

COURSE NAME

COURSE NUMBER

TOTAL CREDIT HOURS: 48

PREREQUISITE(S): NONE

I. PHILOSOPHY/GOALS:

The principles, philosophy and application of fisheries management, including fish culture in Ontario will be discussed in this course and key issues will be addressed by guest speakers. Several field trips will be included.

II. STUDENT PERFORMANCE OBJECTIVES:

Upon successful completion of this course the student will:

1. List the goals, issues and management strategies identified under S.P.O.F.
2. Describe the regulatory and non-regulatory mechanisms used to control angler exploitation of fish stocks.
3. Discuss the use of the morpho-edaphic index to predict potential fish yields.
4. Outline the pros and cons of artificial fishing opportunities.
5. Discuss the objectives of the Community Fisheries Involvement Program and the procedure in planning and executing a C.F.I.P. project.
6. List and discuss the requirements of trout and outline basic trout stream rehabilitation techniques.
7. Discuss methods of fisheries assessment and the role of fisheries assessment units in Ontario.
8. Describe the policies and objectives as well as the physical requirements for fish culture in Ontario.
9. Explain the objectives of conducting a creel census/sample and describe the design types and the calculation differences for each in determining C.U.E. and harvest.
10. Conduct creel census/sample interviews with anglers and record information on interview forms and/or hand-held computers.

COURSE NAME

COURSE NUMBER

III. TOPICS TO BE COVERED:

Hours

Lecture Schedule

4

UNIT 1 GOALS OF FISHERIES MANAGEMENT

- policies, objectives
- goals and strategies
- tools of fisheries management
- fisheries management plans

4

UNIT 2 POPULATION MANIPULATION

- direct population reduction
- stocking: rates and policy

4

UNIT 3 HABITAT MANIPULATION/IMPROVEMENT

- fertilization
- aquatic plant control
- water level manipulation
- artificial spawning structures
- provision of cover/aeration
- C.F.I.P.

6

UNIT 4 REGULATION OF HARVEST

- control of angler exploitation
- size limits
- catch quotas
- area regulations
- gear regulation
- access restriction/sanctuaries

4

UNIT 5 FISHERIES ASSESSMENT

- creel census/survey
- population estimates
- identification of over exploitation
- general activities of Fisheries Assessment Units
- the stock concept
- the ecosystem health index
- the fish community type concept

COURSE NAME

COURSE NUMBER

Lecture Schedule - Continued

Hours

Lecture Schedule

6

UNIT 6 AQUACULTURE

- artificial fishing opportunities, policies/objectives
- fish handling
- egg collection/fertilization
- systems: cage
 : closed

4

UNIT 7 PROBLEMS AND ISSUES

- bait fish harvest policy
- introduction of exotics/competitor fish
- conflict among user groups

IV. EVALUATION METHODS: (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS ETC.)

- A+ - 90% - 100%
- A - 80% - 89%
- B - 70% - 79%
- C - 60% - 69%

R - less than 60%

MARKS

A. Term Tests	60
B. Critiques	20
C. Report	20
TOTAL	<u>100%</u>

A. Term Test

Term tests will be based on lectures, field trips, video and guest speaker presentations. Term tests will account for 60% of the course grade.

FISHERIES BIOLOGY/MANAGEMENT

FOR 327-3

COURSE NAME

COURSE NUMBER

B. Critiques

For guest speaker presentations and field trips, students will be required to submit a typed critique containing:

1. Topic of presentation/site location.
2. Name and title of presenter.
3. Critical review of presentation/field trip activity.
4. References - a listing of at least 3 information sources relating to the topic.

Critiques will be valued at 20% of the grade total.

C. Report

To be announced

SMALL FISH COLLECTION FORM

SPECIMEN NO. _____

COMMON NAME _____

GENUS _____

SPECIES _____

CAPTURE DATE _____

LOCATION _____

WATER DEPTH _____ (meters)

WATER TEMPERATURE _____ ($^{\circ}\text{C}$)

SUBSTRATE _____

AQUATIC VEGETATION _____

COLLECTOR _____

FISHERIES BIOLOGY/MANAGEMENT

FOR 327-3

COURSE NAME

COURSE NUMBER

V. REQUIRED STUDENT RESOURCES

TEXTBOOK(S):

Ministry of Natural Resources. Aquaculture in Ontario. Fisheries Branch, Toronto, Ontario.

