic load of the influent to the treatment plant, WLSSD has to use extremely large quantities of chlorine to meet effluent bacteria standards. The chlorine binds to organic matter producing organic compounds, some of which are carcinogenic. The elimination of chlorination at the plant during the pilot project is expected to reduce production of chlorinated hydrocarbons by 70%. The recommendation also asks WLSSD to continue to work with local industries to determine ways to reduce the organic load in the influent.

WLSSD believes that the treatment plant can reduce the bacterial levels in the effluent to acceptable levels without chlorination. They are sampling water at various places in the river to determine if there are unacceptable levels of fecal coliform. If this occurs, the project will be temporarily discontinued.

Action: The Great Lakes Initiative (GLI) will have a major impact on the level of organic chemicals that can be discharged to Lake Superior. The purpose of the initiative is to protect water quality by having the states and Indian tribes on the U.S. side of the Great Lakes basin adopt 1) common water quality criteria for protection of the aquatic community, humans that eat fish, and wildlife that eat aquatic life, 2) common implementation procedures for determining effluent limits based on water quality criteria, and 3) common antidegradation policies. The U.S. EPA is considering comments on the Great Lakes Initiative and will be publishing a final rule. Once the rule is final, states and tribes will have two years to adopt the GLI guidance.

2. NON-POINT SOURCES

Problem: The Stage I Report stated that there is little or no current information on non-point loadings of nutrients and toxic substances to the Area of Concern. Thus it is difficult to determine strategies to eliminate non-point sources.

Action: The following projects are providing more information on non-point sources of pollution:

- Miller Creek Storm Water Study (See Excessive Loading section)
- Nemadji River Basin Project (See Excessive Loading section)
- Urban Storm Water Demonstration Project (See Excessive Loading section)
- St. Louis River Pollutant Loading Study (See Excessive Loading section)
- Numerous sediment quality studies (See Section III. Contaminated Sediments in the St. Louis River System AOC)

Source: From 1980-1990, 471 spills were reported in the St. Louis River watershed. Spills of petroleum products were one of the most common types of spills in the Twin Ports. Due to the seiche effect, a spill in the harbor could move upstream into the St. Louis River (Stage I Report, pps. V-45 to V-46).

Action: Spill prevention recommendations are a part of the Lakewide Area Management Plan (LaMP) for Lake Superior. The recommendations deal with secondary containment, bypass reduction, reduced handling errors, improved spill reporting and logging, and pollution prevention initiatives.

Source: Atmospheric deposition has been cited as a source of mercury. However, there is little data available on the contribution of atmospheric sources of mercury, PCBs, and dioxin to the St. Louis River System (Stage I Report, pps. V-46 to V-52).

Action: The Superior Binational Program and the LaMP are examining this problem.

V. STAGE III IMPLEMENTATION STRATEGY

A. OUTREACH ACTIVITIES

A large component of the implementation strategy is conducting outreach activities to educate the general public, local elected officials, businesses, and organizations about the environmental problems in the area and the RAP's proposed solutions to these problems. Increasing the visibility of the RAP and local environmental problems will improve chances for successful implementation of RAP recommendations.

One of the strengths of the Stage II process has been the involvement of implementors in the development of recommendations. Many local residents, elected officials, regulators, resource managers, and industries have learned about the RAP because they were involved in developing recommendations. In addition, the RAP has become visible in the area because RAP recommendations have been discussed at city council meetings, public hearings, and public informational meetings.

There has also been a formal attempt to inform people about the RAP. Agency staff have made presentations to diverse groups such as the Kiwanis Club, Rotary Club, Historical Society, 10th grade biology students, and university veterinarian students. The RAP display has been in use on an almost non-stop basis since the fall of 1993. The display was set up at the Earth Day Fairs, Fairlawn Museum, The Depot, Canal Park Marine Museum, Jay Cooke State Park, and at numerous conferences and one-day events. The newsletter, "RAP Report", is being produced three times per year and is mailed to over 1,300 individuals in the region. In addition, news articles were written for local newspapers and a regional magazine.

The St. Louis River Watch program, an offshoot of the RAP, has been instrumental in getting high school and middle school students and their teachers involved in river stewardship. Under the tutelage of their teachers, students sample river water and collect benthic invertebrates to determine water quality at various river reaches. Seventeen schools in the St. Louis River basin participate in the program at present. The program has recently been expanded to the entire U.S. side of the Lake Superior basin.

