



LIMNOLOGY

WL 370 - Fall 2008



INSTRUCTORS: Dr. Michael L. Brown
141B SNP, 688-6121
Office Hours: Monday & Wednesday 9:00-10:30, or scheduled
Course website: <https://d21.sdbor.edu/index.asp>

Mr. Michael Weber
144-1A SNP, 688-4747
Office Hours: Thursday 9:00-10:00, or scheduled

CLASS TIMES: Lecture (WL370-01) -- Tuesday & Thursday 10:00-10:50 SNP 024
Lab S01 (WL370-S01) -- Tuesday 12:00-2:50, plus arranged SNP 179
Lab S02 (WL370-S02) -- Thursday 12:00-2:50, plus arranged SNP 179

COURSE DESCRIPTION

WL 370 is a junior-level course which covers the basic elements of limnology and associated techniques. A preferred description of this course is the study of the functional relationships and productivity of freshwater communities as affected by physical, chemical, and biological components of the aquatic environment. This course presents key concepts regarding how lake systems work and how human activities influence lake function. These concepts (e.g., heat budgets, lake circulation patterns, and nutrient budgets) are incorporated with the lake biota (e.g., phytoplankton, zooplankton, and fish) and synthesized to provide perspective on ecosystem structure and function.

COURSE OBJECTIVES

This course is intended as an introduction to the basic factors and processes that operate in inland waters as dynamic systems. In seeking to fulfill this intention the broad objectives are to draw upon the major aspects of geology, hydrology, physics, chemistry, and biology that apply to inland waters to develop an understanding of fundamental limnological principles and to gain knowledge and practical experience in limnological methods. Specific objectives, integrated into the lecture and lab components of the course, are as follows:

- Learn how major abiotic factors interact to regulate the structure and function of a lake ecosystem.
- Understand the functional roles of organisms in the aquatic community.
- Learn techniques for the collection of aquatic invertebrates and develop competency in the identification of aquatic taxa.
- Develop teamwork skills by working with other students to accomplish assigned tasks in the field and lab environments.
- Develop a collaborative, scientific research paper to demonstrate electronic search competency, scientific writing proficiency, critical thinking (e.g., data analysis and interpretation) and discussion skills.

TEXTBOOK

Brönmark, C., and L.-A. Hansson. 2005. The biology of lakes and ponds, second edition. Oxford University Press, New York. 285 pp.

COURSE FORMAT

Lecture: Class sessions will be comprised of lecture and class discussion (particularly during the latter portion of the course). It is extremely important for you to ask questions and become involved in discussions – these activities will enhance your understanding of the material. It should be apparent that you must have read the assigned textbook material in advance to ensure that you are properly prepared before coming to class (unannounced written or discussion exercises may be given at my discretion).

Tentative Lecture Schedule

Month	Dates	Topics	Associated Reading
September	4 – 30	Syllabus & introduction	
		Lake formation	
		General properties & processes	Ch. 2
		- Light, heat and temperature	“
		- Water movement	“
		- Water chemistry	“
		- Nutrients	“
		- Oxygen	“
October	2	Exam I	
	7 – 28	Aquatic biota	Ch. 3
		- Viruses, fungi, and plants	“
		- Zooplankton	“
		- Other invertebrates	“
	23	Exam II (turn in draft paper [title, intro., & methods])	
	30	Biotic interactions	
November	4 – 25	- Predation, competition...	Ch. 4
		- Food webs	Ch. 5
		Biodiversity, biomanipulation	Ch. 6
		Thanksgiving Holiday – November 27	
December	2 – 11	Environmental threats	“
		Lake management	“
		Exam III – December 18, 12:00-1:40	

Laboratory: Field trips will be made to local water bodies to acquaint you with sampling techniques and to acquire samples for processing in the lab and data for your research report. Teams (~ 5 members each) will be formed to complete various sampling tasks. Lake sampling will include collections of invertebrate biota (i.e., zooplankton, benthos, and insects), and measurements of physical and chemical parameters (e.g., temperature, dissolved oxygen, light, pH, total dissolved solids, turbidity, and chlorophyll a). Collections and measurements will be completed at multiple sites on each system. You must provide your own transportation (car pool) to these local field labs (see appended area map). You must have chest or hip waders and rain gear. After we have completed field sampling portion of the lab, the remainder of the labs will be conducted in-house where you will work in pairs to process your samples.

You will maintain a small notebook (e.g., 5” x 7”) with you during lab and class. This notebook is to be used to log your daily observations in field and in-house labs, and participation (questions and discussions). Notebooks will be collected at the end of the semester and evaluated as a portion of the participation score.

