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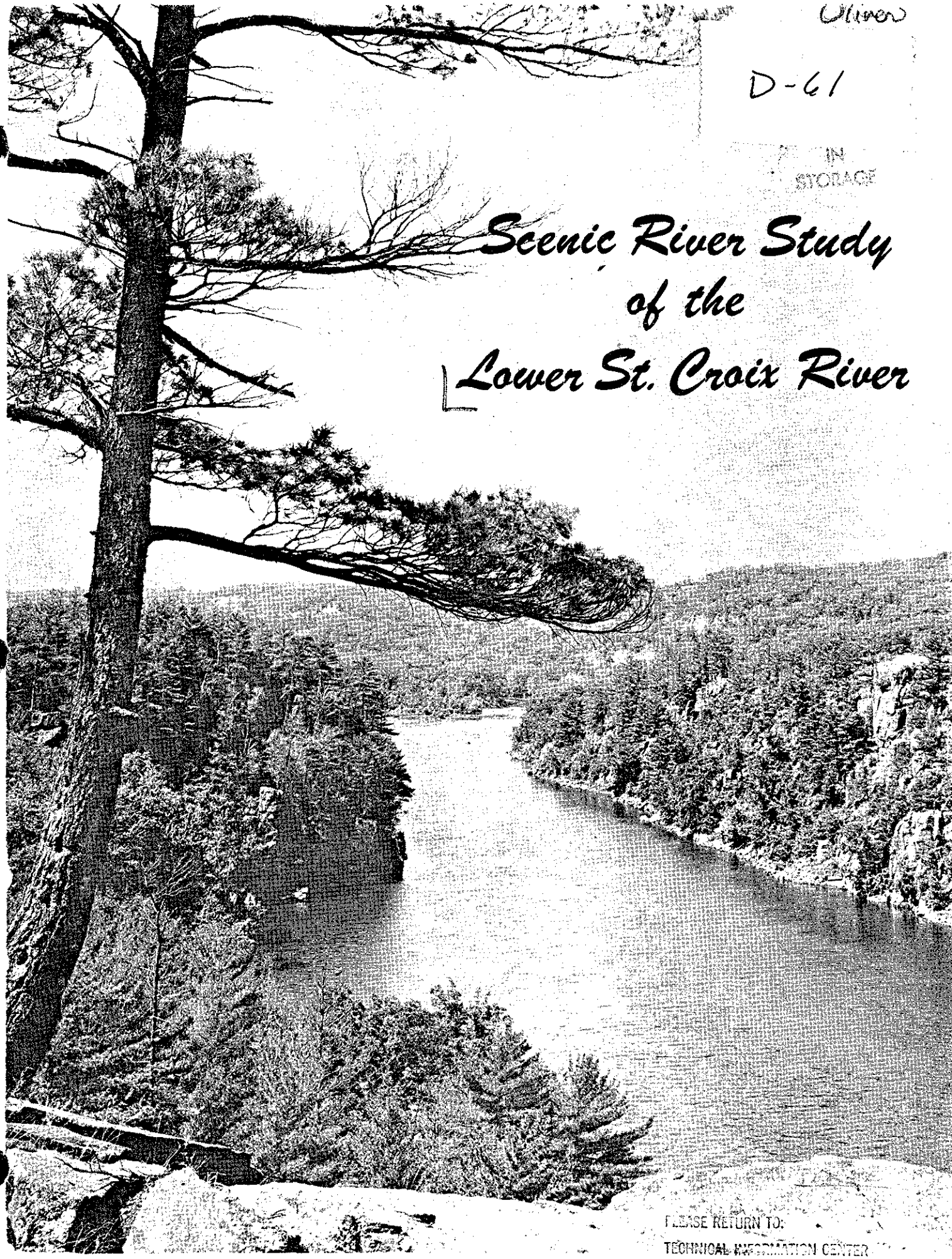
Scenic River Study of the Lower St. Croix River



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Rogers C. B. Morton, Secretary

Bureau of Outdoor Recreation

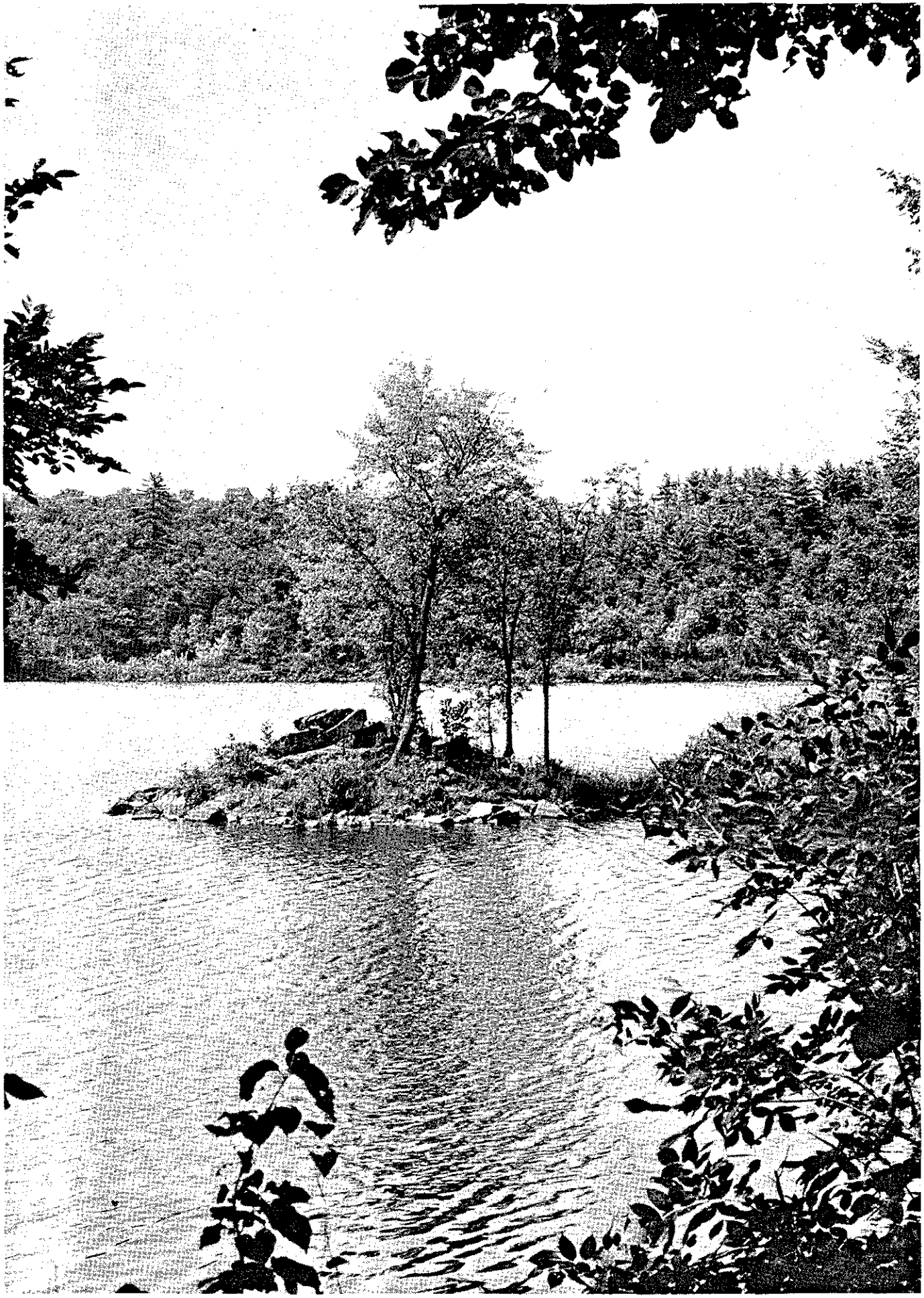
James G. Watt, Director

SCENIC RIVER STUDY
OF THE
LOWER ST. CROIX RIVER

FEBRUARY 1973

THIS REPORT WAS PREPARED PURSUANT TO THE WILD AND SCENIC RIVERS ACT, PUBLIC LAW 90-542, AS AMENDED BY THE ACT OF OCTOBER 25, 1972, PUBLIC LAW 92-560, WHICH DESIGNATED THE LOWER ST. CROIX RIVER A COMPONENT OF THE NATIONAL WILD AND SCENIC RIVERS SYSTEM.

THIS REPORT SETS FORTH CONCEPTUAL GUIDELINES FOR THE CLASSIFICATION, DEVELOPMENT, AND MANAGEMENT OF THE RIVER AREA AS A COMPONENT OF THE NATIONAL SYSTEM AND IS INTENDED FOR USE BY CONCERNED FEDERAL AND STATE AGENCIES INVOLVED IN MASTER PLANNING AND EVENTUAL ADMINISTRATION OF THE AREA.



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I. INTRODUCTION

I. INTRODUCTION

On October 2, 1968, the Congress of the United States enacted the Wild and Scenic Rivers Act, Public Law 90-542. In this Act the Congress stated:

> "It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes."

The St. Croix River, Minnesota and Wisconsin, between the dam near Taylors Falls and the St. Croix's confluence with the Mississippi River, is one of the 27 rivers listed in Section 5(a) of the Act for potential addition to the national wild and scenic rivers system. The Act calls for a determination of the suitability of the river for inclusion in the system and, if it is to be included, recommendations pertaining to the administration and management of the river environment.

Background

Early in 1961, the Senate Select Committee on National Water Resources recommended that certain streams be preserved in their free-flowing condition because their natural, scenic, scientific, aesthetic, and recreational values outweighed their value for water development and control purposes. In January 1962, the Outdoor Recreation Resources Review Commission (ORRRC) recommended that certain rivers be preserved in their free-flowing condition and natural setting. In response to the ORRRC recommendation, a joint Agriculture-Interior departmental team was formed in May of 1962 to study the need for a wild rivers system and to identify rivers having wild river values. In 1964, during the preliminary inventory and evaluation period for the proposed nationwide system of wild rivers, an in-depth study report on the St. Croix-Namekagon Rivers

was prepared by the Lake Central Regional Task Group. The preliminary emphasis of the study was on the possible protection of the St. Croix above Taylors Falls; however, some attention was given to the lower river as well. One of the more significant recommendations of that study was:

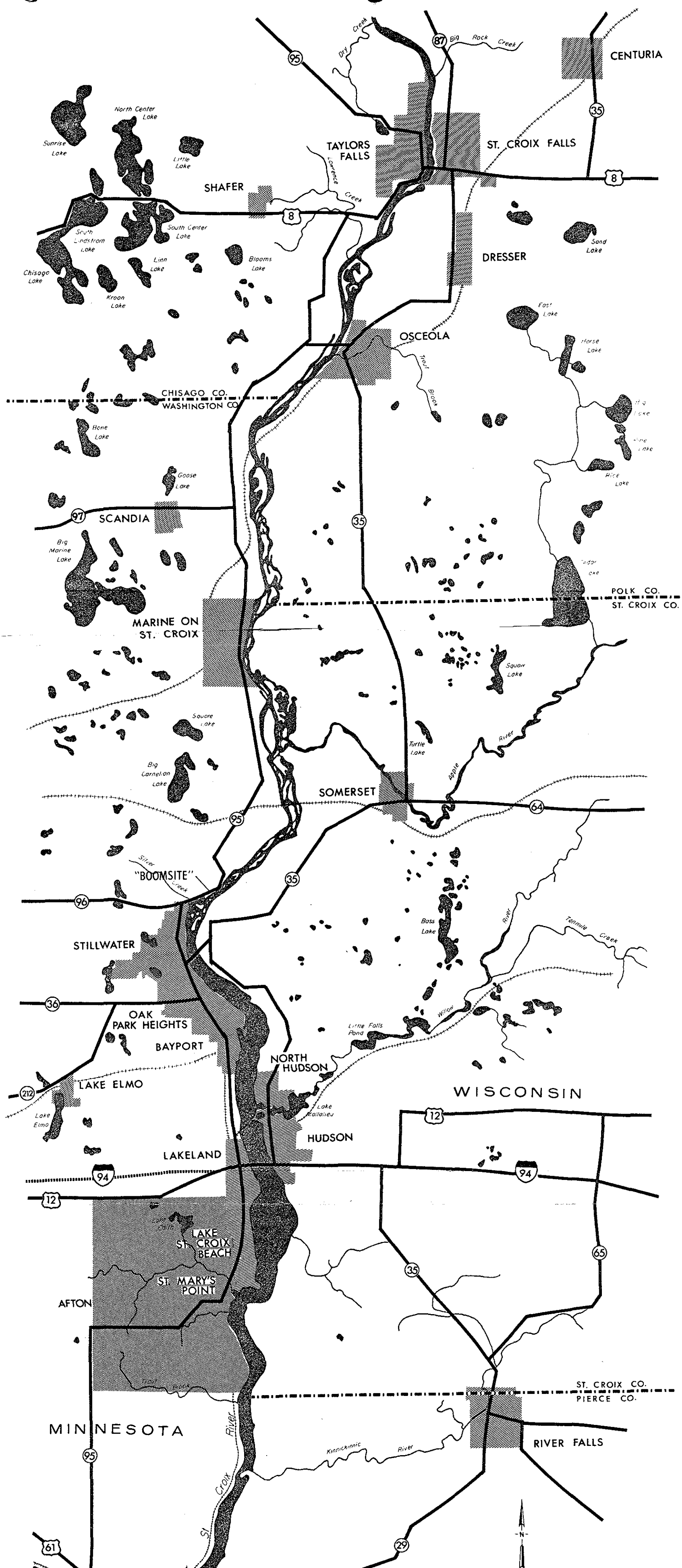
> "The St. Croix River below the study stretch (below Taylors Falls) is a recreation resource of outstanding quality, even though development precludes classifying it as a wild river. Appropriate measures should be taken to assure perpetuation of this portion of the stream as a recreation resource of high quality."

In January 1965, Senators Nelson of Wisconsin and Mondale of Minnesota introduced Senate bill 897, to provide for a St. Croix National Scenic Waterway. The bill proposed a wild river on the upper St. Croix and the promotion of broad recreational use and more intensive types of recreational developments on the lower St. Croix. This bill passed the Senate in September 1965; however, several companion House bills failed to be enacted.

In January of 1967, bills were once more introduced in both Houses of the 90th Congress. These bills proposed a St. Croix National Scenic Riverway very similar to that proposed in the 89th Congress. However, Congress enacted the Wild and Scenic Rivers Act, which became Public Law 90-542 on October 2, 1968. In this Act, the upper St. Croix was designated a component of the national wild and scenic rivers system, and the portion of the river from Taylors Falls to the mouth was included in the study category. As a result of enactment of Public Law 90-542, the St. Croix Riverway bills were not acted upon. The boundaries, classification, and development plan for the St. Croix National Scenic Riverway, as established by the Wild and Scenic Rivers Act, on the upper St. Croix River and its tributary, the Namekagon River, were published in the Federal Register on October 1, 1969, pursuant to Section 3(b) of the Act.

Several bills were introduced in the 92nd Congress to include the lower St. Croix River in Section 3(a) of the Wild and Scenic Rivers Act, to be administered by the Secretary of the Interior as a component of the national wild and scenic rivers system. Public hearings were held in early 1972 by the Senate Committee on Interior and Insular Affairs, in St. Croix Falls, Wisconsin, and Washington, D. C.

The States of Minnesota and Wisconsin have long recognized the recreation potential of the lower St. Croix. The State of Wisconsin has listed the study stretch as one of 48 water trails on 37 rivers. Minnesota has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SCANDIA
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BAYPORT
NORTH HUDSON
LAKE ELMO
WISCONSIN
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ST. MARY'S POINT
AFTON
MINNESOTA
ST. CROIX CO.
PIERCE CO.
RIVER FALLS
North Center Lake
Sunrise Lake
Little Lake
South Lindstrom Lake
South Center Lake
Linn Lake
Blooms Lake
Chisago Lake
Kroon Lake
Sand Lake
Fish Lake
Horse Lake
Big Lake
Pine Lake
Rice Lake
Bone Lake
Goose Lake
Big Marine Lake
Square Lake
Big Carnelian Lake
Turtle Lake
Squaw Lake
Bass Lake
Little Falls Pond
Lake Elmo
Lake Mallalieu
Dry Creek
Big Rock Creek
Lawrence Creek
Trout Brook
Silver Creek
Apple River
Tenmile Creek
Willow River
Kinnickinnic River
St. Croix River
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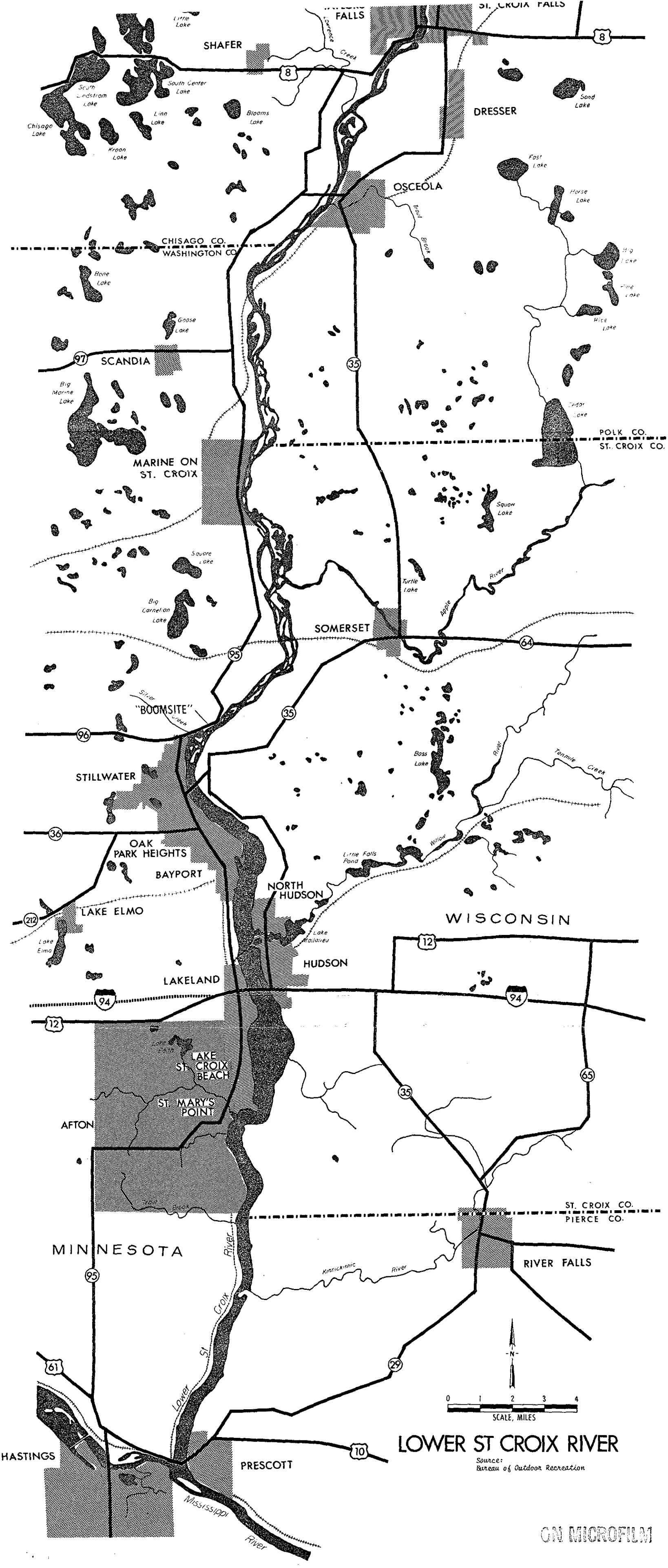

LOWER ST CROIX RIVER

Source:
Bureau of Outdoor Recreation

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classified the lower St. Croix above Stillwater as a state canoe river and that portion of the river below Stillwater as a boating river. The Minnesota and Wisconsin State outdoor recreation plans recognize the importance and necessity for preservation of "scenic rivers" such as the lower St. Croix to provide outstanding quality recreational experiences. The plans also state that the need for this action cannot always be based upon statistical analysis of need but must be policy decisions at the legislative and administrative level of government. The interstate Minnesota-Wisconsin Boundary Area Commission has also shown strong interest in the development of an overall recreation plan for the lower St. Croix and endorsed the scenic riverway concept.

Interest in preserving the lower St. Croix has also been evident at the local level. Many of the local units of government have indicated that a coordinated planning effort would be welcomed. Toward this end, an intergovernmental organization known as the St. Croix River Intergovernmental Planning Conference, with representation from all the counties, cities, villages, and townships bordering on the study reach, was formed in June of 1970 under the sponsorship and guidance of the Minnesota-Wisconsin Boundary Area Commission. The By-Laws of the Conference read:

> "The purpose of the organization is to explore problems and opportunities relating to the orderly development and preservation of the St. Croix River Valley as a scenic and recreational riverway, to consider appropriate measures for coordination and joint action by member jurisdictions on such matters, and to recommend necessary action to appropriate jurisdictions."

In response to Section 5(a) of the Wild and Scenic Rivers Act, a study team composed of representatives of the Bureau of Outdoor Recreation, U. S. Forest Service, National Park Service, Bureau of Sport Fisheries and Wildlife, U. S. Army Corps of Engineers, State of Wisconsin, State of Minnesota, and the Minnesota-Wisconsin Boundary Area Commission was organized to conduct the river evaluation.

II. SUMMARY OF FINDINGS AND RECOMMENDATIONS

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This study finds that the lower St. Croix River and its immediate environment possess outstandingly remarkable scenic and aesthetic, recreational, and geologic values, and that the river and its immediate environment should be protected for the benefit and enjoyment of present and future generations. The lower St. Croix River meets the criteria for inclusion in the national system of wild and scenic rivers which were established in Public Law 90-542, as well as the supplemental criteria established jointly by the Secretary of the Interior and the Secretary of Agriculture, as published in Guidelines for Evaluating Wild, Scenic, and Recreational River Areas Proposed for Inclusion in the National Wild and Scenic Rivers System Under Section 2, Public Law 90-542; February 1970. The study area exhibits the following characteristics.

A highly scenic course, complemented by an island and slough river environment in the upper reaches and a lake-like river environment in the lower reaches.

Water of high quality suitable for many outdoor recreation pursuits, including whole body contact activities.

A colorful history which follows the development of the upper Midwest from the days of the Indian through the logging era.

An outstanding area of geological interest, notably the Dalles of the St. Croix.

Close proximity to the Minneapolis-St. Paul urban area, with a population in 1970 of over 1,800,000 people.

This study has also found several factors which presently or potentially endanger the outstanding natural characteristics of the lower St. Croix River.

A shoreline which is rapidly being developed for both residential and commercial uses and which is under constant pressure from the expanding Twin Cities area for further development.

The possibility of water quality degradation as the population served by the lower St. Croix increases.

The likelihood that recreational use, if not carefully controlled, will destroy the very characteristics which presently make the lower St. Croix appealing.

Recommendations

In order to preserve and enhance the natural beauty of the lower St. Croix River and to develop a plan whereby this river is protected and developed as a component of the national wild and scenic rivers system, the study recommends the following actions:

1. The 52-mile long segment of the river from the dam near Taylors Falls to its confluence with the Mississippi River merits inclusion in the national wild and scenic rivers system.

2. The National Park Service should administer the 27 miles from the dam near Taylors Falls downstream to the log boom site near Stillwater, except for existing state properties.

3. The States of Minnesota and Wisconsin should administer the 25 miles from the log boom site south to the confluence with the Mississippi.

4. The National Park Service and the appropriate agencies of the two states should prepare a comprehensive master plan setting forth specific boundaries and plans for acquisition and development and for the timely implementation of the joint management of the lower St. Croix as a separate component of the national system. Such a plan should require the approval of the Governors of the two states and the Secretary of the Interior.

Additional Recommendations

1. The development and management of the lower St. Croix should place primary emphasis on maintaining and enhancing the aesthetic, scenic, historic, fish and wildlife, and geological features. All recreation facility development should be consistent with protection of the river environment.

2. A comprehensive land use plan should be developed jointly by the units of government bordering on the lower St. Croix River so that land use and developments back from the river will complement the recommended protective efforts along the river.

3. Incorporated municipalities along the lower St. Croix should adopt zoning standards which are consistent with the purposes of the Wild and Scenic Rivers Act. The objective of the standards should be to prohibit new commercial, industrial, or residential uses which are inconsistent with the purposes of the Act, and to protect the shorelands by means of acreage, frontage, and setback requirements. Recommended zoning standards are included in the zoning section of this report.

4. The proposed park area on the lower portion of the Kinnickinnic River should be purchased and managed by the State of Wisconsin in conformance with the concepts presented in this report.

5. Water zoning, including "no wake" and speed zones, should be investigated as a means to prevent degradation of the recreation experience and to enhance water safety.

6. The States of Minnesota and Wisconsin should adopt uniform boat toilet and boat safety regulations for the lower St. Croix.

7. High standards for air and water quality should be adopted and vigorously enforced. Water quality on the lower St. Croix and its tributaries should be carefully monitored through a comprehensive water quality monitoring program for the entire river system.

8. A spoil disposal plan should be developed so that dredge spoil material from the maintenance of the nine-foot channel would be used to supplement existing beach areas or to establish additional recreation sites.

9. The addition of new marina facilities and boat access areas on the lower St. Croix should be permitted only after review and approval by the agencies responsible for managing the riverway program. Any existing or planned boat launching areas upriver from Stillwater, Minnesota, should be converted or limited to walk-in types.

10. Proposals for new bridge crossings, renovation of existing structures, or power line and pipe line crossings should be reviewed and approved in advance by the administering agencies to insure that scenic and recreational values are protected.

11. This study supports the diversion of sewage from communities in Washington County out of the St. Croix watershed, if it is proved feasible in the current study being undertaken by the Metropolitan Council of the Twin Cities area and where feasible from the Wisconsin communities located on Lake St. Croix. Tertiary treatment should be required for all waste water discharges into the St. Croix watershed which are not intercepted by the subject diversion. Applicable state regulations concerning septic tanks should be vigorously enforced.

12. Railroad rights-of-way within the river corridor which may be abandoned in the future, should be considered for trail development.

13. The Northern States Power Dam at Taylors Falls, if it becomes surplus, should be considered for use in stabilizing water flow in the lower St. Croix.

14. All communities along the lower St. Croix which still retain some of the historic flavor of the area should be encouraged in their efforts to maintain their cultural and historical settings.

15. Chisago and Washington Counties should adopt shoreland zoning ordinances using a Natural Environment Stream classification for the lower St. Croix as soon as possible. Present shoreland ordinances in Polk, St. Croix, and Pierce Counties should be amended to provide standards similar to those suggested for Chisago and Washington Counties.

III REGIONAL SETTING

III REGIONAL SETTING

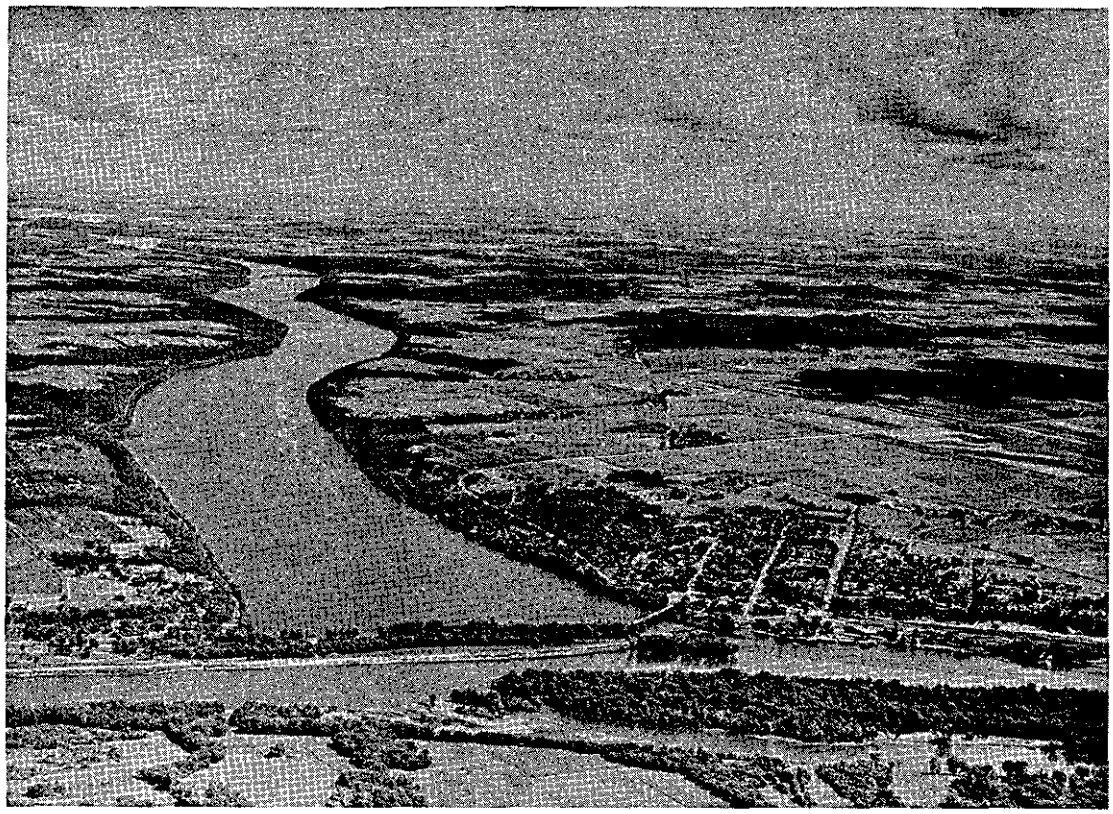
Physical Environment

The St. Croix River has its source near Solon Springs in northwestern Wisconsin, about 20 miles from Lake Superior. It flows southwesterly and then southerly a total distance of 164 miles to its junction with the Mississippi River at Prescott, Wisconsin, approximately 20 miles southeast of Minneapolis-St. Paul. It has a watershed of approximately 7,650 square miles. The upper 37-mile reach of the St. Croix River lies entirely in Wisconsin, while the remaining 127 miles forms part of the boundary between Minnesota and Wisconsin. The lower St. Croix River, as defined in Public Law 90-542, forms the boundary between Minnesota and Wisconsin, and borders five counties--Washington and Chisago in Minnesota, and Pierce, St. Croix, and Polk in Wisconsin. Major metropolitan areas within 150 miles of the study segment are Minneapolis-St. Paul and Duluth, Minnesota. The major tributaries of the lower St. Croix are the Apple, Willow, and Kinnickinnic Rivers, all in Wisconsin. A 60-foot hydroelectric dam at Taylors Falls, Minnesota, separates the upper St. Croix, a formally designated component of the national wild and scenic rivers system, from the study segment.

