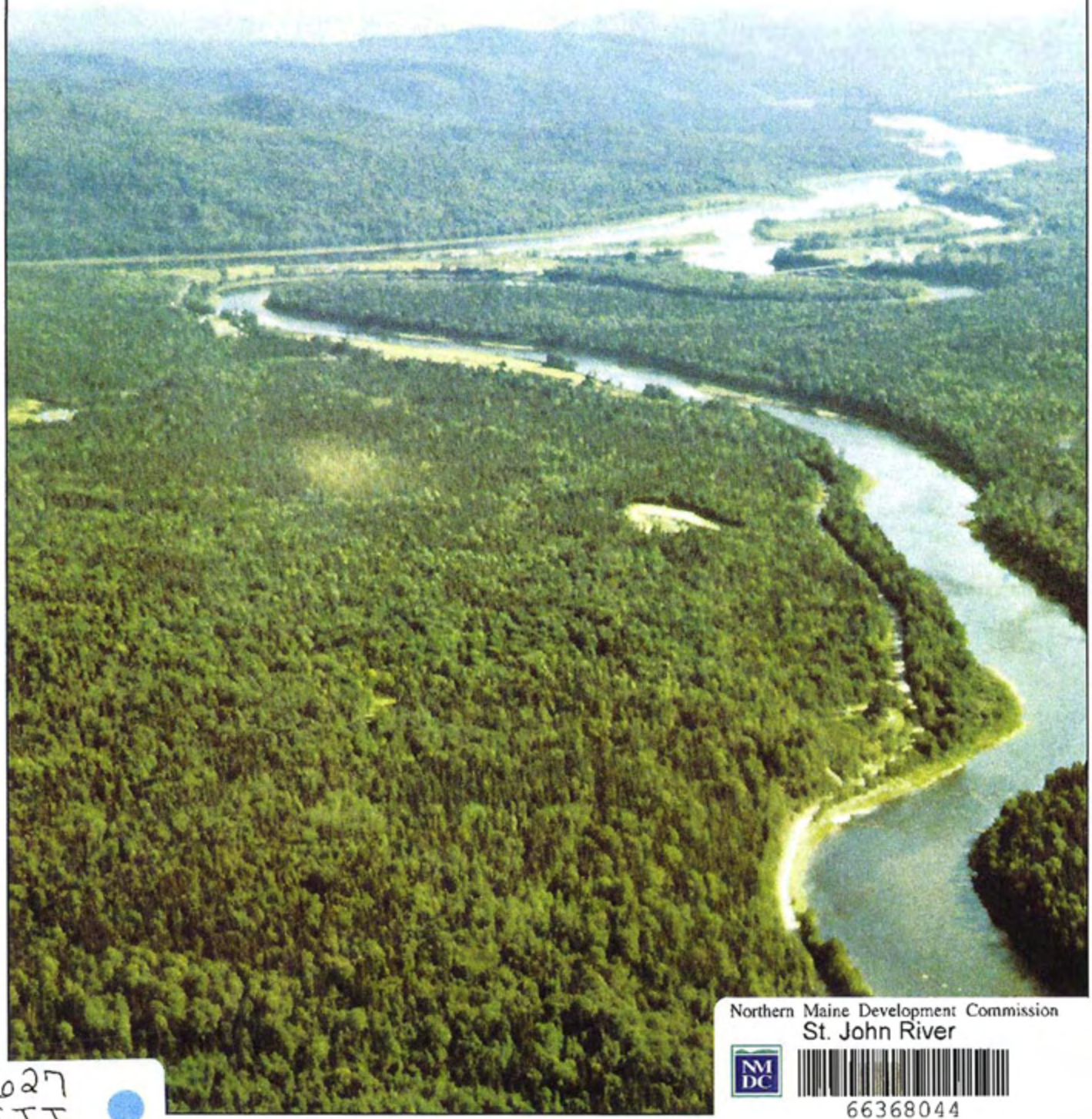
ST. JOHN RIVER BASIN WATER QUALITY MANAGEMENT PLAN

SUMMARY REPORT



Northern Maine Development Commission
St. John River

NORTHERN MAINE REGIONAL PLANNING COMMISSION, INC.

McElwain House
2 Main Street
Post Office Box 779
Caribou, Maine 04736
Tel: (207) 498-8736

March, 1976

Ladies and Gentlemen:

This report for the St. John River Basin summarizes the technical studies, findings, and recommendations of a recently-completed water quality management plan for the United States portion of the St. John River Basin. The study included stream and lakes sampling, computerized mathematical modeling, and a basin-wide investigation of water quality in the Upper St. John, Boundary St. John, Allagash, Fish, Aroostook, Prestile and Meduxnekeag Sub-basins.

The St. John River Basin Plan is not a plan for the construction of facilities, but is a strategy for the protection and enhancement of the region's important water resources, and for the implementation of pollution abatement measures that will bring improvement to water quality problem areas. Because it is a strategy, this plan depends on the support of institutions, policies, financing, and popular understanding of the water quality management needs in the St. John Basin.

This report is designed to present, in abbreviated form, the essential concepts and the special characteristics that shape the basin-wide plan for the St. John.

Sincerely,

Donald C. Eisensmith
Chairman

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James A. Barresi
Executive Director

HISTORIC BACKGROUND

The Executive Board of the Northern Maine Regional Planning Commission (NMRPC) has been involved with water resources planning in the SAINT JOHN RIVER BASIN since October 4, 1967. The Aroostook-Prestile Basin Preliminary Pollution Study was initiated at this time because the Board recognized that industrial expansion was being slowed by the severe pollution problems in the central Aroostook area. Shortly thereafter, the Executive Board approved the expenditure of funds to accomplish preliminary pollution studies for the Saint John and Meduxnekeag Rivers. Other involvement has been: shoreline inventories of lakes in northern Maine; approval of sewerage treatment facilities for several communities, thus providing extra financial assistance for these projects; a comprehensive film documentary called "Rivers' End", filmed exclusively in Aroostook County; the Northern Maine Regional Treatment System Program completed in 1972 which developed a detailed regional plan for optimizing pollution control efforts in the Aroostook River and Prestile Stream Basins; creation of the Aroostook-Prestile Treatment District; and the SAINT JOHN RIVER BASIN WATER QUALITY MANAGEMENT PLAN presented herein.

The preliminary pollution study for the Saint John River, published in November, 1968, recommended that a comprehensive plan for long-range water resource development in the SAINT JOHN RIVER BASIN be undertaken jointly by the U.S. and Canada to determine the optimum relationship of various uses such as: fish and wildlife propagation, industrial and municipal water supply, recreation, and waste water disposal. This initial study concluded that the wise use and development of this natural resource, one of the largest watersheds in eastern North America, would certainly have a major impact on the economic and social well-being of the northeastern U.S. and Canadian Maritime Provinces.

Following the preliminary study, the NMRPC requested proposals from several engineering and planning firms to develop a detailed work plan. After review, the Executive Board selected the Edward C. Jordan Company, Inc., and Meta Systems, Inc., in March, 1971, to be subcontractors on the project. The work plan addressed both the technical problems of water use and water quality, and the institutional problems of basin management. A presentation was made to the U.S. Environmental Protection Agency (EPA) and the State of Maine Department of Environmental Protection in May, 1971. In June, 1972, the NMRPC was selected by EPA to be the primary planning agency for the U.S. portion of the SAINT JOHN RIVER BASIN. The Canadian government also developed a plan for their portions of the Basin.

Because of the joint planning, the North Atlantic Treaty Organization's Committee on the Challenges of Modern Society (NATO/CCMS), Inland Water Pollution Project, selected the Basin as a case study for international cooperation. A series of symposiums were held in Canada, the U.S., France and Belgium to provide an exchange of ideas and to review progress of the respective programs. In September, 1972, at the U.S. Fish River Lake Symposium, a historic agreement was announced by the two governments agreeing on joint measures to cooperate in water quality planning and to recommend programs to enhance water quality on the St. John River and its tributaries. The U.S.-Canada Committee on Water Quality in the St. John was established for this reason. The International Joint Commission was designated to oversee the work of this Committee.

This summary does not attempt to reproduce the major report in miniature. Instead, attention has been focused on identifying the essential elements of the plan, and on highlighting the key factors in the development. Those individuals desiring more information than contained in this summary report should contact the Northern Maine Regional Planning Commission.

