ANNUAL REPORT

GREAT LAKES FISHERY COMMISSION

1975

GREAT LAKES FISHERY COMMISSION

MEMBERS — 1975

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GREAT LAKES FISHERY COMMISSION

Established by Convention between Canada and the United States for the Conservation of Great Lakes Fishery Resources.

ANNUAL REPORT

FOR THE YEAR

1975

1451 Green Road
Ann Arbor, Michigan,
U.S.A.
1978

LETTER OF TRANSMITTAL

In accordance with Article IX of the Convention on Great Lakes Fisheries, I take pleasure in submitting to the Contracting Parties an Annual Report of the activities of the Great Lakes Fishery Commission in 1975.

Respectfully,

K. H. Loftus, *Chairman*

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ANNUAL REPORT FOR 1975

INTRODUCTION

A Convention on Great Lakes Fisheries, ratified by the Governments of the United States and Canada in 1955 provided for the establishment of the Great Lakes Fishery Commission.

The Commission was given the responsibilities of formulating and coordinating fishery research and management programs, advising governments on measures to improve the fisheries, and implementing a program to control the sea lamprey.

In accordance with Article VI of the Convention, the Commission pursues much of its program through cooperation with existing agencies. Sea lamprey control, a direct Commission responsibility, is carried out under contract with federal agencies in each country.

The Commission has now been in existence for 20 years. Its efforts to control the sea lamprey and reestablish lake trout have, in the main, been very successful although inherent problems remain. Residual populations of sea lampreys continue to be a source of mortality. Operational costs and costs of the chemicals used in the sea lamprey control program continue to rise. The need to develop and test alternative and supplementary control methods is urgent. Also, because of environmental considerations, the Commission is obligated to continue its support of research on the immediate and long-term effects of the chemicals being used. Self-sustaining populations of lake trout have not been widely reestablished, and efforts to encourage natural reproduction by lake trout must be intensified.

Through the years of its existence, the Commission has encouraged close cooperation among state, provincial, and federal fisheries agencies on the Great Lakes. Many, and probably most, of the fisheries problems are of concern to all agencies. The development of integrated and mutually acceptable management programs, supported by adequate biological and statistical information is vital. The Commission is gratified with the spirit of interagency cooperation that has developed and anticipates continued cooperation for the benefit of the fishery resource and its users.

Further, recognizing that ultimately the welfare of the fishery resource of the basin depends upon maintaining an environment of the highest possible quality, the Commission, with the support of other fishery agencies, intends to develop close liaison with those governmental agencies who have direct responsibility for water quality, pollution abatement, and land use.

The Commission's Annual Meeting was held at Toronto, Ontario, June 17-19, 1975 and its Interim Meeting was convened in Ann Arbor, Michigan, December 2-3, 1975.

ANNUAL MEETING

PROCEEDINGS

The twentieth Annual Meeting of the Great Lakes Fishery Commission was held in Toronto, Ontario, June 17-19, 1975.

Chairman Loftus called the meeting to order at 1300 hours, June 17 and introduced the Honourable Leo Bernier, Minister of Natural Resources for the Province of Ontario.

On behalf of his government, Mr. Bernier welcomed the Commission to Toronto and expressed his pleasure in meeting some of the people associated with programs of vital importance to Canada and the Province of Ontario. Referring to the 33 million people residing in the Great Lakes basin, he emphasized that we are tenants, not owners, who have an obligation to leave the resources in as good condition, if not better, than we found them. He noted that the Ministry was actively involved in protection and enhancement of water quality, sea lamprey control, and preservation and restoration of fish stocks. Ontario has, within the past year, increased its already considerable commitment to the fisheries program and was trying hard to expand its fish cultural capacity to speed up the restoration effort. Mr. Bernier stated his conviction that close coordination was imperative to achieve fishery objectives and emphasized that his Ministry expected to work closely with the International Joint Commission and the Great Lakes Fishery Commission. In conclusion, he complimented the Commission, and its cooperating agencies, on their sea lamprey control accomplishments to date and expressed his confidence in the progress being made in rebuilding and sustaining Great Lakes fish stocks.

In the Chairman's report to the Commission and delegates, Mr. Loftus expressed the need for a broadening of the Commission's cooperative role and greater devotion of attention to its overall mandate, rather than concentrating efforts on sea lamprey control. Because of funding constraints, the Commission has not yet developed a strong supportive role in interagency matters of fishery research and management, although positive progress has been made on lampricide registration-oriented research. The increasing cost of lampricide makes the search for alternative control methods imperative. He summarized accomplishments of the various entities within the Commission during the past year and reported, with enthusiasm, the Lake Committee's interest in achieving a stronger and more definitive input into Commission programs. The Lake Michigan Chub Technical Committee and Lake Erie's Walleye Protocol Committee continued their work towards definitive conclusions, and the importance of the Great Lakes Fish Disease Control Committee was emphasized through Michigan's costly outbreak of whirling disease at its Sturgeon River hatchery which was consequently closed. The Commission also strengthened necessary close working relationships with the International Joint Commission, and is developing arrangements whereby information and concerns will be exchanged regularly through reciprocal attendance of representatives, from both organizations, at major meetings. A special report and set of guidelines entitled, "A Management Policy for Great Lakes Fisheries," was issued by the Commission and its cooperating agencies, and a new public information report describing the activities of the Great Lakes Fishery Commission is now in preparation.

In conclusion, the Chairman described the problems facing Great Lakes fishery managers as being older, but basically the same as those now emerging in marine situations. He expressed the need for federal agencies in both countries to direct their attention to solutions in the Great Lakes where considerable progress has already been made, and then utilize these solutions as guidelines in approaching similar coastal and marine problems.

Following his report, Mr. Loftus introduced Mr. Carlos M. Fetterolf, Jr., the recently appointed Executive Secretary to the Commission, who would assume his duties as of July 1, 1975. The Chairman went on to express the Commission's appreciation to the U.S. Fish and Wildlife Service for their authorization of Mr. A. L. McLain's tour of duty as Acting Executive Secretary. On behalf of the Commission he thanked Mr. McLain for his excellent performance in a difficult assignment, and congratulated Assistant Executive Secretary Aarne Lamsa for his effort and outstanding performance during the period the Commission was without an Executive Secretary.

Management and Research.[1] Numerous matters pertaining to the management of the Great Lakes fishery received consideration by the Commission.

Reports from each Lake Committee (Ontario, Erie, Huron, Michigan, and Superior) covering management and research activities in 1975 were accepted. The Upper Great Lakes Plenary Session was reviewed and the problems of whirling disease in Michigan and PCB contamination of fish in the Great Lakes discussed. Six recommendations by the Great Lakes Fish Disease Control Committee were approved by the Commission and were transmitted to the member agencies.

Mr. Lynn A. Greenwalt, Director, U.S. Fish and Wildlife Service, presented a draft statement on the role of the Service in a national program for the enhancement of the Great Lakes fishery resource. Program objectives include assistance in prevention of further environmental

[1] Information on cooperative management programs and status of the fisheries resource is presented in Appendix A.

degradation and participatory support in Great Lakes Fishery Commission activities; control of sea lampreys and fish disease; participation in development and maintenance of favorable fish balances, along with conducting fishery investigations; and provision of technical fisheries assistance to federal agencies and Indian tribes.

A National Plan for Marine Fisheries was presented by a National Marine Fisheries Service (NMFS) representative. Presentation of a Federal-Provincial Strategic Plan for Ontario Fisheries by the Assistant Deputy Minister (OMNR) followed. Ontario has also developed the Ontario Fisheries Information System (OFIS) which is a set of independent, yet interrelated, data bases that each deal with different aspects of fisheries. The system is to be used as a tool in management efforts to restore and sustain fish populations.

The International Joint Commission's program on the Great Lakes was outlined and pertinent aspects, such as the 1909 Boundary Waters Treaty and the 1972 Great Lakes Water Quality Agreement, were discussed.

Sea Lamprey Control and Research. The Commission accepted reports on sea lamprey control and research during 1975 from its U.S. and Canadian agents.[2] In reference to Lake Superior, the U.S. reported that of the 81 streams which support or had supported sea lampreys, approximately 22 no longer supported runs. Canada's description of its Humber River dip net operation, located in urban Toronto, indicates a highly efficient method of sea lamprey capture with greater than 50% recapture success of tagged animals.

The Commission also received reports on research programs dealing with sea lamprey biology and registration-oriented research from USFWS laboratories at Hammond Bay and La Crosse.

Scientific Advisory Committee. The Commission accepted a report from its Scientific Advisory Committee containing recommendations pertaining to:

1. Steering Committee for an international symposium on the sea lamprey,
2. Position statement on environmental quality,
3. Technical review of sea lamprey research at Hammond Bay Biological Station,
4. Feasibility study for modeling walleye population of western Lake Erie, and
5. Sea lampreys in the Oswego River drainage.

Commission Structure and Function. The ad hoc G. F. M. Smith Committee was appointed by the Commission in 1974 to investigate

[2]Reports on sea lamprey control and research in United States and Canada appear as Appendices C, D, E, and F.

Commission structure, function and operations. Upon examination of the 1955 "Convention on Great Lakes Fisheries," the Committee agreed that the Convention was satisfactory and rejected renegotiation or alteration. No changes were suggested for the Commission's sea lamprey control program, but, in reference to an examination of procedures and committee structures, the Committee submitted several recommendations concerning Commission structure and operation, including strengthening the lake committees.

Administrative and Executive Decisions. Chairman Loftus summarized action taken by the Commission's Executive Session:

1. Discussed the preparation of a special report "History, Program, and Progress" to be published by autumn for wide distribution,
2. Initiated development of draft statement concerning lake trout policy to be presented at the Interim Meeting in December, 1975,
3. Prepared draft statement concerning barriers to be transmitted to the agencies for their immediate and serious consideration,
4. Accepted the report of the ad hoc committee on Commission structure and function,
5. Accepted the report of the Great Lakes Fish Disease Control Committee with minor amendments,
6. Approved budget requests for fiscal year 1976 and 1977 prepared by the Secretariat,
7. Agreed to fund the PERCIS symposium to the extent of $5,000 in each of the years 1975, 1976, and 1977 for a total of $15,000,
8. Deferred consideration of SAC and Lake Committee recommendations to the fall executive session,
9. Agreed to transmit a formal letter of appreciation to the U.S. Fish and Wildlife Service for Mr. A. L. McLain's services as Acting Executive Secretary of the Commission, and
10. Agreed to act as a repository for written reports, concerning "border incidents" of allegedly illegal Canadian or U.S. fishing in the other's waters. These reports will be assembled and transmitted upon request to the respective departments on an annual basis.

Adjournment. After announcing that the Interim Meeting would be convened in Ann Arbor, Michigan on December 2-3, 1975, and that the next Annual Meeting was tentatively scheduled for Traverse City, Michigan, June 15-17, 1976, the meeting was adjourned by Chairman Loftus at 1500 hours, June 19, 1975.

INTERIM MEETING

PROCEEDINGS

The Great Lakes Fishery Commission's Interim Meeting was convened in Ann Arbor, Michigan on 2-3 December 1975 to evaluate sea lamprey control and research programs; to review programs and budgets for fiscal year 1976, the U.S. transitional period (July 1-September 30, 1976), and fiscal year 1977; and to consider activities of special committees.

Sea Lamprey Control and Research. Reports on sea lamprey wounding rates on lake trout and salmon were presented for Lakes Superior, Michigan, Huron, and Ontario.

Progress reports on sea lamprey control operations in the United States (June-November 1975) and Canada (April-November 1975) were presented by the agents.

Also presented were reports covering sea lamprey research at Hammond Bay Biological Station (larvicides and barrier dams) and registration-oriented research on TFM and Bayer 73.

A U.S. Fish and Wildlife Service representative from La Crosse Fish Control Laboratories summarized progress toward re-registration of TFM. He emphasized that all reports and studies have been assembled and are currently being inventoried and packaged for submission to the Environmental Protection Agency (EPA) early in 1976. The EPA is expected to respond within 90 days.

Following these reports, the Commission reviewed programs and budgets for fiscal years 1976, 1977, and the U.S. transitional period. The transitional period is a one-time three-month interval (July, August, September) to accommodate the change to a new fiscal year to run from October 1 through September 30, rather than the former July 1 through June 30. Following negotiations with the State Department to explain that the summer months of the transitional period are the peak of the field season at which time costs reach their maximum, a transitional period budget of $1,166,000 was adopted, a figure higher than originally proposed by the State Department. A proposed new program (cost $25,000) to construct barrier dams on selected rivers to block spawning sea lamprey was deferred by government policy against new programs commencing in the transition period.

Appropriations for fiscal year 1976 are as follows:

	U.S.	*Canada*	*Total*
Sea Lamprey Control and Research	$2,553,400	$1,147,200	$3,700,600
Administration and General Research	64,600	64,600	129,200
Total	$2,618,000	$1,211,800	$3,829,800

The total budget request for fiscal year 1977 ($4,525,400) calls for a full-scale sea lamprey control and research program, continuation of registration-oriented research, initiation of barrier dam construction in an integrated sea lamprey control program, and support of studies to investigate attractants and repellents.

Special Subcommittees. Progress reports were presented by the Scientific Protocol Committee on Western Lake Erie Walleye, the Lake Michigan Chub Technical Committee and the Lake Erie Committee's Yellow Perch Workshop. Concerning the latter, the Workshop agreed that, in view of the continuing deterioration of the Lake Erie yellow perch resource, a Yellow Perch Technical Committee would be established. This Committee's report, to be presented to the Lake Erie Committee in January 1976, is to include probable effects of alternative size limits, protocol for continued evaluation of results, a statement urging immediate implementation of the recommended regulations, and recognition of each agency's constraints in implementing report recommendations.

Scientific Advisory Committee (SAC). Upon conducting a technical review of Commission-sponsored research at the Hammond Bay Biological Station the Committee spokesman stated that, although the SAC had not yet fully reviewed its findings, the staff of the research station should be commended for the innovativeness and quality of their research. Other items given attention included the Committee's proposal that the Commission transmit the Secretariat's revision of the brief on environmental quality and fish resources of the Great Lakes to the International Joint Commission. The Committee also recommended that the Secretariat take appropriate action to implement the 1973 recommendations concerning catch statistics.

Administrative and Executive Decisions. Chairman Loftus summarized recent executive action which included recommendations from the Lake Committees and the Scientific Advisory Committee.

1) The Commission accepted and endorsed, with minor modification, the Lake Ontario Committee's recommendation that Lake Ontario receive equal consideration in sea lamprey control and allocation of federally-reared lake trout.

2) The Commission accepted the recommendations of the "G. F. M. Smith Committee" on Commission structure and function and is in the process of implementing the recommendations.

3) The Commission, in reference to Lake Ontario and the Smith Committee's recommendations, is transmitting a statement on the role of the Lake Committees to all agencies.

4) The Commission will respond to the Lake Erie Committee's recommendation concerning an 8 to 8-½ inch minimum size limit for yellow perch to protect adults through one or more spawnings after it has been reviewed and acted upon by the Yellow Perch Technical Committee.

5) The Commission approved and transmitted a Scientific Advisory Committee brief on environmental concerns to the International Joint Commission, and believes the brief also addresses itself to Lake Erie Committee concerns, such as adequate funding of biological studies to accompany engineering studies relative to water level control.

6) The Commission, in support of a request from its Upper Great Lakes Committees for a sea lamprey barrier program, will transmit a policy statement on barrier dams to the U.S. and Canadian agencies concerned.

7) The Commission deemed an Upper Great Lakes Committee statement, in support of continued lake trout assessment, too general. State, provincial, and federal representatives agreed to develop uniform monitoring programs relative to criteria, sample size and other parameters.

8) The Commission asked the Scientific Advisory Committee to prepare an outline for a feasibility study to model walleyes (in western Lake Erie).

9) Regarding surveys for sea lampreys in the Finger Lakes and Oswego River system in New York State, the Commission has examined the information available and intends to provide its sea lamprey control agents a definitive statement of what the Commission expects—in essence, that the survey work should concentrate on determining the contribution of larval sea lampreys from that area to Lake Ontario.

The Commission has received correspondence from New York asking Commission support for a sea lamprey control program in the Finger Lakes. The Commission's response will state that Commission control programs would be carried out in those areas that contribute sea lamprey to Lake Ontario, but the Commission could not participate in a New York State program except perhaps in an advisory capacity. A plan for control efforts within the Oswego-Finger lakes watershed will depend upon survey results.

10) The Commission advised that they would provide $15,000 to support the Percid International Symposium (PERCIS).

11) The Commission explained that in Executive Session they had endorsed a statement expressing their concerns over PCBs which will be transmitted to environmental and other agencies in the U.S. and Canada.

In addition, the Commission explained that a policy statement on lake trout rehabilitation is being developed and will be addressed further at the next Executive Meeting.

Other Business. Matters brought to the attention of the Commission included the status of lake trout monitoring in Lake Superior, the Eastland Resolution, and its relevance to Great Lakes fisheries, and progress being made on the PERCIS and SLIS Symposiums.

Adjournment. After announcing that the Annual Meeting would be convened in Traverse City, Michigan, 15-17 June 1976, and that the Interim Meeting was tentatively scheduled for 30 November-1 December 1976 in Ann Arbor, Michigan, the Chairman adjourned the meeting at 1130 hours, 3 December 1975.

APPENDIX A

SUMMARY OF MANAGEMENT AND RESEARCH

The Commission's programs to control sea lampreys and coordinate management and restoration of the fisheries resource have continued throughout the Convention Area. This report will examine the status of several stocks of fish in the Great Lakes Basin, identify some areas of major concern, and steps being taken to address some of the problems.

Lake trout.[3] Restoration of self-reproducing lake trout stocks is a prime goal of the Commission which has coordinated the Great Lakes fishery programs since its formation in 1956. Lake trout rehabilitation for the U.S. waters of the upper Great Lakes has been a cooperative effort among the upper Great Lakes states and the U.S. Fish and Wildlife Service wherein each shoulders a share of the program. The state of Michigan has assumed the burden of rearing the brood fish for sharing eggs with its sister states and the U.S. Fish and Wildlife Service; the latter has assumed the expensive task of raising and planting the bulk of the fish; some of the upper Great Lakes states have also reprogrammed hatcheries for production of lake trout for their waters, and all the agencies participate in research to evaluate the plantings and provide information to assure maximum efficiency in the stocking program. Concurrently, the Province of Ontario has pursued a complementary lake trout planting program on the Canadian side of Lake Superior and a splake (lake trout × brook trout hybrid) program for Canadian waters of Lake Huron and Lake Ontario.

Lake Superior. In Lake Superior, survival of planted lake trout has been good with increasing numbers of native lake trout several years old being caught in several localities, but reproduction and recruitment are not as high as hoped apparently because many lake trout contined to spawn in unsuitable areas along shore rather than on traditional spawning reefs. Sea lamprey wounding rates generally reflect low abundance of sea lamprey except that wounding rates in Minnesota waters continue at a higher level in comparison to most other sections of lake. No explanation has been found for the high wounding in that area.

Two areas of Lake Superior experienced serious declines in lake trout abundance. In Whitefish Bay (eastern Lake Superior), lake trout stocks declined an estimated 30% over 1973 levels. The cause of the decline was not definitely known, but sea lamprey predation was not thought to be the reason. In Wisconsin waters, substantial declines in abundance of lake trout were also reported, particularly in one area of the Apostle Islands—the Gull Island and Michigan Island Shoal which has the largest spawning population of native lake trout in the southern half of Lake Superior. In 1975, heavy fishing by several user groups reduced this important spawning population by 50%. Wisconsin felt that in the face of expanding Indian and recreational fisheries the best protection would be to establish a year-round refuge encompassing the Gull Island and Michigan Island Shoal.

[3]A summary of lake trout and splake plants through 1975 may be found in Appendix B.

Despite problems in several areas, there is general optimism that lake trout populations in Lake Superior will continue to improve, but there is also recognition that existing stocks are insufficient to support an open fishery by all user groups.

Lake Michigan. When the lake trout stocking program was initiated in Lake Michigan in 1965, native lake trout were essentially extinct, in contrast to Lake Superior where remnant native stocks still survived in several areas when "production stocking" was begun in 1958. The lake trout planted in Lake Michigan grew rapidly and by 1970 some had reached maturity. Spawning in increasing amounts has occurred each year since, but no wild (i.e., non-fin clipped) juvenile lake trout have been observed. Many reasons for the apparent lack of spawning success have been postulated—spawning in unsuitable areas such as beaches and other onshore planting sites, contaminants interfering with the development of eggs or young fish, predation on eggs or fry, and inadequate numbers of spawning fish. Research efforts to date have not yielded answers. While a third of the lake trout plants from 1965-1975 have been made offshore, greater attention in recent years has been directed towards planting on traditional spawning reefs in hope that the fish will home to these areas upon maturity and increase their chances for successful reproduction.

It was reported that lake trout appeared to survive well to about age VIII or IX, after which mortality rates increase rapidly. Few lake trout of the 1964-1966 year classes remain.

Sea lamprey wounding on lake trout and other species is generally low, but higher wounding rates in the Sturgeon Bay area of Wisconsin, both in Green Bay and the main body of the lake, indicate a greater abundance of sea lamprey in that area.

Lake Huron. Ontario has maintained an annual splake planting program from 1969 through 1975. United States waters of Lake Huron received splake in the years 1970 through 1972, and lake trout in the years 1973 through 1975. Problems with fish disease in splake brood stock were a major factor in the change of species.[4] Further, in 1973 the U.S. Fish and

[4]Discussed in Appendix B, Trout, splake and salmon plantings, 1974 Annual Report of the Great Lakes Fishery Commission.

