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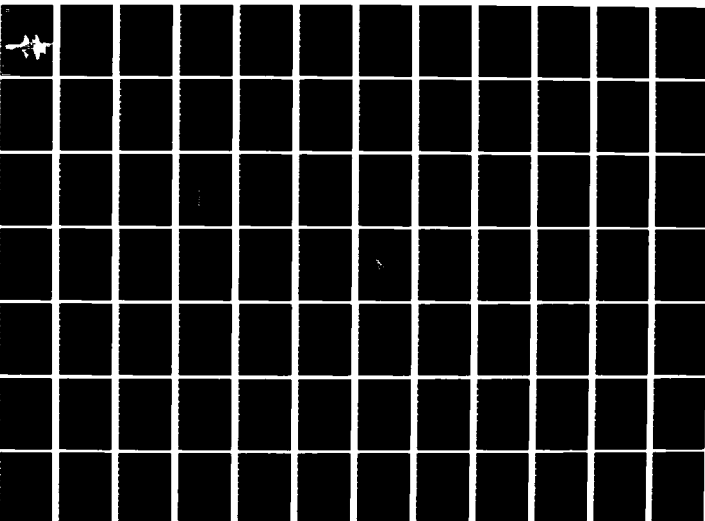
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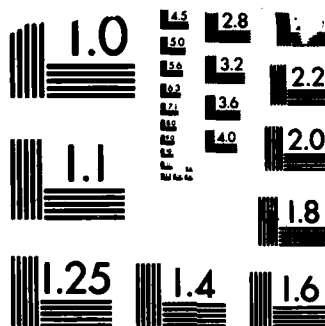
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ST. CROIX RIVER RECONNAISSANCE REPORT



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report presents an updated evaluation of flood problems and needs in the St. Croix River Basin, and changes that have occurred since suspension of the Corps of Engineers' study in 1968. Thirty-eight communities in the St. Croix River basin experience flood problems. These communities were screened and grouped into eight geographic areas: Lake St. Croix communities, including Stillwater, Minnesota; Snake River at Mora and Pine City, Minnesota; Willow River at New Richmond, Wisconsin; Upper		

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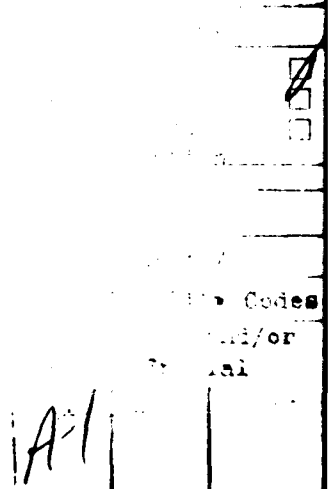
and Lower Clam Lakes in Wisconsin; Trade Lake in Wisconsin; Gilmore Lake and Rice Lake on the Totagatic River in Wisconsin; Big Marine and Big and Little Carnelian Lakes in Minnesota; and the Chisago Chain of Lakes in Minnesota.

It was determined that the flood problems at the Lake St. Croix communities of Bayport; Lake St. Croix Beach; Afton; Prescott; Chisago Chain of Lakes; Upper and Lower Clam Lakes; and Trade Lake could best be addressed under the continuing authorities program, which includes flood control projects with a Federal cost of less than \$5 million, or under the floodplain information program.

Flood reduction measures for Stillwater, Minnesota and New Richmond, Wisconsin include structural and nonstructural solutions. Nonstructural measures include flood proofing, temporary or permanent evacuation, floodplain zoning, flood forecasting and warning, a flood emergency plan, building codes, a development policy, and flood insurance. Structural measures include dams and reservoirs, diversions, channel modification, levees and floodwalls, and lake outlet controls.

The communities of Pine City and Mora on the Snake River, and Big Marine and Big and Little Carnelian Lakes are not interested in assistance from the Corps of Engineers at this time.

ST. CROIX RIVER STUDY



January 1984

FEB 27 1984



**RECONNAISSANCE REPORT
ST. CROIX RIVER STUDY**

SYLLABUS

This reconnaissance report presents an updated evaluation of flood problems and needs in the St. Croix River basin. It considers changes in conditions that have occurred since suspension of the Corps of Engineers study in 1968.

Thirty-eight communities in the St. Croix River basin experience flood problems. With the assistance of State and local governments, these communities were screened and grouped into eight geographic areas for further evaluation. These flood-prone areas are:

- o Lake St. Croix communities, including Stillwater, Minnesota.
- o Snake River at Mora and Pine City, Minnesota.
- o Willow River at New Richmond, Wisconsin.
- o Upper and Lower Clam Lakes in Wisconsin.
- o Trade Lake on the Trade River in Wisconsin.
- o Gilmore Lake and Rice Lake on the Totagatic River in Wisconsin.
- o Big Marine and Big and Little Carnelian Lakes in Minnesota.
- o Chisago Chain of Lakes in Minnesota.

After a preliminary evaluation of these areas, the Corps of Engineers has determined that the flood problems at the Lake St. Croix communities of Bayport, Lake St. Croix Beach, Afton, and Prescott; Chisago Chain of Lakes; Upper and Lower Clam Lakes; and Trade Lake could best be addressed under the continuing authorities program, which includes flood control projects with a Federal cost of less than \$5 million, or under the floodplain information program.

The communities of Pine City and Mora, Minnesota, on the Snake River and Big Marine and Big and Little Carnelian Lakes of Minnesota are not interested in assistance from the Corps of Engineers at this time.

The communities of Stillwater, Minnesota, and New Richmond, Wisconsin, will be considered further in this study. Measures identified for additional study to reduce flood damages at Stillwater and New Richmond include structural and nonstructural solutions. Nonstructural measures include flood proofing, temporary or permanent evacuation, floodplain zoning, flood forecasting and warning, a flood emergency plan, building codes, a development policy, and flood insurance. Structural measures include dams and reservoirs, diversions, channel modification, levees and floodwalls, and lake outlet controls.

For Stillwater and New Richmond, the report recommends consideration of nonstructural measures plus the following structural measures for specific areas:

- o Stillwater, Minnesota, could consider local levees and floodwalls.
- o New Richmond, Wisconsin, could consider diversion, dam modification, channel modification, and levees and floodwalls.

**RECONNAISSANCE REPORT
ST. CROIX RIVER STUDY**

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RECONNAISSANCE REPORT
ST. CROIX RIVER STUDY

INTRODUCTION

This reconnaissance report has three sections. The first section discusses the overall St. Croix River basin study. The second and third sections focus specifically on the communities of Stillwater, Minnesota, and New Richmond, Wisconsin, respectively. These two areas are discussed separately because they will be studied further under the St. Croix River basin study authority while all other areas discussed in this report will be studied under other study authorities. Therefore, the organization of this report provides background data on the overall basin study to help evaluate continuing studies at Stillwater, Minnesota, and New Richmond, Wisconsin.

ST. CROIX RIVER BASIN STUDY

STUDY AUTHORITY

The St. Paul District, Corps of Engineers, conducted this study under authorities given in the following congressional committee resolutions:

- o A resolution of the House Committee on Public Works adopted July 10, 1968, requesting a review of reports on the St. Croix River, reads as follows:

"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports of the Chief of Engineers on the St. Croix River, printed as House Document No. 462, 71st Congress, 2d Session, and other pertinent reports with a view to determining whether flood control improvements along the lower St. Croix River are advisable at this time."

- o A resolution of the House Committee on Public Works adopted March 16, 1954, requesting a review of reports on the St. Croix River and several of its tributaries, reads as follows:

"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the St. Croix River, Wisconsin, and Minnesota, submitted in House Document No. 462, 71st Congress, 2d Session, and other reports with a view to determining whether improvements for flood control

and allied purposes are advisable at this time on the following tributaries: Totogatic River, Namekagon River, Yellow River, Clam River, Wood River, Trade River, Apple River, Tamarack River, and others."

- o Authority for a study at Pine City, Minnesota, on the Snake River, a tributary of the St. Croix River, is contained in resolutions of the Senate Committee on Public Works, adopted February 10, 1950, and the House Committee on Public Works, adopted February 17, 1950. These resolutions request a review of reports on the St. Croix River to determine the advisability of providing improvements for flood control and related water uses on the Snake River at and in the vicinity of Pine City. No funds have been allocated for the Pine City study. The Pine City study has been combined with the St. Croix River basin study.
- o A resolution of the House Committee on Flood Control adopted September 18, 1944, requesting a review of the reports on the Mississippi River, reads as follows:

"Resolved, by the Committee on Flood Control, House of Representatives, that the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act approved June 13, 1902, be, and is hereby, requested to review the report on the Mississippi River between Coon Rapids Dam, Minnesota, and the mouth of the Ohio River, submitted in House Document No. 669, Seventy-sixth Congress, third session, with a view to determining the advisability of providing additional flood protection along the Mississippi River above the mouth of the Missouri River."

The authority in this resolution is considered sufficiently broad to include reservoirs on Mississippi River tributaries such as the St. Croix River and to permit preparation of an interim report on the detailed study recommended in this reconnaissance report.

OBJECTIVES

National Objective

The Water Resources Council Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies, effective March 10, 1983, established rules in accordance with the Water Resource Planning Act of 1965. These rules provide that all federally-assisted water resource projects be planned to achieve the following national objective:

- o Contribute to national economic development consistent with protecting the Nation's environment pursuant to national environmental statutes.

Water and related land resources plans are to be formulated to alleviate flood problems and to take advantage of opportunities that occur at the national, regional, State, and local levels in ways that contribute to this objective.

Planning Objective

- o Reduce flood damages in the St. Croix River basin with emphasis along the main stem and tributaries to the St. Croix River to reduce local, State, and national flood damages and costs during the 1985 to 2085 period of analysis.

In connection with the above primary objective, other planning objectives are:

- o Reduce other water-related resource problems in the St. Croix River basin, including water supply, energy, navigation, recreation, fish and wildlife, and water quality for the 1985 to 2085 period of analysis.
- o Contribute to the environmental, social, and cultural resources in the St. Croix River basin for the 1985 to 2085 period of analysis.

PREVIOUS STUDIES

In 1968, the St. Paul District, Corps of Engineers completed a report on the St. Croix River entitled Phase I Report on Study of Flood Control and Related Purposes for St. Croix River Basin, Minnesota and Wisconsin. The main objective of this report was to establish an overall plan for water and related land resources not only in the St. Croix River basin but on the Mississippi River below the mouth of the St. Croix River as well. This objective included preserving, insofar as possible, the natural beauty of the area.

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 1968 study also determined that a local flood protection project was feasible for Stillwater, Minnesota, but this measure was not included in the recommended plan.

At the time that the 1968 study was being prepared, the St. Croix River was being considered for inclusion under the Wild and Scenic Rivers Act. This legislation, coupled with opposition to the recommended reservoir plan from the States of Minnesota and Wisconsin, led to suspension of the St. Croix River study after submission of the report to higher authority.

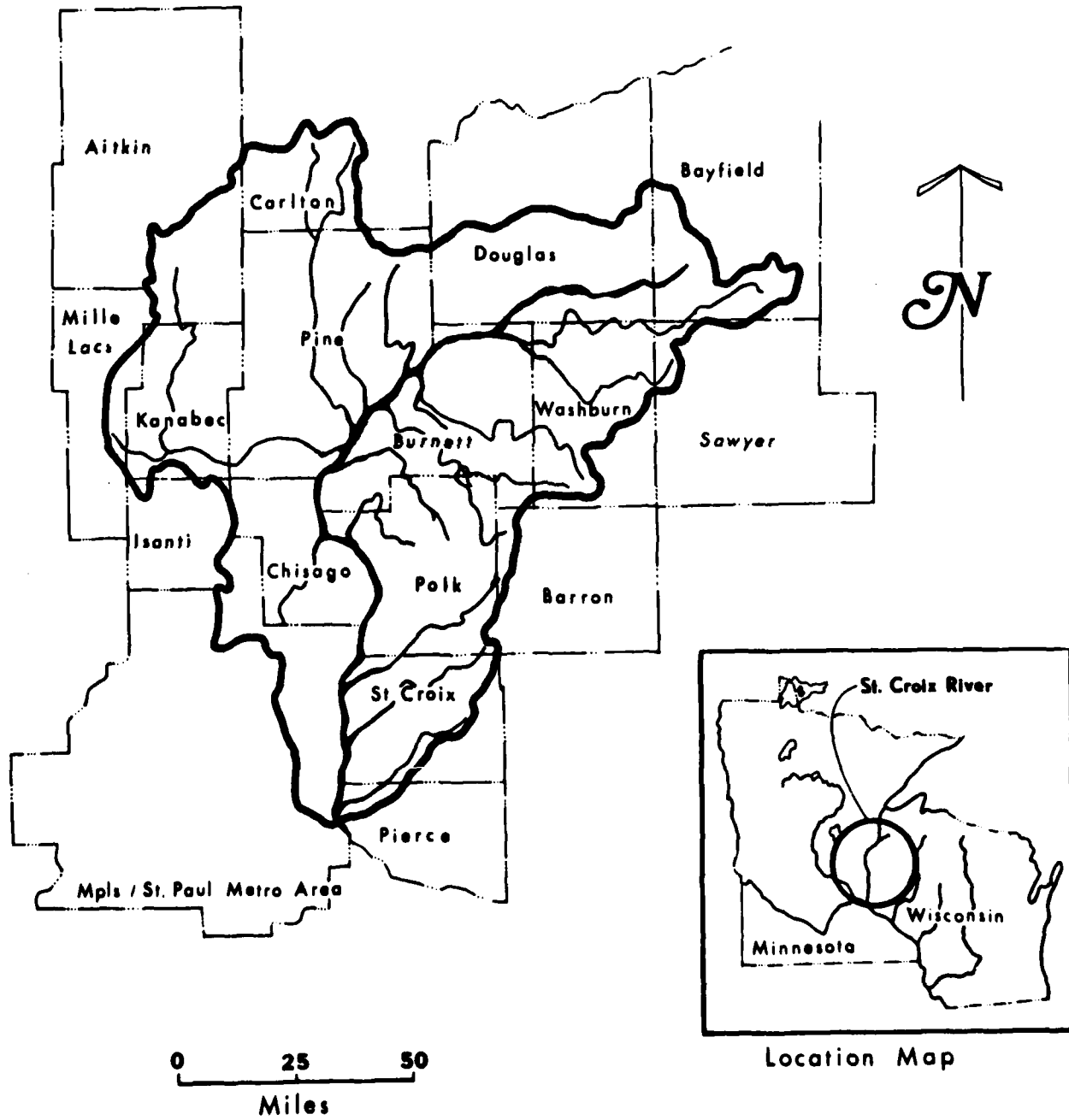
The information contained in the 1968 study is currently out of date and is not usable for development of the present study.

PURPOSE AND SCOPE OF PRESENT STUDY

The study area comprises the St. Croix River basin (see figure 1-1). Unlike the 1968 study, the present study focuses only on flood-prone communities that have an identified flood problem and are interested in participating in the study.

The purposes of this study are to identify those communities in the St. Croix River basin with flood and related water resource problems, develop and evaluate measures for reducing the flood problems, and recommend implementable measures and plans. The recommended plan will permit the best use, or combination of uses, of water and related resources to meet foreseeable short- and long-term needs in the St. Croix River basin.

General Map - St. Croix River Basin



DESCRIPTION OF THE BASIN

The source of the St. Croix River is St. Croix Lake in northwestern Wisconsin. From this source, the river flows generally southwest for 164 miles to its junction with the Mississippi River at Prescott, Wisconsin, about 30 miles below Minneapolis, Minnesota. From river mile 127 to the mouth, the main stem of the St. Croix River forms the boundary between Minnesota and Wisconsin (see figure 1-1). The river widens in its lower 24 miles to form Lake St. Croix, an area used extensively for recreation. The river has a total fall of 341 feet, or an average slope of about 2.1 feet per mile. The slope ranges from 7.7 feet per mile near the Kettle River rapids to near zero in Lake St. Croix, which is a part of the pool formed by lock and dam 3 on the Mississippi River above Red Wing, Minnesota.

From the junction with the Mississippi River to the Washington/Chisago County line (Minnesota), the St. Croix River is designated under Public Law 90-542 (the Wild and Scenic Rivers Act) as Recreational, from that point to St. Croix Falls (Wisconsin) as Scenic, from St. Croix Falls to 10 miles upstream as Recreational, and from that point to Gordon, Wisconsin, as Scenic.

The St. Croix River and its tributaries drain an area of approximately 7,650 square miles: 3,250 in Minnesota and 4,400 in Wisconsin. The southern half of the basin is a farming area devoted principally to dairying, while the northern half is covered with brush and timber in a sandy soil less suitable for farming. Small towns throughout the basin provide a variety of agriculture- and recreation-related services to basin inhabitants and tourists.

Principal tributary streams of the St. Croix River include the Namekagon (1,098 square miles), Yellow (366 square miles), Clam (384

square miles), Wood (180 square miles), Trade (151 square miles), Apple (573 square miles), Willow (284 square miles), and Kinnickinnic (134 square miles) Rivers, which enter the St. Croix River from the east, and the Tamarack (200 square miles), Kettle (1,080 square miles), Snake (996 square miles), and Sunrise (304 square miles) Rivers, which enter from the west.

From about 4 miles south of the mouth of the Trade River to the junction of the St. Croix and Mississippi Rivers, the St. Croix River occupies a gorge cut down to 400 feet below the surrounding uplands. The valley walls are Precambrian basalt plus Cambrian sandstones, siltstones, and shales, capped by Ordovician dolomite in the downstream portion. The valley fill is primarily sand and gravel 225 feet thick at Prescott that thins to nothing at the St. Croix Falls rapids. Between St. Croix Falls and Stillwater, the river is a braided stream that occupies much of the floodplain. Downstream from Stillwater, Lake St. Croix nearly fills the valley floor, and development is restricted to low terraces. The uplands in this lower basin area are mantled by glacial drift composed of sandy and clayey till and sandy outwash. Tributaries to the St. Croix River have steep gradients near the river valley and are generally cut into bedrock.

The topography of the St. Croix River corridor upstream from the mouth of the Trade River is subdued, showing relatively little relief, and the surface is extensively wooded and swampy. The soils in this area are probably sandy. In addition, soft foundation conditions are expected under the tributary floodplains on the Minnesota side.

Records of climatological data are available from various National Weather Service stations within the basin. These records indicate a mean annual temperature of about 42° Fahrenheit, with extremes from

-49° to 108°. Average annual rainfall is about 28 inches, with maximum and minimum extremes of approximately 38 inches and 14 inches. The mean annual snowfall is about 44 inches.

Social Resources

The population of the St. Croix River basin in 1975 was approximately 84,000: 64 percent in Wisconsin and 36 percent in Minnesota. Table 1-1 presents the 1970 and 1980 populations for areas within the basin that could be affected by the study. Some areas have more than doubled in population during the last 10 years.

Table 1-1 - Population in the St. Croix River Basin

Area	1970	1980	Percent of change
<u>Minnesota</u>			
Denmark Township	923	1,140	23.5
Stillwater	10,191	12,290	20.6
Lake St. Croix Beach	1,111	1,176	5.9
St. Mary's Point	319	348	9.1
Afton	248	2,550	928.2
Bayport	2,987	2,932	-1.8
Mora	2,582	2,890	11.9
Pine City	2,143	2,489	16.1
<u>Chisago Lake Chain</u>			
Wyoming Township	1,262	2,312	83.2
Chisago Lake Township	2,319	2,629	13.4
Lent Township	556	1,380	148.2
Shafer Township	636	768	20.8
Franconia Township	650	1,007	54.9
<u>Marine-Carnelian Lakes</u>			
May Township	1,298	2,076	59.9
New Scandia	1,513	2,858	88.9
<u>Wisconsin</u>			
Hudson	5,049	5,434	7.6
Prescott	2,331	2,654	13.9
New Richmond	3,707	4,306	16.2

Income and Employment

In 1975, per capita personal income was \$5,785 for Minnesota and \$5,594 for Wisconsin. For the counties in the Minnesota portion of the basin, per capita personal income was \$5,102, or 12 percent below the Minnesota State average. For counties in the Wisconsin portion, per capita personal income was \$4,574, or 18 percent below the Wisconsin State average. These county averages reflect the predominantly rural character of the study area.

The St. Croix River basin area can be divided into two economic regions: the southern (below St. Croix/Taylors Falls) and the upper. Employment in the southern portion of the basin is dominated by the Minneapolis-St. Paul metropolitan area. The southern portion is composed primarily of bedroom communities from which residents commute to jobs in the nearby metropolitan area. Employment categories most represented among these residents include government, trade, and manufacturing. In contrast, residents in the upper portion of the St. Croix River basin are employed locally in agriculture, recreation, and the service trades.

Natural Resources

The St. Croix River valley encompasses nearly 4,459 square miles in east central Minnesota and northwestern Wisconsin. The St. Croix River valley supports a wide variety of birds, mammals, fish, reptiles, and amphibians, plus several hundred plant species. Situated between two relatively distinct vegetative communities in the north central United States, the valley is a biological "crossroads" for many species. Because the river valley is close to the forest-prairie transition zone, many western animal species occur in association with species more typical of eastern origin. Habitats available to wildlife vary considerably from upland

deciduous forests and grasslands to lowland marshes and open-water expanses. Water quality throughout most of the river is relatively clean. The natural river flow is interrupted twice by two small dams.

Vegetation

Terrestrial - Within the valley, a wide range of plant communities is available to wildlife populations. Relatively steep slopes and rugged terrain offer protection and a variety of habitats that enhance the ecological diversity of the area. Canopy species on the bluff tops vary from a moist association of basswood, large-toothed aspen, sugar maple, and ironwood to a dryer association of northern red oak, bur oak, red cedar, and white pine. Periodic flooding of the lowlands has resulted in a river bottom vegetation that favors wet species. Major tree species characteristic of this community are silver maple, paper birch, American elm, green ash, and cottonwood. Understory vegetation includes willow species, box elder, red osier dogwood, and yellow birch.

Aquatic - Aquatic vegetation in the lower St. Croix River is sparse. Periodic high water from seasonal rains and floods has resulted in a scoured condition along the shore. This condition, in combination with the steep, sandy bottom, prevents the establishment of many aquatic plants.

Fish and Wildlife

Birds - The diversity of the avifauna (birds) within the St. Croix River valley attracts many people seeking recreational opportunities such as bird watching, photography, and hunting. Principal bird groups seen within the valley include waterfowl, raptors, shorebirds, gulls, and passerines. As many as 314 avian species

have been recorded in the valley (this figure represents a compilation of sightings made during nesting, wintering, and migration periods).

Migratory waterfowl use the St. Croix River as both a breeding area and a migratory corridor during spring and fall. Nesting waterfowl common within the project area include mallards, wood ducks, blue-winged teal, and hooded mergansers. These species use a variety of nesting habitats ranging from wooded shorelines to grassy upland areas.

Mammals - Furbearing mammals within the project area include raccoon, mink, red and gray fox, striped skunk, and weasel. These furbearers are important not only for their ecological role as predators but also as a source of income to many trappers. Although considered by some to be pest animals, the following mammals commonly found in the valley play an important ecological role as prey animals: species of shrew, vole, mice, chipmunk, and ground squirrel. Species of recreational importance (hunting, nature observation, photography) include the eastern cottontail rabbit, gray and fox squirrels, and white-tailed deer.

Reptiles and Amphibians - Many reptiles and amphibians are native to the lower St. Croix River valley. An array of frogs, turtles, snakes, and other species that require aquatic or moist conditions frequent the lower elevations. Species such as spring peeper (a tree frog), tiger salamander, red-bellied snake, and garter snake all may be found here. The drier, elevated bluffs support the box turtle, wood frog, hog-nosed snake, and bullsnake. Soft-shelled and snapping turtles commonly use dredged material disposal sites as nesting areas. These two turtle species are also a food source for some people.

Fish - Fish species of the lower St. Croix River have been studied intensively by the Minnesota Department of Natural Resources. Results of these studies indicate that the St. Croix River supports a diverse fish population typical of most river-lakes. At least 62 fish species have been collected and identified. Principal gamefish present in sufficient numbers to support a sport fishery include walleye, sauger, black crappie, white crappie, white bass, and smallmouth bass.

Of paramount importance to all fisheries of the river are the abundance and diversity of spawning habitats. Typically, a river-lake system such as the St. Croix River offers a wide variety of spawning habitats. However, within the Lake St. Croix area, shallow backwater areas necessary for northern pike and largemouth bass spawning are generally lacking. The absence of this habitat type is believed to be one of the primary factors limiting northern pike and largemouth bass in the St. Croix River.

Threatened and Endangered Species - Currently, three federally-listed threatened or endangered species occur within the lower St. Croix River valley. These species are the bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus), and Higgins' eye pearly mussel (Lampsilis higginsii).

Bald eagles are known to nest in both Chisago County, Minnesota, and Polk County, Wisconsin. During the winter, bald eagles also use the lower St. Croix River valley for a wintering area, concentrating around open-water areas where food (fish/waterfowl) is available.

Peregrine falcons are a transient species in the valley, seen most often during spring and fall migration.

The Higgins' eye pearly mussel is a freshwater species whose distribution is restricted to large flowing rivers of the Upper Midwest. The largest known population of this species in the study area is in the St. Croix River at Hudson, Wisconsin.

Recreation

The lower St. Croix River is one of the most extensively used water-based recreational resources within the Upper Midwest. Its unique combination of land, vegetation, and water quality, located within one-half hour's drive from the Twin Cities metropolitan area, provides a high quality resource easily accessible to over 2 million people. Numerous public and private river access points and marinas provide opportunities for recreational boating, water-skiing, fishing, houseboating, beaching, picnicking, and camping, as well as the growing interest in sailing. User studies conducted on the lower St. Croix River have indicated that total boating has increased 60 percent just in the 10-year period between 1970 and 1980. This rapid increase has caused overcrowding on the river and shows no signs of slowing.

The majority of recreational boating occurs below St. Croix Falls because of shallow water upstream. River canoeing and associated activities are extremely popular on the St. Croix River and its tributaries above St. Croix Falls.

Cultural Resources

Except for areas along the St. Croix River main stem and the Namekagon River, the St. Croix River basin has not been systematically surveyed for prehistoric or historic archeological sites or standing structures.

The most comprehensive survey completed to date was conducted for the National Park Service by Commonwealth Associates, which surveyed over 99 percent of the St. Croix National Scenic Riverway. Commonwealth Associates, Inc., prepared three separate reports:

- o 1977. An Archeological Survey of the St. Croix National Scenic Riverway, Phase I Report, Contract No. CX-6000-6-A060, submitted to the National Park Service, Lincoln, Nebraska.
- o 1978. An Archeological Survey of the St. Croix National Scenic Riverway, Phase II Report, Contract No. CX-6000-6-A060, submitted to the National Park Service, Lincoln, Nebraska.
- o 1979. An Archeological Survey of the St. Croix National Scenic Riverway, Phase III Report, Contract No. CX-6000-6-A060, submitted to the National Park Service, Lincoln, Nebraska.

The riverway includes a 103-mile segment along the St. Croix River between the dam at Taylors Falls, Minnesota, and the dam near Gordon, Wisconsin, plus a 94-mile segment along the Namekagon River between Lake Namekagon and its confluence with the St. Croix River (Commonwealth, 1979:1). This 3-year study located and evaluated 217 archeological sites: 63 prehistoric, 163 historic, and 2 multi-component. Of the 217 sites, 91 were determined to be eligible for the National Register of Historic Places (Commonwealth, 1979:213).

STUDIES OF OTHERS

The fiscal year 1983 (October 1, 1982, to September 30, 1983) annual priorities report of the Upper Mississippi River Basin Commission recommended that the St. Croix River basin study be given a high priority to determine the feasibility of structural and nonstructural flood damage reduction measures. The report also

recommended a high priority for ongoing nonstructural measures (such as the National Flood Insurance Program in municipalities with floodplain management ordinances and Section 1362 of the Flood Disaster Protection Act, which provides financial assistance for relocation and floodproofing). A medium priority was recommended for Corps of Engineers continuing authority - small flood control projects (authorized by Sections 205 and 208 of Public Law 93-251) for construction of flood control projects not specifically authorized by Congress.

A draft comprehensive master plan for the management of the Upper Mississippi River system (January 1, 1981) established a preliminary set of system objectives. Under flood management, the plan recommends the following:

- o Adopting management techniques to minimize the economic impact of flooding by:
 - a. Accelerating the adoption of floodplain regulations which limit inappropriate development.
 - b. Maintaining upstream storage in tributary watersheds.
 - c. Instituting management procedures for development that occurred in the floodplain prior to floodplain regulations.

No other agency or interest has studied the St. Croix River basin flood problems and related water resource problems from a basin-wide approach. After the Corps of Engineers study was suspended in 1968, some individual communities, such as the city of Stillwater, carried out preliminary planning studies for local flood protection.

STUDY PARTICIPANTS AND COORDINATION

Agencies and interests were informed of the initiation of the present study and, on two occasions, were requested to participate. (A copy of the first notice, dated January 15, 1982, is on page B-2; the second notice, dated May 4, 1982, is on page B-37 of appendix B.) Inputs to this study effort have been provided by the following: U.S. Department of the Interior - Geological Survey, National Park Service, Fish and Wildlife Service, and Bureau of Mines; Federal Energy Regulatory Commission; U.S. Department of Agriculture - Soil Conservation Service and Forest Service; Minnesota-Wisconsin Boundary Area Commission; Minnesota Department of Natural Resources; Wisconsin Department of Natural Resources; Minnesota Pollution Control Agency; Minnesota Department of Transportation; Wisconsin Department of Transportation; Wisconsin Department of Administration; the State Historical Society of Wisconsin and the Minnesota Historical Society; the cities of Hudson, Prescott, and New Richmond, Wisconsin; and the cities of Stillwater, Bayport, Afton, Lake St. Croix Beach, St. Mary's Point, and St. Paul, Minnesota.

The correspondence received in response to the notices included a number of significant concerns regarding the St. Croix River study. This correspondence is available in appendix B.

One of the concerns raised involved the need for the study. (See the following letters: Wisconsin Department of Natural Resources, February 23, 1982, page B-16, and Upper Mississippi River Waterway Association, May 25, 1982, page B-45.) However, other correspondence, particularly from communities within the basin, requested inclusion in the study and offered support for the study (for example, see the following letters: city of Prescott, February 1, 1982, page B-9; city of Bayport, April 9, 1982, page B-30; Minnesota

Department of Natural Resources, April 27, 1982, page B-33; and Wisconsin Department of Natural Resources, November 4, 1982, page B-56). Preliminary studies have indicated that communities within the St. Croix River basin do suffer flood damages and that there is a need for flood control studies in the basin.

Some interested agencies requested that nonstructural flood control measures be evaluated for the basin (see these letters: Wisconsin Department of Natural Resources, April 15, 1982, page B-31; Minnesota Department of Natural Resources, April 27, 1982, page B-33; and Minnesota-Wisconsin Boundary Area Commission, November 16, 1982, page B-66). Both structural and nonstructural measures are being considered for Stillwater, Minnesota, and New Richmond, Wisconsin. These measures will also be given adequate consideration for those communities studied further under the small projects authority.

The correspondence also expressed considerable support for a flood control project at Stillwater that would enhance the cultural and historical amenities of the community (see letters: Minnesota Department of Natural Resources, April 20, 1982, page B-32, and April 27, 1982, page B-33; and Upper Mississippi River Waterway Association, May 25, 1982, page B-45). One of the measures being considered at Stillwater is a folding floodwall that would not detract from the historical character of the community.

A letter from the Minnesota-Wisconsin Boundary Area Commission (November 16, 1982, page B-66) recommended eliminating reservoirs from the study. Since that letter, main stem and tributary reservoirs have been dropped from further consideration.