The area drained by the St. Croix River is characterized by typical glacial topography, including relatively flat swamp and lake areas in the headwaters region and rolling farmlands in the central and lower portions of the basin. Practically the entire basin is covered with glacial drift through which the streams have cut deeply to form narrow valleys. The St. Croix Basin is predominantly an agricultural area, the lower 100 miles being a rich farming district devoted largely to dairying. The upper portions of the basin have, in general, sandy soils covered with brush and small timber. These soils are less suitable for farming, and in this area agriculture is not as well developed.

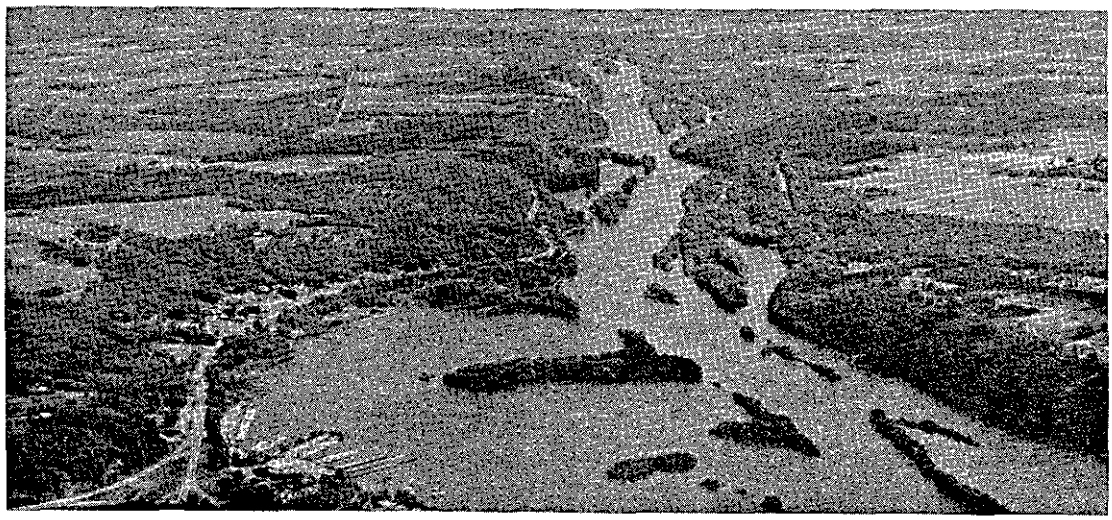
The St. Croix Valley was formed in two stages by water from two glacial lakes. The lower valley, below the communities of Taylors Falls and St. Croix Falls, was created first. This section was carved by runoff waters from glacial Lake Grantsburg which spread over the land from Grantsburg, Wisconsin, west to east-central Minnesota. As the ice melted, this lake rose until it finally spilled over its banks at a point near Taylors Falls and St. Croix Falls. There the water streamed southward, carving the lower St. Croix Valley to the Mississippi.

The character in the lower St. Croix differs from that of the upper river. At Taylors Falls, Minnesota, the start of the lower river segment, the St. Croix has cut a narrow gorge, known as the St. Croix Dalles, through massive black taprock. The nearly vertical cliffs, 75 to 100 feet in height, sheer rock surfaces, and unusual rock potholes are striking geologic features. In contrast, the river valley near Stillwater, Minnesota, is somewhat wider, and the river meanders through a relatively flat



2. Wooded bluffs border Lake St. Croix. Flatlands beyond the bluffs are used primarily for agriculture.

3. Above Stillwater the river is characterized by wooded bluffs, islands, and sloughs.



floodplain. Here the river is split into many channels and backwater areas. Below Stillwater the river widens into Lake St. Croix with a width exceeding one mile and a depth of up to 70 feet. Lake St. Croix is a large reservoir-like river lake. It is created by a natural bar at its junction with the Mississippi and further influenced by a Mississippi River navigational dam about 14.4 miles downstream. Steep wooded bluffs up to 200 feet high border Lake St. Croix, with the flatlands back from the bluffs being used primarily for agriculture.

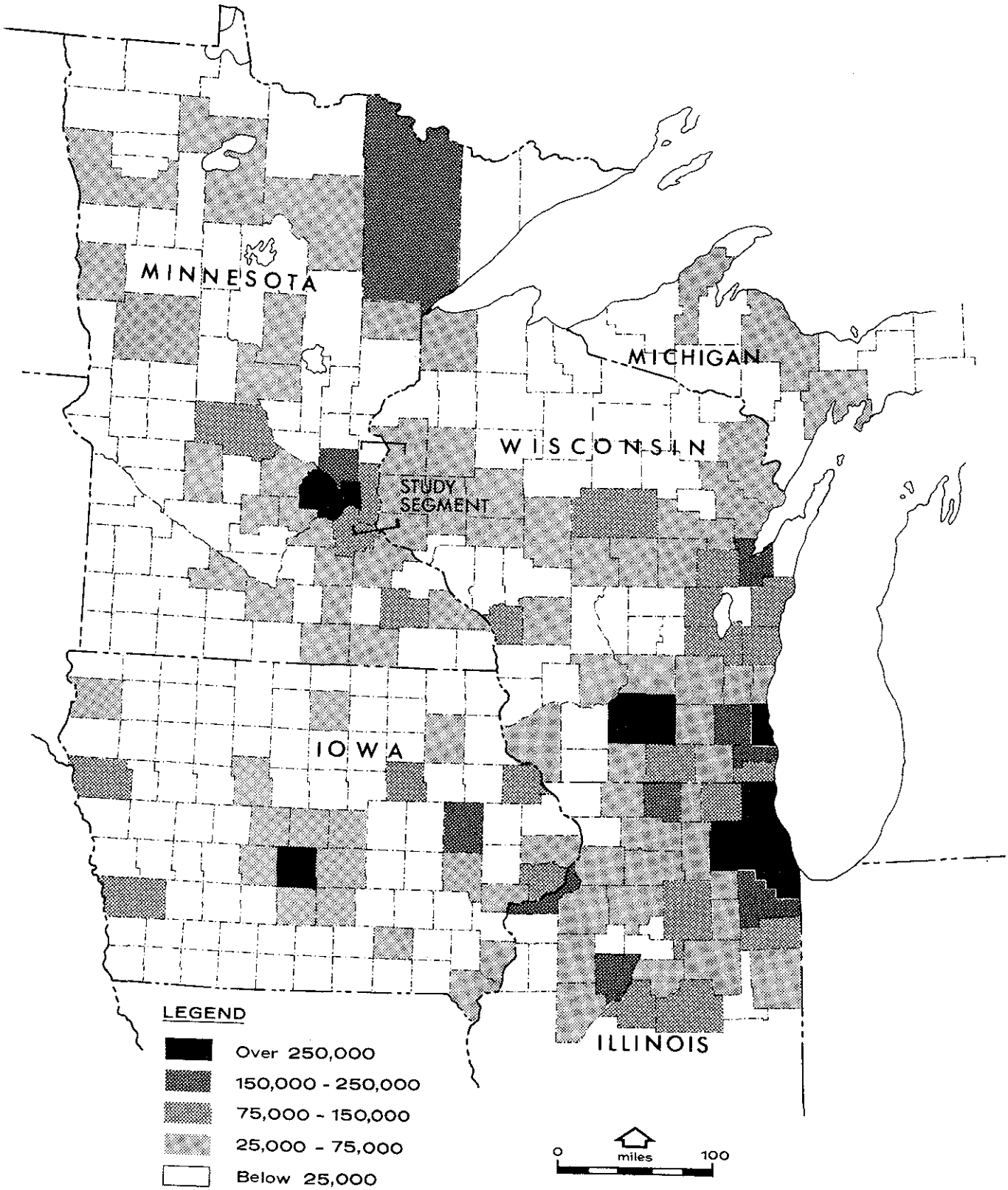
Economy and Population

In 1970 approximately 3,955,000 people lived within 150 miles of the lower St. Croix River and approximately 9,413,000 people lived within 250 miles. By the year 2000 these figures are projected to be over 5,700,000 and 12,000,000, respectively. The river lies on the eastern boundary of the Minneapolis-St. Paul Standard Metropolitan Statistical Area (SMSA) with an estimated population of 1,805,000 in 1970. Approximately 45 percent of the population within 150 miles presently lives in the Twin Cities area. Chicago, Milwaukee, and Omaha are within a day's drive of the lower St. Croix.

The five counties bordering the study segment--Polk, St. Croix, Pierce, Chisago, and Washington--have an estimated population of over 185,000. Washington County accounts for approximately 44 percent of this population and is one of the seven counties making up the Twin Cities metropolitan area for planning and administrative purposes. Polk County is expected to have a slight rise in population, with St. Croix and Pierce Counties experiencing a more rapid population growth. The population of Washington and Chisago Counties is expected to expand rapidly. Between 1960 and 1970 the population in Chisago and Washington Counties grew by over 29 and 57 percent, respectively. The present and projected population growth is primarily a result of urban expansion from the Twin Cities.

The lower St. Croix River is, literally, in the backyard of the Minneapolis-St. Paul metropolitan area, being within a half hour's drive from many Twin Cities residents. The population of the Twin Cities area is projected to double by the year 2000. Thus, the need for imaginative planning decisions is immediate, for if well-planned action is delayed, urbanization will determine the future development of the river.

Small communities are found at several locations along the river and these will undoubtedly experience growth. Populations in 1970 of incorporated communities with over 1,000 inhabitants on the lower St. Croix are shown below:



Source: Bureau of Census

REGIONAL POPULATION BY COUNTY

LOWER ST. CROIX RIVER

Municipality	Population
1. Prescott, Wisconsin	2,331
2. Hudson, Wisconsin	5,049
3. North Hudson, Wisconsin	1,547
4. Osceola, Wisconsin	1,152
5. St. Croix Falls, Wisconsin	1,425
6. Lake St. Croix Beach, Minnesota	1,111
7. Bayport, Minnesota	2,987
8. Stillwater, Minnesota	10,191
9. Oak Park Heights, Minnesota	1,238
10. Afton, Minnesota	2,002

Minneapolis-St. Paul dominates the economy of the lower St. Croix River region. Those places closest to the metropolitan area are, naturally, affected to a greater degree by urban commercial developments than are those communities which are more distant. Many residents of counties on the edge of or outside the metropolitan area, primarily Washington County, Minnesota, and St. Croix County, Wisconsin, commute to work in the Twin Cities. An increase in the degree of industrialization of the Twin Cities appears likely, and thus its economic influence will be more heavily felt in the future. In the nonurban areas, processing of grains, vegetables, and dairy products makes up an important part of the industrial activity, although metal-working and woodworking, apparel, plastics, and others are also represented.

Farming in the region, outside of the Twin Cities, is still a major occupation. Approximately 30 percent of the labor force in the nonurban areas is engaged in this vocation. As is the pattern in virtually all agricultural areas, farms are generally becoming larger and fewer in number. From 1930 to 1960, the decline in agricultural employment accounted for much of the unemployment in the nonurban counties in the lower St. Croix region. Dairy products are presently the leading source of farm income. Forestry has also declined in importance, although a viable forest industry still exists. Mineral production is small, consisting of industrial sands, sand and gravel, basalt, and crushed limestone; however, there are no commercial sand and gravel operations in the St. Croix River corridor.

In 1960, per capita income within a 250-mile perimeter of the lower St. Croix area was approximately 10 percent below the national average. The rural areas with their lower per capita incomes accounted for the low figures. The average household income in the Minneapolis-St. Paul SMSA was estimated to be $11,430 in 1968, 16 percent above the national average.* Within the Minneapolis-St. Paul Office of Business Economics economic area, the per capita income is slightly above the national average and is projected to remain above at least until the year 2020.**

*Sales Management, June 1969.

**Preliminary Report on Economic Projections for Selected Geographic Area, 1968 Water Resources Council.

Transportation Network

The lower St. Croix River basin is readily accessible by all forms of transportation. Nearby Minneapolis-St. Paul is the focus of major highway, railway, and air transportation systems. Interstate Highway 35 provides north-south passage just west of the study area and connects Minneapolis-St. Paul to Duluth and Des Moines. Interstate Highway 94, with portions presently under construction, provides good east-west movement through the study area and connects Minneapolis-St. Paul to Bismarck, Madison, and Milwaukee. The Great River Road, a scenic parkway along both sides of the Mississippi River from Canada to the Gulf, crosses the study segment in the vicinity of Prescott, Wisconsin.

The five-county area bordering the lower St. Croix is traversed north-south by U. S. Highways 61 and 63 and State Highways 35, 65, and 87 in Wisconsin and 95 in Minnesota. The area is crossed in an east-west direction by U. S. Highways 8, 10, and 12, and State Highways 36, 96, 97, and 212 in Minnesota and 64 and 29 in Wisconsin. A well-developed county road system provides circulation throughout the countryside surrounding the lower St. Croix.

The area is served by a network of railroads. The Chicago, Milwaukee, St. Paul, and Pacific Railroad parallels the west bank of the river from the mouth to Lakeland where it is joined by the Chicago and Northwestern Railway. Both lines maintain parallel tracks on the west bank to Bayport and a joint single track to Stillwater. The Chicago and Northwestern crosses the lower St. Croix at North Hudson, and the Soo Line crosses the study segment near Somerset on a high arch trestle and north of Marine-on-St. Croix on a swing bridge. Stillwater is also served from the west by the Burlington Northern which has trackage rights into Bayport. The Burlington Northern also crosses the mouth of the lower St. Croix at Prescott. The Chicago and Northwestern and Burlington Northern crossings carry main lines, as does the Soo Line Somerset crossing; all other trackage carries branch lines. None of the railroads provide scheduled passenger service to communities along the river at this time.

Scheduled commercial air flights are available from the Minneapolis-St. Paul International Airport. General aviation facilities are available at small airports near Lake Elmo, Osceola, downtown St. Paul, and New Richmond.

Large pleasure craft can enter the St. Croix from the Mississippi River and travel as far as Stillwater. This is made possible by the nine-foot channel maintained by the U. S. Army Corps of Engineers. A three-foot channel is authorized from Stillwater to Taylors Falls; however, the controlling depth in this reach is one-foot at extreme low water.

As shown in the following table, several urban areas lie within weekend and long-weekend driving distance from the lower St. Croix.

Table 1

Distance and Driving Time From Major Urban Centers to Lower St. Croix River*

Urban Center	Distance (Miles)	Approximate Driving Time (Hours)
St. Paul, Minnesota	15	0:20
Minneapolis, Minnesota	25	0:30
Duluth, Minnesota	150	3:30
Madison, Wisconsin	236	5:00
Des Moines, Iowa	252	5:55
Green Bay, Wisconsin	257	5:20
Milwaukee, Wiconsin	315	6:35
Omaha, Nebraska	364	8:45
Chicago, Illinois	381	7:40

Recreation Resources

Rivers--Presently two rivers in the upper Midwest have been designated as components of the national wild and scenic rivers system. The Wolf River, Wisconsin, from the Langlade-Menominee County line downstream to Keshena Falls and the upper St. Croix between the dam near Gordon, Wisconsin, and the dam near Taylors Falls, Minnesota, and its tributary, the Namekagon, from Lake Namekagon downstream to its confluence with the St. Croix, have received formal scenic river status. The designated section of the Wolf River lies approximately 200 miles east of the lower St. Croix River and is considered one of Wisconsin's most scenic and rugged rivers. It is much smaller, less developed, and more intimate than the lower St. Croix. The upper St. Croix-Namekagon system also presents different recreation opportunities than the lower St. Croix. The upper section of the river flows through heavily timbered land not well suited to agriculture and lacks the high-forested bluffs of the lower segment. The upper river is more lightly developed and is generally much narrower and shallower than the lower river.

The Upper Iowa River, in northeast Iowa, approximately 100 to 150 miles south of the lower St. Croix, has been designated for potential addition to the national wild and scenic rivers system. A Department of the Interior report dated February 1971 has recommended that the Upper Iowa be included in the national wild and scenic rivers system as a state designated and administered scenic river. The Upper Iowa flows through rural farm and forest country and has very little development, other than agriculture, along its banks. It is a pleasant pastoral stream with a character completely different from that of the lower St. Croix.

Both Minnesota and Wisconsin are active in the protection of riverways. Wisconsin has had a tradition of preserving wild rivers since 1907, when a state forest was designated along the banks of the Brule River. Wisconsin has also recognized the unique values of other streams by establishing the Flambeau River and Black River State Forests and is acquiring land on other rivers for fish and game purposes. Rivers in Wisconsin which bear a wild river designation include the upper St. Croix, Brule, Wolf, Pine, Popple, and Pike. Wisconsin has passed laws prohibiting navigation improvements or dams on the Wolf River and prohibiting dams on the Brule River. The Wisconsin Department of Natural Resources has published a pamphlet entitled Wisconsin Water Trails, which describes water trails on 37 Wisconsin rivers. The Wisconsin outdoor recreation plan indicates 191 miles of canoeing waters in the west central planning region, an 11-county region which includes the eastern portion of the lower St. Croix River.

In Minnesota, the legislature has enacted laws designating 16 streams as canoe and boating route rivers. The Minnesota outdoor recreation plan notes that 306 miles of designated canoe routes are found in planning region 11, the region which includes the seven-county Twin Cities metropolitan area.

The water body with the greatest overall recreation potential in the area is the Mississippi River. This river is the outlet for the drainage of the St. Croix River Basin. A large part of the Mississippi in the region is included in the Upper Mississippi Wildlife and Fish Refuge managed by the Bureau of Sport Fisheries and Wildlife. This waterway with its numerous sloughs and islands provides some of the best waterfowl hunting, sport fishing, and boating in the country.

Lakes--Minnesota and Wisconsin are richly endowed with a large number of relatively high quality natural and man-made lakes. The value of these lakes lies in their aesthetic and recreational attributes, as stabilizers of stream flow for fish and wildlife habitat, and as storage places for water. Most of the larger lakes in the area with desirable shorelines have been built up with either residential or resort development. Nearer urban areas, many lakes have been developed so completely that public access is virtually excluded or, at best, severely limited.

Within 60 miles of the lower St. Croix area there are approximately 1,300 lakes with over 470,000 surface acres. These lakes are, in most cases, highly developed with little or no public lakeside frontage. They receive heavy recreational use, especially by people residing in the Twin Cities. In the Upper Mississippi River Comprehensive Basin Study the first priority in the northwest planning unit is the provision

of additional day-use water-oriented facilities for the Minneapolis-St. Paul area. The acquisition and development of additional lake frontage in close proximity to the metropolitan area is probably the best way of providing more opportunities for water-based activities here. The lower St. Croix River is in the day-use zone of the Twin Cities and, with its lake-like nature in the lower portion of the study segment, is providing water-oriented recreation opportunities for those day-users from the metropolitan region.

Other Resources--In addition to the Upper Mississippi River Wildlife and Fish Refuge and the St. Croix National Scenic Riverway, the federal government operates other areas which provide significant recreational opportunities for the recreationists in the vicinity of the lower St. Croix River.

The Superior National Forest lies approximately 175 miles to the north of the study area. The northern third of this National Forest contains the nationally known Boundary Waters Canoe Area, which offers some of the finest canoe country in the United States. North of the international border is the Quetico Provincial Park which complements the experience of the Boundary Waters Canoe Area. The experience in the two areas differs from that which would be obtained on the lower St. Croix. However, many recreationists, particularly from the heavily populated area of the Twin Cities, are drawn to this northern forest and lake area.

The Chippewa National Forest is approximately 180 miles from the lower St. Croix and offers a wide variety of recreational opportunities. Here, close to the headwaters of the Mississippi, are hundreds of lakes including Lake Winnibigoshish, Leech Lake, and Cass Lake. This forest encompasses a total of more than 640,000 acres.

Approximately 100 miles to the northeast of the lower St. Croix is the Chequamegon National Forest, containing approximately 838,000 acres. This area is located in north-central Wisconsin and extends southward 150 miles from Lake Superior.

Recreational activities in each of the national forests mentioned include swimming, water skiing, picnicking, nature study, boating, canoeing, big game hunting, waterfowl hunting, camping, horseback riding, hiking, and a multitude of winter activities.

Two National Park Service areas, Voyageurs National Park and Apostle Islands National Lakeshore, lie approximately 210 miles and 115 miles, respectively, from the lower St. Croix. Both are relatively new areas, and when developed will provide facilities for a wide variety of recreational opportunities.

The closest national wildlife refuges are the Sherburne National Wildlife Refuge and the previously mentioned Upper Mississippi River Wildlife and Fish Refuge. The Sherburne National Wildlife Refuge is located within one hour's drive of the Twin Cities. The refuge covers 31,500 acres, of which over 10,000 acres will eventually be flooded to provide habitat for waterfowl. It provides excellent opportunities for people to observe wildlife in its natural setting and to become familiar with the various management programs.

The Upper Mississippi Wildlife and Fish Refuge includes some 194,000 acres of wooded islands, waters, and marshes extending 284 miles southward along the Mississippi River from Wabasha, Minnesota, to Rock Island, Illinois. It accommodates some one and three-quarter million visitors annually for such activities as boating, fishing, hunting, bird study, and sightseeing. This area lies approximately 60 miles southeast of the Twin Cities.

Both Minnesota and Wisconsin have jurisdiction over many types of land vital to most forms of outdoor recreation, including wildlife management areas, state forests, state parks, and public accesses to lakes and rivers. Over 330,000 acres of state-owned land are within 60 miles of the lower St. Croix area. In Minnesota's planning region 11, composed of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington Counties, there are over 1,000 acres in state parks; 700 acres in state forests; nearly 17,000 acres in wildlife management areas; and 36 acres of public accesses on lakes and streams. Wisconsin's west-central planning area, which includes Barron, Buffalo, Chippewa, Dunn, Eau Claire, Jackson, Pepin, Pierce, Polk, and St. Croix Counties, has over 4,000 acres in state parks and recreation areas. The west-central planning area also has over 35,000 acres in fish and game management areas. Numerous public fishing and hunting access points are provided throughout the planning area.

Within 60 miles of the lower St. Croix, most of the total public recreation land acreage controlled by the counties is in Wisconsin. Of the over 280,000 such acres in county ownership, 98 percent is in the Wisconsin county forest system. Some of the larger county forests in this area are the Barron, Burnett, and Polk County forests with a total of over 127,000 acres. County forests presently have light development of recreational facilities. The recreational value of the county forests lie mainly in their capacity for a more extensive type of recreational activity such as hunting, fishing, sightseeing, nature study, and hiking. County parks and river and lake accesses are generally developed for more intensive recreational usage such as picnicking and swimming.

Parks and recreation areas provided by cities and villages are a small segment of the total recreation acreage; however, they sustain heavy recreation use. In the vicinity of the lower St. Croix, the most significant urban recreation developments are those which serve the Minneapolis-St. Paul metropolitan area, the major area which the lower St. Croix serves. In Minnesota's planning region 11, there are a total of 171 acres encompassing nearly 12,000 acres. These parks and recreation areas are generally intended to meet the needs of people for recreational opportunities within a short traveling distance of their homes.

Recreation opportunities are also provided by quasi-public organizations such as church groups, youth agencies, and service clubs, although these facilities are generally oriented toward the young recreationist. Private groups and individuals also provide a wide variety of areas ranging from golf courses to shooting preserves. Industrial firms, such as timber and electrical utility companies, provide numerous recreational opportunities and in many cases allow a large part of their lands to be used for recreational purposes.

Recreation Resource Needs--An indicative quantitative estimate of overall recreation needs in the lower St. Croix region is contained in the Upper Mississippi River Comprehensive Basin Study, Appendix K. This study is in the final stages of preparation. The northwest planning unit (Unit E), consisting of the Mississippi Headwaters and the Minnesota, St. Croix, Cannon, Zumbro, and Root River basins, has more than half its population concentrated in the Minneapolis-St. Paul metropolitan area. Thus, the Twin Cities provides a focal point for the major portion of Unit E's recreation demands and needs. The analysis in this report shows that 1,900 acres of Bureau of Outdoor Recreation Class I lands (high density recreation areas) and 97,700 acres of Class II lands (generally outdoor recreation areas) are needed to satisfy present demand. Resource requirements will increase to 15,300 acres of Class I and 598,900 acres of Class II land by the year 2000. The water acreage presently available for recreational use is adequate to satisfy demand through 2000. The largest need is for the provision of day-use opportunities for those people in the Twin Cities area.

Both Minnesota's and Wisconsin's outdoor recreation plans, published in 1968, also give some indication of the recreation resource needs of the lower St. Croix area. In Minnesota's planning region 11, recreation deficiencies to be met by 1980 were determined to be: 150 acres for swimming; 530 acres for camping; 20,146 acres for hunting; 1,390 acres for picnicking, and 600 acres for boat launching. The Minnesota Outdoor Recreation Plan also states:

> "The most immediate recreation needs are to develop the existing opportunities of public areas and to set aside additional land and water for recreational purposes in and around the metropolitan areas, along the Federal and State highway systems, and in the more remote sections of the State."

The Wisconsin outdoor recreation plan calls for 9,437 additional acres of outdoor recreation land, or a seven percent increase from the present acreage, to meet the demands for 1980 in the west-central planning area. The demand here is for more high density or general recreation areas.