The RAP River Stewardship Work Group has led the citizen effort to increase RAP visibility and the involvement of local residents and businesses. The work group organized clean-up projects on Miller Creek and Connors Point. They established a primitive recreation area on Connors Point with donations of time and money from the City of Superior, the National Guard, and local businesses. Work group members are working with businesses in Superior and Duluth to develop environmental, aesthetic, and recreational projects that can be undertaken by these businesses. They also designed an annual RAP environmental stewardship awards program that will recognize environmental accomplishments.

In addition to these existing activities, many of the RAP recommendations call for education efforts. Recommendations with an education component include the following:

- 16 - FEEDLOT WASTE
- 22 - AGRICULTURE EROSION
- 3 - GOLF
- 7 - LAWN EDUCATION
- 23 - CONSTRUCTION EROSION
- 24 - DITCH DESIGN & MAINTENANCE
- 18 - SHORELINE FORESTRY
- 31 - SILVICULTURAL BMPS

35 - GRAIN
15 - BOATING PRACTICES
13 - POINT
34 - PURPLE LOOSESTRIFE
33 - EXOTICS TRANSPORT
43 - RIVER WATCH

B. PARTIES RESPONSIBLE FOR RAP IMPLEMENTATION

The 43 RAP recommendations approved to date, recommend actions to 50 different agencies and organizations. In 23 of the recommendations, the Wisconsin DNR, Minnesota DNR, and/or Minnesota PCA are the primary implementors. In the other 20 recommendations, a variety of 47 other agencies and organizations are the primary implementors.

Since most of the implementors are not members of the Citizens Advisory Committee (CAC), the role of the CAC is to facilitate implementation of the recommendations. That is, to encourage the implementors and to assist with implementation of a recommendation if necessary.

The facilitators will prepare an implementation strategy that includes information such as work tasks, responsible person, completion date, and cost. A paper entitled "Suggestions for Citizens to Facilitate Implementation of RAP Recommendations" was developed by the MN RAP Coordinator and will be used as a starting point when developing the facilitation strategy. The strategy will be reviewed and approved by the Review Committee. This review is necessary in order to ensure a completely thought out strategy rather than to demand formal approval. However, this review will ensure that the facilitators are acting with the understanding of the CAC. The CAC Steering Committee developed specific guidelines for facilitation of recommendation implementation. These guidelines are shown in Figure 5-1.

At the January, February, and March, 1995 CAC meetings, CAC members had the option to sign up to facilitate implementation of a recommendation. Two lists of recommendations were developed. One list contained the recommendations for the three primary state agencies (Wisconsin DNR, Minnesota DNR, Minnesota PCA) and the other list contained recommendations for the other agencies and organizations. As of March 1995, a total of 13 recommendations were adopted by CAC members.

Through the adoption/selection process, CAC members have indirectly prioritized the recommendations on each list. Those recommendations which are adopted have a higher priority. If a recommendation is not adopted in 1995, it likely will be reviewed in 1996, and a determination will be then made on the priority of its implementation.

The CAC members requested that a training session be organized for the facilitators of the recommendations to provide facilitators with skills in teamwork, consensus building, and the use of the media. The Minnesota PCA organized an evening training session on April 6, 1995 with Hans Bleiker of the Institute for Participatory Management and Planning. The RAP facilitators received three hours of training modeled after the nationally recognized course "Systematic Development of Informed Consent".

Figure 5-1 St. Louis River System RAP Stage III Implementation Process

Purpose

This document outlines the process the Citizens Advisory Committee of the St. Louis River Remedial Action Plan will use to facilitate the implementation of the recommendations it has approved.

The following three terms are defined to insure clarity of the intent and scope of this process:

- **Implementor:** Entity identified by the RAP as having the authority, jurisdiction and/or responsibility for executing a RAP recommendation.
- **Facilitator:** A person associated with the RAP who has accepted the responsibility to encourage implementors to execute a RAP recommendation.
- **Facilitation Strategy:** A series of actions to be taken by a facilitator (or team of facilitators) to encourage implementation of a RAP recommendation.

Given the wide range of recommendations and of potential facilitators, there will be wide variations in how different teams of facilitators may push a recommendation toward implementation. In general, it is assumed that facilitators are not responsible for implementation. However, in some circumstances, the roles of facilitators and implementors may be shared.

This document has two sections. The first outlines the process by which facilitators are selected and strategies are prepared and approved. The second defines basic responsibilities of facilitators as agents of the RAP.

