Standard1 Appendix. **Western Carolina University and Environmental Science Mission and Vision**

Western Carolina University

Western is a campus of the University of North Carolina system, located on approximately 600 acres in the unincorporated town of Cullowhee. The university is the primary provider of higher education in Western North Carolina and enrolls approximately 9,500 students in some 220 undergraduate and 40 graduate programs of study.

Western Carolina University creates engaged learning opportunities that incorporate teaching, research and service through residential, distance education and international experiences. The university focuses its academic programs, educational outreach, research and creative activities, and cultural activities to improve individual lives and enhance economic and community development in the region, state and nation.

Western Carolina University is committed to becoming nationally recognized as actively engaged in the economic health of the region. It will lead and support others in strategies to create a prosperous future for the people it serves. Via selective internal program investments, systematic partnership outreach and thoughtful deployment of capital assets, WCU seeks to nurture an ever-expanding economy and community of knowledge in Western North Carolina. In adopting new roles to support economic growth, WCU continues to embrace fully its roles in strengthening intellectual inquiry, community, social institutions, culture and the arts.

Direction six of the University's Strategic Plan (January, 2009) includes the goal that Western Carolina University will expand its focus on education and research tied to environmental sustainability, with particular emphasis on biodiversity and land use. This goal includes three initiatives: Implement the STARS (Sustainability, Tracking and Rating System) accountability system to monitor its goal to become an environmentally conscious campus; *Implement additional advanced degree programs in the environmental sciences focused on applied research related to environmental issues and to take advantage of unique institutional resources*; and Align as appropriate institutional resources, curriculum, and community outreach to address critical land use issues, including environmental reclamation, land use planning, and sustainable development

Environmental Science Program

The B.S. In Environmental Science is an interdisciplinary degree program with an emphasis in natural and applied sciences. Objectives of the program include:

1) providing a specialized education which will make graduates competitive for entry level positions in the environmental field,
2) building on curricula in traditional science programs to develop a program which is attuned to the specialized needs of existing job markets,
3) preparing students for entry into specialized graduate programs in environmental science,
4) reinforcing WCU's role as a center for environmental research and teaching in the Southern Blue Ridge area and the Great Smoky Mountains National Park.

Distinctive characteristics of the program include:

1) *Highly flexible, truly interdisciplinary degree program*
   There are only three ES courses (two 100- and one 400-level); all other coursework is from throughout the sciences. Students create individualized degree plans for their 300- and 400-level courses that are approved by the Executive Committee. The flexibility easily accommodates completion of minors, international experiences, internships, participation in the UNC School for the Environment field semester (at the Highlands Biological Station), etc.

2) *Young program but steady growth*
   Steady growth in majors and numbers of graduates since the program began Fall 2004, with first graduates Spring 2007

3) *Service-learning capstone*
   ES495 students work as a group to address a need in the community. Previous projects have included energy audits and recommendations for the Highlands Biological Station and for businesses in Dillsboro, data collection and recommendations for the WCU's STARS energy use program, and a carbon emissions assessment for the Rabun Gap-Nacoochee School.

4) *Student engagement*
   Relatively high proportion of Juniors and Seniors are involved in activities that enrich their academic experience including internships at DOE laboratories, international experiences, volunteer work (Jackson County Green Energy Park, evaluating WNC sedimentation ordinances, etc.). Many students are involved in research through the Biology and GNR Departments.

Standard2 Appendix. **Environmental Science strategic plan and planning process - 2007**

What do we look like now?
Environmental Science (ES) is a relatively new, growing, interdisciplinary degree program at WCU. It emphasizes natural and applied sciences, along with human interactions with the environment. An executive committee (see members listed above) meets periodically to make decisions on topics such as curriculum, and advising. The strength of the ES program is its distinctive interdisciplinary blending of environmental courses from several disciplines from the College of Arts & Sciences and one program in the College of Health & Human Sciences. The ES program began accepting majors in the fall semester of 2004. It has grown from zero to approximately 30 majors, with students beginning to graduate spring semester 2007. This growth is consistent with anticipated numbers in the original planning documents. One of the entry-level courses (ES150) uses an innovative team-taught approach where the team represents the contributing disciplines to the major (mostly faculty on the ES Executive Committee). The capstone experience (ES495) is consistent with numerous initiatives at WCU including service and experiential learning, the QEP and UNC-Tomorrow. For example, the first project (spring semester 2007) was an in-depth energy analysis for the Highland's Biological Station. Currently, students are working with the Jackson County Green Energy Park conducting an energy analysis for the Dillsboro Downtown Merchant's Association.

What do we want to look like in five years, and what can we do now to make progress toward this vision?
One of the greatest current challenges for the ES program is lack of visibility. In addition, the majors suffer from lack of sense of community as they get dispersed from each other in courses across many disciplines. We hope to work on these issues by creating dedicated space for the ES program somewhere on campus. We envision a place where majors can convene to work on capstone or other ES-related projects; a place where ES job and internships can be posted; a place where student work can be showcased; a place where ES majors can have a "home", to foster a sense of community, etc. We also envision creating a new junior-level seminar or readings type course that will promote a sense of community and ES dedicated space could be used for this course.

Increased visibility will help recruitment and retention efforts toward a target of 10-15 students graduating per year (proportional to University targets). We will also be developing new recruiting materials to distribute throughout campus and high schools in western NC to work toward our graduation goals. In addition, we hope to begin publishing an annual or semi-annual ES newsletter to send to alumni and friends of the ES program.

With the exception of the Program Director, members of the executive committee are volunteers, with no formal ES appointment. Visibility of the ES program and commitment to the ES program will both be strengthened by having the work loads of ES committee members include officially assigned roles in the management and

implementation of the ES program. These faculty could be designated “affiliate ES faculty” or some other designation that would highlight an official interdisciplinary appointment. The outcome of a formal discussion among Department Heads and Deans of programs contributing to the ES program would be a document outlining formalized commitment and official interdisciplinary designation of faculty on the ES executive committee.

Visibility of the ES program will be strengthened by creating scholarships for undergraduates, and other development funding. The creation of scholarships will also help recruitment and retention. The ES committee will work with development staff to explore possibilities in this area. Creation of a newsletter should help development efforts.

The original planning documents for the ES program included a proposed M.S. degree. The M.S. degree program was ‘put on hold’ until the undergraduate program could prove its viability. With the steady growth in the B.S. program, and the demand/need for opportunities for graduate study in ES, NRCM and Geology, we will be exploring the possibility of reviving the proposed graduate program for advanced studies in Environmental Sciences.

Assessment and feedback from the ES program review will help us set additional goals and direction for achieving these goals.

Because the ES program relies heavily on the biology, chemistry, environmental health, geology, natural resources conservation and management departments/programs, it is important that they remain viable in their own right so that they can (1) contribute effectively to the curriculum of the ES program, and (2) so that they can support the additional demands that the ES program will generate on them. Further, as enrollment in the ES program increases, we anticipate that there will be a real need to funnel additional resources to some of the departments contributing to ES, so that these departments/programs can meet increasing demands from the ES program.

Standard 3 **Appendix**

3.1 **WCU Catalog copy of Environmental Science curriculum**

Total number of hours for program: 120.
Liberal Studies Hours: 42
The major requires 69 hours as follows:

Foundations in Environmental Science

BIOL 140 - Principles of Biology I Credits: (4)
BIOL 141 - Principles of Biology II Credits: (4)
CHEM 140 - Advanced General Chemistry Credits: (4)
ES 101 - Careers and Issues in Environmental Science Credits: (1)
ES 150 - Introduction and Approaches to Environmental Science Credits: (4)
ES 495 - Senior Research Seminar in Environmental Science Credits: (3)
GEOL 150 - Methods in Geology Credits: (4)
MATH 140 - Introductory Calculus Credits: (5)

Geographic Information Systems
Choose one from the following list:
GEOG 321 - Geographic Information Systems Credits: (3)
or
NRM 344 - Introduction to Geographic Information Systems Credits: (4)

Environmental Health
Choose one from the following list:
ENVH 310 - Water Quality Control Credits: (3)
ENVH 375 - Environmental Toxicology Credits: (3)
ENVH 440 - Air Quality Control Credits: (3)
ENVH 470 - Principles of Epidemiology Credits: (3)

Environmental Policy
Choose one from the following list:
ECON 310 - Natural Resource Economics Credits: (3)
ENVH 458 - Environmental Regulation and Law Credits: (3)
NRM 442 - Natural Resources Policy and Administration Credits: (3)

Environment and Society
Choose one from the following list:
ANTH 351 - Environmental Anthropology Credits: (3)
GEOG 402 - Conservation of Natural Resources Credits: (3)
PAR 330 - America's Wilderness Ethics and Aesthetics Credits: (3)
PAR 333 - Environmental Ethics Credits: (3)
SOC 371 - Society and the Environment Credits: (3)

Advanced Study in the Environmental Sciences
Student must obtain approval of a degree plan from the ES committee prior to pursuing Advanced Study courses. Advanced Study courses must not duplicate Foundations courses.

A. Quantitative Methods
Choose one from the following list:
BIOL 467 - Biostatistics Credits: (3)
CHEM 232 - Quantitative Analysis Credits: (3)
MATH 375 - Statistical Methods II Credits: (3)

B. Advanced Environmental Sciences

i. Field & Natural Environmental Science
Choose one from the following list:
BIOL 434 - Terrestrial Ecology Credits: (4)
BIOL 435 - Aquatic Ecology Credits: (4)
GEOL 305 - Soils and Hydrology Credits: (4)
GEOL 405 - Hydrogeology Credits: (4)

ii. Analytical/Instrumentation
Choose one from the following list:
CHEM 330 - Aquatic Chemistry (Lecture 3; Lab 1) Credits: (Lecture 3; Lab 1)
CHEM 370 - Instrumental Analysis I Credits: (4)
CHEM 435 - Instrumental Analysis II Credits: (3)
CHEM 461 - Environmental Chemistry Credits: (3)

C. Guided Electives
Choose 18 hours of upper level courses from the list below, or course(s) in consultation with your advisor. Courses may not duplicate other degree requirements.

BIOL 304 - General Ecology Credits: (3)
BIOL 434 - Terrestrial Ecology Credits: (4)
BIOL 435 - Aquatic Ecology Credits: (4)
BIOL 467 - Biostatistics Credits: (3)
BIOL 473 - Microbial Ecology Credits: (4)
BIOL 476 - Contemporary Fisheries Credits: (4)
CHEM 330 - Aquatic Chemistry (Lecture 3; Lab 1) Credits: (Lecture 3; Lab 1)
CHEM 370 - Instrumental Analysis I Credits: (4)
CHEM 435 - Instrumental Analysis II Credits: (3)
CHEM 461 - Environmental Chemistry Credits: (3)
ENVH 310 - Water Quality Control Credits: (3)
ENVH 312 - Solid and Hazardous Waste Management Credits: (2)
ENVH 375 - Environmental Toxicology Credits: (3)
ENVH 440 - Air Quality Control Credits: (3)
ENVH 457 - Industrial Hygiene Credits: (3)

ENVH 470 - Principles of Epidemiology Credits: (3)
GEOL 305 - Soils and Hydrology Credits: (4)
GEOL 405 - Hydrogeology Credits: (4)
GEOL 410 - Fluvial Geomorphology Credits: (3)
GEOL 423 - Contaminated Rivers: Assessment, Remediation, and Restoration Credits: (3)
GEOL 455 - Wetlands Credits: (3)
MATH 270 - Statistical Methods I Credits: (3)
MATH 370 - Probability and Statistics I Credits: (3)
MATH 375 - Statistical Methods II Credits: (3)
NRM 351 - Forest Ecology Credits: (3)
NRM 371 - Landscape Ecology Credits: (3)
NRM 472 - Geospatial Analysis Credits: (4)

D. General Electives Hours (9-24 hours)
Students must take at least 30 hours at the junior-senior level at WCU in order to satisfy general university degree requirements. (General Elective Hours depend on the number of hours taken in the major that also count for Liberal Studies.) Visit the department's website at http://www.wcu.edu/4428.asp to view the 8 semester curriculum guide.

3.2 **Curriculum and advising check sheet**

Environmental Science BS Degree Plan

Purpose

The B.S. degree in Environmental Science at WCU was deliberately designed to allow students to focus their coursework in a way that will help them achieve future career goals. Therefore, ES majors have considerable flexibility in the choice of courses that count toward their B.S. degree. The expectation is that ES majors select courses in a meaningful way (versus just taking what sounds interesting the next semester) and that their selection also makes their degree distinguishable from other science degrees at WCU (such as ENVH, BIOL, GEOL, etc.). To demonstrate that you have selected your coursework in a meaningful way and that illustrates how your degree is distinctly ES, students must *develop and follow* a plan of courses for their Junior and Senior years. This plan is a degree requirement.

Requirements

1. A degree plan for the 18 hours of upper division electives (300- and 400-level courses) must be completed by each student and approved by the Environmental Science Committee ***prior*** to the point where a student has four or fewer semesters remaining
2. Your plan must be approved by the Environmental Science Committee and on file with Laura DeWald before you will be issued your PIN for the upcoming semester
3. Your plan must meet the following requirements:
   a. Course selection should reflect a coherent cluster that supports your future career goal(s) and that reflects the interdisciplinary nature of an Environmental Science degree at WCU
   b. Your plan must be logistically feasible; you must design your plan so that courses are listed in semesters/years when they are actually offered

c. For each course in your plan, you must list the skills you expect to obtain from the course, the prerequisites needed to take the course, and describe how it meets the interdisciplinary and career objective criteria
d. Alternative courses must be listed for each semester (to accommodate unforeseen conflicts, etc.)

Instructions

1. Write a one-page narrative that:
    a. Describes your career goals and provides actual examples and skills needed for that career. For example, if your goal is to work for a consulting firm, do some research and provide examples of consulting firms and skills they require/desire for their employees
    b. Lists 300- and 400-level courses that will help you achieve your career goal and for each course listed, describes skills from that course that will help you achieve your career goal
    c. Describes how your selection of courses is consistent with the interdisciplinary goals of the ES degree at WCU
2. Fill out the attached course check-sheet to illustrate your plan is logistically feasible (must list alternative courses)
3. Turn in your one-page narrative and check-sheet to Laura DeWald no later than two weeks prior to advising day

Course	Credits	Notes & Semester	Grade
Foundations in Environmental Science			
ES101 Careers and Issues in Env. Sci.	1	Fall	
ES150 Intro & Approaches to Env. Sci.	4	Spring, Lab	
BIOL140 Principles of Biology I	4	Fall, Spring, Lab	
BIOL141 Principles of Biology II	4	Fall, Spring, Lab	
CHEM140 Advanced General Chem.	4	CHEM139, Prereq., Fall & Spring, Lab	
GEOL150 Methods in Geology	4	Fall	
MATH146 or 153 Pre-Calculus or Calculus	4	Fall & Spring	
ES495 Senior Seminar in Env. Problems	3	Last Fall semester at WCU	
Geographic Information Systems: choose one from the following:			
GEOG321 Geographic Info. Sys.	3	Lab	
NRM344 Intro. Geographic Info. Sys.	4	Fall & Spring, Lab	
Environmental Health: choose one from the following:			
ENVH375 Environmental Toxicology	3	Fall	
ENVH470 Principles of Epidemiology	3	Spring	
ENVH440 + 450 Air Quality Control	5	Spring, Lab	
ENVH310 + 311 Water Quality Control	4	Fall, Lab	
Environmental Policy: choose one from the following:			
ENVH458 Env. Regulation & Law	3	Fall	
NRM442 Natural Res. Policy & Admin.	3	Fall	
ECON310 Natural Res. Economics	3	Spring (?)	
Environment and Society: choose one from the following:			

SOC371 Society and the Environment	3		
PAR330 Amer. Wild. Ethics & Aesthetics	3	Spring	
GEOG402 Cons. Natural Res.	3	Spring	
PAR333 Environmental Ethics	3	Fall & Spring	
ANTH 351 Env. Anthropology	3		
Advanced Study in Environmental Sciences (must not duplicate Foundations)			
A. Quantitative Methods: choose one from the following:			
BIOL467 Biostatistics	3	Spring	
CHEM232 Quantitative Analysis	3	Fall & Spring, Lab not required	
MATH375 Statistical Methods II	3		
B. Advanced Environmental Sciences			
i. Field & Natural Environmental Science: choose one from the following:			
GEOL305 Soils and Hydrology	4	Spring, Lab	
GEOL405 Hydrogeology	4	Fall, Lab	
BIOL 434Terrestrial Ecology	4	Spring, Lab	
BIOL435 Aquatic Ecology	4	Fall, Lab	
ii. Analytical/Instrumentation: choose one from the following:			
CHEM330 Aquatic Chemistry	3	Fall, Lab	
CHEM370 Instrumental Analysis I	4	Fall, Lab	
CHEM435 Instrumental Analysis II	3		
CHEM461 Environmental Chemistry	3		
Course	**Credits**	**Semester**	**Grade**
C. Electives: 18 hours of upper level courses. Suggestions include **BIOL** 304; 434; 435; 467; 473; 476, **CHEM** 330; 370; 432; 461; 470, **ENVH** 375; 440; 470; 310; 312; 457, **GEOL** 305; 405; 450; 410; 420; 455, **NRM** 351; 471; 472, or **MATH** 270; 370; 375. **Students are welcome to select courses not in the above list if the courses will help achieve career and/or educational objectives, AND the courses are included in a student's approved plan of study.** NOTES: 1) Courses may not duplicate other degree requirements 2) All students MUST have a Plan of Study approved by the Environmental Science Executive Committee prior to completing 60 credits (or 30 credits if you are a transfer student)			
D. General Electives:			
Course	**Credits**	**Semester**	**Grade**

3.3 **Syllabi of courses selected most often by students**

Foundations Courses

ENV 150 – Introduction and Approaches to Environmental Science

Teaching Team: Laura DeWald (coordinator), Beverly Collins (biology), Cindy Atterholt (chemistry), Ben Tanner/Mark Lord (geosciences), Brian Byrd (environmental health), Peter Bates/Brian Kloeppel (natural resource conservation and management)

Each instructor/team will provide a syllabus for their unit that will list their office hours, contact information, reading assignments, topics schedule, and how the points for their section are allocated.

Course Description

- Environmental science is wide-ranging and complex discipline. In this course, you will develop a basic understanding of the complexity of environmental science, and you will be exposed to different approaches to understanding and investigating environmental problems.
- Sustainable solutions to environmental problems require that they be socially desirable, economically feasible and ecologically viable. This requires an environmental scientist to have a broad knowledge of biological, physical, and social sciences. In this course we will use laboratory activities, case studies, readings, and class discussions to explore the varied aspects and approaches to solving environmental problems.

Learning Outcomes

- Students will practice:
  - critical thinking, reading and writing
  - applying scholarly information and methods to understand environmental problems
  - writing technical reports and orally communicating environmental science topics
  - teamwork
- Students will gain knowledge and understanding of the:
  - scientific and societal framework of environmental science
  - principles and topics of environmental science
  - approaches and methodology used in solving contemporary environmental problems

Required Text

Kaufmann, RK, and CJ Cleveland. 2008. Environmental Science. McGraw Hill Co. New York.

The textbook supplements material being taught. Some faculty will use it more than others, and you should expect to receive numerous handouts throughout the course.

Course Structure

- The course has two 75-minute lectures and one 3-hour laboratory per week. You will *not* receive a separate grade for lab because it is *incorporated* into your overall course grade.
- The course consists of a team of faculty who teach different units in the course.

- There are many advantages of being taught by multiple faculty, including getting exposure to different expertise and perspectives. However, teaching styles will vary among instructors so you will need to adapt as faculty rotate throughout the course.
- The coordinator and faculty will do their best to help you transition from one instructor to the next, but you should be aware of expectations listed on the syllabus for each unit.

Assessment of Learning Outcomes and Policies

- ***Attendance*** –Your grade and achievement of learning outcomes is positively correlated to attendance. Keep in mind that graded or not, absences significantly lower your grade.
- ***Writing Assignments*** – All written assignments *must be* typed, double-spaced, and in 12 pt font. You are responsible for turning in hard copies (not electronic) of your assignment to the appropriate instructor. Laboratory reports are due TUESDAYS at 11:00 am, and you must use the technical report format provided in the template handed out in class.
- ***In-Class Group Assignments*** – Environmental science problems can not be solved working as individuals. Therefore, group assignments throughout the course are to help achieve learning outcomes related to team-work.
- ***Oral Reporting*** – Environmental scientists must be able to communicate with the public and their peers. Therefore, you will practice oral presentation skills throughout the course.
- ***Exams*** – Exams assess your understanding and ability to apply your knowledge to environmental science. There six short, content-based, in-class exams at the end of each unit and there are three take-home synthesis concept-based exams. *Students who miss exams will receive a zero (0) for the exam.*

- ***Final Grade****

Individual Units: 6 @ 50 points each …… 300 points
Assignments (10 points) + Technical Report (20 points) + In-Class Exam (20 points)
2-year plan rough draft ……..… 25 points
Synthesis Take-Home Essay Exams: 3 @ 50 points each… 150 points
Total 475 points

Overall Schedule
See Individual Unit Syllabi for more Information

Unit Instructor *	Dates	Topics
DeWald	Jan. 11, 12, 13	Foundations
	Jan. 18, 19	
	Jan. 20	**Foundations Content Exam (30 minutes)**
Atterholt	Jan. 20, 25, 26, 27	Chemistry Approaches
	Feb.1, 2	
	Feb. 3	**Chemistry Content Exam (30 minutes)**
Byrd	Feb. 3, 8, 9, 10	Environmental Health Approaches
	Feb. 15, 16	
	Feb. 17	**ENVH Content Exam (30 minutes)**
Synthesis Exam #1		
Bates & Kloeppel	Feb. 17, 23, 24	Natural Resources Approaches
	Mar. 8, 9	*(advising day: Feb. 22, No classes Mar. 1-3)*

	Mar. 10	**NRCM Content Exam (30 minutes)**
Collins	Mar. 10, 15, 16, 17	Biological Approaches
	Mar. 22, 23	
	Mar. 24	**Biology Content Exam (30 minutes)**
Synthesis Exam #2		
Tanner & Lord	Mar. 29, 30, 31	Geological Approaches
	Apr. 5, 6, 7	
	Apr. 12	**Geology Content Exam (30 minutes)**
DeWald	Apr. 12, 13, 14, 19	Wrap-up, Synthesis
	Apr. 26, 27, 28	2-yr course plans
Synthesis Exam #3 Taken during final exam time period		

*** Each unit has a 45 minute introductory lecture (Thursday) to start the section, followed by three 75-minute lectures (T/TH), and two 3-hour labs (Wednesday).**

*** Each unit has 10 points for in-class and/or homework assignments, one lab report (20 points) and concludes with a 30-minute content-based exam (20 points). Therefore, each unit is worth 50 points.**

There are three take-home synthesis exams that integrate across two units each.

Dr. DeWald will grade all exams and reports.

ES 150: Introduction to Environmental Science
Environmental Chemistry Unit

Contact Information:

Cynthia Atterholt
Office: NS 231A
Office Hours: 11:00 to 12:00 am MWF, or by appointment
Phone: 227-3667
Email: atterholt@wcu.edu

Environmental Chemistry is the study of the sources, identity, levels, reactions, transport, and fate of chemical species in water, soil, and air.

One of the important functions of environmental chemistry is to provide the exposure information necessary for evaluating toxicity and risk. Exposure, hazard, and risk are modified

by the environmental dissipation of chemicals. As chemicals vaporize, dissolve in water, become bound to soil, or react, their concentration and availability change. Escape of chemicals during manufacturing, handling, use, or disposal results in environmental pollution.

For the next 2 weeks, we will focus on how we use chemistry to study the environment.

Readings:

Textbook Chapter 23: Materials, Society, and the Environment
Case study on Rare Earth Metals
Readings placed on WebCat

Laboratory activity:

Synthesis of biofuel from a vegetable oil or fat

Grades for Chemistry Unit:

10 points for homework assignments
20 points for lab report
20 points for content-based exam

50 points total

SPRING 2010 ES 150: INTRODUCTION & APPROACHES TO ENVIRONMENTAL SCIENCE
GEOLOGY: CLIMATE CHANGE AND CARBON STORAGE – LEARNING TO USE THE 4TH DIMENSION

Contact Information:

Ben Tanner, Geology
ST 335; Office Hours MW 10-11, T 8:30-9:30 & appt.
Phone: 227-3915
Email: btanner@wcu.edu

Mark Lord, Geology
ST331A; Office Hours TWH 9:30-11 & appt.
Phone: 227-2271
Email: mlord@wcu.edu

Section Overview: In this section of the course we will first examine how geologists approach environmental problems, specifically focusing on the use of records of past change and rates of change. We will use this approach to study global climate change in a historical context. We will then focus on solutions to the problem of excessive greenhouse gas concentrations in the atmosphere by determining rates of greenhouse gas sequestration (CO_2) in geologic reservoirs (wetland soils). We will use several case studies to provide concrete examples of geological approaches to environmental problems.

GEOLOGY UNIT SCHEDULE			
Wk	**Date**	**Topic**	**Readings***
1	March 25	In-class content exam V; Intro. to Geol. section	
2	Apr 6	Global Climate Change and the Carbon Cycle	Ch. 13
	Apr 7	**Lab: Jackson Cty Park Storm Water Wetland Field Trip** – Collecting samples to measure carbon sequestration – Meet in ST 253	Ch. 6, 104-110
	Apr 8	Importance of Wetland Restoration – Wetlands as a Carbon Sink, Case Study I	Will be assigned on Apr. 7
3	Apr 13	Calculating Your Carbon Output, Case Study II	Chmura et al. Article (WebCat)
	Apr 14	**Lab: Measuring Carbon Sequestration** – Loss on Ignition and Carbon Accumulation Rates – **Meet in ST 314**	
	Apr 15	In-class content exam VI; Wrap-up, Synthesis	

* Chapter/section readings refer to the course text by Kaufmann & Cleveland. Please have material read before the class date indicated.

Section Grading & Policies*

In-class assignments 10 points
Lab Report 20 points

Exam

20 points = content, in-class

*Class policies for this section are the same as those given by Prof. DeWald.

*"The debate on the authenticity of global warming and the role played by human activity is largely nonexistent among those who understand the nuances and scientific basis of **long- term climate processes**,"*

- Peter Doran, Associate Professor of Earth and Environmental Sciences at the University of Illinois at Chicago, lead investigator on a survey of 3,146 scientists on the topic of global warming

ES-150 Introduction and Approaches to Environmental Science
Sustainable Ecosystem Management Unit
Spring 2010

Unit Instructors:

Peter Bates	Brian Kloeppel
ST341	ST307
227-3914	227-2888

Overview: This module will cover issues related to the development and application of sustainable management practices. We will focus on practices that apply to the management of forests and forested watersheds in western North Carolina.

Date	Topic	Reading
Thur. Feb. 18	Introduction/overview	Kaufmann & Cleveland (Ch 7: page 157-165)
Wed. Feb. 24	LAB: Forest stand characterization (meet in ST 253, but dress prepared to go outside)	
Thurs. Feb. 25	Forest stand development	
Tue. Mar. 2	Challenges to achieving sustainable forest management in western NC	Kaufmann & Cleveland (Ch 7: page 165-177) The illusion of preservation
Tue. Mar. 9	Natural resource planning and policy	
Wed. Mar. 10	LAB: Application of planning principals to a municipal watershed	Various newspaper articles

Grading (points for this module will be based on the following percentages:
In-class assignments.....75%
Lab summary due ***.....25%

CHEM 139 General Chemistry I
Spring 2010
MWF 9:05-9:55 (ST 425)

Instructor: Dr. Cynthia Atterholt
Office: NS 231
Contact Info: x 3667
atterholt@email.wcu.edu
Office Hours: MWF 10:00-11:00 pm; or by appointment

I. Course Description

This course is an introduction to chemistry, designed for students who have never taken chemistry or need to brush up on the subject. In this course, you will study basic chemistry including such topics as atomic and molecular structure, chemical bonding, stoichiometry, acids and bases. The laboratory portion of this course will provide an introduction to experimentation. Goals of the course include: (1) development of mathematical problem solving skills, the use of calculators, and interpretation of graphical data, (2) understanding of chemical concepts, and (3) development of scientific reasoning skills. The text will be a source of homework problems and a reference.

II. Learning Objectives

By the end of this course, students will:

- Be able to use the periodic table.
- Understand atomic structure and bonding.
- Be able to name chemical compounds.
- Be able to balance chemical equations.
- Be able to calculate theoretical yields.
- Be able to predict the products that form as a result of mixing known reactants.
- Be able to determine molecular geometries.
- Understand hybrid orbital theory.

III. Course Materials

Text	Chemistry, Fourth Edition by McMurray and Fay , Prentice Hall Publisher
Other Required Materials	**Chemistry Safety Goggles** (required for lab) **must** be purchased at the WCU bookstore. Laboratory handouts are available in the lab packets found in the bookstore. Calculator (TI-30 or TI-31 is fine!)

IV. Grading Procedures:

	Percentage of Final Grade
Attendance	5%
Homework, In-class Assignments, Quizzes	25%
Exams	30%
Final Exam	20%
Laboratory	20%

VI. Tentative Course Schedule

A tentative class schedule for this course is given below. Classroom activities will include lecture, followed by problem-solving activities. **Therefore you should bring the textbook and a calculator to class**. It is also highly recommended that you read the assigned material before you come to the lecture. Four exams will be given in class during the semester.

Date	Topics	Reading Assignments
1/11-1/15	Course Introduction; Elements, & Periodic Table; Properties; Measurement	1.1-1.10
1/18 ML KING day 1/20-1/22	Accuracy, Significant Figures, Dimensional Analysis, Fundamental Laws of Nature	1.11-1.13 2.1-2.2
1/25- 1/29	Structure of the Atom; Compounds and Mixtures; Molecules, Ions, and Bonding; Chemical Nomenclature	2.3 – 2.10
2/1- 2/5	EXAM 1 Balancing Equations, The Mole, Stoichiometry	3.1- 3.4
2/8- 2/12	Percent Yield, Limiting Reactants, Molarity, Solution Stoichiometry	3.5-3.9
2/15- 2/19	Titration; Empirical Formula; Aqueous Chemical Reactions, Net Ionic Equations; Acids, Bases, and Neutralization Reactions	3.10 – 3.11 4.1 – 4.5
2/22-2/26	Oxidation Reduction Reactions; The Activity Series; Balancing Redox Reactions	4.6 - 4.10
3/1 3/3- 3/5 Midterm Break	EXAM 2	
3/8- 3/12	Periodic Table; Light and Electromagnetic Spectrum; Atomic Structure	5.1 – 5.7
3/15-3/19	Electron Orbitals, Atomic Spectra; Electron Configuration	5.8 – 5.10
3/22- 3/26	Orbital Energy Levels; Electron Configuration & The Periodic Table; Anomalous Configurations EXAM 3	5.11 – 5.14
3/29-4/02	Spring Break	
4/5- 4/09	Ions, Ionic Bonding, The Octet Rule	6.1 6.12
4/12 – 4/16	Covalent Bonding, Electron Dot Structures, Formal Charges	7.1 – 7.8

4/19- 4/23	VSEPR; Orbitals; Hybrid Orbitals EXAM 4	7.9 – 7.11
4/26- 4.30	Gas Laws	9.1-9.5
Tuesday 5/4, 11:30 am	FINAL EXAM	

- Exams:
  Four exams will be given in class on the following dates:
  Exam 1: February 1.
  Exam 2: March 1.
  Exam 3: March 24.
  Exam 4: April 23.

