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Fisheries and Aquatic Sciences 1970

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FISH PRODUCTIVE CAPACITY AND LITTORAL HABITAT:  
AN ANNOTATED BIBLIOGRAPHY REFERENCING  
LAKE TROUT, LAKE WHITEFISH, NORTHERN PIKE  
AND WALLEYE IN BOREAL FOREST LAKES

by

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This is the 61st Technical Report  
from the Central and Arctic Region, Winnipeg

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PREFACE

This report was prepared between November 1993 and March 1994 for the Department of Fisheries and Oceans as part of Contract No. FP430-3-9143/01-XSF, SSC File No. XSF93-00205-(302). The database, from which this report was prepared, is the other final product of this contract and is in the Eric Marshall Aquatic Research Library at the Freshwater Institute. Dr Michael Turner was the Scientific Authority.

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## ABSTRACT

MARSHALL, K. E. 1994. Fish productive capacity and littoral habitat: an annotated bibliography referencing lake trout, lake whitefish, northern pike and walleye in boreal forest lakes. Can. Tech. Rep. Fish. Aquat. Sci. 1970: iv + 91 p.

A total of 336 references is included. Many references are to anthropogenic disturbances of the littoral zone. Just over 300 are in the main bibliography. A further 32 references in the appendix are citations to topics related to the main subject but are not from the boreal forest area. The bibliography includes many references also from outside the area, which will be interest to fishery managers, on modelling of populations and fisheries of the four fish species. Annotations are provided to most references outlining the pertinent information in that publication. The main bibliography is in the form of an author index. Systematic, geographic and subject indexes are provided. The appendix is in the same format as the bibliography proper.

Key words: bibliographies; *Coregonus clupeaformis*; lake whitefish; *Esox lucius*; northern pike; *Salvelinus namaycush*; lake trout; *Stizostedion vitreum*; walleye; fishery management; hydroelectric development

## RÉSUMÉ

MARSHALL, K. E. 1994. Fish productive capacity and littoral habitat: an annotated bibliography, referencing lake trout, lake whitefish, northern pike and walleye in boreal forest lakes. Can. Tech. Rep. Fish. Aquat. Sci. 1970: iv + 91 p.

En tout, on énumère 336 titres. Bon nombre des documents traitent de la perturbation d'origine anthropogénique de la zone littorale. Un peu plus de 300 figurent dans la bibliographie principale. En annexe, on donne un autre groupe de 32 titres: ils portent sur des questions connexes au sujet principal, mais ne traitent pas de la forêt boréale. La bibliographie comprend également un bon nombre de titres hors domaine, intéressants pour le gestionnaire de pêches; ils portent sur la modélisation des populations et des pêches des quatre espèces de poissons étudiées. La plupart des titres s'accompagnent d'une notice bibliographique où l'on décrit l'information pertinente présentée dans le document. La bibliographie principale suit l'ordre alphabétique des noms d'auteurs. Le tout se complète d'un index général, d'un index des noms géographiques et d'un index des sujets. L'annexe se présente sous la même forme que la bibliographie principale.

Mots-clés: bibliographies; *Coregonus clupeaformis*; grand corégone; *Esox lucius*; grand brochet; *Salvelinus namaycush*; touladi; *Stizostedion vitreum*; doré; gestion des pêches; aménagement hydro-électrique

## INTRODUCTION

This bibliography, and the associated database, has been prepared to support the Sustainable Fisheries Initiative of the Department of Fisheries and Oceans. It has been compiled using primarily the resources of the Eric Marshall Aquatic Research Library.

Material related to lake trout (*Salvelinus namaycush*), lake whitefish (*Coregonus clupeaformis*), northern pike (*Esox lucius*) and walleye (*Stizostedion vitreum*) in the lakes and reservoirs of the boreal forest region was a prime focus. Searches were made to find publications on the effects of anthropogenic activities which disturb the littoral zone. These activities, of concern to fishery managers, include water level manipulation in regulated lakes, timber harvesting, and dock building associated with cottage development.

The searches showed that many fishes use the littoral zone for spawning and that littoral macrophytes also provide cover for feeding activities. Increases in fluctuations in water levels and turbidity cause serious disruptions to both activities. Changes in the water level are the usual consequences of the damming of a lake or river. When available pre-impoundment studies have been included. References to spawning and other littoral activities of fish from outside the boreal forest region have been included since relatively few references to these activities within the area were found.

Although boreal forest lakes were of prime interest other references are included in the bibliography. Searches were made to find papers dealing with the modelling of productive capacity and fisheries of the four fish species. Many of these are from outside the area and I have included those that I judged to be applicable to situations in the area. Socio-economic aspects of changes in such fisheries are also covered. I was not able to find material from the area dealing with some other topics, such as the effects of clearcutting, and in consequence papers dealing with general aspects of the subject have been included.

Searches were first made using the CD-ROM databases in the Institute library. These were followed by online searches on the Dialog® and CAN/OLE® systems. The following databases were searched:

- a) on CD-ROM - WAVES and AQUAREF (on the WAVES CD-ROM VAGUES), ASFA (Aquatic Sciences and Fisheries Abstracts), Wildlife Review and Fisheries Review, and Arctic and Antarctic Regions.
- b) online - BIOSIS Previews®, Zoological Record, NTIS, Dissertation Abstracts International, and Microlog.
- c) Current Contents on Diskette® was searched for recent papers.
- d) Indexes to the publications of the staff of the Freshwater Institute.

The searches were made between November 1993 and March 1994 inclusive. During this period new material arriving in the Institute library was scanned for pertinent material.

A number of literature reviews and bibliographies was found and these were scanned for further pertinent items. These bibliographies and reviews have been listed so that readers can use them as a source of additional references.

Reference lists in the more significant papers found were also scanned for useful references.

The Appendix contains papers dealing with topics of general relevance not directly related to the fish populations. They provide background information of interest to users of this publication.

Papers dealing only with the uptake by and levels of mercury in fish from reservoirs have not been included as they do not bear directly upon the productive capacity of the fish.

I have included only those publications which will be available to most readers, either in their own libraries or through interlibrary loan facilities. The many reports prepared for the various agencies responsible for building hydroelectric and similar projects have not been included unless I have been able to find a copy in the Institute library. These reports are usually produced in very small numbers and are not generally available.

I have been able to find copies of most of the publications listed. However I have included some items which I was not able to obtain within the time constraints of the project. These items may not have an annotation and the indexing terms selected are based on the information provided in the source citing them.

The bibliography and indexes have been produced by downloading from the database which was prepared using Pro-Cite® software (IBM PC version). The database has been deposited in the Eric Marshall Aquatic Research Library at the Freshwater Institute and can be searched on a PC there. Interested readers may obtain a copy of the database by sending a formatted diskette to: The Eric Marshall Aquatic Research Library, Freshwater Institute, 501 University Crescent, Winnipeg, Manitoba, Canada, R3T 2N6. The database can be supplied in the Pro-Cite format or in the formats available for downloading from this software (ASCII, Microsoft® Word® or WordPerfect®). The database contains both the bibliography proper and the appendix in a single file.

## FORMAT OF THE BIBLIOGRAPHY AND APPENDIX

### AUTHOR INDEX

The Author Index is the bibliography proper. The other indexes refer readers to the Author Index for the full citation. The Appendix has its own indexes and follows the same format as the main bibliography.

References are arranged in alphabetical order by author. Those with more than one author follow those by the senior author alone. Works by the same author, or combination of authors, are in date sequence, the oldest being listed first. When an author, or authors, have more than one publication in the same year, A, B, C, etc. has been used to distinguish them. Cross references are not provided to junior authors.

Authors: Names and initials of authors may not be exactly as printed in a given publication. A standard format has been adopted using the most complete set of initials given so that a proper sequence is maintained. This also aids searching the database on a microcomputer.

Titles: For those items not written in English the title is given first in the original language, followed by a translation. Diacritical marks have not been reproduced. Russian titles have been transliterated using the system adopted by *Chemical Abstracts*.

Journal Citations: *Serial Sources for the BIOSIS Data Base, 1993* has been used as a source to standardize the abbreviations used.

When the pages in a publication are not numbered the number of pages is given in brackets [].

Notes: Where the title on the cover of a report differs from that on the title page a note to this effect has been added in brackets at the end of the citation. If a publication has been issued in another series or format or may be obtained from another source this information is entered here. (UMI = University Microfilms International)

Annotations: These briefly outline the pertinent information in the document. In order to save space lake whitefish is referred to as whitefish unless it is necessary to distinguish it from another species of whitefish. Similarly northern pike is just pike. Walleye has been used in preference to yellow walleye or pickerel. The < and > signs have been used for less than and greater than.

The following abbreviations have also been used in the annotations:

CUE	-	catch-per-unit-effort
HSI	-	habitat suitability index
MEI	-	morphoedaphic index
SIL	-	Southern Indian Lake
TDS	-	total dissolved solids
YOY	-	young-of-the-year.

Locations: Following the annotation there is an indication as to where the reference was found. The item is in the Eric Marshall Aquatic Research Library at the Freshwater Institute when **FWI** appears. This is followed by the call number in parentheses if it is filed as a book. The absence of a call number indicates that the item is filed as a serial. Bodaly indicates that the item is in Dr R. A. Bodaly's personal collection at the Institute in Room 460. The number indicates where it is located in his filing system. Access to this collection is available on request to Dr Bodaly.

Each reference carries at least one indication of where it was found. The following lists the databases where many citations were found:

AQUAREF*	-	database on WAVES CD-ROM VAGUES
ASFA	-	Aquatic Sciences and Fisheries Abstracts (CD-ROM)

## FORMAT

ASTIS*	-	Arctic Scientific and Technical Information Service, a database on the Arctic and Antarctic Regions CD-ROM
BIOSIS	-	BIOSIS Previews® online database
BNT*	-	Boreal Northern Titles, a database on the Arctic and Antarctic Regions CD-ROM
CC Ag	-	Current Contents (Agriculture, Biology and Environmental Sciences) on Diskette
Diss.Abstr.Int.		Dissertation Abstracts International
FR	-	Fisheries Review
Masters Abstr.		Masters Abstracts, included in Dissertation Abstracts Online
NTIS	-	National Technical Information Service online database
SFA	-	Sport Fishery Abstracts
WAVES*	-	database on WAVES CD-ROM VAGUES

The numbers which follow the abbreviation are the item numbers in the database or the volume and part numbers. Those marked \* give locations for most of the items they list.

Other listings refer to items in the bibliography by author and date. NFA 1987 is the Northern Flood Agreement 1987 bibliography which also gives locations for the items listed.

Index Terms: The final line lists the index terms used for that citation. These may provide additional information beyond that given in the annotation.

## SYSTEMATIC INDEX

The various species of prime interest are listed in alphabetical order. The other species that may be mentioned are not indexed. Users are referred to the Author Index for a full citation by author(s) and date in this and the other two indexes.

## GEOGRAPHIC INDEX

North America is listed first and Europe second. Under Canada and the U.S.A. the Provinces, Territories or States appear in alphabetical order. References to the Great Lakes have been placed immediately before the United States. The geographical coordinates of the various locations in North America have been given. These have been taken from the Provincial and Territorial Gazetteers for Canada and from the *National Atlas of the United States of America* and may not correspond to the exact location on a river or large lake where a specific study was made.

Specific locations (e.g., a lake) for material from outside North America are not indicated since their relevance is not site specific. Countries are arranged alphabetically.

## SUBJECT INDEX

A series of index terms has been selected as being relevant to the subject of the bibliography. Some headings (e.g., model) which contain a large number of references have been subdivided in order to make the index more useful in selecting material that a user may wish to find.

## ACKNOWLEDGMENTS

Thanks are due to Dr R. A. Bodaly for allowing access, both by myself and by potential users of this publication, to his personal collection of publications. Neville Ward and Steve Kerr of the Ontario Ministry of Natural Resources, kindly made available a copy of a recent bibliography issued by that agency. The staff of the Eric Marshall Aquatic Research Library at the Freshwater Institute was most tolerant of my presence and gave every assistance in the use of reference facilities available. Dr Bodaly and Mary Layton reviewed a draft of the report.



## AUTHOR INDEX

Ackerman, W. C., G. F. White, and E. B. Worthington, ed. 1973. *Man-made lakes: their problems and environmental effects*. Washington, DC: American Geophysical Union. [xv] + 847 p. *Geophys. Monogr.* 17.

Covers many aspects, mostly related to reservoirs in warm climates, including fisheries, shoreline erosion and resettlement problems.

FWI (JEL/Ack1); Baxter & Glaude 1980; Kerr 1993.

Reservoirs/Fisheries/Socio-economic Aspects.

Acres Consulting Services Limited. 1981. *Reservoir clearing and preparation - environmental protection strategies*. Toronto, ON: Ontario Hydro. 186 p.

100 case histories given. Discusses base-line considerations, problem issues, current methods, criteria for assessing needs and decision making.

Ploskey 1985.

Reservoirs/Flooding/Hydroelectric Development/Mitigation.

—. 1984. *Biological mitigative measures for Canadian hydro facilities*. Niagara Falls, ON: Acres Consulting Services Ltd for Canadian Electrical Association. [xiv] + viii + 237 + [26] p.

[Contract No. 156 G 315].

53 measures identified as having potential; 33 known to have been used. Range from construction and operational details of dams to fish shelters and revegetation of shorelines.

Bodaly 8.

Reservoirs/Flooding/Hydroelectric Development/Mitigation.

Adams, G. F., and C. H. Olver. 1977. Yield properties and structure of boreal percid communities in Ontario. *J. Fish. Res. Board Can.* 34(10): 1613-1625.

Review of data from 70 northern Ontario lakes from 1917 to 1973 show that percids, mainly walleye, made up about one third by weight of fish yield. Most lakes had yield of <2.5 kg/ha/yr. Theoretical yield was 3.4 kg/ha/yr.

FWI; AQUAREF 31107; ASFA 7005300.

Stizostedion vitreum/Canada/Ontario/Productive Capacity/Morphoedaphic Index/Fisheries.

Addison, W. D., and R. A. Ryder. 1970. An indexed bibliography of North American *Stizostedion* (Pisces, Percidae) species. *Ont. Dep. Lands For. Res. Inform. Pap. (Fish.)* 38: [ii] + 318 p.

Extensive bibliography of over 2000 references. Subject index includes

"impoundments".

FWI; Kerr 1993.

Stizostedion vitreum/Bibliographies.

Allard, L. 1964. Grand Rapids forebay survey, Cedar Lake whitefish spawning ground investigations in 1963. *Manit. Fish. Branch MS Rep.* [8] p.

Annual level fluctuations in forebay area expected to have pronounced effect on fish populations and fishery. Fall spawning fish (whitefish, lake trout) most affected. Spawn in late fall when water levels high but eggs do not hatch until late winter when water levels low. If drawdown greater than spawning depth eggs dewatered and perish. Spawning habits need to be studied to make management recommendations.

Machniak 1975A.

Coregonus clupeaformis/Salvelinus namaycush/Canada/Manitoba/Cedar L./Spawning/Water Level.

- Anderson, P. G. 1993. Adaptation of a habitat suitability model for prioritizing habitat rehabilitation needs of northern pike (*Esox lucius*) (Ontario). *M.Sc. Thesis, Trent University, Peterborough, ON.* 118 p.  
HSI models useful to evaluate impact assessment. Used to identify limiting habitat parameters in degraded system to develop remedial action strategies. HSI model for pike (Inskip 1982) applied to Hamilton Harbour and identified reproductive habitat as limiting.  
Masters Abstr. 31(4): 1665.  
Esox lucius/Great Lakes/Model/Reproduction/Habitat Suitability Index.
- Angus, L. R., and W. M. Bivin. 1982. Habitat suitability index models: regression models based on harvests of coolwater and coldwater fishes in reservoirs. *U.S. Fish Wildl. Serv. Rep. FWS/OBS-82/10.25:* 38 p.  
WAVES 98602; Kerr 1993 (Angus spelt Aggus).  
Habitat Suitability Index/Reservoirs/Fisheries.
- Anions, D. W., and L. W. Beaven. 1989. Water control structures and aquatic resources in Prince Albert National Park. *Can. Wildl. Serv. Occas. Pap.* 11: 181-197.  
Structures made in late 1930s help boat access for sport fishing. Shoreline erosion continues on Crean and Waskesiu lakes and loss of sand beaches noted due to high water levels. Spawning habitat of lake trout impaired by siltation and decline related to dams and water level regulation.  
FWI; AQUAREF 85643.  
Salvelinus namaycush/Canada/Saskatchewan/Prince Albert National Park/Crean L./Waskesiu L./Spawning/Flooding/Sedimentation.
- Armour, C. L. 1993. Evaluating temperature regimes for protection of walleye. *U.S. Fish Wildl. Serv. Tech. Rep.* 195: 22 p.  
Temperature regime affects success of walleye. Environmental alterations, including reservoir construction, can affect temperatures. Temperature information for walleye life history and behaviour provided to assist in evaluating any expected changes.  
ASFA 2959759; Kerr 1993.  
Stizostedion vitreum/Temperature/Habitat Use/Reservoirs.
- Armstrong, J. J., and R. D. Dyke. 1967. Walleye egg deposition on artificial spawning beds constructed in the Otonabee River at Bobcaygeon, Ontario. *Ont. Min. Nat. Resour. Lindsay District.* 14 p.  
Kerr 1993.  
Stizostedion vitreum/Canada/Ontario/Artificial Substrates/Spawning.
- Arnason, A. N., and K. H. Mills. 1981. Bias and loss of precision due to tag loss in Jolly-Seber estimates for mark-recapture experiments. *Can. J. Fish. Aquat. Sci.* 38(9): 1077-1096.  
Model developed as result of theoretical analyses of tag loss to show how this affects estimates of population size, mortality and additions to populations.  
FWI; AQUAREF 55616.  
Coregonus clupeaformis/Model/Methods/Tagging/Mark-Recapture/Survival.
- Arthur, J. R., L. Margolis, and H. P. Arai. 1976. Parasites of fishes of Aishihik and Stevens lakes, Yukon Territory, and potential consequences of their interlake transfer through a proposed water diversion for hydroelectric purposes. *J. Fish. Res. Board Can.* 33(11): 2489-2499.

46 species of parasites found in 8 species of fish in summer 1973. Differences noted in parasite fauna of fish of lakes. Consequences of introduction of species of potential economic and pathogenic importance as result of diversion discussed.

**FWI; Baxter & Glaude 1980.**

*Coregonus clupeaformis/Esox lucius/Salvelinus namaycush/Canada/Yukon/Aishihik L./Stevens L./Parasites/Hydroelectric Development.*

**Atton, F. M. 1975.** Impact analysis, hindsight and foresight in Saskatchewan. *J. Fish. Res. Board Can.* 32(1): 101-105.

Describes 3 hydro developments. The 4th which is under study is first where impact analysis is being carried out before implementation is decided upon. Mitigation of effects on fishery resources discussed.

**FWI; NFA 1987.**

*Canada/Saskatchewan/Hydroelectric Development/Impact assessment/Fisheries/Mitigation.*

**Ayles, H. A. 1974.** The fisheries of the East Channel of the Nelson River. *Lake Winnipeg, Churchill and Nelson Rivers Study Board, Canada-Manitoba, 1971-'75. Technical Report, Appendix 5, Vol.2.B: [iv] + 22 p.*

Walleye and pike are only significant unexploited fish in area. Walleye growth rates poorer than in Playgreen or Cross lakes. Recommendations on channel flow made to ensure spawning and incubation success.

**FWI (N/Lak1 A.5 Pt.2).**

*Esox lucius/Stizostedion vitreum/Canada/Manitoba/Nelson R./Hydroelectric Development/Spawning/Water Flow/Growth.*

**Ayles, H. A., S. Brown, K. Machniak, and J. Sigurdson. 1974.** The fisheries of the Lower Churchill lakes, the Rat-Burntwood lakes and Upper Nelson lakes: present conditions and the implications of hydroelectric development. *Lake Winnipeg, Churchill and Nelson Rivers Study Board, Canada-Manitoba, 1971-'75. Technical Report, Appendix 5, Vol.2.I: xi + 100 p.*

Whitefish, pike and suckers predominate in Churchill lakes. Walleye not prominent in catches. Growth and food discussed. Lake areas will be reduced by as much as 75% reducing production. Exposed shorelines will release sediment and increase turbidity. Drawdown inhibits establishment of littoral species. In Rat-Burntwood lakes whitefish not abundant and pike found. Walleye plentiful but in poorer condition than in SIL. Overall production expected to increase following flooding as water area increases. Pike should increase and whitefish decline. Of Nelson River lakes Cross Lake most productive and Kettle Reservoir least. Moose Lake has high production of whitefish. In Sipiwesk Lake (reservoir since 1960) shift from whitefish to pike in commercial catches. In Split Lake which will receive initial impact it is expected that production will suffer. Good walleye sport fishery should be formed in tailrace of Notigi dam.

**FWI (N/Lak1 A.5 Pt.2).**

*Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Churchill R./Rat R./Burntwood R./Cross L./Moose L./Sipiwesk L./Split L./Fisheries/Hydroelectric Development/Water Level/Flooding/Drawdown/Sport Fishing.*

Ayles, H. A., and G. D. Koshinsky. 1974. The fisheries of Southern Indian Lake: present conditions and implications of hydro-electric development. *Lake Winnipeg, Churchill and Nelson Rivers Study Board, Canada-Manitoba, 1971-'75. Technical Report, Appendix 5, Vol.1.H: vii + 117 p.*

Whitefish, walleye and pike present. Distribution of whitefish in lake outlined. Forecast that population will initially increase then decline to level slightly below that before impoundment. Pike expected to increase in abundance, size and condition. Future spawning beds should be prepared before flooding. Walleye found in all parts of lake. Some spawning rivers and streams identified. Feed on cisco and/or whitefish. Impoundment not expected to have adverse effect on stream-spawning walleye provided spawning sites are above high-water levels. Change in flow of Churchill River could disorient migrating walleye.

FWI (N/Lak1 A.5 Pt.1); Machniak 1975A B & C.

Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Southern Indian L./Fisheries/Hydroelectric Development/Flooding/Spawning/Movements.

Barnes, M. A. 1981A. *Evidence of reservoir evolution in the Smallwood Reservoir (Labrador) and some effects of the regulation of discharge as they pertain to regional fish stocks.* St. John's, NF: Newfoundland and Labrador Hydro Environmental Services.

Bodaly 97 (missing).

Canada/Labrador/Smallwood Reservoir/Reservoirs.

---. 1981B. *Stress related changes in lake whitefish (Coregonus clupeaformis) associated with hydro-electric structures.* M.Sc. Thesis, University of Waterloo, Waterloo, ON. xi + 148 p.

After filling, large numbers of whitefish seen below Lobstick control structure. Overcrowded and sustaining physical damage from turbulence. Stressed, energy reserves low, growth rates low. Model of population structure presented.

WAVES 143447; Bodaly 98.

Coregonus clupeaformis/Smallwood Reservoir/Labrador/Canada/Hydroelectric Development/Growth/Model/Water Flow/Reservoirs.

Barnes, M. A., G. Power, and R. G. H. Downer. 1984. Stress-related changes in lake whitefish (*Coregonus clupeaformis*) associated with a hydroelectric control structure. *Can. J. Fish. Aquat. Sci.* 41(10): 1528-1533.

Whitefish accumulate below Lobstick control structure of Churchill Falls facility. Show many stress related symptoms. Liver somatic, stomach content volumes and condition factor all low. Muscle and ovarian protein levels reduced.

FWI; ASFA 827359; ASTIS 138258; FR 85-823; Bodaly 100.

Coregonus clupeaformis/Smallwood Reservoir/Labrador/Canada/Hydroelectric Development/Stress/Reservoirs.

Barnes, N. E. 1990. *Abundance and origin of lake whitefish, Coregonus clupeaformis (Mitchill), congregating downstream of the Missi Falls Control Dam, Southern Indian Lake, Manitoba.* M.Sc. Thesis, University of Manitoba, Winnipeg, MB. 200 p.

Abundance and origin of fish studied. Jolly-Seber mark-recapture model used. Fish caught in fall 1986 resembled fish caught upstream of dam. Those caught in summer 1987 resembled those caught in near-downstream lakes.

Masters Abstr. 31(4):1653.

*Coregonus clupeaformis*/Canada/Manitoba/Southern Indian L./Model/  
Hydroelectric Development/Mark-Recapture.

**Barnes, N. E., and R. A. Bodaly.** 1990. Aggregations of lake whitefish (*Coregonus clupeaformis*) below the Missi Falls control dam: investigations into the collapse of the Southern Indian Lake fishery, p.175-195. In C. E. Delisle, and M. A. Bouchard (ed.) *Joules in the water - managing the effects of hydroelectric development*. Montreal: Universite de Montreal for Canadian Society of Environmental Biologists. *Collection environnement et geologie* 9.

Estimates numbers and origin of whitefish congregating below control dam to judge contribution of dam to decline of fishery.

FWI (N/Del1); AQUAREF 88358.

*Coregonus clupeaformis*/Manitoba/Canada/Southern Indian L./Fisheries/  
Hydroelectric Development/Water Flow.

**Baxter, R. M.** 1977. Environmental effects of dams and impoundments. *Annu. Rev. Ecol. Syst.* 8: 255-283.

Reviews sedimentation and downstream effects. Biological aspects such as changes in benthos, plankton, littoral and fish covered.

FWI; Bodaly 103; Baxter & Glaude 1980; Kerr 1993.

