



DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 391810080

REPLY TO
ATTENTION OF:

CEMVD-PD-SP

MAR 8 2007

MEMORANDUM FOR Commander, St. Paul District (CEMVP-PM-E)

SUBJECT: Reconnaissance Study, St. Croix River Basin, Minnesota and Wisconsin

1. Reference memorandum, CEMVP-PM-E, 26 January 2007, subject as above (encl).

2. The Mississippi Valley Division (CEMVD) has reviewed the revised report. In accordance with memorandum, CECW-MVD, 3 May 2004, subject: Delegation of Approval Authority for Section 905(b) Reports, CEMVD approves the Section 905(b) analysis for the St. Croix River Basin, Minnesota and Wisconsin.

3. As you negotiate the scope and conduct each of these studies, the following guidance should be applied:

a. Aquatic ecosystem restoration is a mission of the Corps, not preservation or protection. Preservation and protection may be best handled through local zoning ordinances or using other agency authorities. Care should be taken not to set expectations for Corps involvement in preservation or protection unless directly related to aquatic ecosystem restoration.

b. EC 1105-2-407 requires that all planning models must be certified. Since these studies primarily address ecosystem restoration, the National Ecosystem Planning Center of Expertise should be contacted regarding certification of any planning models used for the studies.

c. EC 1105-2-408 requires that Review Plans be prepared and included in the Project Management Plan for each study. Additionally, since these studies primarily address ecosystem restoration, the National Ecosystem Planning Center of Expertise must approve the Review Plans and post them on their website.

d. Erosion control in the uplands is largely viewed as more appropriately addressed by the Natural Resource Conservation

CEMVD-PD-SP

SUBJECT: Reconnaissance Study, St. Croix River Basin, Minnesota
and Wisconsin

Service or through local ordinances. Care should be taken not to set expectations for Corps involvement in preservation or protection unless directly related to aquatic ecosystem restoration.

4. Please contact Mr. Bob Petersen (601)634-5286 if you have any questions.



CHARLES BARTON

Chief, St. Louis/Rock Island/St. Paul
District Support Team

Encl

CF:

CEMVD-PD

CEMVD-RB

CEMVD-PD-N (Wilbanks)

CEMVD-PD-SP (Petersen, Price)

CEMVD-RB-T (Vigh)

CEMVD-PD-W (E. Brooks)

CEMVD-OC (Sloan)

CECW-MVD (w/copy of 905(b) analysis)



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CEMVP-PM-E

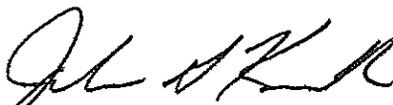
26 JAN 2007

MEMORANDUM FOR Commander, Mississippi Valley Division (CEMVD-PD-SP),
P.O. Box 80, Vicksburg, MS 39181-0080

SUBJECT: Reconnaissance Study, St. Croix River Basin, Minnesota and Wisconsin

1. The revised 905(b) Analysis for the St. Croix River Basin Reconnaissance Study, dated January 2007, is submitted for your review and approval.
2. The report was revised to address MVD comments provided during October 2006.
3. Ten paper copies of the revised report are enclosed. We can also furnish the report in Adobe Acrobat (PDF) or Microsoft Word format upon request.
4. The report recommends proceeding with a series of watershed studies as well as a feasibility study. The recommended studies include the following:
 - Basin-Wide Integrated Watershed Analysis and Planning for the St. Croix River Basin
 - Integrated Watershed Analysis and Planning for Subbasins within the St. Croix River Basin. Individual subbasin studies include:
 - Sunrise River (Minnesota)
 - Snake River (Minnesota)
 - Kinnickinnic River (Wisconsin)
 - Willow River (Wisconsin)
 - Apple River (Wisconsin)
 - St. Croix Headwaters (Wisconsin)
 - Cross Lake Dam Fish Passage
5. For further information regarding this report, please contact Elliott Stefanik, project manager, at 651-290-5260.

Encl
905(b) Analysis (10 cys)


For: MICHAEL F. PFENNING
COL, EN
Commander



**US Army Corps
of Engineers** ®
St Paul District

ST. CROIX RIVER BASIN RECONNAISSANCE STUDY

**Section 905(b) Analysis
(Water Resources Development Act of 1986)**

Minnesota and Wisconsin

January 2007

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- 1 SPONSOR LETTERS OF INTENT
- 2 PROJECT SUPPORT
- 3 POINTS OF CONTACT FOR ALTERNATIVE CORPS PROGRAMS
- 4. ST. CROIX BASIN MAP WITH ADDITIONAL COUNTY AND MUNICIPAL LOCATIONS.

ST. CROIX RIVER BASIN RECONNAISSANCE STUDY

Section 905(b) (Water Resources Development Act of 1986) Analysis

Minnesota and Wisconsin

1. STUDY AUTHORITY

This Section 905(b), Water Resources Development Act of 1986 (WRDA 1986), analysis is authorized by a Resolution of the Committee on Transportation and Infrastructure of the U.S. House of Representatives, September 25, 2002. The resolution reads as follows:

Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That the Secretary of the Army is requested to review the report of the Chief of Engineers on the St Croix River, Wisconsin and Minnesota, published as House Document 462, 71st Congress, 2nd Session, and other pertinent reports to determine whether modifications to the recommendations contained therein are advisable at the present time in the interest of flood damage reduction, environmental restoration and protection, water quality and related purposes to include developing a comprehensive coordinated watershed management plan for the development, conservation, and utilization of water and related land resources in the St Croix River Basin and its tributaries.

Funds were appropriated in fiscal year 2005 to initiate this reconnaissance study.

2. STUDY PURPOSE

The purpose of this reconnaissance study is to identify opportunities for ecosystem restoration, watershed planning, flood damage prevention, navigation, and other related water resource problems and opportunities in the St. Croix River basin in Wisconsin and Minnesota. Some of these issues may be appropriately addressed under this study, which is proceeding under the Corps of Engineers (Corps) program for General Investigations. Other issues may be better addressed through other existing Corps programs. Still other issues may fall outside of typical Corps authorities, and would be better addressed by other Federal, State or local programs. This report will discuss how identified water resource issues might be best addressed by the Corps through this study or other existing Corps programs.

For water resource issues best addressed under the current study, the St. Paul District, Corps of Engineers, assessed the Federal interest potential of identified preliminary solutions (i.e., the estimated cost is acceptable for the identified solution). If Federal interest is demonstrated, the reconnaissance phase will include development of one or more Project Management Plans (PMPs) and negotiation of one or more Feasibility Cost Share Agreements (FCSAs) with non-Federal sponsors for the next phase of study.

This reconnaissance study has resulted in the finding of Federal interest in and potential solutions for select existing water resources problems. This Section 905(b) analysis has

documented the basis for these findings and has initially defined the scope of future feasibility studies.

This reconnaissance investigation has been conducted in close coordination with many agencies active in land and water resource management in the St. Croix River basin, including the National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), Natural Resources Conservation Service (NRCS), U.S. Geological Survey (USGS), Minnesota and Wisconsin Departments of Natural Resources (MnDNR and WDNR), Minnesota Pollution Control Agency (MPCA), Metropolitan Council of the Twin Cities, local watershed districts, local county and municipal interests, and local nongovernmental organizations. These entities are committed to a basin-wide watershed framework to address water resources problems and needs in the St. Croix River basin.

3. LOCATION, CONGRESSIONAL DISTRICTS

3.1 LOCATION

The study area is the entire St. Croix River basin. The St. Croix River originates in Upper Lake St. Croix in northwestern Wisconsin and flows about 160 miles south to join the Mississippi River just southeast of Minneapolis/St. Paul, Minnesota. The watershed includes almost 7,800 square miles: about 4,800 square miles are in Wisconsin and 3,000 square miles are in Minnesota. Figure 1 illustrates the study area (also see Attachment 4).

3.2 CONGRESSIONAL DISTRICTS

The study area includes four congressional districts:

Wisconsin

District 3: U.S. Representative Ron Kind

District 7: U.S. Representative David Obey

Minnesota

District 6: U.S. Representative Michele Bachmann

District 8: U.S. Representative James Oberstar

4. PRIOR STUDIES, REPORTS, AND EXISTING WATER PROJECTS

4.1 EXISTING CORPS OF ENGINEERS PROJECTS

St. Croix River 9-Foot Navigation Channel. The River and Harbor Act of June 18, 1878, authorized a 3-foot navigation channel on the St. Croix River from the St. Croix confluence with the Mississippi River to St. Croix River mile 51.8 at Taylors Falls, Minnesota. The River and Harbor Act of January 21, 1927, authorized a 6-foot navigation channel from the Upper Mississippi River confluence to St. Croix River mile 24.5 at Stillwater, Minnesota. The present 9-foot navigation channel to Stillwater was authorized by the River and Harbor Act of August 30, 1935, and was assured as a result of the completion of Lock and Dam 3 in 1938. Although water depths are adequate to meet the 9-foot depth requirement throughout much of this reach, the St. Paul District does have a dredging and material placement plan for the Kinnickinnic Narrows (Channel Maintenance Management Plan, 1996). This plan was developed with Operation and Maintenance funds for the existing project and addresses long-term management of dredging and dredged material placement sites at this location. Although commercial navigation has recently been minimal or nonexistent on the St. Croix River, the authorized navigation project is likely to continue for the foreseeable future.

4.2 OTHER CORPS OF ENGINEERS PROJECTS

The St. Paul District is participating in the design and construction of the following projects in the St. Croix River basin, where non-Federal interests will own, operate, and maintain the projects (Attachment 4). In addition, the environmental infrastructure projects implemented under the Section 154 and 569 programs are designed and constructed by a non-Federal interest with the Corps reimbursing the non-Federal interest for the Federal share of the project costs.

Specifically Authorized Projects:

- Stillwater Flood and Retaining Wall Project, Stillwater, Minnesota

Section 154, Environmental Infrastructure Assistance: Northern Wisconsin

- Cable, Wisconsin
- Lake Namekagon, Wisconsin

Section 569, Environmental Infrastructure Assistance: Northeastern Minnesota

- Rush Lake, Minnesota (Shorewood Park Sanitary District)
- Cromwell, Minnesota

Section 219, National Environmental Infrastructure Assistance

- St. Croix Falls, Wisconsin

4.3 OTHER FEDERAL PROJECTS: NATIONAL SCENIC RIVERWAY DESIGNATION

The St. Croix National Scenic Riverway, which includes both the Namekagon and St. Croix Rivers, was established in 1968 under the National Wild and Scenic Rivers Act. The portion of the river below St. Croix Falls, Wisconsin, was added in 1972 as The Lower St. Croix National Scenic Riverway. The NPS administers the national scenic riverway, which includes the identified rivers and their riparian lands. Although much of the riparian land is in Federal or State ownership, some land is privately owned.

4.4 EMERGENCY ACTIONS

Recently, the St. Paul District has provided a small amount of emergency support within the basin, mostly associated with flood-fighting efforts. During the 1997 and 2001 floods, the District provided technical support/expertise to several communities along Lake St. Croix. A small amount of structural work, namely pumps and emergency levee work, was also provided. The District has taken other emergency actions, dating back at least to the 1969 flood. The emergency levees are of varying length and condition and, in most cases, do not provide reliable, permanent protection. Emergency levees are located at Hudson, Wisconsin, and Afton, Lake St. Croix Beach, Newport, St. Mary's Point, and Stillwater, Minnesota.

4.5 ONGOING CORPS OF ENGINEERS STUDIES

In addition to this reconnaissance study, the St. Paul District is conducting the following studies for projects that are specifically within or relate to the St. Croix River basin.

General Investigation

- St. Croix River Relocation of Endangered Mussels (Zebra Mussel Control, Upper Mississippi River, Minnesota and Wisconsin)

Implementation of the 2000 Biological Opinion for the Existing 9-Foot Navigation Channel

- Higgins' Eye Pearly Mussel Relocation Plan
- Winged Mapleleaf Relocation Plan

Section 206, Aquatic Ecosystem Restoration

- Kinnickinnic River, Wisconsin (yet to be initiated)

4.6 PREVIOUS CORPS OF ENGINEERS PLANNING STUDIES

Numerous studies and reports have been made on the water and related land resources in the St. Croix River basin. Several reports on the Upper Mississippi River basin have also addressed the St. Croix River basin. Listed below are the reports having significance to water resources in the St. Croix River basin.

Review of Reports on St. Croix River, Minnesota and Wisconsin, at Hudson, Wisconsin (January 31, 1940): This report was prepared by the U.S. Engineer Office, St. Paul, in accordance with a resolution by the Committee on Rivers and Harbors of the U.S. House of Representatives. The report found that the need for a small-boat harbor at Hudson was local and that Federal participation in such a development was not justified. A review of reports on the St. Croix River at Stillwater, dated April 24, 1940, recommended no further work.

Plan of Survey for Flood Control and Related Purposes, St. Croix River, Minnesota and Wisconsin (May 10, 1966): This report was prepared by the St. Paul District, Corps of Engineers, and recommended a study to determine the most suitable plan for a multiple-purpose development to meet the water resource needs of the St. Croix River basin, estimate the cost of improvements selected, and determine the economic feasibility of the improvements.

Phase I Report on Study of Flood Control and Related Purposes for St. Croix River Basin, Minnesota and Wisconsin (January 12, 1968): The report examined various problems and needs in the basin including flood control, navigation, water power, irrigation, watershed protection, land drainage, fish and wildlife needs, and recreation. The study concluded that reservoirs would best meet the objectives of an overall plan and offer a solution to the problems and needs of the basin. The report recommended that further study of a multiple-purpose reservoir near St. Croix Falls be undertaken. The study also found that a local flood protection project was feasible for Stillwater, but this measure was not included in the recommended plan. Further study was not begun because of the pending Wild and Scenic River designation of the St. Croix River.

Upper Mississippi River Comprehensive Basin Study (1972): This report, completed by the Upper Mississippi River Basin Coordinating Committee, suggested a potential flood control project on the St. Croix River consisting of a reservoir near St. Croix Falls.

Flood Plain Information, Willow River and Paperjack Creek, New Richmond, Wisconsin (June 1975): This report provided information on flood potential and flood hazards for land use planning and for management decisions concerning flood control projects and floodplain use. It identified areas in New Richmond that are subject to possible future floods.

Water Resources Subregion Plan for the Saint Croix River Basin (June 1979): This report was prepared by the Upper Mississippi River Basin Commission to describe existing conditions in the basin and recommend a comprehensive water resources plan for the region .

St. Croix River Reconnaissance Report (January 1984): The St. Paul District, Corps of Engineers, prepared this report to update the evaluation of flood problems and needs in the St. Croix River basin and describe the proposed conduct of this feasibility study.

St. Croix River Final Feasibility Report (July 1986): This St. Paul District, Corps of Engineers, report was prepared as a follow-up to the 1984 reconnaissance report. Detailed analysis was performed for flood damage reduction alternatives at Stillwater and New Richmond. The feasibility study identified no structural or nonstructural plans that were feasible for Stillwater. At New Richmond, tentative plans for flood damage reduction were formulated. However, the community decided to discontinue its involvement on the study.

Stillwater Flood and Retaining Wall Project: The purpose of the Stillwater project is to provide flood control and protection to the city of Stillwater. Authorization for this project was provided in WRDA 1992, even though the act contained no formal recommendation for project construction. To support Stage 1 of the project, a design memorandum was completed in 1995. A supplement to this memorandum was completed in June 1998 for Stage 2. Stage 1 construction (reinforce retaining wall near Lowell Park) was completed in November 1997. Stage 2 construction (surcharge soil at Mulberry Point) was completed in June 1999, with the remainder of Stage 2 (extend retaining wall to Mulberry Point) built in November 2000. A study to examine the economic feasibility of Stage 3 was completed in September 2000. With the resulting benefit-cost ratio of 0.3, it was recommended that the study be terminated. The Consolidated Appropriations Act (2004) directed the Corps of Engineers to proceed with work to complete Stage 3 of the Stillwater project. An engineering documentation report is pending for this effort.

Section 22, Planning Assistance to States: The Section 22 program is a continuing authority that allows the Corps to assist States and federally-recognized Indian Tribes with planning for the development, use, and conservation of water and related land resources. Study costs are shared equally between the Corps and the non-Federal sponsor. Two recent efforts have been accomplished under the Section 22 program for the St. Croix River basin. The first was a nutrient loading study for Squaw Lake, St. Croix County, Wisconsin. The second was for a nutrient loading study for Lake Pepin on the Mississippi River. That study included assessment of loading contributions from the St. Croix River.

4.7 STUDIES BY OTHER STAKEHOLDERS

Many stakeholders have conducted land and water resources assessments and planning efforts in the basin. The St. Croix Basin Water Resources Planning Team, a collection of Federal, State and local agencies, recently issued a report on recommended water quality goals for the basin (St. Croix Basin Team, 2004). This report broadly considered historical and present conditions of the basin, projected population increases, and potential changes that may occur to nutrient loading as a result. It recommends target goals for nutrient loading to the St. Croix River, and represents a large, collective effort by several agencies within the basin.

In 1997, the NPS completed its Water Resource Management Plan for the St. Croix National Scenic Riverway (NPS, 1997). A Final Cooperative Management Plan Environmental Impact Statement also was produced jointly by the NPS, WDNR and MnDNR. These documents discuss existing environmental conditions and guide future water resource management for the St. Croix and Namekagon Rivers (both are a part of the St. Croix National Scenic Riverway). Although guidance is limited to these specific rivers, the planning documents tie river issues to issues within the watershed. These documents discuss specific problems and opportunities identified through a broad scoping process; thus, they are helpful in identifying opportunities within this report.

State and local stakeholders also have produced various planning studies outlining needs and potential actions for all or various parts of the St. Croix River basin. For example, the WDNR (2002) produced a report, titled “State of the St. Croix Basin,” in which it outlined the status of land and water resources in the Wisconsin portion of the basin. It also included short-term and long-term goals for basin resources and management. The MPCA (Niemela, 2005) evaluated stream health for several streams within the Minnesota portion of the St. Croix River basin. This report identified several streams impaired for fish and invertebrates. Many additional studies have been performed by Federal, State and local entities. This report includes some forms of watershed planning, most of which have been pursued for a few select areas in the Minnesota portion of the St. Croix River basin.

The Federal Emergency Management Agency (FEMA) has completed several flood insurance studies for communities in the St. Croix River basin, including Afton, Bayport, Lake St. Croix Beach, Lakeland, Lakeland Shores, Lindstrom, Mora, Pine City, Sandstone, and St. Mary’s Point in Minnesota and Hayward, Osceola, North Hudson, St. Croix Falls, Solon Springs, and Spooner in Wisconsin.

Stakeholders within the St. Croix River basin with an interest in planning efforts include, but are not limited to, the WDNR, MPCA, MnDNR, Metropolitan Council of the Twin Cities, NPS, USFWS, and USGS. Several other agencies are interested and active in the basin, including counties, municipalities and watershed districts responsible for water resource management. Nonprofit special interest groups also are very active with issues in the basin.

5. PLAN FORMULATION

The six planning steps in the Water Resources Council’s Principles and Guidelines focus Federal water resources planning efforts leading to plans recommended for authorization:

1. Specify problems and opportunities.
2. Inventory and forecast conditions.
3. Formulate alternative plans.
4. Evaluate effects of alternative plans.
5. Compare alternative plans.
6. Select recommended plan.

In reconnaissance studies, the planning steps defining problems and opportunities and inventory and forecast of future conditions are emphasized. Initial formulation and evaluation of alternative plans is done in the reconnaissance phase, to be iteratively refined in subsequent feasibility studies. The following sections describe the results of the initial planning steps conducted during this reconnaissance study. This information will be refined in future iterations of the planning steps that will be accomplished during the feasibility phase.

Plan formulation for this reconnaissance study was conducted in coordination with St. Croix River basin stakeholders. Existing conditions were described and water resources

problems were identified. Planning objectives and constraints were specified. Opportunities to address water resources problems were identified. Selected potential solutions were evaluated to illustrate Federal interest. Discussions were held with potential non-Federal sponsors to determine their interest in participating in feasibility phase investigations.