VI. ADDITIONAL RESOURCE MATERIALS:

FISHERIES BIOLOGY REFERENCES

Adams, S. Marshall (ed.) 1990. Biological Indicators of stress in Fish. American Fisheries Society Symposium 8. AFS, Bethesda, Maryland.

Cailliet, G.M., M.S. Love and Q.W. Ebeling. 1985. Fishes, A Field Manual on Their Structure, Identification and Natural History. Wadsworth Publishing Co., Belmont, CA.

Calow, P. (ed.) 1985. Fish Energetics. New Perspectives. The Johns Hopkins University Press, Baltimore, MD.

Carlander, K.D. 1977. Handbook of Freshwater Fishery Biology, Vol. 2. Iowa State University Press. QL625.C373 V.2

Cooper, E.L. (ed.) 1987. Carp in North America. AFS, Bethesda, Maryland.

Craig, John F. 1987. The Biology of Perch and Related Fish. Timber Press, Portland, Oregon.

Goldman, C.R. 1983. Freshwater Crayfish. AVI Publishing Co. Inc. QL444.M33I57 1981.

Hoar, W.S. and D. J. Randall. 1983. Fish Physiology. Academic Press Inc., New York, N.Y.

Johnson, J.E., 1987. Protected Fishes of the United States and Canada. American Fisheries Society. Bethesda, Maryland. QL 625.J63

Johnson, L. and B. Burns (eds). 1984. Biology of Arctic Charr. Proceedings after International Symposium, 1981. University Manitoba Press. Winnipeg, Manitoba.

Kendall, R.L. (ed.) 1978. Selected Coolwater Fishes of North America. American Fisheries Society, Bethesda, Maryland.

COURSE NAME

COURSE NUMBER

FISHERIES BIOLOGY REFERENCES - CONTINUED

- Lagler, K.F., J.E. Bardach and R.R. Miller, 1962. Ichthyology. John Wiley and Sons Inc., New York.
- McKeown, B.A. 1984. Fish Migration. Timber Press. Portland, Oregon.
- Moyle, P.B. and J.J. Cech, Jr. 1982. Fishes: An Introduction to Ichthyology. Prentice-Hall Inc., New Jersey.
- Page, Lawrence M. 1983. Handbook of Darters. TFH Publications, Inc. Ltd. Neptune City, New Jersey.
- Pickering, A. (ed.). 1981. Stress and Fish. Academic Press, Inc., New York, N.Y. QL639.1.S74 1981.
- Potts, G.W. and R.J. Wooton. 1984. Fish Reproduction: Strategies and Tactics. Academic Press, Inc., New York, New York
- Raat, A. 1988. Synopsis of Biological Data on the Northern Pike, Esox lucius Linneaus. FAO Fisheries synopsis No. 30, Rev. 2. FAO.
- Scott, W.B. and E.J. Crossman, 1973. Freshwater Fishes of Canada. Bulletin 184. Fish Res. Board of Can., Ottawa.
- Scott, W.B. and Mildred Grace. 1988. Atlantic Fish of Canada. University of Toronto Press, Downsview, Ont., QL 626.5 A8 S36 1988
- Sedgwick, Stephen Drummond. 1982. The Salmon Handbook. Andre Deutsch Ltd. London.
- Sigler, William and J.W. Sigler. 1987. Fishes of the Great Lakes Basin: A Natural History. University of Nevada Press.
- Sigler, W. F. and J. W. Sigler, 1990. Recreational Fisheries Management, Theory and Application. University of Nevada Press.
- Thompson, P. 1980. The Game Fishes of New England and S.E. Canada. Down East Books. Camden, M.E.
- Tytler, Peter and Calow Peter. 1985. Fish Energetics - New Perspectives. John Hopkins University Press. QL639.1.F554 1985.
- Weatherly, A.H. and H.S. Gill. 1987. The Biology of Fish Growth. Academic Press Inc., New York, N.Y.
- Welcomme, R. 1988. International Introductions of Inland Aquatic Species. FAO Fisheries Technical Paper No. 294. FAO.