Basic Process

A. **Facilitator Team.** Members of the CAC (and others affiliated with the RAP) sign up to "champion" or facilitate implementation of specific Stage II recommendations. More than one person can sign up for the same recommendation. Facilitators should be one of the following (listed from most desirable to less desirable):

- CAC member and member of technical work group that developed recommendation.
- Technical work group member.
- CAC member who was not involved with preparing recommendation.
- Person associated with the RAP (through attendance at meetings, participation in events, prior involvement in CAC, etc.).

It is preferred that all teams have at least one member of the original work group that generated the recommendation.

Each team shall select one person to act as lead for the purpose of communications and reporting.

All facilitators shall be approved by the CAC (initially each team voted upon as a team; additional members voted upon individually). Facilitators may be removed by a majority vote of the CAC.

B. **Facilitators prepare a Facilitation Strategy.** Each team is to prepare a strategy that outlines the major actions to be taken to facilitate implementation of a given recommendation. Strategies will vary but each will be prepared following a common format. The components of the strategy are:

1. Recommendation number, name and summary.

2. Desired outcome of facilitation strategy (what determines that the strategy is successful; this need not equate with remediation of the impaired use).
3. Work Tasks: description of specific actions to be taken by team.

One of the first Work Tasks in each strategy shall be to clarify the targeted implementors. These may have changed since the recommendation was approved or not all were identified at that time.

The times and methods of reporting on progress to the CAC shall be defined as distinct Work Tasks.

Any Work Task that involves anticipated contact with the media or require substantive costs to the WDNR or MPCA **must** be included and clearly described.

4. Responsible Person: member of the team responsible for the specified Work Task.
5. Completion Date: date by which the Work Task is to be completed.
6. RAP Cost: cost to the WDNR or MPCA necessary to undertake the Work Task (e.g., copying, major mailing, holding a conference, etc.).
7. Result: describe the expected outcome produced by this Work Task.
8. Status and Comments: information on the status of the Work Task and any relevant observations.

The number and nature of Work Tasks will vary from strategy to strategy. Many may simply involve monitoring and reporting. Others may require extensive involvement by the team. Strategies are expected to be dynamic documents; changes will occur. Major changes should be routed to the Steering Committee for consideration; minor ones may be included in the regular progress reports. The format of the strategy is:

RAP Recommendation (number, name, summary):					
Desired Outcome:					
Work Tasks	Responsible Person	Completion Date	RAP Cost *	Result	Status & Comments
1.					
2.					
n.					

* Only applies to costs incurred by CAC or its sponsoring agencies.

- C. **Strategy Review and Approval.** Facilitator Teams are to submit draft strategies to the RAP Coordinators which will distribute them to a Review Committee. The Review Committee will include: RAP Coordinators (MN and WI), CAC Co-Chairs, and four CAC members. Within two weeks, committee members are to submit comments directly to the Facilitator Team Lead Person. If a strategy is deemed seriously flawed, the committee shall request a review by the CAC and shall notify the Lead Person that the strategy cannot be acted upon until such CAC review. If the strategy is generally acceptable to the Review Committee, the Facilitator Team is to consider the comments, finalize the strategy, submit a copy to the CAC and initiate implementation.
- D. **Strategy Initiation.** Once a strategy has been reviewed, the Facilitator Team starts undertaking the defined work tasks. Reporting times will vary from strategy to strategy. The strategy form itself is the reporting document; teams check off their progress and provide commentary on each step. Changes are to be proposed as amendments to the strategy.

Guidelines for Facilitators

Each member of a Facilitator Team will be given the following guidelines and will be encouraged by the CAC to apply them during the facilitation process.

A. How to Present Yourself

1. You are facilitating the implementation of a recommendation of the St. Louis River RAP Citizen Advisory Committee. In correspondence and public statements, you should identify yourself as a "RAP Recommendation Facilitator."
2. You are an individual participating in the RAP process. As such, you represent the RAP not your agency, organization or company. However, unless specifically authorized by the CAC or Co-chairs, you are not speaking on behalf of the CAC or the sponsoring agencies (WDNR, MPCA).
3. If you have any potential conflict of interest in the recommendation being facilitated by your team, this should be stated. The existence of such self-interest need not disqualify someone from being a facilitator; often times it may be desired to facilitate implementation.

4. Contact with the media is to follow the terms of your Team's strategy and, in general, adhere to the CAC's by-laws. In general, no Facilitator is to initiate contact with the media except as defined in the approved strategy or by prior approval of the Co-Chairs or CAC. If the media contacts you, you may respond to questions relevant to your strategy and within the terms of your strategy; otherwise, politely direct the person to the RAP Coordinator or Co-Chairs.