5.1 WATER RESOURCE PROBLEMS IN THE ST. CROIX RIVER BASIN

5.1.1 Pre-Settlement Conditions

The draining of Glacial Lake Duluth created the St. Croix River valley about 9,000 years ago (Montz et al., 1991 *as cited in* NPS 1997). The northern watershed consisted of northern boreal forest, bogs and peatlands (Curtis, 1959 *as cited in* Triplett et al., 2003). The southern part of the watershed included prairie and mixed hardwoods (Curtis, 1959; Troelstrup et al., 1993a *as cited in* Triplett et al., 2003). The watershed included an abundance of aquatic resources, including inland lakes, major rivers, small streams, and wetland habitats. Before European settlement in the 1800s, Dakota Native Americans occupied the St. Croix River basin. However, it is believed that Native Americans of the region, at least prior to interaction with Europeans, probably had minimal impacts on the landscape and resulting habitat.

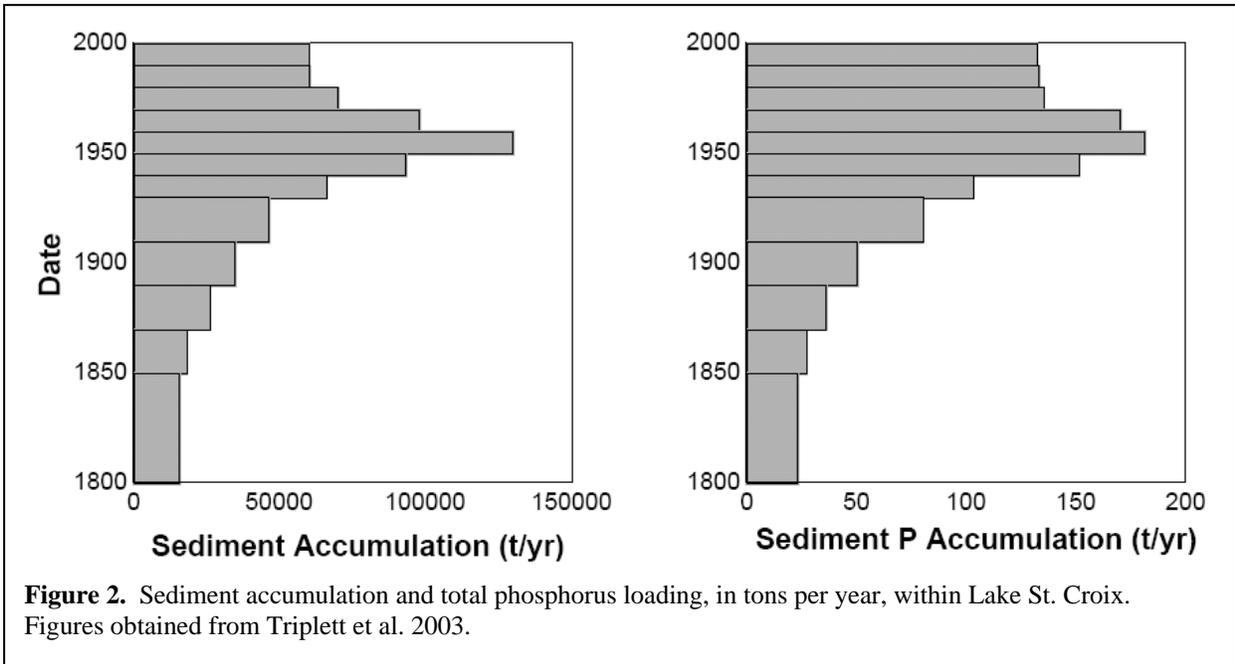
5.1.2 Land Use Changes and Ecosystem Responses

The ecological effects associated with European influence probably became more prevalent with the fur traders, which were common in the St. Croix Valley in the early 1800s (McMahon and Karamanski, 2002). Changes to the landscape accompanied the logging industry that dominated the upper watershed during the mid-1800s. Manmade “improvements” were also pursued on the St. Croix River and its tributaries at this time to assist the transportation of logs and lumber products downstream. These improvements included a variety of crude structures such as low-head dams, wing dams, stream straightening, and other actions. Agricultural activities became more prevalent in the lower St. Croix River basin in the late-1800s through the 1900s and remain a dominant land use today. Human population in the basin increased to 250,000 by 1920, then remained static until the 1970s when it began to increase again. By 1992, 400,000 people were living in the St. Croix watershed (Mulla et al., 1999 *as cited in* Triplett et al., 2003). Population within the basin continues to grow, especially in the lower watershed. Counties within the lower basin continue to experience rapid growth and urbanization as a result of their proximity to the Minneapolis/St. Paul metropolitan area. The changes discussed here were accompanied by dramatic changes in the landscape of the watershed. These changes likely had dramatic effects on its water resources.

The St. Croix River is highly unique in that it has a large, natural lake at its endpoint (Lake St. Croix at the confluence with the Mississippi River). This lake serves as a large basin for accumulation of sediment. Analysis of this sediment can document important changes that may have occurred within the watershed over time. Triplett et al. (2003) evaluated Lake St. Croix sediments to identify important changes that have happened to the lake since 1800. Factors analyzed included sediment and phosphorus loading, as well as changes in lake algal

composition (and thus indicators of biotic changes). This analysis provides great insight into lake changes and potential changes within the watershed that have occurred since European settlement.

Triplett et al. (2003) documented increases in sediment accumulation within Lake St. Croix around the mid-1800s, with a peak accumulation during the period 1950 to 1960 (Figure 2). Current accumulation rates are still about four times that of pre-European settlement. Phosphorus loading to the lake followed a similar pattern and remains at a loading rate that is almost three times the average presettlement loading rate (Figure 2). Triplett et al. (2003) also noted changes in the algal community. The productivity of all algal groups has increased dramatically since 1960. The community composition of diatoms (a unicellular alga) has also shifted. Triplett et al. (2003) noted that, while lake water total phosphorus increased 2.5 times from 1850 to the present, biogenic silica (a measure of the mass of diatoms in Lake St. Croix) increased 5.5 times over the presettlement conditions. Thus, one unit of phosphorus input into the lake can sustain multiple generations of algal productivity. The impact of these changes on higher level organisms such as fish is unclear. However, changes have occurred within Lake St. Croix during the last 100 years that leave it a much different system than it was prior to European settlement.



5.1.3 Existing Conditions

5.1.3.1 St. Croix Watershed Characteristics

The St. Croix River basin exhibits significant diversity, especially from north to south within the basin. Omernik and Gallant (1988) discuss three ecoregions from north to south

within the basin. The northern lakes and forests ecoregion includes a mix of conifer and hardwood forests, with extensive wetlands and lakes. This northernmost ecoregion covers nearly 58 percent of the total basin (Fago and Hatch, 1993). The central hardwood forest ecoregion is characterized by northern deciduous hardwood species and also includes extensive wetland and lake habitat. This ecoregion is located in the middle of the watershed and includes 39 percent of the total basin. The western cornbelt is dominated by agriculture and row-cropping land use. This ecoregion is at the southernmost part of the basin and includes 3 percent of the basin area (Fago and Hatch, 1993).

Hanson (1996 *as cited in* NPS 1997 Volume I) identified land cover within the Saint Croix River basin as 47 percent forest, 37 percent agriculture, 12 percent wetlands, 3 percent water and 1 percent urban. The northern half of the basin has much less agriculture than the southern portion as a result of the less suitable soils and climate and large public ownership of land. The WDNR (2002) stated that a higher percentage of the north is forested, with approximately one-third of these forested lands in either public or industrial ownership. This area basically includes the northern lakes and forests ecoregion discussed above. The WDNR (2002) also identified that this northern area is experiencing significant change through the growth in seasonal and permanent homes on private forest lands and particularly on lake and river shorelands.

The southern portion of the basin has a more favorable climate and highly productive soils that are used for typical agricultural practices. Thus, the southern portion of the basin contains the majority of agricultural land, which includes dairy operations and production of grains and vegetable crops. This area also has an abundance of shallow prairie pothole lakes and wetlands and smaller forested tracts in private ownership.

The southern portion of the basin is also the closest to the Minneapolis/St. Paul metropolitan area. However, the entire basin is in proximity to more than 3 million people when considering east-central Minnesota and western and northern Wisconsin. As a result of this proximity, the basin continues to experience changes in land use. This change is the most pronounced in the southern basin, where agriculture is changing from the typical family farm to consolidation into larger farm units or diverted from agriculture and forest to rural homes or “hobby farms.” Conversion of agriculture land through urbanization is a growing concern. Recent demographic studies by the Metropolitan Council of the Twin Cities and the 2000 U. S. Census predict a 39-percent population growth in the basin by the year 2020. St. Croix County is the fastest growing county in Wisconsin, while Washington and Chisago Counties, both directly adjacent to the St. Croix River in Minnesota, are predicted to have 41-percent to 57-percent population increases, respectively, by the year 2025.

5.1.3.2 Aquatic Habitat

St. Croix River Main Stem

The St. Croix River is generally considered to be an outstanding aquatic resource, which may be best illustrated by the fact that the river contains an unusually high number and variety of

endangered and threatened species. Although numbers vary by location and source, the St. Croix River main stem appears to support about 95 species of fish and 40 species of mussels (NPS, 1997; WDNR, 2002). These species include the federally endangered Higgins' eye pearly mussel (*Lampsilis higginsii*) and winged mapleleaf mussel (*Quadrula fragosa*). Two mussel species found in the St. Croix River, the sheepnose and spectaclecase, are candidate species for listing under the Endangered Species Act.

The population of winged mapleleaf found in the St. Croix River is one of only two remaining known populations in the world and the only one with confirmed reproduction. The winged mapleleaf was historically found in 34 rivers in 12 States. Habitat and water quality degradation are the likely factors for the near elimination of winged mapleleaf. The St. Croix River population has become limited to a single 7-mile stretch of the river. Given their life-history, mussels are excellent indicators of habitat quality. As such, the high-quality habitat provided by this midsize river is extremely rare. It is the only habitat remaining that has been able to maintain a reproducing population of winged mapleleaf. However, continued degradation may completely eliminate this species.

In addition to these federally-listed species, the river also contains 18 species of State-listed fish, 22 species of State-listed mussels, 2 State-listed species of turtles, and 1 State-listed species of salamander (State data based on queries performed in September 2005 of the Minnesota and Wisconsin Natural Heritage Databases). This combination of diversity and occurrence of rare and endangered species suggests that the St. Croix River and its basin provide one of the highest quality riverine environments in the Midwest.

Minnesota and Wisconsin both have declared the St. Croix River to be of exceptional quality and deserving of protection. Minnesota has designated the entire St. Croix River as "Outstanding Resource Value Waters." Similarly, Wisconsin has designated large portions of the St. Croix River as an "Outstanding Resource Water" with the remainder classified as an "Exceptional Resource Water." These classifications generally provide substantial or maximum protection of the resource from stressors such as point source pollution discharge.

St. Croix Basin Tributaries

Fago and Hatch (1993) reported that the St. Croix River has 1,770 tributary streams, with a total length of about 5,600 miles. Of these, 98 drain directly to the St. Croix River (Fago and Hatch, 1993), but most drain into one of the following major tributaries: the Kettle, Snake or Sunrise Rivers in Minnesota or the Namekagon, Clam, Yellow, Apple, Willow or Kinnickinnic Rivers in Wisconsin. Aquatic habitat of these tributaries range from small cold-water trout streams to larger, warm-water rivers.

Niemela et al. (2005) performed rigorous assessments of streams of the Saint Croix River basin within Minnesota. They focused on identifying impaired streams, and studied variables such as fish and invertebrate IBI scores, water quality, habitat quality, and watershed disturbance. Their work focused on wadeable streams (smaller streams), which are about 70 percent of total stream length in the basin.

Niemela et al. (2005) provided a detailed assessment of stream quality for wadeable streams within the Minnesota portion of the St. Croix River basin. Their conclusion was that, while the overall condition of the basin appears to be good, land-use practices and developmental pressures in the southern portion of the basin are affecting the physical, chemical and biological composition of the stream ecosystems. Of streams in the basin that were assessed for fish and/or invertebrates, 36 percent were biologically impaired. Approximately 34 percent of stream kilometers in the basin had watersheds with more than 50-percent watershed disturbance (Figure 3). Niemela et al. (2005) assessments indicated that 100 percent of the streams in what they defined as a high watershed disturbance group were impaired, compared to only 11 percent of streams they defined as a low watershed disturbance group. Niemela et al. (2005) reported that water chemistry and habitat measures were generally poorer in St. Croix River basin streams that had a higher level of watershed disturbance. Similarly, streams with the lowest IBI scores and most of the biologically impaired streams were in the southern portion of the basin in watersheds with a higher level of watershed disturbance. Niemela et al. (2005) identified the greatest number of impaired wadeable streams within the Sunrise and Snake Rivers.

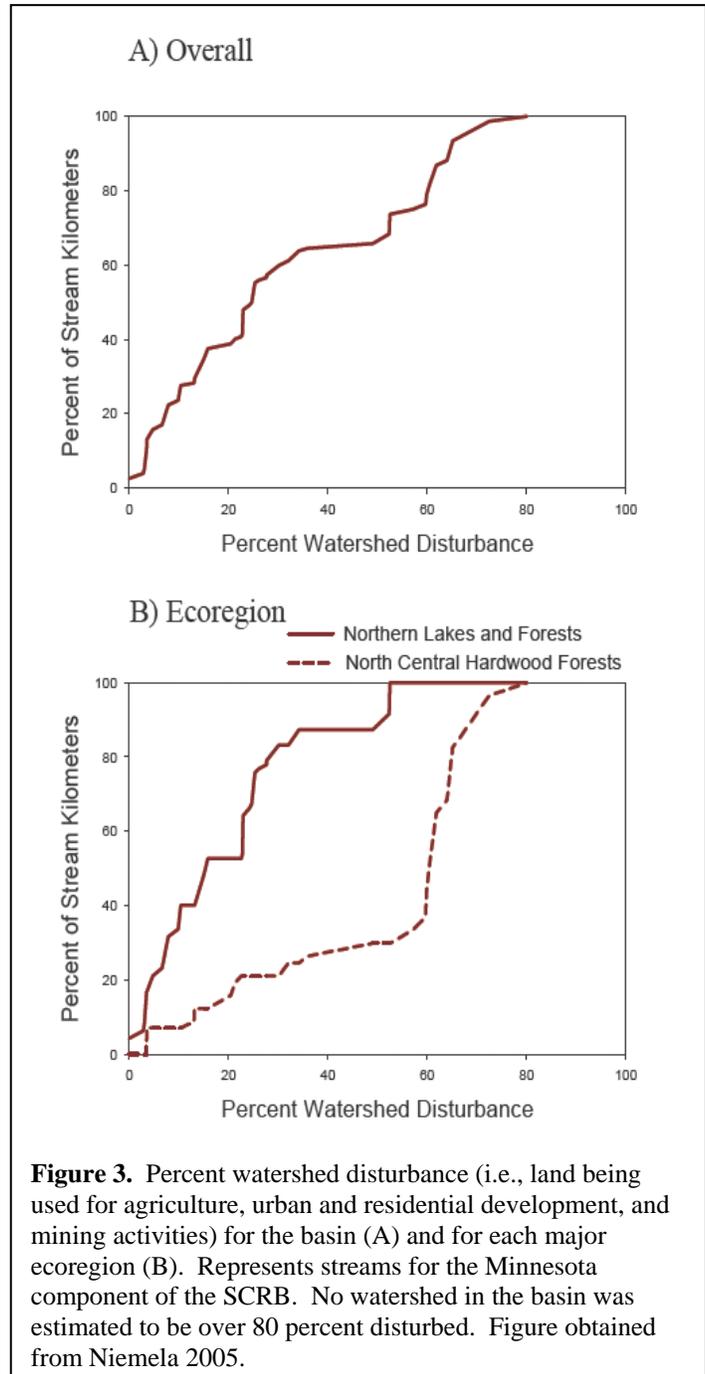
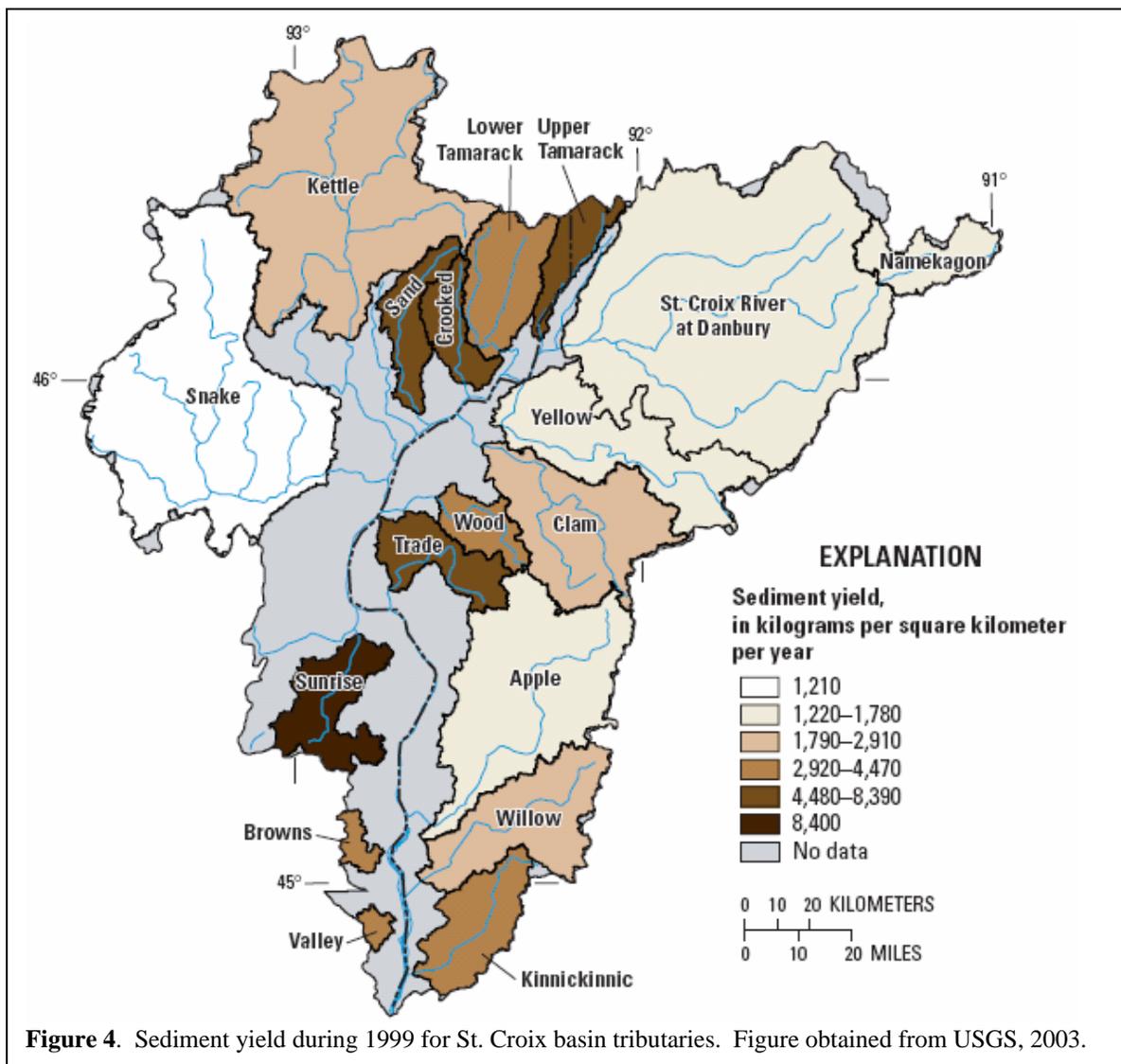


Figure 3. Percent watershed disturbance (i.e., land being used for agriculture, urban and residential development, and mining activities) for the basin (A) and for each major ecoregion (B). Represents streams for the Minnesota component of the SCRB. No watershed in the basin was estimated to be over 80 percent disturbed. Figure obtained from Niemela 2005.

