

STRATEGIES FOR MITIGATING THREATS

Having identified the conservation targets of the Lower St. Louis River, as well as the threats to their health, the next step in this process was to develop strategies to eliminate or abate these threats. In developing strategies, it is critical to ensure that they directly address the specific problems, or sources of stress, that the conservation targets are facing. Strategies must focus on abating known or likely sources of stress and protecting or restoring the identified conservation targets. If local information on conservation targets and their needs is not constantly considered, it is easy to be diverted into strategies that address environmental concerns, but that do not actually improve the health of the conservation targets.

Several related factors must be considered during strategy development.

- Some strategies are short-term and immediate; some strategies are long-term.
- One strategy can address multiple threats.
- Complementary strategies are needed to deal with complex long-term threats.
- Strategies should address various scales of influence; in this case, from local to international.
- Strategies should involve many partners, including citizens.
- Creating more plans to address specific issues or needs can be a very important step in effecting policy changes that will help to implement identified strategies.
- All strategies should take advantage of available information and should identify additional information that is needed to adequately develop and implement the strategies.

To develop strategies for the Lower St. Louis River, a strategy workshop was held on May 8 and 9, 2001, in Duluth, Minnesota. The goals of the strategy workshop were to

- agree on the critical threats to the conservation targets of the Lower St. Louis River;
- develop a set of **feasible** and **effective** strategies to reduce or eliminate the critical threats;
- identify immediate action steps;
- make recommendations about where to implement the strategies and which stakeholders should be involved.

The first part of this meeting was devoted to a broad review of the conservation targets and their needs; this was followed by a review and discussion of the threats that had been identified in previous workshops and discussions. This review set the stage for developing strategies for the Lower St. Louis River. After reviewing the conservation targets and summarizing the critical threats, workshop participants were divided into groups, and each group was given the assignment to develop strategies for a single threat. After developing a first draft of strategies, each group completed a brief, qualitative assessment of the benefit, cost, and feasibility of each of their strategies. Participants later reconvened in a single group to assess and rank all of the different strategies that had been identified. A second strategy workshop was held on June 19, 2001, to further refine the results of the May workshop.

As a result of these workshops, the following list was developed of major identified threats to the habitat of the Lower St. Louis River.

1. Loss of habitat due to development, commercial shipping, and other sources.
 2. Increased sedimentation due to development, forest management practices, and other sources.
 3. Competition from undesirable exotic species introduced by commercial shipping, development, and other sources.
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4. Exposure to sediment-associated contaminants from historical and ongoing point and non-point sources.
5. Degradation of water quality due to development, commercial shipping, forest management practices, contaminated sediments, and other sources.

The purpose of the strategies recommended in this Plan is to protect, enhance, and restore the ecological function of the Lower St. Louis River. To accomplish this, many stakeholders, including public agencies as well as private organizations, will need to work together. Although the St. Louis River Citizens Action Committee (CAC) guided the preparation of this Plan, it is not the role of the CAC to implement the strategies. After the Habitat Plan is completed, the role of the CAC will be to facilitate actions on the part of the appropriate stakeholders as they work together to protect the conservation targets of the Lower St. Louis River.

This section of the document summarizes the strategies developed during the workshops. Strategies are grouped according to which of the major stresses they address. An attempt was made during the strategies workshops to identify the stakeholders that can and should have a role in implementing each strategy, but it was not possible to identify every stakeholder. As a result, the following strategies mention specific stakeholders only where there is a clearly defined responsibility. It is assumed that the first step in every strategy listed here is to identify and bring together all major stakeholders.



Strategies to Address Loss of Habitat

Strategy 1: Protect Critical Remaining Natural Areas

Problem Summary: The loss, fragmentation, and degradation of habitat resulting from development, increased sedimentation, and other factors, has had negative impacts on every conservation target identified in this Habitat Plan. Estuarine aquatic habitats have been filled or dredged, upland forests have been converted to urban areas, and many of the dune communities have been eliminated by development. Loss or degradation of these habitats has negatively impacted populations of birds, fish, and mussels. But despite this widespread habitat degradation and loss, the Lower St. Louis River remains a vital resource for maintaining the biological productivity and diversity of western Lake Superior. In fact, eight of the 28 “priority wetlands” identified in *Wisconsin’s Lake Superior Coastal Wetlands Evaluation* are located within the Lower St. Louis River Habitat Plan project area (Epstein et al. 1997). In addition to areas of relatively undisturbed habitat, much of the current productivity and diversity is supported by areas of high quality habitat that have either recovered from past disturbances or have been relatively less disturbed throughout the history of harbor and urban development. However, many of the remaining examples of these habitats are threatened by new development, ongoing sedimentation, and related problems.

Strategy: Direct protection of the remaining high quality habitat areas is a crucial strategy for protecting the health of the estuary ecosystem.

Actions: A number of critical sites have been identified for immediate protection and maintenance. Many of the recommendations below will require funding for specific projects. The critical sites identified to date and actions needed to protect the health of those sites are listed below.