The St. Paul District, Corps of Engineers, is responsible for the coordination of this study. This reconnaissance report is the

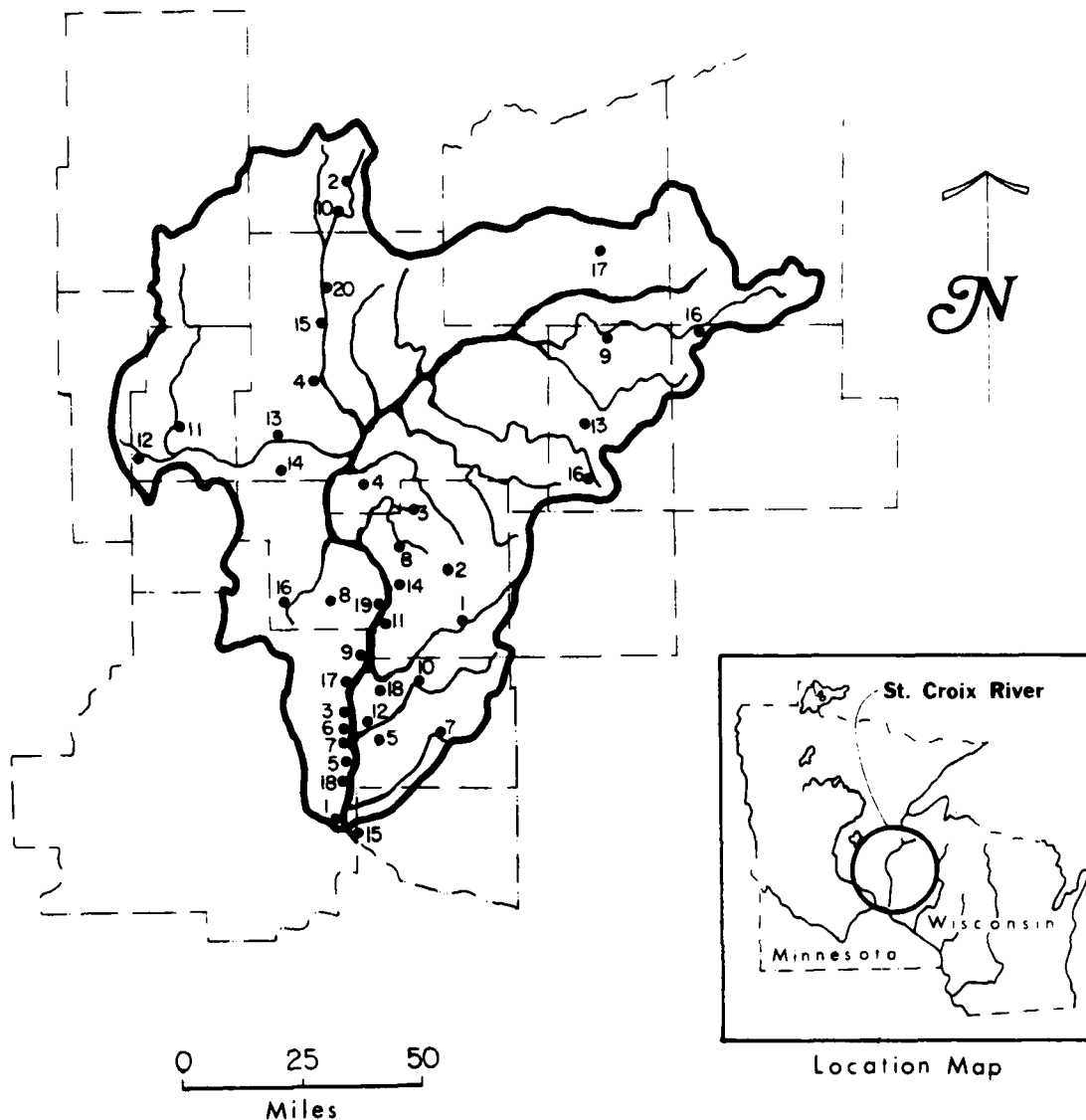
initial coordination vehicle. It will be distributed to all interested Federal, State, and local agencies and to the public. Comments on this report will help guide future study efforts.

PROBLEM IDENTIFICATION

PROBLEMS AND NEEDS OF THE BASIN

Thirty-eight communities in the St. Croix River basin experience flood problems. Figure 1-2 identifies these flood-prone communities and areas within the basin according to participation figures from the National Flood Insurance Program. These areas have been screened by means of a public notice to Federal, State, and local agencies and the responses to the notice. This screening effort identified eight general flood problem areas: (1) the Lake St. Croix communities of Stillwater, Bayport, Lake St. Croix Beach, St. Mary's Point, Afton, and Denmark Township, Minnesota, and Hudson and Prescott, Wisconsin; (2) Mora and Pine City, Minnesota, along the Snake River; (3) New Richmond, Wisconsin, along the Willow River; (4) Clam Lake in Siren Township, Wisconsin, along the Clam River; (5) Trade Lake on the Trade River in Burnett County, Wisconsin; (6) Gilmore and Rice Lake on the Totagatic River in Washburn County, Wisconsin; (7) Big Marine Lake and Big and Little Carnelian Lakes in Washington County, Minnesota; and (8) the Chisago Chain of Lakes in Chisago County, Minnesota. These eight general areas are shown on figure 1-3.

None of the areas currently identified as having a flood problem has developed a flood emergency plan. During the 1965, 1969, and 1971 floods and after suspension of this study in 1968, communities and areas have depended heavily on government assistance from State and Federal agencies during major flood emergencies.



MUNICIPALITY (Co.)

MINNESOTA

1. Alton (Washington)
2. Barnum (Carlton)
3. Bayport (Washington)
4. Hinckley (Pine)
5. Lake St. Croix Beach (Washington)
6. Lakeland (Washington)
7. Lakeland Shores (Washington)
8. Lindstrom (Chisago)
9. Marine on St. Croix (Washington)
10. Moose Lake (Carlton)
11. Mora (Moose Lake)
12. Ogilvie (Kanabec)
13. Pine City (Pine)
14. Rock Creek (Pine)
15. Sandstone (Pine)
16. Stacy (Chisago)
17. Stillwater (Washington)
18. St. Mary's Point (Washington)
19. Taylor's Falls (Chisago)
20. Willow River (Pine)

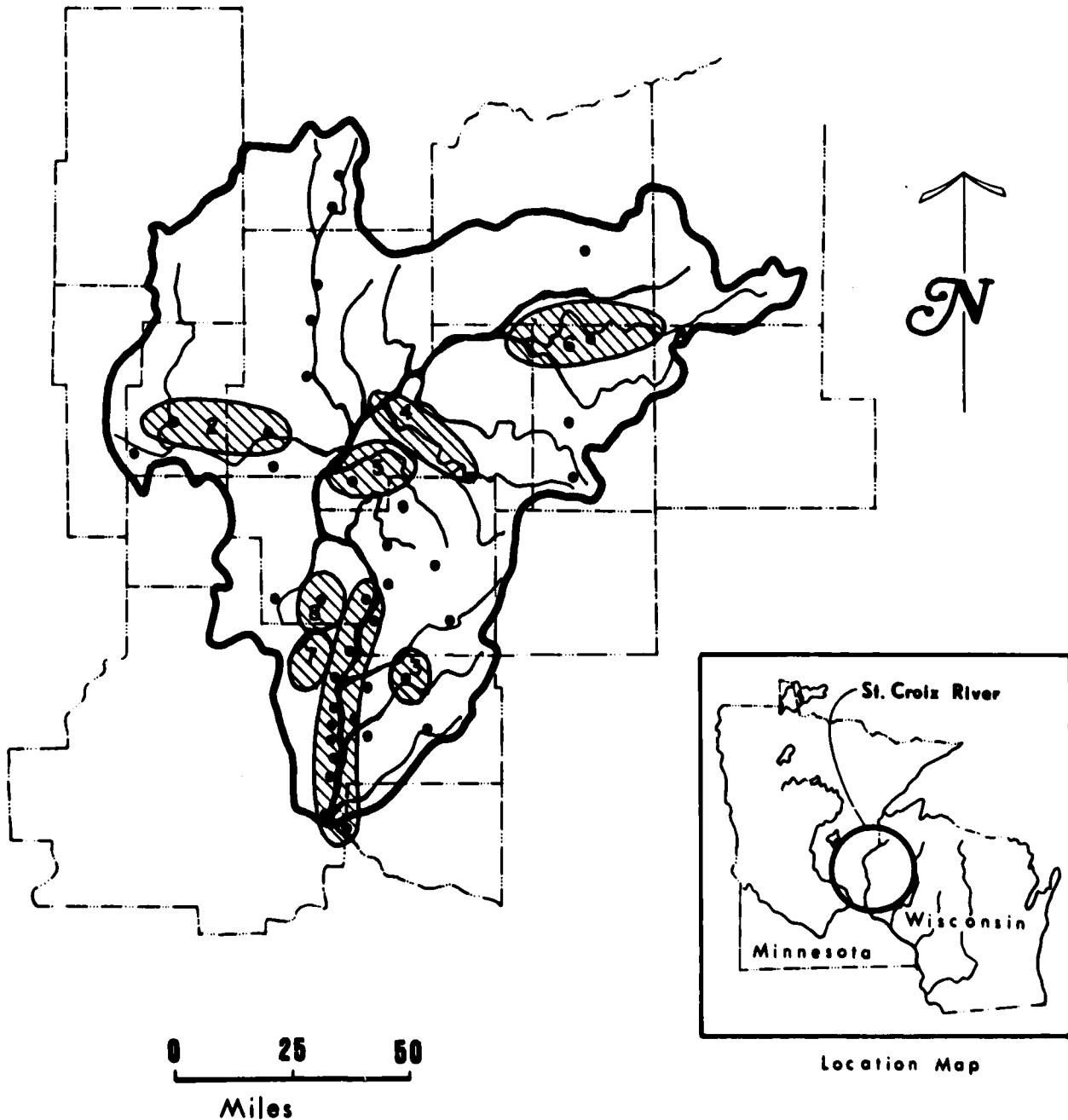
WISCONSIN

1. Amery (Polk)
2. Balsam Lake (Polk)
3. Frederic (Polk)
4. Grantsburg (Burnett)
5. Hudson (St. Croix)
6. Hayward (Sawyer)
7. Hammond (St. Croix)
8. Luck (Polk)
9. Minong (Washburn)
10. New Richmond (St. Croix)
11. Osceola (Polk)
12. North Hudson (St. Croix)
13. Spooner (Washburn)
14. St. Croix Falls (Polk)
15. Prescott (Fierco)
16. Shell Lake (Washington)
17. Salem Springs (Chisago)
18. Somerset (St. Croix)

FIGURE 1-2 - MUNICIPALITIES PARTICIPATING IN THE NATIONAL FLOOD INSURANCE PROGRAM

Eight General Flood Problem Areas

1. Lake St. Croix communities
2. Mora and Pine City on the Snake River
3. Willow River at New Richmond, Wisconsin
4. Clam Lake on the Clam River
5. Trade Lake on the Trade River
6. Gilmore Lake on the Totogatic River
7. Big Marine and Big and Little Carnellan Lakes
8. Chicago chain of lakes



During flood emergencies, earthen emergency levees were constructed at the following communities: Stillwater, Lake St. Croix Beach, St. Mary's Point, and Afton, Minnesota; and Hudson, Wisconsin. Following these floods, the nature of the communities as well as the status of the emergency levees changed.

Lake St. Croix Communities

Flooding at Stillwater, Minnesota, and at other downstream areas is caused by high flows on the St. Croix River and by backwater from high flows on the Mississippi River. Many large floods have occurred on the lower St. Croix River. The largest recorded flood discharge in the St. Croix River basin was in 1950. The 1965 flood, however, caused higher flood stages resulting from flows and backwater effects from the Mississippi River. Other floods in the St. Croix River basin occurred in 1944, 1945, 1951, 1952, 1954, 1957, 1967, 1969, 1971, 1972, 1975, 1979, and 1982.

Flood damages for the 1965 and 1969 floods along the main stem of the St. Croix River are summarized in tables 1-2, 1-3, and 1-4. The average annual damages for the main stem are \$4,104,900.

Table 1-2 - St. Croix Agricultural Damages

Flood	Area ⁽¹⁾	Crop damage	Other agricultural damages	Total agricultural damages
1965	Pool 3	\$5,000	\$22,000	\$27,000
1969	Pool 3	5,900	25,100	31,000

(1) Total damages in pool 3 of the Mississippi River, including the St. Croix River. No other historical information on agricultural damage is available for the St. Croix River basin.

Table 1-3 - St. Croix Transportation Damages

Flood	Area ⁽¹⁾	Roads, ⁽²⁾ bridges, railroads	Detour costs	Total transportation damages
1965	St. Croix River	-	-	\$50,000
1969	<u>Minnesota</u>			
	Carlton	-	-	-
	Chisago	-	-	-
	Kanabec	\$ 800	\$ 2,200	3,000
	Pine	67,000	300	67,300
	Washington	70,000	-	70,000
	<u>Wisconsin</u>			
	Bayfield	-	-	-
	Burnett	-	-	-
	Douglas	-	-	-
	Polk	-	-	-
	St. Croix	-	123,200	123,200

- (1) Historical damages for some counties were not reported or documented after the flood event.
- (2) Does not include railroad historical damages that amounted to approximately 50 percent of the transportation damages.

Table 1-4 - St. Croix Communities Historic Urban Flood Damages(1)

	Total actual												
	Damages sustained					Evacuation				Related losses and costs			
	Residential (structure and contents)	Public contents	Business (structure and contents)	Total (columns 2, 3, & 4)	Personnel and furniture (columns 5 & 6)	Traffic	Relief efforts	Profits	Wages	Total (columns 6, 7, 8, & 9)	Flood fight cleanup (columns 10 & 11)	Flood fight cleanup (columns 11 & 12)	Total actual damages sustained (columns 12 & 13)
1965 Flood													
Minnesota													
St. Croix	-	1,025,000	627,000	1,692,000	-	-	-	-	-	-	1,692,000	594,000	4,286,000
Bayport	310,000	20,000	355,000	685,000	-	-	-	-	-	-	685,000	700,000	1,385,000
Point Douglas	26,000	-	72,000	98,000	-	-	-	-	-	-	98,000	-	98,000
Lake St. Croix Beach	266,000	3,000	-	269,000	-	-	-	-	-	-	269,000	-	269,000
St. Mary's Point	468,000	6,000	-	474,000	-	-	-	-	-	-	474,000	-	474,000
Afton	87,000	11,000	123,000	221,000	-	-	-	-	-	-	221,000	-	221,000
Subtotal:	957,000	1,105,000	1,177,000	3,239,000	-	-	-	-	-	-	3,239,000	1,294,000	4,533,000
Wisconsin													
Hudson	64,000	235,000	465,000	764,000	-	-	-	-	-	-	769,000	57,000	826,000
Prescott	73,000	8,000	120,000	201,000	-	-	-	-	-	-	201,000	-	201,000
New Richmond(2)	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal:	142,000	243,000	585,000	970,000	-	-	-	-	-	-	970,000	57,000	1,027,000
Total	1,099,000	1,348,000	1,762,000	4,209,000	-	-	-	-	-	-	4,209,000	1,351,000	5,560,000
1969 Flood													
Minnesota													
St. Croix	243,000	104,400	220,000	567,400	3,000	-	-	-	320,000	518,600	84,300	926,400	1,584,400
Bayport	27,000	13,300	145,800	186,100	1,100	-	-	-	1,176,700	1,180,200	1,582,300	2,100	1,584,400
Point Douglas	18,100	300	52,000	70,400	2,500	-	-	-	-	286,700	366,000	-	366,000
Lake St. Croix Beach	76,000	13,000	20,900	109,900	4,200	-	-	-	-	3,000	42,000	69,600	111,600
St. Mary's Point	52,000	7,000	64,600	123,600	1,500	-	-	-	-	4,200	95,200	26,100	121,300
Afton	431,100	156,900	482,400	1,070,400	12,300	-	-	-	23,900	28,000	164,600	1,730	166,330
Subtotal:	937,100	310,600	884,900	2,132,600	12,300	-	-	-	1,521,200	2,020,700	3,093,100	183,400	3,276,500
Wisconsin													
Hudson	15,200	22,400	161,600	199,200	-	-	-	-	32,100	32,100	231,200	2,000	235,300
Prescott	50,000	1,500	34,800	86,300	-	-	-	-	285,600	316,600	404,900	500	412,400
New Richmond	65,000	23,800	196,600	285,400	-	-	-	-	65,100	350,700	636,100	6,500	642,600
Subtotal:	130,200	47,700	393,000	570,900	-	-	-	-	362,800	709,400	1,072,200	8,500	1,080,700
Total	1,067,300	358,300	1,277,900	2,693,500	12,300	-	-	-	1,884,000	2,730,100	4,165,300	191,900	4,956,200

(1) Historic flood damages are at price levels at the time of the event. Does not include agricultural and transportation damages.
 (2) This table is an extrapolation of the St. Paul District Corps of Engineers post-flood reports for 1965 and 1969.
 (3) Historic flood damages for New Richmond are unavailable at this time.

Snake River

Past overbank flooding as a result of quick spring thaws or slow-moving, widespread frontal storms has caused urban and agricultural damages on the Snake River near Pine City and Mora, Minnesota. Large floods have passed through both Pine City and Mora, but flood damages have been limited due to the relatively steep banks and lack of floodplain development.

In July 1972, Pine City experienced flooding that rose to within 1.5 feet of the 1-percent chance flood. That flood had an estimated peak discharge of 14,000 cfs (cubic feet per second). Approximately 8 to 10 residential properties plus 2 to 5 commercial and public facilities would be damaged by a 1-percent flood. During the initial Corps field investigations, Pine City and Pine County representatives indicated their desire to replace the Burlington Northern Railroad bridge, which they feel increases the stage of the 1-percent chance flood by approximately 1 to 1.5 feet.

During 1972, Mora experienced flooding that was 2 feet above the 1-percent chance flood. Two or three residential structures and the city wastewater treatment plant were flooded.

At this time, the Corps of Engineers has no information to define the flood problems of Pine City or Mora in quantitative terms. Representatives from the Pine City and Mora areas indicated that they are not interested in participating in a Corps study at this time.

Willow River at New Richmond

Damaging floods on the Willow River and Paperjack Creek at New Richmond, Wisconsin, were reported as early as 1876. Major floods

occurred in 1876, 1893, 1934, 1965, and 1967. A 1-percent chance flood would inundate and considerably damage public, residential, commercial, and industrial property. A preliminary floodplain information report completed in June 1975 identified general flood outlines based on initial hydraulic and hydrology studies. No plans for reducing flood problems were identified. Two major floods occurred in 1965 and 1967.

Flood damage reduction measures currently consist of emergency measures. No permanent or emergency flood control structures are in the area.

Clam River

Residences along Upper and Lower Clam Lakes in Siren Township, Burnett County, Wisconsin, were flooded in April 1965 (approximately 75 cottages, 10 residences, and 1 business), with upwards of 2 feet of water on the first floor of these buildings. The 1952 flood was 9 inches higher, according to local officials. A preliminary investigation in 1965 by the St. Paul District indicated that an economically feasible channel modification and cutoff would reduce the flood problem. An upstream reservoir proposed by local residents was found to be uneconomical. The Wisconsin Department of Natural Resources (Spooner, Wisconsin) has only recently identified a need for an investigation of high water problems on Upper and Lower Clam Lakes.

Trade River

The Wisconsin Department of Natural Resources (Spooner, Wisconsin) has identified the Trade Lake area on the Trade River in Burnett County as needing an investigation of high water problems. Some seasonal and residential homes on Trade Lake are susceptible to

flooding as a result of lake level fluctuations due to limited channel capacity on the Trade River downstream from the lake. Local residents feel the problem could be solved by clearing and snagging the channel downstream of the lake.

Totagatic River

The Wisconsin Department of Natural Resources also identified high water problems on Gilmore and Rice Lakes. Backup from the Totagatic River as a result of limited channel capacity has raised water levels on Gilmore Lake and Rice Lake as much as 5 feet overnight. This type of event occurs 2 to 3 times a year with stages rising and falling within a 3- to 10-day period. Most residents have had difficulty stabilizing sandy banks and keeping septic systems working. The residents would like assistance in reducing the shoreline erosion/stabilization problem. No structures are in danger of being flooded. Technical and engineering assistance in developing solutions to shore and streambank erosion problems could be provided to non-Federal public interests under section 55 of Public Law 93-251.

Big Marine and Big and Little Carnelian Lakes

Big Marine and Big and Little Carnelian Lakes in northeastern Washington County, Minnesota, are kettle lakes formed from ice blocks deposited in glacial till. These lakes have a history of lake level fluctuations with a high-low frequency measured in decades. Lake levels historically have been below the natural outlet of these lakes, which have small watersheds and are sensitive to ground water movements. Fluctuation was not a problem before the 1950's when the shorelines were essentially undeveloped. Intensive development began in the 1950's, when lake levels were below the meander line, and continued into the 1970's. During this period,

developers, with the consent of governments, platted, built, and sold homes and developed wells and septic systems on the dry lakebeds during the low lake level periods.

In the mid-1970's, property owners sought the assistance of the State of Minnesota, Washington County, townships, and the Metropolitan Council. All of these agencies considered the cost of a structural plan too high, and no action was taken. During the past 13 years, mounting frustrations and anger have spread among lakeshore owners.

Currently, 28 structures are inundated by water on Big Marine Lake. Many residents have raised their homes, filled in lots, and relocated well and sanitary systems at substantial individual expense. Total value of the properties on Big Marine Lake, including land and buildings, is estimated to be between \$2.6 and \$3.1 million (1975 price levels). On Big Carnelian Lake, 34 structures have been inundated or raised; the probability exists that another 111 structures will be inundated, with a potential damage of \$3.4 million (1975 price levels). On Little Carnelian Lake, two homes have been relocated, and no other structures appear to be affected.

Since the formation of the Marine-Carnelian Watershed District in June 1981, the Watershed District has completed an overall watershed management plan and consolidated the results of various flood reduction plans considered in the past 13 years. Structural measures considered include lake level control structures, channel modification, pumping, well injection, and impoundment removal. Nonstructural measures include relocation, evacuation, abandonment, raising and filling, and no action. The plan currently receiving the most attention from the Watershed District involves modifying the channel between Big Marine and Big Carnelian Lakes, controlling

Big Marine Lake at elevation 940.8 feet msl (mean sea level), and constructing a gravity flow outlet to the St. Croix River through Big and Little Carnelian Lakes.

The Watershed District has given the lake flooding problem its highest priority. The District sees a two-step solution. Step one involves seeking government assistance to carry out emergency measures that would reduce or prevent increased flooding and further damage. Step two would seek government assistance to plan and implement a permanent solution that considers engineering, economic, social, and environmental impacts. The Watershed District is working with the Corps of Engineers on an emergency plan. They are seeking financial assistance through the Department of Housing and Urban Development to carry out their long-range plan.

Chisago Chain of Lakes

The Chisago Chain of Lakes is in Chisago County, Minnesota, in the Sunrise River watershed. Lakes in the Chisago Chain include North and South Center, North and South Lindstrom, Chisago, Green, and Little Green Lakes. Chisago City, Center City, and Lindstrom, Minnesota, are adjacent to these lakes.

The situation of the Chisago Chain of Lakes is similar to that in the Marine-Carnelian Watershed District. Records show that lake levels in the chain are unstable and that these levels are subject to surface and ground-water fluctuations. In 1847, the lakes meandered as one continuous body of water. In the 1930's, lake levels were quite low. Since 1972, lake levels have steadily increased, resulting in water flows between lakes and rapid water transfer of lake levels such as those that occurred on South Lindstrom and Chisago Lakes during 1974 and 1975. By the summer of 1975, the levels of these five lakes had equalized, whereas in drier

years, such as the 1960's, the levels of Chisago and South and North Lindstrom Lakes were 5 to 7 feet lower than those of North and South Center Lakes.

Table 1-5 shows the historic high and low water levels and the number of structures affected.

Table 1-5 - Chisago Chain of Lakes Water Levels

Lake	Low water levels		High water levels		Number of structures affected
	1930's	1960's	Level	Year	
North and South Center	888.6	-	902.6	1910	117
North Lindstrom	888.8	-	902.6	1910	4
Chisago and South Lindstrom	880.0 (881.3)	-	902.6	1910	67
Green and Little Green	881.5	-	891.5	1975	51

Levels of the Chisago Chain of Lakes are currently uncontrolled and contribute to urban and rural flooding. High lake levels could cause damages to residential structures, restrict the use of and access to lakeshore property, destroy trees and related vegetation, and restrict the recreational use of lakes. Low water levels may encourage development of flood-prone areas, restrict recreational use, and affect fish and wildlife habitat and water quality. The State of Minnesota and Chisago County want a high and low water lake level control on the lake to reduce flood damages and to control lake levels to protect future development in the area.

FORMULATION OF PRELIMINARY PLANS

For flood-prone areas in the St. Croix River basin, the following types of management measures were identified to reduce flood damage. Management measures are a means of reducing or preventing flood

damages through either structural or nonstructural actions. These types of measures could be considered separately or in combination.

STRUCTURAL MEASURES

Structural measures are designed to reduce the frequency and duration of damaging overflows. Typical measures include:

- o Dams and reservoirs. These measures provide flood protection by delaying excessive runoff, thereby reducing flood heights downstream.
- o Levees and floodwalls. These structures protect urban or agricultural areas by acting as flood barriers and by confining floodwaters to floodways where they cause little or no damage.
- o Channel modifications. Flood stages and duration of flooding can be reduced by improving flow conditions within the channel and by increasing the carrying capacity of the stream.
- o Diversions. A diversion removes flow from the river during high stages and passes it safely away from damage areas.

NONSTRUCTURAL MEASURES

Nonstructural measures reduce flood damages without altering the flooding regime of the area. Such measures can be identified as corrective or preventive. Corrective and preventive measures include the following:

o Corrective Measures

Flood forecasting and warning systems. Reliable, accurate, and timely forecasts of floods can be coupled with evacuation to save lives and reduce property losses.

Temporary or permanent evacuation. Permanent evacuation involves identification and removal of structures that are subject to frequent flooding. Temporary evacuation involves the removal of the contents of structures in order to reduce flood damages.

Flood proofing. Flood proofing consists of structural modifications and adjustments to properties designed to reduce or eliminate flood damages.

Floodplain conversion. This measure would be part of an area renewal plan designed to remove deteriorating structures subject to frequent flood damages and to convert the land to a use more compatible with the flood risks.

o Preventive Measures

Floodplain zoning. Zoning is a legal tool used by State and local governments to implement and enforce detailed plans designed to safeguard property for public health, safety, and welfare, and for the best use of available land. Zoning regulations may designate floodways and prohibit uses that would conflict with the capability of the floodway to pass floodwaters. In addition, the ordinance may establish requirements outside the floodway itself, in the floodway fringe area. These requirements may include designating

elevations below which certain types of improvements cannot be constructed or, if constructed, must be flood proofed.

Subdivision regulations. Local governments may use subdivision regulations to specify requirements for curbs and gutters, elevation of lots, zero increase in rate of runoff from subdivision areas into nearby streams, and subdivision plots designating areas subject to flooding.

Building codes. Building codes may prevent or reduce flood damages by requiring proper anchorage of buildings, establishing basement elevations and first floor elevations consistent with potential floods, requiring structural strength to withstand water pressure or high velocities, restricting the use of material that deteriorates rapidly when exposed to water, and prohibiting equipment that might be hazardous to human life when submerged, such as chemical storage containers, boilers, or electrical equipment.

Development policies. Policies may be adopted to encourage development in flood-free areas.

Flood emergency plan. A flood emergency plan is a document that provides a community with a step by step plan of emergency actions that should be taken in the event of a flood to reduce damages and to protect lives and property.

Flood insurance. Insurance is available to property owners in the floodplain to compensate them for flood damages.

DISCUSSION

When the basin study was suspended in 1968, main stem reservoirs, alone and in combination with upstream tributary reservoirs, were found to be economically feasible. Although main stem and tributary reservoirs provided a basin-wide solution to water resource problems and needs in the St. Croix River basin, they were socially and environmentally unacceptable and they faced strong opposition at that time. In addition, main stem reservoirs were found to be incompatible with the Wild and Scenic River designation of the St. Croix River.

Upstream tributary reservoirs, in and of themselves, were not evaluated during the 1968 study. A preliminary evaluation of upstream tributary reservoirs for the St. Croix River basin has demonstrated that these reservoirs are not economically feasible for this area. In addition, opposition to reservoirs of any kind in the basin continues to be strong. For these reasons, the Corps of Engineers will no longer consider main stem and upstream tributary reservoirs in future study efforts for the St. Croix River basin.

Since a basin-wide solution is no longer viable, the flood problems of each community in the St. Croix River basin were identified and evaluated to determine which communities should be included in the study. A preliminary analysis was then conducted for each community to identify flood damage reduction measures that demonstrated economic feasibility. This analysis determined that measures for the Lake St. Croix communities of Bayport, Lake St. Croix Beach, Afton, and Prescott, and the Chisago Chain of Lakes, Upper and Lower Clam Lakes, and Trade Lake were of a scope that would be appropriate for further study under the Corps continuing authority program. Studies in these areas are now being considered under that program. These studies will be initiated as funding and priorities

are established. Each individual community, county, or watershed district would be the likely local sponsor.

This preliminary economic analysis determined that study of the communities of Stillwater, Minnesota, and New Richmond, Wisconsin, should be continued under the general investigation authority.

The communities of Pine City and Mora, Minnesota, on the Snake River have indicated that they are not interested in further studies by the Corps of Engineers. These studies have been discontinued.

The watershed district associated with Big Marine and Big and Little Carnelian Lakes is currently studying the lake flooding in these areas. The watershed district does not desire Corps assistance at this time.

The remainder of this reconnaissance report discusses the flood problems at Stillwater, Minnesota, and New Richmond, Wisconsin. The discussion of Stillwater begins on page 36. New Richmond is discussed beginning on page 72.

STILLWATER

INTRODUCTION

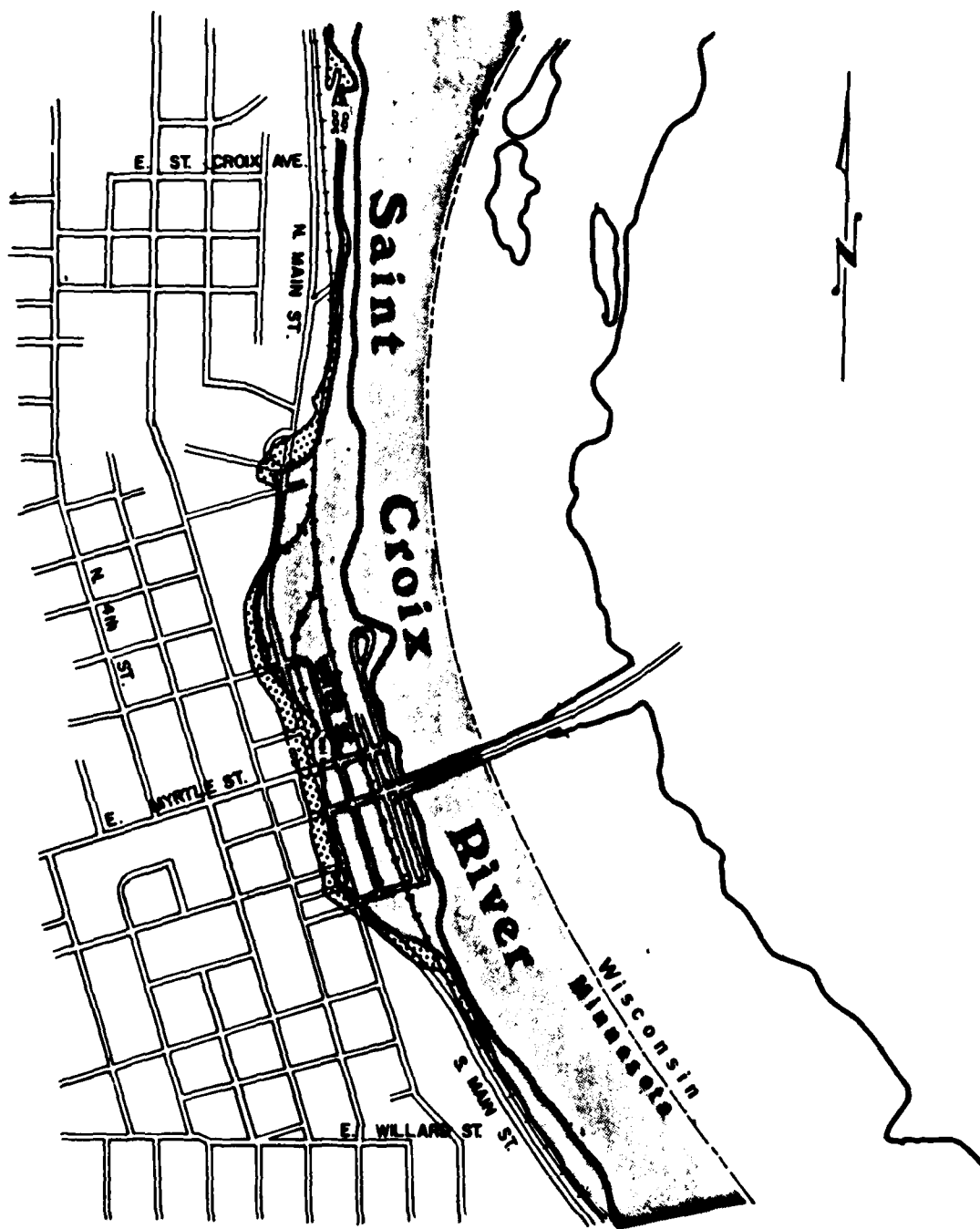
This section of the St. Croix River Reconnaissance Report deals with flooding in the community of Stillwater, Minnesota. Included in this section is a discussion of existing conditions, a preliminary analysis of alternative flood control measures, and a discussion of studies required to determine the feasibility of a permanent flood protection project for the community of Stillwater.

PROBLEM IDENTIFICATION

Existing Conditions

Past flooding along the St. Croix River at Stillwater (figure 2-1) has emphasized the need for flood control, established the extent of possible flood damages, and increased the need for floodplain management among local people.

Downstream from Stillwater, the Corps of Engineers maintains the St. Croix River as a navigation channel. The Corps maintains a 9-foot channel from the mouth of the St. Croix River to river mile 24.5 at Stillwater. A 3-foot channel is authorized from river mile 24.5 to Taylors Falls, Minnesota. Lock and dam 3, located on the Mississippi River near Red Wing, Minnesota, helps to maintain the navigation pool extending up the Mississippi and lower St. Croix Rivers. The normal pool elevation for this reach is 675 feet above mean sea level (1912 adjusted). During periods of high flow, the gates of the dam are raised, and the effect of the dam on flood flows along the St. Croix River is negligible.