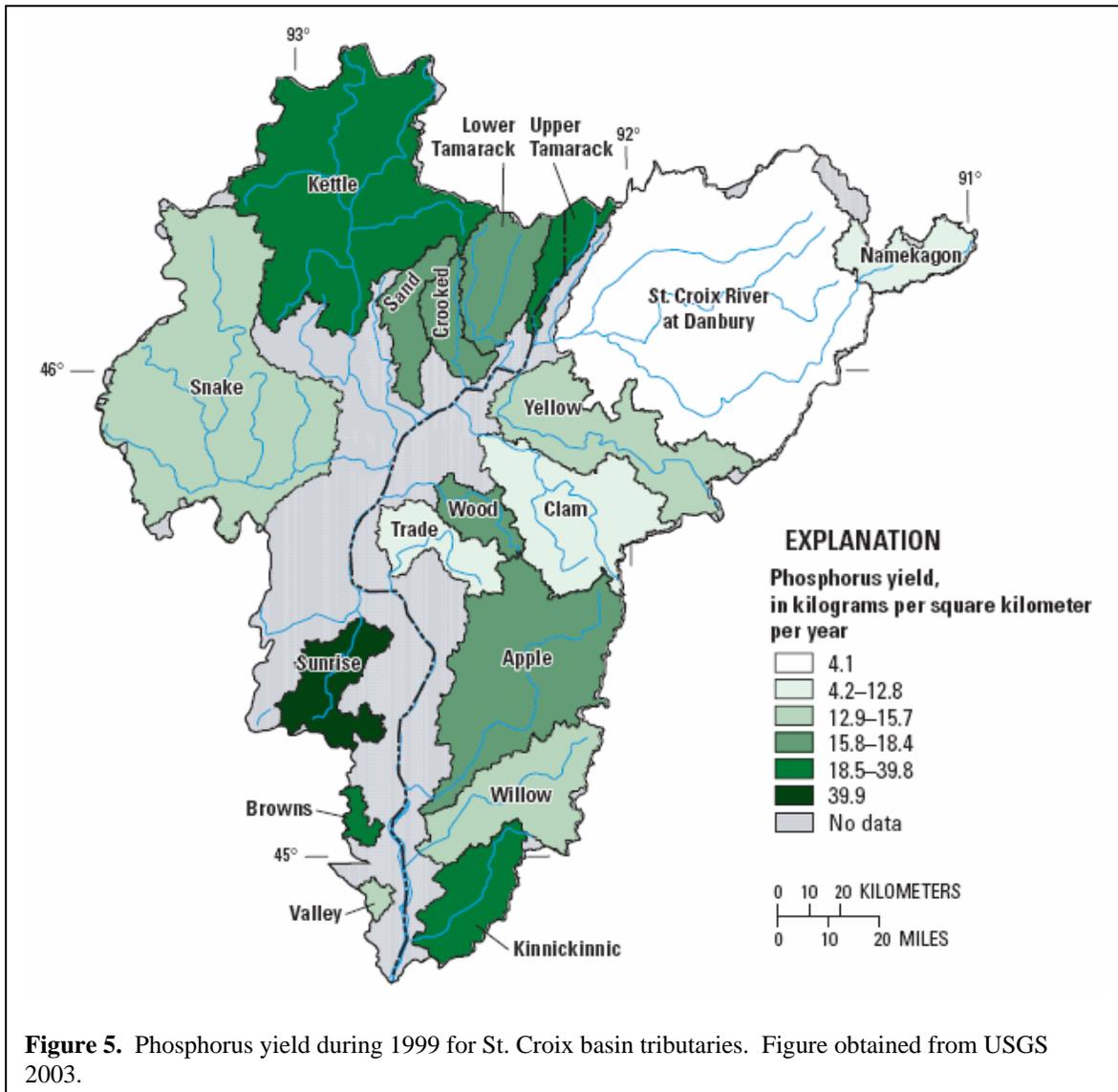
Another metric to assess aquatic habitat is water quality, which is intrinsically a part of habitat quality and, thus, the resulting ecological health of these rivers. The conversion of natural land cover and riparian vegetation has made much of the basin’s land susceptible to erosion. Similarly, conversion of land cover and other human activities have resulted in increased loading rates for nutrients, which is especially a concern in the southern basin, where agricultural activities and continued urban expansion have resulted in increased sediment and nutrient loading.

Recent studies by the USGS (2003) have tried to estimate loading rates of select St. Croix River basin tributaries for suspended sediment and phosphorus. Some of their observations are included in Figures 4 and 5. USGS (2003) observations were complicated by unusual precipitation patterns during the year the observations were made. Their observations suggest that tributaries in the upper watershed (e.g., Sand, Crooked and Upper Tamarack Creeks) can be important contributors of sediment and nutrients. While this may be true under certain conditions, it probably underestimates the loading rates for tributaries in the southern basin. Even with this in mind, the Sunrise River was identified as a major contributor of sediment and phosphorus. Other major tributaries within the southern basin (e.g., Kinnickinnic, Willow, and Apple Rivers) also are likely important contributors (WDNR, 2002; USGS, 2003). It is critical to realize that sediment and nutrient loading are indicators of aquatic habitat quality. Tributaries identified with excessive sediment and nutrient loading are also impaired in terms of aquatic habitat. The observations by Niemela (2005) strongly reflect this. When considering the above information the streams and subwatersheds with the greatest likelihood for degraded habitat include the Sunrise, Snake, Apple, Willow and Kinnickinnic River subbasins.



The tributaries of the St. Croix River basin obviously have a direct effect on habitat quality of the St. Croix River main stem. As noted above, the St. Croix River already has elevated loading rates. As tributary habitat quality continues to decline, the habitat quality of the St. Croix River also will continue to degrade.

In addition to degrading the main stem St. Croix River, nutrient loading (e.g., nitrogen and phosphorus) degrades conditions in the Mississippi River and the Gulf of Mexico. Although relatively small, the St. Croix River does contribute to nutrient loading to the Mississippi River. This impact is important, given the Mississippi River’s highly eutrophic conditions and its contribution to hypoxia in the Gulf of Mexico.



St. Croix River Basin Lakes

Fago and Hatch (1993) reported that 628 lakes (with surface area of at least 1 acre) within the St. Croix River basin are on the St. Croix River or are connected by a tributary. These lakes have a surface area of more than 101,000 acres. An additional 1,725 lakes within the basin do not have a direct surface connection to the St. Croix River (i.e., seepage lakes with no outlet or direct tributary connection). Of these lakes, Fago and Hatch (1993) reported that 82 percent of the lakes “connected” to the St. Croix River and 78 percent of the closed lakes are in Wisconsin.

Lakes provide valuable habitat for fish, invertebrates, submergent and emergent aquatic plants, and other fauna and flora. They provide a tremendous ecological resource, as well as a recreational resource for fishing, boating, canoeing, nature-watching, and other uses. This recreational use also provides important economic value to the region. In addition, the economic value of lake front real estate also is typically very high, as would be expected with a land resource in high demand.

While the ecological condition of basin lakes is generally “good,” a number of problems have been identified. Eutrophication has been and will continue to be a problem on many lakes; it can affect water quality parameters such as water clarity and dissolved oxygen. Cultural eutrophication can and has affected the biota present in these systems. Another major issue is destruction of riparian lake habitat. As lake front property is developed, the area is typically cleared for human use, which eliminates plants and animals that relate to this highly-unique riparian habitat. Within the basin, most larger lakes (e.g., 100 acres or larger) have already been fully developed. The few remaining, smaller lakes continue to be developed at a rapid rate.

5.1.3.4 Nonindigenous Species

A significant threat facing the integrity of the St. Croix River basin ecosystems is from nonindigenous species. The terms nonindigenous, exotic, introduced, and invasive have all been used to describe organisms that were moved by humans outside their native ranges. However, the term nonindigenous is the broadest and has included species introduced from locations within North America and overseas. The Federal Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (Section 1003) has defined “nonindigenous species” as “...*any species or other viable biological material that enters an ecosystem beyond its historic range, including any such organism transferred from one country into another.*” Nonindigenous species can affect aquatic community diversity through an outright loss or displacement of native species. Once established, they may be able to out-compete native species or modify their habitat. Not all species moved outside their native range will become established or have a substantial adverse effect on aquatic communities. However, those species that do may have dramatic effects on the ecosystem. For example, Upper Mississippi River exotic species such as common carp (*Cyprinus carpio*) destroy aquatic vegetation, increase water turbidity, and can reduce, degrade or eliminate certain types of valuable fish and wildlife habitat. In many cases, exotic species have been introduced with positive intentions. However, harmful effects generally outweigh any potential beneficial effects of nonindigenous species.

Nonindigenous species are of growing concern in the St. Croix River basin and are becoming a major focus for natural resource management agencies. A variety of nonindigenous species are found in the basin. Those that are specific to aquatic habitat are discussed briefly below.

Zebra mussels: The first zebra mussel collected from the UMR was found south of La Crosse, Wisconsin, in September 1991. Zebra mussels were discovered in the lower St. Croix River (Lake St. Croix) soon thereafter. Zebra mussels have reached moderate abundance in Lake St. Croix south of the Kinnickinnic Narrows (up to about 100 zebra mussels per square meter), with single individuals observed as far upstream as Stillwater. No zebra mussels have been recorded in other water bodies of the St. Croix River basin in either Minnesota or Wisconsin. However, zebra mussels have spread from the Mississippi and/or St. Croix Rivers to other water bodies within Minnesota and Wisconsin. It appears the spread of zebra mussels to other water bodies within the SCRBA appears imminent. This spread will likely be the result of human activities, likely the transport of recreational boats from an infected water body to one without zebra mussels.

Rusty crayfish: Rusty crayfish are native to streams in the Ohio, Kentucky, and Tennessee region. Spread by anglers who use them as bait, rusty crayfish are prolific and can severely reduce lake and stream vegetation, depriving native fish and their prey of cover and food. They also reduce native crayfish populations. The MnDNR has confirmed the presence of rusty crayfish in the St. Croix River. Neither Minnesota nor Wisconsin has a comprehensive list of rusty crayfish occurrences readily available.

Curly-leaf pondweed: This plant has been present in the upper Midwest since the early 1900s. It is found in 54 water bodies within the Minnesota portion of the St. Croix River basin, including 19 in Chisago County alone (MnDNR unpublished data). Although numbers were not immediately available, it is also found in several water bodies in the Wisconsin portion of the basin. Curly-leaf pondweed likely occurs in the St. Croix River.

Eurasian watermilfoil: Spread primarily by boats and waterbirds, Eurasian watermilfoil reached Midwestern states between the 1950s and 1980s. State nonnative invasive programs in Minnesota and Wisconsin actively track the occurrence of Eurasian watermilfoil. According to 2004 MnDNR data, Eurasian watermilfoil occurs in 11 water bodies across 5 Minnesota counties that intersect the St. Croix River watershed. WDNR 2004 data indicate that Eurasian watermilfoil occurs in 19 water bodies across 7 Wisconsin counties included in the St. Croix River watershed.

Purple loosestrife: Originally introduced in the 1880s, this nonnative invasive plant now occurs in 40 states and all Canadian border provinces. All nine Minnesota counties in the St. Croix River watershed have documented occurrences of purple loosestrife, totaling 147 sites covering 6,000 acres. Although numbers were not immediately available, it is also widespread along water bodies in the Wisconsin portion of the St. Croix River basin.

Flowering rush: Flowering rush is a more recent invader of the St. Croix River basin. Flowering rush occurs in one lake within the St. Croix watershed. The occurrence in Forest Lake, Washington County, Minnesota, was first documented in 1998. Other occurrences, although not in the watershed itself but within Minnesota counties that intersect the watershed, have been identified. A query of the Wisconsin Herbarium (Wisconsin State Herbarium data, 2005) database returned no records for Wisconsin counties in the watershed.

In addition to the species identified above, a number of other nonindigenous aquatic species may be poised to soon invade. These could include species that are already within the Mississippi River basin or those from an outside basin that are close to the St. Croix River basin (e.g., species from the Great Lakes). Species of particular concern include the spiny water flea, round goby, silver carp, bighead carp, and black carp.

5.1.3.5 Flooding

Flooding and flood damage reduction opportunities have been considered for a long time within the St. Croix River basin. As identified above, the St. Paul District pursued a reconnaissance study in 1986 that examined the need for flood damage reduction measures within the St. Croix River basin. This effort identified 38 communities that experienced some form of flooding problems. These communities generally fell into the following eight geographic locations:

1. Lake St. Croix communities.
2. Mora and Pine City (Snake River).
3. New Richmond (Willow River).
4. Clam Lake, Wisconsin (Clam River).
5. Trade Lake, Wisconsin (Trade River)
6. Gilmore and Rice Lake, Wisconsin (Totagatic River).
7. Big Marine Lake and Little Carnelian Lake (Washington County).
8. Chisago Chain of Lakes (Chisago County, Minnesota).

From this 1986 study, only the communities of Stillwater (along Lake St. Croix) and New Richmond were carried forward for consideration. The project at Stillwater was not found to be economically feasible after further consideration. However, a flood damage reduction project was eventually pursued at Stillwater following congressional authorization. Portions of this project are still under development. The project at New Richmond did warrant additional consideration and tentative plans were selected. However, the city elected not to participate further with the Corps on the study.

Flood damage reduction concerns recently have not been a high-priority issue within the St. Croix River basin. The District has not been frequently contacted for assistance with major flooding issues. Coordination for this reconnaissance study generally did not identify any new flooding concerns or any renewed interest in flooding concerns discussed within previous District reports. The two exceptions are (1) concern with flooding at a few communities on Lake

St. Croix and (2) concern of fluctuating lake levels, and resulting damages, for select lakes on the Minnesota side of the southern basin.

For communities along Lake St. Croix, flooding can be caused by a combination of high flows on the St. Croix River and/or the backwater effect of high flows on the Mississippi River. The 1950 flood had the highest river discharge in the St. Croix River basin, but the 1965 flood had higher stages as a result of the massive flood that year on the Mississippi River. The District's 1986 report identified that flooding concerns for Lake St. Croix communities would best be addressed through Section 205 (small flood control projects) of the Corps' Continuing Authorities Program (CAP). Given that most remaining issues for flooding along Lake St. Croix would involve only a few residences or other structures, this recommendation would still seem appropriate. Given the small number of structures that would likely benefit from any flood damage reduction project, it may be difficult to justify future construction projects under Corps of Engineer programs. However, other flood damage reduction programs exist at both the State and Federal level. These programs may be available to assist with other flooding issues.

The second flooding-related problem identified within the St. Croix River basin is that of fluctuating lake levels. Lake levels rise in response to large rainfall or spring runoff events and then moderate for a period of time afterward. This problem exists primarily on the Minnesota side of the basin and north of Minnesota State Highway 36. This area is dotted with many land-locked lakes or basins. It is also an area that is experiencing continually greater development pressure from an expanding Twin Cities metropolis. As the area fills in with additional development, the problem is expected to increase.

Watershed districts have been established to address the numerous water related problems that accompany urban expansion. Fluctuating lake levels is just one of these problems. Watershed districts affected by this problem in this part of the St. Croix River basin include Browns Creek, Carnelian-Marine, Comfort Lake-Forest Lake, and Valley Branch Watershed Districts.

Currently, the problem of fluctuating lake levels appears minor. As such, the problem can be addressed and solutions implemented at the watershed district level. Examples of measures that have been successful in stabilizing lake levels include the construction or modification of outlets at Goggins Lake, Kismet Basin, and Long Lake in the Browns Creek Watershed District and Little Carnelian Lake in the Carnelian-Marine Watershed District.

5.1.3.6 Hydropower and other Dams

The WDNR (2002) identifies 12 dams within the St. Croix River basin that have hydropower-generating facilities; all are in Wisconsin. These dams include the hydropower dam at St. Croix Falls and two hydropower dams each on the Namekagon River (at Trego and Hayward, Wisconsin), the Apple River (two near Somerset, Wisconsin) and the Kinnickinnic River (two at River Falls, Wisconsin). Hydropower dams are also present on the Eau Claire, Clam, and Yellow Rivers. The WDNR (2002) also identified another 170 dams in place within the basin. These dams are "nonhydropower" and were built for other purposes.

While dams can provide important functions (e.g., hydropower), they also can be deleterious to aquatic life and a significant safety hazard. Dams can block migratory fish from accessing important historical habitat. They can also influence sediment transport and other processes that affect river habitat conditions. Dams can also create dangerous hydraulic conditions, especially during high water.

5.1.3.7 Recreation

The St. Croix River basin is a major focal point for recreation and tourism within the region. The NPS (2000) provided the following 3-year average annual park visitation data for the St. Croix River from 1996 through 1998 (Table 1). When considering additional information, the NPS (2000) suggested that the St. Croix River probably experienced 2 million visitors annually during this period. This figure does not include recreational visits at other lakes, rivers or streams throughout the watershed. Recreational activities are variable but generally include some form of water use, such as boating, canoeing, fishing or camping. Recreational use also has become a concern as high use of the resource can result in environmental degradation as well as safety concerns. The high recreational use of the resource, combined with different values and views for how the resource should be managed, has made recreation on the St. Croix River a controversial subject, especially on the lower St. Croix River.

Table 1. Annual average park visitation for select St. Croix River parks during the period 1996 through 1998.

Park	Average Annual Visitation
Minnesota Interstate State Park	364,499
Wisconsin Interstate State Park	338,131
William O'Brien State Park	239,810
Afton State Park	176,748
Kinnickinnic State Park	226,326
St. Croix Bluffs Regional Park	133,754*
Total	1,479,268

*Data are for 1998 only; this park first opened in 1997.

5.1.4 Expected Future Conditions

While stream, river, lake and wetland habitat within the watershed generally still appears to be in good condition, land use within the basin is affecting the habitat quality of several tributaries. Land use activities directly and indirectly influence levels of sediment, nutrients, and contaminants that enter surface and ground waters, which in turn degrades habitat quality. Select St. Croix River basin streams have already been identified as being impaired for use by fish and macroinvertebrates. Chronic stresses within the basin will continue to tax species diversity and abundance. With development pressures spreading, the impairment likely will increase on tributaries and soon be more evident on the St. Croix River itself. Work needed in the basin generally needs to be proactive to preserve the existing water resource values, as opposed to reactive through wide-scale restoration efforts. Comprehensive planning is urgently needed to

preserve the ecological and recreational values of the basin in the face of impending land use and urban expansion of the Minneapolis/St. Paul metropolitan area. Select site-specific actions, such as fish passage, also may provide favorable improvements in areas where adverse effects would be expected to continue.

5.2 PROBLEMS AND OPPORTUNITIES

A number of water resource problems and opportunities have been identified during the course of scoping for this reconnaissance study. Input was received through coordination with a wide range of stakeholders including Federal, State, and local agencies; nonprofit organizations; and the general public throughout the St. Croix River basin. Many of the physical problems are interrelated. Most of the problems require a combination of management actions to be applied in concert and at appropriate scales to be effective. Opportunities exist for application of management actions that would address multiple problems.

5.2.1 Issues Identified through External Scoping

This scoping process included review of outside efforts identifying water resource problems and opportunities for the basin. Three of particular note include recent efforts by the St. Croix Basin Water Resources Planning Team (St. Croix Basin Team 2004), NPS (1997) and WDNR (2002). The St. Croix Basin Team, a collection of Federal, State and local agencies, recently issued a report on recommended water quality goals for the basin. Based on the ecological needs of the St. Croix River, the Basin Team recommended a unified, quantitative goal of a 20 percent reduction in future phosphorous loading to the St. Croix River. This goal was established not only as a water quality goal, but most importantly, because such a goal would help meet the future ecological needs of the St. Croix River. As a result of the efforts of the Basin Team, the MPCA and WDNR formally signed on April 6, 2006, a joint Agreement on Nutrient and Sediment Reduction in the St. Croix River Basin.