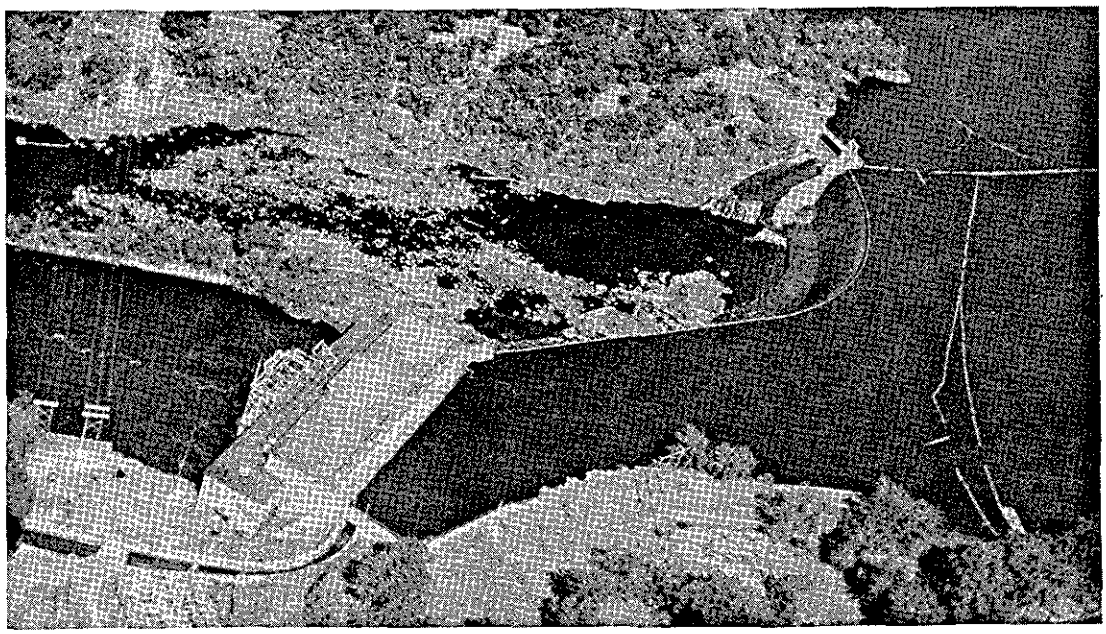
IV. DESCRIPTION AND ANALYSIS OF RIVER

IV. DESCRIPTION AND ANALYSIS OF RIVER

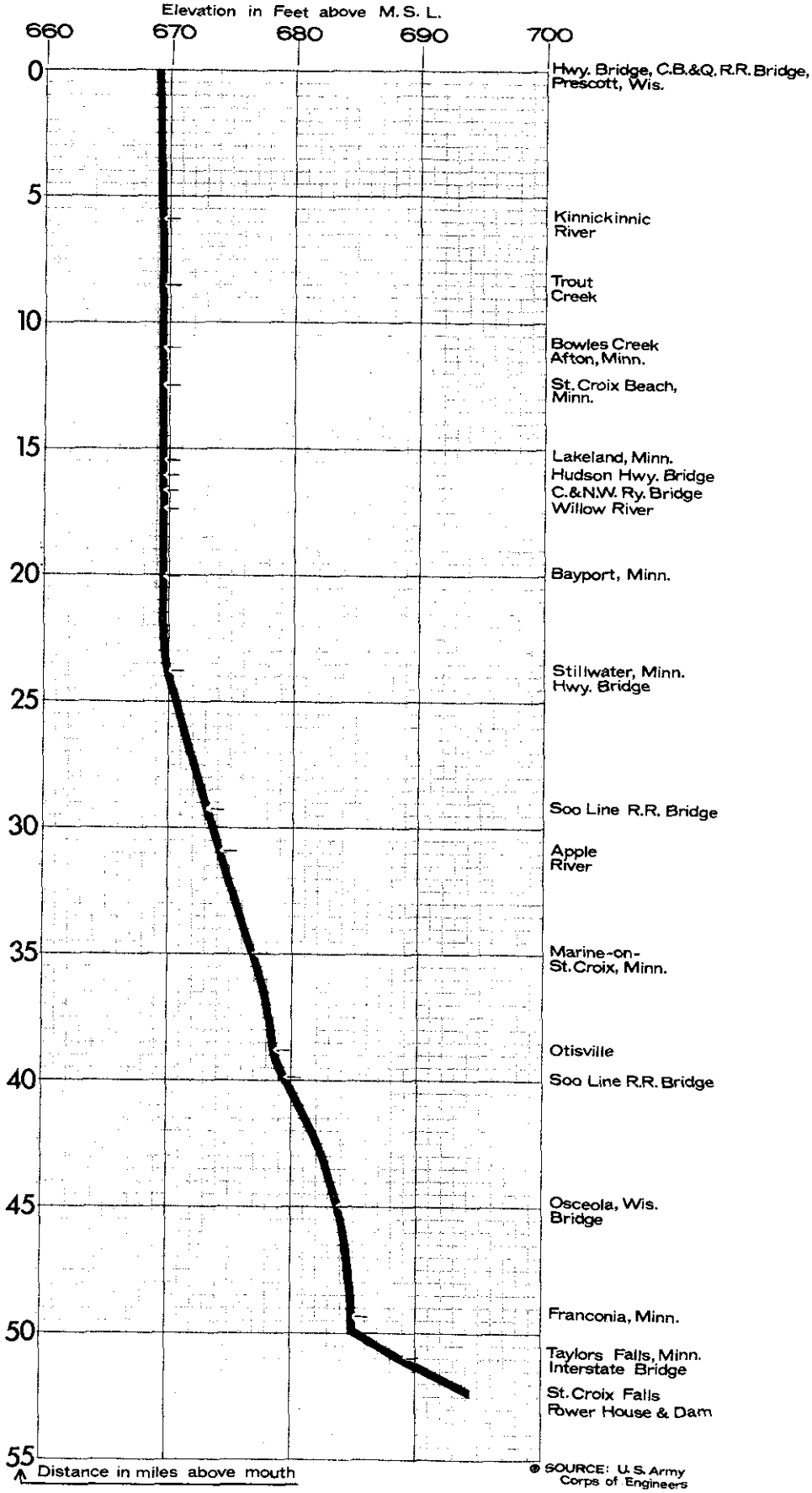
Riverscape

From the dam at Taylors Falls, the lower St. Croix flows in a southerly direction for approximately 52 miles, entering the Mississippi River at Prescott, Wisconsin. The river segment falls approximately 25 feet in this distance. The steepest gradient, about eight feet per mile, is found in the Taylors Falls area. Within this stretch, the river flows through the narrow rock gorge called the St. Croix Dalles. From just below the Dalles downstream to Lake St. Croix, at River Mile 23, the river has an average gradient of .72 feet per mile. There is no significant change in elevation in the remainder of the study segment.

A singular description of the lower St. Croix is difficult because the river exhibits a multitude of characters. In a sense, it is two distinctly different riverscapes. The upper one-half is relatively shallow and intimate with dozens of islands, sandbars, and sloughs, while the lower one-half is broader, deeper, and more developed. Bluffs are a distinctive feature along the entire river. The mixture of deciduous and coniferous trees provides a spectacular array of colors in the autumn.

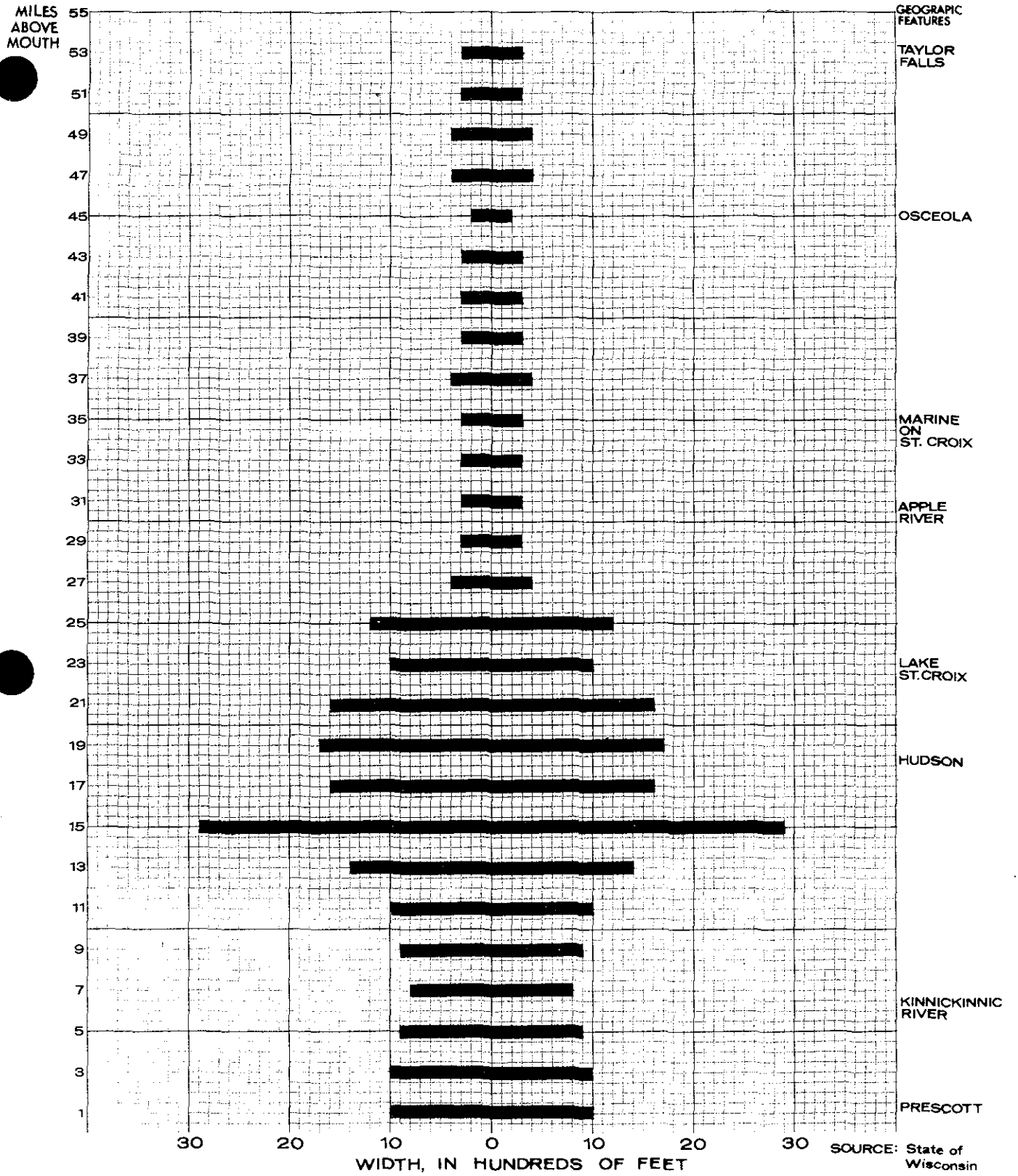


4. The dam between St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota, separates the upper St. Croix (a formally designated component of the national wild and scenic rivers system) from the lower St. Croix.



LOWER ST. CROIX RIVER PROFILE

Figure A



WIDTH DIAGRAM - LOWER ST. CROIX RIVER

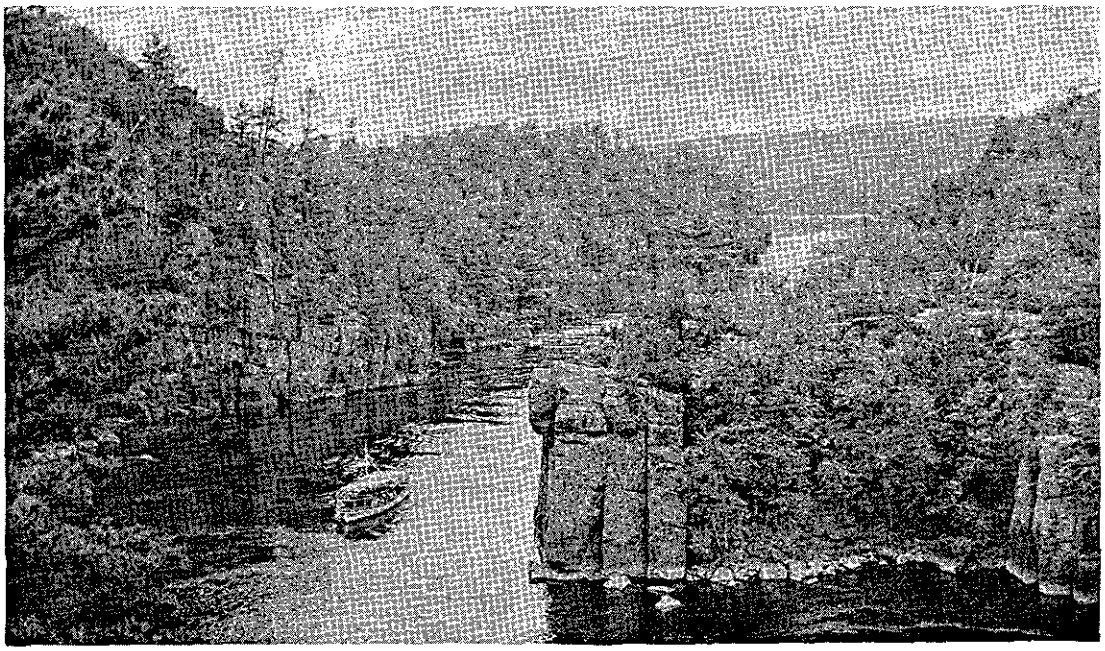
Figure B

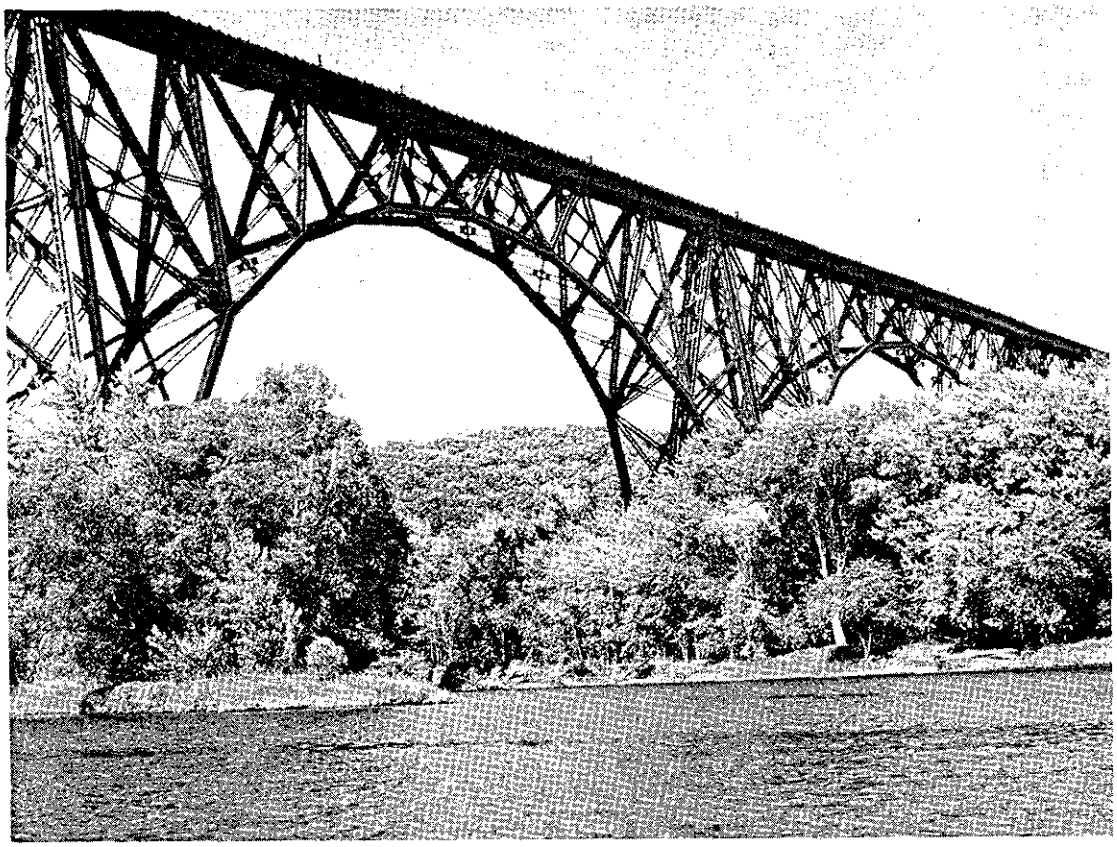
At Taylors Falls the river flows through a narrow, metamorphic rock gorge, the Dalles, which has been protected by inclusion in state parks in both Minnesota and Wisconsin. This area is profusely endowed with stratified and precipitous rock formations, and the walls of the gorge reach heights up to 200 feet above the waterline.

From below the Dalles to the Soo Line swing bridge, the river flows through a heavily wooded, steep sided valley with occasional sandstone and limestone bluffs visible. Few cottages or riverside homes can be seen. Islands, sloughs, and backwater areas make the river scene a delight for the river user who wants to explore. Springs and small feeder streams entering the river from both banks create miniature deltas and valleys of interest. As the river traveler passes the community of Osceola, few residences are visible because the village is built high on the bluff and is well screened. The Osceola highway bridge, at River Mile 43.3, is the first bridge the river user passes under as he travels south from Taylors Falls, although a bridge does cross between Taylors Falls and St. Croix Falls just north of the Interstate Parks. At River Mile 40.3 the second bridge is passed, a swing bridge used by the Soo Line Railroad.

From the Soo Line railroad bridge south to the Soo Line high bridge, the natural characteristics of the river change very little; however,

5. Below the dam the river flows through a narrow rock gorge called the Dalles of the St. Croix.





6. The Soo Line Railroad "high bridge" is a 60-year old, imposing, steel arch bridge which is unique to the area.

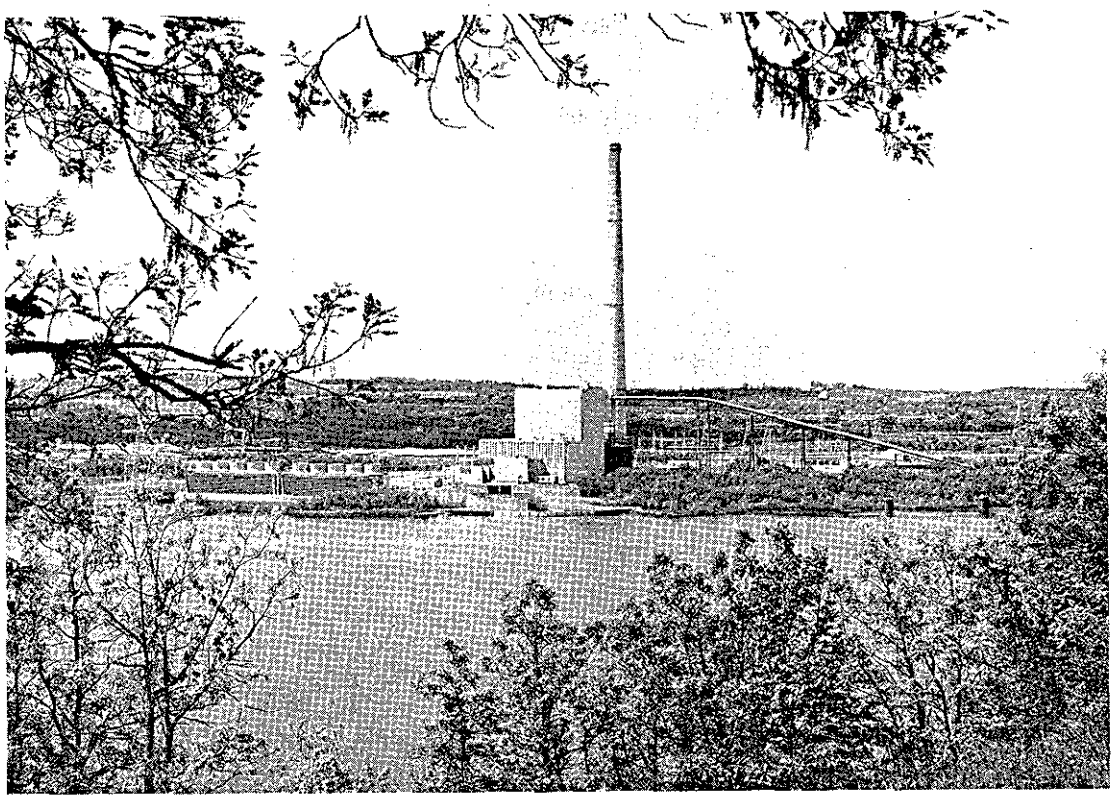
man has had an increasing impact, especially on the Minnesota side. Between River Miles 39 and 37, two unincorporated Minnesota communities exist, Otisville and Copas. Bankside development is relatively heavy in certain areas on the Minnesota side; yet most homes or seasonal residences detract little from the user's impression of the overall river environment. Near River Mile 37, William O'Brien State Park has been developed by the State of Minnesota, and immediately adjacent to the park boundary to the south are the corporate limits of the pleasant little community of Marine-on-St. Croix. Near River Mile 29 the third bridge, the Soo Line Railroad "high bridge," is seen. This 60-year old structure, over 150 feet above the river, is an imposing steel arch bridge which is unique to the area. Approximately one mile downstream from the "high bridge," the river traveler passes towering stone piers which are all that remain of an old railroad bridge. Islands, sloughs, and bluffs still provide a pleasant scene to those on the river.

Moving south from the "high bridge" the character of the lower St. Croix begins to change. The river becomes wider and gradually begins to lose its intimate island and slough environment. From Stillwater to the mouth at Prescott, the river is relatively deep and wide, taking on the features of an elongated reservoir-type lake. This is Lake St. Croix, bounded by steep, wooded slopes in close proximity to the water. Three major constrictions exist in Lake St. Croix below the highway lift bridge at Stillwater--the Hudson "narrows," the delta at the mouth of the Kinnickinnic River, and where the two bridges cross at Prescott.

Bankside development is prevalent at the many communities which front Lake St. Croix. A major landmark in the Lake St. Croix area is the Allen S. King steam-electric generating plant at Oak Park Heights, Minnesota. Its 783-foot stack can be seen throughout much of the area surrounding the lake. Marinas occur at several points along the lower segment of the study reach. Many permanent and seasonal homes are located on the bluffs overlooking Lake St. Croix. Afton State Park in Minnesota and the proposed Kinnickinnic State Park in Wisconsin are also located within this reach.

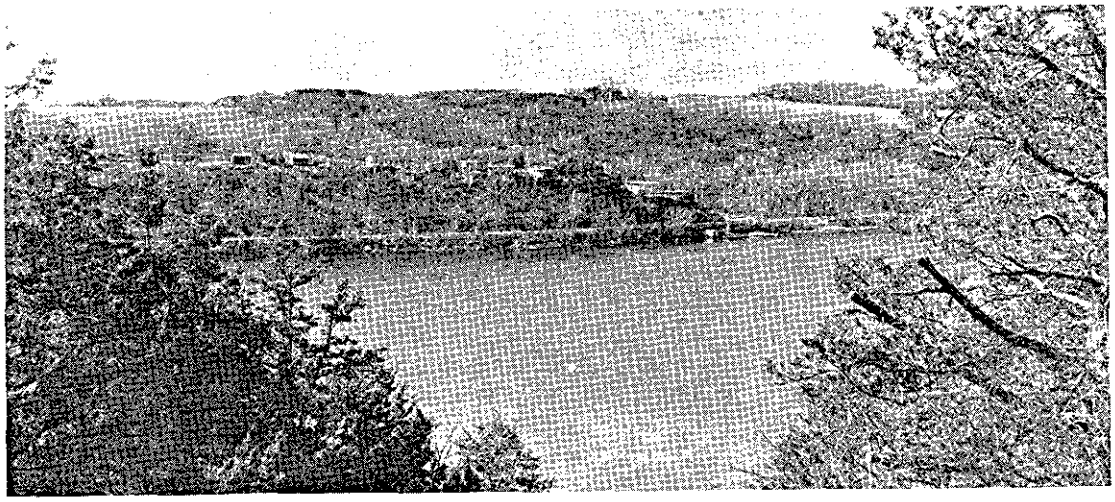
Depths throughout the study segment range from under one foot to over 70 feet. In the Dalles area, depths are estimated to be nearly 70 feet. In the area below the Dalles alternating depths from one to 13 feet occur, depending on the shifting sand bottom. Depths from below the Dalles to Stillwater range primarily from one to three feet. Between Stillwater and Hudson depths range from 10 to 40 feet. Near Afton and St. Mary's Point depths reach as much as 70 feet. Bottom materials throughout the study reach are primarily sand with some gravel.

7. From Stillwater to the mouth at Prescott, the river is relatively deep and wide.



8. A major landmark in the Lake St. Croix area is the Allen S. King generating plant at Oak Park Heights, Minnesota.

9. Many permanent and seasonal homes are located on the bluffs overlooking Lake St. Croix.



Flow Characteristics

A necessary consideration in the evaluation of the lower St. Croix River is the amount of water which flows in its course throughout the year. The amount of flow is particularly important during the summer months when recreation use is at its yearly peak and water level is often at its lowest.

Flow data for the lower St. Croix are available from the gaging station located near St. Croix Falls, Wisconsin, approximately one-third mile downstream from the Northern States Power Company dam at River Mile 52.2. This station has been operative since 1902. The flow of the lower St. Croix is regulated by the dam. The average discharge over a 68-year period of record is about 4,000 cubic feet per second.

Regulations governing the flow of water through the dam were established in 1931. The regulation states :

> ". . . that between April 1 and October 31, whenever the natural river flow exceeds 1,600 feet per second, the reduced flow shall be not less than 1,600 feet per second, and that whenever the natural flow be less than 1,600 feet per second, then the reduced flow shall not be less than such natural flow. Provided, that the district engineer in charge of the locality, may vary these requirements temporarily, as the interests of navigation in his judgment require, prompt report of his action in such instances to be made to the Chief of Engineers. This regulation shall be in full force and effect from the date of approval hereof and shall supersede all previous regulations governing the flow of water through said dam." *

It should also be noted that the data from this one gaging station does not give a completely accurate indication of the flow characteristics farther downstream, since three relatively large tributaries, the Apple, Willow, and Kinnickinnic Rivers, enter the St. Croix downstream from the gaging station. The river is also fed by numerous small springs throughout the upper reaches of the study area.

During periods of intense rainfall or heavy spring runoff, the lower St. Croix has undergone flooding which has resulted in disruption of the normal commerce of the valley. The highest flood of record was experienced in 1965. Portions of Stillwater, Oak Park Heights, Bayport, Lakeland, Lake St. Croix Beach, Afton, and St. Marys Point, Minnesota, and Hudson and Prescott, Wisconsin, are subject to periodic flooding. In the lower reaches of the river, backwater flooding from the Mississippi River is often evident in early spring.

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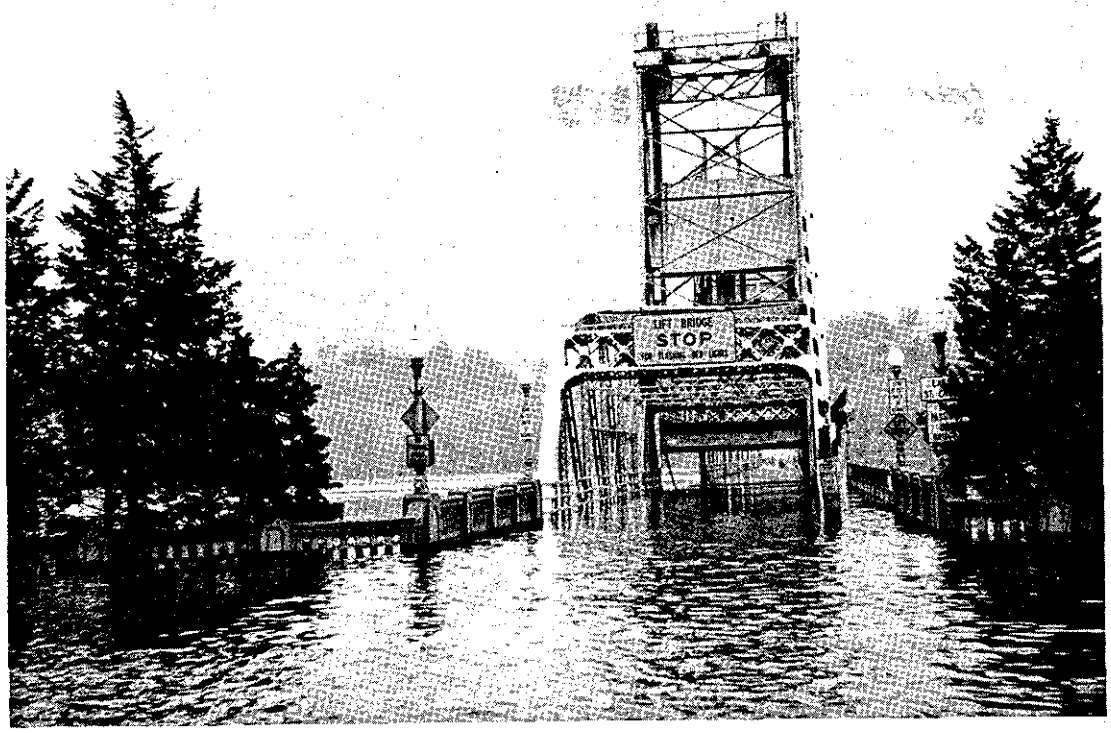
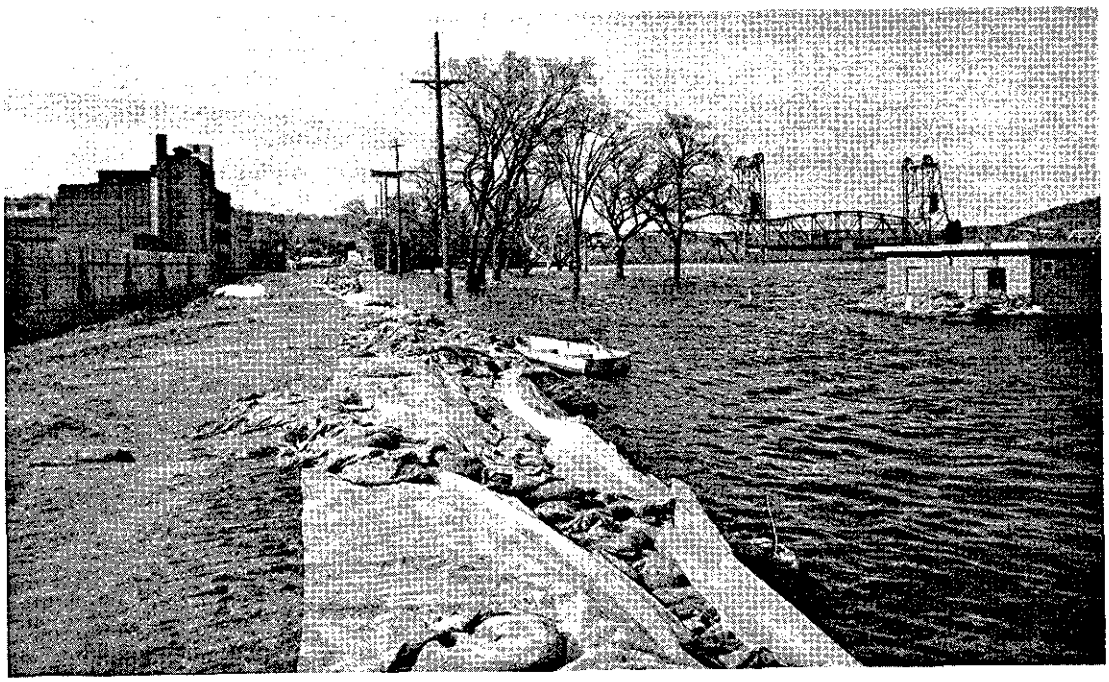
* U. S. Army Corps of Engineers



10. & 11. During periods of intense rainfall or heavy spring runoff, the lower St. Croix has undergone flooding. In the lower reaches of the river, backwater flooding is often evident in early spring.