  If there is a ***compelling reason*** why you must miss an exam, notify me by phone or email ***before*** the exam. The make-up date is Friday, April 30.

- Final Exam:

  The final exam is scheduled for Tuesday, May 4th from 8:30-11:00 pm. The exam is cumulative.

CHEMISTRY 140
ADVANCED GENERAL CHEMISTRY

Spring 2011
Section-04 TTH; 12:35 – 1:50
Belk
Room 323

Brian Dinkelmeyer, Office: NS 229, Office hours MW 11:15 – 12:05 or by appointment.
Office phone: 3675, Email: dinkelmeyer@email.wcu.edu

Text: CHEMISTRY, a Molecular Approach, 2nd ed., N.J. Tro, Prentice Hall, Upper Saddle River, NJ, 2008.

GENERAL COURSE DESIGN Enrollment in this course presumes successful completion of the prerequisites for the course, an open mind and an appetite to learn. You are expected to participate in all class activities by: reading assigned material; doing homework; participating in classroom discussions (may require a calculator, so bring one); and contributing in any way that will benefit you and the class. Attendance is mandatory, participation in class is expected and failure to do so will result in a lowering of your grade. I will not necessarily lecture on all text material, but you are responsible for all assigned topics.

GRADING The course will be graded 100-93=A; 92-90=A-; 89-86=B+; 85-82=B; 81-79=B-; 78-76=C+; 75-73=C; 72-68=C-; 67-63=D+; 62-60=D; 59-55=D-; 54 or below=F. The overall course grade will be based on the laboratory (20%), 3 hour exams (55%), the comprehensive final examination (20%), daily homework assignments, participation, quizzes (5%).
Quiz Policy: If fewer than 70% of the class is in attendance, or if a cell phone rings in class, or if anyone goes to sleep during class, there will be a quiz.

COMMENTS Success in this course demands that you spend time on the course material out of class. There are many example problems in each chapter and problems and questions covering the material at the end of each chapter with answers to selected problems in appendix F. You must gain the experience of working these problems on your own. Of course I will be happy to assisting you if you ask.

I will make every effort that I can to make general chemistry a usefully informative and enjoyable experience. I fully expect you to meet me more than half way in this as I expect you to read, work out of class, and participate in class proceedings. Do these things and we both will be satisfied, don't do them and we both will be disappointed. Please do not hesitate to ask questions either during class, during lab, during my office hours or by email.
Liberal Studies Core Requirement: This course partially satisfies the C5 science requirement of the WCU liberal studies program and contains a laboratory component. In the physical sciences, students will

- Be directed toward the definition and solution of problems involving the character of matter, energy, motion, or mechanical/dynamic systems;

- Use scientific study to appreciate the tentative character of scientific conclusions: repeated experimental testing is needed in order to confirm assertions, and revision (even rejection) of hypotheses is allowed.

Laboratory work is central to understanding scientific work. The lab section of this course will provide an opportunity to experience the environment in which scientific study is conducted.

TENTATIVE COURSE SCHEDULE

Below is a tentative outline for the course. Problems at the end of each chapter are divided according to text section, so address the problems appropriate to the sections we cover. There will many short homework assignments. I want you to think about chemistry everyday.

Review: Chapters 3, 9– Formulas, Equations, Moles, Covalent Bonds

Chapter 10 Molecular Structures.

Chapter 11 – Liquids, Solids, and Intermolecular Forces

Chapter 12 – Solutions

Chapter 13 – Chemical Kinetics

Exam 1 –tentative date: Feb 11

Chapter 14 – Chemical Equilibrium

Chapter 15 –Acids and Bases;

Exam 2 –tentative date Mar 16

Chapter 16 Aqueous Equilibria

Chapter 17 – Free energy and Thermochemistry

Chapter 18 – Electrochemistry

Exam 3- tentative date Apr 18

FINAL EXAMs:

Section 01-Mon, May 2, 3:00-5:30

Section 02-Tues, May 3, 3:00-5:30

BIOL140 Principles of Biology I
Fall 2010

Learning Objectives:

BIOL140 is intended as an introduction to biology for majors and those pursuing related fields in the sciences. Topics covered include macromolecules, cell structure and function, the cell cycle, mitosis and meiosis, energy and energy-harvesting pathways, and genetics and molecular biology.

Lecture text: Life: Biology by Campbell, Reece, Urry, Cain, Wasserman, Minorsky and Jackson(8th edition)

Date		Topic	Reading (chapter)
Aug	23	Introduction	1
	25	Basic chemistry	2
	27	Organic molecules	4/5
	30	Organic molecules	5
Sept	1	Organic molecules	5
	3	Structure and function of the cell	6
	6	Holiday (no class)	
	8	Structure and function of the cell	6
	10	Exam I	
	13	Structure and function of the cell	6
	15	Structure and function of the cell	6
	17	Cell membranes	7
	20	Cell membranes	7
	22	**Thermodynamics**	**8**
	24	Enzymes	8
	27	Glycolysis	9
	29	Exam II	
Oct	1	Krebs cycle	9
	4	Oxidative phosphorylation	9
	6	Oxidative phosphorylation	9
	8	Photosynthesis	10
	11	Photosynthesis	10
	13	**Cell cycle, mitosis**	**11**
	15/18	Fall Break (no class)	
	20	Mitosis	11
	22	Meiosis	11
	25	Exam III	
	27	Genetics	14
	29	Genetics	14
Nov	1	Genetics	14
	3	**Advising day (no class)**	
	5	DNA structure	16
	8	DNA replication	16
	10	RNA and protein synthesis	17
	12	RNA and protein synthesis	17
	15	RNA and protein synthesis	17
	17	Exam IV	
	19	Prokaryotic gene structure and expression	18

	22	Eukaryotic gene structure and expression		18
	24/26	Thanksgiving Holiday (no class)		
	29	Eukaryotic gene structure and expression		18
Dec	1	Viruses	19	
	3	Recombinant DNA technology	20	
	6	Recombinant DNA technology	20	
	8	Recombinant DNA technology	20	
	10	Review		
Dec	14	**Final exam**, Tuesday, 8:30-11 AM		

Grading:

There will be five exams, each exam will be worth 100 points. In addition there will be various written assignments, together these written assignments will be worth 100 points. Seventy-five percent of your grade will be based on your points earned in lecture, twenty-five percent of your grade is based on your lab performance.

Exams (I-V), 100 points each	500 points
Assignments	100 points
Total possible points	600 points

Attendance policy:

Your attendance is required at all exams. If you have to miss an exam you must let me know ahead of time. Exams missed without an excuse will be graded as 0 points earned. Assignments must be turned on the date they are due, no late papers will be accepted.

PRINCIPLES OF BIOLOGY I--LAB
BIOL 140--Lab Syllabus, Fall 2010

Faculty Lab Coordinator: Dr. Ron Michaelis
Office: 211 Stillwell (227-3662)
Office Hours: MW 1:30-2:30, TR 11:00-12:30, or by appointment
E-mail: michaelis@email.wcu.edu

I) Course Description and Learning Objectives

BIOL 140 lab is designed to introduce students to the scientific method, emphasize and extend certain topics that were covered in lecture, teach critical thinking and quantitative skills, and develop scientific writing skills. It is intended that the labs will be held after the corresponding lectures, but this may not always be possible, depending on the progress of your lecture section and the day of the week during which you have lab.

The specific topics to be covered are listed below. The first three labs are exercises designed to build basic skills; they provide examples of the level of competence you should have in applying mathematics to science and writing lab reports if you want to be a science student. Some students may find they already have the skills that are represented in these labs, and will find them very easy. For others, these labs may identify mathematical or writing skills the student needs to improve.

II) Course Materials

You do not need to purchase anything for this class, but you will need to print the pre-lab exercises and lab handouts. There is a pre-lab exercise and a lab handout for each of the labs (except there are no pre-

lab exercises for Lab 1 or Lab 3). Pre-lab exercises, lab handouts and any other relevant documents can be accessed at the BIOL 140 Lab WebCat website.

Students are required to:
1. Print the appropriate pre-lab exercises and lab handouts before coming to lab.
2. Answer the questions in the pre-lab exercises before each lab and hand them in at the beginning of the corresponding lab period. Note—there is no pre-lab exercise for Lab 1 or lab 3.

III) Tentative Lab Schedule (may change as needs arise). Note: each line of the table refers to that entire week.

Week of	Laboratory Exercise	Assignment*
Aug 23	Lab 1--Using Math In Science	Turn in Lab 1 worksheets (at the end of today's lab period) Note--there is no Pre-Lab 1
Aug 30	Lab 2--Scientific Method and Writing Lab Reports	Turn In Pre-Lab 2 (at the beginning of today's lab period) (A formal lab report must be written up)
Sep 6	No Lab—Labor Day	
Sep 13	Lab 3--A Primer On Inferential Statistics	Turn in Lab 3 worksheets (at the end of today's lab period) Turn in Lab 2 lab report Note--there is no Pre-Lab 3
Sep 20	Lab 4--Diffusion/Osmosis Exercise--The Use Of Microscopes (Note: The lab and the microscope exercise are two different projects)	Turn In Pre-Lab 4 (at the beginning of today's lab period) Turn in Use Of Microscopes Worksheet (at the end of today's lab period)
Sep 27	Lab 5--Chemical Composition Of Cells	Turn In Pre-Lab 5 (at the beginning of today's lab period) Turn in Lab 4 (worksheet or report)
Oct 4	Lab 6--Cell cycle, mitosis, meiosis and recombination	Turn In Pre-Lab 6 (at the beginning of today's lab period) Turn in Lab 5 (worksheet or report)
Oct 11	Lab 7--Enzymes And Inhibitors	Turn In Pre-Lab 7 (at the beginning of today's lab period) Turn in Lab 6 worksheet

Note: Only the Monday and Tuesday labs meet the week of Oct 11

Oct 18	Lab 7--Enzymes And Inhibitors	Turn In Pre-Lab 7 (at the beginning of today's lab period) Turn in Lab 6 worksheet

Note: Only the Wednesday, Thursday and Friday labs meet the week of Oct 18

Oct 25	Lab 8--Cellular Respiration And Fermentation	Turn In Pre-Lab 8 (at the beginning of today's lab period) Turn in Lab 7 (worksheet or report)
Nov 1	No Lab--Advising Day	
Nov 8	Lab 9--Photosynthesis	Turn In Pre-Lab 9 (at the beginning of today's lab period) Turn in Lab 8 (worksheet or report)
Nov 15	Lab 10--Mendelian and Nonmendelian Inheritance	Turn In Pre-Lab 10 (at the beginning of today's lab period) Turn in Lab 9 (worksheet or report)
Nov 22	No Lab—Thanksgiving Holiday	
Nov 29	Lab 11 (Part 1)--DNA Extraction and PCR	Turn In Pre-Lab 11 (at the beginning of today's lab period) Turn in Lab 10 (worksheet or report)
Dec 6	Lab 11 (Part 2)--Electrophoresis of PCR Products, Forensic And Medical Applications	Turn In Today's Forensic/Medical Exercise Worksheet (exercise will be handed out in lab)

IV) Work Requirements And Grading

A) You will not get a separate grade for your BIOL 140 lab; it will contribute to your overall grade for BIOL 140. Your lecture professor will determine the specific percentage of the BIOL 140 grade that will come from your lab grade.

Grades for the lab will be determined by the following formula:

Pre-Lab Assignments (9 X 20 points each)	180 points
Lab Reports (5 X 100 points each)	500 points
Lab Worksheets (7 X 25 points each)	175 points
Participation/Attitude	145 points
TOTAL	1000 points

BIOLOGY 141_01, 02 - Principles of Biology II
Fall 2010

Class time: 141-01 MWF 9:05 am - 9:55 am McKee 113
141-02 MWF 11:15 am - 12:05 pm Belk 323

Instructors: Dr. Anjana Sharma, Dr. Kathy Mathews, Dr. Jeremy Hyman, Dr. Kefyn Catley, Dr. Beverly Collins

Text: Biology by Campbell and Reece, 8th Ed. Pearson Education

Tentative Schedule:

DATE		BIOLOGICAL TOPICS	READING ASSIGNMENT
Aug	23	Introduction, Domains of Life	514-515, 551-553
	25	Phylogenetics, Prokaryotes	536-540, Ch. 27
	27	Prokaryotes contd.	Ch. 27
	30	Eukaryotes, Endosymbiosis, Protists	516-517, 575-579,
Sep	1	Protists contd.	580-598
	3	Land Plants, Alternation of Generation	600-604
	6	**No classes – Labor Day Holiday**	
	8	Nonvascular Plants	604-610
	10	Seedless Vascular Plants	610-615
	13	Gymnosperms	618-625
	15	Angiosperms	625-632
	17	**EXAM 1**	
	20	Angiosperms – Reproduction, Seed Development	627-628, 801-806
	22	Angiosperms – Reproduction, Seed Development	806-809
	24	Plant Structure, Growth and Development	738-745
	27	Plant Structure, Growth and Development	746-754
	29	Resource Acquisition and Transport	764-776
Oct	1	Resource Acquisition and Transport contd.	776-781
	4	Soil and Plant Nutrition	785-798
	6	Fungi	636-652
	8	Fungi continued	636-652
	11	**EXAM 2**	
	13	What is an Animal? Animal Origins	Ch 31
	15	**Fall Break**	

	18	**Fall Break**	
	20	Animal Origins – primitive animals	Ch 31
	22	Animal Origins – primitive animals	Ch 31
	25	Protostome animals	Ch 32
	27	Protostome animals	Ch 32
	29	Protostome animals	Ch 32
Nov	1	Protostome animals	Ch 32
	3	**No Classes – Advising Day**	
	5	Protostome animals	Ch 32
	8	**EXAM 3**	
	10	Deuterostome animals	Ch 33
	12	Deuterostome animals	Ch 33
	15	Deuterostome animals	Ch 33
	17	Deuterostome animals	Ch 33
	19	Deuterostome animals	Ch 33
	22	Hormones	Ch 41
	24	**Thanksgiving Holiday**	
	26	**Thanksgiving Holiday**	
	29	Nervous System – Action potentials	Ch 44/45/46
Dec	1	Nervous System – Synapses	Ch 44/45/46
	3	Nervous System - Sensory systems	Ch 44/45/46
	6	Respiration	Ch 48
	8	Circulation	Ch 49
	10	Digestion	Ch 50
	13	**104-02 FINAL EXAM (EXAM 4) 3-5:30 pm**	
	14	**104-01 FINAL EXAM (EXAM 4) 8:30-11 am**	

Learning Objectives: By the end of this course, students should learn and retain basic knowledge about organismal evolution, modern-day organismal diversity, the anatomy, reproduction, physiology and behavior of the major groups of extant organisms, and the scientific method used to understand the biology of life on earth.

Grades:

Exam 1	17.5 %
Exam 2	17.5 %
Exam 3	17.5 %
Exam 4	17.5 %

Laboratory	30 %
Total	100 %
Extra credit	5 %

Extra Credit: 5 % extra credit points are possible for attending up to three science seminars and writing a one- to two-page report (double-spaced) on each. Of the three seminar reports, at least one report must be from the first half of the semester. *Poorly written reports may be returned for a rewrite before a grade is assigned.* You have up to one week following the seminar to turn in the report. For full credit, the report must include:

- The title of the presentation, Name of speaker, Date and Location of the talk,
- A summary of the talk with the main points of the presentation and results or conclusions of the speaker, and
- One question that occurred to you during the talk that you might like to ask the presenter, or a point on which you would like elaboration.

BIOLOGY 141 Lab SPRING 2010

Required Text - *A Photographic Atlas for the Biology Laboratory*, 6th Ed. by Van De Graaff & Crawley

DATE (Week of)	BIOLOGICAL TOPICS
Jan 11	Prokaryotes; Protists I
Jan 18	No lab meeting
Jan 25	Protists II; Set up Plant Nutrition Experiment
Feb 1	Nonvascular and Seedless vascular plants; Collect Nutrition Data
Feb 8	Gymnosperms; Collect Nutrition Data; **Quiz 1**
Feb 15	Angiosperms; Collect Nutrition Data
Feb 22	No lab meeting; Collect final Nutrition Data
Mar 1	No lab meeting- Mid-term break
Mar 8	Fungi, Nutrition report due.
Mar 15	Animal Lab – Phylogenetics exercise; **Quiz 2**
Mar 22	Animal Diversity I– Porifera, Cnidaria, Ctenophores
Mar 29	No lab meeting- Spring break
Apr 5	Animal Diversity II – Platyhelminthes, Annelida, Mollusca; **Quiz 3**

Apr 12	Animal Diversity III – Nematoda & Arthropods
Apr 19	Animal Diversity IV - Echinodermata & Chordata
Apr 26	Animal Diversity V - Local animal diversity; **Quiz 4**

Course Evaluation: Lab accounts for 30% of the course grade.

Worksheets	120
Pre lab assignments	55
Plant Nutrition Report	15
4 Quizzes	40
Total Points:	230

Course Objectives

- Learn to visually identify, verbally describe and sketch representative specimens of major phyla of the three domains and name them according to correct taxonomic designations.
- Learn to utilize a microscope to identify important cells, tissues, organs and structures of the specimens and name them using correct scientific terminology.
- Learn important distinguishing characteristics of the major taxa and life cycles of selected taxa.
- Study the effects of mineral elements on plant development.

Geology 150: Methods in Geology

Instructor: Dr. Ben Tanner **Office:** Stillwell 335 **Office Hours:** MWF 11am-12pm; R 1pm-2pm
e-mail: btanner@email.wcu.ed **Phone:** 227-3915 Also by appointment
Course Text: Chernicoff & Witney, An Introduction to Physical Geology, Fourth Edition
Class Meeting Time: MWF 9:05 – 9:55am, Stillwell 149
Lab Meeting Time: Stillwell 322; Section 30, W 1:25 – 3:15pm; Section 31, W 3:35 – 5:25pm

COURSE DESCRIPTION

Through this course we will achieve a better understanding of science and scientific principles, the Earth, the materials that make up the Earth, and how these materials came to be where they are. We will focus on the systems, processes and cycles on Earth, and begin to learn about the nature of the evolution of our planet. While many aspects of geology are relevant to our everyday lives, we will also explore some of the interesting phenomena of our planet out of pure interest and curiosity (Two traits that help to make us human!). Geology is a fascinating subject. Don't be afraid to be amazed by the world around you!

Goals – This course will further the development of scientific communication and investigation skills. Many of the class assignments will require your active participation and will require systematic thought and problem solving. Many of the projects that we will undertake (such as the wetlands lab project) will not necessarily have a pre-defined outcome. We will develop the skills necessary to take on these types of assignments so that you can approach real-world scientific problems with confidence. You will also communicate your results in the form of scientific papers, lab reports, and in class presentations, thereby strengthening your scientific communication skills.

GRADING	Lab:	30%	Lab practical = 8%, Lab final = 7%, Lab assignments = 15%
	Tests (3):	45%	See makeup policy note below
	Assignments and Participation	10%	Many of the topics that we cover will be through in class assignments, out of class assignments and discussions. It is essential for everyone to participate and participation will be graded during the appropriate classes with a check, check minus, or check plus. Assignments will receive a percentage score. 1 dropped assignment will be allowed and there will be no makeups for assignments unless agreeable arrangements have been made in advance (at least one day) of the class.
	Quizzes	10%	Pop quizzes will be given occasionally that will cover the previous night's reading assignment. One drop is allowed and there will be no makeups unless agreeable arrangements have been made in advance (at least one day) of the class.
	Attendance	5%	It is essential that you attend class in order to succeed in this course. Many topics that I introduce are not covered adequately in the text, and missing assignments and group work will directly impact your course grade. 3 absences with no point deduction and then 2% deduction for additional absences to a maximum of 5% from the final course grade. Non attendance of the mandatory field trip on Nov. 14 will result in an automatic 2% deduction from the final course grade.

100-94%:A, 93-90%:A-, 89-87%:B+, 86-83%:B, 82-80%:B-, 79-77%:C+, 76-73%:C, 72-70%:C-, 69-60%:D, <60%:F

Date	Topic	Assignment
WEEK 1		
8/23 to 8/27	Course Intro	Read Syllabus
	What is Science? Discussion	The Nature of Science Rea
	First Look at Planet Earth	Chp. 1
Lab	No Lab Meeting This Week	
WEEK 2		
8/30 to 9/3	First Look at Planet Earth (Cont.)	Chp. 1
	Minerals	Chp. 2
Lab 1	Unit Conversions	
WEEK 3		
9/6	Labor Day	No Class
9/7 to 9/10	Minerals (Cont.) and Igneous Rocks	Chp. 3
Lab 2	Minerals	
WEEK 4		
9/13 to 9/17	Igneous Rocks and Processes	Chp. 3
	Volcanoes and Volcanism	Chp. 4
Lab 3	Igneous Rocks	
WEEK 5		
9/20 to 9/24	Weathering	Chp. 5
	Sedimentary Processes, Environments, and Rocks	Chp. 6
Lab 4	Weathering Lab	
WEEK 6		
9/27 to 10/1	Metamorphism and Metamorphic Rocks	Chp.7
	Geologic Time	Chp. 8
Lab 5	Sedimentary and Metamorphic Rocks	
WEEK 7		
10/4 to 10/6	Review for Test I and Test I (10/6)	Study!
10/8	Earth's Structure	Chp. 9
Lab 6	Lab Practical	
WEEK 8		
10/11 to 10/13	Earth's Structure	
	Earthquakes	Chp. 10
10/15	Fall Break	
Lab 7	Topographic Maps	
WEEK 9		
10/18	Fall Break	
10/20 to 10/22	Earthquakes/The Earth's Interior	Chp. 10,11
	Streams and Floods	Chp. 15
Lab 8	Geologic Maps	
WEEK 10		
10/25 to 10/29	Streams and Floods	Chp. 15
	Groundwater	Chp. 16
Lab 9	Cullowhee Creek Lab	
WEEK 11		
11/1 to 11/5	Regional Geologic Setting	Outside Reading
	Water/Rock Chemical Interactions	Outside Reading
11/3	Advising Day - No Class, No Lab	
11/6	**Mandatory Fieldtrip to Great Smoky Mtn. N.P.**	
WEEK 12		
11/8 to 11/12	Review for Test II	Study!
	Test II (11/10)	
	Mass Movements	Chp. 14
Lab 10	Groundwater Lab	

Date	Topic	Assignment
WEEK 13		
11/15 to 11/19	Soils/Wetlands	Outside Reading
	Tectonics Revisited	Chp. 12
Lab 11	Wetlands Project Lab	
WEEK 14		
11/21	**COURSE EVAL OPEN**	
11/22	Shores and Coastal Processes	Chp. 19
11/24 to 11/26	Thanksgiving Holiday	
	No Lab Meeting This Week	
WEEK 15		
11/29 to 12/3	Shores and Coastal Processes	
	Glaciers and Ice Ages	Chp. 17
Lab 12	Slope Stability Lab	
WEEK 16		
12/5	**COURSE EVAL CLOSED**	
12/6 to 12/10	Human Use of the Earth's Resources	Chp. 20
	Review for Test III	
Lab 12	Lab Final	
FINALS WEEK		
12/14	Test III, 8:30-11:00am	

ES495: Senior Seminar Fall 2010

Course Objectives:
The purpose of this course is for you to apply your skills and knowledge of environmental science to an open-ended problem. In doing this, you will gain improved understanding and skills in problem definition, in development of methods to address a problem, integration of concepts, project management, data analysis and professional oral and written presentation. This spring we will be working with Lauren Bishop and the WCU Sustainability Council on issues related to recycling on campus.

Seminar Format:
Our seminar will have a format similar to many graduate program research seminars. A key difference between your experience in "regular" classes and this seminar is the responsibility you have to our collective learning and data collection goals, as well as the responsibility you have to the education of your peers. Individually and collectively you will be responsible for reading literature, setting goals related to the overall objective for your project, formulating methods to collect data, collecting and analyzing data, and presenting results and interpretation in a variety of formats.

The projects we are working on are open-ended which means the paths to the outcomes are not fully known. As such, the precise direction and schedule we will take in our seminar is dependent upon a lot of variables that cannot be anticipated over a 15-week period. After establishing an initial plan of action, each group will need to continually assess the plan to assure that it still provides the best path to achieve your group's objectives.

Seminar Plan and Project:
To meet the objectives of our seminar, our course will consist of four phases:

1. Problem definition, background research and methodology
2. Data collection
3. Data analysis
4. Written report and oral presentation

Our semester will culminate with a formal report, and oral and poster presentation. The written report will be in the form of a bound manuscript with different all of you as authors. The report and presentation will be for an audience greater than our seminar class and will include members from the professional community, and the Environmental Science Faculty at WCU.

Evaluation:
15% Project Management: working effectively in a team, meeting deadlines, etc. (see rubric)
Combined assessment from your peers plus your instructor
15% Class Participation
Attendance, using class time effectively (e.g., working days where class does not formally meet),
Leading discussions and participating in discussions of literature related to the project
25% Journal

You are required to keep a journal throughout the semester that documents your experiences and progress toward completing tasks for ES495.

45% Final Report: written document + poster + oral presentation

Writing quality (see rubric), use of literature, use of specifics

Note: Lack of peer reviewed literature will result in a grade no higher than a “C” in this class

Note: Lack of specifics (we will discuss what this means in class) will result in a grade no higher than a “C” in this class

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Introduction to GIS
NRM 344
Fall 2010
Stillwell 354
Tues and Thurs 12:35-1:50
Lab Thursdays: 2:05-3:55

Instructor: Ron Davis
Office: Stillwell 318
Phone: x2726
Office Hours: Wednesday 9-11:00 and Tues 2-3:00pm with others by appointment. I am usually in my office whenever I'm not teaching so if the door is open feel free to stop by with questions.

*** Given the amount of information, and the complexity of GIS software the best advice I can give for this class is:

1) Don't let the work get ahead of you—if you wait until the day an assignment is due then something WILL go wrong. This will only add to the frustration but more importantly you'll less.

2) GIS is about asking and answering spatial questions and problem solving. Always keep in mind the question you're asking. As you'll hear me say ad nauseum: ***If you don't know what you need the GIS program to do, you'll have no way of knowing whether it's done it!.***

- It's a frustrating program at first but always keep in mind the question your asking and this helps you keep track of what tools you need.

- The weekly labs are intended to give you some practice with the software and concepts and often can be finished in a lab session. HOWEVER, don't just rush through them to finish. GIS takes practice and each new concept depends on earlier ones. Racing to finish an exercise might mean you get out of class sooner but you won't get much from it.

- Try to have some fun. TRUST ME I know the frustration, but GIS is a lot like a big puzzle, so have some fun with the problem solving part of things!

3) Ask for help when you need it. The course builds on itself so telling me the day something is due that "I didn't understand" is too late.

I. Purpose

Students will develop basic understanding and skills required to apply GIS analyses in the study, conservation and management of natural resources.

II. Course Objectives:

- Develop and apply skills in scientific problem solving.
- Apply basic data management concepts
- Apply various spatial analyses tools and integrate both raster and vector data sources in GIS analyses.

III. Course Materials

- Required text(s): Required text(s): Bolstad, P. 2005. GIS Fundamentals: A First Text on Geographic Information Systems.
- Other readings will be provided as needed.

V. Grading Procedures: With the exception of some in class exercises used for discussions, all work will be graded and returned to you. Assignments will be designed to provide a variety of approaches to learning.

	Percent
Labs/Quizzes/Assignments	25
Midterm	25
Final Project	25
Final Examination	25

Tentative Schedule

Date	Topic	Reading	Lab/Notes/Comments
Tues, Aug 24	Introduction: Spatial Questions	Chapter 1	
Thurs, Aug 26	GIS components, Spatial Data and GIS Applications	Chapter 2	Assignment 1: Spatial Questions, Problems and Objectives
Tues, Aug 31	Spatial Data Models Continued	Chapter 2	
Thurs, Sep 2	Representing the Earth and its features.	Chapter 2	Lab1: Landcover Maps and Spatial Data
Tues, Sep 7	Map Projections	Chapter 3	
Thurs, Sep 9	Maps and Projections continued	Chapter 3	Lab2: Introduction to ArcGIS
Tues, Sep 14	GIS Data, Data Sources and Management	Chapter 4	
Thurs, Sep 16	GPS Basics	Chapter 5	Lab3: Creating and projecting vector layers in Arc

Tues, Sep 21	Spatial Analysis: Vector Tools	Chapter 9	
Thurs, Sep 23	Spatial Analysis: Vector Tools	Chapter 9	Lab 4: Analysis Tools
Tues, Sep 28	Data Extraction/Analysis	Chapter 8	Supplemental Readings
Thurs, Sep 30	Introduction to Raster Data and Analysis	Chapter 10	Lab 5: Basic Raster Analysis
Tues, Oct 5	Raster Data and Analysis Continued	Chapter 10	
Thurs, Oct 7	MIDTERM		
Tues, Oct 12	Project Work		
Thurs, Oct 14	**Fall Break – No Classes**		
Tues, Oct 19	**Fall Break – No Classes**		
Thurs, Oct 21	Terrain Analyses	Chapter 11	Lab 6: Surface Analyses Tools
Tues, Oct 26	Hydrology and 3D analyses		
Thurs, Oct 28	Spatial Modeling	Chapter 13	Lab 7: Hydrology and 3D tools
Tues, Nov 2	Spatial Modeling Continued		
Thurs, Nov 4	Data Quality, Accuracy and Model Evaluation	Chapter 14	Lab 8: Designing spatial models in Arc
Tues, Nov 9	Integrating Raster-Vector Data Analyses		
Thurs, Nov 11	Spatial Estimation	Chapter 12	TBA
Tues, Nov 16	Applications in NRCM		
Thurs, Nov 18	Applications in NRCM		Project Work
Tues, Nov 23	Applications in NRCM		
Thurs, Nov 25	Thanksgiving Holiday		
Tues, Nov 30	Applications in NRCM		
Thurs, Dec 2	Applications in NRCM		Project Work
Tues, Dec 7	Applications in NRCM		
Thurs, Dec 9	Project Prep		Project Presentations
Thursday Dec 16th	FINAL EXAM		3:00-5:30

ENVH 375 - ENVIRONMENTAL TOXICOLOGY

Fall 2009

Location:	Moore Hall 212
Meeting times:	MWF 11:15 – 12:05
Instructor:	Dr. Burton Ogle
Contact Info:	BOgle@email.wcu.edu (preferred); G-11 Moore Hall; Tel: 227-3517;
Office Hours:	MW 12:20-2:15 (open hours); additional times by appointment.
WebPages:	http://envh.wcu.edu; http://paws.wcu.edu/envh

I. Rationale/Purpose

This course is intended to familiarize students with the mechanisms by which toxins are absorbed, metabolized and excreted from the body. Further, students will become knowledgeable of various classes of toxins, target organs, historical perspectives of toxicology and the importance of risk assessment. This course is required for EH majors and is a useful course for a variety of majors including Environmental Science. The pre-requisite is EH major or permission of instructor.

II. Course Aims and Objectives:

Upon successful completion of ENVH 375, the student will be able to:

- Characterize the routes of entry whereby a toxin may enter the body;
- Understand the differences between acute and chronic toxicity;
- Recognize the biological and physiological pathways of toxins within the body;
- Be familiar with many of the most pervasive toxins, their target organs, and their toxic action;
- Identify dose-response relationships;
- Understand the concepts of lethal dose 50;
- Differentiate between various chronic effects such as carcinogenicity, terratogenicity and mutagenicity;
- Appreciate the historical evolution of the field of toxicology;
- Recognize the relationship and application of toxicology within environmental health practice; and,
  Understand the value of toxicology for evaluating risk.