Literature Reviews/Reservoirs/Sedimentation/Fisheries.

**Baxter, R. M., and P. Glaude.** 1980. Environmental effects of dams and impoundments in Canada: experience and prospects. *Can. Bull. Fish. Aquat. Sci.* 205: vi + 34 p.

Reviews effects including those on fish.

FWI; Bodaly 104.

Literature Reviews/Reservoirs/Canada/Mitigation.

**Becker, C. D., and W. D. Brunson.** 1967. *Diphyllbothrium* (Cestoda) infections in salmonids from three Washington lakes. *J. Wildl. Manage.* 31(4): 813-824.

Dynamics of infection in salmonids of 3 western Washington lakes studied. Higher infections noted in fish feeding more heavily on plankton (cf. Freeman and Thompson, 1969).

FWI; Freeman & Thompson 1969.

Parasites/USA/Washington/Food.

**Benndorf, J., H. Schultz, A. Benndorf, R. Unger, E. Penz, H. Kneschke, K. Kossatz et al.** 1989. Food web manipulation by enhancement of piscivorous stocks: long term effects in the hypertrophic Bautzen reservoir, p.567-569. In J. F. Talling, Z. Brandl, and V. Straskrabova (ed.) *Proceedings of the International Conference on Reservoir Limnology and Water Quality. 2. Chemical Limnology, Primary Production, Plankton, Benthos and Fish Interactions. Ergebn. Limnol./Adv.Limnol.*, 33. [Summary only. Full paper in *Limnologica* 19(1): 97-110, 1988 (FWI; FR 89-2681)].

Catch restriction on pike and pikeperch fisheries along with stocking of pikeperch found to control planktivorous fish.

FWI; ASFA 2296950.

*Esox lucius*/Stizostedion lucioperca/Germany/Fishery Management/  
Biomaniipulation/Reservoirs.

- Bennett, D. H., O. E. Maughan, and D. B. Jester jr. 1985. Generalized model for predicting spawning success of fish in reservoirs with fluctuating water levels. *N. Am. J. Fish. Manage.* 5(1): 12-20.  
Computer model (SUCCESS) predicts spawning success of centrarchid fishes and allows prediction of impact of level fluctuations on other fishes.  
FWI; Bodaly 126.  
Reservoirs/Fishery Management/Spawning/Model/Water Level.
- Berkes, F. 1978. An investigation of Cree Indian domestic fisheries in northern Quebec. *Arctic* 32(1): 46-70.  
Cisco most important and whitefish 2nd in fisheries on LaGrande and Eastmain rivers. Study made before hydro development.  
FWI; Bodaly 137.  
Coregonus clupeaformis/Canada/Quebec/James Bay/LaGrande R./Eastmain R./Fisheries/Hydroelectric Development.
- . 1981. Some environmental and social impacts of the James Bay hydroelectric project, Canada. *J. Environ. Manage.* 12(2): 157-172.  
Study of estuarine fishes of LaGrande River. Whitefish and cisco support domestic fishery of 50,000 kg/yr. Pike present to minor extent (1% catch). Forecast that whitefish and pike will decline and conservation of former should have high priority. Socio-economic impacts discussed.  
FWI; Bodaly 138.  
Coregonus clupeaformis/Esox lucius/Quebec/James Bay/LaGrande R./Hydroelectric Development/Socio-economic Aspects/Fisheries.
- . 1982. Preliminary impacts of the James Bay Hydroelectric Project, Quebec, on estuarine fish and fisheries. *Arctic* 35(4): 524-530.  
Flow alterations affected fish stocks and Cree Indian subsistence fisheries in lower LaGrande River. Initial impact on whitefish and cisco small but fishing activity ceased 1979-1981 due to physical changes in fishing areas and socio-economic effects. Impact assessment fell short of predicting these impacts.  
FWI; Bodaly 140.  
Coregonus clupeaformis/Canada/Quebec/James Bay/LaGrande R./Fisheries/Socio-economic Aspects/Hydroelectric Development/Water Flow.
- Berkes, F., and T. Goenec. 1982. A mathematical model on the exploitation of northern lake whitefish with gill nets. *N. Am. J. Fish. Manage.* 2(2): 176-183.  
Models used to generate numerical results by combining growth and mortality curves, calculating number of fish caught by different mesh sizes and subtracting fish caught from unexploited fish population. Change from regulating mesh size to regulating fishing intensity suggested.  
FWI; ASFA 342308.  
Coregonus clupeaformis/Model/Fishery Management.
- Berkes, F., and D. Pocock. 1987. Quota management and "people problems": a case history of Canadian Lake Erie fisheries. *Trans. Am. Fish. Soc.* 116(3): 494-502.  
Discusses implementation of new management plan for Ontario's commercial fisheries including those for walleye. Study of plan suggests number of elements of a pragmatic resource planning protocol, including baseline biological data and socio-economic and cultural information on fishermen.  
FWI.

*Stizostedion vitreum*/Canada/Ontario/Great Lakes/Fisheries/Socio-economic Aspects.

Bidgood, B. F. 1966. Spring movement of walleyes into Richardson Lake, Alberta. *Alberta Dep. Lands For. Manuscr. Rep.* 32 p.

Kerr 1993.

*Stizostedion vitreum*/Canada/Alberta/Richardson L./Peace-Athabasca Delta/Movements.

—. 1968. Ecology of walleyes in Richardson Lake - Lake Athabasca. *Alberta Fish. Sect. Res. Rep.* 1: [ii] + 21 p.

Study made in 1967 before lake levels dropped in 1968. Walleye migrate from Richardson Lake to spawn in Maybelle River. In spring fish were entering Richardson Lake under ice. Returns showed fish tagged in Richardson Lake were caught in Lake Athabasca.

FWI; Bodaly 149.

*Stizostedion vitreum*/Canada/Alberta/Peace-Athabasca Delta/Richardson L./Athabasca, L./Spawning/Movements/Water Level.

—. 1971. Ecology of walleyes, *Stizostedion v. vitreum*, in the Richardson Lake - Lake Athabasca complex, p.187-203. In E. R. Reinelt et al. (ed.) *Proceedings of the Peace-Athabasca Delta Symposium, Edmonton, January 14 and 15, 1971.* Edmonton, AB: University of Alberta.

Mark-recapture studies show cyclic movement of walleye. Mature fish migrate in spring from oligotrophic waters of Lake Athabasca to dystrophic waters of lake, into Athabasca River delta and Richardson Lake complex, and up Maybelle River to spawn. Post-spawning fish returning to Lake Athabasca commercially harvested in Richardson and Athabasca lakes. Pike follow same migration pattern about a month later. Lowered water levels in Athabasca River could reduce size of spawning population of walleye.

FWI (N/Rei2).

*Esox lucius*, *Stizostedion vitreum*/Canada/Alberta/Peace-Athabasca Delta/Athabasca, L./Richardson L./Fisheries/Spawning/Movements/Water Level.

Bietz, B. F., J. Grant, and P. McKee. 1988. *Stock-habitat relationships for selected Canadian freshwater fish.* Montreal, PQ: Canadian Electrical Association. ix + 237 p.

Examines relationship between quantitative measures of habitat availability and stock size of selected fish species as related to fisheries habitat protection at hydroelectric developments.

WAVES 133820.

*Stizostedion vitreum*/Coregonus clupeaformis/Hydroelectric Development/Model.

Bodaly, R. A. 1980. Pre- and post-spawning movements of walleye, *Stizostedion vitreum*, in Southern Indian Lake, Manitoba. *Can. Tech. Rep. Fish. Aquat. Sci.* 931: v + 30 p.

Movements of 2 walleye populations from streams tributary to SIL studied 1975-1978. Ascended streams in spring while lake was ice-covered. 5°C threshold temperature for upstream movement. Fish concentrated in shallow bays next to spawning streams in late spring and early summer. Greatest dispersal noted in late summer. One fish moved 160 km in lake and movements of >100 km were not uncommon.

FWI; BNT; SQUAREF 45480; Ebbers et al. 1988; Bodaly 162.

*Stizostedion vitreum*/Canada/Manitoba/Southern Indian L./Movements/Spawning/Temperature.

- Bodaly, R. A., R. N. Erickson, and R. J. P. Fudge. 1980. Pre- and post-impoundment experimental fish catches, Southern Indian Lake, Manitoba, 1972-1979. *Can. Data Rep. Fish. Aquat. Sci.* 201: v + 73 p. Tabular presentation of data on whitefish, walleye and pike caught in gill nets before and after impoundment in 1976. FWI; WAVES 13899; AQUAREF 46382. Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Manitoba/Canada/Southern Indian L./Hydroelectric Development/Flooding.
- Bodaly, R. A., C. J. Hrenchuk, and R. J. P. Fudge. 1983. Post-impoundment experimental fishing, Southern Indian Lake, Manitoba: catches (1982) and *Triaenophorus crassus* cyst counts in lake whitefish (1978, 1979, 1982). *Can. Data Rep. Fish. Aquat. Sci.* 401: v + 75 p. Gives CUE and cyst counts from experimental catches of pike, walleye and whitefish. FWI; ASFA 697181; WAVES 101236; AQUAREF 64371. Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Southern Indian L./Fisheries/Flooding/Hydroelectric Development/Parasites.
- Bodaly, R. A., T. W. D. Johnson, and R. J. P. Fudge. 1980. Post-impoundment changes in commercial fishing patterns and catch of lake whitefish (*Coregonus clupeaformis*) in Southern Indian Lake, Manitoba. *Can. Manuscr. Rep. Fish. Aquat. Sci.* 1555: iv + 14 p. Prior to flooding catch mostly light-colored, export or grade A fish. After flooding in late 1976 darker-colored fish made up 12-72% of catch. Fishing effort moved from south of Sand Point to Loon Narrows. Increased turbidity of water, from shoreline erosion, changed patterns of fish movement. FWI; WAVES 74104; AQUAREF 474572. Coregonus clupeaformis/Manitoba/Canada/Southern Indian L./Fisheries/Hydroelectric Development/Flooding/Sedimentation/Movements.
- . 1983A. Post-impoundment commercial whitefish fishery of Southern Indian Lake, Manitoba: summer 1980 and 1981 results. *Can. Manuscr. Rep. Fish. Aquat. Sci.* 1686: iv + 14 p. Confirms severe declines in CUE and market quality of catch. *Triaenophorus* cyst counts continue above export limit. FWI; WAVES 74125. Coregonus clupeaformis/Manitoba/Canada/Southern Indian L./Fisheries/Hydroelectric Development/Flooding/Parasites.
- . 1983B. Post-impoundment declines in catch and market quality in the winter commercial whitefish fishery, Southern Indian Lake, Manitoba. *Can. Manuscr. Rep. Fish. Aquat. Sci.* 1685: iv + 9 p. Prior to impoundment winter catch light-colored export quality fish. After flooding darker-colored, lower quality fish make up 12-51% of catch. CUE declined from 18.5 to 4.2 kg/net/night. FWI; ASFA 680425; WAVES 74124; AQUAREF 65540. Coregonus clupeaformis/Manitoba/Canada/Southern Indian L./Fisheries/Hydroelectric Development/Flooding.
- Bodaly, R. A., T. W. D. Johnson, R. J. P. Fudge, and J. W. Clayton. 1984. Collapse of the lake whitefish (*Coregonus clupeaformis*) fishery in Southern Indian Lake, Manitoba, following lake impoundment and river diversion. *Can. J. Fish. Aquat. Sci.* 41(4): 692-700.



Pre-impoundment fish light-colored and lightly parasitized by *Triaenophorus*. Market quality only maintained by fishing selected areas where quality highest. Increases in proportion of darker-colored and more highly parasitized fish noted. Fishery essentially collapsed following impoundment in 1976. Catch declined on traditional fishing grounds due to emigration of fish to other parts of lake and adjacent water bodies.

**FWI**; ASFA 761745; AQUAREF 80771.

*Coregonus clupeaformis*/Canada/Manitoba/Southern Indian L./Fisheries/  
Hydroelectric Development/Flooding/Parasites.

**Bodaly, R. A., and L. F. W. Lesack.** 1984. Response of a boreal northern pike (*Esox lucius*) population to lake impoundment: Wupaw Bay, Southern Indian Lake, Manitoba. *Can. J. Fish. Aquat. Sci.* 41(4): 706-714.

Population monitored for 1 year before and 5 years after impoundment. Abundant YOY in 1st year after impoundment, 4-10 times higher than in following 3 years. Flooded terrestrial vegetation conducive to reproductive success only in 1st year. Impoundment no effect on growth, condition or mortality in Bay. Growth limited by forage fish abundance. Very little surface area increase in bay due to impoundment.

**FWI.**

*Esox lucius*/Canada/Manitoba/Southern Indian L./Reproduction/Survival/  
Growth/Flooding/Hydroelectric Development.

**Bodaly, R. A., and D. M. Rosenberg.** 1990. Retrospective analysis of predictions and actual impacts for the Churchill-Nelson hydroelectric development, northern Manitoba, p.221-242. In C. E. Delisle, and M. A. Bouchard (ed.) *Joules in the water - managing the effects of hydroelectric development*. Montreal: Universite de Montreal for Canadian Society of Environmental Biologists. *Collection environnement et geologie* 9.

In lakes on Churchill River below SIL fisheries yields have been maintained despite falling water levels following diversion due to movement of whitefish downstream from SIL. Drop in whitefish fisheries was predicted in SIL. Cross Lake had severe spring and summer drawdown which was greater than expected hence predictions of effect on fisheries underestimated. In Notigi Reservoir water levels raised. Increases in mercury levels in fish unpredicted. Whitefish abundance forecast to decrease because of poor spawning success but size and abundance increased due to influx of fish from SIL.

**FWI (N/Del1).**

*Coregonus clupeaformis*/Manitoba/Canada/Southern Indian L./Notigi L./Cross L./  
Fisheries/Hydroelectric Development/Flooding/Drawdown/Spawning/Water Level/  
Impact Assessment.

**Bodaly, R. A., D. M. Rosenberg, M. N. Gaboury, R. E. Hecky, R. W. Newbury, and K. Patalas.** 1984. Ecological effects of hydroelectric development in northern Manitoba, Canada: the Churchill-Nelson river diversion, p.273-309. In P. J. Sheehan, D. R. Miller, G. C. Butler, and P. H. Bourdeau (ed.) *Effects of pollutants at the ecosystem level*. New York: Wiley.

Overall features of project described. Ecological effects of development and future planning needs for such developments in sub-arctic areas summarized.

**FWI (JE/She1); NFA 1987.**

Canada/Manitoba/Southern Indian L./Hydroelectric Development/Impact  
Assessment.

- Boucher, R., and E. Magnin. 1977. Comportement et dynamique de la population des grands brochets, *Esox lucius* L., du lac Helene, Territoire de la Baie James. Behaviour and dynamics of the population of northern pike, *Esox lucius* L., in lac Helene, James Bay, p.201-218. In J. Dube, and Y. Gravel (ed.) *Proceedings, 10th Warm Water Workshop, American Fisheries Society, Northeast Division, Montebello, QC, 1977*. Quebec, Ministere du Loisir, de la Chasse et de la Peche. RRF 52  
[In French. Translation: *Can. Transl. Fish. Aquat. Sci.* 4778: 16 p., 1981].  
Documents fauna of lake before hydroelectric development.  
FWI (NF/Dub2 - original, translation filed as serial); WAVES 111413.  
*Esox lucius*/James Bay/Helene, L./Quebec/Canada/Hydroelectric Development.
- Brady, C. 1978. Ox Narrows artificial lake trout spawning bed. L.M. Frost Natural Resource Centre Report (Ontario Ministry of Natural Resources). 5 p.  
Kerr 1993; Olver & Martin 1984.  
*Salvelinus namaycush*/Artificial Substrates/Canada/Ontario/Spawning.
- Brown, R. W., and W. W. Taylor. 1992. Effects of egg composition and prey density on the larval growth and survival of lake whitefish (*Coregonus clupeaformis* Mitchell). *J. Fish Biol.* 40(3): 381-394.  
Larval growth in Lake Michigan modelled as function of prey abundance using threshold-corrected hyperbolic equation.  
FWI; ASFA 2806387.  
*Coregonus clupeaformis*/Great Lakes/Model/Growth/Survival/Juveniles/Food.
- Bruce, W. J. 1974. The limnology and fish populations of Jacopie Lake, west forebay, Smallwood Reservoir, Labrador. *Can. Fish. Mar. Serv. Tech. Rep. Ser.* NEW/T-74-2: vii + 74 p.  
Inventory in 1973 assesses possibilities for commercial and sport fisheries. Whitefish, lake trout and pike present. Whitefish most abundant but made up only 13.4% by weight of catches.  
FWI; WAVES 59331; Machniak 1975B.  
*Coregonus clupeaformis*/*Esox lucius*/*Salvelinus namaycush*/Canada/Labrador/Smallwood Reservoir/Fisheries/Reservoirs/Hydroelectric Development.
- . 1975. Experimental gillnet fishing at Lobstick and Sandgirt lakes, Smallwood Reservoir, western Labrador, 1974. *Can. Fish. Mar. Serv. Intern. Rep. Ser.* NEW/I/75-4: [vi] + 35 p.  
Whitefish 58% of number and 50% of weight of fish caught. Lake trout 10% of number and 35% of weight. Over 50% of whitefish immature. 70% of lake trout <7 years immature. All mature by age 10.  
FWI; WAVES 71787; Bodaly 200.  
*Coregonus clupeaformis*/*Salvelinus namaycush*/Canada/Labrador/Smallwood Reservoir/Fisheries/Reservoirs/Hydroelectric Development.
- . 1984. Potential fisheries yield from Smallwood Reservoir, western Labrador, with special emphasis on lake whitefish. *N. Am. J. Fish. Manage.* 4(1): 48-66.  
Lake trout and whitefish dominant species by number and biomass. Surface gillnets most efficient at catching marketable whitefish. Large incidental catch of lake trout with bottom nets. Recommendations for development of proposed fisheries given.  
FWI; ASFA 781948; AQUAREF 67894; Bodaly 204.

*Coregonus clupeaformis*/Salvelinus namaycush/Canada/Labrador/Smallwood Reservoir/Fishery Management/Hydroelectric Development/Reservoirs.

Bruce, W. J., and R. F. Parsons. 1979. Biology of the fishes of Ossokmanuan Reservoir, Labrador, 1976. *Can. Fish. Mar. Serv. Tech. Rep.* 836: iv + 33 p.

Results of experimental gillnetting show whitefish a dominant species. Lake trout also present. Growth slow in both.

**FWI**; WAVES 11912; AQUAREF 39885; FR 76-13055; Bodaly 201.

*Coregonus clupeaformis*/Salvelinus namaycush/Labrador/Canada/Ossokmanuan Reservoir/Growth/Fecundity/Reservoirs/Hydroelectric Development.

Bryan, J. E., and D. A. Kato. 1975A. Spawning of lake whitefish, *Coregonus clupeaformis*, and round whitefish, *Prosopium cylindraceum*, in Aishihik Lake and East Aishihik River, Yukon Territory. *Can. J. Fish. Aquat. Sci.* 32(2): 283-288.

Spawning grounds used by lake and round whitefish found. Lake whitefish spawn from early November to mid-December. Spawn over silt and *Potamogeton* in water with little current and 2-2.5 m deep.

**FWI**; Bodaly 212; Kerr 1993.

*Coregonus clupeaformis*/Canada/Yukon/Aishihik L./Spawning/Hydroelectric Development.

—. 1975B. Spawning of lake whitefish, *Coregonus clupeaformis*, and round whitefish, *Prosopium cylindraceum*, in Aishihik Lake and East Aishihik River, Yukon Territory, Part III: iv + 23 p. In Northern BC & Yukon Div. Fisheries & Marine Service, *Additional aquatic resource studies in the Aishihik system relative to hydroelectric development*. *Can. Fish. Mar. Serv. Tech. Rep. Ser.* PAC/T-75-4.

Spawning grounds used by lake and round whitefish found. Lake whitefish spawn from early November to mid-December. Spawn over silt and *Potamogeton* in water with little current and 2-2.5 m deep.

**FWI**.

*Coregonus clupeaformis*/Canada/Yukon/Aishihik L./Spawning/ Hydroelectric Development.

Bykov, N. E. 1974. O nekotorykh osobennostyakh razmnozheniya shchuki v Saratovskom vodokhranilishche. Some of the characteristics of pike reproduction in the Saratov Reservoir. *Izv. Gos. Nauchno-Issled. Inst. Ozern. Rechn. Rybn. Khoz.* 95: 86-87.  
[In Russian. Translation: *Can. Fish. Mar. Serv. Transl. Ser.* 3733: 4 p., 1976].

Fluctuations in water level result in mortality of deposited eggs.

**FWI (original & translation)**; WAVES 112845.

*Esox lucius*/Survival/Eggs/Russia/Water Level/Reservoirs.

Carlander, K. D. 1977. Biomass, production, and yields of walleye (*Stizostedion vitreum vitreum*) and yellow perch (*Perca flavescens*) in North American lakes. *J. Fish. Res. Board Can.* 34(10): 1602-1612.

Walleye biomass averaged 16 kg/ha but data not adequate to show relationship with mean depth, alkalinity, latitude or MEI.

**FWI**; AQUAREF 31106; ASFA 7005290.

*Stizostedion vitreum*/Productive Capacity/Morphoedaphic Index.

Carlander, K. D., J. S. Campbell, and R. J. Muncy. 1978. Inventory of percid and esocid habitat in North America, p.27-38. In R. L. Kendall (ed.) *Selected coolwater fishes of North America*. Washington, DC: American Fisheries Society. *Spec. Publ. Am. Fish. Soc.* 11.  
[FWI Library holds copy of data sheets upon which this paper is based (MLA/Car1 v.1-3)].

Questionnaires sent to fishery agencies to find habitat occupied by fishes including walleye and pike. Species habitat areas grouped by size within lakes, impoundments and streams listed by drainage areas.

FWI (MLA/Ken1); Ebbers et al. 1988.

*Esox lucius/Stizostedion vitreum/Habitat Use/Reservoirs.*

Carlisle, R. F. 1986. Indices as predictors of fish community traits, p.46-56. In G. E. Hall and M. J. Van Den Avyle (ed.) *Reservoir fisheries management: strategies for the 80's*. Bethesda, MD: American Fisheries Society.

Reviews use of indices as predictors of fish standing crop, yields and community structure and outlines alternative approaches to reservoir research. FWI (NFL/Hal1).

*Reservoirs/Model/Fishery Management/Literature Reviews.*

—. 1987. Simplified method based on bioenergetics modeling to estimate food consumption by largemouth bass and northern pike. *Trans. Am. Fish. Soc.* 116(2): 224-231.

Growth data for 3 populations of each used with temperature data to estimate cumulative consumption rates.

FWI; ASFA 1688485.

*Esox lucius/Food/Model/Growth/Temperature.*

Chapman, C. A., and W. C. Mackay. 1984. Versatility in habitat use by a top aquatic predator, *Esox lucius* L. *J. Fish Biol.* 25(1): 109-115.

Radiolocation and ultrasonic telemetry used in Seibert Lake, Alberta. Extensive movements noted. Preference for shallow vegetated areas close to shore. Wind and sun influence distribution; on sunny days move close to shore and when windy move offshore but not always into deeper water.

FWI; ASFA 827715.

*Esox lucius/Canada/Alberta/Seibert L./Movements/Habitat Use.*

Chapman, J. L., and W. C. Mackay. 1990. Ecological correlates of feeding flexibility in northern pike (*Esox lucius*). *J. Freshwater Ecol.* 5(3): 313-322.

Large fish in Mere Lake, Alberta, studied. Fish prey limited to one species. In May, June and July feed on invertebrates. Usually found in shallow water with tall, penetrable vegetation. Dietary changes due to changes in abundance of prey in littoral zone.

FWI; ASFA 2405684.

*Esox lucius/Canada/Alberta/Mere L./Food/Habitat Use.*

Chaput, G. J., and D. A. deGraaf. 1983. *Empirically predicted yields of lake whitefish in West Forebay as related to the impact of recurrent fish kills at Lobstick Control Structure, Smallwood Reservoir, Labrador*. St. John's, NF: LGL Limited Environmental Research Associates for Newfoundland and Labrador Hydro. xvii + 119 p.

Assessment of impact of mortality of whitefish in West Forebay used to predict potential yield from empirical relationships. Estimates based on depth of basin, TDS, total phosphorus and chlorophyll, mortality rates and relative biomass of

all fish in area. Fishkills associated with opening of control gates due to physical damage in extreme turbulence in initial stages of opening. Since gate closure prohibited from mid-June to late-September no large fishkills reported. Yields of whitefish highest in Lobstick area. West Forebay yield predicted at 1.0 and for Lobstick area 1.4 kg/ha/yr.

WAVES 144315; Bodaly 259.

*Coregonus clupeaformis*/Canada/Labrador/Smallwood Reservoir/Fishkills/Survival/Water Flow/Reservoirs/Hydroelectric Development/Productive Capacity.

**Chen, M. Y.** 1993. Preliminary assessment of the impact of fluctuating water levels in northern pike in Reindeer Lake. *Sask. Fish. Branch Fish. Manage. Rep.* 93-2: iii + 15 p.

Since 1942, when lake dammed, levels rose 1.7 m. Some 430 km<sup>2</sup> new surface area over shallow water grows aquatic vegetation which is suitable spawning and nursery area for pike. Usually water levels rise during pike spawning and nursery season. Level changes are greater than before impoundment. Comprehensive study of all fish in lake needed if population declines.