The area above Stillwater is the segment where the river's depth becomes a major factor in determining the level of boating use. Canoes and watercraft with shallow drafts are the most suitable for use in this section of the lower St. Croix where the river's channel is constantly changing with the movement of the sandy bottom material. Two sand bar areas in particular impede motorboat navigation: the Arcola bar just north of the Soo Line "high bridge" keeps larger motorized watercraft from the upper reaches and sand bars near the mouth of the Apple River also make passage by motorboat difficult. At mean low flows, sand bar recreation is enhanced; however, passage by motorized watercraft is hampered. From Stillwater downstream the depth is usually sufficient for boating throughout the recreation season; however, some difficulties might be encountered if larger watercraft stray from the navigation channel.

Mid-May through mid-September is considered the primary recreation season on the lower St. Croix. Rain and melting snow usually cause high water during the period March through May; high water may also occur in the early summer or fall as a result of heavy rains. The river ice which goes out with the spring snowmelt presents hazardous boating conditions until late April. Normally, by the middle of May the stream velocities have decreased. Depths are then adequate for small recreational craft in the area above Stillwater and for the larger craft in the area below Stillwater. Customarily, late spring rains cause another significant rise in the river in June, allowing deeper draft boats to traverse the entire segment from a period of from one to three weeks. Low water occurs anytime during the late summer through the winter, although usually in the period September through February.

Water and Air Quality

Although water quality records for the lower St. Croix are presently not complete enough for a detailed analysis, the available information indicates that the river contains water of relatively high quality.

The segment of the river from Taylors Falls to Stillwater has four domestic waste water sources discharging into the river. These are found at Taylors Falls and Shafer, Minnesota, and at St. Croix Falls and Osceola, Wisconsin. All of these communities except Shafer provide secondary waste treatment facilities. The water quality is excellent in this reach with dissolved oxygen levels normally at saturation level.

That portion of the river from Stillwater to Prescott has four domestic waste water sources discharging into the river. Oak Park Heights, Stillwater, and Bayport, Minnesota, and Hudson, Wisconsin, have secondary waste treatment facilities. Small communities along the lower St. Croix without sewer systems include Lakeland, Lakeland Shores, Lake St. Croix Beach, St. Marys Point, Afton, and Marine-on-St. Croix, all of which are in Minnesota. As the population being served increases, water quality could become a problem if waste water discharges are not adequately treated.

The Metropolitan Sewer Board, an agency of the Metropolitan Council of the Twin Cities area, has recently assumed management and operation of the sewage treatment plants in Stillwater, Oak Park Heights, and Bayport. The Board is preparing a report which will outline several alternative plans for regional interceptors and sewage treatment plants to serve a large segment of Washington County, including all incorporated communities along the St. Croix from Stillwater to Afton. This report is expected to be submitted to the Metropolitan Council in the near future. It is anticipated that the alternatives in the report will include one or two large plants on the St. Croix or a plant on the Mississippi River. Completion of the proposed system is not expected before the late 1970's. Meanwhile, the existing plants will be operated as interim facilities and be phased out when the new regional system becomes operational.

The Minnesota Pollution Control Agency has adopted new standards and is expected to issue orders requiring advanced waste treatment (nutrient removal) by Minnesota disposal systems discharging into Lake St. Croix. Adoption of such practices should help to curtail some of the water fertility problems in this reach of the study segment.

An industrial source of heated water is the Allen S. King steam-electric generating plant at Oak Park Heights. A water quality monitoring program in the vicinity of the Allen S. King plant was initiated in 1966 by the Northern States Power Company. The following parameters have been monitored: water analysis, coal pile drainage, water temperature and ice measurement, macro-invertebrates, phytoplankton, and attached algae. A fish population study and a creel census have also been conducted in conjunction with the Northern States Power studies. The data to date indicate that the King plant has not caused pollution of sufficient impact to damage major portions of local aquatic and terrestial ecosystems of the river valley. These studies should be continued to determine if any long-range effects will occur. One interesting conclusion from the creel census is that plant operations have stimulated bank fishing and boat fishing in the area of the cooling water discharge canal.

Another industrial discharge is located at Hudson where the United Refrigerator Company releases approximately 100,000 gallons per day of water used in manufacturing processes in its plant.

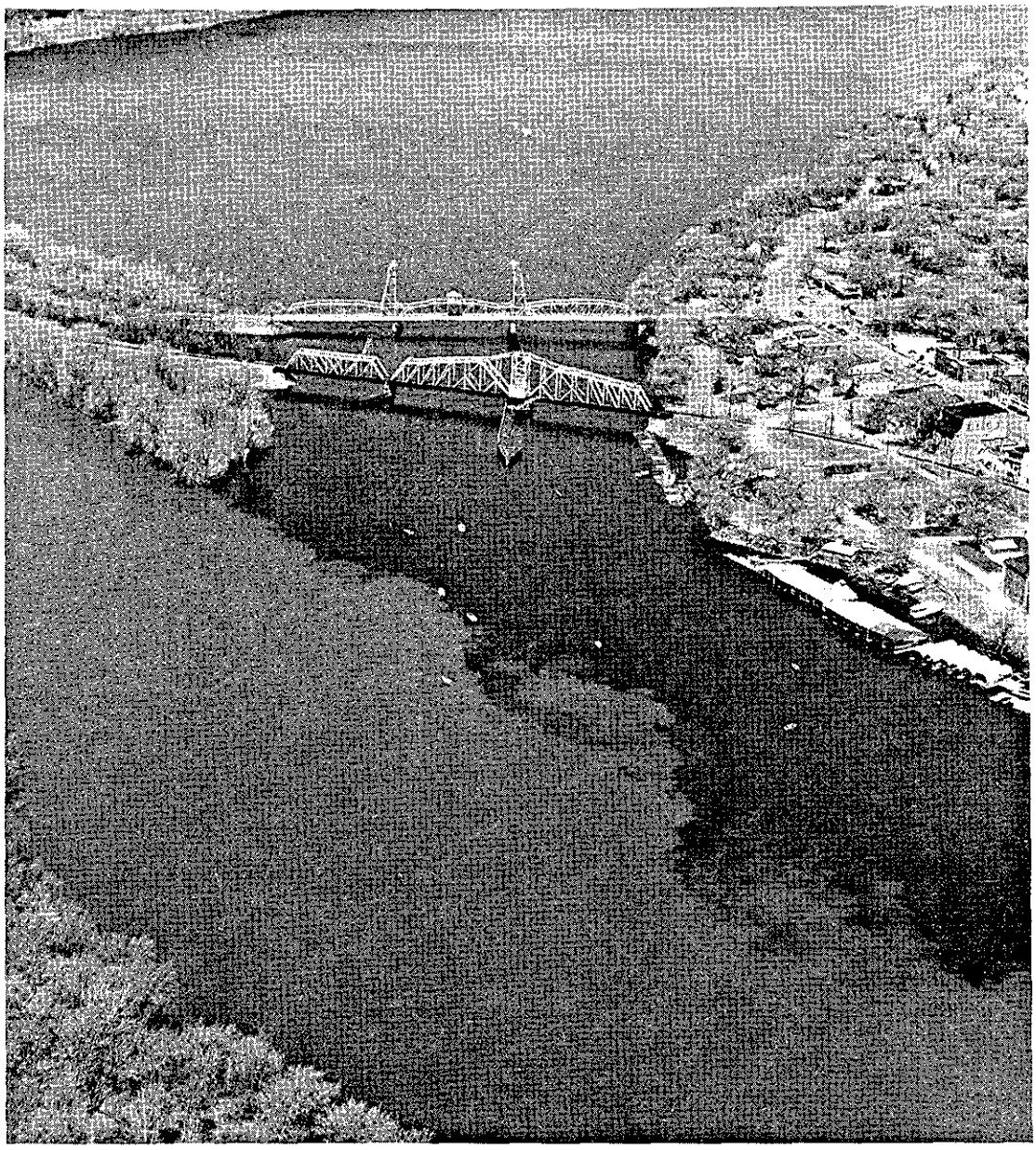
The water in the reach from Stillwater to the mouth is considered to be of good quality, with dissolved oxygen concentrations being in excess of six milligrams per liter. Waters from the lower St. Croix have moderate fertility consistent with their origin in sandy soils and relatively insoluble rock formations. They also receive drainage from rich farmlands, soluble rock formations, and communities in the lower watershed. The net result is a greatly enriched water supply which produces occasional algae blooms in Lake St. Croix. Thus, the aesthetic quality of the water is affected in some locations by nuisance blooms and dense mats of algae growing on rocks as a result of upstream nutrient influx.

The use of recreational watercraft during the summer months is not a major source of pollutants; however, certain characteristics of those vessels with toilets on board make it necessary to consider waste discharge from this source. Recreational watercraft may congregate for a weekend and contaminate a previously uncontaminated bathing beach or other critical water area. Another area of concern is in harbors and marinas where the concentration of vessels is heaviest and there is a minimum natural flushing of the contaminants discharged. The expanding number of recreational boaters will compound this problem in the future.

Both Minnesota and Wisconsin have regulations governing waste discharges from watercraft into the St. Croix River. A comparison of these laws indicates some important differences which, due to the interstate travel, makes enforcement very difficult. Wisconsin law has a no-discharge provision and incinerators and holding tanks are the only approved waste treatment devices. Besides these devices, Minnesota also approves the macerator-disinfector device, which has been shown to be much less effective. The need for uniform regulations to control waste discharges in interstate waters, in this case the lower St. Croix, is obvious. Every effort should be made to facilitate uniform regulations as soon as possible.

Flood conditions on the lower St. Croix create seasonal water quality problems and endanger the existing sewage treatment facilities. Backwater flooding from the Mississippi River also mixes water of lower quality, that from the Mississippi, with water in the St. Croix.

Because the lower St. Croix is an interstate stream, it comes under the provisions of the Federal Water Quality Act of 1965, Public Law 89-234. Enforceable State-Federal Water Quality Standards have been adopted by Minnesota and Wisconsin for the St. Croix River. These



12. Confluence of the St. Croix River with the silt laden Mississippi River at Prescott, Wisconsin.

standards protect the river for the designated use of whole body contact recreation, propagation and maintenance of warm-water sport fishery, public water supply, commercial fishing, aesthetics, industrial water supply, agricultural use, commercial usages and waste assimilation. The standards require secondary treatment with year-round disinfection of municipal wastes and the equivalent treatment of industrial waste.

In conformance with the provisions of Section 12(c) of the Wild and Scenic Rivers Act, if the lower St. Croix River becomes a part of the national wild and scenic rivers system, abl levels of state governments should cooperate with the Administrator, Environmental Protection Agency, to enforce the established water quality standards.

Air Quality

An air quality monitoring program was initiated by the State of Wisconsin in the vicinity of Hudson, Wisconsin, in March 1967. This program was instituted primarily to monitor emissions from the Allen S. King generating plant at Oak Park Heights, Minnesota. The monitoring program provided about one year of preoperational and one year of post-operational monitoring for comparison. The State of Wisconsin removed their monitoring equipment in June 1969 because of a more urgent need for the equipment elsewhere in Wisconsin and because of the lack of direct evidence showing any adverse effect of the plant on the air quality of the area.

The Northern States Power Company has also had an ongoing air quality monitoring program since construction of the Allen S. King generating plant. Their air monitoring program includes data on air temperatures, sulfur oxide, particulate emissions, wind, paint panels, and plant pathology studies. Again, no significant adverse effects have been attributed to the generating plant other than the aesthetic detraction of the emissions of smoke which are visible from a major portion of the river area.

In August 1969, the Minneapolis-St. Paul Air Quality Control Region was established. This region, which includes Washington County, provides for a regional attack on air pollution. While the Administrator, National Oceanic and Atmospheric Administration, retains approval authority, the State of Minnesota assumes the responsibility for developing standards and an implementation plan which includes administrative procedures for abatement and control. The Minnesota Pollution Control Agency is presently in the process of obtaining approval for its proposed air quality standards.

Air quality monitoring should be a continuing program to determine both short and long term effects of emissions on the river valley environment. With an expanding population and industrial base in the Twin Cities area, constant vigilance and strict adherence to adequate air quality standards must be maintained.

Climate

Climate in the lower St. Croix River basin is characterized by warm humid summers and cold, snowy winters. Occasional periods of extreme temperatures occur. The average daily high is 85 degrees in July and 23 degrees in January. The major period of recreational use is mid-May through mid-September, Although light use occurs during the spring and fall. The recreation season has an even distribution of clear, partly cloudy, and cloudy days. Days with sunshine can be expected between 60 to 70 percent of the time.

Precipitation in this area averages approximately 27 inches annually with an average snowfall of 40 inches. Sixty-four percent of the yearly precipitation occurs from May through September.

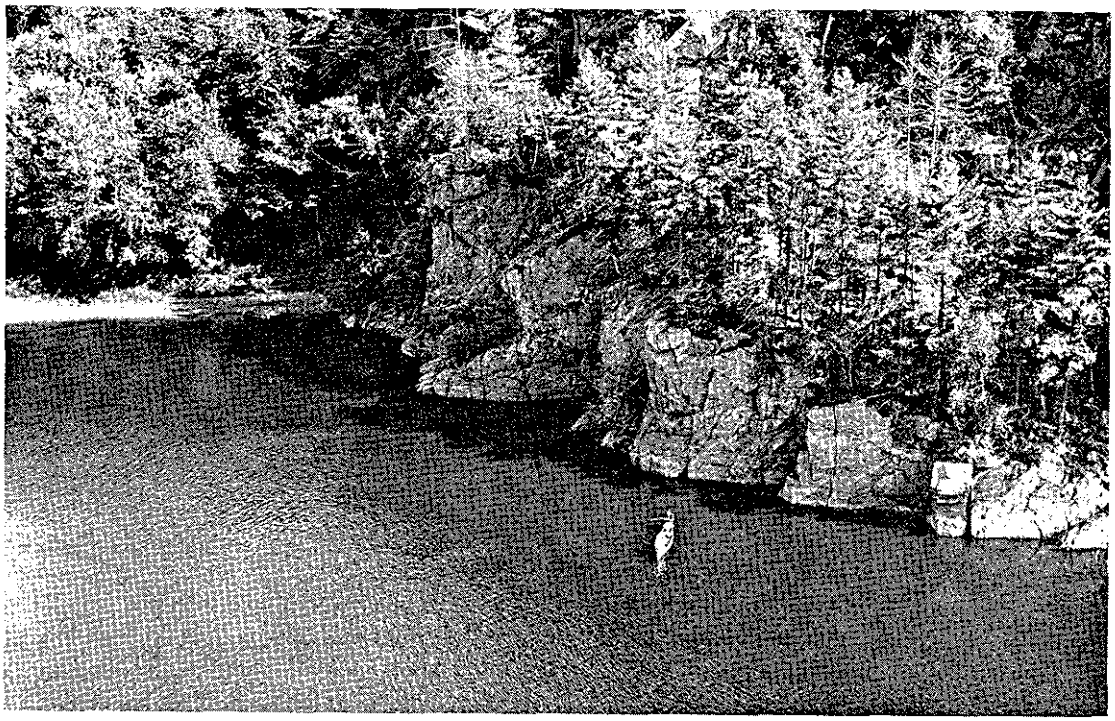
Geology and Soils

The St. Croix basin was formed by a complex sequence of major geological events.

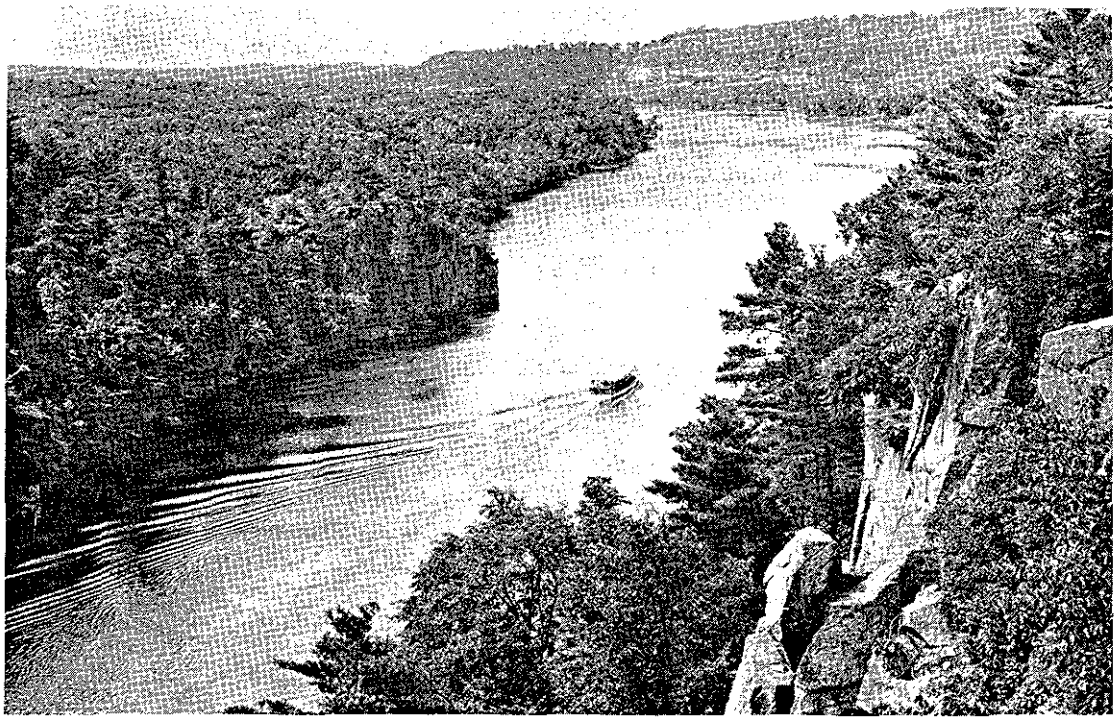
The oldest rocks in the area are Precambrian in origin and are composed primarily of metamorphic and volcanic material. These are overlain in some sections by interbedded sedimentary and extrusive volcanic rocks of Keweenawan age, and these are in turn covered in places by the Cambrian Dresbach and Franconia sandstones, unconsolidated glacial sands, clays, silts, sedimentary rocks, and gravels. The Franconia sandstones exist only in the lower St. Croix basin.

The St. Croix valley was formed in two stages by water from two glacial lakes. The lower valley, below the Cities of Taylors Falls and St. Croix Falls, was made first. This section was carved out by water from glacial Lake Grantsburg which spread over the land from Grantsburg, Wisconsin, westward into east central Minnesota. As the ice melted, this lake rose until it finally spilled over its banks at a point near Taylors Falls and St. Croix Falls. There the water streamed southward, carving the lower St. Croix valley to the Mississippi. Later, when the level of the lake fell, this river ceased to flow. Then, in the course of many centuries, glacial Lake Grantsburg dried up, leaving a sandy plain.

Later, glacial Lake Nemadji was formed by water ponded between a retreating ice front and a divide at the southwestern corner of Lake Superior. This lake drained through an outlet discharging into the Kettle River and the St. Croix River. Lake Nemadji later connected



13 & 14. The sheer rock surfaces and unusual rock potholes of the Dalles of the St. Croix are striking geologic features.



with glacial Lake Brule to become glacial Lake Duluth, which drained into the St. Croix River. The major outlet for these waters became the St. Croix drainage basin. As the glacier retreated, sediment was carried away by outwash streams and ultimately deposited along their course. With each episode of advance and retreat by the glacier, new deposits in the form of terraces were developed. As the continental glacier melted and decreased in weight and size, the earth's crust was relieved of a tremendous pressure. This pressure release caused the crust to rise and was accompanied by further retreat of the glacier. The result was that the St. Croix River no longer drained ancient Lake Duluth but split to form two river valleys--the south flowing St. Croix and the north flowing Brule.

Near Taylors Falls the river has patiently cut and exposed up to 10 layers of lava rock mantled by deposits formed during three separate glacial episodes. These sheer rock surfaces and unusual rock potholes are striking geologic features.

Soils

The St. Croix River flows through a deep valley with occasional bluffs of sandstone and limestone for most of the distance between Taylors Falls and Stillwater. Many of these bluffs have a thin mantle of silt or sandy loam over rock. From south of Bayport to Afton there are large, nearly level terraces composed of sand and gravel. There is very little alluvial land along this stretch of the river, but nearly level sand and gravel alluvial fans have formed at the mouth of almost every stream that flows into the river. Flooding is frequent on these fans and on the adjacent small areas of alluvial land. There are also numerous low sandy islands and bars in the upper reaches of the study segment that are frequently used for camping, picnicking, and other river-oriented recreation. The islands are constantly forming and reforming as erosion eats away at the upstream end of the island or deposits soil material at the downstream end. These islands are frequently flooded during high water stages.

Most of the soils in these areas have moderate to severe limitations for most recreational uses principally because of flooding, slope, or rockiness. The flooding is common early in the spring, before seasonal use, but may occur at other times as a result of local heavy rains. Even though the limitations are quite restrictive, development of these areas can be worthwhile because of the very scenic nature of the river and surrounding lands.

A limited sediment problem exists on the study sector of the river. The origin of materials here is primarily sandy land; thus, the waters are usually free of silt and relatively clear. However, there is considerable bed load movement of sand and gravel in the river bed. The

source of this material is confined to the lower St. Croix River basin. The Northern States Power Company dam at St. Croix Falls at the upper end of the study segment is an effective barrier to movement of this sediment from the upper basin.

Much of this sediment is a result of geologic erosion of glacial till deposits. However, accelerated erosion as a result of road and building construction, sand and gravel operations, agriculture and streambank erosion is occurring.

Flora

The early logging operations left few of the original white pine or red pine stands except in isolated, steeper situations, where a few virgin tracts of these stately conifers still exist. The remaining pine are mainly second growth, principally located on the higher ground. They are intermixed with ironwood, elm, oaks, and silver and sugar maple. Basswood, hackberry, dogwood, paper birch, and aspen occur less frequently.

Near the river, in moister situations, and on most of the numerous islands, several species of deciduous trees densely vegetate thousands of acres along the river. Boxelder, silver maple, elm, ash, and cottonwood are well represented in this zone. Forming an understory or occupying cut-over areas are such species as chokecherry, dogwood, mountain maple, thorn apple, highbush cranberry, and elderberry.

Periodic flooding of the lowlands has resulted in a river bottom ecology favoring hydrophytic species along many parts of the river. In selected lowland sites white cedar, tamarack, spruce, willow, and alder appear.

Timber stands are generally composed of mature second growth. Dominated as it is now by a variety of hardwoods, with an intermixing of conifers, the lower St. Croix valley has become an important fall attraction. Thousands of people come here each September and October to observe, photograph, and otherwise enjoy the spectacular panorama of colors which blanket the valley. Autumn coloring of the mixed deciduous trees is spectacular. Among the trees and shrubs that provide a kaleidoscope array of fall color are the maples, oaks, hickory, and evergreens.

Ground cover plants are both numerous and varied. They range from primitive mosses and lichens through ferns, fungi, and spermatophytes. Mushroom hunters find considerable variety here, but they probably concentrate most on the tasty morels which are avidly sought after each spring.

Flowering plants of interest include the trillium, anemone, water marigold, wild strawberry, jack-in-the-pulpit, skunk cabbage, Solomon's seal, wild geranium, forget-me-nots, asters, goldenrod, and wild rose. Some less popular species include poison ivy, stinging nettle, and beggar's ticks.

Various flowering shrubs are valued both by man and wildlife. Adding beauty and fragrance to the landscape, they also furnish food and cover. They include chokecherry, juneberry, dogwood, snowberry, elderberry, wild grape, pincherry, raspberry, and hingbush cranberry.

Aquatic vegetation is relatively sparse in the river channel. Periodic high water and floods have resulted in a scoured condition. This, in combination with the rubble and boulder-covered bottom, has discouraged the establishment of most aquatic plants. The most important exceptions are wild celery and river pondweed. In protected backwater areas and sloughs other species of pondweeds, naiads, cattail, coontail, rushes, sedges, sagittaria, bur-reed, and duckweek appear. However, such areas are generally offstream, and these plants often go unnoticed by river travelers.

Fauna

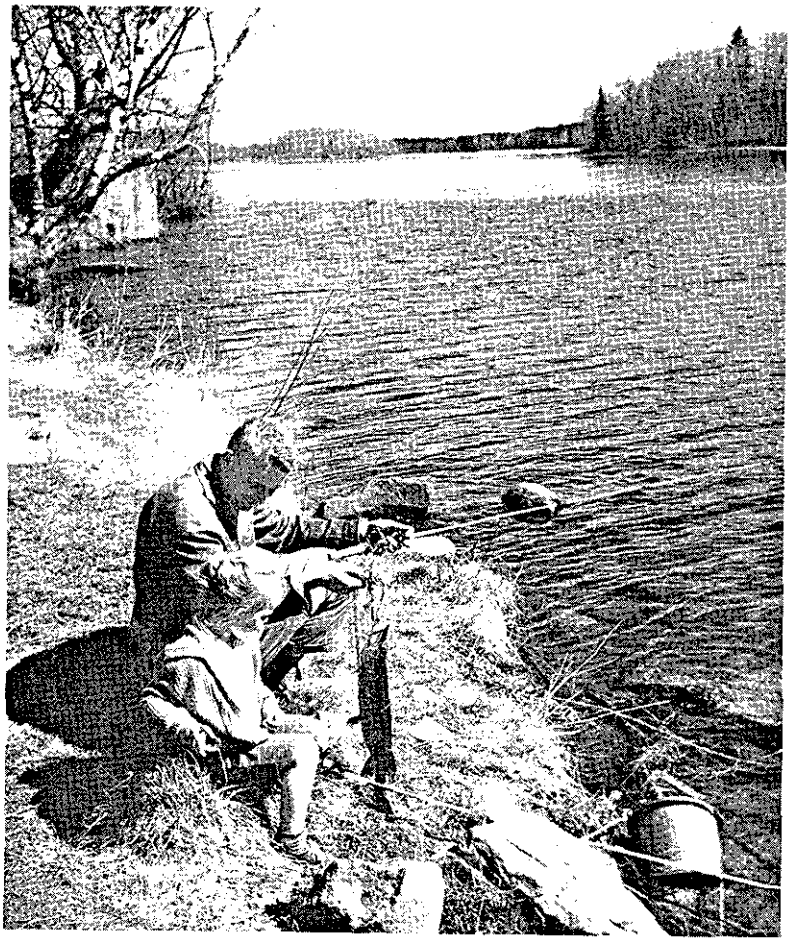
Fisheries. The Lower St. Croix fishery is strongly influenced by the Mississippi River and its fish species. The dam and natural barrier at Taylors Falls prevent fish movements between the lower and upper St. Croix River. This has tended to limit the fish distribution, separating it into distinct but rather similar fisheries.