Wildlife Service planted 486,000 yearling lake trout × splake backcrosses in Michigan waters. Survival and growth of these fish were good and in the fall of 1975 Michigan collected about 90,000 eggs for rearing to test viability.

Assessment efforts to compare lake trout, backcrosses and splake have been difficult because of differences in size at planting, in growth and gear selectivity, in planting localities, and season of planting. Nevertheless, it appeared that the yearling lake trout survived better than fall fingerlings, that survival of backcrosses was greater than of lake trout in the same planting, and that splake grew well, but survival after age III appeared low.

Lake Erie. In Lake Erie, small plants of lake trout were made by Pennsylvania in 1969, 1974, and 1975. In 1975, New York also initiated lake trout plants with a stocking of 170,000 fall fingerlings. A few lake trout from the earlier plants by Pennsylvania have been caught commercially and by the sport fishery.

Lake Ontario. In Lake Ontario, splake were planted by the Province of Ontario, beginning in 1972 and continued through 1974; none were planted in 1975. New York made a small plant of Seneca Lake strain lake trout in 1973, but in 1974 and 1975 other strains of lake trout were planted through a cooperative agreement between U.S. Fish and Wildlife Service and the State. Assessment studies showed good survival of lake trout through 1975 and early maturity of some of the males planted in 1973 as yearlings (Seneca Lake strain). Sea lamprey wounding was considerably higher than that reported from Lakes Superior, Huron, or Michigan. Some fears were expressed that sea lamprey abundance in Lake Ontario would have to be reduced further before restoration of fish stocks could be comparable to that of the Upper Great Lakes.

Chubs. Chubs are major commercial species in Lakes Superior and Michigan and in Canadian waters of Lake Huron, particularly Georgian Bay. No fishable chub stocks remain in Lake Erie or Lake Ontario.

Lake Superior. In the Summary of Management and Research in the Commission's 1972 Annual Report (Appendix A, page 16), the status of the declining chub fishery in U.S. waters of Lake Superior was addressed and concern was expressed over the "fishing up" process wherein the fishery seeks target species in new areas when stocks in traditional fishing grounds have been depleted. The report also noted that some (U.S.) agencies were considering catch quotas. Michigan took action in 1975 by instituting areal harvest quotas consisting of two parts, an individual allotment and an open quota. Wisconsin expressed concern over the declining catch-per-unit-effort and shifting of effort to the best fishing grounds, fearing a decline in their chub population. In recent decades the Minnesota catch has been small compared to Michigan and Wisconsin landings.

By contrast, the Province of Ontario has felt that the chub populations in their waters of Lake Superior are currently underutilized and has encouraged the fishery under a quota system. The Canadian catch has

steadily increased from a low of about 4,000 pounds in 1969 to 455,000 pounds in 1975.

Lake Michigan. The rapid decline of the chub stocks in Lake Michigan and formation of the Lake Michigan Chub Technical Committee were summarized in the Summary of Management and Research in the Commission's Annual Report of 1974 (Appendix A, page 14). Since there was no harvestable surplus, the Committee unanimously agreed there was no justification for a chub fishery in Lake Michigan and, therefore, recommended that "the chub fishery be suspended in 1975 and the suspension remain in effect until the population stabilizes and a harvestable surplus occurs." They also recommended an assessment program with a quota of 310,000 pounds for the four states surrounding lake Michigan.

In June 1975, Wisconsin effected an emergency closing order prohibiting chub fishing except by six contract fishermen authorized to take 120,000 pounds for assessment purposes. This closure expired in October, the open fishery resumed briefly, but closure was reinstated in mid-December by administrative rule. A permanent closure is being enacted for 1976. Illinois closed its chub fishery effective September 1975, allowing an annual assessment quota of 30,000 pounds assigned to three fishermen. Michigan's chub fishery was closed in July 1975 by emergency order, but injunctions against the state allowed chub fishing to continue sporadically throughout most of the year. Permanent closure with an assessment quota of 160,000 pounds is being developed for implementation in 1976. In Indiana there is no chub fishery so the matter is of limited concern. Surveys by the U.S. Fish and Wildlife Service using bottom trawls in the fall of 1975 yielded catches somewhat higher than those of 1974, but the levels were well below those observed in the late 1960's. This was the first evidence of improvement in chub stocks observed from 1967 through 1975.

Lake Huron. Chub stocks in U.S. waters of Lake Huron have been protected by closure of the commercial fishery and appear to be increasing in abundance. Most of the Canadian commercial catch of chubs is taken in Georgian Bay where about 692,000 pounds were netted in 1975, an increase of about 78,000 pounds over 1974. Landings in 1975 in other Canadian waters of Lake Huron were just over 100,000 pounds.

Lake Herring. Only Lake Superior now supports a significant population of this species. At one time they were an abundant commercial species in all the Great lakes but various factors have reduced their abundance severely in Lakes Ontario, Huron, and Michigan and to virtual extinction in Lake Erie.

The Summary of Management and Research in the Commission's 1974 Annual Report (Appendix A, page 12) states the conclusions and recommendations of the Lake Superior Lake Herring Subcommittee which had been formed to review, evaluate, and summarize those factors most likely to be responsible for the decline of lake herring in Lake Superior. In 1975, agencies began to implement various measures to enhance lake herring stocks. Michigan instituted a 200,000 pound quota on herring taken incidentally to the chub fishery. Minnesota stocked 31 million herring fry in 1975 and collected another 61 million eggs for stocking fry in May 1976. They also closed the herring fishery in November to protect spawning stocks. In Ontario waters where total landings of lake herring have been fairly stable over the past decade, the Ontario herring fishery continued without major change in 1975. Individual quotas have been in effect for several years in Black Bay allowing for a harvest of 1.5 million pounds. Plans are to extend quotas to Thunder Bay in 1976.

Since many believe that the invasion of rainbow smelt has been a major cause of the decline of lake herring in the Great Lakes, a cooperative study was initiated in 1974 by the U.S. Fish and Wildlife Service (Ashland Biological Station) and the Province of Ontario to examine the possible relations between lake herring and rainbow smelt in two areas, the Apostle Island region in Wisconsin and Black Bay in Ontario waters. Lake Herring are scarce in the former area and abundant in the latter. Smelt are about equally abundant in both areas.

Lake Whitefish. Major lake whitefish fisheries formerly existed in all the Great Lakes, but now the species is commercially important only in Lake Superior, Lake Michigan and Lake Huron, collectively referred to as the upper Great Lakes. Lake whitefish populations in the upper Great Lakes were severely reduced by sea lamprey predation. With sea lamprey control, they have responded dramatically, reaching high levels of abundance in many areas to become the mainstay of several successful commercial fisheries.

Lake Superior. In Lake Superior, where sea lamprey probably never reached maximum abundance prior to implementation of control measures, the catch of lake whitefish has gradually increased from an annual 500,000-600,000 pounds (1958-1967) to a fairly stable level of 1 million pounds in 1973 through 1975. About 45 percent of the reported catch was taken from Michigan waters, but an unregulated fishery in Whitefish Bay in the eastern end of the lake was estimated to equal or exceed the reported commercial catch. Fears were expressed that stocks in that area would be depleted by overfishing. Wisconsin in 1975 reported that their commercial harvest (294,000 pounds) was the best since 1966. Harvest of lake whitefish in Minnesota waters in recent decades has been minor compared to the catch taken in other waters. Canadian harvest of whitefish has been increasing for several years. Quotas are being established and arranged in combination with lake trout quotas so that lake trout will be the incidental catch. When the quota for either species is filled, the large mesh gillnet fishery will be closed.

Lake Michigan. The major lake whitefish fisheries are located in northern Lake Michigan where this species continues to provide the major support to the commercial fishing industry. In 1957 the commercial catch of whitefish reached its nadir when only 25,000 pounds were landed. Following sea lamprey control measures initiated in 1960, the population rebounded and in 1973 the commercial harvest peaked at 3.6 million pounds. In 1974 and 1975 the catch stabilized at about 3.4 million pounds, with slightly over 2 million being landed in Michigan and the balance in Wisconsin. Few lake whitefish are caught in Indiana or Illinois waters.

Lake Huron. In Lake Huron, lake whitefish populations never dropped to the low levels experienced in Lake Michigan. In this century commercial harvest has varied from a high of 6.6 million pounds in 1953 to a low of 450,000 pounds in 1959, increasing thereafter with some fluctuation to an average of over 1.1 million pounds through the 1970's, reaching 1.3 million pounds in 1975, the highest landings since 1961.

Lake Erie and Lake Ontario. In contrast to earlier decades when lake whitefish were a major component of the commercial fishery in Lake Erie and Lake Ontario, current annual catches are a few hundred pounds in Lake Erie and a few thousand pounds in Lake Ontario.

Pink Salmon. Small numbers of fingerling pink salmon were inadvertently introduced in Thunder Bay, Lake Superior in 1956. In the odd years 1957 through 1967, a few spawning fish were reported, but from 1969 through 1975, abundance steadily increased as their distribution expanded. By fall of 1975 they were spawning in most Lake Superior tributaries and in several northern Lake Michigan and Lake Huron streams. It is possible that this, the only freshwater pink salmon stock in existence, will eventually spread throughout the Great Lakes basin.

Smelt. Smelt are an important commercial fish in Lake Superior waters of Minnesota with recent catches ranging from slightly under one million pounds to over two million pounds annually; landings in Ontario, Wisconsin, and Michigan waters of Lake Superior are considerably smaller. Catches in Green Bay of Lake Michigan (both Michigan and Wisconsin waters) average about one million pounds annually. The major harvest of smelt, however, is reported by Canadian commercial fishermen from Lake Erie, with recent annual landings ranging from about 9 million pounds in 1970 to 17 million pounds in 1973 and 1975. Their catches of smelt do not necessarily reflect actual abundance since harvest is regulated to a large extent by the processors' ability to handle the catch. Smelt catches in U.S. waters of Lake Erie are insignificant in comparison; only 13,000 pounds were landed in 1975.

Carp. Carp are a fairly important commercial species in several areas of the Great Lakes. Commercial catch of carp is not a true reflection of abundance, but a reflection of marketability. Lake Erie catches exceed those from the other Great Lakes, averaging 3.2 million pounds annually over 1966-1975. In Lake Michigan, the major harvest is taken in Wisconsin waters of Green Bay which has averaged about 2.5 million pounds annually over the same period. In Lake Huron the yearly carp harvest exceeded one million pounds in the first half of the past decade but gradually dropped from 1.4 million pounds in 1971 to 684,000 pounds in 1975; most of the catch is taken in Saginaw Bay, Michigan. In Lake Ontario, recent catches have varied from 317,000 pounds in 1966 to 611,000 in 1969; the catch in 1975 was 416,000 pounds.

White bass. White bass are an important component of the commercial fishery only in Lake Erie where catches in the previous ten years have ranged from 1.1 million pounds in 1971 to 5.3 million pounds in 1974. In 1975, the harvest was 4.3 million pounds. The catch in the early 1970's was reduced because of several regulation changes and closures caused by mercury contamination levels exceeding government guidelines.

Alewives. The commercial catch of alewives in Lake Michigan, almost entirely in Wisconsin and Michigan waters, exceeds by far that of any other species in the Great Lakes, with annual catches in the decade 1966-1975 ranging from a low of 27 million pounds (1968) to a high of 45 million pounds (1974). The catch in 1975 was about 35 million pounds. Over half the harvest is caught in Green Bay where landings over the same decade have ranged from 11 million pounds in 1966 to 27 million pounds in 1973. In 1975, the catch in Green Bay was 19 million pounds. Harvest is unregulated and governed by profitability and processor's capabilities.

Walleye. Walleye are of commercial and sports interest in several areas of the Great Lakes, but primarily in Lake Erie (and mostly in the western basin). Commercial catches in Lake Erie from 1945 through 1958 exceeded 4 million pounds yearly, peaking at 15.4 million pounds in 1957. The catch began to decline rapidly from 9 million pounds in 1958 to 3 million pounds in 1959 and 1.8 million pounds in 1960. Throughout the 1960's the commercial catch fluctuated between 476,000 pounds (1969) and 2.7 million pounds (1963). During this decade, concern over the dwindling population led to unsuccessful attempts to achieve better interagency regulations to protect the stocks.[5] In 1970, because of mercury contamination, marketing of walleyes from the western basin was prohibited. With mercury loss to the environment reduced in the early 1970's, contaminant levels in walleye began to drop. Renewed efforts were made to achieve regulatory consensus before the commercial fishery was re-opened. Walleye abundance began to increase during this period of reduced exploitation. With interagency cooperation, a Walleye Scientific Protocol Committee (SPC) was formed in 1973 to develop quotas and fair sharing of western basin walleye among Ontario, Michigan and Ohio while simultaneously fostering recovery of the resource. The SPC is expected to present its report to the Commission's Lake Erie Committee in 1976.

Yellow Perch. Yellow perch stocks are of commercial and sports interest in many areas of the Great Lakes, but the major commercial harvest occurs in Lake Erie, with the major catch taken in Canadian waters. Lake Erie catches exceeded 20 million pounds in most years from 1957-1970, reaching a record high of 33 million pounds in 1969. Thereafter catches dropped rapidly, declining to 10 million pounds in 1975, with

[5]A more detailed discussion on the walleye problem may be found in the Summary of Management and Research, Annual Report of the Great Lakes Fishery Commission for 1973, Appendix A, page 13.

further declines predicted. Signs of stress were reported in yellow perch stocks through the 1970's; recruitment had become unstable and weak, with no strong year classes since 1965, and commercial catches comprised proportionally fewer adult perch and more immature perch. Following documentation of the plight of yellow perch and recommendations from the Yellow Perch Ad Hoc Committee in 1972 and 1973[6] and from the Yellow Perch Workshop in 1974, a Yellow Perch Technical Committee was established to develop the technical information needed for considering alternative minimum size limits, and to present an assessment protocol to evaluate the response of the resource to such experimental management. The Committee expected to present its findings and recommendations to the Commission's Lake Erie Committee in 1976.

General. Restoration of lake trout populations through planting programs to reestablishes self-sustaining stocks is one of the Commission's primary goals, but the process is agonizingly slow. There is evidence of some reproductive success in parts of Lake Superior, none in Lake Michigan, and it is too soon to expect results from Lake Huron and Lake Ontario plantings.

Concern over the plight of several stocks of fish has led the Commission and its cooperators to address problems through formation of ad hoc committees comprising appropriate agency representation and knowledgeable scientists. Examples include the Lake Superior Lake Herring Subcommittee, Lake Michigan Chub Technical Committee, Scientific Protocol Committee for Management of Walleye in Western Lake Erie, and (western Lake Erie) Yellow Perch Technical Committee. Their reports and recommendations consolidate the best scientific knowledge available.

While recreational fisheries in the Greak lakes are booming, the commercial fishing industry in many areas is in a decline. Restrictions on sale of fish because of contaminants, decreasing abundance of highly-valued species, and increasing regulations to protect fish stocks have put some fishermen out of business and shifted others to harvesting lower-valued species. Nevertheless, the Great Lakes commercial fishing industry has the potential, as the problems are resolved, of continuing as a major participant in Great Lakes fisheries.

Looking into the future, control of sea lamprey will continue to be an essential component of managing Great Lakes salmonid stocks. Problems with contaminants will continue and conflicts caused by as yet inadequately unregulated Indian fisheries will intensify. Inter-agency management and coordinated assessment and research of fish stocks will continue to improve. As long as the welfare of the fishery resource is considered paramount, problems are amenable to negotiation and resolution.

[6]See Summary of Management and Research, Annual Report of Great Lakes Fishery Commission for 1973, Appendix A, page 19.

APPENDIX B

SUMMARY OF TROUT, SPLAKE, AND SALMON PLANTINGS

Intensive annual plantings of hatchery reared salmonids continue to be the principal method employed to rehabilitate Great Lakes fisheries. In 1975, over 24 million trout and salmon were planted. Even comparatively warm and shallow Lake Erie received over 2.5 million salmon and trout in 1975, belying the general public misconception that it is a "dead lake."

In Lakes Superior, Michigan, Huron and Ontario, salmon and trout survival is dependent upon sea lamprey control since experience has shown that planting of these species where sea lamprey are abundant results in high mortality of fish and heavy lamprey wounding on survivors. In Lake Erie there is not evidence that the sea lamprey population causes high mortality of planted salmon and trout.

Most of the rainbow and brown trout and all the Pacific salmon plantings are aimed at the recreational fishery. On the other hand, a substantial part of the lake trout and the Province of Ontario's splake plantings are intended to develop self-sustaining stocks. With anglers pursuing a wide variety of species ranging from salmon and trout to yellow perch and walleye to pan fish and bass, it was estimated that Great Lakes recreational fishermen spent $350 million on daily fishing expenses in 1975.

Lake trout have been planted annually in Lake Superior since 1958 and in Lake Michigan since 1965. These programs have been carried out cooperatively by the U.S. Fish and Wildlife Service, the states of Michigan, Wisconsin, and Minnesota, and the Province of Ontario. Lake trout eggs are obtained from brood fish in hatcheries or from mature lake trout from inland lakes. Nearly all are reared to yearlings (ca. 30/pound) and planted during the spring and early summer. In the fall of 1971, 1972, and 1973, however, the U.S. Fish and Wildlife Service made experimental plants of fall fingerlings to compare survival and growth of regular-size fall fingerlings (about 80/pound) with fingerlings whose growth was accelerated to about 30/pound through diet and the use of heated rearing water. Data collected through assessment fishing to compare the survival and growth of the paired plants has shown considerable variation in the comparative performance over the years, but in general the accelerated-growth fingerlings have outperformed the normal-growth fish. Better information on the comparative survival of the two groups may emerge when the fish become vulnerable to large mesh assessment gillnets. If fall plants of accelerated-growth fingerlings are advantageous, production in U.S. Federal hatcheries could be increased at minimum cost.

To rehabilitate fish stocks in Lake Huron, the Province of Ontario and the State of Michigan originally agreed to plant highly-selected splake. These fish were developed in Ontario through an intensive breeding program in which male brook trout were crossed with female lake trout to produce a fast growing fish similar to lake trout in behavior and appearance and to the brook trout in fast growth and early maturity. Following several generations of selective breeding a splake was developed which grows rapidly, matures at an early age, and inhabits deep water. First plants were made in 1969 in Ontario waters (mostly yearlings) and in 1970 in Michigan waters (mostly fingerlings). Because of a shortage of highly-selected splake brood fish and the need to expand rehabilitation efforts in U.S. waters of Lake Huron, splake sperm also was used to fertilize lake trout eggs to produce backcrosses. It was believed these fish would retain the advantages of early maturity and fast growth. The first backcrosses were produced in the fall of 1971 and planted in lake Huron as yearlings in the spring of 1973. The program was to continue but unfortunately, in the fall of 1972 kidney disease was discovered in the splake brood stock held in the United States. Because of fish disease control policies, the sexual products from the fish were deemed unacceptable for rearing and consequently planting programs with splake and backcrosses were postponed in the United States. New brood stock was established by egg and fry imports from Ontario, but because the State of Michigan felt that rehabilitation efforts could not be deferred on Lake Huron, lake trout were planted in 1973 to bring stocking levels up to approximately one million lake trout and hybrids.

Further difficulties with disease in the new United States brood fish in 1974 necessitated their disposal and further delayed the U.S. splake-backcross stocking program, making it improbable that any hybrids could be produced prior to 1977. While a new splake brood stock from Ontario eggs was being established, it was agreed to continue planting lake trout in U.S. waters of Lake Huron in the interim. During this period of difficulty in the United States, Ontario was able to continue their plants of highly-selected splake in Lake Huron.

In Lake Erie, Pennsylvania made small experimental plants of lake trout fingerlings in 1969 and yearlings in 1974 and 1975.

Plants of yearling splake in Lake Ontario were initiated in 1972 and continued through 1974 by the Province of Ontario, but none were planted in 1975. In addition, plants of lake trout were made by New York State in 1973 and, through a cooperative arrangement between New York and U.S. Fish and Wildlife Service, in 1974 and 1975.

Annual plantings of lake trout and hybrids in the Great Lakes are summarized in Table 1 and Table 2 details the 1975 plants in each of the Great Lakes. Other small experimental plants of first generation splake have been made by Wisconsin and Michigan in Lake Superior (Table 3).

Coho salmon, usually stocked in the spring as yearlings, have been planted annually in Lakes Superior and Michigan since 1966, and in Lake Huron, Erie, and Ontario since 1968. Table 4 summarizes annual plantings in each of the Great Lakes, and Table 5 details the 1975 plantings in each of the Great Lakes.

Annual plantings of chinook salmon, usually stocked in the spring as fingerlings, have been made in Lakes Superior and Michigan since 1967, in Lake Huron since 1968, in Lake Erie since 1970, and in Lake Ontario since 1969. Table 6 summarizes annual plantings of chinook salmon in the Great Lakes and Table 7 details the 1975 plantings in each of the Great Lakes.

In 1972, Michigan and Wisconsin inaugurated plants of Atlantic salmon in the Upper Great Lakes. In 1972, Wisconsin planted 8,000 3-year-old and 12,000 2-year-old fish in Lake Superior; in 1973 the entire plant was 2-year-old fish. After 1972, Michigan discontinued its plants in Lake Huron but continued them in Lake Michigan. Table 8 summarizes Atlantic salmon plantings in the Great Lakes 1972-1975.