III. Course Materials

- Required text(s): Basics of Toxicology by Kent – WCU Book Store Rental Program
- Background/supplementary readings. Furnished as electronic files on Web CAT
- A personal computer with internet access (for homework and WebCAT access)
- A notebook to print and keep PowerPoint printouts
- A USB pen drive to keep all of your course files in one place

V. Grading Procedures:

All grades will be posted on WebCAT (Grade Book module). Students may view their grades at all times and using the tables below, can estimate their overall performance in this class.

Evaluation Type	Percentage of Final Grade

Tests (typically 3)	50%
Online Quizzes	15%
Research Project and Presentation	10%
Attendance, Class Participation and Pop Quizzes	15%
Final Comprehensive Examination	10%
	100%

Research Project and Presentation: Each student is expected to research a topic chosen jointly by the instructor and student. Students will prepare a PowerPoint presentation on that topic to be presented at the end of the semester. Topics may be *environmental toxins, toxic release events, agencies that support toxicological research*, etc. A scholarly research paper of no less than 1,200 words (approximately 5 pages), plus references. No less than 1/2 of the references must be from peer-reviewed journals. Papers will follow APA style. Papers will be accepted for review and/or grading during week 12 of the semester. The final date for submitting papers will be the last day of class.
Online Quizzes: Prior to each test, an objective, online quiz will be available on Web Cat. Students are expected to complete the quizzes on time and individually.
Tests: Three tests will be given during the semester. The test dates will be assigned toward the end of the last inclusive unit (see course outline). The tests will be short answer, fill in the blank, and essay. They represent ½ the total grade for the course.
Pop Quizzes: Periodically, and typically following an additional reading assignment, pop quizzes will be given as a check for the student and instructor that progress is being maintained.
Final Exam: the final exam will be mostly multiple-choice, with one or two essay questions. This examination is comprehensive.

VIII. Tentative Course Schedule - *May change to accommodate guest presenters & student needs*

Topical Unit	***Week Covered***
Introduction to Course and the History of Toxicology	1
Bhopal and Chemical Information Sources	2
Dose Response and Understanding Dose/Response Curves	3
Routes of Exposure	4 - 5
Test 1	
Factors that Influence Toxicity	6 - 7
Absorption, Distribution, Metabolism and Elimination of Toxins	8 – 10
Biotransformation	11
Test 2	
Environmental Toxins and Risk Assessment	12
Natural/Biological Toxins	13 – 14
Test 3	
Student presentations	15

ENVH 310 Water Quality Control
Fall 2009, 3 credit hours

Faculty: Dr. Tracy Zontek, G-09 Moore Hall, zontek@email.wcu.edu
Office Hours: MWF 10:00-12:00; other times by appt.

Graduate Teaching Assistant: James Picker, jwpicker@catamount.wcu.edu
Undergraduate Teaching Assistant: Jennifer Wessling, jwessling1@catamount.wcu.edu
Teaching assistants will help outside class by appointment only.

I. Rationale/Purpose
The processes for the development of water resources and water supplies, quantity and quality requirements, pollution prevention control measures, and collection and treatment of wastewater for disposal or reuse will be examined in the context of health implications.

II. Course Aims and Objectives
Upon successful completion of the ENVH 310 course students will:

- Understand the health hazards associated with drinking water supplies, wastewater disposal systems, and industrial effluents.
- Acquire an understanding of the treatment methodologies and laboratory tests applicable to surface waters, drinking water supplies and wastewater disposal systems.
- Analyze water and watersheds to determine health and acceptability.
- Comprehend the sources and effects of water pollution.
- Understand the significance and impact and correctly apply water quality legislation to different cases.
- Value the significance of safe water and proper sanitation to health and well-being.

III. Course Materials
Text: Hammer, M. J. and Hammer, Jr. M. A. (2008). Water and wastewater technology, 6th edition, Upper Saddle River, NJ: Pearson Education, Inc.

The student will receive information through readings, case studies, Internet sources, PowerPoint presentations, handouts, discussion, video presentation, and projects. In addition, current mass media and peer reviewed journal articles will be posted for topics as appropriate.

V. Grading Procedures
All grades will be posted on WebCAT (Grade Book module). Students may view their grades at all times and can estimate their overall performance in this class.

There are a number of different evaluation methods in this course to allow students to build on their technical skills, as well as improve their oral and written communication. Each module will have an online quiz with questions taken from presentations, class discussions, and the text. There are a total of two exams; each will contain critical thinking discussion questions. The water quality expedition activities require the student to review materials on DVD, answer questions, and write a short reflection. The group project allows students to collaboratively examine the health of a local stream, compare it to other waterways in the area, and develop oral presentation to the community.

Evaluation Instrument	Approximate Points
Exams	200
Online module quizzes	225
Water Quality Expedition Activities	175
Group Project Presentation	100

ENVH 440 – Air Quality Control

Spring 2010

Western Carolina University
College of Health and Human Sciences, School of Health Sciences
Environmental Health Program

Location:	Moore Hall 101
Meeting times:	MWF 8:00 – 8:50
Instructors:	Dr. Burton Ogle
Contact Info:	BOgle@email.wcu.edu (preferred); G-11 Moore Hall; Tel: 227-3517; Fax: 227-7446
	Office Hours: MWF 11:15-12:05 (open hours); additional times by appointment.
Webpages:	http://envh.wcu.edu;
Prerequisites:	ENVH major or permission of instructor
Co-requisites:	ENVH 450 (for ENVH majors)
Credits:	3 semester hours

I. Rationale/Purpose

This course presents a broad view of all major aspects of air quality. It includes a study of pollutants, pollutant sources, effects of pollution, dispersion of pollution, legal authority for air pollution control, measurement and control of emissions, enforcement of regulations, inspections, implementation plans, and other related topics.

II. Course Aims and Objectives

The objective of this course is to provide the student with an understanding of the sources, causes, and effects of air pollution and to introduce the student to various strategies for air quality management and control. The student will learn to:

- Recognize and use appropriately the air pollution control terms associated with all major aspects of air quality;
- Relate the legal aspects of air pollution control to the tasks one performs on the job;
- Identify the weather and topographic factors that affect pollution dispersion and the sources and limitations of related data;
- Identify the areas of risk assessment in air;
- Describe the authority and program elements necessary for compliance with the Clean Air Act;
- Associate air pollution control apparatus with the types of sources and pollutants to which they are typically applied;
- Recognize the role that government agencies play in a current comprehensive air pollution control program; and,
- Recognize the health and welfare goals which motivate efforts to improve and/or maintain the quality of air.

III. Course Materials

- Required text(s): Air Quality by Thad Godish – 4th Edition – Book Store Rental
- Background/supplementary readings. Furnished as handouts and/or electronic files on WebCAT
- Loose-leaf notebook to maintain all course materials (e.g. PowerPoint notes; readings, etc.)
- USB pen drive (or other portable drive) to keep all course-related electronic files and submissions.

V. Grading Procedures

All grades will be posted on WebCAT (Grade Book module). Students may view their grades at all times and can estimate their overall performance in this class.

Evaluation Instrument	*Percentage of Grade*
Reflection Papers	10
Quizzes (one for each unit/chapter)	25
Attendance and Participation	10
Tests (4 tests)	40
Final, Comprehensive Exam	15
Total	**100**

A quiz (online) will follow each unit. Tests are normally in-class and cover two to three units each. Generally, quizzes are T/F and Multiple-choice and tests are short-answer, multiple choice and discussion. Reflection papers will be completed in WebCat – it is highly recommended that you save your reflections in Microsoft Word on your pen drive but cut and paste your reflection into the WebCat submission window for each assignment. Reflection papers are assigned for readings, videos, and/or hands-on laboratories.

VII. Tentative Course Schedule - *May change to accommodate student needs*

Topical Unit	*Reading*	*Week Covered*
Introduction and Chapter 1 – The Atmosphere	Ch. 1	1-2
Chapter 2 - Atmospheric Pollutants	Ch. 2	2 – 5
Test 1		
Federal Air Quality Regulation	Handout	5 – 6
NC Clean Smokestacks Act	Handout	5 - 6
Chapter 3 – Dispersion	Ch. 3	7
Chapter 4 – Atmospheric Effects	Ch. 4	8
Chapter 5 – Health Effects	Ch. 5	9
Test 2		
Chapter 6 – Welfare Effects	Ch. 6	10 - 11
Chapter 7 – Air Quality Assessment	Ch. 7	12 - 13
Chapter 10 – Control of Static Emissions	Ch. 10	14 - 15
Test 3, followed by Final Comprehensive Exam		

College of Health and Human Sciences
School of Health Sciences
Environmental Health Program

I. Course: ENVH 470, Principles of Epidemiology

II. Text: R. M. Merrill (2010). Introduction to Epidemiology, 5th edition, Sudbury, MA: Jones and Bartlett Publishers. ISBN: 978-0-7637-6622-1

III. Professor: Brian D. Byrd, PhD, MSPH
Email: bdbyrd@wcu.edu (best method of communication)
Office: Moore G07
Phone: 227-2607
Fax: 227-7446
Office hours: M 9:15-11:15, Wednesday 9:15-12:15 and by appointment

Portions of this course will be administered on WebCAT. It is the student's responsibility to maintain access to WebCAT and their Catamount email account throughout the entire semester. IT Services Help Desk: 227-7487,1-866-928-7487(toll free), itshelp@email.wcu.edu

IV. Course Description and Background:
Epidemiology is the study of the distribution and determinants of disease/health in populations. It is the cornerstone discipline/science in public health. This course will focus on descriptive and analytic epidemiological techniques and concepts. Briefly, descriptive epidemiology focuses on the characterization of the distribution (spatial and temporal) of disease/health related events. Analytic epidemiology focuses on finding and quantifying associations (*e.g.*, risk factors) and the causes of disease/health. This course covers application of epidemiologic procedures to the understanding of the occurrence and control of conditions such as infectious and chronic diseases, community health and environmental health hazards.

V. Course Aims and Objectives:
This introductory course is designed to provide students with an overview of the occurrence of disease in human populations through epidemiological methods, results and applications. Emphasis will be placed on identifying the totality of health problems and the needs of human populations and how these issues can be prevented and controlled.

Specifically, by the end of this course, students will:

- Know the basic terminology, methods, and principles of epidemiology
- Understand the significance and use of statistical measures and records in epidemiology
- Appreciate the role of epidemiology in Public Health and Environmental Health Sciences
- Understand epidemiologic strategy and the epidemiologic investigation process
- Access available governmental (county, state, federal, global) epidemiologic data inventories
- Prepare an epidemiological report using basic techniques, methods and data sources

VI. Instructional Methods:
The student will receive information through readings, case studies, internet sources, PowerPoint presentations, handouts, discussion, video presentation, and projects. In addition, current mass media and peer reviewed journal articles will be discussed as appropriate.

VIII. Assignments and Evaluation Methods:

There are a number of different evaluation methods in this course to allow students to improve their technical, written communication and critical thinking skills and abilities. There are a total of three exams and a comprehensive final; each will contain a mix of multiple choice, short answer, and critical thinking discussion questions. Each student will produce a written report worth 100 points summarizing a computer based study of an infectious disease outbreak (Pharyngitis in Louisiana). Each student will present a case study as a short technical presentation (powerpoint) in a manner appropriate for a local or regional conference.

Evaluation Instrument	Points
Exams (3)	300
Final Exam (Cumulative)	100
Computer Based Learning Write Up (Outbreak Investigation Report)	150
Oral Presentation (Case Studies)	100
Participation (Attendance, Discussions, Current Events, etc.)	50
Total Points	**700**

XIII. Tentative Schedule of Topics

Tentative Course Schedule
Spring 2010

	Date	Topic	Reading Assignment
1	Tues, Jan 12	Course Expectations Introductions Epidemiology as a Liberal Art	
2	Thurs, Jan 14	Foundations of Epidemiology	Chapter 1
3	Tues, Jan 19	In Class Assignment	TBA
4	Thurs, Jan 21	In Class Assignment	TBA
5	Tues, Jan 26	Historic Developments in Epidemiology	Chapter 2
6	Thurs, Jan 28	Historic Developments in Epidemiology	Chapter 2
7	Tues, Feb 2	Practical Disease Concepts	Chapter 3
8	Thurs, Feb 4	Practical Disease Concepts	Chapter 3
9	**Tues, Feb 9**	**Exam One**	
10	Thurs, Feb 11	Design Strategies and Statistical Methods	Chapter 4
11	Tues, Feb 16	Design Strategies and Statistical Methods	Chapter 4
12	Thurs, Feb 18	Design Strategies and Statistical Methods	Chapter 4
	Tues, Feb 23	**Advising Day – No Classes**	
13	Thurs, Feb 25	Descriptive Epidemiology	Chapter 5
14	Tues, Mar 2	Descriptive Epidemiology	Chapter 5
	Thurs, Mar 4	**Mid-Term Break – No Classes**	
15	Tues, Mar 9	General Health and Population Indicators	Chapter 6
16	Thurs, Mar 11	General Health and Population Indicators	Chapter 6
17	**Tues, Mar 16**	**Exam Two**	
18	Thurs, Mar 18	Field Epidemiology	Chapter 10
19	Tues, Mar 23	Field Epidemiology	Chapter 10
20	Thurs, Mar 25	Field Epidemiology	Chapter 10
	Tues, Mar 30	**Spring Break – No Classes**	
	Thurs, Apr 1	**Spring Break – No Classes**	
21	Tues, Apr 6	Analytical Epidemiology	Chapter 7
22	Thurs, Apr 8*	Analytical Epidemiology	Chapter 7
23	Tues, Apr 13	Analytical Epidemiology	Chapter 7
24	**Thurs, Apr 15**	**Exam Three**	
25	Tues, Apr 20	Student Presentations	
26	Thurs, Apr 22	Student Presentations	
27	Tues, Apr 27	Student Presentations	
28	Thurs, Apr 29	Student Presentations	

WESTERN CAROLINA UNIVERSITY
ENVIRONMENTAL REGULATION AND LAW - ENVH 458
FALL 2010

INSTRUCTOR:
Phillip B. Kneller
G 08 Moore Hall
Phone: 227- 2654 Email: pkneller@email.wcu.edu

OFFICE HOURS:
MWF - 1:00 - 2:00 P.M.
T R - 2:00 - 3:00 P.M.
Or By Appointment

COURSE RATIONALE:

The student will acquire an understanding of a variety of approaches to environmental law, the importance of the understanding fundamental law, the court system, and the development of knowledge of several national acts relating to the environment and the general public's health. The student will also gain knowledge in professional development by applying any segment of the entire legal system to resolve environmental issues.

CATALOG DESCRIPTION:

This course introduces basic concepts of environmental law to include the workings of the justice system, the litigation process, witness testimony, and major environmental health laws.

TEXT:

Environmental Law Handbook, Arbuckle, et.al., Governmental Institutes, Inc. Rockville, MD, 1999.

COURSE AIMS ANDOBJECTIVES:

Upon completion of this course students should be able to:

a. Understand the methods by which environmental laws are promulgated.
b. Discuss the role of the courts in environmental cases.
c. Define the rights of regulated individuals, and limits of government authority.
d. Distinguish between civil and criminal prosecution.
e. Review case histories and discuss their implications.
f. State the intent of major environmental legislation.

FACULTY EXPECTATION OF STUDENTS:

General Course Conduct:

1. Students are expected to participate in group activities and any other instruction methods deemed appropriate and conducive to learning.

EVALUATION OF STUDENT PERFORMANCE:

Grades will be determined from scores based on the following:

Graded Activities

3 Unit Exams - 100 Points Each
Final Exam - 100 Points

TENTATIVE LECTURE SCHEDULE

AUG.	25	INTRODUCTION AND BASIC ENVIRONMENTAL LAW
	27	BASIC ENVIRONMENTAL LAW
SEPT.	1	COMMON LAW
	3	NUISANCE
SEPT.	8	NEGLIGENCE
	10	TRESSPASS
SEPT.	15	PERMITS
	17	ORGANIC LAW
SEPT	22	RIGHTS OF THE REGULATED
	24	**EXAM I**
SEPT.	29	TYPES OF LIABLILITIES
OCT.	1	LIABILITIES
OCT.	6	LIABILITIES
	8	**BREAK**
OCT.	13	**BREAK**
	15	ENFORCEMENT SOURCES
OCT	20	ENFORCEMENT SOURCES
	22	ENFORCEMENT IMPOVEMENTS
OCT.	27	**EXAM II**
	29	UST
NOV.	3	CWA
	5	CWA-SDWA
NOV.	10	SDWA
	12	**EXAM III**
NOV.	17	CASE PRESENTATION AND PROSECUTION PREPARATION
	19	PROSECUTION PREPARATION
NOV.	24	DISCLOSURE AND DEFENSE PREPAPRATION
	26	**HOLIDAY**
DEC.	1	DEFENSE PREPARATION
	3	DEFENSE DISCLOSURE
DEC.	8	PROSECUTION PRESENTAION
	10	PROSECUTION PRESENTAION

Natural Resource Policy and Administration - NRM 442
Western Carolina University

If you are thinking one year ahead, sow seed. If you are thinking ten years ahead, plant a tree. If you are thinking 100 years ahead, educate the people – Kuan-Tsu, third century BC

Fall 2010 - 148 Stillwell Building
Monday, Wednesday, and Friday 11:15 to 12:05

Professor: Brian Kloeppel, 307 Stillwell Building, bkloeppel@wcu.edu, 828-227-2888
Office Hours: Monday 12:05-1:05 PM, Wednesday 9:55-10:55 AM, and by appointment

I. Rationale/Purpose
The purpose of this course is to explore the process and rationale of the policies and administration involved in managing our natural resources.

II. Course Aims and Objectives:

- Aims
  The aims of this course are to introduce, discuss, analyze, evaluate, and predict the policies, processes, and outcomes of natural resource policy and administration.
- *By the end of this course, students will:*
  - Be able to identify the audiences involved in the development and impact of natural resource policies
  - Be able to identify top-down and bottom-up policy development and identify the strengths and weaknesses of each
  - Understand the weaknesses and identify the research needed to effectively develop, write, review, enforce, and administer effective natural resource policies
  - Appreciate the long-term need and desire for natural resource conservation, preservation, restoration, and the need for all three
- Demonstrate an excitement of learning, understanding, and appreciating the need for natural resource policies and the administration needed to develop and administer policies.

III. Course Resources

- Required text:
  - The Policy Process: a practical guide for natural resource professionals. 2002. By Tim W. Clark. Yale University Press, New Haven, Connecticut. ISBN 978-0-300-09012-3
- We will also have supplementary readings from two other sources:
  - Principles of Water Resources: History, Development, Management, and Policy, Third Edition. 2010. By Thomas V. Cech. John Wiley & Sons, Incorporated, Hoboken, New Jersey. ISBN 0470136316.
  - Taking Sides: Clashing Views on Environmental Issues, Thirteenth Edition. 2009. By Thomas A. Easton. McGraw Hill, New York, New York. ISBN 978-0-07-351444-4.
- I will post additional resources to the course Blackboard page as the semester goes on. Please learn how to access these resources.

V. Grading Procedures:

Description of Item	*Percentage of Grade*
Exam I	20%
Exam II	20%
Two Papers	20%
Media Policy Issues, Class Participation	20%
Final Exam	20%
Total	100%

VII. Tentative Course Schedule

May change to accommodate schedules and student needs

Day / Date	Topic	Reading Assignment	Media Policy
M, 23 August	Syllabus and Introduction		BK
W, 25 August	Hist. Context of Forest Use	Chapter 1, p 1-16	JB, AB
F, 27 August	Decision Process Stages	Chapter 4, p 56-64	BC
M, 30 August	Forest Resource Policy	S,H,S: Chapter 2, p 17-46	DC, RD
W, 01 September	Hunter Library - peer review		
F, 03 September	Forest Resource Policy		KFaw
M, 06 September	Labor Day - no class		
W, 08 September	Water Resource Policy	Cech: Chapter 8, p 249-293	JF, KFoy
F, 10 September	Kloeppel out - focus on papers		
M, 13 September	**paper topics due**	review paper topics	RF
W, 15 September	Water Res. Policy / Review		AH, RH
F, 17 September	**First Mid-term Exam**		
M, 20 September	Wildlife Policy	handouts - ESA	RJ
W, 22 September	Kloeppel out - focus on papers		
F, 24 September	Kloeppel out - focus on papers		
M, 27 September	Wildlife Policy / **outlines due**		RK, PL
W, 29 September	Wildlife Policy		TL
F, 01 October	Energy Policy	Taking Sides #12, p 220-240	ML, CM
M, 04 October	Energy Policy		EM
W, 06 October	Energy Policy		KM, TP
F, 08 October	Food Policy / **1st paper due**		PPittman
M, 11 October	Food Policy		PPurnell, DS
W, 13 October	Food Policy	Taking Sides #13, p 244-257	KU
F, 15 October	Fall Break - no class		
M, 18 October	Fall Break - no class		
W, 20 October	Recreation Policy	S,H,S: Chap 12, p 262-291	BW, DZ
F, 22 October	Recreation Policy		JB, AB
M, 25 October	Recreation Policy		BC
W, 27 October	Policy Audiences	Chapter 2, p 17-31	DC, RD
F, 29 October	Policy Audiences		KFaw
M, 01 November	Policy Audiences / Review		JF, KFoy
W, 03 November	Advising Day - no class		
F, 05 November	**Second Mid-term Exam**		
M, 08 November	Policy Enforcement		RF
W, 10 November	Policy Enforcement		AH, RH
F, 12 November	"Green" Policies		RJ
M, 15 November	"Green" Policies	Taking Sides #9, p 166-189	RK, PL
W, 17 November	Conflict Resolution		TL
F, 19 November	Conflict Resolution		ML, CM
M, 22 November	Conflict Res. / **2nd paper due**	Taking Sides #2, p 22-36	EM
W, 24 November	Thanksgiving Break - no class		
F, 26 November	Thanksgiving Break - no class		
M, 29 November	Planning Exercise	handouts, multi-day exercise	KM, TP
W, 01 December	Planning Exercise		PPittman
F, 03 December	Planning Exercise		PPurnell, DS
M, 06 December			KU
W, 08 December	Lecture Topic: student choice		BW, DZ
F, 10 December	Review		BK

Final Exam: Monday, 13 December 2010, 3:00 PM to 5:30 PM

PAR 330: American Wilderness Ethics and Aesthetics

How near to good is what is wild. There is the marrow of nature—there her divine liquors—that is the wine I love.
-Henry David Thoreau

Spring 2009
Stillwell 425
TR 9:30-10:45 am

Instructor: Dr. David Henderson dghenderson@wcu.edu
251 Stillwell Building 828-277-2932

Office Hours: Monday 1:00-2:00 pm, Tuesday 11:00-12:00 and by appointment.
Scheduling visits ahead of time is helpful, but drop-ins are welcome.

Course Aims and Objectives:

- Aims and Specific Learning Objectives:
  - Trace the development of the American conception of *wilderness*.
  - Familiarity with the major figures and texts of the wilderness preservation tradition.
  - Situate American attitudes toward wilderness in their broader historical context.
  - Compare and contrast American views of nature with those of other times and cultures.
  - Connect developments in science and art with attitudes toward nature preservation.
  - Evaluate arguments for and against the preservation of wilderness.
  - Enrich personal appreciation of wild nature.
- Liberal Studies learning goals
  - Demonstrate the ability to locate, analyze, synthesize, and evaluate information;
  - Demonstrate the ability to interpret and use numerical, written, oral, and visual data;
  - Demonstrate the ability to read with comprehension, and to write and speak clearly, coherently, and effectively as well as to adapt modes of communication appropriate to an audience;
  - Demonstrate the ability to critically analyze arguments;
  - Demonstrate the ability to recognize behaviors and define choices that affect lifelong well-being;
  - Demonstrate an understanding of
    - Past human experiences and ability to relate them to the present;
    - Different contemporary cultures and their interrelationships;
    - Issues involving social institutions, interpersonal and group dynamics, human development and behavior, and cultural diversity;
    - Scientific concepts and methods as well as contemporary issues in science and technology;
    - Cultural heritage through its expressions of wisdom, literature and art and their roles in the process of self and social understanding.
- This course is a Perspectives course. The primary goals of the Perspectives courses are:
  - To promote love of learning and to cultivate an active interest in the Liberal Studies;
  - To build on the Core's foundation through practice and refinement of areas of academic emphasis;
  - To provide students with a broadened world view and knowledge base;
  - To provide experiences in the arts, humanities, and social sciences from which connections between disciplines can be revealed;
  - To provide an introduction to the challenges of living in a global society;
  - To create opportunities for reflection on values, and for discussing differences in values in a critical yet tolerant manner;
  - To afford opportunities to make career or disciplinary choices.
- This course satisfies the P4 Perspective requirement of the Liberal Studies Program. In it, you will be exposed to landmark texts that embody the traditional Western heritage of humanity's attempt to understand the human condition and that engage you in the exploration of the significance of human modes of being, thought, and values in your life. As in all Liberal Studies Perspective offerings, this

course will emphasize reading, writing, and the use of information, as well as one or more of the following: critical analysis, oral communication, service learning, moral reflection, and cultural diversity.

Course Materials

- Required texts:
  - *Wilderness and the American Mind*, Roderick Nash, 4th ed. (Yale 2001).
  - *Great New Wilderness Debate*, eds. Callicott and Nelson (Georgia 1998). [*GNWD*]
  - *American Wilderness: A New History*, ed. Michael Lewis (Oxford 2007). [*AW*]

- Recommended further resources:
  - *The Idea of Wilderness*, Max Oelschlaeger (Yale 1993).
  - *The Wilderness Debate Rages On*, eds. Callicott and Nelson (Georgia 2008).

Grading Point System:

You may complete any combination of the following assignments to achieve however many points you wish. There is no benefit to your grade to earning more than 100 points.

Assignment	Graded out of
Daily reading responses	2 pts each
Nature Journal	30 pts
Midterm Paper	
5 pages	25 pts
7 pages	35 pts
Final Paper	
7 pages	35 pts
12 pages	50 pts
15 pages	60 pts
Taking a draft to the Writing Center	5 pts
Final Essay Exam	20 pts
Other opportunities	TBA

SCHEDULE

GNWD: Great New Wilderness Debate; AW: American Wilderness

Week 1: Jan 10-14

- Tuesday – Cancelled for Snow
- Thursday – Introductions and Syllabus

Week 2: Jan 17-21

- Tuesday – Old World Opinion
  - Nash 1-22: Prologue & Chpt 1
  - Blackboard: Coates selection
- Thursday – Pre-Columbian America
  - *GNWD* 414-442: Denevan
  - *AW* 15-33: "... First Contact"

Week 3: Jan 24-28

- Tuesday – Colonial Period
  - Nash 23-43: Chpt 2
  - Blackboard: P. Miller
  - *GNWD* 23-27: Edwards

- Thursday – Romanticism
  - Nash 44-66: Chpt 3
  - *GNWD* 28-30: Emerson

Week 4: Jan 31 – Feb 4
- Tuesday – Romantic Natural History
  - *AW* 73-90: "Natural History, Romanticism ..."
- Thursday – American Wilderness Art
  - Nash 67-83: Chpt 4
  - *AW* 91-112: "... American Landscaper Art"

Week 5: Feb 7-11
- Tuesday – Henry David Thoreau
  - Nash 84-95: Chpt 5
  - *GNWD* 31-47: Thoreau selections
  - Blackboard: Thoreau selections
- Thursday – Preservation
  - Nash 96-121: Chpts 6 & 7

Week 6: Feb 14-18
- Tuesday – John Muir
  - Nash 122-140: Chpt 8
  - *GNWD* 48-62: Muir selections
- Thursday – Frederick Olmsted and Gifford Pinchot
  - Blackboard: "Olmsted Legacy"
  - *AW* 131-147: "Sylvan Prospect"

Week 7: Feb 21-25
- Tuesday – *Advising Day*
- Thursday – Ansel Adams

Spring Break: Feb 28 – Mar 4

Week 8: Mar 7-11
- Tuesday – Wilderness Cult
  - Nash 141-160: Chpt 9
  - GNWD 63-74: Roosevelt
  - Blackboard: Turner
- Thursday – Hetch-Hetchy
  - Nash 161-181: Chpt 10

Week 9: Mar 14-18
- Tuesday – Aldo Leopold
  - Nash 182-199: Chpt 11
  - *GNWD* 75-84: Leopold
- Thursday – The Wilderness Act
  - Nash 200-237: Chpt 12
  - *GNWD* 85-102: Marshall and Olson

Week 10: Mar 21-25
- Tuesday – The Wilderness Act
  - *GNWD* 103-153: Leopold Report, Act and Woods
- Thursday – Wilderness Philosophy and Poesy
  - Nash 238-271: Chpt 13
  - Blackboard: Snyder and Jeffers

Week 11: Mar 28 - Apr 1
- Tuesday – Alaska and Irony of Victory
  - Nash 272-341: Chpts 14 & 15
- Thursday – International Perspective
  - Nash 342-390: Chpt 16 & Epilogue

Week 12: Apr 4-8
- Tuesday – International Perspective
  - *GNWD* 217-245: Harmon & Guha
- Thursday – Indigenous Perspective
  - *GNWD* 201-206, 314-324, 628-641: Bear, Bayet and Nabhan

Week 13: Apr 11-15
- Tuesday – Critics
  - *GNWD* 337-394: Callicott and Rolston
- Thursday – Critics
  - *GNWD* 325-333, 443-499: Talbot, Birch and Cronon

Week 14: Apr 18-22
- Tuesday – Replies
  - *GNWD* 395-413, 652-690: Foreman, Noss and Plumwood
- Thursday – *Break*

Week 15: Apr 25-29
- Tuesday – Biodiversity and Conservation Biology
  - *GNWD* 595-616: Grumbine
  - *AW* 205-222: "Conservation Science"
- Thursday – Management and Restoration
  - *GNWD* 521-539: Noss
  - Blackboard: Katz, Henderson

PAR 333: Environmental Ethics

Fall 2010
MK 229
TR 12:35-1:50 pm

Instructor: Dr. David Henderson dghenderson@wcu.edu
251 Stillwell Building 828-277-2932

Office Hours: Tuesday 11:00 am – 12:00 pm, Wednesday 10:00 – 11:00 am and by appointment. Scheduling visits ahead of time is helpful, but drop-ins are welcome.

I. Rationale/Purpose

Environmental ethics concerns how humans ought to relate to nature. We will examine the relationship between culture and nature, the ecological embeddedness of all human activity and the possibility of obligations regarding future generations, the other animals, species and ecosystems. A diverse array of positions (such as deep ecology and ecofeminism) and practices (such as wilderness preservation and ecological restoration) will be examined and critically assessed. (P1)

II. Course Aims and Objectives:

- Specific Learning Objectives:
  - Appreciate the ethical dimensions of environmental problems
  - Discern the implications of ethical theory for environmental practice
  - Evaluate social and economic policy in terms of its ecological consequences
  - Cultivate a moral sensibility toward the biotic community
  - Critically assess one's own environmental impact
  - Be introduced to the rich corpus of environmental literature
- Liberal Studies learning goals
  - Demonstrate the ability to locate, analyze, synthesize, and evaluate information;
  - Demonstrate the ability to interpret and use numerical, written, oral, and visual data;
  - Demonstrate the ability to read with comprehension, and to write and speak clearly, coherently, and effectively as well as to adapt modes of communication appropriate to an audience;
  - Demonstrate the ability to critically analyze arguments;
  - Demonstrate the ability to recognize behaviors and define choices that affect lifelong well-being;
  - Demonstrate an understanding of
    - Past human experiences and ability to relate them to the present;
    - Different contemporary cultures and their interrelationships;
    - Issues involving social institutions, interpersonal and group dynamics, human development and behavior, and cultural diversity;
    - Scientific concepts and methods as well as contemporary issues in science and technology;
    - Cultural heritage through its expressions of wisdom, literature and art and their roles in the process of self and social understanding.