-  100 YEAR FLOOD OUTLINE
-  500 YEAR FLOOD OUTLINE

0 800 1600
SCALE IN FEET

ST. PAUL DISTRICT
CORPS OF ENGINEERS
FLOOD MAP
ST. CROIX RIVER
STILLWATER, MINNESOTA

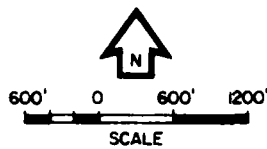
Under Public Law 90-542 (the Wild and Scenic Rivers Act) the St. Croix River, from the junction with the Mississippi River to the Washington/Chisago County line (Minnesota), is designated as Recreational; from above that point to St. Croix Falls (Wisconsin) as Scenic; from St. Croix Falls to 10 miles upstream as Recreational; and from that point to Gordon, Wisconsin, as Scenic.

The city of Stillwater has developed a flood emergency plan, but the plan is currently out of date. During 1965 and 1969, the community depended on government assistance from State and Federal agencies to fight floods.

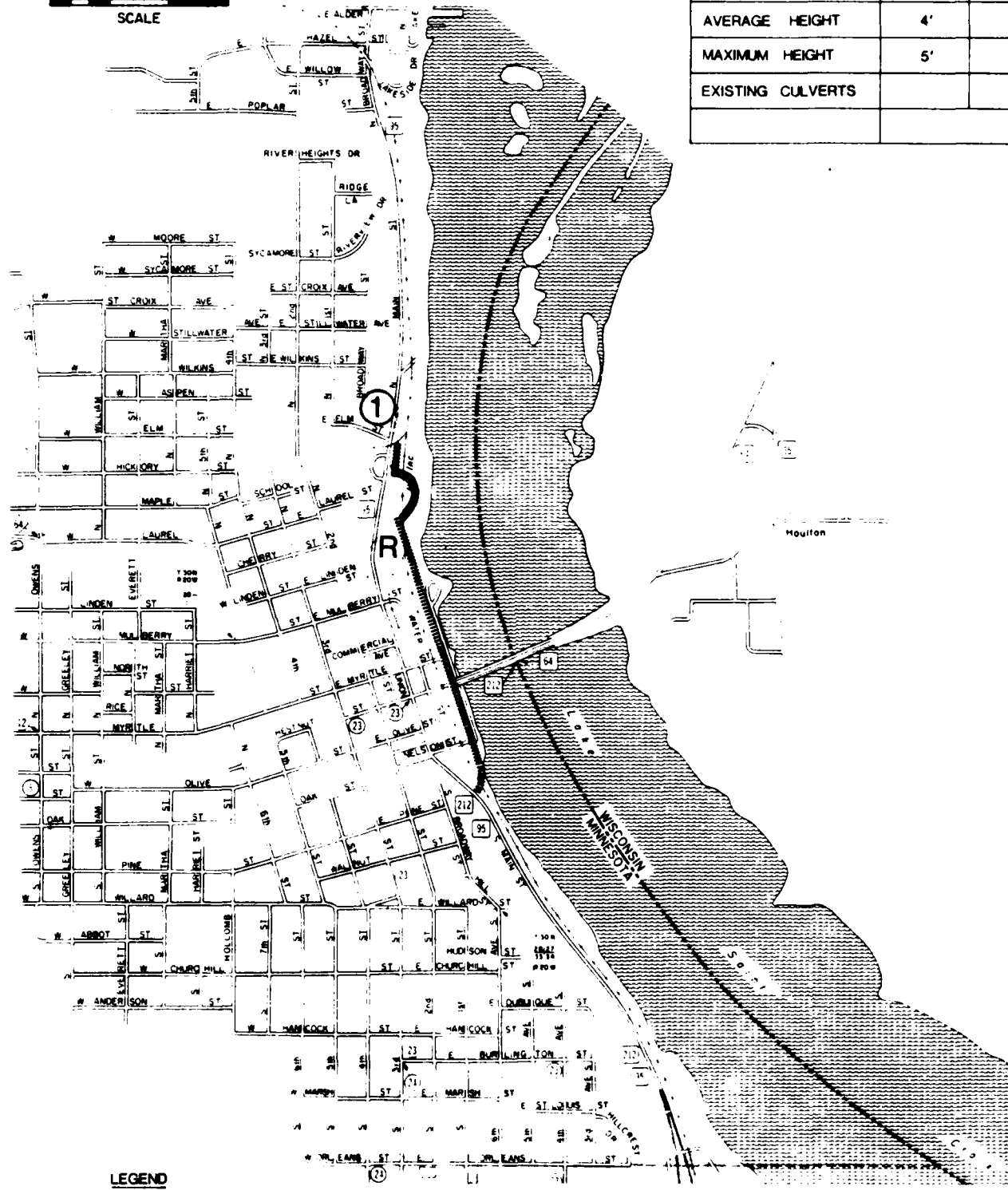
Emergency levees at Stillwater were initially constructed in the spring of 1965 and rebuilt in 1969 and in 1972. Most of the levee was placed on parking lots, streets, and railroad rights-of-way. Approximately 900 feet of levee has been removed. The 350-foot portion remaining has a top elevation of 696 (1912 datum), which provides 2 feet of freeboard over the 1965 flood. The riverward side slope is 1V on 4H, and the landward side slope is 1V on 2H. The average levee height is 4 feet, with a maximum height of 5 feet. Figure 2-2 shows the general levee alignment plus the portions remaining and removed.

The city of Stillwater participates in the National Flood Insurance Program and has enacted floodplain regulations.

Social Resources - Stillwater is one of the oldest communities in Minnesota. The early importance of the area was the result of its key role in the logging era of the upper St. Croix River basin (1830 - 1900). Following the decline of the logging industry, the economy of the area shifted to that typical of a small agricultural service center. This trend continued until the mid-1970's. At present,



	REACH 1	REACH 2
ELEVATION 1912 DATUM	696	
TOTAL LENGTH	350'	
AVERAGE TOP WIDTH	5'	
AVERAGE HEIGHT	4'	
MAXIMUM HEIGHT	5'	
EXISTING CULVERTS		



LEGEND

- ① REACH NUMBER
- EXISTING CULVERTS
- EMERGENCY FLOOD LEVEE
- R REMOVED LEVEE SECTION

Figure 2-2
EMERGENCY FLOOD LEVEE
STILLWATER
WASHINGTON CO. MINNESOTA

Stillwater is in another major transition - to a recreation service area and bedroom community for the Minneapolis-St. Paul metropolitan area.

Populations for the city of Stillwater and Washington County for the 20-year period 1960-1980 are shown in table 2-1.

Table 2-1 - Population for Stillwater
and Washington County, Minnesota, 1960-1980

	1960	1970	1980	Percent of change 1960 to 1980
Stillwater	8,310	10,191	12,290	48.0
Washington County	52,432	83,003	113,571	117.0

Washington County, which includes the city of Stillwater, is part of the Minneapolis-St. Paul metropolitan area. Washington County has experienced a large increase in population since the two primary metropolitan counties, Hennepin and Ramsey, were developed to near capacity in the 1960's and 1970's. Stillwater has seen less growth, proportionally, because of its location at the far eastern border of Washington County. As expansion of the metropolitan area continues, additional growth in Stillwater is expected. Transportation time between Stillwater and Minneapolis-St. Paul is approximately 35 minutes during "rush-hour" periods over an excellent network of U.S. and interstate highways.

Economic Resources - Stillwater has experienced a large increase in economic activity over the last decade, primarily in the area of retail trade (see table 2-2). This increase is the result of three factors: increased population, due to expansion of the Minneapolis-St. Paul metropolitan area; increased tourism, as a result of St. Croix River designation as a Wild and Scenic River; and concerted local efforts to renovate local historic structures for retail use.

Table 2-2 - Retail Sales for
Stillwater, Minnesota, 1977 and 1981 (in \$1,000's)

Category	(1) # Filing	Total 1977	(1) # Filing	Total 1981
Lumber/hardware	16	\$ 4,594	21	\$ 9,138
General merchandise	8	2,083	6	8,712
Food stores	6	7,671	12	10,062
Automobile dealers/gas stations	25	19,130	26	26,580
Apparel	8	2,171	16	3,586
Furniture	26	1,011	24	1,260
Eating/drinking	27	8,519	42	14,400
Miscellaneous retail	<u>73</u>	<u>7,423</u>	<u>136</u>	<u>10,798</u>
Total	189	52,602	283	84,536

(1) Indicates number of businesses that reported sales figures for that year.

Capital investment in retail structures has changed significantly over the last 3 to 5 years. This investment has been directed toward renovation and rehabilitation of older structures in the downtown area and toward conversion of the structures to "mini-malls" containing restaurants and small retail establishments. The focus of the development has been an area approximately three blocks east and west of Main Street extending the entire north-south length of the downtown area. Much of this area lies within the St. Croix River floodplain.

The trend toward higher land values and increased economic activity is expected to continue into the foreseeable future. Although little land in the downtown area is vacant and available for new development, increasing land values will support additional conversions to higher economic uses.

Natural Resources - The fish and wildlife resources in the city of Stillwater are rather limited. The area consists of urban commercial developments, railroad yard facilities, boat launching

and storage facilities, and park development. Because of the urban conditions, the wildlife value of the area is restricted to songbirds and similar species, including bluejays, robins, and sparrows. However, this is an important resource because it is in an urban setting. The area farther upstream and downstream of the city becomes less developed and provides more habitat for non-urban wildlife species such as beaver, squirrel, raccoon, and bird species such as flickers and woodpeckers. The lower St. Croix River provides very important recreational amenities, including fishing, boating, and many other water-oriented activities. As a result, access to the river is an important consideration.

The Minnesota Department of Natural Resources has identified two major planning and management goals for the St. Croix River and Lake St. Croix near Stillwater. The first is the successful establishment of a muskellunge population capable of maintaining itself under sustained recreational fishing pressures. The Department of Natural Resources has already introduced muskellunge to the lake and river, and it has monitored that species' population. Other muskellunge stocking in the river and lake may be forthcoming, possibly involving other genetic populations. Included in the goal of a viable muskie population is the need to evaluate its population trends.

The other goal identified by the Department of Natural Resources involves public access to the river and lake. The Department wants to increase the number of access points and parking spaces in the Stillwater-Bayport area, not only for fishery management, but also for other water-based recreation.

Another goal that would benefit fish and wildlife as well as recreation is improving the water quality of the St. Croix River basin. Other benefits would result from reduced erosion and

sedimentation. Encouraging the use of more land treatment measures in the basin would produce some of these benefits. Land treatment measures include conservation tillage, contour farming, shelter-belts, stock ponds, grassed waterways, and others.

Overall, the Minnesota Department of Natural Resources feels that it is important to maintain the existing habitat and aesthetic qualities of the St. Croix River basin. Any flood control plans developed by the Corps of Engineers will consider the goals established by the Minnesota Department of Natural Resources as well as other State, local, and national goals and objectives for the basin.

Cultural Resources - In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, the National Register of Historic Places has been checked. As of March 25, 1983, 15 historic National Register structures are within the city of Stillwater, and a number of National Register sites are outside of the city but within Stillwater Township. Stillwater has not been systematically surveyed for archeological sites. Stillwater was included in the 1980 Minnesota State Historic Preservation Office's standing structure survey of Washington County. On the basis of that survey, a Multiple Resource Area (MRA) nomination was submitted to the National Register of Historic Places and entered on April 20, 1982. Within Stillwater, eight historic structures are part of the MRA nomination. Other historic structures within Stillwater have been individually nominated to the National Register of Historic Places. Project coordination has been initiated with the Minnesota State Historic Preservation Officer, the State Archeologist, and the National Park Service.

Historically, Stillwater played a significant role in the State's early lumber industry. The State's first sawmill was built just

north of Stillwater at Marine, by the Marine Lumber Company, in 1839. The first lumber activity at Stillwater began in 1843 or 1844 when Johnn McKusick (from Stillwater, Maine) and others began the Stillwater Lumber Company and Sawmill. In 1854 a steam-power plant was built at Stillwater by Samuel Hersey and Isaac Staples. This plant powered five circular saws, a gang saw, and other machinery. Within 4 years, the Hersey-Staples Company held title to 34,000 acres of land in the St. Croix River valley. Other companies also operated out of Stillwater, and the intensity of industry activities made Stillwater the logging center of Minnesota. In 1851, the area lumbermen united to create a log boom. It was located first across from Osceola, Wisconsin, and later just north of Stillwater in Lake St. Croix. The lumbermen established the St. Croix Boom Company, where logs were identified, sorted, and sent to mills or down the river. By 1874, 3½ billion board feet of logs went through the boom (Blegen 1963: 319-320; Harvey 1980).

Three centers of lumber activity existed in the State of Minnesota by 1860: Stillwater and Marine on the St. Croix, St. Anthony Falls, and Winona. Washington County produced the most lumber (Blegen 1963: 321). By 1869, Stillwater still dominated the lumber industry in the St. Croix region - sending 225 log rafts down the river in that year. By 1874, nine mills were in operation in Stillwater. The production of white pine in the St. Croix River valley peaked in 1895 with 373 million board-feet of lumber (Blegen 1963: 325).

A number of National Register sites in or near Stillwater still stand as examples of the industry, activities, and lives of the people from Stillwater's beginnings as a lumber industry center.

The limestone powerhouse of the St. Croix Lumber Mills/Stillwater Manufacturing Company is the only known industrial structure associated with Isaac Staples. The powerhouse was built in 1850 by

Sawyer and Heaton, who built the second lumbermill in Stillwater. Staples bought the powerhouse in 1869. Changes have been made to the structure, but the smokestack and stone work of the building are original. The industrial building now attached to the powerhouse was built around 1900 by the Stillwater Manufacturing Company. A lumber-drying kiln is also present, which was built by the Stillwater Manufacturing Company in the 1890's (Harvey 1980).

A number of Stillwater residences were built by lumbermen. They include the Roscoe Hersey House, the Albert Lammers House, the Captain Austin Jenks House, the William Sauntry Residence and Recreation Hall, and the Ivory McKusick House.

Other significant National Register sites within Stillwater include the Joseph Wolf Brewery; the Old Minnesota State Prison; the Old Warden's House; the Chicago, Milwaukee, and St. Paul Railroad Freight House and Depot; the Staples Block and St. Johns Lodge #1; the Minneapolis and St. Paul Suburban Railway Company Office and Power House; the Washington County Courthouse; and the Mortimer Webster House.

The National Register structures located within, or very near to, the project area include the Joseph Wolf Brewery, the Old Warden's House, and the old Minnesota State Prison, all located within or near the standard project flood line; and the Chicago, Milwaukee, and St. Paul Freight House and Depot, the Staples Block and St. Johns Lodge #1, and the St. Croix Lumber Mills/Stillwater Manufacturing Company, all of which are located within the 100-year flood line.

No prehistoric or historic archeological sites are known to exist within the project area. However, because of the intensity of historic lumber industry activities along the riverfront, there is

an extremely high probability that potentially significant unknown historic archeological sites exist within the project area. There is a much smaller probability that prehistoric sites are still intact because of the historic activities in the area. The proposed project alignments will be surveyed to determine if any prehistoric and/or historic archeological sites exist within the project area.

Recreation Resources - The city of Stillwater provides a variety of recreational opportunities for local and regional residents through seasonal programs and the operation and maintenance of a number of park facilities. A three-member City Park Commission and a nine-member Recreation Board coordinate park and recreation services. A full-time Park Manager oversees park maintenance and development programs.

Lowell Park, located along the St. Croix River, provides weekend tourists and local residents an opportunity to walk along the river, picnic, or enjoy shoreline fishing. The park is used during the summer to host several music/art festivals that attract thousands of people and provide money-making opportunities for city retailers.

Current park development plans call for improvements to reconstruct an existing bandshell and to provide new park toilets within an existing pumping station. Other park-related development concepts being considered by Stillwater interest groups include use of adjacent railroad tracks (expected to be abandoned soon) to support a tourist train, use of park shoreline to support a new paddleboat for tourist traffic along the St. Croix River, and possible expansion of park boundaries south along the river on city-owned lands to provide improved shoreline access to the public.

Previous Plans

Studies by the Corps of Engineers in 1968 considered two structural solutions for the community of Stillwater. One of the structural plans proposed storage of the standard project flood at a reservoir site on the main stem of the St. Croix River near St. Croix Falls, Wisconsin. This plan was found to be economically feasible at the time of the 1968 study. Since that time, however, it has been determined that this proposed plan would not be acceptable because of environmental and social constraints and its incompatibility with the wild and scenic and recreation designation of the St. Croix River. The other structural plan considered construction of an earthen levee at Stillwater. Preliminary estimates of costs and benefits associated with the plan were found to be economically feasible.

More recent studies by the city of Stillwater in 1974 considered a permanent dike along an alignment used for flood emergency levees during the 1965, 1969, and 1971 floods. The report referenced the benefits, which included avoiding the repeated costs of construction and hauling away of emergency levees plus the peace of mind that a permanent levee would afford the owners of property within the flood-threatened area. A major disadvantage would be the change in scene of the river view from the downtown area. The city's report made the following recommendations relating to this study:

- o The city requested the Corps of Engineers to participate in the detailed design and construction of a permanent dike.
- o The dike, if ultimately constructed of earthen material, should include aesthetic features (related to shape of the structure, plantings, and park equipment) to make such a facility acceptable in the location proposed.

Problems, Needs, and Opportunities

Flooding at Stillwater is caused by high flows on the St. Croix River and by backwater from high flows on the Mississippi River. These conditions have occurred many times on the St. Croix River at Stillwater. The largest recorded flood discharge in the St. Croix River basin was in 1950. However, the 1965 flood caused higher flood stages due to flows and backwater effects from the Mississippi River. Other documented significant floods have occurred in 1944, 1945, 1951, 1952, 1954, 1957, 1967, 1969, 1971, 1972, 1975, 1979, and 1982. (See figure 2-3 on the following page.)

Approximately 81 structures in Stillwater are subject to flooding from high flows on the St. Croix River. These structures are located in a strip along Main and Water Streets in downtown Stillwater and constitute the heart of the business district. The businesses include a creamery, restaurants, retail stores, and light manufacturing. Floods in 1965 and 1969 would have caused extensive damages to all of these structures if the city had not undertaken an emergency flood fight.

In addition to these two large events, floods in 1950, 1951, and 1952 inundated portions of the floodplain. Historic damage information for these events is not available at this time. Because floodplain use has changed considerably since the 1950's, it is doubtful that any meaningful damage comparisons could be made.

FLOOD HISTORY ANNUAL MAXIMUM STAGES ST. CROIX RIVER AT STILLWATER 15 SEPT. 82

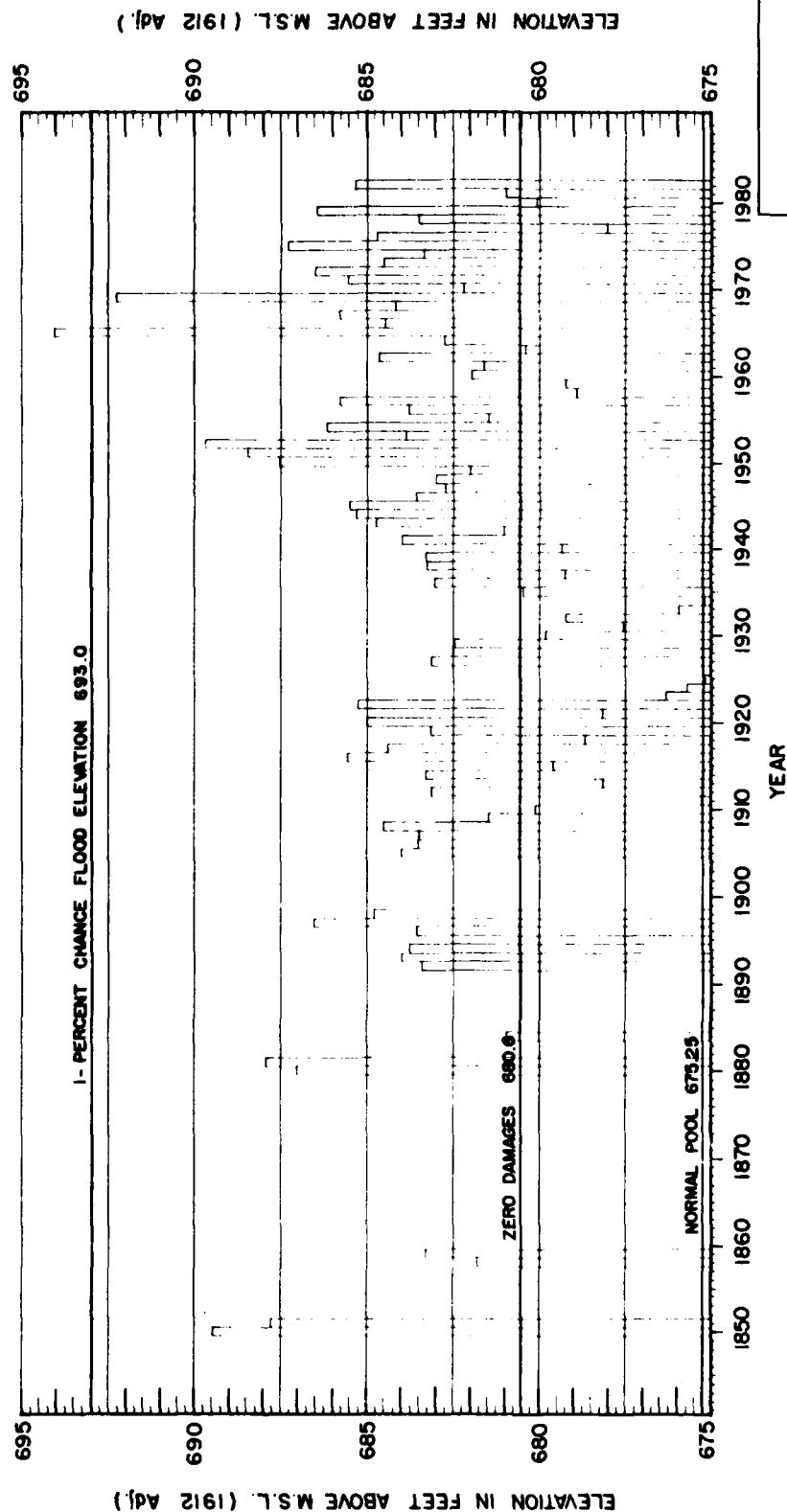


FIGURE 2-3
FLOOD HISTORY
STILLWATER, MINNESOTA

Peak flood elevations and frequencies for historic, 100-year, and 500-year flood events are shown in the following table.

Table 2-3 - Stillwater Historic Flood Frequencies

Flood event	Frequency in percent ⁽¹⁾	Elevation in 1912 msl
1969	1.4	692.24
1965	0.6	694.09
1952	3.0	689.71
1951	6.5	688.40
1950	9.5	687.53
100-year	1.0	692.9
500-year	0.2	696.5

(1) The frequencies attached to these events are from an August 1966 frequency curve. Seven of the twenty largest events have occurred since 1966.

Crest predictions for floods of this magnitude would cause the city to undertake actions to construct an emergency levee. Current costs for levee construction and removal are approximately \$300,000. Under current conditions of development, an unsuccessful flood fight would cause considerable damage to the commercial district, disrupt city services, close the bridge over the river (forcing traffic to detour 20 miles to cross the St. Croix River), and close State Highway 95 (causing trip delays and detours through residential streets).

Damages to public and commercial facilities for a recurrence of the historic and hypothetical events in table 2-3 are summarized in table 2-4 below. Average annual damages under existing conditions of development are \$748,000.

Table 2-4 - Damages to Public and Commercial Buildings

Event	Damages under current conditions of development⁽¹⁾
1969	\$ 8,520,000
1965	10,100,000
1952	5,350,000
1951	3,210,000
1950	1,620,000
100-year	8,933,000
500-year	12,000,000

(1) Includes the cost of an unsuccessful flood fight but does not include traffic rerouting and delay charges.

Conditions if No Federal Action Is Taken

The most probable future, if no Federal action is implemented, is no change from the existing condition. Flood reduction actions are expected to be those used in the past.

Currently, the community of Stillwater depends on emergency measures to reduce flood damages during a flood event. These actions include construction of emergency levees, temporary evacuation of residents, and removal of the contents of commercial properties. This situation puts a significant drain on local financial resources and manpower for cleanup costs, affects the local economy and tourism revenues, and could, potentially, cause loss of life.

In addition, nonstructural measures such as floodplain zoning, floodproofing, and flood insurance would continue to be implemented in the community. However, individual homeowners who currently depend on flood insurance would be required to assume an increasing share of insurance costs if the Federal Government phases out the subsidy for this program. Flood proofing would be implemented only by individuals who can afford the capital investment. Remaining properties would continue to suffer flood damages and losses in capital investment. Negative impacts on community land use,

community image, property owners, and community aesthetics would continue to occur over a long period.

The natural resources of the area would continue to decline because of the urban nature of the area and its limited resources. These losses are not expected to be large or significant.

Historic structures would continue to be flooded, resulting in possible structural damage and increased costs for repair and restoration. Any plans to enhance and develop the city's historic character would also be hindered by the continued flooding problems.

FORMULATION OF PRELIMINARY PLANS

Since suspension of this study in 1968, there have been many new public laws, executive orders, and changes in the engineering, economic, environmental, social, recreational, and cultural criteria for planning, design, and implementation of flood damage reduction plans. Any plan for flood damage reduction will address these changes in policy, regulations, and procedures.

Planning Constraints

Any flood damage reduction plan proposed at Stillwater must be technically and economically feasible, socially and environmentally acceptable, and capable of being carried out. In addition, the specific planning constraints listed below apply to any proposed plan for the study area:

- o The plan must not conflict with the Federal Wild and Scenic River designation of the St. Croix River under Public Law 90-542.

- o The plan must be consistent with the city of Stillwater's policy to promote cultural and historic amenities.
- o The plan should emphasize nonstructural methods of flood control.
- o The plan must be acceptable to those who will ultimately be responsible for carrying out any selected plan.

Plan Formulation Rationale

The Corps of Engineers will conduct studies to identify and evaluate the impacts of various flood damage reduction plans for the city of Stillwater. Flood damage reduction measures, both structural and nonstructural, will be evaluated to identify the best plan. The engineering, economic, environmental, recreational, cultural, and social impacts will be evaluated according to the Water Resources Council Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. This evaluation will provide local decision-makers with a common basis for screening and selecting the best plan. The level of detail will be sufficient to determine whether a feasible flood damage reduction plan can be recommended for implementation.

The following criteria will also guide the evaluation of plans:

- o The plan must be technically feasible.
- o The plan must be implementable.
- o The plan must be complete and not require future improvements.
- o The plan must have a local sponsor.

An interdisciplinary team was assembled early in the reconnaissance study to help identify area problems and to develop an approach for

analyzing flood and related water resource problems. After flood problem areas were identified and scoped, team members developed this report.

Measures Identified for Study

Table 2-5 lists structural and nonstructural measures that were identified for consideration in this study. Structural measures include upstream tributary dams, levees, and floodwalls. Nonstructural measures include floodproofing, temporary or permanent evacuation, floodplain zoning, flood forecasting and warning, flood emergency plans, building codes, development policies, and flood insurance. These measures are described beginning on page 31 of this report.

Table 2-5 - Management Measures Available for Reducing
Flood Damages at Stillwater

Measure	Availability
<u>Structural</u>	
Dams and reservoirs	X
Levees and floodwalls	X
Emergency levees	X
Channel modifications	
Diversions	
<u>Nonstructural</u>	
Flood warning	X
Floodplain evacuation	X(1)
Floodproofing	X
Floodplain conversion	
Floodplain zoning	X
Subdivision regulations	
Building codes	X
Development policy	
Flood emergency plan	X
Flood insurance	X

(1) Temporary evacuation only.

For all flood-prone areas subject to flooding, this report recommends further consideration of corrective and preventive nonstructural measures in combination with structural measures. Corrective measures such as floodproofing or floodplain evacuation are directed at structures in the floodplain. In combination with structural measures, corrective measures will be analyzed for economic, environmental, and social impacts.

Flood insurance is listed as a nonstructural measure although it neither corrects nor prevents flood damages. In reality, people will always want to build in floodplains and will need insurance against the risk of being flooded. Flood insurance will only spread the cost of floodplain damages among the insured.

Emergency measures are also a reality in flood areas. Where floods occur, there will always be a chance for a flood to occur that exceeds the area's capacity to protect itself. In combination with a flood emergency plan of action, structural and nonstructural measures can be identified and implemented in floodprone areas to reduce flood damages in an organized and managed effort.

Assessment and Evaluation of Management Measures

Upstream tributary reservoirs, levees, and floodwalls were the structural measures identified for further consideration in reducing flood damages at Stillwater.

Upstream tributary reservoirs would reduce flood damages along the entire reach of the St. Croix River by holding floodwater and reducing downstream flood elevations until the water can be released safely downstream. If feasible, this measure would reduce flood damages in Lake St. Croix areas and in all urban and rural reaches downstream of reservoir sites including Stillwater. In addition,

reservoirs offer the opportunity to improve other water related problems and needs, including conservation storage for water supply, hydropower for local energy needs, increased water-based recreation areas, and fish and wildlife opportunities. Initial studies have determined that tributary reservoirs are not economically, socially, or environmentally feasible. Therefore, tributary reservoirs will not be considered further in this study.

Levees/floodwalls appear to be the only structural measure that could significantly reduce flood damages at Stillwater. A preliminary evaluation in 1968 also showed feasibility for this measure.

The proposed alignment for this measure would be located somewhere between the Burlington Northern/Chicago and Northwestern Railroad tracks and the St. Croix River. No structures would be affected. This alignment offers the opportunity to remove urban areas from the St. Croix River floodplain.

A number of levee/floodwall alternatives will be considered for construction along the proposed alignment. These alternatives include various types of fixed floodwalls such as concrete and sheet pile, unique floodwall designs such as a folding floodwall, and earthen levee. At this time, the final plan is expected to consist of a combination of these alternatives that will be selected depending upon the planning, engineering, economic, social, environmental, recreational, and cultural constraints of the study and project area and the needs of the city of Stillwater.

For the purpose of assessing the costs and benefits associated with the project, a folding floodwall in the central business district and an earthen levee north and south of this floodwall along the entire length of the proposed alignment were evaluated. The project

first costs for such a plan are \$7.3 million for the 100-year level of protection. These first costs include two closure structures and one pumping station. At this stage of study, only two levels of protection -- the 100-year level and the 500-year level -- were evaluated. These two levels of protection would provide average annual benefits of \$629,700 and \$674,000, respectively, to existing properties. This provides a benefit-cost ratio of 1.03. A unique floodwall design such as a folding floodwall in combination with a fixed floodwall appears to show greater economic feasibility. However, limited knowledge and use of these designs preclude a detailed evaluation at this level of study. During detailed studies, a plan that optimizes net economic benefits will be formulated.

In addition to flood damage reduction benefits because of the high demand for land in this growing commercial/recreation area, the potential exists for intensification in existing land use. The quantity and quality of the recreation experience may also be enhanced. An important consideration in the formulation of flood reduction plans is the impact on the advantage that Stillwater enjoys because of its location on the river. This advantage may be because of the accessibility of the river from both the visual and transportation aspects. Lowell Park also abuts the river and provides a convenient location for special festivals and events which attract people to the town. This resource may be impacted by any proposed plan. Municipal parking lots are sandwiched between Lowell Park and the downtown area. These areas may be impacted by proposed levee alignments. Observations made on festival weekends indicate that parking is already in short supply. Further investigation and quantification are needed in these two areas.

Of the nonstructural measures identified in table 2-5, floodplain conversion, subdivision regulations, and development policies will

not be emphasized in further study efforts. The floodplain at Stillwater is located in a densely developed area that does not allow for much new development. In addition, the Wild and Scenic designation of the St. Croix River would discourage development in open-space areas. Floodplain conversion is not currently considered a viable measure for Stillwater because the central business district which has been developed to promote tourism is in the floodplain.

Social Impacts - A preliminary analysis of folding floodwalls suggests that the social effects would be primarily positive. This measure appears to be consistent with current desired future uses of the riverfront area because it would preserve the physical and visual access to the river. Benefits of this measure would accrue to existing and potential land use, business and commercial activities, and regional growth. Since the real estate requirements of folding floodwalls would be consistent with locally supported recreation/open space use, no negative acquisition/displacement effects are expected.

Levees would have similar positive effects resulting from protection of existing properties. However, negative consequences would also result. Aesthetic quality would suffer from elimination of visual access to the river from downtown. Because downtown businesses rely to some degree on the river as a tourist attraction, this measure could also reduce business activities. Should this decline in business result, secondary social effects would occur in tax revenues, regional growth, and local controversy. Feasibility studies will address the importance of river access as a recreational, economic, and community well-being resource.

Nonstructural alternatives for Stillwater include floodproofing and floodplain evacuation. Social impacts of floodproofing could occur

in the following categories: business and commercial activities, aesthetics, and community growth and development. Beneficial effects on business and commercial activity could result from a reduction in flood damages. However, retail trade relies to a significant extent on the historic nature of the downtown structures. Alteration of the structures for floodproofing could detract to some degree from their historic character and, hence, from their attraction to tourist trade. This consequence would also have a secondary negative effect on community growth and development. Likewise, the changed structures could detract from the aesthetic characteristics of the downtown, since the primary "motif" is that of a historic river community.