As a part of developing its Water Resource Management Plan for the St. Croix National Scenic Riverway, the NPS held a series of scoping workshops with key resource stakeholders. Stakeholders included several Federal and State agencies, as well as select nongovernmental organizations. The purpose was to identify key management issues facing the riverway. Initial collaboration with stakeholders identified 133 resource issues of concern. To prioritize these issues, stakeholders were asked to rank these issues in terms of relative importance. The top issues of concern are presented in Table 2 and include characterization and effects of nutrient and sediment loading, nonindigenous species, and urban expansion, as well as other issues.

Table 2. Prioritization of top water resource issues identified by NPS (1997) during the development of the Water Resource Management Plan for the St. Croix National Scenic Riverway.

Water Resource Related Issues - Results of Prioritization Survey			
St. Croix National Scenic Riverway			
Total Number Surveyed = 16 Resource Management Professionals			
Total points are the sum of all individual ratings, where High = 3, Mod = 2, and Low = 1			
Rank = Placement out of 133 issue statements			
		TOTAL	RANK
Subject	Issue	POINTS	
Non Point Sources	Impacts of tributary nutrient loads on river	47	NO. 1
Nutrients	Impacts of tributary nutrient loads on river	46	NO. 2
Point Sources	Need for a phosphorus (nutrient) effluent standard	44	TIE 3
Data Availability and Management	Need recommendation for interagency ecosystem monitoring design	44	TIE 3
Mussels	Flow fluctuations effect: habitat, stranding	44	TIE 3
Cumulative Effects	Serious lack of information on cumulative effects from human impacts	43	TIE 4
Sedimentation	Need to determine the contribution to sediment load from tributaries and land use	43	TIE 4
Exotics Management	Invasion of milfoil, loosestrife, zebra mussels, ruffe, Asiatic clam (<i>Corbicula</i>), rusty crayfish, <i>P. crispus</i> , <i>Bathyterpes</i>	42	TIE 5
Data Availability and Management	Need to determine if available data are sufficient to ensure non-degradation of the Riverway	42	TIE 5
Non Point Sources	Lack of information about storm water inputs of toxics and sediment	42	TIE 5
Perceived Quality/Aesthetics	Crowding/Use conflicts	42	TIE 5
Non Point Sources	Increasing impacts from increasing populations	42	TIE 5

Finally, WDNR (2002) identified a list of its priority water resource issues for the St. Croix River basin. From this list, the top four were selected as being top priority:

1. Shoreland (lakes and rivers) habitat protection and restoration.
2. Nonpoint source runoff contamination of surface water.
3. Cooperation with grassland/prairie and wetland restoration initiatives to protect water quality and enhance wildlife habitat.
4. Northwest Sands Integrated Management Plan (WDNR, 2002).

Additional scoping and planning efforts for water resource projects have certainly been performed by a number of other Federal, State, and local entities. Several such efforts were noted during this study. Any future project work within the St. Croix River basin would consider these additional scoping efforts, as appropriate, as a part of the planning process.

5.2.2 Issues Identified through this Study

To further define water resource problems within the St. Croix River basin, the District performed extensive coordination during 2005 and 2006. Input was received from a wide range of stakeholders including Federal, State, and local agencies; nonprofit organizations; and the

general public. In addition to independent meetings with various stakeholders, the District hosted five public meetings during July and August 2005 (Figure 6). The purpose of these meetings was to identify potential water resource problems and solicit ideas for potential water resource projects. Meetings were held at Hudson, Stillwater, St. Croix Falls, Siren, and Hayward. Notices for these meetings were sent to numerous Federal, State and local agency representatives; nonprofit organizational interests; and numerous media outlets within the basin. Participation was greatest from Federal, State and local agencies and nonprofit groups. General public participation was limited, although members from the public did attend, especially at the sites within the lower watershed.

This scoping process, combined with efforts by other agencies described above, allowed the district to characterize current resource concerns within the St. Croix River basin. A wide variety of issues were identified from site-specific issues to those that were broad and more programmatic to the entire basin. The physical, chemical, and ecological problems and related opportunities include the following. State and Federal (e.g., Corps of Engineers, U.S. Department of Agriculture (USDA), USFWS, Environmental Protection Agency (EPA)) programs are available to conduct ecosystem restoration, water quality improvement and watershed management.

- Degraded aquatic habitat and biological communities in St. Croix River tributaries.
Opportunities: Restore channelized or degraded tributaries. Restore wetland areas. Improve lake, riparian and aquatic habitat. Reduce nutrient and sediment loading to tributary streams and lakes.
- Elevated nutrient loading to lakes, tributaries and St. Croix River.

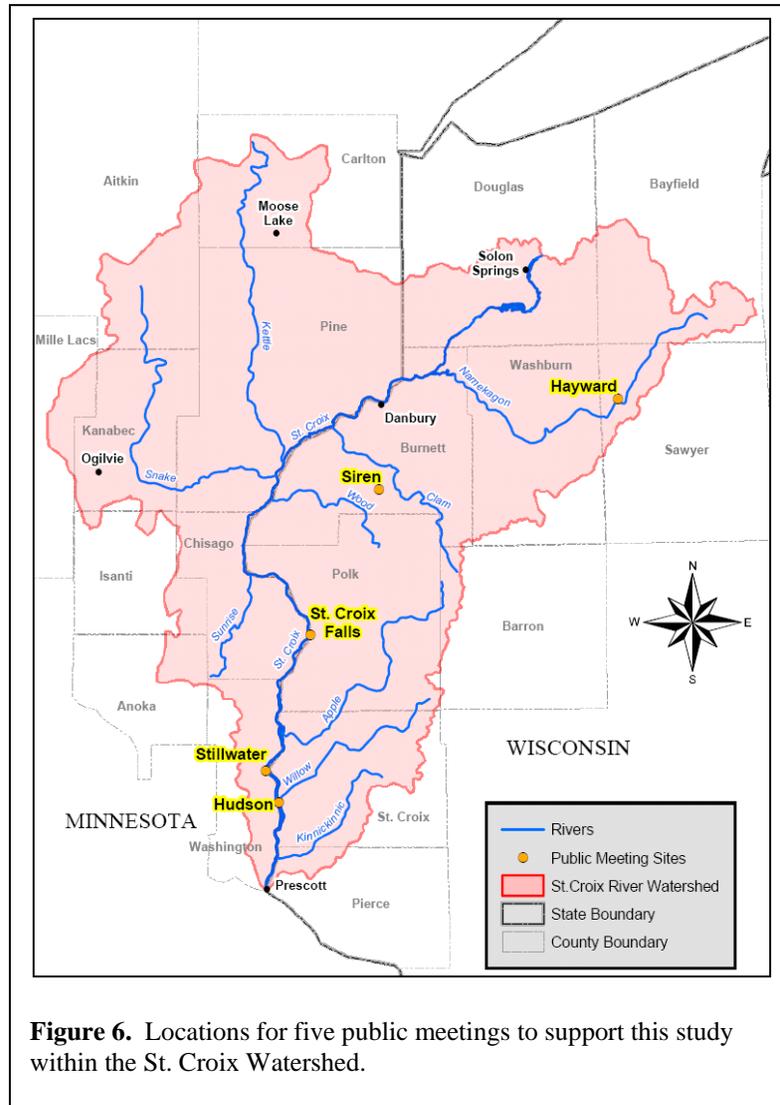


Figure 6. Locations for five public meetings to support this study within the St. Croix Watershed.

Opportunities: Identify key areas of intense nutrient loading. Incorporate best management practices in rural and urban landscape design. Improve residential and municipal waste treatment system to reduce nutrient loading to the St. Croix River basin. Increase perennial vegetation cover on the landscape by growing alternative crops. Restore wetlands. Reduction in nutrient loading is a direct improvement to aquatic habitat.

- Elevated sediment loading to tributaries and St. Croix River.

Opportunities: Identify key areas of intense erosion and sediment loading. Reduce soil erosion from rural and urban lands through a combination of best management practices and improved land management. Restore channelized tributary streams; stabilize eroding tributary channels or lake shores. Reduction in sediment loading is a direct improvement to aquatic habitat.

- Loss of river habitat connectivity for fish migration.

Opportunities: Remove dams or construct fishways to reconnect fragmented habitats.

- Nonindigenous species throughout the St. Croix River basin.

Opportunities: Monitor for continued spread of existing species or introduction of new species. Develop a “rapid response” plan to eradicate small patches of newly introduced species. Use removal techniques to control excessive populations of invasive aquatic plants. Incorporate educational opportunities to help minimize future spread.

- Unstable and eroding stream channels and lake shorelines.

Opportunities: Restore channelized tributary channels; stabilize eroding tributary channels; stabilize eroding lake shores.

- Flooding (both urban areas and areas adjacent to lakes).

Opportunities: Provide protection measures for affected structures. Modify lake hydrology to reduce lake level fluctuations.

- Stormwater and wastewater management.

Opportunities: Assist communities, counties, watershed districts, or other entities with planning and construction of infrastructure for stormwater and wastewater management.

- Emergency spill response plan.

Opportunities: Assist States, counties, communities or other entities with planning and implementing an emergency response plan for key areas within the St. Croix River basin.

- Watershed planning for the St. Croix River basin and subbasins.

Opportunities: Perform watershed planning to better define management objectives across the entire St. Croix River basin or appropriate subbasins. Identify management techniques to meet those objectives. This effort could consider many of the problems and opportunities identified above, including methods to improve aquatic habitat, reduce nutrient and sediment loading, identify areas for habitat restoration, implementation of wastewater and stormwater planning and management, smart-growth development, as well as other possible actions.

5.3 NATIONAL OBJECTIVES

The national or Federal objective of water and related land resources planning is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the Nation.

The Corps of Engineers has added a second national objective for Ecosystem Restoration in response to legislation and Administration policy. This objective is to contribute to the Nation's ecosystems through ecosystem restoration, with contributions measured by changes in the output of ecosystem goods and services of value to human society.

5.4 PLANNING OBJECTIVES

The national objectives of NED and Ecosystem Restoration are general statements. The water and related land resource problems and opportunities identified in this study are stated as specific planning objectives to provide focus for the formulation of alternatives. These planning objectives reflect the problems and opportunities and represent desired future conditions.

The planning objectives for land and water resources in the St. Croix River basin include the following:

1. Perform watershed planning at the basin and subbasin scale for the comprehensive management of land and water resources.
2. Restore wetland, stream, river, lake and riparian ecosystems.
3. Protect rare/unique aquatic resources (e.g., listed species).
4. Reduce soil erosion and sediment loading to the St. Croix River and tributaries.
5. Reduce nutrient loading to the St. Croix River and tributaries.
6. Protect existing resources from existing and future land use activities.
7. Promote "smart development" for the protection of multiple uses.
8. Promote sustainable land use activities.
9. Reduce introduction, spread and effects of nonindigenous species.
10. Stabilize stream channels and lake shores.
11. Reduce economic damages from flooding.

Significant opportunity exists to collaboratively plan and implement management actions through Federal (Corps of Engineers, USDA, EPA, USGS), State (MnDNR, WDNR, Board of Water and Soil Resources (BWSR), MPCA), local (Metropolitan Council, counties, watershed districts, landowners) agencies. During this reconnaissance study, relationships among agencies and stakeholders have developed that provide an opportunity to work together. Without coordinated action, this opportunity will fade as time passes.

5.5 PLANNING CONSTRAINTS

Planning constraints are temporary or permanent limits imposed on the scope of the planning process and choice of solutions. Planning constraints include ecological, economic, engineering, legal, and administrative constraints. Some are states of nature; some are based on the design of built structures. Legislation or rule making imposes other constraints. The human-imposed constraints are possible to change. Planning constraints include the following:

1. All applicable Federal, State, and local laws, regulations, and policy.
2. The scope and products of the reconnaissance study as prescribed by the Resolution of the Committee on Transportation and Infrastructure of the U.S. House of Representatives, September 25, 2002, which authorized the study.
3. Funding and time limits for the reconnaissance study.
4. Restriction to water and related land resources in the St. Croix River basin.
5. The existing population, land use, communities, and economy of the basin.
6. The existing constructed water resources projects in the basin (largely existing dams).
7. The climate, geology, soils, and native biota of the Mississippi River basin.

5.6 ALTERNATIVES

During the reconnaissance phase, alternatives were identified and assessed at a relatively low level of detail, limited to descriptions of conceptual measures for achieving study objectives. The study evaluated the likelihood that more detailed plans could be formulated that would qualify for Federal assistance with implementation and maintenance through local support. Alternative plans consisted of combinations of actions or measures that address one or more of the planning objectives.

Through public meetings, interagency discussions, review of existing documents and consultation with stakeholders, a number of alternative plans were identified. These plans were

subjected to a preliminary screening to identify a set of plans that would meet the following criteria:

1. Contribute to meeting the planning objectives.
2. Determine positive Federal interest (Corps of Engineers).
3. Identify interested non-Federal cost share sponsor(s).
4. Appropriate for this specifically authorized study (rather than another Corps of Engineers program).

The following three alternative plans met those criteria:

1. Integrated watershed analysis and planning for the entire St. Croix River basin.
2. Integrated watershed analysis and detailed planning for subwatersheds of the basin.
3. Cross Lake Dam fish passage.

A wide variety of management measures likely need to be applied in combination, in appropriate sequence, and at appropriate locations and scales to meet the planning objectives for future conditions in the St. Croix River basin. The first two alternatives above will directly help identify what management actions are necessary to address the identified problems and opportunities. The third alternative directly addresses an identified water resource issue.

In addition to the three alternatives listed, several other plans may also be worthy of District participation but better fall into other programs potentially more appropriate than the current study. Still other St. Croix River basin problems are worthy of Federal investment, but fall outside typical Corps authority or resource areas. These issues are outlined briefly in Section 6.

5.6.1 Basin-Wide Integrated Watershed Analysis and Planning for the St. Croix River Basin

While stream and river habitat within the watershed generally still appear to be in good condition, land use within the basin is affecting habitat quality of several tributaries and lakes. With development pressures spreading, the impairment likely will increase on tributaries and soon be more evident on the St. Croix River itself. Comprehensive watershed planning is urgently needed to preserve the ecological and recreational values of the basin while meeting the economic needs of the region.

Watershed planning could occur on several scales. The planning proposed here includes general analysis and planning over the entire St. Croix River basin. Analysis and planning for subwatersheds is also recommended and is discussed further below. Broad, programmatic planning associated with a basin-wide analysis allows for the setting of basin-wide goals and quantitative objectives. Then, analysis can identify how best to meet those objectives at the basin scale. Watershed planning at the tributary level can then include more detailed setting of goals and objectives and analysis of how to meet those goals and objectives.

Watershed planning could involve consideration and planning for a wide variety of watershed and water resource issues. Goals and objectives could be highly variable. Clearly, aquatic habitat protection via reduced sediment and nutrient loading were key issues identified during scoping. Reductions in nutrient and sediment loading will have corresponding substantial improvements on aquatic habitat. Other issues could include identification and planning of future land use activities (both urban and agriculture), “smart” growth, stormwater and wastewater management, wetland and habitat protection and restoration, invasive species management, flood damage reduction, and other possible areas.

The district can support some, but probably not all, of the solutions to these problems. However, within the context of watershed planning, the district can serve as the planning organization to lead a watershed planning effort. The district can lead and perform analyses and assist with developing some form of watershed management plan. It also can take part in site-specific projects that address water resource needs identified within the watershed management plan, including habitat restoration and implementing flood damage reduction measures.

We propose to link the Corps of Engineers technical expertise with other Federal, State and local agencies to address water resource needs systemically across the entire St. Croix River basin. The scope of work for the basin-wide watershed assessment would be refined later during the development of a PMP and an FCSA. However, we propose the following initial description of an integrated watershed, aquatic ecosystem and water quality restoration planning effort for the St. Croix River basin.

5.6.1.1 Study Objectives

The primary objective is to prepare a plan for watershed, aquatic ecosystem, and water quality management and restoration in the St. Croix River basin. Specific goals and quantifiable objectives would be established for water resource needs within the basin. These goals will likely be focused on aquatic habitat protection and improvement, given its strong interest in the basin.

The district proposes to collaborate with St. Croix River basin stakeholders to develop a coarse-scale watershed analysis tool. The assessment tools proposed would likely include one or more models that would, at a minimum, predict nutrient and sediment loading of the St. Croix River and select tributaries. These are two critical components to aquatic habitat quality within the St. Croix River. The exact structure of these models would be determined in the initial steps of the project. The model(s) would provide a coarse, basin-wide planning tool to help the planning team identify alternatives to protect St. Croix River aquatic habitat, even with projected urban growth. The type of model(s) used would best meet the needs at analyzing conditions within the basin, while fitting within the constraints of the district and non-Federal sponsor. Ongoing advancements in computer modeling technology offer the opportunity to improve our understanding of the St. Croix River basin watershed as a system. This knowledge would facilitate better overall watershed management and application of remedial programs.

The District proposes to work with local stakeholders to identify a group of future development and land-use scenarios for the St. Croix River watershed. These scenarios would then be modeled to help characterize how potential development and land-use changes would affect St. Croix River and tributary habitat. Scenarios would be revised and analyzed to identify potential actions that might best meet the ecological, social and economic needs of the basin.

These work products would allow for more effective planning for “smart development,” that being development or management of areas in a manner that would minimize habitat degradation. The information generated by this effort would enable local, State and Federal officials to set reasonable and attainable ecological goals for the watershed that are compatible with local and regional economic needs for sustainable development and change.

5.6.1.2 Planning Framework

Development of a watershed management plan for the St. Croix River basin will be based on a standard planning process of assessing existing conditions, forecasting future conditions, and identifying desired future conditions based on planning objectives. The system needs will be identified through comparison between forecasted future conditions and desired future conditions. Simulations of different alternative management and restoration plans (combinations of measures) will be done using the analysis tools prescribed above. Results of this modeling and planning effort would be synthesized into a report that decision-makers can use to allocate investments in watershed, water quality, and ecosystem restoration in the basin. The watershed management plan will identify the most effective combination of management measures to attain the plan objectives.

5.6.1.3 Stakeholder Team

We propose two teams be formed to perform the analysis discussed. The first would be an interagency stakeholder team to identify the broad resource needs within the St. Croix River basin. This group would identify the specific broad, future goals and objectives for watershed management within the basin. A range of resource interests would be present, including, but not limited to, ecology, agriculture, economics, land use planning and recreation. Participants would be invited from a range of Federal, State and local agencies. These agencies could include the MPCA, MnDNR, WDNR, the Minnesota and Wisconsin Departments of Agriculture, BWSR, and the Metropolitan Council of the Twin Cities. Federal participants would include the St. Paul District, NPS, NRCS, USFWS, USGS, and EPA. There also would be opportunity to involve the Corps’ National Ecosystem Planning Center of Expertise with setting of goals and objectives, as well as analyzing future conditions.

5.6.1.4 Technical Team

We propose that an interagency technical team be formed with expertise in aquatic habitat, hydrology, geomorphology, limnology, ecology, agriculture, planning, and modeling.

This group would guide the modeling work and analyze what general management measures would be needed to meet the long-term future goals identified by the stakeholder team (above). The Federal and non-Federal participants would be similar to those outlined above, with the emphasis here being on the technical aspects of modeling. The U.S. Army Engineer Research and Development Center (ERDC) Environmental Laboratory would likely participate in the technical team. The technical team would collaborate and assist the district on the details of model development and application. The non-Federal participants would be the lead people representing their respective agencies for in-kind cost-share work.

5.6.1.5 Watershed Model Selection

To perform the modeling, we propose to use one or more models developed to predict how land use activities would influence future nutrient and sediment loading. The types of model(s) used would be those that would best analyze conditions within the basin, while fitting within the constraints of the district and non-Federal sponsor. The constraints are critical because the likely non-Federal sponsor(s) for this effort may have limited funds.