III. Course Materials

- Required texts:
  - *A Companion to Environmental Philosophy*. ed. Dale Jamieson. (Blackwell, 2001). [rental]
  - *Foundations of Environmental Ethics*. Eugene Hargrove. (Environmental Ethics Books, 1989). [purchase]
- Additional readings shall be made available through Blackboard.

V. Grading Procedures:

- Grade Components
  - Weekly Reading Discussion Board: 35%
  - Participation in Paper Workshop: 5%
  - Paper: 35%
  - Field Trip / Service Learning Participation: 15%
  - Attendance and Participation: 10%

- Weekly Reading Discussion Board: Each week you should select something that you find interesting in the reading and discuss it in the Blackboard discussion board. Your post should be professional in tone and at least 150 words. Clearly identify the portion of the reading you are discussing. Each week's post will be due before the next Monday at 5:00 PM.

- A 1800-2000 word (7 pages), double-spaced paper will be written on a topic discussed in or relevant to the course. Present the issue clearly. Argue for a substantive conclusion. Cite scholarly sources with a consistent, professional format, preferably Chicago style footnotes. The paper will be due on Monday, April 26th.

- A few weeks before the paper is due, we will have a paper workshop in class (Monday, April 5th). Have a complete draft of at least 1400 words (5 pages), and bring two hard copies. You will read and give feedback on two of your peers' papers as well as receiving feedback on your own. Turn in an electronic copy of the rough draft via Blackboard.

- You will have the option of participating in a field trip and/or service learning projects. Details will be given separately.

SCHEDULE

Week 1: Aug 23-27

- Tuesday – Introductions and Syllabus
- Thursday – What is Nature?
  - *Leopold "Mountain", Price and Budiansky (Blackboard)*

Week 2: Aug 30 – Sept 3

- Tuesday – Cultural Traditions: Indigenous perspectives, China
  - *Blackwell chapters 1 and 2*
- Thursday –– Cultural Traditions: India, Jainism, Buddhism
  - *Blackwell chapters 3 and 4*

Week 3: Sept 6-10

- Tuesday – Cultural Traditions: Greek, Judaism
  - *Blackwell chapters 5 and 6*
- Thursday – Cultural Traditions: Christianity and Islam
  - *Blackwell chapters 7 and 8; Henderson (Blackboard)*

Week 4: Sept 13-17

- Tuesday – Cultural Traditions: Modernity
  - *Blackwell chapters 9 and 10*
- Thursday – Traditional Philosophical Attitudes
  - *Foundations chapter 1*

Week 5: Sept 20-24

- Tuesday – Traditional Land Use Attitudes
  - *Foundations chapter 2; Blackwell chapter 33*
- Thursday – Aesthetic and Scientific Attitudes
  - *Foundations chapter 3; Blackwell chapter 18*

Week 6: Sept 27 - Oct 1

- Tuesday – Wildlife Protection Attitudes
  - *Foundations chapter 4*
- Thursday – Meta-Ethics
  - *Blackwell chapter 11*

Week 7: Oct 4-8

- Tuesday – Normative Ethics
  - *Blackwell chapter 12*
- Thursday – Therapeutic Nihilism
  - *Foundations chapter 5*

Week 8: Oct 11-13

- Tuesday – An Ontological Argument
  - *Foundations chapter 6 & afterword*

Week 9: Oct 20-22

- Thursday – Sentientism
  - *Blackwell chapter 13 and 29*

Week 10: Oct 25-29

- Tuesday – The Land Ethic
  - *Blackwell chapter 14; Leopold "Land Ethic" (Blackboard)*
- Thursday – Deep Ecology
  - *Blackwell chapter 15*

Week 11: Nov 1-5

- Tuesday – Ecofeminism
  - *Blackwell chapter 16*
- Thursday – Ecological Economics
  - *Blackwell chapter 19; Hardin and 'Fisheries' (Blackboard)*

Week 12: Nov 8-12

- Tuesday – Environmental Justice
  - *Blackwell chapters 23 and 30*
- Thursday – Sustainability
  - *Blackwell chapter 27; Cobb (Blackboard)*

Week 13: Nov 15-19

- Tuesday – Biodiversity
  - *Blackwell chapter 28; ESA selections and Gould (Blackboard)*
- Thursday – PAPER WORKSHOP
  - *Bring two copies of your 5-page rough draft. Be on time.*

Week 14: Nov 22-23

- Tuesday – Population
  - *Blackwell chapter 25*

Thanksgiving Break

Week 15: Nov 29 – Dec 3

- Tuesday – Consumption
  - *Blackwell chapter 34*
- Thursday – Wilderness
  - *Blackwell chapter 24; Plumwood (Blackboard)*

Week 16: Dec 6-10

- Tuesday – Restoration
  - *Katz and Light (Blackboard)*
- Thursday – Disobedience
  - *Blackwell chapter 36; Thoreau (Blackboard)*

GEOGRAPHY 402
CONSERVATION OF NATURAL RESOURCES
SPRING 2009

"Quantity, quality, and distribution of resources in the United States; dilemma of increasing demand on a dwindling resource base." (WCU Catalog course description)

Instructor: Dr. J.W. Neff, Associate Professor of Geography (Ph.D. 1975 Univ. of Tenn.)
Office: 339 Stillwell Office hours: Posted on office door Phone: 227-7367
e-mail: neffj@email.wcu.edu
Required text: G. Tyler Miller and S. Spoolman, ***Environmental Science: Principles, Connections, and Solutions***, 12th Edition, 2008.

I. COURSE OBJECTIVES.

The primary objective of the course is to help increase the student's knowledge of the earth's complex environmental systems. It is from these systems and processes that we derive the natural resources upon which human existence depends. **Our knowledge of these resources and systems rests upon fundamental scientific principles that are generally beyond debate and opinion**.

The course, however, is also "issues-oriented" because our collective and individual approaches to the **management** of these natural resource systems is frequently wrapped in controversy, discussion, and disagreement about their use, abuse, and "conservation". Our focus is the United States, but an international or **global perspective** is necessary and unavoidable.

It is hoped that you, the Student, will be careful NOT to lust for the simple (and simple-minded) answers often loudly proclaimed by groups or individuals representing various interest groups and political ideologies, doctrines, and decrees. The "natural world" and human existence are complex; **no one can legitimately claim to explain with finality all that has happened or will happen in humankind's long interaction with Nature**.

Finally, because much of our interaction with Nature is based upon attitudes, values, morals, and beliefs as well as upon objective science, we should look to the realms of both Science and Spirituality for perspective.

II. COURSE REQUIREMENTS AND GRADING.

The Point System. During the semester, the student will attempt to accumulate "points", generated by the following activities:

1. Mid-Term Exam	100 points
2. Quizzes, 10 pts. each (best ten)	100
3. Book Reading Project	100
4. Final Exam	100
TOTAL	400

III. COURSE OUTLINE

	Date	Topic	Reading
Jan.	**13**	**Introduction and Requirements**	
	15	Resources, Conservation, and Geography: Some **Definitions**	6-12
	20	Philosophy and History of Conservation: The "Ideal" vs. Reality.	S23-S30, S60
	22	Philosophy and History: Sustainability	19-21, 425-29
	27	**The Population Factor: Growth Dynamics**	**124-137**
	29	The Population Factor: Carrying Capacity	12-19,S16-17, S31
Feb	**3**	**Food Resources: The Less Developed Regions**	**198-204**
	5	**Food Resources: The Lesser Developed Regions**	**209-218**
	10	***Land of Plenty, Land of Want* (video)**	**218-25**
	12	Soil Resources: The Tropical "Problem"	49,44-47
	17	Soil Resources: Mollisols vs. Ultisols	204-09
	19	Forest Resources: Another Tropical "Problem"!	86-90,160-62
	24	*ADVISING DAY – NO CLASSES*	
	26	Forest Resources: American "Hot Button" Issue	152-56
Mar	10	*Forest Wars* (video)	168
Mar	**12**	**MID-TERM EXAM**	
	17	**Book Questions: Silent Spring**	
	19	**Water Resources: The NAWAPA Syndrome**	**228-34,237-38**
	24	**Water Resources: Water Wars?**	**227,243-50**
	26	Energy Resources: Petroleum's Grip	S61,279,280-90
Apr	2	Energy Resources: Nuclear, A Faustian Bargain?	290-97
	7	Energy Resources: Hydel: Three Gorges, Bad Creek, and The Alternatives	304-17,235-36 S69
	14	***No Class – Professor Absence***	
	16	The Greenhouse Effect: Global Warming **and North Carolina's Disappearing Coast**	364-75, S70
	21	Land Resources: Growth and "development" as Resource Destruction	137-147
	23	Land Resources: Wildlife Space	149,164-74
	28	Wildlife Resources: The Southern Appalachian	182-94

Black Bear and species of "Special Concern"_ _____

Apr 30 Book Questions: The Monkey Wrench Gang_____

May 5 (Tues) FINAL EXAM, 12:00 – 2:30_____

FINAL PROJECT: THE BOOKS (READING PROJECT): 100 points (Each book = 50 points)

Rather than assign a standard term paper/research project, the professor has selected two important books for you to read. These books are representative of the many writings that have influenced environmental/conservation thinking by the public and by our decision-makers. The difficult task for the professor has been to narrow the list to just two that he feels every student of conservation should be exposed to. Perhaps you will be affected by what you read such that you, too, will someday influence environmental perception and policy! Why not?

You will not be required to "write" book reports or reviews of these books. Rather, you be asked specific questions about the content of each book. These questions will be delivered at Mid-Term and on the last day of classes. You will need to allocate sufficient time to read and absorb the content of each book prior to the mid-term and final class day.

You should immediately begin the quest to obtain the two books. Used copies are available from Amazon.com or can be bought or ordered at bookstores such as City Lights in Sylva, Malaprops in Asheville, etc. You might have friends/acquaintances who may let you buy or borrow their copies. Whatever strategy you choose, please get started on your quest as soon as possible, especially for the first reading selection.

I think you will enjoy this assignment. It is the professor's perception that students do not read enough and deny themselves some of the truly profound ideas that constitute the foundations of our professions and our society. This assignment is one very small attempt to mitigate that shortcoming to some degree.

THE BOOKS:

March 12 : ***Silent Spring***, Rachel Carson, 1962

April 30 : ***The Monkey Wrench Gang,*** Edward Abbey, 1975

ARTICLE REVIEW PROJECT INSTRUCTIONS – 100 POINTS

Part I. BIBLIOGRAPHY – DATE DUE: TUESDAY, FEB. 6

Each student will compile a bibliography of 10 – 15 research articles from professional journals for the country assigned below. These articles can be obtained from any research journal that serves the broad fields of Natural and Social Sciences (Biology, Environmental Science, Resources Management, Geography, Economics, Political Science, History, Anthropology, etc.) There is an abundance of such journals in the Library and on-line. Your only limitations are: (1) the articles you list MUST relate to **conservation and/or environmental issues**; and (2) the articles must be geographically **specific to the country or region** you have been assigned.

The bibliography should list the most recent articles first, then work in reverse chronological order until the minimum number of references is accumulated. Articles more than 20 years old are generally out-of-date and unacceptable unless they have a very strong "history" focus. Use your text as a guide as to what topics are appropriate (Table of Contents or readings). Your references must be presented in proper bibliographic style with full information about each reference you have listed.

Part II. ARTICLE REVIEWS - DATE DUE: TUESDAY, APRIL 10

Your article reviews shall consist of two parts: **Summary of Content** and **Critique/Analysis**.

Summary of Content:

(1) The contents of each article must be summarized IN YOUR OWN WORDS. DO NOT COPY/PLAGIARIZE THE ARTICLE ABSTRACTS!! The penalty for doing so is severe.

(2) Identify the major focus and general theme(s) of each article and validate this by displaying sample passages or excerpts from the article.

(3) Identify the methods used by the authors (researchers) to investigate the assumptions and hypotheses that guided the research.

Critique/Analysis:

Identify what you believe to be the strong and/or weak points of the articles. Are the authors'/researchers' methodology and database apparently sound? Are the generalizations and conclusions seemingly accurate and valid? Were the authors able to verify the original working hypotheses – or refute them? Is the work well-written and understandable? Are graphics, maps, or other visual aids integrated effectively into the articles? What did you learn from the articles?

Statements such as: "I thought the article was boring", or "I enjoyed the article very much" DO NOT constitute a critique! Provide some intellectual energy and depth into the work. Think deeply about it before you write. You cannot absorb and analyze the content of this type of material after only one or even two readings. You have to STUDY the article; it will require multiple readings.

Advanced Courses

Quantitative Methods

Biostatistics
(BIOL 467)

Instructor: **Thomas H. Martin**
Office: 333 Natural Sciences Building
voice: (828) 227-3660
email: tmartin@wcu.edu

Lecture/Lab: 8:00 am - 9:55 am WF

Texts: Zar, J.H. 1999. Biostatistical Analysis (4th Edition). Prentice Hall, Upper Saddle River, NJ – or the 10th edition (2010).

Supplemental (freely available for download):

Faraway, J. 2002. Practical regression and ANOVA using R. Available online URL: http://www.maths.bath.ac.uk/~jjf23/book/

Venables, W.N., D.M. Smith and the R Development Core Team. 2009. An Introduction to R: Notes on R, a programming environment for data analysis and graphics (Version 2.10.1). Available online URL: http://cran.r-project.org/doc/manuals/R-intro.html

Verzani, J. 2002. SimpleR: Using R for introductory statistics. Available online, URL: www.math.csi.cuny.edu/Statistics/R/simpleR/printable/simpleR.pdf

Course: Statistical concepts and methods for biologists, design of experiments for computer analysis by ANOVA, single or multiple regression, principal components. 2 Lecture, 2 Lab.

Grading: Final letter grades will be based on the proportion of points earned out of the total number of points available. There will be weekly quizzes and a comprehensive final exam in addition to 5 "lab practicals." The quizzes and final exam will primarily focus on knowledge of concepts, vocabulary, and choice and interpretation of procedures. The "practicals" will involve calculation, but will be "open-resource." I will drop the lowest quiz score and the lowest practical score.

By the end of this course, you should:

- have a good understanding of the rationale underlying hypothesis testing in the sciences.
- understand the distinction between statistical significance and biological significance.
- be familiar with calculator-based and computer analysis of data.
- be able to compute summary statistics and conduct tests for differences among multiple samples.

- be able to describe the relationships among related variables.

Computers/Software:

This class is about analyzing and interpreting your data, but we often (or even usually) use computers for data analysis and data visualization. You are expected to be familiar with basic computer use, including familiarity with basic spreadsheet use. We will use spreadsheet software (e.g. Excel) for data management and some visualization. If you feel you need help, Class TIPS (**T**echnology **I**nstruction/**P**eer **S**uccess) is currently located in Hunter Library Room 53. (As you enter the new computer commons from the Hunter quad area, Class TIPS will be on your right through the double glass doors).

Statistical Analysis software available at WCU:

SAS (SAS Inc., Cary, NC) once stood for "statistical analysis system" and was created in the early 1970s by Jim Goodnight, John Sall and other NC State University colleagues to analyze agricultural-research data. SAS Institute was founded in 1976 to develop and sell the software. This software was once the most commonly used software for biological statistical analysis. In recent years they have focused more and more on business applications.

SPSS (SPSS Inc., Chicago, IL) once stood for the Statistical Package for the Social Sciences and was first released in 1968, by Norman H. Nie, C. Hadlai (Tex) Hull and Dale H. Bent and distributed by University of Chicago's National Opinion Research Center, where Nie and Hull were employed. The company has been completely independent of the university since 1975.

Minitab Statistical Software (State College, PA) was developed in 1972 by three statistics instructors at Penn State University. Minitab is often used in introductory statistics courses
R is an open-source implementation of S (language and environment originally developed at Bell Laboratories (formerly AT&T, now Lucent Technologies) by John Chambers and colleagues (S-plus, distributed by TIBCO Software Inc., Palo Alto, CA, is the proprietary implementation). R was initially written by Robert Gentleman and Ross Ihaka of the Statistics Department of the University of Auckland, New Zealand. It's maintenance and development is now moderated by a nonprofit group: The R Foundation for Statistical Computing, (Vienna, Austria). Since mid-1997 there has been a core group of about 20 people with write access to the R source, but the current program is the result of a collaborative effort with contributions from all over the world. *R is available as Free Software under the terms of the Free Software Foundation's GNU General Public License* in source code form. It compiles and runs on a wide variety of UNIX platforms and similar systems (including FreeBSD and Linux), Windows and MacOS.

Because R is freely available for download by anyone, runs on all major computer operating systems, and is rapidly growing in popularity among scientists, I have chosen to use it exclusively in my class. R has a fairly steep learning curve (as do SAS and SPSS), but we will use R Commander (Rcmdr), a graphical user interface (GUI) developed by John Fox (McMaster University) to "ease" you into using the program.

If you would prefer to use one of the other packages you may. I can offer assistance with SAS with confidence, but I haven't used SPSS or Minitab since the early '80s. You may also use any other statistical software to which you have access. But, be aware that many "point and click" packages are not capable of doing more complicated analyses.

A note on laboratory/homework assignments:

Most assignments will consist of problem sets consisting of very direct questions. Most of these questions will have straight-forward answers. But, lab practical's will involve real-life research scenarios and will not be so direct. For these open-ended questions that depend on your decisions for analyzing and interpreting the results of a study, you should take great pains to explain exactly what you did. Additionally, I expect appropriate tables and graphics to help explain your interpretation (pick up any peer-reviewed journal in the life sciences and you'll see why).

Tables should have the following format: There should be a table legend, placed above the table, explaining the contents of the table in sufficient detail so that the reader does not have to refer to the text. There should be a line (often a double line) separating the table from the table legend at the top, a single line separating the table headings from the body of the table, and a single line separating the table from the text at the bottom:

Table 1. An example table summarizing the fictitious results of an analysis of variance.

Source	df	SS	MS	F	P
Main Effect	3	432.234	144.078	4.321	0.067
Error	12	400.123	33.344		
Total	15	832.357			

Figure legends should be placed under the graphic, and should follow the recommendation for table legends regarding the ability to "stand alone." Graphs should be clear and devoid of "chart junk." Graphs can be constructed using Excel, but other dedicated graphics software typically does a better job. Graphs can also be drawn by hand – but be very neat and concise!

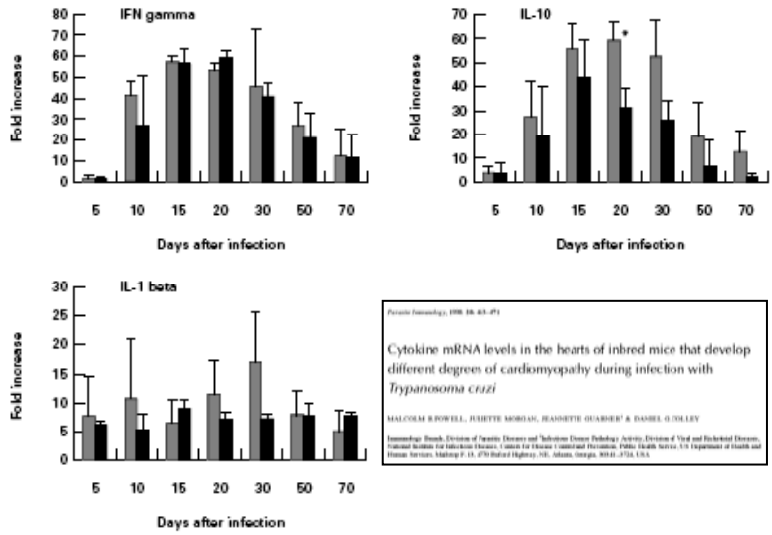

Figure 2 Mean fold increases of IFNγ, IL-10 and IL-1β mRNA in hearts from B10.D2 mice (solid bars) and DBA/2 mice (toned bars) ± SD. n = five mice per group, except for DBA/2 mice on day 70 where n = 3. * denotes a significant difference at $P < 0.05$.

Course Schedule:

I plan to cover topics in more or less the same sequence as they are presented in your textbook:

- An introduction to data and its description (Chapters 1-4)
- Probability and hypothesis testing (Chapters 5 - 7)
- 2-sample hypothesis testing (Chapters 8-9, 13)
- Regression and Correlation (Chapters 17-21)
- ANOVA (Chapters 10-16)
- Contingency and Goodness-of-fit (Chapters 22-24)

We will not spend equal amounts of time on each of these areas. Analysis of linear models (ANOVA and regression) is the most common statistical approach used in Biology, so we will be spending most of the semester focused on these techniques. You will also note that I have not attached dates to particular topics. I prefer to move through the material at a pace dictated by the class, so some semesters we cover all the topics and in some semesters we do not. I want to push you, but I don't want to knock you over.

Chem 232: Quantitative Analysis

Scott W. Huffman

Spring 2011

Course Information

- Lecture: MW 11:15-12:05 ST 254
  - Lecture Instructor: Scott W. Huffman, Ph.D.
  - Office: Natural Science Building Room 224
  - Phone: 227-3669
  - Email: shuffman@wcu.edu
  - Office Hours: Tuesday 2-3pm and Friday 11-12am or by appointment
  - Website: http://paws.wcu.edu/shuffman/
- Text: Quantitative Chemical Analysis by Danial Harris 8th Edition.

Course Description and Prerequisites

This course is an introduction to analytical and equilibrium physical chemistry, and data analysis. The prerequisites of this course are a passing grade in CHEM 140 and MATH 140 or higher or MATH 146.

Grade Determination

Assignment	Percentage
Hour Exams	50
Final Exam	10
Lab [a]	20
Quiz	20
Total	100

a: Note: You must pass the lab to pass the class.

Analytical and Instrumentation

Chem 330--Aquatic Chemistry
Fall 2010

Lecture: TR, 9:30-10:45 a.m., NS 308
Prerequisites: CHEM 132 & 133 or CHEM 139 & 140
Text: *Environmental Aquatic Chemistry*, 2th. Ed., Eugene Weiner, CRC Press, 2008.
Instructor: Dr. Cynthia Atterholt, NS 231 and ST 407
Office Hours: M, W, F, 9-10 am, or by appointment
Phone Number: 227-3667
e-mail: atterholt@email.wcu.edu

Course Description

Aquatic chemistry is the branch of environmental chemistry that deals with chemical phenomena in water. Aquatic chemistry is concerned with the chemical processes affecting the distribution and circulation of chemical compounds in natural waters. One goal is to describe and predict the chemical behavior of oceans, estuaries, rivers, lakes, groundwater, and soil water systems, and to describe the processes involved in water treatment.

The study of aquatic chemistry draws on the fundamentals of chemistry but is also influenced by other sciences, especially geology and biology. Through the hydrologic cycle, water interacts continuously with matter. Because of the complexity of natural systems, simplified models are often used to study factors that affect the chemical composition and behavior of natural waters.

In this course, we will study the fundamentals of aquatic chemistry and some of the applications. Some of the topics covered will be found in the textbook and others will be provided in lecture or through supplemental material. The lab is a separate course.

Tentative Lecture Schedule:

Chapter 1	Water Quality
Chapter 2	Contaminant Behavior in the Environment
Chapter 3	Major Water Quality Parameters
Chapter 4	Behavior of Metal Species in the Natural Environment
Chapter 5	Soil, Groundwater, and Subsurface Contamination
Chapter 6	Nonaqueous Phase Liquids
Chapter 7	Dense Nonaqueous Phase Liquids
Chapter 8	Biodegradation and Bioremediation
Chapter 10	Selected Topics in Environmental Chemistry

Grading:

Homework, Quizzes, Reports, Papers	20%
3 Exams (20% each)	60%
Final Exam	20%

Assignments:
There will be reading and homework questions assigned during the semester. All homework assignments are to be typed (so I can read them). However, you may hand write equations and chemical structures—just make sure they are legible! On the date that the assignment is due, I will collect your papers then we will discuss the questions in class. You may want to keep a copy of your answers so that you have them available during the discussion. You need to be present in class to participate in class discussions.

Water Quality/Chemistry Papers:
Students will report on an article from a current environmental/water quality journal (approved by me) about a current topic related to water quality or water chemistry. A typed (2-3 page) report will be submitted with a summary of the issue, including a discussion about the significance related to water quality.

Exams:
There will be three exams given during the semester plus the final exam. Each exam will cover material from reading assignments, lecture, and homework. The final exam will be cumulative. Test questions will include multiple choice, short answer, short essay, and problems. **Tentative exam dates are: September 23, October 28, and November 23.**

Final Exam:
There will be a comprehensive final exam **Wednesday, Dec. 15, from 12:00 noon until 2:30 pm.** The final will count for 20% of your final grade.

COURSE SYLLABUS FOR CHEMISTRY 432 INSTRUMENTAL ANALYSIS II SPRING 2010

LECTURE 432-01, NS 208, TR 11 AM – 12:15 PM

INSTRUCTOR = DR. ARTHUR SALIDO
OFFICE = STILLWELL 416
PHONE = 227-2587
EMAIL = email me in WebCAT (WebCT)
OFFICE HOURS = W 3-4, R 1-2 PM or by appt.
PRE/CO REQUISITES = CHEM 370, 352

1. RATIONALE / PURPOSE
To investigate advanced environmental, biological, and materials applications of modern chemical instrumentation.

2. COURSE AIMS AND OBJECTIVES
Aims: This course covers the theories and practices related to contemporary analytical instrumentation. Some essential skills that are required include the following: college-level reading proficiency, mastery of algebraic operations, and a very high capacity to grasp, analyze, and manipulate abstract concepts.
Specific Learning Objectives: Upon completion of this course, a student will be able to demonstrate competence in these areas:

a. Understanding contemporary instruments and related methods
b. Solving chemical problems
c. Understanding and applying chemical principles (demonstrated by test, quiz, lab and homework performance)
d. Making accurate physical and chemical measurements in laboratory
e. Using MS Excel to investigate complex equilibria, solve problems, plot, and manipulate recorded data

3. COURSE MATERIALS
a. Rental textbook “PRINCIPAL OF INSTRUMENTAL ANALYSIS, 6TH EDN.” Skoog
b. Scientific Calculator
c. MS Office

5. GRADING POLICIES

A = 90-100% B = 80-89.9% C = 70-79.9
D = 60-69.9% F=<60
*Thursday March 18
Last day to drop with an automatic grade of "W"

a. Tests
TBA – at least 10 days in advance

b. Quizzes and Homework
Quizzes will be short, unannounced, one to three question assignments to ensure that you are keeping up with classwork.

Homework will be assigned at regular intervals throughout the semester. You will hand it in for a grade and will work alone.

c. Final Exam
The Final Exam will be administered on Tuesday May 4, 12-2:30 pm. This is the only time for the final.

6. COURSE STRUCTURE

Course concepts will be covered from the textbook and from peer-reviewed articles. Students will also be engaged in a semester-long project (described in a separate handout) which will apply theoretical ideas to tangible applications. I am hoping for a course involving a lot of discussion and contributions from many students.
The basic outline of the course (from the textbook) is as follows:

1. Section 5 "Separation Methods"
1. Introduction to Separations
2. Gas Chromatography
3. Liquid Chromatography
4. Supercritical Fluid Chromatography and Extraction (possible)
5. CE and CEC

2. Chapter 20 "Molecular Mass Spectrometry"
1. Ion Sources
2. Desorption and MALDI methods
3. Miscellaneous non-proximate methods
4. Mass Spectrometer types
5. Tandem MS
6. Applications and Extra Articles

3. Section 3 "Molecular Spectroscopy" (possible)
1. UV-Vis, IR, Raman

4. Section 2 "Atomic Spectroscopy"
1. Methods
2. AAS, AFS
3. AES, OES
4. ICPMS
5. X-Ray Methods

Field and Natural Environmental Science

Spring 2010
Geology 305-01
Lecture: Tu & Th 8-9:15, ST 150
Lab: Tuesday 1:00-2:50; 3:00-4:50, ST 155

Dr. Mark Lord
Office: ST331A
Ph. 227-2271
Email: mlord@wcu.edu
Office Hrs: T, W, & Th

9:30-11

SOILS AND HYDROLOGY

Tentative Schedule

Class #	Date		Topic	Reading
1, 2	Jan 12, 14	Earth Materials	Introduction; Overview of Soils & Hydrology	Brady, Ch. 1
3, 4	Jan 19, 21		Soil genesis & Soil Properties	Brady, Ch. 1, 2 & 4
5, 6	Jan 26, 28		Earth Materials & Landforms	Brady, Ch. 2
7, 8	Feb 2, 4	Soil Processes & the Environment	Weathering Processes and Products; clays	Brady, Ch. 2 & 8
9, 10	Feb 9, 11		Nutrient Cycling (mostly N) **Exam I, Thursday, Feb. 11th**	Brady, Ch. 12
11, 12	Feb 16, 18		Soil Classifications; Soil Strength, Land use	Brady, Ch. 3 & 4.9
13	Feb **23**, 25		**Advising Day, Tues. Feb. 23rd, No Class**; Soil erosion & slope stability…	Brady, Ch. 2
14	Mar 2, **4**		…Soil erosion & slope stability ; Review **Mid Term Break, Thurs., Mar 4th**	Brady, Ch. 5 & 15
15, 16	Mar 9, 11		Water Cycle, Evapotranspiration, Precipitation, and Runoff	Brady, Ch. 5
17	Mar 16, 18	Hydrologic Processes	Subsurface water flow; soil hydrology… (GSA)	Brady, Ch. 6
18, 19	Mar 23, 25		…Subsurface water flow; soil hydrology **Exam II, Thursday, Mar. 25th**	Brady, Ch. 6 +
-	**Mar 30, Apr 1**		**Spring Break**	
21, 22	Apr 6, 8		Groundwater basics	Winter, p.VI-VII & 1-8
23, 24	Apr 13, 15		Groundwater – Surface Water Interaction; applied hydrology	Winter, p. 9-32
25, 26	Apr 20, 22	Environmental Systems	Regional Flow Systems; Mountain and Riverine Systems	Winter, p. 9-45
27, 28	Apr 27, 29		Environmental Issues; Review & Synthesis	Winter, p. 54-78
	May 6th	**Thursday, 12–2:30 *** FINAL EXAM–CUMULATIVE *****		

About the course: My goal as course instructor is provide the educational framework and knowledge necessary so that you can learn key information, processes, and approaches in the field of soils and hydrology. Specific topics we will investigate include soil properties and classification, soil strength properties and site characterization, soil biogeochemical properties and processes, water cycle, and the hydrology of soils, runoff, and groundwater. In each of these topics, environmental and land use considerations will be addressed. As much as possible, we will take a systems (i.e. integrated) approach

to the study of soils and hydrology. This approach necessitates a high level of understanding of the topics we investigate.

Student Learning Objectives:

1. Have a fundamental understanding of basic processes and properties of soils and hydrology.
2. Understand the relationship and importance of this course material and approaches to those of your major.
3. Understand the mutual interaction humans and natural systems.
4. Know how to approach basic problems, in the field and office, related to soils and hydrology.

Grading

20 % Exam I
20 % Exam II
30 % Final Exam (cumulative)
30 % Laboratory (mostly), and class assignments & quizzes(?)

