

**GREAT LAKES FISH DISEASE CONTROL
POLICY AND MODEL PROGRAM**

Edited by
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SPECIAL PUBLICATION 85-4



Great Lakes Fishery Commission

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The Great Lakes Fishery Commission was established by the Convention on Great Lakes Fisheries between Canada and the United States, which was ratified on October 11, 1955. It was organized in April 1956 and assumed its duties as set forth in the Convention on July 1, 1956. The Commission has two major responsibilities: first, develop coordinated programs of research in the Great Lakes and, on the basis of the findings, recommend measures which will permit the maximum sustained productivity of stocks of fish of common concern; second, formulate and implement a program to eradicate or minimize sea lamprey populations in the Great Lakes.

The Commission is also required to publish or authorize the publication of scientific or other information obtained in the performance of its duties. In fulfillment of this requirement the Commission publishes the Technical Report Series, intended for peer-reviewed scientific literature, and Special Publications, designed primarily for dissemination of reports produced by working committees of the Commission. Technical Reports are most suitable for either interdisciplinary review and synthesis papers of general interest to Great Lakes fisheries researchers, managers, and administrators or more narrowly focused material with special relevance to a single but important aspect of the Commission's program. Special Publications, being working documents, may evolve with the findings of and charges to a particular committee. Sponsorship of Technical Reports or Special Publications does not necessarily imply that the findings or conclusions contained therein are endorsed by the Commission.

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In this copy of Special Publication 85-4, the following corrections have been made:

| <u>Page</u> | <u>Section</u> | <u>Correct ion</u> |
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| 4 | 1.8 | Section 8 changed to 4. |
| 5 | 5.1 | Section IV changed to 4. |
| 5. | 5.2 | Annex IV changed to V. |
| 5 | 8.3 | Annex IV changed to V. |
| 8 | 7.2 | “Regulations and Manual” changed to “Regulations: M a n u a l ” |
| 6 | 8.2.b. | Annex II changed to IV. |

GREAT LAKES FISH DISEASE CONTROL
POLICY AND MODEL PROGRAM

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GREAT LAKES FISH DISEASE CONTROL POLICY

Efficient propagation of fish may be severely affected by the occurrence of fish diseases. Disease outbreaks have caused serious losses in fish hatcheries and potential exists for such losses in feral Great Lakes fish populations. Disease problems have resulted in reduced survival of stocked fish, production cost increases of 20 to 30 percent or more, significant losses of fish to the public, and diminished economic returns to Great Lakes communities.

To work toward the attainment of fish disease control in the Great Lakes basin, it shall be the policy of the Great Lakes Fishery Commission to encourage each agency to:

- develop legislative authority and regulations to allow control and possible eradication of fish diseases,
- prevent the release of seriously infected fish,
- discourage the rearing of diseased fish,
- prevent the importation, into the Great Lakes basin, of fish infected with emergency diseases,
- prevent the transfer, within the Great Lakes basin, of fish infected with restricted diseases, and
- eradicate fish diseases where practicable.

The Great Lakes Fishery Commission will strive to coordinate the fish disease control program of the agencies. To this end the Commission endorses and supports the Model Fish Disease Control Program as a guide for agency program development.

- Adopted by the Great Lakes Fishery Commission,
9 May 1985.

MODEL
GREAT LAKES FISH DISEASE CONTROL PROGRAM

INTRODUCTION

Fish disease control in the Great Lakes basin is the responsibility of those agencies which manage the fisheries resources. The Fish Disease Control Committee of the Great Lakes Fishery Commission has developed this model program to unify and coordinate the fish disease control efforts of the member agencies. This program sets forth the essential requirements for the prevention and control of serious infectious diseases, and includes a system for inspecting and classifying fish hatcheries as well as the technical procedures to be used during these evaluations.

The committee wishes to make it clear that it is in no way seeking fish disease control authority. The recommendations advanced by this program are provided as an aid to the member agencies in the development of legislation and regulations. The committee seeks the advice and counsel of these agencies in the continuing development of fish disease control programs to assure that they serve the best interests of all the Great Lakes fishery resources.