Plantings of rainbow and steelhead trout and brown trout have been continued in all the Great Lakes over the years, but have not been included in these records because of the variability in reporting and difficulty in separating "inland" plantings from "Great Lakes" plantings. Nevertheless, the need for stocking information on these species prompted the Secretariat to include 1975 rainbow and steelhead trout and brown trout plantings in the Annual Report. Table 9 lists the plantings of rainbow and steelhead trout and Table 10 the plantings of brown trout.

Table 1. Annual plantings (in thousands) of lake trout, splake[1,2] and backcrosses[3] in the Great Lakes, 1958-1975.

Year	Michigan	Wisconsin	Minnesota	Ontario	Total
		LAKE SUPERIOR			
1958	298	184	—	505	987
1959	44	151	—	473	668
1960	393	211	—	446	1,050
1961	392	314	—	554	1,260
1962	775	493	77	508	1,853
1963	1,348	311	175	477	2,311
1964	1,196	743	220	472	2,631
1965	780	448	251	468	1,947
1966	2,218	352	259	450	3,279
1967	2,059	349	382	500	3,290
1968	2,260	239	377	500	3,376
1969	1,860	251	216	500	2,827
1970	1,944	204	226	500	2,874
1971	1,055	207	280	475	2,017
1972	1,063	259	293	491	2,106
1973	894	227	284	500	1,905
1974	888	436	304	465	2,093
1975	872	493	337	510	2,212
Subtotal	20,339	5,872	3,681	8,794	38,686

LAKE MICHIGAN

Year	Michigan	Wisconsin	Illinois	Indiana	Total
1965	1,069	205	—	—	1,274
1966	956	761	—	—	1,717
1967	1,118	1,129	90	87	2,424
1968	855	817	104	100	1,876
1969	877	884	121	119	2,001
1970	875	900	100	85	1,960
1971	1,195	945	100	103	2,343
1972	1,422	1,284	110	110	2,926
1973	1,129	1,170	105	105	2,509
1974	1,070	971	176	180	2,397
1975	1,151	1,055	186	186	2,577
Subtotal	11,717	10,121	1,092	1,075	24,005

Table 1—(Cont'd)

LAKE HURON

Year	Michigan Splake	Michigan Lake trout	Michigan Backcrosses	Ontario Splake	Total
1969	—	—	—	35	35
1970	43	—	—	247	290
1971	74	—	—	468	542
1972	215	—	—	333	548
1973	—	629	486	412	1,527
1974	—	793	—	299	1,092
1975	—	1,053	—	523	1,576
Subtotal	332	2,475	486	2,317	5,610

LAKE ERIE

Year	Pennsylvania	NewYork	Total
1969	17	—	17
1974	26	—	26
1975	34	150	183
Subtotal	77	150	226

LAKE ONTARIO

Year	Ontario Splake	New York Lake trout	Total
1972	48	—	48
1973	39	66	105
1974	26	644	670
1975	—	514	514
Subtotal	113	1,224	1,337

Great Lakes total, lake trout	66,616
Great Lakes total, splake	3,248
Grand Total	69,864

[1]Lake trout × brook trout hybrid.

[2]Excludes small experimental splake plants by Michigan and Wisconsin in Lake Superior (see Table 3).

[3]Lake trout × splake hybrid (see text).

Table 2. Planting of lake trout and splake[1,2] in the Great Lakes, 1975.

Location	Numbers	Fin clip
LAKE SUPERIOR-LAKE TROUT		
Michigan waters		
Black River Harbor Area		
Black River Harbor	25,000	left pectoral
Ontonagon Area		
Porcupine Mtns, State Park	25,000	left pectoral
Ontonagon River Mouth	25,000	left pectoral
4-Mile Reef	25,000[3]	left pectoral
Potato Reef	25,000[3]	left pectoral
Porcupine Mtns. Reef	23,500[3]	left pectoral
Eagle Harbor	25,000	left pectoral
Keweenaw Bay Area		
Big Traverse Bay	25,000	left pectoral
Halberg Reef	25,000[3]	left pectoral
Traverse Point	50,000[3]	left pectoral
Buffalo Reef	50,000[3]	left pectoral
Pequaming	25,000	left pectoral
Huron Bay Area		
Point Abbaye Reef	50,000[3]	left pectoral
Marquette Area		
Big Bay Reef	25,000[3]	left pectoral
Loma Farm	50,000	left pectoral
Partridge Island Reef	100,000[3]	left pectoral
Marquette Power Plant	50,000	left pectoral
Munising Area		
Laughing Fish Point	50,000[3]	left pectoral
Shelter Bay-Williams Is. Reef	50,000[3]	left pectoral
Wood Island Reef	25,000[3]	left pectoral
Grand Marais Area		
Grand Portal Island Reef	25,000[3]	left pectoral
Grand Marais	50,000	left pectoral
Whitefish Bay Area		
Tahquamenon Reef	25,000[3]	left pectoral
Pendills Bay via Pendills Creek	23,901[4]	none
Subtotal	872,401	
Wisconsin waters		
Bark Point (Herbster)	50,000	left pectoral
Onion River	38,350	left pectoral
Bayfield Public Dock	91,730	left pectoral
Washburn	119,600	left pectoral
Squaw Bay	147,300[3,5]	left pectoral
Devil's Island Shoals	46,404[3,5]	left pectoral
Subtotal	493,384	

Table 2—(Cont'd)

Location	Numbers	Fin clip
Minnesota waters		
Duluth (Lester River)	99,995	left pectoral
Palmers (Stoney Point)	28,992	left pectoral
Beaver Bay (Kings Landing)	79,990	left pectoral
Tofte	80,480	left pectoral
Hovland	47,160[5]	left pectoral
Subtotal	336,617	
Ontario waters		
West end		
Rossport Area		
Near Schreiber Channel	25,000[3]	left pectoral
Wilson Is. and Channel Is.	50,000[3]	left pectoral
Moffat Strait	25,000[3]	left pectoral
Salter Island	25,000[3]	left pectoral
Thunder Bay Area		
Papoose Is. Area	50,000[3]	left pectoral
Mary Is. Area	50,000[3]	left pectoral
Mackenzie Bay to Lambert Is.	25,000[3]	left pectoral
East end		
Inner Batchawana Bay	62,500	left pectoral
Pancake Point	62,500	left pectoral
Agawa Bay (Sinclair Cove)	72,500	left pectoral
Michipicoten Bay	62,500	left pectoral
Subtotal	510,000	
Total, Lake Superior	2,212,402	
LAKE MICHIGAN-LAKE TROUT		
Michigan waters		
Whaleback Shoal	25,000[3]	left pectoral
Escanaba Area		
Escanaba	50,279[3]	left pectoral
Minneapolis Shoal	50,792[3]	left pectoral
Peninsula Point	25,603	left pectoral
Port Inland	25,000[3]	left pectoral
Trout Island Shoal	25,000[3]	left pectoral
Millecoquins Reef (Near Naubinway)	25,000[3]	left pectoral
Petoskey	75,200	left pectoral
Charlevoix Area		
Simmons Reef	25,000[3]	left pectoral
Gray's Reef	25,000[3]	left pectoral
S. Fox Island Shoal	35,000[3]	adipose-left pectoral

Table 2—(Cont'd)

Location	Numbers	Fin clip
Fisherman's Island	50,000[3]	left pectoral
Charlevoix	17,000	left pectoral
Charlevoix	51,050	adipose-left ventral
Grand Traverse Bay Area		
Acme	75,000	left pectoral
Greilickville	100,000	left pectoral
Good Harbor Bay	35,000	adipose-left pectoral
Frankfort	50,000	left pectoral
Manistee	40,000	left pectoral
Ludington	50,000	left pectoral
Montague	49,000	left pectoral
Grand Haven	49,000	left pectoral
Holland	50,000	left pectoral
Saugatuck (1 mile upriver)	49,000[6]	right pectoral-left ventral
South Haven	49,000	left pectoral
Benton Harbor	50,000	left pectoral
Subtotal	1,150,924	
Wisconsin waters		
Larsen's Reef	48,000	left pectoral
Larsen's Reef	100,000[6]	right pectoral-left ventral
Whaleback Shoal	35,000[3]	adipose-left pectoral
Gill's Rock	36,500[3]	adipose-left pectoral
Sturgeon Bay	98,000	left pectoral
Algoma	100,000[3]	left pectoral
Kewaunee	101,000[3]	left pectoral
Manitowoc	148,000[3]	left pectoral
Sheboygan	100,000	left pectoral
Milwaukee	96,000[3]	left pectoral
Racine	96,000	left pectoral
Kenosha	96,000	left pectoral
Subtotal	1,054,500	
Indiana waters		
Gary (Bethlehem Steel Pier)	186,000	left pectoral
Illinois waters		
Lake Bluff (Lake Front Park)	186,000	left pectoral
Total, Lake Michigan	2,577,424	

Table 2—(Cont'd)

Location	Numbers	Fin clip
LAKE HURON-SPLAKE		
Ontario waters		
Georgian Bay		
Parry Sound (Mowat and Davy Islands)	98,500	right pectoral
Cedar Point	86,936	right pectoral
Meaford	49,780	adipose-right pectoral
Lions Head	134,563	right pectoral
Main Basin		
Green Island Harbor (Manitoulin Is.)	100,000	right pectoral
North Channel		
Heywood Island	53,320	right pectoral
Total, Lake Huron splake	523,099	
LAKE HURON-LAKE TROUT		
Michigan waters		
Potagannissing Bay (Detour)	52,000[3]	left ventral
Cedarville Area		
Surveyor's Reef	26,000[3]	left ventral
Middle Entrance Reef	26,000[3]	left ventral
Goose Island Shoal (Hessel)	26,000[3]	left ventral
Mackinac City Area		
North Graham Shoal	52,000[3]	left ventral
Round Island Shoal	26,000[3]	left ventral
Zela Shoal	78,000[3]	left ventral
Raynolds Reef (Cheboygan)	26,000[3]	left ventral
Hammond Bay	99,000	left ventral
Adams Point	78,000	left ventral
Middle Island (Rockport)	78,000[3]	left ventral
Scarecrow Island (Thunder Bay)	26,000[3]	left ventral
Black River Island (Alpena)	78,000[3]	left ventral
Greenbush	78,000	left ventral
Tawas Point	78,000	left ventral
Grindstone City	100,000	left ventral
	50,500[6]	left pectoral
Port Sanilac	75,000	left ventral
Total, Lake Huron lake trout	1,052,500	
Total, Lake Huron lake trout & splake	1,575,599	
LAKE ERIE-LAKE TROUT		
Pennsylvania waters		
Offshore	33,600	none

Table 2—(Cont'd)

Location	Numbers	Fin clip
New York waters		
Offshore-Barcelona	149,789	none
Total, Lake Erie	183,389	
LAKE ONTARIO-LAKE TROUT		
New York waters		
Eastern Basin		
Selkirk	129,000	adipose-left ventral
Stoney Island (Henderson Harbor)	143,400	adipose-left ventral
Central Basin		
Hamlin Beach	242,000	adipose-left ventral
Total, Lake Ontario	514,400[1,6]	
Grand total lake trout planted in Great Lakes, 1975	6,540,115	
Grand total splake planted in Great Lakes, 1975	523,099	
Grand Total	7,063,214	

[1]Lake trout × brook trout hybrid.
[2]Excludes F_1 splake plants in Lake Superior (see Table 3).
[3]Offshore plants.
[4]Unmarked fingerlings released during hatchery fire.
[5]State plants—all other U.S. plants by U.S. Fish and Wildlife Service.
[6]Fast-growth fall fingerling plants (other plants consist of yearling fish).

Table 3. Plantings of F_1 splake in Lake Superior, 1971, 1973, 1974, and 1975

Year	State	Location	Numbers	Fin clip
1971	Michigan	Copper Harbor	13,199	none
1973	Wisconsin	Bayfield Area	5,000	dorsal-left ventral
1974	Wisconsin	Washburn	10,316	dorsal
		Houghton Point	9,782	dorsal
1975	Wisconsin	Pikes Bay	15,000	dorsal-right ventral
	Total, Lake Superior		53,297	

Table 4. Annual plantings (in thousands) of coho salmon in the Great Lakes, 1966-1975.

LAKE SUPERIOR

Year	Michigan	Minnesota	Ontario	Total
1966	192	—	—	192
1967	467	—	—	467
1968	382	—	—	382
1969	526	110	20	656
1970	507	111	31	649
1971	402	188	27	617
1972	152	145	—	297
1973	100	35	—	135
1974	455	74	—	529
1975	275	—	—	275
Subtotal	3,458	663	78	4,199

LAKE MICHIGAN

Year	Michigan	Wisconsin	Indiana	Illinois	Total
1966	660	—	—	—	660
1967	1,732	—	—	—	1,732
1968	1,176	25	—	—	1,201
1969	3,054	217	—	9	3,280
1970	3,155	340	48	—	3,543
1971	2,411	267	68	5	2,751
1972	2,269	258	96	—	2,623
1973	2,003	510	—	5	2,518
1974	2,788	318	125	—	3,231
1975	2,026	433	46	—	2,505
Subtotal	21,274	2,368	383	19	24,044

LAKE HURON

Year	Michigan	Total
1968	402	402
1969	667	667
1970	571	571
1971	975	975
1972	249	249
1973	100	100
1974	500	500
1975	627	627
Subtotal	4,091	4,091

Table 4—(Cont'd)

LAKE ERIE

Year	Michigan	Ohio	Pennsylvania	New York	Total
1968	—	20	86	5	121
1969	—	92	134	10	236
1970	—	254	197	74	525
1971	—	122	152	95	369
1972	—	38	131	50	219
1973	—	96	315	—	411
1974	200	188	366	29	783
1975	101	231	363	125	819
Subtotal	301	1,041	1,744	388	3,483

LAKE ONTARIO

Year	Ontario	New York	Total
1968	—	40	40
1969	130	109	239
1970	145	294	439
1971	160	122	282
1972	122	230	352
1973	272	240	512
1974	438	217	655
1975	226	812	1,038
Subtotal	1,493	2,064	3,557

Great Lakes total, coho salmon, 1966-1975	39,374

Table 5. Plantings of coho salmon in the Great Lakes, 1975.

Location	Numbers	Fin clip
LAKE SUPERIOR		
Michigan waters		
Black River	50,000	none
Presque Isle River	25,000	none
Dead River	200,000	none
Total, Lake Superior	275,000	
LAKE MICHIGAN		
Michigan waters		
Thompson Creek	104,000	none
Brewery Creek	123,952	none
Platte River	800,202	none
Portage Lake Channel	200,046	none
Big Manistee River	350,096	none
Little Manistee River	200,601	none
Big Sauble River	151,094	none
Gurney Creek	96,200	
Subtotal	2,026,191	
Wisconsin waters		
Little River	40,000	none
Pensaukee River	8,500	none
Algoma	10,000	left pectoral
	10,000	right pectoral
	10,000	left ventral
	10,000	right ventral
Ahnapee River	20,000	none
Kewaunee River	40,000	none
Two Rivers	11,000	left maxillary
	13,200	none
East Twin River	10,000	right maxillary
	15,000	none
Little Manitowoc	46,000	none
Sheboygan	41,000	none
Sheboygan River	14,000	adipose-right ventral
Milwaukee	54,000	none
Pike River (Kenosha)	80,000	none
Subtotal	432,700	

Table 5—(Cont'd)

Location	Numbers	Fin clip
Indiana waters		
Trail Creek	23,000	none
Little Calumet River (E. Branch)	23,000	none
Subtotal	46,000	
Total, Lake Michigan	2,504,891	
LAKE HURON		
Michigan waters		
Carp River	25,000	none
Tawas River	100,892	none
AuSable River	150,060	none
Cass River	151,410	none
Diamond Creek	100,000	none
Elk Creek	100,000	none
Total, Lake Huron	627,362	
LAKE ERIE		
Michigan waters		
Huron River	100,620	none
Ohio waters		
Put-in-Bay	43,200[1]	none
Chagrin River	108,000[1]	none
Huron River	39,200[2]	right ventral
	40,141[2]	left ventral
Subtotal	230,541	
Pennsylvania waters		
Elk Creek	65,500	none
Godfrey Run	112,500	none
Trout Run	53,500	none
Bear Creek (Walnut Creek)	16,500	none
Presque Isle Bay	95,700	left ventral
Sixteen Mile Creek	19,650	right pectoral
Subtotal	363,350	

Table 5—(Cont'd)

Location	Numbers	Fin clip
New York waters		
Dunkirk Harbor	25,000	none
Eighteen Mile Creek	50,000	none
Cattaraugus Creek	49,700	adipose
Subtotal	124,700	
Total, Lake Erie	819,211	
LAKE ONTARIO		
Ontario waters		
Don River	44,272	right pectoral
Humber River	25,960	right pectoral
Credit River	120,977	right pectoral
Niagara River	34,560	right pectoral
Subtotal	225,769	
New York waters		
Salmon River	50,000	adipose
	225,000	none
	74,500[2]	adipose-left ventral
	53,800[2]	left ventral
	94,300[2]	none
South Sandy Creek	20,000	none
	14,000[2]	none
Skinner Creek	25,000	none
	17,500	none
Little Salmon River	30,000	none
	21,100[2]	none
Sodus Creek	57,400	none
Maxwell Creek	28,700[2]	none
Sandy Creek	25,000[2]	left ventral
Oak Orchard Creek	25,000	none
	17,200[2]	none
Eighteen Mile Creek	20,000	none
	13,800[2]	none
Subtotal	812,300	
Total, Lake Ontario	1,038,069	
Great Lakes total, coho salmon, 1975	5,539,533	

[1]6 month old fish planted in spring.
[2]Fingerlings.

Table 6. Plantings of chinook salmon in the Great Lakes, 1967-1975.

LAKE SUPERIOR

Year	Michigan	Minnesota	Total
1967	33	—	33
1968	50	—	50
1969	50	—	50
1970	150	—	150
1971	252	—	252
1972	472	—	472
1973	509	—	509
1974	295	228	523
1975	253	—	253
Subtotal	2,064	228	2,292

LAKE MICHIGAN

Year	Michigan	Wisconsin	Indiana	Illinois	Total
1967	802	—	—	—	802
1968	687	—	—	—	687
1969	652	66	—	—	718
1970	1,675	119	100	10	1,904
1971	1,865	264	180	8	2,317
1972	1,691	317	107	24	2,139
1973	2,115	757	—	174	3,046
1974	2,046	616	159	757	3,578
1975	2,816	927	156	381	4,280
Subtotal	14,349	3,066	702	1,354	19,471

LAKE HURON

Year	Michigan	Total
1968	274	274
1969	255	255
1970	643	643
1971	894	894
1972	515	515
1973	967	967
1974	776	776
1975	655	655
Subtotal	4,979	4,979

Table 6—(Cont'd)

LAKE ERIE

Year	Michigan	Ohio	Pennsylvania	New York	Total
1970	—	150	—	—	150
1971	—	180	—	—	180
1972	—	—	150	—	150
1973	305	—	155	125	585
1974	502	—	189	125	816
1975	401	—	483	85	969
Subtotal	1,208	330	977	335	2,850

LAKE ONTARIO

Year	Ontario	New York	Total
1969	—	70	70
1970	—	141	141
1971	89	149	238
1972	190	427	617
1973	—	696	696
1974	225	963	1,188
1975	—	920	920
Subtotal	504	3,366	3,870
Great Lakes Total, chinook salmon, 1967-1975			33,462

Table 7. Plantings of chinook salmon in Great Lakes, 1975.

Location	Numbers	Fin clip
LAKE SUPERIOR		
Michigan waters		
Black River	51,615	none
Dead River	150,429	none
Sturgeon River	50,718	none
Total, Lake Superior	252,762	
LAKE MICHIGAN		
Michigan waters		
Menominee River	101,425	none
Cedar River	101,896	none

Table 7—(Cont'd)

Location	Numbers	Fin clip
Escanaba	156,000	none
Petoskey	101,565	none
Grand Traverse Bay (East)	101,500	none
Brewery Creek	75,330	none
Bowers Harbor	75,552	none
Portage Lake	51,840	none
Little Manistee River	300,144	none
Manistee River	409,490	none
Sauble River	153,741	none
Muskegon River	530,155	none
Grand River	103,336	none
Flat River	101,850	none
Thornapple River	101,238	none
Kalamazoo River	100,410	none
St. Joseph River	250,295	none
Subtotal	2,815,767	
Wisconsin waters		
Lower Fox River	60,000	none
Little River	50,000	none
Pensaukee	50,000	none
Strawberry Creek	150,600	none
Ahnapee River	50,000	none
Kewaunee River	50,000	none
Twin Rivers	100,000	none
Little Manitowoc	50,000	none
Sheboygan River	100,000	none
Soule Creek	65,000	none
Milwaukee	75,000	none
Kenosha	93,275	none
Pike River	33,000	none
Subtotal	926,875	
Illinois waters		
Kellogg Ditch, Zion	92,590	none
Waukegan River	83,540	none
Diversey Harbor	102,200	none
Jackson Harbor (inner)	102,810	none
Subtotal	381,140	

Table 7—(Cont'd)

Location	Numbers	Fin clip
LAKE MICHIGAN (continued)		
Indiana waters		
Trail Creek	72,000	none
Salt Creek	20,000	none
Little Calumet River (East Branch)	64,000	none
Subtotal	156,000	
Total, Lake Michigan	4,279,782	
LAKE HURON		
Michigan waters		
Nagel's Creek	52,281	none
Harrisville	200,256	none
AuSable River	302,500	none
AuGres River	100,447	none
Total, Lake Huron	655,484	
LAKE ERIE		
Michigan waters		
Detroit River	300,460	none
Huron River	100,636	none
Subtotal	401,096	
Pennsylvania waters		
Elk Creek	270,000	none
Walnut Creek	213,000	none
Subtotal	483,000	
New York waters		
Dunkirk Harbor	35,000	none
Cattaraugus Creek	50,000	none
Subtotal	85,000	
Total, Lake Erie	969,096	

Table 7—(Contd)

Location	Numbers	Fin clip
LAKE ONTARIO		
New York waters		
Salmon River	315,000	none
	35,000	adipose
	35,000	left ventral
North Sandy Creek	20,300	none
South Sandy Creek	61,000	none
Skinner Creek	50,000	none
Grindstone Creek	50,000	none
Little Salmon River	104,500	none
Sterling Creek	50,000	none
Sandy Creek	99,500	none
Oak Orchard Creek	99,500	none
Total, Lake Ontario	919,800	
Great Lakes total, Chinook Salmon, 1975	7,072,294	

Table 8. Plantings of Atlantic salmon in the Great Lakes, 1972-1975.