One possibility for modeling would be the use of one or more Soil and Water Assessment Tools (SWAT). These models are distributed lumped-parameter models developed by the USDA Agricultural Research Service (ARS) to predict the impact of land management practices on water, sediment and agricultural chemical yields in large watersheds with varying soils, land use and management conditions over long periods of time (more than 1 year). As with most models, SWAT has limitations and would need to be modified to best meet the needs for future loading projections. However, the model is being applied to one small subwatershed within the basin (Willow River in Wisconsin). This technique may allow for a more efficient application of the model to the entire basin or possibly other subwatersheds that could effectively represent the basin. The SWAT also may be less costly to apply compared to other models (e.g., Gridded Surface Subsurface Hydrologic Analysis or GSSHA). If other models are identified early by the technical team, these alternative model(s) would certainly be considered for use by the district.

5.6.1.6 Simulate Existing and Future Conditions

The SWAT model(s) will be adapted to predict existing and future transport and loading of sediment (Total Suspended Solids or TSS) and total phosphorus (TP) through major tributaries and to the St. Croix River. The SWAT model(s) will then be used to analyze how various existing and future land management scenarios (e.g., alternative BMPs for agriculture and urban areas, wide scale habitat restoration, etc.) affect transport and loading of TSS and TP to the St. Croix River. The modeling of future conditions would include both a “with” and “without” project condition. The with-project condition would include the land management scenarios referenced above, while the without project condition would include future projections without the described future actions. The technical team will collaborate to identify appropriate assumptions for modeling existing and future conditions. The appropriate time scales also would be identified through collaboration. A 15-year window would address the existing goals

for achieving nutrient and sediment loading reductions by 2020, while a 50-year window (2056) also would address typical Corps of Engineer planning requirements.

5.6.1.7 Watershed Management Plan

The watershed management plan would document the planning process and development of the selected modeling tools. The exact content of the watershed management plan would depend on which objectives were identified during early scoping for the effort. However, any watershed plan would discuss how the modeling tools were used to assess the combination of management measures needed to attain the planning objectives. The type, geographic distribution, sequence of implementation, and implementing agency for the management measures would be described in the watershed management plan for the St. Croix River basin.

5.6.1.8 Cost Estimate for St. Croix River Basin Watershed Planning

This effort assumes costs for watershed planning only and would not include any potential district projects that might emerge from this study. A watershed study is only a planning effort, with no associated construction actions. A watershed study would be pursued within the feasibility phase immediately following this current reconnaissance phase.

The cost for a future watershed study is highly uncertain and depends on a number of factors that were beyond what could be investigated for this report. This uncertainty is especially the case for a watershed study across an entire basin that includes two States, several counties, and many municipalities that could have an interest. The expense will largely be driven by the goals and objectives of the study, what supporting data would need to be collected, and what technical analyses would need to be performed. These variables would need to be defined during the development of the PMP and FCSA. At a minimum, it is anticipated that such a study would evaluate measures to improve future land use, manage projected urban growth, and otherwise facilitate meeting the goals for nutrient and sediment loading for the basin. Other goals would likely be included.

The preliminary estimate for a watershed study for the entire St. Croix River basin is \$1.75 million. A more refined breakdown of costs is discussed below. This study is supported by a number of parties within the basin. The MPCA has expressed intent to cost-share such a study (Letter of Intent in Attachment 1), with additional sponsor(s) also potentially participating.

It should be noted that the scale of this effort needs to consider the financial capabilities of the parties involved, especially for local non-Federal sponsors who would participate in the study. The district should strive to develop a study plan that accomplishes important goals within the financial capabilities of its cost-share participants.

5.6.2 Integrated Watershed Analysis and Planning for Subbasins within the St. Croix River Basin

Comprehensive watershed planning for the entire basin provides a broad perspective on how to meet the basin's general water resource needs. However, planning at the subbasin level would provide more detailed identification of local goals and objectives, analysis of how best to meet those goals and objectives, and how the actions of the subbasin work toward the general goals for the St. Croix River basin.

Any subbasin within the St. Croix River basin could be a candidate for more detailed watershed planning. However, several subbasins reviewed during this study may be prime candidates for initial study:

- Sunrise River (Minnesota)
- Snake River (Minnesota)
- Kinnickinnic River (Wisconsin)
- Willow River (Wisconsin)
- Apple River (Wisconsin)
- Upper St. Croix River (Wisconsin)

The identification of these subbasins was based on several factors. First, these major tributaries need thorough planning to reduce continued degradation of themselves and the St. Croix River. The Sunrise, Snake, Apple, Willow and Kinnickinnic Rivers appear to be among the most degraded tributaries, as well as the greatest contributors to degraded habitat in the St. Croix River. They also contain sensitive resources that may be subject to the greatest immediate threats of development and urban growth. By contrast, the upper St. Croix River is in relatively better condition and does not have the same level of impairment. However, the headwaters area has become more impaired in recent years, and in the interest of protecting the entire basin, careful planning for management of the upper watershed is important. Moreover, protection of the headwaters has received significant interest during this scoping process. Thus, the upper St. Croix River (headwaters subbasin) has been included here for study. All of these basins also received interest and support during the scoping process and have received Letters of Intent for sponsorship from one or more non-Federal cost-share sponsors.

It should be noted that other subbasins could certainly be considered as well for detailed planning or could be substituted if stakeholders feel they warrant planning. These could include, for example, Browns Creek, Valley Branch or Trout Creek subbasins in Minnesota. Although these subbasins are smaller, they face immediate threats of urban expansion. Watershed planning has occurred within these basins, but a more detailed analysis may be warranted.

5.6.2.1 Study Objectives

The primary objective is to prepare a plan for aquatic ecosystem and water quality management and restoration within subbasins of the St. Croix River basin. First, specific goals and objectives would be established for water resource needs within the basin, including how to

contribute toward the established regional goal of reducing phosphorus loading to the St. Croix River by 20 percent. More refined quantitative goals for protecting and improving aquatic habitat also would be developed specific to the subbasin.

The St. Paul District proposes to collaborate with the appropriate subbasin stakeholders to develop a watershed management plan. This could include review of current and historical conditions, collection of additional data, and development of appropriate tools for watershed analysis. Where appropriate, watershed assessment tools could include one or more models that would predict key aquatic habitat components, such as nutrient and sediment loading, at appropriate points within a subbasin. The exact need and structure of these models would be determined in the initial steps of the project. The model(s) would provide a planning tool to help the planning team identify alternatives to best manage water resources of the subbasin, even with projected urban growth. The type of model(s) used would best meet the needs to analyze conditions within the subbasin, while fitting within the constraints of the District and cost-share sponsor.

For future modeling work, the district proposes to work with the local stakeholders to identify a group of future development and land-use scenarios for the selected subbasin. These scenarios would be modeled to help characterize how potential development and land-use changes would affect tributary habitat. Scenarios would be revised and analyzed to identify potential actions that might best meet the ecological, social and economic needs of the subbasin.

Ultimately, these work products (e. g., watershed management plan, modeling tools, etc) would allow for more effective planning for “smart development,” that being development or management of areas in a manner that would minimize habitat and water quality degradation. The information generated by this effort will enable local, State and Federal officials to set reasonable and attainable ecological goals for the watershed that are compatible with local and regional economic needs for sustainable development and change.

5.6.2.2 Planning Framework

Development of a watershed management plan for the selected subbasins will be based on a standard planning process of assessing existing conditions, forecasting future conditions, and identifying desired future conditions based on planning objectives. The system needs will be identified through comparison between forecasted future conditions and desired future conditions. Simulations of different alternative management and restoration plans (combinations of measures) would likely be done using the analysis tools prescribed above. Results of this modeling and planning effort would be synthesized into a report that decision-makers can use to allocate investments in watershed, water quality, and ecosystem restoration. The watershed management plan will identify the most effective combination of management measures to attain the plan objectives.

5.6.2.3 Stakeholder and Technical Teams

Similar to the planning effort for the entire St. Croix River basin, we propose a stakeholder team and a technical team be formed to facilitate planning at the subbasin level. The interagency stakeholder team would identify the resource and set specific future goals and objectives for watershed management within the subbasin. A range of resource interests would be present, including, but not limited to, ecology, agriculture, economics, land use planning and recreation. Participants would be invited from a range of Federal, State and local agencies. There also would be opportunity to involve the Corps' National Ecosystem Planning Center of Expertise with setting of goals and objectives, as well as analyzing future conditions.

The interagency technical team would be formed with expertise in hydrology, geomorphology, limnology, ecology, agriculture, planning, and modeling. This group would guide the modeling (or related similar work) and analyze what general management measures would be needed to meet the long-term future goals identified by the stakeholder team. The Federal and non-Federal participants would be similar to those outlined previously, with the emphasis being on the technical aspects of modeling. Where appropriate, we propose that the ERDC Environmental Laboratory participate in the technical team. The team would collaborate and assist the district on the details of model development and application. The non-Federal participants would represent their respective agencies as a part of in-kind cost-share work.

5.6.2.4 Watershed Assessment

Where appropriate, we propose to develop one or more models to predict how land use activities would influence future subbasin tributary conditions. The type of model(s) used would be those that best analyze conditions within the basin, while fitting within the constraints of the district and cost-share sponsor. The constraints are critical because the likely cost-share sponsor(s) for this effort may have limited funds.

One possibility for modeling would be the use of one or more SWAT models. This type of model has been applied to one subwatershed within the basin (Willow River in Wisconsin). Use of this type of model may allow for a more efficient application of the model to the entire basin or possibly other subwatersheds that could effectively represent the basin. The SWAT also may be less costly to apply compared to other models (e.g., GSSHA). If other models are identified early by the technical team, the district would certainly consider their use.

It should be noted that modeling may not be necessary for every potential watershed study. However, for preliminary planning efforts, including estimation of costs, this report assumes modeling would be a part of each watershed study.

5.6.2.5 Evaluate Existing and Future Conditions

The SWAT model(s) will be adapted to predict existing and future conditions for loading of TSS and TP through major tributaries and to the St. Croix River. The SWAT model(s) will

then analyze how various existing and future land management scenarios (alternative BMPs for agriculture and urban areas, wide scale habitat restoration, etc.) affect loading of TSS and TP to the St. Croix River. The modeling of future conditions would include both a “with” and “without” project condition. The with-project condition would include the land management scenarios referenced above, while the without project condition would include future projections without the described future actions. The technical team will collaborate to identify appropriate assumptions for modeling existing and future conditions. The appropriate time scales also would be identified through collaboration; a 15-year window would address the existing goals for achieving nutrient and sediment loading reductions by 2020 while a 50-year window (2056) also would address typical Corps of Engineer planning requirements.

5.6.2.6 Watershed Management Plan

The Watershed Management Plan would document the planning process and development of the selected modeling tools. The exact content of the Watershed Management Plan would depend on which objectives were identified during early scoping for the effort. However, any watershed plan would discuss how the modeling tools were used to assess the combination of management measures needed to attain the planning objectives. The type, geographic distribution, sequence of implementation, and implementing agency for the management measures would be described in the watershed management plan for the St. Croix River basin.

5.6.2.7 Cost Estimate for SCRB Subbasin Planning

Many of the issues identified above for watershed planning across the entire basin also apply here. The cost for a future watershed study for select subbasins is also highly uncertain. The expense will largely be driven by the goals and objectives of the study, what supporting data would need to be collected, and what technical analyses would need to be performed. Watershed modeling may not be necessary for every potential watershed study. However, for preliminary planning efforts, including estimation of costs, this report assumes modeling would be a part of each watershed study. At a minimum, it is anticipated that a study for the subbasin would evaluate measures to improve future land use, manage growth, and otherwise facilitate meeting the general basin goals for improved aquatic habitat via reduced nutrient and sediment loading.

The preliminary estimate for a watershed study for any select subbasin is \$750,000. A more refined breakdown of costs is discussed below.

The district has received Letters of Intent for all indicated subbasin studies (Attachment 1). As discussed above, the scale of this effort needs to consider the financial capabilities of the parties involved, especially for local cost-share sponsors that would participate in any subbasin study. The district should strive to develop a study plan that accomplishes important goals within the financial capabilities of its cost-share participants.

5.6.3 Cross Lake Dam Fish Passage

5.6.3.1 General Description

Cross Lake Dam on the Snake River presents undesirable ecological and safety conditions that could be addressed through a relatively simple Federal action (Figure 7). Implementation of a rock ramp-style fishway similar to that used in other regions of the St. Paul District could address both the ecological and safety issues associated with this dam.

5.6.3.2 Problem Description

The Cross Lake Dam is located on the Snake River at Pine City. Cross Lake is a natural lake on the Snake River. However, the dam stabilizes and increases, to a small extent, water elevations on Cross Lake. The dam is approximately 12 river miles upstream of the confluence of the Snake and St. Croix Rivers.

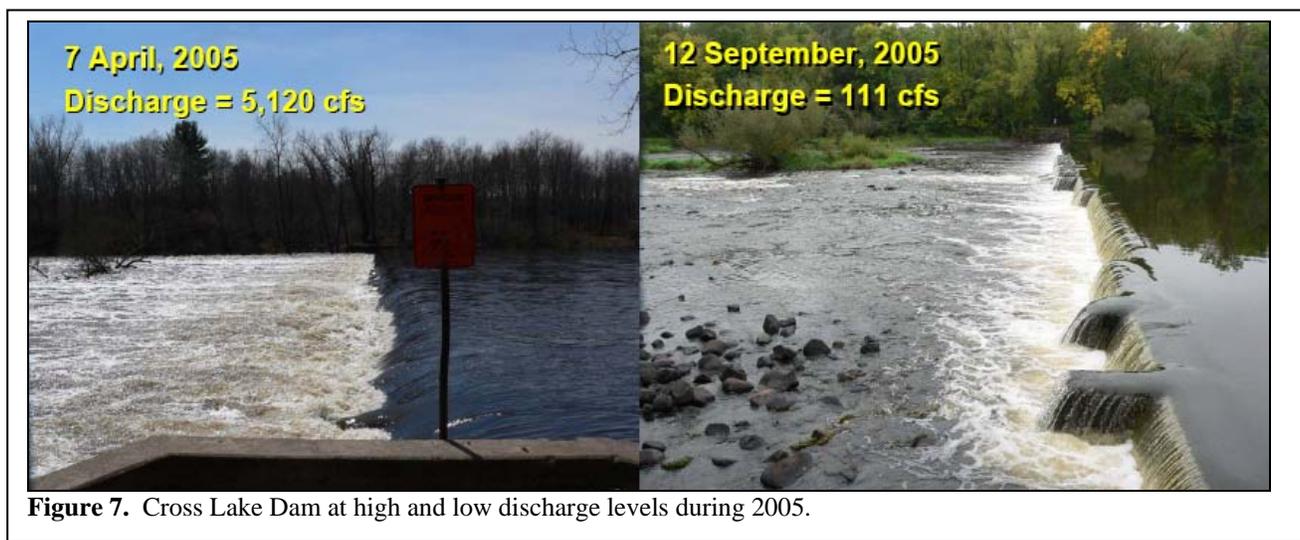


Figure 7. Cross Lake Dam at high and low discharge levels during 2005.

The Snake River supports a diverse fishery, with over 60 species observed (Fago and Hatch, 1993). These species includes lake sturgeon and probably over 15 species that typically migrate to meet diverse habitat requirements. However, most of the Snake River is separated from the St. Croix River by Cross Lake Dam, which prevents fish movements between these two water bodies. Even though the dam extends only a few feet above the existing river bottom, it likely provides an impediment to free fish migration. Above Cross Lake Dam is about 91 miles of main stem Snake River habitat, as well almost 900 miles of tributaries (MnDNR, pers. Comm.)

Fish populations within both the St. Croix and Snake Rivers would benefit from restoring the connection. Although the level of “impairment” is different for each species, it is likely that Cross Lake Dam is at least a significant barrier during much of the year for many species. The MnDNR has identified this dam as a significant issue where providing fish passage would result in important benefits for both Snake and St. Croix River fish populations.

In addition to fishery resources, the Snake River is popular for canoeing, kayaking, and fishing. These activities are especially popular in the vicinity of the dam. However, hydraulic conditions during high water create a “roller” below the dam that is extremely dangerous. Drownings have occurred as recently as 2005. As such, this location is a safety concern during high-water conditions.

5.6.3.3 Potential Alternatives

Dam removal is not a feasible option given the social impacts and perception, especially among lake front property owners along Cross Lake immediately upstream. However, an alternative that would provide for a migration corridor for fish and address the safety issue associated with the hydraulic roller would be implementation of a rock ramp fishway. This structure would be similar to those employed by the St. Paul District on the Red River of the North. One such project at Midtown Dam was done specifically to address both safety and fish passage concerns.

Cross Lake Dam is about 400 feet wide, with a crest approximately 3 feet above the downstream riverbed. The MnDNR owns the dam and the parking area immediately adjacent to the dam. This parking area would conveniently serve as the staging and access site to the dam for construction. The MnDNR has provided a Letter of Intent in support of the project.

5.6.3.4 Benefits of Cross Lake Dam Modification

A rock ramp similar to those on the Red River would facilitate fish movement over Cross Lake Dam. It would reconnect fish populations between the St. Croix and upper Snake Rivers, providing fish access to over 90 miles of diverse Snake River habitat, as well as almost 900 miles of tributary habitat. The riffles and pools created by these structures also serve as quality habitat for fish and invertebrates. In addition, a rock ramp would also eliminate the hydraulic roller and increase safety at the project site during high-water conditions. Postproject observations of similar rock ramp structures have demonstrated them to be effective at allowing fish migration and improving safety by eliminating hydraulic rollers.

The proposed rock ramp structure would have few adverse impacts. Past experience has shown that these structures have no substantial effect on the 100-year flood profile. The structure also would be designed to minimize any effects on Cross Lake elevations.

5.6.3.5 Conceptual Plans and Estimates for Cross Lake Dam Fish Passage

We considered a rock ramp fishway at the Cross Lake Dam. We assumed a basic 20:1 slope, with individual drops of about 1 foot over an individual riffle (Figure 8). The roughly estimated cost for construction, including assumptions for Planning, Engineering and Design and Construction Management, was about \$225,000. It is anticipated that the proposed project can be completed on lands owned by the State of Minnesota, and no additional lands, easements or

rights-of-way would be required. Thus the estimate does not include any real estate costs. This estimate would need to be refined in greater detail during the feasibility phase. However, given the very basic nature of the project, planning costs would probably be relatively small, and the entire project could potentially be completed for less than \$500,000.



Figure 8. Example of a rock ramp fishway. Pictured is a partially constructed fishway at Midtown Dam on the Red River of the North. The cascading riffles are on the right, with the remaining dam on the left.

5.6.3.6 Mode of Project Implementation

This project could be implemented as a part of the current study or as a project under Section 206 of the Corps' CAP. Given the value of the project, interest of the sponsor, and current funding challenges of the CAP, the project will be left in as a recommendation within the current study. However, the project could be moved under Section 206 of the CAP, if such action is warranted.

5.7 PRELIMINARY EVALUATION OF ALTERNATIVES

5.7.1 Resource Significance

Resources of the St. Croix River basin are ecologically, economically, and culturally significant. Federally listed threatened and endangered species are institutionally recognized significant resources that occur in the basin. These species include the federally endangered Higgins' eye pearly mussel (*Lampsilis higginsii*) and winged mapleleaf mussel (*Quadrula fragosa*), as well as other federally listed species. The States of Minnesota and Wisconsin combined list more than 60 species as threatened, endangered, and special concern species that occur in the basin.

The winged mapleleaf is especially representative in that it was historically found in 34 rivers in 12 States. Habitat degradation has reduced winged mapleleaf to only two remaining populations in the world, with the only confirmed reproducing population limited to a single 7-mile stretch of the St. Croix River. Given their life history, mussels are excellent indicators of habitat quality. As such, the high-quality habitat provided by this midsize river is extremely rare. It is the only habitat remaining that has been able to maintain a reproducing population.

In addition to its ecological importance, the St. Croix River basin is heavily used for recreation. Portions of the basin are federally recognized for their scenic and recreational

importance. Included is the St. Croix National Scenic Riverway, which extends 252 miles and includes the majority of both the St. Croix and Namekagon Rivers.