The social impacts of permanent evacuation would be significantly adverse. Relocation of structures from the floodplain would cause severe disruptions in community growth and business activity. Relocation would move the downtown retail community away from its primary customer access route (Minnesota Highway 95) and remove its two major attractions (access to the river and historic structures). Without these qualities, the retail trade would have few resources with which to compete with similar services provided throughout the Minneapolis-St. Paul metropolitan area. With this measure, substantial reductions in retail trade and community growth would occur.

During the feasibility study, all of the impacts to the categories identified in Public Law 91-611 will be evaluated and displayed.

Recreation Impacts - It appears that any structural floodwall or levee, other than a folding floodwall which would be located on existing city parkland, would have an impact on existing area

recreational use. An earthen levee would require most, if not all, of the existing park area. A permanent floodwall could cut off the park area from the adjacent city business district.

Lowell Park, located adjacent to the St. Croix River, is the location of a number of river festivals which attract tourists to the city. Their expenditures are important to local restaurant and other tourist oriented retailers. Visual intrusions to, or actual removal of, the park could result in reduced tourism activity.

Nonstructural alternatives are not expected to have significant impacts on existing or future project recreation resources.

Natural Resource Impacts - This general evaluation identifies areas of potential natural resource impact. In later study stages, more detailed impact assessments would be carried out, including assessment of the 17 points required by Section 122 of Public Law 91-611.

The exact location of the structural measures has not yet been identified but they may be on city parklands or other open space. It appears that most of the construction would occur in urban areas. The study area has not been evaluated for its habitat value, but usually the loss of any habitat in an urban area is important because of its scarcity and value in providing wildlife and recreational amenities. Possible areas that could be affected include water quality, urban wildlife, and vegetation.

Aquatic impacts could result if alternatives affect the St. Croix River. Because the endangered Higgins' eye pearly mussel has been found downstream of Stillwater, the area will be surveyed to determine the status of this species in the study area.

One possible alternative for obtaining fill material for the levee involves the use of dredged material from the river. Before this alternative could be recommended, a sediment analysis would be conducted in the area to determine acceptability of the material.

As the study progresses and more detailed designs of alternatives are developed, it will be necessary to conduct environmental evaluations and to comply with existing laws, including: Endangered Species Act of 1973, as amended; Clean Water Act of 1977, as amended; Executive Orders 11990 on wetlands and 11988 on floodplains; Fish and Wildlife Coordination Act; National Environmental Policy Act of 1969, as amended; and other Federal and State statutes.

Cultural Resource Impacts - The construction of an earthen levee may impact presently unrecorded prehistoric and historic archeological sites along the river. Further, the height of the levee would have a negative visual impact, both from the river side looking at the city, and from the historic buildings within viewing and walking distance of the riverfront. The presence of a levee may also negatively impact any future historic waterfront restoration plans.

A permanent floodwall would have the same construction and visual impacts as an earthen levee. However, the visual intrusion of a permanent wall would be even more negative because it would be difficult to blend it in with the historic setting of the area.

A folding floodwall within the park area and along other visually- and pedestrian-sensitive areas should not have a visual impact on any of the structures listed on the National Register of Historic Places. Because of the folding nature of the floodwall, the historic integrity and feeling of the riverfront could be maintained. The design of the floodwall and subsequent landscaping

could be developed around a historic theme, thereby minimizing the negative visual impacts and at the same time enhancing the historic nature of the riverfront. The folding floodwall should not inhibit future development or restoration of the riverfront. Since none of the alignments have been surveyed, it is possible that prehistoric and historic archeological sites may be located in the project area.

PLAN OF STUDY

Future study efforts will focus on viable flood reduction measures that meet the needs of the city of Stillwater, are consistent with the water and related resource needs of the St. Croix River basin, and complement the Wild and Scenic River status of the St. Croix River. A full range of structural and nonstructural measures will be considered in light of the conditions that have changed since 1968. All study efforts will be coordinated with Federal, State and local interests.

The study consists of two planning stages - reconnaissance and feasibility. This reconnaissance report identifies, assesses, and recommends for further study general ways of reducing flood damages. During the feasibility study, the first iteration consists of a more detailed assessment of recommended reconnaissance level measures in terms of their engineering, economic, environmental, social, recreational, and cultural impacts and opportunities. The alternatives are screened, and specific measures, or combinations of measures, or plans, are carried into detailed studies. The final feasibility report will recommend one plan for detailed engineering and design studies.

Study Tasks

Background Information and Basic Data - Additional information will be collected to identify the engineering, economic, environmental, recreation, social, and cultural profile in the study area. This base will be expanded and developed in more detail, as necessary, to meet the needs of the Stillwater study.

Hydrologic and Hydraulic Studies - Additional information will be obtained to determine drainage characteristics, topography, cross sections, river conditions, gaging stations, bridge locations and dimensions, and other hydrologic and hydraulic information.

Discharge-frequency curves and rating curves and standard project flood data will be developed or updated for Stillwater. Necessary hydrographs will be developed for the design of local protection works at damage centers and controlling locations. Preliminary evaluations will consider both the present and anticipated future needs of Stillwater as well as the needs of upstream and downstream reaches. Where local protection works appear feasible, designs will be prepared for three degrees of protection. Preliminary studies will be made to determine the interior drainage requirements.

Economic Studies - Available data have been collected to identify the economic base of the study area. These data will guide in establishing economic trends, market areas, and future needs. This base will be expanded and developed in more detail, as necessary, to meet the needs of the study.

For the economic evaluation, a detailed inventory of the 500-year floodplain (as defined by the flood insurance rate maps) will be completed. This inventory will provide the damage base from which flood damage relationships will be derived. These relationships

will be based on current hydraulic information, generalized depth-damage tables, damage potential interviews, and a field survey of the damageable properties. Average annual damages with and without a plan will then be evaluated. Changes in the damageable base will be projected from the regional economic trends, using generalized growth factors, as modified by local ordinances.

Geotechnical and Foundation Studies - Background geologic and foundation information will be compiled. This information will be used to identify sites and borrow areas, general soil conditions, and potential foundation problems. No geotechnical problem sufficient by itself to eliminate any alternative is anticipated, but future studies will require site-specific investigations to verify the feasibility of alternatives not eliminated by other considerations.

Stability of local flood protection structures will not be a problem but, where alluvial sands or sandy glacial drift at least 100 feet thick exist, seepage control through the thick, pervious foundation would be an important design consideration.

Borrow sources being considered for levee construction are dredged material from the marina adjacent to the project area, dredged material from the proposed city docking area on the lake, dredged material at Bayport, and alluvial deposits from a commercial pit operation south of Bayport. Samples for analysis to aid seepage investigations will be acquired from potential borrow sources.

Real Estate Studies - Preliminary real estate appraisals for a local protection project will be made for project formulation. Estimates will consider the acquisition costs of lands and damages, relocation assistance payments, and administrative costs.

Design and Cost Studies - Preliminary design and cost estimates of local improvements will be developed. These estimates will include costs of land, rights-of-way, major structures, and relocation of roads, railroads, and utilities. Cost estimates will also be made for nonstructural measures. Benefits identified in economic studies will be compared with these costs to determine each measure's benefit-cost ratio.

Plan Formulation Studies - During plan formulation, a wide variety of measures will be considered. The effectiveness, impacts, and opportunities of each measure will be evaluated and displayed to guide selection and recommendation of measures or combinations of measures for detailed study. Close coordination with interested Federal, State, and local interests will be accomplished to assure that adequate information is available for the screening and selection decisions.

During plan formulation, the current flood emergency plan for Stillwater will be updated to reflect changed conditions since completion of the plan. This plan will assist the community in preparing and handling flood emergency situations until a permanent flood control project is completed.

Cultural Resource Studies - Cultural resource tasks that need to be accomplished during future study phases include a literature review of Stillwater's history, with a reconstruction of the historic riverfront through the use of archival sources and photographs; a reconnaissance level field survey of the proposed project area for prehistoric and historic archeological sites; and participation in a Visual Resource Evaluation Methodology study to evaluate the visual impacts of proposed alternatives on the historic character of Stillwater. An assessment of Stillwater's historic resources and the impact of proposed alternatives on those resources will

constitute a major portion of the cultural resources work in the future. Close coordination and communication with concerned city officials and the public will be required to accomplish this task.

Recreation Studies - The focus of the next level of recreation resource analysis will be on identifying regional needs within the confines of the study area. Available State Comprehensive Outdoor Recreation Plans (SCORP's) and similar studies will be used in a summary analysis of existing and future recreation resource demand and supply that will identify resource needs. Adequate, detailed data appear to be available on recreational water surface use for the lower St. Croix River main stem.

A secondary focus will be on assessing the make-up of public visitors who currently use project lands. A user survey may be necessary during summer 1984 to collect these data. Particular emphasis will be placed on attempting to identify the aesthetic impacts associated with protection measures.

Because of the lack of formal development plans for the project area, it will be difficult to assess the impact of project conditions on recreation resources.

Alternative structural flood control measures are expected to follow an alignment through public park or quasi-public lands. The alignment would parallel the St. Croix River, which has been nationally recognized as a quality recreation resource by its designation as a component of the Federal Wild and Scenic Rivers System.

The proposed levee or folding floodwall could also serve as a walkway for the many summer tourists and sightseers who visit the city during the warm weather months. Landscaping and beautification

measures combined with recreational enhancement structures would provide an opportunity for the city of Stillwater to optimize use of the selected flood control alternative.

Future studies will attempt to identify the importance to tourists of the city's location on the river and the value of river access made available to tourists by means of Lowell Park. Efforts will also be undertaken to estimate the value of tourist expenditures associated with festivals in the park.

Though public use data are not available at this time, an economically feasible recreation development should be possible. The feasibility of any such development depends on detailed studies to tailor the scale of development and to optimize the facilities.

Environmental Studies - Background information on vegetative communities and habitat types, quantity, and quality will be collected to help evaluate the impacts of flood reduction measures. An impact assessment and the preliminary determination of any needed compensation and enhancement features will be made. Aerial photos of impact areas will be used to help identify and quantify impacts. The general impacts of each measure will be assessed and evaluated for comparison among measures.

In addition, if the project could adversely affect the riverine environment, the area will be surveyed for the presence of endangered Higgins' eye pearly mussels.

During the feasibility analysis of the project, evaluations will be conducted to comply with executive orders on wetlands (Executive Order 11990) and floodplains (Executive Order 11988) and with the Council on Environmental Quality memorandum on prime and unique farmlands. An endangered species assessment will be prepared to

comply with the Endangered Species Act. In addition, a Section 404(b)(1) evaluation may be needed to comply with the Clean Water Act.

Social Analysis Studies - Studies to be performed during the next level of analysis include a social profile to develop base condition data on study area demographic and social structure characteristics, a preliminary impact assessment of proposed measures and plans, and an institutional analysis to identify participating water resource management organizations. Data developed will be used to assist in plan formulation, evaluation, and public involvement activities.

Social analysis activities required for the feasibility phase of the study fall into three categories: support for the economic evaluation; support for plan formulation; and report preparation for the environmental impact statement and feasibility report. Activities to be performed are a survey of business and community leaders to determine proportions of revenues attributable to river resource access; future projection of downtown land use; demographic analysis and projection of future population, economic and business activities, and transportation; institutional assessment and fiscal analysis; and public involvement support.

Public Involvement

The objective of the public involvement program is to actively involve the public so that studies can be responsive to public needs and preferences. The "public" is defined as any affected or interested non-Corps of Engineers entity, including other Federal, State, regional, and local government offices; public and private organizations; and individuals. Cooperation and coordination among Federal water resources agencies, State interests, and community interests is important, and their concerns must be recognized and

considered. In recent years, this need for mutual cooperation and coordination has been amplified by public concern for the environment, economic development, and social well-being. To carry out this dialogue, cooperation, and coordination, the Corps will periodically hold workshops, public meetings, and other public involvement activities to inform, obtain comments, and discuss study proposals and progress.

Report Coordination

The next study iteration will develop the alternatives in more detail and screen them to determine which measures or combinations of measures will be studied in the feasibility study. This report will be coordinated with participating Federal, State, and local interests.

CONCLUSIONS

The community of Stillwater, Minnesota, located in the St. Croix River basin, has experienced serious flood problems. This report has identified a number of possible flood protection measures that could solve these problems.

Both structural and nonstructural flood damage reduction measures appear feasible at Stillwater, but these measures have received only a preliminary analysis at this early level of study. They will require additional engineering, economic, environmental, social, recreational, and cultural analysis. Information being gathered now will be used to help decision-makers determine the feasibility of various measures. Current study efforts have focused on updating baseline economic and engineering data for analyzing flood control measures.

The nonstructural measures being considered include floodproofing, temporary or permanent evacuation, an updated flood emergency plan, building codes, flood warning, and flood insurance. Structural measures include levees and floodwalls.

NEW RICHMOND

INTRODUCTION

This section of the St. Croix River reconnaissance report deals with flooding in the community of New Richmond, Wisconsin. Included in this section is a discussion of existing conditions, a preliminary analysis of alternative flood control measures, and a discussion of studies required to determine the feasibility of a permanent flood protection project for the community of New Richmond.

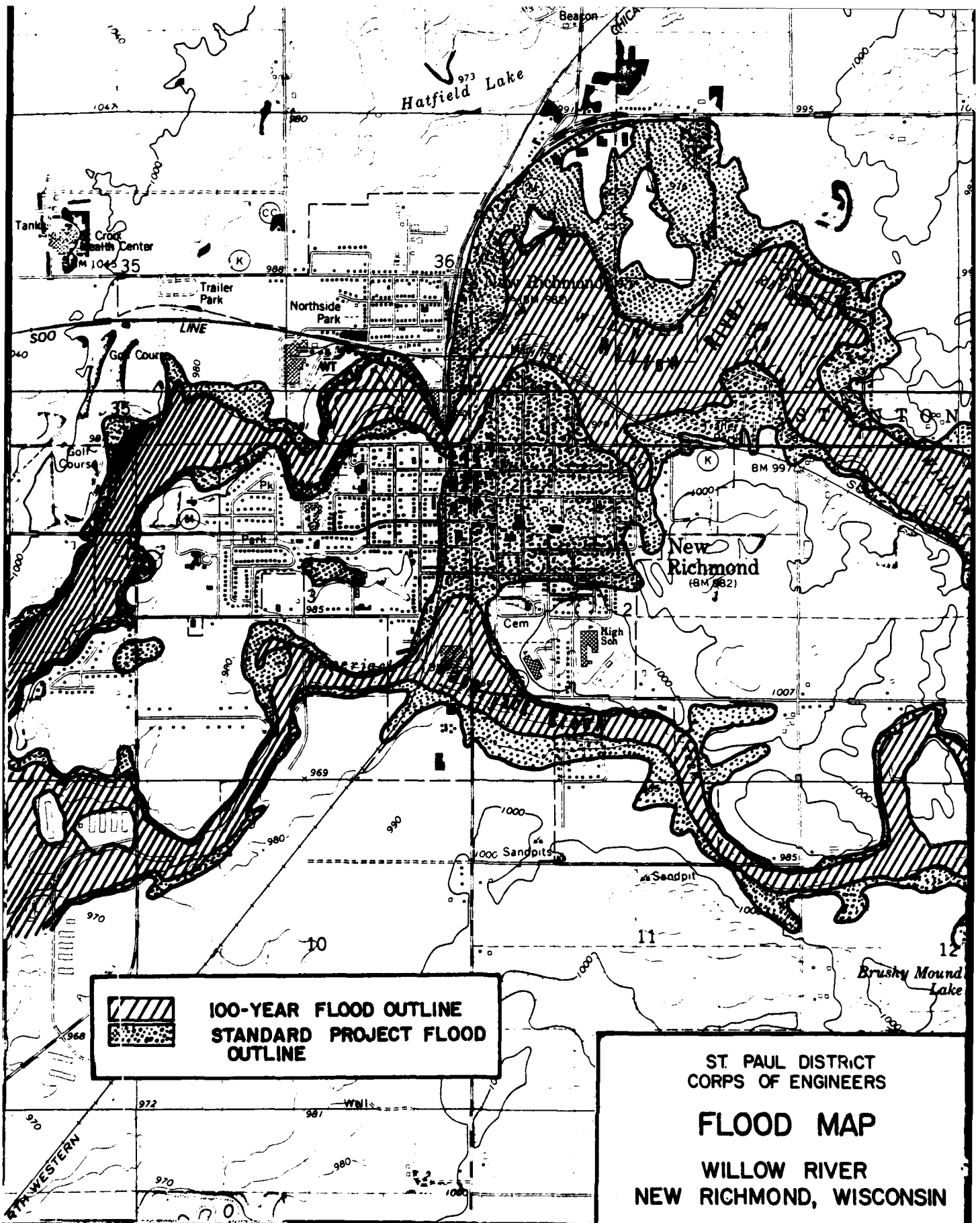
PROBLEM IDENTIFICATION

Existing Conditions

Past flooding and the threat of future flooding along the Willow River and Paperjack Creek at New Richmond (figure 3-1) have emphasized the need for flood control, established the extent of possible flood damages, and increased local people's perception of the need for floodplain management.

The Willow River originates in Polk County near Clear Lake. It flows southwesterly across St. Croix County and discharges into the St. Croix River at Hudson, Wisconsin. The drainage area above New Richmond is 175 square miles. Within the study area, the Willow River falls 39.6 feet, or 5.6 feet per mile.

Paperjack Creek originates southeast of New Richmond and has a drainage area of 8.4 square miles above the confluence with the Willow River. Within the study area, the slope is 9.6 feet per mile. During heavy rainstorms or large discharges from a combination of rainfall and snowmelt, Paperjack Creek serves as a partial relief to New Richmond as water is diverted into the creek



from a natural diversion on the Willow River east of the city. This natural diversion helps reduce the damages caused by flooding on the Willow River.

The city of New Richmond has no flood emergency plan. Emergency measures consist mainly of sandbagging during high flow periods. There are no permanent flood control structures in the area. Existing city and county zoning ordinances and building codes regulate future development and construction in the floodplain.

The National Weather Service (U.S. Department of Commerce) has a flash flood warning network. The community of New Richmond participates in this program.

City officials have arranged for an area resident to report on an upstream gage in the Willow River. This would give the city 1 to 3 days warning for potential floods on the Willow River. However, the warning time for Paperjack Creek is only a few hours. The natural diversion of Willow River floodwaters into Paperjack Creek could cause a hazardous situation to develop rapidly.

A small dam is located on the Willow River in New Richmond immediately upstream of the Chicago and Northwestern Railroad Bridge and the Domain Industries mill (formerly Doboy Industries). The water surface upstream of the dam can be controlled by manually placing or removing stop logs at the dam.

About 3 years ago, Doboy turned over the ownership and operation of the dam to the city of New Richmond. The city has kept the level of the Willow River lower than that previously maintained by Doboy. City officials have indicated that they would like to obtain moveable steel gates to facilitate the passage of ice and that State funding might be available. Several improvements in the flood

situation have occurred since 1965. In 1966, larger culverts were installed on Highway 65, and in 1982 the old bridge on Highway 64 was replaced by a new bridge at a higher elevation. Local drainage work has been completed near the Domain Industries elevator adjacent to the Willow River. Within the next year, the city sewage treatment plant will be moved to a higher elevation well above the 100-year flood level. The State is expected to replace the Highway 65 bridge over the Willow River within 3 years.

Social Resources - New Richmond is located in the central portion of St. Croix County, Wisconsin, at the junction of State Highways 64 and 65. The community is approximately 35 miles northeast of St. Paul, Minnesota. From the turn of the century to World War II, New Richmond served primarily as a trading and service center for the agricultural area surrounding it. Since World War II, the city has expanded its agricultural economic base with light industry/manufacturing and expanded retail services.

There has been a steady growth in the population and economy of New Richmond for the past several decades. The growth rate accelerated somewhat between 1970 and 1980. This rate could continue, and perhaps increase, if current trends of population and industrial movement to the east and northeast of the Twin Cities persist.

The 1980 population estimate for New Richmond was 4,306. This figure represents a 16-percent increase over the 1970 estimate (3,707), and a 30-percent increase since the 1960 estimate of 3,316 (U.S. Census Bureau, 1960; 1970; 1980). Changes in total population from 1960 to 1980 can be attributed to natural increases, expansion, and diversification in the community economic base and, to a lesser extent, on in-migration of commuters from the Twin Cities metropolitan area.

Economic Resources - New Richmond community leaders indicate that local economic growth has been moderate over the last 10 years. They suspect that this trend will continue until positive changes occur at the State and national levels. New Richmond's total civilian labor force was 1,505 in 1970 and 2,035 in 1980, representing a 35-percent increase. During the decade, unemployment rose from 5.8 percent to 6.8 percent, and the percentage of persons whose income falls below the poverty level decreased from 9.7 percent to 5.2 percent.

A moderately diversified and expanding economy accompanied by changes in the composition of the population have created a greater need for housing. The total number of housing units increased by 36 percent between 1970 and 1980. Approximately 27 percent of all owner-occupied units and 35 percent of all renter-occupied units were constructed during this period.

Because few other developable areas are available within the city limits, many of the new housing units were constructed in the floodplain. These developments occurred primarily in two areas: in the south, along and to the south of Paperjack Creek, and in the north, along the north shore of Mill Pond. Future residential development is anticipated to occur outside the floodplain to the south and possibly to the west near the golf course. However, development will be curtailed until the new waste treatment plant is completed in 1985. New industrial development is expected to take place outside the floodplain in the northwest, adjacent to the municipal airport.

HERE

Natural Resources - The existing conditions at New Richmond range from urban residential area to rural wooded creek and wetland habitat. The urban areas are mostly mowed lawns with limited

wildlife habitat value. The rural areas along Paperjack Creek and the Willow River consist of woodland and wetland habitat with scattered residential units. These rural areas appear to provide good wildlife habitat for semi-aquatic species such as beaver and upland terrestrial wildlife such as white-tailed deer.

Paperjack Creek is an intermittent stream with some small ponds created by culverts or other structures. These ponds are mostly used as stock-watering ponds. The fishery value of Paperjack Creek is limited. Willow River provides good habitat for aquatic species and is a State-designated trout stream.

Cultural Resources - In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, the National Register of Historic Places has been checked. As of June 15, 1983, no National Register sites are located within New Richmond. To date, New Richmond has not been systematically surveyed for archeological or historic sites. However, the New Richmond Preservation Society is conducting a survey of New Richmond for historic buildings and sites. Project coordination was initiated in 1982 with the Wisconsin State Historic Preservation Officer, the State Archeologist, and the National Park Service. This correspondence is available in Appendix B.

In 1855, B. B. Foster settled in what now is Glover Park in New Richmond. He established the first industry, a sawmill, on the banks of the Willow River. The river was narrow and shallow. Horses could cross the river without difficulty near Glover Park, a situation that gave the settlement its first name, Foster Crossing. The name was subsequently changed to Cold Springs, then to Richmond, and finally to New Richmond. New Richmond was incorporated as a village in 1857 and as a city in 1895. (U.S. Army Corps of Engineers, 1975)

Lumbering was the main activity in the early years of New Richmond. The Willow River was used for log drives. In 1867, the first flour mill was built on the Willow River at the site of the present Domain Industries Feed Mills. It was destroyed in the flood of 1876. The New Richmond Roller Mills, predecessor of Domain Industries, Inc., was founded in 1883. A dam on the Willow River, built initially as a holding pond for logs at the sawmill, generated power for the flour mills. (U.S. Army Corps of Engineers, 1975)

On June 12, 1899, a devastating tornado struck New Richmond. In 7 minutes, 119 people were killed, 146 others injured, and 225 buildings destroyed. For a width of about one-half mile, not a building was left standing. However, by the end of the summer of 1899, a large portion of the city was rebuilt. (U.S. Army Corps of Engineers, 1975)

Recreation Resources - The supply of trail-related outdoor recreation activities for St. Croix County and New Richmond includes hiking and nature walking, bicycling, horseback riding, and snowmobiling. Currently, the county has 11 miles of hiking and nature trails, with an additional 3.5 miles proposed.

Recently, local bicycle traffic has increased tremendously. St. Croix County also has many bicycle enthusiasts who have formed bike clubs. The county has designated 185 miles of roadway in the county as a bicycle route. Present county bike routes appear adequate, but continued improvement and development of biking facilities will be necessary to serve future demand. Existing county trails should connect with trails of community, areawide, and State-wide significance, wherever possible.

St. Croix County has no designated and marked horseback riding trails. Horseback riding does occur throughout the county, but is of a nature where designated trails are not required.

St. Croix County presently has 86 miles of designated snowmobile trails. There is a need for more marked and groomed trails. If trail mileage increases, use likely will also increase, thereby creating more demand.

The city of New Richmond has 12 recreation areas of significant size that are used regularly. These areas total 58 acres. Four more proposed areas have recreation potential or could be used to expand existing facilities. Most park areas in the city serve recreational activities other than trail-related ones, but several park areas have an emphasis on trails or are in areas with a great potential for tying into a trail system. These areas include Paperjack Park, the school system's parkgrounds, and the New Richmond Nature Center.

Paperjack Park runs along Paperjack Creek and is being considered for expansion, both in land area and in facilities. The St. Croix County Outdoor Recreation Plan also recommends expansion and further development of Paperjack Park, including biking and hiking trails. The public schools are located within a short distance of Paperjack Park. The city may wish to take advantage of this and tie the park into school recreation, such as biking and hiking trails for physical education, or by adding science and nature walks to the curriculum.

The New Richmond Nature Center has 1 mile of trail running along the Willow River. The area remains in a natural state with no major improvements or facilities aside from the trail. Willow River State Park, with 8.75 miles of hiking trails within its boundaries, is approximately 8 miles downstream from the Nature Center.

Previous Plans

The Corps study currently underway is the first assessment of flood problems at New Richmond. The St. Paul District prepared an informational floodplain report on New Richmond in June 1975. This report provided information on flood potential and hazards for land-use planning and for use in management decisions about future flood control projects and floodplain use. It did not propose potential solutions to the flood problems as the current study does.

Problems, Needs and Opportunities

Damaging floods on the Willow River and Paperjack Creek at New Richmond, Wisconsin, were reported as early as 1876. Major floods occurred in 1876, 1893, 1934, 1965, and 1967. The main cause of flooding is snowmelt and heavy rains. New Richmond experiences flash floods that afford little warning for emergency preparation. Ice jams also contribute to flood situations. Ice collects behind bridges, dams, and other obstructions in the river and causes floodwaters to rise, as was the case during the 1965 flood. Another factor influencing the flood problem at New Richmond is a natural diversion that exists on the Willow River just east of the city. At high flood elevations, water naturally flows out of the Willow River into Paperjack Creek. At the 100-year flood level, Paperjack Creek carries about a third of the total flow of the Willow River. This situation equalizes the flows down the two rivers but increases damages to homes along Paperjack Creek.

Two major floods have occurred within the past 20 years (1965 and 1967). Data from the early floods of 1876, 1893, and 1934 are limited, but apparently the April 1965 flood had the highest peak discharge to date. A long-time city resident stated that the flood of 1934 was similar in magnitude to the flood of 1965. Ice jams,

particularly at Highways 64 and 65, created obstructions to the flow in the spring floods of April 1965 and March 1967 and produced stages that were higher than those that would be found in an unobstructed channel. Peak discharges for the Willow River and Paperjack Creek at Highways 64 and 65 are shown in the following table.

Table 3-1 - Estimated Peak Flood Crest Elevations and Discharges at State Trunk Highways 64 and 65

Date/flood	Willow River			Paperjack Creek			Total
	Estimated discharge (cfs)(1)	Exceedance frequency (percent)	Elevations (2,3)	Estimated discharge (cfs)(1)	Exceedance frequency (percent)	Elevations (2,3)	
April 11, 1965	6,400	2.7	978.7	1,300	6.5	-	7,700
March 31, 1967	3,260	23.0	975.8	440	21.0	-	3,700
100-year flood	8,000	1.0	980.0	4,500	1.0	968.0	12,500
Standard project flood	18,400	SPF	988.1	16,750	SPF	975.0	35,150

(1) Cubic feet per second.

(2) Feet above sea level datum, 1929 adjusted.

(3) Flooding begins at elevation 975 with an approximate discharge of 3,000 cfs.

The 500-year flood for New Richmond is based on a 96-hour rainfall with 79 percent of the rainfall occurring between 48 and 72 hours.

Peak discharges for the Willow River and Paperjack Creek are as follows:

Table 3-2 - Peak Discharges - Willow River and Paperjack Creek

Location	100-year flood	500-year flood
	(cfs)	(cfs)
Willow River	8,000	18,400
Paperjack Creek without diversion	980	2,250
Naturally occurring diversion from Willow River to Paperjack Creek	4,500	16,750
Paperjack Creek after diversion	5,480	19,000

Floods equal in magnitude or greater than those that have occurred in the past could occur in the future. In the past, large floods have been experienced on streams with geographical and physiographical characteristics similar to those found in the study area.

A flood of 100-year or greater frequency on the Willow River and Paperjack Creek would result in inundation of residential, commercial, and industrial sections in the New Richmond area. The deep flood water flowing at high velocity and carrying floating debris would create hazardous conditions. Isolation of areas by flood water could create medical, fire, or law enforcement emergencies.

The total estimated average annual flood damages for New Richmond amount to \$367,300. Approximately 65 percent of the damages would involve residential buildings. Based on a reconnaissance level field survey for the city of New Richmond, major industrial, commercial, and public facilities would, as a group, incur total damages of about \$1.1 million from the 100-year flood and about \$15.3 million from the 500-year flood.

Conditions if No Federal Action is Taken

The most probable future, if no Federal action is implemented, is no change from the existing condition. Flood reduction actions are expected to be those used in the past.

The community of New Richmond would continue to depend on emergency measures to reduce flood damages. These actions include construction of emergency levees, sandbagging of residences, and temporary evacuation of residents in high risk flood areas. This

situation puts a significant drain on local financial resources and manpower for cleanup costs.

In addition, nonstructural measures such as floodplain zoning, floodproofing, and flood insurance would continue to be implemented in the community. However, individual homeowners who may depend on flood insurance would be required to assume an increasing share of insurance costs if the Federal Government phases out the subsidy for this program. Flood proofing would be implemented only by individuals who can afford the capital investment. Remaining properties would continue to suffer flood damages and losses in capital investment. Negative impacts on community land use, community image, property owners, and community aesthetics would continue to occur over a long period.

Archeological sites and historic buildings and sites would continue to be affected as they have been in the past. Any historic buildings that presently flood and that may sustain structural damage would continue to be similarly affected in the future.

With no Federal action, recreation resources and opportunities would continue to be enhanced by independent actions of local government and private interests. The frequent flooding would seriously affect potential future recreation opportunities associated with this riverine area.

FORMULATION OF PRELIMINARY PLANS

Since suspension of the St. Croix River study in 1968, there have been many new public laws, executive orders, and changes in the engineering, economic, environmental, social, recreational, and cultural criteria for planning, design, and implementation of flood

damage reduction plans. Any plan for flood damage reduction will address these changes in policy, regulations, and procedures.

Planning Constraints

Any plan proposed to reduce flood damages at New Richmond must be technically and economically feasible, socially and environmentally acceptable, and capable of being implemented. In addition, the specific planning constraints listed below apply to any proposed plan for the study area:

- o The plan should emphasize nonstructural methods of flood control.
- o The plan must be acceptable to those who will ultimately be responsible for carrying out any selected plan.

Plan Formulation Rationale

The Corps of Engineers will conduct studies to identify and evaluate the impacts of various flood damage reduction plans for the city of New Richmond. Flood damage reduction measures, both structural and nonstructural, will be evaluated to identify the best plan. The engineering, economic, environmental, recreational, cultural, and social impacts will be evaluated according to the Water Resources Council Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. This evaluation will provide local decision-makers with a common basis for screening and selecting the best plan. The level of detail will be sufficient to determine whether a feasible flood damage reduction plan can be recommended for implementation.

The following criteria will also guide the evaluation of plans:

- o The plan must be complete, effective, efficient, and acceptable.
- o The plan must be technically feasible.
- o The plan must be in the Federal interest and be implementable.
- o The plan must be complete and not require future improvements.
- o The plan must have local support and cooperation and be sponsored by a non-Federal interest.

An interdisciplinary team was assembled early in the reconnaissance study to help identify problem areas and to develop an approach for analyzing flood and related water resource problems. After flood problem areas were identified and scoped, team members developed this report.

Measures Identified for Study

Table 3-3 lists structural and nonstructural measures that were identified for further consideration in this study. Structural measures include upstream tributary dams, levees, a diversion, dam modifications, and channel modifications. Nonstructural measures include floodproofing, temporary or permanent evacuation, floodplain zoning, flood forecasting and warning, flood emergency plans, building codes, development policies, and flood insurance. These measures are described beginning on page 31 of this report.

For all flood-prone areas subject to flooding, this report recommends further consideration of corrective and preventive nonstructural measures in combination with structural measures. Corrective measures such as floodproofing or floodplain evacuation are directed at structures in the floodplain. In combination with

structural measures, corrective measures will be analyzed for economic, environmental, and social impacts.

Flood insurance is considered a nonstructural measure although it neither corrects the flood problem nor prevents flood damages. In reality, people will always want to build in floodplains and will need insurance against the risk of being flooded. Flood insurance only spreads the cost of floodplain damages among the insured.