Year	State	Area	Numbers	Fin clip
LAKE SUPERIOR				
1972	Wisconsin	Bayfield	20,000	adipose-left ventral
1973	Wisconsin	Bayfield	20,000	right ventral
Total			40,000	
LAKE MICHIGAN				
1972	Michigan	Boyne R.	10,000	none
1973	Michigan	Boyne R.	15,000	none
1974	Michigan	Platte R.	7,308	adipose
		Boyne R.	14,555	none
1975	Michigan	Boyne R.	9,500	none
		Boyne R.	13,167[1]	none
Total			69,530	
LAKE HURON				
1972	Michigan	AuSable R.	9,000	none
Great Lakes total, Atlantic salmon, 1972-1975			105,363	

[1]Atlantic salmon cross

Table 9. Plantings of rainbow and steelhead trout in Great Lakes, 1975.

Location	Numbers	Fin clip
LAKE SUPERIOR		
Minnesota waters—rainbow trout		
Brule River	8,460[1]	none
Cascade River	4,230[1]	none
Deviltrack Lake	8,460[1]	none
Temperance River	4,230[1]	none
Baptism River	11,520[1]	none
Beaver Creek	11,520[1]	none
Split Rock River	22,860[1]	none
French River	2,820[1]	none
	7,200	adipose
Sucker River	7,075[1]	none
Stoney Point	36,958[1]	none
	4,250	none
Subtotal, rainbow trout	129,583	
Minnesota waters—steelhead trout (all fry)		
Brule River	6,000	none
Deviltrack Lake	2,000	none
Onion River	2,000	none
Temperance River	7,500	none
Baptism River	19,583	none
Beaver Creek	19,583	none
Split Rock River	19,584	none
Stewart River	12,500	none
French River	10,000	none
Subtotal, steelhead fry	98,750	
Wisconsin waters—rainbow trout		
Cornucopia	5,000	none
Long Bridge	5,000	none
Superior Entry	11,320	none
S. Washburn Harbor	10,000	none
Onion River	5,000	none
Bodins Landing	5,000	none
Madeline Island	5,000	none
West Sand Bay	5,000	none
Brule River	3,500	none
Flag River	2,000	none
Cranberry River	2,350	none
Sioux River	2,000	none
Subtotal, rainbow trout	61,170	

Table 9—(Cont'd)

Location	Numbers	Fin clip
Michigan waters—rainbow trout		
Porcupine Mt. State Park	75[10]	none
Subtotal, rainbow trout	75	
Michigan waters—steelhead trout		
Black River Harbor	5,000	none
Presque Isle	5,000	none
Anna River	5,000	none
Two Hearted River	5,092	none
St. Marys River	5,082	
Subtotal, steelhead trout	25,174	
Total, rainbow and steelhead trout, Lake Superior	314,752	
LAKE MICHIGAN		
Michigan waters—steelhead trout		
Cedar River	10,000	none
Roger River	50,400	none
Prairie Creek	151,116	none
Petoskey	23,789	none
Bear River	105,548	none
Jordan River	24,174	none
Elk River	5,076	none
Boardman River	5,094	none
Betsie River	10,044	none
Big Manistee River	20,200	none
Ruby Creek	5,148	none
Pentwater River	5,170	none
White River	10,120	none
Duck Lake	5,038	none
Muskegon River	20,160	none
Rogue River	10,230	none
Pigeon Lake	5,038	none
Kalamazoo River	5,272	none
Rabbitt River	5,060	none
Black River	5,060	none
Paw Paw River	5,060	none
St. Joseph River	20,000	none
Galien River	55,868	none
Platte River	87,600	none
Subtotal, steelhead trout	650,265	

Table 9—(Cont'd)

Location	Numbers	Fin clip
Michigan waters—rainbow trout		
Black River	25,000	none
Bear Creek	5,000	none
Silver Creek Pond	1,100	none
E. Grand Traverse Bay	20,000	none
Subtotal, rainbow trout	51,100	
Wisconsin waters—rainbow trout		
Marinette	27,380	none
	3,400[1]	none
Oconto	10,850	none
	9,150[1]	none
Stone Quarry	5,000	none
Moonlight Bay	5,000	none
Bailey's Harbor	12,525	none
	5,000[1]	none
Schauer Park	15,357	none
Whitefish Bay	2,400	none
	5,000[1]	none
Westers	7,500	none
Sturgeon Bay Coast Guard Station	11,000	none
Algoma	20,900	none
Kewaunee	21,900	none
Two Creeks	700	none
Manitowoc	13,500	none
	5,000[1]	none
Two Rivers	20,500	none
	7,500[1]	none
Sheboygan	32,200	none
North Point	5,000	none
Port Washington	20,200	none
	7,777[1]	none
Harrington Beach	11,300[1]	none
Milwaukee	20,931	none
Racine	5,600	none
	39,020[1]	none
Kenosha	19,800	none
	25,428[1]	none
Subtotal, rainbow trout	396,818	
Indiana waters—steelhead trout		
Trail Creek	108,000	none
Little Calumet River (E. Branch)	109,000	none
Subtotal, steelhead trout	217,000	

Table 9—(Cont'd)

Location	Numbers	Fin clip
Illinois waters—rainbow trout		
Waukegan Harbor	72,266[1]	none
	50,000[1,2]	none
Belmont Harbor	30,283[1]	none
Off Waveland Avenue, Chicago	50,000[1]	none
Off 50th Street	50,000[1]	none
Subtotal, rainbow trout	252,549	
Total rainbow and steelhead trout, Lake Michigan	1,567,732	
LAKE HURON		
Michigan waters—steelhead trout		
St. Marys River	5,082	none
Carp River	55,553	none
Cheboygan River	5,069	none
Ocqueoc River	5,064	none
Thunder Bay River	5,052	none
Black River	5,000	none
AuSable River	36,660	none
Tawas City	5,000	none
Whitney Drain	56,571	none
Rifle River	65,373	none
Caseville	5,076	none
Port Hope	5,058	none
Harbor Beach	5,094	none
Port Sanilac	5,094	none
Subtotal, steelhead trout	264,746	
Michigan waters—rainbow trout		
Sturgeon River	129,869	none
Thunder Bay	25,000	none
AuSable River	2,000	none
Subtotal, rainbow trout	156,869	
Ontario waters—rainbow trout		
Georgian Bay		
Nottawasaga River	11,000	none
Colpoy Bay	10,000	right pectoral

Table 9—(Cont'd)

Location	Numbers	Fin clip
Lake Huron Basin		
Saugeen River	10,000[3]	right pectoral
Lucknow River	30,000[1]	none
	1,000	none
Subtotal, rainbow trout	62,000	
Total rainbow and steelhead trout, Lake Huron	483,615	
LAKE ERIE		
Michigan waters—steelhead trout		
Detroit River	10,000	none
Ohio waters—rainbow trout		
Arcola Creek	5,033	none
Chagrin River	53,592	none
Rocky River	33,322	none
Turkey Creek	5,033	none
Subtotal, rainbow trout	96,980	
Ohio waters—steelhead trout		
Conneaut Creek	147,780	none
	32,717	left ventral
Subtotal, steelhead trout	180,497	
Pennsylvania waters—rainbow trout		
Conneaut Creek	785	none
	165[4]	none
Crooked Creek	1,660	none
	120[4]	none
Elk Creek	5,280	none
	315[4]	none
Twenty Mile Creek	1,020	none
	120[4]	none
Subtotal, rainbow trout	9,465	
Pennsylvania waters—steelhead trout		
Elk Creek	7,000	none
Walnut Creek	2,750	none
Subtotal, steelhead trout	9,750	

Table 9—(Cont'd)

Location	Numbers	Fin clip
Ontario waters—rainbow trout		
South Creek	25,000	none
	11,100	tetracycline
Pierric Creek	25,000	none
Big Otter Creek	1,000[5]	none
Youngs Creek	20,465	none
	5,500[6]	left pectoral
	1,000[5]	none
Big Creek	15,500	tetracycline
	5,500[6]	left pectoral
	250[5]	none
Lehman's Dam	2,250[5]	none
Dedrick's Creek	5,500	tetracycline
	250[5]	none
Silver Creek	500[5]	none
Little Otter Creek	1,000[5]	none
Dorchester Creek	300[5]	none
Komoka Creek	400[5]	none
Burnt Mill Creek	500[5]	none
Flat Creek	1,000[5]	none
Venison Creek	6,925	tetracycline
	500[5]	none
Deer Creek	4,565	none
Trout Creek	1,750	none
	14,000	tetracycline
Lyndock Creek	13,890	none
Stoney Creek	9,330	none
Stream I	4,400	tetracycline
Stable Creek	2,200	tetracycline
Deerlick Creek	17,500	tetracycline
Windham Creek	1,100	tetracycline
North Creek	2,600	tetracycline
Outlet Creek	1,500	tetracycline
Brookton Creek	2,600	tetracycline
Teeterville Creek	1,100	tetracycline
Becker Creek	1,425	tetracycline
Chapman Creek	2,600	tetracycline
Paint Mill Creek	3,325	tetracycline
Stream E	1,425	tetracycline
Schoppes Creek	5,200	tetracycline
Lehman's Dam	1,560[5]	none
Young's Creek	1,300[6]	none
Big Creek	173[10]	none
Little Otter Creek	37[10]	none
Subtotal, rainbow trout	223,020	

Table 9—(Cont'd)

Location	Numbers	Fin clip
Ontario waters—rainbow trout eggs		
South Creek	25,000	
Pierric Creek	25,000	
Big Otter Creek	50,000	
Total rainbow trout eggs	100,000	
Total, rainbow and steelhead trout, Lake Erie	529,712[7]	
LAKE ONTARIO		
New York waters—rainbow trout		
Selkirk Beach	57,100	none
Rochester Beach	47,800	none
Olcott Beach	47,800	none
Sodus Beach	99,000	none
Subtotal, rainbow trout	251,700[1]	
Ontario waters—rainbow trout		
Soper Creek	4,968	right pectoral
Duffin Creek	24,500	none
Subtotal, rainbow trout	29,468[8]	
Total rainbow trout, Lake Ontario	281,168	
Total rainbow trout planted, 1975	1,563,928[9]	
Total steelhead trout planted, 1975	1,456,182	
Great Lakes total, rainbow and steelhead trout, 1975	3,020,110	

[1]Fingerlings.
[2]Golden mutant.
[3]In addition, 510,000 eggs were planted in Saugeen River.
[4]Palomino rainbow trout.
[5]15-18 month old fish. All other Ontario Lake Erie plants, unless otherwise indicated, are 1-month-old fish.
[6]10-11 month old fish.
[7]Excludes eggs planted in Ontario waters.
[8]In addition, 15,000 eggs were planted in Bronte Creek.
[9]Excludes 100,000 eggs planted in Lake Erie by Ontario.
[10]Brood stock.

Table 10. Plantings of brown trout in the Great Lakes, 1975.

Location	Numbers	Fin clip
LAKE SUPERIOR		
Minnesota waters		
Baptism River	37,800[1]	none
Beaver Creek	19,908[1]	none
Gooseberry River	3,780[1]	none
Manitou River	2,016[1]	none
Stewart River	17,640[1]	none
French River	14,700[1]	none
Sucker River	11,760[1]	none
Subtotal	107,604	
Wisconsin waters		
Herbster	10,000	none
Cornucopia	10,000	none
Superior Entry	27,750	none
Long Bridge	20,000	none
S. Washburn Harbor	10,000	none
Saxon Harbor	10,000	none
Port Wing	8,824	none
Flag River	2,000	none
Fish Creek	2,500	none
Sioux River	1,000	none
Sand River	500	none
Subtotal	102,574	
Michigan waters		
Black River	500	none
Mud Creek	2,000	none
Presque Isle River	2,000	none
Marquette Bay	20,275	none
Sturgeon River	10,000	none
Subtotal	34,775	
Total, Lake Superior	244,953	
LAKE MICHIGAN		
Michigan waters		
Little Bay De Noc	20,000	none
Grand Traverse (East)	10,000	none
Grand Traverse (West)	10,000	none
Frankfort	10,000	none
Manistee	10,000	none
White Lake	10,000	none

Table 10—(Cont'd)

Location	Numbers	Fin clip
Muskegon	5,000	none
Grand Haven	5,000	none
Holland	5,000	none
Saugatuck	5,000	none
South Haven	10,000	none
Benton Harbor	10,000	none
Galien River	5,000	none
Big Cedar River	1,700	none
Sturgeon River	10,000	none
Black River Ship Canal	10,000	none
St. Joseph Ship Channel	10,000	none
North Paw Paw River	8,600	none
East Paw Paw River	2,600	none
West Paw Paw River	3,200	none
Pine Creek	4,500	none
Big Rabbit River	9,700	none
Gun River	8,000	none
Swan Creek	10,500	none
Grand River Ship Channel	5,000	none
North Crocker Creek	2,600	none
Crockery Creek	6,900	none
Lake Michigan (Muskegon County)	10,000	none
Muskegon River Ship Channel	5,000	none
Norris Creek	4,000	none
Pentwater River	3,000	none
South Pere Marquette River	11,000	none
Pere Marquette River	8,000	none
Sable River	4,000	none
Betsie River	5,500	none
Lake Michigan (Manistee County)	10,000	none
Bear River	6,000	none
Bear River	4,000	adipose
Subtotal	278,800	
Wisconsin waters		
Marinette	2,500	none
	5,000[1]	adipose
	4,275[1]	left ventral
	1,975	none
Oconto	5,000	none
	5,000	right ventral
	1,875[1]	right pectoral
	1,875[1]	none
Stone Quarry	5,000	none
Fish Creek	5,000	none
Egg Harbor	3,000	none
Bailey's Harbor	7,500	none

Table 10—(Cont'd)

Location	Numbers	Fin clip
Moonlight Bay	5,000	none
Schauer Park	4,200	none
	17,500[1]	none
Westers	5,000	none
Whitefish Bay	6,200	none
Sturgeon Bay	17,000	none
Algoma	17,400	none
Kewaunee	21,850	none
Two Creeks	5,000	none
Two Rivers	17,000	none
Manitowoc	10,000	none
	7,500[1]	none
Cleveland	11,540	none
Sheboygan	30,000	none
North Point	10,000[1]	none
Port Washington	22,000	none
Harrington Beach	6,425	none
Milwaukee	30,905	none
	6,992[1]	none
Racine	28,250	none
Kenosha	28,600	none
Subtotal	356,362	
Illinois waters		
Waukegan Harbor	10,499[1]	none
Indiana waters		
East Chicago	11,056[1]	none
Bethlehem Pier	3,596[1]	none
Michigan City	5,500[1]	none
Subtotal	20,152	
Total, Lake Michigan	665,813	

LAKE HURON

Location	Numbers	Fin clip
Michigan waters		
Carp River	10,000	none
Hessel-Cedarville	10,000	none
Rockport	10,000	none
Thunder Bay	60,000	none
Tawas Bay	10,000	none
Caseville	5,025	none
Port Austin	10,000	none

Table 10—(Cont'd)

Location	Numbers	Fin clip
Grindstone City	10,000	none
Port Hope	10,000	none
Harbor Beach	10,000	none
Port Sanilac	10,000	none
Total, Lake Huron	155,025	
LAKE ERIE		
Pennsylvania waters		
Conneaut Creek	2,450[2]	none
Crooked Creek	1,220[2]	none
Elk Creek	2,800[2]	none
Twenty Mile Creek	760[2]	none
Subtotal	7,230	
New York waters		
Athol Springs	16,000[1]	adipose-right ventral
Dunkirk Harbor	10,000[1]	adipose-left ventral
Subtotal	26,000	
Total, Lake Erie	33,230	
LAKE ONTARIO		
New York waters		
Wilson Beach	17,500	left ventral
Olcott Beach	17,500	left ventral
	50,000[1]	none
Rochester	6,700	none
Hamlin Beach	30,400	adipose
	12,000	none
	38,000[1]	none
	75,100[1]	right ventral
Selkirk Beach	17,300	left pectoral
	6,200	none
	100,000[1]	none
Total, Lake Ontario	370,700	
Great Lakes total, brown trout, 1975	1,469,721	

[1]Fingerlings. All other plants, unless otherwise stated, consist of yearlings.
[2]Two-year-old fish.

APPENDIX C

SEA LAMPREY CONTROL IN THE UNITED STATES

Bernard R. Smith and Robert A. Braem
U.S. Fish and Wildlife Service

The catch of adult sea lampreys at eight index barriers in Lake Superior tributaries increased from the record low of 1,912 in 1974 to 4,487 in 1975. The number taken increased 245% in the two streams west of the Keweenaw Peninsula and 49% in the six streams east of the Peninsula. The percentage of rainbow trout bearing sea lamprey wounds or scars was 1.6 in 1974 and 1.4 in 1975.

Routine control work continued as planned. A total of 383 tributaries of Lakes Superior, Michigan, Huron, and Ontario were surveyed for the collection of pretreatment information and data on reestablished and residual populations, or to verify that sea lampreys had not become established in streams that previously contained no sea lampreys. Fifty-one tributaries of Lake Superior were surveyed, 169 of Lake Michigan, 160 of Lake Huron, and 3 of Lake Ontario. Ten of the streams not previously infested contained small sea lamprey populations.

Scheduled chemical treatments were carried out on 27 tributaries of Lake Superior, 19 of Lake Michigan, and 10 of Lake Huron. Twelve streams remain to be treated before June 30, 1976, to complete the schedule.

Observations of sea lamprey populations in streams and lentic areas continued during the year with emphasis on populations established on deltas (alluvial fans), survival and rate of transformation in offshore areas, and growth of lamprey ammocetes. Of lamprey larvae held in cages at water depths of 35 feet, the rate of transformation was 10% in Lake Superior and 53% in Lake Michigan. Water temperatures in June at that depth averaged 8 C (46 F) in Lake Superior and 14 C (58 F) in Lake Michigan. In 1974, 5% of the sea lampreys similarly caged in Lake Superior metamorphosed. Those that did not were left and reexamined in mid-September 1975; 62% had metamorphosed.

Presented at: Great Lakes Fishery Commission, Annual Meeting, Traverse City, Michigan, June 15-17, 1976.

Surveys and Chemical Treatments

Lake Superior Surveys. Pretreatment investigations were completed on 20 Lake Superior tributaries in 1975. The Salmon Trout River in Marquette County was the only stream that contained a large ammocete population. Larvae in four streams—Furnace Creek and the Waiska, Two Hearted, and Ontonagon Rivers—were restricted in distribution and only moderately abundant. The remaining 15 streams contained only small numbers of lampreys.

Posttreatment examinations were conducted on two streams. Four residual sea lamprey larvae (35-52 mm long) were taken in the Nemadji River, which had ben treated during high flows in June. Survey of the Betsy River was negative, but the survey will be rescheduled because water levels were too high to ensure that collecting efforts were effective.

Reestablishment surveys of 10 streams disclosed no new populations, but residual larvae were found in 2. The absence of reestablished sea lampreys in collections from 18 survey stations on the Rock River indicates that the dam at the mouth, renovated in 1971, continues to be a barrier to spawning adults.

Ammocetes were collected from 1 of 19 streams that had not produced sea lampreys in past surveys. Washington Creek on Isle Royale yielded 53 ammocetes (33-115 mm long) during surveys in June and September. The population, which appears to include two year classes, is confined to the lower 2 miles of stream.

Lake Superior Chemical Treatments. A total of 27 streams, with a combined flow (measured just before treatment) of 3,053 cfs, were treated during the year (Table 1). Sea lamprey larvae were abundant in the Salmon Trout (Marquette County) and Sturgeon Rivers; relatively common in the Silver, East Sleeping, and Cranberry Rivers; and scarce in the rest.

Five streams scheduled for treatment in 1975 were not treated. Sea lampreys have not become reestablished in the Iron River, Boston-Lily Creek, or Mud Lake Outlet, and too few larvae survived treatment in the Arowhead River in 1973 to warrant re-treatment. The Waiska River has been rescheduled for 1976.

The Montreal and Black Rivers were treated for the first time. No ammocetes were collected from an apparently very small population in the Montreal River. Collections during treatment of the Black River indicated only a small sea lamprey population in the turning basin below Black River harbor, but a lake seiche reduced the effectiveness of the treatment. The basin was resurveyed by scuba divers who collected 322 sea lamprey ammocetes. The river will be re-treated in 1976.

The Silver River is treated annually to control the ammocete population living in the delta of the stream in Huron Bay. High water and the lack of the usual seiche in Huron Bay resulted in ideal conditions for treatment. Collections from the river, and its estuary and alluvial fan in Huron Bay contained 214 larvae and 28 transforming ammocetes.