Barrier Beach & Dune Communities of Minnesota Point & Wisconsin Point

Most Important Barrier Beach and Dune Communities

- Pine forests of Minnesota Point and Wisconsin Point
- Publicly owned recreation areas on Minnesota Point and Wisconsin Point
- Publicly owned beach front on Minnesota Point and Wisconsin Point

To Minimize Loss of Habitat in Barrier Beach and Dune Communities

- Many of the goals and strategies outlined in the *Minnesota Point Environmental Management Plan* (Park Point Community Club 1999) are compatible with this Habitat Plan. Support implementation of actions recommended in the Management Plan by leveraging funds and actively participating in restoration and protection projects.
- The city of Superior’s Code of Ordinances protects Wisconsin Point from residential, commercial, and industrial development, while allowing for recreational development. In order to continue to protect this unique and important natural resource, the city of Superior should develop a management plan for Wisconsin Point that is consistent with the goals of this Habitat Plan. The management plan should ensure that all recreational development projects are designed in a way that protects and enhances the natural communities of Wisconsin Point while providing opportunities for public recreation. Appropriate

projects will allow the public to utilize and appreciate the recreational and biological values of Wisconsin Point while fostering stewardship of the globally significant natural communities of beach, dune, and pine forest.

- Increase public understanding and awareness of the importance of the barrier beach and dune communities to migratory birds and the need to minimize disturbance of the habitat.
- If new recreational trails are added to Wisconsin Point or Minnesota Point, all trails should be designed and built with the primary goal of protecting and enhancing the natural communities while allowing public recreation.
- Encourage people to stay on designated trails on Wisconsin Point and Minnesota Point.
- Eliminate use of motorized vehicles and bicycles on the sand dunes and beaches of Minnesota Point and Wisconsin Point. Use technology such as video cameras to assist in enforcing restrictions.
- Work with the Army Corps of Engineers (U.S. ACOE) to develop erosion control projects that might include using dredge material to fill areas around the navigation structures at the Superior entry and Duluth ship canal.
- Evaluate ACOE Sec. 1135 funding for restoration projects.
- Emphasize the area's importance as habitat for migratory birds.
- Coordinate with the U.S. Fish and Wildlife Service (U.S. FWS) to ensure that Wisconsin Point remains designated as "Critical Habitat" for the piping plover.

Upland Conifer and Hardwood Forests

Most Important Stands of Upland Conifer and Hardwood Forests

- Clough Island (Wisconsin)
- Magney-Snively Forest (Minnesota)
- St. Louis River and Red River Streambank Stabilization Area (Wisconsin)
- Areas surrounding Pokegama Bay and other clay-influenced bays (Wisconsin)
- Jay Cooke State Park (Minnesota)
- Additional high-quality forest areas identified as a result of ongoing inventory work

To Minimize Loss of Habitat in Upland Conifer and Hardwood Forests

Clough Island

- Facilitate permanent protection of the forest community on Clough Island using a formal conservation designation. One possibility is federal ownership as a National Wildlife Refuge.
- Ensure that government agencies (such as state DNR, U.S. FWS, etc.) and conservation organizations understand the ecological significance of Clough Island and the importance of tracking land ownership and land management on the Island. Determine what permits and approvals are necessary for any development projects on the Island. Request that regulatory agencies (i.e., DNR, city of Superior, U.S. ACOE) keep the public and the CAC informed of any applications for permits on Clough Island.

Magney-Snively Forest

- Protect the Magney-Snively Forest using a formal conservation designation such as the Duluth Natural Areas Program or the Minnesota Scientific and Natural Areas Program that would afford permanent protection to the forest community.
- Acquire important privately owned parcels within and around the city-owned Magney-Snively Park to be included as part of the designated protected area or as part of a buffer area.

- Survey plant communities and breeding birds within the Magney-Snively Forest to establish baseline data for monitoring the health of the forest.

St. Louis River and Red River Streambank Stabilization Area

- The St. Louis River and Red River Streambank Stabilization Area is a 5,000-acre parcel located on the southern bank of the St. Louis River between the village of Oliver, Wisconsin, and the Wisconsin/Minnesota border. It is owned by the State of Wisconsin and managed by the Wisconsin Department of Natural Resources (WDNR). The WDNR should develop a Management Plan for the area that is compatible with the goals of this Habitat Plan. The Management Plan should specifically address 1) restoration of mature conifer and hardwood forest to control erosion of red clay sediment, and 2) protection of water quality through control of off-highway vehicles (OHVs) and restoration of stream crossings that have been degraded by uncontrolled use of recreational vehicles.

Pokegama and other clay-influenced bays

- WDNR and the city of Superior should develop management plans for the publicly owned lands surrounding the clay-influenced bays. The management plans should be compatible with the goals of this Habitat Plan.

Jay Cooke State Park

- Incorporate the goals of the Habitat Plan into all Jay Cooke State Park management activities.

Other forested areas

- Continue to evaluate the quality of existing forests, especially municipal forests in Duluth and Superior. Facilitate formal conservation designation for all forests identified as high-priority for protection.

In all forested areas

- Encourage agencies (city and state) to inventory and document problem erosion areas. Control or eliminate OHV use by encouraging enforcement of existing regulations, developing trails in appropriate areas, and using education and outreach as a tool; work with local OHV clubs, where they exist; create a hotline to report illegal OHV use.
- Incorporate goals of the Habitat Plan into forest management plans throughout the entire estuary.