**FWI.**

*Esox lucius*/Canada/Saskatchewan/Reindeer L./Spawning/Flooding/Water Level.

**Chevalier, J. R.** 1977. Changes in walleye (*Stizostedion vitreum vitreum*) population in Rainy Lake and factors in abundance, 1924-75. *J. Fish. Res. Board Can.* 34(10): 1696-1702.

Annual commercial harvests declined from 150,000 kg in 1920s to 19,000 kg in early 1970s. Total harvests of all species averaged 374,000 kg from 1924 to 1975, 45% greater than MEI estimated allowable harvest. Growth rate increased from 1959 to 1965 as response to decreased abundance. Effect of water level changes on abundance discussed.

**FWI; SQUAREF 31115; ASFA 7005380; Schlick 1978; Ebberts et al. 1988.**

*Stizostedion vitreum*/Canada/Ontario/Rainy L./Fisheries/Growth/Morphoedaphic Index/Water Level.

**Christie, G. C., and H. A. Regier.** 1988. Measures of optimal thermal habitat and their relationship to yields for four commercial fish species. *Can. J. Fish. Aquat. Sci.* 45(2): 301-314.

Lake trout, whitefish, pike and walleye studied. Thermal habitat area and thermal habitat volume used as predictor variables in equations to estimate total sustained yields. Other variables also discussed including MEI.

**FWI; Bodaly (unfiled).**

*Coregonus clupeaformis*/*Salvelinus namaycush*/*Esox lucius*/*Stizostedion vitreum*/Fisheries/Model/Morphoedaphic Index/Temperature.

**Cohen, Y., and P. Radomski.** 1993. Water level regulations and fisheries in Rainy Lake and the Namakan Reservoir. *Can. J. Fish. Aquat. Sci.* 50(9): 1934-1945.

Difference between yearly maximum and minimum water levels (YMXR) is index of lake dynamics: shoals are exposed and inundated, and diversity of aquatic plant community is affected. Shoals and emergent macrophytes provide spawning habitat for fish. 5-yr moving variance of YMXR fluctuates regularly with periods of about 11.2 yr (same as sunspot cycle). Links established between fluctuations in YMXR and fluctuations in fish populations. Walleye fluctuations synchronized with those of whitefish and pike more than those of either species with others.

**FWI.**

- Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/USA/Minnesota/  
Rainy L./Namakan Reservoir/Water Level/Reservoirs/Fisheries.
- Cohen, Y., P. Radomski, and R. Moen. 1991. *The fish communities of Rainy Lake and the Namakan Reservoir*. St. Paul, MN: Minnesota Department of Natural Resources. 155 p.  
History of fishery and effect of water level changes discussed.  
Cohen & Radomski 1993.  
Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/USA/Minnesota/  
Rainy L./Namakan Reservoir/Water Level/Fisheries/Reservoirs.
- . 1993. Assessing the interdependence of assemblages from Rainy Lake fisheries data. *Can. J. Fish. Aquat. Sci.* 50(2): 402-409.  
Differences and similarities between communities in different parts of lake determined by analyzing species diversity over time, using matrices of partial correlations and discriminant function analysis. In less disturbed communities walleye contributed most to synchronization in fluctuations of yearly relative CUE among 6 common species.  
FWI; ASFA 2906692.  
Stizostedion vitreum/USA/Minnesota/Rainy L./Namakan Reservoir/Fisheries/  
Reservoirs.
- Cohen, Y., and J. N. Stone. 1987. Multivariate time series analysis of the Canadian fisheries system in Lake Superior. *Can. J. Fish. Aquat. Sci.* 44 (Suppl.2): 171-181.  
Multivariate, autoregressive (ARMA) model used early data to forecast following months. Results within one standard error of actual figures.  
FWI; ASFA 1709469.  
Salvelinus namaycush/Great Lakes/Fishery Management/Model.
- Colby, P. J., R. E. McNicol, and R. A. Ryder. 1979. Synopsis of biological data on the walleye, *Stizostedion vitreum* (Mitchill, 1818). *FAO Fish. Synop.* 119: 140 p.  
Literature review of biology.  
FWI; Ebbers et al. 1988; Kerr 1993.  
Stizostedion vitreum/Literature Reviews.
- Cole, R., T. Ward, F. Ward, and R. Deitner. 1986. A simulation model for managing fisheries in reservoirs on the Rio Grande of New Mexico, p.18-27. In G. E. Hall and M. J. Van Den Avyle (ed.) *Reservoir fisheries management: strategies for the 80's*. Bethesda, MD: American Fisheries Society.  
Mathematical model predicts biological and economic consequences of alternatives for managing river flow through reservoirs and connecting waters. Simulated input of water, suspended sediments, limiting plant nutrients, and solar radiation to give fish production partitioned by method of feeding. Economic aspects covered include angler expenditures and other recreational costs.  
FWI (NFL/Hall).  
USA/New Mexico/Rio Grande R./Reservoirs/Model/Fishery Management/Sport Fishing/Socio-economic Aspects/Water Flow.
- Collins, J. J. 1987. Increased catchability of the deep monofilament nylon gillnet and its expression in a simulated fishery. *Can. J. Fish. Aquat. Sci.* 44(Suppl.2): 129-135.

Modelling effect of changes in mesh size in Lake Huron whitefish fishery showed enhanced catchability of deep nets is inversely proportional to intensity of fishery and total mortality rates.

**FWI**; ASFA 1709379; FR 33(3).

Coregonus clupeaformis/Fisheries/Model/Great Lakes/Survival.

**Cook, M. F., and E. P. Bergersen.** 1988. Movements, habitat selection, and activity periods of northern pike in Eleven Mile Reservoir, Colorado. *Trans. Am. Fish. Soc.* 117(5): 495-502.

Ultrasonic telemetry determined activity patterns of 21 adult fish. Home ranges not noted but preferred vegetated littoral areas. Aquatic vegetation key factor in habitat selection.

**FWI**; ASFA 1952316; FR 89-2124; Kerr 1993.

Esox lucius/USA/Colorado/Eleven Mile Reservoir/Movements/Habitat Use/Reservoirs.

**Crooks, S.** 1972. Water-level fluctuations and yellow pickerel, northern pike and lake whitefish in Lac Seul. *Ont. Dep. Lands For. Manuscr. Rep.* ix + 116 p.

No correlation found between water level fluctuations at spawning times and year class strength of pike or walleye. Inundation of fertile land caused initial increase in productivity and excellent angling. Declining angling and commercial fishing related to decreased fertility of water. Decline in growth rate of pike may indicate under-exploitation but may be due to decline in fertility of water.

**FWI (MLA/Cro 2)**; Machniak 1975B & C.

Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Ontario/Seul, L./Fisheries/Spawning/Sport Fishing/Water Level.

**Crossman, E. J., and J. M. Casselman.** 1987. An annotated bibliography of the pike, *Esox lucius* (Osteichthyes; Salmoniformes). *R. Ont. Mus. Life Sci. Misc. Publ.* xix + 386 p.

Covers all aspects of biology of species. Includes subject index.

**FWI (MLA3/Cro3)**; Kerr 1993.

Esox lucius/Bibliographies.

**Cuerrier, J. P.** 1954. The history of Lake Minnewanka with reference to the reaction of lake trout to artificial changes in environment. *Can. Fish Cult.* 15: 1-9.

Following changes in water levels large lake trout much reduced in number and many small individuals found.

**FWI**; Olver & Martin 1984; Baxter & Glaude 1980; Kerr 1993.

Salvelinus namaycush/Canada/Alberta/Minnewanka L./Water Level.

**Day, J. C., K. C. Bridger, S. E. Peet, and B. F. Friesen.** 1982. Northwestern Ontario river diversions. *Water Resour. Bull.* 18(2): 297-305.

[Title in journal has "dimensions" in place of "diversions"].

Ogoki River diversion had minimal effect on Lake Nipigon fisheries where whitefish, pike and lake trout fisheries declining. Winter drawdown in lake minimally increased but not enough to affect egg incubation. Some siltation problems in northern part of lake where diverted water enters. Problems higher up diversion route where walleye adversely affected by increased turbidity. Long Lake diversion also diverts water into Lake Superior. Few or no fisheries in diversion route. Socio-economic aspects of both diversions discussed.

- FWI; Bodaly 373.  
Coregonus clupeaformis/Salvelinus namaycush/Stizostedion vitreum/Esox lucius/  
Fisheries/Canada/Ontario/Nipigon L./Ogoki R./Long L./Socio-economic Aspects/  
Drawdown/Sedimentation.
- de Graff, N. M. 1993. Fisheries assessment of Aishihik, Canyon and Sekulmun  
lakes, 1991-92. *Yukon Government, Technical Report TR-93-1*: [iv] + iv +  
68 + [40] p.  
Aishihik Lake used for hydroelectric generation. Water levels manipulated since  
1975. Fishery resources reassessed to examine impacts of level fluctuations.  
MEIs determined. Lake trout and whitefish gillnetted. Benthos sampled.  
Radiotelemetry used to monitor prespawning movements of whitefish. Pike  
present.  
Bodaly (unfiled).  
Salvelinus namaycush/Coregonus clupeaformis/Esox lucius/Canada/Yukon/  
Aishihik L./Canyon L./Sekulmun L./Growth/Movements/Food/Benthos/  
Hydroelectric Development/Morphoedaphic Index/Water Level.
- Dean, E. L. 1976. Whitefish fluctuations - factors affecting abundance. *Sask.  
Fish. Wildl. Branch Fish. Tech. Rep. 76-4*: [v] + 61 p.  
Reviews types and causes of fluctuations in abundance, information on  
reproduction, development and early life history. Among environmental factors  
water level fluctuations, turbidity and siltation especially in relation to  
spawning sites important.  
FWI; WAVES 64867.  
Coregonus clupeaformis/Water Level/Spawning/Sedimentation/Reproduction/  
Literature Reviews.
- . 1977. Whitefish fluctuations - factors affecting abundance. Part 2. *Sask.  
Fish. Wildl. Branch Fish. Tech. Rep. 77-2*: [x] + 162 p.  
Reviews studies on Saskatchewan fisheries. No significant correlations found  
between year-class strength and temperature, wind or water level fluctuations.  
Large frequent fluctuations happen more often in heavily exploited lakes.  
Where 4 or less year-classes contribute to fishery intensity should be  
reduced.  
FWI; WAVES 65370.  
Coregonus clupeaformis/Canada/Saskatchewan/Water Level/Fishery Management.
- Deriso, R. B. 1987. Optimal  $F_{0.1}$  criteria and their relationship to maximum  
sustainable yield. *Can. J. Fish. Aquat. Sci.* 44(Suppl.2): 339-348.  
Western Lake Erie walleye stocks illustrate use of model.  
FWI; ASFA 1709669.  
Stizostedion vitreum/Great Lakes/Model/Productive Capacity/Fishery  
Management.
- Derksen, A. J. 1967. *Variations in abundance of walleyes, Stizostedion vitreum  
vitreum (Mitchill), in Cedar and Moose lakes, Manitoba*. M.Sc. Thesis,  
University of Manitoba, Winnipeg, MB. [x] + 97 p.  
[Also issued as: *Manit. Fish. Branch MS Rep.*].  
Fish netted during summers 1962-64. Age structure examined to determine  
year-class strengths. Commercial fishery samples also taken. Strengths of  
year-classes positively correlated with spring discharges from Saskatchewan  
River during first year of life of year-class.  
FWI; WAVES 62383; Ebbers et al. 1988.  
Stizostedion vitreum/Canada/Manitoba/Cedar L./Moose L./Water Level.



- . 1978. Utilization of the Big Grass Marsh area by fish populations and proposals for fisheries enhancement. *Manit. Fish. Branch MS Rep. 78-77*: [iv] + 55 p.  
Development of marsh for flood control could affect spawning of Lake Manitoba pike and walleye which use area. Provision of fish spawning habitat necessary if adverse effects of flood control proposal are to be avoided.  
FWI; WAVES 63839; Ebbers et al. 1988.  
Stizostedion vitreum/Esox lucius/Manitoba/Canada/Spawning/Whitemud R./Water Level.
- DeRoche, S. E. 1969. Observations on the spawning habits and early development of lake trout. *Prog. Fish-Cult.* 31(2): 109-113.  
Shallow water bars and reefs selected for spawning in Thompson Lake, Maine. A drawdown of only 1 ft could cause high egg loss. Since some fish spawn as early as late September the drawdown limitations now in effect from mid-October to April should be extended.  
FWI; Kerr 1993.  
Salvelinus namaycush/USA/Maine/Thompson L./Spawning/Drawdown.
- Deyne, G. 1983. Analysis and interpretation of Kenogamissi fish data, 1971-75. *Ont. Min. Nat. Resour. Manuscr. Rep.* 48 p.  
Ebbers et al. 1988.  
Stizostedion vitreum/Canada/Ontario/Kenogamissi L./Sport Fishing/Reservoirs.
- Diana, J. S., W. C. Mackay, and M. Ehrman. 1977. Movements and habitat preference of northern pike, *Esox lucius*, in Lac Ste. Anne, Alberta. *Trans. Am. Fish. Soc.* 106(6): 560-565.  
Movements monitored using ultrasonic transmitters in fish stomachs. Well defined home ranges not established. Usually found within 300 m of shore in water <4 m deep. Most daily movements <1000 m.  
FWI; Kerr 1993.  
Esox lucius/Canada/Alberta/Ste. Anne, L./Movements/Habitat Use.
- Dickson, I. W. 1969. Developmental potential of the Grand Rapids forebay fishery. *Manit. Fish. Branch MS Rep.* 69-9: [ii] + 31 p.  
Development of coarse fishery potential in Easterville area considered. Theoretical potential significant. Depends on development of new markets for coarse fish as existing ones would not provide satisfactory monetary return. Whitefish, walleye and pike present.  
FWI; WAVES 62455; Machniak 1975B & C.  
Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/Manitoba/Cedar L./Fisheries/Hydroelectric Development.
- . 1972. The impact of impoundments on fisheries. *Manit. Fish. Branch MS Rep.* 72-8: 21 p.  
General review.  
Machniak 1975A, B & C.  
Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Fisheries/Reservoirs.
- Doan, K. H. 1979. Commercial catch of the fishery at Cedar Lake, Manitoba, before and after the Grand Rapids hydroelectric project. *Manit. Fish Branch MS Rep.* 79-48: iii + 28 p.  
Isolated fishing community relocated in advance of rising water levels. Fishery has marketed 3 times as much fish since flooding than in comparable time before. Improved fishing attracted more fishermen. Reduction of whitefish and

walleye did not take place as forecast. Increases in pike catches were forecast.

**FWI; WAVES 63846; Bodaly 399.**

*Coregonus clupeaformis/Esoc lucius/Stizostedion vitreum/Canada/Manitoba/Cedar L./Fisheries/Socio-economic Aspects/Flooding.*

**Donetz, J. E., and V. Macins.** 1981. An evaluation of walleye movement in Lake of the Woods, from tag returns 1962 to 1980. *Ont. Min. Nat. Resour. Fish. Assess. Unit Lake of the Woods-Rainy Lake Rep.* 1981-4: 79 p.

Over 14,000 walleye tagged since 1962. Tag returns, over half from anglers, show that walleye move in established patterns after spawning and each distinct population returns to its "home" area. Migration patterns affected by shoreline, currents and weather patterns.

**WAVES 120015; AQUAREF 54486; ASFA 449235.**

*Stizostedion vitreum/Canada/Ontario/Lake of the Woods/Spawning/Movements.*

**Downing, J. A., and C. Plante.** 1993. Production of fish populations in lakes. *Can. J. Fish. Aquat. Sci.* 50(1): 110-120.

Biological production estimates of 100 fish populations from 38 lakes worldwide collected. Relationship between annual production of fish ( $P$ ), annual mean standing biomass and maximum individual body mass ( $W$ ) determined.  $P$  declines with  $W$ . Exploited populations found to be 70% more productive than unexploited populations of same standing biomass.

**FWI.**

*Coregonus clupeaformis/Esoc lucius/Productive Capacity/Model.*

**Downing, J. A., C. Plante, and S. Lalonde.** 1990. Fish production correlated with primary productivity, not the morphoedaphic index. *Can. J. Fish. Aquat. Sci.* 47(10): 1929-1936.

Estimates of biological production of entire lake communities collected from literature. Correlation analysis show production not related to MEI but to annual phytoplankton production, mean total phosphorus concentration and average fish standing crop. Equations presented and compared with previous models.

**FWI; Bodaly (unfiled).**

*Morphoedaphic Index/Fishery Management/Model/Productive Capacity.*

**Dunning, D. J., Q. Ross, and J. Gladden.** 1982. Evaluation of minimum size limits for St. Lawrence River northern pike. *N. Am. J. Fish. Manage.* 2(2): 171-175.

Modelling indicates decline in yield of older fish if harvest of younger fish is curtailed.

**FWI; ASFA 363015; AQUAREF 59836.**

*Canada/Esoc lucius/Fisheries/Model/Productive Capacity.*

**Durbin, J. K.** 1980. Jackfish and Murray lakes - game fish populations under impact. *Sask. Fish. Wildl. Branch Fish. Tech. Rep.* 80-6: [vi] + 139 p. [Cover title reads: Game fish populations under impact - Jackfish-Murray lakes].

Shore zones of lakes affected by cottage development and farming practices. Water levels fluctuate. Direct correlation between pike recruitment and water level. High water levels in 1974 and 1975 increased abundance of pike. Growth declined with overcrowding. Aquatic weeds increased. Pike heavily angled especially in Murray Lake. Walleye populations low in Jackfish Lake and

moderately high in Murray Lake. Spawning areas not found and no YOY present. Low water levels may be responsible.

FWI; WAVES 65369.

*Stizostedion vitreum*/Esox lucius/Canada/Saskatchewan/Jackfish L./Murray L./Sport Fishing/Drawdown/Shoreline Development/Water Level.

—. 1981. Tobin Lake fishery 1979: 17 years after impoundment. *Sask. Fish. Wildl. Branch Fish. Tech. Rep.* 81-5: 147 p.

Reservoir maturity combined with slower flushing rate, due to upstream impoundments, contribute to increased production in lake. Dominant gamefish changed from pike to walleye, in part due to spring level fluctuations and shoreline erosion. Trophy pike much sought after by anglers but trophy fishery cannot be maintained because of increased angling pressure.

FWI; WAVES 65372.

Esox lucius/*Stizostedion vitreum*/Canada/Saskatchewan/Tobin L./Sport Fishing/Water Level/Water Flow/Productive Capacity.

Durnford, E. 1990. *Potential of a whitefish resource in the Smallwood Reservoir, Labrador, related to fresh frozen fish and golden caviar production.* St. John's, NF: Seafood Development Unit, Marine Institute. 1 vol.

Commercial fishery with annual quota of 295,000 kg proposed. Roe examined for suitability for caviar. Harvesting in late August/early September recommended. *Triacanthoporus* in flesh of 70% of whitefish.

WAVES 117753.

*Coregonus clupeaformis*/Labrador/Canada/Smallwood Reservoir/Fisheries/Hydroelectric Development/Parasites/Reservoirs.

Ebbers, M. A., P. J. Colby, and C. A. Lewis. 1988. Walleye - sauger bibliography. *Minn. Dep. Nat. Resour. Div. Game Fish. Invest. Rep.* 396: [i] + 201 p.  
[Also issued as *Ont. Min. Nat. Resour. Fish. Branch Maple Contrib.* 88-02.].

Lists over 3,000 references. Subject index includes "impoundments", "socio-economics of fisheries" and "water levels" with separate listing for each species.

FWI; Kerr 1993.

*Stizostedion vitreum*/Bibliographies/Reservoirs/Water Level.

Edwards, G. A. 1979. Northern pike spawning in the Turtle Marsh, 1976 and 1977. *Manit. Fish. Branch MS Rep.* 79-45: 26 p.

Many pike migrate into marsh to spawn. Turtle River overflowed its banks in 1976 and provided multiple access routes to marsh for spawning fish. No flooding in 1977 so pike restricted to defined channels. Proposal by Ducks Unlimited to subdivide marsh into cells would reduce spawning habitat and adversely affect Dauphin Lake pike population. Intensive pike management program necessary if DU proposal goes ahead.

FWI; WAVES 63848.

Esox lucius/Canada/Manitoba/Turtle R./Spawning/Flooding/Shoreline Development.

Erickson, C. M., and R. Cann. 1993. A preliminary evaluation of walleye (*Stizostedion vitreum*) reproductive success on two constructed lake shoals in southwestern Manitoba. *Manit. Fish. Branch MS Rep.* 93-03: 159 p.

- Spawning shoals constructed in 1990 on Crawford and Stuart lakes to provide spawning substrates in structurally natural form. Based on egg distribution walleye prefer constructed spawning areas over natural bottom types. YOY numbers in Crawford Lake 4 times greater in 1992 than in 1990 before shoals made.  
 FWI; WAVES 148617.  
 Stizostedion vitreum/Canada/Manitoba/Crawford L./Stuart L./Spawning/  
 Artificial Substrates.
- Evans, D. O., J. M. Casselman, and C. C. Willox. 1991. Effects of exploitation, loss of nursery habitat and stocking on the dynamics and productivity of lake trout populations in Ontario lakes. *Lake Trout Synthesis Working Group Report (Ontario Ministry of Natural Resources)*. 193 p.
- Kerr 1993.  
 Salvelinus namaycush/Canada/Ontario/Productive Capacity/Shoreline  
 Development.
- Faubert, N., M. Dubreuil, L. R. Sequin, and D. Roy. 1977. Propagation du grand brochet, *Esox lucius* L., au futur reservoir de LG 2, Baie James, avec ou sans aménagement approprié. Propagation of the northern pike, *Esox lucius* L., in the future LG 2 reservoir at James Bay, with or without appropriate management, p.219-230. In J. Dube, and Y. Gravel (ed.) *10th Warm Water Workshop, American Fisheries Society, Northeast Division, Montebello, QC, 1977*. Quebec, Ministère de Loisir, de la Chasse et de la Pêche. RRF 52.  
 [Translated as: *Can. Transl. Ser. Fish. Aquat. Sci.* 4775: 9 p., 1981].  
 Study to determine if stocks prior to impoundment sufficient to ensure natural propagation; if not, steps needed to restore stocks to appropriate levels. Pike abundant.  
 FWI (NF/Dub2 original, translation filed as serial); WAVES 111411; AQUAREF F10442.  
 Esox lucius/Canada/Quebec/James Bay/Fishery Management/LG 2 Reservoir/  
 Hydroelectric Development/Reservoirs.
- Fortin, R., and M. Gendron. 1990. Reproduction, croissance et morphologie comparees des grandes coregones (*Coregonus clupeaformis*) nains et normaux du reservoir Outardes-2 (Quebec). Reproduction, growth and comparative morphology of dwarf and normal lake whitefish (*Coregonus clupeaformis*) from Outardes-2 reservoir (Quebec). *Can. J. Zool.* 68(1): 17-25.  
 [In French, abstract in English].  
 Fall experimental fishing for spawners and drift net samples of eggs showed presence of sympatric populations of dwarf and normal whitefish. Dwarfs mature at younger age than normal fish and show much slower growth rate and fecundity.  
 FWI; FR 91-194.  
 Coregonus clupeaformis/Canada/Quebec/Outardes-2 Reservoir/Growth/  
 Reproduction/Hydroelectric Development/Reservoirs.
- Framingham, C. F., J. A. Macmillan, J. Craven, J. D. Collison, and R. M. Kabuluk. 1974. Simulation of alternatives for the South Indian Lake commercial fishery. *Manit. Dep. Mines Resour. Environ. Manage. Resour. Plan. Tech. Rep.* 4: 100 p.  
 Documents simulation model to be used by socio-economic study group to assess potential income and employment impacts of diversion project.

- NFA 1987.  
Canada/Manitoba/Southern Indian L./Fisheries/Socio-economic Aspects/  
Hydroelectric Development/Model.
- Freeman, R. S., and B. H. Thompson. 1969. Observations on transmission of  
*Diphyllobothrium* sp. (Cestoda) to lake trout in Algonquin Park, Canada.  
*J. Fish. Res. Board Can.* 26(4): 871-878.  
Study of relationship between high consumption of plankton and high level of  
parasite infection. No correlation found contrary to Becker and Brunson (1967).  
FWI; Machniak 1975C.  
Salvelinus namaycush/Canada/Ontario/Algonquin Park/Parasites.
- Frie, R. V. 1987. *Simulation of the walleye population and fishery of Lake of  
the Woods, Minnesota*. Ph.D. Dissertation, University of Minnesota, St.  
Paul, MN. 174 p.  
[UMI Order No. AAD88-05709. Author presented paper, with G.R.  
Spangler, with this title at 117th Annual Meeting of American Fisheries  
Society, 1987, see p.87 of *Abstracts* (FR91-6136)].  
An age-structured, numerical, more flexible version of yield-per-recruit  
analytical model used as well as delay-difference equations for predicting  
biomass dynamics from time series of catches and efforts. Population not  
over-exploited 1970-1984.  
Diss.Abstr.Int. 49B(3): 620-621, 1988.  
Stizostedion vitreum/USA/Minnesota/Lake of the Woods/Fisheries/Model.
- Frisk, T., K. Salojarvi, and M. Virtanen. 1988. Modelling the impacts of lake  
regulation on whitefish stocks, p.467-475. In A. Jarvinen (ed.)  
*Proceedings of the International Symposium on Biology and Management  
of Coregonids, Joensuu, Finland, 1987*. *Finn. Fish. Res.* 9.  
Model based on assumed functional relationships and specified causal  
connections between many factors, including lake volume, bottom area, water  
level, fish densities and spawning areas. Model applied to whitefish stock in  
lake in northern Finland.  
FWI (MLA/Jar1, 2nd copy filed as serial); ASFA 2163845.  
Coregonus sp./Finland/Model/Water Level/Spawning/Productive Capacity.
- Fudge, R. J. P., and R. A. Bodaly. 1984. Post-impoundment winter sedimentation  
and survival of lake whitefish (*Coregonus clupeaformis*) eggs in  
Southern Indian Lake, Manitoba. *Can. J. Fish. Aquat. Sci.* 41(4): 701-705.  
Flooding resulted in extensive shore erosion and increased suspended sediment  
levels. Winter sedimentation on spawning grounds of whitefish gave layer 1-4  
mm in depth. Egg survival low where exposed to sedimentation.  
FWI; ASFA 761763; AQUAREF 75090.  
Coregonus clupeaformis/Canada/Manitoba/Southern Indian L./Spawning/  
Sedimentation/Flooding/Hydroelectric Development/Survival/Eggs.
- Gaboury, M. N., and J. W. Patalas. 1981. An interim report on the fisheries  
impact study of Cross and Pipestone lakes. *Manit. Dep. Nat. Resour. MS  
Rep.* 81-22: 190 p.  
CUE of whitefish, walleye and pike highest in east Cross Lake and lowest in  
Pipestone. Whitefish and pike in east Cross showed characteristic response to  
exploitation with faster growth rate, younger age at maturity and fewer older  
fish. Early spring drawdown of Cross Lake may dewater spawning areas.  
NFA 1987.

Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/Manitoba/  
Cross L./Pipestone L./Fisheries/Drawdown.

—. 1982. The fisheries of Cross, Pipestone and Walker lakes, and effects of hydroelectric development. *Manit. Dep. Nat. Resour. MS. Rep.* 82-14: 217 p.

Fish stocks, including whitefish, walleye and pike assessed and impacts of current water level regime, regulated by Jenpeg impoundment determined. Drawdown contributed to decreased abundance of fish in Cross and Pipestone lakes by causing winterkill in March 1981. Dewatering of coregonid spawning areas detrimental. Walker Lake fish stocks not impacted by Jenpeg regulation. New water level regime proposed.

**FWI; WAVES 64826; ASFA 502844; Bodaly 531; Ebbers et al. 1988; Kerr 1993.**  
Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/Manitoba/  
Cross L./Pipestone L./Walker L./Drawdown/Spawning/Fishkills/Hydroelectric  
Development.

—. 1984. Influence of water level drawdown on the fish populations of Cross Lake, Manitoba. *Can. J. Fish. Aquat. Sci.* 41(1): 118-125.

Discharge into lake regulated, with drawdown in summer reducing available fish habitat. Standing crop of all major fishes, including whitefish, walleye and pike, lower than before regulation. Early, rapid drawdown resulted in winterkill in March 1981. Overwinter drawdown dewatered whitefish spawning areas and eggs desiccate.

**FWI; ASFA 761387; SQUAREF 68160; Bodaly 2112; Ebbers et al. 1988; Kerr 1993.**  
Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/Manitoba/  
Cross L./Fisheries/Spawning/Hydroelectric Development/Drawdown.

Garside, E. T. 1964. Progress report on the 1963 fisheries survey of the Grand Rapids reservoir. *Manit. Fish. Branch MS Rep.* 4 p.

Extensive early winter drawdown likely to destroy eggs of whitefish by drying and freezing. No spawning area for walleye noted in forebay area. Bottom fauna, food of whitefish being surveyed.

**FWI; WAVES 62377.**

Stizostedion vitreum/Coregonus clupeaformis/Canada/Manitoba/Cedar L./  
Drawdown/Spawning/Hydroelectric Development.

Garside, E. T., A. J. Derksen, and W. N. Howard. 1973. Summer food relations and aspects of the distribution of the principal percoid fishes of the Saskatchewan River delta prior to 1965 impoundment. *Manit. Fish. Branch MS Rep.* 73-18: ii + 17 p.

Summer diet of walleye mostly fish with some macrobenthos. Moose Lake sauger population poor, perhaps due to competition for food with walleye and pike although all three species existed together in Cedar Lake.

**FWI; WAVES 63774; Ebbers et al. 1988.**

Stizostedion vitreum/Canada/Manitoba/Saskatchewan R./Moose L./Cedar L./Food.

Geen, G. H. 1974. Effects of hydroelectric development in western Canada on aquatic ecosystems. *J. Fish. Res. Board Can.* 31(5): 913-927.

General review of projects completed, under construction or planned in western Canada. Several have blocked or impeded migrations of economically important fish.

**FWI; Baxter & Glaude 1980; Kerr 1993.**

Hydroelectric Development/Canada/Alberta/Saskatchewan/Manitoba/Yukon/NWT.

- Genge, R. E. 1986. Development and application of a model to predict nutrient enrichment effects on lake trout habitat, p 8. In *6th Annual International Symposium, Lake and Reservoir Management: Influences of nonpoint-source Pollutants and Acid Precipitation, Nov.5-8, 1986, Portland, OR*. North American Lake Management Society.  
[Summary only].  
Regression analysis used to determine relationship between optimal habitat and mean summer chlorophyll a levels and ratio of epilimnetic to hypolimnetic volumes. Increased chlorophyll levels associated with proposed development used to predict amount of habitat available.  
ASFA 1452397.  
Salvelinus namaycush/Canada/Ontario/Model/Eutrophication/Productive Capacity.
- Gigliotti, L. M., and W. W. Taylor. 1990. The effect of illegal harvest on recreational fisheries. *N. Am. J. Fish. Manage.* 10(1): 106-110.  
Yield-per-recruit model used to evaluate poaching on legal harvest. Both taking of fish below legal size and removal of fish from catch-and-release fisheries considered. Reduction in pike fisheries of 10-66% noted.  
FWI; ASFA 2297653; FR 35(4).  
Esox lucius/Sport Fishing/Model/Productive Capacity.
- Gill, D., and A. D. Cooke. 1974. Controversies over hydroelectric developments in sub-arctic Canada. *Polar Rec.* 17(107): 109-127.  
Discusses Aishihik Lake, Peace River, Churchill River diversion and James Bay projects. Benefits, environmental effects (including those on fish) and social costs discussed.  
FWI; Baxter & Glaude 1980.  
Hydroelectric Development/Canada/Yukon/Aishihik L./Alberta/Peace-Athabasca Delta/Manitoba/Churchill R./Southern Indian L./Quebec/James Bay/  
Socio-economic Aspects.
- Gillet, C. 1989A. Le déroulement de la fraie des principaux poissons lacustres. The spawning of lake fishes. *Hydroecol. Appl.* 1(1/2): 117-143.  
Spawning conditions important for management and protection of natural spawning grounds in reservoirs. Date of spawning, temperature regimes, spawning substrates and depth of spawning grounds should be determined. Existence of geographic sub-populations with differing spawning habits and homing behaviour also should be looked for.  
FWI; ASFA 243743.  
Coregonus clupeaformis/Spawning/Fishery Management/Hydroelectric Development/Reservoirs.
- . 1989B. Realisation de frayeres artificielles flottantes pour les poissons lacustres. Artificial floating spawning grounds for fishes in lakes and impoundments. *Hydroecol. Appl.* 1(1/2): 145-193.  
Floating artificial spawning substrates for use in lakes and reservoirs where level fluctuates tested. Some attractive to spring spawners (e.g., pike). Fish spawn on these structures even when anchored away from shore. Pike egg densities >1,000/m<sup>2</sup> found.  
FWI.  
Esox lucius/Spawning/Reservoirs/Artificial Substrates.
- Gislason, G. S., J. A. MacMillan, and N. J. R. Ward. 1975. *An overview of the Manitoba freshwater fishery*. Winnipeg, MB: University of Manitoba, Department of Agricultural Economics and Farm Economics. 147 p.

Models of the commercial fishery for whitefish on lakes Winnipeg, Manitoba and Winnipegosis reviewed.

WAVES 101832.

Canada/Manitoba/Coregonus clupeaformis/Fisheries/Model.

Gravel, Y., and J. Dube. 1980. Les conditions hydriques et le rôle de la végétation dans une frayère à grand brochet, *Esox lucius* Linne. Water conditions and the role of vegetation in the spawning of northern pike, *Esox lucius* Linne. *Eau Que.* 13(3): 229-230.

[In French, English abstract].

Artificial regulation of water levels destroyed many valuable spawning areas. Mitigation discussed. Vegetation important in spawning areas.

FWI; Crossman & Casselman 1987.

*Esox lucius*/Canada/Quebec/Spawning/Water Level/Habitat Use/Mitigation.

Griffiths, J. S. 1987. Simulation studies of potential effects from Atikokan TGS on walleye eggs. *Ont. Hydro Res. Div. Rep.* 86-290-K: 15 p.

Ebbers et al. 1988.

*Stizostedion vitreum*/Canada/Ontario/Atikokan/Eggs/Reservoirs.

Hagenson, I. 1986. Fish population data from Rat and Split lakes, 1985. *Manit. Fish. Branch MS Rep.* 87-4: 59 p.

Data collected in summer of 1985, 9 years after Churchill River diversion.

Growth rates, age composition, maturity, survival and mortality of whitefish, walleye, sauger and pike given.

NFA 1987.

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/Rat L./Split L./Fisheries/Hydroelectric Development.

—. 1987. Fish population data from Split and Stephens lakes, 1986. *Manit. Fish. Branch MS Rep.* 87-26: 59 p.

Samples taken in summer of 1986, 10 years after Churchill River diversion.

Growth rates, age compositions, maturity, survival and mortality rates of whitefish, walleye, sauger, cisco and pike given for future management purposes.

FWI; WAVES 102447.

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/Split L./Stephens L./Growth/Survival/Fishery Management/Hydroelectric Development.

—. 1988. Fish population data from Split and Stephens lakes, 1987. *Manit. Fish. Branch MS Rep.* 88-15: 66 p.

Samples taken in summer of 1987, 11 years after Churchill River diversion.

Growth rates, age compositions, maturity, survival and mortality rates of whitefish, walleye, sauger and pike given for future management purposes.

FWI; WAVES 108755.

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/Split L./Stephens L./Growth/Survival/Fishery Management/Hydroelectric Development.

—. 1989. Fish population data from Split and Stephens lakes, 1988. *Manit. Fish. Branch MS Rep.* 89-16: 70 p.

Samples taken in summer of 1988, 12 years after Churchill River diversion.

Growth rates, age compositions, maturity, survival and mortality rates of whitefish, walleye, sauger and pike given for future management purposes.



**FWI; WAVES 111928.**

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/  
Split L./Stephens L./Growth/Survival/Fishery Management/Hydroelectric  
Development.

—. 1990. Fish population data from Split and Stephens lakes, 1989. *Manit. Fish. Branch MS Rep.* 90-07: 70 p.

Samples taken in summer of 1989, 13 years after Churchill River diversion. Growth rates, age compositions, maturity, survival and mortality rates of whitefish, walleye, sauger and pike given for future management purposes. **FWI; WAVES 114742.**

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/  
Split L./Stephens L./Growth/Survival/Fishery Management/Hydroelectric  
Development.

**Hagenson, I., and J. F. O'Connor.** 1978A. Fisheries inventory and lake classification, Whiteshell Provincial Park, 1978. *Manit. Fish. Branch MS Rep.* 78-83: [viii] + 113 p.

Lakes studied in 1978 to determine fisheries potential, assess effect of previous management activities and make recommendations for future recreational fishing opportunities. Lake trout in George Lake only. Walleye present in many lakes.

**FWI; WAVES 63851.**

*Stizostedion vitreum*/*Salvelinus namaycush*/Canada/Manitoba/Whiteshell/Sport Fishing/Morphoedaphic Index/Fishery Management.

—. 1978B. A fisheries survey of fourteen lakes in Nopiming Provincial Park, 1976. *Manit. Fish. Branch MS Rep.* 78-82: [xii] + 190 p.

MEI used to provide estimate of potential of lakes for intensive sport fishery. Development of park should have little effect on morphometry or water quality of lakes, and stream crossings should have little effect on spawning runs if standards are followed. Expected increase in angler pressure will probably affect density dependent factors among sport fish stocks.

**FWI; WAVES 63842.**

*Stizostedion vitreum*/*Esox lucius*/Canada/Manitoba/Nopiming/Sport Fishing/  
Morphoedaphic Index/Fishery Management.

**Hakkari, L., and P. Bagge.** 1984. On the fry densities of pike (*Esox lucius* L.) in Lake Saimaa, Finland. *Verh. int. Ver. theor. angew. Limnol.* 22(4): 2560-2565.

Pike spawn on *Carex* and littoral Poaceae. High fry densities found where vegetation was dense and bottom covered by detritus. Few found on stony shores.

**FWI; ASFA 1132043.**

*Esox lucius*/Finland/Spawning/Habitat Use.

**Hanna, J. E., M. F. P. Michalski, P. G. C. Campbell, R. Perrier, M. Cantin, and D. Johnson.** 1982. Fisheries productivity and water level fluctuations in Lac Seul, northwestern Ontario. *Can. Water Resour. J.* 7(2): 365-388.

Lake regulated for power production since 1935. Supports sport and commercial fisheries for pike, whitefish and walleye. Increased yield of pike associated with initial flooding. Changes in water level regulation had short term negative impacts on productivity and fishery has adapted to new regimes with little long term effect. Correlations between spring water levels and fish yields suggest threshold response beyond which changes have little effect.

FWI; AQUAREF 60702; Bodaly 616.

*Stizostedion vitreum*/*Coregonus clupeaformis*/*Esox lucius*/Canada/Ontario/  
Seul, L./Fisheries/Hydroelectric Development/Water Level.

Hassler, T. J. 1969. Biology of the northern pike in Oahe Reservoir, 1959 through 1965. *U.S. Bur. Sport Fish Wildl. Tech. Pap.* 29: 13 p.  
Study of effect of impoundment on biology of most important sport fish in reservoir.

FWI; WAVES 24397; Bodaly 636.

*Esox lucius*/USA/South Dakota/North Dakota/Oahe L./Reservoirs.

Hatch, D., J. J. Keleher, and G. A. Schoch, ed. 1984. *Southern Indian Lake and hydro development: Proceedings of Manitoba Environmental Council Special Meeting, 19 January 1973*. Winnipeg, MB: The Council. iv + 73 p.

Presentations discuss effects of this development and urge the Minister to discontinue the project.

NFA 1987.

Canada/Manitoba/Southern Indian L./Hydroelectric Development.

Healey, M. C. 1975. Dynamics of exploited whitefish populations and their management with special reference to the Northwest Territories. *J. Fish. Res. Board Can.* 32(3): 427-448.

Reviews data on mortality, growth, reproduction and stock size of exploited and unexploited populations in northern North America. Natural mortality 0.20-0.80 in unexploited populations, but in exploited populations total mortality was as high as 0.94. Compensatory changes in growth noted in response to fluctuations in population size.

FWI; Bodaly 645.

*Coregonus clupeaformis*/Productive Capacity/Fishery Management/Growth/  
Survival/NWT/Canada.

Hecky, R. E., and H. A. Ayles. 1974A. Summary of fisheries-limnology investigations on Southern Indian Lake. *Lake Winnipeg, Churchill and Nelson Rivers Study Board, Canada-Manitoba, 1971-'75. Technical Report, Appendix 5, Vol.1.A:* 26 + [5] p.

Whitefish, walleye and pike most abundant commercial species. Sport fishing for walleye above average.

FWI (N/Lak1 A.5 Pt.1); Bodaly 653.

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/  
Fisheries/Hydroelectric Development.

----. 1974B. Summary of fisheries-limnology investigations on the lower Churchill lakes and on Rat-Burntwood lakes. *Lake Winnipeg, Churchill and Nelson Rivers Study Board, Canada-Manitoba, 1971-'75. Technical Report, Appendix 5, Vol.2.C:* [ii] + 25 p.

Suggests that weirs be constructed at outlets of Churchill lakes to maintain levels or they will drop when river flow reduced. Whitefish is main commercial fish species. Walleye more plentiful on diversion route than in SIL but their condition poorer. Reduction of available spawning sites expected. Impacts on Rat-Burntwood lakes will be so great that mitigation measures are not likely to be meaningful. "Wait-and-see" attitude suggested. Since walleye congregate in dam tailraces new sport fishery may be formed.

FWI (N/Lak1 A.5 Pt.2); Bodaly 653.

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/  
Churchill R./Rat R./Burntwood R./Fisheries/Hydroelectric Development/Sport  
Fishing.

Hecky, R. E., R. W. Newbury, R. A. Bodaly, K. Patalas, and D. M. Rosenberg.  
1984. Environmental impact prediction and assessment: the Southern  
Indian Lake experience. *Can. J. Fish. Aquat. Sci.* 41(4): 720-732.  
Predictions related to physical environment (shoreline erosion, sedimentation,  
etc.) qualitatively correct. Decrease in water temperature unpredicted.  
Biological responses above primary trophic level not predicted include rapid  
decline in whitefish fishery and increases in mercury concentrations in fish.  
FWI; AQUAREF 72042.  
*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/  
Southern Indian L./Hydroelectric Development/Flooding/Temperature/  
Sedimentation.

Heikinheimo-Schmid, O., and A. Huusko. 1988. Management of coregonids in the  
heavily modified Lake Kemijarvi, northern Finland, p.435-445. In A.  
Jarvinen (ed.) *Proceedings of the International Symposium on Biology  
and Management of Coregonids, Joensuu, Finland, 1987.* Finn. Fish. Res.  
9.

Lake influenced by water level regulation, pulp mill effluents and log floating.  
40% of vendace spawning grounds and 90% of lake spawning whitefish  
destroyed by water level regulation. Only river spawning whitefish able to  
reproduce in their normal way. Poor growth of whitefish noted. Intensified  
fishing, reduction of whitefish stocking, use of planktivorous whitefish and  
clearing of shores for seining recommended to increase yield of coregonids.  
FWI (MLA/Jar1, 2nd copy filed as serial).  
*Coregonus albus*/*Coregonus* sp./Finland/Fishery Management/Water Level/  
Spawning/Growth.

Helminen, H., J. Sarvala, and A. Hirvonen. 1990. Growth and food consumption  
of vendace (*Coregonus albus* (L.)) in Lake Pyhajarvi, SW Finland: a  
bioenergetics modeling analysis, p.511-522. In R. D. Gulati, E. H. R. R.  
Lammens, M. L. Meijer and E. van Donk (ed.) *Bio-manipulation: tool for  
water management.* Dordrecht, The Netherlands: Kluwer Academic  
Publishers, *Hydrobiologia* 200/201.

Bioenergetic model used to estimate daily food consumption of YOY and adult  
vendace in mesotrophic lake.  
FWI.

*Coregonus albus*/Finland/Food/Model/Productive Capacity.

Hinch, S. G., N. C. Collins, and H. H. Harvey. 1991. Relative abundance of  
littoral zone fishes: biotic interactions, abiotic factors and postglacial  
colonization. *Ecology* 72(4): 1314-1324.

Multivariate ordination techniques used to establish relationships among  
abundances of most frequently occurring littoral zone fishes in 25 central  
Ontario lakes. Sucker less abundant when pike present.  
FWI.

*Esox lucius*/Canada/Ontario/Model/Food.

Hoffman, G. L., and O. N. Bauer. 1971. Fish parasitology in water reservoirs: a  
review, p.495-511. In G. E. Hall (ed.) *Reservoir fisheries and limnology.*  
Washington, DC: American Fisheries Society.

Reviews literature on effects of impoundment on fish parasites.

## FWI (NFL/Ha11).

Literature Reviews/Parasites/Reservoirs.

Holt, C. S., G. D. S. Grant, G. P. Oberstar, C. C. Oakes, and D. W. Bradt. 1977. Movement of walleye, *Stizostedion vitreum*, in Lake Bemidji, Minnesota, as determined by radio biotelemetry. *Trans. Am. Fish. Soc.* 106(2): 163-169. Daily and seasonal movements studies using VHF radio-tag system for 3 seasons of year 1973-1974. Moved parallel to shore and did not show a diel on-shore off-shore pattern. Rock bars and spits served as boundaries of ranges within which fish moved. Large movements coincided with periods of heavy cloud cover and precipitation. FWI; ASFA 7021860; Kerr 1993. *Stizostedion vitreum*/USA/Minnesota/Bemidji, L./Movements.

Hooper, W. C. 1973. *Summary report of limnology and sport fisheries task for the Green River Environmental Impact Study*. Fredericton, NB: New Brunswick Department of Fisheries and Environment. 35 p.

Clearcutting of trees before flooding is recommended to enhance fishery for lake trout and whitefish.

WAVES 109716; Ploskey 1985.

*Coregonus clupeaformis*/*Salvelinus namaycush*/Canada/New Brunswick/Green R./Flooding/Fishery Management/Mitigation.

—. 1977. Limnological aspects and suggested fisheries management for ten New Brunswick impoundments. Aspects limnologiques et suggestions de pisciculture pour dix lacs artificiels du Nouveau-Brunswick. *N.B. Fish. Wildl. Branch Fish. Manage. Rep.* 5: [iii] + 17 (English); [iii] + 18 (French) p. [In English and French].

Lake trout abundant in Long Lake. Whitefish common in First Green, Serpentine, Trousers and West Branch lakes. MEI used to calculate potential fish production.

FWI; WAVES 118953; Bodaly 703.

*Coregonus clupeaformis*/*Salvelinus namaycush*/Canada/New Brunswick/Long L./First Green L./Serpentine L./Trousers L./West Branch L./Morphoedaphic Index/Productive Capacity.

Howard, W. N. 1967A. The abundance of marketable and rough fish in Cedar Lake. *Manit. Fish. Branch MS Rep.* [12] p.

Results from 1962 and 1966 catches used to estimate rough fish potential of lake. Eastern part not currently fished commercially. Much of catch is suckers. Close to Easterville pike is abundant especially in winter and could supplement reduced winter income. Whitefish also present. Walleye in summer fishery.

FWI; WAVES 62228.

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/Cedar L./Fisheries/Hydroelectric Development.

—. 1967B. A summary report on the fishery of Cedar Lake, Manitoba, with comments on future management. *Manit. Fish. Branch MS Rep.* [27] p. Fish population dynamics rapidly changing due to increased lake levels from construction of hydroelectric dam. Greater quantities available and more intensive fishing could be allowed for the period immediately following flooding. Pike increasing due to new spawning sites in flooded areas. Whitefish and walleye caught. Using MEI annual fish production should be 932,000 lb (2.9 lb/acre).

FWI; WAVES 62217; Machniak 1975B.

*Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/Manitoba/Cedar L./Fishery Management/Hydroelectric Development/Flooding/Spawning/Habitat Use/Morphoedaphic Index.*

—-. 1968. A summary report on the fisheries of Cedar Lake, and the Saskatchewan River in Manitoba, with comments on future management. *Manit. Fish. Branch MS Rep.* [20] p.

Dramatic increase in northern pike population following impoundment. Walleye also increasing. Some whitefish spawn face desiccation from drawdown. Population expected to decline. Calculations based on MEI give annual fish production of 932,000 lb (2.9 lb/acre).

FWI; WAVES 62384; Machniak 1975B & C.

*Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/Manitoba/Cedar L./Saskatchewan R./Fishery Management/Spawning/Drawdown/Hydroelectric Development/Morphoedaphic Index.*

—-. 1969. The present potential of the marketable and rough fish resources of Cedar Lake in 1966 and 1967. *Manit. Fish. Branch MS Rep.* 68-13: 30 p. Eastern part of Cedar Lake surveyed to see if rough fish stocks sufficient for establishment of processing facilities. Sucker fishery possible. Whitefish, walleye and pike present.

FWI; WAVES 62462.

*Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/Manitoba/Cedar L./Fisheries/Morphoedaphic Index/Hydroelectric Development.*

Hubbell, G. G. 1967. A bibliography with abstracts of the literature on ecology of impoundments. *Mich. Dep. Conserv. Res. Div. Rep.* 104: 70 p. [Report also includes: Cooper, G. P. Fish production in impoundments. 20 p.].

Bibliography and Cooper's paper cover reservoirs mostly in USA.

Bodaly 310.

Reservoirs/Bibliographies/Productive Capacity.

Hurley, D. A. 1986. Growth, diet and food consumption of walleye (*Stizostedion vitreum vitreum*): an application of bioenergetics modelling to the Bay of Quinte, Lake Ontario, population, p.224-236. In C. K. Minns, D. A. Hurley and K. H. Nicholls (ed.) *Project Quinte: point source phosphorus control and ecosystem response in the Bay of Quinte, Lake Ontario*. Ottawa, ON: Department of Fisheries and Oceans. *Can. Spec. Publ. Fish. Aquat. Sci.* 86.

Energy requirements for 1978 year-class of walleye calculated from observed growth 1978-1983. 2 models of energy expenditure examined.

FWI (JE/Min1); ASFA 1334731.

*Stizostedion vitreum/Great Lakes/Model/Growth/Food.*

Hutchinson, N. J., B. P. Neary, and P. J. Dillon. 1991. Validation and use of Ontario's Trophic Status Model for establishing lake development guidelines. *Lake Reservoir Manage.* 7(1): 13-23.

Trophic Status Model of Ontario's Lakeshore Capacity Study is refinement of Dillon and Rigler (1975) model. New version allows modelling of watersheds, extending 3 lakes upstream for up to 15 catchments of study lake.