Table 3-3 - Management Measures Available for Reducing
Flood Damages at New Richmond

Measure	Availability
<u>Structural</u>	
Dams and reservoirs	X
Levees and floodwalls	X
Emergency levees	X
Dam modifications	X
Channel modifications	X
Diversions	X
<u>Nonstructural</u>	
Flood warning	X
Floodplain evacuation	X(1)
Floodproofing	X
Floodplain conversion	
Floodplain zoning	X
Subdivision regulations	X
Building codes	X
Development policy	
Flood emergency plan	X
Flood insurance	X

(1) Temporary evacuation only.

Emergency measures are also a reality in flood areas. Where floods occur, there will always be a chance for a flood that exceeds the area's capacity to protect itself. In combination with a flood emergency plan of action, structural and nonstructural measures can

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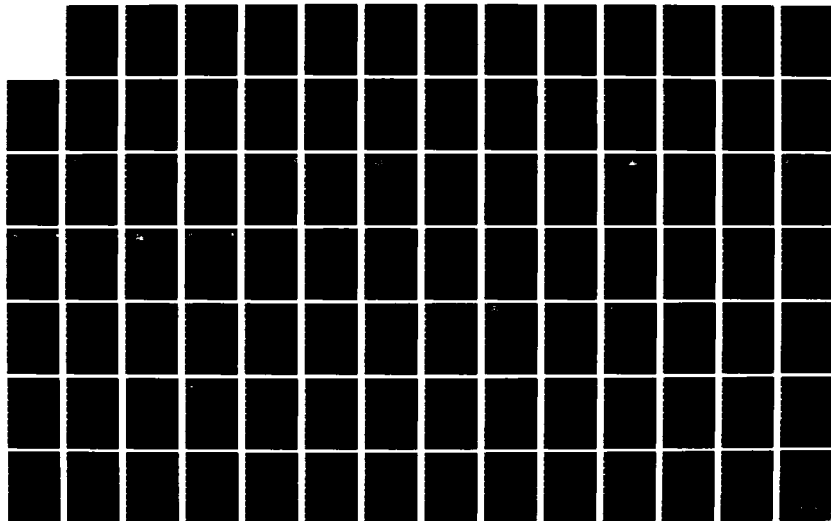
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TILLWATER MINNESOTA AND NEW RICHMOND WISCONSIN(U)
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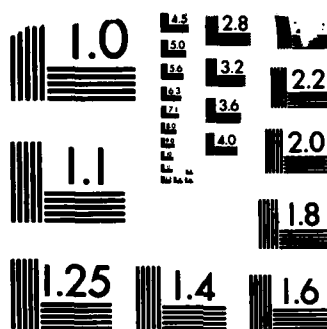
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be identified and implemented in flood-prone areas to reduce flood damages in an organized and managed effort.

Assessment and Evaluation of Management Measures

In combination with nonstructural measures, upstream tributary reservoirs, levees, diversion, dam modifications, and channel modifications were the structural measures identified for further consideration in reducing flood damages at New Richmond.

Upstream tributary reservoirs on the Willow River would reduce flood damages in New Richmond by holding floodwater and reducing downstream flood elevations until the water could be released safely downstream. If feasible, this measure would reduce flood damages not only in New Richmond but also in all urban and rural reaches downstream of reservoir sites. In addition, reservoirs may offer the opportunity to improve other water-related problems and needs, including conservation storage for water supply, hydropower for local energy needs, increased water-based recreation areas, and fish and wildlife opportunities. At this time, tributary reservoirs on the Willow River are not economically, socially, or environmentally feasible. Therefore, upstream tributary reservoirs will not be considered further in this study.

Levees, a diversion, dam modifications, and channel modifications appear to be the only structural measures that could reduce flood damages at New Richmond. Preliminary field inspections indicate that these measures have the potential to benefit the city of New Richmond.

A diversion and channel modification on Paperjack Creek would reduce flood damages on the Willow River by diverting excess flood flows to Paperjack Creek. A natural diversion currently operates between the

Willow River and Paperjack Creek. At present, Paperjack Creek is unable to handle high flood flows without flooding residences. Channel modification of Paperjack Creek to handle standard project flood flows would virtually eliminate all flood damages in New Richmond. Although this plan appears to be a complete solution to the flood problem at New Richmond, it does not appear to be economically feasible at this time. Additional detailed studies, particularly in reevaluating the standard project floodplain, and calculation of damages may increase the feasibility of this plan.

Modification of County Highway GG at the Willow River to prevent use of the natural diversion between the Willow River and Paperjack Creek is also a possible measure for flood reduction at New Richmond. This measure, which would basically cause County Highway GG to act as a dam, would force all flood flows down the Willow River and reduce damages on Paperjack Creek. However, the residual impact on Mill Pond and the residential area surrounding Mill Pond may preclude consideration of this plan. As the study progresses, additional detailed studies will be undertaken to evaluate these potential impacts.

It appears that levees in combination with dam and/or bridge modifications is the most economically feasible plan for New Richmond. Levees would protect the central business, residential, and industrial areas of New Richmond. One levee is proposed south of the Willow River and Mill Pond, and the other levee is proposed along Paperjack Creek in the vicinity of Domain Industries. In addition, either the Highway 64/65 bridge and Soo Line Railroad bridge would be replaced to alleviate constriction of flood flows and ice jams, or closure structures would be installed along the levee alignment.

For the purpose of assessing the costs and benefits associated with the project, levees in conjunction with two closure structures and one pumping station were evaluated. The project first costs associated with this plan at the standard project flood level of protection are \$3.5 million. Protection from the standard project flood would provide an estimated average annual benefit of \$367,300 at October 1982 prices, for a benefit-cost ratio of 1.2. The project first costs and average annual benefits were determined from the standard project flood outline contained in the New Richmond Floodplain Information Report prepared by the St. Paul District in 1975. It appears, based on preliminary field review, that this outline may need reevaluation, particularly in the area of the Chicago and Northwestern Railroad line.

Of the nonstructural measures identified in table 3-3, floodplain conversion, development policies, and floodplain evacuation will not be emphasized in further study efforts. The floodplain at New Richmond contains virtually the entire community, making floodplain conversion an impossibility. In addition, it is not possible to construct utilities and streets outside the floodplain and still provide services to the community.

Floodplain evacuation is not a cost-effective alternative for the city of New Richmond. Fifteen residential structures with a total market value of \$836,000 are most frequently flooded. Using October 1982 prices, these residential structures would have total average annual damages of \$58,200. Including a residential contents affluence factor, estimated average annual benefits would be \$60,100 and the annualized costs to remove these structures would be \$67,400. With these costs and benefits, economic justification is lacking for purchase and removal of these structures.

The final plan selected for New Richmond will consist of both structural and nonstructural measures. At this time, a plan consisting of levees and closure structures (or bridge replacements) and other nonstructural measures such as floodplain zoning, flood warning, and floodproofing appears to be economically feasible.

Social Impacts - The flood damage reduction measures being considered for New Richmond would have varying degrees of flood protection and varying positive effects on the public health and safety in existing residential areas and in the central business district.

Beneficiaries of the Willow River diversion include the central business district and residential areas in the floodplains. However, this measure could generate controversy among residents of the north (around Mill Pond) and of the south (along Paperjack Creek) and it therefore has implications for community cohesion. Residents to the north may oppose a reduction in the Willow River flowage and in the water level of Mill Pond because of their investment in the aesthetic qualities of the pond. Residents to the south, especially in the area of Park View Drive, may oppose an increase in the flow of Paperjack Creek for a variety of reasons, such as safety.

Levees along the Willow River may require commercial and residential land acquisition and relocation of residents. The measure could provide substantial protection and safety for the central business district and for the north and central residential areas. Levee construction along Paperjack Creek would require less acquisition and relocation. It would protect primarily the commercial area adjacent to Highway 65. Few benefits would be realized by residents south of Paperjack Creek.

Municipal dam removal/modification, in conjunction with channel modification, would involve neither land acquisition nor relocation. This measure would protect commercial and residential properties in the floodplain.

Nonstructural measures for New Richmond include floodproofing and a flood warning system. Flood proofing would benefit individual businesses and residents located in the floodplain. These benefits, in turn, could have long-term positive effects on the general economy of New Richmond and subsequent implications for its future growth and development.

A community flood warning system would involve various Federal, State, and city officials and the general community, in addition to floodplain residents. The social effects of a flood warning system depend on the system's effectiveness, as influenced by five variables: (1) community situational factors (population density, etc.), (2) hydrologic features, (3) weather data availability, (4) communication network, and (5) individual responsiveness. An effective system would benefit the community, but at present it is difficult to ascertain the immediate as well as the long-term social effects of a flood warning system.

In addition, secondary social impacts may accrue to other Section 122 effect categories. These impact areas will be assessed during the feasibility phase for possible project induced changes.

Natural Resource Impacts - This general evaluation identifies areas of potential natural resource impact. In later study stages, more detailed impact assessments will be carried out, including the 17 points required by Section 122 of Public Law 91-611.

Construction of flood control alternatives at New Richmond has the potential to produce significant impacts.

Channelization of a diversion channel and Paperjack Creek would take place in wetland and woodland areas and could greatly impact wetland and woodland habitat. The area of the natural diversion to Paperjack Creek appears to provide good quality wildlife habitat for deer, hawks, ducks, herons, and semi-aquatic species such as beaver, mink, and muskrat.

A diversion of the Willow River during high flows would require placing a structure across the river. The possible impacts on fish, especially trout, have not yet been investigated. The diversion would change the sedimentation patterns in the area. Presently, Mill Pond serves as a sediment trap for the Willow River. Under modified conditions, the sediment would drop out farther upstream or downstream. The diversion would also pond water on the mainstream of the Willow River. This occurs under natural conditions, but increased duration and frequency of storage of non-flowing water could adversely affect vegetative communities.

A flood control alternative involving levees through the main part of the city would likely be in areas that are less environmentally sensitive than the diversion alternative. Levees and floodwalls would destroy some urban wildlife habitat, primarily for songbirds and similar species.

Cultural Resource Impacts - The proposed alternatives have not been surveyed for archeological or historic sites. The impact of each proposed alternative on cultural resources is unknown at this time. Surveys will be conducted during future studies to determine if any cultural resource sites will be affected.

Recreation Impacts - The extent of recreation impacts in New Richmond is uncertain at this time because the exact location and design of the project are not finalized. When project plans are finished, a more complete, detailed assessment of recreation impacts will be completed.

Several of New Richmond's city parks are within special flood hazard areas⁽¹⁾: Glover, Mary, Hemenway, and Paperjack Parks, and the New Richmond Nature Center. These parks total approximately 32 acres.

There are two major alternatives for the New Richmond flood control project. The first is a levee system along Mill Pond and the Willow River, and along Paperjack Creek. The other alternative is a diversion of the Willow River and channel modification of Paperjack Creek.

The levee system has good potential for a trail tie-in to existing trails at the New Richmond Nature Center. This alternative would have no evident recreation impacts on park areas adjacent to the levees. There are no swimming beaches or other direct waterfront activities that would be impaired by a levee system.

A major visual impact may be experienced at Mary Park on Mill Pond. This is the city's largest park, used extensively for picnicking. Its main features are a swimming pool and accommodations for passive recreation, supported and enhanced by the lakeside setting. It is a well-maintained and attractive park. A levee nearby could be regarded as a visual intrusion as well as an access deterrent for boat launching and fishing. The impact would, of course, depend on the exact location and design of the levee.

(1) Flood Hazard Boundary Map, City of New Richmond, Wisconsin, National Flood Insurance Program.

A levee system on Paperjack Creek may have a visual impact on the surrounding residential neighborhood, but again the degree of impact would depend on the location and design of the actual levee. In this visually sensitive area, landscape plantings could be used to minimize visual impact and the feeling of intrusion.

Channelization of Paperjack Creek would have no major recreation impacts. Paperjack Park and possibly the New Richmond Nature Center could be inundated during periods of high water, but this situation would be temporary. There are no visual impacts associated with the diversion itself.

PLAN OF STUDY

Future Corps of Engineers study efforts will focus on viable flood reduction measures that meet the needs of the city of New Richmond and that would be consistent with the water and related resource needs of the St. Croix River basin. A full range of structural and nonstructural measures will be considered. All study efforts will be coordinated with Federal, State, and local interests.

The study consists of two planning stages - reconnaissance and feasibility. This reconnaissance report identifies, assesses, and recommends for further study general ways of reducing flood damages. During the feasibility study, the first iteration consists of a more detailed assessment of recommended reconnaissance level measures in terms of their engineering, economic, social, environmental, recreational, and cultural impacts and opportunities. The alternatives are screened, and specific measures or combinations of measures, or plans, are carried into detailed studies. The final feasibility report will recommend one plan for detailed engineering and design studies.

Study Tasks

Background Information and Basic Data - Additional information will be collected to identify the engineering, economic, environmental, recreation, social, and cultural profile in the study area. This base will be expanded and developed in more detail, as necessary, to meet the needs of the New Richmond study.

Hydrologic and Hydraulic Studies - Additional information will be obtained to determine drainage characteristics, topography, cross sections, river conditions, gaging stations, bridge locations and dimensions, and other hydrologic and hydraulic information.

Discharge-frequency curves and rating curves will be developed or updated for all damage centers on the Willow River at New Richmond. Because of potential discrepancies in the current standard project flood outline, standard project flood data will be reevaluated during feasibility studies to determine the accuracy of known data. Adjustments in the flood outline will be made as necessary. The necessary hydrographs will be developed for the design of local protection works at damage centers and controlling locations. Preliminary evaluations will consider both the present and anticipated future needs of New Richmond as well as the needs of downstream reaches. For damage centers where local protection works appear feasible, designs will be prepared for three levels of protection for project formulation. Preliminary studies will be made to determine the interior drainage requirements.

Economic Studies - For feasibility studies, the existing inventory of the 500-year floodplain will be verified for elevation of structures at both the front and rear entrance. The existing inventory will also be updated to reflect expected changes to the standard project flood outline. The market values of the structures

developed from tax assessor records appear to be conservative based on recent sales of an area realtor. Therefore, the feasibility study will verify the market value of structures. The field survey also pointed out the need to verify how many of the commercial structures have basements. In some cases, the field survey forms showed no basement for commercial structures, even though interviews with the firms verified the existence of a basement.

The updated and verified inventory will provide the damage base from which flood-damage relationships will be derived. These relationships will be based on the revised hydraulic information, generalized depth-damage tables, damage potential interviews, and a field survey of the damageable properties. Average annual damages with and without an alternative plan will then be evaluated. Changes in the damageable base will be projected from the regional economic trends. Three steps will be used to measure flood damages for a future year: (1) the number and size of physical units will be calculated; (2) the future value of units will be estimated; and (3) the damage susceptibility of units will be determined. If the 20th future year development alters existing damages by less than 10 percent, further analysis of development will not be necessary unless there is specific knowledge of a major change after the 20th year. For the New Richmond area, no future increases in average annual damages are expected except affluence-related increases in residential content damages and a small increase in the damage-susceptible residential units between 100-year and 500-year flood lines. Flood emergency costs will be identified for the following items: (1) protection of life, health and property; (2) evacuation; (3) emergency care; (4) emergency preparedness; (5) administrative costs; (6) transportation and detours; and (7) flood-fighting costs.

Geotechnical and Foundation Studies - Additional geologic and foundation information will be compiled. This information will be used to identify sites and borrow areas, general soil conditions, and potential foundation problems. No geotechnical problem sufficient by itself to eliminate any alternative is anticipated, but future studies will require site-specific investigations to verify the feasibility of alternatives not eliminated by other considerations.

Real Estate Studies - Preliminary real estate appraisals will be made for project formulation. Estimates will take into account the acquisition costs of lands and damages, relocation assistance payments, and administrative costs.

Design and Cost Studies - Preliminary design and cost estimates of local improvements will be developed. These estimates will include costs of land, rights-of-way, major structures, and relocation of roads, railroads, and utilities. Cost estimates will also be made of nonstructural measures. Benefits identified in economic studies will be compared with these costs to determine each measure's benefit-cost ratio.

Plan Formulation Studies - Anticipated changes in the standard project flood outline may necessitate a reconsideration of measures and plans contained in this report. The effectiveness, impacts, and opportunities of each measure will then be evaluated and displayed to guide selection and recommendation of measures or combinations of measures for detailed study. Close coordination with Federal, State, and local interests is necessary if the selection and recommendation process is to assure that appropriate information is available for the screening and selection decisions.

During plan formulation, a flood emergency plan will be prepared for use by the city of New Richmond. The plan will assist the community in preparing for and handling flood emergency situations until a permanent flood control project is completed. This plan will be closely coordinated with the Wisconsin Department of Natural Resources.

Cultural Resource Studies - Each of the proposed alternatives will be surveyed for cultural resource sites. Any sites or buildings located will be assessed for National Register of Historic Places eligibility. If National Register sites are documented, coordination will be conducted with the appropriate State and Federal agencies to determine the best course of action.

Recreation Studies - Coordination with a non-Federal sponsor will be carried out to incorporate recreation development and environmental quality (beautification) into the project. Implications to visual resources and recreation resources will also be evaluated in greater detail in future studies.

Environmental Studies - As the study progresses and more detailed designs of alternatives are developed, environmental evaluations will be necessary to comply with existing laws, including: the Endangered Species Act of 1973, as amended; the Clean Water Act of 1977, as amended; Executive Orders 11990 on wetlands and 11988 on floodplains; the Fish and Wildlife Coordination Act, as amended; and other Federal and State statutes. The Corps of Engineers will prepare documentation required by the National Environmental Policy Act of 1969, as amended, including an environmental impact statement or environmental assessment and finding of no significant impact.

Other environmental studies, including aquatic and terrestrial evaluations, may be required. Fisheries, water quality, and sedimentation studies would be needed for the Willow River which is a designated trout stream. Additional wetland and woodland evaluations would be needed for Paperjack Creek primarily because of the more undeveloped character of the creek.

Social Analysis Studies - Studies performed during the next level of analysis will include a social profile to develop base condition data on study area demographic and social structure characteristics, a preliminary impact assessment of proposed measures and plans, and an institutional analysis to identify participating water resource management organizations. Data developed will be used to assist in plan formulation, evaluation, and public involvement activities.

Social analyses required for the feasibility stage of the study fall into three categories: support for the economic evaluation; support for plan formulation; and report preparation for input to the environmental and feasibility studies. Studies to be performed will include: future projection of downtown land use; demographic analysis and projection of future population, economic and business activities, and transportation; institutional assessment and fiscal analysis; and public involvement support.

Public Involvement

The objective of public involvement is to actively involve the public so that studies can be responsive to public needs and preferences. The "public" is defined as any affected or interested non-Corps of Engineers entity, including other Federal, State, regional, and local government offices; public and private organizations; and individuals. For Corps planning to be responsive to public needs and preferences, it must involve an ongoing dialogue

between Corps planners and the public. Cooperation and coordination among Federal water resources agencies, State interests, and community interests is important, and their concerns must be recognized and considered. In recent years, this need for mutual cooperation and coordination has been amplified by public concern for the environment, economic development, and social well-being. To carry out this dialogue, cooperation, and coordination, the Corps will periodically hold workshops, public meetings, and other public involvement activities to inform, obtain comments, and discuss study proposals and progress.

Report Coordination

The next study iteration will develop the alternatives in more detail and screen them to determine which measures or combinations of measures will be studied in the feasibility study. This report will be coordinated with participating Federal, State, and local interests.

CONCLUSIONS

The community of New Richmond, Wisconsin, located on the Willow River in the St. Croix River basin, has experienced serious flood problems. This report has identified a number of possible measures that could solve these flood problems.

Both structural and nonstructural flood damage reduction measures appear feasible at New Richmond, but these measures have received only a preliminary analysis at this early level of study. They will require additional engineering, economic, environmental, social, recreational, and cultural analysis. Information being gathered now will be used to help decision-makers determine the feasibility of

various measures. Current study efforts have focused on updating baseline economic and engineering data for analyzing flood control measures.

Nonstructural measures being considered for New Richmond include floodproofing, temporary or permanent evacuation, a flood emergency plan, building codes, flood warning, and flood insurance. Structural measures include levees, dam modifications, channel modifications, and modification of a natural diversion on the Willow River.

RECOMMENDATIONS

The St. Paul District recommends that the Corps of Engineers initiate feasibility studies for the communities of Stillwater, Minnesota, and New Richmond, Wisconsin.

Edward G. Rapp
Colonel, Corps of Engineers
District Engineer

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RECONNAISSANCE REPORT

ST. CROIX RIVER STUDY

APPENDIX A

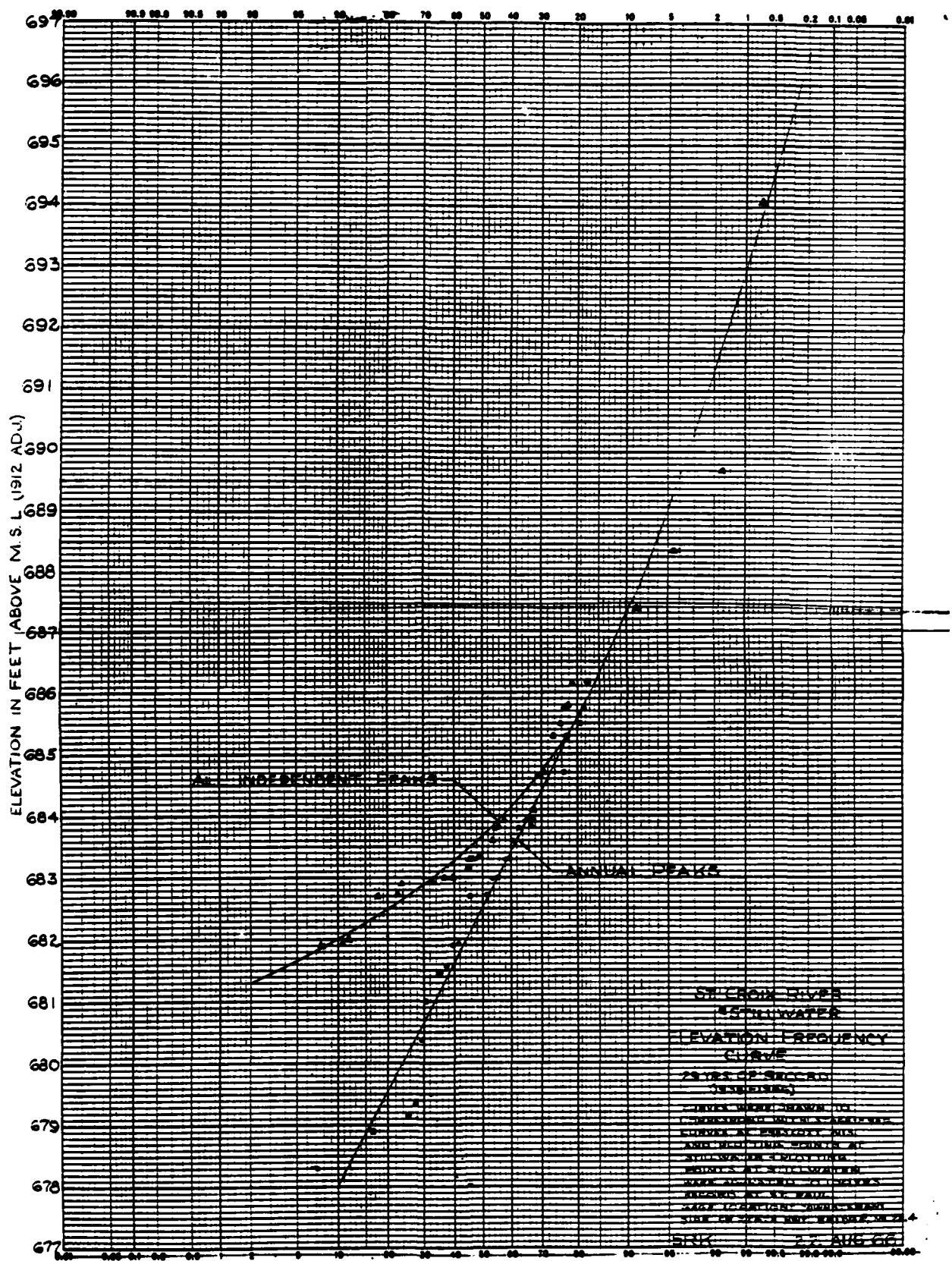
TECHNICAL INFORMATION

January 1984

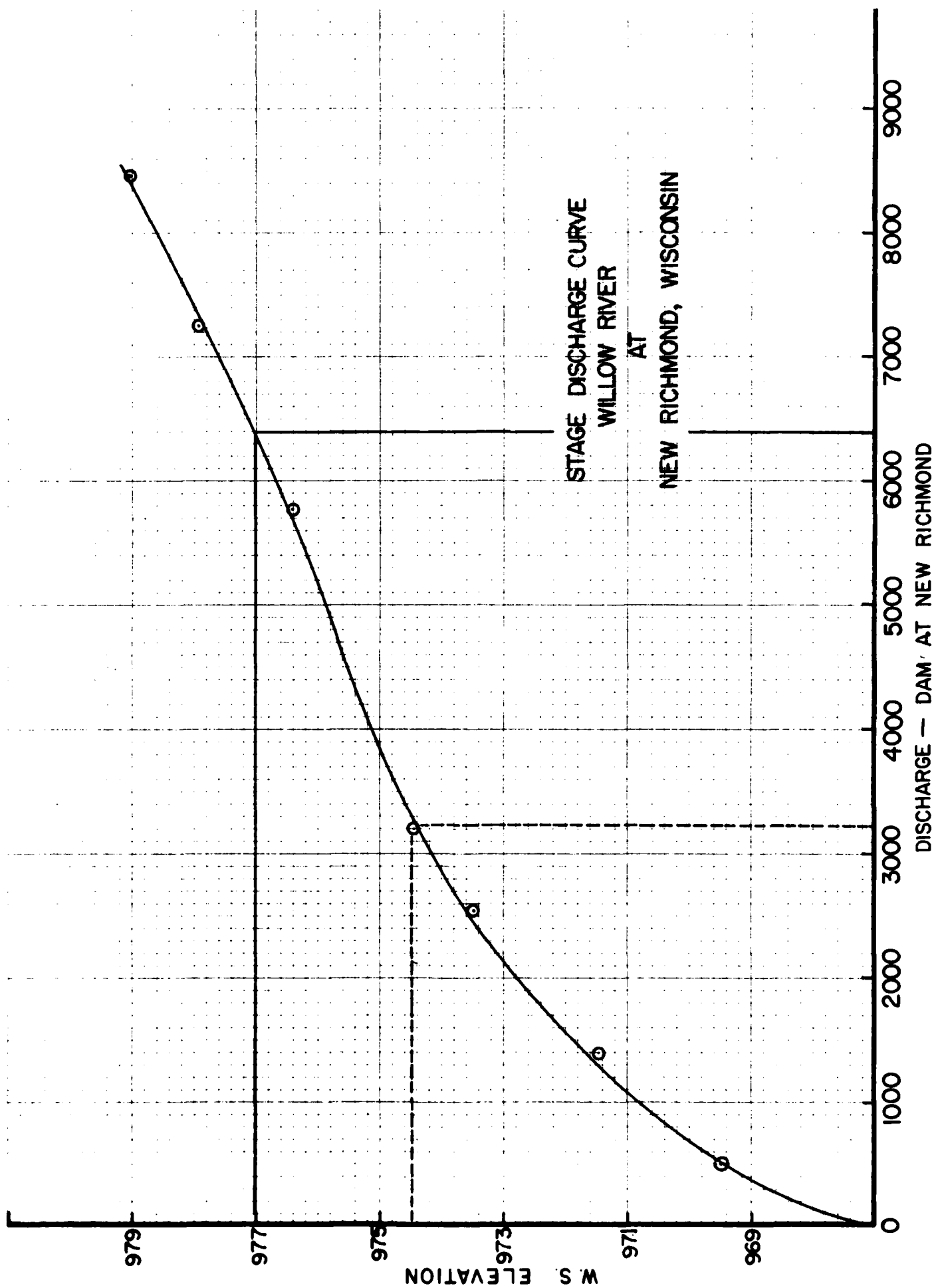
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ELEVATION FREQUENCY CURVE, ST. CROIX RIVER, STILLWATER, MINNESOTA



ELEVATION DATA - BRIDGES AND CULVERTS
WILLOW RIVER AND PAPERJACK CREEK,
NEW RICHMOND, WISCONSIN

Structure	Miles Above Confluence	Under Clearance Elevation	Water Surface Elevations			
			IRF		SPF	
			Downstream	Upstream	Downstream	Upstr
Willow River:						
S.T.H. 64	1.74	953.0	953.0	953.3	957.4	961
Downstream Domain RR	3.54	969.0	968.9	970.6	972.2	973
Upstream Domain RR	3.56	967.0	970.4	970.9	973.4	973
C & NW RR	3.57	976.0	970.9	970.9	972.0	972
S.T.H. 64 & 65	3.64	977.0	979.8	980.2	988.0	988
Soo Line RR	3.87	983.0	980.6	981.3	988.8	989
County Road K	5.61	980.0	981.9	982.0	990.0	990
Soo Line RR	6.24	980.0	982.4	983.0	990.3	990
Paperjack Creek:						
Old County Rd. A	0.16	939.5	942.8	943.1	949.2	949
County Rd. A	0.45	946.2	944.6	948.1	950.3	950
Town Road	1.41	952.0	956.5	958.4	963.0	963
C & NW RR	1.80	964.0	961.4	967.2	968.1	974
S.T.H. 65	2.00	961.7	967.7	969.8	974.5	975
Bilmar Avenue	2.46	968.7	975.9	979.2	980.3	985
Town Road	3.15	974.5	980.2	980.4	987.2	987
Town Road	3.33	974.9	980.9	981.3	988.4	989
Farm Road	3.62	973.6	981.8	981.9	989.9	990
County Rd. G-G	4.55	980.0	982.9	983.5	991.3	991

Feet, mean sea level datum, 1929 adjustment.

RECONNAISSANCE REPORT

ST. CROIX RIVER STUDY

APPENDIX B

COORDINATION

January 1984

**APPENDIX B
COORDINATION**

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APPENDIX B
COORDINATION

INTRODUCTION

This appendix presents the views and comments of other Federal and non-Federal interests on the flooding problems in the St. Croix River basin. The materials include letters in response to the 15 January 1982 notice of resumed study plus the coordination to date on the study.



NCSSED-PB

REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
1135 U. S. POST OFFICE & CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101

15 January 1982

NOTICE

ST. CROIX RIVER BASIN FEASIBILITY STUDY

The St. Paul District, Corps of Engineers, has resumed the St. Croix River basin feasibility study. Congress authorized the study in 1954 and 1968. Initial funding was provided in 1965.

A preliminary report was completed in January 1968. It recommended further study of a large multiple-purpose reservoir near St. Croix Falls, Wisconsin. Local flood protection measures at Stillwater, Minnesota, were also found to be feasible.

The study was suspended in June 1968 because of the pending wild and scenic designation of the St. Croix River. U.S. Representative Arlen Erdahl has asked that the study be resumed.

The study objective is to develop a plan to reduce flood damages. Measures used must be compatible with the wild and scenic designation of the river. Therefore, major changes to the river, such as reservoirs or channel modifications, will no longer be considered.

The initial focus will be on flood problems at Stillwater. Other communities in the basin may also be studied if State and local interests desire it. In addition to flood control, we are authorized to study water supply, recreation, hydroelectric power, navigation, fish and wildlife, and other related water resource purposes.

Please let us know if you want to be kept informed of meetings and study progress. If you would like to directly participate in the study, provide the name and telephone number of someone with whom we can coordinate.

If you need additional information, write to this office or call. Mr. John Bailen (612-725-7494) is the study manager. Your comments and suggestions are welcome.

WILLIAM W. BADGER
Colonel, Corps of Engineers
District Engineer

NOTE: Mr. Martin McCleery (612-725-5882) is the current study manager.



Minnesota Telephone
(612) 436-7131

MINNESOTA-WISCONSIN BOUNDARY AREA COMMISSION

619 SECOND STREET, HUDSON, WISCONSIN 54016

*Serving Our Sponsor States on the St. Croix
and Mississippi Rivers since 1965*



Wisconsin Telephone
(715) 386-9444

January 21, 1982

John Bailen
Planning Section
St. Paul District
Corps of Engineers
1135 U.S. Post Office & Customs House
St. Paul, Minnesota 55101

Re: St. Croix River Basin Feasibility Study

Dear John:

This will confirm our telephone conversation of this morning concerning the Corps' plans to resume its St. Croix River Basin Feasibility Study. As we discussed, much has changed since this study was suspended in 1968, most importantly the creation (in 1968) of the St. Croix National Scenic Riverway north of St. Croix Falls, and creation (in 1972) of the Lower St. Croix National Scenic Riverway from St. Croix Falls south.

I have reactivated our file on this study. While I don't have a copy of any previous study document, our file does contain a number of status reports that adequately summarize what was going on at that time. We also have two copies of the transcript of a public hearing held at Stillwater on Feb. 1, 1966; if you don't have one and would like it for your files, just give me a call.

We would greatly appreciate keeping closely informed about the progress of this study, and would like to participate as much as possible in meetings on the project.