Sheltered Bays and Shallow Wetlands

Most Important Sheltered Bays and Shallow Wetlands

- Sheltered bays between the Fond du Lac dam and Spirit Lake
- Allouez Bay
- Oliver Marsh
- Wetland priority sites identified in *Wisconsin's Lake Superior Coastal Wetlands Evaluation* (Epstein et al. 1997)

To Minimize Loss of Habitat in Sheltered Bays and Shallow Wetlands

- Facilitate formal conservation designation of land surrounding important sheltered bays and shallow wetlands through fee title acquisition, conservation easement, or landowner incentives.
- Ensure that land surrounding sheltered bays is maintained with native vegetative cover. Educate landowners about the importance of restoring and maintaining buffer strips of native vegetation along shorelines of bays and wetlands.

- Eliminate excess sedimentation in sheltered bays by controlling OHV activity in uplands through enforcement of existing regulations and development of trails in appropriate areas. Use education and outreach as a tool, work with local OHV clubs, and create an effective method (such as a hotline) to report illegal activity.
- Establish no-wake zones in some sheltered bays to eliminate disturbance of migratory birds utilizing those bays and to minimize damage to wild rice and other emergent and submergent plants.
- Support the work of the Nemadji River Basin Project (and other projects) to control hydrologic extremes and the resulting increased erosion and sedimentation occurring in the Nemadji River Basin.

Strategy 2: Maintain a List of Priority Restoration Projects and Sites

Problem Summary: While many of the less disturbed areas in the Lower St. Louis River provide important ecological functions, nearly all have been modified in some way that either threatens conservation targets or impairs their function. Ecological restoration is the process of assisting the recovery and management of ecological integrity, which includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices. Restoration can be appropriate in a wide variety of sites that vary from slightly disturbed to highly disturbed. Priority restoration projects should improve the health of conservation targets by reducing or eliminating the sources of stress.

Strategy: As part of this Habitat Plan a list has been developed of priority restoration projects and sites where restoration is needed. This list should be continuously updated and maintained as restoration projects are completed and new sites and projects are identified.

Actions: Refine criteria for identifying and ranking priority restoration projects and sites. Identify additional restoration projects and sites as soon as possible. Use existing information and new data generated by the Habitat Plan to identify and develop or acquire missing GIS (geographic information system) data layers needed for ongoing restoration and management of conservation targets.

Priority sites and restoration projects identified to date are listed below.

Barrier Beach & Dune Communities

Wisconsin Point

- Work with landowners and appropriate agencies to remove old structures, parking lots, and fences on Wisconsin Point that are no longer in use, not considered historic, and are not suited for future uses. Restore the areas to more natural habitat.

Minnesota Point and Wisconsin Point

- Remove non-native plants from pine forests on Minnesota Point and Wisconsin Point.
- Develop a project to examine the genetics of local vs. non-local beachgrass so that appropriate source material for restoration projects can be identified.
- Develop a local source for beachgrass if needed.
- Plant local beachgrass on dunes to stabilize sand.

Upland Conifer and Hardwood Forests

Clough Island

- Restore areas of degraded forest habitat on Clough Island. The Island currently contains significant remnants of forest, wetland, and undeveloped shoreline that provide important habitat for numerous migratory and breeding birds and other species. These habitats should be restored and expanded.

Sheltered Bays and Shallow Wetlands

Clough Island

- Restore wetland habitat on and surrounding Clough Island where appropriate. The Island currently contains significant remnants of forest, wetland, and undeveloped shoreline that provide important habitat for numerous migratory and breeding birds and other species.
- Carry out revegetation and other erosion control projects on Clough Island to benefit shorelines and shoreline wetlands.

Spirit Island and Spirit Lake

- Carry out revegetation or other erosion control projects on Spirit Island to benefit shorelines and shoreline wetlands.
- Remove contaminated sediments from Spirit Lake as the first step toward restoration.
- Restore wetlands used by migratory birds in the area of Spirit Lake; new methods to decrease wave action from wind and boats may be needed to allow more emergent vegetation to become established.

Mud Lake

- Restore wetlands for migratory birds at Mud Lake.

Stora Enso Bay/Coffee Grounds Flats

- Restore wetlands at Stora Enso Bay/Coffee Grounds Flats project area.

Various Sheltered Bays

- Re-establish wild rice beds.

Industrially Influenced Bays

Stryker Bay, US Steel Superfund site, and various areas on the Wisconsin shore

- Remediate contaminated sediments in industrially-influenced bays. Determine what types of habitat each industrially-influenced bay should support. Determine the impact of the loss of a given area, based not on the degraded condition, but on the ideal ecological condition of the bay. Restore selected industrially-influenced bays to have the natural resource values and functions of unaltered sheltered bays.

Industrial Slips

- Identify sites where hardened shorelines and inactive slips can be restored to provide greater ecological function, and carry out a demonstration project to restore an inactive slip.

Fish Habitat

Keene Creek

- Restore and improve in-stream habitat conditions in Keene Creek.
- Restore native conifers in riparian areas.

Kingsbury Creek

- Restore in-stream habitat and riparian habitat along Kingsbury Creek, including areas within the Lake Superior Zoo.
- Restore native conifers in riparian areas.

Fond du Lac dam

- Improve habitat near Fond du Lac dam for lake sturgeon, walleye, and smallmouth bass. The wing dam below Fond du Lac dam, which was created as an area to capture walleye for spawning operations, has been shown to strand fish. Redistribution of wing dam rocks would reduce the risk of mortality for walleye and lake sturgeon and create smaller eddies and structures for spawning.
- WDNR and MDNR are currently monitoring spawning lake sturgeon in this area. Continue monitoring sturgeon populations. Develop a program to radio-tag sturgeon for better monitoring.