Class and laboratory assignments will play an integral role in your success in this course. The assignments will offer you the opportunity to become an active investigator in our field of study as well as let you master basic skills. All work submitted for this course must meet minimum college-level requirements with respect to writing, clarity, and completeness. Work submitted that does not meet minimum expectations will not be accepted for evaluation; work that is not accepted may be corrected and resubmitted with "late". All late work, without an approved excuse, will receive a "late" penalty. Assignments turned in late on the day it is due will lose 10%. After this day, assignments will lose an additional 20 % per day. Unless specified otherwise, all out-of-class written assignments must be word-processed (i.e. typed), 12 point font, double-spaced, and have one inch margins. All references used must be cited in a standard, complete reference format.

Texts

Elements of the Nature and Properties of Soils, 2nd edition, by Brady and Weil. (from Bookstore)
Ground Water and Surface Water: A Single Resource by Winter, Harvey, Franke, & Alley.
online at: http://pubs.usgs.gov/circ/circ1139/

Geol 305-30 & 31: Soils and Hydrology Lab
Dr. Mark Lord, ST331A
Office Hrs: M,T, & Th 9:30-10:30 & appt. & appt
Phone: 227-2271
Email: mlord@wcu.edu

Lab: Tuesday 1:00-2:50; 3:00-4:50, ST 155

Spring 2010
Dr. Susan Barbour Wood, ST317
Office Hrs: T 11-12, W 1-2, R 12-1,

Phone: 227-2491
Email: susanwoodt@wcu.edu

Lab Assistant: Andrew Allen
Email: wallen1@catamount.wcu.edu

The lab component of the Soils & Hydrology course is a fundamental part of your success in this course. The goal of the lab is to directly support your learning in soils and hydrology by taking a hands-on approach to as we explore a variety of topics, including several on-going environmental problems. Hopefully, you find the lab educational, interesting, and fun!

Tentative Lab Schedule

Date	#	Points*	Instr.	Lab Topic

Jan 12	-		-	No Lab
Jan 19	1	25	SBW	Map Skills and Scale Laboratory. Due Jan 26th.
Jan 26	2	25	SBW	Earth Materials: Lab includes questions and short lab quiz on Feb. 2nd.
Feb 2	3	25	SBW	Earth Materials Quiz Soil Property Lab--Field Methods. Due Feb 9th
Feb 9	4	75	ML	WCU Soil Profiles & Properties, Part I. Due Mar. 9th.
Feb 16	5		ML	WCU Soil Profiles & Properties, Part II. continued
Feb 23	**-**		-	**Advising Day—No Lab Meeting.**
Mar 2	6		ML	WCU Soil Profiles & Properties, Part III. continued
Mar 9	7	25	SBW	Landslides and Slope Stability. Due Mar. 16th.
Mar 16	8	25	SBW	Soil Erosion Prediction—the Universal Soil Loss Equation. Due Mar. 23rd. *(gsa)*
Mar 23	9	50	SBW	Stream Discharge & Water Quality, Part I. Due Apr. 13th.
Mar 30	**-**		-	**Spring Break Week**
Apr 6	10		ML	Stream Discharge & Water Quality, Part II. continued
Apr 13	11	60	ML	Monitoring and Analysis of Hydrologic Systems, Part I. Due date TBA.
Apr 20	12		ML	Monitoring and Analysis of Hydrologic Systems, Part II
Apr 27	13		ML	Monitoring and Analysis of Hydrologic Systems, Part III

* **Lab assignments** over the semester vary in length, from 1 to 3 weeks. All labs must be turned in collated, stapled, and with name(s). Unless stated otherwise, all lab assignments are due at the **start** of lab of the week following the assignment. Labs assignments are considered **late** if not turned in at this time. Turning in labs after the start of lab because of problems with printers, computers, dogs, traffic, parking, parties, alignment of stars, etc. is all okay, however, the lab will still be docked 10% for being late that day and 20% per day after that.

Geology 405: Hydrogeology
Fall 2010
Lecture: TR 9:30-10:45 ST155
Lab: M 2:05-4:55 ST155

Dr. Mark Lord
Rm. ST331A
Ph. 227-2271
Email: mlord@wcu.edu
Office Hours: MWF 9:30-10:30

Dr. Dave Kinner
Rm. ST319, dkinner@wcu.edu

HYDROGEOLOGY

Purpose and Objectives:
The purpose of this course is to provide an introduction to hydrogeology with emphasis on groundwater, groundwater-surface water interactions, geologic controls, water quality, field investigations, and environmental problems. At the end of this course you should

- know, understand, and master fundamental qualitative and quantitative principles of hydrogeology
- know how to approach and solve basic problems in field hydrogeology
- know locations of hydrogeologic data and how to use them in hydrologic investigations
- understand how hydrogeology is interrelated with other aspects of the geosciences as well as other environmental science disciplines

Course Outline:
The outline below shows course topics and the order that we will address them in Hydrogeology; most topics will require about one week to cover.

Topic	Chapter in Fetter*
Introduction to hydrogeology and course Set-up: WCU Hydrogeologic Research Project with NC DENR	1
Hydrologic cycle with emphasis on stream flow	2
Hydrogeologic properties of earth materials	3
Darcy's Law and principles of groundwater flow	4
Groundwater flow solutions: flow nets, regional flow systems, and modeling	4.11-4.14, 7
Stream, groundwater, and ecosystem interactions	7.7, 6
Hydrogeologic settings	8
Groundwater flow to wells	5
Water chemistry—introduction	9
Groundwater Contamination & Water quality	10
Hydrology management	11
*** **Cumulative Final Exam on Wednesday, December 15th, 12:00 - 2:30** ******	

* The chapters listed in Fetter are those most directly related to the topic we will be discussing. In some cases, the entire chapter will not be directly relevant to our class. In addition to readings in Fetter, there will be outside readings.

Course Text: Applied Hydrogeology, (4th edition), by C.W. Fetter

Course Overview:
Many of the principles and concepts of hydrogeology are difficult and require hands-on effort for full comprehension. Furthermore, many of the principles and concepts of hydrogeology are conveyed quantitatively. Thus, to maximize the value of this course to your education, your full participation (e.g. attendance, preparedness, effort, attitude) in the course is essential. Field investigations, student projects, homework, and other problem solving exercises will make up a significant part of our exploration of

hydrogeology. There is a very practical side to this too: hydrogeology is embedded into many of our nation's (and world's) environmental problems. There is a high probability that those of you who pursue careers in environmental work will be involved in hydrogeologic studies. Therefore, your ability to get a job related to hydrogeology and to do well at the job will be linked to how much you take from this course.

And last, this is an upper-level course. As such, I have high expectations for students in this class. I expect students to demonstrate appropriate resourcefulness, independence, and dedication.

Grading:
Labs, projects, homework, etc. will make up a significant portion of this course; because of this, we will only have two full exams (a midterm and a final). In addition to the two exams, there will be several mastery quizzes. The focus of quizzes will be on skills (e.g. problems) rather than concepts and will be mostly based on homework. The date of the midterm will be set at least one week in advance of the exam.

Exams will consist of essays, quantitative problems, and short answer questions; exams may include a take-home portion.

20 % Midterm Exam
30 % Final Exam (cumulative)
20 % Labs (reports, projects, data)
15 % Class assignments, quizzes, class participation & preparedness
15 % Research Project

All work submitted for this course must meet minimum college-level requirements with respect to writing, clarity, and completeness. Work submitted that does not meet minimum expectations **will not be accepted** for evaluation, but may be corrected and resubmitted with a late penalty (*see below*).

All work must be turned in on the assigned due dates by 4:00 pm to be considered for full credit. Late work that is not excused will be penalized at 10% per day (including Saturday and Sunday). All out-of-class written assignments, unless stated otherwise, must be typed, 12 point font, double-spaced, and have one inch margins. All references used must be cited in a standard reference format. A general exception to required typing is problem solving homework. All written work must be neat and clearly labeled. Problems involving math should show all work and have all units labeled.

Bio 434: Terrestrial Ecology

Lecture: M,W,F 9:05-9:55 ST 152

Lab: M 2:30 – 5:20 NS 118

Instructor: Beverly Collins
Office: 109 Natural Science Bldg, collinsb@email.wcu.edu, 828-227-3663
Office Hours: Mon 11:00-12:00; other times by appointment

Purpose: To provide a fundamental and detailed understanding of terrestrial ecosystems, including the patterns of systems on the landscape and the processes that structure them.

Course Objectives: *By the end of this course, students will:*

- Demonstrate knowledge of historical and current concepts and theories of terrestrial ecology
- Apply ecological knowledge and concepts to current issues involving terrestrial ecosystems

Course Materials

- Supplementary readings: Papers and book chapters – relevant citations will be given during lectures. Reading assignments will be given during class, sent via email, or posted on the course schedule on WebCat.

Grading Procedures:

- Lecture grades will be based on two exams (midterm and final) and participation in class discussions.

	Objective or material covered	***Number of points***
Discussion	Objective: participate in class discussion at each class meeting	34
Midterm	Material covered: Regions, Landscapes	33
Final	Material Covered: Individuals and Species Interactions	33
		100

- Laboratory grades will be based on participation and a final written report. Graduate students will be required to be the lead author on the final report.

	Objective or material covered	*Number of points*
Participation	Objective: participate in lab and field activities	25
Report	Objective: prepare a scientific paper based on results of lab activities	25
		50

Tentative Course Lecture Schedule

May change to accommodate guest presenters & student needs. Reading assignments will be assigned prior to the due date.

Date	Topic
Jan 14	Forces that have shaped terrestrial ecosystems
Jan 16	Forces – continued
Jan 18	Patterns and processes – ecological theory
Jan 21	No Class – MLK
Jan 23	Biomes
Jan 25	Regions and Landscapes
Jan 28	Steve Yurkovich – Regional Geology and Soils
Jan 30	Dan Pittillo – Paleoecology
Feb 1	Dan Pittillo – Paleoecology and Regional Communities
Feb 4	Emergent properties of landscapes
Feb 6	The Southern Appalachians to the Sea
Feb 8	Disturbance and the Landscape
Feb 11	Ecosystems – structure and function
Feb 13	Ecosystem structure
Feb 15	Ecosystem processes
Feb 18	Terrestrial food chains
Feb 20	Species and genotype diversity effects on ecosystems
Feb 22	Disturbance and ecosystems
Feb 25	Communities – patterns and processes
Feb 27	Community structure
Feb 29	**Midterm Exam**
Mar 3	Spring Break – no class
Mar 5	Spring Break – no class
Mar 7	Spring Break – no class
Mar 10	Diversity – causes and effects
Mar 12	Mechanisms of community assembly
Mar 14	Community dynamics
Mar 17	Succession
Mar 19	Easter Break – no class
Mar 21	Easter Break – no class
Mar 24	Population growth in terrestrial ecosystems
Mar 26	Limits to population growth
Mar 28	Population interactions – pollination
Mar 31	Population interactions – dispersal
Apr 2	Population interactions – competition
Apr 4	Population interactions - predation
Apr 7	Population interactions – parasites and hosts
Apr 9	Diversity within populations – causes and effects
Apr 11	Reproductive biology and fitness
Apr 14	Individuals in terrestrial ecosystems
Apr 16	Environmental heterogeneity

Apr 18	Ecophysiology – light, water, and temperature
Apr 21	Ecophysiology and ecosystem cycling
Apr 23	Humans in terrestrial systems
Apr 25	The future of terrestrial ecology
Apr 28	Climate change
Apr 30	Invasive species
May 2	Managing terrestrial systems

Tentative course lab schedule
Schedule may change according to guest presenters and student needs.

Date	Lab
14 Jan	Question asking: phenology
22 Jan	**No lab – MLK**
28 Jan	Regional geology and soils – S. Yurkovich
4 Feb	The importance of maps
11 Feb	Field: sampling the environment; decomposition study
18 Feb	Community structure – spatial and temporal scales
25 Feb	Community dynamics – the potential community (seedbank study)
3 Mar	**No Class – spring break**
10 Mar	Species interactions – competition experiment setup
17 Mar	Field trip – Coweeta
24 Mar	Species interactions – food webs and predator-prey
31 Mar	Field sampling – phenology and architecture
7 Apr	Field sampling – community structure and biodiversity
14 Apr	Field sampling – physiological ecology
21 Apr	Field sampling – pollination and dispersal
26 Apr	**Field Trip and Sampling: Optional for Biol 434**
28 Apr	Reports

The field labs will be concentrated in 1-3 sites and will be conducted as a scientific inquiry; i.e., we will generate questions and collect data to test hypotheses. The final lab report will be based on this class project.

Aquatic Ecology
Biol 435

Thomas H. Martin
333 Natural Sciences Bldg.
voice: 227-3660
email: tmartin@wcu.edu

Lecture: 12:30 pm - 1:45 pm TR Stillwell 143
Lab: 2:05 pm - 4:50 pm T Natural Science Bldg 118

Text: *Freshwater Ecology: Concepts and Environmental Applications*, by Walter K. Dodds, with supplements from the primary literature.

Supplemental:
Merritt, R.W. & Cummins, K.W., 1996, An introduction to the aquatic insects of North America. Kendall/Hunt, Dubuque, 862p.
Thorpe, J.H., and A.P. Covich. 2001. Ecology and classification of North American freshwater invertebrates, 2nd edition. Academic Press, San Diego.

Goals: To provide students with an understanding of the theoretical and applied aspects of the ecology of aquatic systems. We will touch on groundwater and wetland ecology, but our emphasis will be on the basics of stream and lake ecology and application to environmental problems.

Grading: Your final grade will be based on the percentage of the total points available that you have amassed over the course of the semester. Points available include:

Midterm 1	100 points	Sept 22
Midterm 2	125 points	Nov 3
Final	125 points	Dec 17
Lab Practicum	100 points	Nov 24
Semester Project	50 points	Dec 17
Total	500 points	

Grading Scale

A+	97-100%
A	93-96%
A-	89-92%
B+	85-88%
B	81-84%
B-	77-80%
C+	73-76%
C	65-72%
D	53-64%
F	<53%

Equipment: I suggest that you invest in wading gear. The Biology Department has a limited supply of hip-waders, but I would strongly recommend that you invest in your own pair. Communal use of rubber footwear just doesn't seem to me to be a good idea. You may "wet-wade," however you must wear a pair of sturdy shoes to protect your feet from sharp objects.

Lecture outline (Chapters in Dodds):

Introduction (1)

Basic properties of water (2-3)

- Chemical and Physical properties
- Density, Viscosity and movement
- Diffusion, light & heat

Hydrology and Geomorphology (4-6)

- Hydrologic cycle, soil & groundwater
- Wetlands
- Stream flow & geology
- Lakes and geologic processes, types of lakes
- Movement of water within lakes/reservoirs and stratification

Chemical dynamics (11-14)

- Oxygen, Carbon, Sulfur
- Nitrogen, Phophorus
- Silicon, Iron
- Aquatic Pollutants (Acid, metals, organic pollutants, suspended solids, thermal pollution)

Nutrient dynamics (16-17)

- Nutrient limitation
- Nutrient remineralization
- Trophic state
- Eutrophication

Population Interactions (18-21)

- The "microbial loop"
- Top-down control of aquatic communities
- Food webs & trophic cascades
- Non-predatory interactions

Ecosystems (22)

- The River Continuum Concept
- Serial discontinuity (effects of damming streams)
- The Flood Pulse Concept (effects of flood regime alteration)
- The Riverine Productivity Model

Mayfly clipart courtesy of Dave Whitlock (www.davewhitlock.com)

Electives

Bio 304: General Ecology
Spring, 2010
MWF 11:15-12:05 ST 144

Instructors: Beverly Collins, 109 NS, collinsb@email.wcu.edu, 227-3663, Office Hours: M, F 10:00 – 11:00
Joe Pechmann, 111 NS, jpechmann@email.wcu.edu, 227-3661, Office Hours: T, R 12:30 – 1:30

Purpose: To provide a basic understanding of ecosystem and population processes, pathways of energy and materials, interactions among organisms and populations, and the human role in the biosphere.

Course Objectives: *By the end of this course, students will:*

- Demonstrate a basic understanding of organism-environment interactions over scales from the individual to the landscape
- Explain current ecological concepts and questions, and their development
- Design basic ecological studies, interpret ecological data, and use them to evaluate hypotheses
- Apply ecological knowledge and concepts to the current environment

Course Materials

- Required text: Ecology by Michael L. Cain, William D. Bowman, and Sally D. Hacker; 2008, Sinauer Associates, Inc, ISBN: 978-0-87893-083-9. Assignments listed on course schedule. The textbook website (http://www.sinauer.com/ecology/, no password required) contains abundant supplementary material, including chapter summaries, outlines, flashcards and key terms, and exercises.
- Required supplemental text: A primer of ecology, fourth edition, by Nicholas J. Gotelli; 2008, Sinauer Associates, Inc, ISBN: 978-0-87893-318-1. Assignments listed on course schedule.
- Supplementary readings: Papers and book chapters. Relevant citations for optional readings will be given during lectures. Required reading assignments will be given during class, sent via email, or posted on the course schedule on WebCT.

Grading Procedures:
Grades will be based on homework, three exams, and a final exam.

•	*Objective or material covered*	*Number of points*
homework	Indepth exploration of specific topics	10
Exam I	Physiological ecology	25
Exam II	Populations and population growth	25
Exam III	Species interactions	25
Exam IV	Communities, ecosystems, and landscapes	25
Final	Application of ecological concepts to the current environment	40
		150

- Final: Identify a current, regional ecological question or environmental issue. For the final exam, explain the issue from an ecological perspective and use ecological concepts to design an experiment, sampling scheme, or remediation plan. You should choose an issue and assemble information during the semester. Relevant information (newspaper articles; journal articles; books, etc) may be brought to the final exam, however, the written product (ecological explanation and experiment, sampling scheme, or remediation plan) must be completed, from scratch, during the exam.

Tentative Course Schedule

May change to accommodate guest presenters & student needs. Reading assignments may be updated prior to the due date.

Day	Date	Topic	Reading - Cain et al.	Reading - other
M	11-Jan	Introduction - what is ecology	Chapter 1	
W	13-Jan	Environmental variation - climate	Chapter 2	
F	15-Jan	Biomes	Chapter 3	
M	18-Jan	***No Class - MLK***		
W	20-Jan	Environment: temperature and water	Chapter 4	
F	22-Jan	Environment: temperature and water	Chapter 4	
M	25-Jan	Environment: light	Chapter 5	
W	27-Jan	Environment: energy (foraging game)	Chapter 5	
F	29-Jan	**Exam I**		
M	1-Feb	Population distributions	Chapter 8	
W	3-Feb	Demography & life tables	Chapter 9	Gotelli Chapter 3:50-59
F	5-Feb	Demography & life tables- exercises	Chapter 9	
M	8-Feb	Life histories	Chapter 7	
W	Feb-09	Population growth & density-dependence	Chapter 9	Gotelli Chapters 1:2-16, 2
F	12-Feb	Population dynamics- regulation/fluctuations	Chapter 10	Gotelli Chapters 1:2-16, 2
M	15-Feb	Population dynamics- stochasticity/extinctions	Chapter 10	Gotelli Chapter 1:16-22
W	17-Feb	Competition- models	Chapter 11	Gotelli Chapter 5:100-115
F	19-Feb	Competition vs facilitation	Chapter 11	
M	22-Feb	Competition- empirical studies	Chapters 11, 18:393-396	Gotelli Chapter 5:116-122
W	24-Feb	**Exam II**		
F	26-Feb	Predation- graphical models	Chapter 12	
M	1-Mar	Predation- empirical studies	Chapter 12	
W	3-Mar	***No Class - break***		
F	5-Mar	***No Class - break***		
M	8-Mar	Predation- effects & evolutionary responses	Chapter 12	
W	10-Mar	Herbivory	Chapter 12	erlich&raven 1964
F	12-Mar	Parasitism	Chapter 13	
M	15-Mar	Positive interactions	Chapter 14	
W	17-Mar	Pollination and dispersal	Chapter 14	Wilson et al; Fenster et al.
F	19-Mar	**Exam III**		
M	22-Mar	Communities - Introduction and structure	Chapter 15	Whittaker 1956
W	24-Mar	Communities - species interactions	Chapter 15	

F	26-Mar	Species diversity	Chapter 18:388-392, 396-407	
M	29-Mar	***No Class - break***		
W	31-Mar	***No Class - break***		
F	2-Apr	***No Class - break***		
M	5-Apr	Community dynamics	Chapter 16	Pickett 2009
W	7-Apr	Biogeography	Chapter 17	
F	9-Apr	**ASB**		
M	12-Apr	Ecosystem structure	Chapter 19	Pickett 2002
W	14-Apr	Ecosystems and Management		
F	16-Apr	Trophic structure	Chapter 20	
M	19-Apr	Cycling	Chapter 21	
W	21-Apr	Cycling and carbon structure	Chapter 21	
F	23-Apr	Landscape ecology - foundations	Chapter 23	Turner 2005
M	26-Apr	Landscape dynamics & management	Chapter 23	Mladenoff et al.
W	28-Apr	Global ecology	Chapter 24	
F	30-Apr	**Exam IV**		
M	3-May	**Final Exam: 3:00-5:30**		

BIOL 438/538: Ecological Restoration **Spring 2011**

INSTRUCTOR: Laura E. DeWald
Contact Information: 316 Natural Science, 227-2748, *ldewald@wcu.edu*
Office Hours: T/W/Th 12:30-2:00, or by appointment

COURSE DESCRIPTION:

Ecosystems and social systems are extremely complex. In this course we will examine why ecological restoration is not a panacea for the world's environmental problems, but will also see how it can offer effective guidelines and procedures for making a real difference for ecological recovery. The objective is for you to understand the ecological basis of restoration. We will examine different ecosystems, restoration projects, and ways in which people agree and disagree about restoration. Restoration theory and concepts will be discussed in a structured seminar format. Journal article discussions and presentations will provide experience to apply ecological restoration principles to selected ecosystem problems or theoretical ecological issues. By the end of the course, you will have read broadly in restoration literature, understand important ecological and social issues related to restoration, and recognize the context and constraints of restoration. Finally, this course will provide practice critical thinking, critical reading, effective oral communication, and scientific inquiry.

LEARNING OUTCOMES:

As a result of this course, you will be able to:

- Read and interpret primary literature (books and scientific articles) that supports the science and practice of ecological restoration (critical reading).
- Develop integrative study guide questions based on the reading assignments and outside literature to guide class discussions (critical thinking, critical reading).
- Discriminate between different modes of inquiry in the biological and social sciences (critical reading, critical thinking).
- Understand the backgrounds and themes of major different disciplinary contributions to restoration ecology (critical reading, critical thinking).
- Participate in, and be responsible for guiding thoughtful discussions about a broad spectrum of restoration-related policy and ecology issues (effective oral communication).
- Think critically about competing claims and social decisions related to restoration ecology (critical reading, critical thinking)

REQUIRED TEXT AND MATERIALS:

Greipsson, S. 2011. *Restoration Ecology*. Jones & Bartlett Learning. 408 pages.
Journal articles and other assignments are posted on Blackboard as .doc or PDF files.

ASSESSMENT:

You will demonstrate your understanding of ecological restoration literature and concepts through (1) participation in class discussions, (2) examinations, and (3) a case study paper and presentation.

Successful, discussions rely on an active interchange of ideas, so thoughtful participation is highly important. Typed responses to questions will be turned in to document your preparation for discussions. Oral presentation of your ideas, supported by visual display materials, is also an important professional skill. The final paper is a critique of the use of ecological principles in an ecological restoration project of your choice.

The rubric below characterizes different levels of excellent academic work:

(1) Excellent: Written or verbal discussion clearly and completely addresses the question, there is thorough and logical development of thoughts, points are supported by literature, with correct grammar, spelling, and citations have proper format.

(2) Good: Written or verbal discussion is complete or nearly complete in addressing the question, thoughts are generally logically and thoroughly expressed, most arguments or questions of fact are supported by the literature, and there are only minor errors of grammar, spelling, or citation format.

(3) Needs Improvement: Discussion is incomplete answer or is tangential to the question, thoughts are sometimes illogical or incomplete, arguments or questions of fact are only sporadically supported by the literature, and there are moderate errors of grammar, spelling, or citation format.

(4) Poor: Answer mostly fails to address the question, thoughts are often illogical or incomplete, arguments or questions of fact rarely supported by the literature, and there are substantial errors of grammar, spelling, or citation format.

Final grades will be assigned according to the following criteria:

Exams: 2 @ 100 points each	200 points
Participation in discussions	100 points
Case Study Presentation and Paper	100 points
Total	400 points

Tentative Schedule

Date	Lecture Topic	Assignment
Part I: Introduction and Reference Conditions		
Jan. 10, 12, 14	Defining Restoration Ecology, Goals	Chap. 1 & 14
Jan. 17	No Class (MLK Holiday)	
Jan. 19	Discussion: Reference Conditions	Journal Articles
Jan. 21	No Class (LD out of town)	
Part II: Restoring Composition and Structure		

Jan. 24, 26 Jan. 28	Genetics Discussion	Pages 64-66, 74-77 Journal Articles
Jan. 31, Feb. 2 Feb. 4	Populations and Communities Discussion	Chap. 5 Journal Articles
Feb. 7, 9 Feb. 11	Populations and Communities Discussion	Chap. 5 Journal Articles
Feb. 14, 16 Feb. 18	Biodiversity Discussion	Chap. 3 Journal Articles
Take Home EXAM #1: Handed out February 18, DUE February 25		
Part III: Restoring Function		
Feb. 21, 23	Invasive and Keystone Species	Chap. 7 & Pages 48-51
Feb. 25 Feb. 28, Mar. 2, 4	No Class: Credit for Exam #1 No Class: Spring Break	
Mar. 7, 9 Mar. 11	Invasive and Keystone Species Discussion	Chap. 7 & Pages 48-51 Journal Articles
Mar.14, 16 Mar. 18	Abiotic Factors Discussion	Chap. 6, 8, Pages 44-48 Journal Articles
Mar. 21, 23 Mar. 25	Succession and Disturbance Discussion	Chap. 4 Journal Articles
Mar. 28, 30 Apr. 1	Succession and Disturbance Discussion	Pages 34-43 Journal Articles
Take Home EXAM #2: Handed out April 1, DUE April 8		
Part IV: Applying Restoration Ecology		
Apr. 4, 6 Apr. 8	Class Discussions: Case Studies No Class: Credit for Exam #2	Handouts
Apr. 11, 13, 15, 18	Class Discussions: Case Studies	Handouts
April 18 Paper Due		
Apr. 20, 22	No Class: Easter Break	
Apr. 25, 27, 29	Presentations (2 each day @ 25 min each)	Handouts
May 2 3:00-5:30	Presentations (5 @ 25 min each)	Handouts

BIOL 441: Conservation Biology Fall 2009

Instructor: Laura E. DeWald
Contact Information: Office: 136B ST, 227-2478, *ldewald@wcu.edu*,
Office Hours: T/Th 9:30-11:00, W 1:00 – 3:00, or by appointment
Drop-ins are always welcome anytime my office door is open!

Course Description and Objectives: Conservation biology describes itself as multidisciplinary and as a crisis discipline in which immediate action needs to be taken. This will explore these concepts as they apply to effective conservation of biodiversity in managed ecosystems. The course is divided into three parts: (1) components of biodiversity that should be considered in conservation objectives, (2) strategies for conserving biodiversity in managed landscapes, and (3) case studies of biodiversity conservation plans in managed landscapes. The format of the course is lecture/discussion where I will introduce concepts in a lecture format but the majority of each class period is devoted to discussing the concepts.

Reading Assignments:
Required textbook: Groom, M.J., G.K. Meffe, and C.R. Carroll. 2005. Principles of Conservation Biology. 3rd Edition. Sinauer Associates, Inc. Sunderland, MA
Journal Articles: We will be reading literature from peer-reviewed journals as a supplement to the textbook. Articles will be available to you electronically on WebCAT.

Assessment: Your final grade in this course will be based on two exams, a group-based conservation plan, and a group presentation based on your plan. The two exams are each 35% and the conservation plan and presentation are 30% of your final grade.

Exams: will concentrate on material covered since the last exam, though students will be responsible for major concepts presented earlier. Exams will be take-home and essay question format. In most cases, questions are designed to evaluate the students' ability to assimilate and apply the lecture and discussion material.

Conservation Plan and Presentation**:** Teams of three will develop a conservation plan to conserve biodiversity in an assigned US ecoregion. The final product will consist of a paper (7 to10 double-spaced pages, 1-inch margins, 12-point font), and a presentation to the class describing your comprehensive plan of how biodiversity is being conserved in your ecoregion. This will be a team grade but group members will have an opportunity to use peer evaluation to adjust individual grades.

"In terms of conventional physics, the grouse represents only a millionth of either the mass or the energy of an area. Yet, subtract the grouse and the whole thing is dead…"
Excerpt from "A Sand County Almanac", Aldo Leopold, Forester and author

Date	Topic	Textbook Reading*
Weeks 1-5: Defining Biodiversity and Threats to Conserving It		
Aug. 25 & 27	Defining Biodiversity, Social Component	Chapters 1& 2, 4 & 5
Sept. 1 & 3	Genetic Considerations	Chapter s11 & 10

Sept. 8 & 10	Small Populations, Habitat Degradation	Chapters 3, 6
Sept. 15 & 17	Fragmentation, Overexploitation	Chapters 7, 8
Sept. 22 & 24	Species Invasions	Chapter 9
Sept. 29	No class – Take Home EXAM #1 due October 6 at 8:00 am	
Weeks 6-10: Strategies for Conserving Biodiversity in Managed Landscapes		
Oct. 1	Ecosystem Approaches – Gary Wein, Guest Speaker	Chapters 12 & 13
Oct. 6	Ecosystem Approaches	Chapters 12 & 13
Oct. 8 & 13	No Class – Fall Break	
Oct. 15	Conservation Plans/Reserve Designs	Chapter 14
Oct. 20 & 22	Conservation Plans/Reserve Designs	
Oct. 27 & 29	Restoration	Chapter15
Nov. 3 & 5	Sustainable Development: Certification, Carbon Sequestration	Chapter 16
Nov. 10	Science and Policy	Chapter 17
Nov. 17	Take Home EXAM #2 due: Nov. 17 at 8:00 am	
Weeks 11-15: Conserving Biodiversity in Managed Landscapes: Conservation Plans		
Nov. 12 & 17	Conservation Plan Examples	Handouts
Nov. 19 & 24	No Class: Teams Work on Conservation Plans	
Nov. 26	No Class: Thanksgiving Holiday	
Dec. 1 & 3	Conservation Plan Presentations (4)	Handouts
Dec. 8 & 10	Conservation Plan Presentations (4)	Handouts
Dec. 17	Noon – 2:30: Conservation Plan Presentations (3)	Handouts

Geology 455/555: Wetlands

Instructor: Dr. Ben Tanner **Office:** Stillwell 335 **Office Hours:** MW 12-1pm, R 10-11am, F 8:10-9am, Also by appointment
e-mail: btanner@email.wcu.edu **Phone:** 227-3915
Course Text: Mitsch and Gosselink (2000), Wetlands **Class Meeting Time:** MW 4:00 – 5:15 Stillwell 355

COURSE DESCRIPTION AND GOALS

Wetlands are important components of the landscape that provide a refuge for a diversity of plant and animal species. Wetlands also play a role in flood mitigation, storm abatement, aquifer recharge, and they provide a "natural filter" by removing excess nutrients and toxic materials from the water. Despite their importance, wetland destruction has been a significant problem historically. This course will cover many issues dealing with wetlands and wetland science including wetland delineation, hydrology, and biogeochemistry. The course will consist of a mixture of readings from several texts, lectures on important topics, field-based exercises, journal article reviews, and class discussion. There will be several fieldtrips over the course of the semester that will allow students to directly explore the topics that are covered in class. At the end of the course you should have a fundamental understanding of how wetlands are defined, how we identify them in the field, what functions they serve, how they function internally, how we derive environmental information from them, and what the societal issues are concerning wetlands and their preservation.

