Instructor: Bob Nowak Phone: 784-1656 Email: nowak@cabnr.unr.edu
Office: FA 125 Office hours: Tuesdays 11:00 AM – 1:00 PM or by appointment

Topic Outline

Date	Topic
	I) Water Balance of Plants
Jan 20	A) Water potential
22	B) Soil, plant, air continuum
	C) Physiological control
27	1) Roots and water uptake
29	2) Hydraulic conductivity
Feb 3	3) Stomatal conductance and transpiration
5	
	II) Carbon Balance of Plants
10	A) C_3, C_4, and CAM photosynthesis
	B) Carbon gain in the environment
12	1) Leaf gas exchange
17	
19	2) Canopy gas exchange
24	*Guest lecture: Dr. Chris Lortie – Plant-plant interaction discussion*
26	3) Water use efficieny
Mar 2	C) Carbon allocation
	First exam handed out – due 9:30 AM on March 11
	III) Nutrient Balance of Plants
4	A) Macro- and micronutrients in plants
9	B) Physiology and energetics of nutrient uptake
11	**First exam turned in**
	C) Root physiological responses to nutrient uptake
16, 18	*Spring break*
23	*Guest lecture: Dr. Carla D' Antonio – Invasive plants discussion*
25	*Guest lecture: Dr. Tom Dudley – Plant-herbivore interaction discussion*
30	D) Root system growth and architecture
Apr 1	E) Mycorrhizal symbiosis
6	IV) Energy Balance of Plants
	A) Components of energy balance
8	B) Leaf microclimate and energy balance of leaves
13	*Guest lecture: Dr. Robert Pattison – Extreme events discussion*
15	*Guest lecture: Dr. Jeanne Chambers – Seedling establishment discussion*
20	C) High temperature tolerance
22	D) Low temperature tolerance
	Second exam handed out – due 7:30 AM on May 7
27	V) Literature discussion sessions
29	
May 4	
May 7	*Final exam period: 7:30 – 9:30 AM*
	Second exam turn in

Course Objectives

The primary objective of the course is to develop an understanding of the interrelationship between individual plants and the abiotic and biotic components of their environment. The course will focus on how plants

function in their natural environment and will address the following questions:

- What can plants do, given their physiological capacities and the constraints of the environment?
- How do plants tolerate stress? What options are available to avoid or ameliorate stress?
- How do plants acquire and allocate resources? What are the ecological consequences of their strategies?
- To what extent do the physiological characteristics enhance ecological success?

The format of the course consists of formal lectures and discussion sessions. The first 4 sections concern some abiotic factors in the environment and will examine: 1) plant microenvironment with a focus on plant temperature; 2) water balance, *i.e.* how water moves from the soil through the plant into the air as well as the effects of drought; 3) plant nutrient relations with an overview of the availability of nutrients, nutrient uptake, and plant responses to nutrient deficiencies; and 4) plant carbon balance with an emphasis on how plants get carbon and what do they have to do with it and what can they do with it.

The purpose of discussion sessions is to:

- expose you to original (and often recent) literature.
- help develop skills to critically read articles.
- evaluate new ideas.

One student will lead each discussion session. The schedule for the discussion sessions will be drawn up at the beginning of the second class meeting; come prepared to sign up for dates that are compatible with your schedule.

Grades

A total of 65% of the grade will be from the 2 tests. Both tests will be take-home exams. Each test will primarily cover material that was presented after the last exam, but may also cover earlier material.

Exam 1: Up to & including day handed out	=	30% of grade
Exam 2: Entire semester	=	35% of grade
Total	=	65%

A total of 35% of the grade will be based on the discussion portion of the course. Discussion will be on current literature or review articles that expand some aspect of the material presented in class. Everyone is expected to read the assigned papers, to participate in the discussion, and to lead one discussion session. Grades will be based upon an evaluation of participation in the discussions using criteria such as active involvement in the discussion, extent of contributions to the discussion, ability to lead and stimulate the discussion, etc. Evaluations for each individual will be done by the instructor, the class as a whole, and the individual and weighted as follows:

Instructor evaluation	=	15% of grade
Class evaluation	=	10% of grade
Self evaluation	=	10% of grade
Total	=	35%

Final grades will be assigned according to the following scale:

A = >90%
B = 80-90%
C = 70-80%
D = 60-70%
F = <60%

NOTE: This course does not use the plus/minus system of grading.