Nesting Bird Habitat

Interstate Island

- Improve nesting habitat for the common tern at Interstate Island through the addition of sand and gravel, planting of native vegetation, and control of ring-billed gulls.

Wisconsin Point

- Improve nesting habitat for piping plover on Wisconsin Point through appropriate vegetation management.



Strategies to Address Exposure to Sediment-associated Contaminants

Strategy 3: Remediate Contaminated Sediments and Restore Natural Functions

Problem Summary: Contaminated sediments are a significant environmental, economic, and social concern in portions of the Lower St. Louis River. Elevated levels of sediment-associated toxic substances, including metals, PAHs, PCBs, pesticides, and dioxins/furans are contributing to a number of confirmed and possible use impairments. These use impairments include degradation of benthic macroinvertebrate communities and fish and wildlife habitat, ecological and human food chain effects (including fish consumption advisories), restrictions on dredged material management, and increased costs to industry (IJC 1989).

In support of the three-phase sediment strategy of the St. Louis River System Remedial Action Plan (RAP) Stage Two (MPCA and WDNR 1995), sediment assessment studies have been conducted at the US Steel and St. Louis River/Interlake/Duluth Tar Superfund sites, Hog Island Inlet/Newton Creek, several industrial slips, and embayments with historical and ongoing deposition.

Remediation plans are currently being developed for the Superfund sites and Newton Creek. To date, remedial actions at these sites have been primarily limited to on-land areas, a small amount of sediment remediation, and other source control measures. Contaminated sediments in the river have not yet been remediated.

Future implementation of contaminated site management plans should result in clean-up and restoration actions at sites that present an unacceptable risk to conservation targets and human health. In the meantime, none of the contaminated sediment sites in the estuary has been completely remediated and exposure to sediment contaminants, degradation of water quality, and use impairments continue.

Strategy: From an ecological perspective, the preferred strategy is to remediate contaminated sediments as soon as possible. However, management decision-makers for contaminated sediments need to consider technical, social, and economic factors in selecting remedial alternatives. It is likely that a combination of strategies may be needed at each contaminated sediment site. Therefore, the recommended strategy is that remedial alternatives be developed and implemented for each contaminated sediment area of the St. Louis River Area of Concern (AOC) as soon as possible, and that the affected resources be restored according to the appropriate conservation goal for the area. In addition, appropriate source controls must be developed for each contaminated sediment area.

Actions:

- Encourage responsible parties and governmental agencies to continue action to remediate contaminated sediments and restore natural functions.
- Minnesota and Wisconsin agencies should work more aggressively with responsible parties to design and implement remediation of contaminated sediments at the US Steel and St. Louis River/Interlake/Duluth Tar Superfund sites.

- The natural resource trustees should utilize their damage assessment authorities to ensure restoration of ecological processes and other natural resource services.
- WDNR should continue to pursue remediation of contaminated sediments at Newton Creek/Hog Island Inlet.
- Management plans for other areas of contaminated sediments should be completed by MPCA and WDNR as soon as possible. The management plans should be compatible with and supportive of the conservation goals of this Habitat Plan. These management plans should include the development and use of GIS to integrate sediment database information with site- and target-specific conservation strategies identified in this Habitat Plan.
- State and federal representatives should be contacted to help acquire funding to support these actions.



Strategies to Address Increased Sedimentation and Degraded Water Quality

Strategy 4: Reduce Peak Stream Flows that Result from Land Use Patterns

Problem Summary: Land use patterns have changed regional watersheds from those dominated by forests and wetlands to those containing significant amounts of impervious surfaces (such as roads, rooftops, and parking lots), maintained lawn, and agricultural fields. This has resulted in changes in stream flow. Development and conversion of forests and wetlands to other uses tends to speed the movement of stormwater from the land to streams and rivers. Conversion of conifer forest to young deciduous forest can result in hydrologic changes to streams. Increasing the rate at which stormwater reaches streams increases peak stream flow and decreases the amount of water in the streams at base flow conditions. Increased peak flow results in increased sedimentation in many habitats, primarily the sheltered bays, the clay-influenced river mouths and bay, and the industrially-influenced bays. The sheltered bays and clay-influenced bay provide critical habitat for fish spawning, bird nesting, and feeding for a wide range of species. Sediments slowly fill these bays, causing the decline and loss of wetland vegetation. In addition, suspended clay reduces light penetration in the already dark, tannic waters of the river. Lower light penetration results in less habitat available for submergent plants. The decline and loss of wetland vegetation that results from excess sedimentation also means lower productivity (reduced food availability) and loss of spawning and nesting habitat, all of which negatively impact native bird and fish populations. Lower base flow affects the habitat available in the tributary streams for trout and other fish.

Strategy: Reduce peak stream flows that result from land use patterns.

Actions: Priority actions to address increased peak flows include the following.