MODEL PROGRAM

Section 1. Definitions

For the purpose of this program the term

- 1) "Commission" means the Great Lakes Fishery Commission;
- 2) "Member agency" means each federal, provincial, and state government fishery management or conservation agency, the Great Lakes Private Fish Health Protection Cooperative, Ontario Trout Farmers Association, or other interested parties normally participating in the activities of the Great Lakes Fish Disease Control Committee;
- 3) "Great Lakes basin" means the geographical area encompassing Lake Ontario (including the St. Lawrence River from Lake Ontario to the forty-fifth parallel of latitude), Lake Erie, Lake Huron (including Lake St. Clair), Lake Michigan, Lake Superior, their interconnecting waters, and all tributaries to those lakes and waters;
- 4)* "Fish" means live fish as listed in Annex I, their viable eggs, sperm, or products used for fish foods which have not been so processed as to render them incapable of transmitting an emergency or restricted fish disease agent;

*In cases where the disease(s) is not transferred via the egg (or properly disinfected egg), the terms of the policy may not apply.

- 5) "Fish hatchery" means any facility which holds, rears, or releases fish of the species listed in Annex I in the waters of the Great Lakes basin or whose effluent waters drain into the basin;
- 6) "Emergency fish disease" as listed in Annex IV means certain infectious diseases of fish which are transmissible directly or indirectly, from one fish to another, and are not known to exist in the Great Lakes basin;
- 7) "Restricted fish disease" as listed in Annex IV means certain infectious diseases of fish which are transmissible, directly or indirectly, from one fish to another, and are currently known to exist within the Great Lakes basin, but whose geographic range is limited,
- 8) "Fish Disease Inspection Report" means a document giving evidence of inspections and diagnostic work performed as referred to in Section 4 and exhibited in Annex II;
- 9) "Certificate" means a document signed by a fish health official indicating the fish health status of a facility;
- (10) "Fish Health Official" means a fish health specialist who meets the requirements set forth in Section 7;
- (11) **"Source"** means any point or place of origin of fish and/or eggs including a fish hatchery or free ranging spawning population.

Section 2. Basic Obligation

The member agencies shall take all appropriate measures including the development of legislative authority and regulations, where necessary, to prevent the introduction of emergency and restricted fish disease, to contain them within their known geographic ranges, and to strive for their elimination in accordance with the provisions of this program.

Section 3. Application

- 1) The provisions of this program apply to:
 - a) fish of the species identified in Annex I;
 - b) emergency and restricted fish disease agents as listed in Annex IV,
 - c) fish disease research on fish infected with, or exposed to, emergency and restricted fish disease agents and/or the possession of these infectious agents.
- 2) The provisions of this program shall not apply to:
 - a) fish in transit through the Great Lakes basin which are not released from their original shipping containers;
 - b) specimens of fish imported or exported for purposes of diagnostic or inspection services and related laboratory tests provided that all necessary biological containment measures are taken to avoid any dissemination of fish disease agents.

- 3) Nothing in this program shall derogate from the right of the member agencies to apply additional measures of inspection, quarantine, and disease eradication for the control of fish diseases.

Section 4. Fish Disease Inspection Reports

- 1) Fish Disease Inspection Reports, listing the emergency and restricted fish diseases, shall include the information prescribed in Annex II..
- 2) Fish Disease Inspection Reports may only be issued by a Fish Health Official.
- 3) Hatcheries shall be classified in accordance with the plan described in Annex VI on the basis of annual fish health inspections and other disease and/or diagnostic work performed.

Section 5. Importation

- 1) Fish imported from outside the jurisdiction of a member agency must be accompanied by a certificate or other document giving equivalent assurance as to the state of health of the fish and which is prepared and signed by a Fish Health Official in accordance with Section 4.
- 2) In the case of fish imported into the Great Lakes basin from either within or outside the jurisdiction of member agencies, our goal shall be that no importation of fish with a record of either emergency or restricted disease shall be permitted. For an interim period, importations of fish from facilities with restricted disease classifications may be permitted, provided this does not result in downgrading of the receiving facility's classification; and meets with the requirements stated in Annex V.