THE NATURE OF THE STUDY

RELATIONSHIP TO OTHER PLANNING EFFORTS

Basin-wide water quality management planning suggests by name and requires by definition that an overview be established. A basin plan is designed to set the overall framework within which more particular plans and projects can be undertaken for individual problems or for smaller subregions in the Basin. The law which guides the nation's water improvement effort (PL 92-500) refers to a basin plan in Section 303(e), and instructs that such a plan should be prepared to allow subplans to take full advantage of a comprehensive strategy for basin-wide water quality management.

Section 208 of PL 92-500 calls for a related plan — the Areawide Waste Treatment Management Plan. The 208 plan, which should be guided by the strategy established in a 303(e) plan, addresses the pollution abatement needs of a designated problem area, generally consisting of a basin's more heavily urbanized and/or industrial sector. Within the St. John River Basin there is a designated 208 study area covering Caribou, Washburn, Presque Isle, Easton, Fort Fairfield, Mapleton, Baline, Mars Hill and Westfield, in the watersheds of the Aroostook River and Prestile Stream. The 208 plan is intended to look more closely at a particular section of a basin, and guide the design of facilities, institutions, and programs for pollution abatement within this section.

For the actual planning and design of pollution abatement facilities, PL 92-500 establishes a three-step process described in Section 201 of the laws. The 201 plan is intended to follow the guidelines resulting from the 208 study; and the 208 plan in turn is designed to fall under the general strategy of a 303(e) plan.

In actuality, all these plans can occur within a basin simultaneously. As this 303(e) plan was concluding, a 208 plan was already begun in the basin; and even as the 208 areawide plan was underway, 201 facilities plans and construction programs have continued on course in several municipalities.

ELEMENTS OF THE 303(e) BASIN PLAN

In initial steps in this study was an analysis of present water quality and an inventory of the conditions within the Basin which affect water quality. These conditions include land use, hydrology, municipal and industrial point sources of pollution, climate, economy, geology, and agricultural practices. Studies of these characteristics of the basin were supplemented by water quality sampling programs and by mathematical modeling of the basin's rivers and lakes, their pollution loading, and their ability to assimilate, or accept the present and projected loadings.

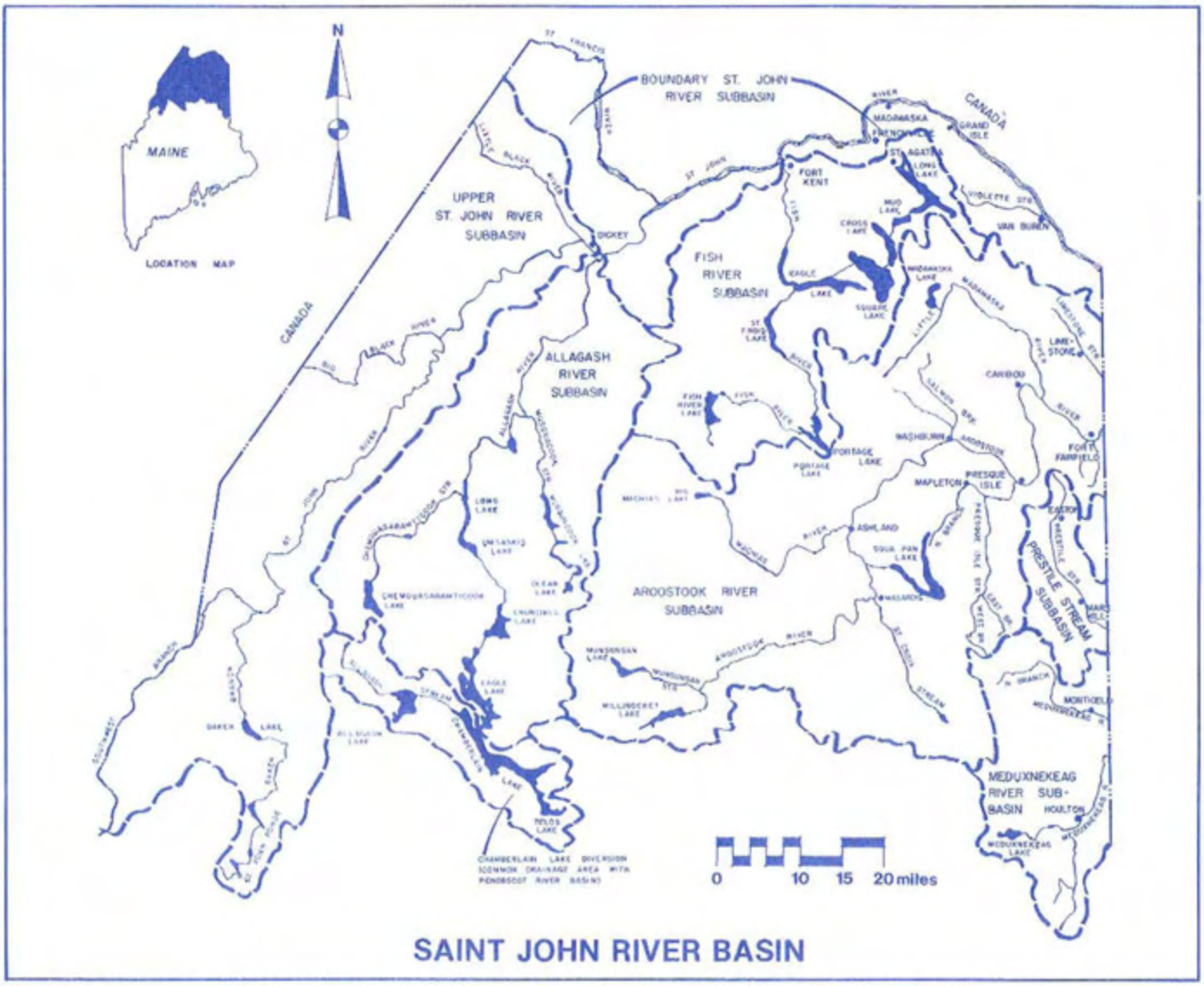
The study has also included assessment of the current programs for pollution control in the basin and a survey of the investigations which are available to administer these programs. The plan recognizes that the current programs for point source abatement appear adequate, but that much too little is being done to prevent agricultural runoff and similar non-point sources of pollution from entering the region's waters. The plan outlines the kinds of pollution that are currently being ignored, presents an institutional framework, and the establishment of policy making and enforcement tools which might evolve to address these sources.

DESCRIPTION OF THE BASIN

The St. John River Basin is one of the largest watersheds in Eastern North America. It is a natural resource whose wise use and prudent development can have a major impact on the economic, social and environmental well-being of the northeastern United States and the Canadian Maritime Provinces.

The Basin is located partly in northern Maine, partly in south-central Quebec and partly in northwestern New Brunswick. Boundary watersheds are those of the St. Croix and Penobscot Rivers. About one-third of the 21,260 square mile Basin is located in the State of Maine as shown below. The United States portion of the Basin is the focus of this report.

The St. John River originates at Little St. John Lake on the border of Maine and Quebec. From there, it flows north through Maine to St. Francis, where it then forms the international boundary between the United States and Canada. The major United States tributaries to the St. John River are the Allagash River, Fish River, Aroostook River, Prestile Stream, and Meduxnekeag River. The watersheds of these river systems combine to form the United States portion of the St. John River Basin, which closely corresponds with Maine's Aroostook County.



SAINT JOHN RIVER BASIN

The watersheds of the Upper St. John River and the Allagash River, in the western portion of the Basin, have a combined area of 3,064 square miles and comprise the most remote area of the State. The famed Allagash Wilderness Waterway is in this area, as are many unspoiled lakes, ponds and streams. The Village of Allagash (1970 population - 465) is the major population center. Almost all the land in these watersheds are forested, and forest operations here are well organized and extensive. There are no major industries or developments.

The Fish River system lies to the east of the Allagash, and comprises a series of lakes. Land use in this watershed is, again, for the most part, forests, although there is also some agriculture. Fort Kent is the only population center of more than 1,000, and is home of the only major industry — a girls nightwear manufacturer.

North of the Upper St. John, Allagash and Fish River watersheds is a narrow strip of land that follows the course of the St. John River from St. Francis to Hamlin. The watershed of the boundary St. John, as this section of the river is referred to, supports population centers at Frenchville, Madawaska, St. Francis, and Van Buren. There are several industries located here and one most notable for its size and impact on water quality: the Fraser Paper Company at Madawaska. Agriculture is a more significant land use along the boundary St. John than it is in the more remote watersheds described previously; unlike the previously named waterways, there is very limited recreational use of the boundary St. John River.