Laboratory Schedule

Date	Location	Activity	
Sep	9,11	SNP 179	Equipment, techniques & preservation
	^a Sat., 13	Brookings city ponds (n = 3)	Sampling trip
	16, 18	SNP 179	Zooplankton (ID, count, size structure)
	^b Sat., 20	Brookings barrow pits (n = 3)	Sampling trip
	23, 25	SNP 179	Zooplankton (ID, count, size structure)
Sep/Oct	30, 2	“	Benthic organisms (ID, count)
Oct	7, 9	“	Benthic organisms (ID, count)
	14, 16	“	Aquatic insects (ID, count)
	21, 23	“	Aquatic insects (ID, count)
	28, 30	“	Chlorophyll analysis
Nov	4, 6	“	Light extinction
Nov	11, 13		Paper development
	18, 20		Paper development
	25, 27	Thanksgiving Holiday	
Dec	2, 4		Review, turn in research paper
	9, 11	“	Lab practicum

^a Lab section S01 will sample three of the Brookings Softball Complex ponds.

^b Lab section S02 will sample the HWY 14 bypass, Gustafson's and Interstate barrow pits.

EVALUATION AND STUDENT RESPONSIBILITIES

The major emphasis of this course is to gain knowledge and experience. Successful completion of lab tasks and exams will be the two primary approaches for determining your proficiency on subject matter. Furthermore, it is essential that you develop the skills necessary to interpret data and communicate results. As such, you will be assigned a research paper that summarizes your team's (groups of three) analysis and interpretation of the comparative data collected from the ponds and barrow pits. In general, this paper will be typed, a maximum of 10 double-spaced pages in length (not including title page, references, tables and figures), and evaluated in areas of focus, comprehensiveness, and clarity of scientific writing. All references must be appropriately acknowledged – plagiarism will result in a fail grade. Explicit guidelines are provided in a detailed handout appended to this syllabus. This assignment requires equitable team member contributions, literature searching and writing completion that involves electronic information/technology based skills.

Exams will consist of essay, multiple choice, and true/false questions. Graded components of the course will breakdown as follows:

Lecture exams (3 @ 100 pts ea)	300	50 %
Research paper (due November 16)	150	25
Lab practicum	100	16.7
Class/lab participation log	50	8.3
Pop quizzes (10 pts ea, as necessary)	---	---
	<u>600</u>	<u>100%</u>

Grades will be assigned according to the following scale. I will lower these limits if dictated by a lower distribution; however, only by attaining these averages will you be assured of receiving a desired grade.

90.0-100%	A
80.0-89.9	B
70.0-79.9	C
60.0-69.9	D
<60.0	F

Makeup exams will not be given except in extremely extenuating circumstances. No makeup exam will be given unless the instructor was contacted to explain the situation before the start of the scheduled exam. Format of makeup exams will be at my discretion.

Your attendance is mandatory for all lecture and lab periods. Upon request, you will be expected to assist with any field trip preparations. You will be expected to participate in all phases of field work. Not being prepared for conditions (waders, rain gear) encountered will not excuse you from participation.

ADA POLICY

Students are entitled to ‘reasonable accommodations’ under the provisions of the *Americans with Disabilities Act* (ADA). Information concerning the provisions of the ADA of 1990 and Section 504 of the Rehabilitation Act are available from the Office of Disability Services located in 145 Binnewies Hall. The telephone number is (605) 688-4504, (605) 688-4394 TTD. Additional information is available at <http://www3.sdstate.edu/StudentLife/DisabilityServices/Index.cfm>. Please discuss your needs with me as well.

ACADEMIC FREEDOM AND RESPONSIBILITY IN LEARNING

Freedom in learning. Students are responsible for learning the content of any course of study in which they are enrolled. Under Board of Regents and University policy, student academic performance shall be evaluated solely on an academic basis and students should be free to take reasoned exception to the data or views offered in any course of study. Students who believe that an academic evaluation is unrelated to academic standards but is related instead to judgment of their personal opinion or conduct should first contact the instructor of the course. If the student remains unsatisfied, the student may contact the department head and/or dean of the college which offers the class to initiate a review of the evaluation.

ACADEMIC DISHONESTY POLICY

Any form of academic dishonesty will not be tolerated. You are subject to the academic dishonesty policy in the following section.

The Department and the University have taken a strong and clear stand regarding academic dishonesty. We believe that it is unethical and unprofessional to present work done by others in a manner indicating that the student/s is/are presenting material as his/her original ideas or work; such activity is academic dishonesty. Plagiarizing or knowingly assisting others in plagiarizing on tests, quizzes, problems, assignments, research papers, theses, dissertations, or other academic activities is unacceptable behavior. All academic work completed by students is expected to be the original work of that individual student, unless permission is specifically granted beforehand by the faculty member for some form of team effort or other format. If students are unsure if a particular activity may be regarded as a form of academic dishonesty they should consult the faculty member before undertaking such an activity.