- Support implementation of the recommendations of the Nemadji River Basin Project.
- Support research efforts to identify high-priority subwatersheds contributing to peak flow problems.
- Support the retention of wetlands throughout the St. Louis River and Nemadji River watersheds.
- Support the retention of mature forest stands within the watershed.
- Re-establish conifer forests in appropriate areas of the watershed, focusing first on areas where this would have the greatest impacts, including sites on red clay soils adjacent to steep slopes, grassy open areas, and forests currently dominated by early successional hardwood species.
- Establish a 2:1 replacement ratio for replacing wetlands lost to development in high-priority subwatersheds.

Strategy 5: Control Nonpoint Source Pollution from Roads and Parking Lots

Problem Summary: Sand and salt are important safety tools for winter road maintenance, but when they enter streams and wetlands they become stresses on habitats and the plants and animals that live in those habitats. Chloride from road salt can create conditions inhospitable to plants and fish. Sand can fill wetlands, cover fish spawning areas, and kill fish eggs, aquatic insects, and plants.

Strategy: Control nonpoint source pollution from roads and parking lots to reduce the impact of road sand and salt.

Actions: Priority actions to reduce the impact of sand and salt include:

- Educate the public on the impacts of sand and salt in aquatic environments.
- Work to reduce the use of road salt or convert to non-chloride based treatments for de-icing roads in winter.
- Work to reduce the amount of sand and salt placed on roads by installing sensors and monitoring equipment, and by improving plowing equipment and road maintenance techniques. Provide opportunities for additional training for equipment operators.
- The city of Superior and the city of Duluth should work to initiate earlier and more aggressive street sweeping programs to remove accumulated sand from roads in the spring before it reaches storm drains and streams.
- Work with owners of parking lots to better manage snow removed from lots in problem areas, especially in the Miller Creek watershed (Minnesota). Snow management should include consideration of runoff into streams and storm drains and should address accumulated salt and sand in snow piles.
- Initiate projects to install sediment traps to capture sand in storm sewers and ditches before it reaches streams and wetlands. Priority areas already identified for attention include the Miller Creek watershed, the Kingsbury Creek watershed, and the Keene Creek watershed (Minnesota).
- Evaluate streams, in both Minnesota and Wisconsin, that flow into sheltered bays and shallow wetlands and develop projects to reduce the effects of sand and salt.
- Maintain and enhance vegetated buffer strips along roadsides and parking lots to trap sediment and salt before it enters storm drains and ditches. Engage in regular maintenance activities to remove accumulated sediment from these areas.

Strategy 6: Improve Stormwater Management and Eliminate Sanitary Sewer Overflows

Problem Summary: Developed areas generally include infrastructure designed to move stormwater out of the way as quickly as possible. Because Duluth is built on a relatively steep hill of impervious crystalline rock, the city has always utilized the many natural streams of the hillside as an integral part of its stormwater sewer system. This system delivers stormwater quickly and directly into the St. Louis River and Lake Superior. During times of high stormwater runoff in both Duluth and Superior, the runoff carries road salt and sand, petroleum residues, nutrients, trash, and sediment directly into the river and lake. An additional problem occurs when excess stormwater infiltrates the sanitary sewer systems and causes overflows that result in untreated sewage entering the St. Louis River and Lake Superior. These problems related to current stormwater management practices can lead to degraded water quality that negatively impacts populations of fish and other biota that inhabit the estuary.

Strategy: Improve stormwater management and eliminate sanitary sewer overflows. In 1999 the EPA enacted new regulations that require cities the size of Duluth and Superior to obtain a Phase II Storm Water Permit. One of the requirements of this permit is to prepare and implement a stormwater management plan that will focus on mitigating surface water contamina-

tion from nonpoint sources. The cities of Duluth and Superior are both currently working to map and evaluate existing stormwater systems as the first steps in developing stormwater management plans. Duluth has established a stormwater utility and Superior has established a stormwater engineering position. Duluth is also working with homeowners to eliminate inflow and infiltration problems throughout the city.

Actions:

- Encourage and support ongoing efforts in Duluth and Superior to improve stormwater management and eliminate sanitary sewer overflows.
- Educate the public about why building and maintaining stormwater and sanitary sewer infrastructure is a critical element in protecting water quality.

Strategy 7: Minimize Impacts of Recreational Vehicles

Problem Summary: When not used carefully, recreational vehicles, including OHVs, snowmobiles, mountain bikes, motor boats, and personal watercraft, can have serious impacts on habitats. On land, recreational vehicles can destroy vegetation and seriously damage soil, leading to accelerated erosion and sedimentation. Excess nutrients, chemicals, and other debris are carried along with the soil into the streams, wetlands, St. Louis River, and ultimately Lake Superior, impairing water quality. The red clay soils found in the watershed of the Nemadji River and the Lower St. Louis River are easily damaged by motorized vehicles and are slow to recover from damage. On water, boats and personal watercraft cause wakes that can destroy submergent and emergent vegetation and waterfowl nests.

Strategy: Encourage the responsible governmental agencies to improve management of recreational trails and increase regulation of recreational motorized vehicles with the goal of minimizing the impacts on public and private lands and waters.

Actions:

- Restrict OHV use to designated trails.
- Establish seasonal restrictions on trail use.
- Use OHV license fees to rehabilitate and restore habitat that has been impacted by improper use.
- Improve management of recreational trails, especially at stream crossings and wetlands.
- Establish no-wake zones or no-motor zones in sensitive wetland areas of the Lower St. Louis River.