Also tributary to the St. John River are the Aroostook River, Prestile Stream, and Meduxnekeag River. The watersheds of these rivers are located in the eastern and central sections of the Basin, where Aroostook County's major population centers, industries, and agricultural areas exist. The United States watersheds along these rivers do not drain directly to the St. John River, though. They generally drain in an easterly direction, crossing the Maine border and flowing through New Brunswick before reaching the St. John. Nevertheless, these tributaries have to be considered, since their eventual impact on the St. John River — and certainly their importance to water quality within the Basin — are a principal concern in basin-wide water quality management.

Within the watersheds of the Aroostook, Prestile and Meduxnekeag are population centers at Caribou, Easton, Presque Isle, Fort Fairfield, Washburn and Houlton. These are most heavily industrialized and most intensively farmed areas of the Basin. The industries — mostly food processing plants — are so-called "wet process" industries due to their reliance on large quantities of water for production. They also discharge large quantities of spent water to the river system for disposal.

The concentration of municipal, industrial, and agricultural sources of pollution in the Aroostook and Prestile watersheds has been a source of concern over the years. An areawide plan (PL 92-500, Section 208 as previously discussed) is underway in this area. Previously completed studies have led to a report describing a Northern Maine Regional Treatment System, and to subsequent formation of the Aroostook-Prestile Treatment District, an agency which has been given responsibility by the Maine Legislature for point source pollution abatement programs in the area.

WATER QUALITY CLASSIFICATIONS

WATER QUALITY STANDARDS

There are two sets of water quality standards for the Basin. The first of these, set up by the State in 1964, assigned water quality classification to Maine surface waters based on the existing quality and type of use of each segment. Along with these classifications were assigned limits for certain pollutants, and a description of the type of use that corresponded to each classification. A brief outline of the surface water classification system (for fresh water only) is shown below.

STATE CLASSIFICATION

A The highest classification. No discharge of sewage or other wastes into this classification of water is permissible.

B-1 Acceptable for recreational purposes and after adequate treatment for use as public water supply.

B-2 Acceptable for recreational boating, fishing, industrial and public water supplies after adequate treatment. Allows higher coliform bacteria counts than B-1.

In Classes B-1 and B-2, disposal of sewage or industrial wastes is permissible provided it does not lower the classification.

C Satisfactory for recreational boating, fishing and other uses except public water supplies and bathing, unless adequately treated to meet standards. Allows higher bacteria counts and less oxygen than the B levels.

D The lowest classification. Considered as primarily devoted to the transportation of sewage and industrial wastes without causing public nuisance.

MAINE SURFACE WATER CLASSIFICATION SYSTEM

Class	Dissolved Oxygen % Sat.	Dissolved Oxygen mg/l	Coliform Bacteria Per 100 Millimeters	Treated Waste Discharge	Permitted Uses
A	75	5	100	No	Potable water, bathing, all recreation
B-1	75	5	300	Yes	Potable water if treated, bathing, all recreation
B-2	60	5	1000	Yes	Potable water if treated, bathing, all recreation
C	50	4	5000	Yes	Boating, fishing and wildlife
D	—	2	Not to exceed numbers that would be harmful to the public health	Yes	Power generation, navigation, industrial processes

The second standard for labeling water quality is basically an overlay to the earlier State system. By Federal law, the Maine Department of Environmental Protection had to further classify water segments according to their ability to be brought into compliance with the State Legislated Standards. Standard treatment levels were established by the Federal Government, and a resultant classification scheme was outlined showing three water segment classifications:

1. Water Quality Segments

   Based on its State classification and on the application of baseline treatment as described by Section 301 of PL 92-500, any water segment which will remain too degraded to meet its sources has been labled *Water Quality Limited.*

2. Effluent Limited Segments

   Those waters which now meet the water quality standards set for classification, or which will do so after all waste sources receive baseline treatment, have been labeled *Effluent Limited.*

3. Lake Stress

   A *Lake Stress* label is given to impounded waters where water quality standards are threatened by culturally induced conditions. Pollutants in such a case might include agricultural runoff, leachate from the septic systems of lakefront developments, or the pollutants that might result from recreational use of an impounded water.

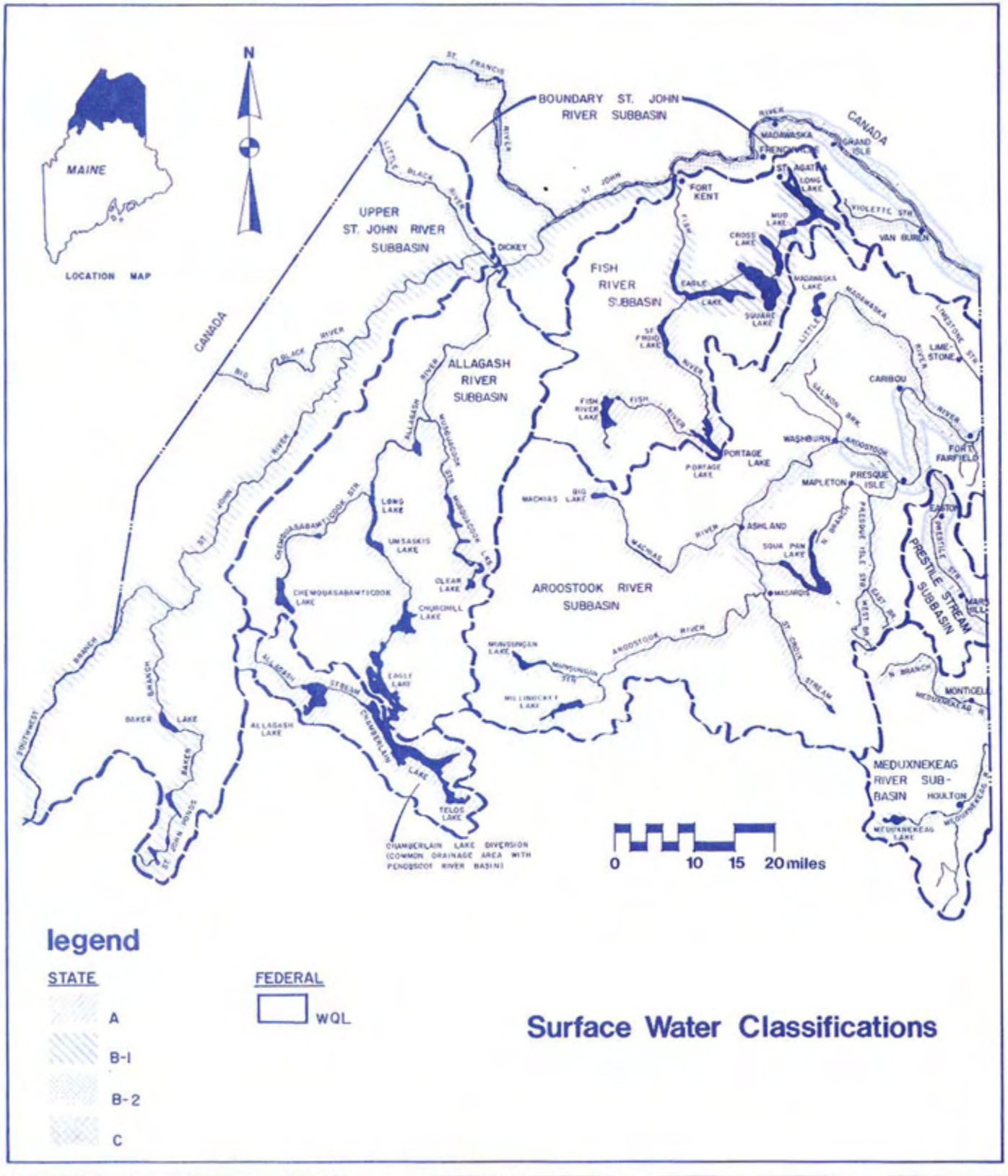
GENERAL WATER QUALITY IN THE BASIN

Water quality in the St. John Basin ranges from the high quality nearly undisturbed condition of the Upper St. John and upstream tributaries, to conditions which fail to support even the most tolerant of fish species.

In general, the water segments in the Basin are Class A or B-1 in the more remote areas, and Class B-2 or C in more developed areas. A map showing the surface water classification for the stream segments is shown on the following page.