GRADING	Tests (2)	45%	Mid-term and final worth 20% each.
	Assignments	40%	Field and lab-based exercises will be assigned over the course of the semester and will be due 1 week after they are introduced. Specific details and expectations will be communicated when the exercises are assigned.
	Journal Article Reviews	10%	You will be assigned journal article readings over the course of the semester and will be required to turn in a 1 page (12 point font, double-spaced) summary of the articles. Also, you will be responsible (as a group) for leading a discussion of one of the articles.
	Participation	5%	Attendance, field trip participation, and participation in discussion and group work will be considered.

GRADUATE STUDENT ASSIGNMENTS

In keeping with WCU policy, graduate students will be required to complete several additional assignments. For a portion of the "assignment" score, graduate students are required to complete the field-based assignments (20% of the 40% indicated) but are additionally required to construct and turn in a grant-style proposal of an original research idea (GSA Style) on a topic that is related to wetlands (the other 20%). Additionally, each graduate student will be expected to lead 1 journal article discussion over the course of the semester (as an individual and not as part of a group) for a portion of their journal article review grade.

FIELD TRIPS

All field trips for the course are mandatory. There may be a field trip fee (maximum $75) for the excursion to the SC coast. If you cannot attend one of the field trips, you will be given an alternative assignment.

COURSE INFORMATION
Geology 423/523
Contaminated Rivers: Assessment, Remediation, and Restoration

Dr. Jerry R. Miller
Fall 2010
Lecture: Stillwell 143, MWF 10:10-11:00
Email: jmiller@wcu.edu

Office: Stillwell 302
Ph. 227-2269
Office Hrs: MW: 9-10 or by appointment (my door is always open)

Course Objectives
During this course we will explore the integration of hydrology, geomorphology, and geochemistry to effectively assess, remediate, and/or restore streams and rivers contaminated by hydrophobic contaminants such as trace metals (lead, mercury, zinc, cadmium). By the end of the course, you should have an understanding of the primary processes through which contaminants are dispersed from point and non-point sources of pollution, the mechanism involved in retention and release of contaminants from sedimentary deposits, the techniques used to map contaminant hotspots, and the various methods used to remediate and/or clean up contaminated rivers, thereby reducing the potential environmental impacts on both human and ecosystem health.

Textbook: Miller, J.R. and Orbock Miller, S.M., 2007. Contaminated Rivers: A Geomorphological-Geochemical Approach to Site Assessment and Remediation. Springer.

--- The textbook was written specifically for this course and you will be expected to keep up with the reading assignments. ***Both exam and quiz questions may pertain to materials within the assigned readings which were not discussed in class!***

Grading:

Undergraduates (Geol 423)	***Graduate Students (Geol 523)***
Midterm: 20%	Exam I: 15 %
Final Exam: 20%*	Final Exam: 15%
Quizzes: 20 %**	Quizzes: 20 % **
Homework: 30%	Homework: 30 %
Participation: 10%***	Paper/Research Project: 10%
	Participation: 10%***

*- The final exam is comprehensive. Approximately 20 % of the final will be related to materials covered during the Midterm.
** - Quiz dates will not be announced ahead of time, and they cannot be made up unless you have a medical excuse, or I have pre-approved your absence. Quiz materials will include information contained within the assigned readings! You will be able to drop your lowest quiz score obtained during the semester.
*** - If you do not attend class, it will impact your participation score, and it is unlikely

that you will do well on the exams as most all of the materials on the tests will come from the lectures.

Homework: Homework will consist of a variety of exercises to increase your understanding of the subject's key concepts and methods. In some cases, you may be required to download and use software created by governmental agencies (shareware). In addition, homework will require that you score a set number of points by reading a selected number of books and/or by watching provided movies/documentaries. **Note** that assignments submitted for evaluation must meet minimum requirements with respect to writing, clarity, and completeness. Homework must be turned in on the day that it is due. Failure to meet the deadline will result in a reduction in the final score. There are no exceptions to this rule, unless it is approved by me in advance, or there is some excruciating circumstance. ***I will not accept homework that is more than two-weeks late!***

Fieldtrips: One Saturday fieldtrip will likely be required during the semester.

Notes on the Differences in Grading between Geology 491 and Geology 591:

1. Exams for graduate students will have the same format as the rest of the class; however, for the essay portion of the exams, I will expect the graduate students to a broader and deeper understanding of the course materials.
2. Graduate students will be required to conduct a case study of a contaminated river that has or is in the process of being remediated. Results of the case study will be presented in a brief (10 page double-spaced) paper (outlined elsewhere).

Study Suggestions

(1) Go over your notes on a regular basis - preferably after every lecture. Compare your notes with those of your friends to insure that they are complete. If you have questions, write them down and bring them to class. We will start every lecture with a question and answer session. ***If you miss a class, make sure you arrange to borrow another student's notes. Note that it is your responsibility to find out what was discussed.***

(2) Note that the readings are required. Test and quiz questions will be taken from the assigned materials whether I cover it in class or not!

Tentative Class Schedule and Reading List

Month/Day	Topic	Readings (From Miller and Orbock Miller, 2007)
Monday, August 23	Course Introduction	Chapter 1, pg. 1-21
Wed., August 25	Types of Pollutants; regional and national surveys of water quality	Chapter 1, pg. 1-21
Fri., August 27	Guiding principles of the geomorphological-geochemical	Chapter 1, pg. 21-31

	approach	
Monday, August 30	Physical partitioning of trace metals	Chapter 2, pg. 33-38
Wed., Sept. 1	Chemical partitioning of trace metals; sorption processes; precipitation-dissolution reactions	Chapter 2, pg. 39-43
Fri., Sept. 3	Adsorption-desorption processions	Chapter 2, pg. 43-51
Monday, Sept. 6	**No Class**	
Wed., Sept. 8	Ion exchange; reactive substrates	Chapter 2, pg. 60
Fri., Sept. 10	Metal speciation; metal remobilization	Chapter 2, pg. 67
Monday, Sept. 13	Review of basin hydrology; contaminant transport pathways	Chapter 3, pg. 69-85
Wed., Sept. 15	Synoptic Sampling	Chapter 3, pg. 85-87
Fri., Sept. 17	Temporal variations in dissolved concentrations; hysteresis	Chapter 4, pg. 103-113
Monday, Sept. 20	Temporal variations in particulate concentrations; hysteresis; calculation of loads	Chapter 4, pg. 123
Wed., Sept. 22	Review of channel hydraulics and sediment transport processes	Chapter 5, pg. 127-136
Fri., Sept. 24	Hydraulic sorting; dilution, and contaminant storage, biological uptake	Chapter 5, pg. 136-143
Monday, Sept. 27	Downstream patterns in contaminant distributions	Chapter 5, pg. 144-151
Wed., Sept. 29	Trace metal distribution within a reach	Chapter 5, pg. 151-152 & 162-170
Fri., Oct. 1	Project Assignments & Discussion	
Monday, Oct. 4	Concentration normalization methods;	Chapter 5, pg. 170-173
Wed., Oct. 6	Temporal variations in bed concentrations	Chapter 5, pg. 173-175
Fri., Oct. 8	Catch-up and review	
Monday, Oct. 11	**Midterm Exam**	
Wed., Oct. 13	Paper Discussions	
Fri., Oct. 15	**No Class; Fall Break**	
Monday, Oct. 18	**No Class; Fall Break**	
Wed., Oct. 20	Floodplains: formative processes and deposits	Chapter 6, 177-192
Fri., Oct. 22	Factors influencing trace metal storage; Grain size, deposit age, sediment mixing, post-	Chapter 6, 193-202

	depositional processes	
Monday, Oct. 25	Factors influencing trace metal storage; Grain size, deposit age, sediment mixing, post-depositional processes	Chapter 6, 193-202

Month/Day	Topic	Readings (From Miller and Orbock Miller, 2007)
Wed., Oct. 27	Overbank deposits; processes and controls on depositional rates	Chapter 6, pg. 209
Fri., Oct. 29	Geographical patterns of contaminants in overbank deposits	Chapter 6, pg. 209-219
Monday, Nov. 1	**GSA; No Class**	
Wed., Nov. 3	**No Class; Advising**	
Fri., Nov. 5	Constructing contaminant loading histories	Chapter 6, 219-227
Monday, Nov. 8	River Metamorphosis	Chapter 7, pg. 235-254
Wed., Nov. 10	Terraces and contaminant distributions	Chapter 7, pg. 254-262
Fri., Nov. 12	Remediation standards & background assessments	Chapter 8, pg. 271-282
Monday, Nov. 15	Health and risk based standards; prioritizing clean up sites	Chapter 8, pg. 282-288
Wed., Nov. 17	Ex Situ Remediation Methods: Excavation and Dredging	Chapter 9, 289-301
Fri., Nov. 19	Ex Situ Treatments; Project Discussions	Chapter 9, 302-310
Monday, Nov. 22	In Situ Treatments: Soil flushing,	Chapter 10, pg. 327-334
Wed., Nov. 24	**No Class; Thanksgiving Holiday**	
Fri., Nov. 26	**No Class; Thanksgiving Holiday**	
Monday, Nov. 29	Phytoremediation, etc.	Chapter 10, pg. 334-338
Wed., Dec., 1	In Situ capping, solidification and stabilization	Chapter 10, pg. 338-346
Fri., Dec. 3	Monitored Natural Recovery	Chapter 10, 346-350
Monday, Dec. 6	Forensic Source Determinations	
Wed., Dec. 8	Review for exam; Project Work	
Fri., Dec. 10	Last day of classes; Project Presentations	
Wed., Dec. 15	Final Exam – 8:30-11:00 am	

NRM 351: FOREST ECOLOGY **Spring 2010**

Instructor: Laura E. DeWald 316 Natural Science, 227-2478 *ldewald@wcu.edu*

Learning Outcomes: Students will:

1. Understand how tree species respond to micro-environmental factors including light, temperature, water and soil characteristics;
2. Understand within- and between-species relationships within communities;
3. Understand the role of disturbance and change within forest ecosystems;
4. Practice applying forest ecology principles to sustainable forestry practices including uses such as carbon sequestration and cellulosic biofuel production;
5. Practice evaluating forest management decisions in light of ecological principles;
6. Practice critical thinking, reading and writing; applying scholarly information and methods to understand complex issues; oral communication; integrating concepts; teamwork involved with solving forest ecological problems

Required Text: Barnes, J.P., D.R. Zak, S.W. Denton, and S.H. Spurr 1998. ***Forest Ecology 4th edition***. John Wiley & Sons, New York. 774 pages.

Evaluation:

Exams: 3 @ 100 points each	300 points
Research Paper	100 points
Class Participation/assignments	100 points
Lab Reports	200 points
Total	700 points

Exams: concentrate on material covered since the last exam, though students will be responsible for major concepts presented earlier. Exams are take-home, essay question format. Questions are designed to evaluate students' ability to integrate and apply the material presented. Late exams will not be accepted.

Research Paper: Each student will investigate a forest ecological problem in the southern Appalachians. The final product will consist of a paper (7 to10 double-spaced pages, 1-inch margins, 12-point font), and a presentation to the class. A visit to the writing center is STRONGLY advised and will be rewarded with a 10% bonus!

Laboratory Exercises: are intended to illustrate and reinforce concepts discussed in class.
Labs where data are collected will require students to write a formal scientific report. Late reports will only be accepted with prior approval of the instructor. Writing quality counts significantly in report grade and it is STRONGLY suggested you visit the writing center prior to turning your reports in. A template for technical reports will be handed out in class and reports will be graded based on completeness, scientific merit and writing quality.

Class Participation: in-class exercises will be randomly assigned during the semester. These are designed to evaluate how well you are understanding lecture material and reading assignments. These assignments can not be made up; students who are not present will receive a 0.

Tentative Schedule

Date	Lecture/Lab Topic	Assignment
Jan.10, 11, 13	Lab: Writing Scientific Reports Lecture: Adaptation – Genetic Basis	Barnes *et al.* Chapters 4 and 5
Jan. 17, 18, 20	Lab: Set Up Phenology Study (on your own) Lecture: Adaptation – Light	Barnes *et al*. Chapter 8
Jan. 24, 25, 27	Lab: Transpiration Study Lecture: Adaptation – Water	Barnes *et al.* Chapters 6 and 7
Jan. 31, Feb. 1, 3	Lab: Transpiration Study Continued Lecture: Adaptation – Temperature	Barnes *et al.* Chapters 7 and 9
Feb. 7, 8, 10	Lab: Transpiration Study – Conclusion Lecture: Nutrients	Barnes *et al.* Chapter 11
Feb. 15	**Exam #1 DUE**	**Study Hard**
Feb. 14, 15, 17	Lab: Site Quality Lecture: Soils	Barnes *et al.* Chapter 11
Feb. 21, 24	Lab: Site Quality Lecture: Site Evaluation	Barnes *et al.* Chapters 10 and 13
Feb. 22	**No Class: Advising Day**	**Fall Course Schedules**
Feb. 28, Mar. 1, 3	**No Class: Spring Break**	**Relax and Have Fun**
March 7, 8, 10	Lab: Plant Communities Lecture: Populations	Barnes *et al.* Chapter 15
March 14, 15, 17	Lab: Plant Communities Lecture: Disturbance – Succession	Barnes *et al.* Chapters 16 and 17
March 21, 22, 24	Lab: Plant Communities Lecture: Disturbance – Fire	Barnes *et al.* Chapters 16 and 12
March 29	**Exam #2 DUE**	**Study Hard**
March 28, 29, 31	Lab: Plant Communities Lecture: Biodiversity	Barnes *et al.* Chapter 20
April 4, 5, 7	Lab: Plant Communities Lecture: Ecological/Sustainable Forestry	Barnes *et al.* Chapter 21
April 11, 12, 14	Lab: Forest Restoration Lecture: Restoration and Forest Health	Handouts
April 18, 19	Lab: Presentation Preparation Lecture: Carbon Sequestration **Research Paper DUE! April 19, 9:30 am**	Handouts
April 25, 26, 28	Lab: Student Presentations Lecture: Student Presentations	Presentation Preparations
May 4	**Final Exam: Noon – 2:30**	**Study Hard**

LANDSCAPE ECOLOGY
NRM 371
Spring 2008
Stillwell 354
MWF 10:10-11:00
Lab Wed: 3:35-5:20

Instructor: Dr. Ron Davis
Office: Stillwell 318
Phone: x2726
Office Hours: MWF 8:00-9:30am Tues 2-3:00pm
NOTE: I have an open door policy and am frequently in my office when not teaching. Please feel free to stop by my office.

I. Purpose

Purpose: To provide students the knowledge and skills needed to apply ecologic principles to the study and management of landscapes

II. Course Objectives:

1. Explain the relationship between landscape scale, pattern, and processes and the functioning of terrestrial ecosystems

2. Apply skills developed within the course and lab to describe and quantify landscape, components, pattern and processes

3. Apply basic GIS methods to the study of landscapes

4. Apply the concepts of landscape ecology to management of resources including forests, soil, water, wildlife and biodiversity.

Students will develop basic understanding and skills required for applied GIS analyses in the study and management of natural resources or other fields.

III. Course Materials

- Required text(s): Farina, A. 2006. Principles and methods in landscape ecology. Springer.
- Supplemental: Habitat Fragmentation and Landscape Change: An Ecological and Conservation Synthesis
- Other readings will be provided as needed.

V. Grading Procedures: With the exception of some in class exercises used for discussions, all work will be graded and returned to you. Assignments will be designed to provide a variety of approaches to learning.

	Percentage of Grade
Exams (3)	**40**
Lab Exercises	**20**
Project	**40**
Final Examination	**20**

Approximate point values—The proportions listed above will apply to whatever the final point total ends up to be, but the approximate breakdown (w/revised lab schedule) is as follows.

- Assignments will be graded on a percentage (0-100) and then weighted according to the scale above.
- For example, if your average score on labs is 85% then at the end of the course your lab grade will be 0.85*50 = 42.5/50
- Your total score out of 100% will be graded according to the scale shown below

Tentative Course Schedule
Fall 2009

	Date	Topic	Reading	LAB
1	Mon, Aug 24	Introduction to Course		
2	Wed, Aug 26	Ecology of Landscapes: Processes	Farina 2.6-2.9.8	Scale of Analysis: Deer Populations Dynamics at MSH
3	Fri, Aug 28	Ecology of Landscapes: Processes	Farina 2.6-2.9.9	
4	Mon, Aug 31	Landscape Classifications		
5	Wed, Sep 2	Scale, Pattern and Process	Farina Chapter 3	Lab: Classifying Landscapes
6	Fri, Sep 4	Scale, Pattern and Process	Farina Chapter 3	
	Mon, Sep 7	Labor Day Holiday – No Classes		
7	Wed, Sep 9	Ecosystem Function	Notes	Lab: Ecosystem Function, Biodiversity
8	Fri, Sep 11	Biodiversity	Notes	
9	Mon, Sep 14	Connectivity	Notes	
10	Wed, Sep 16	Review		Lab: Connectivity, Habitat Quality
11	Fri, Sep 18	Landscape Processes	Farina Chapter 4	
12	Mon, Sep 21	Landscape Processes	Farina Chapter 4	
13	Wed, Sep 23	Landscape Patterns	Farina Chapter 5	Landscape Metrics
14	Fri, Sep 25	Landscape Patterns	Farina Chapter 5	
15	Mon, Sep 28	Quantifying Landscape Patterns	Farina Ch 8 (sections 1-3 only)	
16	Wed, Sep 30	Review		**TEST 1 During Lab**
		PART II: Species and Population Perspective		
17	Fri, Oct 2	Populations and Landscapes:	notes	
18	Mon, Oct 5	Populations and Landscapes		
19	Wed, Oct 7	Habitat Loss	L & F Chapter 4	Lab: Habitat Evaluations
	Fri, Oct 9	Fall Break – No Classes		
	Mon, Oct 12	Fall Break – No Classes		
20	Wed, Oct 14	Habitat Quality	L & F Chapter 5	Lab: Field Methods 1
21	Fri, Oct 16	Fragmentation	L & F Chapter 6	
22	Mon, Oct 19	Species Interactions/Behavior	L & F Chapter 7	
	Wed, Oct 21	Advising Day – No Classes		NO LAB
23	Fri, Oct 23	**TEST 2 IN CLASS**		
		PART III: Linking		

3.4. **Frequency of course offerings and mean class size for previous five years**

	2006-2007		2007-2008		2008-2009		2009-2010		2010-2011
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Environmental Science*									
Undergraduate									
Student Credit Hours	70	18	57	6	111	18	35	89	56
# Courses	3	1	3	1	3	1	2	3	2
Avg Section Enrollment	14.00	6.00	11.67	2.00	21.67	6.00	14.50	14.33	20.00

*Table includes only Environment Science courses (ES 101, ES 150, ES 495); does not include courses from other departments (e.g., Environmental Health, Biology, Natural Resource Conservation and Management) that are part of the Environmental Science curriculum.

3.5 **Number of junior-senior majors since 2004**

Academic Year	Number of Majors
2006-2007	
UG Lower Division	14
UG Upper Division	6
2007-2008	
UG Lower Division	17
UG Upper Division	9
2008-2009	
UG Lower Division	17
UG Upper Division	16
2009-2010	
UG Lower Division	19
UG Upper Division	24
2010-2011	
UG Lower Division	21
UG Upper Division	22

3.6 **Time to degree (TTD) data for program graduates since 2004**

	# in Cohort	# Graduated
Fall 2004	1	
Spring 2005	5	
Fall 2005	14	
Spring 2006	7	
Fall 2006	7	
Spring 2007	2	2
Fall 2007	13	1
Fall 2008	12	
Fall 2009	11	7
Fall 2010	19	1
Spring 2008	2	1
Spring 2009	7	1
Spring 2010	3	3
Grand Total		16

3.7 Course sequence for 4-year graduation

- **Major Program Guide For: B.S. in Environmental Science (120 credit hours)**

Freshman Year							
Fall				**Spring**			
Course Prefix or Liberal Studies Requirement	**Course Number**	**Course Title**	**Hours**	**Course Prefix or Liberal Studies Requirement**	**Course Number**	**Course Title**	**Hours**
	190	First Year Seminar	3	C4		Wellness	3
BIOL	140	Principles of Biology	4	GEOL	150	Methods in Geology	4
ENGL	101	Composition I	3	BIOL	141	Principles of Biology II	4
ES	101	Careers and Issues in Environmental Science	1	ENGL	102	Composition II	3
ES	150	Introduction and Approaches to Environmental Science	4	General Elective			3
Sophomore Year							
Fall				**Spring**			
Course Prefix or Liberal Studies Requirement	**Course Number**	**Course Title**	**Hours**	**Course Prefix or Liberal Studies Requirement**	**Course Number**	**Course Title**	**Hours**
P1		Social Sciences	3	CHEM	140	Advanced General Chemistry	4
P3		History	3	P4		Humanities	3
CHEM	139	General Chemistry	4	P6		World Culture	3
MATH	140	Introductory Calculus	5			Environmental Health Elective	4
						Environmental Policy Elective	3
Junior Year							
Fall				**Spring**			
Course Prefix of Liberal Studies Requirement	**Course Number**	**Course Title**	**Hours**	**Course Prefix of Liberal Studies Requirement**	**Course Number**	**Course Title**	**Hours**
P1		Social Sciences	3			JR-Sr Upper Level and General Electives	14
NRM	344	Introduction to Geographic Information Systems	4			Analytical / Instrumentation Elective	2 or 3
		Quantitative Methods Elective	3				
		Field and Natural Environmental Science Elective	4				
		General Elective	2				
Graduation Fee: After earning ninety hours, the student must file an application form with the Dean after paying a $30 graduation fee to the University Cashier.							
Senior Year							
Fall				**Spring**			
Course Prefix or Liberal Studies Requirement	**Course Number**	**Course Title**	**Hours**	**Course Prefix of Liberal Studies Requirement**	**Course Number**	**Course Title**	**Hours**
		UL Perspectives	3	ES	495	Senior Seminar in Environmental Problems	3
		Environment and Society Elective	3			General Electives	10
		Jr-Sr Upper Level and General Electives	10	P5		Fine & Performing Arts	3

3.8 **Most recent assessment plan**

A plan has been put forth to address the following questions about the ES program:

- Are the goals and objectives of the ES Program being achieved?
- Which methods of program delivery work best at achieving the goals and objectives of the ES Program?
- To what extent does the ES major prepare graduates for entry into the workforce or a graduate program?
- How satisfied are the students with the program?
- What is the current "identity" of the ES program?
- How do the students feel about not having a defined "community?"
- How can the program identify, recruit, and sustain majors?
- Are students integrating and applying information between courses & courses and courses & actions?

The table below shows the data collection instruments that would be used to address the evaluation questions:

Evaluation Question	Data Collection Source
Are the goals and objectives of the ES Program being achieved?	Online checklist Online survey Interviews Program documentation
Which methods of program delivery work best at achieving the goals and objectives of the ES Program?	Online survey Interviews End of course student evaluations
To what extent does the ES major prepare graduates for entry into the workforce or a graduate program?	Student survey Interviews
How satisfied are the students with the program?	Online checklist Online surveys Interviews End of course student evaluations
What is the current "identity" of the ES program?	Online checklist Online survey Interviews
How do the students feel about not having a defined "community?"	Online checklist Online survey
How can the program identify, recruit, and sustain majors?	Online survey Program documentation
Are students integrating and applying information between courses & courses and courses & actions?	Online checklist Online survey Interviews

Standard 4 **Appendix**

4.1 **Tabular distribution of tenure status, gender, and ethnic origin of faculty.**
Data from Office of Institutional Planning

Tenure Status	Ethnic Origin	Gender
Tenure-track	W	M
	W	M
	W	M
	W	M
	W	F
Tenured	W	M
	W	M
	W	M
	W	M
	W	M
	W	M
	W	F
	W	F
	W	F

4.2 **Roster identifying credentials for all full and part-time faculty**

Faculty Member	Academic Rank	Degree, Year	Institution	Specialty
Atterholt, Cynthia	Tenured Assoc. Prof.	Ph.D. 1996	UC Davis	Agricultural/Environmental Chemistry
Bates, Peter	Tenured Assoc. Prof.	Ph.D. 1990	U. of Minnesota	Forestry
Byrd, Brian	Tenure-track, Assist. Prof.	Ph.D. 2009	Tulane U.	Medical Entomology/ Parasitology
Collins, Beverly	Tenured Assoc. Prof.	Ph.D. 1985	Rutgers U.	Plant ecology
Davis, Ron	Tenure-track Assist. Prof.	Ph.D. 2005	U. of Illinois	GIS/Remote Sensing, Wildlife Ecology
DeWald, Laura	Tenured Assoc. Prof.*	Ph.D. 1986	Virginia Tech	Forestry/Genetics
Huffman, Scott	Tenure-track Assist Prof,*	Ph.D. 2001	U. of Rhode Island	Vibrational Spectroscopy
Kloeppel, Brian	Tenure-track Assoc. Prof.*	Ph.D., 1885	U. of Wisconsin - Madison	Watershed Ecology
Kneller, Phillip	Tenured Assoc. Prof.	M.S.E.H., 1980	George Washington U.	Environmental Health
Lord, Mark	Tenured Full Prof.	Ph.D. 1985	U. North Dakota	Geology
Martin, Tom	Tenured Assoc. Prof.	Ph.D. 1990	NC State U.	Aquatic ecology
Ogle, Burton	Tenured Assoc. Prof.	Ph.D. 1998	Va. Commonwealth U.	Industrial Hygiene
Tanner, Ben	Tenure-track Assist. Prof.*	Ph.D. 2005	U. Tennessee	Organic Geochemistry
Zontek, Tracy	Assistant Professor	Ph.D., 2006	U. of Nebraska – Lincoln	Occupational health and safety

*Portfolio currently under consideration for tenure and/or promotion to next higher rank

4.3 **Summary of sponsored research activities for faculty since 2006.** Data from WCU Office of Research Administration

PI	Funding Source	Amount	Title of Project
Tracy Zontack	Association of Environmental Health Academic Programs	$ 4,000.00	Meeting students on their own turf: Podcasting as a method to recruit environmental health majors
Brian Byrd	Association of Environmental Health Academic Programs	$ 4,000.00	whatisenvironmentalhealth.org: A Recruitment Tool Enhanced by Student Perspectives of the Discipline
Phillip Kneller	Eastern Band of Cherokee Indians	$ 41,349.00	Study of he correlation of ozone levels to hospital admissions rates for respiratory and cardiovascular illnesses
Burton Ogle	Association of Environmental Health Academic Programs	$ 7,500.00	AEHEP Program
Beverly Collins	USDA	$ 3,349.00	Location and simulated harvesting effects on the medicinal herb Chamaelirum luteum
	NC Wildlife Resources Commission	$ 10,000.00	Carolina northern flying squirrel movements and den site selection along Cherohala Skyway
	USDA: Forest Service	$ 11,878.00	Analysis of Forest Vegetation and Wildlife Habitat in the South
Tom Martin	National Park Service	$ 20,179.00	Aquatic invertebrate identifications from a high elevation stream in Great Smoky Mountains National Park
	USDA	$ 26,732.00	Upper Tellico OV Area Stream Macroinvertebrate Monitoring
	NC Wildlife Resources Commission	$ 10,000.00	Genetic identification of southern Appalachian brook trout population in NC
Laura DeWald	Sate of NC; UNC Office of the Presideent	$ 99,000.00	Northern Red Oak Genomic Investigations
Peter Bates	Land Trust for the Little Tennessee	$ 4,213.00	Forest Conditions on Yellow Creek
	Balsam Mtn Preserve	$ 43,400.00	Designing a Sustainable Forest Management Plan for BMP
	Land Trust for the Little Tennessee	$ 13,000.00	Monitoring Forest Sustainability: A process approach to selecting and testing
	Land Trust for the Little Tennessee	$ 35,000.00	Western Carolina Forestry Project

	Town of Waynesville	$ 50,000.00	Development of Forest Management Plan for the Waynesville Watershed
Ron Davis	Balsam Mtn Trust	$ 11,590.00	Wildlife Studies at Balsam Mtn Preserves
Brian Kloppel	US Forest Service	$ 33,874.00	Coweeta Permanent Vegetation Plot Remeasurements
Ben Tanner	Arcadia Partners for Science and Learning via NPS	$ 5,000.00	Determination of Carbon Sequestration Rates in Salt and Freshwater Marshes in the Schoodic Section of Acadia National Park
	Main Sea Grant	$ 3,000.00	Use of biomarkers to determine life cycles of Maine sea marsh panes
	Cherokee Central Schools	$ 3,200.00	Rivercase Irrigation System

4.4 **Current curriculum vitae for full-time faculty**

Laura E. DeWald

Director, Environmental Science Program, Phone: (828) 227-2478; E-mail: ldewald@wcu.edu
Appointment : 50% Environmental Science (Chemistry & Physics Department)
25% Biology Department
25% Natural Resources Conservation & Management Program (Geoscience & Natural Resources Dept.).

EDUCATION

Ph.D., Forestry (genetics) Virginia Tech University 1986
Dissertation: Changes in Loblolly Pine Seedling Root Growth Potential: Over Time, During Cold Storage, and Among Half-Sib Families

M.S., Forest Resources (genetics), Penn State University 1982
Thesis: Juvenile Performance in a Range-Wide Provenance Study of *Alnus glutinosa* (L.) Gaertn.

B.S., Forestry, Michigan Technological University 1980

PROFESSIONAL EXPERIENCE

Associate Professor with tenure, Western Carolina University	2007-present
Director, Environmental Science Program, WCU	2006-present
Graduate Faculty, Western Carolina University	2005-present
Assistant Professor, Tenure Track, Western Carolina University	2004-2007
Associate Dean, School of Forestry, Northern Arizona University	2003-2004
Affiliate Faculty, Environmental Science Dept., NAU	1998-2004
Associate Professor with Tenure, School of Forestry, NAU	1998-2004
Assistant Professor, Tenure Track, School of Forestry, NAU	1994-1998
Dept. Chair, Forest Resources, Green River CC, Auburn, WA	1993-1994
Forest Resources Faculty, Green River Community College, Auburn WA	1992-1994
Forest Biology Faculty, Warren Wilson College, Asheville, NC	1989-1992
Forest Supervisor, Warren Wilson College, Asheville, NC	1989-1992
Post-Doctoral Research Associate, Dept. Forestry, Univ. FL	1987-1989
Post-Doctoral Research Associate, Forest Resources Dept. Univ. MN	1986-1987

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

My area of expertise is conservation genetics focused primarily on plants. However, my interdisciplinary background in natural resources and conservation biology allows me to direct research in areas broader than genetics. My research seeks to answer questions that can be applied to improving conservation, restoration and management of forested ecosystems and I work from the genetic to the landscape spatial scales. Research with students at WCU has included genetic variation in aspen stands in northern Arizona, alkaloid and genetic variation among goldenseal populations, sensory cues for pollination and pollination visitors of *Trillium cuneatum*, river cane patterns of recruitment and culm morphology, changes in genetic diversity of northern red oak following decline of American chestnut and harvesting, arthropod and avian

assemblages in insecticide-treated and untreated eastern hemlock stands in GSMNP, evaluation of potential habitat in golf courses in western NC, and effects of phosphorus and mycorrhizal fungi on growth of Oriental bittersweet.