Strategy 8: Implement BMPs to Control Sedimentation and Protect Water Quality

Problem Summary: Water quality is affected by many human activities. For example, increased impervious surface and loss of natural vegetation caused by large-scale residential and commercial developments often results in increased sedimentation. Even seemingly innocuous projects such as the creation of a bicycle trail can also contribute to these problems. Undeveloped forested land and other vegetative cover absorbs stormwater and slows the velocity of stormwater runoff because wetlands, duff layers, and soils within forests act as natural sponges to hold water and release it gradually. But when land is developed, the loss

of forest, wetlands, and other vegetative cover, in combination with the associated increase of impervious surface area, causes a higher volume of water to drain off the land more quickly. The greater volume of fast-moving water in the natural drainageways causes erosion of the stream banks and channels. This chain of events increases rates of sedimentation in the Lower St. Louis River; the eroded sediments are most often deposited in the sheltered bays, river mouths, and other important aquatic habitats in the estuary.

Best Management Practices (BMPs) have been developed to minimize the problems caused by various activities. For example, with any proposed project, it is important to map the subwatersheds to determine where water flows naturally and plan developments in a way that retains a more natural flow of water through the watershed, reduces runoff and sedimentation, and minimizes the increase in impervious surface.

Strategy: Implement BMPs to control sedimentation and protect water quality.

Actions:

- Compile, evaluate, and improve existing BMPs; develop additional ones as necessary.
- Identify target groups and stakeholders. Distribute BMPs, promote public education, and encourage use of BMPs.
- Begin a long-term campaign to improve implementation of BMPs to protect water quality. This should include forest management, agriculture, recreational development, shorelines, building construction, road construction and maintenance, golf courses, and impervious surfaces. The campaign should focus not just on public education, but also on incentives to encourage the use of BMPs.

Strategy 9: Increase Use of Compatible Forest Management Practices

Problem Summary: The watershed of the Lower St. Louis River and Nemadji River includes many areas of erosion-prone sand and clay. Inappropriate forest management practices can contribute to erosion and sedimentation that leads to high nutrient and sediment loading in the Lower St. Louis River. This degrades estuarine aquatic habitats and negatively impacts fish species that utilize these habitats. Some fish species cannot tolerate higher sediment levels, and their populations may be directly affected by increased sediment loading. In addition, remaining forests have been managed so that they are primarily in an early successional stage dominated by aspen and birch. This has been highly detrimental to the northern conifer-hardwoods, boreal spruce-fir, and white pine-red pine forests of this area. Their natural range of age classes, species diversity, and other features has largely disappeared.

Strategy: Increase use of forest management practices that are compatible with the goals of the Habitat Plan.

Actions:

State and county land management agencies and the state extension services should promote forest management practices that

- encourage age class diversity and harvest unit sizes,
 - encourage forest type and tree species diversity,
 - work toward elimination of tree plantations of non-native species such as Scotch pine,
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- encourage planting of conifers or other long-lived species in riparian areas, and
- re-establish the natural range of age classes, species diversity, downed woody debris, snags, and other characteristic features.

Strategy 10: Enhance Enforcement and Compliance Monitoring of Environmental Permits

Problem Summary: Permits that are intended to protect environmental quality are already necessary for many activities such as constructing roads or buildings, building in or near wetlands, and discharging wastewater from industrial activities. Such activities have the potential to cause increased erosion and sedimentation, loss of habitat, and degradation of water quality within the watershed. All too often, regulatory agencies do not have the staff needed to enforce the permit restrictions and environmental damage occurs despite the permitting process. Lack of enforcement or permit-review backlogs can lead to unnecessary loss of wetlands, violation of air and water quality permits, lack of spill reporting, and uncontrolled stormwater runoff that results in excess erosion and sedimentation.

Strategy: Enhance the enforcement of existing permits, increase compliance monitoring for environmental permits, and ensure that effective penalties are administered for non-compliance.

Actions:

- Increase monitoring of permit compliance at development sites.
- Strengthen the ability of regulatory agencies to stop or prevent problems on development projects.
- Identify weaknesses in existing regulations and strengthen the regulations as needed.
- Modify the priorities of permit issuing agencies to require more compliance inspection visits.
- Establish a network of personnel for monitoring permit compliance and coordinate compliance inspection visits across agencies.
- Enforce regulations covering septic system integrity and maintenance.
- Hold meetings with permit issuers and applicants with the goal of identifying ways to streamline and improve compliance monitoring, then follow-through on the recommendations.
- Provide incentives for permit review based on inclusion of BMPs.
- Allow permit applications to be submitted via the World Wide Web.

Strategy 11: Modify Current Land Use/Zoning Regulations

Problem Summary: Residential, commercial, and industrial development projects result in many changes to the land and water, and the zoning regulations that govern these developments often fail to consider the natural ecosystems. The most obvious impact of development is the direct loss, degradation, and fragmentation of upland and wetland habitats and the resulting negative impacts on species that utilize those habitats. Development is also a primary cause of increased sedimentation, a significant contributor to degraded water quality; it is also a factor contributing to the spread of undesirable non-native plant species. Careful planning coupled with appropriate zoning regulations can help to minimize impacts to the habitats.

Strategy: Work with local zoning commissions and zoning supervisors to modify current zoning regulations to ensure appropriate land uses within the watershed.

Actions:

- Review existing zoning regulations for compatibility with the goals of this Habitat Plan.
- Identify alternative zoning scenarios.
- Meet with local and regional zoning boards and commissions to present alternative ideas.