As can be seen on the map, there are 3 Water Quality Limited segments in the Basin: (1) the border segments of the St. John River from the Fraser Paper Company outfall at Madawaska to the international border at Hamlin, a distance of 35.4 miles; (2) the 37.3 - mile segment of the Aroostook River from its confluence with Salmon Stream to the Canadian border at Fort Fairfield; and (3) the 18.9 - mile segment of the Prestile Stream from the Vahlsing Company outfall at Easton to the border. As described earlier in these Water Quality Segments, it has been estimated that the application of baseline waste treatment to all sources along the segment will not enable the segment to meet its legal water quality classification. In general, the limiting characteristic is dissolved oxygen (DO), a vital ingredient if a river is to support fish life or avoid becoming stagnant. Dissolved oxygen supports a biological cycle which allows a river to purify itself; without oxygen the river dies.

In the remainder of the Basin, stream segments are Effluent Limited, meaning they are or will be in line with the standards set for them upon completion of baseline treatment for all waste sources. There are no Lake Stress segments.



ST. JOHN RIVER BASIN
WATER QUALITY MANAGEMENT STUDY

POPULATION — GROWTH TRENDS IN THE BASIN

Water quality is affected most closely by the impact of man on the environment. To a great extent this impact is related to population concentration. That is, in areas where population density is high, those activities that most affect water quality take place. Therefore, in attempting to delineate a plan for the future management of the Basin's water quality, it is necessary to project the number and distribution of people that must be taken into consideration over the duration of the planning period. Projecting the population of the St. John Basin is extremely difficult, since the degree of error increases for less populated regions. The assumption must be made that future population levels will evolve in an orderly manner from conditions both past and present. Compounding the problem are the uncertainties of migration, both internal and external.

In general, the overall population of the Basin is expected to increase continuously, but not dramatically, during the planning period. This will result primarily from a projected population increase in the Aroostook Subbasin. In other subbasins, stable or slightly declining populations are expected. The projected populations for the subbasins and the Basin as a whole are shown below.

SUBBASIN POPULATION PROJECTION

Subbasin	Year			
	1970	1980	1990	1995
Meduxnekeag	12,625	12,500	12,400	12,400
Prestile	5,513	5,500	5,500	5,500
Aroostook	48,184	50,500	53,100	54,500
Fish	7,909	7,500	7,400	7,300
Boundary St. John	13,273	13,100	13,200	13,200
Upper St. John and Allagash	456	450	450	450
Total St. John Basin	87,960	89,550	92,050	93,350

SOURCES AND TYPES OF POLLUTION

INTRODUCTION

Water pollution originates from two source types — point and non-point. The point source is typically the outfall through which waterborne municipal, industrial, commercial or residential wastes are discharged into a waterbody. Non-point source pollution is that which enters a waterbody diffused, which cannot be attributed to a single outfall or discharge location. Examples include nutrient and sediment-laden runoff from croplands, oil spilled from boats or shoreline operations, and leachate from dumps or non-functioning septic systems.

The Water Quality Limited segments listed in the previous section occur in areas where point sources put a heavy pollution loading into streams which have insufficient assimilative capacity.

Discharges from wet process industries and from municipal or joint municipal-industrial wastewater systems contribute high BOD (Biochemical Oxygen Demand) which depletes the stream's available dissolved oxygen. Fecal coliform counts, which indicate the presence of human wastes or those from other warm-blooded animals, are also high in these segments.

Along the Effluent Limited Segments — particularly in the more remote areas — the principal cause is either insufficient dissolved oxygen or high coliform bacteria counts. These can result from pollution which is not traced back to a municipal sewer system; for example, agricultural runoff can carry water-form sediment, pesticides, and biocides to the streams adjacent to farmlands, and similarly diffuse wastes can enter the stream from septic systems, dump leachates, aerial spraying for spruce budworm infestations, or a variety of other non-point sources.

Particular point and non-point sources of pollution in the St. John Basin are described more specifically as follows.

POINT SOURCES

Point source discharges are nearly always associated with built-up areas. In the St. John River Basin, there are only seven municipalities which can be considered urban: Fort Kent, Madawaska, Van Buren, Caribou, Fort Fairfield, Presque Isle, and Houlton. Contained within the boundaries of these communities, an area relatively small compared to the rest of the Basin, are most of the major point sources of pollution. These include both domestic and industrial waste sources.

Municipal sewerage and treatment systems in the above-mentioned communities are for the most part either recently upgraded or under construction. Fort Kent, Van Buren and Houlton have recently completed secondary wastewater treatment plants. In these towns, attention is now turning to the upgrading of the sewer system to alleviate combined sewer overflows, excessive infiltration, and other problems that occasionally upset the treatment system's efficiency.

Primary wastewater treatment plants exist at Caribou and Presque Isle. While Presque Isle has yet to take steps to upgrade its unsatisfactory facility, the City of Caribou is now concentrating on final design studies for a secondary system to meet its pollution control responsibility. Progress in Caribou and Presque Isle is guided by the Aroostook-Prestile Treatment District.

The remaining two of the Basin's seven urban areas — Madawaska and Fort Fairfield — are now constructing secondary waste treatment plants.

Municipal point source abatement programs are given direction and financial assistance by PL 92-500, and its construction grants program, which currently contributes up to 75 percent of the cost of construction of required facilities.

Industrial point sources exist in the Basin's major communities, mostly associated with the processing of potatoes or other food products. Among such industries are:

Frenchville Starch Co., Frenchville
Stein-Hall Starch Co., Fort Kent
Daigle Potato Products Co., Fort Kent
McCain Foods Inc., Washburn
Potato Services, Inc., Presque Isle
Colby Cooperative Starch, Co., Caribou
Cyr Brothers Foods, Caribou
American Kitchen Foods, Caribou
A&P Co., Fort Fairfield
Vahlsing, Inc., Easton
Triple A Sugar Corp., Easton

The R. T. French Company in Washburn, and the A. E. Staley Manufacturing Company in Houlton discharge little or no wastes to the rivers of the Basin. They practice an alternative waste disposal procedure called land application, in which liquid wastes are spread on land in a controlled manner, allowing the natural soil system to assimilate the waste materials.

The quantity of wastewater discharged by the other food processors listed above ranges up to a high of 3.6 millions gallons per day (mgd). However, discussion of the quantities and impact of the wastewaters from these processors can have little accuracy at any single point in time, due to the seasonal fluctuations, frequent changes in processes used, and in more cases the tenuous circumstances surrounding the operation and ownership of the plants themselves.

Several of the food processors are now, or are contemplating, joining in with the municipal treatment systems to meet their pollution abatement needs.

The largest single point source in the Basin is neither a municipal sewerage system nor a food processing plant — it is the Basin's only large paper company, Fraser Paper, Ltd., in Madawaska and Edmundston. Fraser discharges 17 mgd of BOD and suspended solids-laden wastewater to the boundary St. John River. It is the primary source of the river's pollution problem, and the reason for the boundary St. John's Water Quality Limited classification.

NON-POINT SOURCES

The contribution of non-point sources of pollution has not until recently been given major consideration when assessing the total loading on a waterbody. It is recognized now, however, that in lightly populated regions such as the St. John Basin, non-point sources may often be the primary source of water quality degradation. There are two prevalent land uses — agriculture and forestry — which contribute substantial amounts of various pollutants to the Basin's waters. Non-point sources associated with agriculture, forest operations, and other activities are described below.