B. Expenses

1. The basic rule is you are responsible for the costs incurred to undertake your strategy.
2. If a strategy has significant costs not to be paid by the Team, these are to be identified in the strategy.
3. There will be no reimbursement of costs incurred by facilitators without prior written approval from the appropriate agency.

C. Communications

1. Teams are encouraged to communicate frequently with the RAP staff, co-chairs, other CAC members and other Facilitator Teams.
2. Facilitators are encouraged to seek help or advice from other teams.

D. Behavior and Operating Style

1. Facilitators are encouraged to be non-adversarial and solution oriented in their approach to implementors and others involved in their strategy.
2. Facilitators are encouraged to attend any CAC-sponsored training sessions regarding facilitation.

C. MECHANISM FOR TRACKING IMPLEMENTATION

Implementation of recommendations will be tracked by the RAP Coordinators and the CAC Co-chairs who will periodically submit a report to the CAC members. A document has been developed that lists the recommendations and implementation actions that have been taken. The document is updated bimonthly and will be expanded to include the name(s) of the CAC member or other RAP volunteer who has taken responsibility for facilitating implementation of a recommendation. These facilitators will be in touch with the CAC Co-chairs, RAP Coordinators, and other CAC members as they work on a recommendation. They will also periodically report back to the CAC on implementation progress.

In addition to these internal communications, there will be biennial public reviews of the RAP and its activities. These meetings will provide the public with information on the RAP and allow the public to give some feedback on the RAP.

D. PROGRESS TOWARDS ACHIEVING RAP GOALS

In Stage I, the Citizens Advisory Committee developed 16 goals for the RAP process. The recommendations developed and actions taken in Stages I and II are consistent with these 16 goals. Implicit in these goals, is the larger goal of restoring the impaired uses in the AOC. The 16 goals and progress towards meeting these goals are listed below.

Goal	Goal being met?	Activities that Address the Goal
1. The achievement and maintenance of a quality of water that protects the integrity of the ecosystem and which is amenable to safe recreational uses, including body contact recreation such as swimming.	Yes and No	<p>Yes:</p> <ul style="list-style-type: none"> • The swimming and aquatic life uses are supported on the river reaches within the AOC, except for the harbor area. • There are no beach closings due to high fecal coliform levels. • Bacterial inputs to the river and Lake Superior will begin to decrease as the following planned activities are implemented: Duluth I/I reduction, Superior sewer system upgrade, replacement of failing septic systems in Fond du Lac, connection of the village of Oliver to WLSSD, and upgrading of marine sanitation devices. <p>No:</p> <ul style="list-style-type: none"> • The water quality in the harbor does not support the swimming and aquatic life uses. • The integrity of the ecosystem is affected by toxic pollutants in the sediment that are difficult to clean up.

<p>2. The implementation of a staged river clean-up which results in the remediation of existing polluted sites and prevention of further degradation.</p>	<p>Yes and No</p>	<p>Yes:</p> <ul style="list-style-type: none"> • Clean-up work at the Arrowhead Refinery and Interlake Superfund sites are progressing slowly but surely. • Five landfills (Engineers Realty, Potlatch, Rice Lake, Superior - Wisconsin Point, and USG Cloquet #1) believed to be sources of pollution, have been closed or are in the process of being closed. All closures require clay capping, monitoring wells, and treatment of leachate. • The 26 contaminated sites at the Duluth Air Force Base are being cleaned up. • In 1994, Murphy Oil completed construction of a new wastewater treatment plant that meets stricter effluent limits. • Since 1993, Georgia Pacific is sending their wastewater to Superwood which treats it and recovers a marketable by-product. • Sediment sampling in 1993 and 1994 has provided the information needed to determine contaminated sediment sites that must be remediated. <p>No:</p> <ul style="list-style-type: none"> • The U.S. Steel Superfund site, Crawford Creek RCRA site, and contaminated sediment hotspots are still being investigated. Remediation is not yet occurring.
<p>3. The establishment and maintenance of a coordinated monitoring network and information management and analysis system for the St. Louis River System AOC.</p>	<p>No</p>	<ul style="list-style-type: none"> • A monitoring plan is in the development stage.
<p>4. The identification and evaluation of all existing point and nonpoint pollution sources, including regional airborne contributions, contaminated sediments, and episodic sources such as spills.</p>	<p>Yes and No</p>	<p>Yes:</p> <ul style="list-style-type: none"> • The Pollutant Loading Study will provide information on input of pollutants, nutrients, and suspended solids. • Contaminated sediment investigations in the harbor, lower river, and reservoirs is giving a much clearer picture of sediment quality. <p>No:</p> <ul style="list-style-type: none"> • Air borne contributions of pollution have been examined for Lake Superior, however, there is little specific data on the St. Louis River. • There is little or no quantifiable data on the sources of nutrients to the AOC. • An examination of spills by the Pollution Prevention Work Group did not turn up any specific recommendations other than that the WDNR should continue to work with Murphy Oil (largest # of industrial spills) to minimize spills.
<p>5. The reduction of pollutant inputs, including nutrient and sediment loadings from point and nonpoint sources.</p>	<p>Yes and No</p>	<p>See Goals #2,#4 and #7</p>