The game fish most sought after by sport fishermen are the walleye, sauger, northern pike, smallmouth and largemouth bass, white bass, black crappie, white crappie, yellow perch, rock bass, bluegill, and other sunfish species. The fish species normally harvested commercially are the carp, buffalo, catfish, drum, and suckers. Quillback, redhorse, and, occasionally, eels are also taken. Other major predator forage fish include the dogfish, mooneye, gizzard shad, gar, log-perch, and burbot. In addition, two species present, but considered uncommon, are the shovelnose sturgeon and paddlefish. The lake sturgeon, a rare species, is also present.

In order of abundance, crappies, white bass, sunfish, and carp are the most common. These species are followed by the sauger, walleye, smallmouth bass, redhorse, and suckers.

Fishing is generally concentrated on sauger, walleye, and panfish in the lake, while smallmouth bass are more sought after in the upper reaches above Stillwater. Northern pike are less frequently taken throughout. Above Stillwater muskies are taken, though rarely. Near Hudson rainbow trout are occasionally caught, mainly incidental to other fishing.

Winter fishing is important in the area between the Stillwater highway bridge and the Hudson railroad bridge and is also popular near Prescott. Sunfish, crappies, white bass, walleye, sauger, and perch are the more important species taken in the winter.

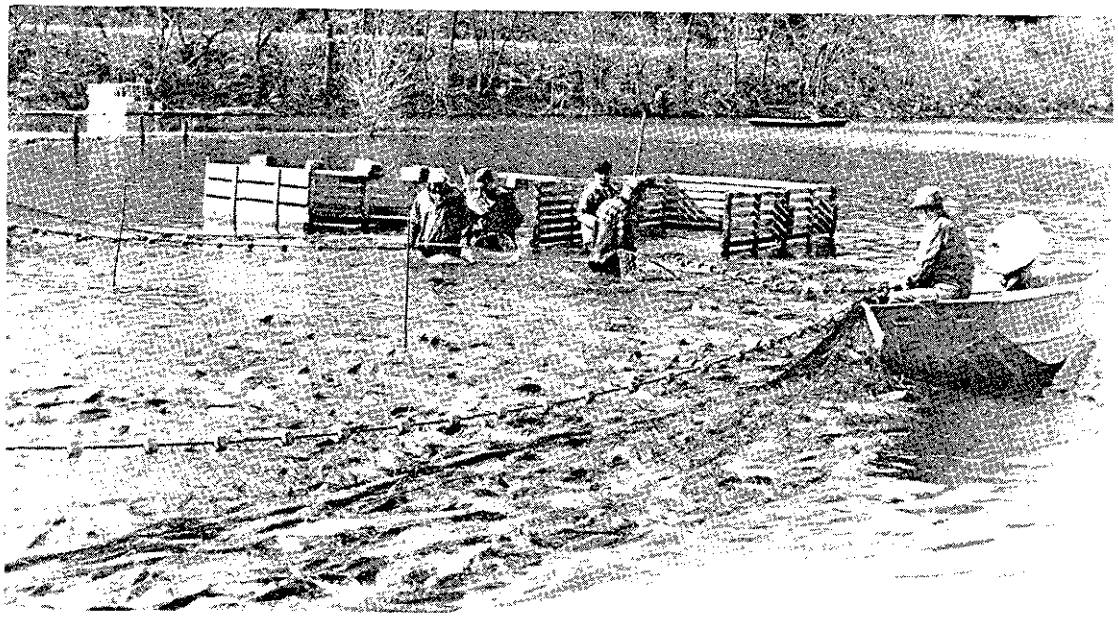


15.

Fishing the lower St. Croix is enjoyed by people of all ages.

16.

A limited amount of commercial fishing occurs on the lower St. Croix.



The State of Wisconsin has active trout stocking programs for Apple and Willow Rivers tributaries.

Fish netting samples taken in 1970 in the Kinnickinnic River listed 10 different species. Listed in their order of abundance are shiners, long-nose dace, white sucker, creek chub, short-nosed dace, log perch, bluntnose minnow, carp, Johnny darter, and green sunfish. This sampling of the Kinnickinnic River should give an indication of the species composition in the other tributary streams.

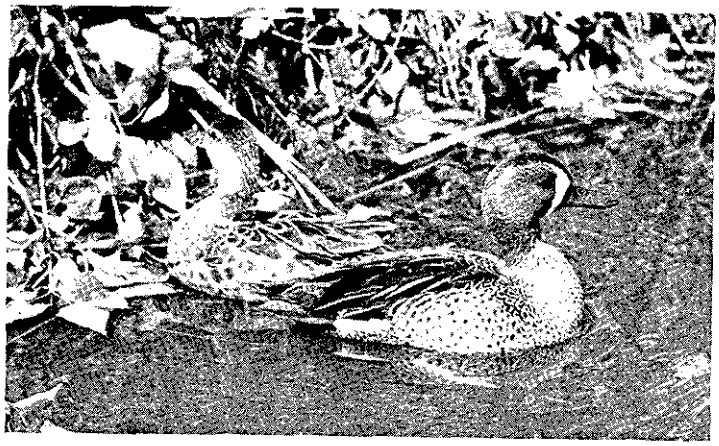
The lower St. Croix River contains a fresh-water mussel (Lampsilis higginsi) which is of more than passing interest. Once widely distributed in and commercially important in some portions of the upper Mississippi River system, this species is now rare and in danger of extinction. It is a candidate for inclusion on the list of endangered species published by the Department of the Interior. At present, this large and beautiful fresh-water mussel is known to survive only in the Minnesota River above New Ulm, Minnesota, where it is threatened by a dam; in the Mississippi River, but only sporadically because of pollution; in the Meramec River, Missouri, where a dam also threatens its survival; and in the lower St. Croix River. Assuring the integrity of the St. Croix, including the elimination of pollution is, therefore, extremely important to the preservation of this rare species in the United States.

Wildlife. The St. Croix River, within the study reach, provides a natural travel lane, as well as permanent residences for many game and nongame animals. The relatively steep walled valley is well covered with numerous species of trees, shrubs, and herbaceous plants that are highly attractive to a variety of wildlife.

Many different species of waterfowl utilize the river during the annual spring and fall migrations. During migration, surface feeding ducks include widgeon, mallard, wood duck, blue and green-winged teal, pintail, gadwall, black duck,and shoveller. Diving ducks, primarily the lesser scaup, ringneck, goldeneye, canvasback, and redhead, frequent the river. The valley's breeding ducks are primarily confined to wood duck, mallard, and blue-winged teal.

Marsh and shorebirds include Wilson's snipe, rails, woodcock, gallinules, and several species of sandpipers. These birds occupy shoreline and lowland habitats along the lower St. Croix.

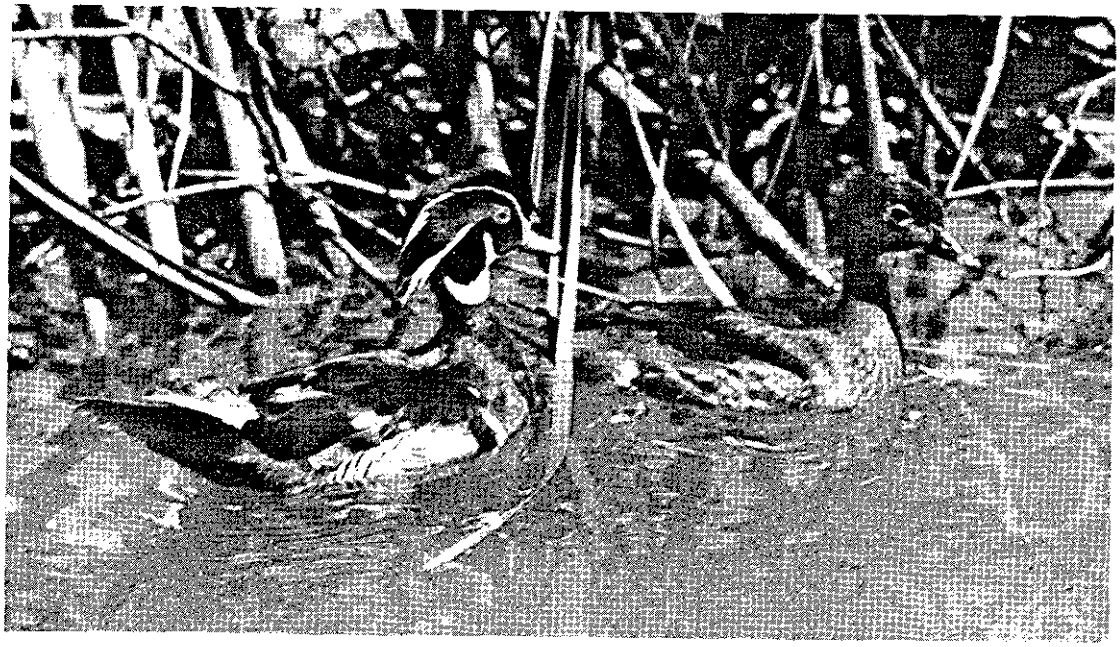
Several species of upland game birds inhabit the lower St. Croix valley. Ruffed grouse are present in limited numbers. Mourning doves are abundant throughout the river valley and are nesting residents. However, they are not a legal game bird in either Minnesota or Wisconsin.



17. *Blue-winged Teal.*

18. *Mallard.*

19. *Wood Duck.*



A few bobwhite quail and pheasants occur along the valley, principally in association with agricultural lands edging the lower end of the valley.

The mast producing trees, principally oak and hickory, provide an excellent food supply for gray squirrels and fox squirrels. Cottontail rabbits are common on the higher ground. Snowshoe hares occur in isolated locations where suitable cover exists. Other species heavily dependent upon woodland habitat include the porcupine, red squirrels, and flying squirrels.

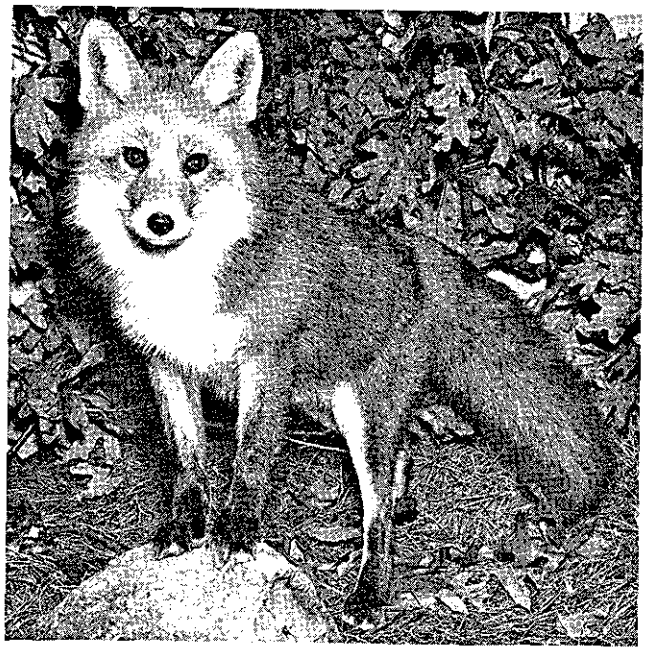
White-tailed deer are common. They have made an excellent comeback along the river since the 1930's, due largely to the improved protection and management programs of both states. Black bear are uncommon but are occasionally reported.

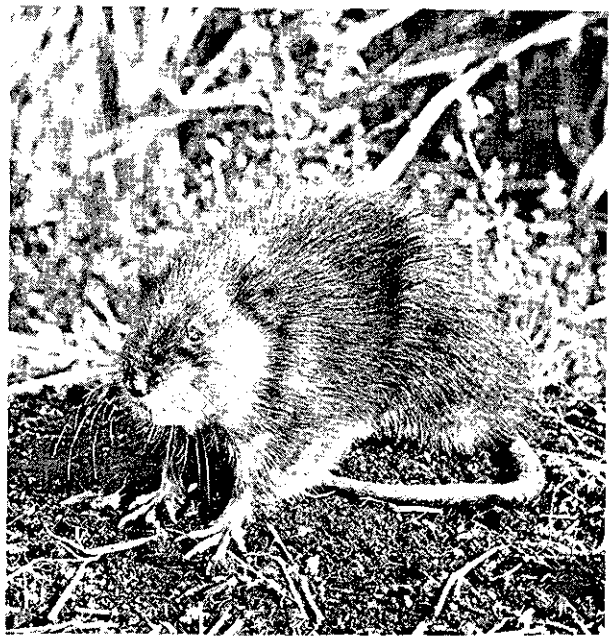
Muskrat, mink, raccoon, fox, and skunks are common along the lower St. Croix. Beaver occasionally take up residence in the tributary streams. Otter and opossum are present but uncommon. Trapping activity is generally very limited.

Numerous nongame species of wildlife provide aesthetic and intangible values to bird watchers, wildlife photographers, and other outdoor recreationists who find enjoyment in nature's beauty. The sight of brilliantly plumaged birds such as cardinals, tanagers, and grosbeaks or the songs of warblers and thrushes heard throughout these woodlands cannot be valued in terms of money, but their worth is no less real.

The diversified fauna of the St. Croix valley attracts many people to the area. The rich variety of animal life, especially the avifauna, is due to several factors. These include the midcontinental location, with overlapping ranges of eastern and western species; climatic conditions in the sheltered valley; and the merging of differing life zones. These factors have enabled a number of southern birds to extend their ranges northward in the valley. Among this group are the Carolina wren, mockingbird, cardinal, and several warblers.

Great blue herons and common egrets are a prime viewing attraction each fall. Another autumn attraction is the hawk migration along the bluffs. In addition to numerous red-tailed hawks and other broad-winged species, falcons, ospreys, and eagles migrate through the valley. Turkey vultures, gulls, and terns may be observed along the river, and the pied-billed grebe and little green heron are frequently sighted. The spring and fall migrations of warblers are annual highlights for enthusiastic bird watchers.





The small mammals inhabiting the lower St. Croix region include shrews, bats, moles, mice, chipmunks, and ground squirrels. These small animals are gaining increasing recognition for their ecological role in the natural system. They serve an important function as buffer species between predators and game birds.

Numerous reptiles and amphibians are native to this area. These include salamanders, toads, frogs, turtles, snakes, and skinks. These forms add considerable interest and variety to the area fauna.

Hunting and fishing would be permitted on riverside lands under applicable federal and state regulations if the lower St. Croix is included in the national wild and scenic rivers system. It may be necessary, however, to designate zones and establish periods when no hunting would be permitted for reasons of public safety, administration, or public use and enjoyment.

History and Archaeology

The St. Croix valley was inhabited for many centuries by the Indian. Archaeological evidence indicates that a culture flourished in this area as long as two thousand years ago. The Dakota Indian Nation, later know as the Sioux, were the early inhabitants.

During the sixteenth century another Indian Nation, the Ojibway, or more popularly, Chippewa, began to move into this area from regions north and east of the St. Croix valley. The Chippewa were forced from their old home in the St. Lawrence valley by the powerful Iroquois Confederation.

The entry of the Chippewa into the long-held lands of the Dakota threw the two tribes into conflict. Battles at Mille Lac, the Dalles, Point Prescott, Battle Hollow, and numerous small forays into each other's country finally resulted in the Sioux being driven from their old home and forced to take up residence in the southwest area of the lower St. Croix region. However, tribes continued to raid each other's land.

The seventeenth century saw not only the continuation of the conflict between the Chippewa and the Sioux but also the coming of the first European to the valley. The first such man of which a record exists is Daniel Greysolon, Sieur du Lhut (Duluth). In 1680 he traveled from Lake Superior down to the Mississippi and passed along the St. Croix and Brule Rivers. Duluth, along with other French explorers, claimed the whole of the Great Lakes region and thereby the St. Croix valley for France. Gallic claims before Duluth's went as far back as the explorations of Jacques Cartier in 1534 and Samuel de Champlain in 1608.

Although this river is called the St. Croix, at the time Duluth made his expeditions in the region it was not referred to by this name. The exact origin of the name St. Croix has been lost in time. However, most historians believe that a companion of Duluth, a Sieur de la Croix, was shipwrecked at the junction of this river and the Mississippi. Later explorers and adventurers who knew of this story, Duluth not among them, appear to have altered this man's name and popularized it as the name of the river.

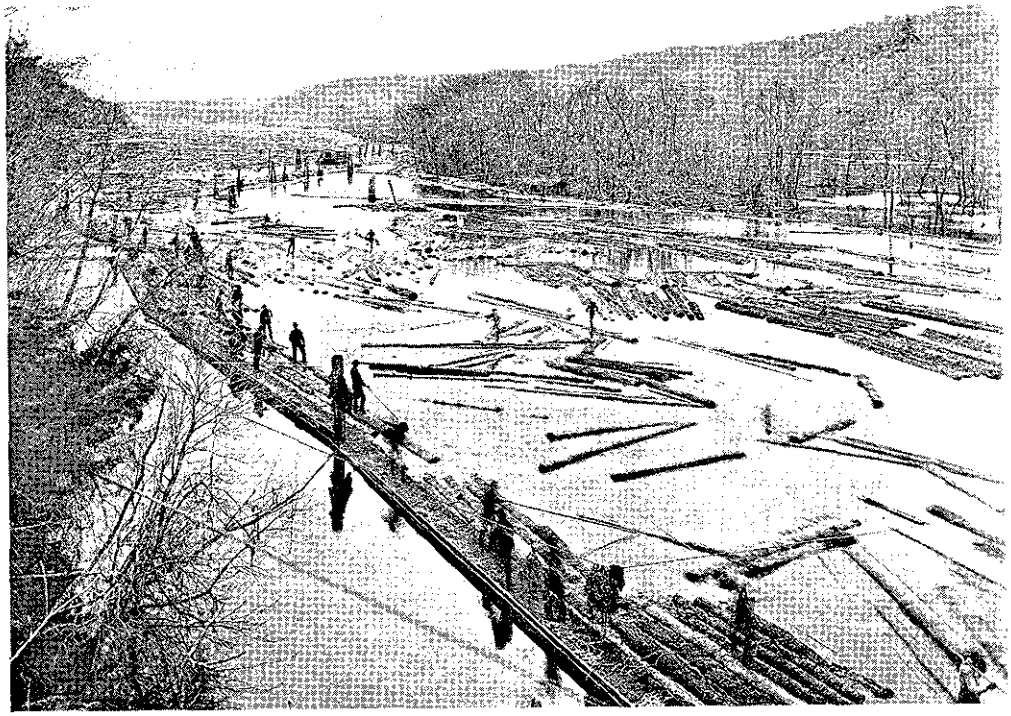
The St. Croix valley region would not have held the attraction for these early explorers if it had not been for an economic incentive for development. The valley was rich in fur-bearing animals, and with the constant search for more pelts for the European markets the area was a natural place for the establishment of trading posts. One particularly important adventurer in this respect, a contemporary of Duluth, was Pierre Charles le Sueur. During the early years of the eighteenth century, le Sueur organized a trading network which loosely stretched from Lake Superior to the Mississippi, passing through the valleys of the Brule and St. Croix.

At the beginning of the second quarter of the nineteenth century, fur trading in the St. Croix valley was on the wane. Most of the fur bearing animals had either been caught or driven away. The fur industry which had seen the successive rule of the French, British, and Americans in the St. Croix valley came virtually to a close by 1830.

The first fort built within the St. Croix basin was erected at Point Prescott to control Indian hostilities, although this proved to be a nearly impossible task. It was thought that less conflict would result if some type of boundary existed between the Chippewa and Sioux Nations. A conference was held in 1825 and a peace treaty signed by both tribes in which an imaginary boundary line was drawn dividing the Sioux of the southwest valley region from the Chippewa of the northeast. The line ran approximately diagonally from southeast to northwest and crossed the St. Croix at Cedar Bend, a point about eight miles below the Village of Osceola. Unfortunately, the boundary line did little to stop the warfare between the Sioux and Chippewa.

Indian domination of these lands could not, however, last long, for by the 1830's the great pine forests of the upper St. Croix began to attract American lumbermen from Maine. Besides lumbermen, pressure to remove the Indian and open these lands also came from the settlers who had been pouring into the area which was to become the State of Wisconsin. With these forces in operation, 1837 saw two treaties negotiated between the government, the Sioux, and the Chippewa which acquired the Indian lands in the St. Croix basin.

New industry came to the region in the 1830's, when lumbermen began the removal of the white pine. The first sawmill to produce lumber



24. The St. Croix served as a logging highway in the late 1800's.

was located at Marine and sawed its first log in 1839. By 1840 the lumber industry had brought considerable growth to the area. Settlements had been established at St. Croix Falls, Marine, Stillwater, Taylors Falls, and Prescott. The 1804's saw continued expansion with sawmills being built at Stillwater, Osceola, Arcola, and Hudson.

The first years of the twentieth century saw the production of lumber in the St. Croix valley fall sharply. The last log was sent down the St. Croix in 1914. Soon, the old lumbermen of the valley had either retired, faded into obscurity, moved into the new boom areas farther to the west, or transferred their interests out of lumber.

Twentieth century development in the St. Croix valley following the end of the lumber industry was confined to the period after World War II. From the end of the lumbering era to the appreciation of the vabley's resources as a recreational facility, the area was in slow economic decline. There were few businesses or people attracted to the valley. Recreation, however, has once again brought the St. Croix valley into the forefront of many mid-westerners' minds.

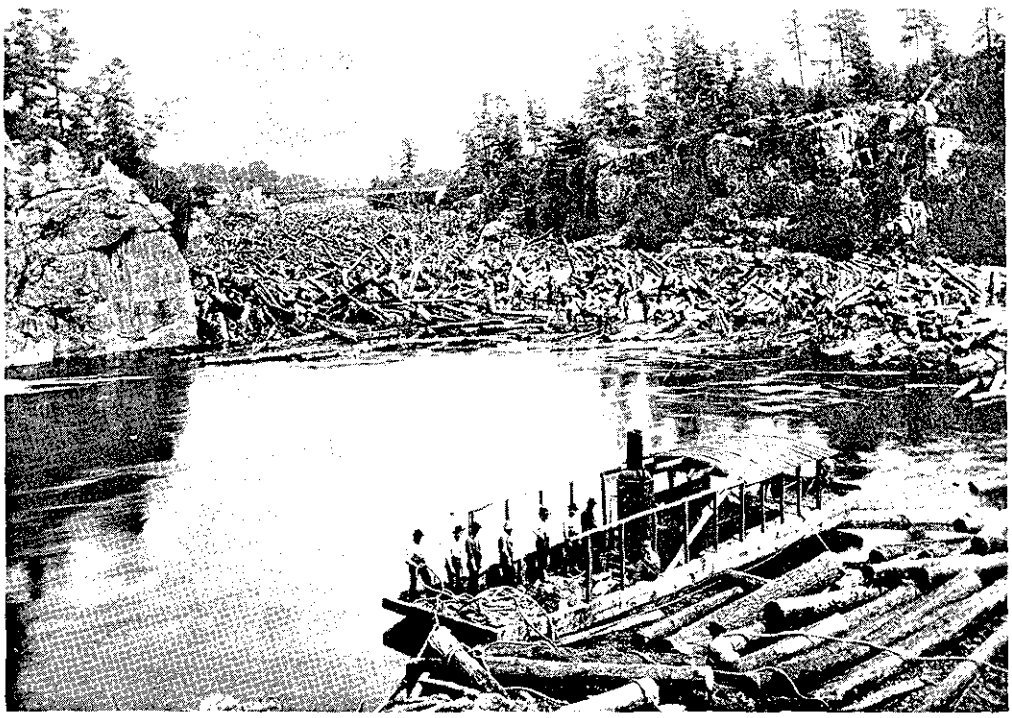
In general, the only element of this area's history which gained national importance was the lumber industry. There was no one part

of this industry in the valley which achieved national significance by itself. Rather, its significance came from the role the valley loggers played in the lumbering era which as a whole formed a significant part of the nation's heritage. Unfortunately, there is very little which remains of this industry within the valley. There is not one sawmill still intact. In fact, the most that still exists are the ruins of the Marine Lumber Company's enginehouse on the banks of the St. Croix River in Marine-on-St. Croix, Minnesota. Three miles north of Stillwater on U. S. Highway 95, in a wayside park overlooking the river, is a marker which commemorates the spot where Isaac Staples, in 1856, built the boom which was to play such an important role in the lumbering industry in the valley.

The Stillwater Convention of 1848 led to the organization of Minnesota as a territory in 1849 and its eventual creation as a state. This was an event of special significance, but all that remains is a plaque affixed to a building at the corner of Main and Myrtle Streets in Stillwater.

Other places where historic events took place, such as the various Indian battles of the Chippewa and Sioux conflict, early fur trading posts, other sawmill sites along the river, settler's first homes, etc., appear to be of local significance.

25. Log jam at Taylors Falls, Minnesota, in 1886.



Access

In the 52-mile study stretch, nine bridges cross the lower St. Croix River. Three serve U. S. highways, two serve state highways, and four serve railroads.

Other than at riverfront communities, only minor road segments closely parallel the river. Due to the bluffs along many portions of the river, few roads have been constructed along the river's edge. Numerous private roads lead to riverside properties; however, these provide little or no access of any kind for the public.

State designated boat access is limited, especially in the lowermost stretches. State parks which provide boat access on the study reach are the Wisconsin Interstate Park, the Minnesota Interstate Park, and William O'Brien State Park. The Minnesota Highway Department maintains a walk-in access off the Boomsite Wayside on State Route 95 just north of Stillwater.

Other publicly owned boat ramps on the lower St. Croix are:

Public Ramps:

Prescott Public Ramp (below mouth on Mississippi)
Black Bass Bar Access (Troy Township)
St. Croix Cove Access (Troy Township)
Hudson Lakefront Park Ramp
North Hudson Access (unimproved)
Bayport Park Landing
Stillwater Park Landing (Wisconsin side - unimproved)
Twin Springs Access (above Houlton)
Marine Ferry Road (across from Marine-on-St. Croix)
Otisville Access (unimproved)
Franconia Access

Numerous boat access areas are provided by private parties. Generally these areas are of two types--those that furnish access and facilities to the general public for a fee and marinas that cater to individuals on a contract basis. These areas, by type, along the lower St. Croix are:

Fee Access	Location
Hastings Marine*	Hastings, Minnesota
Bob's Place	Point Douglas, Minnesota
Kinnickinnic Resort (rental only)	Near Kinnickinnic Delta
Windmill Marina	Afton, Minnesota

*Located on Mississippi River; however, a large percentage of its clients use the lower St. Croix River.

Fee Access (con't)	Location (con't)
Beanie's Resort	Lakeland, Minnesota
Royal Marine, Inc.	Hudson, Wisconsin
Bayport Ramp	Bayport, Minnesota
Sunnyside Marina	Oak Park Heights, Minnesota
Muller Marine	Stillwater, Minnesota
Rumph Harbor	Stillwater, Minnesota
Marine Boat & Canoe Service	Marine-on-St. Croix, Minnesota
Camp Croix	Osceola, Wisconsin
Muller Canoe Rental (canoes only)	Taylors Falls, Minnesota
Contract Access	
Kings cove*	Hastings, Minnesota
Captain Dick's	Prescott, Wisconsin
St. Croix Riviera	Near Kinnickinnic Delta
Afton Chris Craft	Afton, Minnesota
St. Croix Yacht Basin	Hudson, Wisconsin
Wolf Marine	Stillwater, Minnesota

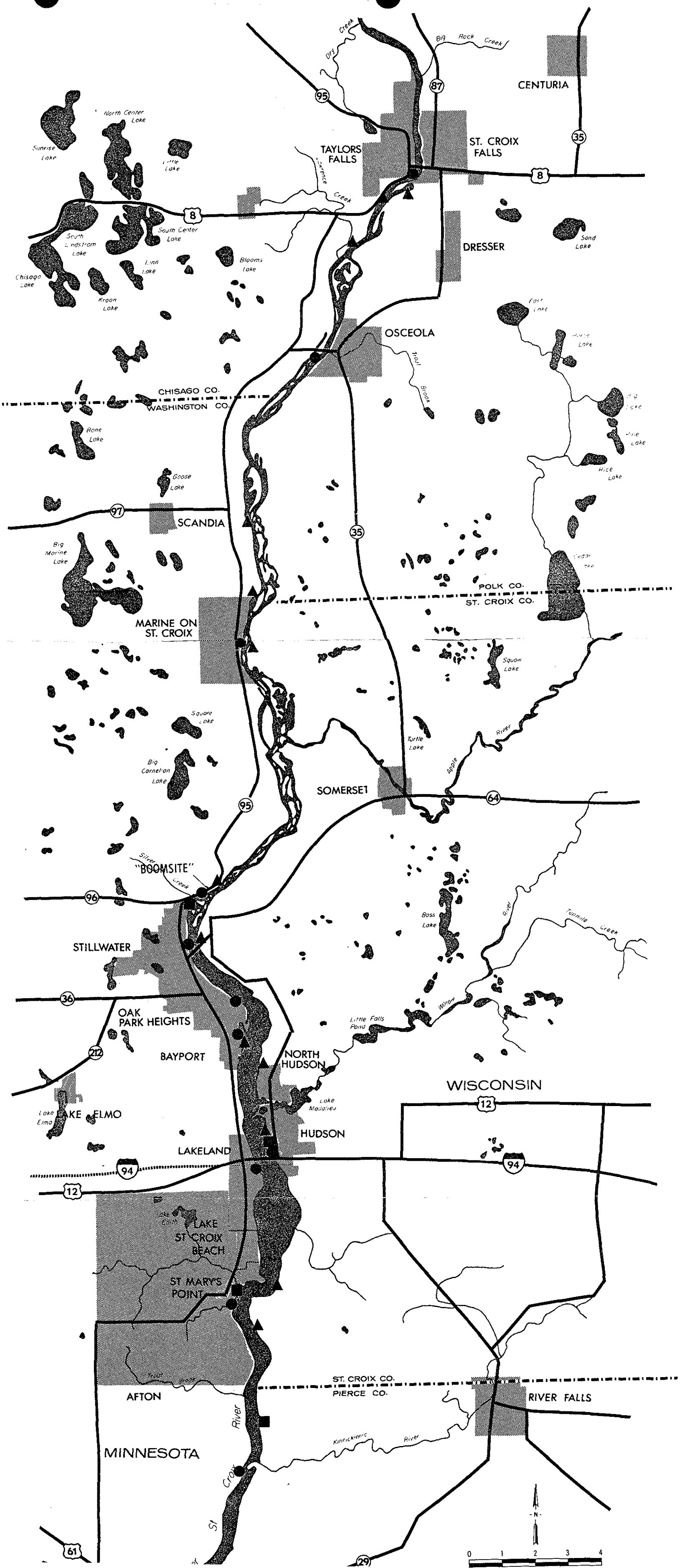
Land Use

Agriculture

Farming is the dominant use in the lower St. Croix River area. As might be expected, the area's agriculture activity is oriented toward the nearby metropolitan markets. Livestock, dairy, and cash grain farming and the growing of specialty crops, such as apples, are common. Row crop agriculture with corn and small grains predominates. Virtually all the agricultural land within the river corridor lies behind the bluffs.