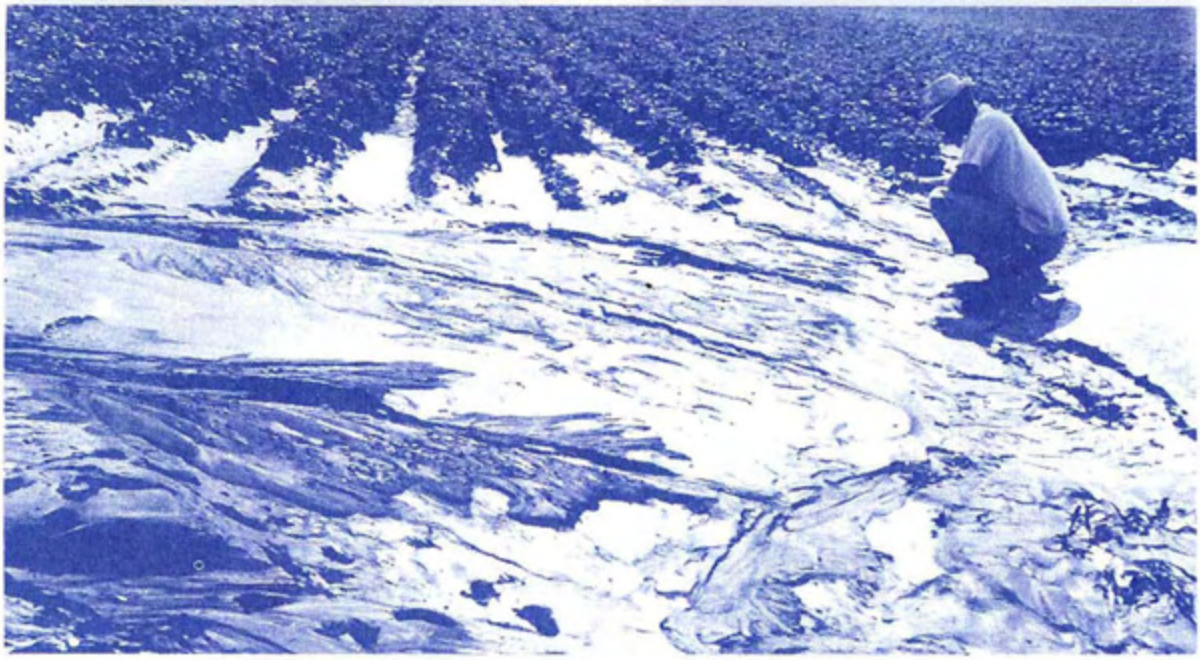
Agriculture

The three most significant non-point sources of pollution resulting from agriculture are: (1) sedimentation as a result of erosion from agricultural lands; (2) nutrients as a result of crop fertilization; and (3) biocides resulting from the use of pesticides, insecticides, herbicides and fungicides.

Rainfall and resulting runoff can cause severe erosion of soils which have lost their ground cover vegetation or organic content. In Aroostook County, this is a major problem — not only in terms of water pollution but also in the actual loss of soil from active farmland.

Good soil conservation practices have not been followed in the Basin's agricultural areas for the past decade. The area's agricultural economy centers around a single cost crop — the potato. Low crop prices coupled with rising production costs have forced farmers to intensify their use of the land. The short growing season, abandonment of field rotations, and failure to plant winter cover crops have necessitated increased use of fertilizers, pesticides, fungicides, and herbicides. As a result, an imbalance in the natural soils system has led to a breakdown in soil structure, and to increased erosion. It is estimated that there is a soil loss of about 2,380,000 tons per year in the Basin.

Nutrients, such as phosphorous and nitrogen, are also found in the water in agricultural regions of the Basin. Most are carried along with the sediment that reaches the rivers as runoff. Average



annual nutrient losses are estimated at 4.4 pounds of nitrogen per acre and 0.8 pounds of phosphorous per acre. These estimates yield a total nutrient loading of approximately 833,500 pounds of nitrogen and about 152,000 pounds of phosphorous discharged to the Basin's surface waters each year as a result of soil erosion from runoff.

A number of toxic chemicals are also used on the potato crop to retard disease, insects, and weeds, and to kill the potato vines prior to harvest. These chemicals are also carried along in the runoff from croplands, mostly adhered to soil particles. Approximately 140,000 pounds of biocides enter into the Basin's surface waters each year through this means.

Forest Sources

Nutrient and sediment inputs from a forest ecosystem are natural phenomena. The level of these pollutants in a given stream or lake will vary from year to year, depending on a number of environmental factors.

Disruption of the natural forest ecosystem results from forestry operations, which are common in the Basin, and to a much lesser extent from recreational uses of the area's forests.

Forest harvesting operations require the construction of logging roads to give trucks and machinery access to the timber being harvested. Usually these logging roads are neither well constructed nor maintained. As a result, they can easily be eroded during rainstorms.

Forestry is a major industry in Maine, and the State's forest resource is considered highly valuable. Maine is plagued by a small moth known as the spruce budworm, to which has been attributed the death of literally millions of spruce and fir trees. For more than 3 decades, Maine has been using aerial sprays to control this insect. The spruce budworm control program is expensive — costing as much as $5 million per year — and it is also of concern to environmentalists. Little is currently known about the concentration of insecticide that reaches the Basin's surface waters as a result of spray application. The balance of impacts — water quality versus the forests — must be carefully considered in regard to aerial spraying of insecticides. However, more research is needed in order to set the equation for such an assessment.

The Basin's forests also give sportsmen and campers a place to enjoy the outdoors. Recreational uses are not seen as a major source of pollution. Some campsites in the region show signs of overuse; particular areas of concern include pit toilets located in unsuitable soils, destruction of ground cover and compaction of the soil at heavily used sites, and improper disposal of trash or garbage.

NON-POINT SOURCES (CONT'D).

Lakefront Development

The pollution problems in the Basin's lakes are often a result of improper development along the lake shoreline. Most of these developments have no access to public wastewater collection systems, and thus depend on on-lot subsurface disposal systems.

Fecal coliforms, the bacteria which indicates the presence of human wastes in a waterbody, have been found in Long, Cross, Eagle, St. Froud, Portage, and Fish River Lakes. Daigle Pond, Soldier Pond, and Nickerson and Meduxnekeag Lakes have also been reported to be stressed by malfunctioning (or inadequate) sewage disposal systems at lakefront developments.

The Fish River tributary to the St. John is basically a chain of lakes. Water is held for long periods in some of these lakes — particularly Long and Eagle Lakes thus any pollutants which reach these waters are held there for a long time. Based on an average annual flow regime, it takes five years for Long Lake to completely change over its stored water.

Also common along the Basin's lakes are agricultural developments, which can add significantly to the nutrient content and fertility of the lake system.

POOR SOILS FOR SUBSURFACE DISPOSAL

Dumps

Active and abandoned dumps are found throughout the populated sections of the Basin. Improper operation, poor locations, and soil characteristics can allow rain to seep through these dumps and carry organics and bacteria from the waste material to nearby streams, lakes, or groundwater supplies.

Municipal, private, and industrial dumps are operated in the Basin. The State of Maine has mandated that open municipal dumps be closed, which may lead to further development of private systems. Maine's potato industry requires the disposal of cull, or unmarketable potatoes, which, through decomposition, can add a sizeable organic loading to the Basin's water courses. According to the University of Maine Extension Service, about 190,000 barrels of cull potatoes were dumped at private disposal areas in 1970.

Other Non-Point Sources

Additional non-point sources of pollution reach the Basin's surface waters through a variety of activities. Among these, the runoff from highways can carry large amounts of road salt to nearby waterbodies. The use of outboard motors can result in BOD and waste fuel discharges to lakes in the Basin. Similar discharges result from the operation of motorized snow vehicles in the winter.

The disposal of solid and liquid wastes from on-lot disposal systems and from the operation of wastewater treatment plants also poses a difficult problem. As greater treatment levels are required by law, and as more and more towns and industries discharge their wastes to treatment plants in the Basin, the resulting problem of sludge disposal increases. Sludge is the treated by-product of a pollution control plant, consisting of grit, solids, and scum removed from the raw wastes that undergo treatment at such plants. A good secondary wastewater treatment plant removes about 90 percent of these materials from incoming wastewater, and must find a means and location for disposing of this end product.

THE IMPACT OF POLLUTION SOURCES

WATER QUALITY FINDINGS

The point and non-point sources of pollution have an impact on water quality in the Basin. The degree of impact depends on a number of factors, including: the volume of stream flow at the time of discharge; production methods or levels (if any) at the major wet process industries; and weather conditions. The latter have a fairly substantial role due to the tendency of runoff to carry high BOD, sediment, and chemical loadings to the Basin's water courses.

During this study, several sampling and analysis programs were undertaken to supplement information recorded during previous investigations. The study program included river and lakes sampling, supplemental grab samples, visual and aerial reconnaissance, industrial and municipal point source discharge investigations, a special sedimentation study, and a study of the river bottom along the boundary St. John.

Two major sampling programs were undertaken in the summer and fall of 1972. Water samples were taken over a 24 to 48-hour period at predetermined sites along the St. John and its tributaries. These were then analyzed for temperature, dissolved oxygen (DO), BOD_5, COD, pH, conductivity, turbidity, color, total and suspended solids, total and fecal coliform, total phosphorus, and total nitrogen.

In addition, the headwaters of the Basin's major rivers were studies using visual reconnaissance, supplemented by the taking of grab samples during October 1972.

At the major industrial plants or municipal waste treatment facilities, an on-site tour was made to assess manufacturing and waste treatment methods, and methods of solid and liquid waste disposal. This was followed by an industrial sampling program.