Our office carries two responsibilities with respect to the St. Croix River. The Minnesota-Wisconsin Boundary Area Commission itself was created by the legislatures of the two states in 1965 to "conduct studies and to develop recommendations relating to the present and future protection, use and development in the public interest, of the lands, river valleys and waters which form the boundary" between the two states. The Commission has been actively involved in preservation and development issues on both the St. Croix and Mississippi rivers since its creation. It played a key role in enactment of P.L. 92-560, which added the Lower St. Croix to the National Wild and Scenic Rivers System, and has been regularly and continually involved in St. Croix preservation issues at the local, state and federal levels.

The Boundary Area Commission has also made its offices available as a coordination center for the Lower St. Croix Management Commission, which is made up of the three agencies charged with management of the Lower St.

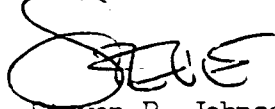
John Bailen
Page 2

January 11, 1982

Croix National Scenic Riverway (National Park Service, Minnesota DNR, Wisconsin DNR). Part of my job assignment as associate director of the MSBAC is to serve as staff to the Lower St. Croix Management Commission and its Technical Committee. Through our office, then, you can gain access to the field and policy-making people in those three agencies who have responsibility for the St. Croix. The LSCMC Technical Committee will next meet Feb. 25 and this subject will be on the meeting agenda. If you would like to attend that meeting and make contact with all those agency people at the same time, let me know and I'll schedule time on the agenda for you. If you would rather contact the agencies directly and separately, I'd be happy to supply you with the names and telephone numbers of the St. Croix contact people in each agency.

I look forward to hearing more about this study.

Very truly yours,



Steven P. Johnson, Associate Director

cc: Karen Loechler, MDNR
Jake VanderVoort, WDNR
Henry Hughlett, NPS

SPJ:rmb



State of Wisconsin \ DEPARTMENT OF TRANSPORTATION



DIVISION OF PLANNING

4802 Sheboygan Avenue
P. O. Box 7913
Madison, WI 53707

January 28, 1982

Mr. John Bailen, Study Manager
St. Croix River Basin Feasibility Study
St. Paul District, U.S. Army Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Mr. Bailen

In response to your January 15, 1982 notice of the "St. Croix River Basin Feasibility Study", I would like to be kept informed of meetings and study progress.

My phone number is (608) 267-7756 and address as shown above. If you should need any information that the Wisconsin Department of Transportation could supply, please feel free to contact me.

Sincerely,

Michael Kennedy
Bureau of System Planning

cc: Marty Beekman, Dist. 6
Don Wilson, Dist. 8

RANDOLPH W. PETERSON

Senator 19th District
27 State Capitol Building
St. Paul, Minnesota 55155
Phone: 296-8018
and
155 Collen Street
Wyoming, Minnesota 55092

Senate
State of Minnesota

February 1, 1982

William W. Badger
Colonel, Corps of Engineers
District Engineer
St. Paul District
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Col. Badger:

I received your letter indicating that the St. Paul District Corps of Engineers has resumed the St. Croix River Basin Feasibility Study. Although I do not wish to participate directly, I would like to know when meetings are held and the progress of the study.

Thank you for informing me of this matter.

Sincerely,

Randolph W. Peterson

Randolph W. Peterson
State Senator
District 19

RWP/sw



Minnesota Pollution Control Agency

FEB 01 1982

Colonel William W. Badger
St. Paul District, U.S. Army Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Attention: NCSED-PB

Dear Colonel Badger:

RE: St. Croix River Basin Feasibility Study
Flood Control At Stillwater, Minnesota

This is in response to your notice of January 15, 1982, regarding the referenced project. We request that you keep us informed of meetings and study progress. The Minnesota Pollution Control Agency will participate in the study process and we therefore request that you direct all contacts to Mr. Louis Flynn of my staff at (612) 296-7225.

Sincerely,

Barry C. Schade
Director
Division of Water Quality

BCS/LLF:jae

B-7

Phone: (612) 296-7225

1935 West County Road B2, Roseville, Minnesota 55113
Regional Offices - Duluth/Brainerd/Detroit Lakes/Marshall/Rochester
Equal Opportunity Employer



THOMAS O'KEEFE
Director

CITY OF HUDSON

Dept. of Public Works
CITY HALL

505 Third St.
HUDSON, WISCONSIN 54016
(715) 386-9021

February 1, 1982

Mr. William W. Badger
Colonel, Corps of Engineers
District Engineer
1135 U.S. Post Office &
Custom House
St. Paul, MN 55101

Dear Colonel Badger:

Our St. Croix County Planning office may be of great assistance to you for the St. Croix River basin feasibility study.

We urge you to contact them at (715)386-5581 or stop by their office at the courthouse at 911 Fourth Street in Hudson. They have a considerable amount of information put together and may save some duplication of efforts.

Sincerely,

Tom O'Keefe
Tom O'Keefe
Director

TO/lm

Office of the Mayor

*City of Prescott
Prescott, Wisconsin*

54021



February 1, 1982

William W. Badger, Colonel
Corps of Engineers, St. Paul District
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

Inresponse to NCSED-PB of January 15, 1982, the City of Prescott is interested in participation in the study of the St. Croix River basin feasibility study. I have contacted Mr. John Bailen in this regard and have discussed it with him.

Please consider me as the representative of our city:

Mayor Dean C. Hauschildt

Home: 1085 Monroe St.
Prescott, WI 54021

City: 233 Broad No.
Prescott, WI 54021

PH: 715/262-5018

PH: 715/262-5544

Work: So. Wash. Co. Schools #333
Park Sr. Hi.
Cottage Grove, MN 55016

PH: 459-5571 x1171

Prescott is located, as you know, at the mouth of the St. Croix and has had several flooded experiences throughout the years and are very much concerned about what happens upstream as well as with our own runoff.

I would be happy to meet with anyone from your area in regard to this study. Thank you.

Sincerely yours;

Dean C. Hauschildt

Dean C. Hauschildt, Mayor
Prescott, Wisconsin

B-9



United States
Department of
Agriculture

Soil
Conservation
Service

4601 Hammersley Road
Madison, Wisconsin 53711

February 3, 1982

Col. William W. Badger
District Engineer
Corps of Engineers
Department of the Army
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Col. Badger:

This letter is in response to your information request of January 15, 1982. The St. Croix River watershed is a part of Wisconsin which has not been involved in Soil Conservation Service project work. Therefore we have no flood hazard inventories or other water resource inventories available.

However, I believe you should contact a representative at Wisconsin Department of Natural Resources' Bureau of Water Regulation and Zoning and the Department of Emergency Government for specific activities which could have a bearing on your studies.

If the Corps' studies involve inventories and/or proposed actions on the St. Croix tributaries I would like to be informed. Contact Robert Martin, Asst. State Conservationist-Water Resources (608-264-5578).

Thank you for the opportunity to be of assistance.

Sincerely,

Kenneth M. Cochrane
Cliffton A. Maguire *for*
State Conservationist



The Soil Conservation Service
is an agency of the
Department of Agriculture

ROBERT W. HARER

326 North
State Capitol
Madison, WI 53702
(608) 266-1526

Home:
R. R. 1
Woodville, WI 54028
(715) 684-3717



Wisconsin Legislature
Assembly Chamber
MADISON
53702

STATE REPRESENTATIVE
29th Assembly District
St. Croix County and
portions of Dunn, Pierce,
and Polk Counties

MEMBER:
Committee on Transportation
Committee on Energy
Committee on Aging, Women
and Minorities
Committee on Government
Operations
Minnesota-Wisconsin
Boundary Area Commission

February 4, 1982

Colonel William W. Badger, CE
District Engineer
St. Paul District, Corps of Engineers
Department of the Army
1135 US Post Office & Custom House
St. Paul, MN 55101

Dear Colonel Badger:

Thank you for your recent letter concerning the St. Croix River basin feasibility study. This is an issue for which I have great concern.

I would appreciate your informing me of meetings and study progress. I will make every effort to attend the meetings and help in any way I can.

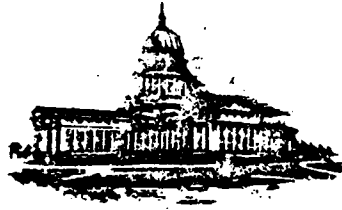
Yours truly,

A handwritten signature in cursive script that reads "Robert W. Harer".

ROBERT W. HARER
State Representative
29th Assembly District

DAVID E. PAULSON
335E North
State Capitol
Madison, WI 53702
Tele: (608) 266-9651

R.R. 4—P.O. Box 75
Amery, WI 54001
Tele: (715) 268-2488



REPRESENTATIVE
28th District

COMMITTEE MEMBER
Agriculture
Transportation
Veterans and Military
Affairs

WISCONSIN LEGISLATURE
ASSEMBLY CHAMBER
MADISON
53702

February 5, 1982

Mr. William W. Badger
Colonel, Corps of Engineers
Department of the Army
1135 United States Post Office & Custom House
St. Paul, Minnesota 55101

Dear Mr. Badger:

Thank you for the correspondence concerning the St. Croix
River Basin Feasibility Study.

I have appreciated the information you have shared with me,
thus far, concerning developments in this area. I would be
most grateful if you would continue to keep me informed of
meetings and study progress concerning the St. Croix River Basin
and the feasibility study.

Thank you for your assistance.

Sincerely,

A handwritten signature in cursive script that reads "David E. Paulson".

David E. Paulson
State Representative
28th Assembly District

DEP:dn



FOUNDED IN 1849

MINNESOTA HISTORICAL SOCIETY

690 Cedar Street, St. Paul, Minnesota 55101 • (612) 296-6126

9 February 1982

Colonel William W. Badger
District Engineer/St. Paul District
Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

RE: NCSED-PB

This letter is to inform you that we wish to be kept informed of meetings and progress on the St. Croix River basin feasibility study.

Sincerely,

Dennis A. Gunnestad
for Russell W. Fridley
State Historic Preservation Officer

RWF/fr



State of Wisconsin \ DEPARTMENT OF ADMINISTRATION

EAU CLAIRE
54701

Feb. 10, 1982

DEPARTMENT OF ADMINISTRATION
DIVISION OF EMERGENCY GOVERNMENT
WEST CENTRAL AREA OFFICE
5005 HIGHWAY 53 SOUTH 715-836-4519

Col. Wm. W. Badger
St. Paul District Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Re: NCSED-PB

Dear Colonel Badger:

Your notice regarding the St. Croix River Basin Feasibility Study has been forwarded to me by our central office in Madison. The State Administrator would like this office to be kept informed of meetings and study progress. Please forward any information to:

Albert J. Sperger, Director
NW-WC Area Office
Div. of Emergency Government
5005 Highway 53 South
Eau Claire, WI 54701 Phone: 715-836-4519

Sincerely yours,

ALBERT J. SPERGER, Director
NW-WC Area

em

cc: Tony Testolin



State of Wisconsin \ DEPARTMENT OF TRANSPORTATION



February 12, 1982

TRANSPORTATION - DISTRICT

1701 N. 4th Street
P. O. Box 425
Superior, WI 54880

Mr. John Bailen, Study Manager
St. Croix River Basin Feasibility Study
St. Paul District, U.S. Army Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN. 55101

Dear Mr. Bailen:

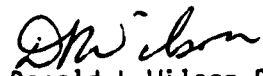
The District 8 office of the Wisconsin Department of Transportation in Superior jointly shares jurisdictional responsibilities with the Minnesota Department of Transportation for state highway bridges across the St. Croix River at Osceola, St. Croix Falls, Grantsburg and Danbury, Wisconsin.

This office also has responsibilities and interests in local roads and other Wisconsin transportation modes. If you anticipate that the study will affect Wisconsin transportation interests north of the William O'Brien State Park, I would like to be involved in the study to the extent appropriate to coordinate flood control and transportation interests.

My phone number is (715) 394-0549 and the address is as shown above.

Sincerely,

D H Jorgensen PE
District Director


Donald L Wilson PE
Chief Transportation Assistance &
Planning Engineer

meq



State of Wisconsin

DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

BOX 7921
MADISON, WISCONSIN 53707

February 23, 1982

IN REPLY REFER TO: 1650-2

Col. William W. Badger, District Engineer
Corps of Engineers
St. Paul District
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Attn: John Bailen

Dear Col. Badger:

Re: St. Croix River Basin Feasibility Study

The Department has reviewed your January 15, 1982 letter concerning the above-referenced project. Because the nature of the proposal has not been defined it is difficult to detail the Department's concerns. Discussion with staff and other concerned parties has not indicated that serious flood control problems have been experienced on the Wisconsin side of the Lower St. Croix River. We are not at this time convinced that a study of that nature is warranted.

Department personnel will attend the February 25 meeting of the Lower St. Croix Management Commission. We would hope that your staff will provide more complete discussion of the origin and need for the study at that time.

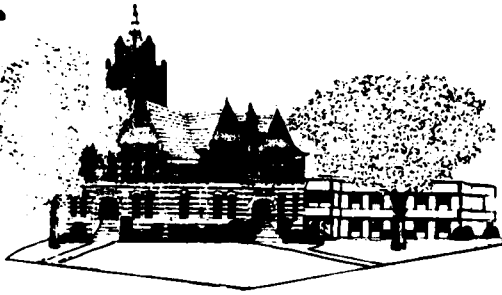
I spoke with John Bailen, your study manager on February 18th, at that time I requested that the Department be allowed to submit detailed comments after the February 25th meeting. I would like to confirm that request on behalf of the Department, as we feel that a more meaningful response can be transmitted at that time. If you have any questions or concerns please contact me at (608) 266-6673.

Sincerely,
Bureau of Environmental Impact

Steven Ugoretz
Environmental Specialist

SU:je/2227R

cc: Gordon Slifer - WCD
Jake VanderVoort - WCD
Jim Harrison - Minn.-Wis. Boundary Commission
Joel Schilling - Minn. Division of Water



ST. CROIX COUNTY
WISCONSIN

ZONING OFFICE 796-2239

HAMMOND, WI 54015

February 25, 1982

Department of the Army
St. Paul District, Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Sir:

We have been receiving your public notices. Could you limit our notifications to articles pertaining only to St. Croix County. We have no need for activity in any other part of Wisconsin.

Thank you.

Yours truly,

Harold C. Barber
Harold C. Barber

sl



State of Wisconsin \

DEPARTMENT OF TRANSPORTATION



March 4, 1982

TRANSPORTATION - DISTRICT 6

718 West Clairemont Avenue
Eau Claire, WI 54701

Col. William D. Badger
U. S. Army Corps of Engineers
St. Paul District
1135 U. S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

SUBJECT: 0608-10-00
Planning
St. Croix River Basin
Feasibility Study

We have an interest in the subject study and would like to be kept informed of meetings and study progress.

Please send all appropriate meeting notices and reports to me at the above address.

Sincerely,

T. R. Clark, P.E.
District Director

M. L. Beekman /m

M. L. Beekman, P.E.
Chief, Transp. Assistance
& Planning Section

GWM:MLB:jaf

CITY OF STILLWATER

On the Beautiful St. Croix

216 North Fourth Street
STILLWATER, MINNESOTA
55082

MAYOR
DAVID C. JUNKER

FINANCE DIRECTOR-COORDINATOR
NILE L. KRIESEL

COUNCILMEN:
BARBARA AVISE
ANNE MARIE BODLOVICK
BRAD MAC DONALD
HARRY D. PETERSON

CITY CLERK
DOROTHY R. SCHNELL

CITY ATTORNEY
DAVID T. MAGNUSON

March 16, 1982

William W. Badger, Colonel
Department of the Army
St. Paul District Corp of Engineers
1135 U. S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

In behalf of the City Council of the City of Stillwater I wish to thank you for providing input through your staff at an informal meeting concerning the St. Croix River Basin Feasibility Study. This meeting was held in the Council Chambers on March 15 and was attended by Council members, City Staff, City Business Community Representatives and Representatives of the Department of Natural Resources of the State of Minnesota. Contributions from your staff and from the DNR staff gave all of those persons present a far better understanding of the procedures required and timeframe involved with the proposed feasibility study.

Upon conveying this information to the City Council at their regular meeting on March 16, 1982, the City Council gave their unanimous support to the study. This support is conveyed through Resolution 7049 attached.

Sincerely,


David C. Junker
Mayor

jcj
Enclosure

c.c. Senator Dave Durenberger
Congressman Arlan Erdahl
Senator Rudy Boschwitz
Governor Albert Quie
Commissioner Joseph Alexander, DNR

RESOLUTION NO. 7049

RESOLUTION SUPPORTING CORPS OF ENGINEERS ST. CROIX RIVER BASIN
FEASIBILITY STUDY.

WHEREAS, the City of Stillwater is located adjacent to the beautiful St. Croix River; and

WHEREAS, the St. Croix River has, from time to time, overan its natural banks causing damage or the threat of damage to properties within the City of Stillwater; and

WHEREAS, the City Council of the City of Stillwater has determined that a need exists for flood control measures to eliminate or reduce the potential of damage to properties caused by flooding; and

WHEREAS, the City of Stillwater desires flood control measures that are compatible with the wild and scenic designation of the St. Croix River and consistent with the City's policy to promote its cultural and historical amenities; and

WHEREAS, the Army Corps of Engineers have received authorization and funding to resume a flood control feasibility study.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL of the City of Stillwater, Minnesota that the City of Stillwater approves and supports the resumption of the St. Croix River Basin feasbility study by the Army Corps of Engineers and requests that other State or Federal agencies having an interest in the study give their approval and lend their support to this study.

Adopted by the Council this 16th day of March, 1982.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
St. Paul Field Office, Ecological Services
570 Nalpak Building
333 Sibley Street
St. Paul, Minnesota 55101
March 29, 1982

IN REPLY REFER TO:

Colonel William W. Badger
District Engineer, St. Paul District
U.S. Army Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

This Planning Assistance letter has been prepared in compliance with the obligations of the U.S. Fish and Wildlife Service (FWS) to the St. Paul District, Corps of Engineers under our FY 82 Support Agreement regarding the initiation of a feasibility study for flood protection on the lower St. Croix River (SCR), with primary emphasis on protection in the Stillwater, Minnesota area.

This initial response is intended to provide a descriptive overview of the major fish and wildlife resources of the lower SCR, with primary emphasis on the Stillwater area. Included in this report are summary descriptions of geology, vegetation, fish and wildlife resources, threatened and endangered species and designated critical habitat within the project area. We will provide more detailed information if and when the study progresses to other phases.

Environmental Setting

The St. Croix River Valley encompasses nearly 11,550 Km² in east-central Minnesota and northwestern Wisconsin.^{1/} Situated between two relatively distinct biomes in the north-central United States, the valley is a biological "crossroads" for many species. Being located in close proximity

to the forest-prairie transition zone, many western species of animals occur in association with species of more typical eastern origin. Habitats available to wildlife vary considerably from upland deciduous forests and grasslands, to lowland marshes and open water expanses. The St. Croix Valley supports a wide variety of birds, mammals, fish, reptiles and amphibians, plus several thousand species of vascular and nonvascular plants. Water quality throughout most of the river's course is relatively clean and its natural flow is interrupted twice by two small dams.

Geology

Within the last million years at least four glaciers cut across the St. Croix River Valley forming hills and valleys from debris transported long distances. The bedrock geology from the upper portions of the Valley consist primarily of Precambrian igneous lava flows and metamorphic crystalline formations while those in the lower valley consist of marine sandstones, shales and limestone. Outcroppings southward through the valley indicate that bedrock formations are progressively younger in age.^{3/} Present topography in the project area includes flat-topped, steep-sided sedimentary hills adjacent to the SCR with a relatively narrow floodplain and river valley.

Vegetation

Terrestrial

Within the valley a wide range of vegetational communities are available to wildlife populations. Relatively steep slopes and rugged terrain offer protection and a variety of habitats that enhance the ecological diversity of the area. However, man has had a profound impact on the composition, distribution and abundance of some communities. Early

logging operations left few of the original white or red pine stands that typically grew along the valley flanks.^{2/} Today's pines are mainly second growth trees intermixed with various species of hardwoods. Canopy species occurring on the bluff tops vary from a mesic association of basswood, large-toothed aspen, sugar maple and ironwood to a more xeric association including northern red oak, bur oak, red cedar and white pine.^{1/} Shrubs indicative of this community include black cherry, gray dogwood and hazelnut. The herb layer under the mesic forest consists of anemone, wild strawberry, northern bedstraw, Solomon's seal and large-flowered trillium.^{3/} Periodic flooding of the lowlands has resulted in a river bottom vegetation favoring hydrophytic species. Major tree species characteristic of this community are silver maple, paper birch, American elm, green ash and cottonwood. Under-story vegetation includes willow species, box elder, red-osier dogwood and yellow birch.

Aquatic

Aquatic vegetation in the lower SCR is sparse. Periodic high water from seasonal rains and floods resulted in a scoured condition along the shore. This, in combination with the steep, sandy bottom, has prevented the establishment of many aquatic plants. However, wild celery and river pondweed are two exceptions which can be found in isolated beds along this stretch of river. In protected backwater areas other species of pondweed, naiads, cattail, horsetail, rushes, sedge, arrow-head and duckweed may occur.

Fish and Wildlife

Birds

The diversity of the avifauna within the SCR Valley attracts many people

seeking recreational opportunities in such forms as bird watching, photography and hunting. Principal groups of birds seen within the valley include waterfowl, raptors, shorebirds, gulls and passerines. As many as 314 avian species have been recorded in the valley representing a compilation of sightings made during nesting, wintering and migration periods.^{1/} As would be expected, species diversity and abundance varies with the season and within each vegetation community. The wooded valley and floodplain provide excellent nesting habitat for such species as the red-tailed hawk, screech owl, great-horned owl, woodcock and ruffed grouse. Passerine species are numerous in the thick under-story and include many warblers, sparrows, thrushes and woodpeckers.^{4/}

Migratory waterfowl utilize the SCR as both a breeding area and as a migratory corridor during spring and fall migration. Nesting waterfowl common within the project area include mallards, wood ducks, blue-winged teal and hooded mergansers. These species utilize a variety of nesting habitats ranging from wooded shorelines to grassy upland areas.

Other water-related or "wading" birds common to this area include the great blue heron, green heron, black-crowned night heron, ring-billed gull and black terns. The sandy beaches and shallow water areas are often frequented by species like the spotted sandpiper, killdeer and common snipe.

Mammals

Furbearing mammals that occur within the project area include raccoon, mink, red and gray fox, striped skunk and weasel. These species are important not only for their ecological role as predators but also provide income to many trappers adjacent to the SCR. Although considered

by some to be pest animals, the following species commonly found in the SCR Valley play an important ecological role as prey species and serve as a "buffer" to many species of recreational importance to man. These include species of shrew, vole, mice, chipmunk and ground squirrel. Species of recreational importance include the eastern cottontail rabbit, gray and fox squirrels and white-tailed deer.

Reptiles and Amphibians

Many reptiles and amphibians are native to the Lower St. Croix River Valley. An array of frogs, turtles, snakes and other species that require aquatic or moist environs frequent the lower elevations. Species such as spring peepers, tiger salamanders, red-bellied snake and garter snake all may be found here. The drier elevated bluffs support the box turtle, wood frog, hog-nosed snake and bullsnake. Disposal sites for dredged material are commonly used by soft-shelled and snapping turtles as nesting areas. These two species are also utilized as a food source by many people.

Fish

The ichthyofauna of the lower SCR has been studied intensively in past years by the Minnesota Department of Natural Resources. Results from their studies indicate that the St. Croix supports a diverse fish population typical of most river-lakes. At least 62 species have been collected and identified in past years.^{5/} Principal gamefish present in sufficient numbers to support a sport fishery include walleye, sauger, black crappie, white crappie, white bass and smallmouth bass. Other gamefish of lesser importance include the channel catfish, flathead catfish, northern pike, largemouth bass and bluegill.^{3/} Of the above,

walleye, sauger and crappie are probably the most sought after gamefish. The more common rough fish in the St. Croix are carp, freshwater drum, gizzard shad, shorthead redhorse and silver redhorse. Species which support a commercial harvest include carp, buffalo fish, catfish, sheepshead and sucker.^{4/} Principal forage fish include silver chub, emerald shiner, spottail shiner, trout-perch and logperch.

Of paramount importance to all fisheries of the SCR is the abundance and diversity of spawning habitats. Typically, a river-lake system like the St. Croix offers a wide variety of spawning habitats. However, within the project area and below Stillwater, shallow backwater areas necessary for northern pike and largemouth bass spawning are generally lacking.^{6/} The absence of this habitat type is believed to be one of the primary factors limiting northern pike and largemouth bass in the SCR.

Threatened and Endangered Species

Currently, there are three federally listed threatened or endangered species that occur within the lower St. Croix River Valley. These species are the bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus) and the Higgin's eye pearly mussel (Lampsilis higginsii).

Bald eagles are known to nest in both Chisago County, Minnesota and Polk County, Wisconsin.^{7/} However, these nesting areas are considerably north of the Stillwater area and depending on project design, should not be affected by proposed construction activities. During the winter months, bald eagles also utilize the lower SCR for a wintering area concentrating around open water areas where food (fish/waterfowl) are

available. Although the total number of eagles wintering along this stretch of river is dependent on weather conditions and food availability, small numbers do persist throughout even the most severe winter months.

Peregrine falcons are a transient species to the SCR Valley, being seen most often during spring and fall migration. Tentative plans are underway to reintroduce this species at a number of locations within Minnesota and Wisconsin. The St. Croix River Valley has been identified as one such location for a future peregrine falcon release program.

The Higgin's eye pearly mussel is a freshwater species restricted in distribution to large flowing rivers of the Upper Midwest region. The largest known population of this species in close proximity to the project area is at Hudson, Wisconsin. A recent proposal submitted to the FWS by the Wisconsin Department of Natural Resources calls for the designation of critical habitat for this species between river mile 16.1 and 17.9. This proposal is presently being reviewed by the FWS.

Needs, Recommendations and Planning Goals

The Minnesota Department of Natural Resources has identified two planning and management goals for the St. Croix River and Lake St. Croix near Stillwater. The first of these is the successful establishment of a muskellunge population capable of maintaining itself under sustained recreational fishing pressures. MDNR has in the past introduced muskellunge to the Lake and River, and has been monitoring that species' population there. Other muskellunge stocking in the River and Lake may be forthcoming, possibly involving other genetic populations. Included in the goal of establishing a viable muskie population, is the need to evaluate

its population trends. Depending on the flood damage reduction alternative selected, and its impacts, the Corps may find it useful to cooperate with MDNR in its attempt to establish a St. Croix muskellunge population.

The other goal identified by MDNR involves public access to the River and Lake. MDNR would like to increase both the number of access points and parking spaces in the Stillwater-Bayport area, not only for fishery management purposes, but also for other water-based recreation. This, too, may offer the Corps the opportunity to provide additional project-related benefits in the St. Croix Feasibility Study.

Discussion

Due to the preliminary nature of this project and subsequent lack of detailed project information, our comments deal with the identification of general fish and wildlife resources in the St. Croix River Valley. Once project plans are formalized and made available for our review, potential specific impacts to fish and wildlife resources can be identified and measures developed to minimize any adverse impacts.

Sincerely,



Richard F. Berry
Field Office Supervisor

cc: Minn. DNR, Warner Road (E. Feiler, Del Barber)
Minn. DNR, Div. of Waters, St. Paul (Joel Schilling)

Literature Cited

1. Faanes, Craig A. 1981. Birds of the St. Croix River Valley: Minnesota and Wisconsin. Fish and Wildlife Service, North American Fauna, Number 73.
2. National Park Service. 1980. Reconnaissance Survey, Twin Cities Metropolitan River Corridors.
3. Colingsworth, R. F. and J. R. Gudmundson. 1973. Environmental Impact Assessment Study, St. Croix River Pool, North Star Research Institute.
4. Short-Elliott-Hendrickson, Inc., Consulting Engineers. 1979. Final Environmental Impact Statement on Proposed Bayport Marina.
5. Northern States Power Company. 1971. Annual Report, Environmental Monitoring and Ecological Studies Program, Allen S. King Generating Plant, Oak Park Heights, Minnesota.
6. NUS Corporation. 1978. Northern States Power Company, Section 316(b) Demonstration for the Allen S. King Generating Plant on Lake St. Croix.
7. U.S. Environmental Protection Agency. 1981. Final Environmental Impact Statement, Wastewater Treatment Systems, St. Croix Falls, Wisconsin and Taylors Falls, Minnesota.

CITY OF BAYPORT

BAYPORT, MINNESOTA 55003
WASHINGTON COUNTY

Council Meets the First Monday
of Each Month - 7:00 P.M.

612/439-2530

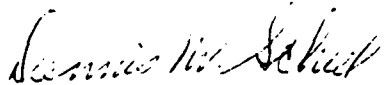
April 9, 1982

Department of the Army
St. Paul Dist. Corps of Engineers
1135 US Post Office & Custom House
St. Paul, Mn. 55101

Sirs:

Our engineer has just brought to our attention a communication dated January 15, 1982 sent to the City of Stillwater, Mn. regarding flood protection measures study. The Bayport Council feels the City of Bayport should be considered in the study as the community to the south of the City of Stillwater on the St. Croix River.

Sincerely,



Dennis W. Scheel, mayor
210 N. 6th St.
Bayport, Mn. 55003
430-1441



State of Wisconsin

DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

BOX 7921
MADISON, WISCONSIN 53707

April 15, 1982

IN REPLY REFER TO:

Colonel William Badger, District Engineer
Corps of Engineers - St. Paul District
1135 U. S. Post Office & Custom House
St. Paul, MN 55101

Attn: John Bailen and Martin McCleary

Dear Colonel Badger:

Re: St. Croix River Basin Feasibility Study

After we sent our March 9, 1982 letter to you, the Department learned the City of Prescott, Wisconsin is interested in participating in the flood damage control aspects of the above-referenced study. Mayor Dean Hauschildt and Councilwoman Betty House have indicated the City would like help in dealing with flooding problems in the waterfront area of Prescott.

In view of this recent development, the Department has no objection to the Corps' including Prescott in the reconnaissance phase of the study. The Department strongly urges the Corps concentrate upon nonstructural methods of flood hazard mitigation and flood damage control for Prescott.

As the reconnaissance study proceeds and throughout any subsequent phases of the feasibility study, we urge the Corps to keep the Department informed of its progress. Gary Lepak, West Central District, has been designated as the Department's contact person for this project. He can be reached at (715)836-5161.

If you have any questions on the Department's position on this study, please contact Steve Ugoretz of my staff. His telephone number is (608)266-6673. We look forward to productive cooperation between our agencies in the conduct of the feasibility study.

Sincerely,
Bureau of Environmental Impact

Howard S. Druckenmiller
Director

1816P

cc: Joel Schilling, MDNR, Division of Water
Pat Olson, MDNR, Metro Region, Waters
Steve Johnson, Minnesota-Wisconsin
Boundary Area Commission

Jake Vandervoort, WCD, Eau Claire
Larry Larson - WRZ/5
Gary Lepak, WCD, Eau Claire
Mayor Dean Hauschildt, Prescott



STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

BOX 37, CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

DNR INFORMATION
(612) 296-6157

FILE NO _____

April 20, 1982

Colonel William W. Badger
District Engineer, St. Paul District
Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

The following is an additional response to our letter of February 23, 1982, regarding the resumption of the St. Croix Basin Feasibility Study. On March 15, 1982, Department staff met with the City of Stillwater regarding their concerns over potential flooding of public and private properties and their stormwater management problems. We have also received a copy of the Resolution of the Stillwater City Council supporting the study.

The Department recognizes the City's concerns and suggests that measures investigated by the Corps of Engineers in this study be of an innovative nature with emphasis on the protection or enhancement of existing historical and cultural attributes of this unique riverway. This is our understanding of the City's desires, as well.

In addition, the recreational potential of the St. Croix River has been mentioned by the staff of the Minnesota-Wisconsin Boundary Area Commission as an area of concern in view of declining state and federal budgets. Mr. Post of your staff has mentioned that recreation is a legitimate study purpose; therefore, we would suggest that your initial reconnaissance report examine the Master Plan for the riverway and possible interaction with Corps' activities or programs.

Finally, the Big Marine-Carnelian Lakes water levels are a problem faced by this Department on a recurring basis which should be addressed in the problems and needs assessment. It is recommended that coordination be established with the Carnelian-Marine Watershed District to explore this problem.

We appreciate the opportunity to respond to your request and look forward to working with the Corps through the reconnaissance phase and any subsequent actions.

Yours truly,


Joseph N. Alexander
Commissioner

cc: Senator Durenberger, Senator Boschwitz, Congressman Erdahl, Governor Quie,
Mayor Dave Junker, Larry Seymour



STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

BOX 32 CENTENNIAL OFFICE BUILDING • ST. PAUL MINNESOTA • 55155

DNR INFORMATION
612/296-6137

FILE NO _____

April 27, 1982

Mr. John Bailen
Corps of Engineers, St. Paul District
1135 Y. S. Post Office and Custom House
St. Paul, MN 55101

ATTN: NCSED-PB

Dear Mr. Bailen:

The following letter will provide additional response of a more specific technical nature to the Department's letter of April 20, 1982 regarding the St. Croix River Basin Feasibility Study. The specific responses made pertain to the Corps letter of request dated: January 15, 1982.