FWI.

Model/Productive Capacity.

Inskip, P. D. 1982. Habitat suitability index models: northern pike. *U.S. Fish Wildl. Serv. Rep. FWS/OBS-82/10.17*: v + 40 p.

Gives HSI details affecting life history.

FR 31(1); Kerr 1993.

*Esox lucius*/Model/Habitat Suitability Index.

Jagtman, E., S. H. Hosper, M. L. Meijer, and E. van Donk. 1990. The role of fish stock management in the control of eutrophication in shallow lakes in the Netherlands, p.328-343. In W. L. T. Van Densen, B. Steinmetz and R. H. Hughes (ed.) *Management of Freshwater Fisheries. Proceedings of a Symposium Organized by the European Inland Fisheries Advisory Committee, Goteborg, Sweden, 31 May - 3 June, 1988*. Wageningen, The Netherlands: PUDOC.

Eutrophication leads to change in food web. Littoral vegetation gone from lakes. This habitat important for pike which have disappeared. Bream increased and steps being taken to reduce numbers by introducing predatory fish.

ASFA 2915257.

*Esox lucius*/The Netherlands/Eutrophication/Habitat Use.

Jenkins, R. M. 1965. Bibliography on reservoir fishery biology in North America. *U.S. Fish Wildl. Serv. Res. Rep.* 68: 57 p.

WAVES 17414 & 72060; Machniak 1975C.

Reservoirs/Fisheries/Bibliographies.

—. 1970. The influence of engineering design and operation and other environmental factors on reservoir fishery resources. *Water Resour. Bull.* 6(1): 110-118.

Positive correlation found between standing crop of both pike and walleye and surface area of a reservoir and negative correlation with mean annual water level fluctuations.

FWI; Ebbers et al. 1988.

*Esox lucius*/Stizostedion vitreum/Reservoirs/Productive Capacity/Water Level.

—. 1982. The morphoedaphic index and reservoir fish production. *Trans. Am. Fish. Soc.* 111(2): 133-140.

[First paper in special section on MEI in *Transactions*].

MEI used to estimate potential fish harvest and standing crop in reservoirs. Emphasis on reservoirs in USA.

FWI.

Morphoedaphic Index/Fisheries/Reservoirs/Productive Capacity.

Jensen, A. L. 1978. Assessment of the lake trout fishery in Lake Superior, 1929-1950. *Trans. Am. Fish. Soc.* 107(4): 543-549.

Logistic surplus production model indicates fishery became overexploited at time sea lamprey reached lake.

FWI; AQUAREF 38923.

Great Lakes/*Salvelinus namaycush*/Fisheries/Model/Productive Capacity.

—. 1981. Population regulation in lake whitefish, *Coregonus clupeaformis* (Mitchill). *J. Fish Biol.* 19(5): 557-573.

Fishery stock assessment model used to study potential for whitefish to compensate for fishing mortality. Capacity appears large.

FWI; ASFA 153928.

*Coregonus clupeaformis*/Fisheries/Model/Productive Capacity.

- . 1986. Assessment of the United States lake whitefish (*Coregonus clupeaformis*) fisheries of Lake Superior, Lake Michigan, Lake Huron. *J. Fish. Res. Board Can.* 33(4): 747-759.  
[Also issued by NTIS as PB 257 265/9].

Logistic surplus model indicates that in most areas fish overexploited.

FWI; SQUAREF 24449; NTIS 523929.

*Coregonus clupeaformis*/Great Lakes/Model/Fisheries/Productive Capacity.

- . 1991. Multiple species fisheries with no ecological interaction: two-species Schaefer model applied to lake trout and lake whitefish. *ICES J. Mar. Sci.* 48(2): 167-171.

Relation between maximum sustainable yields fished both together and separately calculated using Schaefer model. When fished together lake trout is seriously overexploited.

FWI; ASFA 2590438; FR 37(2).

*Coregonus clupeaformis*/Salvelinus namaycush/Fisheries/Model/Great Lakes/Productive Capacity.

- Jensen, R. E., and M. Y. Chen. 1986. Feasibility of cage incubation of lake trout eggs in Lake Diefenbaker. *Sask. Fish. Wildl. Branch Fish. Tech. Rep.* 86-1: iv + 24 p.

Stocking with fingerlings did not produce viable lake trout population. Habitat should not be limiting and food for adults and juveniles present. 4,000 eggs placed in baskets in aluminum cages lowered to depth of 10 m in spillway channel below drawdown levels. 15-20% hatched. Recommends 200,000 to 500,000 eggs be cage incubated biannually for 10 years and artificial spawning beds be constructed once mature fish established.

FWI; WAVES 90173.

*Salvelinus namaycush*/Canada/Saskatchewan/Diefenbaker, L./Eggs/Artificial Substrates/Reservoirs/Spawning.

- Johnson, F. H. 1957. Northern pike year-class strength and spring water levels. *Trans. Am. Fish. Soc.* 86: 285-293, 1956.

High spring water levels during spawning and small decline during egg incubation period represent good conditions for production of strong year classes.

FWI; Crossman & Casselman 1987; Bodaly 762; Kerr 1993.

*Esox lucius*/Water Level/Spawning/USA/Minnesota/Ball Club L.

- . 1967. Status of the Rainy Lake walleye fishery, 1966. *Minn. Dep. Conserv. Div. Game Fish Invest. Rep.* 295: 16 p.

Commercial fish catches and effect of lake water levels on spawning discussed. Ebbers et al. 1988.

*Stizostedion vitreum*/USA/Minnesota/Rainy L./Fisheries/Spawning/Water Level.

- Johnson, F. H., and W. J. Scidmore. 1965. A comparison of the abundance of walleyes in the commercial catch in Rainy Lake, Minnesota-Ontario, with lake elevations during the walleye spawning period in the years contributing to the catch. *Minn. Dep. Nat. Resour. Div. Fish Wildl. Staff Rep.* 4 p.

Correlation found between water level at time of spawning and subsequent year-class strength.

Cohen & Radomski 1993.

*Stizostedion vitreum*/USA/Minnesota/Canada/Ontario/Rainy L./Namakan Reservoir/Reservoirs/Spawning/Water Level/Fisheries.

- Johnson, F. H., R. D. Thomasson, and B. Caldwell. 1966. Status of the Rainy Lake walleye fishery, 1965. *Minn. Dep. Nat. Resour. Sect. Fish. Invest. Rep.* 292: 22 p.
- Walleye catches declined since 1956. Recommends restrictions for commercial and sport fisheries.
- Ebbers et al. 1988; Cohen & Radomski 1993.
- Stizostedion vitreum*/USA/Minnesota/Rainy L./Fisheries/Sport Fishing.
- Johnson, M. G., J. H. Leach, C. K. Minns, and C. H. Olver. 1977. Limnological characteristics of Ontario lakes in relation to associations of walleye (*Stizostedion vitreum vitreum*), northern pike (*Esox lucius*), lake trout (*Salvelinus namaycush*), and smallmouth bass (*Micropterus dolomieu*). *J. Fish. Res. Board Can.* 34(10): 1592-1601.
- 2,500 lakes between 42 and 52°N surveyed. Lake types based on combinations of 4 species determined. 22% of lakes walleye-pike, 19% pike only, 16% lake trout only. Lake depth and area variables of greatest significance in determining lake types.
- FWI; Kerr 1993.
- Esox lucius*/*Salvelinus namaycush*/*Stizostedion vitreum*/Canada/Ontario/Habitat Use.
- Johnson, R. P. 1971. Investigation of lake trout spawning in Lake Athabasca, 1971. *Sask. Dep. Nat. Resour. Rep.* 12 p.
- Kerr 1993.
- Salvelinus namaycush*/Canada/Saskatchewan/Athabasca, L./Spawning.
- Joy jr, E. T. 1975. *The walleye, Stizostedion vitreum (Mitchill), population and sport fishery of the Big Eau Pleine, a fluctuating, central Wisconsin reservoir.* M.S. Thesis, University of Wisconsin, Stevens Point, WI. 97 p.
- Age, growth, food and movements studied.
- Ebbers et al. 1988; FR 92-892.
- Stizostedion vitreum*/USA/Wisconsin/Big Eau Pleine Reservoir/Reservoirs/Water Level/Fisheries/Age/Food/Growth/Movements.
- June, F. C. 1971. The reproductive biology of northern pike, *Esox lucius*, in Lake Oahe, an upper Missouri River storage reservoir, p.53-71. In G. E. Hall (ed.) *Reservoir fisheries and limnology.* Washington, DC: American Fisheries Society. *Spec. Publ. Am. Fish. Soc.* 8.
- Extensive study of sexual maturation and spawning. Pike increased in abundance after closure of dam in 1958. Water level manipulations reduced littoral vegetation.
- FWI (NF/Hall); Bodaly 780.
- Esox lucius*/USA/North Dakota/South Dakota/Oahe, L./Reproduction/Reservoirs/Water Level.
- Kallemeyn, L. W. 1986. Impact of water level management on availability of northern pike spawning habitat in Namakan Reservoir, Voyageurs National Park. *Conf. Sci. Natl Parks* 4: 171.
- [Abstract only].
- FR 87-3554.
- Esox lucius*/USA/Minnesota/Namakan Reservoir/Spawning/Water Level/Reservoirs.



—. 1987. Correlations of regulated lake levels and climatic factors with abundance of young-of-the-year walleye and yellow perch in four lakes in Voyageurs National Park. *N. Am. J. Fish. Manage.* 7(4): 513-521.

Significant correlations found between lake level and walleye year-class strength in 3 of 4 lakes sampled. Strongest year-classes produced in years with higher more stable temperatures. Water levels should be raised earlier in the spring to enhance reproductive success.

FWI; FR 88-1763; ASFA 2225835; Ebbers et al. 1988; Kerr 1993.

Stizostedion vitreum/USA/Minnesota/Voyageurs National Park/Water Level/Temperature/Spawning.

Karjalainen, J. 1992. Density-dependent feeding, growth and survival of vendace (*Coregonus albus* (L.)) larvae. *Joensuu Yliopiston Luonnontieteellisiä Julk.* 27: 29 p.

Summarizes published results in experimental and field conditions. Bioenergetic model for coregonid larvae constructed.

WAVES 141738.

Coregonus albus/Juveniles/Model/Food/Growth/Survival/Productive Capacity.

Kelso, J. R. M. 1976. Diel movement of walleye, *Stizostedion vitreum vitreum*, in West Blue Lake, Manitoba, as determined by ultrasonic tracking. *J. Fish. Res. Board Can.* 33(9): 2070-2072.

8 walleye 2-5 years of age, fitted with ultrasonic transmitters, released, and followed for periods of up to 24 hours. Lake thermally stratified and movements limited to homothermous epilimnion, above 10 m, and to region of steeply sloping bottom, usually <100 m from shore.

FWI; BIOSIS 63036492; AQUAREF 27230; Kerr 1993.

Stizostedion vitreum/Canada/Manitoba/West Blue L./Movements.

—. 1978. Diel rhythm in activity of walleye, *Stizostedion vitreum vitreum*. *J. Fish Biol.* 12(6): 593-599.

Move generally along shore, mostly within 100 m, and were relatively inactive during day. Activity, probably associated with feeding, increased at sunset and sunrise.

FWI; AQUAREF 39754; Kerr 1993.

Stizostedion vitreum/Food/Movements.

Kerr, S. J. 1993. A bibliography of selected fish habitat protection guidelines and references. Volume 1: Aquatic habitat. Volume 2: Impacts of activities on aquatic habitat. *Ont. Min. Nat. Resour. Publ.* 50408 & 50408-1: iv + 187; iv + 159.

[WordPerfect diskette of bibliography with each volume].

Very extensive bibliography. Citations listed under subject headings. Vol.1 includes "reservoirs", "lake trout", "northern pike", "walleye & sauger" and "whitefish". Vol.2 includes "aquatic vegetation control", "buffers & setbacks", "cottage development", "dams and impoundments", "docks & boathouses", "erosion & sedimentation", "forestry & logging practices", "shoreline alterations", "water level/flow fluctuations" and "waterpower developments" .

FWI.

Bibliographies/Coregonus clupeaformis/Esox lucius/Salvelinus namaycush/Stizostedion vitreum/Reservoirs/Forestry/Water Level/Water Flow/Sedimentation/Shoreline Development.

- Kerr, S. R. 1979. Prey availability, metaphoetesis, and the size structures of lake trout stocks. *Invest. Pesq.* 43(1): 187-198.  
Model suggests size compositions of stocks determined by availability of prey types and fishing mortality.  
FWI; AQUAREF 44651.  
Salvelinus namaycush/Fisheries/Model/Food/Productive Capacity/Survival.
- Kiell, D. J. 1982. Development of a reservoir preparation strategy. *Can. Water Resour. J.* 7(2): 112-131.  
Exercise to determine effective reservoir preparation strategy made during Upper Salmon Project in Newfoundland. Predicted changes in littoral zone development, water quality and fisheries considered. Cost of forest clearing in relation to benefits discussed.  
FWI; Ploskey 1982.  
Reservoirs/Flooding/Canada/Newfoundland/Upper Salmon R./Mitigation.
- Kitchell, J. F., M. G. Johnson, C. K. Minns, K. H. Loftus, L. Grieg, and C. H. Oliver. 1977. Percid habitat: the river analogy. *J. Fish. Res. Board Can.* 34(10): 1936-1940.  
Optimum habitat of percids, including walleye, in lakes may be defined by the littoral and sublittoral environmental conditions equivalent to those in large, temperate rivers. Evolutionary origins and reproductive patterns also reflect their riverine ancestral habitat.  
FWI; AQUAREF 311140; ASFA 7005630.  
Stizostedion vitreum/Reproduction/Habitat Use/Temperature.
- Koonce, J. F., T. B. Bagenal, R. F. Carline, K. E. F. Hokanson, and M. Nagiec. 1977. Factors influencing year-class strength of percids: a summary and a model of temperature effects. *J. Fish. Res. Board Can.* 34(10): 1900-1909.  
[Also issued by NTIS as PB 276 242/2].  
*Stizostedion* and *Perca* reviewed. Index of water temperature regime correlates well with year-class strength of walleye in many waters of North America. Explained on basis of probabilistic model.  
FWI; NTIS 630973.  
*Stizostedion vitreum*/Model/Temperature.
- Koonce, J. F., and B. J. Shuter. 1987. Influence of various sources of error and community interactions on quota management of fish stocks. *Can. J. Fish. Aquat. Sci.* 44(Suppl.2): 61-67.  
Comparison of fishery control systems based on population and surplus production models. Walleye fishery of western Lake Erie used as illustration.  
FWI; ASFA 1709302.  
*Stizostedion vitreum*/Great Lakes/Model/Productive Capacity/Fishery Management.
- Koshinsky, G. D. 1973. The limnology-fisheries of the outlet lakes area: present conditions and implications of hydroelectric development. *Lake Winnipeg, Churchill and Nelson Rivers Study Board, Canada-Manitoba, 1971-'75. Technical Report, Appendix 5, Vol.2.A: ix + 156 p.*  
Study of Playgreen, Kiskittogisu, Kiskitto and Cross lakes. Whitefish, walleye and pike present. Domestic gillnet fisheries, mostly for whitefish, in Cross and Little Playgreen lakes. Commercial fish production averages 560,000 lb annually over all lakes. Playgreen produces over half. Impacts expected include increased productivity in Kiskittogisu Lake. Reduced productivity in Playgreen

due to increased turbidity. Adverse effect on reproduction of pike and walleye expected. Significant new fishery habitat in Jenpeg forebay and tailwater areas. Forecasts slight decline in fish production followed by slight increase. FWI (N/Lak1 A.5 Pt.2).

Coregonus clupeaformis/Esox lucius/Canada/Manitoba/Playgreen L./Kiskittogisu L./Kiskitto L./Cross L./Fisheries/Hydroelectric Development.

Kristenson, J. 1979. *Walleye studies in the Peace-Athabasca Delta, 1978.*

Edmonton, AB: LGL Limited for Fisheries Subcommittee, Peace-Athabasca Delta Monitoring Committee. vii + 54 p.

Study of spawning areas of walleye in delta and compares significance with those in Richardson Lake. Characteristics of walleye in different areas of delta compared. Commercial fisheries in different areas discussed. Richardson Lake walleye not overexploited.

FWI (MLA/Kri4); WAVES 90886.

Stizostedion vitreum/Canada/Alberta/Peace-Athabasca Delta/Richardson L./Spawning/Fisheries.

Kristenson, J., and S. A. Summers. 1978. Fish populations in the

Peace-Athabasca Delta and the effects of water control structures on fish movements. *Can. Fish. Mar. Serv. Manuscr. Rep.* 1465: vi + 62 p.

Tagged goldeye and walleye moved between delta and Athabasca River. Whitefish remained in delta from year to year. Number of whitefish, pike and walleye present in delta waters estimated. Movements of fish past Little Rapids weir and fishway studied.

FWI; WAVES; Ebbers et al. 1988.

Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Alberta/Peace-Athabasca Delta/Movements.

—. 1981. Fish populations in the Peace-Athabasca Delta and the effects of water control structures on fish movements. *Can. Fish. Mar. Serv. Data Rep.* 61: iv + 216 p.

Tabulations of fish data used in Kristenson & Summers (1978).

FWI; WAVES.

Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Alberta/Peace-Athabasca Delta/Movements.

Lehman, J. 1986. Raising the level of a subarctic lake, p.317-330. In G. H. Orians (ed.) *Ecological knowledge and environmental problem solving: concepts and case studies.* Washington, DC: National Academy Press.

A case study of the effects of raising the level of SIL by 3 m in 1976. Flow through lake reduced by 75% as waters were diverted. Some of predictions on the effects were wrong. Disparities between predictions and outcomes analyzed so that future projects will be based on better models.

FWI (JE/Eco2); Bodaly 2130.

Canada/Manitoba/Southern Indian L./Flooding/Water Flow/Hydroelectric Development.

Liaw, W. K. 1978. Jackfish and Murray lakes - environmental changes and whitefish populations. *Sask. Fish. Wildl. Branch Fish. Tech. Rep.* 78-5: [vii] + 97 p.

Jackfish Lake water levels higher since dam constructed in 1966. Cottage development around lake and agricultural practices in watershed resulted in increase silt loadings and slight increase in TDS. Standing crop of benthos increased 3 times. Murray Lake less affected by cottages and agriculture.

Whitefish, walleye and cisco declined in Jackfish Lake after 1955. Pike increased. In Murray Lake all fish increased except whitefish. Commercial whitefish fisheries operate on both lakes and current quotas exceed sustainable levels.

FWI; WAVES 64931.

Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/  
Saskatchewan/Jackfish L./Murray L./Water Level/Sedimentation/Fishery  
Management/Shoreline Development.

—. 1979. Trends in whitefish fisheries in Saskatchewan. *Sask. Fish. Wildl. Branch Fish. Tech. Rep.* 79-4: [iv] + 45 p.

[Cover title: Whitefish fisheries in Saskatchewan].

In undeveloped fishery rough measure of resource can be obtained using Ryder's MEI or data from test nettings and production records of similar lakes in same area. As fishery develops catch and effort data collected and used to estimate maximum sustainable yield. Based on this and long term trends in fishery proper quotas established. Quotas need to be examined periodically in light of trends in catches. Quota must protect stock during years of poor recruitment.

FWI; WAVES 64866.

Coregonus clupeaformis/Fishery Management/Morphoedaphic Index.

—. 1986. Fishery and limnology of four lakes west of Sandy Bay. *Sask. Fish. Branch Fish. Tech. Rep.* 86-2: viii + 94 p.

Recommends use of smaller mesh nets in fishery which includes whitefish, walleye and pike. Separate species quotas for each lake proposed. Water levels regulated by dams.

FWI; WAVES 92978.

Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/  
Saskatchewan/Reeds L./Guilloux L./Pikoo L./Sokatisewin L./Fishery  
Management/Water Level.

Liu, K. M., and A. L. Jensen. 1993. Simulation of population regulation in lake whitefish, *Coregonus clupeaformis*. *J. Fish. Soc. Taiwan* 20(2): 153-165.

Bioenergetic model coupling Larkin's predator-prey model, Ursin's bioenergetic growth model, Ivlev's feeding equation and exponential mortality model used to simulate whitefish fishery. Examines population compensation processes, random food concentrations, age specific mortality, size dependent recruitment and maturity.

BIOSIS 96134803.

Coregonus clupeaformis/Great Lakes/Model/Fisheries/Survival/Food.

Lyons, J. D. 1984. *Walleye predation, yellow perch abundance, and the population dynamics of an assemblage of littoral-zone fishes in Sparkling Lake, Wisconsin*. Ph.D. Dissertation, University of Wisconsin, Madison, WI. 205 p.

[UMI Order No. AAD85-00833].

Bioenergetic model used to quantify impact of walleye predation on littoral-zone fishes in northern Wisconsin lake.

Diss.Abstr.Int. 46B(2): 407.

Stizostedion vitreum/USA/Wisconsin/Sparkling L./Model/Food.

Lyons, J. D., and J. J. Magnuson. 1987. Effects of walleye predation on the population dynamics of small littoral-zone fishes in a northern Wisconsin lake. *Trans. Am. Fish. Soc.* 116(1): 29-39.

Bioenergetic model used to assess effect of predation by juvenile walleye on darters and minnows in Sparkling Lake.

FWI; ASFA 1658832.

Stizostedion vitreum/USA/Wisconsin/Sparkling L./Food/Model/Juveniles.

**MacDonald, D. G.** 1965. Lake Athabasca in Alberta. *Alberta Fish and Wildlife Division*: [iii] + 83 + [10] p.

Study made before Bennett Dam affected water levels. Reviews history of commercial fishery of Lake Athabasca, Richardson Lake and Lake Claire-Lake Mamawi. Potential of fisheries for walleye, whitefish, pike and lake trout discussed. Special problems including walleye escapement from Richardson Lake covered. Quotas recommended for walleye and pike. Closed areas, mesh size limits, as well as further studies necessary.

FWI (MLA/MacD2); WAVES 64027.

Coregonus clupeaformis/Esox lucius/Salvelinus namaycush/Stizostedion vitreum/Canada/Alberta/Richardson L./Athabasca, L./Peace-Athabasca Delta/Water Level/Fisheries.

**Macdonald, J. S., G. Miller, and R. A. Stewart.** 1988. The effects of logging, other forest industries and forest management practices on fish: an initial bibliography. *Can. Tech. Rep. Fish. Aquat. Sci.* 1622: 212 p.

Covers water quality, stream channel morphology, streamflow, water supply, forest soils, forest fires, climate, toxicology and pollution.

FWI; WAVES 106934.

Logging/Bibliographies/Water Flow/Fisheries.

**Machniak, K.** 1975A. The effects of hydroelectric development on the biology of northern fishes (reproduction and population dynamics). I. Lake whitefish, *Coregonus clupeaformis* (Mitchill): a literature review and bibliography. *Can. Fish. Mar. Serv. Tech. Rep.* 527: iv + 67 p.

Review, including European literature, of spawning and early life history. Usually spawn in <5 m on boulders or coarse stones. Stream spawning forms spawn earlier than lake spawners. Outlines hazards associated with impoundments.

FWI; WAVES 52261; AQUAREF 24570; Bodaly 1006; Kerr 1993.

Coregonus clupeaformis/Literature Reviews/Bibliographies/Hydroelectric Development/Spawning/Reservoirs.

—. 1975B. The effects of hydroelectric development on the biology of northern fishes (reproduction and population dynamics). II. Northern pike, *Esox lucius* (Linnaeus): a literature review and bibliography. *Can. Fish. Mar. Serv. Tech. Rep.* 528: iii + 67 p.

Review, including European literature, of reproduction and population biology. Hazards to successful spawning in nature and reservoirs outlined. Usually spawn in <50 cm of water.

FWI; WAVES 52262; AQUAREF 24569; BNT 438871; Bodaly 1007; Kerr 1993.

Esox lucius/Spawning/Literature Reviews/Bibliographies/Hydroelectric Development/Reservoirs.

—. 1975C. The effects of hydroelectric development on the biology of northern fishes (reproduction and population dynamics). III. Yellow walleye, *Stizostedion vitreum vitreum* (Mitchill): a literature review and bibliography. *Can. Fish. Mar. Serv. Tech. Rep.* 529: iv + 68 p.

Review, including European literature, of spawning and early life history. Commonly spawn in riffles of streams or along lake shorelines. Prefer clean

gravel at depths of <1.5 m. Appear to be less influenced by water level changes than other shallow water spawners. Siltation of spawning beds major cause of spawning failure in impoundments.

**FWI; WAVES 58359; SQUAREF 24568; Bodaly 1008; Ebbers et al. 1988; Kerr 1993.**  
Stizostedion vitreum/Literature Reviews/Bibliographies/Hydroelectric Development/Spawning/Reservoirs.

———. 1975D. The effects of hydroelectric development on the biology of northern fishes (reproduction and population dynamics). IV. Lake trout, *Salvelinus namaycush* (Walbaum): a literature review and bibliography. *Can. Fish. Mar. Serv. Tech. Rep.* 530: iv + 52 p.

Review, including European literature, of lake trout biology and effects of hydroelectric development. Usually spawn in clean gravel at variety of depths. Artificial spawning beds show some success.

**FWI; WAVES 52264; SQUAREF 24567; Bodaly 1009; Kerr 1993.**

*Salvelinus namaycush*/Spawning/Literature Reviews/Bibliographies/Hydroelectric Development/Artificial Substrates/Reservoirs.