High sediment loadings in the tributaries to the Upper St. John River led to an investigation of the origin and extent of this pollution. Samples and photographs were taken which indicated extensive siltation. The cause appears to have been dredging projects on the Canadian tributaries to the Upper St. John.

During sampling and analysis of the boundary St. John River between Madawaska and Grand Falls, the dissolved oxygen level was found to be lower than expected on the basis of known pollutant loadings. To test a hypothesis that river bottom (benthic) deposits were behind this phenomenon, a special field study was undertaken. The benthic investigation showed that a substantial BOD is being exerted on the St. John River downstream of the pulp and paper mill discharges at Edmundston and Madawaska. This results from the anaerobic breakdown of organic matter in the river bottom deposits.

MADAWASKA AND EDMUNDSTON

MATHEMATICAL MODELING

As part of this study, a mathematical river model was created to simulate the water quality implications of various pollutant loadings. The model is a computer-based tool that approximates a river's hydraulic characteristics and thus can indicate how a river might react to alternative water quality management plans.

River models were prepared for the boundary St. John, Aroostook and Meduxnekeag Rivers and for the Prestile Stream. The models were used to simulate river behavior in terms of dissolved oxygen, total nitrogen and total phosphorus for three alternative loading conditions: (1) continuation of current loadings; (2) application of best practicable treatment (BPT); and (3) application of best available treatment (BAT). BPT and BAT generally correspond to secondary wastewater treatment and more advanced wastewater treatment, respectively.

The model showed that under current loads the boundary St. John River had adequate dissolved oxygen from Fort Kent to Madawaska, but that Fraser Company discharges at Madawaska and Edmundston cause dissolved oxygen (DO) to drop rapidly to zero just beyond Grand Isle. Nonpoint sources cause total phosphorus to gradually increase from Fort Kent to Madawaska, where raw municipal discharges cause phosphorus to jump slightly.

The Aroostook River has had a poor DO profile under high loadings. DO drops from Washburn to Presque Isle, and then decreases steadily before reaching Caribou. It has dropped to zero between Fort Fairfield and Tinker Dam. Total phosphorus and nitrogen in the Aroostook increase in steps at the locations of municipal outfalls.

Dissolved oxygen in the Meduxnekeag meets that river's B-1 classification under current loadings. Total nitrogen and phosphorus rise sharply at the Houlton treatment plant outfall.

The Prestile Stream model results show DO levels which meet the stream's C classification under current loading conditions without industrial discharges. Total nitrogen and phosphorus gradually decrease downstream from Mars Hill.

A mathematical model was also developed to simulate the behavior of the Fish River chain of lakes. However, because of the limited data on existing conditions, the results of that model have limited usefulness.

It should be noted that the above results do not include river profiles for total or fecal coliform. Even where DO levels are within the standards set for stream classifications, coliform counts can cause the stream segments to be out of conformance. This is true even in the very sparsely populated regions, although the magnitude of the problem is greater in urban areas. Insufficient municipal or industrial treatment systems cause much of the problem. However, a substantial loading also results from the wet weather overflow of combined sewer systems (systems which collect domestic wastewater and stormwater), and to urban runoff.

INSTITUTIONS AND POLLUTION CONTROL MEASURES

POINT SOURCE ABATEMENT

The program for point source abatement is stringent and clear-cut. It is administered nationally by the U.S. Environmental Protection Agency (EPA) and locally by the Maine Department of Environmental Protection.

The program is specifically directed to the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), which requires that municipal and industrial sources of pollution receive "best practicable treatment" (BPT) by July 1, 1977, and "best available treatment" (BAT) by July 1, 1983. The EPA has set the standards for BPT and BAT.

Any point source waste discharge must meet the standards set by the National Pollutant Discharge Elimination System (NPDES), which is basically a permit system allowing municipalities and industries to discharge a specific quantity of wastes, up to a maximum limit set in the permit conditions. The permits are issued along with scheduled deadlines for the abatement of waste discharges. Failure to comply either with the effluent limits or the scheduled compliance data can result in sizable penalties.

The progress of municipal treatment construction programs is closely tied to the construction grants program. This program is based on federal assistance covering up to 75 percent of eligible construction. Funds are allocated to each state by the EPA, and the State is then responsible for distribution of the allocated amounts. In Maine, a priority point system governs the distribution of these funds.

Highlights of the point source abatement program in the Basin are discussed below.

Frenchville has no municipal sewerage system. The Frenchville Starch Company has been discharging raw wastes to the St. John River through the 1975 processing season. The cost of abatement programs for the town or the industry appear prohibitive. Frenchville has 19 priority points, a standing which leaves 40 Maine communities ahead of Frenchville in line for construction grant assistance.

Fort Kent is sewered and has a secondary wastewater treatment plant. The town's two largest industries, Stein-Hall Starch Company and the Daigle Company are considering permanent tie-ins with the municipal plant. Stein-Hall had until 1975 been discharging raw water to the Fish River and has been experimenting with discharge to the Fort Kent plant. Daigle Company operations have been sporadic. Pre-treatment would be required if Daigle were to discharge to the municipal system.

Madawaska currently discharges raw wastes to the St. John River, but has been awarded a construction grant for a municipal treatment system. Design plans have been prepared and funds allocated to Madawaska for construction to commence in 1976. Madawaska's largest industry, Fraser Paper Ltd., has been issued an NPDES permit requiring that BPT be provided by October 1, 1976. The company will have to construct its own treatment facilities to meet this requirement.

Van Buren has completed construction of a secondary wastewater treatment plant. However, a large and unexpected problem with excess inflow and infiltration into the sewer system has caused problems at the plant. Sewer repairs and combined sewer separation may be required to cancel the problem.

Grand Isle has no municipal system. A 1972 report recommended service to 500 of the town's 800 people. Grand Isle has 21 priority points in the State system.

Portage Lake has no municipal collection system. Lakefront development on generally unsuitable soils results in a nutrient loading to the lake. A sewer report was prepared in 1971 and recommended a collection and treatment system, but no action has been taken by the town to date.

St. Agatha has a municipal secondary wastewater treatment plant which discharges to Long Lake. The nutrient loading imposed by this discharge, however, is not felt to be as important as that imposted by non-point sources.

Ashland operates an oxidation pond wastewater treatment system which, when supplemented by the addition of disinfection facilities will meet the town's 1976 NPDES discharge requirements.

Washburn has a collector system serving about 1,100 people, but provides no treatment due to a halt in the treatment plant design in 1972. The halt was brought about by the advent of PL 92-500 and uncertainty about its effect on a joint municipal-industrial pollution control agreement with Taterstate Frozen Foods (now McCain Foods Inc.). It is expected that the town will soon reinitiate design of a municipal treatment plant, while McCain Foods Inc. will provide land application of its wastewaters.

Mapleton discharges secondary treatment plant effluent to the North Branch of the Presque Isle Stream.

The City of **Presque Isle** operates an old system which is inadequate. The sewer system is mostly combined, and the treatment system provides inefficient primary treatment levels prior to discharge to the Presque Isle Stream. Presently, plans have been initiated for upgrading of the system. Potato Services, Inc., in Presque Isle, is one of the nation's largest potato processors. The company has installed its own treatment facilities and is currently meeting its NPDES permit requirements.

Caribou, as part of the Aroostook-Prestile Treatment District, is currently conducting design studies for secondary wastewater treatment, to include consideration of the City's two major industries: Cyr Foods, and American Kitchen Foods. Decisions have been made by these two industries to join the system. Colby Co-op may construct their own facilities.

Loring Air Force Base operates a satisfactory secondary treatment system.

Fort Fairfield is currently constructing a joint municipal-industrial wastewater treatment facility that will also serve both the community and the A&P food processing plant.

Limestone operates a secondary wastewater treatment plant that was constructed in 1966. There are some problems during wet weather due to excessive inflow and infiltration in older portions of the town's collection system, and due to the treatment plant's location on the Limestone Stream flood plain.

Monticello has no municipal sewage collection system, although a stormwater system discharges into the North Branch of the Meduxnekeag. Unsuitable soils cause poor operation of on-lot disposal systems, but municipal sanitary sewers do not appear to be forthcoming. The town ranks below 99 other Maine communities in terms of construction grant priority points.

Houlton has a secondary treatment plant but like other towns in the Basin, is experiencing serious infiltration/inflow problems assqciated with the age of its sewer system.

Easton has two large industries, Vahlsing, Inc., and a cooperatively-owned sugar beet refinery. The town itself has no sewers. However, the industries have not been fully operating, if at all, in recent years.