Section 6. Transfer and Release of Fish within the Great Lakes Basin

- 1) No fish exhibiting overt signs of emergency or restricted diseases should be released.
- 2) No fish from a hatchery with a record of an emergency disease within the last two years should be transferred or released.
- 3) In the case of fish from hatcheries with a record of specific restricted diseases, refer to Annex V for guidelines on transfer and release.
- 4) No lot of fish suffering excessive mortalities or epizootics should be transferred or released.

Section 7. Fish Health Official

- 1) Each member agency shall identify, by name, to the Chairman of the Great Lakes Fish Disease Control Committee, those individuals whom the agency recognizes to be responsible for carrying out fish hatchery inspections and the issuance of inspection reports in accordance with this policy. This recognition should include private fish health inspectors also recognized by the state or province in which they perform on-site inspections.

- 2) Competence of fish health officials shall be based upon standards set forth by the Canadian Fish Health Protection Regulations: Manual of Compliance which requires adequate laboratory facilities and qualified personnel to assure the prompt and accurate conduct of inspection and diagnoses Under the procedures set forth in Annex III, or the standards set forth by the Fish Health Section of the American Fisheries Society.
- 3) The Chairman of the Great Lakes Fish Disease Control Committee shall be responsible for compilation and distribution of current lists of these Fish Health Officials-such lists to be updated annually.
- 4) All Fish Health Officials shall submit copies of all Fish Disease Inspection Reports to the appropriate member agency under whose jurisdiction the inspected hatchery lies.

Section 8. Reports by Member Agencies

- 1) Member agencies shall present to each periodic meeting of the Great Lakes Fish Disease Control Committee a report covering the status of fish diseases, the measures adopted for their control, the activities and problems of their Fish Health Official, and such other information as may be requested to enhance the effectiveness of this program.
- 2) Hatchery Classification
 - a) Semi-annually, on 30 June and 31 December, each member agency shall provide an updated classification listing covering all its hatcheries to the Chairman of the Great Lakes Fish Disease Control Committee for compilation and distribution as in 1) above.
 - b) At an interim date, changes in hatchery classifications concerning emergency and restricted diseases as listed in Annex IV shall be submitted to the Chairman of the Great Lakes Fish Disease Control Committee for compilation and distribution as in 1) above.
- 3) The Chairman of the Great Lakes Fish Disease Control Committee or his designee shall maintain records of the reports submitted to him.

Section 9. Amendment of the Model Program and the Annexes

Amendments to this model program or its annexes may be proposed by any member agency or by the Great Lakes Fish Disease Control Committee. Any such proposal made by a member agency shall be submitted to the Committee for its comments and recommendations. The proposed amendment, together with the comments and recommendations of the Committee, shall be communicated to the Commission for consideration.

ANNEX I

SPECIES COVERED BY THE PROGRAM

All species and hybrids of the family Salmonidae are subject to provisions of the Fish Disease Control Program for the Great Lakes basin.

Other species may be added at such time as the GLFDCC deems appropriate.

ANNEX II
FISH DISEASE INSPECTION REPORT

It is recommended that each member agency use the standardized form attached to facilitate data retrieval.

ANNEX III

INSPECTION PROCEDURES AND METHODS OF DIAGNOSIS

INSPECTION PROCEDURES

The data obtained from inspections are an essential part of our program to control and improve the quality of fish produced at fish hatcheries. Therefore, it is essential that all hatchery inspections be conducted in accordance with the following procedures.