<p>6. The reduction of toxic substance inputs to the St. Louis River System AOC through the following steps:</p> <ul style="list-style-type: none"> a) water quality which meets or exceeds the ambient water quality standards of both states for the classification of the water body; b) initiation or maintenance of a program of no net increase in the discharges of toxic substances (anti-degradation policy); c) over the long term, execution of a program to eliminate discharges of toxic substances; and d) substitution and development of nontoxic substances for use in or in connection with industrial applications, business, home, land management, and other important users (pollution prevention). 	<p>Yes and No</p>	<p>Yes:</p> <ul style="list-style-type: none"> • Water quality meets Minnesota standards for toxics except for lead found in water samples taken at the I-535 bridge. • Lake Superior has been designated a zero discharge zone by the International Joint Commission. Through the Binational Forum, Minnesota, Wisconsin, Michigan, and Ontario are beginning to manage activities in the lake basin to eliminate the input of nine designated bioaccumulative chemicals. • WLSSD has initiated a pilot project to eliminate chlorination at the treatment plant to reduce production of chlorinated organic compounds in their effluent. • Potlatch Corporation is now using chlorine dioxide rather than elemental chlorine in their paper process, eliminating a source of chlorine to the river. • WLSSD has instituted mercury reduction programs in the community. They work with dentists to minimize the mercury input to the plant from dental activities and they collect mercury containing batteries to keep the mercury out of the waste stream. • WLSSD has established a household hazardous waste recycling center. • WLSSD is undertaking a project to examine substitutes to household products that contain toxic materials. • WLSSD has started a Clean Shop program that allows very small quantity generators of hazardous waste to dispose of their waste. • Also, see Goal #2 for other toxics reductions. <p>No:</p> <ul style="list-style-type: none"> • Many of the pollution prevention activities are in the planning or start-up stage. • Contaminated sediment in the river is a source of toxic contaminants that will be difficult to clean-up.
<p>7. Lessening of the need for dredging through reductions in sediment loading. Establishment of environmentally sound and economically feasible procedures for maintenance dredging and dredged materials management.</p>	<p>Yes and No</p>	<p>Yes:</p> <ul style="list-style-type: none"> • Proctor has adopted an erosion control ordinance and Hermantown passed a resolution requiring sediment and erosion control plans for all developments except single family homes. • The NPDES permit program requires sediment and erosion control plans for most development projects. • The Harbor Technical Advisory Committee of the Metropolitan Interstate Committee is attempting to develop a plan for dealing with dredged material. • Some of the dredged material at Erie Pier is being recycled. <p>No:</p> <ul style="list-style-type: none"> • Programs like the Nemadji River Basin Project and RAP recommendations to decrease erosion have not yet been implemented.