A high percent of the agricultural land is managed under good soil conservation practices such as contour and strip cropping, grassed waterways, and sediment control structures.

*Located on Mississippi River; however, a large percentage of its clients use the lower St. Croix River.


CENTURIA
ST. CROIX FALLS
TAYLORS FALLS
DRESSER
OSCEOLA
SCANDIA
MARINE ON ST. CROIX
SOMERSET
"BOOMSITE"
STILLWATER
OAK PARK HEIGHTS
BAYPORT
NORTH HUDSON
HUDSON
LAKE ELMO
LAKELAND
LAKE ST CROIX BEACH
ST MARY'S POINT
AFTON
RIVER FALLS
WISCONSIN
MINNESOTA
CHISAGO CO.
WASHINGTON CO.
POLK CO.
ST. CROIX CO.
PIERCE CO.
North Center Lake
Sunrise Lake
Little Lake
South Center Lake
South Lindstrom Lake
Linn Lake
Chisago Lake
Kroon Lake
Blooms Lake
Sand Lake
Bone Lake
Goose Lake
Big Marine Lake
Square Lake
Big Carnelton Lake
Squaw Lake
Turtle Lake
Boss Lake
Little Falls Pond
Lake Mallalieu
Lake Elmo
Dry Creek
Big Rock Creek
Trout Brook
Silver Creek
Apple River
Willow River
Tenmile Creek
Kinnickinnic River
St Croix River
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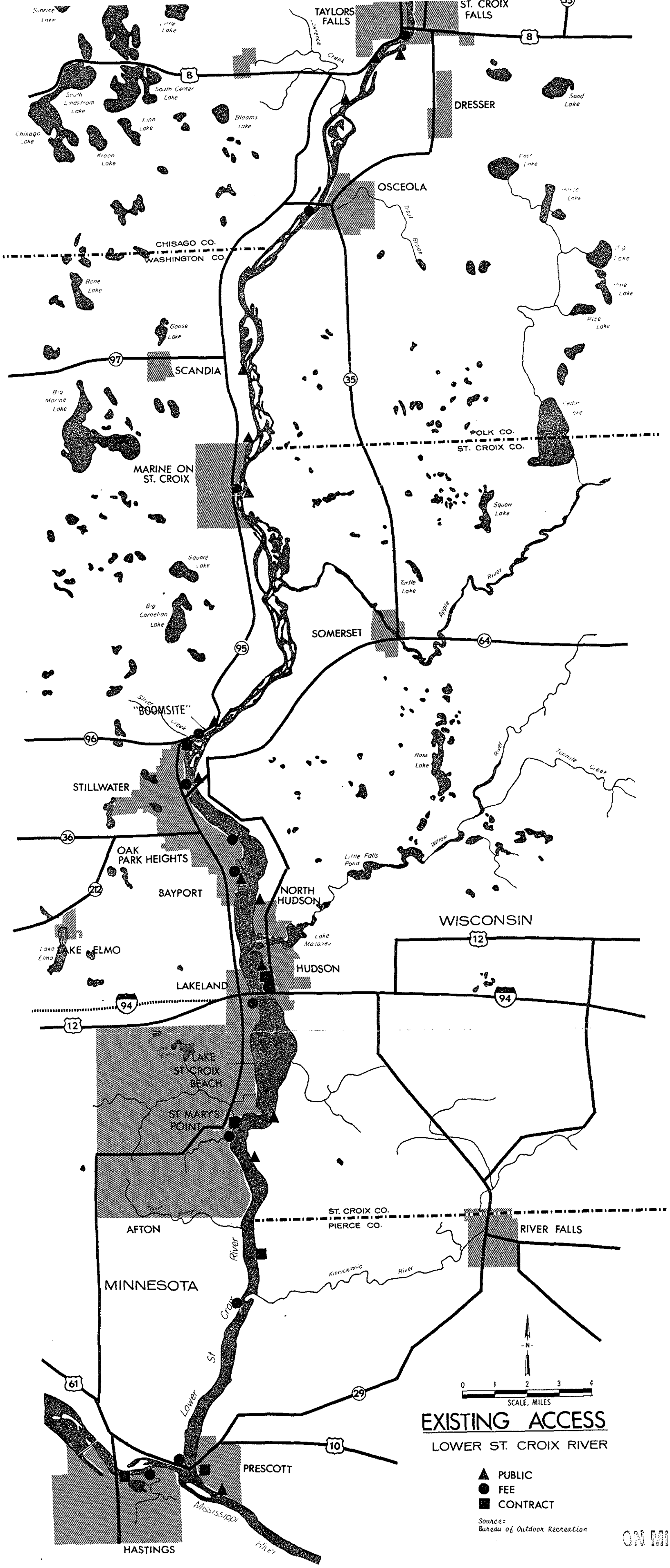

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Table 2

Land Use--Entire St. Croix River Basin

Use	Acres	Percent
Cropland	1,100,663	23
Pasture (Permanent)	406,500	8
Forest	2,645,692	56
Urban and Built-up	232,346	5
Other	375,032	8
	4,760,233	100

Table 3

Land Use--Five Counties Bordering Lower St. Croix

Use	Acres	Percent
Cropland	594,100	44
Pasture (Permanent)	152,223	11
Forest	398,567	30
Urban and Built-up	87,833	7
Other	101,471	8
	1,334,194	100

Table 4

Land Use--River Corridor within Study Area*

Use	Acres	Percent
Cropland	6,988	17
Pasture (Permanent)	538	1
Forest	15,901	37
Urban and Built-up	17,426	41
Other	1,613	4
	42,466	100

*River corridor below St. Croix Falls consisting on one-quarter mile back from the bluff lines and one mile up to the major tributaries.

Recreational use of the lower St. Croix does not conflict with the farming enterprises in the valley. With cooperation and careful planning, the river valley can accommodate both agriculture and recreation.

Forestry.

At present, forests cover 30 percent of the five counties bordering the lower St. Croix and 37 percent of the river corridor within the study reach of the river. At this time, there is little harvesting of timber and manufacture of timber products. Most of the forest cover is along the streams on the steeper terrain and in wetland areas. There are some scattered farm woodlots.

The primary uses of the land in forests are watershed protection, wildlife habitat, recreation and environmental enhancement. This is expected to continue in the future, especially in the river corridor.

The hydrologic condition of the forest land is fair to good. In general, it yields relatively small amounts of sediment and surface run-off.

Oak Wilt disease is present in the area and is causing concern. The U. S. Forest Service, in cooperation with the States of Wisconsin and Minnesota, is currently making an Oak Wilt survey in the lower St. Croix to determine the severity of the problem. There is also some incidence of Dutch Elm disease in the area.

With the expanding urban populations of the metropolitan area, the need for open space is placing heavy demands on the forested areas in the region. Considerable impact on the forest land could result from the inclusion of the lower St. Croix in the wild and scenic river system. Fire control is not a serious problem now in these predominantly hardwood types but could become so with increased recreation use of the river and the adjacent forest land. Heavy use of sites for camping, picnicking, and hiking could lead to excessive surface run-off, soil erosion, and sedimentation due to a reduction or loss in natural ground cover if proper planning and development measures are not undertaken.

Urbanization and Rural Development

A significant portion of the river corridor is occupied by towns and villages. In addition to this, there are numerous summer and year-round homes built along the river and the bluffs. High-rises, town-houses, condominiums, and planned unit developments are presently being proposed for the first time in several areas along the river.

Land Ownership

Nearly 14 percent of the 114 miles of river frontage on the lower St. Croix is owned by the States of Minnesota and Wisconsin. This ownership amounts to over 15.8 miles of frontage. The state-owned areas which are included in these figures are the two Interstate Parks, William O'Brien State Park, Afton State Park, the St. Croix Islands Public Fishing and Hunting Grounds, the proposed Kinnickinnic State Park, and several smaller tracts owned by the respective states.

Nearly 23 percent of the river frontage is within the boundaries of 14 incorporated river communities. This amounts to approximately 26 miles of river frontage. The major portion of this land is privately owned.

Quasi-public youth camps control approximately four miles of river frontage or over three percent of the total frontage. This involves six camps.

Nearly 83 percent of the total river frontage (94.2 miles) is in some form of private ownership. Private ownership is fragmented, in most cases, with small riverside lots common. No major private ownership exists along the lower St. Croix.

Island ownership in the river is varied. Many of the islands have not been surveyed and are a part of the public domain. In some instances, patents may have been issued. In other cases, the states may claim title under the Swamplands Act. Presently, 24 islands, including nearly 105 acres, are federally owned. These islands are mainly in the area north of Stillwater and near Osceola. Eighteen of the federally owned islands are in Minnesota and six are in Wisconsin. An additional 15 islands (45 acres) are in state ownership and 20 islands (60 acres) in private lands.

The following tabulation shows the land ownership pattern occurring along the lower St. Croix River, based on miles and percent of river frontage:

Table 5

Land Ownership

Ownership	River Frontage (miles)	Percent
State of Minnesota	5.2	4.6
State of Wisconsin	10.6	9.2
Quasi-public	4.0	3.5
Private	94.2	82.7
Total:	114.0	100.0

Water Rights

Both Minnesota and Wisconsin operate under a modified form of riparian water rights typical of the eastern states. Both states incorporate in their Constitutions clauses of the Northwest Ordinance, which provide that the public shall have the right to use the navigable rivers for navigation and other public purposes, including, as affirmed by the courts, recreation purposes.

The study reach of the St. Croix comes under the definition of navigable waters at both state and federal levels. Since navigability is commonly the test which must be satisfied before broad public rights attach to waters, the public's right to the use of the waters of the lower St. Croix River has been clearly established.

The laws of each state differ as to ownership of the streambed, but the exclusive rights of riparian owners and coexisting public rights, as defined largely through court decisions, have been determined to be basically the same in both states, with the public (state) rights considered paramount.

In Wisconsin, the owner of the streambank owns the streambed to the middle or thread of the watercourse.* In some recent cases, the court has suggested that the state has a qualified title in the streambed for protection of public rights adhering to navigable waters, and that the state holds the underlying bed in trust for all its citizens, subject only to the qualified title of the riparian owner in the streambed.

In Minnesota, the state is the absolute owner of the beds of navigable watercourses and of the overlying waters, a doctrine commonly referred to as the Minnesota Trust Doctrine. In this case, a riparian owner's title to lands abutting navigable waters extends to the ordinary high watermark. He also has the right to use the waters, to have access thereto, and to encroach on these waters (pursuant to permit) up to the point where he does not impair navigability or other public purpose.

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* Since the St. Croix forms the interstate border in this reach, a Wisconsin riparian would own to the state boundary line which is defined in the Wisconsin Constitution as "the main channel." Because this would probably be interpreted to mean the main "navigable" channel (as it has been on the Minnesota-Wisconsin segment of the Mississippi River), Wisconsin riparian ownership of the streambed and state jurisdiction over the waters lie close to the Wisconsin shore at points and equally close to the Minnesota shore at other points.

The general rights of riparian owners in both states on the study reach include exclusive rights of access from his lands to the navigable channel of the river; the right to build and maintain suitable lands, wharves, and piers for his use, subject to permit and regulations to protect public rights; and to water his livestock or withdraw water for "domestic purposes."

Both states have Constitutional provisions giving them a concurrent jurisdiction over boundary waters. This is a regulatory right presently unimpaired by any congressional pre-emption. However, since the study reach is a federally designated navigation route maintained by the U. S. Army Corps of Engineers and the U. S. Coast Guard, there is federal authority to prevent obstructions and protect navigability of the lower St. Croix by preventing diversions of water.

Another difference between the laws of the two states relates to land accretion. In Wisconsin, any land which accretes on land belonging to a riparian owner (including the streambed) would become his private property. However, the court has ruled that a sudden disruption or avulsion, such as the sudden shift caused by a change in the course of the stream, does not give the gaining riparian the right to the "newly formed" lands. Thus, in general, islands formed by gradual natural accretion in Wisconsin would be private unless a public agency owns the shoreline. In Minnesota, where the state owns the streambed, individual accreted islands would be state-owned.

Zoning

The present status of state and local zoning along the lower St. Croix shoreline is relatively complex. With the two states, five counties, and the many municipal and township governments involved, a complete analysis is difficult.

The Wisconsin Water Resources Act (Chapter 614, Wisconsin Laws of 1965) provides for joint state-local action to protect shorelands and to minimize flood damages. Counties are required to enact shoreland regulations in unincorporated areas. Shorelands are defined as being "1,000 feet from a lake, pond or flowage; 300 feet from a river or stream or to the landward side of the floodplain, whichever distance is greater." Villages, cities, and counties are given the responsibility to adopt reasonable and effective floodplain zoning regulations along rivers and streams where flood damage may occur. If local units of government fail to enact and enforce adequate shoreland and floodplain regulations, the State of Wisconsin is empowered to enact ordinances for the local units

of government and cause them to be enforced. All three Wisconsin counties fronting on the study reach have adopted shoreland zoning which has been approved by the state. All three counties also have subdivision regulations which are acceptable to the state. However, only Pierce County has a floodplain zoning ordinance which is acceptable but not yet approved by the state. St. Croix County has a partial floodplain zoning ordinance but it is deficient in terms of state standards. Polk County has no floodplain ordinance. Provisions of the various zoning measures include setback from water, adequate ground disposal of sewage, lot size, avoidance of steep slopes, maintaining bank cover, boat house location, and protection of wetlands.

The State of Minnesota, in accordance with the authority granted in the Laws of Minnesota 1969, Chapter 777, also provides for statewide shoreland zoning. Minimum standards and criteria for the subdivision, and use and development of shorelands of public waters, have been established by the Department of Natural Resources. Many of the provisions of Minnesota's shoreland policies are similar to those of Wisconsin. Presently neither Chisago or Washington Counties have state approved shoreland zoning. This is due to the relatively recent passage of the Act and the recent release of guidelines. One major difference in Minnesota's shoreland policy is the establishment of a classification system for public waters. The classes, as defined by the Department of Natural Resources, are: Natural Environment Lakes and Streams, Recreational Development Lakes, General Development Lakes and Streams, and Critical Lakes. Each class has a different set of standards which must be followed, and the classification which should be sought for the lower St. Croix is Natural Environment Stream. Chisago and Washington Counties should adopt a Natural Environment classification for the lower St. Croix as soon as possible. For uniform zoning and river protection purposes, it would be highly desirable to have the affected Wisconsin counties adopt a parallel stream classification system.

The zoning measures provided by both states for shoreline protection are generally considered adequate for protection of shorelands of normal waters but not for rivers having a unique status. For these types of waters, more stringent controls would be desirable.

Zoning on a county and township basis varies throughout the length of the study reach. A high percentage of the river's edge is zoned rural residential or recreational residential. In these zones, year-round single-family dwellings, seasonal single-family dwelling, and a limited number of commercial uses serving recreational needs are permitted. Another major zoning type is conservancy districts. These zones are generally wetland areas and are established to protect and preserve the natural character of certain lands for their values to wildlife,

water conservation, flood control, and other public purposes. It should be noted that St. Croix County has a 150-foot conservancy district along its entire shoreline in which only restricted development is permitted. The total zoning picture is complex and far from uniform.

Until an effective river protection plan can be implemented, protection from adverse development is necessary. In an effort to accomplish this, the objectives and recommendations listed below were developed and presented to the St. Croix River Intergovernmental Planning Conference in October 1970 for their consideration. These guidelines were endorsed by the Minnesota-Wisconsin Boundary Area Commission and recommended to the local units of government.

Zoning Objectives Appropriate for River Preservation

Rationale: In order to reduce the effects of over-crowding and poorly-planned shoreland development, to prevent pollution of surface and ground waters and erosion, to provide ample space on lots for sanitary facilities, to minimize flood damage, to maintain property values, and to preserve and maintain the exceptional scenic and natural characteristics of shoreland and adjacent water areas in this river corridor, all units of government are encouraged to control lot size and placement of structures on lots. This should be a regional objective carried out on a cooperative intergovernmental basis with each unit of government sharing the administrative responsibility for the river corridor.

Specific Measures Suggested for Zoning in Rural (Unincorporated) Areas: Development along the river corridor outside of incorporated boundaries should:

(1) be limited to single-family detached dwellings, agricultural or forestry uses;

(2) provide for lot sizes within the study reach of not less than two acres in size with at least a 200-foot width at the normal high water line and at the building line;

(3) discourage platting of lands within the river influence zone;

(4) provide setbacks for structures at a minimum of 200 feet from the normal high water mark and 100 feet back from a bluff line as viewed from the water surface of the river;

(5) avoid construction of permanent structures within the floodplain and on slopes exceeding 12.5 percent;

(6) limit clearing of existing natural vegetation to no more than 30 percent and avoid any clear-cutting whatsoever;

(7) provide screening of structures with natural vegetation;

(8) limit height of structures in the river influence zone to 30 feet;

(9) avoid construction of facilities storing hazardous materials and the construction of obtrusive structures within one-quarter mile of the normal high watermark.

Specific Measures Suggested for Zoning in Incorporated Areas: Development along the river corridor within incorporated boundaries should:

(1) provide open space parklands in the river influence zone to the greatest extent possible;

(2) provide for setback of unavoidable developments from shore or bluff lines, preferably 200 feet from the normal high watermark and 100 feet from the bluff line as viewed from the river;

(3) avoid development of permanent structures in floodplains and on slopes exceeding 12.5 percent;

(4) limit heights of buildings near the shoreline and blufflines to a maximum of 30 feet.

Specific Measures Suggested for Zoning in All Areas of the River Corridor:

(1) Assure that all commercial developments having an impact on the use of the water surfaces (such as marinas, boat launching ramps, campgrounds, etc.) are consistent with available water space, shore space, and aesthetic characteristics of the entire river segment.

(2) Ordinances governing all aspects of use of signs should be adopted in such a way that they insure compatibility of such objects with scenic preservation of the riverscape.

Water Zoning

Presently there is no zoning of the water surface other than the designated federal navigation channel, designated swimming beaches, and "no wake" zones established at channel constrictions near the Hudson "narrows," the Kinnickinnic delta, and the Prescott bridge crossings. Congestion, characteristics of the waterway, and conflicts between uses suggest the need for expanded water surface zoning.

Non-Recreational Uses of the Lower St. Croix River

The Wild and Scenic Rivers Act requires that river studies authorized by the Act be coordinated with water resources planning involving the same river which is being conducted pursuant to the Water Resources Planning Act. In this regard, the St. Croix River is included in the Upper Mississippi River Comprehensive Basin Study. To effect coordination, preliminary drafts of the Upper Mississippi study were consulted in the preparation of this report.

A U. S. Army Corps of Engineers navigation project provides for the maintenance of a channel nine feet in depth with a minimum width of approximately 200 feet from the mouth to Stillwater. A six-foot channel from Stillwater to the mouth was completed in 1930. With the construction of pool no. 3 on the Mississippi River in 1938, the six-foot channel was automatically increased to nine feet.

Periodic maintenance of this nine-foot channel by dredging is chiefly confined to the area near Hudson, Wisconsin, between River Miles 16 and 17, and in the vicinity of the Kinnickinnic River between River Miles 6 and 7. The spoil material, mainly sand, has been deposited on the Kinnickinnic River delta and has expanded islands near Hudson.

A three-foot navigation channel above Stillwater to Taylors Falls was completed in 1900. However, this channel has not been maintained. The controlling depth in this reach of the river is one foot at extreme low water. The navigation project also provided for the improvement of the harbor and waterfront at Stillwater.

A harbor for small boats was authorized at Hudson by the 1950 River and Harbor Act. Located adjacent to and just upstream from the Interstate 94 bridge at the lower end of Hudson, the project provides for a harbor basin about 500 by 550 feet in size with five-foot depth. This has not been built because of a lack of local interest.

Congress has authorized a study to determine the feasiblity of a commercially navigable waterway to connect the Mississippi River with Lake Superior. Three possible routes are being studied. One route is along the St. Croix-Bois Brule Rivers which would connect with the Mississippi River at Prescott, Wisconsin. If such a waterway was constructed, extensive modification of the free-flowing characteristics of the St. Croix would be necessary. This would result in the removal of the St. Croix as a component of the national wild and scenic rivers system.

Other water resources development studies include: a flood survey for the entire St. Croix River, a reconnaissance report for flood protection at Lake St. Croix Beach, and a study for a 12-foot navigation channel from the mouth to Stillwater.

The U.S. Coast Guard is authorized to install and maintain navigational marking on the lower St. Croix.

A 60-foot hydroelectric dam, constructed in 1905, at Taylors Falls is operated by the Northern States Power Company. Peaking power operations fluctuate the flow and level of the river in the Dalles area a maximum of three feet. However, these fluctuations cause little effect on the river's recreational use. If this dam becomes obsolete, consideration should be given to operating the dam to regulate and supplement the water flow below this structure. It should be noted that this structure does not have a large amount of storage and, therefore, does not have the potential to regulate flow to a major degree.

Twelve small hydroelectric dams exist on the major tributaries of the lower St. Croix. The four structures on the Willow River are no longer in operation for power production and have been turned over to the State of Wisconsin for state park purposes. The Apple and Kinnickinnic Rivers have six and two power dams, respectively. The Federal Power Commission reports that no undeveloped hydroelectric power sites exist within the study reach of the St. Croix.

The Upper Mississippi River Comprehensive Basin Study - Appendix I, Flood Control, discusses the possibility of a flood control dam three-quarters mile above St. Croix Falls. This report states: "Urban centers such as Afton, St. Croix Beach, Stillwater, and Bayport, Minnesota, and Hudson, Wisconsin, would be protected from high flood flows on the St. Croix River by such a reservoir but consideration should also be given to the need for local protection works to eliminate damages from Mississippi River backwater effects. Local levee protection appears to be the best solution for protecting these urban centers from Mississippi River flood flows unless such flows can be reduced. Floodplain regulation and floodproofing measures should also be considered."

Commercial navigation is presently a minor use of the riverway. Commercial traffic amounted to 1,300,000 tons in 1970, primarily coal shipped by barge to the Allen S. King Power Plant at Oak Park Heights, Minnesota. The coal barge traffic consists of one tow, from Hastings to the King Plant and back, each weekday during the navigation season. No barge traffic occurs on weekends or holidays during the summer recreation season. Conflicts between barge traffic and recreational boaters occur primarily at the few narrow points in the river channel; however, these are considered to be very minor at the present time.

The source for all water supply in communities along the river is ground water; however, the St. Croix River is being considered as a source of water supply to meet the future needs of the Minneapolis-St. Paul metropolitan area.

The major industrial water user of the lower St. Croix is the Allen S. King fossil fuel power generating plant. The only other major industrial concerns along the lower St. Croix are the Anderson Corporation at Bayport, Minnesota, and the United Refrigerator Company at Hudson, Wisconsin.

The river also serves as an outfall for several industrial waste and sanitary treatment plants. If the St. Croix is to continue to perform its many different functions, treatment plants must be limited in number and located only in selected reaches suitable for such a use. The Metropolitan Council of the Twin Cities area is examining the possibility and desirability of either diverting sewage entirely out of the St. Croix River watershed or locating one or more treatment works discharging into that river.

Commercial fishing does occur on the lower St. Croix; however, this activity is quite limited and does not interfere with the recreational uses.

Recreation

Existing Recreation Facilities. The major developed public use areas along the lower St. Croix River are William O'Brien State Park, Minnesota Interstate Park, and Wisconsin Interstate Park.

The two interstate parks include an area of 167.5 acres in Minnesota extending 1.1 miles down the St. Croix River from Taylors Falls and 1,118 acres in Wisconsin with over two miles of river frontage west and south of St. Croix Falls. Both parks were set aside by the legislatures of the two states because of the scenic beauty and interesting

geology. These parks, established in 1900, represent one of the earliest developments in cooperative outdoor recreation in the nation and were the first interstate parks established in the United States. The Village of Taylors Falls, Minnesota, and the City of St. Croix Falls, Wisconsin, are located on opposite banks of the St. Croix River just above the parks. Between the parks, the river runs through the Dalles of the St. Croix.

The Minnesota park contains facilities for picnicking, fishing, canoeing, boating, tent and trailer camping, and hiking, while the park in Wisconsin has facilities for picnicking; swimming; tent, trailer, and group camping; fishing; boating; canoeing; and hiking. Of special interest is the St. Croix Falls trout hatchery adjacent to Wisconsin Interstate Park and operated by the Wisconsin Department of Natural Resources. The hatchery covers approximately 37 acres. Commercial launch trips are also available from Taylors Falls through the Dalles area. In 1969 both parks combined had over 740,000 visitors.

The William O'Brien State Park boundary contains 552 acres of beautifully wooded rolling countryside and includes a large island. The park has approximately one mile of frontage on the St. Croix River and is located off State Highway 95, about two miles north of Marine-on-St. Croix, in Washington County, Minnesota. Park facilities provide for such activities as tent and trailer camping, hiking, fishing, picnicking, swimming, horseback riding, boating, and canoeing. In 1969 the park received an estimated 226,000 visitors.

Willow River State Park, a 2,700-acre park on the Willow River approximately three miles upstream from its confluence with the St. Croix, is being developed north of Hudson, Wisconsin. This area has been used primarily by hunters and fishermen, but will offer campsites, beach facilities, and picnic areas in 1971. Eventually this park will provide facilities for a full range of recreation activities. In 1969 the park experienced nearly 3,000 visitors with 308 total camper days. Dams prevent access to this park from the St. Croix River by watercraft.

Approximately seven miles north of the mouth of the St. Croix River, the State of Minnesota has recently designated Afton State Park. This new park has about 2.5 miles of frontage on Lake St. Croix. Facilities are being developed for camping, boating, picnicking, swimming, fishing, and hiking, and total parklands will encompass nearly 1,300 acres.

The St. Croix Islands Recreation Area is an undeveloped group of five islands in the St. Croix River managed by the Minnesota Department of Natural Resources. This area lies immediately north of the City of Stillwater, Minnesota, and contains approximately 40 acres of land. Present use is limited to river users for camping and nature study. The

St. Croix Island Recreation Area was formerly designated a scenic reserve. No recreation facility development is planned for the five islands.