- 1) Sample Population - The following definitions will apply to the designation of populations for sampling purposes.
 - a) For all fish except those being inspected for whirling disease, the sample population is determined on the basis of the lot and production environment. For our purposes the lot is defined as those fish which originated from the same broodstock during the same year, and are being raised on the same water source. Example: Two egg shipments of fall spawning rainbow trout from the same hatchery received in September and December are considered one lot; similarly, all spring spawning rainbow trout from the same source are another lot. However, when one part of the lot is held in an open water supply and the other is in a closed water supply, each will be sampled as a separate population. All lots of broodstock of a single species held in the same water supply are considered one population regardless of the age of the fish.
 - b) When conducting a whirling disease inspection, the sample population is defined as all fish in the hatchery held in the same water supply. Samples should be weighted towards the most susceptible species and ages of fish available. Whirling disease spores are difficult to detect in lake trout and coho salmon and in fish larger than 12 inches in length, and in fish younger than 160 days.
 - c) Wild broodstocks must be inspected at least once during the time that eggs destined for a Great Lakes basin hatchery are being obtained. All broodstock present at the time of inspection will constitute the sample population. The sample size should be large enough to detect diseases at an assumed incidence of infection of 2 percent. Where it is not feasible to sample wild broodstocks at the 2 percent assumed incidence level a smaller sample may be taken at the discretion of the inspecting pathologist after all risks are considered.
- 2) Sample Size
 - a) For viral, bacterial, and parasitic diseases the number of samples to be collected from a given lot is based upon stratified random sampling which provides 95 percent confidence of detecting a disease with an assumed minimum incidence of detectable infection of two or five percent depending upon conditions.

Minimum sample sizes for populations varying from 50 to infinity are as follows:

| <u>Population or lot size</u> | <u>Assumed Incidence</u> | |
|-----------------------------------|--------------------------|-----------|
| | <u>2%</u> | <u>5%</u> |
| | <u>Size of Sample</u> | |
| 50 | 50 | 30 |
| 100 | 75 | 45 |
| 250 | 110 | 50 |
| 500 | 130 | 55 |
| 1,000 | 140 | 55 |
| 1,500 | 140 | 55 |
| 2,000 | 145 | 60 |
| 4,000 | 145 | 60 |
| 10,000 | 145 | 60 |
| 100,00 and any larger | 150 | 60 |

The above sample sizes are minimum, and in situations where disease is suspected, larger samples may be necessary and should be taken at the discretion of the inspector.

3) Sample Collection

Moribund fish and those with clinical signs should be sampled during any inspection. The method of collecting subsamples from rearing units to obtain a representative sample is left to the discretion of the pathologist.

For bacterial diseases - sampling of broodstock populations and production fish should be done on a continuing basis throughout the year using moribund and/or dying fish whenever possible. Samples of fixed material for the detection of the Gram positive Renibacterium can be sent to agency laboratories by hatchery managers on a periodic basis. Training should be provided to hatchery managers in preparing cultured material for diagnosis of the Gram negative bacterial pathogens. Cultures also can be sent to agency laboratories for confirming diagnosis. The annual ease history of each designated lot should be compiled by the inspector using this accumulated sampling data. The minimum number of samples is left to the discretion of the inspector.

METHODS OF DIAGNOSIS

The "Procedures for the Detection and Identification of Certain Fish Pathogens," developed by the Fish Health Section of the American Fisheries Society or the "Manual of Compliance to the Fish Health Protection Regulations" of the Department of Fisheries and Oceans, Canada, provide the basis for the work supporting fish hatchery inspections and certifications. If more sensitive or more definitive procedures are available, they may be used but any departures from the basic procedures set forth by the FHS of the AFS must be noted on all associated inspection certificates. The Fish Disease Control Committee, in an effort to encourage the use of the best possible methods, should be notified of technical advances enhancing the implementation of the program. Procedural changes issued by the FHS of the AFS or by the Canadian National Registry of Fish Diseases will be incorporated into the program by the Committee as appropriate.

ANNEX IV

LIST OF DISEASE AGENTS COVERED BY THE PROGRAM

EMERGENCY

Those diseases which have not been detected within waters of the Great Lakes Basin.