State-recognized significant resource areas include the following State parks and scenic river designations within the St. Croix River basin:

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- | | |
|-----------------------------|---|
| • Interstate State Park, MN | • Interstate State Park, WI |
| • Wild River State Park, MN | • Willow River State Park, WI |
| • Banning State Park, MN | • Kinnickinnic State Park, WI |
| • Moose Lake State Park, MN | • Kettle River, a State of MN Wild and Scenic River |
-

In addition to the State designated areas listed above, several Minnesota and Wisconsin State scientific and natural areas are in the basin.

Given its proximity to Minneapolis/St. Paul, as well as several communities in western Wisconsin, the basin is within easy access of more than 3 million people. This proximity subjects the watershed not only to heavy recreational use, but also to urban expansion and growing population. These pressures increase the potential for stressors to water resources within the basin. These stressors will threaten the ecological integrity that is so important within the basin.

In addition to the ecological, recreational and aesthetic resources identified above, the basin also provides important economic values. The southern part of the basin includes extensive agricultural use that provides important economic income for the area. Recreational use of the basin brings in tourism dollars. Urban growth and development in the area has been and will continue to be important for the local economy, especially in the southern part of the basin.

The Nature Conservancy has identified conservation priorities for freshwater biodiversity in the Upper Mississippi River basin, including the St. Croix River basin (The Nature Conservancy, 2003, Appendix 13). These areas include the entire St. Croix River main stem, as well as a large area of the headwaters (namely, the Upper St. Croix and Namekagon River watersheds).

5.7.2 Preliminary Estimate of Project Costs

Table 3 contains preliminary estimates of project costs; construction, operation, and maintenance costs and study costs for the indicated projects. Only the Cross Lake Dam Fish Passage has costs indicated for project construction and operation and maintenance. The study costs for all three studies are described in Section 11, Feasibility Phase Cost Estimate. This estimate will include a proposed breakdown of costs for the referenced watershed studies, which for these alternatives represent the entire “project cost.”

These projects are only representative examples of the types of projects that could be implemented in the St. Croix River basin and do not constitute all the potential project

opportunities. Additional opportunities will be identified during the course of the feasibility studies, particularly as part of the integrated watershed study and analysis (Alternatives 1 and 2).

Table 3. Preliminary Project Cost Estimates. Estimates are for July 2006 and do not include future inflation.

Project	Estimated Construction Cost	Annual O+M Cost	Study Cost
Watershed Study for the SCRB	N/A	N/A	\$1,750,000
Watershed Study for select Sub-Watersheds (per individual sub-watershed)	N/A	N/A	\$740,000
Cross Lake Dam Fish Passage	\$225,000	\$1,000	\$150,000

5.7.3 Preliminary Estimate of Project Benefits

Potential benefits from the proposed studies and project are discussed below. Potential benefits include environmental, economic, safety and social benefits for different projects.

5.7.3.1 Basin-Wide Integrated Watershed Analysis and Planning for the St. Croix River Basin

Existing land use activities combined with projected population growth and land use changes could substantially degrade the ecological and social values of the St. Croix River basin. This integrated analysis would lead to more informed, ecologically effective decision-making for watershed management, aquatic ecosystem protection and restoration. Implementation of study recommendations should result in increased distribution and abundance of wildlife and aquatic resources, including federally endangered species; improved biodiversity, improved water quality (ecological benefits), and increased recreational opportunities. It also would facilitate more sustainable urban development and agricultural practices (economic benefits). The proposed watershed study and analysis represent a holistic approach to system-wide management and restoration of aquatic, wetland, and riparian habitats within the St. Croix River basin. These actions would result in significant benefits to ecosystems of unique local, regional, and national importance. The proposed study would help identify future goals and objectives for water management within the basin and possible ways to meet those objectives. The proposed watershed studies wouldn't themselves provide benefits, but they would provide critical guidance on land use and water resource management that would directly protect and improve these resources. It also will foster smart growth and development, which is important for the regions economy.

The watershed study may identify a variety of potential projects under Corps of Engineers and other Federal agency authorities. A number of non-Federal sponsors, stakeholders, and other Federal agencies have expressed support for this proposal, and it offers

an opportunity to guide implementation of several existing government programs to maximize their benefits.

5.7.3.2 Integrated Watershed Analysis and Planning for Subbasins within the St. Croix River Basin

The proposed watershed planning for subbasins of the St. Croix River basin would augment the basin-wide planning described above and provide a more refined analysis of watershed management opportunities within individual subbasins. The analysis would also identify how best to integrate the goals and objectives of the subbasin with those of the entire basin.

The integrated analysis would lead to more informed, ecologically effective decision-making for watershed management and aquatic ecosystem protection and restoration both in the select subbasin and the basin as a whole. Implementation of study recommendations should result in increased distribution and abundance of wildlife and aquatic resources, including federally endangered species; improved biodiversity, improved water quality (ecological benefits), and increased recreational opportunities. These benefits would be most pronounced in the immediate sub-basin, but should augment benefits for the entire basin. The subwatershed studies also would facilitate more sustainable urban development and agricultural practices (economic benefits).

A number of non-Federal sponsors, stakeholders, and other Federal agencies have expressed support for these studies, and it offers an opportunity to guide implementation of several existing government programs to maximize their benefits. The integrated analysis would contribute to increased ecosystem goods and services through natural resources management and sustainable land use in the select subwatershed. These benefits would include more sustainable agriculture and urban growth; increased distribution and abundance of wildlife and aquatic resources, including federally endangered species; and increased recreational opportunities.

5.7.3.3 Cross Lake Dam Fish Passage

Two important benefits would be realized through this project. Fish passage would reconnect the Snake River basin with the St. Croix River basin. More than 90 miles of Snake River habitat, as well as almost 900 miles of tributary habitat, would be made available. Fish and mussel populations within both the St. Croix and Snake Rivers would benefit from restoring the connection. Those especially benefited would be long-distance migrants such as lake sturgeon. Species diversity above the Snake River dam also may be improved, because the Snake River above the dam has fewer total fish species than the St. Croix River. Given the amount of habitat that would be made accessible on the Snake River (a major St. Croix River tributary), the project is easily justified given a total project cost of under \$500,000. The benefit-cost ratio would generally be within what has proven acceptable on other similar projects.

The second important benefit would be improved safety conditions at the dam through elimination of the hydraulic roller. The rock ramp structure also could provide local recreational canoeing and kayaking opportunities.

6. ADDITIONAL PROJECT INTERESTS

Scoping for this reconnaissance study identified several needs within the basin, only a portion of which are identified as alternatives above. Some of the issues should be considered within the broader context of a watershed plan. However, specific issues may be difficult to directly address within the context of this study. They may be better addressed through other Corps programs or possibly by programs of other Federal or State agencies. These project interests are identified below.

6.1 GORDON DAM FISH PASSAGE

The WDNR identified fish passage at Gordon Dam as a resource interest. Gordon Dam is on the St. Croix River near its headwaters close to Solon Springs. The dam forms the St. Croix Flowage and is a complete barrier to upstream fish migration (Figure 9).

The WDNR asked the District to investigate possible fish passage at this location. An initial plan was formulated, and a preliminary rough cost estimate, for construction only, was about \$300,000. This estimate does not include costs for real estate or additional study phases.

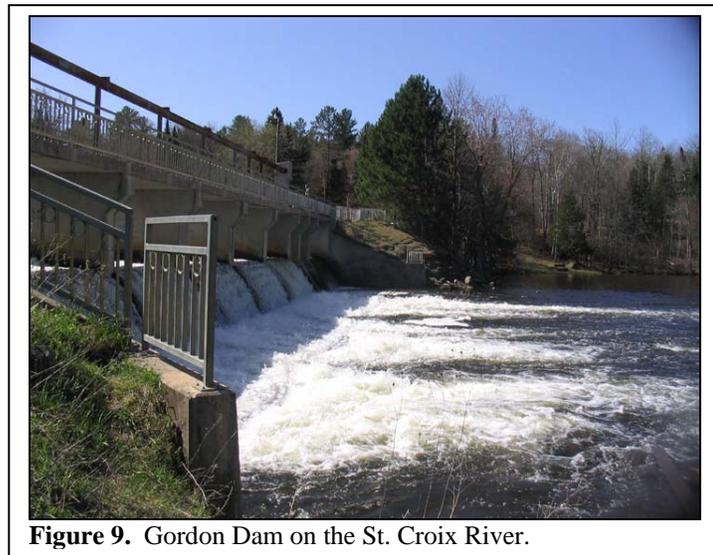


Figure 9. Gordon Dam on the St. Croix River.

Given the likely costs and benefits, the District is not recommending the project move forward at this time. However, if new information surfaces as to the value of habitat above Gordon Dam, or if fish passage is also provided systemically, then fish passage at Gordon Dam may be revisited.

6.2 STORMWATER AND WASTEWATER INFRASTRUCTURE IMPROVEMENTS

Scoping identified issues with stormwater and wastewater infrastructure. Assistance was needed both with planning and construction of new facilities. This theme was common throughout the St. Croix River basin, especially within the southern reach. Existing

infrastructure is often old and cannot handle existing needs. These problems will be exacerbated in the future with urban expansion. Assistance with planning and/or construction of such infrastructure could contribute toward the basin-wide goal of nutrient management for the St. Croix River and tributaries. As such, some level of planning for such facilities might be possible within any given watershed study. However, additional construction efforts would be most valuable in assisting communities or counties with stormwater and wastewater needs.

Although assistance for these projects could be provided through this study, other appropriate programs already exist within the Corps of Engineers, some of which may be particularly applicable for stormwater and wastewater issues. For this reason, projects for stormwater and wastewater infrastructure should be referred to these alternative Corps programs (discussed below).

6.2.1 Nation-Wide Assistance

Amendments to Section 219 of WRDA 1992 can authorize the Corps to assist with the development of wastewater collection and treatment systems. Project costs are shared with the Corps funding 75 percent of the project costs, and the non-Federal sponsor funding the remaining 25 percent. The Federal share is capped at \$5 million (Attachment 3).

6.2.2 Northeastern Minnesota Environmental Infrastructure Program

Section 569 of WRDA 1999 authorizes the Corps to establish a program to provide environmental assistance to non-Federal parties in northeastern Minnesota (including most Minnesota counties within the St. Croix River basin). Assistance may be in the form of design and construction for water-related infrastructure and resource protection and development projects. This includes projects related to wastewater treatment, water supply, environmental restoration, and surface water protection and development. Stormwater infrastructure also could receive funding through this program. The project must be publicly owned. Project costs are shared with the Corps reimbursing 75 percent, and the non-Federal sponsor funding the remaining 25 percent (Attachment 3).

6.2.3 Northern Wisconsin Environmental Infrastructure Program

The Northern Wisconsin Environmental Infrastructure Program (Section 154 of the Consolidated Appropriations Act of 2002) authorizes the Corps to establish a pilot program to provide environmental assistance to non-Federal interests in northern Wisconsin (including Douglas and Bayfield Counties). Assistance may be in the form of design and construction help for water-related environmental infrastructure and resource protection and development projects. These projects can include projects related to wastewater treatment, water supply, environmental restoration, and surface water resource protection and development. The project must be publicly owned. Project costs are shared with the Corps reimbursing 75 percent, and the non-Federal sponsor funding the remaining 25 percent (Attachment 3).

6.2.4 River Falls Stormwater Management

The city of River Falls, Wisconsin, identified a specific project for stormwater infrastructure improvement. This project is discussed in the Lake George Area Stormwater Treatment Concept Plan (River Falls, 2005). The major feature of this study was a reconfiguration plan that would route stormwater from River Falls into Lake George (a hydroelectric impoundment). Lake George would be modified to better facilitate stormwater treatment prior to entering the main flow of the Kinnickinnic River.

River Falls (2005) provides a comprehensive discussion of both the costs and benefits of the proposed plan. The estimated construction costs for this project were \$700,000 to \$1,300,000. This plan would facilitate improved stormwater management from sections of downtown River Falls. Aquatic benefits were quantified and would include improved wetland habitat within Lake George and improved stream habitat within the Kinnickinnic River.

The habitat benefits identified would probably not justify the estimated cost of the project. However, given the multiple benefits of improved stormwater management, reduced sediment and nutrient loading to the Kinnickinnic and St. Croix Rivers, and improved habitat, the overall plan may be supportable. However, an amendment to the Section 219 authority, referenced above, may be more appropriate for addressing the needs and benefits of this project. As such, the project will not be pursued as a part of this study.

6.3 NONINDIGENOUS SPECIES CONCERNS

Scoping identified strong concern with threats from nonindigenous species. These concerns were identified by the public, as well as through several documents for management by other Federal and State agencies. Some nonindigenous species have already been found within the basin, while others are relatively close to the basin and could invade in the very near future.

In general, the St. Paul District has had limited involvement with invasive species management. However, the District has been involved with zebra mussel issues on both the St. Croix and Mississippi Rivers. This involvement has included monitoring zebra mussel populations within these rivers as well as select tributaries. The impetus for this monitoring largely emanates from the April 2000 Biological Opinion for the Mississippi River 9-foot navigation channel. As a result, the District monitors zebra mussels on the St. Croix River. NPS, the MnDNR and WDNR also monitor zebra mussels in the basin. In addition to monitoring, the District is initiating a zebra mussel control feasibility study. This study will identify and investigate realistic alternatives, if any, to control zebra mussels within the St. Croix and Mississippi Rivers. This feasibility study was initiated in fiscal year 2006 and will probably take 3 years to complete. Results from this study will be applied to the St. Croix River and may be applicable to other locations within the St. Croix River basin.

Potential project ideas for nonindigenous species include invasive species monitoring, educational programs, water craft inspections, development of rapid response plans to new invasions, and use of mechanical equipment (such as a harvester) to remove milfoil from aquatic systems. While these ideas would greatly contribute to management of nonindigenous species, they are generally areas of limited Corps participation. Other agencies, such as the USFWS, USDA, and State DNRs have programs to specifically address many of these ideas. Admittedly, these programs are often underfunded. As a result, nonindigenous species concerns may not be addressed to the level they should be. The District also could potentially be involved with other control measures for nonindigenous species that include some type of construction project. However, no such type of construction project appears feasible at this time.

The District will consider incorporating nonindigenous species control or management within its proposed watershed studies. Although this would be limited to a planning exercise, it could include things such as baseline data collection and development of a rapid response plan, or similar documents, that help direct management activities.

Additional information on management of nonindigenous species is available at the following:

MnDNR Invasive Species Program

Jay Rendall, Coordinator: (651) 259-5131; jay.rendall@dnr.state.mn.us
http://www.dnr.state.mn.us/ecological_services/invasives/index.html

WDNR Invasive Species Program

Regional Aquatic Nuisance Species (ANS) Coordinators
Spooner: Kathy Bartilson, 715-635-4053, kathy.bartilson@dnr.state.wi.us
Eau Claire: Mark Endris, 715-839-1631, mark.endris@dnr.state.wi.us
<http://www.dnr.state.wi.us/invasives/>

USDA, National Invasive Species Information Center (NISIC)

National Agricultural Library
<http://www.invasivespeciesinfo.gov/>

USFWS

<http://www.fws.gov/contaminants/Issues/InvasiveSpecies.cfm>

6.4 BANKS/SHORELINE EROSION

Scoping identified strong concern with threats from streambank erosion, as well as erosion along lake shorelines. Streambank erosion is likely a problem at many sites throughout the basin. Much of the concern for lake shoreline erosion centered on Lake St. Croix, where bank and beach erosion has become increasingly problematic.

However, with a few specific exceptions, the District does not typically perform erosion protection/stabilization type projects. One exception is where bank stabilization has been

implemented as a direct part of a specific habitat restoration project. Although control of erosion is generally desirable, it usually needs to be a part of a defined, site-specific habitat restoration project. It may be possible to consider bank and shoreline erosion within the watershed studies proposed within this report. Sediment loading is an important issue facing tributaries and the St. Croix River, and bank erosion may be an important source for this loading. It is possible that erosion control could be included as an item for consideration within these watershed studies. Future projects to control bank erosion could emerge from these studies if such erosion is identified as a problem that can be feasibly addressed, and contributes toward improved habitat conditions. The decision of how to consider bank or shoreline erosion within future watershed studies would be made during the scoping process for those studies.

The District can also address streambank erosion under its Section 14 Program. Section 14 of the 1946 Flood Control Act, as amended, permits construction of bank protection works to protect endangered highways, highway bridge approaches and other essential, important public works, such as municipal water supply systems and sewage disposal plants; churches, hospitals, schools and other nonprofit public services; and known cultural sites that are endangered by flood-caused bank or shoreline erosion. Repair, restoration, and/or modification of the eroding streambank is allowed. Section 14 covers only protection of important and essential public facilities that serve the general public. Privately-owned riverfront and privately-owned facilities are not eligible for protection. Erosion protection is not eligible if the problem is caused by the design or operation of the facility itself or by inadequate drainage or lack of reasonable maintenance.

Each project constructed must be economically justified and the maximum Federal expenditure per project is \$1 million. If the cost exceeds the \$1 million Federal cost limit, the difference must be provided through non-Federal cash contribution. Studies are accomplished at full Federal expense up to \$40,000, with the remainder cost shared. Non-Federal interests must contribute a minimum of 35 percent of the project costs, of which at least 5 percent of the total cost must be in cash. Contact information for this program is listed in Attachment 3. No potential Section 14 projects were identified during this scoping process.

6.5 AQUATIC HABITAT/ECOSYSTEM RESTORATION

Scoping identified general interests for habitat restoration. Many of the interests were more conceptual in nature, with few site-specific requests provided. Two that were mentioned include the two fish passage projects discussed earlier. Other general interests provided were wetland restoration, as well as other habitat restoration that would assist in meeting the goals of reduced nutrient and sediment loading throughout the basin. Although no site-specific requests were provided, such efforts could evolve out of the future referenced watershed studies. These projects could be included under the current study, or be moved to a Section 206 or 1135 project within the Corps' CAP (Contact information for the CAP is listed in Attachment 3).

It should be noted that, during the scoping process, several references were made to using land acquisition and conservation easements to maintain or restore high priority habitat areas. Such action may be highly effective at protecting valuable habitat and may contribute toward

meeting goals for watershed management. However, Corps of Engineer policy states that proposals that consist primarily of land acquisition are not appropriate as Civil Works ecosystem investments. While exceptions do exist where land acquisition has been pursued, these have likely been special authorizations by Congress. Ultimately, projects that are largely based on land purchase are often better pursued by other Federal, State or local agencies.

Other studies for aquatic habitat restoration that have already been suggested within the St. Croix River basin include the Kinnickinnic Section 206 project, which includes cold-water stream habitat restoration within the Kinnickinnic watershed. This project has been formally submitted as a Section 206 project under the Corps' CAP. Because of the overwhelming number of projects that have been submitted for consideration, this project has not yet received funding. The District has also met with the WDNR to discuss cold-water stream restoration for several streams within Polk County, Wisconsin. However, given the current funding difficulties within CAP, no formal request has been submitted.

Another general habitat issue is the protection and restoration of riparian lake habitat. This issue was identified both by the public and the WDNR as a primary resource need for lakes within the basin. Restoration of this habitat would likely occur through working with lakefront property owners for voluntary management of riparian lake habitat or through implementing some type of lease or property purchase. These types of construction actions are outside typical Corps activities and would better be addressed by the State resource agencies. However, planning for riparian habitat restoration could be a consideration for future watershed studies.

6.6 FLOOD DAMAGE REDUCTION

As discussed above, large-scale flood damage reduction issues were not identified during this scoping process. It is possible that flood damage reduction issues could be brought forward during one of the proposed watershed studies. Such projects could be reconsidered at that point.

