BOT 4214/5214 BOTANICAL LIMNOLOGY Fall 2010

Lectures Tu/Th 10:30-11:45 in LSE 011; Lab Th 1:30-4:20 in LSE 011 https://oc.okstate.edu/
Dr. Bill Henley, LSE 006 744-5956 bill.henley@okstate.edu
Office hours: "officially" M/W 9:00-10:00, Tu 4:00-5:00; however, feel free to drop by anytime

Optional Books: G.E. Dillard. 1999. *Common Freshwater Algae of the U.S.* J. Cramer.
G.W. Prescott. 1980. *How to Know the Aquatic Plants* (2nd Ed.). W.C. Brown Co.
E.N. Nelson & R.W. Couch. 1985. *Aquatic Plants of Oklahoma*. OAS [Lab copies]
G.E. Crow & C.B. Hellquist. 2000. *Aquatic and Wetland Plants*. U. Wisc. Press [Lab copies]
Additional readings from primary literature will be provided

Field Trip Fee: To cover van rental & mileage, a field trip fee of up to $35 will be assessed by the bursar.

Prerequisite: Plant Biology (BOT 1404 or equivalent); some knowledge of limnology helpful

Objectives: This laboratory course is designed for advanced students in Biological/Environmental Sciences as a general introduction to the functional ecology, morphology, physiology and taxonomy of aquatic plants and algae. Ability to identify common species and major features of their anatomy is expected, although emphasis will be on ecology of phytoplankton and macrophytes, primarily in lacustrine/lentic (lake) systems. Labs will develop identification skills and knowledge of morphology and ecology of aquatic plants and algae, and common laboratory and field techniques relevant to botanical limnology.

Course format: Lecture periods will emphasize critical thinking through discussion of primary literature (research papers), with informal lectures to emphasize and clarify the most important information for each paper discussed. **Students enrolled in BOT 5214 will need to "present" to the class and lead critical discussions of three papers, and turn in written reviews thereof**. You will be graded on thoroughness of your critique (written and oral) and ability to lead and participate in the discussions.

We will use the Online Classroom interface (https://oc.okstate.edu/) to post and present graphs, digital images of plants and algae, and administer online "quizzes" concerning literature readings. The online material is NOT a substitute for attending class! **You should be actively taking notes and asking questions in class to ensure you understand the conceptual material**. The goal is to have you think critically about the material, because the essay exams will ask you explain complex graphical data, photos, and concepts.

Lab: Some labs will be inside, others are field trips. **Please be on time, especially for field trips, which will depart promptly at 1:30** to avoid returning late. For all field trips, dress for getting wet, muddy, sunburned and hot (possibly cold late in the semester). Cheap water shoes are highly recommended; **flip-flops are strongly discouraged**. Bring a notepad, pencil, sunglasses, water bottle. **Lab runs until 4:20 – don't schedule conflicts or whine to leave early!**

Grading: Total points = 630 (4214) or 750 (5214)
3 lecture exams (80, 100, 120 points = **300**); your lower midterm exam score will = 80 points
2 lab exams (40 + 60 points = **100**); your lower lab exam score will = 40 points
online "quizzes" on journal article readings (15 x 10 = **130** total after dropping lowest two scores)
lab participation (start with **50**, lose 25 for each *unexcused* absence)
Graded analytical laboratory techniques, graded for accuracy (**50**)
5214 ***only*** (4214 may do for optional bonus): 15 species personal plant/algae herbarium collection (**60**)
5214 ***only***: Written reports and lead discussions of 3 papers (20 x 3 = **60**)
Lecture exams will be mainly essay form and may include, e.g., data graphs/tables to interpret. See the web page for example questions. Course letter grades will be based on the following percentages out of the 630/750 total points:

A = 90-100% B = 80-89% C = 70-79% D = 60-69% F = 0-59%

Near 100% attendance at lectures and labs is expected. Makeup exams/labs will not be given; officially-excused absences from exams (e.g. illness with doctor's note) will result in dropping that exam from the course grade calculations and appropriate weighting of the other exams, whereas unexcused absences will result in a zero score. **Cheating or plagiarism incidents will follow the OSU Academic Integrity Policy (http://academicintegrity.okstate.edu/)**.

Exam Schedule (Tu,Th 10:30-11:45) [timing of lecture subjects is approximate]

Tues., September 28 **EXAM I** [date may change, with advanced warning]
Thur., October 7 (in lab) **MACROPHYTE LAB PRACTICAL EXAM** (macrophyte ID, morphology)
Thur., November 4 **EXAM II** [date may change, with advanced warning]
Thur., Dec. 2, 5:00 PM **ALGAE LAB PRACTICAL; personal herbariums due**
Thur., December 16, 10:00-11:50 **FINAL EXAM** (cumulative)

Tentative Lab Schedule (Th 1:30-4:20) [Changes to this schedule will be announced in lecture.]

