Limnology Lab - Conservation of Aquatic Resources

Zoology and Environmental Studies 316

Sample Syllabus

Course Description

Biological, physical, and chemical characteristics and their interrelationships in Wisconsin lakes and streams.

Course Objectives

The course is roughly divided into four sections that are outlined below. We should emphasize that at some points during the semester, you will be working on more than one project at a time. Planning is critical.

Learn basic physical, chemical, and biological sampling techniques used in limnological research: You will be using both laboratory and field research techniques as you collect and analyze data for your scientific research papers. Please dress appropriately for days we are sampling- we will sample in the rain and in rough windy weather. Come to lab prepared.

Learn the importance of seasonal cycles in lakes by tracking changes in a single lake over time. Because of our proximity to Lake Mendota we have the opportunity to observe changes in the lake from late summer to early fall.

Learn how morphology and location of lakes influence limnological characteristics of lakes by comparing several lakes in Northern Wisconsin. We will collect data from numerous lakes during the mandatory Trout Lake Multi-Lake Field Trip. Using these data you will form and test your own hypotheses in your Multi-Lake Comparison paper.

Propose and conduct an original group research project, as research scientists do on a regular basis. This part of the course will allow your group to organize and conduct original scientific research that will culminate with an in-class presentation along with your Group Project paper.

This is a writing intensive course. We stress the importance of scientific writing in presenting your ideas and research results to your peers. We expect you to finish this course with the ability to produce a well-written scientific paper.

Grading and Expectations

Assignment or Requirement	Percent of Final Grade
Lab Questions/Exercises	20
Lab Participation	10
Quizzes	10
Multi-Lake Research Paper -Hypotheses (10%) -TA Check-In (10%) -Complete Draft (30%) -Final Draft (50%)	20
Group Project -Hypotheses and Experimental Design (10%) -Partial Draft (10%) -Complete Draft (30%) -Final Paper (40%) -Class Presentation (10%)	40

Your prompt attendance is required at all laboratory sessions. You must contact us in advance if you will be missing a lab, or you will lose all points associated with that lab and participation points. Arrive on time to lab as we will often give

important announcements within the first 10 minutes and we will use the first portion of the lab for paper discussion sessions and quizzes. Plan that each lab to go until 5:20 PM.

Quizzes will occur at the **start of lab** and are based on the assigned reading and lab manual chapter. If you are unexpectedly late for class and miss the quiz you will be given a zero, so please come to class on time. Quizzes will be based on general comprehension of the readings and application of the week's concepts. We will not quiz you on the fine details of a paper, but rather on the general concepts. Quizzes are designed to ensure students read the text before coming to lab, which will elevate the level of learning. Your lowest quiz score will be dropped.

Lab questions are due the following week. Many labs will have you work through questions during class. You are welcome to discuss the questions as a group, but each individual needs to write their own answers. Clear verbatim copying will not be tolerated and is considered plagiarism. Additionally, several sets of questions require you to work through questions after class. These should be done individually. Labs 9, 11, 12, & 14 will have an assignment/exercise turned in at the end of class. These will be combined with the Lab Questions in final grade determination.

The majority of your grade is determined by the multi-lakes research paper and group project. Both are graded through the semester to ensure continual progress and to help avoid potential problems. Because each of these papers requires field data, their due dates will overlap and you will be working on both projects simultaneously. Be sure to plan ahead to ensure both papers are completed by the appropriate due dates.

Written Work Evaluation Policy

Because this class is an upper-division writing class we will not be spending much of our time correcting grammar, spelling and sentence structure problems in your writing. We are assuming that you have had training in these fundamental writing skills. Therefore, if you are not confident in your writing skills you should start papers early and revise frequently. Have a friend review your work or contact the Writing Center on campus: www.wisc.edu/writing/, or 608/263-1992, or 6171 Helen C. White. You will be evaluated on grammar, structure, and clarity even if we do not give feedback on these components. The focus of our comments will be organization, content, graphing and analysis, and an understanding of the material.

Plagiarism

Plagiarism will not be tolerated. Consequences will be severe and all cases will be reported to the Dean of Students office. If you need clarification on what constitutes plagiarism see http://writing.wisc.edu/Handbook/QuotingSources.html. Science is a collaborative effort and we encourage students to work together on assignments/projects. However if you do work collaboratively, you need to indicate the names of the people you worked with on that assignment, and your final product must be your own original work.

Required Text

The Zoology 316 laboratory manual is the only required text. It is available through the Zoology department office. Additional readings are available online using the University's subscription. The additional readings will not be provided, and it is your responsibility to find the journal articles.

Required Readings

Bates College 2004. *How to Write a Paper in Scientific Jounral Style and Format,* http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWtoc.html.

Beisner, B.E., Dent, C.L., Carpenter, S.R. 2003. Variability of lakes on the landscape: Roles of phosphorus, food webs, and dissolved organic carbon. *Ecology 84*: 1563–1575.

Brezonik, P., Menken, K.D., Bauer, M. 2005. Landsat-based remote sensing of lake water quality characteristics, including chlorophyll and colored dissolved organic matter (CDOM). *Lake and Reservoir Management* 21:373-382.

Dillon, P.J., Rigler, F.H. 1974. The phosphorus-chlorophyll relationship in lakes. *Limnology and Oceanography* 19:767-773.

Dodson, S.I. 2000. The relationship in lake communities between primary production and species richness. *Ecology* 81:2662-2679.

Kratz, T., Webster, K., Bowser, C., Magnuson, J., Benson, B. 1997. The influence of landscape position on lakes in northern Wisconsin. *Freshwater Biology* 37:209-217.