- 1) VHS - Viral Hemorrhagic Septicemia Virus
- 2) IHN - Infectious Hematopoietic Necrosis Virus
- 3) CS - Ceratomyxosis (*Ceratomyxa shasta*)
- 4) PKD - Proliferative Kidney Disease agent

RESTRICTED

Those diseases currently present within the Great Lakes basin, but whose geographic range is limited. Every appropriate action should be taken to further reduce their range.

- 1) WD - Whirling Disease (*Myxosoma cerebralis*)
- 2) IPN - Infectious Pancreatic Necrosis Virus
- 3) BKD - Bacterial Kidney Disease (*Renibacterium salmoninarum*)
- 4) BF - Furunculosis (*Aeromonas salmonicida*)
- 5) ERM - Enteric Redmouth (*Yersinia ruckeri*)

Every effort should be made by member agencies to encourage private fish health inspectors, diagnosticians, or academic laboratories conducting fish disease diagnostic work to report the occurrence of any of the above disease agents detected within the Great Lakes basin to a member agency.

ANNEX V

GUIDELINES FOR THE CONTROL AND MANAGEMENT OF DISEASE AGENTS

EMERGENCY

In the event any emergency disease agent is confirmed in any fish stock under propagation, immediate steps shall be initiated to eradicate this disease from the facility and adjacent water as authorized by the member agency with jurisdiction. Refer to the guidelines for disinfections and eradication as described in Meyer, F.P., J.W. Warren, and T.G. Carey fed.). 1983. A guide to integrated fish health management in the Great Lakes basin. Great Lakes Fishery Commission, Ann Arbor, Michigan. Spec. Pub. 83-2, chapter 14, 121-134.

1) Viral Hemorrhagic Septicemia (VHS) Virus

No fish or eggs from any source, unless the source has been regularly inspected and found to have a history of freedom from VHS for the past 2 years shall be imported into the Great Lakes basin.

2) Infectious Hematopoietic Necrosis (IHN) Virus

No fish or eggs from any source, unless the source has been regularly inspected and found to have a history of freedom from IHN for the past 2 years shall be imported into the Great Lakes basin.

3) Ceratomyxosis (CS), *Ceratomyxa shasta*

No fish from any source, unless the source has been regularly inspected and found to have a history of freedom from CS for the past 2 years shall be imported into the Great Lakes basin. An exception may be made in the case of eggs only as the disease agent is not known to be transmitted via the egg.

4) Proliferative Kidney Disease (PKD) Agent

No fish from any source, unless the source has been regularly inspected and found to have a history of freedom from PKD for the past 2 years shall be imported into the Great Lakes basin. An exception may be made in the case of eggs only as the disease is not known to be transmitted via the egg.

RESTRICTED

1) Whirling Disease (WD), *Myxosoma cerebralis*

No fish from any source, unless the source has been regularly inspected and found to have a history of freedom from WD for the past 2 years shall be imported into the Great Lakes basin. In the event WD is confirmed in any fish within a hatchery the fish may not be stocked within the Great Lakes basin, nor may any fish be stocked from the affected station until it has undergone a 2-year period of inspections demonstrating freedom from the disease agent.

2) Infectious Pancreatic Necrosis (IPN) virus

No fish, eggs, or gametes from any source, unless the source has been regularly inspected and found to have a history of freedom from IPN for the past 2 years shall be imported into the Great Lakes basin. In the event IPN is confirmed in any stock under propagation, every effort should be made not to release these fish into waters of the Great Lakes basin.

3) Bacterial Kidney Disease (BKD), *Renibacterium salmoninarum*

Since this disease agent is enzootic within the Great Lakes basin, harsh restrictions on importation are unrealistic at this time. However, every effort should be made not to import or stock fish with overt signs of the disease.

4) Bacterial Furunculosis (BF), *Aeromonas salmonicida*

Since the disease agent is enzootic within the Great Lakes basin, harsh restrictions on importation are unrealistic at this time. However, every effort should be made not to import or stock fish with overt signs of the disease.