Mars Hill operates a primary wastewater treatment plant which discharges to the Prestile Stream.

NON-POINT SOURCE ABATEMENT

Unlike point sources which are being regulated and abated by one of the nation's most intensive pollution control programs, there exists neither the funding nor the organization to control the more difficult non-point sources.

It is possible, and current trends seem to indicate, that the EPA may have to assume regulatory control over non-point sources. But even if it does, the true effectiveness of such a program will depend upon public awareness, adequate regulatory mechanisms at the local level, and certainly upon economic incentives for land use or other measures used to control non-point sources.

The EPA has estimated that about 15 percent of the nation's waters fail to meet water quality standards as a direct result of non-point sources. In the St. John River Basin, a much higher percentage of the surface waters are affected by predominantly non-point sources.

The abatement of non-point sources cannot follow the same procedure as that for point sources. The collection and treatment of non-point sources would be an immense undertaking. Successful abatement will have to depend on education and preventive programs.

Some of the major abatement measures that need to be considered in the Basin are the following:

- exposure of and education on programs relating to non-point sources
- improve soil conservation practices, through crop rotation, contouring, grade stabilization

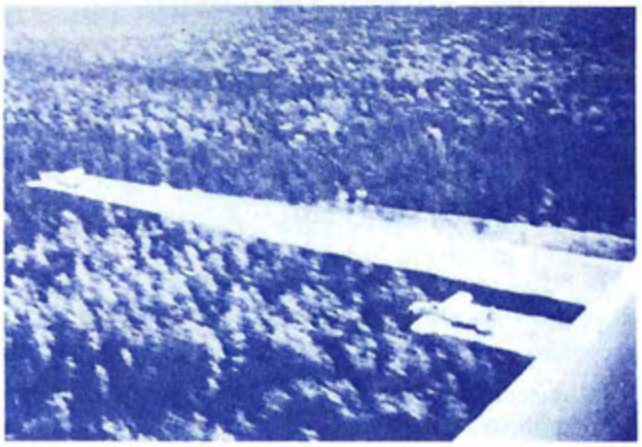
AGRICULTURE EROSION

STRIP CROPPING

DIVERSION DITCH

CROP ROTATION

LONG LAKE



AERIAL FOREST SPRAYING

- establish buffer strips along watercourses to take over where soil conservation practices fail to provide enough administration control
- establish sound practices for the use of fertilizers and other agricultural chemicals
- establish guidelines for the location and construction of logging roads, and provide incentives and/or enforcement to ensure that the guidelines are followed
- conduct further research in biological and environmental controls for spruce budworm reductions, and consider atmospheric and other conditions when using spray insecticides
- provide adequate supervision of campsites to prevent overuse or improper waste disposal practices
- increase efforts to control open dumps, and to ensure that landfill sites are based on adequate soils information and design standards, followed by periodic inspection of operating practices
- prevent further stress on lakes which suffer from water quality degradation, and provide strict adherence to shoreland zoning, the State Plumbing Code, and other existing laws designed to protect the lakes from pollution resulting from lakefront development
- study the impact of outboard motor use and establish guidelines to prevent their use from overly adding to lake pollution.

In addition to these measures, the control of urban runoff and combined sewer overflows is an important part of the pollution control needs in more developed areas. Residual wastes — including septic tank sludge (septage), and municipal and industrial wastewater treatment plant sludges — must be disposed of properly.

All of these non-point abatement measures require awareness, policy, financing and enforcement. The Basin should look carefully at these requirements and incorporate a sound management strategy. Attention should be given to the consolidation of policy making and enforcement efforts and to the broadening out to the grass roots level the implementation programs required to successfully control non-point sources of pollution.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The Basin's economy and population are relatively stable, although not in all respects healthy. The economic base, with respect to the wet process industries, is turning from the production of potato starch to processed potato products. Potatoes remain a single primary cash crop and are intensively cultivated. This has led to overuse of the land and of fertilizers, biocides and pesticides and has reduced soils stability. Agriculture runoff has become a principal source of pollution.

Forests cover 90 percent of the Basin, and represent a major resource. There may be increased exploitation of this resource as the demand for wood derived products continues to rise.

Urban areas are not expected to grow rapidly, although there will be a continued migration to the Basin's few urban centers. This trend is not expected to add significantly to the Basin's water quality problems.

Water quality is generally high in the Basin, due in large part to the relatively light development of this area of Maine. The most highly stressed waters — the St. John River below Madawaska and the Aroostook River below Washburn — are degraded primarily by industrial and municipal point sources. All of these have treatment plants in the planning, construction, or operational phase. Although it appears that BPT will not be met by the 1977 goal of PL 92-500, nonetheless, progress has been significant toward this goal, and will continue. Treatment beyond BPT level will not raise the quality of the Basin's waters significantly. The institutions, programs and funds for point source abatement are effective.

Non-point sources, however, are not well controlled, nor for that matter well recognized. The pollutant loading from these sources has a significant impact on water quality — particularly in terms of lake eutrophication and stream sedimentation. The relative impact of non-point sources will become much more apparent as point source control continues to progress. The primary non-point source is agricultural runoff, which is concentrated in the eastern portion of the Aroostook River watershed, along the boundary St. John River, and in the Prestile Stream and Meduxnekeag River watersheds. Other non-point sources include logging activities in forest regions, malfunctioning or inadequate subsurface waste disposal systems at lakefront developments, combined sewer overflows, and leachate from dumps and salt piles.

The largest single polluter in the entire St. John Basin is Fraser Paper, Ltd., at Madawaska and Edmundston. International cooperation is necessary if water quality standards are to be achieved in these boundary waters.

The general outlook for water quality in the Basin is good; it is particulary good for improving the quality of highly-stressed waters in the Basin — those segments which are receiving effluents from the major industrial and municipal discharges. The only major requirement of the point source abatement program is international cooperation along the boundary St. John.

Non-point sources must be addressed if the Basin's water quality management program is to be truly effective in the years to come.

RECOMMENDATIONS:

1. An agreement should be pursued between the United States and Canada for abating the pollution on the St. John River, primarily coming from the Fraser Paper Company paper mill in Madawaska and its pulp mill in Edmundston. The United States-Canada Committee on Water Quality in the St. John has recommended that the Fraser Paper, Limited, pulp mill in Edmundston convert to the kraft process and provide effluent treatment equivalent to the Environmental Protection Agency guidelines for the pulp and paper industry. This recommendation should be pursued. If this arrangement cannot be agreed upon, another agreement which would provide an effluent equivalent to Best Practicable Treatment from the two mills should be pursued.

2. The recommendations of the Maine Department of Environmental Protection in the May, 1975 "Aroostook River Water Quality Management Plan" and the March, 1974 "Prestile Stream Considerations of Reclassification" should be followed.

3. Wastewater treatment facilities are required for the Eastern Maine Starch Company and Daigle Potato Products, Inc. in Fort Kent. These two industries should either pre-treat their effluent prior to discharge to the Fort Kent municipal system, or they should provide Best Practicable Treatment for their own wastes prior to discharge to the Fish River. The Frenchville Starch Company should provide Best Practicable Treatment to its wastes prior to discharge to the St. John River. The town of Portage Lake should provide secondary treatment of its wastewaters and should utilize land disposal so as not to discharge to Portage Lake. The excessive inflow/infiltration at Houlton and Van Buren should be eliminated.

The South Branch of the Meduxnekeag River should be reclassified to Class B-1. Treatment of the wastewaters from the A.E. Staley Manufacturing Company and the municipality of Houlton has significantly reduced the pollution sources to this branch of the river.

4. A plan for areawide residual waste management should be developed for the Basin, and particularly for the Aroostook River corridor between Washburn and Fort Fairfield, to provide possible reuse for the potato processing plant sludges as animal feed. Such a project could be undertaken by the Aroostook Prestile Treatment District or the Northern Maine Regional Planning Commission as part of the present 208 program.

5. Water quality monitoring within the Basin should be expanded to provide a Prime Monitoring Network station on the St. John River just upstream of the international border at Hamlin.

6. Continuing efforts should be made to develop a secondary cash crop in the Basin. Such crops could, in addition to providing a more balanced economy, allow for soil revitalization and help improve water quality by reducing soil erosion.