<p>8. Protection and restoration of fish and wildlife habitat, including fish spawning and nursery areas, and aquatic and/or upland breeding, nesting, or migration habitat.</p>	<p>Yes</p>	<ul style="list-style-type: none"> • Minnesota Power modified practices at the Fond du Lac dam to eliminate fish strandings downstream. • Wisconsin DNR designated the St. Louis and Red Rivers Streambank Protection Area and purchased land to minimize erosion , preserve the shoreline, and protect Lake Superior walleye spawning habitat. • City of Superior is considering designating 1/2 of the Municipal Forest as a state natural area. • Wisconsin DNR created a common tern nesting platform in Allouez Bay. • MDNR is conducting habitat restoration projects at Grassy Point and Hearing Island. • Recommendations have been developed that outline methods to protect and restore habitat.
<p>9. Identification and protection of remaining wetlands, including a program of no further loss of wetlands in or along the St. Louis River or estuary, no loss of critical wetlands or wetland functions, no net loss of wetlands in the drainage basin, and an overall policy of restoring and/or enhancing diminished or drained wetlands. Any unavoidable wetland losses shall be compensated for by establishment of replacement wetlands of equal value on a two for one basis.</p>	<p>Yes and No</p>	<p>Yes:</p> <ul style="list-style-type: none"> • The City of Superior is developing a Special Area Management Plan that will designate wetlands to be protected and determine mitigation for destruction and/or disturbance of other wetlands. • The St. Louis River Board will be purchasing riparian lands along the St. Louis River to protect these lands. <p>No:</p> <ul style="list-style-type: none"> • There is no plan for the basin with regards to protection of wetlands.
<p>10. A healthy and well balanced ecosystem, where native species can live and reproduce naturally and are not restricted from thriving due to substrate degradation.</p>	<p>No</p>	<ul style="list-style-type: none"> • Exotic fish species like the ruffe and white perch are increasing in numbers while native species are declining. • Purple loosestrife has infested the shoreline and wetlands of the estuary. • Contamination of sediment (substrate degradation) continues to be a problem in the AOC and affects the population and diversity of benthic organisms.
<p>11. Management of the St. Louis and Nemadji River systems in a geographically and functionally unified manner. A coordinated approach should be taken by both states in the planning and implementation of ecosystem programs.</p>	<p>Yes and No</p>	<p>Yes:</p> <ul style="list-style-type: none"> • Minnesota and Wisconsin agencies are working together on the Nemadji River to examine the entire watershed. • The Nemadji River Basin Project participants are working in cooperation with the RAP to develop consistent recommendations. The Minnesota PCA, Minnesota DNR, and Wisconsin DNR are jointly developing a monitoring plan for the St. Louis River to determine the success of remedial actions. <p>No:</p> <ul style="list-style-type: none"> • A Stage I recommendation called for the establishment of a St. Louis River Forum. This cooperative type of effort has not occurred.

<p>12. Participation in the Remedial Action Plan by all stakeholders, ensuring effective community involvement in developing and implementing an achievable plan of action.</p>	<p>Yes and No</p>	<p>Yes:</p> <ul style="list-style-type: none"> • Most proposed implementors of recommendations were involved in developing the recommendations, thus the buy-in required for implementation has already been established. • Local elected officials have been willing to work with the RAP to implement and/or investigate proposed solutions. • New members continue to join the CAC. <p>No:</p> <ul style="list-style-type: none"> • It has been difficult to keep local businesses and industries involved in the RAP at the committee level.
<p>13. Planned water dependent development consistent with other goals stated herein.</p>	<p>Yes and No</p>	<p>Yes:</p> <ul style="list-style-type: none"> • Development of a Port Plan by the City of Duluth and Minnesota DNR which advocates this goal. Continuing development of the Special Area Management Plan for wetlands in Superior. <p>No:</p> <ul style="list-style-type: none"> • There has been little development of the waterfront for water dependent businesses. Most recent development and future development plans are for residential (condominiums, townhouses) or commercial (outlet mall) development that is not water dependent.
<p>14. Expanded public awareness and understanding of the value of attaining and maintaining a healthy ecosystem within the St. Louis River AOC and the role of the individual in that effort.</p>	<p>Yes</p>	<ul style="list-style-type: none"> • Outreach and education activities have included the following: giving presentations to civic groups and school children; showing the RAP display at conferences, environmental events, and museums; assisting with the stenciling "Don't Dump Drains to Lake Superior" project; awarding RAP environmental stewardship awards; issuing press releases on environmental problems and solutions; and attending public meetings and hearings.
<p>15. Enhanced variety of water oriented recreational opportunities throughout the Area of Concern, including public access to the water and shore, trails, beaches, and facilities for fishing from shore.</p>	<p>Yes</p>	<ul style="list-style-type: none"> • Construction of Loonsfoot Public Boat Landing in Superior. • Construction of public fishing pier on Barkers Island in Superior. • Creation of Connors Point Recreation Area in Superior. • Creation of Connors Pointe Festival Park in Superior. • Ongoing construction of a walking/biking trail along the bayfront in Superior. • Completion of the Lakewalk along the Lake Superior shore in Duluth. • Proposed construction of Keene Creek Trail from Irving Park to Grassy Point

16. The restoration and preservation of as much scenic beauty to the area as possible.	Yes	<ul style="list-style-type: none"> • River Stewardship Work Group is developing partnerships with Superior and Duluth waterfront industries to undertake aesthetic and environmental projects. • The recreational projects that have been undertaken (see above) have improved the aesthetics of the shoreline.
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E. FUTURE PLANS

The following actions are planned for 1995 and the future. Some of these actions are dependent on funding. In addition to these actions, there will be other activities as recommendations begin to be implemented and new issues arise.