Strategy 12: Restore Natural Drainage Systems and Processes

Problem Summary: The watershed of the Lower St. Louis River includes many areas of erosion-prone sand and clay. Throughout the watershed, hydrologic modifications—such as increased impervious surface, loss of wetlands, construction of drainage ditches near roads and farms, and the presence of hydroelectric dams—have resulted in altered stream flow patterns that contribute to increased peak flows and increased erosion and sedimentation that lead to high nutrient and sediment loading in the Lower St. Louis River.

Strategy: Restore natural drainage systems and processes through landscape-scale management strategies.

Actions:

- Identify existing drainage systems, map subwatersheds to determine where water flows naturally, and plan any future developments in a way that retains a more natural flow of water through the watershed, reduces runoff and sedimentation, and minimizes the increase in impervious surface.
- Identify potential restoration areas and set up a demonstration project.



Strategies to Address Competition from Exotic Species

Strategy 13: Control Populations of Undesirable Exotic Species

Problem Summary: The Lower St. Louis River ecosystem includes ecologically harmful exotic species such as purple loosestrife, zebra mussel, rusty crayfish, and others. By competing for habitat, food, and breeding areas, these undesirable exotic species can drive out native species, cause localized eradication, impact fisheries, spread disease, and reduce species biodiversity. In addition, if undesirable exotic species are not controlled, the Lower St. Louis River could act as a source for introducing these species to other areas where they are not yet a problem.

Strategy: Control the spread of undesirable exotic species to other areas and work to eliminate existing populations of undesirable exotic species in the Lower St. Louis River.

Actions:

- Develop and use approved biological methods to control undesirable exotic species already found in the Lower St. Louis River.
- Enhance and coordinate efforts to educate users of the Lower St. Louis River about the importance of preventing the spread of undesirable exotic species.
- Work for additional regulatory measures to restrict the transport of undesirable exotic species into uninfested areas.
- Develop other uses for undesirable exotic species that would help to control the populations.

Strategy 14: Regulate Ballast Water Discharge to Control Introduction of Exotic Species

Problem Summary: Ballast water discharge has been the main pathway for the introduction of many of the fourteen exotic species now found in the Lower St. Louis River. Although ships from foreign ports are required to exchange ballast water in the open ocean before entering the Great Lakes, there is no law that prevents ships within the Great Lakes from taking on ballast water in one port and dumping it in another port. Because the Duluth-Superior Harbor is an active international port, the Lower St. Louis River remains a likely site for further introduction of exotic species. Exotic species have the potential to eliminate or greatly reduce populations of native fish and mussels, as well as populations of other invertebrates and plankton that comprise critical lower levels of the food web.

Strategy: Discharge of ballast water should be regulated to control movement of exotic species. A coordinated plan to control and treat ballast water discharge at all scales, including intercontinental shipping, Great Lakes shipping, and movement to inland waters, is needed. Efforts are underway by the Great Lakes Panel on Aquatic Nuisance Species to strengthen federal legislation through reauthorization of the National Invasive Species Act (NISA) to address current legislation gaps and to support establishment of ballast water criteria and standards, treatment technologies, and new vessel design.

Actions:

- The Great Lakes Panel on Aquatic Nuisance Species should continue work to strengthen federal legislation through reauthorization of NISA.
- The International Joint Commission, Coast Guard, and shipping industry should develop a comprehensive ballast water control plan. The plan should be coordinated throughout the Great Lakes states to ensure a consistent policy.
- Develop new technologies to treat and/or manage ballast water.

Strategy 15: Develop Zebra Mussel Control Strategy

Problem Summary: Introduced via ballast water in the late 1980s, the population of the non-native zebra mussel is currently expanding in the Lower St. Louis River. Zebra mussels attach themselves in dense layers to any hard surface, including native mussels, aquatic plants, surface water intake pipes, docks, and pilings. In addition to competing with native mussels for food, the zebra mussels cover native mussels so densely that they are unable to open and close their shells. Left unchecked, zebra mussels are likely to eliminate populations of native mussels throughout the harbor, and possibly upstream to the Fond du Lac dam.

Strategy: Develop a zebra mussel control strategy that includes preventing upstream expansion of zebra mussel populations and controlling or eliminating existing populations of zebra mussels.

Actions:

- Complete survey field work to determine habitat needs of native mussels.
- Identify important native mussel beds, map them, and eliminate zebra mussels.
- Establish a long-term monitoring protocol for zebra and native mussels; monitor the presence, locations, and abundance of native and non-native mussel species; determine upstream limits to distribution of zebra mussels, and determine the influence of seiche in distribution of zebra mussels.
- Determine water flow in the estuary and make predictions/assessments about whether zebra mussels will colonize and infest the entire Lower St. Louis River.
- Consult with experts from other areas, such as Lake Erie, the Mississippi River, and the St. Croix River, to help assess the likelihood of zebra mussels spreading in the Lower St. Louis River.

Strategies to Address Multiple Stresses

Strategy 16: Infuse the Lower St. Louis River Habitat Plan into Public Planning Processes

Problem Summary: From an ecological perspective, most of the major stresses to the Lower St. Louis River—loss of habitat, increased sedimentation, degradation of water quality, and exposure to sediment-associated contaminants—are directly related to land use decisions, but land use decisions are often based on incomplete or inaccurate ecological information. Rarely does the public planning process include a comprehensive determination of the effects that proposed land uses will have on the overall health of the watershed.