In addition, interested stakeholders also could pursue flood damage reduction through the Corps' Section 205 Program. Through the authority provided by Section 205 of the 1948 Flood Control Act, the St. Paul District can plan, design and construct small flood control projects that have not been specifically authorized by Congress. Under the Section 205 program, the first \$100,000 of project funds is provided at full (100 percent) Federal expense. Beyond that, study costs are shared at a 50-50 split, and construction costs are split 65 percent Federal and 35 percent non-Federal. Projects must be economically justified, and not cost more than \$7 million for Federal contributions (Contact information for this program is listed in Attachment 3).

7. FEDERAL INTEREST

7.1 GENERAL

Ecosystem restoration is a high priority mission for the Corps of Engineers, and a basin-wide approach to water resources management is Corps of Engineers policy. The Corps' objective in ecosystem restoration planning is to contribute to National Ecosystem Restoration (NER) by increasing the net quantity and/or quality of desired ecosystem resources (Engineer Regulation (ER) 1105-2-100). The objective of ecosystem restoration is to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition. Ecosystem restoration efforts will involve a comprehensive examination of the problems contributing to the system degradation and the development of alternative means for their solution (ER 1165-2-501). The intent of restoration is to partially or fully reestablish the attributes of a naturalistic, functioning, and self-regulating system.

7.2 BASIN-WIDE INTEGRATED WATERSHED ANALYSIS AND PLANNING FOR THE ST. CROIX RIVER BASIN

This reconnaissance study proposes an integrated watershed analysis and planning effort for future land and water resource activities across the entire St. Croix River basin. The study will identify general future goals and objectives for water resource management within the basin and identify what actions may be needed to meet those future goals and objectives. The study will develop tools that can be used to consider both structural and nonstructural measures that could be used to meet these objectives. These structural and nonstructural measures could potentially be considered by the St. Paul District as future projects or implemented by other Federal, State or local governments.

Corps regulations require a broad perspective in planning for civil works projects. ER 1105-2-100 (22 April 2000) states that:

Civil works planning should incorporate a watershed perspective, whether that planning involves a project feasibility study or a more comprehensive watershed study. Such planning should be accomplished within the context of an understanding and appreciation of the impacts of considered actions on other natural and human resources in the watershed. In carrying out planning activities, we should encourage the active participation of all interested groups and use of the full spectrum of technical disciplines in activities and decision-making. We also should take into account: the interconnectedness of water and land resources (a systems approach); the dynamic nature of the economy and the environment; and the variability of social interests over time. Specifically, civil works planning should consider the sustainability of future watershed resources, specifically taking into account environmental quality, economic development and social well-being.

Other Federal, State, and local groups contacted during this study strongly support development of an integrated analysis for watershed management, protection and restoration. They considered it an integral complement to their ongoing St. Croix River basin initiatives. The Corps of Engineers can be a central organization that ties together several common efforts and accomplishes these much needed planning efforts under one study. The integrated study will provide for informed implementation of structural and/or nonstructural management measures throughout the basin, along with a powerful tool to perform continued incremental analysis and refinement of future management actions. This type of action has strong support from other Federal, State and local agencies.

This watershed study will provide recommendations on how to protect and improve aquatic St. Croix River and tributary habitat; protect federally listed species and augment other Corps studies on federally listed species in the basin; and promote smart and sustainable urban development and agricultural practices. The study will work in concert with several other St. Croix River basin initiatives, including ongoing Corps studies, as well as efforts by other Federal, State and local agencies. It will also work to protect Federal interests associated with the St. Croix River National Wild and Scenic River designation.

The costs estimates for this effort are highly speculative and will be refined during development of the PMP. Ultimately, the goals and objectives will need to be clearly defined before the cost estimate can be revised. However, given the rough cost estimate of \$1.75 million, the St. Paul District believes that the insight and information collected on improved future land use and water resource management, and the resulting ecological, economical and social benefits of the proposed efforts exceed project costs. The proposed measures are technologically feasible, and they can be accomplished in a cost effective and efficient manner. Potential sponsors are able and willing to participate as non-Federal partners in cost-shared feasibility studies.

It should be noted that study objectives may need to be tailored to the financial capabilities of the project sponsors. While the likely sponsors are interested in joining a serious effort for detailed watershed planning, project outputs will need to be scaled appropriately to accomplish strong benefits while staying with the bounds of reason. We believe this can be done.

7.3 INTEGRATED WATERSHED ANALYSIS AND PLANNING FOR SUBBASINS WITHIN THE ST. CROIX RIVER BASIN

In addition to the basin-wide analysis discussed above, this reconnaissance study proposes an integrated watershed analysis and planning effort for future land and water resource activities across multiple subbasins of the St. Croix River basin. The study will identify more specific future goals and objectives for water resource management within the selected subbasin(s) and identify what actions may be needed to meet those future goals and objectives. The study will develop tools to evaluate both structural and nonstructural measures that could be used to meet these objectives. The St. Paul District could potentially consider these structural

and nonstructural measures as future projects or projects that could be implemented by other Federal, State or local governments.

The list of subbasins for consideration includes the Sunrise, Snake, Willow, Kinnickinnic, Apple and Upper St. Croix River subbasins. The reasons for electing these subbasins are described above. However, this list is not comprehensive, and additional studies could be added as new interests or resource needs emerge. Ultimately, the studies that would be initiated first would be driven both by resource need and identification of cost-share sponsors prepared to sign an FCSA.

This integrated study will provide for informed implementation of structural and/or nonstructural management measures throughout the indicated subbasins, along with powerful tools for incremental analysis and refinement of future management actions. It will help identify how the goals and priorities of these subbasins fit within the broader goals and objectives for the basin. It will also facilitate how best to meet those broad and specific needs of the basin. In fact, focusing on these strategic sub-basin areas will help the broader basin more easily reach its management goals. These subbasin studies have strong support from other Federal, State and local agencies, as well as special interest groups.

The cost estimates for these efforts are preliminary and will be refined during development of the PMP. Ultimately, the goals and objectives will need to be clearly defined before the cost estimate can be revised. However, given the rough cost estimate of \$750,000 per subwatershed study, the District believes that the insight and information collected on existing conditions, improved future land use and water resource management, and the resulting ecological benefits of the proposed efforts would exceed project costs for each study. The proposed measures are technologically feasible, and they can be accomplished in a cost effective and efficient manner. Potential sponsors are able and willing to participate as non-Federal partners in cost-shared feasibility studies.

It should be noted that study objectives may need to be tailored to the financial capabilities of the project sponsors. This tailoring may be especially important where the potential non-Federal sponsors for a subwatershed study are more limited compared to a study across the entire St. Croix River basin. While the likely sponsors are interested in joining a serious effort for detailed watershed planning, it is realized that project outputs will need to be scaled appropriately to accomplish strong benefits while staying within the bounds of reason.

7.4 CROSS LAKE DAM FISH PASSAGE

Federal interest in Cross Lake fish passage is based not only on the expected ecological benefits for both the Snake and St. Croix Rivers but also the safety benefits on-site. Significant benefits and no adverse environmental impacts are anticipated from the implementation of this action. The Snake River supports a diverse fishery, including lake sturgeon and probably over 15 migratory species. However, most of the Snake River is separated from the St. Croix River by Cross Lake Dam, which prevents fish movements between these two water bodies. Fish passage would provide access to about 91 miles of main stem Snake River habitat, as well as almost 900 miles of tributaries (MnDNR, pers. comm.). Species diversity above the Snake River dam also may be improved, as the Snake River above the dam has fewer total fish species than the lower St. Croix River. MnDNR, the owner of the dam, has provided a Letter of Intent to support the action. The estimated construction costs of \$225,000 are relatively low compared to other successful fish passage projects. Given the basic nature of project design, further planning costs should also remain relatively low. This preliminary analysis conducted during the reconnaissance phase indicates that the ecological and safety benefits of proposed actions would exceed project costs.

8. PRELIMINARY FINANCIAL ANALYSIS

Non-Federal sponsors will be required to provide 50 percent of the feasibility phase costs. Letters of intent from several potential sponsors are listed in Table 4 and are included as Attachment 1. The letters identify each sponsor’s willingness to pursue the feasibility study and to share in its cost.

Table 4. Organizations submitting letters of intent for identified projects.

Organization	Basin-wide Integrated Watershed Analysis for the SCRB	Integrated Watershed Analysis for sub-basins within the SCRB	Cross Lake Dam Fish Passage
Wisconsin Department of Natural Resources		X	
Minnesota Pollution Control Agency	X	X	
Chisago County, MN		X	
Washington County, MN		X	
Anoka County, MN		X	
Minnesota Department of Natural Resources			X

The integrated watershed analysis and planning would involve multiple State and local agencies as well as non-profit organizations that could contribute both cash and in-kind services. We anticipate that some of the non-Federal partners may enter into third-party agreements to support official study sponsors. Given the wide variety of potential funding partners, it appears funding

capacity will be sufficient to support the non-Federal cost share. Specific expectations will be developed in the PMP for the study.

9. SUMMARY OF FEASIBILITY STUDY ASSUMPTIONS

The following critical assumptions will provide a basis for the feasibility study:

1. One PMP and FCSA will be executed for a watershed study addressing basin-wide integrated watershed analysis and planning for the St. Croix River basin. The products of this integrated watershed analysis would provide the technical basis for decision-making for implementation of potential structural and/or nonstructural measures. Most of the nonstructural management measures could probably be implemented by the non-Federal sponsors or other Federal partners.

2. Multiple PMPs and FCSAs will be executed for watershed studies addressing integrated watershed analysis and planning for subbasins within the St. Croix River basin. It is likely that six subwatershed studies would be performed in the future. The products of these integrated watershed analyses would provide the technical basis for decision-making for implementation of potential structural and/or nonstructural measures. Most of the nonstructural management measures could probably be implemented by the non-Federal sponsors or other Federal partners.

3. A PMP and FCSA will be executed for a feasibility study for the Cross Lake Fish Passage project described in this report. The decision documents will be integrated feasibility reports and National Environmental Policy Act (NEPA) compliance documents prepared by the St. Paul District. The priorities and schedules of the proposed feasibility studies will be determined in consultation with the potential non-Federal sponsors during the development of the PMPs.

4. Identification of a Federal interest in additional water resources projects is likely during the course of the initial watershed studies. We anticipate that supplements to this 905(b) analysis may be required to support specific recommendations for additional feasibility studies in the future as non-Federal interest arises.

10. FEASIBILITY PHASE MILESTONES

The proposed integrated watershed analysis and planning effort for the entire basin is tentatively proposed to take about 3 years, subject to availability of funds. Given the size of the basin, the sensitivity and value of the resource, and the large number of stakeholders, it would appear such a study would take at least 2 to 3 years to produce an acceptable product. Conversely, the proposed subbasin watershed assessment feasibility studies would likely take at least 1 to 2 years, subject to availability of funds. The proposed Cross Lake Fish Passage feasibility study would probably need less than 1 year, subject to availability of funds. The potential non-Federal sponsors' fiscal years typically run from July 1 through June 30, and

current budgets have already been passed. Both Federal and non-Federal funding would need to be obtained before the studies could be initiated. The milestone schedules for all studies are shown in Figure 10 and Table 5. These schedules are generic as to starting date, but they identify the significant milestones.

Figure 10. Milestone Schedule for proposed watershed studies within the St. Croix River basin.

Schedule for Watershed Study of Entire SCRB		Year 1				Year 2				Year 3			
ID	Task Name	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	Start Project												
2	Initial Stakeholder Meetings												
3	Define Scope of Watershed Study												
4	Identify Desired Future Condition												
5	Initial Technical Team Meetings												
6	Identify Data Needs												
7	Collect Data												
8	Model Development												
9	Calibrate Model												
10	Identify Alternatives to Meet Desired Future Conditions												
11	Identify Future Scenarios for Analysis												
12	Simulate Future Conditions												
13	Coordinate Results with Stakeholders												
14	Prepare Draft Watershed Management Plan												
15	Review Draft Watershed Management Plan												
16	Revise Plan												
17	Deliver Final Watershed Management Plan and Corresponding Models												

Schedule for Watershed Studies of Select SCRB Sub-basins.		Year 1				Year 2				Year 3			
ID	Task Name	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	Start Project												
2	Initial Stakeholder Meetings												
3	Define Scope of Watershed Study												
4	Identify Desired Future Condition												
5	Initial Technical Team Meetings												
6	Identify Data Needs												
7	Collect Data												
8	Model Development												
9	Calibrate Model												
10	Identify Alternatives to Meet Desired Future Conditions												
11	Identify Future Scenarios for Analysis												
12	Simulate Future Conditions												
13	Coordinate Results with Stakeholders												
14	Prepare Draft Watershed Management Plan												
15	Review Draft Watershed Management Plan												
16	Revise Plan												
17	Deliver Final Watershed Management Plan and Corresponding Models												

Table 5. Cross Lake Dam Fish Passage feasibility milestone schedule.

Feasibility Phase Milestones	Month Completed
PHASE 1	
Notice of Intent/Notice of Initiation of Feasibility Study	Jan (year 1)
Public Scoping Meeting	Jan (year 1)
ITR Initial Meeting and Site Visit	May (year 1)
Field Investigations Complete	Jun (year 1)
In-Progress Review Meeting	Jun (year 1)
Alternative Designs Complete	Jun (year 1)
Select Recommended Plan	Jun (year 1)
ITR Review of Draft Alternative Formulation Report	Jul (year 1)
Alternative Formulation and Evaluation Complete	Aug (year 1)
Alternative Formulation Report Complete	Aug (year 1)
Conduct Alternative Formulation Briefing	Aug (year 1)
ITR Team Review AFB Issues and Conduct VE Study	Sep (year 1)
Complete Draft Feasibility Report (DFR) and Draft EA	Nov (year 1)
DFR and Draft EA Review/Comment/Revision	Dec (year 1)
Submit DFR and DEA to Division and HQ and Mail to Public	Dec (year 1)
Comment and Response Period	Jan (year 2)
Conduct Public Meeting	Jan (year 2)
Prepare Final Feasibility Report (FFR) and Final EA	Feb (year 2)
ITR Team Review Final Product	Mar (year 2)
Submit FFR and FEA to Division and HQ	Apr (year 2)
Division Commander's Transmittal Letter	May (year 2)
DE Report Summary	May (year 2)
HQ Policy Compliance Review	Jun (year 2)
District Presentation to CWRB	Jun (year 2)
Prepare Draft Chief's Report	Jul (year 2)
Review of Chief's Report	Jul (year 2)
Sign Chiefs Report	Sep (year 2)

11. FEASIBILITY PHASE COST ESTIMATE

The estimated feasibility phase costs are shown in Tables 6a, 6b, and 6c. These costs are based on initial cost estimates for feasibility study tasks including planning, public involvement, environmental assessment, engineering surveys and design, study management, and plan formulation. Detailed cost estimates will be developed in consultation with cost-share sponsors in developing the PMPs and FCSAs with the non-Federal partners.

Table 6a. Integrated watershed analysis and planning for the SCRB

	Activity	Cost (1,000s)
1	Planning and Project Management	\$200
2	Identification of Study Goals and Objectives	\$250
3	Coordination	\$75
4	Public Involvement	\$25
5	Model(s) Development and Calibration	\$750
6	Baseline Data Collection	\$100
7	Future Scenario Formulation and Analysis	\$200
8	Report Preparation	\$100
9	Contract Administration	\$50
	TOTAL	\$1,750

Table 6b. Integrated watershed analysis and planning for subbasins within the SCRB

	Activity	Cost (1,000s)
1	Planning and Project Management	\$85
2	Identification of Study Goals and Objectives	\$50
3	Coordination	\$40
4	Public Involvement	\$10
5	Model(s) Development and Calibration	\$350
6	Baseline Data Collection	\$50
7	Future Scenario Formulation and Analysis	\$40
8	Wetland Mitigation Planning Report Preparation	\$75
9	Watershed Management Report Preparation	\$40
10	Contract Administration	\$10
	TOTAL	\$750

Table 6c. Cross Lake Dam Fish Passage

	Activity	Cost (1,000s)
1	Planning and Project Management	\$75
2	Coordination	\$5
3	Public Involvement	\$5
4	Baseline Data Collection	\$10
5	H&H Modeling	\$50
6	Designs and Cost Estimates	\$25
7	Real Estate Studies	\$10
8	DFR Preparation	\$25
9	ITR	\$15
10	Contract Administration	\$5
	TOTAL	\$225

Assumptions:

1. All costs are in thousands of dollars.
2. This estimate includes substantial in-kind services from several non-Federal partners in addition to cash contributions.
3. Work by other Federal agencies would be included in this estimate. Assume that the Corps of Engineers would obtain funding and distribute it to other Federal agencies as needed to support the study.

12. POTENTIAL ISSUES AFFECTING INITIATION OF FEASIBILITY PHASE

This 905(b) report includes Letters of Intent for project sponsorship. The St. Paul District is assuming that the potential sponsors will continue to demonstrate a willingness and capability to fulfill their commitments under the potential FCSAs. It is not anticipated that the sponsors will indicate any issues that would preclude their signing FCSAs. Upon signing of this 905(b) report, the District will enter into discussions with prospective sponsors to determine the most advantageous approach for budgeting and scheduling purposes. More detailed discussions will continue during the development of the PMPs.

It must be noted that the integrated watershed analysis and planning, both for the St. Croix River basin and select subbasins, promises to be a complicated interagency effort. Significant coordination will be required in the remaining reconnaissance phase to draft an acceptable project management plan and develop cost-sharing arrangements. This coordination will need to be aligned with the available funding and budget cycles of both the Federal Government and cost-sharing sponsors.

13. VIEWS OF OTHER RESOURCE AGENCIES

The St. Croix River Basin Reconnaissance Study included extensive coordination with local, State, and Federal agencies throughout the basin. The implementation of a comprehensive watershed-based approach to water resource management in the St. Croix River basin has received strong widespread support, which will be evidenced upon receipt of the anticipated letters of intent and letters of support from sponsors. No agency opposition has been raised to any of the proposed studies.

14. RECOMMENDATIONS

We recommend that this 905(b) analysis report be approved as a basis for proceeding with the following studies in the St. Croix River basin:

1. Integrated watershed analysis and planning for the entire St. Croix River basin.
2. Integrated watershed analysis and detailed planning for the following St. Croix Basin subwatersheds:
 - Sunrise River (Minnesota)
 - Snake River (Minnesota)
 - Kinnickinnic River (Wisconsin)
 - Willow River (Wisconsin)
 - Apple River (Wisconsin)
 - Upper St. Croix River (Wisconsin)
3. Cross Lake Dam Fish Passage.

The integrated watershed analysis, at both the basin and subbasin levels, would facilitate better watershed management and identify specific opportunities for the St. Paul District and other stakeholders. The study would integrate the efforts of a wide range of agencies currently working independently, leading to more cost-effective use of existing government programs.

The Cross Lake Dam Fish Passage study would lead to restored connectivity between the St. Croix and Snake Rivers. Reconnecting this ecosystem would benefit several species of native fish and improve safety conditions at the dam.

Remaining tasks in the reconnaissance phase include developing PMPs and finalizing FCSAs with the non-Federal sponsors. The feasibility phase of the studies would begin under the authority of the General Investigations program upon execution of cost sharing agreements and receipt of Federal and non-Federal funds.

We also recommend that this report serve as the basis for future reconnaissance studies not specifically described herein. Supplemental 905(b) analyses would be developed, as appropriate, as additional opportunities arise.

There are sufficient indications that cost-effective solutions to watershed management in the St. Croix River basin can be formulated that will result in appropriate environmental outputs for the identified project costs. These potential solutions are consistent with Army and budgetary policies, and the projects meet criteria for Federal participation in project implementation.


COL
MICHAEL F. PFENNING
COL, EN
Commander

15. REFERENCES

CMMP. 1996. Channel Maintenance Management Plan for the 9-Foot Navigation Project. Corps of Engineers, St. Paul District. St. Paul, Minnesota.

Fago and Hatch. 1993. Aquatic Resources of the St. Croix River Basin, *as printed in*, Proceedings of the Symposium on Restoration Planning for the Rivers of the Mississippi River Ecosystem. Biological Report 19, October 1993. U.S. Department of Interior, National Biological Survey.