The University has a policy on academic honesty, procedures for academic grade and dishonesty appeals, and sanctions for such activities (see Student Code). The Student Code has **different** procedures for undergraduate and graduate students.

The Department policy described in this handout is intended to attempt to address perceived academic dishonesty violations between the faculty member/s and student/s **before** Student Code procedures are

implemented. This is done because under Student Code procedures the **minimum** penalty for academic dishonesty is Disciplinary Probation. These added Department steps (Steps 1, 2, and 3 of the Undergraduate Student and Graduate Student Procedures) should not be construed as an attempt to circumvent the Student Code system; both students and/or the faculty member have the option to go directly into that system. The Department procedures portion of this policy are only available to a student one time; any second perceived offense will immediately follow the Student Code procedures.

Undergraduate Student Procedure

1. When a student/s is/are determined to have broken the Academic Dishonesty Policy, he/she will be notified **verbally** by the faculty member involved as to the problem and sanction selected. This is similar to procedures 02:02:01:03 and 02:02:01:04 in the Student Code. The faculty member will do this immediately after the perceived violation occurs. Sanction options available to the faculty member are as follows:
 - a. provide the student/s a grade of zero or some other score on the test, quiz, problem, assignment, or other academic endeavor involved;
 - b. provide the student/s a grade of “F” in the course;
 - c. request that the student/s withdraw from the course;
 - d. request that the student/s change the grading for the course to an “audit”; or
 - e. immediately refer the case to the Student Code procedures.

The sanction selected is at the discretion of the faculty member, based on the seriousness of the situation.

2. If the student/s agrees to the sanction proposed by the faculty member the process is completed.
3. If the student/s does not agree to the sanction proposed by the faculty member, he/she has the right to appeal the faculty member’s decision. This **Informal Phase Appeal** should be made directly (**both verbally and in writing**) to the faculty member involved within 5 class days of notification or within 7 calendar days of notification, if the incident is at the end of the semester. The faculty member may then modify or leave unchanged the sanction proposed in step 1. A copy of the student’s **written appeal** and the faculty member’s **written response** will be sent to the Department Head so that a confidential record to protect the student/s and the faculty member is established. The student/s written appeal and faculty member written response will be secured in the student’s file until graduation or he/she leaves the program; if no further perceived violations have occurred these materials will be purged from the student’s file.
4. If the student/s is/are still dissatisfied with the decision he/she can appeal to the Department Head. This **Informal Phase Appeal** should be made **verbally**. The Department Head will utilize this verbal appeal and the written student appeal and faculty written response described in step 3 to reach a decision. (These are steps 02:02:01:05, 02:02:01:06, and 02:02:01:07 in the **Informal Phase Appeal** process described in the Student Code).
5. If the student/s and faculty member agree with the Department Head’s decision, the process is completed. Up to this point, no one other than the student/s, faculty member, and Department Head has been made aware of the situation.
6. If the student/s or faculty member is/are dissatisfied with the Department Head’s decision they can enter the **Formal Phase** of the Student Code process (Student Code 02:02:02). It is the responsibility of the faculty member and student/s to be aware of the procedures and penalties involved.



Highway 14 bypass pond

Gustafson's pond



Brookings Softball Complex ponds

Interstate pond

Writing Guidelines for Limnology Research Paper

In addition to the general information contained in the *Universal Writing Guideline* included at the end of this handout, the following instructions provide specific guidance on how to write your research paper – review each set of instructions thoroughly! Your team-written paper will be critically evaluated in areas of focus, comprehensiveness, and clarity of scientific writing.

General instructions:

- Each member will equally contribute to the abstract, introduction, methods, and reference sections; however, individuals will be “in charge” of developing their part of the results and discussion sections for zooplankton (column samples), benthic invertebrates (dredge samples) or insects (stovepipe samples).
- The body of the paper (introduction, materials and methods, and results and discussion) should not exceed 10 pages.
- Use a word processor to type the paper double-spaced on one side of 8.5x11” paper.
- Use a 12 pt Times Roman font throughout the paper unless you need to reduce font size in a large table.
- Use 1-inch (2.5-cm) margins on all sides.
- Number all pages, starting with 1 on the title page.
- Do not justify the right-hand margin.
- Indent the first line of each paragraph.
- Describe statistical methods in enough detail to enable a knowledgeable reader with access to the original data to verify the reported results.
- Use the same font for the same mathematical symbol regardless of where it appears in the manuscript (text, displayed equations, tables, figures, or figure legends).
- Use abbreviations sparingly. Use periods after all abbreviations except for metric measures, compass directions, and time (s, min, h, d, yr; do not abbreviate 'week' or 'month'). Use hh:mm h or hh:mm:ss h for time of day. Do not use a.m. or p.m. E.g., 09:30 h, 18:24:44 h.
- Provide the full expansion of all acronyms on first use, followed by the acronym (or abbreviation) in parentheses.
- Do not abbreviate state, province, city, or country names.
- Thoroughly proofread and spell-check the manuscript (visually and with the word processor).