Annual treatments of Eliza Creek and the Sucker River have reduced sea lamprey populations of the deltas and offshore areas. Eliza Creek has an offshore population in Eagle Harbor, but the stream has not contained ammocetes during the last two annual treatments. No sea lampreys were collected during the 1975 treatment of the area off the mouth of the Sucker River in East Bay.

Populations of sea lampreys were present off the mouths of Furnace Creek and the Falls River in Lake Superior and in lakes within the Au Train and Big Garlic River systems during treatments in 1975. If the 1975 treatments have not eliminated these ammocetes, the streams will be treated annually to limit recruitment.

Most of the treatments were routine, with little mortality of fish other than lampreys. Pink salmon were present in most streams treated after September 1, but mortality from the lampricide was very low.

Lake Michigan Surveys. Pretreatment surveys were conducted on 18 tributaries of Lake Michigan in 1975. Collections from the Pere Marquette, White, Muskegon, and Cedar Rivers indicated the presence of large sea lamprey populations, including numerous larvae that had survived the 1974 chemical treatment of the Cedar River. Ammocetes were moderately abundant in the Ford and Whitefish rivers and relatively scarce in the remaining 12 streams.

Of 55 additional streams examined to determine whether populations had become reestablished since the last chemical treatments, 33 were reinfested. Populations were large in 5 streams, moderately large in 7, and small in 21. Small numbers of residual sea lampreys were taken in three streams.

Resurveys of 96 Lake Michigan tributaries where sea lampreys had not been found previously disclosed small numbers of larvae in 6 (Fig. 1). Two ammocetes (102 and 127 mm long) were taken in Bowen Creek, 2 (46 and 48 mm) in Bass Lake Outlet, 10 (42-129 mm) in Flower Creek, 3 (50-81 mm) in Duck Creek, 1 (73 mm) in Allegan 5 Creek, and 34 (31-145 mm) in a small tributary of the Oconto River.

In surveys of the deltas of nine streams with Bayluscide, moderate numbers of sea lamprey larvae were found off the mouths of Horton and Porter Creeks and the Boardman and Platte Rivers. The length of the largest larvae off Porter Creek and the Platte River indicated that a few were probably transforming and producing parasitic-phase sea lampreys. Distribution of larval sea lampreys off the Platte River in Loon Lake was more extensive than previously suspected; they were taken as far as 1,600 feet from the mouth of the river. Ammocetes are still present in the delta area of Porter Creek, even though it has been treated annually since 1969 and the stream has not produced sea lampreys since 1973. The delta area of Boardman River in Boardman Lake has a newly established sea lamprey population. Until recently the dam below Boardman lake has been an effective barrier to sea lampreys.

Lake Michigan Chemical Treatments. A total of 19 streams, with a combined flow (measured just before treatment) of 954 cfs, were treated

Table 1. Details on the application of lampricides to tributaries of Lake Superior in 1975.
[Lampricides used are in pounds of active ingredient.]

Stream	Date	Discharge at mouth (cfs)	TFM: Concentration (ppm): Minimum effective	TFM: Concentration (ppm): Maximum allowable	TFM: Pounds used	TFM: Hours applied	Bayer 73: Pounds of powder used	Bayer 73: Granules: Pounds used	Bayer 73: Granules: Acres treated
Salmon Trout R. (Mqt.)	June 11	52	2.1	5.5	550	12	—	—	—
Amnicon River	June 15	220	1.0	3.0	1,078	12	0.4	—	—
Nemadji River	June 17	640	1.8	5.1	4,928	12	—	—	—
Ontonagon River	June 26	630	1.5	5.0	5,390	12	0.7	—	—
Sturgeon River	July 7	600	1.5	4.0	5,214	12	9.1	6.0	1.2
Montreal River	July 12	230	2.0	4.0	528	6	—	—	—
Black River	July 14	52	2.0	5.0	616	17	—	10.0	2.0
Little Two Hearted R.	July 24	44	1.5	4.5	396	12	—	—	—
Blind Sucker River	July 24	30	2.2	6.5	242	12	1.4	—	—
Two Hearted River	July 26	210	1.5	4.0	1,650	12	—	—	—
Big Garlic River	Aug. 27	15	2.1	6.0	66	6	—	7.5	1.5
Falls River	Sept. 4	50	3.0	9.0	286	8	—	10.0	2.0
Slate River	Sept. 4	5	1.8	5.1	44	12	—	25.0	5.0
Ravine River	Sept. 6	3	1.6	4.7	22	—	—	10.0	2.0
Silver River	Sept. 7	60	2.1	6.0	440	10	—	22.5	4.5
East Sleeping River	Sept. 17	15	2.6	7.7	506	25	7.7	—	—
Cranberry River	Sept. 20	1	1.5	4.0	132	23	9.1	—	—
Little Iron River	Sept. 20	8	2.0	4.0	154	24	—	—	—
Harlow Creek[1]	Sept. 26	2	1.8	5.1	44	8	-	5.0	1.0
Furnace Creek	Oct. 1	16	2.5	8.5	176	12	—	15.0	3.0
Eliza Creek	Oct. 1	1	2.1	6.0	22	24	—	—	—
Traverse River	Oct. 1	6	1.7	4.7	198	18	—	—	—
Little Beaver Creek	Oct. 5	2	2.5	7.0	22	9	—	10.0	2.0
Au Train River (upper)	Oct. 7	90	4.0	11.5	1,056	12	—	25.0	5.0
Gratiot River	Oct. 17	8	1.8	5.1	110	11	—	—	—
Sullivans Creek	Oct. 16	3	2.5	6.5	22	12	—	—	—
Sucker River	Oct. 19	60	2.4	6.0	704	14	—	25.0	5.0
Total	. . .	3,053	. . .	. . .	24,596	. . .	28.4	171.0	34.2

[1]Treated Bismark Creek and delta.

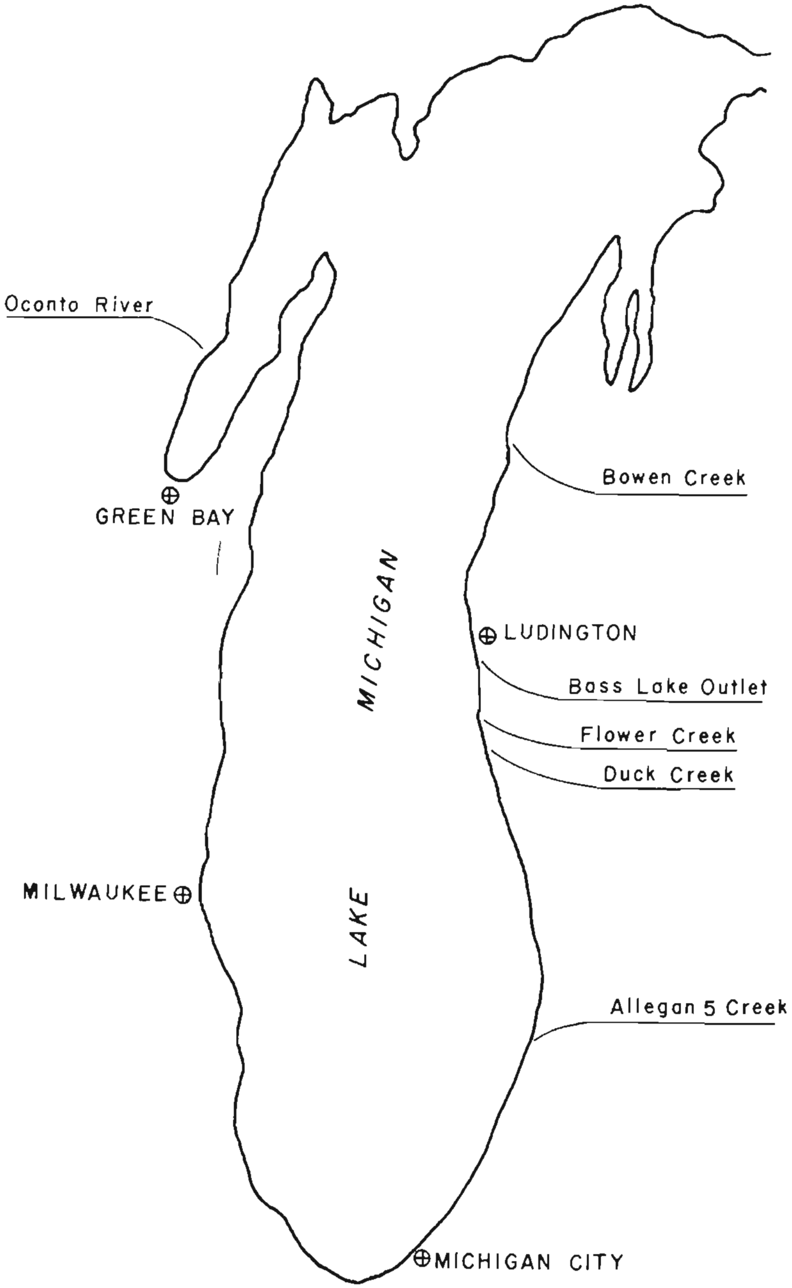

Figure 1. New sea lamprey populations in Lake Michigan tributaries, 1975.

(Table 2). Flower Creek, the Kewaunee and East Twin Rivers, and a section of the Boardman River were treated for the first time. Ammocete collections in these and 10 other streams treated were small. Large numbers of sea lampreys were collected from the Carp Lake River and moderate numbers in Bear, Hibbards, and Hog Island Creeks and the Cataract River.

Ten streams were scheduled for treatment to fulfill the commitment to the Great Lakes Fishery Commission. Nine of these are scheduled for the 1976 field season, and Gibson Creek has been dropped from the schedule because the ammocete population has apparently disappeared.

The Boardman River between the Sabin and Union Street dam was treated for the first time. Larval sea lampreys had not been found above the Union Street dam until 1974. Treatment collections from the 2-mile stretch of stream contained what appears to be three year classes.

The treatment of the Rabbit River, a tributary of the Kalamazoo, resulted in a fairly large kill of white suckers, northern pike, motttled sculpins, and northern creek chubs. No other significant fish kills occurred.

Lake Huron Surveys. Pretreatment surveys were completed on nine Lake Huron tributaries in 1975. Large ammocete populations were again present in the East Au Gres and Rifle Rivers, but the number of infested tributaries on the Rifle River had decreased from 39 in 1968 to 20 in 1975. Moderate numbers of sea lampreys were taken in five streams—the Pine (Iosco County), Ocqueoc, Carp, and Pine (Mackinac County) Rivers and Beavertail Creek. Two streams yielded only a few larvae.

Reestablished ammocete populations were found in 21 of the 46 streams examined. Small numbers of residual sea lampreys were found in four streams, including a tributary of the Tawas River where the presence of a privately owned, trout-rearing plant has caused treatment problems.

Sea lampreys were found in 3 of 105 tributaries of Lake Huron examined that did not contain sea lampreys when last surveyed (Fig. 2). Collections from the little Pigeon river, a tributary of Mullet Lake, contained 15 ammocetes (20-93 mm long) and those from 266-20 Creek contained 37 (12-176 mm); 3 metamorphosing larvae (162-178 mm) were collected from Beaugrand Creek. These three streams are all in Cheboygan County.

The initial survey of the St. Clair River and its delta area in Lake St. Clair was conducted in July. Three sea lampreys (42-69 mm long), 18 American brook lampreys, and 26 *Ichthyomyzon* spp. were collected from 11 of the 19 stations surveyed. The sea lampreys were taken at three stations. Collection results and a general survey of the habitat indicated that the capacity for lamprey production was limited.

Small populations of sea lamprey larvae were found in the delta areas of the Devils River (3, 54-80 mm long) and of the East Au Gres River (21, 57-82 mm). A survey off the mouth of the Au Sable River was negative.

Examination of deep water channels of the Cheboygan, Thunder Bay, Black (Alcona County), and Au Sable Rivers yielded sea lampreys in

Table 2. Details on the application of lampricides to tributaries of Lake Michigan in 1975.
[Lampricides used are in pounds of active ingredient.]

			TFM				
			Concentration (ppm)				
Stream	Date	Discharge at mouth (cfs)	Minimum effective	Maximum allowable	Pounds used	Hours applied	Pounds of Bayer 73 powder used
Door County #23 Creek	May 8	2	7.5	21.5	44	8	—
Bear Creek	May 8	3	7.5	21.8	110	8	—
Three Mile Creek	May 9	4	7.0	23.0	132	12	—
Kewaunee River	May 10	65	5.0	15.0	880	12	5.9
East Twin River	May 12	62	5.0	15.0	1,056	12	8.4
Manistee River[1]	May 13	50	6.0	14.0	1,115	12	—
Stoney Creek	May 21	11	7.0	14.0	193	16	—
Hibbards Creek	May 21	17	5.0	15.0	363	12	3.5
Little Manistee River	June 3	300	5.0	12.0	4,862	18	—
Manistique River[2]	June 7	40	2.2	6.4	330	8	—
Carp Lake River	June 13	28	4.0	11.0	501	16	—
Poodle Pete Creek	Sept. 4	6	1.9	5.6	44	12	—
Little Fishdam River	Sept. 6	34	2.0	6.0	770	14	—
Flower Creek	Sept. 9	22	5.0	12.0	435	12	—
Boardman River	Sept. 17	250	4.0	10.0	2,988	12	16.1
Hog Island Creek	Sept. 18	5	2.5	10.0	220	16	—
Cataract River	Sept. 21	21	3.5	10.0	220	12	—
Point Patterson Creek	Sept. 23	7	4.0	10.0	88	9	—
Kalamazoo River[3]	Sept. 25	27	8.0	16.0	826	16	—
Total	. . .	954	. . .	. . .	15,177	. . .	33.9

[1]Completion of Bear Creek treatment of July 25, 1974.
[2]Treated Weston Creek only.
[3]Treated Rabbit River only.

Figure 2. New sea lamprey populations in Lake Huron tributaries, 1975.

the Cheboygan and Au Sable. In the Cheboygan River, 128 sea lampreys (29-186 mm long) were collected below the dam and navigation locks in the City of Cheboygan. Three stations on the Au Sable River produced 21 (52-73 mm) in the lower 3 miles of stream.

Lake Huron Chemical Treatments. Ten streams, with a total flow (measured just before treatment) of 1,285 cfs, were treated during the field season (Table 3). Beavertail and McKay Creeks were re-treated because heavy rains caused treatment failures in the fall of 1974. Three streams remain to be treated in early 1976 to fulfill the commitment to the Commission.

Ammocetes were numerous only in the Rifle and lower Carp Rivers; numbers in the Pigeon and Sturgeon Rivers were considerably reduced, in comparison with the numbers present during previous treatments.

Closure (by the Michigan Department of Natural Resources) of the trout- and salmon-rearing facility on the Sturgeon River at Wolverine, Michigan, because of "whirling disease" has opened an additional 22 miles of stream to sea lampreys. The low-head dam at this station, which was a barrier to lampreys, cannot be maintained without full-time attendance.

No fish mortality occurred during treatments.

Lake Ontario Surveys. Stream surveys on Lake Ontario tributaries began in early August and continued until mid-October, when persistent high water made further work impractical. Distribution surveys were completed on the Little Salmon River and two tributaries on Oneida Lake before survey conditions deteriorated. During the high-water period, work was confined to surveys of the Black River and several smaller tributaries of the Oswego, Oneida, and Seneca Rivers.

A pretreatment survey was completed on the upper sections of the Little Salmon River after adults and larvae were reported above a dam that was previously believed to be a barrier to spawning adults. A large population of larvae of all sizes, including transforming stages, was found throughout the upper river. The stream was later treated by the Canadian Sea Lamprey Control unit from Sault Ste. Marie.

Investigations of the Oswego river system to determine its possible contribution to adult lamprey stocks in Lake Ontario began in late August. Surveys of Fish Creek and Big Bay Creek, tributaries of Oneida Lake, showed widespread and heavy infestation by sea lampreys; in Fish Creek the ammocetes were present in about 70 miles of stream.

After October 1, because very high water made surveys unreliable on the main stems of the Oswego, Oneida, and Seneca Rivers, investigations were restricted to the smaller feeder streams. Eight sea lamprey larvae (70-135 mm long) were collected from three of seven stations in Carpenters Brook, a stream that enters the Seneca River near Jordan, New York, about 45 miles upstream from Lake Ontario and 25 miles downstream from the outlet of Cayuga Lake. No lampreys were found in nine other streams checked during this period, but all must be reexamined when survey conditions are more favorable. In summary, sea lamprey am-

Table 3. Details on the application of lampricides to tributaries of Lake Huron in 1975
[Lampricides used are in pounds of active ingredient.]

Stream	Date	Discharge at mouth (cfs)	TFM: Concentration (ppm) Minimum effective	TFM: Concentration (ppm) Maximum allowable	TFM: Pounds used	TFM: Hours applied	Bayer 73: Pounds of powder used	Bayer 73: Granules Pounds used	Bayer 73: Granules Acres treated
Albany Creek	May 9	25	1.8	5.1	242	12	—	0.5	—
Joe Straw Creek	May 10	12	2.2	6.4	66	10	—	—	—
Trout Creek	May 11	15	1.8	5.1	66	9	0.3	2.0	0.5
McKay Creek	May 13	21	3.5	10.3	286	10	—	6.5	1.3
Beavertail Creek	May 23	30	4.0	11.0	594	12	—	—	—
Carp River	June 2	440	1.5	5.0	4,323	12	24.5	15.0	3.0
Sturgeon River	June 26	250	9.0	18.0	5,870	12	—	—	—
Pigeon River	June 29	120	6.0	15.0	3,788	12	—	—	—
Pine River (Iosco Co.)	July 10	90	11.0	21.0	4,466	16	—	—	—
Rifle River	July 24	282	6.0	15.0	6,026	17	19.3	—	—
Total	. . .	1,285	. . .	. . .	25,727	. . .	44.1	24.0	4.8

Table 3. Details on the application of lampricides to tributaries of Lake Huron in 1975
[Lampricides used are in pounds of active ingredient.]

Stream	Date	Discharge at mouth (cfs)	TFM				Bayer 73		
			Concentration (ppm)		Pounds used	Hours applied	Pounds of powder used	Granules	
			Minimum effective	Maximum allowable				Pounds used	Acres treated
Albany Creek	May 9	25	1.8	5.1	242	12	—	0.5	—
Joe Straw Creek	May 10	12	2.2	6.4	66	10	—	—	—
Trout Creek	May 11	15	1.8	5.1	66	9	0.3	2.0	0.5
McKay Creek	May 13	21	3.5	10.3	286	10	—	6.5	1.3
Beavertail Creek	May 23	30	4.0	11.0	594	12	—	—	—
Carp River	June 2	440	1.5	5.0	4,323	12	24.5	15.0	3.0
Sturgeon River	June 26	250	9.0	18.0	5,870	12	—	—	—
Pigeon River	June 29	120	6.0	15.0	3,788	12	—	—	—
Pine River (Iosco Co.)	July 10	90	11.0	21.0	4,466	16	—	—	—
Rifle River	July 24	282	6.0	15.0	6,026	17	19.3	—	—
Total	. . .	1,285	. . .	. . .	25,727	. . .	44.1	24.0	4.8

mocetes have been found in six tributaries (Fish, Scriba, and Big Bay Creeks, and Hall, Cold Spring, and Carpenters Brooks) of the Oswego River below the Finger Lakes (Fig. 3).

The application of Bayer 73 granules to the area off the mouth of the Black River at Dexter, New York, yielded no sea lamprey ammocetes. A series of dams in the Dexter-Watertown area should limit spawning sea lampreys to the lower 1-½ miles of the stream.

Studies of Adult Sea Lampreys

Migrant Sea Lampreys. Operation of electric barriers on eight tributaries along the south shore of Lake Superior, to provide an index of the abundance of sea lampreys and provide data on their biological characteristics, continued in 1975. The barriers were operated from April 15 to July 13. Effectiveness of the weir on the Silver River was interrupted by a flash flood on May 21, 1975, which severely damaged the weir and caused a 36-hour power failure.

The number of adult sea lampreys captured in 1975 increased to 4,487 from the record low of 1,912 recorded in 1974 (Table 4). The largest increase in catch was in the Amnicon River (Wisconsin) weir, where 2,606 sea lampreys (58% of the 1975 total) were captured, compared with 270 in 1974. The catch increased by 194 in the Two Hearted River and 229 in the Sucker River, and declined by 283 in the Brule River. Compared with catches in 1974, the number of sea lampreys increased 245% in the two streams west of the Keweenaw Peninsula and 49% in the six streams east of the Peninsula.

The 1975 run began during the second week in May and declined gradually through June and early July. The largest 5-day catch was taken May 21-25 (20% of the total run); the last 5 days accounted for only 1% of the total run.

On Weston Creek, Lake Michigan, where an electrical weir is operated to block sea lampreys from bypassing the Manistique Pulp and Paper Company Dam on the Manistique River, a company employee inadvertently turned off power to the weir on May 30, before cleaning debris from a screen upstream from the weir. Power was not restored until June 2. Weston Creek was treated with TFM on June 7 to destroy any sea lampreys that might have escaped through the weir during this period; however, no spawning or larval sea lampreys were found above the weir.

The average length of sea lampreys from Lake Superior increased from 432 mm in 1974 to 436 mm in 1975, and average weight increased (significantly) from 170 g to 186 g. The percentage of males was 31 in 1975 compared with 30 in 1974.

The electric barrier on the Ocqueoc River, a tributary of Lake Huron, captured 1,901 adult sea lampreys in 1975. The lampreys averaged 460 mm in length and 209 g in weight, compared with 455 mm and 194 g in 1974. The percentage males was 31 in 1975.