Action	1995	Future dates
Hog Island Inlet/Newton Creek site	Feasibility study being developed	
Crawford Creek wetland site	Off-site assessment of sediment may occur in 1995	
Fond du Lac Reservation study	Collection of benthic organisms - 1995	
Lakehead Dock	Sediment investigation - Jan. - Feb., 1995	
R-EMAP Project	Project begins - June, 1995	
U.S. EPA mercury research with sediments	Proposals have been submitted for funding through 1997.	
Great Lakes Sport Fish Consumption Advisory Task Force	Review of sport fish protocol complete - Spring, 1995	
Superior Forest Management Plan	Updated plan approved by City Council - March, 1995	
River Watch benthic macroinvertebrate surveys	Expected to continue through 1995	
Harbor Technical Advisory Committee	Continued discussion of dredged materials disposal alternatives	

<p>Urban Storm Water Demonstration Project</p>	<p>Storm water plans complete - July, 1995</p> <p>Stockpile runoff BMP manual developed - 1995</p> <p>Continue storm water monitoring and planning - 1995</p> <p>Develop loading projections - 1995</p>	
<p>"Don't Dump" stenciling week</p>	<p>Scheduled for the week of May 15, 1995</p>	

Action	1995	Future dates
Green Thumb project	Planning, team building, networking - Jan. to March, 1995 Phase I at schools and parks - Apr. to Oct., 1995	Phase II with homeowners - 1996
Pollutant Loading Study	Sampling continues - 1995	
Nemadji River Basin Project	Project ongoing through Spring, 1996 Approach Wisconsin DNR about Nemadji watershed receiving Priority Watershed status - 1995	
Duluth I/I elimination	Inspection & enforcement scheduled to begin	Planned completion of disconnection project - 2002
Superior I/I elimination	Addendums and updates to the Facilities Plan are to be submitted in the future.	
Oliver, WI septic system corrective measures	\$750,000 grant received from WI Dept. of Development - January, 1995 Construction could begin - Fall, 1995	
MN Individual Sewage Treatment System Law	Inspection provision effective - 12/31/95	
4 - SHIP WASTE recommendation	Pilot effluent sampling study planned for Duluth/Superior harbor - Summer, 1995	
Education and inspection to ensure environmentally safe boating practices	Coast Guard efforts continue into 1995 if funding remains	
21 - FOAM recommendation	Sampling proposed - Spring, 1995	
Red and St. Louis Rivers Streambank Protection Area	Wisconsin DNR accepts ownership - Jan. 1995	
St. Louis River Board land acquisitions	Additional acreage to be purchased will be determined in 1995	

Action	1995	Future dates
Superior Special Area Management Plan	Plan acceptance and permit application - anticipated in 1995	
Hearding Island Wildlife Management Area	Develop citizen-stewardship group for resource management	
Grassy Point Wetland	Develop coordinated mgmt. plan with public, city, and state Remove saw mill wood waste	
Wild rice reintroduction study	Continued into 1995	
Arrowhead Refinery	Clean-up of site will continue.	
Duluth Air Force Base	Investigations and clean-up of different contaminated sites will continue.	
Engineers Realty Demolition Landfill	Landfill is scheduled for closure by November, 1996.	
Murphy Oil Refinery	Evaluation of new technology and pilot studies to remove metals from the effluent.	
Potlatch Industrial Landfill	Continuation and expansion of activities to determine environmental effects to the river and actions to reduce impacts to river.	
Superior-Wisconsin Point Landfill	Completion of monitoring plan for the landfill - Spring, 1995	
USG Cloquet #1 Industrial Landfill	Final capping of landfill - 1995 Continued waste characterization and monitoring.	
Western Lake Superior Sanitary District Treatment Plant	Continuation of pilot non-chlorination study	

In the next year, measurable objectives need to be determined for many of the impaired uses. Some of these objectives have been outlined in the Stage II recommendations. However, these objectives are often not measurable, making it difficult to determine the status of the impaired use.

As the objectives are determined, a monitoring plan will be developed for the AOC. This plan will likely outline monitoring to examine changes and trends in water quality, sediment quality, fish tissue contamination, fish populations, and benthos. The plan will be designed to

demonstrate the effect of remedial actions that are taken to restore the impaired uses in the harbor.

Once the objectives and monitoring plan have been developed, a report will be developed that summarizes the information. The report will complement this Progress Report and provide the information necessary to determine the status of use impairments over time.