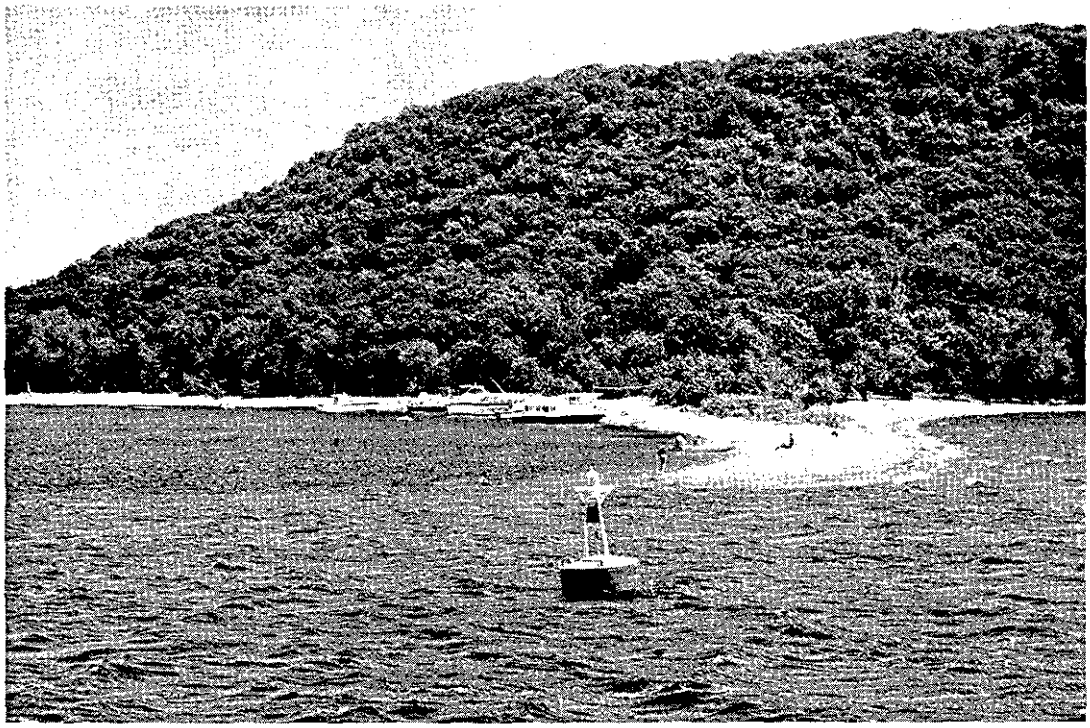
The St. Croix Islands Public Hunting Grounds are managed by the Wisconsin Department of Natural Resources. These public areas are located near the confluence of the Apple River and contain approximately 504 acres of islands and marsh area used primarily for waterfowl hunting and fishing. Purchase of additional acreage is being planned by the state as funds and availability of lands permit.

Two game refuges are managed along the lower St. Croix River by the State of Minnesota. The Stillwater Game Refuge and the St. Croix River Game Refuge are north of Stillwater and Marine-on-St. Croix, respectively. Both are statutory in nature and hunting is prohibited in them except when opened by special regulation. No game management, other than regulation, is applied since this land is primarily privately owned. A fish hatchery and rearing station, comprised of 338 acres of public land, is located north of Osceola, Wisconsin.

There are eight highway waysides or overlooks along the lower St. Croix, most of which are located in Minnesota. North of Stillwater a small parklike area has been developed as an overlook and rest area with picnicking and comfort station facilities. This is the only wayside area with developed facilities. Most of the remaining areas are overlooks with historical or informational markers. A historical marker and highway wayside has been developed by the State of Wisconsin across from the Allen S. King plant.

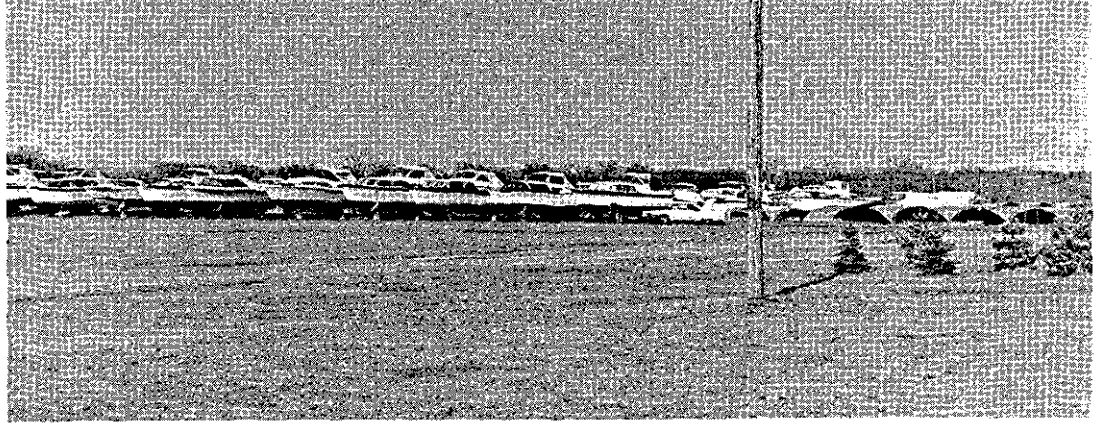
Washington County maintains a small beach on Point Douglas, near the mouth of the St. Croix, comprised of about 200 feet of frontage, which the county plans to expand significantly in the near future. Another small county park, St. Croix County's Troy Beach, is located about two miles south of Hudson, Wisconsin. This area has about 1,000 feet of beach used for swimming, primarily by local residents on weekdays but with as much as 85 percent of weekend use by metropolitan area residents.

Troy Township maintains two public boat launching ramps across Lake St. Croix from Afton, Minnesota. Franconia Township provides a public launch site just south of Minnesota Interstate Park and New Scandia Township maintains the Otisville launch site north of William O'Brien State Park. Another ramp is located at the Twin Springs subdivision in St. Joseph Township, across from Stillwater. These ramps receive relatively light local use at the present time.



26. *Many of the prime sandbars and sand spits on Lake St. Croix are leased or owned by private boater organizations, and their use by the general public is limited.*

27. *Marinas constitute the primary form of private recreational use.*



Many of the municipalities along the lower St. Croix provide river-oriented recreation facilities for public use. These communities are Stillwater, Bayport, and Lake St. Croix Beach in Minnesota and North Hudson, Hudson, and Prescott in Wisconsin. These municipal areas, as a whole, provide boat launching, swimming, picnicking, and fishing sites. Some accommodate a limited amount of camping. Birkmose and Prospect Parks in Hudson have no facilities on the river; however, they possess outstanding vantage points overlooking Lake St. Croix. Recreational use of these areas is, for the most part, local, although there is a weekend influx of residents from the Twin Cities area. Minimal fees are charged to non-local residents for swimming and/or boat launching at most of these municipal parks.

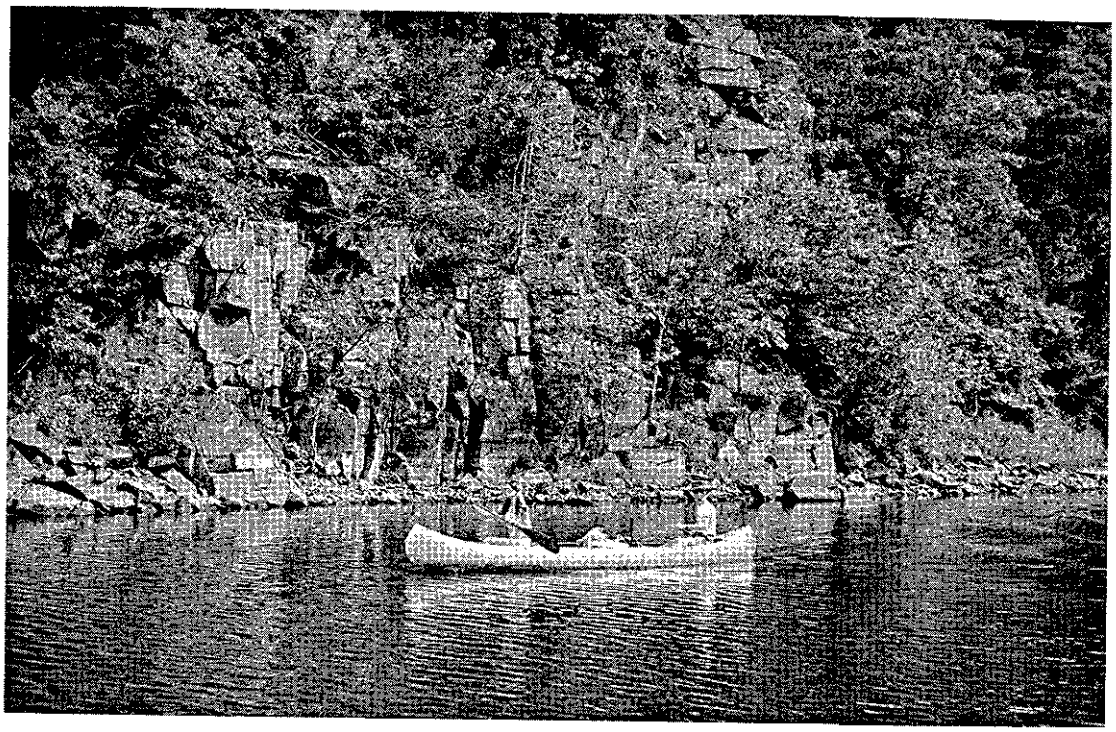
Six group camps are located on the lower St. Croix River, including two Boy Scout camps, a Young Man's Christian Association (YMCA) camp, a church camp, a Christian Brothers retreat camp, and a Kiwanis camp. While their facilities are not open to the general public, these camps do afford recreational opportunities for thousands of individuals, mostly young people from the Twin Cities area.

Commercial marinas constitute the primary form of private recreational development that has taken place on the lower St. Croix. Presently, 16 privately owned marinas exist in the study area, mostly on Lake St. Croix. They provide 1,727 rental slips, 796 of which are covered and 931 of which are open berths. All are currently operating at capacity and most add a few slips each year. All offer moorage on a contract basis; some also provide access, overnight dockage, and other services for a daily fee. All but three have public fuel docks and 10 offer marine head pumpout services. Lake St. Croix and the six-mile stretch of river just above it receive heavy use by recreational boaters, and the private marinas service a major portion of this use.

Canoe livery service is found at Taylors Falls, William O'Brien State Park, and Marine-on-St. Croix. Commercial sightseeing launch trips are available through the Dalles of the St. Croix. Fishing boat liveries are found at Prescott, Point Douglas, Kinnickinnic delta, Lakeland, Marine-on-St. Croix, and Stillwater.

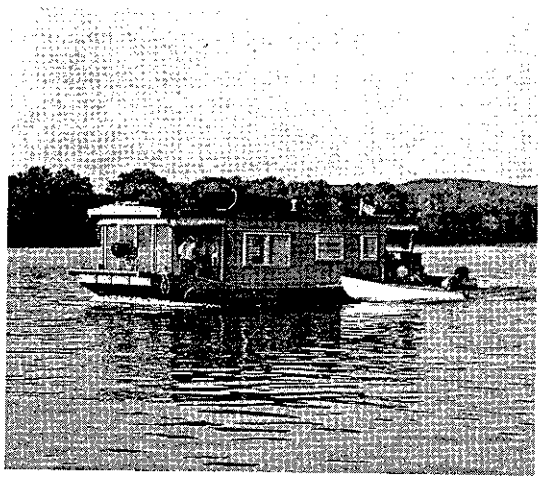
Corporate-owned recreational land is found on the Minnesota side of the St. Croix. One large area is on Lake St. Croix below the Afton Park parcel and the other is near Lake Elmo. Golfing, skiing, picnicking, and other day-use recreational activities are found in the Lake Elmo area. The other area is not developed at the present time.

Private campground development within the river corridor is limited to two areas. These are the Kinnickinicnic Resort and Camp Croix, which have six and 37 campsites, respectively.

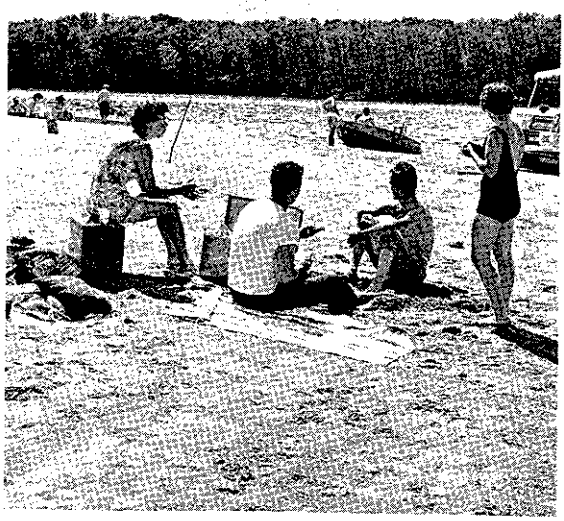


28. Canoeists are frequent users of the river above Stillwater.

29.
Houseboats are often seen in the island and slough areas.



30.
Use of islands and sandbars is heavy.



Islands and sandbars provide excellent recreational vantage points. Most of the prime sandbars on Lake St. Croix are leased or owned outright by private boater organizations, and their use by the general public is limited. Sandbars are sites for camping, picnicking, fishing, and swimming, and on summer weekends they are heavily utilized. Island ownership is not always clear; some are owned by the federal government and are under control of the Bureau of Land Management. The Bureau of Land Management surveys report 30 unsurveyed islands below Taylors Falls in Minnesota. Some are located in state wildlife areas, such as the St. Croix Islands, and undoubtedly some are private as a result of accretion.

New Recreation Facilities Already Programmed. The State of Wisconsin is presently reviewing the state park potential of lands at the mouth of the Kinnickinnic River. This would probably be a somewhat linear park comprised of about 1,200 acres of land along the valley of the Kinnickinnic River with facilities for picnicking, camping, swimming, fishing, and hiking. Since it would also include the large delta at the mouth, it would provide a major public recreation area on the lower St. Croix River.

A parks and open-space plan developed by the Metropolitan Council of the Twin Cities area recognizes various potential open space areas along the lower St. Croix River in Washington County. Practically the entire river corridor in Washington County is proposed for some type of protection or open space development. A trail system along the river is proposed, as well as in and between Lake Elmo and Cottage Grove Metropolitan Parks. Although not on the river, the two metropolitan parks would affect the recreational use of the lower St. Croix area. Protection of the various wetlands, floodplains, and steep slopes is also urged.

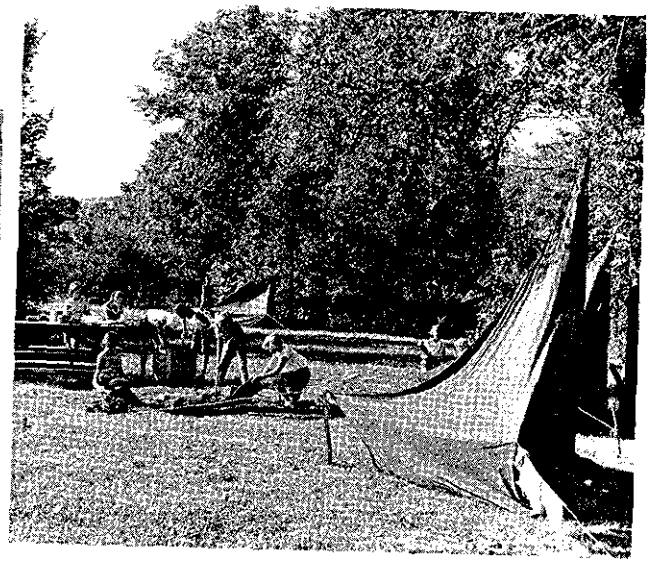
A federal study, in cooperation with the affected states, to determine the feasibility of establishing an Upper Mississippi River National Recreation Area was completed in 1971. The study reach extended from Minneapolis, Minnesota, to St. Louis, Missouri. That study also investigated the lower reaches of the St. Croix River from Afton to Point Douglas on the Minnesota side and from the Kinnickinnic River to the Mississippi River on the Wisconsin side. Based on the study, legislation was introduced to authorize establishment of an Upper Mississippi River National Recreation Area. Hearings on the proposed legislation were held in 1972.

Recreation Use and Opportunities. The lower St. Croix River provides a fine base for a wide variety of recreational activities. Although there are relatively few sources of use statistics or estimates of use for the study segment as a whole, the characteristics of the river-oriented recreationists' present and potential use opportunities can be assessed in a general manner.

31. Ice fishing on the lower St. Croix.

32.
Swimming at Point Douglas near the mouth of the St. Croix.

33.
Camping and picnicking presently occur primarily at the state park.



Camping is concentrated primarily at the facilities provided at the state parks and the few existing private campgrounds that are developed near the river. Further involvement by the private sector could partially offset the demands for camping facilities generated in the Twin Cities area. Camping use at the state-managed campgrounds along the lower St. Croix totaled over 96,000 in 1969. The camping use in municipal or privately developed areas has not been adequately inventoried. Additional camping occurs on the islands and sandbars, and in some instances, this use is significant. It is estimated by the Minnesota Conservation Department that there were over 1,000 camp-nights of camping on Lake St. Croix in 1968. Island camping is especially heavy in the island area of the river above Stillwater where some boaters simply park their houseboat or tent at a favorite spot and "commute" back and forth from shore in small craft.

Swimming presently takes place at county and municipal beaches, off islands and sandbars, and at Interstate and William O'Brien State Parks. Troy Beach and Point Douglas Beach experience primarily local use during the week, with heavy use by Twin Cities residents on weekends and holidays. In some cases, public swimming opportunities are limited due to the nature of the terrain. Several sandy beach sites exist; however, the present ownership pattern precludes their use by the public. The City of Stillwater recently closed its municipal beach on the St. Croix in favor of another beach on an inland lake within the city limits.

Trail use is presently a minor activity in the river corridor. Hiking trails are provided within William O'Brien and the interstate parks. All opportunities for trail development along the river should be investigated and made part of any future comprehensive recreation plan for the river. The development of a network of trails could provide a valuable opportunity for the urban recreationists to participate in a stimulating outdoor activity. If any railroad rights-of-way are abandoned in the future, particularly that right-of-way paralleling the river below Lakeland, every attempt should be made to secure these for the trail development.

Fishing is presently a major recreational use of the river. This includes all three types--boat, bank, and ice fishing. Boat fishing is more concentrated at the mouths of the tributaries such as Apple and Kinnickinnic, near the discharge canal of the steam generating plant at Oak Park Heights, in the Hudson narrows, and at the confluence of the St. Croix with the Mississippi River. Bank fishing is fairly common in the vicinity of Stillwater, the power plant canal, and at William O'Brien State Park. Ice fishing is the least popular of the three types of fishing; however, this is an important wintertime activity. A creel census has been conducted on Lake St. Croix since 1966 in an attempt to monitor the effects of the steam generating plant on fish and fishing. The total estimated

hours of all types of fishing in 1966, 1967, and 1968, was 93,200 hours, 73,000 hours, and 106,280 hours, respectively. An eight-foot rise in water level on Lake St. Croix in June of 1967 caused the lower use in that year. Some conflicts presently exist between fishermen and power boaters, especially on weekends and at other times in the popular fishing spots at narrow sections. Few boat fishermen are found on the river during peak pleasure-boating periods.

The most definitive analysis of recreational use by boaters and canoeists is the "1970 Lower St. Croix River Recreation Use Survey" conducted by the Minnesota-Wisconsin Boundary Area Commission in cooperation with the Minnesota and Wisconsin Departments of Natural Resources, local marinas, and Wisconsin State University-River Falls. Utilizing a combination of aerial censuses, key-point ground observations and self-administered boater questionnaires, the survey reveals many important facts regarding use patterns and pressures relating to watercraft on the river.

The survey report estimates that approximately 205,000 persons age six years or over used the river for recreation by watercraft in the 1970 summer recreation season. Another 36,048 took excursion trips on commercial sightseeing launches in the vicinity of the Dalles of the St. Croix at the upper end of the study reach.

The survey clearly indicated the importance of shoreline and island areas to watercraft users. It showed that 81.3 percent of the river trips included recreational activities on shore or islands. This suggests that, from the standpoint of the typical watercraft user, recreational enjoyment of the study area could be related as much to the quality and availability of shore and island recreation sites as it is to the quality and availability of the waters. It is felt that this is especially significant in the lower 32 miles of the study segment where water depths are sufficient to support power boating activities. The lower 32 miles represent approximately three-fourths of the total water surface of the lower St. Croix and the most attractive shore and island areas become crowded with beached boats of all types on weekends and holidays.

As a result of the boater use survey, several major problems become apparent. Overuse of the lower St. Croix by all types of boat traffic is a serious threat to the river environment and the quality of the river user's experience. Methods for controlling recreational boat traffic and the resulting use of the shoreline and islands should be investigated. These controls might include "no wake" zones, speed limits, and water surface or time zoning.

V CONCLUSIONS

V. CONCLUSIONS

The lower St. Croix River, from the dam near Taylors Falls, Minnesota, downstream to its confluence with the Mississippi River, and its immediate environment possesses natural values and provides potential recreation opportunities which warrant inclusion in the national wild and scenic rivers system. This free-flowing river offers scenic, recreational, and geologic values of a distinctive nature to the large population of the Minneapolis-St. Paul area and the upper Midwest. This river unit is long enough, 52 miles, to provide a meaningful recreational experience, and a sufficient volume of water during normal years exists to permit full enjoyment of water-related outdoor recreation activities. The lower St. Croix is, overall, a resource of high quality. It contains water of relatively high quality and meets the "Aesthetics-General Criteria" as defined by the National Technical Advisory Committee on Water Quality in Water Quality Criteria, April 1, 1968. This portion of the St. Croix River is not subject to any major proposed water resource developments that would seriously conflict with a scenic or recreational river program.

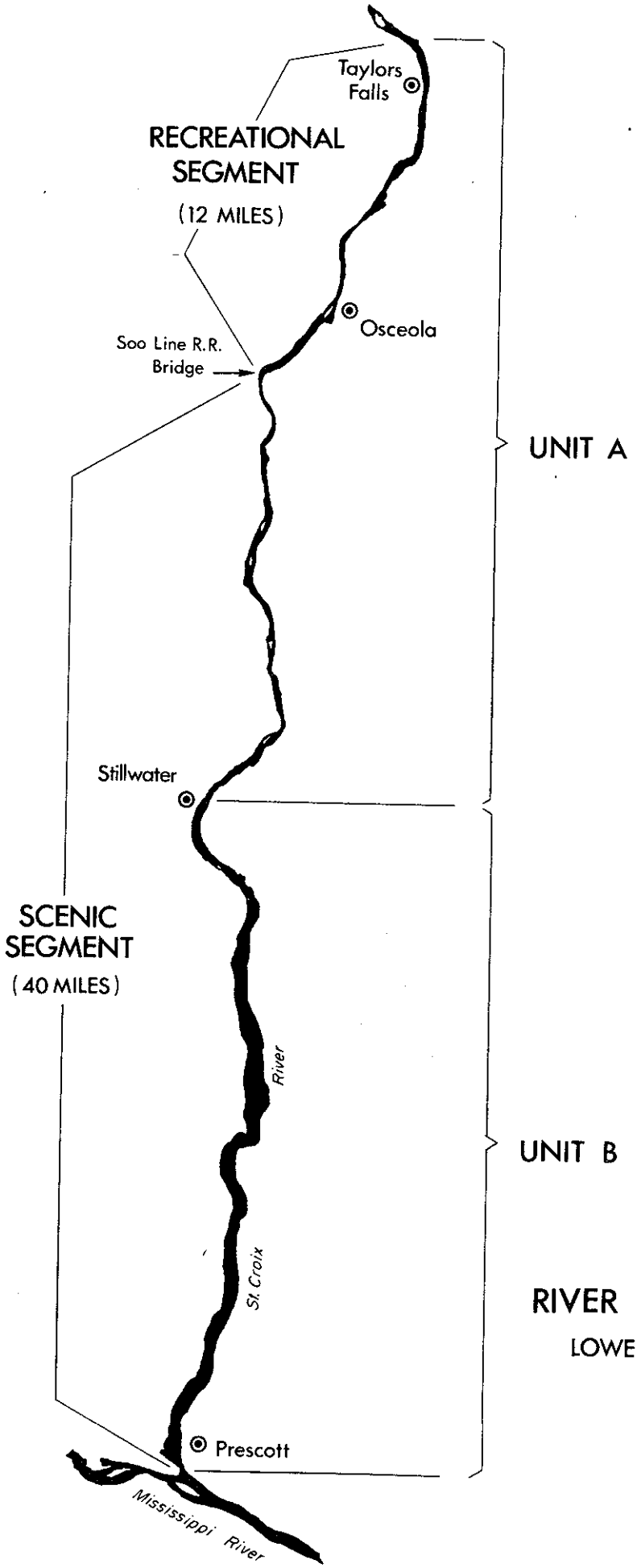
Recommended Classification

The Wild and Scenic Rivers Act states in Section 2(b), "Every wild, scenic, or recreational river in its free-flowing condition, shall be considered eligible for inclusion in the national wild and scenic rivers system and, if included, shall be classified, designated, and administered as one of the following:

(1) Wild river areas - Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

(2) Scenic river areas - Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

(3) Recreational river areas - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines and that may have undergone some impoundment or diversion in the past."



RIVER CLASSIFICATION

LOWER ST. CROIX RIVER

Figure C

The lower St. Croix River with its particular physical characteristics and areas of developed shoreline does not conform to a single classification. The river contains two of the above-listed classes, scenic and recreational.

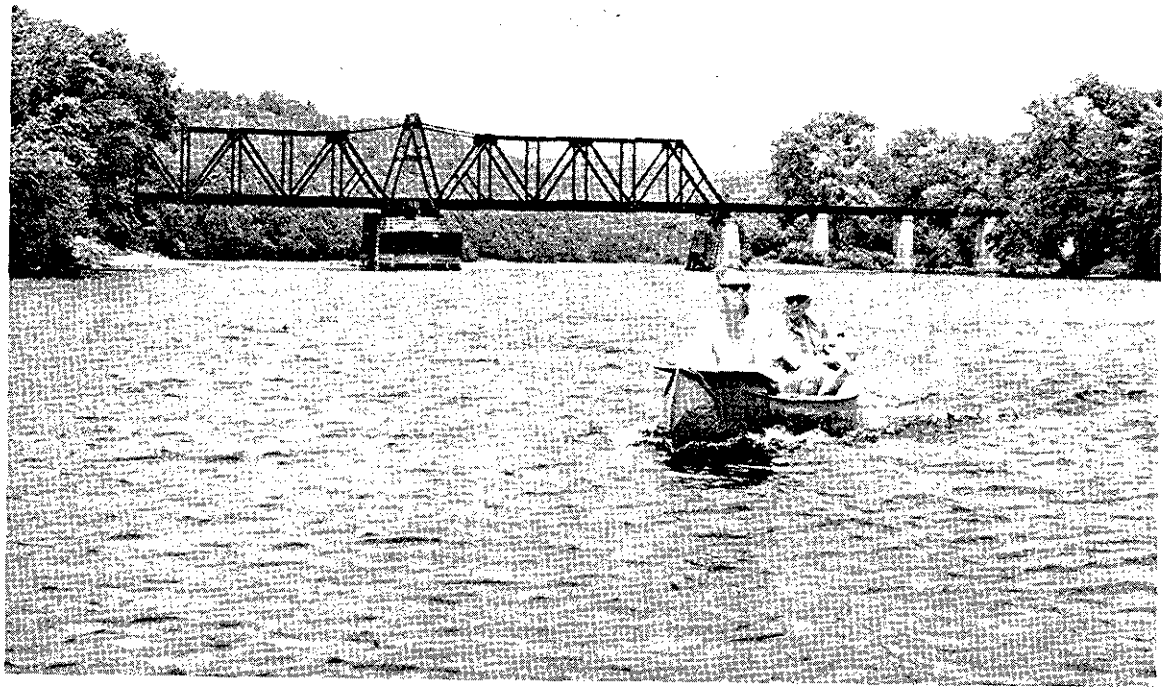
Scenic - From the dam near Taylors Falls, downstream to River Mile 40.2 at the Soo Line Railroad swing bridge. The scenic segment, approximately 12 miles in length, includes a narrow gorge, the Dalles of the St. Croix, and the interstate parks of Minnesota and Wisconsin. The shoreline of this reach of the river is largely in a natural condition. The only road that parallels the riverbank in this segment is one and one-half miles of U. S. Highway 8 mainly within the Interstate Park of Minnesota. Two roads bridge the river within this reach. One is U. S. Highway 8 just below the dam at Taylors Falls. The other is at Osceola, and this river crossing receives only moderate traffic.

Recreational - From the Soo Line Railroad swing bridge downstream to the confluence of the St. Croix River with the Mississippi River. This 40-mile segment includes William O'Brien State Park, the St. Croix Islands Public Hunting Grounds, the Boomsite Wayside, St. Croix Islands Recreation Areas, and Afton State Park. It also includes the incorporated communities of Marine-on-St. Croix, Stillwater, Oak Park Heights, Bayport, North Hudson, Hudson, Lakeland, Lake St. Croix Beach, St. Mary's Point, Afton, and Prescott. Numerous seasonal and year-round residences are found clustered within this stretch. There are three highway and three railroad crossings located within this reach. Even with this amount of development, the recreational segment still retains many scenic and recreational values that enables it to qualify for inclusion in the national wild and scenic rivers system.