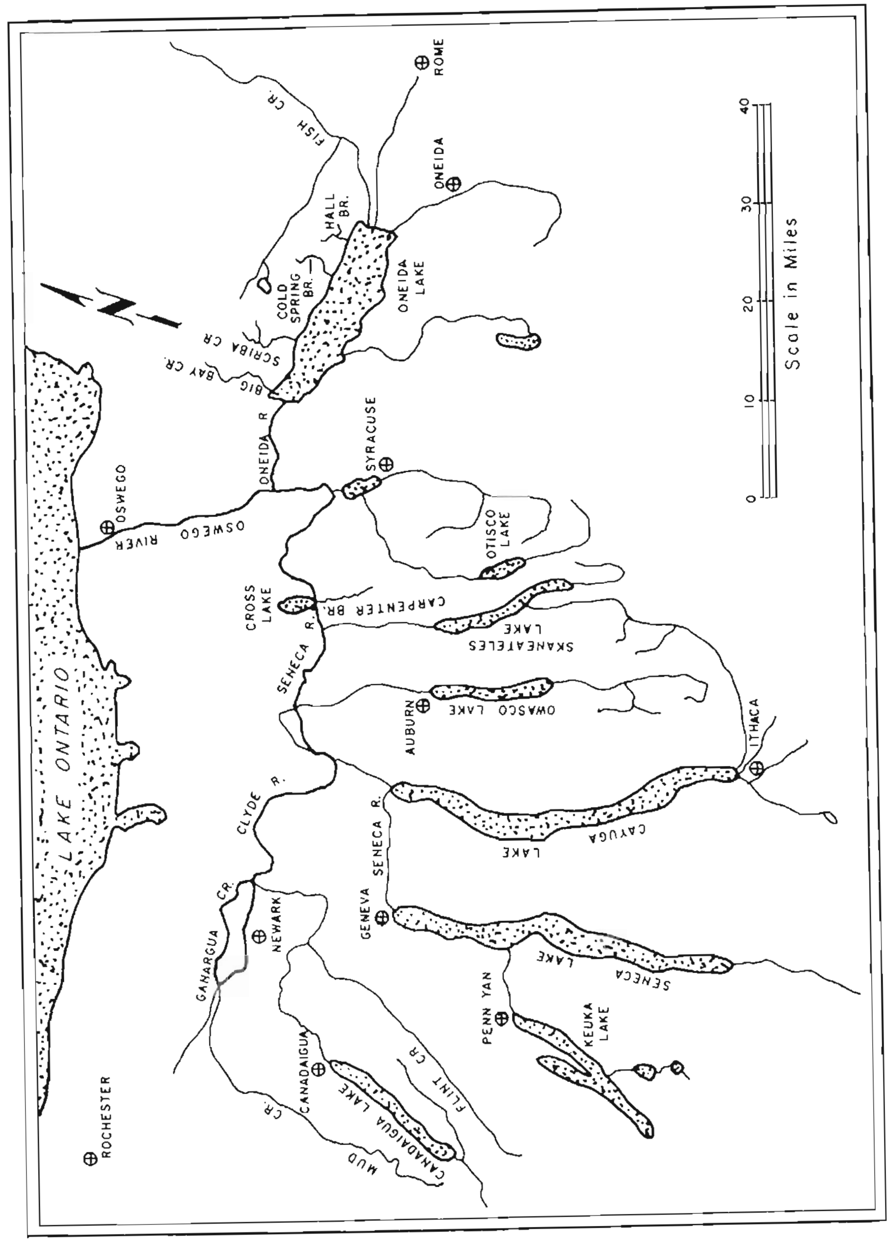

Figure 3. Oswego River system, showing various streams mentioned in the text.

Table 4. Number of adult sea lampreys taken at electric barriers operated in eight tributaries of Lake Superior through July 13, 1961-75.

Year	Betsy	Two Hearted	Sucker	Chocolay	Iron	Silver	Brule	Amnicon	Total
1961	1,366	7,498	3,209	4,201	2,430	5,052	22,478	4,741	50,975
1962	316	1,757	474	423	1,161	267	2,026	879	7,303
1963	444	2,447	698	358	110	760	3,418	131	8,366
1964	272	1,425	386	445	178	593	6,718	232	10,249
1965	187	1,265	532	563	283	847	6,163	700	10,540
1966	65	878	223	260	491	1,010	226	938	4,091
1967	57	796	166	65	643	339	364	200	2,630
1968	78	2,132	658	122	82	1,032	2,657	148	6,909
1969	120	1,104	494	142	556	1,147	3,374	1,576	8,513
1970	87	1,132	337	291	713	321	167	1,733	4,781
1971	104	1,035	485	53	1,518	340	1,754	4,324	9,613
1972	146	1,507	642	294	280	2,574	4,121	132	9,696
1973	294	894	468	270	16	495	261	149	2,847
1974	201	489	249	17	1	117	568	270	1,912
1975	197	683	478	24	8	206	285	2,606	4,487

The number of rainbow trout (1,636) handled at the barriers in Lake Superior declined somewhat from that in 1974, but was 24% above the 1969-74 average (1,318). The percentage of rainbow trout longer than 305 mm (total length) with sea lamprey wounds or scars declined from 1.6 in 1974 to 1.4 in 1975.

The number of longnose suckers captured at the Lake Superior barriers increased slightly, and white sucker numbers decreased, from the 1974 totals. The numbers taken in 1975 and (in parentheses) the average number caught in 1969-74 were as follows: longnose suckers, 14,180 (13,126); and white suckers, 7,467 (10,194).

Samples of sea lampreys were taken periodically from the spawning migration below the Manistique River paper mill dam. The average length and weight of the 353 lampreys collected was 482 mm and 256 g; 33% were males. These values in 1974 were 484 mm, 235 g, and 34%.

Small (4 feet by 2 feet) wire-mesh traps were fished at two locations to obtain information on the efficiency of small traps for sampling adult sea lampreys at dams, powerhouses, and other physical barriers. One trap fished below the Rock River Dam (Lake Superior) from May 28 to September 5, 1975, caught 377 adult sea lampreys, of which 87 were taken in a single day (June 24). The average length and weight were 401 mm and 180 g; these values are slightly less than those for the barrier catch (436 mm and 186 g). The sex ratio (31% males) was identical with that of lampreys taken in the barriers.

A second trap was fished from July 15 to August 5 at a powerhouse in the St. Marys River. Personnel of the Corps of Engineers, who had reported a concentration of adult sea lampreys there, tended the trap daily. A total of 429 adults were captured, of which 139 were taken on July 15. In addition, 37 were captured by hand. Five adults were collected on August 4, 1 day before termination of the project. The average length and weight of the lampreys were 465 mm and 257 g. The sex ratio, 50% males, differed significantly from that in most collections from the upper Great lakes, which were predominately female.

Parasitic Sea Lampreys. The collection of parasitic-phase sea lampreys taken by fishermen from Lakes Superior, Michigan, and Huron continued in 1975 (Table 5). A total of 198 sea lampreys were collected by Lake Superior commercial and sport fishermen, of which 50% (99) were taken in Wisconsin waters. The collection contained only 14 parasitic-phase sea lampreys less than 201 mm long; 12 of these were taken from the Keweenaw Peninsula area (MS-3).

Table 5. Number of parasitic-phase sea lampreys and (in parentheses) the number of spawning-phase sea lampreys collected in commercial and sport fisheries, by lake and statistical district, 1970-75.[1]

District[2] and length (mm)	1970	1971	1972	1973	1974	1975	Total 1970-75
LAKE SUPERIOR							
M-1							
200 or less	0	0	0	0	—	—	0
<200	5 (2)	1	3	3	—	—	12 (4)
M-2							
200 or less	0	0	0	0	0	0	0
<200	6	5	16 (7)	13 (16)	3 (1)	14	57 (24)
M-3							
200 or less	0	0	1	0	0	0	1
<200	16	16	7	9 (1)	7	12	67 (1)
Wisc.							
200 or less	15	9	3	4	6	0	37
<200	107 (1)	302	232 (2)	199 (1)	117	97 (2)	1,054 (6)
MS-1							
200 or less	0	—	—	—	—	—	0
<200	4	—	—	—	—	—	4
MS-2							
200 or less	0	0	0	0	1	0	1
<200	10	23	8 (2)	5 (1)	4 (1)	11 (1)	61 (5)
MS-3							
200 or less	13	33	11	6	8	12	83
<200	19	68	29	61	17	27	221
MS-4							
200 or less	2	5	1	1	3	1	13
<200	49 (1)	145	121 (3)	74 (1)	45	13	447 (5)
MS-5							
200 or less	0	0	0	0	0	0	0
<200	0	18	5	2	2	0	27

Table 5—(Cont'd)

District[2] and length (mm)	1970	1971	1972	1973	1974	1975	Total 1970-75
Ms-6							
200 or less	1	2	2	6	3	1	15
< 200	8 (1)	12	13	7	9	7	56
Total							
200 or less	31	49	18	17	21	14	150
< 200	224 (4)	590	434 (16)	373 (20)	204 (2)	181 (3)	2,006 (45)
LAKE MICHIGAN							
MM-1							
200 or less	0	0	1	12	7	2	22
< 200	6	30	46	99 (1)	40 (4)	37 (9)	258 (14)
MM-2							
200 or less	25	2	1	7	12	1	48
< 200	5	20	9	3	5	19 (1)	61 (1)
MM-3							
200 or less	3	14	22	13	4	10	66
< 200	40	68 (3)	104 (2)	71	59	68	410 (5)
MM-5							
200 or less	4	2	10	4	7	1	28
< 200	2	3	8 (4)	6 (2)	7	4	30 (6)
MM-6							
200 or less	0	0	0	0	1	0	1
< 200	0	0	0	1	0	2	3
MM-7							
200 or less	0	0	0	0	0	0	0
< 200	0	2	0	1	1	0	4
MM-8							
200 or less	1	2	2	0	1	1	7
< 200	0	1	1	1	1	1	5
WM-1							
200 or less	1	3	5	1	1	0	11
< 200	2	63 (16)	31 (40)	37 (8)	38 (14)	33 (8)	204 (86)
WM-2							
200 or less	0	175	144	91	107	15	532
< 200	1	410	432	258	250	187	1,538
WM-3							
200 or less	11	24	6	3	1	0	45
< 200	20	124	108	47	29	20	348
WM-4							
200 or less	1	8	3	1	1	1	15
< 200	66	112 (130)	27 (160)	56 (42)	54 (80)	77 (107)	392 (519)
WM-5							
200 or less	1	9	5	5	2	0	22
< 200	5	14	11	13	19	3	65

Table 5—(Cont'd)

District[2] and length (mm)	1970	1971	1972	1973	1974	1975	Total 1970-75
WM-6							
200 or less	0	0	2	—	—	—	2
< 200	0	0	0	—	—	—	0
Total							
200 or less	47	239	201	137	144	31	799
< 200	147	847 (149)	777 (206)	593 (53)	503 (98)	451 (125)	3,318 (631)
LAKE HURON							
MH-1							
200 or less	0	2	2	0	0	5	9
< 200	70	110	88	31	10	111	420
MH-3							
200 or less	0	0	4	—	—	—	4
< 200	10	40	5	—	—	—	55
MH-4							
200 or less	0	0	0	0	0	0	0
< 200	12	35	21	8	12	24 (3)	112 (3)
MH-6							
200 or less	0	0	—	—	—	—	0
< 200	1	15	—	—	—	—	16
Total							
200 or less	0	2	6	0	0	5	13
< 200	93	200	114	39	22	135 (3)	603 (3)

[1]Includes corrections of previously published figures.

[2]Boundaries are defined in "Fishery Statistical Districts of the Great Lakes," by S. H. Smith, H. J. Buettner, and R. Hile, Great Lakes Fishery Commission Technical Report No. 2, 1961. Lampreys were not collected from the fishermen in Lake Michigan districts MM-4, Illinois, or Indiana, and Lake Huron districts MH-2 or MH-5.

Lake Michigan fishermen collected 607 sea lampreys in 1975, of which 64% were taken from two statistical districts in Wisconsin: the Gills Rock area (WM-2) produced 202 and the Algoma area (WM-4) produced 185. Sea lampreys captured off Algoma were 58% (107) spawning-phase adults. The Gills Rock area contributed 48% (15) of the parasitic-phase sea lampreys less than 201 mm long, but 92 less than the number collected from the same area in 1974.

Lake Huron fishermen produced 143 sea lampreys in 1975, of which 81% (116) were taken from the DeTour, Michigan, area (MH-1).

Ammocete Studies

A study of the rate of transformation of larvae caged in Lake Superior (35 feet deep) and in the Big Garlic River was continued. Larvae (mean length, 152 mm) from the Big Garlic River were used as test animals. In 1974, 5% (3 of 59) of the larvae in Lake Superior metamorphosed, compared with 45% (26 of 57) in the Big Garlic River. In 1975, 10% (6 of 58) of the larvae caged in Lake Superior and 51% (23 of 45) of those in the Big Garlic River metamorphosed. A third group caged at a depth of 35 feet in Lake Michigan, near Escanaba, transformed at a rate (53%) similar to that in the Big Garlic River. In a group of larvae held in an aquarium at room temperature for comparison, 84% (38 of 45) metamorphosed. Water temperature in June averaged 14 C (58 F) in the Big Garlic River and Lake Michigan, 8 C (46 F) in Lake Superior, and 21 C (69 F) in the aquarium.

Of the caged larvae held in Lake Superior that failed to metamorphose during a similar experiment in 1974, 62% (20 of 32) had transformed by mid-September 1975.

Ammocetes of the 1974 year class were collected in 33 streams, compared with 38 streams for the 1973 class. The annual average number of newly reinfested streams in 1971-74 was 41. The reduction in the number for the 1974 year class was accompanied by a reduction in the number of larvae collected per hour on such large rivers as the Bad and Sturgeon.

By the end of 1975, larvae of the 1975 year class had been collected in 19 streams; however, chemical treatments eliminated this year class in 7 streams. Table 6 shows the present status of the remaining reestablished populations in tributaries of Lake Superior.

Estuaries, offshore areas, or inland lakes associated with 35 streams were examined in 1975. One or more larvae were collected in 22 of these lentic areas.

Lentic populations associated with the Silver and Sucker Rivers have been reduced by annual treatments. In the Silver River, the number of ammocetes collected at two index stations in the estuary declined from 185 in 1973 to 8 in 1974 and 1 in 1975. Off the mouth of the Sucker River in East Bay, only one sea lamprey larva was recovered from 45,000 square feet of prime habitat.

Two treatments (June 1973 and October 1974) of Furnace Creek, however, were not successful in eliminating small larvae in the offshore areas. A total of 112 larvae and 2 transformed lampreys were collected off the mouth in 1975. It is apparent that treatments in June occur too early to prevent recruitment to the offshore area and those in October are too late. The rapid migration of larvae from Furnace Creek to the offshore area is due to the proximity of the spawning grounds to Lake Superior. Chemical treatment in mid-August should reduce much of this recruitment to offshore areas.

Recruitment of ammocetes to the offshore area in Eagle Harbor was prevented in 1974 and 1975 by chemical treatments of Eliza Creek. The mean length of the 49 larvae collected in 1975 was 106 mm; it has increased 12 mm each year in 1974 and 1975.

Marked larvae were introduced on the Bismark Creek delta in Harbow Lake and the Otter River delta in Otter Lake to provide data on

Table 6. Tributaries of Lake Superior with reestablished populations of sea lampreys.

Stream	Date of last treatment	Year classes present 1973	1974	1975
Waiska River	10/2/72	X	X	
Pendills Creek	7/27/73			X
Galloway Creek	9/12/71	X	X	
Betsy River	8/22/74			X
Sable River	9/7/73			X
Seven Mile Creek	7/19/67	X		
Five Mile Creek	10/17/73		X	
Harlow Creek	10/1/74			X
Little Garlic River	10/3/74			X
Salmon Trout River (Mqt. Co.)	6/11/75			X
Huron River	9/21/74			X
Firesteel River	7/27/73	X	X	
Bad River	8/18/73	X	X	X
Sand River (Bayfield Co.)	10/16/64		X	
Brule River	7/29/74		X	X
Poplar River	7/25/74			X
Middle River	7/25/74		X	X
Amnicon River	6/15/75			X
Split Rock River	10/19/64	X	X	
Arrowhead River	8/16/73	X	X	
Number of streams		7	10	12

recovery rates and population estimates of ammocetes. On the delta of Bismark Creek, 96 (48%) of 200 marked larvae and 11 unmarked larvae were recovered during a survey with Bayer granules. The high recovery rate of marked larvae and the small number (11) of unmarked sea lampreys collected indicate that control efforts on this delta have been effective. On the larger delta of Otter River, 104 (18%) of 583 marked plus 159 unmarked sea lamprey larvae were recovered during the posttreatment survey. These figures, which provide a population estimate of 893 larvae, indicate the need for increased control.

Scuba divers from the Marquette Station assisted the Canadian Department of the Environment in a mark-recapture study in conjunction with a chemical treatment of the St. Marys River. Divers also assisted in the recovery of ammocetes and in a survey of bottom types in Batchawana Bay.

APPENDIX D

SEA LAMPREY CONTROL IN CANADA

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This report summarizes the activities of the Canadian sea lamprey control agent during the period April 1, 1975 to March 30, 1976, in compliance with the Memorandum of Agreement between the Department of the Environment and the Great Lakes Fishery Commission. The Canadian sea lamprey control program is the responsibility of the Department's Sea Lamprey Control Centre located at Sault Ste. Marie, Ontario.

Controlled applications of lampricide to sea lamprey infested streams continue to be the mainstay of the control program. Stream treatments with the selective toxicant TFM, commencing in 1959, resulted in dramatic declines in sea lamprey populations, first in Lake Superior and subsequently in the other Great Lakes where control measures have been implemented. A second toxicant, Bayer 73, has been developed in two formulations—one a wettable powder used as an additive to TFM in stream treatments; the other a granular material used as a survey tool for sea lamprey larvae. Portable electro-shockers are also used in stream surveys. The continuing success of the sea lamprey control program is due in large measure to the effectiveness with which these techniques have been developed and refined in order to locate and destroy sea lamprey populations.

Electric Barrier Operations

In 1975 seven electrical assessment barriers were operated on Canadian tributaries of Lake Huron to monitor sea lamprey spawning runs. The total catch in 1975 was 343 sea lamprey, an increase of 52 per cent over that of the previous year, but a decrease of 94 per cent from the average catch during the period of 1970-1974 (Table 1). At the present time, therefore, the increase does not appear to indicate anything more than a relatively minor fluctuation in sea lamprey abundance in Lake Huron.

Table 1. Numbers of sea lamprey taken in electrical assessment barriers, Lake Huron, from 1970 to 1975 inclusive.

	Count for the season					
Streams	1970	1971	1972	1973	1974	1975
North Channel Area						
Kaskawong	482	271	206	135	146	168
Georgian Bay Area						
Still	558	960	426	14	10	28
Naiscoot-Harris*	173	446	472	8	1	8
Mad	8	15	1	0	1	0
Subtotals	739	1421	899	22	12	36
Lake Huron Area						
Manitou	3	12	11	14	4	8
Blue Jay	236	332	380	22	61	127
Bayfield	128	7	7	4	2	4
Subtotals	367	351	398	40	67	139
TOTALS	1588	2043	1503	197	225	343

*Harris is a tributary of the Naiscoot.

Stream Surveys

Sea lamprey larval surveys were conducted on 79 tributaries and lake areas of Lake Superior, 24 Lake Huron tributaries, and 36 Lake Ontario tributaries, including 19 in Ontario and 17 in New York State. Routine surveys of 42 Lake Superior streams and one Lake Ontario stream provided no indication of previously unrecorded sea lamprey streams. Re-established sea lamprey populations were found in seven out of 17 Lake Superior streams, in nine out of 12 Lake Huron streams, and in 15 out of 18 Lake Ontario streams surveyed. Distribution surveys were carried out in 12 Lake Superior locations, 14 Lake Huron streams and 24 Lake Ontario streams. Treatment-evaluation surveys were carried out on eight Lake Superior streams, five Lake Huron streams and 10 Lake Ontario streams. Larval population studies were undertaken on six Lake Superior streams, two Lake Huron streams and two Lake Ontario streams.

Applications of granular Bayer 73 were made to offshore areas containing populations of larval sea lamprey in selected portions of Batchawana Bay, Mountain Bay, Mackenzie Bay and the lower Nipigon River in Lake Superior. Similar applications were made in Providence Bay, Michaels Bay and Mudge Bay (all on Manitoulin Island) in Lake Huron. The same material was also applied in the Whitefish Island area of St.

Marys River in connection with a mark-and-recapture study of the sea lamprey larval population. These applications are part of a continuing effort to contain and reduce populations of larval sea lamprey in lentic environments.

Lampricide Treatments

On Lake Superior eight of the ten scheduled stream treatments were completed. These were on the Batchawana, Agawa, Michipicoten, Big Pic, Cypress, Nipigon, Stillwater and Black Sturgeon Rivers. Treatments of Pigeon River and Cash Creek were posponed when only very few sea lamprey were found in them.

On Lake Huron seven of the eight scheduled stream treatments were conducted. These were on Echo River, two unnamed streams, H-65 and H-68, located on St. Joseph Island, Thessalon River, Mississagi River, Serpent River and Silver Lake Creek. In addition, Lauzon Creek was treated bringing the total to eight. The Magnetawan River treatment was omitted owing to the absence of sea lamprey of transformation size.