Response to Item #1 Communities with Water Resource Problems

FLOODING

<u>Location</u>	<u>(Damage Potential)</u>	<u>Type of Damage</u>
Unincorporated Areas	(most areas low damage potential)	
Copas Area	(low-moderate damage potential)	
Denmark Township 110th Street	(moderate damage potential)	10-15 homes
Stillwater	(high damage potential)	several stores, restaurant, boatworks, park, bridge, homes (3)
Lake St. Croix Beach	(moderate damage potential)	many structures, septic system
St. Mary's Point	(moderate-low damage potential)	few homes, new homes are flood proofed
Lakeland	(low damage potential)	homes (~ 8)
Oak Park Heights	(low damage potential)	restaurant, sewage treatment plant (?)

B-33

AN EQUAL OPPORTUNITY EMPLOYER

Afton	(moderate damage potential)	restaurant, bar, small businesses, few homes, marina--creek backup
Bayport	(high damage potential)	marina--Perro Creek backup, numerous residential structures, commercial structures
Franconia Town (Chisago County)	(high damage potential)	mobile homes and structures
Lakeland Shores	(low-moderate damage potential)	residential structures

Response to Item #2 Potential Solution to Problems Above

In response to Item #2, the Department is in receipt of a resolution (No. 7049) recently passed by the City of Stillwater pertaining to their interest in this study. We share the City's concern that any measures ultimately implemented should be compatible with the wild and scenic river designation and be consistent with the City's policy to promote its cultural and historical amenities. In this regard, we would stress that structural control methods are generally inappropriate due to the classification of the river as wild and scenic as well as existing Department and legislative policy (M.S. 104.01, Subd. 3) stressing non-structural measures such as flood plain zoning, flood proofing, flood warning practices as well as property acquisition and relocation.

Specifically in the City of Stillwater situation, certain limited structural methods (e.g. temporary and/or portable) may be applicable so long as cultural and historical values as viewed from the river are not adversely impacted. An additional approach which should be examined in the study would involve the development of local comprehensive plans through a cooperative effort between the Corps of Engineers, the Department and local governments which might include a combination of non-structural and limited structural measures.

Additional possible solutions to the above problems which should be addressed in the study are as follows:

- 1) Examination of the extent of development both urban and agriculture which may have resulted in increased runoff and erosion coupled with measures to reduce these impacts.
- 2) Investigation of tributary subwatershed's to assess the loss and restoration of wetlands and/or the creation of small headwater reservoirs.
- 3) Assessment of the extent of artificial constrictions of the river downstream of flood prone areas.

Other Related Water Resource Issues

RECREATION RELATED

Marinas issues

Shoreline erosion due to large boat traffic

Water surface use conflicts (recreational boating vs.
barges, if proposed)

Public access issues

User Conflict:

- fisherman
- power-boaters
- sailors
- swimmers

Resource limitations

- number and availability of beaches
- acres of water
- PCB fish contamination

Resource enhancement

- establishment of self-sustaining muskellunge
population

Response to Item #3 Information Availability

AVAILABLE DATA

- Lower St. Croix Mgmt. Plan
- flood plain data available from USGS and Minnesota DNR-
Central Office
- cultural resource data from MSH and NPS Omaha
- fish and wildlife information from USFWS, Minnesota and
Wisconsin DNR, and Northern States Power Company
- user surveys and evaluations

Although there are a number of resource issues identified we believe that the primary focus of the current effort should be flood damage reduction.

The Department is committed to active participation in the study and we look

Mr. John Bailen
April 27, 1982
Page Four

forward to future discussions toward establishment of a specific scope for the study.

Yours truly,

DIVISION OF WATERS

Joel G. Schilling
Water Resources Planner

JGS:ds

cc: Mayor David C. Junker
Jim Harrison, MN-WI Boundary Area Commission
Ken Carr, USFWS
Jack Skrypek, MDNR
Karen Loechler, MDNR
Larry Seymour, MDNR
Martin McCleery, USCOE



DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
1135 U. S. POST OFFICE & CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101

REPLY TO
ATTENTION OF:

NCSPD-PF

4 May 1982

The St. Paul District, Corps of Engineers, has resumed the St. Croix River Basin Feasibility Study. The study was authorized in 1954 and 1968, and received initial funding in 1965. A preliminary report completed in January 1968 examined the water resource problems in the St. Croix River basin and identified potential solutions. However, the study was suspended in June 1968 as a result of the pending Wild and Scenic River designation of the St. Croix River.

The current study objective is to resume the scoping process and reexamine the water resource problems of the basin in view of changed conditions since 1968. The inclosed report summarizes the basin's problems, needs, and solutions as of January 1968. Please review the inclosure (especially pages 3 through 6) and provide your comments and any current information focusing on the water resource problems and needs in the St. Croix River basin. Also, please designate a contact person for further coordination.

Please note that solutions identified in the 1968 plan included three reservoir plans. Reservoirs are no longer an acceptable method of solving water resource problems along the main stem of the St. Croix River as a result of the Wild and Scenic River designation and will not be studied further. Other methods will need to be identified as the study progresses.

The initial focus of the St. Croix River study will emphasize flood problems and needs. The following list shows communities which have experienced flooding in the past.

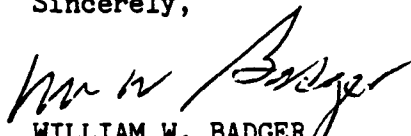
<u>Community</u>	<u>Indicated an interest in the study</u>
Minnesota	
Stillwater	Yes
Bayport	Yes
St. Croix Beach	---
St. Marys Point	---
Afton	Yes
Pine City	---
Mora	---
Wisconsin	
Hudson	---
Prescott	Yes
New Richmond	---

4 May 1982

During the scoping process, other water resource problems and needs will need to be identified. We have the authority and capability to study related water resource problem areas, including navigation, hydropower, water supply, recreation, and fish and wildlife, in connection with flood damage reduction.

Your cooperation is appreciated. If you have any questions, please contact Mr. Martin McCleery, project manager (612-725-7284).

Sincerely,



WILLIAM W. BADGER
Colonel, Corps of Engineers
District Engineer

1 Incl.
As stated



United States
Department of
Agriculture

Soil
Conservation
Service

316 North Robert St., Room 200
St. Paul, Minnesota
55101

SUBJECT 150-14 - BASIN AREA PLNG - River Basin Studies -
St. Croix River Basin Feasibility Study

DATE: May 14, 1982

TO Colonel William Badger
District Engineer
St. Paul District, Corps of Engineers
1135 Post Office Bldg. & Custom House
St. Paul, Minnesota 55101

The report on Study of Flood Control and Related Purposes for St. Croix River Basin has been reviewed as requested and the following comments are provided.

We are in agreement with the statement on page 5, which implies that no project activities under the authority of PL-566 are underway within the St. Croix Basin in the State of Minnesota. However, for clarification, watershed protection is defined as those activities which are undertaken solely for the purpose of protecting the land resource base and related water resources. At the present time all of Minnesota is organized into soil and water conservation districts. It is through conservation districts that SCS aids individuals, groups and units of government in the use of natural resource information. Through the efforts of the SCS and the soil and water conservation districts an ongoing program for erosion control and runoff retardation is maintained.

Public Law 97-98 Farmland Protection Policy Act was passed December 22, 1981, to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with State, units of local government, and private programs and policies to protect farmland. The SCS maintains information on important and prime farmland which is available for your consideration and use.

Also, the state legislature has passed legislation creating agricultural preserves in the 7 County Twin Cities Metropolitan area. It offers farmers in designated agriculture zones a package of incentives for keeping their land in long term agriculture. This action would be applicable to both Anoka and Washington Counties, portions of which are in the St. Croix basin.



The Soil Conservation Service
is an agency of the
Department of Agriculture

Colonel William Badger

Thank you for the opportunity to comment on this report. Please contact Ivan Wilkinson, River Basin-Watershed Planning Staff Leader (725-7682) if you have need for further coordination on this project.

A handwritten signature in black ink, appearing to read "Harry M. Major". The signature is fluid and cursive, with a large initial "H" and "M".

Harry M. Major
State Conservationist



United States
Department of
Agriculture

Forest
Service

North Central Forest Experiment Station
1992 Folwell Avenue
St. Paul, MN 55108

4900

May 14, 1982

Col. William W. Badger
Department of the Army
St. Paul District, Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Col. Badger:

Your letter (Ref. NCSPD-PF) of May 4 regarding the St. Croix River Basin Feasibility Study has been forwarded to me for reply. I have reviewed the Phase 1 report and have no additional comments or current information to offer.

We would appreciate being kept informed as your study progresses. Our Research Work Unit here at the North Central Forest Experiment Station deals with river recreation research and we would be particularly interested in knowing about any recreation studies which you might undertake.

You may contact me at (612) 642-5232.

Sincerely,

JOHN H. SCHOMAKER
Acting Project Leader





FEDERAL ENERGY REGULATORY COMMISSION
CHICAGO REGIONAL OFFICE
230 SOUTH DEARBORN STREET, ROOM 3130
CHICAGO, ILLINOIS 60604

May 20, 1982

Colonel William W. Badger
District Engineer
St. Paul District Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

Your May 4, 1982 letter states that the St. Croix River Basin Feasibility Study is being resumed, and you ask that a contact person be designated for further coordination.

The primary concern of this office relates to hydropower development. Since your letter indicates that the development of reservoirs is no longer an acceptable method of solving water resource problems along the main stem of the St. Croix River, it appears unlikely that your study will involve potential hydropower development. However, in the event that hydropower potential is included as part of a development plan, we would appreciate being so advised. Please direct future correspondence dealing with this study to me.

Sincerely,

A handwritten signature in cursive script, reading "Lawrence F. Coffill", is written over the typed name.

Lawrence F. Coffill, P.E.
Regional Engineer

CITY OF HUDSON

CITY HALL

505 Third Street

HUDSON, WISCONSIN 54016

May 24, 1982

Office of the Mayor

Mr. William W. Badger
Colonel, Corps of Engineers
Department of the Army
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Colonel Badger:

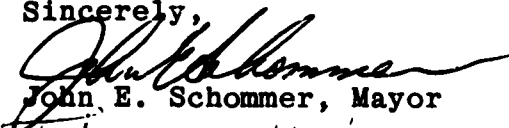
The City of Hudson Park Board, Public Works Department and Council have been and are concerned about the high water in our area bordering the St. Croix River. We do expect it during spring runoff; but for the past few years, it has been higher and for longer periods of time.

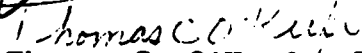
Our Lakefront Park is used regularly and continually by people from many communities for a wide variety of activities. The Little League field can't be used; the boat launch hasn't been open yet; the swimming beach will not be open as scheduled; and the parking lot won't get a chance to dry up.

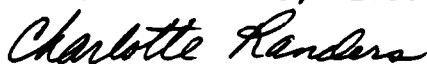
Our Park Board has spent many hours planning and implementing ideas for good use of Lakefront. Future plans include more improvements; but money spent for these plans cannot be justified under the present water conditions.

We would appreciate anything you can do to help control this situation so that the St. Croix River is kept at a more normal level. If we should contact someone else, please forward this information. Thank you.

Sincerely,


John E. Schommer, Mayor


Thomas C. O'Keefe, Director Public Works


Charlotte Randers, President-Park Board

ELMER A. HUSET
General Manager

BOARD OF WATER COMMISSIONERS

LEONARD W. LEVINE, PRESIDENT
DEBORAH Y. BACHRACH, VICE PRESIDENT

W. J. MEUWISSEN
Supt. of Water Distribution

THOMAS D. MOGREN
Assistant General Manager

RAYMOND E. LANGEVIN

RON MADDOX

ROGER A. MOHROR
Supt. of Water Supply

JOANNE SHOWALTER

VERNE E. JACOBSEN
Water Production Engineer

MISSISSIPPI RIVER

LAKES

TREATMENT

PUMPING

DISTRIBUTION

May 25, 1982

Col. William W. Badger -
District Engineer, Corps of Engineers
1135 U.S. Post Office and Custom House
Saint Paul, Minnesota 55101

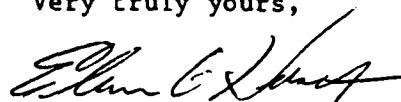
Re: St. Croix River Feasibility Study

Dear Col. Badger:

Reference is made to your letter of May 4, 1982.

Please be advised that Mr. Roger Mohror, Superintendent of Water Supply, will be the designated coordination contact person for the Water Utility.

Very truly yours,



Elmer A. Huset
General Manager

RAM:kja

B-44

4TH FLOOR CITY HALL ANNEX - ST. PAUL, MINNESOTA 55102

UPPER MISSISSIPPI WATERWAY ASSOCIATION

INCORPORATED 1932
P.O. Box 1116
Burnsville, Minnesota 55337
612-894-2583

Dedicated to navigation and sound water resource management.

May 25, 1982

Officers 1981-82

CHAIRMAN OF THE BOARD

Norton L. Quarve

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TREASURER

Vern Gust

LEGAL COUNSEL

Jeffrey W. Lambert

EXECUTIVE VICE PRESIDENT

Erv A. Timm

Col. William W. Badger
District Engineer, St. Paul District
U. S. Army Corps of Engineers
1135 U. S. Post Office & Custom House
Saint Paul, Minnesota 55101

Attention: Mr. Martin McCleery, Project Manager
St. Croix River Basin Feasibility Study

Dear Col. Badger:

Your May 4th letter addressed to this organization advised that the St. Paul District, Corps of Engineers, was resuming the St. Croix River Basin Feasibility Study which has been under suspension since 1968 as a result of enactment of the Wild and Scenic Rivers Act and the designation of the St. Croix River as a Wild and Scenic River.

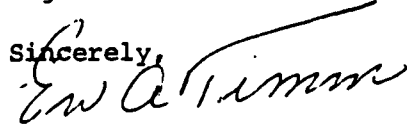
The letter asked that we review the enclosure, make appropriate comments, provide current information focusing on the water resource problems and needs in the St. Croix River Basin and designate a contact person for continuing coordination relative to the progress of the study.

We have not found a groundswell of enthusiasm or interest relative to flood control among communities on the Lower St. Croix, and, of course, the proposed reservoir on the Upper St. Croix in the preliminary study is no longer feasible. I believe that the only community that met the cost-benefit ratio for justification of construction of a floodwall in the preliminary report was Stillwater, Minnesota, and it would seem that a simple mathematical computation would update the cost-benefit studies adjusted to current construction and interest rates.

This Association has a concern relative to continued maintenance of the navigational channel on the Lower St. Croix, and must, therefore, monitor the proposed St. Croix River Basin Feasibility Study as to its potential adverse impacts on waterborne commerce. However, this interest is for the purpose stated, and should not be misconstrued as supporting the need for the study.

I will appreciate being placed on your mailing list for future communications relative to the study as well as notices of any and all meetings scheduled relative thereto.

Sincerely,



Erv A. Timm

Executive Vice President B-45

The Mississippi River Lock and Dam Navigation System—a priceless multipurpose national energy saving environmentally oriented transportation mode, linking domestic and world trade areas by water with the Upper Midwest; providing stable river water levels for usage by municipal, private, commercial, recreational, wildlife, and aquatic interests.



United States Department of the Interior

NATIONAL PARK SERVICE

ST. CROIX NATIONAL SCENIC RIVERWAY

P. O. BOX 708

ST. CROIX FALLS, WISCONSIN 54024

IN REPLY REFER TO:

May 28, 1982

L7423(LOSA)

Colonel William W. Badger
District Engineer
St. Paul District, Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

Thank you for your letter of May 4 transmitting a copy of "Phase I Report on Study of Flood Control and Related Purposes For St. Croix River Basin, Minnesota and Wisconsin" completed in January 1968. Your letter asked for comments and current information focusing on the water resource problems and needs in the St. Croix River basin.

In accordance with current National Park Service policy, our Regional Office will provide the official comments so I have furnished that office with a copy of the 1968 report.

Thanks again for the opportunity to submit comments.

Sincerely,

Gustaf P. Hultman
Superintendent



Minnesota Pollution Control Agency

June 3, 1982

William W. Badger, Colonel
Corps of Engineers, District Engineer
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

Thank you for your May 4, 1982 letter concerning the St. Croix River Basin Feasibility Study.

At this time, we have no specific comments on the material that was received with your letter. Lanny Peissig in the Section of Monitoring and Analysis of the Division of Water Quality will be the Agency's designated contact person for this study. His telephone number is 296-7397.

If I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Louis J. Breimhurst
Executive Director

LJB:rbj

Phone 612/296-7301

1935 West County Road B2, Roseville, Minnesota 55113

Regional Offices • Duluth Brainerd Detroit Lakes Marshall Rochester

Equal Opportunity Employer

City of Lake St. Croix Beach

June 29th, 1982

Office of Clerk

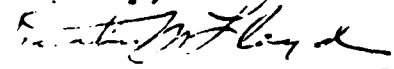
Department of the Army
St. Paul District Corps of Engineers
1135 U. S. Post Office and Custom House
St. Paul, Minnesota 55101

Attention: Martin McCleery

Dear Sir:

This letter is being sent to you as a formal request for the City of Lake St. Croix Beach to be included in the St. Croix River Basin Feasibility Study in relation to Flood Control Measures.

Yours truly,


Dorothy M. Lloyd, City Clerk

436-7716



HISTORIC PRESERVATION DIVISION

July 2, 1982

Mr. Wayne Knott
Chief, Environmental Resources Branch
St. Paul District, Corps of Engineers
1135 US Post Office and Custom House
St. Paul, Minnesota 55101

SHSW: 364-82
RE: St. Croix River Basin
Study

Dear Mr. Knott:

As requested in your letter of June 7, 1982, I am enclosing a copy of our most recent list of properties in Wisconsin that are included in the National Register of Historic Places. Pierce and St. Croix Counties have not been systematically surveyed to identify buildings or archeological sites that may be eligible for inclusion in the National Register of Historic Places.

We do have some information in our files for buildings in the cities of Prescott and Hudson. However, this material is not comprehensive, and should be considered as nothing more than a windshield survey.

Perhaps the best source for general St. Croix River information would be the reports on the National Scenic Riverway portion of the River prepared by Commonwealth Associates for the National Park Service.

If more specific information is needed please contact me at (608) 262-2732.

Sincerely,

Richard W. Dexter
Chief, Compliance Section

RWD:1kr

Enclosure

B-49

THE STATE HISTORICAL SOCIETY OF WISCONSIN

816 STATE STREET • MADISON, WISCONSIN 53706 RICHARD A. ERNEY, DIRECTOR

Office of the Mayor

*City of Prescott
Prescott, Wisconsin*

54021



July 12, 1982

Colonel William Badger, District Engineer
Corps of Engineers - St. Paul District
1135 U. S. Post Office & Custom House
St. Paul, MN 55101

Attn: John Bailen and Martin McCleary

Dear Colonel Badger:

Re: St. Croix River Basin Feasibility Study

Thank you for your efforts involved in our meeting of June 3, 1982
and for the concerns of Prescott in regard to river flooding.

One of Prescott's greatest concerns in flooding is that of closing
the bridge due to flooding of US Highway #10 on the Minnesota side
in Washington Co. and also fear that the bridge may be jeopardized
in the flood. This cuts Prescott off from the work place, hospitals,
commercial shipments, etc. as it did in 1965 and 1969 and is a
disaster for our City.

With this letter, I request on behalf of the City of Prescott that
this flooding issue be considered in this study along with other
concerns as discussed at our meeting.

Thank you.

Sincerely yours,

Dean C. Hauschildt, Mayor
City of Prescott

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
177 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

ER 82/946

July 15, 1982

Colonel Edward G. Rapp
District Engineer
U.S. Army Engineer District
St. Paul
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Rapp:

The Department of Interior has reviewed the Phase I Report on Study of Flood Control and Related Purposes for the St. Croix River Basin in Minnesota and Wisconsin. Consolidated comments of various Departmental subdivisions are provided for your consideration during ongoing phases of the project study.

General Comments

The Bureau of Mines has reviewed the subject report with regard to mineral resources and impact on the mineral industry. Mining in the basin is restricted to sand and gravel and stone production. Nearly all modern sand and gravel operations wash the pit product, because aggregate used in construction must be free of clay.

Because any increase in sand and gravel production will necessitate additional water resources, we suggest that you contact the state aggregate associations for their assessment of future water needs in the area. Their addresses are:

Faye C. Selck, Director
Wisconsin Redimix Concrete Association
10850 West Wisconsin Avenue
Milwaukee, Wisconsin 53226
(414) 774-1150

Jerry Kastner, Executive Director
Aggregate Redimix of Minnesota Association
P.O. Box 27102
Minneapolis, Minnesota 55427
(612) 929-9732

As indicated in your May 1982 solicitation of comments, much of the data in the 1968 Report are outdated and should be corrected. A development since 1968 that will affect the updating of the Report has been the enactment of the Endangered Species Act of 1973. Among the species listed as threatened or endangered, habitats of several are found in the St. Croix River Basin. These species and the

counties within the St. Croix Basin where they are listed to occur are:

<u>Species</u>	<u>Distribution</u>
Gray Wolf	Douglas and Burnett Counties, WI; Aitkin, Carlton and Pine Counties, MN
Bald Eagle	Barron, Bayfield, Burnett, Douglas, Pierce, Polk, St. Croix, Sawyer and Washburn Counties, WI; Carlton, Chisago and Washington Counties, MN
Peregrine Falcon	Pierce, Polk and St. Croix Counties, WI; Chisago, Pine and Washington Counties, MN
Higgin's Eye Pearly Mussel	Lower St. Croix River, MN and WI

These endangered species comments constitute informal consultation only. They do not fulfill the requirements of Section 7 of the Endangered Species Act, as amended.

We are not aware of other major special wildlife or fish-related problems or needs in the basin that have developed since the 1968 Report. However, there has been little effort expended to date regarding potential conflicts between fish and wildlife resources and alternatives such as impoundment on mainstream tributaries. It is likely that alternatives involving tributary impoundments would have severe impacts on local fish and wildlife populations.

It does not appear at this time that the subject project will affect Indian trust lands.

The National Park Service person designated to be contacted for further coordination in St. Croix River Basin flood control matters is Mr. Dave Shonk who can be contacted by telephone at (402) 221-3481 (FTS: 864-3481).

Specific Comments

Page 3, item 10. The report indicates that the St. Croix River from its confluence with the Mississippi River to St. Croix Falls is "scenic". Rather, the St. Croix River, from the Mississippi River to the Washington-Chisago County line (Minnesota), is "recreational" and from that point to St. Croix Falls, the river is "scenic". Rather than "wild" from St. Croix Falls to Gordon, the river is "recreational" from St. Croix Falls to 10 miles upstream from there and "scenic" to Gordon. The Namekagon River, rather than "wild" between Trego and its confluence with the St. Croix River, is "recreational" from Trego to the railroad bridge just upstream from U.S. Highway 35 and "scenic" from that bridge to Lake Namekagon.

Page 4, paragraph 15. If it is decided to provide additional storage for water from the Mississippi River to supply Minneapolis-St. Paul, a diversion route through Chisago, Big Marine, Big Carnellian, and Elmo Lakes would afford several thousand acre-feet of such storage.

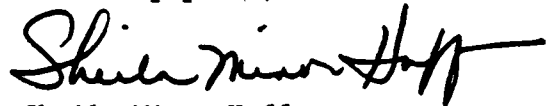
Page 6, item 21. The reference to "fast white water" in the second sentence should be eliminated.

Conclusions

Since this report is outdated and revisions will be made such as stated: "Reservoirs are no longer an acceptable method of solving water resource problems", this office reserves final comments until after the proposed adjustments are made to the Phase I Report or as other phases of the study are completed.

We will look forward to solutions which are compatible with the national status the river has acquired since the earlier study was authorized.

Sincerely yours,



Sheila Minor Huff
Regional Environmental Officer

CITY OF NEW RICHMOND
156 EAST FIRST STREET
ST CROIX COUNTY
NEW RICHMOND WISCONSIN
54017

OFFICE OF CITY CLERK-TREASURER

August 16, 1982

District Engineer
St. Paul District Corp.
1135 USPO Andcustom House
St. Paul, MN 55101

Dear Sir;

Please use this letter as authorization to proceed with the St. Croix River Basin Study and include the City of New Richmond, WI. The Common Council of the City of New Richmond approved this study at a regular council meeting on August 9, 1982.

As explained by Mr. Martin McCleary of the Corp. of Engineers, this does not obligate the City of New Richmond at this time.

Yours truly,



Eloise M. Anton,
City Clerk-Treasurer

County of Chisago

BOARD OF COUNTY COMMISSIONERS

Chisago County Courthouse
CENTER CITY, MINN. 55012

October 15, 1982

District Engineer
St. Paul District Corp of Army Engineers
Room 1232 U.S. Post Office
180 East Kellogg
St. Paul, MN 55101

COMMISSIONERS

District 1
DONALD REED
District 2
SARAH MOLD
District 3
DAVID A. JOHNSON
District 4
ROSEMARY MASLOSI
District 5
LOREN JENNINGS

TO WHOM IT MAY CONCERN:

In response to the January 15, 1982 notice regarding the St. Croix River Basin feasibility study, the County of Chisago is interested in having the Corp of Engineers study the Chisago Chain of Lakes flooding problem as part of the St. Croix Basin feasibility study.

For the past six years rising lake levels have contributed to the flooding of urban and rural areas in Chisago County. We would like the Corp to investigate the feasibility of stabilizing these lake levels so that some planned level of future development can be implemented.

It is the understanding of the Chisago County Board of Commissioners that participation in the early stages of this study does not necessarily imply participation in the remedy stage.

Sincerely,



Loren Jennings, Chairman
Chisago County Board of Commissioners



State of Wisconsin / DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besedny
Secretary

Northwest District Headquarters
Box 309
Spooner, WI 54801

November 4, 1982

3500

Department of the Army
St. Paul District, Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, MN 55101

Attn: District Engineer
Corps Files - NGSED-PB

Dear Colonel Rapp:

Mr. Martin McCleary of your staff has been in phone contact with this office to discuss the proposed basin feasibility study for the St. Croix River basin.

Some of the concerns we have in this District are with the reoccurring high water problems that involve Upper and Lower Clam Lakes on the Clam River, the Trade Lake area on the Trade River in Burnett County and Gilmore and Rice Lakes on the Totagatic River in Washburn County. These lakes with the exception of Rice Lake are highly developed with summer cottages, permanent residences and all have resort businesses and public access. All are important recreational and economic resources which suffer frequent flood damage or at least flood problems.

Attached are lake maps for the waters identified above and county maps to locate them within the St. Croix watershed.

Your consideration to include these important waterways in the St. Croix basin study would be appreciated. We will look forward to hearing more from you on the study program. If more info is needed from this office please advise. I am sure the township and counties governments where the above waters are located will also support the proposed study and any relief to high water problems that may result.

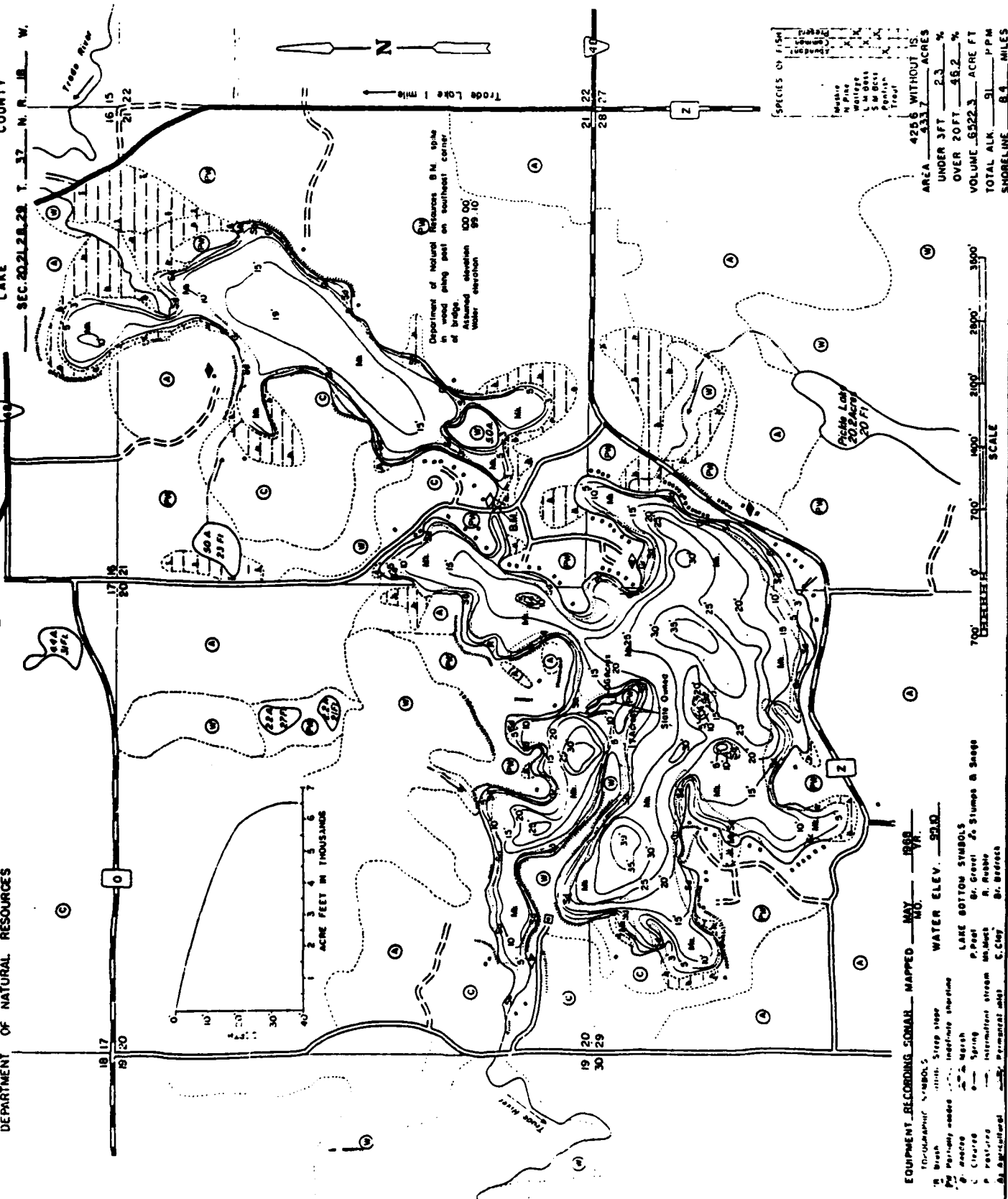
Sincerely,


John M. Donatelli
Water Management Coordinator

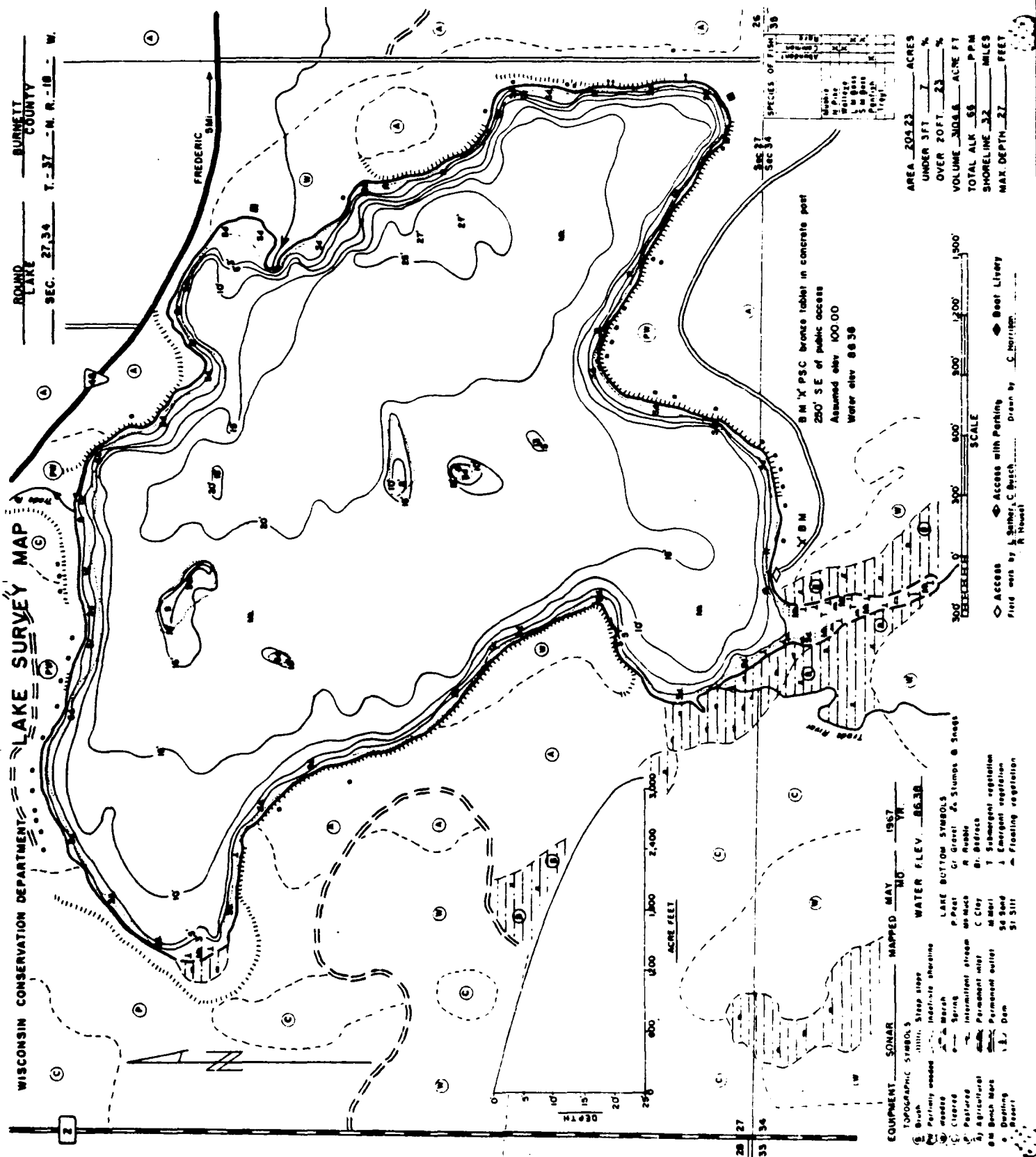
JMD:ja
Attachment
cc: J. Schweiger
Bureau of Water Reg & Zoning
M. McCleary