Recommended Administration

This study has concluded that for purposes of administration and management, the lower St. Croix should be divided into two units. The segment descriptions and rationale for the division is as follows:

Unit A - This segment includes that portion of the lower St. Croix from the dam at Taylors Falls, downstream to River Mile 25, the "Boomsite," a distance of approximately 27 miles. Unit A includes the entire portion of the river recommended for "scenic" classification and 15 miles of the river which is recommended for "recreational" classification. Incorporated communities in this segment include Marine-on-St. Croix,



34. From the dam at Taylors Falls to the Soo Line Railroad swing bridge, the lower St. Croix is classified as "scenic". From the swing bridge south the river is classified as "recreational".

Osceola, Taylors Falls, and St. Croix Falls. Unit A possess natural qualities which are, in general, more distinctive than those found in Unit B. The river environment is composed of numerous islands, sloughs, and backwater areas and is much more intimate than Unit B. Riverside communities are scarcely visible to the river user. Unit A lies immediately downstream from the St. Croix National Scenic Riverway, and area administered by the National Park Service. Administration of Unit A would logically rest with the National Park Service.

Unit B - This segment includes the lower St. Croix from the "Boomsite" downstream to the rivers confluence with the Mississippi River, a distance of 25 miles. The entire length of Unit B is recommended for "recreational" classification. This unit includes ten incorporated communities with nearly 16 miles of river frontage within their corporate limits. This unit is characterized by its lake-like appearance, heavy recreational use, and, overall, a greater level of bankside development. This unit is also the nearest unit to the Twin Cities metropolitan area. Because of the lake-like character and greater level of development, it has been concluded that administration by the States of Minnesota and Wisconsin is appropriate.

Because of the breakdown of the study area into two units, administration will be discussed separately for the two respective units.

Unit A - The National Park Service would have responsibility for the administration in Unit A. Those segments of river frontage that are presently owned and managed by the respective states could remain in their present status. The National Park Service would acquire interest in the additional lands, in fee or easement, as needed to protect scenic and recreational values. Development and use would be consistent with a master plan prepared for the river in cooperation with the states.

Unit B - The Minnesota Department of Natural Resources and the Wisconsin Department of Natural Resources would be the primary agencies involved in administration of Unit B in accordance with the master plan for the river prepared in conjunction with the National Park Service. Each state would administer its own lands and waters.

It is suggested that the National Park Service and states form a committee in order to facilitate the coordinated administration of the lower St. Croix and to carry out the master plan as finally approved by the Governors and the Secretary of the Interior.

VI RECOMMENDED RIVER PLAN

VI RECOMMENDED RIVER PLAN

This river plan is designed to guide in the preservation of the lower St. Croix River as a component of the national wild and scenic rivers system. The proposed boundaries and developments are presented as conceptual recommendations and should not be construed as being the complete or final plan for the lower St. Croix River. The master plans for the ultimate management and protection of the riverway should be prepared with the full cooperation of all concerned agencies.

Area

The boundary suggested for the preservation of the lower 52 miles of the St. Croix River encompasses all lands fronting on the river including approximately 7,900 acres. The total riverway would extend from the dam near Taylors Falls to its confluence with the Mississippi River. It is estimated that 2,730 acres should be purchased in fee. Scenic or use easements are recommended for the remaining 5,115 acres. These figures are estimates, and it is expected that the managing agencies will refine them when a master plan for the river is prepared. The breakdown of acreage by unit is as follows:

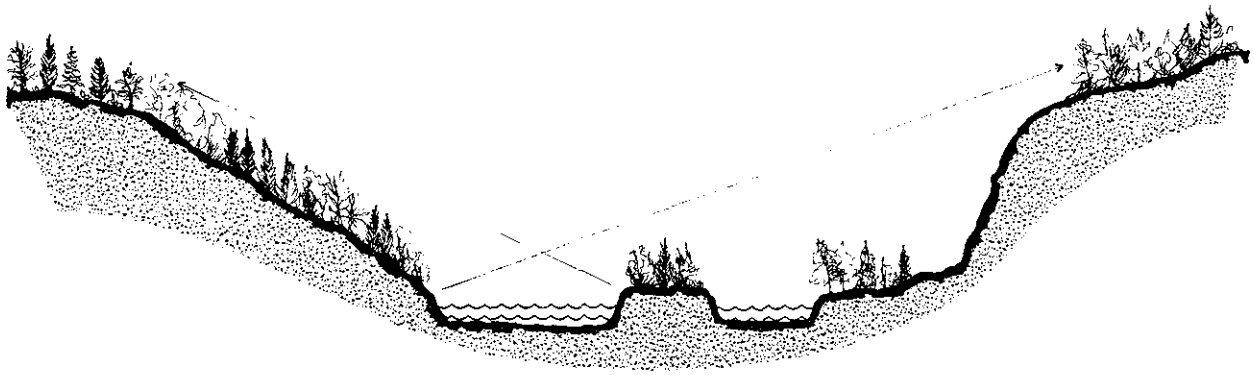
Unit A - An estimated 5,400 acres of land should be acquired in fee or easement. Of this total, scenic easements should be purchased on an estimated 1,445 acres and 2,700 acres should be purchased in fee. Islands not already in public ownership should also be acquired.

Unit B - An estimated 2,500 acres of land should be protected including 2,470 acres by scenic easements and 30 acres acquired in fee.

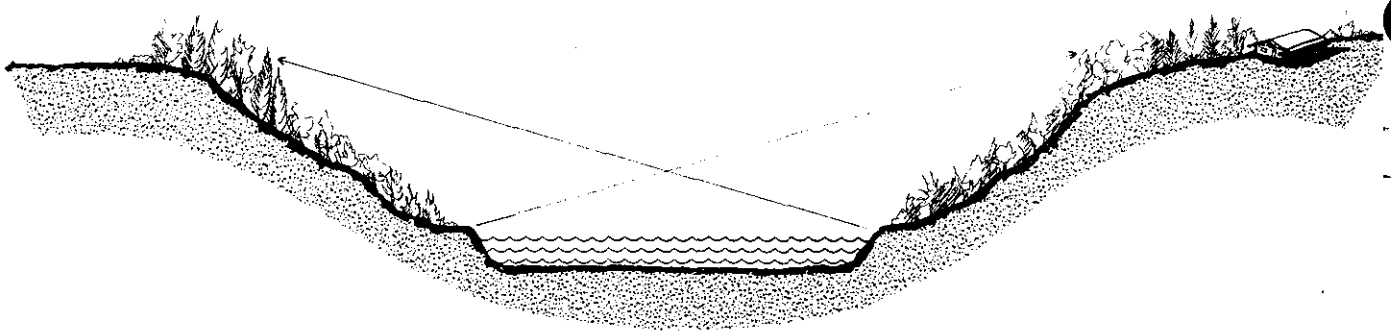
Boundary

The recommended boundary for land use control on Units A and B is shown on the Conceptual Development Plan map. Determination of the boundary is based on concepts developed in a number of other recent wild and scenic river studies. A "visual corridor" or critical sight line is the basic element of the concept. The "visual corridor" is essentially the zone of adjacent land which has a visual impact on the river user and, therefore, should be protected from adverse use and development if the scenic and recreational appeal of the riverway is to be maintained within this corridor. Where bluffs or hillsides

Sketch 1



Sketch 2



Source: Bureau of Outdoor Recreation

VISUAL CORRIDORS
for Typical Valley Cross Sections

Figure D

closely front the river, the boundary extends to the ridge line. Where the river bank is low, a strip of land 50-400 feet deep should be adequate to protect the view from the river. This strip of land would support a screen of trees and brush and accommodate a hiking trail. Important natural, historic, and scientific sites, which do not necessarily fit under the "visual corridor" guidelines, but are still closely associated with the river also should be included within the boundary. The boundary should extend a short distance up the scenic Apple River valley. Several other areas which are vulnerable to adverse development also should be afforded protection.

Acquisition Policy and Land Use Controls

Within the boundary for both riverway units, property rights should be acquired in order to protect the natural scene and accommodate the existing and expected recreational use. Fee acquisition would mainly be confined to the islands not in public ownership and acreage needed to provide public access and facilities as well as to protect the river and resource values which may be jeopardized by less-than-fee control. The remainder of the privately owned shorelands, with the exception of incorporated communities, would be controlled by scenic easements. A scenic easement is essentially an agreement or a series of agreements whereby a landowner binds himself and all future owners of the land to refrain from using or developing the land in ways which would detract from the scenic beauty of the area. Such an easement permits an owner to retain use and possession of his land, subject to the restriction that the scenic character of the land shall remain unchanged. Scenic easements do not grant rights of ingress or egress to the general public. Another advantage of an easement in lieu of fee is that it permits land to remain in private ownership and, therefore, remain on the tax rolls. In general, because of the desirability of maintaining a more natural character, lands along the 12-mile segment classified as "scenic" would be purchased in fee. Most of the land along the remaining 40 miles of river classified as "recreational" will be controlled by using scenic easements. One exception is the rugged area located on the Wisconsin side across from Marine-on-St. Croix and William O'Brien State Park.

Control and protection through scenic easements normally require careful investigation with respect to the extent of restrictions necessary to protect scenic values adequately.

The scenic easement rights most likely to be acquired along the lower St. Croix are:

1. Restrictions of the land to specific uses and developments, such as limiting to single-family residential, agricultural, timber growing, or particular recreational uses.

2. Limitations on the heights of future structures, on the exterior appearance of buildings and on the density of development.

3. Prohibitions of billboards and advertising signs.

4. Prohibitions of piles of trash or other unsightly materials.

5. Restrictions on the allowable extent of the cutting of trees and native vegetation

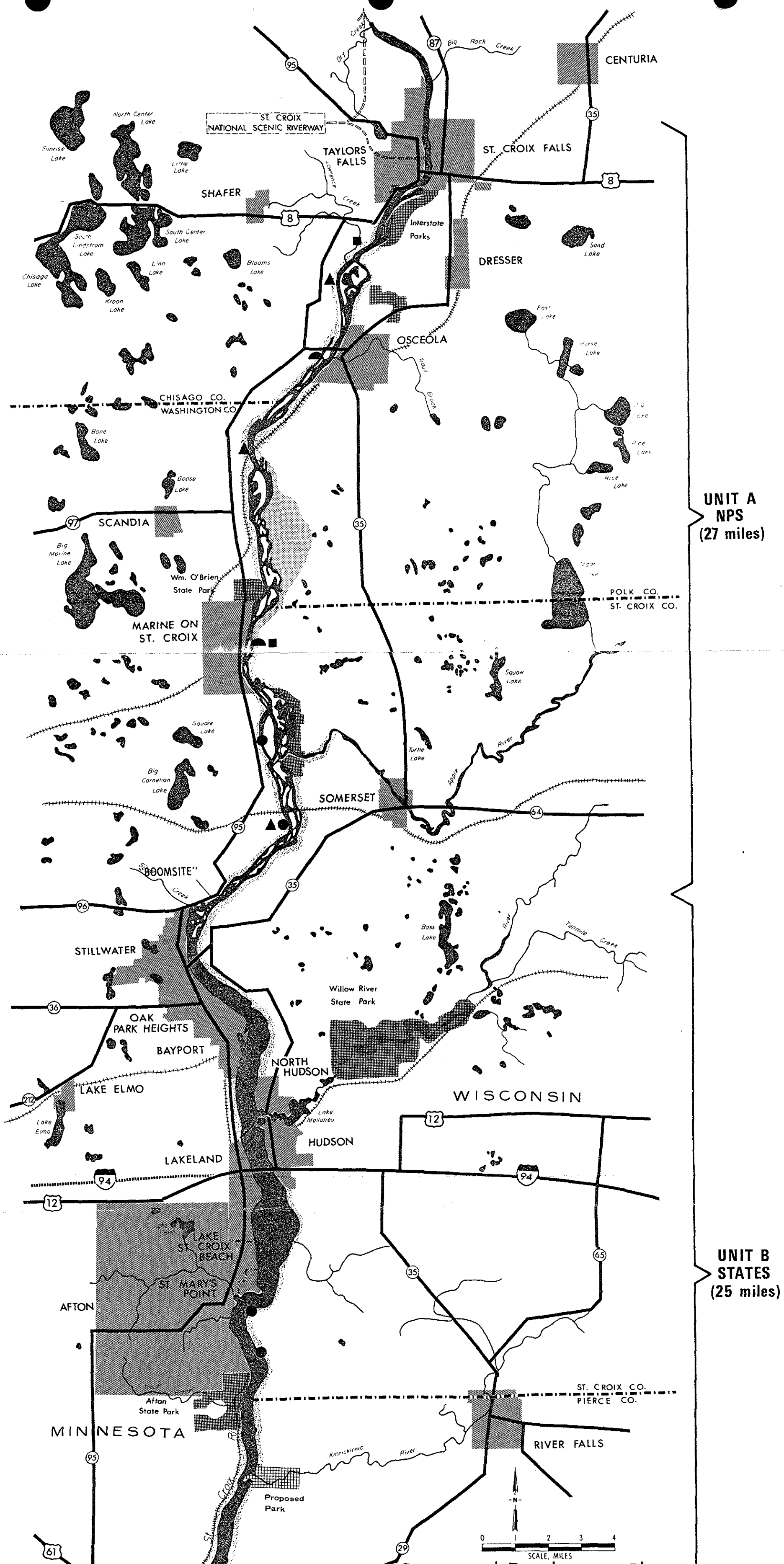
Incorporated towns which abut the lower St. Croix should be required to adopt zoning ordinances which will protect the riverway and are consistent with the purposes of the Wild and Scenic Rivers Act.

Strong zoning ordinances may be a means of protecting the river in some areas in lieu of acquiring easements or purchasing land from individual owners. Floodplain and other protective zoning measures have provided some control and protection throughout the river area. It should be expanded to control an additional buffer zone outside the designated river boundaries.

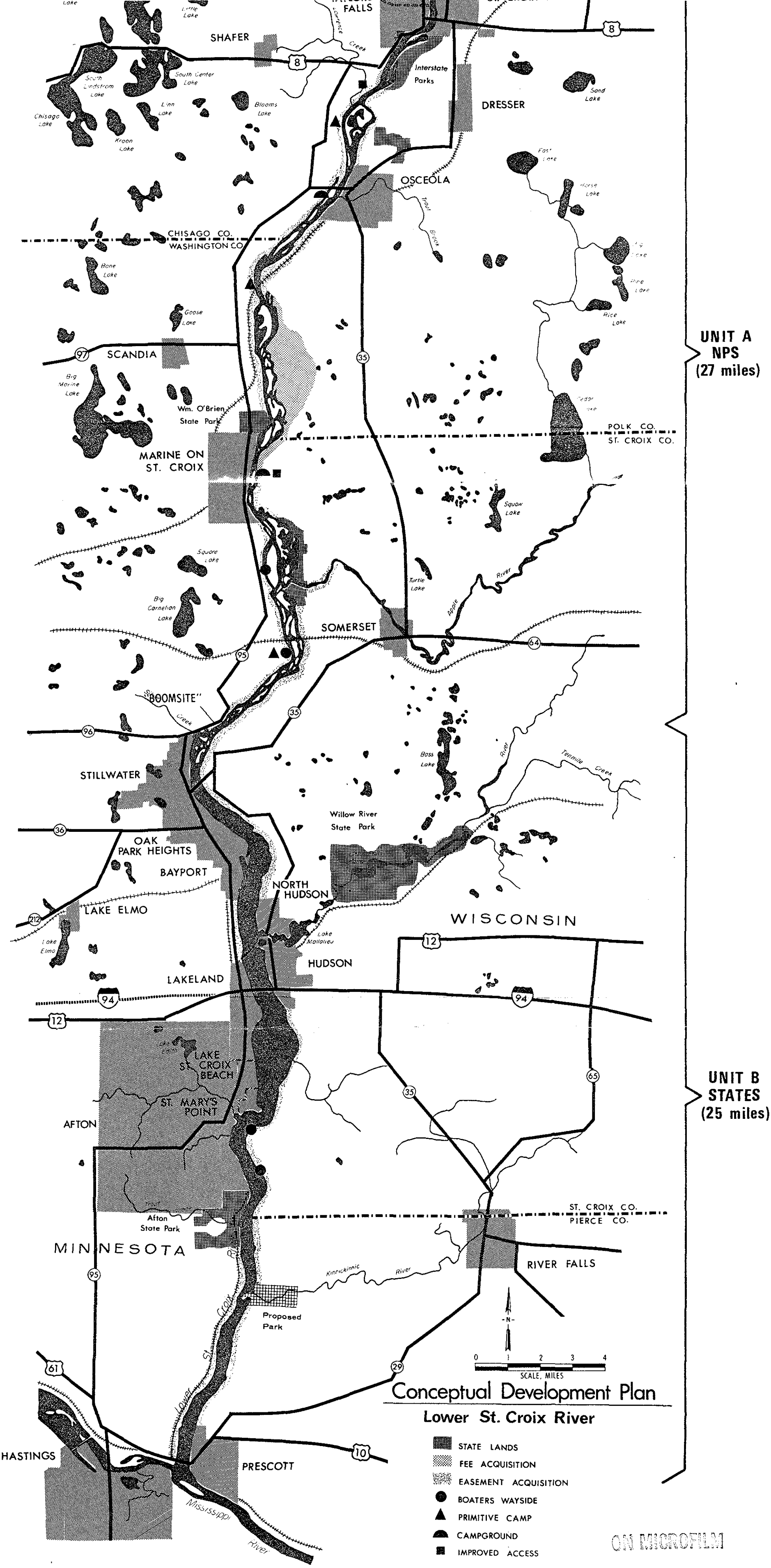
Development

The conceptual development plan for the lower St. Croix is directed toward the goal of preserving and protecting the river environment, while providing suitable recreation facilities required for appropriate visitor use and enjoyment of the river. Any and all developments should be evaluated with respect to the possible consequences on the natural character of the river. Future resource managers should recognize the possibility of environmental degradation by recreational overuse as well as by poorly conceived commercial, residential, and industrial uses. The present range of recreation facilities at the two Interstate Parks, the William O'Brien State Park, the soon to be developed Afton and Willow River State Parks, and the proposed Kinnickinnic State Park will provide for a large number of recreationists, both river and nonriver oriented, and should lessen the number of additional facilities required.

The proposed developments listed below are to provide the river user with appropriate service facilities at strategic locations. These



Conceptual Development Plan



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locations were selected, after a review of present facilities, in an attempt to satisfy expected user needs in a manner consistent with protecting scenic and recreational values.

Unit A - Due to the difficulty of maintenance and use control on the islands, and because of their fragile nature and frequent flooding, no facility development is proposed. The islands should be protected and retained in their natural state and camping thereon should be restricted. If, during the detailed master planning, it appears feasible to develop certain selected islands for overnight use, the management agencies should carefully monitor and control this use. Day use of islands should not be restricted unless it proves detrimental to the island environments. Recreational craft with self-contained sanitary facilities may, if it proves feasible, be allowed to use the islands as tie-up areas at night, as well as during the day.

Two small river-oriented canoe camping areas are proposed along the upper reach of the river. Each camping area would be reached only from the river and would consist of a number of primitive shelters or tent pads, adequate sanitary facilities, a hand waterpump, and fire rings. Permanent walkways may be necessary from the river's edge to protect the soil and vegetative cover. A simple canoe landing point could be provided by securing a few logs placed parallel to the shore. These sites should be spaced appropriately between the Interstate Parks and the Soo Line high bridge.

A combination wayside and small campground is suggested for the area near the Soo Line high bridge. This area would have sanitary facilities, picnic tables, primitive shelters or tent pads, water supply, and boat landing area to serve both boaters and canoeists.

A small campground, accessible from both the river and by road, is recommended for the area at the "old Marine ferry crossing" on the Wisconsin shore. This area is across the river from Marine-on-St. Croix and would include sanitary facilities, campsites, water supply, and a carry-in type boat launching area. This campground would also serve as trailhead for trails extending into the large, rugged, scenic area to the north.

A boaters wayside consisting of sanitary facilities, a potable water supply, picnic tables, and a boat landing area is recommended for the Minnesota shore across from the mouth of the Apple River. This area should be accessible only from the water.

The privately developed campground presently located on the river near Osceola should be purchased and leased to a concessionaire. This campground is being operated and maintained in an orderly manner; however, to assure a high quality area in the future, full control of its operation by the administering agencies is desirable.

The addition of campgrounds and other overnight facilities by private enterprise would be encouraged outside of the scenic or recreational river boundaries.

This plan envisions the development of a system of foot trails and nature walks in the area north of the proposed camping site at the "old Marine ferry crossing." These trails could be developed to provide the river users hiking experiences of one to several hours. The varied natural features in this area would provide the managing agency an opportunity to develop a wide range of interpretive nature walks. Opportunities also exist to develop scenic vistas overlooking the river.

Blufftop and river valley trails along other portions of the lower St. Croix could be constructed which would not detract from the river scene. Spur and loop trails might be developed at scenic overlooks and other points of interest. All trails within this river corridor should be restricted to foot travel.

Boat launching sites, such as public roads terminating at the river's edge, upstream from the "Boomsite" should be converted or limited to walk-in types of watercraft. This would aid in reducing the numbers of large boats using the river in Unit A.

Unit B - Catfish Bar and Black Bass Bar on the lower river segment are proposed for fee acquisition and limited development. Both are sand spits on the Wisconsin shore of Lake St. Croix with a high potential for use as boaters waysides. The fine sand beaches provide recreational opportunities for the general public. Sanitary facilities, picnic tables, and potable water need to be provided.

Several additional sand beaches along both sides of Lake St. Croix should be investigated during master plan formulation to determine their potential as additional boaters waysides and day-use areas. These beaches, generally smaller in size, could provide necessary shore access for the many boaters. Access to these areas should be available only from the water.

Additional facility development for day-use activities on or near the lower St. Croix could be provided by the expansion of existing park facilities and development of two proposed urban-oriented parks by the Metropolitan Council of the Twin Cities area, at Lake Elmo and Cottage Grove Ravine.

Costs and Economic Impact

Acquisition cost of the 2,730 acres of shorelands and privately owned islands recommended for fee purchase, plus the 4,000 acres recommended for scenic easement purchase would total approximately $8,680,000. Provision of the recreation developments recommended in the conceptual plan would cost an estimated $300,000. Broken down by units these costs are:

Unit A -	Fee Acquisition (2,700 acres)	$4,050,000
	Easement Acquisition (2,645 acres)	2,975,000
	Development	250,000
		$7,275,000
Unit B -	Fee Acquisition (30 acres)	$ 55,000
	Easement Acquisition (2,470 acres)	1,300,000
	Development	50,000
		$1,405,000

The present recreational use of the river is considered near optimum capacity. Therefore, the proposed recreation facility developments included in the conceptual development plan were intentionally kept at a minimum in an attempt to control the expected increase in recreational use and to protect the natural and scenic attributes of the river. Over-development and excessive use could seriously jeopardize the values that qualify the lower St. Croix River for inclusion in the national system of wild and scenic rivers. The study also recognized that the conceptual plan for the lower St. Croix should limit overnight facilities and place more emphasis on day-use activities.

The study has assumed that any loss of benefits from the limiting of total recreational use on the lower St. Croix by the proposed plan would be offset by a higher quality experience by the recreationist.

The economic effects derived from the implementation of such a program are such things as the increased sales of retail business establishments, increased number of certain types of commercial enterprises providing services to the users of the recreational facilities, changes in tax structures, better markets for commodities produced locally, and increases in employment opportunities. However, using the assumption that recreational use of the river would increase with or without a scenic river program these economic effects are not attributable to the scenic river program and, therefore, no evaluation has been made.

Since little commercial timber lands or agricultural lands are included within the boundaries, no significant land use changes would result from the scenic river proposal.

The opportunities that would be realized by establishing the lower St. Croix as a component of the national wild and scenic rivers system are manifold:

1. It would preserve an outstanding natural river environment for future generations. This river's scenic, aesthetic, geological, and recreational values are being threatened by commercial and residential development. If action is not forthcoming in the near future, this river will be degraded as have so many rivers throughout the country.

2. This river section has the potential for helping to meet open space needs of an expanding metropolitan complex.

3. It would complement other outdoor recreation opportunities in an area noted for such attractions.

4. It would help to protect the river area from improper or too heavy use as recreational pressures increase.

The opportunities foregone or curtailed by the proposal are:

1. Development of the lower St. Croix as a scenic river would preclude development of the river lands within the boundary for additional incompatible commercial and residential development.

2. Initially there would be an annual reduction in local government taxes of an estimated $10,500. The counties affected would be St. Croix County, $2,800; Polk County, $3,500; Chisago County, $3,200; and Washington County, $1,000. The tax information was obtained and estimated from 1970 county tax records. In the long run, however, establishment of a national scenic river would tend to enhance property values in the vicinity.

Management Objectives

The management objectives for the lower St. Croix River should be to protect and enhance the values which caused it to be recommended for inclusion in the national wild and scenic rivers system. Management objectives for both riverway units should be to:

1. Maintain the river's natural, free-flowing condition;

2. Protect scenic, recreational, geologic, fish and wildlife, historic, archaeologic, and other similar resources;

3. Maintain or enhance water quality;

4. Provide opportunities for river-oriented recreation which are consistent with protection of the quality of the river and its environment.

Some specific management suggestions to achieve the above objectives are:

Recreation

Efforts should be made to establish visitor use levels which do not endanger the values for which the scenic river was designated. Access sites and other facilities should be developed and distributed with close attention to the impact that could result from overuse. A system of periodic evaluation and monitoring focused on the outstanding values and more sensitive elements of the river environment should be developed.

Facility development should not detract from the quality of the river scene. Development should be placed back from the river's bank and, where possible, screened from the view of the river user.

A detailed inventory of historic, archaeologic, and other similar sites should be made and a program developed for their protection.

The managing agencies should provide a concise guide for river users showing public use areas, boating laws, use zones, etc.

Water zoning, including "no wake" and speed zones, should be instigated as a means to prevent degradation of the river user's experience and to encourage and enhance water safety.

The addition of new marina facilities and boat access areas on the lower St. Croix should be permitted only after review and approval by the agencies responsible for managing the riverway program. All marinas, existing or proposed, should provide approved boat toilet pump-out stations. Any existing or planned boat launching areas upriver from the "Boomsite" should be converted or limited to walk-in types.

Fish and Wildlife

Habitat management for fish and wildlife should reflect equal consideration of game and nongame species, and all practices employed should be in conformance with the maintenance of the natural qualities of the riverway.

Land Resource Use

Municipalities along the lower St. Croix should adopt zoning standards which are consistent with the purposes of the Wild and Scenic Rivers Act. The standards should have the objective of prohibiting new commercial, industrial, or residential uses which are inconsistent with the purposes of the Act, and of protecting the shore and bluff lands by means of acreage, frontage, and setback requirements.

Removal of vegetation from the banks and bluffs should be restricted, especially where it endangers the river corridor's scenic and recreational values.

Reseeding or planting of native vegetation should be used in all areas where rehabilitation is required. Special management protection measures will be essential for areas of unique ecological value.

Protection of the forest resources within and near the river corridor from fire, insects, and disease damage should receive added emphasis. Control or salvage measures necessary for diseased or damaged trees should be carefully weighed against the possible adverse impact on the river's scenic values.

Maintenance of stable soils and protection of the watershed adjacent to the river is essential. Because a high percent of the recreation activity and development will take place near the river's edge, special emphasis should be placed on preventing and controlling soil erosion. This is true for both natural and man-caused deterioration. Soil stabilization measures and revegetation should be undertaken, where feasible, on all exposed soil areas.

Water Resources

Since river and stream communities are especially susceptible to any type of pollution, careful attention must be given to the planning and construction of developments along the river and its tributaries. A program for monitoring chemical, biological, and physical water quality characteristics should be established as well as the early implementation of necessary protective measures.

A spoil disposal plan should be developed so that dredge spoil material from the maintenance of the nine-foot channel would be used to supplement existing beach areas or established additional recreational sites.

Utilities

New utilities should be located out of sight or otherwise be screened from view of the river.

New construction of powerline and pipeline crossings of the river should be avoided where possible. However, where it is determined that such construction is essential, the managing agencies should ensure that the construction is consistent with the purposes of the Wild and Scenic Rivers Act.

No additional power generation facilities should be permitted on the lower St. Croix River.

APPENDIX A

PHOTO CREDITS

Photo Number	Source
Cover	Wisconsin DNR
Frontispiece	Wisconsin DNR
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33	Minnesota DNR
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