RELEVANT COURSES TAUGHT (since 2004)

Environmental Science Courses (Dept. Chemistry/Physics) - undergraduate
Careers and Issues in Environmental Science (ES101, 1 credit)
Introduction and Approaches to Environmental Science (ES150, 4 credits)
Senior Seminar in Environmental Science = ES Capstone (ES495, 3 credits)

Biology Department: undergraduate (400 level and below), graduate (500 & 600 level)
Dendrology (BIOL254, 4 credits)
Conservation Biology (BIOL441/541, 3 credits)
Ecological Genetics (BIOL438/538, 3 credits)
Ecological Genetics (BIOL639, 3 credits)

Natural Resources Conservation and Management Courses - undergraduate
Conservation and Management of Natural Resources (NRM140, 3 credits, Liberal Studies)
Forest Ecology (NRM351, 3 credits)

PUBLICATIONS (since 2004, students underlined)

Zhang, H. LE **DeWald**, TE Kolb. 2011. Ecophysiological differentiation in response of *Keoleria cristata* and *Elymus elymoides* to drought along an elevation gradient. Western North American Naturalist (in press)

Zhang, H, LE **DeWald** and SE Smith. 2011. Allozyme variation in dominant pine and grass species in northern Arizona. Journal of Heredity (in review)

Lett, C, LE **DeWald** and J Horton. 2011. Mycorrhizae and soil phosphorus affect growth of *Celastrus orbiculatus*. Biological Invasions (accepted pending approval of submitted revisions)

Falcone, JF and LE **DeWald**, 2010. Comparisons of arthropod and avian assemblages in insecticide-treated and untreated eastern hemlock (*Tsuga canadensis* [L] Carr) stands in Great Smoky Mtns National Park, USA. Forest Ecology and Management. 260:856-863

DeWald, LE and MF Mahalovich. 2008. Historical and contemporary lessons from ponderosa pine studies at the Fort Valley Experimental Forest. Pages 204-213 In: Olberding, SD and MM Moore, tech. coords. 2008. Fort Valley; Experimental Forest – A Century of Research 1908-2008. RMRS-P-53CD. Fort Collins, CO. USDA Forest Service, 408 pages. (www.fs.fed.us/rm/pubs/rmrs_p053.pdf)

McRae, BH, P Beier, LY Huynh, L **DeWald**, and P Keim. 2005. Habitat barriers limit gene flow and illuminate historical events in a wide ranging carnivore, the American puma. Molecular Ecology 14:1965-1977.

PRESENTATIONS/ABSTRACTS AT PROFESSIONAL MEETINGS

(since 2004 or maximum of 10, students underlined)

Hoffman, K and LE DeWald. 2010. Patterns of recruitment and culm morphology in *Arundinaria gigantea* ([Walt.] Muhl.). 71st Annual Meeting, Association of Southeastern

Biologists, April 7-10, 2010, Asheville, NC

DeWald, LE and SQ Grant. 2009. Response of southern Appalachian tree species to climate change: Should we intervene? Southern Appalachian Man and the Biosphere Annual conference. Asheville, NC. Nov. 17-19, 2009.

Falcone, JF and LE **DeWald**. 2009. **(Invited)**. Comparisons of arthropod and avian communities in insecticide-treated and untreated hemlock stands in Great Smoky Mountains National Park. Science Colloquium. Great Smoky Mtns National Park, Gatlinburg, TN. March 20

Extine, J, LE **DeWald** and R Davis. 2008. Ability of Golf Courses to Provide Landscape Connectivity in Western North Carolina. 6th Southern Forestry and Natural Resources GIS Conference, Orlando FL March 24-26.

Falcone, JF and LE **DeWald**. 2008. Effects of a hemlock woolly adelgid (*Adelges tsugae*) insecticide treatment on arthropod community diversity and food availability for insectivorous birds in Great Smoky Mountains National Park. 69th Annual Meeting, Association of Southeastern Biologists, Spartanburg, SC April 16-19.

Lett, C and LE **DeWald**. 2008. Effects of mycorrhizal fungi on the growth of *Celastrus orbiculatus*. 69th Annual Meeting, Association of Southeastern Biologists, Spartanburg, SC April 16-19.

Extine, JL and LE **DeWald**. 2008. Analysis of quality of habitat patches in western North Carolina golf courses using interior forest birds and landscape indices. 69th Annual Meeting, Association of Southeastern Biologists, Spartanburg, SC April 16-19.

Grant, S and LE **DeWald**. 2008. Changes in genetic diversity of *Quercus rubra* following different harvesting regimes and the decline of *Castanea dentata* in Western North Carolina. 69th Annual Meeting, Association of Southeastern Biologists, Spartanburg, SC April 16-19.

DeWald, LE and MF Mahalovich. 2008. Historical and contemporary lesson from ponderosa pine studies at the Fort Valley Experimental Forest. Fort Valley Experimental Forest – A century of Research 1908-2008. Flagstaff, AZ, August 7-9.

DeWald, LE and P Bates. 2008. Field experience for students also provides critical assistance for family landowners in the southern Appalachians. Presentation at the 7th Biennial Conference, University Education in Natural Resources, March 13-15, Corvallis, OR

GRANTS AND AWARDS (selected, last 5 years, students underlined)

2007: Falcone, FJ and LE DeWald. Effects of hemlock woolly adelgid (*Adelges tsugae*) and an insecticide treatment on food availability for the black-throated green warbler (*Dendroica virens*) in Great Smoky Mountains National Park. Network Research Grant Program, Appalachian Highlands Science Learning Center Seed Grants, USDI Great Smoky Mountains National Park. May-August 2007. $2000

2007-2008: Elliott, K and LE DeWald. Sciences: Seeking clear indicators for effective new changes in educating students, North Carolina State NC QUEST – continuation project. $125,000

2007: Collaborator with Collins, B. LI-COR Purchase. LI-COR Environmental Education Fund (LEEF), LI-COR Biosciences, Lincoln NE. 2 $25,000

2006-2007: Elliott, K and LE DeWald. Sciences: Seeking clear indicators for effective new changes in educating students. North Carolina State NC QUEST. 2006-2007, $250,000

2006: DeWald, LE and D. Macken. Production and distribution of native medicinal plants in western North Carolina. Institute for the Economy and Future, Western Carolina University. $3000

2005-2008: DeWald, LE and W Bonds. Northern red oak genomic investigations. UNC Genomics Training Support Grants. 2005-2008, $100,000

ACADEMIC AWARDS AND NOMINATIONS

Elected Society of American Foresters Fellow, 2008

Certificate of Appreciation 2008 Appalachian SAF for serving as 2007 Chair of the Forest Science and Technology Committee.

Appointed to Michigan Technological University's Presidential Council of Alumnae (outstanding female alumni who advise the President of the University), 2005-present

SELECTED COMMITTEE SERVICE AT WCU (college level or above, since 2004)

2005-2007, WCU Microgrants committee, Coulter Faculty Center for Excellence in Teaching and Learning (**Chair** 2006-2007)

2009-Present, WCU Graduate Council and Curriculum sub-committee (Subcommittee Chair 2010 – Present)

2009-Present, College of Arts and Sciences Dean's Advisory Board

2008-2009, College of Arts and Sciences Ad Hoc Committee for Helen Patton Center

2008-2009, College of Arts and Sciences, Environmental Science MS Degree Planning Committee

2007, College of Arts and Sciences Science Education Faculty Search Committee

SELECTED PROFESSIONAL & REGIONAL SERVICE

Society of American Foresters

2008-Present. National Committee on Professional Forestry Curriculum Accreditation Chair, 2010 – present

2010-present, Fellows Selection Committee, Appalachian SAF

2007, NC Division – Science and Technology Chair

2007-present, NC Division – Nantahala Chapter Chair

Peer Reviewer

2004-present, research manuscripts for numerous journals, and textbook reviews

Conferences and Meetings

2010 Program Chair, Assoc. S. Biologists, Annual Meeting, April 7-10, 2010, Asheville, NC.

2007, Program Co-Chair SAF NC Division Summer Meeting. June 6-8, 2007 Waynesville, NC

2006, Inquiry-based science instruction professional development workshop for Alleghany County elementary and middle-school teachers. Sparta, NC. July 10-14, Sept 1, Oct. 12

2005, 2006, 2007, Facilitator of the Assessment of Student Learning Focus Group, Scholarship of Teaching and Learning, Summer Institute, Western Carolina University

2006-2007 Participant in the Western Carolina University "Public School Projects for Math and Science" Collaborative work with a public school teacher to enhance science education

Cynthia Atterholt
Department of Chemistry & Physics; Phone: (828) 227-3667; E-mail:atterholt@email.wcu.edu

EDUCATION

Ph.D., University of California, Davis, CA	1996
Dissertation: "Controlled Release of Insect Sex Pheromones from Sprayable, Biodegradable Materials for Mating Disruption"	
M.B.A. Winthrop University, Rock Hill, SC	1987
B.S.Ed., Kent State University, Kent, OH	1977

PROFESSIONAL EXPERIENCE

Department Head, WCU Department of Chemistry and Physics	2004-present
Associate Professor of Chemistry, WCU Dept. of Chemistry & Physics	2002-present
Assistant Professor, Western Carolina University	1996-2002
Research Assistant, University of California, Davis	1991-1996
Chemistry Teacher, Clover High School, Clover, SC.	1984-1991
Development Chemist, Sandoz Chemical Corporation, Charlotte, NC.	1981-1984
Chemical Lab Technician, Union Carbide, Linde Division, North Royalton, OH.	1977-1981

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

Controlled release of insect sex pheromones as an alternative to the use of pesticides.
The rheology of aqueous wax emulsions used as carriers for the field application of pheromones.
Air quality monitoring and research.

RELEVANT COURSES TAUGHT (since 2004)

Aquatic Chemistry, Environmental Chemistry, and General Chemistry

PUBLICATIONS (students and postdocs underlined)

Frederique M. De Lame, James R. Miller, Cynthia A. Atterholt, and Larry J. Gut, "Development and Evaluation of an Emulsified Paraffin Wax Dispenser for Season-Long Mating Disruption of *Grapholita molesta* in Commercial Peach Orchards," *Journal of Economic Entomology*, 2007, 100 (4); 1316-1327.

Invited article on the agricultural use of pesticides published by McGraw-Hill Publishers. The article was published in a set of Chemistry books entitled "Chemistry: Foundations and Applications," 2004.

A.L. Salido, C.A. Atterholt, J.R. Bacon, and D.J. Butcher, "An Environmental Focus using Inductively Coupled Plasma Optical Emission Spectrometry and Ion Chromatography," *J. Chem. Ed.*, 2003, *80*, 22-23.

D.J. Butcher, P.F. Brandt, N.J. Norgaard, C.A. Atterholt, A.L. Salido, "Sparky IntroChem: A Student Oriented Introductory Chemistry Course," *J. Chem. Ed.*, 2003, *80*, 137-139.

PRESENTATIONS/ABSTRACTS AT PROFESSIONAL MEETINGS (students and postdocs underlined)

Stephen Ballew and Cynthia Atterholt, "Rheological characteristics of aqueous wax emulsions used for the controlled release of pheromones as an alternative to the use of pesticides for insect pest management." Poster presentation at the Joint SE/SW Regional ACS Meeting, December 3, 2010.

Lisa McCracken and Cynthia Atterholt, "Evaluation of wax carriers for the controlled release of pheromones for mating disruption in an integrated pest management program." Poster presentation at the 239 National ACS meeting in San Francisco, CA, March 23, 2010. The poster was also chosen for the Sci-Mixer event on March 22, 2010.

Vonny M. Barlow , James F. Walgenbach , Paul H. Davis , Cynthia A. Atterholt, "Performance of selected pheromone reservoir systems for mating disruption of codling moth in the Eastern commercial apple production system." Presented at the National Entomological Society of America meeting in Indianapolis, IN, December 15, 2009.

R. Borges, L. E. J. Mafra, F. M. De Lame, James R. Miller, Larry J. Gut, T. P. Reed, Cynthia A. Atterholt, Reginald R. Coler and Agenor Mafra-Neto, "SPLAT-OFM A & K: a new sex pheromone tool to manage oriental fruit moth populations**."** Paper presentation at the National Meeting of the Entomological Society of America, Fort Lauderdale, FL, December 2005. Agenor Mafra-Neto was the presenting author.

GRANTS AND AWARDS (selected, last 5 years, students and postdocs underlined)

Research gift in the amount of $10,000 funded by ISCA Technologies Inc., 2010.

Chancellor's Travel Fund Grant in the amount of $1000 to attend the National ACS meeting in San Francisco, CA, March 21-25, 2010.

Research gift in the amount of $1500 funded by ISCA Technologies Inc., 2006.

PI on an internal grant from the Institute for the Economy and the Future, 2005, in the amount of $2000 to study the controlled release of Gypsy Moth pheromones.

ACADEMIC AWARDS AND NOMINATIONS

Recipient of the Chancellor's Meritorious Service to Student Award, 2007.

SELECTED COMMITTEE SERVICE AT WCU (college level or above, since 2004)

Environmental Science Executive Committee
Western North Carolina Biotechnology Advisory Committee
SACS Committee and QEP subcommittee
WCU's Center for Mathematics and Science Education Advisory Committee
Anthropology program review committee

SELECTED PROFESSIONAL & REGIONAL SERVICE

Member, American Chemical Society
Member, Entomological Society of America

Peter Bates
Natural Resource Conservation and Management Program
Department of Geosciences and Natural Resources
Phone: 828.227.3914

EDUCATION

Ph.D. University of Minnesota, Forestry (minor Soil Science) 1990
Dissertation: Quaking aspen regeneration in northern Minnesota: Effects of harvest season and site conditions.
Advisor: Charlie Blinn

M.S. Montana State University, Soil Science 1981
Thesis: Compaction by logging equipment of six soils in northwestern Montana as affected by soil water content, equipment type and number of passes.
Advisor: Larry Munn

B.S. University of Montana, Forestry 1977

PROFESSIONAL EXPERIENCE

Program Director, Natural Resource Conservation & Mgmt Program, WCU	2006-present
Adjunct Associate Professor, Dept of Forestry and Natural Resources, Clemson	2006-present
Assistant and Associate Professor, Western Carolina University	1993-present
Visiting Professor, Department of Soil Science, University of Minnesota	1994
Post-doctoral Associate, Department of Soil Science, University of Minnesota	1990 to 1993
Graduate Research Assistant, University of Minnesota	1987 to 1990
Soil Scientist, Minnesota Agricultural Experiment Station.	1981 to 1987

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTERESTS

My areas of expertise are silviculture, soils, and sustainable resource management; and I am actively engaged in the design and implementation of resource management and restoration treatments on numerous sites throughout the southern Blue Ridge. My current research interests focus on assessing restoration and sustainable resource management treatments such as prescribed burning, crop tree management, and invasive plant control.

COURSES TAUGHT AT WCU

NRM-140 Natural Resource Conservation and Management
NRM-150 Introduction to Natural Resources Management
NRM-210 Methods in Natural Resources Management
NRM-342 Microcomputer Applications in Natural Resources Management
NRM-344 Introduction to Geographic Information Systems
NRM-351 Forest Ecology
NRM-352 Forest Resource Measurements
NRM-420 Soil Genesis and Classification

NRM-440 Integrated Resource Management
NRM-451 Foundations of Silviculture
NRM-452 Forest Management
NRM-483 Applications in Forest Management
NRM-493 Applications in Silviculture
BIOL-593 Topics in Biology
ES-150 Introduction to Environmental Science (part of instruction team)

PUBLICATIONS (since 2004)

Grigal, D.F., Bates, P.C, and R.K. Kolka. (*in press*). Ecosystem C storage and flux in upland/peatland watersheds in northern Minnesota. Ch. 9 in Peatland Biogeochemistry and Watershed Hydrology at the Marcell Experimental Forest. CRC Press, Inc. 518 pp.

Bates, P.C. and Rob Lamb. 2008. Forest stewardship plan for the Waynesville watershed. Available online at http://www.townofwaynesville.org/content/view/374/347/

Bates, P.C, and P. Carlson. 2004. The application of sustainable forest management in a western North Carolina watershed. In: Moore, Susan and Robert Bardon, eds. Enhancing the Southern Appalachian Forest Resource Symposium Proceedings, [CD-ROM] (2004). Available at: http://www.ncsu.edu/feop/symposium/proceedings_2003

PRESENTATIONS/ABSTRACTS AT PROFESIONAL MEETINGS (since 2004)

Bates, P.C. Review of 'ad hoc' SBR FLN monitoring. SBR Fire Learning Network, Crossnore, NC. May 20, 2010.

Bates, P.C. Review of monitoring protocols in a high elevation red oak stand. SBR Fire Learning Network, Dillard, GA. May 21, 2009.

Bates, P.C. Prescribed fire research in high-elevation red oak stands. *Field tour* for the Southeastern Hardwood Silviculture Group of the Society of American Foresters. Cold Mountain Game Lands, Haywood County, NC. April, 30, 2009.

Bates, P.C. and Dean Simon. First year results of a prescribed fire in a high elevation red oak stand. 3rd Fire in Eastern Oak Forests Conference. Carbondale, Illinois. May 20-22, 2008.

DeWald, Laura E and P.C. Bates. Field experiences for students also provides critical assistance for family landowners in the southern Appalachians. 7th Biennial Conference of University Teaching in Natural Resources. Corvallis, Oregon. March 13-15, 2008.

Bates, P.C., Dean Simon, and Rob Lamb. Interim results for a prescribed fire in a high-elevation red oak stand. SBR Fire Learning Network, June 17, 2008, Asheville, NC.

Bates, P.C., John Hagan, Jerry Miller, and Tom Martin. Developing forest sustainability indicators for a southern Appalachian watershed. National Convention of the Society of American Foresters. Portland, Oregon. October 23-27, 2007.

Mozeley, Jennifer, Kevin Griffin, Mason Phillippi, John Austin, and P.C. Bates. Evaluating crop tree release treatments in southern Appalachian coppice stands. National Convention of the Society of American Foresters. Portland, Oregon. October 23-27, 2007.

VanDenabeele, Weston, Erin Beck, Brad Elliott, and P.C. Bates. Deer effects on forest regeneration in western North Carolina. National Convention of the Society of American Foresters. Portland, Oregon. October 23-27, 2007.

Bates, P.C. and R. I. Lamb. The Western Carolina Forest Sustainability Initiative (and field tour). NC Division of the Society of American Foresters Annual Meeting. Balsam, North Carolina. June 7, 2007.

Bates, P.C., S. Rabby, J. Slagle, and D. Evans. Vegetative competition effects on planted black cherry seedlings in southern Appalachian clearcuts. Society of American Foresters National Convention. Fort Worth, Texas. October 19-23, 2005.

GRANTS AND AWARDS (since 2004)

2010. Land Trust for the Little Tennessee. Restoring Open Woodland Habitats Through Implementation of Prescribed Fire and Invasive Exotic Plant Control Surrounding the Nantahala National Forest. *Source:* The National Forest Foundation. **Amount funded: $40,000.**

2010. Bates, P.C. Characterization of preburn stand conditions in the Southern Blue Ridge. *Source:* The Nature Conservancy. **Amount funded: $24,000.**

2009. Bates, P.C. and Rob Lamb. Continuation of the design and implementation of forest stewardship activities in the Waynesville watershed. *Source:* The Town of Waynesville. **Amount funded: $24,000**.

2009. Bates, P.C. Characterization of preburn stand conditions at Cold Mountain (Haywood County, NC), Bluff Mountain (Ashe County, NC), and Yellow Creek (Graham County, NC). *Source:* The Nature Conservancy. **Amount funded: $6000.**

2008. Bates, P.C. and Rob Lamb. Continuation of the design and implementation of sustainable forest management practices at the Balsam Mountain Preserve. *Source:* Balsam Mountain Trust. **Amount Funded $10,087**.

2008. Lamb, Rob and P.C. Bates. Implementation of forest restoration treatments on the Gibson Bottoms tract in Macon County, NC. *Source:* The Land Trust for the Little Tennessee. **Amount funded: $4618**.

2008. Bates, P.C., Beverly Collins, and Rob Lamb. Assessment of the impacts of a prescribed burn on forest regeneration and the herbaceous plant community on the Cold Mountain Gamelands. *Source*: The Nature Conservancy. **Amount funded: $2500.**

2008. Bates, P.C. and Rob Lamb. Implementation and promotion of prescribed fire as a habitat restoration tool in Macon and Graham Counties, NC. *Source*: The Land Trust for the Little Tennessee **Amount funded $5324**.

2008. Bates, P.C. and Rob Lamb. Continuation of the design and implementation of forest stewardship activities in the Waynesville watershed. *Source:* Town of Waynesville, NC. **Amount funded $24,000**. *Funding awarded to Forest Stewards, Inc.*

2007. Bates, P.C. and R. Lamb. Assessment of Forest Condition on the Yellow Creek Conservation Lands. *Source:* Land Trust for the Little Tennessee. **Amount Funded: $4213**.

2006. Bates, P.C., J. Brown, N. Christensen, M. Lord, T. Martin, and J. Miller. Development of a detailed forest management plan for the Waynesville watershed. *Source:* Town of Waynesville. Amount requested: $50,000. **Amount Funded: $50,000.**

2006. Carlson, P.C, D.D. Desmond, and P.C. Bates, The western Carolina community forestry project. A collaborative proposal submitted by the Land Trust for the Little Tennessee in partnership with Western Carolina University. National Forest Foundation and Home Depot Foundation. **Amount funded: $35,000.**

2005. Bates. P.C. Continued development of sustainable forest management opportunities in the Balsam Mountain Preserve. *Source:* Balsam Mountain Trust. **Amount Funded $12,700.**

2005. Bates, P.C. Development of a timber inventory and preliminary forest management plan for the Fisher Creek watershed. *Source:* Town of Sylva. **Amount funded: $3000.**

2005. Bates. P.C. Forest stewardship support for western North Carolina Landowners. Source: Duke University Nicholas School of the Environment and Earth Sciences. **Amount Funded: $14,500.**

2005. Bates, P.C. Timber stand assessment in the proposed Balsam Gap Property Conservation Easement along the Blue Ridge Parkway. *Source:* The Conservation Fund. **Amount funded: $5000.**

2004. Boner, R.R. Southern Appalachian Wildlife Conservation Initiative. A collaborative proposal submitted by The Conservation Fund in partnership with Western Carolina University and the Land Trust of the Little Tennessee. *Source:* Doris Duke Charitable Foundation. **Amount funded: $1.5 million.**

2004. Bates, P.C. Establishment of a sustainable forest management demonstration area within the Balsam Mountain Preserve. *Source:* Balsam Mountain Trust. **Amount Funded: $3600.**

2004. Bates, P.C. Development of a strategic forest management plan for the Waynesville watershed. *Source:* Town of Waynesville. **Amount funded: $7000.**

SELECTED COMMITTEE SERVICE AT WCU (college level or above)
WCU/Eastern Band of the Cherokee Indian Advisory Council (2008-present)
University Task Force to study creation of a College of Science and Technology (2009)
University Research Council (2007-2009)
UNC-Tomorrow Environmental Work Group (2008)
A&S Faculty representative to Chancellor's External Performance Review (2008)
College of Arts & Sciences Tenure, Promotion, and Review Committee (2004-2007)
College of Arts & Sciences, Conditions of Faculty Employment Committee (2004-2007)
Chancellors Distinguished Teaching Award Committee (2007-2007)

SELECTED PROFESSIONAL AND REGIONAL SERVICE
Board of Directors, Balsam Mountain Trust (2010-present)
President, Board of Directors, Forest Stewards, Inc. (2008-present)
Town of Waynesville Watershed Advisory Committee (2007-present)
Balsam Mountain Trust, Land Management Committee (2007-present)
Board of Directors, Southern Forestry Foundation (2005-2009)

Phillip B. Kneller
School of Health Sciences, Environmental Health Program

EDUCATION

Master of Science - Environmental Health	
George Washington Graduate School of Arts and Sciences	1980
Bachelor of Science - Zoology	
University of Maryland	1970

PROFESSIONAL EXPERIENCE

Associate Professor, Environmental Health Program Western Carolina University	2009 - present
Director, School of Health Sciences, Western Carolina University	2007 -2009
Interim Head, Dept. of Health Sciences, Western Carolina University	2006 -2007
Acting Chair, Dept. of Health Sciences, Summer, WCU	2005 - 2006
Associate Professor, Environmental Health Program, WCU	1993 - 2007
Assistant Professor, Environmental Health Program, Illinois State University	1985 - 1993
Head of Faculty, Project HOPE, Saint Lucia	1981 - 1985
Consultant in Environmental Health to the College of Arts, Science, and Technology, Jamaica	1983
Peace Corps WHO Smallpox Eradication Program, Harrarge Province, Ethiopia	1970 - 1972

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

Grants have been received for environmental manpower training in Antiqua, nutrition officer training in Saint Lucia, resource recovery and solid waste management, Diamond Star Motors, a development education grant on third world poverty, a study on ozone levels and hospital admissions, a large EPA funded grant on the health effects of ozone and particulate matter on hikers in the Smokey Mountain National Park, and a Asthma/Indoor Air Quality workshop travel grant. Publications include articles on sanitation controls in vending machines, personal cup use in vending machines, aquaculture and mobile fish processing, and the impacts of food service certification.

RELEVANT COURSES TAUGHT

Environmental Health Science: Systems and Solutions, (General Education Course)
Introduction and Approaches to Environmental Science
Introduction to Environmental Health
Residential and Institutional Hygiene
Food Sanitation and Protection
Environmental Health Practices
Air Quality Control
Industrial Hygiene
Environmental Regulation and Law
Senior Seminar in Environmental Health

PUBLICATIONS AND SCHOLARLY ACTIVITIES

Abstract- Integration of Mosquito Ecology Laboratory Exercises into Biological and Environmental Health Courses, Lilly Conference on College and University Teaching at Greensboro, for February 2011

Platform Presentation- Benefits of Recruiting and Hiring Graduates from Accredited E. H. Programs, National Environmental health Association Annual Education Conference, June 9, 2010

Presentation- Conducting Risk-based Food Inspections, Mountain District North Carolina Environmental Health Association, June 3, 2009.

McGraw-Hill Publishers Art Review Panel for twenty four chapters for the proposed textbook: "This Global Environment: An Integrated Approach." January – March 2006.

McGraw-Hill Publishers three day Focus Group in Dubuque, Iowa for the proposed textbook: "This Global Environment: An Integrated Approach." June 2005.

Presentation to Superintendents of Jails in Western North Carolina on "Environmental Regulations and Concerns for County Jails." May 2004.

Presentation to Jackson County Health Department for Food Service Manager Certification on "Hazard Analysis Critical Control Points." January 1999.

Presentation to the National Education Forum for Food Safety Issues on "Certification of Foodservice Manager." March 1997.

Presentation to the Land of the Sky Regional Council on "The Health Impacts of Air Pollution." May 1996.

"Aquaculture and Mobile Fish Processing." Submitted to the Journal of Environmental Health. Published April 1993.

"Personal Cups in Hot Beverage Vending Machines." Submitted to the Dairy, Food, and Environmental Journal. Published December 1992.

"An Evaluation of the Impact of Foodservice Certification: A Retrospective Study." Submitted to the Journal of Environmental Health, Published March - April 1990.

"Sanitation Controls for Cold Cup Soft Drink Vending Machines." Submitted to the Dairy, Food, and Environmental Sanitation Journal. Published August 1990.

PROPOSALS AND GRANTS:

"A Study of the Correlation of Ozone Levels to Hospital Admission Rates for Respiratory and Cardiovascular Illness." Funded by the Environmental and Natural Resources Offices for the Eastern Band of Cherokee Indians, 2006.Total funds: $41,349

"Asthma/Indoor Air Quality Workshop Travel Grant." Funded by the U.S. Environmental Protection Agency and the National Environmental Health Association, 2002. Total funds: $717

"Great Smoky Mountains National Park Hiker Health, Air Quality and Traffic Congestion Study." United States Environmental Protection Agency, 2002. Total funds: $163,000

"Dispersion Modeling - State Permits and Title III." Funded by Western Carolina Faculty Center for Teaching Excellence and the College of Applied Sciences, 1995. Total funds: $951

"Carolina Environmental Law - Teaching Improvement Micro Grant." Funded by the Western Carolina Faculty center for Teaching Excellence and the College of Applied Sciences, 1993. Total funds:$689

"Personal Cups in Hot Beverage Vending Machines." Funded by the National Automatic Merchandising Association, 1992. Total funds $1,000

"Third World Poverty: Reality and Response," a development education grant. Funded by the Society for International Development - U.S.A., 1990. Total funds: $4,800

"Development of Mobile Fish Processing Unit," Funded by the Pride of the Prairie Aqua Foods, Inc. 1990. Total funds: $4,000

"A Review of Sanitation Controls for Cup Dispensing Soft Drink Vending Machines." Funded by the National Automatic Merchandising Association, 1989. Total funds: $5,000

"Evaluation of Foodservice Certification." Funded by the Illinois Environmental Health Association and Illinois State University, 1988. Total funds: $818

"Resource Recovery - Solid Waste Management, Diamond Star Motors," Funded by the Community Action Agency, 1988. Total funds: $1,250

"Nutrition Officer Training," St. Lucia. Funded by USAID, 1984. Total funds:$24,385

"Environmental Health Manpower Training," Antigua. Funded by USAID, 1983.Total funds: $21,250

ACADEMIC AND PROFESSIONAL HONORS

Diplomat Status, American Academy of Sanitarians – 1991 to present

Spirit of Environmental Health Award, The Association of Environmental Health Academic Programs – 2005 - 06

Certificate of Appreciation, The Student Environmental Health Association, Western Carolina University, 2004

Excellence in Teaching Award, Department of Health Sciences – 2002-2003

Certificate of Appreciation, The Student Environmental Health Association, Illinois State University, Normal, Illinois - 1989

Certificate of Appreciation, the People-to-People Health Foundation, (Project HOPE), Millwood, Virginia - 1987

Registered Sanitarian, National Environmental Health Association 1987

Registered Sanitarian, Maryland - 1983

Valuable Service Award, Smallpox Eradication Program, Ministry of Health, Ethiopia - 1972

SELECTED COMMITTEE SERVICE AT WCU

University:

Chancellor's Steering Committee

Western Carolina University Mentoring Program

Council on Internal and External Affairs

Vice - Chancellor's Instructional Improvement Grant Committee

Council of Student Affairs - Chair

Committee on Nominations, Elections, Committees, and Councils - Chair

Admissions, Readmissions, and Retention Committee

General Education Committee

University Program Review Committee

Committee on Environmental Science/Studies
Search Committee for a Program Coordinator Environmental Sciences Program
SACS Compliance Committee
College:
Faculty Senate - College of Applied Sciences
Search Committee for the Dean of the College of Applied Sciences
Search Committee for the Dean of the College of Health and Human Sciences
College Tenure, Promotion, and Reappointment Committee
School:
Director, School of Health Sciences
Committee on Tenure, Promotion, and Reappointment
Post Tenure Review Committee
Search Committee for a Program Director of Health Information Management
Search Committee for a Program Director of Nutrition and Dietetics
Search Committee for a Chair of the Department of Health Sciences
Search Committee for a faculty member Environmental Health Sciences Program
Clinical Laboratory Science Admissions Committee

SELECTED PROFESSIONAL & REGIONAL SERVICE

Member of the Board for the Association of Environmental Health Academic Programs
Member of the National Environmental Health Science Accreditation Council
Chair - International Committee for the National Environmental Health Science Accreditation Council
Academic Site Visitor for the National Environmental Health Science Accreditation Council
Treasurer and member of the Western Carolina University Chapter of the Phi Beta Delta Society of International Scholars
Member of the North Carolina State of Practice subcommittee on food protection
Member of the American Public Health Association committee on food protection
Member of the Illinois Environmental Health Association Board of Directors
President of the Bloomington Chapter for the Society of International Development
President of the Illinois Heartland Chapter of Returned Peace Corps Volunteers

MARK L. LORD
Department of Geosciences and Natural Resources; Phone: (828) 227-2271; E-mail: mlord@wcu.edu

EDUCATION

Ph.D. University of North Dakota, Geology 1988
Dissertation: Sedimentology and stratigraphy of glacial lake Souris, North Dakota: effects of a glacial-lake outburst
Advisor: Alan E. Kehew, Western Michigan University

M.S. University of North Dakota, Geology 1984
Thesis: Paleohydraulics of Pleistocene drainage development of the Souris, Des Lacs, and Moose Mountain spillways, Saskatchewan and North Dakota
Advisor: Alan E. Kehew, Western Michigan University

B.S. State University of New York College at Cortland, Geology; Honors 1981

PROFESSIONAL EXPERIENCE

2006-Present Department. Head, Department of Geosciences and Natural Resources, Western Carolina University
1998-Present: Professor of Geology (Assistant 98-03, Associate 03-08), Department of Geosciences and Natural Resources Management, Western Carolina University
1995-1998: Co-Director and Co-Founder, French Creek Environmental Education Project (FCEEP), Meadville, Pennsylvania. The FCEEP was a hands-on, investigative, natural science education outreach program which partnered college and precollege students in a holistic study of a watershed *(FCEEP program enlarged; now named Creek Connections)*
1990-1998: Assistant Professor of Geology, Department of Geology, Allegheny College
1988-1990: Assistant Professor of Earth Science, University Arkansas at Little Rock
1987: Geologist (part-time), North Dakota Geological Survey

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTERESTS

My areas of expertise are in the general realm of hydrogeology and geomorphology. More specifically, I am an environmental hydrogeologist; I study problems of hydrology in the context of the geologic setting and history that have relevance to understanding the potential role of humans in environmental systems. My current research projects, all which involve students, examine the interaction of groundwater in surface water in different geologic settings, both in the Southern Appalachians and in alpine meadows in Nevada. In addition, I pursue scholarship related to understanding the educational benefits of undergraduate research.