**Macins, V.** 1981. Walleye, *Stizostedion vitreum vitreum*, spawning bed rehabilitation. *Ont. Min. Nat. Resour. Lake of the Woods Fish. Assess. Unit Rep.* 5 p.

**Kerr 1993.**

*Stizostedion vitreum*/Canada/Ontario/Lake of the Woods/Spawning.

**Madenjian, C. P.** 1991. Limits to growth of young-of-the-year walleye, *Stizostedion vitreum vitreum*, an individual-based model perspective. *Can. J. Fish. Aquat. Sci.* 48(8): 1492-1499.

Model accurately describes variation in growth shown between cohorts from Oneida Lake (New York) and western Lake Erie.

**FWI.**

*Stizostedion vitreum*/USA/New York/Oneida L./Great Lakes/Model/Growth.

**Magnuson, J. J., J. D. Meisner, and D. K. Hill.** 1990. Potential changes in the thermal habitat of Great Lakes fish after global climate warming. *Trans. Am. Fish. Soc.* 119(2): 254-264.

Changes in size of thermal habitat for cold-, cool- and warm-water fish estimated in Lake Michigan and Lake Erie. Lake trout considered and minimal change forecast. Walleye minimum thermal habitat should decrease.

**FWI; ASFA 2309698.**

*Stizostedion vitreum*/*Salvelinus namaycush*/Great Lakes/Model/Climate Change/Temperature.

**Marcus, M. D., W. A. Hubert, and S. H. Anderson.** 1982. Habitat suitability index models: lake trout (exclusive of the Great Lakes). *U.S. Fish Wildl. Serv. Rep. FWS/OBS-82-10.84*: vi + 12 p.

[NTIS Report PB85-135028/XAD].

Identifies habitat variables important for species.

**FR 85-435; NTIS 2413153; Kerr 1993.**

*Salvelinus namaycush*/Model/Habitat Suitability Index.

**Marshall, K. E.** 1978. A bibliography of the lake trout, *Salvelinus namaycush* (Walbaum), 1970-1977. *Can. Fish. Mar. Serv. Tech. Rep.* 799: iv + 11 p.

Some 170 references listed. Subject and geographic indexes provided.

**FWI; Kerr 1993.**

*Salvelinus namaycush*/Bibliographies.

Marshall, K. E., and J. J. Keleher. 1970. A bibliography of the lake trout, *Cristivomer namaycush*, 1929-1969. *Fish. Res. Board Can. Tech. Rep.* 176: iv + 60 p.

Contains 475 references. Subject and geographic indexes provided.

FWI; Kerr 1993.

*Salvelinus namaycush*/Bibliographies.

Marshall, K. E., and M. Layton. 1985. A bibliography of the lake trout, *Salvelinus namaycush* (Walbaum), 1977 through 1984. *Can. Tech. Rep. Fish. Aquat. Sci.* 1346: iv + 15 p.

Almost 300 references listed. Subject and geographic indexes provided.

FWI.

*Salvelinus namaycush*/Bibliographies.

Marshall, K. E., M. Layton, and C. Stobbe. 1990. A bibliography of the lake trout, *Salvelinus namaycush* (Walbaum), 1984 through 1990. *Can. Tech. Rep. Fish. Aquat. Sci.* 1749: iv + 25 p.

Some 320 references listed. Subject and geographic indexes provided.

FWI.

*Salvelinus namaycush*/Bibliographies.

Marshall, T. R. 1977. Morphological, physiological, and ethological differences between walleye (*Stizostedion vitreum vitreum*) and pikeperch (*S. lucioperca*). *J. Fish. Res. Board Can.* 34(10): 1515-1523.

Literature review shows that pikeperch are generally more tolerant than walleye of wide range of environmental sources of stress, such as organic pollution, sedimentation, and fluctuating water levels. Increased reproductive success may be due to ritualistic redd building and guarding behaviour of pikeperch which results in consistently successful rate of fertilization and lower mortality of eggs and larvae.

FWI; SQUAREF 31097; Ebbers et al. 1988.

*Stizostedion vitreum*/*Stizostedion lucioperca*/Spawning/Survival/Water Level/Sedimentation/Literature Reviews.

Martin, N. V. 1955. The effect of drawdowns on lake trout reproduction and the use of artificial spawning beds. *Trans. N. Am. Wildl. Conf.* 20: 263-271.

Lowering water level before spawning of limited value since there may not be good spawning areas available. When spawning takes place in unfavourable places egg loss high. Problems identified in attracting fish to spawn in artificially created suitable areas in Shirley Lake.

FWI; Bodaly 1043; Olver & Martin 1984; Kerr 1993.

*Salvelinus namaycush*/Canada/Ontario/Algonquin Park/Drawdown/Spawning/Artificial Substrates.

—. 1957. Reproduction of lake trout in Algonquin Park, Ontario. *Trans. Am. Fish. Soc.* 86: 231-244, 1956.

Water level drawdown in late fall and winter may expose some eggs and make large areas of potential spawning beds unavailable. Fry leave spawning beds by late May.

FWI; Machniak 1975C; Olver & Martin 1984; Bodaly 1045; Kerr 1993.

*Salvelinus namaycush*/Canada/Ontario/Algonquin Park/Drawdown/Spawning.

- . 1960. Homing behaviour in spawning lake trout. *Can. Fish Cult.* 26: 3-6. Artificial spawning beds constructed below limit of drawdown. One, near previously used spawning site, was used. Two others were not. Various means of attracting fish to new beds tried, including moving rocks from old spawning beds and penning ripe fish over new bed.  
FWI; Machniak 1975C; Olver & Martin 1984; Kerr 1993.  
Salvelinus namaycush/Canada/Ontario/Algonquin Park/Spawning/Artificial Substrates/Movements.
- Martin, N. V., and F. E. J. Fry. 1973. Lake Opeongo: the ecology of the fish community and of man's effects on it. *Great Lakes Fish. Comm. Tech. Rep.* 24: 34 p.  
Drawdown in fall, usually <1 m, little effect on fall spawning fish. Sport fishery for lake trout discussed. Whitefish present.  
FWI; WAVES 72785; Machniak 1975C; Olver & Martin 1984.  
Coregonus clupeaformis/Salvelinus namaycush/Canada/Ontario/Algonquin Park/Opeongo L./Drawdown/Spawning/Sport Fishing.
- Martin, N. V., and C. H. Olver. 1980. The lake charr, *Salvelinus namaycush*, p.205-277. In E. K. Balon (ed.) *Charrs, salmonid fishes of the genus Salvelinus*. The Hague, The Netherlands: Dr W. Junk.  
Extensive review of all aspects of its biology including anatomy, reproduction, life history, ecology and population dynamics.  
FWI (MLA/Bal2); Kerr 1993.  
Salvelinus namaycush/Literature Reviews.
- McCarragher, D. B., and R. E. Thomas. 1972. Ecological significance of vegetation to northern pike, *Esox lucius*, spawning. *Trans. Am. Fish. Soc.* 101(3): 560-563.  
Detailed study of lakes in Nebraska to find preference for different types of vegetation. Flooded prairie grasses held highest densities of eggs.  
FWI; Bodaly 1130; Kerr 1993.  
Esox lucius/USA/Nebraska/Spawning/Habitat Use/Flooding.
- McConnell, W. J., E. P. Bergersen, and K. L. Williamson. 1982. Habitat suitability index models: a low effort system for planned coolwater and coldwater reservoirs. *U.S. Fish Wildl. Serv. Rep.* FWS/OBS-82/10.3: 47 p.  
Technique described for measuring reservoir habitat suitability based on composite score for 5 primary attributes (temperature, turbidity, non-living cover, drawdown and shallow cove frequency).  
FWI; Kerr 1993.  
Reservoirs/Model/Habitat Suitability Index/Temperature/Drawdown.
- McGovern, S. P. 1983. *An annotated bibliography on: the effects of water-level fluctuations in lakes and reservoirs on walleye, Stizostedion vitreum, northern pike, Esox lucius, and lake whitefish, Coregonus clupeaformis, populations.* Winnipeg, MB: University of Manitoba, Natural Resources Institute. 22 p.  
Kerr 1993.  
Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Bibliographies/Water Level/Reservoirs.



McGuire, S. 1980. Mesomikenda Lakes - fishery rehabilitation project 1980. *Ont. Min. Nat. Resour. Rep.* 61 p.

Ebbers et al. 1988.

*Stizostedion vitreum/Canada/Ontario/Mesomikenda L./Age/Growth/Water Level.*

McMahon, T. E., J. W. Terrell, and P. C. Nelson. 1984. Habitat suitability information: walleye. *U.S. Fish Wildl. Serv. Rep. FWS/ OBS-82/10.56:* vii + 43 p.

HSI models aid in identifying important habitat variables.

FWI; WAVES 115439; SFA 29(3); Kerr 1993.

*Stizostedion vitreum/Habitat Suitability Index.*

McMurtry, M. J. 1986. Susceptibility of lake trout (*Salvelinus namaycush*) spawning sites in Ontario to acidic meltwater. *Ontario Fisheries Acidification Report Series* 86-01: 14 p.

Survey to determine which spawning sites were susceptible. Many of spawning sites in <2 m, <10 m from shore and within 20 m of an inlet. Over half in positions susceptible to acidic meltwater.

AQUAREF 97860.

*Salvelinus namaycush/Canada/Ontario/Spawning/Acid Precipitation.*

McTavish, W. B. 1953. A biological investigation of Southern Indian Lake, summer 1952. *Manit. Fish. Branch MS Rep.* 97 p.

Description of lake long before diversion shows excellent quality whitefish present. Commercial fishing averages 800,000 lb/yr. Walleye and pike in good condition.

Bodaly 1161.

*Coregonus clupeaformis/Esoc lucius/Stizostedion vitreum/Canada/Manitoba/Southern Indian L./Fisheries.*

Miller, R. B., and M. J. Paetz. 1959. The effects of power, irrigation and stock water developments on the fisheries of the South Saskatchewan River. *Can. Fish Cult.* 25: 12-26.

Lake Minnewanka has annual drawdown of 35 ft exposing littoral zone where benthos does not become established. Lake trout fishery declined after impoundment. Suggested that fish cannot find forage fish to feed upon. Whitefish introduced to provide forage. Lake trout spawn at great depths below drawdown levels. In Ghost Lake reservoir lake trout introduced but only caught in silt free area near mouth of Ghost River. McGregor Reservoir supports commercial whitefish fishery and also contains pike. Drawdown of 15 ft reduces area by 40%. Chin Lake reservoir dammed in early 1900s supports occasional commercial fishery for whitefish and pike. Level being raised and severe drawdowns of 54 ft reducing area by 50% expected to reduce fish production. Management of such reservoirs discussed.

FWI; Machniak 1975B C & D; Bodaly 1076; Addison & Ryder 1970; Baxter & Glaude 1980; Kerr 1993.

*Esoc lucius/Salvelinus namaycush/Canada/Alberta/Minnewanka, L./Ghost L./Chin L./McGregor Reservoir/Fisheries/Water Level/Productive Capacity/Reservoirs/Food.*

Milliman, S. R., A. P. Grima, and C. J. Walters. 1987. Policy making within an adaptive management framework, with an application to lake trout (*Salvelinus namaycush*) management. *Can. J. Fish. Aquat. Sci.* 44 (Suppl.2): 425-430.

Lake trout rehabilitation in Great Lakes used as example of policy design process known as "adaptive management". Combined with basic concepts of natural resource economics this example is used to outline how a policy which most likely maximizes socio-economic gains can be chosen.

**FWI;** FR 33(3).

Salvelinus namaycush/Fishery Management/Model/Socio-economic Aspects.

**Minns, C. K., and J. E. Moore.** 1992. Predicting the impact of climate change on the spatial pattern of freshwater fish yield capability in eastern Canadian lakes. *Clim. Change* 22(4): 327-346.

Equations of fish yield in lakes as a function of mean air temperature exist for whitefish, walleye and pike. Using modelling features of a GIS, maps prepared using global climate model. Substantial spatial re-distribution of fishery capabilities forecast.

**FWI;** ASFA 2865868.

Stizostedion vitreum/Esox lucius/Coregonus clupeaformis/Fisheries/Model/Climate Change/Productive Capacity/Temperature.

**Mohr, L. C., and J. A. W. Kirton.** 1986. Fish population data from Sipiwesk and Cross lakes, 1985. *Manit. Fish. Branch MS Rep.* 86-28: 83 p.

Analysis of samples collected in 1985 includes maturity, mortality, survival rate estimates, effect of mesh size on CUE and population structure. Whitefish, walleye and pike present.

**NFA** 1987.

Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Cross L./Sipiwesk L./Fisheries.

**Moncrieff Montgomery & Associates Ltd.** 1971. *A socio-economic study of Fort Chipewyan, the Peace-Athabasca Delta and the Lake Athabasca region.* Edmonton, AB: Moncrieff, Montgomery & Associates Ltd. 128 p.

Study made to counteract adverse effects of low water levels caused by Bennett Dam on fur and fish economy of Fort Chipewyan community. Discusses past and present economic patterns, including fishing. Recommends socio-economic improvement through combination of social assistance and development of employment, economic diversity and vocational opportunity.

**BNT** 397458.

Canada/Alberta/Peace-Athabasca Delta/Socio-economic Aspects/Fisheries.

**Mosindy, T.** 1987. Lake trout studies, Clearwater Bay, Lake of the Woods, 1984-1987. *Ont. Min. Nat. Resour. Lake of the Woods Fish. Assess. Unit Rep.* 1987:02: 44 p.

Shoreline development caused increased growth of algae and sedimentation on shoals used as spawning beds.

**FWI;** WAVES 107330.

Salvelinus namaycush/Canada/Ontario/Lake of the Woods/Spawning/Shoreline Development.

**Murray, A. R.** 1978. Critique of reports of the Institute for Northern Studies and Churchill River Studies for the Churchill River Board of Inquiry. *Sask. Dep. N. Sask. Fish. Div. Fish. Manuscr. Rep.* 2: [iv] + 41 p.

Inquiry reviewed social, economic and environmental implications of reservoir at Wintego Rapids on Churchill River. INS report criticised reports submitted to inquiry and this report comments on those criticisms. Effects of impoundment on whitefish infestation with *Triaenophorus* discussed. Food of

pike, walleye and lake trout in area of proposed reservoir tabulated. Use of MEI discussed in relation to commercial fisheries.

FWI; WAVES 65347.

*Coregonus clupeaformis*/*Salvelinus namaycush*/*Esox lucius*/*Stizostedion vitreum*/  
Canada/Saskatchewan/Wintego Reservoir/Morphoedaphic Index/Parasites/  
Reservoirs/Food.

**Newburg, H.** 1975. Evaluation of an improved walleye (*Stizostedion vitreum*) spawning shoal with criteria for design and placement. *Minn. Dep. Nat. Resour. Div. Game Fish Invest. Rep.* 340: 39 p.

Artificial spawning reefs constructed in Rainy Lake in attempt to restore declining fishery.

Ebbers et al. 1988; Cohen & Radomski 1993; Kerr 1993.

*Stizostedion vitreum*/USA/Minnesota/Rainy L./Artificial Substrates/Spawning/  
Fishery Management.

**Northern Flood Agreement.** 1987. Annotated bibliography for Churchill-Nelson river diversion region. *Northern Flood Agreement Manitoba, Ecological Report Series 87-1*: 15 p. + appendices.

An extensive listing of references under broad subject headings dealing with area. References usually annotated and locations of most are given. Includes unpublished reports prepared for Manitoba Hydro.

FWI; WAVES 111919.

Bibliographies/Canada/Manitoba/Southern Indian L./Hydroelectric  
Development/Fisheries.

**O'Connor, J. F.** 1982. Changes in the characteristics of the Playgreen Lake whitefish (*Coregonus clupeaformis*) population: 1975-1981. *Manit. Fish. Branch MS Rep.* 82-16: ix + 64 p.

Data collected during commercial sampling program evaluated to see if any changes had occurred which could be directly attributed to opening of 2-Mile Channel. Mean weight of fish in commercial catch decreased 35% and growth rates also decreased.

FWI; WAVES 115955; NFA 1987.

*Coregonus clupeaformis*/Canada/Manitoba/Playgreen L./Fisheries/Hydroelectric  
Development.

**Oglesby, R. T., J. H. Leach, and J. Forney.** 1987. Potential *Stizostedion* yield as a function of chlorophyll concentration with special reference to Lake Erie. *Can. J. Fish. Aquat. Sci.* 44(Suppl.2): 166-170.

Models for predicting potential fish yields from indices of productivity or standing crop at a lower trophic level have proved most reliable when applied to a specific fish association. Walleye yield from Lake Erie plotted against chlorophyll concentration is curve showing maximum catch of 10 kg/ha/yr when chlorophyll between 7.5 and 12.5 mg/m<sup>3</sup>.

FWI; ASFA 1709456.

*Stizostedion vitreum*/Great Lakes/Model/Productive Capacity/Fishery  
Management.

**Olver, C. H., and N. V. Martin.** 1984. A selective bibliography of the lake trout, *Salvelinus namaycush*, 1784-1892. *Ont. Fish. Tech. Rep. Ser.* 12: iii + 109 p.

Contains 1900 references. Subject index includes headings "impoundments" and "water levels". Lists many Ontario Ministry of Natural Resources internal reports.

**FWI;** Kerr 1993.

Salvelinus namaycush/Bibliographies.

**Osborn, T. C., D. B. Ernst, and D. H. Schupp.** 1981. The effects of water levels and other factors on walleye and northern pike reproduction and abundance in Rainy and Namakan Reservoirs. *Minn. Dep. Nat. Resour. Sect. Fish. Invest. Rep.* 374: 32 p.

No positive relationship found between mean spring water levels in Namakan Reservoir and fish abundance. Rising levels in May may benefit pike populations. Walleye population increased but growth rates decreased.

**FWI;** WAVES 767; Crossman & Casselman 1987; Ebbers et al. 1988; Kerr 1993. Stizostedion vitreum/Esox lucius/USA/Minnesota/Rainy L./Namakan Reservoir/Water Level/Reservoirs.

**Patalas, J. W.** 1984A. Fish population data from Sipiwesk, Split and Stephens lakes, 1983. *Manit. Fish. Branch MS Rep.* 84-24: 66 p.

Growth rates of whitefish, pike, sauger and walleye described to provide database for future management programs.

NFA 1987.

Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Sipiwesk L./Split L./Stephens L./Fishery Management/Growth.

—. 1984B. Fish population data from Notigi, Wapisu, Threepoint and Footprint lakes, 1983. *Manit. Fish. Branch MS Rep.* 84-25: 70 p.

Growth rates of whitefish, pike, sauger and walleye described to provide database for future management programs.

NFA 1987.

Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Notigi L./Wapisu L./Threepoint L./Footprint L./Fishery Management/Growth.

**Payer, R. D., D. L. Pereira, M. L. Larson, J. A. Younk, R. V. Frie, D. H. Schupp, and T. C. Osborn.** 1987. Status and simulation model of Lake of the Woods, Minnesota, walleye fishery. *Minn. Dep. Nat. Resour. Sect. Fish. Invest. Rep.* 389: 160 p.

Population stabilized since 1986-70 when it had limited number of year-classes. Now 5-6 abundant year-classes. Water levels high after 1973 coinciding with entry of large 1966 year-class into fishery. Open water angling pressure increased in both Minnesota and Ontario.

**FWI;** WAVES 102632.

Stizostedion vitreum/USA/Minnesota/Canada/Ontario/Lake of the Woods/Fisheries/Sport Fishing/Water Level.

**Peace-Athabasca Delta Project Group.** 1972. The Peace-Athabasca Delta Project - a Canadian resource: a report on low water levels in Lake Athabasca and their effects on the Peace-Athabasca Delta. [Edmonton, AB]: The Group. 144 p.

[Cover bears subtitle "Summary report"].

Fish resources, including walleye and pike discussed. Income of local people from fishing tabulated. Effect of low water levels on walleye and lake trout summarized. Remedial measures discussed.

**FWI (JE/Pea);** Baxter & Glaude 1980.

Salvelinus namaycush/Stizostedion vitreum/Canada/Alberta/Peace-Athabasca Delta/Spawning/Socio-economic Aspects/Fisheries/Mitigation/Water Level.

—. 1973. The Peace-Athabasca Delta Project. Technical report: a report on low water levels in Lake Athabasca and their effects on the Peace-Athabasca Delta. [Edmonton, AB]: The Group. 176 p.

Annual fish harvest of whitefish, pike, walleye and lake trout tabulated. Migration of adult and YOY walleye into and out of Richardson Lake area shown. Effects of changes in water level on all species discussed with special emphasis on spawning success of lake trout in Lake Athabasca. Socio-economic aspects of fisheries in area outlined.

FWI (JEL/Pea1); Baxter & Glaude 1980.

Coregonus clupeaformis/Esox lucius/Salvelinus namaycush/Stizostedion vitreum/Canada/Alberta/Peace-Athabasca Delta/Athabasca, L./Richardson L./Spawning/Movements/Socio-economic Aspects/Fisheries/Mitigation/Water Level.

Peckham, R. D. 1979. Evaluation of interior Alaska waters and sport fish with emphasis on managed waters - Delta District. *Alaska Dep. Fish Game Fed. Aid Fish Restor. Job Segment Rep.* G-III-I: 87-114.

George Lake supports pike sport fishery. MEI for lakes in area presented.

FWI; WAVES 74625.

Esox lucius/USA/Alaska/Morphoedaphic Index/Fishery Management.

Penn, A. F. 1975. Development of James Bay: the role of environmental impact assessment in determining the legal right to an interlocutory injunction. *J. Fish. Res. Board Can.* 32(1): 136-160.

Discusses legal problems in dealing with scientists' statements which may not provide clear statements about likelihood of specific impacts.

FWI; Machniak 1975C.

Canada/Quebec/James Bay/Hydroelectric Development/Legal Aspects/Impact Assessment.

Pepin, S. 1988. *Validation des lectures d'age et croissance en longueur du dore jaune, Stizostedion vitreum (Mitchill), dans le reservoir Gouin. Validation of age and linear growth determinations in the walleye, Stizostedion vitreum (Mitchill), in the Gouin Reservoir.* Quebec, PQ: Quebec Ministere du Loisir, de la Chasse et de la Peche. ix + 49 p. [In French].

Study to determine which bone is most reliable for age determination in this reservoir. Scales, operculum and spiny ray sections of dorsal fin used.

WAVES 110905.

Stizostedion vitreum/Canada/Quebec/Gouin Reservoir/Reservoirs/Age/Methods/Growth.

Peters, J. C. 1986. Enhancing tailwater fisheries, p.278-285. In G. E. Hall and M. J. Van Den Avyle (ed.) *Reservoir fisheries management: strategies for the 80's*. Bethesda, MD: American Fisheries Society.

State-of-the-art for managing tailwater fisheries assessed and deficiencies identified.

FWI (NFL/Ha11).

Reservoirs/Fishery Management/Water Flow.

Ploskey, G. R. 1982. Fluctuating water levels in reservoirs: an annotated bibliography of environmental effects and management for fisheries. *U.S. Army Corps Eng. Waterways Exp. Sta. Vicksburg Tech. Rep.* E-82-5: 134 + 8 p.

WAVES 105282.

Bibliographies/Water Level/Reservoirs/Fisheries.

—. 1983. A review of the effects of water-level changes on reservoir fisheries and recommendations for improved management. *U.S. Army Corps Eng. Waterways Exp. Sta. Vicksburg Tech. Rep. E-83-3*: 83 p.

Ploskey 1986.

Reservoirs/Water Level/Fisheries/Bibliographies.

—. 1985. Impacts of terrestrial vegetation and preimpoundment clearing on reservoir ecology and fisheries in the United States and Canada. *FAO Fish. Tech. Pap. 258*: v + 35 p.

[Cover title: Impacts of preimpoundment clearing on reservoir ecology and fisheries in the United States and Canada].

Review covers more warm water reservoirs than northerly ones. Outlines policies in USA and Canada for clearing.

**FWI**; WAVES 13722; Bodaly 2111; Kerr 1993.

Reservoirs/Literature Reviews/Canada/USA/Fisheries/Mitigation.

—. 1986. Effects of water-level changes on reservoir ecosystems, with implications for fisheries management, p.86-97. In G. E. Hall and M. J. Van Den Avyle (ed.) *Reservoir fisheries management: strategies for the 80's*. Bethesda, MD: American Fisheries Society.

Reviews literature dealing with effects on aquatic biota. Optimum regime is drawdown in late summer/fall, flood vegetation in spring and maintain high levels during growing season.

**FWI (NFL/Hall)**.

Reservoirs/Fishery Management/Literature Reviews/Water Level.

Pollock, K. H., and R. H. K. Mann. 1983. Use of an age-dependent mark-recapture model in fisheries research. *Can. J. Fish. Aquat. Sci.* 40(9): 1449-1455.

Data from study of pike in Dorset, England, used with Jolly-Seber mark-recapture model.

**FWI**; SQUAREF 64319; SFA 28(4).

*Esox lucius*/England/Fisheries/Model/Mark-Recapture.

Prevost, G. 1957. Use of artificial and natural spawning beds by lake trout. *Trans. Am. Fish. Soc.* 86: 258-260, 1956.

Beds made of sharp rocks better than natural beds of rounded boulders as they provide better protection from predators.

**FWI**; Oliver & Martin 1984; Bodaly 1333; Kerr 1993.

*Salvelinus namaycush*/Canada/Quebec/Artificial Substrates/Spawning.