The major paper sections (in order) required in your paper are:

1. Title page

Capitalize only the first word, proper nouns, and acronyms in the title.

2. Abstract

Write the abstract as a single paragraph of no more than 250 words. State what you did and what you found; omit 'introductory' statements that summarize previous work and avoid statements that do not identify actual findings. Summarize rather than advertise both the important findings and their significance. Because the abstract must stand on its own, it cannot include references.

3. Introduction

4. Materials and Methods (includes description of study sites)

5. Results and Discussion (you may split into two separate sections)

6. Acknowledgments

7. References (a minimum of 10)

Make sure that each citation is complete, according to the following examples:

Article:

Markham, J. L., D. L. Johnson, and R. W. Petering. 1991. White crappie summer movements and habitat use

in Delaware Reservoir, Ohio. *North American Journal of Fisheries Management* 11:504-512.

Book:

Stumm, W., and J. Morgan. 1981. *Aquatic chemistry*, 2nd edition. Wiley and Sons, New York.

Chapter:

Irwin, E. R., and R L. Noble. 1996. Effects of reservoir drawdown on littoral habitat: assessment with on-site measures and geographic information systems. Pages 324-334 *in* L. E. Miranda and D. R. DeVries, editors. *Multidimensional approaches to reservoir fisheries management*. American Fisheries Society, Symposium 16, Bethesda, Maryland.

Thesis:

Lott, J.P. 1991. Food habits of yellow perch in eastern South Dakota glacial lakes. M.S. Thesis, South Dakota State University, Brookings.

8. Tables

Start each table on a new page. Format tables so that they will fit on the printed page, portrait or landscape format. Type table captions as double-spaced paragraphs at the top of each table.

9. Figures

Figure captions must be formatted as one paragraph per figure. Symbols used in the figure (e.g., circles, squares, ...) must be explained on the figure itself (i.e., not in the figure legend). No special symbols are allowed in the figure legend. Number all figures serially. If a figure consists of multiple panels, put all panels on one page and repeat axes titles on each panel only if they are different. Explain all panels in each figure (A), (B), etc.. Put scale bars on the figure, NOT in the figure legend. Make figures as simple as possible. For example, avoid grid lines and boxes around symbol definitions.

Universal Writing Guidelines for Wildlife and Fisheries Sciences Courses

Wildlife and Fisheries Sciences 300/400-level courses with writing assignments should follow these guidelines. Grading on written assignments should be affected by compliance with these guidelines. The goal is to aid students by promoting effective written communication skills.

1. The introduction must include the following:
 - a. a lead sentence that addresses the specific topic of the paper;
 - b. general important findings of others concerning the topic;
 - c. justification (or need) for the information presented; and
 - d. a specific purpose or purposes statement located at the end of the introduction.
2. Citations are required for all information presented that is not common knowledge (other than author results). Not doing so is plagiarism.
3. Copying recorded material (written or archived media) verbatim is plagiarism, unless quotation marks are used and a citation is provided. Long quotes should be avoided and even short quotes should be used sparingly.
4. All information cited in the text should be represented by an entry in the literature cited section and vice versa.
5. A consistent literature cited format should be used – the format is at the discretion of the instructor.
6. Tables and figures should be in the correct format.
7. Table and figure captions should contain sufficient information so that the captions could stand alone without referring to the text of the paper (this includes scientific names).

8. All figures and tables should be referred to and discussed in the text and should appear in the text in the same order in which they are first mentioned. Unless otherwise requested, tables and figures should be included in the text as soon as possible after their initial discussion in the paper.
9. Information (results) that the author or someone else has reported should be written in the past tense.
10. Acronyms and abbreviations should only be used after being initially defined. Both should be used sparingly.
11. Sentences should never start with an Arabic number, an acronym, or an abbreviation.
12. Pages should always be numbered, generally at the bottom center of the page.
13. The first time an organism is mentioned in the text its scientific name must appear. The first letter of the genus is capitalized; the species is in lower case. The scientific name is either italicized or underlined.
14. All numbers should be to the same decimal point in a common data array. Significant digits imply precision.
15. Possessives and contractions should be avoided.
16. Paragraphs must follow the concepts of correct paragraph structure – they should not be just random breaks in the narrative. One sentence paragraphs should be avoided.
17. Unless otherwise specified, all text (including literature cited) should be double-spaced.