Date	Lab/ Field	Activity
8/26	F	Tour of area macrophyte sites: Yost Lake, Sooner Lake, Teal Ridge wetland
9/2	F	Sooner Lake: macrophyte transects
9/9	F	Boomer Lake: vertical profiles of light, macrophyte photosynthesis, plankton/water sampling
9/16	F	Sooner Lake(?): mapping clonal macrophytes
9/23	L	Start N & P spiking experiments w/ macrophyte(s)
9/30	L	Open lab for studying macrophytes (end by 3:30 – football game)
10/7	L	**Macrophyte Lab practical**
10/14	L	End N & P spiking experiments w/ macrophyte(s)
10/21	L	Learn methods: chlorophyll extraction (algae and macrophytes) and Hach nutrient assays
10/28	L	Learn methods - chlorophyll analyses
11/4	L	Set up phytoplankton competition experiment
11/11	L	Finish phytoplankton competition experiment
11/18	L	Open lab for studying algae
12/2	L	**Algae Lab practical; personal herbariums due**
12/9	L	Demonstration: flow cytometry or PAM fluorescence

The **lecture schedule** is dictated by the readings list (next page). **Colored text** = initials of students enrolled in BOT 5214, indicating their responsibility for leading discussions and providing written reviews of the papers. **Because of copyright laws, everyone will need to independently download each paper through the library website.** I recommend Web of Science* but PubMed, etc. also may work. I will demonstrate on the first day.
* http://apps.isiknowledge.com/WOS_GeneralSearch_input.do?product=WOS&search_mode=GeneralSearch
If you are working off campus, you'll need to log into the proxy server for access.

I will post a brief quiz concerning each paper in Online Classroom, ~1 week prior to the discussion date. The **quizzes will be due by 6:00 PM the evening before (typically Monday**) the discussion day. Don't forget, because no extensions will be granted. I will drop your lowest two scores.

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Readings List (Discussion led by indicated persons in class on Tuesdays except Thurs. 9/30; **online quizzes due 6 PM the day before**)

Date/leader	General Topic	Reference
8/31 WJH	Macrophyte biogeography	Les, D.H., D.J. Crawford, R.T. Kimball, M.L. Moody & E. Landolt. 2003. Biogeography of discontinuously distributed hydrophytes: a molecular appraisal of intercontinental disjunctions. *Int. J. Plant Sci*. 164:917-932
9/7 **MM**	Macrophyte dispersal & colonization	Riis, T. 2008. Dispersal and colonisation of plants in lowland streams: success rates and bottlenecks. *Hydrobiologia* 596:341–351.
9/14 **AT**	Reproduction in invasive species	Makkay, K., F.R. Pick & L. Gillespie. 2008. Predicting diversity versus community composition of aquatic plants at the river scale. *Aquat. Bot*. 88:338–346.
9/21 **RM**	Macrophyte population genetics	Chen, L., L. Xu & H. Huang. 2007. Genetic diversity and population structure in *Vallisneria spinulosa* (Hydrocharitaceae). *Aquat. Bot*. 86:46–52.
9/30 **Thu** **ST**	Macrophyte physiological ecology (light)	Middelboe, A.L. & S. Markager. 1997. Depth limits and minimum light requirements of freshwater macrophytes. *Freshw. Biol*. 37:553–568.
10/5 **MM**	Macrophyte physiological ecology (light)	Hussner, A., H.P. Hoelken & P. Jahns. 2010. Low light acclimated submerged freshwater plants show a pronounced sensitivity to increasing irradiances. *Aquat. Bot*. 93:17-24.
10/12 **AT**	Macrophyte ecology (nutrients)	Demars, B.O.L. & A.C. Edwards. 2008. Tissue nutrient concentrations in aquatic macrophytes: comparison across biophysical zones, surface water habitats and plant life forms. *Chem. & Eco* 24:413-422.
10/19 **RM**	Macrophyte physiological ecology (DIC)	Jones, J.I. 2005. The metabolic cost of bicarbonate use in the submerged plant *Elodea nuttallii*. *Aquat. Bot*. 83:71–81.
10/26 **ST**	Applied macrophyte ecology	James, W.F. 2008. Effects of lime-induced inorganic carbon reduction on the growth of three aquatic macrophyte species. *Aquat. Bot*. 88:99-104.
11/2 WJH	Phytoplankton community ecology	Litchman, E. & C.A. Klausmeier. 2008. Trait-based community ecology of phytoplankton. *Annu Rev. Ecol. Evol. Syst*. 39:615–639.
11/9 **MM**	Phytoplankton community dynamics	Greisberger, S. & K. Teubner. 2007. Does pigment composition reflect phytoplankton community structure in differing temperature and light conditions in a deep alpine lake? An approach using HPLC and delayed fluorescence techniques. *J. Phycol*. 43:1108–1119.
11/16 **AT**	Algal nutrient competition	Yoshida, M., T. Togashi, K. Takeya, J. Yoshimura & T. Miyazaki. 2007. Ammonium supply mode and the competitive interaction between the cyanobacterium *Microcystis novacekii* and the green alga *Scenedesmus quadricauda*. *Fund. Appl. Limnol*. 170:133-140
11/23 **RM**	River eutrophication	Dodds, W.K. 2006. Eutrophication and trophic state in rivers and streams. *Limnol. Oceanogr*. 51:671–680.
11/30 **ST**	Mixing effects on phytoplankton ecology	Serra, T., J. Vidal, X. Casamitjana, M. Soler & J. Colomer. 2007. The role of surface vertical mixing in phytoplankton distribution in a stratified reservoir. *Limnol. Oceanogr*. 52:620–634.
12/7 WJH	Phytoplankton physiology: temperature	Bissinger, J.E. & D.J.S. Montagnes. 2008. Predicting marine phytoplankton maximum growth rates from temperature: Improving on the Eppley curve using quantile regression. *Limnol. Oceanogr*. 53:487–493.