McMahon, E. M. and T. J. Karamanski. 2002. Time and the River - A History of the Saint Croix. A Historic Resource Study of the Saint Croix National Scenic Riverway. Midwest Regional Office, National Park Service. United States Department of the Interior. Omaha, Nebraska.

National Park Service. April 1997. Water Resources Management Plan for the St. Croix National Scenic River Way. Volumes I and II.

National Park Service. 2000. Final Cooperative Management Plan Environmental Impact Statement, Lower St. Croix National Scenic Riverway.

Niemela, S.; D. Christopherson; J. Genet; J. Chirhart; and M. Feist. July 2005. A Comprehensive Assessment of Rivers and Streams in the St. Croix River Basin Using a Random Site-Selection Process. Minnesota Pollution Control Agency, Environmental Bulletin No. 6.

Omernik, J.M. and A.L. Gallant. 1988. Ecoregions of the Upper Midwest States. U.S. Environmental Protection Agency. EPA/600/3-88/037. U.S. EPA, Environmental Research Laboratory, Corvallis, OR. 56p.

River Falls. April 2005. Lake George Area Stormwater Treatment Concept Plan. City of River Falls, Wisconsin.

St. Croix Basin Team. August 2004. St Croix Basin Phosphorus-Based Water-Quality Goals. Report recommended Water-Quality Goals of the St. Croix Basin Water Resources Planning Team and the Proceedings of the 5th Annual Conference "Protecting the St. Croix: Reducing and Managing Nutrients and Sediments. Partnered by the Minnesota Department of Natural Resources, Minnesota Pollution Control Agency, Wisconsin Department of Natural Resources, and St. Croix National Scenic Riverway – National Park Service.

Triplett, L. D.; M. B. Edlund and D. R. Engstrom. September 2003. A Whole-Basin Reconstruction of Sediment and Phosphorus Loading to Lake St. Croix. St. Croix Watershed Research Station, Science Museum of Minnesota. Marine on St. Croix, Minnesota.

Wisconsin DNR. March 2002. The State of the St. Croix Basin. Wisconsin Department of Natural Resources, Publication WT-555-2002.

USGS. January 2003. Nutrient and Suspended-Sediment Concentrations and Loads, and Benthic-Invertebrate Data for Tributaries to the St. Croix River, Wisconsin and Minnesota, 1997-1999. U.S. Geological Survey. Water-Resources Investigations Report 01-4162.

**ATTACHMENT 1
SPONSOR LETTERS OF INTENT**

Agency	Basin-Wide Integrated Watershed Analysis and Planning for the SCRB	Integrated Watershed Analysis and Planning for Subbasins within the SCRB	Cross Lake Dam Fish Passage
Wisconsin Department of Natural Resources		X	
Minnesota Pollution Control Agency	X	X	
Chisago County, MN		X	
Anoka Conservation District, MN		X	
Washington County, MN		X	
Minnesota Department of Natural Resources			X



Minnesota Pollution Control Agency

520 Lafayette Road North | St. Paul, MN 55155-4194 | 651-296-6300 | 800-657-3864 651-282-5332 TTY www.pca.state.mn

November 11, 2006

Colonel Michael F. Pfenning
District Engineer
U.S. Army Engineer District, St. Paul
190 Fifth Street East
St. Paul, MN 55101-1638

Dear Colonel Pfenning:

The Minnesota Pollution Control Agency (MPCA) has reviewed the draft St. Croix River Watershed 905(b) Reconnaissance Report which identifies opportunities to address watershed planning and other water resource issues in the St. Croix Basin. The MPCA wishes to express its interest and willingness to assist and participate with non-federal sponsors in United States Army Corps of Engineers' (USACE) Feasibility Phase Studies. Notably, the Reconnaissance Report focuses on Integrated Watershed Analysis and Studies for the entire St. Croix Basin and the Sunrise River and Snake River sub-watersheds.

We understand that study costs will be shared between the USACE and the non-federal sponsors on a 50/50 basis, and all or part of the non-federal cost-share can be provided as cash or in-kind services. We also understand that the exact scope of such a study will be developed in future discussions; however, the proposed emphasis on watershed planning will be important in addressing the 20 percent phosphorus reduction target for St. Croix Lake, which was the subject of a recent nutrient reduction agreement between the MPCA and the Wisconsin Department of Natural Resources. Integrated watershed analysis and planning for the Sunrise River and Snake River subwatersheds will also be important in addressing the priority concerns identified in the local water plans of counties, watershed districts and other watershed management organizations in the St. Croix Basin. The MPCA has established working relationships with many jurisdictions in these areas, often aided by state grant and loan funding. We actively seek new opportunities to form partnerships with local, state and federal agencies working to meet the water resource management needs in this rapidly changing watershed.

We understand that the USACE will initiate studies when funds are appropriated by Congress and allocated to the St. Paul District, a Feasibility Cost Sharing Agreement has been executed between the USACE and the local sponsor, and any initially required sponsor contributions have been provided. We also understand that this letter constitutes an expression of intent and does not represent either a financial or contractual obligation on the part of the State of Minnesota or the federal government.

We look forward to future opportunities to work with the USACE and local units to protect and enhance the water resources of the St. Croix.

Sincerely


Gaylen F. Reetz
Regional Division Manager

GFR/CA:bao

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State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
John Gozdzialski, Regional Director

Northern Region Headquarters
810 W. Maple Street
Spooner, Wisconsin 54801
Telephone 715-635-2101
FAX 715-635-4105
TTY Access via relay - 711

October 19, 2006

Colonel Michael F. Pfenning
District Engineer
U.S. Army Engineer District, St. Paul
190 Fifth Street East
St. Paul, MN 55101-1638

Dear Colonel Pfenning:

The Wisconsin Department of Natural Resources has reviewed the draft St. Croix River 905(b) Reconnaissance Report and is interested in participating as a non-federal sponsor in a United States Army Corps of Engineers' (COE) Feasibility Phase Study (Study) focusing on Integrated Watershed Analysis and Study for select St. Croix Subbasins.

State, local, and federal resource agencies in Wisconsin and Minnesota, as part of the St. Croix Basin Water Resources Planning Team, have set a goal of a 20% reduction in nutrient loading throughout the entire basin, and signed a Nutrient Reduction Agreement in April, 2006 to implement this goal. The proposed study emphasis on watershed planning, including consideration of nutrient loading issues, will be important to assist the St. Croix River Basin Community in this effort. These studies appear especially important for future management of the St. Croix River watersheds. We are most concerned on completing these planning activities in the Willow River, Apple River and Kinnickinnic River watersheds. There are local units of government that are also very active and interested in helping with this monitoring and planning project.

We understand that the Study costs will be shared between the COE and non-federal sponsors on a 50/50 basis, and all or part of the non-federal cost-share can be provided as cash or in-kind services. We feel it is important to take the next step to scope out the project objectives, costs, and other details. We understand that the exact scope of the study content and geographic extent will need to be discussed.

We further understand that the COE will initiate the Study when funds are appropriated by the Congress and allocated to the St. Paul District. We also understand that this letter constitutes an expression of intent and does not represent either a financial or contractual obligation on the part of the sponsor or the federal government.

Signed

Robert Baczynski
Lower St. Croix Basin Watershed Supervisor

dnr.wi.gov
wisconsin.gov

*Quality Natural Resources Management
Through Excellent Customer Service*





State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
John Gozdzialski, Regional Director

Northern Region Headquarters
810 W. Maple Street
Spooner, Wisconsin 54801
Telephone 715-635-2101
FAX 715-635-4105
TTY Access via relay - 711

October 3, 2006

Colonel Michael F. Pfenning
District Engineer
U.S. Army Engineer District, St. Paul
190 Fifth Street East
St. Paul, MN 55101-1638

Dear Colonel Pfenning:

The Wisconsin Department of Natural Resources has reviewed the draft St. Croix River 905(b) Reconnaissance Report and is interested in participating as a non-federal sponsor in a United States Army Corps of Engineers' (COE) Feasibility Phase Study (Study) focusing on Integrated Watershed Analysis and Study for the Upper St. Croix Subbasin.

State, local, and federal resource agencies in Wisconsin and Minnesota, as part of the St. Croix Basin Water Resources Planning Team, have set a goal of a 20% reduction in nutrient loading throughout the entire basin, and signed a Nutrient Reduction Agreement in April, 2006 to implement this goal. The proposed study emphasis on watershed planning, including consideration of nutrient loading issues, will be important to assist the St. Croix River Basin Community in this effort. This study appears especially important for future management of the St. Croix River headwaters. There are local organizations that are also very active and interested in helping with this monitoring and planning project.

We understand that the Study costs will be shared between the COE and non-federal sponsors on a 50/50 basis, and all or part of the non-federal cost-share can be provided as cash or in-kind services. We feel it is important to take the next step to scope out the project objectives, costs, and other details. We understand that the exact scope of the study content and geographic extent will need to be discussed.

We further understand that the COE will initiate the Study when funds are appropriated by the Congress and allocated to the St. Paul District. We also understand that this letter constitutes an expression of intent and does not represent either a financial or contractual obligation on the part of the sponsor or the federal government.

Sincerely,

Kathy Bartilson
St. Croix Basin Watershed Supervisor



Anoka Conservation District
16015 Central Ave NE Suite 103
Ham Lake, Minnesota 55304
Ph: 763-434-2030 Fx: 763-434-2094
www.AnokaSWCD.org

pal *7c*

September 18, 2006

Colonel Michael Pfenning, District Engineer
US Army Engineer District, St. Paul
190 Fifth Street East
St. Paul, MN 55101-1638

Dear Colonel Pfenning,

Anoka Conservation District staff have been briefed about the St. Croix River 905(b) Reconnaissance Study. We are supportive of a US Army Corps of Engineers (US ACOE) Feasibility Studies on the St. Croix watershed, particularly the Sunrise River sub-watershed. We would be interested in participating as a non-federal cost share partner in the Integrated Watershed Analysis and Study for the Sunrise River Sub-basin, and the larger-scale Basin-Wide Integrated Watershed Analysis and Planning for the St. Croix River Basin (though the only portions of that watershed within our jurisdictional area are the Sunrise River watershed).

We recognize that the Sunrise River is a significant source of nutrients and sediments to the St. Croix River, and believe the work you are considering would be beneficial to both waterways. While the Anoka County portion of the Sunrise River watershed is relatively small, we suspect that our portion of the watershed is a significant contributor to downstream problems, but its magnitude relative to pollutant sources elsewhere in the watershed is unknown. A US ACOE feasibility study, paired with our past and coinciding work, would effectively facilitate watershed management across municipal boundaries.

If you pursue this project, we would like to provide input as you prepare a Project Management Plan (PMP). Our involvement at that early phase will ensure your work builds upon work we have already done in our small part of the watershed. It will also ensure that our agency can adjust our own resources to best contribute to your study, as our contributions to a US ACOE study would be entirely work-in-kind.

We do understand that the US ACOE will only initiate this study when funds are appropriated by Congress and allocated to the St. Paul District, a Feasibility Cost Sharing Agreement has been executed, and any initially required sponsor contribution has been provided. We also understand that this letter constitutes an expression of support and intent to participate, but does not represent either financial or contractual obligation on the part of the Anoka Conservation District or the federal government.

Respectfully,

A handwritten signature in black ink, appearing to read "Kim Kovich", written over a horizontal line.

Kim Kovich, Chair
Anoka Conservation District Board of Supervisors



COUNTY OF CHISAGO

BOARD OF COMMISSIONERS

Chisago County Government Center
313 North Main Street, Room 172
Center City, MN 55012-9663

Phone: 651-213-8830 • FAX: 651-213-8876

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District 5
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John Moosey
County Administrator

August 24, 2006

Colonel Michael F. Pfenning
District Engineer
U.S. Army Engineer District, St. Paul
190 Fifth Street East
St. Paul, MN 55101-1638

Dear Colonel Pfenning:

Chisago County has reviewed the draft St. Croix River 905(b) Reconnaissance Report and is interested in participating as a non-federal sponsor in a United States Army Corps of Engineers' (COE) Feasibility Phase Study (Study) focusing on Integrated Watershed Analysis and Study for the Sunrise River Sub-basin.

We understand that the Study costs will be shared between the COE and the non-federal sponsor on a 50/50 basis, and all or part of the non-federal cost-share can be provided as cash or in-kind services. We also understand that more than one non-federal sponsor can be involved. We understand that the exact scope of the study will need to be discussed. However, the proposed study emphasis on watershed planning, including consideration of nutrient loading issues, will be important to assist Chisago County in addressing the priority concerns adopted as part of the County's Water Plan, particularly the 20% phosphorus loading reduction goal. Such a study appears especially important in light of future population growth and potential development.

We understand that the COE will initiate the Study when funds are appropriated by Congress and allocated to the St. Paul District, a Feasibility Cost Sharing Agreement has been executed between the COE and the sponsor, and any initially required sponsor contribution has been provided. We also understand that this letter constitutes an expression of intent and does not represent either a financial or contractual obligation on the part of the sponsor or the federal government.

Sincerely,

Mike Robinson, Chair
Chisago County Board of Commissioners

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PM *tlc*

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District 3

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District 4

R.H. Stafford
District 5

September 26, 2006

Colonel Michael F. Pfenning
District Engineer
U.S. Army Engineer District, St. Paul
190 Fifth Street East
St. Paul, MN 55101-1638

RE: United States Army Corps of Engineers' Feasibility Phase Study

Dear Colonel Pfenning:

Washington County has reviewed the draft St. Croix River 905(b) Reconnaissance Report and is interested in participating as a non-federal sponsor in a United States Army Corps of Engineers' (COE) Feasibility Phase Study (Study) focusing on Integrated Watershed Analysis and Study for the Sunrise River Sub-basin. Washington County strongly supports protection of water resources and works closely with numerous organizations on water resource projects.

Washington County understands that the Study costs will be shared between the COE and the non-federal sponsor on a 50/50 basis, and all or part of the non-federal cost-share can be provided as cash or in-kind services. The county understands that more than one non-federal sponsor can be involved. The county recognizes that the next step is to scope out the project objectives, costs, and other details and the exact scope of the study will need to be discussed. The proposed study has an emphasis on watershed planning and nutrient loading issues which are important components in evaluating and solving water quality problems. Such a study appears especially important in light of future population growth and potential development.

Washington County understands that the COE will initiate the Study when funds are appropriated by Congress and allocated to the St. Paul District, a Feasibility Cost Sharing Agreement has been executed between the COE and the sponsor, and any initially required sponsor contribution has been provided. This letter constitutes an expression of intent and does not represent either a financial or contractual obligation on the part of the sponsor or the federal government.

Washington County strongly supports the U.S. Army Corp of Engineer's efforts in protecting and improving water quality in the Sunrise River Watershed and in the entire St. Croix River Basin. If you need additional information or have any questions please contact Amanda Goebel at 651-430-6744 or via email at amanda.goebel@co.washington.mn.us.

Government Center • 14949 62nd Street North — P.O. Box 6, Stillwater, Minnesota 55082-0006
Phone: 651-430-6001 • Fax: 651-439-6017 • TTY: 651-430-6246
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Sincerely,



Bill Pulkrabek, Chair
Washington County Board of Commissioners

- CC: Washington County Board of Commissioners
Jim Schug, County Administrator, Department of Administration
Lowell Johnson, Director, Department of Public Health & Environment
Cindy Weckwerth, Program Manager, Department of Public Health & Environment
Amanda Goebel, Senior Environmental Specialist, Department of Public Health & Environment
John Freitag, Senior Environmental Specialist, Department of Public Health & Environment
Tom Lynch, Board Chair, Comfort Lake Forest Lake Watershed District



Minnesota Department of Natural Resources
Section of Fisheries

1200 Warner Road
St. Paul, Minnesota 55106
Telephone: 651-772-7950

January 8, 2007

Colonel Michael F. Pfenning
District Engineer
U.S. Army Engineer District, St. Paul
190 Fifth Street East
St. Paul, MN 55101-1638

Dear Colonel Pfenning:

The Minnesota Department of Natural Resources has reviewed the draft St. Croix River 905(b) Reconnaissance Report and is interested in participating as a non-federal sponsor in a United States Army Corps of Engineers' (COE) Feasibility Phase Study (Study) focusing on Fish Passage at Cross Lake Dam on the Snake River.

We understand that the Study costs will be shared between the COE and the non-federal sponsor on a 50/50 basis, and all or part of the non-federal cost-share can be provided as cash or in-kind services. We feel it is important to take the next step to scope out the project objectives, costs, and other details. We understand that the exact scope of study content and geographic extent will need to be discussed. However, we believe such a project is a valuable contribution to restoring fisheries habitat on the Snake River, as well as improving safety conditions at the Cross Lake Dam.

We understand that the COE will initiate the Study when funds are appropriated by the Congress and allocated to the St. Paul District, a Feasibility Cost Sharing Agreement has been executed between the COE and the sponsor, and any initially required sponsor contribution has been provided. We also understand that this letter constitutes an expression of intent and does not represent either a financial or contractual obligation on the part of the Minnesota DNR or the federal government.

Sincerely,

A handwritten signature in cursive script that reads "Dirk Peterson".

Dirk Peterson
Central Region Fisheries Manager
dirk.peterson@dnr.state.mn.us

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ATTACHMENT 2

AGENCIES AND GROUPS EXPRESSING INTEREST AND SUPPORT

During scoping for this report, several Federal, State and local agencies, as well as other groups, expressed interest and support through formal and informal correspondence. The list below includes many of the groups that have expressed support and interest in the study. Additional groups also will likely surface to participate, especially when detailed scoping begins for the referenced watershed studies. Some of the groups listed below also have provided Letters of Intent for project sponsorship.

- Minnesota Pollution Control Agency
- Minnesota Department of Natural Resources
- Wisconsin Department of Natural Resources
- Anoka County, Minnesota
- Chisago County, Minnesota
- Isanti County, Minnesota
- Washington County, Minnesota
- Washington Conservation District (Minnesota)
- St. Croix County, Wisconsin
- Burnett County, Wisconsin
- Metropolitan Council for the Twin Cities
- St. Croix Basin Water Resources Planning Team
- Comfort Lake/Forest Lake Watershed District (Minnesota)
- Upper St. Croix Watershed Alliance
- West Wisconsin Land Trust
- Friends of the St. Croix Headwaters
- Cross Lake Snake River Association
- University of Wisconsin - Stevens Point Center for Science and Education
- St. Croix Watershed Research Station
- U.S. Geological Survey
- National Park Service, St. Croix Scenic Riverway
- U.S. Fish and Wildlife Service

ATTACHMENT 3

Points of Contact for Alternative Corps Programs

Section 219 – Nationwide Assistance

St. Paul District Point of Contact: Roland Hamborg; 651-290-5327;
Roland.O.Hamborg@usace.army.mil

**Section 569 – Environmental Infrastructure Assistance,
Northeast Minnesota**

St. Paul District Point of Contact: Roland Hamborg; 651-290-5327;
Roland.O.Hamborg@usace.army.mil

**Section 154 – Environmental Infrastructure Assistance,
Northern Wisconsin**

St. Paul District Point of Contact: Roland Hamborg; 651-290-5327;
Roland.O.Hamborg@usace.army.mil

Section 14 – Emergency Bank Protection

St. Paul District Point of Contact: Joe Mose; 651-290-5567; Joseph.H.Mose@usace.army.mil

Section 206 – Aquatic Ecosystem Restoration

St. Paul District Point of Contact: Joe Mose; 651-290-5567; Joseph.H.Mose@usace.army.mil

Section 1135 – Habitat Restoration

St. Paul District Point of Contact: Joe Mose; 651-290-5567; Joseph.H.Mose@usace.army.mil

Section 205 – Small Flood Control Projects

St. Paul District Point of Contact: Joe Mose; 651-290-5567; Joseph.H.Mose@usace.army.mil

Section 22 – Planning Assistance to States

St. Paul District Point of Contact: Terry Zien; 651-290-5714; Terry.R.Zien@usace.army.mil

Attachment 4: St. Croix Basin Map with Additional County and Municipal Locations.