FISHERIES MANAGEMENT REFERENCES

- Anderson, L.G. (ed). 1986. The Economics of Fisheries Management (2nd ed). The Johns Hopkins University Press, Baltimore, MD.
- Bennett, G.W. 1971. Management of Lakes and Ponds. 2nd edition. Van Nostrand Reinhold, Toronto.
- Butler, M. et al. 1988. The Application of Remote Sensing Technology to Marine Fisheries: An Introductory Manual. FAO Fisheries Technical Paper #295. Unipub SH334.7.A66.
- Everhart, W.H., A.W. Eipper and W.D. Youngs. 1981. Principles of Fisheries Science. Cornell University Press, Ithaca, London.
- Grant, W.E. 1986. Systems Analysis and Simulation in Wildlife and Fisheries Science. John Wiley and Sons, Rexdale, ON.
- Gresswell, R.E. (ed.). 1988. Status and Management of Interior Stocks of Cutthroat Trout. A.F.S. Symposium SO892-2284 4. Bethesda, Maryland. QL 638 S2 S785
- Lackey, R.T. and L.A. Nielson (eds). 1980. Fisheries Management. John Wiley and Sons. Toronto, Ontario.
- McNeil, William J. (ed.). 1988. Salmon Production, Management and Allocation: Biological, Economic and Policy Issues. Proceedings of the World Salmonid Conference, Portland, Oregon in 1986. Oregon State University Press, Oregon.
- Mills, Derek and David Piggins (eds). 1988. Atlantic Salmon: Planning for the Future. Proceedings of the Third International Atlantic Salmon Symposium, Biarritz, France in 1986. Timber Press. Portland, OR. SH 346.I57 1986
- Mills, D. 1989. Ecology and Management of Atlantic Salmon. Chapman and Hall. QL 638 S2 M48 1989
- Nielsen, Larry A. and David L. Johnson (eds). 1983. Fisheries Techniques. AFS, Bethesda, Maryland.
- Royce, William F. 1984. Introduction to the Practice of Fishery Science. Academic Press, New York, N.Y.
- Royce, William. F. 1987. Fishery Development. Academic Press Inc., New York, N.Y. SH328.R74 1987.
- Royce, William F. 1987. Fishery Development. Academic Press, New York, N.Y.

AQUACULTURE/NUTRITION REFERENCES

- Beveridge, Malcolm, C.M. 1987. Cage Aquaculture. Fishing News Books Ltd. New York, N.Y. SH151.B48
- Bonn, E.W. et al. 1976. Guidelines for Striped Bass Culture. AFS Publishing Co., Bethesda, MA. SH351.B3G85
- Brown, E. Evan. 1980. Fish Farming Handbook. AVI Publishing Co., Inc. Westport, CT.
- Brown, E. Evan. 1980. Crustacean and Mollusk Aquaculture in the United States. AVI Publishing Co., Inc. Westport, CT
- Cowey, C., A. Mackie and J. Bell (eds). 1985. Nutrition and Feeding in Fish. Academic Press, Inc., New York, N.Y. SH156.N88 1985.
- Davis, H.S. 1973. Culture and Diseases of Game Fishes. University of California Press, Berkeley, CA.
- Goldman, Charles R. 1983. Freshwater Crayfish V. AVI Publishing Co., Inc. Westport, CT.
- Hall, G.E. (ed) 1986. Managing Muskies. Papers from the International Muskie Symposium at LaCrosse, Wisconsin, April 4-6, 1984. AFS Publishing Co., Bethesda, MA.
- Halver, John E. 1988. Fish Nutrition (2nd ed). Academic Press, Inc., New York, N.Y.
- Harrell, R.M. 1990. Culture^o and Propagation of Striped Bass and its Hybrids. A.F.S. Bethesda, Maryland.
- Huner, J.V. and E.E. Brown 1985. Crustacean & Mollusk Aquaculture in the United States. AVI Publishing Co. Inc. SH365.A3C78 1985.
- Lannan, J.E. 1986. Principles and Practices of Pond Aquaculture. AVI Publishing Co., Inc. Westport, CT.
- Leitritz, Earl and Robert C. Lewis. 1980. Trout and Salmon Culture (Hatchery Methods). ANR Publications, Oakland, CA.
- McLarney, William, O. 1984. The Freshwater Aquaculture Book: A Handbook for Small Scale Fish Culture in North America. Hartley and Makrs, Inc.
- Meade, J.W. 1989. Aquaculture Management. Van Nostrand Reinhold. SH135 M43 1989.