5) Enteric Redmouth (ERM), *Yersinia ruckeri*

No fish, eggs, or gametes from any source, unless the source has been regularly inspected and found to have a history of freedom from ERM for the past 2 years shall be imported into the Great Lakes basin. In the event ERM is confirmed in any stock under propagation, every effort should be made not to release these fish into waters of the Great Lakes basin.

ANNEX VI

HATCHERY DISEASE CLASSIFICATION PROGRAM

DISEASES

Each salmonid hatchery and spawning population, whether wild or domesticated, will be inspected and classified for the following;:

| <u>Disease or Agent</u> | <u>Abbreviation</u> |
|--|---------------------|
| Viral Hemorrhagic Septicemia (VHS), virus | VE |
| Infectious Hematopoietic Necrosis (IHN), virus | VH |
| Infectious Pancreatic Necrosis (IPN), virus | VP |
| Bacterial Kidney Disease (BKD), <i>R. salmoninarum</i> | BK |
| Furunculosis, <i>A. salmonicida</i> | BF |
| Enteric Redmouth (ERM), <i>Y. ruckeri</i> | BR |
| Whirling Disease, <i>M. cerebralis</i> | SW |
| * Ceratomyxosis, <i>C. shasta</i> | SC |
| * Proliferative Kidney Disease (PKD) | SP |

CLASSIFICATION

1) Class A-1

The A-1 classification is assigned to those fish hatcheries meeting the following criteria:

- a) All fish cultural water must be obtained from enclosed sources such as springs or wells which are free of fish.
- b) Samples of all fish lots reared on the station must have been inspected as per Annex III for all diseases listed above, at least annually. Three successive negative inspections over a continuous 2-year period are required. The L-year period begins with the first complete negative inspection. For example, a hatchery is inspected in September 1981 and found to be *free* of all of the disease listed above. This negative inspection starts the "clock" on the 2-year countdown towards Class A status. Two more complete negative inspections are required at approximately annual intervals to qualify a hatchery for classification as a Class A facility in September 1983. More inspections during that 2-year period lend credence to the classification but do not hasten the assignment of the classification.

*Inspections within the Great Lakes Basin need not include these diseases unless there have been known importations of fish from enzootic areas.

- c) To maintain A-1 status hatcheries must assure that all fish or eggs have been obtained only from properly inspected Class A-1 or Class A-2 sources.

2) Class A-2

The A-2 classification differs from A-1 only to the extent that the hatchery has an open water supply such as a stream or lake with resident fish. The A-2 classification is also assigned to discrete spawning populations of free-ranging fish which have met all other class A-1 inspection requirements.

3) Class B

Hatchery and free-ranging spawning populations are assigned a B classification when one or more of the diseases caused by the agents listed above have occurred within the past two years. The disease abbreviation becomes part of the classification. For example, a hatchery where furunculosis has been confirmed would be classified B-BF. The diseases that are diagnosed at a hatchery will continue under observation for a period of 2 years after a disinfection program is carried out. This will be done by placing the disease abbreviation in parentheses. For example, the classification of a B-BF,BK,VP hatchery would be changed to A-1 (or A-2) - (BF,BK,VP) (4/81) after an April 1981 disinfection. The observational or parenthetical disease Classification will also be used when eggs are received from a source having a parenthetical or confirmed disease. For example, the classification of an A-2 hatchery would be changed to B-(BF,BK) if eggs or fish were received from a source classified B-(BF,BK) or B-BF,BK. In other words, a hatchery cannot have a higher classification than the source of its stock. These observational or parenthetical classifications will remain in effect until the disease is confirmed; or, if not confirmed, for a period of 2 years after the date the stock responsible for the classification is removed from the hatchery. If two negative complete annual inspections are accomplished during this period, upgrading of the classification may be considered at the conclusion of the 2-year anniversary date.