Strategy: The Lower St. Louis River Habitat Plan should be infused into public planning processes throughout the region. The focus should be on those plans that are directly linked to the estuary and the immediate surrounding communities of Superior and Duluth, such as the Port Plan and city comprehensive land use plans. Science-based information needs to be an integral part of the public planning process throughout the entire St. Louis River watershed.

Actions:

- Identify local planning initiatives within the Lower St. Louis River watershed, including but not limited to, the Port Plan, Port Management Plan, city comprehensive plans, and management plans for recreation areas.
- Once identified, members of the Habitat Plan partnership should be matched with each local planning initiative.

Strategy 17: Encourage the Development and Implementation of a Comprehensive Port Plan

Problem Summary: Commercial shipping and associated industries are a vital part of the Twin Ports economy. However, development projects, dredging and filling, and other commercial activities can result in the loss and degradation of critical estuarine aquatic habitats that support fish, mussels, and breeding and migratory birds. Balancing effective utilization of the waters, near shore areas, and waterfront lands of the Duluth-Superior Harbor while also protecting, restoring, and enhancing the valuable habitat of the Lower St. Louis River is a difficult task.

Strategy: A comprehensive Port Plan should be developed and implemented. A carefully developed and broadly accepted comprehensive Port Plan can help to provide needed balance. An effective Port Plan will provide the basis for protection, restoration, and enhancement of the many assets of the Duluth-Superior Harbor and will help assure that commerce and recreation can develop fully without impairment of the habitats that are so vital to the health of the western Lake Superior region. An effective Port Plan will identify sensitive areas where extra care is needed to preserve, restore, and enhance the values of the Lower St. Louis River, including critical and important habitat. An effective Port Plan will result in preservation of waterfront areas for uses that are consistent with the existing infrastructure, including the navigation channels and associated structures. It is very important that maritime

commerce utilize existing harbor infrastructure rather than encroach on the remaining high quality habitat areas of the Lower St. Louis River. Deep-water maritime commerce should be consolidated along the existing 28-foot channels and should use existing structures as much as possible. Land fronting the existing 23-foot channels should be reserved for maritime commerce that can utilize these channels without the requirement for deepening. Expansion of constructed and maintained navigation facilities should be carefully evaluated in light of the habitat values inherent in the Lower St. Louis River. The remaining waterfront land should be reserved for water-dependent activities including habitat protection, recreation, and scenic beauty. Land uses that are not water dependent should be restricted to non-waterfront sites. Plans should be developed to protect sensitive areas from spills and other accidents or failures. These plans should be included in the Port Plan directly or by reference.

Actions:

- Support the development of an effective Port Land-use Plan for the Superior, Wisconsin, portion of the Harbor. Complete review and acceptance of the Superior Port Plan will be important so that it can be used as a template for updating the Duluth Port Plan.
- Support revision of the Duluth Port Plan so the two plans form a comprehensive guide to effective management and utilization of the values of the Lower St. Louis River and the Duluth-Superior Harbor.

Strategy 18: Encourage the Development and Implementation of a Comprehensive Dredge Material Management Plan

Problem Summary: A century of dredging and disposing of dredged materials has extensively modified habitat in the Lower St. Louis River. Ongoing dredging and dredged materials management practices have the potential to cause additional loss and degradation of estuarine aquatic habitats and place additional stress on fish, mussel, and bird populations.

Strategy: A comprehensive dredged materials management plan (DMMP) should be developed and implemented. A draft DMMP was developed in 1997. This draft should be updated and approved. A good comprehensive DMMP can result in reduced impacts to habitats from dredging practices. While restoration of the habitat in the Lower St. Louis River to pre-dredging conditions is not feasible and is not a goal of this Habitat Plan, future dredged materials management activities should be designed and managed to minimize detrimental impacts to important habitats. Opportunities to protect, restore, or enhance habitat through the control and redesign of dredged material management practices should be fully exploited.

An effective dredged materials management plan will

- enable habitat restoration and enhancement that may be economically difficult or impossible without the benefit of redirected dredged materials management activities;
- reduce the need for dredging by recommending land use changes that will result in reduced sedimentation within the harbor;
- provide the basis to obtain additional funding to demonstrate and practice innovative beneficial reuse of dredged materials and important habitat restoration and enhancement activities.

Beneficial reuse of dredged materials to restore and enhance habitat may facilitate regulatory approval of dredging projects that would be difficult or impossible to authorize if containment or disposal of the dredged materials was proposed. It is also possible that streamlined regulatory processes can be utilized for projects that are consistent with an agency-approved comprehensive dredged materials management plan. Therefore, a comprehensive dredged materials management plan will benefit commercial interests in the harbor in addition to natural resources interests in the Lower St. Louis River.

Actions:

- A comprehensive dredged materials management plan should be developed cooperatively by the Port Authority, Corps of Engineers, WDNR, MDNR, MPCA, the CAC, and others. The Harbor Technical Advisory Committee (HTAC) of the Metropolitan Interstate Committee (MIC) will provide the best forum to bring the necessary partners together for this purpose. Considerable work has already been produced that can provide the basis for an effective dredged materials management plan.