Priegel, G. R. 1970. Reproduction and early life history of the walleye in the Lake Winnebago region. *Wis. Dep. Nat. Resour. Tech. Bull.* 45: 105 p.

High water levels during and shortly after hatching beneficial to fry survival as movement out of spawning bed is improved.

**FWI**; Schlick 1978; Kerr 1993.

*Stizostedion vitreum*/USA/Wisconsin/Winnebago, L./Spawning/Reproduction/Water Level.

Prosser, N. S. 1986. An overview of reservoir fisheries problems and opportunities resulting from hydropower, p.238-246. In G. E. Hall and M. J. Van Den Avyle (ed.) *Reservoir fisheries management strategies for the 80's*. Bethesda, MD: American Fisheries Society.

Reviews literature, mostly relating to reservoirs in USA. Special attention to effects on spawning.

**FWI (NFL/Ha11).**

Coregonus clupeaformis/Reservoirs/Literature Reviews/Fisheries/Hydroelectric Development/Spawning.

Raat, A. J. P. 1980. Synopsis of biological data on the northern pike, *Esox lucius*. *FAO Fish. Synop.* 30(Rev.2): ix + 178 p.

Reviews European and North American literature on biology, growth, migration and population dynamics.

**FWI**; Kerr 1993.

*Esox lucius*/Literature Reviews.

—. 1990. Production, consumption and prey availability of northern pike (*Esox lucius*), pikeperch (*Stizostedion lucioperca*) and European catfish (*Silurus glanis*): a bioenergetics approach, p.497-509. In R. D. Gulati, E. H. R. R. Lammens, M. L. Meijer and E. van Donk (ed.) *Biomanipulation - tool for water management*. Dordrecht, The Netherlands: Kluwer Academic Publishers. *Hydrobiologia* 200/201.

Bioenergetic models applied to assessment of food consumption of pike, pikeperch and European catfish in drainable ponds. Ponds stocked with known numbers of 0+ predators. Prey fish naturally recruited 0+ cyprinids. All piscivores realised part of their production on a non-fish diet.

**FWI**; FR 35(4).

*Esox lucius*/*Stizostedion lucioperca*/Model/Productive Capacity/Food.

Rawson, D. S. 1945. Further investigations of the effect of power development on the fisheries of Lake Minnewanka, Banff. *Can. Natl Parks Bur. Rep.*

Lake trout spawn in early October at a depth of 4.5-9.1 m. Eggs hatch in May. Machniak 1975D; Olver & Martin 1984; Kerr 1993.

*Salvelinus namaycush*/Canada/Alberta/Minnewanka L./Fisheries/Hydroelectric Development.

Robins, G. L. 1970. A bibliography of the pike perch of the genus *Stizostedion* (including the genus known as *Lucioperca*). *Fish. Res. Board Can. Tech. Rep.* 161: ii + 67 p.

Lists some 600 references under broad subject headings. Includes many European studies on pikeperch in reservoirs as well as North American material on walleye.

**FWI**.

*Stizostedion vitreum*/*Stizostedion lucioperca*/Bibliographies.

Ruane, R. J., C. E. Bohac, W. M. Seawell, and R. M. Shane. 1986. Improving downstream environment by reservoir release modifications, p.270-277. In G. E. Hall and M. J. Van Den Avyle (ed.) *Reservoir fisheries management: strategies for the 80's*. Bethesda, MD: American Fisheries Society.

Tailwater fisheries may be adversely affected by reservoir releases. Various methods, most associated with maintaining good oxygen levels discussed.

**FWI (NFL/Ha11).**

Reservoirs/Fishery Management/Water Flow/Mitigation.

Ryder, R. A. 1965. A method for estimating the potential fish production of north-temperate lakes. *Trans. Am. Fish. Soc.* 94(3): 214-218.

Original description of MEI based on data for 34 North American lakes.

**FWI**; Ryder 1982.

Morphoedaphic Index/Fisheries/Productive Capacity.

—. 1982. The morphoedaphic index - use, abuse, and fundamental concepts. *Trans. Am. Fish. Soc.* 111(2): 154-164.

[This issue of *Transactions* contains other papers on MEI].

MEI used globally as fish yield estimator. Discusses reasons why some predictions not correct.

**FWI.**

Morphoedaphic Index/Fisheries/Productive Capacity.

Ryder, R. A., S. R. Kerr, K. H. Loftus, and H. A. Regier. 1974. The morphoedaphic index, a fish yield estimator - review and evaluation. *J. Fish. Res. Board Can.* 31(2): 663-688.

MEI historically reviewed and evaluated. Background to development of MEI discussed as well as recent advances. MEI defined and criteria for use examined. Significance of components explained.

**FWI;** Olver & Martin 1984.

Morphoedaphic Index/Fisheries/Productive Capacity.

Sakagawa, G. T., and R. L. Pycha. 1971. Population biology of lake trout (*Salvelinus namaycush*) of Lake Superior before 1950. *J. Fish. Res. Board Can.* 28(1): 65-71.

Ricker model used to calculate yield per recruitment.

**FWI;** AQUAREF 11874.

*Salvelinus namaycush*/Great Lakes/Fisheries/Model/Productive Capacity.

Schlesinger, D. A., and H. A. Regier. 1982. Climatic and morphoedaphic indices of fish yields from natural lakes. *Trans. Am. Fish. Soc.* 111(2): 141-150.

[Special section on MEI in this issue of *Transactions*].

Stepwise regression analysis showed for intensively fished lakes climatic index (mean annual air temperature) accounts for 74% of variability in maximum sustainable yield. MEI accounts for a further 8%.

**FWI;** Bodaly (unfiled).

Canada/USA/Fisheries/Model/Morphoedaphic Index/Productive Capacity/  
Temperature.

—. 1983. Relationship between environmental temperature and yields of subarctic and temperate zone fish species. *Can. J. Fish. Aquat. Sci.* 40(10): 1829-1836.

Fish from subarctic and temperate zone lakes show optimal growth and temperature preferenda. Curvilinear relationships between "long-term mean annual air temperature" and sustained yields of whitefish, pike and walleye were fitted using data from 23 intensively fished lakes in Canada and northern USA. Some of lakes impounded.

**FWI;** Bodaly (unfiled).

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/USA/  
Fisheries/Model/Temperature/Productive Capacity.

Schlick, R. O. 1966. The commercial fishery on the north arm of Moose Lake. *Manit. Fish. Branch MS Rep.* [ii + 15] p.

Concern over effects of fluctuating water level and failure of fish production reason for report. Expected that whitefish population will decrease and pike and goldeye increase. Walleye population, main commercial population, will probably fluctuate as in past. No reason for decline is evident. Management of arm should change to a walleye lake.

**FWI;** WAVES 61648; Machniak 1975A.



*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/  
Moose L./Fishery Management/Water Level.

—. 1968. A survey of Sipiwesk Lake in 1966. *Manit. Fish. Branch MS Rep.* 68-5: 17 p.

Survey to establish commercial limits made in June 1966. MEI 5.5. Limit of 120,000 lb proposed includes whitefish, walleye, pike, goldeye and sauger. FWI; WAVES 62442.

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/  
Sipiwesk L./Morphoedaphic Index/Fisheries.

—. 1972. A fisheries survey of Playgreen Lake, 1971. *Manit. Fish. Branch MS Rep.* 18 p.

Fisheries survey to determine sustainable, annual commercial fish quota. Normal MEI index approach was modified due to large area of very shallow water. Annual limit of 290,000 lb on fishery for whitefish, walleye, sauger and pike.

FWI; WAVES 98424.

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/  
Playgreen L./Morphoedaphic Index/Fishery Management.

—. 1978. A history of sauger (*Stizostedion canadense*) and walleye (*Stizostedion vitreum vitreum*) harvests, south basin Lake Winnipeg, and a literature review of ecological influences on these species. *Manit. Fish. Res. Sect. MS Rep.* 78-78: 36 p.

Literature review includes effects of water levels, temperature and water currents.

FWI; WAVES 63836.

*Stizostedion vitreum*/Literature Reviews/Water Flow/Water Level/Temperature.

Schouwenburg, W. J. 1974. The Aishihik Hydroelectric Development. Implications for fisheries resource management. *Can. Fish. Mar. Serv. Tech. Rep. Ser.* PAC/T/74-19: 250 p.

Reviews recent information pertinent to resolution of fisheries resource maintenance problems posed by development.

WAVES 59485.

Canada/Yukon/Aishihik L./Fishery Management/Hydroelectric Development.

Schweitzer, R. D., W. N. Howard, D. P. Swain, and A. J. Derksen. 1973.

Pre-impoundment observations on some fish populations in Moose Lake, Manitoba, 1963. *Manit. Fish. Branch MS Rep.* 73-29: [vi] + 44 p.

Catches of pike, walleye, whitefish and tullibee obtained by gillnetting. Age growth, relative abundance and total mortality rates examined.

Machniak 1975B & C.

*Stizostedion vitreum*/*Coregonus clupeaformis*/*Esox lucius*/Canada/Manitoba/  
Moose L./Growth/Survival.

Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. *Bull. Fish. Res. Board Can.* 184: 966 p.

Reviews distribution, ecology, feeding, reproduction, etc. of Canadian freshwater fishes including lake trout, whitefish, walleye and pike.

FWI (MLA/Sc01).

*Stizostedion vitreum*/*Salvelinus namaycush*/*Coregonus clupeaformis*/*Esox lucius*/  
Literature Reviews/Canada.

Sexsmith, W. 1981. *Water quality of Long, Trousers, Serpentine and Sisson Branch reservoirs: 1979-1980*. St. John, NB: New Brunswick Environmental Service Branch. 32 p.

Severe drawdowns reduce productivity. Water drawn off below surface results in increasing bottom water temperatures often destratifying Sisson Branch Lake. Long and Serpentine lakes support lake trout.  
AQUAREF 95283.

*Salvelinus namaycush*/Canada/New Brunswick/Long L./Trousers L./Serpentine L./Sisson Branch L./Drawdown/Productive Capacity.

Sharov, A. F., and E. A. Kriksunov. 1991. A simulation model of two interacting exploited fish populations through competition in the early phases of life. *ICES Mar. Sci. Symp.* 193: 113-116.

Model uses *Coregonus albus* and *Osmerus eperlanus* from Lake Pskov-Chud to show that *Osmerus* is more sensitive to changes in environmental conditions than *Coregonus*. As juveniles both species have common food resource.  
ASFA 2611553.

*Coregonus albus*/Model/Juveniles/Food/Russia/Productive Capacity.

Shroyer, S. M. 1991. *Growth of Red Lakes walleye from the 1940's to the 1980's*. M.S. Thesis, University of Minnesota, St. Paul, MN. 111 p.  
[UMI Order No. AAD 13-44876].

Growth of walleye determined from samples taken from commercial catches in 1949/50, 1968/96, 1972/73 and 1987/88. Age and year effects estimated using models. Growth declined logarithmically with increasing age after first growing season.

Masters Abstr. 29(4): 605.

*Stizostedion vitreum*/USA/Minnesota/Red L./Model/Growth.

Sopuck, R. D. 1978. The commercial fishery of Playgreen Lake with notes on recent changes in the whitefish (*Coregonus clupeaformis*) population.  
*Manit. Fish. Branch MS Rep.* 78-67: iv + 66 p.

Whitefish increased from 1967 to 1977. Size increased and older age groups more abundant. Growth rates declined and survival increased. Walleye and pike also present. Changes may be due to hydroelectric development.

FWI; WAVES 64821; Bodaly (unfiled).

*Coregonus clupeaformis*/*Esox lucius*/*Stizostedion vitreum*/Canada/Manitoba/Playgreen L./Fisheries/Growth/Survival/Hydroelectric Development.

Stewart, D. J., D. Weininger, D. V. Rottiers, and T. A. Edsall. 1983. An energetics model for lake trout, *Salvelinus namaycush*: application to the Lake Michigan population. *Can. J. Fish. Aquat. Sci.* 40(6): 681-698.

Sensitivity analysis indicates general robustness of model, especially for estimating consumption by fitting a known growth curve.

FWI; ASFA 632607; AQUAREF 63423.

*Salvelinus namaycush*/Great Lakes/Fisheries/Model/Productive Capacity.

Stone, D. D. 1963A. Lake St. Martin fish production and water control. *Manit. Fish. Branch MS Rep.* [13] p.

Stabilization of lake at higher level than present recommended to decrease possibility of winterkill and make lake more attractive for recreational purposes. Dauphin River flow needs to be controlled for migration and spawning of whitefish and walleye. This flow would draw down present lake level a further 3 ft. Cost of control structure estimated at \$300,000.

FWI; WAVES 62295; Machniak 1975A & C.

Stizostedion vitreum/Coregonus clupeaformis/Canada/Manitoba/St. Martin, L./Fisheries/Fishkills/Water Level/Water Flow/Socio-economic Aspects/Spawning.

—. 1963B. Winter surveys of Lake St. Martin. *Manit. Fish. Branch MS Rep.* [11] p.

Whitefish and pike caught in winter of 1962/63. Period of low precipitation could cause low water levels and in long, severe winter heavy fish mortality (winterkill) could damage commercial fishery. Low flows in Dauphin River have prevented upstream spawning migration of walleye.

FWI; WAVES 62294.

Esox lucius/Coregonus clupeaformis/Stizostedion vitreum/Canada/Manitoba/St. Martin, L./Drawdown/Fishkills/Spawning/Water Flow.

—. 1965. Some limnological consequences of a decline in water levels in a shallow productive lake in Manitoba. *Manit. Fish. Branch MS Rep.* [i] + 15 p.

Lake St. Martin yields 1% of Manitoba commercial fish production (1952-1963). In 1961 dam built to maintain level of Lake Manitoba caused drop in level of Lake St. Martin and decline in water quality and fish production. In fall 1964 no whitefish ascended Dauphin River because of low water and catch in Lake St. Martin dropped from over 100,000 lb to 3,300 lb. Without control structure on Dauphin River and increased water level and flushing rate in Lake St. Martin there is little hope for recovery of fishery. Pike and walleye also caught in winter fishery. Walleye used to run up Dauphin River to spawn in May and June but this has virtually stopped.

FWI; WAVES 62264.

Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/ Manitoba/St. Martin L./Fisheries/Water Level/Spawning.

Stone, J. N., and Y. Cohen. 1990. Changes in species interactions of the Lake Superior fisheries system after the control of sea lamprey as indicated by time series models. *Can. J. Fish. Aquat. Sci.* 47(2): 251-261.

Changes detected by multivariate time series (MVTs) analysis on monthly time series of CUE for lake trout, walleye, whitefish and other species. Intraspecific interactions more numerous than interspecific interactions. Lake trout interactions with other species changed due to stocking and diet changes.

FWI; ASFA 2207312; FR 90-4592.

Stizostedion vitreum/Coregonus clupeaformis/Salvelinus namaycush/Great Lakes/Fisheries/Model/Productive Capacity.

Strange, N. E., R. J. P. Fudge, and R. A. Bodaly. 1991. Post-impoundment response of a boreal northern pike (*Esox lucius*) population in Wupaw Bay, Southern Indian Lake, Manitoba, 1976-88. *Can. Tech. Rep. Fish. Aquat. Sci.* 1823: v + 48 p.

Spawning success not enhanced by flooding, except in first year after flooding.

FWI; ASFA 2765325; WAVES 136464; FR 92-7368.

Esox lucius/Canada/Manitoba/Southern Indian L./Spawning/Flooding/Hydroelectric Development.

Summers, S. A. 1978. *Walleye studies in Richardson Lake and Lake Athabasca: April-July 1977*. Edmonton, AB: LGL Limited. 67 p.

Richardson Lake population little affected by Peace River water levels. It would be influenced by changes of levels in Athabasca River. Other spawning areas in delta may be directly affected.

**FWI (MLA/Sum1); WAVES 63891.**

Stizostedion vitreum/Canada/Alberta/Peace-Athabasca Delta/Richardson L./Athabasca, L./Spawning/ Water Level.

**Sunde, L. A. 1962.** Preliminary assessment of the probable effect of the Grand Rapids development on the fishes and fishing industry of the forebay area. *Manit. Fish. Branch MS Rep.* 5 p.

**Machniak 1975B & C.**

Stizostedion vitreum/Esox lucius/Canada/Manitoba/Cedar L./Fisheries/Hydroelectric Development.

**Swanson, B. L. 1982.** Artificial turf as a substrate for incubating lake trout eggs on reefs in Lake Superior. *Prog. Fish-Cult.* 44(2): 109-111.

Eggs placed between sandwiches of artificial turf suspended in water. 78% of eggs hatched and most of sac fry left sandwiches.

**FWI; Olver & Martin 1984; Kerr 1993.**

Salvelinus namaycush/Artificial Substrates/Spawning/Great Lakes.

**Swanson, G. 1986.** An interim report on the fisheries of the lower Nelson River and the impacts of hydro-electric development, 1985 data. *Manit. Fish. Branch MS Rep.* 86-19: xx + 228 p.

Study includes post-impact assessment of Kettle River/Long Spruce Reservoir. Mid-impact (pre-impoundment) study of Long Spruce-Limestone area and pre-development study of remote downstream tributaries in Limestone-Conawapa area. Whitefish, pike and walleye present and mortality rates discussed.

**FWI; WAVES 92017; NFA 1987; Bodały 2124.**

Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Nelson R./Hydroelectric Development/Impact Assessment/Survival.

**Taylor, M. W. 1981.** A generalized inland fishery simulator for management biologists. *N. Am. J. Fish. Manage.* 1(1): 60-72.

Model is age-class structured simulator designed for easy use by fishery managers. Self-sustaining walleye population used as example.

**FWI; ASFA 308447.**

Stizostedion vitreum/Model/Fishery Management.

**Tebby, C. D. 1974.** Fishes of Abraham Lake (reservoir) and the upper North Saskatchewan River, Alberta. *Alberta Lands For. Fish Wildl. Div. Fish. Res. Rep.* 11: 87 p.

**Olver & Martin 1984.**

Salvelinus namaycush/Canada/Alberta/Abraham L./Reservoirs.

**Terrell, J. W., T. E. McMahon, P. D. Inskip, R. F. Raleigh, and K. L. Williamson. 1982.** Habitat suitability index models: Appendix A. Guidelines for riverine and lacustrine applications of fish HSI models with the Habitat Evaluation Procedures. *U.S. Fish Wildl. Serv. Rep.* FWS/OBS-82-10.A: v + 54 p.

Offers guidelines for field application of HSI models and reviews method for predicting future values for selected model variables.

**FWI; WAVES 99856.**

Model/Fisheries/Habitat Suitability Index.

Tikkanen, P., T. Niva, T. Yrjana, K. Kuusela, S. Hellsten, L. Kantola, and E. Alasaarela. 1988. Effects of regulation on the ecology of the littoral zone and the feeding of whitefish, *Coregonus* spp., in lakes in northern Finland, p.457-465. In A. Jarvinen (ed.) *Proceedings of the International Symposium on Biology and Management of Coregonids, Joensuu, Finland, 1987*. *Finn. Fish. Res.* 9.

Basis for estimating effects was comparison of macrozoobenthos in geomorphologically similar littoral zones in a regulated lake and one in its natural state. Stomach contents analyzed. Abundance and biomass of macrozoobenthos higher in non-regulated lake by factor of 2 to 3. Difference less marked on sandy than on rocky bottoms. Chironomid larvae dominated community in regulated lake. Proportion of planktonic food higher in whitefish from regulated lake. Benthos more important in non-regulated lake.

**FWI (MLA/Jar1, 2nd copy filed as serial); FR 89-7436.**

*Coregonus* sp./Finland/Food/Drawdown.

Townsend, G. H. 1975. Impact of the Bennett Dam on the Peace-Athabasca Delta. *J. Fish. Res. Board Can.* 32(1): 171-176.

Low water levels during filling of Williston Reservoir exposed many acres of lake bottom. This will increase risk of delay in walleye spawning runs into delta lakes. Building fixed crest weir on outlet channel of Lake Athabasca should mitigate effect. Low water levels do not appear to have harmed lake trout.

**FWI; Ebbers et al. 1988.**

*Salvelinus namaycush/Stizostedion vitreum/Canada/Alberta/Peace-Athabasca Delta/Athabasca L./Spawning/Water Level/Mitigation.*

Trippe, E. A. 1993. Relations of fecundity, maturation, and body size of lake trout, and implications for management in northwestern Ontario lakes. *N. Am. J. Fish. Manage.* 13(1): 64-72.

Life history in 6 lakes of varying conductivity described. An adaptive management strategy based on differences in growth, fecundity and maturity schedule recommended.

**FWI; Bodaly (unfiled).**

*Salvelinus namaycush/Canada/Ontario/Growth/Reproduction/Fishery Management.*

Voellestad, L. A., J. Skurdal, and T. Qvenild. 1986. Habitat use, growth, and feeding of pike (*Esox lucius* L.) in four Norwegian lakes. *Arch. Hydrobiol.* 108(1): 107-117.

Pike mainly littoral. Numbers of pelagic fish increased with increasing turbidity. Growth rapid when feeding on whitefish in deep lake. In more eutrophic lakes growth slower and smelt and ruffe major prey species.

**FWI; ASFA 1873403.**

*Esox lucius/Norway/Food/Habitat Use.*

Wagner, M. W. 1981. *Economic performance of the summer commercial fishery of Southern Indian Lake, Manitoba*. Practicum, Natural Resources Institute, University of Manitoba, Winnipeg, MB. 163 p.

Economic performance of 24 fishing enterprises studied. Only 33% of enterprises generated sufficient revenue to achieve long term economic viability. Another 33% viable only in short term.

**NFA 1987.**

*Coregonus clupeaformis/Canada/Manitoba/Southern Indian L./Fisheries/Socio-economic Aspects/Hydroelectric Development.*

—. 1984. Postimpoundment change in financial performance of the Southern Indian Lake commercial fishery. *Can. J. Fish. Aquat. Sci.* 41(4): 715-719. Economic surveys in 1977 and 1980 revealed decrease in cash flow per fishing enterprise of 66% so that by 1980 capital costs not being met. Decreased CUE on traditional fishing grounds, increase in proportion of lower grade whitefish and decrease in number of days spent fishing contribute. Projected that by 1981 viability will worsen.

**FWI.**

Coregonus clupeaformis/Canada/Manitoba/Southern Indian L./Fisheries/  
Socio-Economic Aspects/Hydroelectric Development.

**Waldrum, J. B.** 1983. *The impact of hydro-electric development upon a northern Manitoba native community.* Ph.D. Dissertation, University of Connecticut, Storrs, CT. xiii + 340 p.

Describes impact of hydro-electric development upon Cree Indians and Metis of South Indian Lake. Seeks to link ecological, political and socio-economic aspects of hydro development. By assessing accuracy of pre-project impact assessments as they related to community hoped to facilitate better impact assessments of future resource development projects.

**NFA 1987.**

Canada/Manitoba/Southern Indian L./Hydroelectric Development/Socio-economic Aspects/Fisheries/Impact assessment.

—. 1988. *As long as the rivers run: hydroelectric development and native communities in western Canada.* Winnipeg, MB.: University of Manitoba Press. 253 p.

Opens with a discussion effects of hydroelectric developments on native peoples in Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and the Yukon. A chapter deals with the alienation of native lands in western Canada. Three chapters discuss in detail the development and effects of Squaw Rapids dam (Saskatchewan), Grand Rapids dam and Churchill River diversion (both in Manitoba). Concluding chapter discusses "the common good".

**FWI (N/Wal2); WAVES 108829.**

Hydroelectric Development/Canada/Manitoba/Southern Indian L./Cedar L./Saskatchewan/Tobin L./Socio-economic Aspects/Fisheries.

**Walters, C. J.** 1975. An interdisciplinary approach to development of watershed simulation models. *J. Fish. Res. Board Can.* 32(1): 177-195.

One model deals with James Bay area of Quebec and provides information for management programs including socio-economic impacts of fisheries modification.

**FWI.**

Coregonus clupeaformis/Salvelinus namaycush/Esox lucius/James Bay/Quebec/  
Model/Socio-economic Aspects.

**Watson, R. A.** 1977. *Metazoan parasites from whitefish, cisco and pike from Southern Indian Lake, Manitoba: a preimpoundment and diversion analysis.* M.Sc. Thesis, University of Manitoba, Winnipeg, MB. xi + 197 p.

Parasite fauna of whitefish and pike studied. Changes following impoundment predicted.

**FWI; NFA 1987.**

Coregonus clupeaformis/Esox lucius/Canada/Manitoba/Southern Indian L./  
Parasites/Hydroelectric Development/Flooding.

**Watson, R. A., and T. A. Dick.** 1979. Metazoan parasites of whitefish, *Coregonus clupeaformis* (Mitchill), and cisco, *Coregonus artedii* Lesueur, from Southern Indian Lake, Manitoba. *J. Fish. Biol.* 15(5): 579-588.

Increase in copepod-vectored cestodes with concomitant decrease in amphipod-vectored parasites predicted after flooding and diversion.

**FWI; Bodaly 1731.**

*Coregonus clupeaformis/Canada/Manitoba/Southern Indian L./Flooding/Parasites/Hydroelectric Development.*

—. 1980. Metazoan parasites of pike, *Esox lucius* Linnaeus, from Southern Indian Lake, Manitoba, Canada. *J. Fish Biol.* 17(2): 255-261.

Impoundment could greatly change parasite levels. Initial decrease could be followed by rapid increase.