Academic Dishonesty Policy: Students are expected to adhere to the ethical code as described in the UNR Student Handbook. This code specifies that with enrollment, an individual commits to the principles embodied in the code. Academic dishonesty in any form is unacceptable. In the event of an academic dishonesty issue, the procedures for addressing the issue are outlined in the University's "Academic Dishonesty Procedures", which can be obtained from the Director of Student Judicial Affairs in the Jones Visitor Center.

Reference Materials

Journals – Many journals have articles that relate to issues that are covered in class. These include (but are not restricted to) the following journals. Most are found in the Health and Life Sciences Library.

American Journal of Botany
Ann Rev Ecology & Systematics
Ann Rev Plant Phys & Mol Biol
Agricultural & Forest Meteorology
Australian J Plant Physiology
Biogeochemistry
Ecological Applications
Ecological Modeling
Ecological Monographs
Ecology
Ecosystems
Forest Ecology and Management
Functional Ecology
Global Change Biology
International J Biometeorology
International J Plant Sciences
Journal of Applied Ecology
J Applied Vegetation Science
Journal of Arid Environments
Journal of Ecology
Journal of Range Management
Journal of Vegetation Science
Microbial Ecology
Nature
New Phytologist
Oecologia
Oikos
Photosynthetica
Physiologia Plantarum
Plant Cell & Environment
Plant Ecology (formerly Vegetatio)
Plant Physiology
Planta
Science
Soil Biology and Biochemistry
Soil Science Soc. America Journal
TREE Physiology
Trends in Ecology & Evolution
Western North American Naturalist

Reference Texts – The following are some good reference texts that should be on reserve in the Life and Health Sciences Library. The call number is at the end of the citation.

Bazzaz FA, Grace J (1997) Plant Resource Allocation. Academic Press, New York. 303 p. **QK 717 .P58 1997**

Boyer JS (1995) Measuring the Water Status of Plants and Soil. Academic Press, San Diego. 178 p. **QK870 .B68 1995**

Caldwell MM, Pearcy RW (1994) Exploitation of Environmental Heterogeneity by Plants. Academic Press, San Diego. 429 p. **QK905 .E96 1994**

Fitter AH, Hay RKM (1987) Environmental Physiology of Plants, 2nd Edition. Academic Press, New York. 423 p. **QK 711.2 .F566 1987**

Gates DM (1980) Biophysical Ecology. Springer-Verlag, New York. 611 p. **QH 541 .G39**

Jones HG (1992) Plants and Microclimate: A Quantitative Approach to Environmental Plant Physiology. Cambridge University Press, New York. 323 p. **QK 754 .J66 1992**

Koch GW, Mooney HA (1996) Carbon Dioxide and Terrestrial Ecosystems. Academic Press, San Diego. 443 p. **QK753 .C3 C37 1996**

Kramer PJ, Boyer JS (1995) Water Relations of Plants and Soil. Academic Press, San Diego. 495 p. **QK870 .K72 1995**

Lambers H, Chapin FS III, Pons TL (1998) Plant Physiological Ecology. Springer-Verlag, New York. 540 p. **QK717 .L35 1998**

Marschner H (1986) Mineral Nutrition of Higher Plants. Academic Press, Orlando. 674 p. **QK 867 .M37 1986**

Mooney HA, Winner WE, Pell EJ (1991) Responses of Plants to Multiple Stresses. Academic Press, San Diego. 422 p. **QK 754 .R47 1991**

Nobel PS (1991) Physiochemical and Environmental Plant Physiology. Academic Press, San Diego. 635 p. **QK 711.2 .N623 1991**

Pearcy, R.W., J.R. Ehleringer, H.A. Mooney, and P.W. Rundel (eds.). 1989. Plant Physiological Ecology: Field Methods and Instrumentation. Chapman and Hall, New York. **QK905 .P57 1989**

Press MC, Scholes JD, Barker MG (1999) Physiological Plant Ecology. Blackwell Science. 480 p. **QK717 .B75 1998**

Russell G, Marshall B, Jarvis PG (1989) Plant Canopies: Their Growth, Form, and Function. Cambridge University Press, New York. 178 p. **QK 924.5 .P53 1989**

Schulze E-D, Caldwell MM (1995) Ecophysiology of Photosynthesis. Springer-Verlag, Berlin. 576 p. **QK882 .E28 1995**

Smith SD, Monson RK, Anderson JE (1997) Physiological Ecology of North American Desert Plants. Springer-Verlag, New York. 286 p. **QK 133 .S58 1997**