FISHERIES BIOLOGY/MANAGEMENT

FOR 327-3

COURSE NAME

COURSE NUMBER

AQUACULTURE/NUTRITION REFERENCES - CONTINUED

Muir, J.F. and R.J. Roberts (eds). 1985. Recent Advances in Aquaculture. Vol. 2. Westview Press, Boulder, CO.

Piper, Robert G. et al. 1982. Fish Hatchery Management. United States Dept. of the Interior. Fish and Wildlife Service, Washington, DC.

Sedgwick, Stephen Drummond. 1973. Trout Farming Handbook. Seeley Service, London.

Spotte, S. 1979. Fish and Invertebrate Culture (2nd ed). John Wiley and Sons, Inc., Rexdale, ON.

Stickney, R.R. 1979. Principles of Warmwater Aquaculture. John Wiley and Sons, Inc., Rexdale, ON.

Stickney, Robert R. 1986. Culture of Nonsalmonid Freshwater Fishes. CRC Press, Inc., Boca Raton, FLA.

Stroud, R.H. (ed). 1986. Fish Culture in Fisheries Management. AFS, Bethesda, Maryland.

Swift, Donald R. 1985. Aquaculture Training Manual, Fishing News Books Ltd., Surrey, England

Thorpe, J.E. 1980. Salmon Ranching. Academic Press, Inc. New York, New York.

Tucker, C.S. (ed). 1985. Channel Catfish Culture. Elsevier Science Publishing Co., New York, N.Y. SH167.C35C48 1985.

GENERAL

- AMOS, K.H. (ed). 1985. Procedures for the Detection and Identification of Certain Fish Pathogens. 3rd edition. AFS, Bethesda, Maryland.
- ELLIS, ANTHONY E. 1985. Fish and Shellfish Pathology. Academic Press. Harcourt and Brace Jovanovich, Don Mills, Ont.
- MAWDESLEY THOMAS, L.E., ed. 1972. Diseases of Fish. No. 30. Symposia of the Zoological Society of London, Academic Press, London and New York.
- POST, G. 1983. Textbook of Fish Health. TFH Publication, Inc. Ltd., Neptune city. N.J.
- RIBELIN. W.E., and G. MIGAKI, eds. 1975. Pathology of Fishes. University of Wisconsin Press, Madison, WI. pp. 1004.
- ROBERTS, R.J., ed., 1978. Fish Pathology. Bailliere Tindall, London. pp. 1978.
- ROBERTS, R.J. and C.J. SHEPHERD, 1974. Handbook of Trout and Salmon Diseases. Fishing News (Books) Ltd., Surrey, England. pp. 168
- WARREN, J.C. 1978. Diseases of hatchery fish. United States Fish and Wildlife Service. Twin Cities, Minnesota. pp. 94
- WOOD, J.W. 1968. Diseases of Pacific Salmon, their Prevention and Treatment. Hatchery Division, Department of Fisheries, State of Washington, Olympia, WA. pp. 82.

BACTERIAL AND FUNGAL (see also GENERAL references above)

- BULLOCK, G.L., D.A. CONROY, S.F. SNIEZSKO 1971. Bacterial diseases of fishes. In Snieszko S.K. and H.R. Axelrod, eds. Book 2A of Diseases of Fishes. T.F.H. Publications, Inc., Neptune City, N.J. pp. 151.