**FWI; Bodaly 1732.**

*Esox lucius/Canada/Manitoba/Southern Indian L./Parasites/Hydroelectric Development/Flooding.*

**Weagle, K. V.** 1974. The fisheries of the Lower Churchill River and diversion route lakes: exploitation and reproduction. *Lake Winnipeg, Churchill and Nelson Rivers Study Board, Canada-Manitoba, 1971-'75. Technical Report, Appendix 5, Vol.2.J: vi + 38 p.*

Outlines pre-diversion situation. For Churchill River lakes 60-75% reduction in commercial fisheries (mostly whitefish, with some walleye and pike) expected with lower lake levels. Mitigation measures suggested are outlet weirs to maintain water levels and compensation program. Commercial fisheries on diversion route underfished. Increased lake levels will cause 90-100% reduction in commercial catch. Compensation to fishermen and fish camp owners suggested. Increased pike habitat in Notigi tailrace area may offer increased sport fishing.

**FWI (N/Lak1 A.5 Pt.2).**

*Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Churchill R./Rat R./Burntwood R./Fisheries/Hydroelectric Development/Sport Fishing/Mitigation.*

**Weagle, K. V., and W. Baxter.** 1974. The fisheries of Southern Indian Lake: exploitation and reproduction. *Lake Winnipeg, Churchill and Nelson Rivers Study Board, Canada-Manitoba, 1971-'75. Technical Report, Appendix 5, Vol.1.I: x + 163 p.*

[Includes Appendix VII: D. E. Topolniski Revenue-expenditure analysis for selected fishing operations on Southern Indian Lake: ii + 32 p.].

Details size, fecundity, spawning, mortality and migration of whitefish and walleye. Fishery described. Potential for trophy fishery for pike identified. 1973 survey of winter and summer fishery found that fishermen did not keep good records of revenues and expenditures. To mitigate effects of hydroelectric development on-site training programs for fishermen justified.

**FWI (N/Lak1 A.5 Pt.1).**

*Coregonus clupeaformis/Esox lucius/Stizostedion vitreum/Canada/Manitoba/Southern Indian L./Fisheries/Hydroelectric Development/Flooding/Socio-economic Aspects/Spawning/Mitigation.*

**Weagle, K. V., and R. A. Cameron.** 1974. The impact of the Strutt Lake hydro project on the Snare River, N.W.T. *Can. Fish. Mar. Serv. Tech. Rep. Ser.* CEN/T-74-4: vi + 32 p.

Little difference in growth or condition of fish between lakes and reservoir. Differences noted in species composition in 3 lakes on Strutt River - most

abundant species in lakes is whitefish and in reservoir longnose suckers. Reduced flows in Snare River below Judd Lake may reduce walleye in Strutt Lake by eliminating an important spawning area.

FWI; WAVES 38889; Machniak 1975B & C; Bodaly 1733.

Stizostedion vitreum/Coregonus clupeaformis/Esox lucius/Canada/NWT/Strutt L./Snare R./Hydroelectric Development/Growth/Spawning/Water Flow.

Weber, D. T., and R. L. Imler. 1974. An evaluation of artificial spawning beds for walleye. *Colo. Div. Wildl. Spec. Rep.* 34: 17 p.

2 5,000 ft<sup>2</sup> rock spawning beds installed in Lonetree Reservoir in fall 1971. Estimates of spawning adults and YOY populations made to compare situation before and after.

WAVES 22760.

Stizostedion vitreum/USA/Colorado/Lonetree Reservoir/Reservoirs/Spawning/Artificial Substrates.

Wepruk, R. 1984. The Shebandowan Lake background data analysis for fisheries management directives. *Ont. Min. Nat. Resour. Interim Rep.* 64 p.

Ebbers et al. 1988.

Stizostedion vitreum/Canada/Ontario/Shebandowan L./Fishery Management/Water Level.

Wheeler, J. P. 1980. *Age determination and biological studies of northern pike, Esox lucius Linnaeus 1758, from Lobstick area, Smallwood Reservoir, Labrador.* M.Sc. Thesis, Memorial University of Newfoundland, St. John's, NF. 87 p.

Pike show large mean lengths and weights similar to other unexploited populations in northern lakes. Larger than usual ranges in length and weight of each age class noted. Diet of larger fish mostly whitefish. Growth similar to that in other northern lakes.

WAVES 61624; Bodaly 1737 (summary & bibliogr. only).

Esox lucius/Canada/Labrador/Smallwood Reservoir/Growth/Food/Age/Methods/Hydroelectric Development/Reservoirs.

Whitfield, R. 1950. Elevations of Lake Wanipitei and their effects upon the eggs of the spawning fishes. *Ont. Dep. Lands For. North Bay Distr. MS Rep.* 3 p.

Discusses effects of drawdown on lake trout population.

Olver & Martin 1984.

Salvelinus namaycush/Ontario/Wanipitei, L./Water Level/Eggs.

Wilgress, S. 1989. An interim assessment of the Shoal Lake fishery, 1988. *Ont. Min. Nat. Resour. Lake of the Woods Fish. Assess. Unit Rep.* 1989-01: 26 p.

Size of spawning population at Waugh near mouth of Falcon River established at 27,000. 1979 and 1983 year-classes made up much of population. Low water levels in spring of 1988 reduced amount of spawning habitat.

ASFA 2118029.

Stizostedion vitreum/Canada/Ontario/Shoal L./Spawning/Water Level/Habitat Use.



Wilton, M. L. 1982. Observations concerning water drawdown and its effects on natural lake trout reproduction in four south central Ontario lakes. *Ont. Min. Nat. Resour. Algonquin Region MS Rep.* 21 p.

Olver & Martin 1984.

*Salvelinus namaycush*/Canada/Ontario/Algonquin Park/Drawdown/Spawning.

—. 1985. Water drawdown and its effect on lake trout (*Salvelinus namaycush*) reproduction in three south-central Ontario lakes. *Ont. Fish. Tech. Rep. Ser.* 20: 9 p.

[Available as MicroLog Fiche 86-03807/1].

Study of Bark Lake found that reproduction of lake trout no longer possible with annual 10 m drawdown. Fishery sustained by hatchery plantings. Mary Lake has 0.83 m winter drawdown curtailing spawning success on some shoals. Bella Lake has no dam or drawdown and spawning occurs in <0.3 m., ice thickness lessens towards shore and egg loss is minimal.

**FWI**; ASFA 1164171; WAVES 88079; FR 86-1132; Microlog 1144368; Kerr 1993.

*Salvelinus namaycush*/Canada/Ontario/Bark L./Mary L./Bella L./Spawning/Drawdown.

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Manitoba (*cont.*)

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Mortality (*see: Survival*)

## Movements

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Movements (*cont.*)

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- Hubbell 1967.
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- Joy 1975.
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- Kallemeyn 1986.
- Kerr, S.J. 1993.
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Sedimentation (*see also: Appendix*)

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Spawning (*see also:* Artificial  
Substrates & Appendix)

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Jensen, R.E. & Chen 1986.  
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Martin & Fry 1973.  
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Stone 1963A.  
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Strange et al. 1991.  
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Temperature (*see also*: Appendix)

- Armour 1993.  
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 Kitchell et al. 1977.  
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 Magnuson et al. 1990.

Temperature (*cont.*)

- McConnell et al. 1982.  
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Turbidity (*see*: Sedimentation)

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 Barnes, M.A. 1981B.  
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 Peters 1986.  
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Flooding & Appendix)

- Allard 1964.  
 Ayles, Brown et al. 1974.  
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Water Level (*cont.*)

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Kerr, S.J. 1993.  
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Ploskey 1982.  
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Watershed Management (*see:*  
Appendix)

## AUTHOR INDEX

Aubertin, G. M., and J. H. Patric. 1974. Water quality after clearcutting a small watershed in West Virginia. *J. Environ. Qual.* 3(3): 243-249.

Negligible effect found on temperature, pH, non-storm turbidity and concentrations of most dissolved solids. Nitrogen and phosphorus showed slight increases. Every effort made to minimize effects of clearcutting by careful road maintenance and retention of forest strip near banks of stream.

**FWI;** Macdonald et al. 1988.

USA/West Virginia/Clearcutting

Chapman, A. R. 1986. Northern river diversion. In *1st National Student Conference on Northern Studies*.

General review of SIL impoundment, predictions and actual impacts.

ASTIS 283398.

Canada/Manitoba/Southern Indian L./Hydroelectric Development/Flooding.

Cook, R. B. 1988. The effects of acidic deposition on aquatic resources in Canada: an analysis of past, present, and future effects. *Oak Ridge National Laboratory. Environmental Sciences Division Publication* ORNL/T:10405, No.2894: xiii + 145 p.

Assesses impact in Eastern Canada. Includes model studies on effects of chemical changes on biological systems.

**AQUAREF** 97582.

Salvelinus namaycush/Canada/Acid Precipitation/Model

Couillard, D. . 1993. Quality of life: the importance of man-environment relations and a tentative conceptual model. *J. Environ. Syst.* 12(2): 163-184.

Holistic planning for a group of hydrographic basins must consider both socio-economic and environmental problems that accompany development projects. Descriptive and conceptual model based on pecuniary advantages developed with six parts: survival of species, well-being, activities, production, overproduction and life constraints. Model applied to problems arising from a forestry complex in Chamouchouane River watershed in Quebec.

**ASFA** 429041.

Forestry/Model/Canada/Quebec/Chamouchouane R./Socio-economic Aspects.

Dillon, P. J., and F. H. Rigler. 1975. A simple method for predicting the capacity of a lake for development based on lake trophic status. *J. Fish. Res. Board Can.* 32(9): 1519-1531.

Calculates capacity of lake for development (e.g., cottages) based on relationships between nutrient inputs and water quality parameters reflecting trophic status. Lakes in southern Ontario used to demonstrate technique.

**FWI.**

Shoreline Development/Model/Canada/Ontario.

Efford, I. E. 1975. Assessment of the impact of hydro-dams. *J. Fish. Res. Board Can.* 32(1): 196-209.

Impact statements study only alternatives to design of dam. Should include analyses of alternative uses of a valley, long-term value of delaying the decision, relative merits of generating power by other means and merits of reducing demand for energy.

FWI; NFA 1987; Baxter & Glaude 1980; Kerr 1993.

Hydroelectric Development/Impact assessment.

Feller, M. C. 1981. Effects of clearcutting and slashburning on stream temperature in southwestern British Columbia. *Water Resour. Bull.* 17(5): 863-867.

Both treatments increased summer water temperatures in western hemlock/western red cedar/Douglas fir forests. With slashburning effects lasted longer than clearcutting alone.

FWI; ASFA 167626; Macdonald et al. 1988.

Clearcutting/Canada/British Columbia/Temperature.

Feller, M. C., and J. P. Kimmins. 1984. Effects of clearcutting and slash burning on streamwater chemistry and watershed nutrient budget in southeastern British Columbia. *Water Resour. Bull.* 20(1): 29-40.

General increase in nutrient concentrations in stream waters for 2-3 years after cutting followed by decline to or below former levels. Potassium and nitrate increased most. Clearcutting and burning caused greater nutrient losses than cutting alone.

FWI.

Canada/British Columbia/Clearcutting.

Gibbons, D. R., and E. O. Safo. 1973. An annotated bibliography of the effects of logging on fish of the western United States and Canada. *U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. PNW 10*: 145 p.

317 references of which 278 are annotated. Subjects covered include erosion and sedimentation, water quality, and effects on salmonids.

WAVES 22084; Macdonald et al. 1988; Kerr 1993.

Bibliographies/Logging.

Hartman, G. F., (ed.) 1983. *Proceedings of the Carnation Creek workshop: a ten year review, Malaspina College, Nanaimo, B.C., February 24 to 26, 1982.* Nanaimo, BC: Pacific Biological Station. 404 p.

Review of project in area of hemlock and cedar forest. Includes papers on effects of logging on hydrologic regime of watershed including changes in concentration patterns and temperature of water. Responses of fish in creek to logging also discussed.

FWI (P/Har4); WAVES 26101.

Logging/Canada/British Columbia.



Kimmel, B. L., and A. W. Groeger. 1986. Limnological and ecological changes associated with reservoir aging, p.103-109. In G. E. Hall and M. J. Van Den Avyle (ed.), *Reservoir fisheries management: strategies for the 80's*. Bethesda, MD: American Fisheries Society.

Trophic upsurge and depression in recently impounded reservoirs well known. Little known of longer-term consequences of reservoir aging. Changes due to aging of reservoir may be overshadowed by land use changes in catchment area. Management practices need to cover whole area.

**FWI (NFL/Hal1).**

Reservoirs/Watershed Management.

Kraske, C. R., and I. J. Fernandez. 1993. Biogeochemical responses of a forested watershed to both clearcut harvesting and papermill sludge application. *J. Environ. Qual.* 22(4): 776-786.

Mixed northern hardwood and conifer stand in Maine clearcut in winter 1985-86. Harvest residues windrowed and red pine seedlings planted. Herbicide applied in 1987 to reduce vegetative competition. Harvested area floor pH was higher than uncut areas. Major nutrients were also higher in soil solution in harvested area. Calcium and magnesium were very much higher in harvested area. Effect of putting sludge on harvested area also studied.

**FWI; CC Ag 13 Dec 93.**

USA/Maine/Clearcutting.

Likens, G. E., F. H. Bormann, N. M. Johnson, Fisher. D.W., and R. S. Pierce. 1970. Effect of forest cutting and herbicide treatment on nutrient budgets in the Hubbard Brook watershed-ecosystem. *Ecol. Monogr.* 40(1): 23-47.

Cutting, with felled trees remaining in place, increased streamflow by 39% in first year and 28% in second. Large increases in all major ions noted in stream waters, 6-8 times larger than for a forested area. Stream temperatures higher and turbidity increased.

**FWI; Macdonald et al. 1988.**

USA/New Hampshire/Clearcutting/Temperature.

Lotspeich, F. B., and W. S. Platts. 1982. An integrated land-aquatic classification system. *N. Am. J. Fish. Manage.* 2(2): 138-149.

Simple classification proposed to integrate aquatic with terrestrial aspects to form basic ecological system. Fishery managers, timber harvesters and agriculturists operate from common base allowing optimum input for all resources including fishery.

**FWI.**

Model/Fishery Management/Watershed Management.

McCombie, A. M. 1983. *Lakeshore capacity study, fisheries net productivity: index of cottage impact on fisheries*. Toronto, ON: Ontario Ministry of Municipal Affairs and Housing. 31 p.

Kerr 1993.

Canada/Ontario/Fisheries/Shoreline Development.

Moffatt, A. S. 1993. Clearcutting's soil effects. *Science (Wash. DC)* 261(5125): 1116.

Report of Ecological Society of America meeting at which Elaine Ingham stated that when forest is clearcut damage underground is equally cataclysmic to that above ground. Soil can be biologically destroyed even if it seems physically intact. Study made on Olympic Peninsula, Washington State. Large surge of nitrogen noted in groundwater following clearcutting. Speedy replanting with seedlings recommended before all soil organisms die.

FWI; CC Ag 20 Sep 93.

USA/Washington/Clearcutting.

Moore, J. W. 1978A. Biological and water quality surveys at potential mines in the Northwest Territories. II. Inco gold property, Contwoyto Lake. *Can. Environ. Protect. Serv. NW Reg. Manusc. Rep. NW-78-6: v + 39 p.*

Lake trout in lake. Important to ensure that tailings do not contaminate lake. Studies needed to find where lake trout spawn to see that they are not affected by mining development.

FWI; AQUAREF 37642.

Salvelinus namaycush/Canada/NWT/Contwoyto L./Spawning/Mining.

—. 1978B. Biological and water quality surveys at potential mines in the Northwest Territories. III. Giant Salmita gold property, at Matthews Lake. *Can. Environ. Protect. Serv. NW Reg. Manusc. Rep. NW-78-7: v + 24 p.*

Shoreline near mine probably nursery area for lake trout. Whitefish found in quantities sufficient for domestic and sport fisheries. Concentrations of heavy metals in water low.

FWI; ASTIS 16543; BNT 52817; AQUAREF 37963.

Coregonus clupeaformis/Salvelinus namaycush/Canada/NWT/Matthews L./Mining.

Narver, D. W. 1972. A survey of some possible effects of logging on two eastern Vancouver Island streams. *Fish. Res. Board Can. Tech. Rep. 323: 55 p.*

In 1970 survey made of 2 streams to assess effects of logging and burning on fish populations, invertebrate drift, stream temperatures and channel width. In Jump Creek, in hemlock/cedar forest, fish population almost double in numbers and 10 times by weight in forested part of creek compared with clearcut areas. In Wolf Creek, in Douglas fir forest, steelhead were much more abundant in logged than in forested areas. This was attributed to higher summer temperatures in those parts of the stream. Channels of both streams were badly eroded.

FWI; WAVES 28633; Macdonald et al. 1988.

Canada/British Columbia/Clearcutting/Temperature.

Newbury, R. W. 1981. Some principles of compatible hydro-electric design. *Can. Water Resour. J.* 6(3): 284-294.

Most of hydroelectric potential lies north of centres of population differing from those previously developed. These new projects require new and experimental design solutions because of their size, complexity of combining river systems and severe climatic conditions.

FWI; NFA 1987.

Canada/Hydroelectric Development.

Orlob, G. T. 1984. Mathematical models of lakes and reservoirs, p.43-62. In F.B. Taub (ed.) *Lakes and reservoirs*. Amsterdam: Elsevier. *Ecosyst. World* 23.

Offers series from one-dimensional temperature to multi-dimensional water quality-ecological models.

FWI (JEL/Tau1).

Model/Reservoirs.

Rawson, D. S. 1958. Indices to lake productivity and their significance in predicting conditions in reservoirs and lakes with disturbed water levels, p.27-42. In P. A. Larkin (ed.) *The investigation of fish-power problems*. Vancouver, BC: University of British Columbia. *H. R. McMillan Lectures in Fisheries*, 1957.

Suggests best way to make predictions is by comparison with other lakes in the same area of similar size to that being modified. Good data is necessary. FWI; Machniak 1975C; Olver & Martin 1984.

Reservoirs/Model/Fisheries/Water Level/Productive Capacity.

Robertson, R. A., and B. R. Eliassen. 1974. Environmental engineering studies associated with the Aishihik River hydroelectric development. *Can. Fish. Mar. Serv. Tech. Rep. Ser. PAC/T-74-18*.

de Graff 1993.

Canada/Yukon/Aishihik L./Hydroelectric Development.

Schindler, D. W., R. W. Newbury, K. G. Beaty, J. Prokopowich, T. Ruszczyński, and J. A. Dalton. 1980. Effects of a windstorm and forest fire on chemical losses from forested watersheds and on the quality of receiving streams. *Can. J. Fish. Aquat. Sci.* 37(3): 328-334.

Windstorm followed by a forest fire caused significant increases in runoff and in losses of nitrogen, phosphorus and potassium from two small Precambrian watersheds. Water yields were 1.6 and 1.8 times the pre-impact means.

Maximum losses were for nitrate with values 3.4 and 9 times previous values.

FWI.

Canada/Ontario/Forest Fire.

Scruton, D. A. 1984. A survey of selected lakes in Labrador, with an assessment of lake status and sensitivity in relation to acid precipitation. *Can. Tech. Rep. Fish. Aquat. Sci.* 1296: v + 115 p.

130 lakes surveyed. Lake trout, pike and whitefish present. Most lakes moderately or highly sensitive to potential acidification. Models indicated little evidence of anthropogenic acidification.

FWI; WAVES 14251; ASTIS 153575.

Salvelinus namaycush/Coregonus clupeaformis/Esox lucius/Labrador/Canada/Acid Precipitation.

Seppanen, P. 1972. Determination of summer cottaging capacity. *Aqua Fenn.* 1972: 104-107.

Relates the number of cottages per hectare of lake surface area as a means of estimating the potential impact and need for regulation to avoid degradation of water quality and lake biota.

FWI; Kerr 1993.

Shoreline Development.

Stern, E. M., and W. B. Stickle. 1978. Effects of turbidity and suspended materials in aquatic environments: literature review. *U.S. Army Corps Eng. Waterways Exp. Sta. Vicksburg Tech. Rep. D-78-21.*

Kerr 1993.

Literature Reviews/Sedimentation.

Tamm, C. O., H. Holmen, B. Popovic, and G. Wiklander. 1974. Leaching of plant nutrients from forest soils as a consequence of forestry operations. *Ambio* 3(6): 211-221.

Clear felling, forest fertilization and drainage of swamps are forms of forest management which disturb nutrient cycle. Leaching of plant nutrients into surface and ground waters occurs. Such nutrients may cause eutrophication of lakes, reservoirs and streams.

**FWI.**

Clearcutting.

Tripplett, J. R., D. A. Culver, and G. B. Waterfield. 1980. An annotated bibliography on the effects of water-level manipulation on lakes and reservoirs. *Ohio Dep. Nat. Resour. Fed. Aid Restor. Proj. Rep. F-57-R.*

Ploskey 1986; Kerr 1993.

Bibliographies/Water Level/Reservoirs.

University of Toronto. 1971. *Lakeshore capacity environmental analysis and classification of inland lakes in Ontario for recreational development, a bibliography.* Toronto, ON: Ontario Department of Municipal Affairs. 35 p.

Kerr 1993.

Canada/Ontario/Shoreline Development/Bibliographies.

Weich, H. E., P. E. Symons, and D. W. Narver. 1977. Some effects of potato farming and forest clearcutting on small New Brunswick streams. *Can. Fish. Mar. Serv. Tech. Rep. 745: 13 p.*

Survey of 33 small streams in area of spruce forest made in late 1974 to study effects on fish, benthos and physical characteristics of streams. In clearcut watershed, streams had 17% fewer trout, over 200% more sculpins and 26% less benthos than control streams. Damage attributed mainly to sedimentation and channelization and to a lesser extent to lack of riparian leave strips. Logging road crossings important source of fine sediment.

**FWI; WAVES 18321.**

Clearcutting/Canada/New Brunswick.

## SYSTEMATIC INDEX

*Coregonus clupeaformis*  
Moore 1978B.  
Scruton 1984.

*Esox lucius*  
Scruton 1984.

*Salvelinus namaycush*  
Cook 1988.  
Moore 1978A.  
--- 1978B.  
Scruton 1984.

## GEOGRAPHIC INDEX

## CANADA

Cook 1988  
Newbury 1981

British Columbia

Feller 1981.  
Feller & Kimmins 1984.  
Hartman 1983.  
Narver 1972.

Manitoba

Southern Indian Lake (57°10'  
98°30')  
Chapman 1986.

New Brunswick

Welch et al. 1977

Newfoundland & Labrador

Scruton 1984.

Northwest Territories

Contwoyto Lake (65°42'  
110°50')  
Moore 1978A

Matthews Lake (64°04' 111°14')  
Moore 1978B.

Ontario

Dillon & Rigler 1975.  
McCombie 1983.  
Schindler et al. 1980.  
University of Toronto 1971.

Quebec

Chamouchouane River (48°37'  
72°20')  
Couillard 1993.

Yukon Territory

Aishinik Lake (61°25' 137°07')  
Robertson & Eliassen 1974.

## U.S.A.

Maine

Kraske & Fernandez 1993.

New Hampshire

Likens et al. 1970.

Washington

Moffatt 1993.

West Virginia

Aubertin & Patric 1974.

## SUBJECT INDEX

## Acid Precipitation

Cook 1988.  
Scruton 1984.

Bibliographies (*see also*: Literature Reviews)

Gibbons & Salo 1973.  
Tripplett et al. 1980.  
University of Toronto 1971.

## Fisheries

McCombie 1983.  
Rawson 1958.

## Fishery Management

Lotspeich & Platts 1982.

Flooding (*see also*: Water Level)

Chapman 1986.

## Forest Fire

Schindler et al. 1980.

## Forestry

Couillard 1993.

Clearcutting

Aubertin & Patric 1974.  
Feller 1981.  
Feller & Kimmins 1984.

Clearcutting (*continued*)

Kraske & Fernandez 1993.  
 Likens et al. 1970.  
 Moffatt 1993.  
 Narver 1972.  
 Tamm et al. 1974.  
 Welch et al. 1977.

Logging

Gibbons & Salo 1973.  
 Hartman 1983.

## Hydroelectric Development

Chapman 1986.  
 Efford 1975.  
 Newbury 1981.  
 Robertson & Eliassen 1974.

## Impact Assessment

Efford 1975.

Literature Reviews (*see also:*  
Bibliographies)

Stern & Stickle 1978.

## Mining

Moore 1978A.  
 --- 1978B.

## Models/Modelling

Cook 1988.  
 Couillard 1993.  
 Dillon & Rigler 1975.  
 Lotspeich & Platts 1982.  
 Orlob 1984.  
 Rawson 1958.

## Productive Capacity

Rawson 1958.

## Reservoirs

Kimmel & Groeger 1986.  
 Orlob 1984.  
 Rawson 1958.  
 Tripplett et al. 1980.

## Sedimentation

Stern & Stickle 1978.

## Shoreline Development

Dillon & Rigler 1975.  
 McCombie 1983.  
 Seppanen 1972.  
 University of Toronto 1971.

Socio-economic Aspects  
 Couillard 1993.

## Spawning

Moore 1978A.

## Temperature

Feller 1981.  
 Likens et al. 1970.  
 Narver 1972.

Water Level (*see also:* Flooding)

Rawson 1958.  
 Tripplett et al. 1980.

## Watershed Management

Kimmel & Groeger 1986.  
 Lotspeich & Platts 1982.