7. Research should be undertaken to try to better quantify the water quality implications of land use activities. Special emphasis should be given to investigating the relationships among agricultural runoff, erosion, and sedimentation-borne pollutant loadings to waterbodies. Such research could be sponsored either by the University of Maine or through the Environmental Protection Agency on a research or demonstration project basis. Another agricultural land use activity which should be studied for its water quality impact and its ability to reduce sedimentation is the use of greenbelt buffer zones adjacent to waterbodies.

8. A regional effort should be initiated to petition the Agriculture Stabilization and Conservation Service to develop long-term continuity in its funding programs, so that continuous economic incentive is provided to land users who follow the programs set up by the Soil

Conservation Service and Agriculture Stabilization and Conservation Service. Only the continuous application of conservation practices will provide long-term benefits to the land owners.

9. Local agricultural agencies, together with agencies such as Aroostook Prestile Treatment District and the Northern Maine Regional Planning Commission, should work closely with Federal agencies such as the Soil Conservation Service and Environmental Protection Agency to educate the public on the economic and water quality implications of soil loss and sedimentation, and to provide farmers with the incentive to participate in a non-point source abatement program.

10. To provide non-point source management, a regional agency should be allowed to evolve as a local planner and coordinator. Special purpose agencies, such as the Agriculture Stabilization and Conservation Service and Soil Conservation Service would provide operational and technical support to this agency. The evolution should synchronize closely with a clear non-point strategy, a strategy developed through a logical succession of steps from basic research to the recommendation and enactment of necessary regulations. The 208 program presently underway could define the role and makeup of such an agency.

11. The local agency or institution that evolves to become the Basin's non-point planner and coordinator should elicit grass roots support from individuals and organizations who can participate in the non-point source abatement program. This approach will allow for decentralization throughout the Basin to meet the unique needs of particular areas, and it will involve farmers in cooperative action with minimal external pressures.

RELATED STUDY REFERENCE:

For a deeper understanding of international considerations and the institutional arrangements which are being explored as a result of this program, we refer you to a related "Report of the Canada-United States Committee on Water Quality in the St. John River". An underlying term of reference for that related report lies in the belief: "that if the planning processes underway for the past several years on both the Canadian and United States sides of the boundary river are to lead to implementation programs, as seems likely, then there is considerable merit in both sides formally agreeing now to minimum water quality objectives in order that neither side preempts or deprives the other of its options for future development based on environmentally sound use of the water resource." The mechanism for accomplishing this task rests in the authority of the International Joint Commission (IJC) as envisioned under the Boundary Waters Treaty. This related report and its recommendations have been prepared for consideration by the IJC and a copy may be obtained by contacting the Northern Maine Regional Planning Commission.

THE NEXT STEP:

Our job is done; our work has begun. To see the recommendations of this and the related Canada-U.S. Committee Report brought to fruition requires an ongoing dialogue between the parties involved. True, we may proceed with projects in our respective countries independent of one another and still maintain a semblance of respect for one another's goals: Yet to deal with ever changing realities and needs in either country, we cannot rely on these documents alone. The next step then rests with the IJC and the federal governments of each country to establish the direction we pursue to maintain that needed exchange.

ACKNOWLEDGEMENTS

Studies as comprehensive and unique as the SAINT JOHN RIVER BASIN Plan require cooperation and enthusiastic support from International, Federal, State and local levels to be successful. It is my belief that this study has been very successful and we owe much of our achievement to this support. Listed on the following page are the individuals and organizations which have contributed to the success of this project, however, special recognition should be given to a number of organizations and individuals without whose vision and support, the project would not have been possible.

One of those deserving special recognition is Honorable Governor Kenneth M. Curtis for his enthusiastic support and for his formal indorsement designating the NMRPC as the planning body responsible for the SAINT JOHN RIVER BASIN Study.

We also appreciate the efforts of both the U.S. and Canadian governments for having the foresight to develop concurrent plans on either side of the international border for the SAINT JOHN RIVER BASIN. Special consideration is also in order for the North Atlantic Treaty Organization's Committee on the Challenges of Modern Society (NATO/CCMS), Inland Water Pollution Project, for selecting the SAINT JOHN RIVER BASIN as a case study for international cooperation. The symposiums sponsored by NATO have been very helpful indeed for our River Basin and others throughout the world.

The U.S.-Canada Committee on Water Quality in the Saint John River, established by an exchange of notes between the two countries, has been more than responsible by providing a semi-formalized arrangement by which two sovereign nations could cooperate in seeking and achieving mutually acceptable solutions to water quality problems. The purpose of the committee was to exchange information, provide progress review, assist in plan coordination, and in making appropriate recommendations to relevant authorities and the International Joint Commission regarding the improvement of water quality in the Basin. It has been my pleasure to serve on this committee with the following individuals who deserve special recognition:

Mr. John A. S. McGlennon — Regional Administrator, U.S. Environmental Protection Agency

Mr. William Adams, Jr. — Director, State of Maine — Department of Environmental Protection

Mr. James Meek — Chief, Areawide Management Branch, U.S. Environmental Protection Agency

Mr. Richard H. Millest — Environment Canada

Mr. Brian B. Barnes, Deputy Minister, Department of the Environment, N.B. Canada

Mr. Leonce Chenard — Deputy Minister, Department of Fisheries, N.B., Canada

Mr. John M. Henderson — Planning Director for the Saint John River Basin Board, Fredericton, N.B., Canada

The financial and technical support from the Water Quality Office of the U.S. Environmental Protection Agency and the help provided by Mr. Don Smith, Project Officer is gratefully acknowledged.

Particular note is also deserving for the entire Congressional Delegation, community participants, municipal officials, woodland owners, and the many other unnamed individuals who, through their patience and support, have furthered the cause of this study.

The study has shown that the Basin is bountifully supplied with water resources by nature. However, it is also evident that past lack of awareness has significantly reduced the usefulness of this resource. Careful planning, good management, and continued enthusiastic support will be essential if these resources are to contribute, at anywhere near their potential, to our economic and social development.

James A. Barresi
Executive Director
Northern Maine Regional Planning Commission

NORTHERN MAINE REGIONAL PLANNING COMMISSION

ACKNOWLEDGEMENTS

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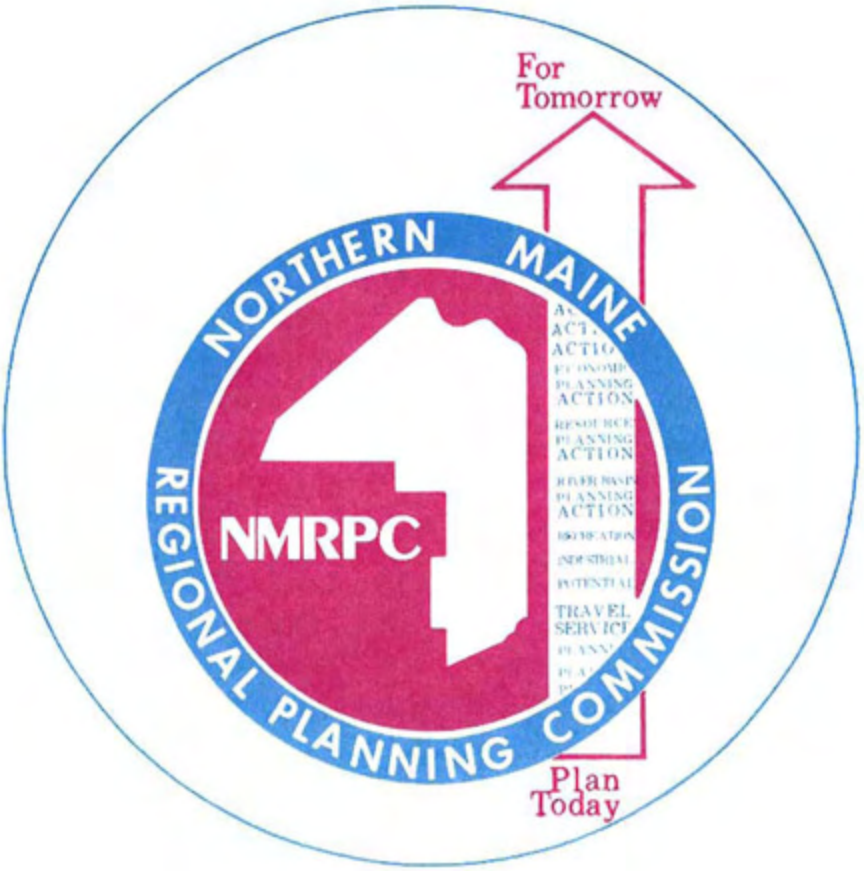

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