On the Ontario side of Lake Ontario the five scheduled stream treatments were completed. These were on Duffin, Lynde, Oshawa and Grafton Creeks and Salmon River. On the New York side of Lake Ontario the five scheduled stream treatments were completed. These were on Salmon and Little Salmon Rivers and Grindstone, Sterling and Wolcott Creeks. In addition, Snake Creek was treated when transforming sea lamprey were found in it. Tables 2, 3, 4 and 5 summarize the information related to treatments carried out in Lake Superior, Lake Huron, the Ontario side of Lake Ontario, and the New York side of Lake Ontario, respectively.

Sea Lamprey from Commercial Fishermen

Commercial fishermen submitted 452 sea lamprey caught incidentally in their gear, in response to a reward offered for the specimens and related catch information. The collection in 1975 included nine specimens from Lake Superior, 103 from the North Channel, 120 from the main basin of Lake Huron, and 220 from Lake Ontario. The predominance of female sea lamprey in the offshore fishery and the positive correlation between lamprey size and prey size continue to characterize the sea lamprey collections. No significant changes in average size or sex ratio, compared with the previous year's data, were observed.

Sea Lamprey from Humber River, Lake Ontario

The largest sea lamprey catch of record—6,848 animals—was taken by the contract fisherman who has collected specimens in the Humber River since 1968. There is no explanation for the increase which is contrary to evidences of reduced sea lamprey abundance in other parts of

Table 2. Summary of streams treated with lampricide, Lake Superior, 1975.

Stream Name	Date	Flow (cfs)	TFM lbs. act. ingr.	Bayer 73 lbs. act. ingr.	Granular Bayer 73 lbs.	Sea lamprey abundance	Approx. stream miles treated
Batchawana R.	July 23-25	258	1,470	25	—	Moderate	9.0
Agawa R.	Sept. 17	120	455	8	—	Scarce	1.0
Michipicoten R.	Oct. 1-2	1,830	6,729	131	—	Moderate	13.8
Big Pic R.	Sept. 8-16	349	6,058	114	24	Scarce	69.0
Cypress R.	July 9-10	35	256	—	2	Abundant	3.2
Nipigon R.	Aug. 3-4	1,782	14,494	280	13	Scarce	8.0
Stillwater Cr.	July 16-17	8	137	—	—	Scarce	5.0
Black Sturgeon R.	Aug. 19-21	450	4,461	87	90	Moderate	10.1
Totals		4,832	34,060	645	129		119.1

Table 3. Summary of streams treated with lampricide, Lake Huron, 1975.

Stream Name	Date	Flow (cfs)	TFM lbs. act. ingr.	Bayer 73 lbs. act. ingr.	Granular Bayer 73 lbs.	Sea lamprey abundance	Approx. stream miles treated
H-68	June 20	2	27	—	5	Scarce	0.2
Echo R.	July 2-4	19.5	302	—	—	Scarce	7.4
Silver Lake Cr.	July 8-9	17.5	299	2	10	Moderate	3.5
Mississagi R.	July 16, 22-25	1,970	6,174	114	13	Abundant	28.0
Thessalon R.	July 28-Aug. 1	242	1,881	—	—	Moderate	25.0
Serpent R.	Aug. 19-23	120	375	—	3	Scarce	7.5
Lauzon Cr.	Aug. 21	20	56	—	—	Scarce	0.5
H-65	Aug. 26, 27	1	70	—	—	Scarce	1.7
Totals		2,392	9,184	116	31		73.8

Table 2. Summary of streams treated with lampricide, Lake Superior, 1975.

Stream Name	Date	Flow (cfs)	TFM lbs. act. ingr.	Bayer 73 lbs. act. ingr.	Granular Bayer 73 lbs.	Sea lamprey abundance	Approx. stream miles treated
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Serpent R.	Aug. 19-23	120	375	—	3	Scarce	7.5
Lauzon Cr.	Aug. 21	20	56	—	—	Scarce	0.5
H-65	Aug. 26, 27	1	70	—	—	Scarce	1.7
Totals		2,392	9,184	116	31		73.8

Table 4. Summary of streams treated with lampricide, Canadian side of Lake Ontario, 1975.

Stream Name	Date	Flow (cfs)	TFM lbs. act. ingr.	Bayer 73 lbs. act. ingr.	Granular Bayer 73 lbs.	Sea lamprey abundance	Approx. stream miles treated
Duffin Cr.	May 27-30 & June 9	45	965	8	—	Moderate	16.5
Lynde Cr.	May 13-17	16	772	—	3	Moderate	19.0
Oshawa Cr.	May 8-9	35	1,107	—	29	Moderate	11.5
Grafton Cr.	May 22-23	7	282	—	—	Moderate	5.0
Salmon R.	June 4-6	200	2,995	1	23	Abundant	14.2
Totals		303	6,121	9	55		66.2

Table 5. Summary of streams treated with lampricide, New York State side of Lake Ontario, 1975

Stream Name	Date	Flow (cfs)	TFM lbs. act. ingr.	Bayer 73 lbs. act. ingr.	Granular Bayer 73 lbs.	Sea lamprey abundance	Approx. stream miles treated
Grindstone Cr.	May 6-8, May 13-16	34	383	—	3	Moderate	22.4
Salmon R.	May 21-23 May 28-29 June 3-6	1,372	4,298	35	—	Moderate	37.9
Wolcott Cr.	June 10-11	53	1,020	—	—	Moderate	5.8
Sterling Cr.	June 11-12 June 17-18	85	1,179	7	—	Moderate	4.8
Little Salmon R.	June 18-21 Oct. 25-Nov. 3	90	1,927	7	—	Abundant	50.4
Snake Cr.	Oct. 22-25	7	262	—	—	Moderate	9.5
Totals		1,641	9,069	49	3		130.8

Lake Ontario. It is noted however that sea lamprey are observed among the Pacific salmon which congregate in the fall of the year off the estuaries of the Humber and Credit Rivers in Lake Ontario.

Sea Lamprey Tag-And-Recapture Studies—Lake Ontario

Four hundred sea lamprey caught in the Humber River were tagged and released at several points in Lake Ontario in an effort to detect any dominant patterns or directions in their movements. A total of 85 specimens were recaptured, most of them near the release points. Several however travelled, or were carried, for distances up to 140 miles.

Trawling in St. Marys River

Surface trawling for adult sea lamprey was resumed in the fall of 1975 at the outfall of the Sault Edison Electric plant in St. Marys River. The average catch of 0.44 sea lamprey per hour of trawling was not significantly different from that observed in 1974. Table 6 summarizes the results of trawling in St. Marys River in the years 1973-1975 inclusive.

Table 6. Numbers of sea lamprey caught per hour of trawling at the Edison Sault Electric Plant in St. Marys River—1973, 1974 and 1975 from November 22 to December 8.

Week Ending			Trawling Time Hours			No. of Lamprey			No. of Lamprey per Hour		
1973	1974	1975	1973	1974	1975	1973	1974	1975	1973	1974	1975
Nov. 24	Nov. 23	Nov. 22	12.5	29.5	24.0	6	20	23	0.5	0.7	0.96
Dec. 1	Nov. 30	Nov. 29	20.3	29.5	24.5	8	11	4	0.4	0.4	0.16
Dec. 8	Dec. 7	Dec. 6	22.3	22.0	28.2	10	4	7	0.4	0.2	0.25
Totals/Averages*			55.1	81.0	76.7	24	35	34	0.44*	0.43*	0.44*

Trawling in Lake Ontario

Surface trawling for adult sea lamprey off the mouth of Credit River, Lake Ontario, was carried out for the first time in the fall of 1975. Of the 40 sea lamprey captured, 33 were tagged and released, with the expectation that some might be recaptured during spawning runs in the spring of 1976.

Experimental Mechanical Assessment Weir

To evaluate the feasibility of using mechanical devices to assess sea lamprey runs, a weir consisting of a wire-mesh trap and single lead was fished in Sable River, a Lake Superior tributary during the spring and early summer of 1975. The trap caught 14 adult sea lamprey, which were tagged and released upstream.

APPENDIX E

ALTERNATIVE METHODS OF SEA LAMPREY CONTROL

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Introduction

The Great Lakes Fishery Commission (GLFC) is committed to a continuing program of assessing the impact of residual sea lamprey populations on Great Lakes fish stocks. Its main charge is to develop an integrated, cost-effective lamprey control program that will include the continued use of chemical toxicant where appropriate, but that will also include the use of repellents, attractants, sterilants, physical barriers, and othe methods as may prove useful, economical, and ecologically safe.

The Great Lakes Fishery Laboratory, under contract with GLFC, performs research on the development of alternative methods for control of the sea lamprey. This research is conducted at the Hammond Bay Biological Station located on Lake Huron near Rogers City, Michigan, and at the Monell Chemical Senses Center (MCSC) at the University of Pennsylvania, Philadelphia, Pennsylvania.

Chemical Sensing in the Sea Lamprey

The Monell Chemical Senses Center at the University of Pennsylvania, Philadelphia, Pennsylvania, has been formally designated a field station for FWS research on the sea lamprey and a cooperative agreement of work to be performed at Monell was signed by the FWS and the Trustees of the University on April 30, 1976.

Initial emphasis in the Monell studies will be placed on the identification and characterization of nontoxic chemical substances, including sea lamprey pheromones, that when applied strategically will attract or repel maturing sea lampreys and thereby facilitate their capture as they enter streams to spawn. The principal investigator selected to lead this research entered on duty at Monell on June 1, and he and FWS staff are now engaged in the development of a detailed work plan for the studies to be performed at Monell.

Development of Methods to Sterilize Sea Lampreys

Chemosterilant studies. Laboratory tests at the Hammond Bay Biological Station (HBBS) have shown that *P,P*-Bis (1-aziridinyl)-*N*-methylphosphinothioic amide (PMPA) dissolved in saline and injected intraperitoneally at a dosage of 100 mg/kg sterilizes spawning-run sea lampreys. A field test in 1974 on the Big Garlic River, Marquette County, Michigan, conducted cooperatively with Marquette Sea Lamprey Control Station (MSLCS) also demonstrated that treatment of male sea lampreys with PMPA sterilized them. Although the results of the 1974 field test suggested strongly that PMPA-treatment did not affect the nest building activity, spawning behavior, or mating competitiveness of these lampreys, a deficiency in the design of this test prevented a conclusive demonstration.

A follow-up field test in cooperation with MSLCS is now underway to more fully determine the effectiveness of the PMPA-sterilized male release technique for use in sea lamprey control. This follow-up test is being conducted on the Big Garlic River between Kreig's Falls and Pat's Falls (section III of the test area used in 1974). This portion of the river was chosen because it contains good spawning habitat, and because we are more easily able to control the size and composition of the introduced population of spawning-run lampreys in this area than in other portions of the river. Kreig's Falls, the upstream end of the test area, is a complete barrier to the upstream movement of lampreys and a trap at the downstream end of the study area (immediately above Pat's Falls) prevents downstream movement. No adult lampreys are present above Kreig's Falls that could move downstream into the study area, and Pat's Falls is a complete barrier to upstream movement, thus the size and composition of the introduced population of spawning-run lampreys in the test area will not be altered by migration—the major reason for the partial failure of the 1974 field test.

During early June 1976, approximately 1,000 adult lampreys were collected below the power dam on the lower Manistique River, Lake Michigan, and transported to HBBS. From these, 70 females and 300 males, sexed according to their external characteristics, were selected for the test. These individuals were then weighed, and marked with a Petersen-type tag. The tag was attached so that a white numbered disc was visible on one side of the lamprey and an unnumbered, colored disc was visible on the other side. The location and color of the disc distinguish the sex of the lamprey and also distinguish normal males from PMPA-sterilized males.

Of the 300 tagged males, a total of 270 were sterilized with an intraperitoneal injection of PMPA. Injected lampreys were placed in static-water recovery tanks where they were held for 24 hours. After the lampreys were removed from the recovery tanks, the water in these tanks was treated with hydrochloric acid to destroy any PMPA released by the lampreys. According to Dr. A. B. Borkovec (U.S. Department of Agriculture, Beltsville, Md.) PMPA in aqueous solution can be completely degraded in minutes by treatment with 10 ml concentrated hydrochloric acid per gallon of solution.

The 270 PMPA-sterilized males, 30 normal males, and 70 normal females were transported from HBBS to the test area and released immediately below Kreig's Falls on June 5, 1976. The nest building and spawning activities of these lampreys will be observed closely and recorded and the production of stage 18 burrowing larvae will be determined in August. These data should permit an adequate evaluation of the potential effectiveness of the PMPA-sterilized male release technique as a method for sea lamprey control. An administrative report describing the results of this follow-up field study is scheduled for completion in October 1976.

A cooperative study is also underway with the Canadian Department of Fisheries and Environment (DFO) to permit independent evaluation of the potential of the PMPA-sterilized male release technique for controlling sea lamprey. During May-July 1976, HBBS staff will supply DFO with a total of 400 PMPA-sterilized male sea lampreys. HBBS staff will collect these lampreys at the Ocqueoc River weir, inject them with PMPA, and transport them to the Sable River, a tributary to Batchawana Bay on Lake Superior, for release and study by DFO staff.

Immunological studies. Studies were begun this spring at HBBS to develop an immunological method for producing sterility in spawning-run sea lampreys. Although research at HBBS has already discovered several chemical compounds that produce sterility in spawning-run sea lampreys, the development of an immunological method still highly desirable because the latter approach would not require registration before it could be used in the sea lamprey control program.

At this time a total of 7 antigens have been prepared from sea lamprey gonadal products and tissue mixed with Freund's adjuvant, and injected intramuscularly into domestic rabbits (6 months old, approximately 3 pounds). The first injection was followed in 7 days by a booster shot. The animals were test bled 21 days later from the marginal ear vein and their serum checked for antibody against the antigen used. No antibody production was observed to the soluble portion of any of the antigens used in these initial tests and a second series of injections and booster shots is planned. When antibody production is confirmed, the rabbits with antibodies will be bled by heart puncture and the rabbit antisera will be injected into prespawning lampreys at varying dose rates. Injections will be made intraperitoneally so that the injected antisera will come into direct contact with the lamprey's gonadal mass. These lampreys will then be tagged to permit individual recognition and placed in an artificial spawning stream. When they exhibit spawning behavior, they will be removed from the stream and spawned with normal individuals of the opposite sex. These eggs and embryos will be held at 18 C and checked for viability, rate, and normalcy of development.

Development of Criteria for Aging Lamprey Wounds and Scars

A total of 14 lamprey attachments and resultant wounds have been observed on rainbow trout since this study began at HBBS in the spring of 1975. Photographic records showing the progress of wound healing on four of these fish have been completed, and the development of a photographic record continues on a fifth individual.

Studies on wounding and wound healing in lake trout began in January 1976 and a total of 16 lamprey attachments and wounds have been observed. Six of the lake trout wounded by lamprey died, presumably as a result of these wounds. Observations on healing of non-lethal wounds on five lake trout were recorded and 62 photographs of these wounds were also taken. Four lake trout with healing wounds are presently being observed and photographed.

Lampreys also formed attachments on seven F_5 splake since we began tests with this species in the spring of 1976. Three of these splake died, aparently as a result of lamprey attachment and feeding. Wounds on two of the survivors are now being observed and photographed and two other splake still have lampreys attached to them.

We believe that the information obtained from all fish tested to date, including those still under observation, will permit us to draft a report by December 1976 describing criteria for distinguishing between lamprey wounds and scars and for estimating the ages of these wounds and scars under field conditions.

APPENDIX F

REGISTRATION—ORIENTED RESEARCH ON LAMPRICIDES IN 1975

Fred P. Meyer, Director

Fish Control Laboratories
La Crosse, Wisconsin 54601

Introduction

Contracted research on TFM was completed during the year. Studies on TFM have been terminated awaiting rulings from the Environmental Protection Agency on the adequacy of submitted data.

The primary emphasis in research for the Commission is now directed toward the completion of the research protocol on Bayer 73.

TFM

Registration Submission. Personnel from the Fish Control Laboratory and the Division of Population Regulation, Washington, D.C. met at the Hammond Bay Biological Station on October 23-24, 1975 to review and assemble data to be included in a submission for amended registration to the Environmental Protection Agency. The completed package should be ready for submission in early 1976.

Bayer 73

Contract Research. Problems with the development of analytical procedures to determine tissue levels of Bayer 73 led to consideration of different approaches. Preliminary studies using a radioimmune assay (RIA) have given encouraging results. Additional work is planned for the next 12 months to improve the levels of Bayer 73-specific antibodies.

Contracting of a programmed study on Bayer metabolism and residue levels in dairy cows was held up pending an opinion from the Environmental Protection Agency as to the need for such a study. A ruling is expected in early 1976.

Physiology. Brook trout (*Salvelinus fontinalis*) weighing from 300 to 600 grams were injected intraperitoneally (IP) with 0.1 mg Bayer 73. All fish survived the 48-hour postinjection observation period. Analysis of the bile for Bayer using CNA indicated a 100-fold variation in concentration between fishes sampled. The low levels of Bayer 73 observed in the bile (all less than 20 mg/l) may be a reflection of a slow rate of absorption of the lampricide from the body cavity.

Residue Methods Development. Extraction of fish muscle with acetone has been shown to be effective for recovery of Bayer 73 residues. Fish exposed to ^{14}C-labeled Bayer 2353 (the free acid of Bayer 73) and extracted with acetone gave 95 to 98% recovery of radioactivity in the extract. However, analyses of these extracts by gas chromatography have been unsuccessful due to the presence of fat in the extracts. The presence of fat interferes with the recovery of chloronitroaniline (CNA) from hydrolysis of Bayer 73. CNA is the portion of the Bayer 73 molecule which lends itself to sensitive analysis by gas chromatography with electron capture detection.

Several procedures for the cleanup of fish extracts for Bayer 73 analysis have been tried, but to date no procedure has been successful in achieving the cleanup necessary for GC analysis.

Gel permeation chromatography with Bio-beads SX-3 and Sephadex LH-20 have shown promise but have not yet given sufficient cleanup or adequate recovery. Steam distillation yields good cleanup but the recoveries are too low. Several absorption chromatography techniques also have ben tried as well as solvent partitioning. Procedures showing the most promise are being further investigated.

Analysis of carp exposed to 0.05 mg/l Bayer (0.025 mg/l Bayer 2353 + 0.025 mg/l ^{14}C-Bayer 2353) for 12 hours at 12 C gave good recovery of Bayer residues from muscle by acetone extraction. Analysis of the extracts for Bayer residues after gel permeation chromatography cleanup by gas chromatography (GC) and liquid scintillation (LS) gave good agreement, but insufficient cleanup and low recoveries indicate that this approach is not adequate. The concentrations of Bayer in plasma as measured by GC and LS were 17.5 and 25.6, respectively. Ether extracts of gallbladder bile contained 4.87 mg/l Bayer residues as measured by LS and 0.45 mg/l as measured by GC. The LS method measures Bayer metabolites as well as the parent compound whereas the GC method measures only Bayer. Bile which had been incubated with glucuronidase was analyzed by LS and GC and averaged 35.5 and 40.9 mg/l of Bayer, respectively, indicating that much of the Bayer residue in bile is in the form of the glucuronide.

Effects of Granular Bayer 73 on Benthic Invertebrates. A sampling program was conducted on the delta of the Boardman River in Boardman Lake in Michigan to assess the effects of granular Bayer 73 on benthic invertebrates. Samples were taken before treatment and up to 13 days after treatment. Significant differences were found in total numbers of organisms before treatment (9,178/m^2) and 7 days after treatment (5,498/m^2). Most of the reduction occurred among oligochaetes, chironomids, snails and clams. Scuds and mayflies were only slightly affected. Diversity indices indicate no adverse effects on community structure in the benthos populations.

A meeting was held on July 30, 1975 in Marquette, Michigan to discuss dust problems associated with field use of granular Bayer 73, the effects of low pH's on the solubility and activity of Bayer 73, and possible effects of this phenomenon on lamprey control efforts. Attending were personnel from the U.S. and Canadian Sea Lamprey Control units and the Fish Control Laboratory.

Dust Problems. Physical tests determined that about 7% of granular Bayer 73 consists of "fines" that are too small to penetrate the surface tension of water. Particle or granule size can be increased with little difficulty. The formulator is currently using 35 to 60 mesh size sand. If closer screening is desired, the cost will increase.

The dusting problem is related to characteristics of technical Bayer. Technical Bayer is hygroscopic and tends to cake after formulation. To prevent caking, 1% silica is added during formulation. Chemagro feels the dusting is probably silica granules separating out. Dusting could be reduced by coating the granules with a very hard starch. This would require special drying equipment that Chemagro does not have. Naturally, the cost would also have to be increased if this change was desired.

A search of the available information indicates that 1% formulations are likely to be more effective than the 5% product now in use. Switching to the 1% formulation would be a minor problem for the manufacturer (Chemagro) but could involve significantly higher material, shipping, and application costs due to the fivefold increase in product mass. Whether such a switch is economically feasible remains to be determined.

Solubility of Bayer Formulations. Currently used formulations were reviewed with the Chemagro Corporation to determine if the formulated product might adversely affect solubility of the Bayer 73.

The present formulation uses Carbowax 4000 plus methylene chloride to make the Bayer stick to the granules. During processing the methylene chloride evaporates and is lost. Carbowax 4000 is so highly soluble that the Bayer should come off the granules (but not necessarily go into solution) shortly after they enter water. Release of Bayer 73 from granules thus is not the source of the observed solubility problems.

Effects of Water Characteristics on Solubility of Bayer 73. Granular Bayer 73 (5% active ingredient), used for control of lamprey larvae or to test for their presence, is designed to release the chemical at the water-soil interface.