4) Class C

Hatcheries and free-ranging spawning populations having an unknown disease history, have not been inspected for all diseases listed, or have undergone only one or two complete annual inspections, will be assigned a C classification. In the case of partial inspection data, the disease abbreviation following the C will be used to identify the specific disease(s) for which inspection data are not available. This will be followed by the regular classification for which inspections have been completed. For example, at a hatchery where Whirling Disease was not included in the inspection, and inspection or diagnostic work revealed BF and BK, the classification would be C-SW,B-BF,BK. Class C classifications will also apply to new hatcheries or to hatcheries with no disease record until completion of the full 2-year inspection program. In this case, the classification of a hatchery, having an open water supply would be C until the hatchery is found to be free of all diseases listed, and would be changed to A-2 after completion of the third negative complete annual inspection.

5) Restrictions

No shipments of fish or eggs will be made without prior approval of the receiving authorities whenever that shipment will knowingly downgrade the classification of the receiving hatchery. Shipments of fish or eggs between hatcheries will be governed by the disease status of the hatcheries involved. At least one inspection for each designated disease, except as noted above for unnecessary or unavailable samples, will be conducted on all lots of salmonids, regardless of age, prior to the transfer of eggs, or transfer or stocking of fish.

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GREAT LAKES FISHERY COMMISSION

SPECIAL PUBLICATIONS

- 79-1 KING, E. L., Jr. and T. A. EDSALL. 1979. Illustrated field guide for the classification of sea lamprey attack marks on Great Lakes lake trout. Great Lakes Fish. Comm. Spec. Pub. 79-1. 41 p.
- 82-1 BERST, A. H., and G. R. SPANGLER. 1982. Recommendations for freshwater fisheries research and management from the Stock Concept Symposium (STOCS). Great Lakes Fish. Comm. Spec. Pub. 82-1. 24 p.
- 82-2 KOONCE, J. F. (ed.), L. GREIG, B. HENDERSON, D. JESTER, K. MINNS, and G. SPANGLER. 1982. A review of the adaptive management workshop addressing salmonid/lamprey management in the Great Lakes. Great Lakes Fish. Comm. Spec. Pub. 82-2. 40 p.
- 82-3 AUER, N. A. (ed.). 1982. Identification of larval fishes of the Great Lakes basin with emphasis on the Lake Michigan drainage. Great Lakes Fish. Comm. Spec. Pub. 82-3. 744 p.
- 83-1 KOONCE, J. F. (ed.), D. JESTER, B. HENDERSON, R. HATCH, and M. JONES. 1983. Quota management of Lake Erie fisheries. Great Lakes Fish. Comm. **Spec.** Pub. 83-i. 39 p.
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- 84-1 ESHENRODER, R. L., and J. F. KOONCE. 1984. Recommendations for standardizing the reporting of sea lamprey marking data. Great Lakes Fish. Comm. Spec. Pub. 84-1. 21 p.
- 84-2 ESHENRODER, R. L., T. P. POE, and C. H. OLVER (ed.). 1985. Working papers developed at the August 1983 conference on lake trout research. Great Lakes Fish. Comm. Spec. Pub. 84-2.
- 84-3 MINNS, C. K., J. M. COOLEY, and J. E. FORNEY. 1984. Analysis of the response to the use of "Adaptive Environmental Assessment Methodology" by the Great Lakes Fishery Commission. Great Lakes Fish. Comm. Spec. Pub. 84-3. 21 p.
- 85-1 PAINE, J. R., and R. B. KENYON (ed.). 1985. Lake Erie fish community workshop (report of the April 4-5, 1979 meeting). Great Lakes Fish. Comm. Spec. Pub. 85-1. 58 p.
- 85-2 SPANGLER, G. R., and L. D. JACOBSON (ed.). A workshop concerning the application of integrated pest management (IPM) to sea lamprey control in the Great Lakes. Great Lakes Fish. Comm. Spec. Pub. 85-2. 97 p.
- 85-3 ESHENRODER, R. L. (ed.). 1985. Presented papers from the Council of Lake Committees Plenary Session on Great Lakes predator-prey issues, March 20, 1985. Great Lakes Fish. Comm. Spec. Pub. 85-3. 134 p.