VI. REFERENCES

- Bard, Roger. 1994. St. Louis County Health Department. Personal Communication.
- Baumann, P. 1984. Cancer in Wild Freshwater Fish Populations with Emphasis on the Great Lakes. *J. Great Lakes Res* 10(3): 251-253.
- Busiahn, T.R. 1993. Can the ruffe be controlled before it becomes your problem? *Fisheries* 18(8):22-23.
- Cook, R.B. and J.J. Ameel. 1983. Water Chemistry in St. Louis Bay June - November, 1982. In Chemical and Biological Studies Related to the Water Quality of St. Louis Bay of Lake Superior. U.S. EPA Environmental Research Lab, Duluth, MN. May 1984.
- Davis, T.E. 1983. St. Louis River Estuary Colonial Bird Program, 1983. Report to the Minnesota Department of Natural Resources, St. Paul, MN.
- Davis, T.E. 1987. St. Louis River Estuary Colonial Bird Program, 1987. Report to the Minnesota Department of Natural Resources, St. Paul, MN.
- Ensor, K.L., W.C. Pitt, and D.D. Helwig. 1993. Contaminants in Minnesota Wildlife. Minnesota Pollution Control Agency, St. Paul, MN.
- Glass, G.E., J.A. Sorensen, K.W. Schmidt, and G.R. Rapp, Jr. 1990. New Source Identification of Mercury Contamination in the Great Lakes. *Environmental Science and Technology* 24(7): 1059-1068.
- Koch, R.G., R.D. Morden, P.W. DeVore, L.M. Koch, and A.B. Dickas. 1976. Environmental Inventory of Lower St. Louis River Covering Proposed Improvements to Duluth-Superior Harbor. Minnesota and Wisconsin. The Center for Lake Superior Environmental Studies Publication #34. University of Wisconsin: 67 pages.
- MN DNR. 1993. Minnesota's Native Vegetation: a Key to Natural Communities. MN DNR Biological Report No. 20. Minnesota Department of Natural Resources Natural Heritage Program, St. Paul, MN.
- Morgan, Mary. 1994. City of Superior Parks and Recreation Department. Personal Communication.
- MPCA. 1994. (Draft) Second Tier Sediment Remediation for the Lower St. Louis River: Thomson, Forbay and Fond du Lac Reservoirs - Final Report. Minnesota Pollution Control Agency, St. Paul, MN. 91 pages plus appendices.
- MPCA. 1994. (Draft) Summary of Individual Sewage Treatment System Law. Minnesota Pollution Control Agency, St. Paul, MN.
- MPCA and WI DNR. 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.
- Malecki, R.A., B. Blossey, S.D. Hight, D. Schroeder, L.T. Kok, and J.R. Coulson, 1993. Biological Control of Purple Loosestrife. *BioScience* 43:680-686.

- Niemi, G.J., and T.E. Davis. 1979. Notes on the nesting ecology of the Piping Plover. *Loon* 51(Summer):74-79.
- Niemi, G.J., T.E. Davis, G.D. Vieth, B. Vieux. 1986. Organochlorine chemical residues in Herring Gulls, Ring-billed Gulls, and Common Terns of Western Lake Superior. *Archives of Environmental Contamination and Toxicology* 15:313-320.
- Penning, W.L. 1993. The Common Tern (*Sterna hirundo*) in western Lake Superior: History, management, and population modeling. MS Thesis, University of Minnesota.
- Pratt, D.M., W.H. Blust, and J.J. Selgeby. 1992. Ruffe, *Gymnocephalus cernuus*: newly introduced in North America. *Can. J. Fish. Aquatic. Sci.* 49:1616-1618.
- Ruffe Control Committee. 1993. Ruffe control program. Aquatic Nuisance Species Task Force. Washington, D.C.
- Selgeby, J.H. 1993a. Status of Ruffe in the St. Louis River Estuary, 1992, with Emphasis on Predator Prey Relations. Minutes of the Lake Superior Committee, Great Lakes Fishery Commission, Ann Arbor, MI.
- Selgeby, J.H. 1993b. Trophic Relations of Ruffe and the Status of Ongoing Research in the St. Louis River Estuary, Lake Superior, 1992. Report to the Great Lakes Fishery Commission, Lake Superior Committee, March 31, 1993.
- Swain, E.B., Engstrom, D.R., Brigham, M.E., Henning, T.A. & Brezonik, P.L. Increasing Rates of Atmospheric Mercury Deposition in Midcontinental North America. *Science*, Vol. 257, August 7, 1992.
- Verry, Elon S., et al. February 1983. Aspen Clearcutting Increases Snowmelt and Storm Flow Peaks in North Central Minnesota. *Water Resources Bulletin*, Volume 19, No. 1.
- Waterfront Task Force. March 1990. Waterfront Plan - City of Superior, Wisconsin.