Tests were conducted in the laboratory to determine the influence of pH, total hardness, and water temperature on the rate of release of Bayer 73 from the granules. Samples of various lots of the chemical in storage at the Ludington Biological Station were used. Both pH and temperature of the water affected the release of the chemical. When the pH was below 7.0 (usually about 6.5), no Bayer 73 could be detected in the water by colorimetric spectrophotometry. Either it failed to go into solution, or it precipitated immediately after dissolving from the granules. The chemical dissolved in alkaline water and the release rate increased as the pH increased. Dissolution at pH 8.5 averaged about 1.6 times that at pH 7.5 in 4 hours. The release from granules at temperatures of 12 C or above was about twice that at 7 C in 4 hours. However, no more than 40% of the Bayer 73 was released into the water in any of the 4-hour tests.

The activity of Bayer 73 is influenced by pH. At a pH of 6.5, most of the dissolved Bayer should exist in the un-ionized form. Since un-ionized Bayer is more toxic than ionized, low pH should not cause a loss of activity. This observation is substantiated by a 24-hour LC99 of 0.08 mg/l for sea lamprey larvae under standard laboratory conditions.

However, solubility problems may arise when Bayer 73 is added to waters of low pH. Under acid conditions, the ethanolamine salt converts to the anilide moeity which is only 1/10 as soluble. This explains the results observed in tests conducted on the effects of pH, hardness, and temperature.

It appears that problems encountered in the field use of Bayer in acid waters may be related to the length of time un-ionized Bayer remains in solution. If the ethanolamine salt converts to the relatively insoluble anilide moeity, the length of time required for this to occur directly affects the efficiency of Bayer applications. It is highly possible that lamprey larvae escape adequate exposure to a lethal dose, in other words, to an effective contact time. Slow rates of dissolution coupled with rapid precipitation as the insoluble form would counteract the toxicity of the Bayer that may be applied. Results could thus vary from good to "no effect" in the various acid water systems to be treated.

LITERATURE ON TFM AND BAYER 73

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APPENDIX G

ADMINISTRATIVE REPORT FOR 1975

Meetings. The Commission held its 1975 Annual Meeting in Toronto, Ontario, June 17-19, 1975, and its Interim Meeting in Ann Arbor, Michigan on December 2-3, 1975. The Commission also held executive meetings of Commissioners and staff as follows: February 6 (Ann Arbor, Michigan), May 6-7 (Washington, D.C.), June 17, 19 (Toronto, Ontario), September 4 (Ann Arbor, Michigan), and December 1, 3 (Ann Arbor, Michigan). Meetings of Standing Committees during 1975 were:

Lake Erie, at Lansing, Michigan, March 11-12
Lake Ontario, at Lansing, Michigan, March 12-13
Combined Upper Great Lakes, at Milwaukee, Wisconsin, March 25-26
 Lake Superior, at Milwaukee, Wisconsin, March 25
 Lake Huron, at Milwaukee, Wisconsin, March 26
 Lake Michigan, at Milwaukee, Wisconsin, March 26
Great Lakes Fish Disease Control Committee, at
 Milwaukee, Wisconsin, March 24
 Ann Arbor, Michigan, May 8-9
Sea Lamprey Control and Research, at Ann Arbor, Michigan, April 3
Scientific Advisory Committee, at
 Toronto, Ontario, June 16
 Harbor Springs, Michigan, October 29-30
 Ann Arbor, Michigan, December 1

Officers and staff. The Chairman, Mr. Loftus, and the Vice-Chairman, Mr. Reed, appointed in June 1974, continued their terms of office through 1975. The Commissioners appointed to the various internal operating committees in October 1974 also continued their assignments through 1975.

Mr. McLain continued as Acting Executive Secretary through June 1975. Mr. Carlos M. Fetterolf, Jr., was appointed Executive Secretary and assumed his post on July 1, 1975. There were no other changes in staff.

Staff activities. The Commission's staff (Secretariat) performs several major functions. The Secretariat provides assistance to the standing committees for all phases of the Commission's program. On behalf of the Commission it provides liaison with agencies and individuals with whom the Commission deals, including assistance in coordinating fishery programs, planning meetings, arranging the presentation of reports, and preparation of minutes. The Secretariat provides direct assistance to the Commission in program development and acts on behalf of the Commission as circumstances may require. During 1975 the staff participated in conferences, meetings and activities sponsored by:

Canadian Committee for Freshwater Fisheries Research
Lake Michigan Study Group
Lake Erie Walleye Management-Scientific Protocol Committee
Lake Superior Advisory Committee
Great Lakes Commission
State Fish and Game Directors and National Marine Fisheries Service Meeting
American Fisheries Society
Wisconsin Sea Grant
Eastland Fisheries Survey
International Joint Commission Annual Meeting
IJC Research Advisory Board
IJC Water Quality Objectives Subcommittee
Water Pollution Control Federation
US/USSR Symposium on Water Quality
Sierra Club
American Institute of Fishery Research Biologists
National Symposium on PCB's
Midwest Fish and Wildlife Conference
Electric Power Research Institute Workshop on Impact of Thermal Power Plant Cooling Systems on Aquatic Environments
International Association for Great Lakes Research Board of Directors and Annual Meeting

Accounts and Audit. The Commission accounts for the fiscal year ending June 30, 1975 were audited by Icerman, Johnson, and Hoffman of Ann Arbor. The firm's report is appended.

Program and Budget for Fiscal Year 1975. At its 1973 Annual Meeting, the Commission adopted a program and budget for sea lamprey control and research in fiscal year 1975 which provided for continuation of sea lamprey control in Lake Superior, Lake Michigan, Lake Huron, and Lake Ontario; continuation of field research projects, Hammond Bay Laboratory research, and registration-oriented studies on lampricides; and a modest beginning for design and construction of lamprey barrier dams as a segment of integrated sea lamprey control. The program called for a total expenditure for sea lamprey control and research and administration and general research of $3,624,245.

Subsequently, the program for sea lamprey conrol and research was revised to match reduced appropriations provided by the U.S. government, including deferral of the start of the sea lamprey barrier dam program which would improve control and reduce costs. Final funding for fiscal year 1975 was as follows:

	U.S.	*Canada*	*Total*
Sea Lamprey Control and Research	$2,186,750	$ 981,820	$3,168,570
Administration and General Research	55,250	55,250	110,500
Total	$2,242,000	$1,037,070	$3,279,070[7]

Sea lamprey control and research in Canada in fiscal year 1975 was carried out under agreement with the Canadian Department of Environment ($800,000) and the U.S. Fish and Wildlife Service ($1,570,200). In addition, the Commission contracted with the North American subsidiaries of Farbewerke Hoechst Ag. to purchase 120,000 pounds of TFM at $4.57 per pound. At the end of the fiscal year the Canadian agent refunded $24,951 and the U.S. agent $21,174; these monies were used for the purchase of supplemental lampricides.

Program and Budget for Fiscal Year 1976. At the 1974 Annual Meeting, the Commission adopted a program and budget for sea lamprey control and research in fiscal year 1976 estimated to cost $4,128,300. The program called for continuation of sea lamprey control on Lakes Superior, Michigan, Huron, and Ontario; continuation of sea lamprey research at Hammond Bay Biological Station and registration-oriented studies on lampricides; establishment of a sea lamprey survey capability for Lake Erie (the only Great Lake without sea lamprey control); and another attempt to initiate a sea lamprey barrier dam project to reduce future costs of lampricide treatments and improve sea lamprey control in difficult-to-treat streams. A budget of $129,200 was adopted for administration and general research.

Following revisions to adjust to changes in proposed contributions by the governments, the Commission proceeded with the following program for sea lamprey control and research on a budget of 3,774,100.

The Canadian agent scheduled treatments of 23 tributaries to their waters of the Great Lakes and 5 tributaries in the State of New York this fiscal year. Seven problem areas involving major applications of granular Bayer 73 also are scheduled. In addition, an assessment barrier network will continue operation on selected Lake Huron tributaries.

The U.S. agent has scheduled 44 lampricide treatments; 23 tributaries to Lake Superior, 15 to Lake Michigan, and 6 to Lake Huron. Operation of the eight assessment barriers on Lake Superior tributaries

[7]Includes supplementary contributions totalling $63,770 ($44,000 U.S. and $19,770 Canadian) to partially cover cost-of-living increases to employees of the Commission's U.S. agents.

and the device on the Ocqueoc River, a tributary to Lake Huron, is planned. The reestablishment phase of the larval studies will continue; however, the age and growth study in the Big Garlic River will be terminated. The U.S. agent also will establish a survey capability on Lake Ontario and the unit also will have the responsibility of assessing the possible contribution of sea lampreys from the Oswego River—Finger Lakes system to the parasitic stocks of Lake Ontario.

The current sea lamprey research program at the Hammond Bay Biological Station and the registration-oriented work at the La Crosse Fish Control Laboratories also are to continue through fiscal year 1976.

The Commission plans to negotiate a Memorandum of Agreement with its U.S. agent, the U.S. Fish and Wildlife Service, for work involving $1,753,060 and expects to provide lampricides valued at $667,340. A Memorandum of Agreement has been executed which provides the Commision's Canadian agent, the Department of Environment, with $881,100. In addition, the Commission plans to provide lampricides valued at $266,100. The Commission also reviewed its Administration and General Research budget for fiscal year 1976. The funding for fiscal year 1976 is as follows:

	U.S.	Canada	Total
Sea Lamprey Control and Research	$2,613,400	$1,160,700	$3,774,100
Administration and General Research	64,600	64,600	129,200
Total	$2,678,000	$1,225,300	$3,903,300[8]

Program and Budget for Transitional Period (July 1-September 30, 1976). Following notification that the U.S. fiscal year was being changed in 1976 to begin on October 1 rather than July 1, the Commission submitted a budget request of $1,191,000 (U.S. only) for the transitional period of July 1-September 30. However, the State Department had submitted earlier, without consultation, a budget of $723,700, some $467,300 less than required, on the assumption that the needs of the Commission's program were equal throughout the year and that one quarter of the annual appropriation, plus a modest increase for higher costs, was adequate. Following negotiations which stressed that the three summer months included the field work period of maximum costs, a transitional period budget of $1,166,000 was adopted after deferring the $25,000 sea lamprey barrier dam program. It is expected that a supplemental appropriations bill will provide the additional $442,300. In addition, monies for a cost-of-living increase granted to employees of the U.S. agent increased the final amount to $1,182,700.

[8]Includes supplementary contributions totaling $43,500 (U.S. $30,000, Canada $13,500) to partially cover cost-of-living increase to employees of the Commission's U.S. agent.

During the transitional period, the Commission's U.S. control agent has scheduled lampricide treatments on 9 tributaries to Lake Superior, 9 tributaries to Lake Michigan, and 11 tributaries to Lake Huron (total 29 streams). The operation of assessment barriers on 8 Lake Superior tributaries will continue into this period. The Lake Ontario assessment unit will resume surveys in the Oswego-Finger Lake system, concentrating on the areas which may best answer whether sea lamprey from these inland New York waters contribute to the parasitic populations in Lake Ontario. In addition, the Sea Lamprey Control and Research Committee recommended that a survey capability for Lake Erie be developed; this unit will begin operations in the summer of 1976.

Registration-oriented studies on lampricides at La Crosse Fish Control Laboratories (USFWS) will be maintained. At the Hammond Bay Biological Station studies on sea lamprey wounding and alternative and supplemental control techniques will be continued.

Program and Budget for Fiscal Year 1977. At the 1975 Annual Meeting, the Commission adopted a program and budget for sea lamprey control and research in fiscal year 1977 estimated to cost $4,375,400. The program calls for continuation of sea lamprey control on Lakes Ontario, Huron, Michigan, and Superior, stream surveys to locate sea lamprey infested streams on Lake Erie, the operation of assessment weirs on Lakes Superior and Huron, continuing research to assess immediate and long-term effects of lampricides in the environment, research to improve present control techniques, including biological controls, and a new project to build barrier dams on selected streams to prevent sea lamprey access to problem areas, thus reducing the use of expensive lampricides and application costs. A budget of $150,000 was adopted for administration and general research for a total program cost of $4,525,400 of which $3,094,000 is being requested from the U.S. Government and $1,431,400 from Canada.

Reports and Publications. In 1975, the Commission published an Annual Report for 1973, one paper in its Technical Report Series, and a brochure describing the Commission's history, programs, and progress.

"Changes in the lake trout population of southern Lake Superior in relation to the fishery, the sea lamprey, and stocking, 1950-70, by Richard L. Pycha and George R. King. Great Lakes Fishery Commission, Tech. Rep. 28, 34 pp. July 1975.

History, program and progress, by Walter R. Crowe, Great Lakes Fishery Commission, Special Rep. 23 pp. September 1975.

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ANN ARBOR, MICHIGAN
HOWELL, MICHIGAN

Great Lakes Fishery Commission
Ann Arbor, Michigan

We have examined the accompanying balance sheets of Great Lakes Fishery Commission as of June 30, 1975, and the related statements of revenues and expenditures and encumbrances, changes in encumbrances and fund balances, and source and application of funds for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the financial statements mentioned above present fairly the financial position of Great Lakes Fishery Commission at June 30, 1975, and the results of its operations and changes in its financial position for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with the preceding year.

Icerman, Johnson & Hoffman

Ann Arbor, Michigan
September 12, 1975

Great Lakes Fishery Commission
Balance Sheet
June 30, 1975

	Administration and General Research Fund	*Sea Lamprey Control and Research Fund*	*Total*
Assets			
Cash in bank	$18,673	$396,301	$414,974
Accounts receivable	-0-	98,578	98,578
Prepaid expense	520	-0-	520
	$19,193	$494,879	$514,072
Liabilities and Fund Balance			
Current Liabilities			
Accounts payable	$ 6,358	$ 53,455	$ 59,813
Accrued wages	1,599	-0-	1,599
	$ 7,957	$ 53,455	$ 61,412
Encumbrances (Note 2)	$ -0-	$ 89,808	$ 89,808
Fund Balance	$11,236	$351,616	$362,852
	$19,193	$494,879	$514,072

See notes to financial statements on page 95.

Great Lakes Fishery Commission
Statement of Revenues and Expenditures and Encumbrances
Year Ended June 30, 1975

Administration and General Research Fund

	Budget	*Actual*	*Over or (Under) Budget*
Revenues			
Canadian government	$ 55,250	$ 55,250	$ -0-
United States government	55,250	55,250	-0-
Miscellaneous	-0-	442	442
	$110,500	$110,942	$ 442
Expenditures and Encumbrances			
Salaries	$ 70,240	$ 51,641	$(18,599)
Fringe benefits	10,340	18,345	8,005
Research	10,000	10,000	-0-
Travel	6,520	7,506	986
Communications	1,500	914	(586)
Rents and utilities	900	603	(297)
Printing and reproduction	7,000	4,846	(2,154)
Other contractual services	1,500	1,800	300
Supplies	1,500	2,758	1,258
Equipment	1,000	4,087	3,087
	$110,500	$102,500	$ (8,000)
Excess of revenues over expenditures and encumbrances	$ -0-	$ 8,442	$ 8,442

Great Lakes Fishery Commission
Statement of Revenues and Expenditures and Encumbrances
Year Ended June 30, 1975

Sea Lamprey Control and Research Fund

	Budget	*Actual*	*Over or (Under) Budget*
Revenues			
Canadian government:			
Operating revenues	$ 962,050	$ 962,050	$ -0-
Refund for unexpended funds	-0-	24,951	24,951
Cost of living increase	-0-	19,770	19,770
United States government:			
Operating revenues	2,142,750	2,142,750	-0-
Refund for unexpended funds (Note 3)	-0-	21,174	21,174
Cost of living increase	-0-	44,000	44,000
Interest	-0-	25,821	25,821
	$3,104,800	$3,240,516	$ 135,716
Expenditures and Encumbrances			
Canadian Department of the Environment	$ 800,000	$ 800,000	$ -0-
United States Bureau of Sport Fisheries and Wildlife	1,583,700	1,570,210	(13,490)
Lampricide purchases (Note 2)	596,100	553,304	(42,796)
Special studies	70,000	9,395	(60,605)
Building rentals (Note 2)	55,000	55,000	-0-
	$3,104,800	$2,987,909	$(116,891)
Excess of revenues over expenditures and encumbrances	$ -0-	$ 252,607	$ 252,607

See notes to financial statements on page 95.

Great Lakes Fishery Commission
Statements of Changes in Encumbrances and Fund Balances
Year Ended June 30, 1975

Administration and General Research Fund

	Encumbrances	*Fund Balance*
Balances (deficit), July 1, 1974	$ 2,500	$(12,206)
Excess of revenues over expenditures and encumbrances		8,442
Adjustment for prior year encumbrances cancelled	(2,500)	2,500
Transfer from the Sea Lamprey Control and Research Fund		12,500
Balances, June 30, 1975	$ -0-	$ 11,236

Sea Lamprey Control and Research Fund

	Encumbrances	*Fund Balance*
Balances, July 1, 1974	$ 119,097	$ 111,509
Excess of revenues over expenditures and encumbrances		252,607
Prior year encumbrances paid	(119,097)	
Outstanding encumbrances applicable to the 1974-75 budget	89,808	
Transfer to the Administration and General Research Fund		(12,500)
Balances, June 30, 1975	$ 89,808	$ 351,616

Great Lakes Fishery Commission
Statements of Source and Application of Funds
Year Ended June 30, 1975

	Administration and General Research Fund	*Sea Lamprey Control and Research Fund*	*Total*
Source of Commission Funds			
Revenues:			
Budget	$110.942	$3,240,516	$3,351,458
Non-budget transfers	12,500	-0-	12,500
	$123,442	$3,240,516	$3,363,958
From reduction in assets:			
Accounts receivable	314	78,757	79,071
From increasing liabilities:			
Accrued wages	622	-0-	622
Encumbrances at June 30, 1975	-0-	89,808	89,808
	$124,378	$3,409,081	$3,533,459
Application of Commission Funds			
Expenditures:			
Budget	$102,500	$2,987,909	$3,090,409
Non-budget transfers	-0-	12,500	12,500
	$102,500	$3,000,409	$3,102,909
Expenditures for items encumbered June 30, 1974	-0-	119,097	119,097
To increase in assets:			
Cash	18,128	263,689	281,817
Prepaid expense	520	-0-	520
To reduction in liabilities:			
Accounts payable	3,230	25,886	29,116
	$124,378	$3,409,081	$3,533,459

Great Lakes Fishery Commission

Notes to Financial Statements
June 30, 1975

Note 1. Significant Accounting Policies

All amounts appearing on the financial statements are in United States dollars.

The books of account for the Commission are maintained on a modified accrual basis of accounting. Revenues are recognized when received except that balances of budgeted receipts that have been promised by the Canadian or United States governments are set up as receivables at June 30, 1975.

Inventories, equipment and related property items are expensed as they are purchased.

The cash balances for both funds operate from two bank accounts, one checking account and one savings account. Therefore, at any point in time, the bank accounts are each composed partly of the Administration and General Research Fund and partly of the Sea Lamprey Control and Research Fund.

Note 2. Budgeted Encumbrances

Unused funds at year-end are set up as encumbrances and charged to expenses. At June 30, 1975, these funds consist of $89,808 ($24,951 from the Canadian government and $64,857 from the United States government) which are encumbered for lampricide purchases and building rentals in the Sea Lamprey Control and Research Fund.

Note 3. Sea Lamprey Control and Research Fund Revenues

The refund from the United States government includes refunds for the years ended June 30, 1973 and 1972, which were $11,312 in excess of the amounts believed to be refundable.

Note 4. Federal Income Taxes

The Great Lakes Fishery Commission is exempt from federal income taxes under Sec. 501(c)(1) of the Internal Revenue Code.

COMMITTEE MEMBERS – 1975

(Commissioners in Italics)

SCIENTIFIC ADVISORY COMMITTEE

CANADA	UNITED STATES
F. E. J. Fry, Chm.	*W. M. Lawrence*
M. G. Johnson	J. H. Kutkuhn
A. H. Lawrie	S. H. Smith
H. A. Regier	D. A. Webster

SEA LAMPREY CONTROL AND RESEARCH

CANADA	UNITED STATES
C. J. Kerswill	*W. M. Lawrence*, Chm.
K. H. Loftus	*L. P. Voigt*
J. J. Tibbles	G. L. Buterbaugh

MANAGEMENT AND RESEARCH COMMITTEE

CANADA	UNITED STATES
C. J. Kerswill, Chm.	*Claude Ver Duin*
F. E. J. Fry	*N. P. Reed*
R. M. Christie	W. J. Harth
E. Gage	C. E. Parker
A. Holder	R. J. Poff
W. Hendry	J. A. Scott
J. J. Tibbles	H. D. Tait

FINANCE AND ADMINISTRATION COMMITTEE

CANADA	UNITED STATES
E. W. Burridge	*L. P. Voigt*, Chm.
K. H. Loftus	*N. P. Reed*

LAKE COMMITTEES

LAKE HURON	LAKE ONTARIO
R. M. Christie, Chm.	E. Gage, Chm.
J. A. Scott, V-Chm.	C. E. Parker, V-Chm.

LAKE MICHIGAN	LAKE SUPERIOR	LAKE ERIE
R. J. Poff, Chm.	J. A. Scott, Chm.	C. E. Parker, Chm.
W. J. Harth, V-Chm.	W. Hendry, V-Chm.	A. Holder, V-Chm.
F. Lockard	C. R. Burrows	N. E. Fogle
W. H. Tody	R. J. Poff	R. B. Kenyon