Lewis Jr, W.M. 1996. Tropical lakes: how latitude makes a difference. *Perspectives in tropical limnology*: 43-64.

Mahoney, M.J. 1977 Publication prejudices: An experimental study of confirmatory bias in the peer review system. *Cognitive Therapy and Research.* 1:161-175.

Paul, M.J., Meyer, J.L. 2001. Streams in the urban landscape. *Annual Review of Ecology and Systematics* 32:333-365.

Pace, M.L., Cole, J.J. 2002. Synchronous variation of dissolved organic carbon and color in lakes. *Limnology and Oceanography 47*:333–342.

Peterson, G.D., Beard Jr, T.D., Beisner, B.E., Bennett, E.M., Carpenter, S.R., Cumming, G.S., Dent, C.L., Havlicek, T.D. 2003. Assessing future ecosystem services: a case study of the Northern Highlands Lake District, Wisconsin. *Conservation Ecology*, *7*(3), 1.

Rosenzweig, M.L, Davis, J.I., Brown, J.H. 1988. How to write an influential review. *Bulletin of the Ecological Society of America* 69:152-155.

Schindler, D.W., Curtis, P.J., Parker, B.R., Stainton, M. P. 1996. Consequences of climate warming and lake acidification for UV-B penetration in North American boreal lakes. *Nature* 379:705-708.

Sponseller, R.A., Benfield, E.F., Valett, H.M. 2001. Relationships between land use, spatial scale and stream macroinvertebrate communities. *Freshwater Biology* 46:1409-1424.

Vannote, R. L., Minshall, G. W., Cummins, K. W., Sedell, J. R., Cushing, C. E. 1980. The river continuum concept. *Canadian Journal of Fisheries and Aquatic Science* 37:130–137.

Vadeboncoeur, Y., Vander Zanden, M.J., Lodge, D.M. 2002. Putting the Lake Back Together: Reintegrating Benthic Pathways into Lake Food Web Models. *Bioscience* 52: 44-54.

Verburg, P., Hecky, R.E., Kling, H. 2003. Ecological consequences of a century of warming in Lake Tanganyika. *Science* 301:505–507.

Wynne, R.H., Lillesand, T.M. 1993. Satellite observation of lake ice as a climate indicator: Initial results from statewide monitoring in Wisconsin. *Photogrammetric Engineering and Remote Sensing 59:*1023-1031.

Syllabus & Calendar - SAMPLE

				Assignments and Due Dates		
Week (Meeting Place)	**Activities**	**Weekend Requirement**	**Reading Assignment**	**Questions & Quizzes**	**Group Project Paper**	**Multi-Lakes Paper**
Week 1 (Noland)	Limnological Field Techniques: light, temp, DO	--	Verburg et al. (2003)	Quiz 1	--	--
Week 2 (CFL Dock)	Limnological Field Techniques: pH, ANC, conductivity	--	Kratz et al. (1997), Schindler et al. (1996)	Quiz 2 Lab 1 Questions	--	--
Week 3 (Noland)	Stream Bio-indicators: Biotic Responses to Water Quality (Black Earth Creek Trip)	--	Sponseller et al. (2001), Paul & Meyer (2001)	Lab 2 Questions	Informal project proposals (Due 24 hours after lab via email)	--
Week 4 (Noland)	Limnological Lab Techniques: Phosphorous + Silica	Trout Lake Trip #1 weekend	Dillon & Rigler (1974), Beisner et al. (2003)	Quiz 4	--	Hypotheses
Week 5 (CFL Dock)	Biological Communities in Lakes	Trout Lake Trip #2 weekend	Vadeboncoeur et al. (2002), Dodson et al. (2000)	Quiz 5 Lab 4 Questions	--	--
Week 6 (Noland)	Limnological Lab Techniques: Chlorophyll a + Color	--	Pace & Cole (2002)	Quiz 6 Lab 5 Questions	Present hypotheses & experimental design	--
Week 7 (Noland)	Limnological Field Techniques: Stream Hydrology and Watersheds	--	Vannote et al. (1980), additional TBD	Quiz 7 Lab 6 Questions	--	--
Week 8 (No formal meeting)	Independent Group Project Work	--	--	--	Partial draft of intro & methods - (due Friday 5pm in learn@uw dropbox)	--

Week (Meeting Place)	Activities	Weekend Requirement	Reading Assignment	Questions & Quizzes	Group Project Paper	Multi-Lakes Paper
Week 9 (Noland)	Scientific Writing & Excel Workshop	--		Quiz 9 Lab 7 Questions Lab 9 Exercise	--	10 minute check-in with TA (scheduled outside of class)
Week 10 (No formal meeting)	Independent Group Project Work	--	--		--	--
Week 11 (Noland)	Peer Review of Group Project Paper and Multi-Lake Paper	--	Rosenzweig et al. (1988), Mahoney (1977)	Quiz 11 Lab 11 Exercise	Complete draft (1 hard copy per student in class, and 1 submitted to learn@uw dropbox)	Complete draft (1 hard copy per student in class, and 1 submitted to learn@uw dropbox)
Week 12 (Noland)	Temporal and Global Limnology	--	Lewis (1996), Brezonik et al. (2005)	Quiz 12 Lab 12 Exercise	--	--
Week 13 (No formal meeting)	Thanksgiving - NO CLASS	--	--	--	--	--
Week 14 (Noland)	Management Scenarios	--	Peterson et al. (2003)	WOWM Pre-Survey	--	Final paper (in learn@uw dropbox)
Week 15 (Noland)	Final Group Project Presentations	--	--	WOWM Post-Survey	Final paper & presentations (in learn@uw dropbox)	--