~~TRADE LAKE~~ ~~BURNETT COUNTY~~

-N. N. -18-

EQUIPMENT RECORDING SONAR MAPPED MAY 1968
MO. YR.[illegible]

AREA 433.7 ACRES
UNDER 3 FT 2.3 %
OVER 20 FT 46.2 %
VOLUME 6522.3 ACRE FT
TOTAL ALK. 91 PPM
SHORELINE 8.4 MILES



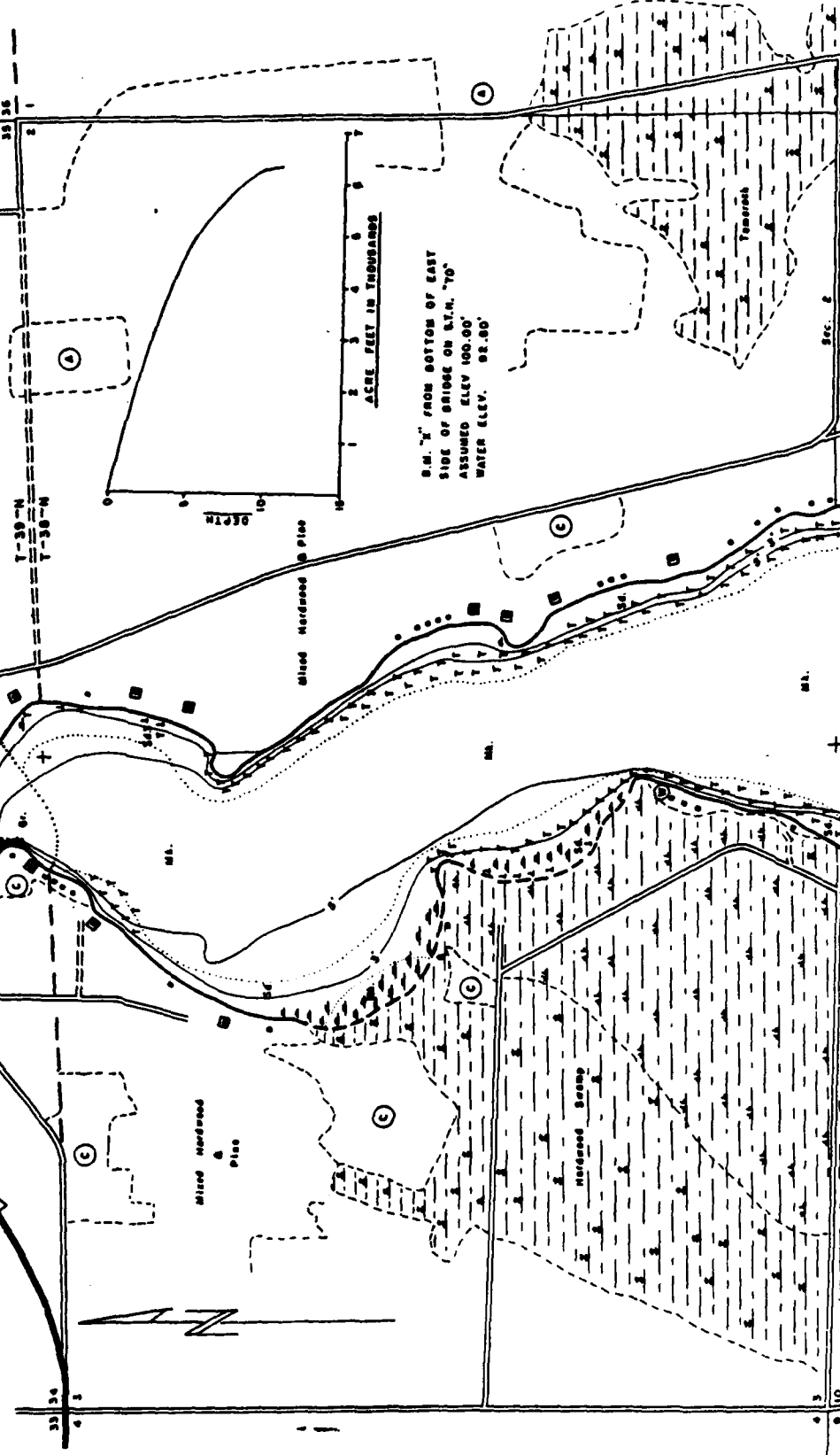
WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

CLAY LAKE
BURNETT COUNTY
SEC. 23, 10, 11, 12, 13, 14, 15
T. 36 N. R. 18 E. M.
Sheet 1 of 2

SHEET 4 MILES

70



SPECIES OF FISH

Species	Number
Walleye	1
Rock Bass	1
White Perch	1
Yellow Perch	1
Smallmouth Bass	1
Brook Trout	1
Atlantic Salmon	1
Arctic Char	1
Grayling	1
Trout	1
Salmon	1
Steelhead	1
Brook Trout	1
Atlantic Salmon	1
Arctic Char	1
Grayling	1
Trout	1
Salmon	1
Steelhead	1

AREA 1,352.3 WITH ISLANDS
UNDER 3 FT. 2.8 ACRES
OVER 3 FT. 0 ACRES
VOLUME 8,282 ACRES
TOTAL ALK. 102 PPM
SHORELINE 12.3 MILES

EQUIPMENT RECORDING SONAR MAPPED AUGUST 1984
NO. 100

TOPOGRAPHIC SYMBOLS
Brash
Partially wooded
Wooded
Cleared
Pastured
Agricultural
Bm Bare Mtn
Steep slope
Indefinite shoreline
Marsh
Spring
Intermittent stream
Permanent stream
Permanent outlet
Submerged vegetation

LAKE BOTTOM SYMBOLS
P. Peat
Gr. Gravel
M. Muck
R. Rubble
C. Clay
Br. Bedrock
M. M. Submerged vegetation

WATER ELEV. 92.8'

LAKE SURVEY MAP

CLAM
LAKE

BURNETT
COUNTY

SEC. 23, 10, 11, T. 38 N. R. 16 E. W.
14, 15

Sheet 2 of 2



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1955
NO.

WATER ELEV. 32.8'

AREA 1,253.3 WITH ISLANDS
UNDER 3 FT. 2.8 ACRES
OVER 3 FT. 0 ACRES

800' 0' 800' 1,200' 1,800' 2,400' 3,000'
SCALE

Access with Permits Access Boat Livery
Field work by R. M. P. and L. S. S. Dr. E. L. S.

SPECIES OF FISH		1954	1955
Brook Trout	100	100	100
Whitefish	100	100	100
Walleye	100	100	100
Yellow Perch	100	100	100
Rock Bass	100	100	100
Smallmouth Bass	100	100	100
Crayfish	100	100	100
Bluegill	100	100	100
Golden Shiner	100	100	100
Common Carp	100	100	100
Channel Catfish	100	100	100
Striped Bass	100	100	100
Atlantic Salmon	100	100	100
Steelhead	100	100	100
Arctic Char	100	100	100
Brook Silverside	100	100	100
White Sucker	100	100	100
Blackchin Shiner	100	100	100
Longnose Darter	100	100	100
Spottail Shiner	100	100	100
Golden Age Goby	100	100	100
Common Loach	100	100	100
Blackchin Shiner	100	100	100
Longnose Darter	100	100	100
Spottail Shiner	100	100	100
Golden Age Goby	100	100	100
Common Loach	100	100	100

TOPOGRAPHIC SYMBOLS
 ① Brush
 ② Partly wooded
 ③ Wooded
 ④ Closed
 ⑤ Pastured
 ⑥ Agricultural
 ⑦ Bare Marsh
 ⑧ Drying
 ⑨ Road
 ⑩ Steep slope
 ⑪ Interim. shoreline
 ⑫ Marsh
 ⑬ Spring
 ⑭ Intermittent stream
 ⑮ Permanent inlet
 ⑯ Permanent outlet
 ⑰ Dam
 ⑱ Ridge
 ⑲ Trench

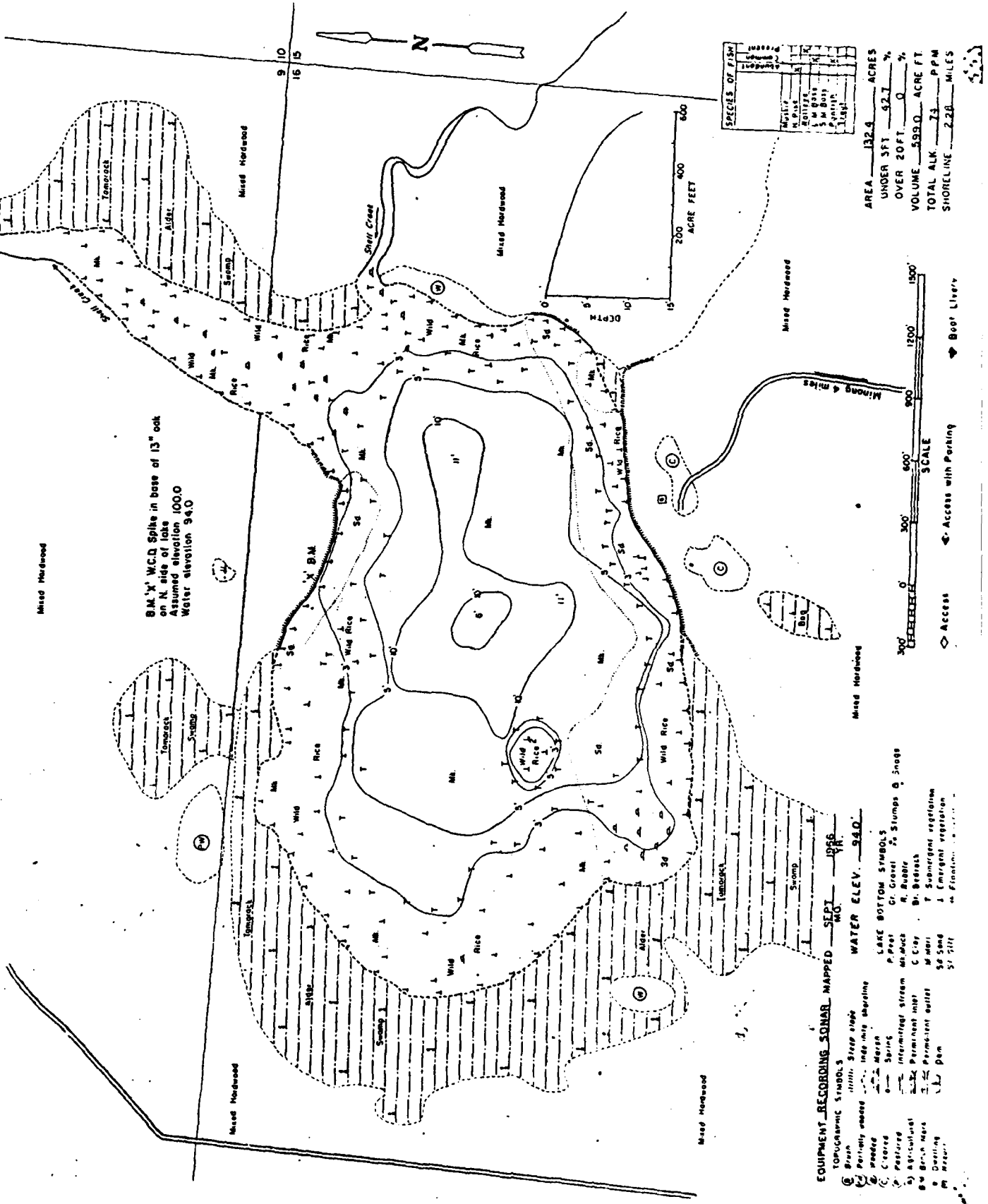
LAKE BOTTOM SYMBOLS
 P. Peat
 M. Muck
 C. Clay
 M. M. M. M. M.
 S. Sand
 S. Silt
 G. Gravel
 R. Rubble
 B. Bedrock
 T. Submergent vegetation
 E. Emergent vegetation
 F. Floating vegetation

LOWER CLAM LAKE
BURNETT COUNTY
T. 39 N. R. 16 E.W.
SEC. 26, 34, 35



LAKE SURVEY MAP

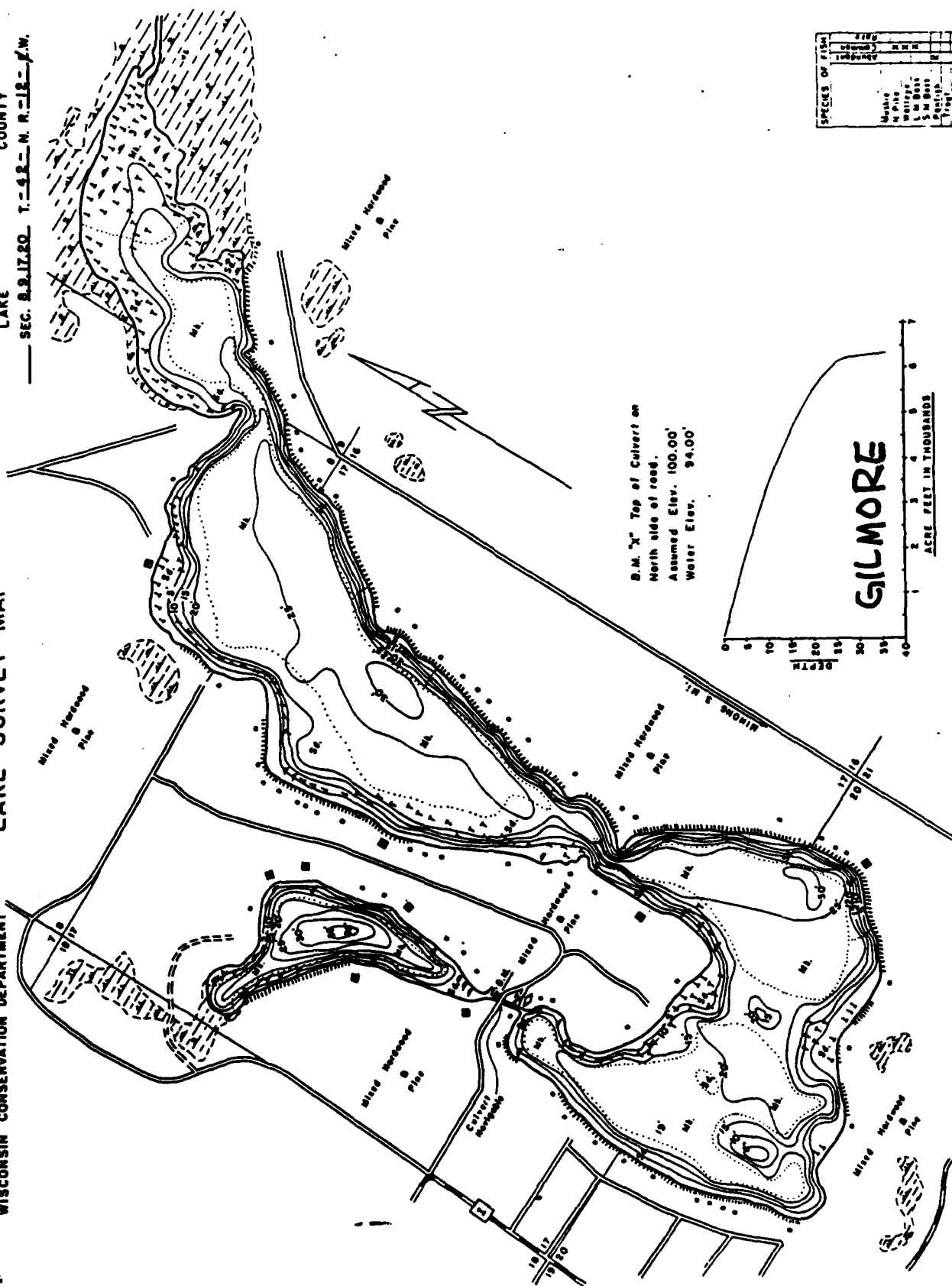
RICE LAKE
WASHBURN COUNTY
SEC. 9, 16 T. 42 N. R. 12 W.



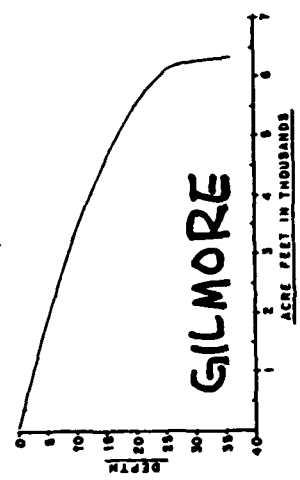
LAKE SURVEY MAP

WISCONSIN CONSERVATION DEPARTMENT

GILMORE LAKE
— SEC. 8, 9, 17, 20 T. 42 N. R. 12 W.



B.M. "X" Top of Culvert on North side of road. Assumed Elev. 100.00' Water Elev. 94.00'

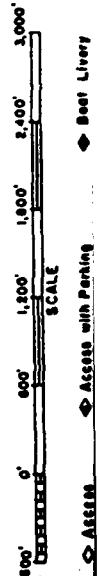


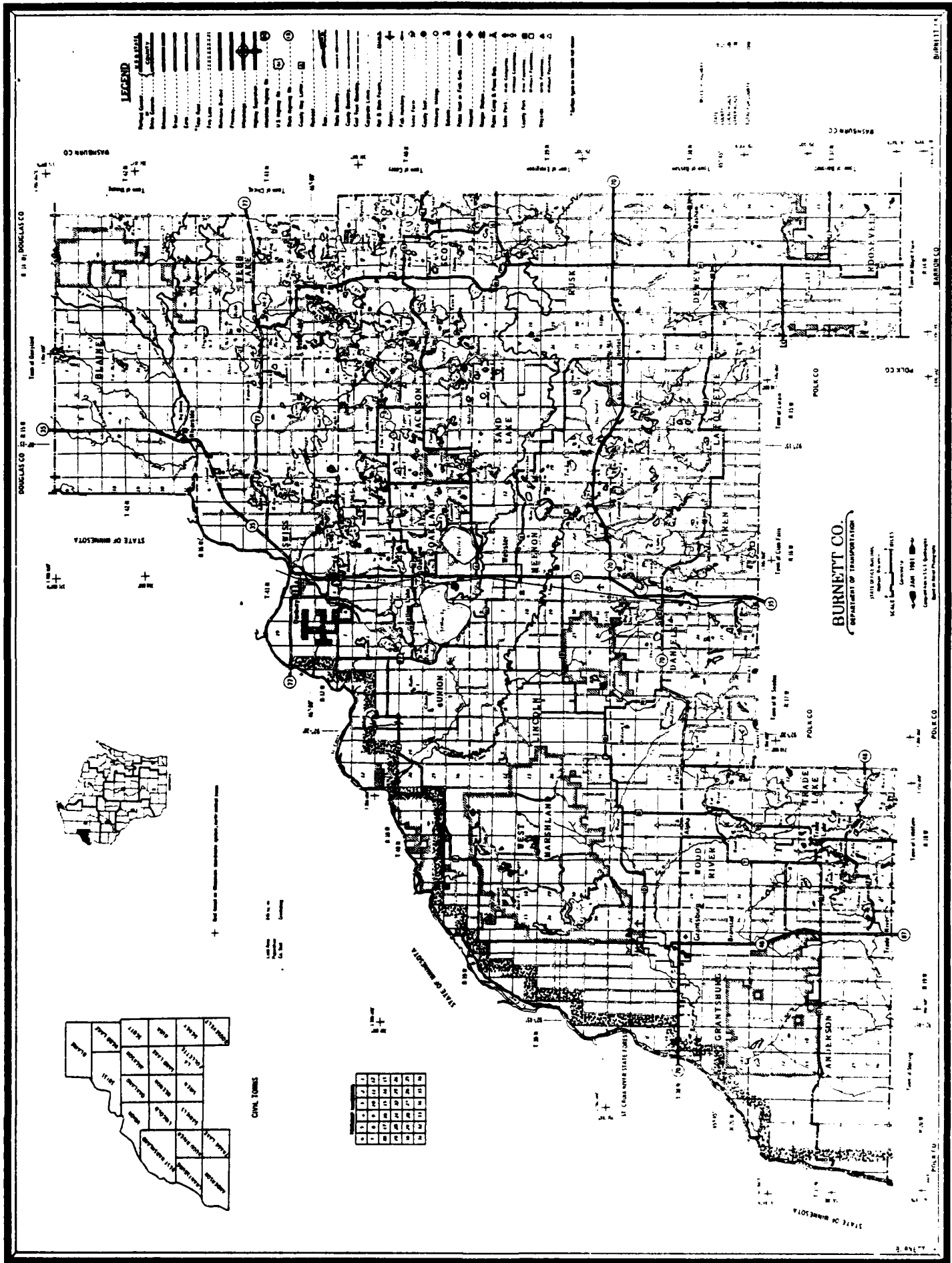
EQUIPMENT RECORDING SONAR MAPPED JULY 1984

- TOPOGRAPHIC SYMBOLS
- Grass
 - Shrub
 - Partial wetland
 - Wetland
 - Cleared
 - Pasture
 - Aspen forest
 - Big Bushy Area
- Water Elev. 94.00'
- LAKE BOTTOM SYMBOLS
- Gr. Grass
 - P. Post
 - W. Marsh
 - Spring
 - Intermittent stream
 - Perennial wet
 - Perennial wet
 - Submerged vegetation

SPECIES OF FISH	Volume	Weight	Length	Age
Walleye				
Whitefish				
Yellow Perch				
Rock Bass				
Smallmouth Bass				
Brook Trout				

AREA	383.4	ACRES
UNDER 5 FT.	18	%
OVER 20 FT.	2	%
VOLUME	3,307.2	ACRE FT
TOTAL ALK.	3.8	PPM
SHORELINE	7.8	MILES





DOUGLAS CO

DOUGLAS CO

CIVIL TOWNS

MINONG	FROG CREEK
CHICOG	BROOKLYN
GULL LAKE	STINETT
EVERGREEN	TREGO
SPONGER	CRYSTAL
BASHAW	BEAVER BROOK
BARRONETT	SARONA
LOW LAKE	BIRCHWOOD

LEGEND

U.S. STATE	COUNTY
Portage Canal	—
Blue Canals	—
Boundaries	—
Gravel	—
Earth	—
Timber	—
Fire Lake	—
Maritime District	—
Freeway	—
Interchange	—
Highway Separation	—
Interstate Highway No.	—
U.S. Highway No.	—
State Highway No.	—
County Highway No.	—
Railroad	—
Dike	—
State Boundary	—
County Boundary	—
City Town Boundary	—
Corporate Limits	—
Not a State Property	—
Airport	—
Fish Hatchery	—
State Park	—
County Seat	—
Ministry Building	—
School	—
Public Hall or Public Bldg.	—
Public Station	—
Public Camp & Public Bldg.	—
State Park - with Camp	—
County Park - with Camp	—
County Park - with Camp	—
Trayville	—

*Symbol types in this code are shown

M.S. EXP. 174

T-37-4

SARVET CO

WASHBURN CO.
DEPARTMENT OF TRANSPORTATION

STATE OFFICE BUILDING

SCALE 1:100,000

Copyright 1961

Copyright Map of U.S. Department of Transportation

Based on Aerial Photographs

WASHBURN 65-4

BARRON CO

BARRON CO

STATE
COUNTY
LOCAL POINTS
OTHER ROADS
TOTAL FOR COUNTY

177
99
1
177

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

+ Grid based on Washington meridian system, north central zone



MINNESOTA-WISCONSIN BOUNDARY AREA COMMISSION

619 SECOND STREET, HUDSON, WISCONSIN 54016-1576

*Serving Our Sponsor States on the St. Croix
and Mississippi Rivers since 1965*



Minnesota Telephone
(612) 436-7131

Wisconsin Telephone
(715) 386-9444

November 16, 1982

Col. Edward Rapp
District Engineer
St. Paul District
Corps of Engineers
1135 U.S. Post Office & Customs House
St. Paul, Minnesota 55101

ATTN: Martin McCleery

Re: Reconnaissance Report, St. Croix River Study

Dear Col. Rapp:

The purpose of this letter is to recommend a major change in the above-referenced Reconnaissance Report, based on a position adopted unanimously by the Minnesota-Wisconsin Boundary Area Commission on November 12, 1982. It is the Commission's hope that this letter will accompany the draft Reconnaissance Report when it is submitted to the North Central Division office in Chicago.

The Reconnaissance Report reviews several flood control alternatives for communities on Lake St. Croix and recommends further study of each alternative. The Boundary Area Commission feels strongly that one of those alternatives is so clearly infeasible that it should be dropped from further study immediately.

The draft Reconnaissance Report recommends further study of construction of six to nine upstream tributary reservoirs for flood control purposes. The Boundary Area Commission recommends the Reconnaissance Report be rewritten to show that while the tributary reservoir concept was evaluated, it was found to be infeasible and not deserving of further study.

The Commission's reasons for concluding the tributary reservoirs are infeasible fall into two areas. The first area deals with the high costs of the reservoirs and the very limited benefits that would result. The second area concerns the current protected status of the Kettle River. All the reasons combined lead to the unmistakable conclusion that the reservoirs will never be built, and the Commission feels the Corps can better spend its research funds and a lot of citizen anxiety can be saved if the tributary reservoir portion of the study is stopped at this stage of the study.

The draft Reconnaissance Report recommends detailed study of both structural and non-structural flood control methods for the cities of Stillwater, Bayport, Lake St. Croix Beach, Afton and Prescott. All five of those communities are located on the lower 25 miles of the St. Croix River in an area known as Lake St. Croix. Communities on Lake St. Croix face two kinds of flood threats: backwater flooding from the Mississippi River (at Prescott) as well as flood flows on the St. Croix itself. Tributary reservoirs could affect flood flows on the St. Croix, but would not affect backwater flooding from the Mississippi (the highest recorded flood on Lake St. Croix was the result of Mississippi backwater flooding). If levees are found to be cost-effective for Lake St. Croix communities, those levees will need to be built regardless of whether or not tributary reservoirs are constructed. If reservoirs are built, the local levees might not need to be quite as high as they would be without reservoirs, but the cost difference between low and high levees is very small compared to the cost of a low levee plus the tributary reservoirs. It is the Commission's

November 16, 1982

understanding that the local governments would have to pay a portion of the cost of any levees constructed in their community, and would also have to pay a portion of the cost of any reservoirs shown to benefit the community. Given the choice of paying part of the cost of a levee or part of the cost of a levee plus the reservoirs, the Commission has no doubt that affected governments would choose the less expensive option---which is clearly the taller levee.

In terms of the non-structural alternatives, the Commission wishes to strongly encourage the Corps to pursue such an analysis very thoroughly. We are familiar with the projects underway in the Prairie du Chien and Kickapoo Valley areas and would want to be sure that such approaches to potential flood damage reduction are seriously evaluated on Lake St. Croix.

The costs of the tributary reservoirs are not exclusively economic. Thousands of landowners would lose their property to inundation behind the reservoirs. While reservoirs are of great recreational benefit in arid areas, such is not the case in Northeastern Minnesota and Northwestern Wisconsin, where hundreds of lakes dot the area and provide vast opportunities for lake-type recreation. The federally-protected St. Croix and Namekagon rivers provide many river recreation-type experiences in the area, but they lack the challenging rapids of the Kettle River, and heavy use of the St. Croix and Namekagon has driven many true solitude-seekers to canoe the Yellow, Clam, Snake and Sunrise rivers. The Snake and Sunrise are currently under study for possible inclusion in the Minnesota State Wild and Scenic Rivers System. Creation of the tributary reservoirs would destroy a recreational amenity that is currently in demand in the area, while creating another amenity that is currently abundant. The potential environmental impact of the reservoirs has scarcely been discussed, but must be considered to be significant. Many of the areas that would be inundated by the reservoirs are currently forested and inhabited by abundant wildlife, including the endangered bald eagle.

The six upstream tributary reservoirs were studied as part of the 1968 Phase I Report. That report shows that more than half (248,500 acre/feet of a total 452,500 acre/feet) of all the water to be impounded would be held behind a dam on the Kettle River. Clearly, the Kettle River reservoir is essential if the tributary reservoirs are to have any impact on downstream flooding; without the Kettle, the other five wouldn't impound sufficient water to make the project worthwhile. And just as clearly, the Kettle River will not be impounded. The Kettle is currently a central component of the Minnesota State Wild and Scenic Rivers System, and has qualified for inclusion in the National Wild and Scenic Rivers System as a state-administered river. All that remains for federal designation of the Kettle is an application from the governor of Minnesota to the Secretary of the Interior. The state has not made that application, but might be quickly motivated to do so if it were thought necessary to block a dam proposal. A reservoir would be a significant threat to Minnesota's current program on the Kettle: the reservoir would cover all of the lower 22.5 miles of river, all of which is classified by federal standards as "wild." (By comparison, no segment of the federally-designated St. Croix and Namekagon rivers carries the "wild" classification.)

In summary, the Kettle River would play a pivotal role in flood control utilizing tributary reservoirs, but is currently protected from impoundment by state law and

November 16, 1982

has a high potential of quickly obtaining federal protection as well. Tributary reservoirs would be a very costly method of reducing flood levels in communities where additional flood protection would be necessary anyway. Continuing a study of tributary reservoirs would serve only to unnecessarily agitate thousands of citizens in a lengthy study of what is obviously an infeasible alternative. The Minnesota-Wisconsin Boundary Area Commission urges the Corps of Engineers to reject further study of that alternative.

Very truly yours,

MINNESOTA-WISCONSIN BOUNDARY AREA COMMISSION



William Howe, Chairman

cc: Honorable Arlen Erdahl
Honorable Steve Gunderson
Honorable James Oberstar
Honorable David Obey
Joel Schilling, Minnesota DNR
Pat Olson, Minnesota DNR
Paul Swenson, Minnesota DNR
Gary Lepac, Wisconsin DNR
Steve Ugoretz, Wisconsin DNR
David Jacobson, Wisconsin DNR
Jake VanderVoort, Wisconsin DNR
David Shonk, National Park Service

rmh



United States Department of the Interior

FISH AND WILDLIFE SERVICE
St. Paul Field Office, Ecological Services
570 N. Park Building
333 Sibley Street
St. Paul, Minnesota 55101

IN REPLY REFER TO

May 11, 1983

Colonel Edward G. Rapp
District Engineer, St. Paul District
U.S. Army Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Rapp:

This Planning Assistance Letter regarding the initiation of a feasibility study for flood protection on the lower St. Croix River, is submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). This letter addresses one segment of that project dealing specifically with flood protection for the City of New Richmond in St. Croix County, Wisconsin.

On April 12, 1983, a field review of the project area was conducted by COE and FWS personnel. Two alternatives presently being considered were reviewed and discussed at that time. A cursory description of both alternatives is presented below.

ALTERNATIVE # 1

One option discussed involved construction of a dry dam on the Willow River and channelization of a natural water diversion area running from the Willow River south to a small tributary known as Paperjack Creek. By diverting a majority of the floodwater into Paperjack Creek it is believed that inner core areas of New Richmond will be safe from periodic flooding. Environmentally, this alternative has an array of associated impacts ranging from inundation of uplands behind the dry dam to wetland modification/destruction. Periodic high water in these lowland areas has resulted in a vegetation community favoring hydrophytic species, collectively known as floodplain forest. However, prolonged inundation of these and adjacent uplands may be detrimental to vegetation communities and associated faunal species. Potential sedimentation behind the dry dam is also viewed as a major environmental problem associated with this alternative.

An undetermined amount of wetland acreage will be affected by construction of the proposed diversion channel. Principal wetlands affected by channelization would include palustrine emergent wetlands (formerly Type 2, 3, 4, and 6) dominated by sedge, cattail, and various broad-leaved plants. These wetlands occur throughout the proposed diversion route and along Paperjack Creek. Depending on the extent of channelization, the biological productivity of each wetland area will be reduced or totally destroyed.

ALTERNATIVE # 2

The second proposal discussed calls for construction of a levee system at various locations within the city limits of New Richmond which are subject to periodic flooding. Each site was field reviewed and appear to be in areas that are less environmentally sensitive than those of Alternative # 1. However, specific design, location, and construction techniques must be available for review before an accurate environmental picture may be presented. From a biological standpoint, Alternative # 2 is favored as compared to Alternative # 1.

Due to the preliminary nature of this project and subsequent lack of detailed information regarding both alternatives, the comments provided are general in nature. Once detailed plans for each alternative are formalized and made available for our review, specific impacts to fish and wildlife resources will be identifiable. Until that time, please keep this office abreast of new developments regarding this project and the need for future FWS involvement.

Sincerely,



Nancy B. Walters
Acting Field Office Supervisor

cc: MN DNR, St. Paul

END