

COURSE DESCRIPTION AND MAJOR OBJECTIVES

Dr. Culver

LIMNOLOGY

EEOB 655

Definition: the scientific study of the physical, chemical, and biological conditions in continental waters. It includes streams, rivers, ponds, lakes, reservoirs, estuaries, and wetlands and is closely related to oceanography. It is not limited to fresh water, since many lakes (e.g. the Great Salt Lake) are saltier than the ocean.
(It is not the study of arms and legs!)

Course Description: The course provides undergraduate and graduate students an introduction to limnology, emphasizing the function of north temperate lakes and ponds, although streams and rivers are included. Lecture topics include the physics and chemistry of continental waters, an introduction to the major biotic communities, and a series of lectures on the interactions among the plants and animals, predators and prey, and the physicochemical and biotic components of aquatic systems. Laboratory exercises and field trips (3) are designed to provide a practical introduction to limnological methods. Activities include morphometry of lakes, circulation and stratification, chemical water quality analysis, identification of planktonic and benthic organisms, field sampling in lakes, ponds, and streams, and paleoecology of lakes.

Prerequisites: Students should have taken 20 hrs biological sciences and 10 hrs chemistry. A course in ecology is also recommended (e.g. Evolution, Ecology and organismal Biology EEOB 413.01). EEOB 655 is particularly suited to students wishing to concentrate in Ecology, Environmental Sciences, Marine Biology or Fisheries. It is highly recommended for students wishing to take courses at a Biological Field Station such as Stone Laboratory this summer.

Objectives:

- 1) Understand the major physical factors influencing the function of lakes, ponds, and streams
- 2) Understand the cycles of the most important chemicals influencing lake function, and the interaction between biological and chemical portions of the ecosystem using compartmental (systems) models.
- 3) Learn the major communities of organisms living in the various aquatic habitats, including their life cycles and roles within the ecosystem.
- 4) Understand how the organisms and the abiotic portions of aquatic ecosystems interact to determine ecosystem function.
- 5) Obtain experience reviewing the primary literature in an area of interest and integrate it into a piece of scientific writing related to the function of aquatic systems.
- 6) Obtain practical experience with techniques commonly used in aquatic ecology, including water quality data analysis and presentation, quantitative chemical analysis of fresh water, field collection and identification of plants and animals, etc.

<u>Week</u>	<u>Lecture Topics</u>	<u>Reading Assignments (W=Wetzel)(Readings in H=Hutchinson are recommended, but not required)</u>	
I. Apr 1	M Introduction; Origin of lake basins; Morphometry. W Properties of water; Light and lakes. F Thermal balance and stratification.	W1-7,15-42; W8-14,43-69; W71-92;	H1-194 H366-425 H426-540
II. Apr 8	M Movements of water. W Dissolved matter_Principal ions, nutrient cycles,oxygen F Inorganic carbon, pH	W93-128; W151-186; W187-204;	H250-365 H541-652 H653-690
II. Apr 15	M Nitrogen. Read "The Algal Bowl" by Vallentyne W Phosphorus F Minor ions; Sediments; redox, diss. organic carbon	W205-237; W239-288; W289-330;	H836-877 H727-752 H753-801
IV. Apr 22	M EXAMINATION : Over first three weeks' work W Communities in lakes F Algae: biological character & life cycles Term Paper topic and annotated bibliography due by today	W129-150; W331-358	H2 226-305 H2 306-397
V. Apr 29	M Algae: Dynamics & seasonal cycles W Algae: Primary productivity F Zooplankton: Biol. character & life cycles	W358-374 W375-394 W395-433	H2 398-489 H2 490-724
FIELD TRIP TO LAKE ERIE May 3-5 (Required) Lv 1:00 pm Fri, Ret 5:00 pm Sun			
VI. May 6	M Zooplankton: Population characteristics and dynamics W Zooplankton: Production; Fish as plankton predators F Littoral Community: Larger plants/benthic animals	W433-488 W527-600 W600-629,665-720	H3 (all!)
VII. May 13	M EXAMINATION Over second three weeks' work W Detritus chains, decomposers, microbial loop F Eutrophication	W489-525, 731-783	
VIII. May 20	M Trophic dynamics W Fish biology F Fish biology	W721-730	
IX. May 27	M MEMORIAL DAY HOLIDAY W Introduced Species F Paleolimnology (lab too)	W785-842	
TERM PAPER DUE BY 11:30 AM, May 25			
X. Jun 3	M Organization of aquatic communities W 11:30-12:30 LAB PRACTICAL; SENIORS' FINAL EXAM 1:30 PM R --Graduating seniors grades due 4:30 PM F To be Announced FINAL EXAMINATION: Wed JUNE 12 11:30 am-1:18 pm		

Grade Distribution: Midterms 30%, Term Paper 20%, Lab Reports (#1 5%, #2 5%, others total 5%), Lab Practical exam 15%, Final Examination 20%. In addition, graduate students will present a seminar Friday Night at Lake Erie.

Required Textbooks: Wetzel, R. 2001. Limnology, 3d edition. Academic Press
Course Copy: Lab&Lecture Handouts. Available at the Neil Avenue Copez for about \$10.

On Reserve:

Vallentyne, J. R. 1974. The Algal Bowl: Lakes and Man. Environment Canada

Wetzel, R. 2001. Limnology, 3d ed

Hutchinson, G.E. 1957. A Treatise on Limnology (Volumes I: Physics & Chemistry) (Not assigned, just for reference)

“ ” 1967. Volume II: Plankton
“ ” Volume III: Aquatic Vascular Plants
“ ” Volume IV: Benthos

Week Laboratory Topics and Reading Assignments

- I. Morphometry: graphical representation of limnological data.
Report due in Lab on April 10(for W lab) or 11(R lab) Instructions in Course Copy
- II. Aquarium models of lake thermal processes.
Report due in Lab on 17 or 18 April (See Course Copy)
- III. Chemistry I: Oxygen, phosphorus and conductivity. (Course Copy)
- IV. Chemistry II: Inorganic carbon complex: alkalinity, acidity, pH, total inorganic carbon; hardness, calcium (Course Copy)
- V. Phytoplankton; Primary production (Course Copy)
- VI. Zooplankton I: Field trip to West Campus Pond. (Bring old shoes and organism Identification guides)
- FIELD TRIP TO LAKE ERIE** (May 3-5, Required) Lv 1:00 pm Fri, Ret 5:00 pm Sun
- VII. Zooplankton II: Taxonomy and Keying-out exercise
- VIII. Benthos and streams: Field trip to Olentangy River or Big Darby Creek.
Be prepared to wade (old tennis shoes or hip boots. Bring identification guides)
- IX. Fish biology and paleolimnology
- X. **Laboratory practical examination** (during Wed. lecture hour) & **Graduating Senior Final Exam** (Wed)