COLLEGE COURSES TAUGHT (last 5 years)

Geol 405/505 Hydrogeology
Geol 305 Soils and Hydrology
Geol 140 Environmental Geology
EnvSci 150 Environmental Science

Geol 302 Geomorphology
Geol 150 Methods in Geology (aka Physical)
Geol 495 Seminar: Research in Hydrology
Geol 491 Topics: Smoky Mountains Field Trip
Geol 491 Topics: Ancient Sedimentary Environ. Field Trip

PUBLICATIONS (since 2004, students underlined)

Published, in press or accepted

Lord, M.L., Jewett, D.G., Miller, J.R., Germanoski, D., and Chambers, J.C., (accepted, exp. pub. March 2011), Hydrologic Processes influencing Meadow Ecosystems, Chapter 4: *In* Chambers, J.C., Miller, J.R., eds. Geomorphology, hydrology and ecology of Great Basin meadow complexes-implications for management and restoration. Gen. Tech. Rep. RMRS-GTR-###. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. (~41 p + figs).

Miller, J.R., **Lord, M.L.,** and Germanoski, D., (accepted, exp. pub. fall 2010), Meadow Sensitivity to natural and anthropogenic disturbance, Chapter 5: *In* Chambers, J.C., Miller, J.R., eds. Geomorphology, hydrology and ecology of Great Basin meadow complexes-implications for management and restoration. Gen. Tech. Rep. RMRS-GTR-###. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. (~44 p + figs).

Trowbridge, W., Chambers, J.C., Germanoski, D**., Lord, M.L**., Miller, J.R.; and Jewett, D.G., in press, Characterization of Meadow Ecosystems Based on Watershed and Valley Segment/Reach Characteristics, Chapter 7: *In* Chambers, J.C., Miller, J.R., eds. Geomorphology, hydrology and ecology of Great Basin meadow complexes-implications for management and restoration. Gen. Tech. Rep. RMRS-GTR-###. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Kehew, A.E., **Lord, M.L.,** and Kozlowski, A.L., expected publ. 2011, Glacifluvial Landforms of Erosion, *In* Scott A. Elias, Editor-in-Chief, Encyclopedia of Quaternary Science, 2nd edition, Elsevier B.V., Amsterdam.

Lord, M.L., Germanoski, D., and Allmendinger, N.E., 2009, Fluvial geomorphology: Monitoring streams systems in response to a changing environment, in Young, R., and Norby, L., Geological Monitoring: Boulder, Colorado, Geological Society of America, p. 67–101.

Kehew, A.E., **Lord, M.L.,** Kozlowski, A.L., and Fisher, T., 2009, Proglacial megaflooding along the margins of the Laurentide Ice Sheet, *In* Burr, D.M., Baker, V.R., and Carling, P.A., eds., Megaflooding on Earth and Mars: Cambridge University Press, p. 104-127.

Kehew, A.E. and **Lord, M.L.,** Oct. 2009, Catastrophic glacial-lake outburst spillways: form and process relationships, (part of a group of online vignettes to supplement new text, Key Concepts of Geomorphology by Bierman, P. and Montgomery, D. 2009, supported by an NSF program). http://serc.carleton.edu/vignettes/collection/36631.html, (vignette was solicited and reviewed)

Kehew, A.E., **Lord, M.L.,** and Kozlowski, A.L., 2007, Glacifluvial Landforms of Erosion, *In* Scott A. Elias, Editor-in-Chief, Encyclopedia of Quaternary Science, Elsevier B.V., Amsterdam, p. 818-831.

Peterson, V., **Lord, M.L**., and Vandervoort, K., 2007, Establishment of an investigative curricular approach across the geology and physics programs at Western Carolina University and implementation at other institutions, *In* Karukstis, K.K. and Elgren, T.E., editors, Developing and sustaining a research-supportive curriculum: a compendium of successful practices, Council on Undergraduate Research, p. 425-448.

Bluemle, J.P., **Lord, M.L**., and Hunke, N.T., 2006, Exceptionally long, narrow drumlins—the Hogback Ridge, in Manz, L.A., editor, Quaternary Geology of the Missouri River valley and adjacent areas in northwest-central North Dakota: 52nd Midwestern Friends of the Pleistocene Field Conference, June 2006, North Dakota Geological Survey, Geologic Investigations no. 24, p. 133-137.

Miller, J.R., **Lord, M.L**., Yurkovich, S., Mackin, G, and Kolenbrander, L., 2005, Historical trends in sedimentation rates and sediment provenance, Fairfield Lake, western North Carolina: Journal of American Water Resources Association, vol. 41(5), p. 1053-1075.

Jewett, David G., **Lord, Mark L**., Miller, Jerry R., and Chambers, Jeanne C., 2004, Geomorphic and hydrogeologic controls on surface and subsurface flow regimes in riparian meadow ecosystems, in Chambers, J.C. and Miller, J.R., Great Basin riparian ecosystems: ecology, management, and restoration: Society of Ecological Restoration, Island Press, Washington, p. 124-161.

Presentations/Published Abstracts at Professional Meetings (since 2004, students underlined)

Hiatt, C., Burnette, M., Roberts, W., Harrison, C., Lord, M., Kinner, D., and Campbell, T., 2011, Analysis of groundwater-surface water interaction in a headwaters stream system in the Southern Appalachians, Cullowhee, NC: Part A: Physical Setting in different hydrogeomorphic reaches: Geological Society of America Abstracts with Programs, Vol. 43.

Allen, E., MacIntyre, A., Dobyne, J., Padgett, M., Lord, M., Campbell, T., and Kinner, D., 2011, Analysis of groundwater-surface water interaction in a headwaters stream system in the Southern Appalachians, Cullowhee, NC: Part B: Hydrogeology in different hydrogeomorphic settings: Geological Society of America Abstracts with Programs, Vol. 43.

Lord, M.L., Miller, J.M., Villarroel, L., Germanoski, D., Mackin, G., Lechler, P., and Walsh, D., 2010, Connectivity in Hydrogeomorphic systems: Geological Society of America Abstracts with Programs, Vol. 42.

Allen, A., Tury, R., Buchanan, J., McKibben, J., Remington, K., Sills, C., **Lord, M**., Yurkovich, S., and Campbell, T., 2010, Analysis of a headwaters stream system in the southern Appalachians, Cullowhee, NC. Part A: Setting and stream geomorphology: Geological Society of America Abstracts with Programs, Vol. 42.

Walsh, D., Goad, S., Evans, S., Stainback, D., Hayes, J., **Lord, M**., Yurkovich, S., and Campbell, T., 2010, Analysis of a headwaters stream system in the southern Appalachians, Cullowhee, NC. Part B: Groundwater-stream water interaction, Geological Society of America Abstracts with Programs, Vol. 42.

Lord, M., Miller, J., Germanoski, D., Villarroel, L., Tury, R., Walsh, D., and Chambers, J., 2009, Do reach-scale geomorphically defined process zones predict sensitivity of channel systems and hydrologic processes in the mountains of the central Great Basin?: Geological Society of America Abstracts with Programs, Vol. 41.

Germanoski, D., Miller, J., **Lord, M**., Jewett, D., Chambers, J., and Trowbridge, W., 2009, Geomorphic and hydrogeological controls on the distribution of wet meadows in the central Great Basin: Geological Society of America Abstracts with Programs, Vol. 41.

Peterson, Virginia.L., and **Lord, Mark.L**., (invited) 2008, Intentional Development of Research Skills as a Framework for Curriculum Reform: American Geophysical Union Proceedings, Dec. 2008.

Tennant, Christopher, **Lord, Mark**, and Miller, Jerry, 2008, Hydrological and meteorological controls on water quality, Allens Creek, North Carolina: Geological Society of America Abstracts with Programs, Vol. 40.

Miller, Jerry; Kochel, R. Craig; and **Lord, Mark,** 2007, Effectiveness and use of in-stream structures in river restoration in North Carolina: Abstracts of North American Benthological Society 55th Annual Meeting, Columbia, SC.

Baker, G.S., Sturtevant, K.A., **Lord, M**., Miller, J., Jewett, D., Germanoski, D., and Chambers, J., 2007, Utilizing multiple geophysical techniques to analyze hydrologic controls on riparian meadow complexes in the central Great Basin, NV; Geological Society of America Abstracts with Programs, Vol. 39, no. 6.

Germanoski, D., Miller, J., **Lord, M**., Jewett, D., Chambers, J., Trowbridge, W., Sturtevant, K., and Baker, G., 2007, Geomorphic Controls on Meadow Ecosystems – Watershed scale processes: Abstract Volume, Annual Meeting of the Society for Range Management, Reno, Nevada.

Sturtevant, K., Baker, G., **Lord, M**., Miller, J., Jewett, D., Germanoski, D., and Chambers, J., 2007, Geomorphic Controls on Meadow Ecosystems – Insights into Local Processes Using Near-surface Seismology and Ground Penetrating Radar: Abstract Volume, Annual Meeting of the Society for Range Management, Reno, Nevada.

Sturtevant, K., Baker, G., **Lord**, **M.,** Miller, J., Jewett, D., Germanoski, D., and Chambers, J., 2007, Combining seismic and ground penetrating radar techniques to analyze geologic controls of riparian meadow complexes in the central Great Basin, Nevada USA: Symposium on the Application of Geophysics to Environmental and Engineering Problems, Proceedings, Denver, Colorado.

Lord, M., Jewett, D., Miller, J., Germanoski, D., Chambers, J., Sturtevant, K., and Baker, G., 2007, Hydrology of central Great Basin Meadow Ecosystems – Effects of Stream Incision: Abstract Volume, Annual Meeting of the Society for Range Management, Reno, Nevada.

Chambers, J., Trowbridge, W., Jewett, D., **Lord, M**., Germanoski, D., Miller, J., Sturtevant, K., and Baker, G., 2007, Relationships of Meadow Vegetation to Groundwater Depth: Effects of Precipitation Variability and Stream Incision: Abstract Volume, Annual Meeting of the Society for Range Management, Reno, Nevada.

Miller, J., Germanoski, D., **Lord, M**., Jewett, D., Chambers, J., Trowbridge, W., Sturtevant, K., and Baker, G., 2007, Utilization of In-stream Structures for Wet Meadow Stabilization in the Central Great Basin: A Process Oriented Approach: Abstract Volume, Annual Meeting of the Society for Range Management, Reno, Nevada.

Sturtevant, K., Baker, G., **Lord, M**., Miller, J., Jewett, D., Germanoski, D., and Chambers, J., 2006, Analyzing geologic controls of riparian meadow complexes using multiple geophysical techniques in the central Great Basin, NV: Geological Society of America Abstracts with Programs, Vol. 38.

Miller, J.R., Kochel, R.C., **Lord, M.L**., and Martin, T., Limitations of the use of in-stream structures in stream restoration projects in North Carolina: Geological Society of America Abstracts with Programs, Vol. 38.

Trowbridge, W., Chambers, J., Germanoski, D., **Lord, M**., Jewett, D., Miller, J., and Baker, G., 2006, Meadow formation and degradation in the Central Great Basin: Abstracts volume, Annual Meeting of Ecological Society of America, Memphis, TN.

Jewett, D.G., Chambers, J.C., Trowbridge, W.B., Germanoski, D., **Lord, M.L.**, Miller, J.R., and Baker, G.S., 2006, Managing and Restoring Upland Riparian Meadows in the Central Great Basin: Abstracts, 2006 Great Basin Collaborative Watershed and Research Workshop, Reno, NV.

Yurkovich, S.P., and **Lord, M.L**., 2006, Designing a curriculum around undergraduate research: Geological Society of America Abstracts with Programs Vol. 38.

Sturtevant, K., Baker, G., **Lord, M.L**., Miller, J.R., Germanoski, D., and Chambers, J., 2006, Utilizing multiple geophysical techniques to analyze bedrock geometry and sedimentologic controls on riparian meadow complexes in the central Great Basin, Nevada: Geological Society of America Abstracts with Programs Vol. 38.

Tennant, C., Morgan, V., Means, C., **Lord, M.L**., Jewett, D.G., and GBEMP Research Group, 2006, Hydrogeologic setting and characteristics of riparian meadow complexes in the mountains of central Nevada: a case study: Geological Society of America Abstracts with Programs Vol. 38.

Jackson, B., Means, C., Morgan, V., Perkinson, P., Sheehan, T., Tennant, C., and **Lord, M.L**., 2006, Analysis and development of a monitoring proposal for the potential removal of a low-head dam: a case study of the Dillsboro Dam, western North Carolina: Geological Society of America Abstracts with Programs Vol. 38.

Kochel, R.C., Miller, J.R., **Lord, M.L**., and Martin, T., 2005, Geomorphic problems with in-stream structures using natural channel design strategy for stream restoration projects in North Carolina: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Lord, M.L., Allmendinger, N.E., Waters-Tormey, C., Caldwell, E., and Yurkovich, S., 2005, Stream restoration: a course runs through it: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Beck, F., Clark, P. **Lord, M.L**., and Jewett, D.G., 2005, Subsurface characterization of upland riparian meadows in central Nevada using an innovative direct-push exploration rig: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Chambers, J.C., Jewett, D.J., **Lord, M.L**., Miller, J.R., and Germanoski, D., 2005, Relationships among geomorphology, hydrology and vegetation in riparian meadows: restoration implications: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Germanoski, D., Miller, J.R., **Lord, M.L**., Jewett, D.G., Chambers, J.C., Baker, G., and Bergman, J., 2005, Reach specific channel stabilization based on comprehensive evaluation of valley fill history, alluvial architecture and groundwater hydrology in a mountain stream in the central Great Basin, Nevada: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Jewett, D.G., Chambers, J.C., Miller, J.R., **Lord, M.L**., Germanoski, D., and Baker, G.S., 2005, An integrated, science-based approach to managing and restoring upland riparian meadows in the Great Basin of central Nevada: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Lord, M.L., Jewett, D.G., Miller, J.R., Germanoski, D., Baker, G., and Chambers, J., 2005, Hydrogeomorphic setting, characteristics, and response to stream incision of montane riparian meadows in the central Great Basin—implications for restoration: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Sturtevant, K., Baker, G., **Lord, M.L**., Miller, J.R., Jewett, D., and Germanoski, D., 2005, Integrating geophysics, geology, and hydrogeology to determine bedrock geometry controls on the origin of isolated meadow complexes within the central Great Basin, Nevada: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Trowbridge, W.B., Germanoski, D., **Lord, M.L**., Jewett, D., Baker, G., and Chambers, J., 2005, An interdisciplinary approach to riparian meadow characterization and prioritization, central Great Basin: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Allmendinger, N., **Lord, M.L**., and Germanoski, D., 2005, A three-tiered system for monitoring fluvial systems: Geological Society of America Abstracts with Programs Vol. 37, No. 7.

Jewett, David, Jerry Miller, **Mark Lord**, Dru Germanoski, and Greg Baker. 2004. Hydrologic, Geomorphic, and Vegetation Studies in Support of BMP Selection and Implementation in Rapidly Degrading Upland Watersheds in central Nevada. Best management practices conference, sponsored by the EPA, Arlington, VA, 13-15 April 2004.

Peterson, Virginia; **Lord, Mark**; and Vandervoort, Kurt; April 2004, Cullowhee Creek Environmental Field Station, National Science Foundation Workshop on CCLI projects.

Germanoski, D., Miller, J., Jewett, D., **Lord, M**., Chambers, J. and Bergman, J., 2004, The importance of alluvial valley history on modern channel instability and reach-specific restoration: Geological Society of America Abstracts with Programs, v.36, no.2.

GRANTS AND AWARDS (SELECTED, last 5 years**)**

2010 Testing the Benefits of Undergraduate Research-Based Learning at Various Curricular Levels Using Authentic Research Questions in Hydrogeomorphology. National Science Foundation: Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics Program, David Kinner and Mark Lord, amount requested $199,099, **pending**.

2010 Establishment Western Carolina University property as a State Hydrologic Research Station, focused on groundwater-surface water interaction: North Carolina Department of Environment and Natural Resources, Resource Evaluation Program, in kind, 41 groundwater wells installed at three sites along Cullowhee Creek – Long Branch drainages. (estimated funding exceeds $100 K).

2009 Development of effective monitoring protocols for collection and interpretation of water quality data in western North Carolina. North Carolina Water Resources Research Institute: Jerry Miller and Mark Lord, amount requested, $49,186. **Not funded**.

2009 Collaborative Research: Influence of Process Zone Structure and Connectivity on Sediment Sources, Transport, and Storage, Mkabela Catchment, South Africa: National Science Foundation: Division of Earth Sciences—Geomorphology Program, Jerry Miller and Mark Lord, amount requested $173,219, **not funded**.

2008 Basin Sensitivity Analysis in the Great Basin of Nevada: Expansion of an Existing Process-Based Classification Systems Modification IV, USDA NRE Forest Service: Jerry Miller and Mark Lord, amount **awarded**, $20,000.

2007 Basin Sensitivity Analysis in the Great Basin of Nevada: Expansion of an Existing Process-Based Classification Systems Modification III, USDA NRE Forest Service: Jerry Miller and Mark Lord, amount **awarded**, $9,768.

2007 Basin Sensitivity Analysis in the Great Basin of Nevada: Expansion of an Existing Process-Based Classification Systems Modification II, USDA NRE Forest Service: Jerry Miller and Mark Lord, amount **awarded**, $25,000.

2007 Basin Sensitivity Analysis in the Great Basin of Nevada: Expansion of an Existing Process-Based Classification Systems Modification I, USDA NRE Forest Service: Jerry Miller and Mark Lord, amount **awarded**, $41,000.

2007 Determination of sediment sources and transport pathways, Mgeni and Berg Catchments, South Africa, National Science Foundation--International Travel Grant: Jerry Miller, Dave Kinner, Mark Lord (participated through match funds), amount **awarded**, $13,559

2006 Basin Sensitivity Analysis in the Great Basin of Nevada: Expansion of an Existing Process-Based Classification Systems, USDA NRE Forest Service: Jerry Miller and Mark Lord, amount **awarded**, $65,000.

2006 March, Miller, Jerry, and Lord, Mark, Water Quality Monitoring Program, Allens Creek Town of Waynesville, NC, amount **awarded** $30,000.

2006 March, Supplemental Grant for Geomorphic, Hydrologic and Vegetation Interactions Related to Meadow Complexes in the Central Great Basin – Implications for Restoration, U.S. Forest Service Contract, Mark Lord and Jerry Miller, amount **awarded** $9,000.

2006 July, Lord, Mark, and Miller, Jerry, Proposal for Developing a Water Quality Monitoring Plan for potential implementation of a Forest Management Plan, *in* Bates, Peter (lead PI), Proposal to develop a forest management plan for the Waynesville Watershed, Town of Waynesville, NC, amount **awarded** for Water Quality component ~$7,000.

2005 June, Geomorphic, Hydrologic and Vegetation Interactions Related to Meadow Complexes in the Central Great Basin – Implications for Restoration, Phase III, EPA Ecosystem funding through the U.S. Forest Service Contract, Mark Lord and Jerry Miller, amount **awarded** $51,183.

2005 Monitoring of Cullowhee Creek Restoration Project, Monitoring program for the Cullowhee Creek restoration, Mountaintop Land Development Company. Larry Kolenbrander, Jerry Miller, Mark Lord, Tom Martin, amount **awarded** $27,000.

EDUCATION AWARDS & NOMINATIONS

Chancellor's Meritorious Award for Engaged Teaching, **2007-2008**, WCU

Nominated for College of Arts and Sciences Teaching Award, WCU, for the **2001-02, 2002-03**, **2003-04, 2004-05** academic years; I did not to pursue consideration for the award.

Governor's Award for Environmental Excellence in Education & Outreach, The French Creek Environmental Education Project, State of Pennsylvania, Fall **1998**.

A Pledge and a Promise Environmental Award, Anheuser-Busch, The French Creek Environmental Education Project, April **1997**, Finalist, 3rd Place, $2,500 Award.

Conservation Educator of the Year-General, Pennsylvania Wildlife Federation, **1997**.

Excellence in Education, CNG Foundation Award, Consolidated Natural Gas Company, The French Creek Environmental Education Project, 1 of 7 Finalist for $100,000 award, **1996**.

SELECTED SERVICE (since 2004**)**

Western Carolina University

2009-present, University Strategic Planning Council
2009 Dean's Evaluation Task Force, University
2008-present, Tenure and Promotion Committee, College of Arts & Sciences
2008-2009, Ad hoc leadership group to work with administration to enhance and formalize use of WCU outdoor spaces for instruction and research.
2008-present, GNR Recruiting and Retention Committee
2007-2008, Strategic Planning Committee, College of Arts & Sciences
2007-present, University Committee to Institutionalize Undergraduate Research and Creative Scholarship
2007-2008, Curriculum Committee, College of Arts & Sciences
2006-present, Department Heads Council, University
2006-present, Chair, Secondary Science Education Advisory Committee, WCU
2006, Sciences & Mathematics Advisory Committee, College of Arts & Sciences
2005-2006, Dean's Advisory Board, College of Arts & Sciences
2005-2007, GNRM Committee A: Faculty Affairs
2003-2006, Fall to present, Cullowhee Creek Stream Restoration Committee, University ad hoc
2003- present, Executive Committee, Environmental Science Program
1999-2002 Environmental Science Degree Planning Committee

Regional & Professional Service (selected, since 2004)

2010-present, Jackson County Water Resources Board, Vice Chair
2008-2009 Jackson County Water Task Force, Appointed by Provost to represent WCU.
High School Science Teacher Dialogue, WCU, Oct. 2008, One-day meeting/conversation arranged with about 35 high school science teachers from the mountain areas of North Carolina. Three goals of conversation: 1) review of College Science Education curriculum, 2) recruiting and retention of science educators, and 3) how to improve partnership between schools and WCU. Dialogue developed with Kefyn Catley, Mark Lord, and other faculty on the science education committee, and in collaboration with CEAP.
Water Quality Issues in Western North Carolina Round Table, May 2008, At WCU, sponsored by the newly formed Institute or Watershed Research and Management—a largely GNR initiative (about two dozen people from wide variety of agencies and NGOs).
2006 – present, member of reference group on Modelling non-point source water pollution, South Africa Water Resources Committee, meets for one 2-day meeting per year.

Beverly Collins
Department of Biology; Phone: (828) 227-3663; E-mail: collinsb@wcu.edu

EDUCATION

Ph.D., Rutgers University	1985
Dissertation: "Herb layer response to experimental canopy gaps"	
M.S., Rutgers University	1979
Thesis: "Displacement of *Andropogon scoparius* by the successional shrub *Myrica pensylvanica*"	
B.S., University of Kentucky	1977

PROFESSIONAL EXPERIENCE

Director, WCU Helen Patton Environmental Center	2009-present
Director, WCU Southern Appalachian Biodiversity and Ecology Center	2007-present
Associate Professor, Western Carolina University	2006-present
Graduate Faculty, Western Carolina University	2006-present
Graduate Faculty Affiliate Member, Appalachian St. U.	2006-2007
Adjunct Professor, University of Memphis	2004-2009
Associate Research Ecologist, Savannah River Ecology Lab, U. Georgia	1993-2006
Visiting Assistant Professor, U. Georgia, Winter term	1993-1994
Assistant Professor, Biology, Memphis State University	1988-1993
Labwide Postdoctoral Fellowship, Savannah River Ecology Lab	1985-1988

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

My area of expertise is plant ecology. My research seeks to answer questions about "how plant communities are put together" and "what causes them to change over time" especially as applied to ecosystem management, restoration, and conservation. Current research with students at WCU includes the foraging habitat of the federally endangered Carolina northern flying squirrel; the role of native ferns in remediating arsenic contaminated soil; and ecology of high elevation rock outcrop plant communities.

RELEVANT COURSES TAUGHT (since coming to WCU in 2006)

Flora of the Southern Appalachians. (co-taught with Kathy Mathews)
Methods in Ecology and Evolution (co-taught with Joe Pechmann)
Physiological and Ecosystem Ecology (undergraduate, graduate)
General Ecology (co-taught with Joe Pechmann, 2009)
Advanced Methods in Ecology (graduate, co-taught with Joe Pechmann)
General Biology – 141, Diversity; 241 Ecology and Evolution
Community and Landscape Ecology (undergraduate, graduate)
Ecology in Fiction and Film (co-taught with Deidre Elliot)
Coadaptation Biology (undergraduate, graduate)
Summer Ventures, Mathematical Biology (high school students, co-taught with Erin McNelis)
Terrestrial Ecology (undergraduate, graduate)
Community and Landscape Ecology (graduate, undergraduate)

PUBLICATIONS (since 2004, students and postdocs underlined)

Greenberg, C., **B. Collins**, and F. R. Thompson. In press. Sustaining young forest communities – Ecology and management of early successional habitat in the US central hardwood region. In press - Springer

Griep, M. T. and **B. Collins**. In press. Chapter X, Wildlife and forest communities. In: D. Wear and J. Greis (eds) Southern Forest Futures Assessment. USDA Forest Service, Southern Research Station.

Pittillo, J. Dan and **Beverly Collins**. 2010. Flowering phenology: trends over 32 years in a common garden. Southeastern Naturalist 9:837-846.

Collins, B., T. M. Schuler, W.M. Ford, and D.Hawkins. 2010. Stand dynamics of relict red spruce in the Alarka creek headwaters. In: Rentch, James S.; Schuler, Thomas M. Proceedings from the conference on the ecology and management of high-elevation forests in the central and southern Appalachian Mountains. 2009 May 14-15; Slatyfork, WV. Gen. Tech. Rep. NRS-P-64. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 242 p.

Collins, B. and S. Foré. 2009 Genetic and demographic structure within a large population of *Echinacea laevigata* (Asteraceae). Journal of Torrey Botanical Society 136:445-456.

Kwit, C. and **B. Collins**. 2008. Native Grasses as a Management Alternative on Vegetated Closure Caps. Environmental Management 41:929-936.

Collins, B. and L. Battaglia. 2008. Oak regeneration in southeastern bottomland hardwood forest. Forest Ecology and Management 255:3036-3054.

Collins, B., P. Hyatt, and M. Trani. 2007. Relationships of mammals to vegetative communities. Chapter 3, The Land Manager's Guide to Mammals of the Southeastern United States. M. K. Trani, W. M. Ford, and B. R. Chapman, eds. The Nature Conservancy, Southeastern Region, Durham, NC. 546pp.

Schnurr, J. and **B. Collins**. 2007. Influences on oak and pine establishment with time-since-fire in sandhills longleaf pine forests. Southeastern Naturalist 6:523-534.

Dilustro, J., **B. Collins** and L. Duncan. 2006. Land use history effects in mixed pine hardwood forests at Fort Benning. Journal of Torrey Botanical Society 133:460-467.

Battaglia, L. and **B. Collins**. 2006. Linking hydroperiod and vegetation response in Carolina Bay wetlands. Plant Ecology 184: 173-185.

Collins, B., P. Minchin, J. Dilustro, and L. Duncan. 2006. Land use effects on groundlayer composition and regeneration of mixed pine hardwood forests in the Fall Line Sandhills, S.E. USA. Forest Ecology and Management 226:181-188.

Collins, B., R. Sharitz, K. Madden, and J. Dilustro. 2006. Comparison of sandhills and mixed pine hardwood communities at Fort Benning, Georgia. Southeastern Naturalist 5(1):92-102.

Holladay, C.-A., C. Kwit, and **B. Collins**. 2006. Woody regeneration in and around aging southern bottomland hardwood forest gaps: effects of herbivory and gap size. Forest Ecology and Management 223:218-225.

Lejeunesse, S. J. J. Dilustro, R. R. Sharitz, and **B. S. Collins**. 2006. Ground layer carbon and nitrogen cycling and legume nitrogen inputs in a frequently burned mixed pine forest. American Journal of Botany 93: 84-93.

Collins, B. S., R. R. Sharitz, and D. P. Coughlin. 2005. Elemental composition of native wetland plants in constructed mesocosm treatment wetlands. Bioresource Technology 96:937-948.

Dilustro, J.J., **B. Collins**, L. Duncan, and C. Crawford. 2005. Moisture and soil texture effects on soil CO_2 efflux components in southeastern mixed pine forests. Forest Ecology and Management. 204:85-95.

Battaglia, L. **B. Collins**, and R. Sharitz. 2004. Do regeneration strategies of bottomland hardwoods predict field distributions? Forest Ecology and Management 198:15-30.

Collins, B., J V. McArthur, and R. R. Sharitz. 2004. Plant effects on microbial assemblages and remediation of acidic coal pile runoff in mesocosm treatment wetlands. Ecological Engineering 23:107-115.

Battaglia, L., **B. Collins**, and P. Weisenhorn. 2004. Regeneration in bottomland forests: recruitment and persistence of *Quercus michauxii* in and around aging canopy gaps. Can. J. For. Res. 34:1359-1364.

PRESENTATIONS/ABSTRACTS AT PROFESSIONAL MEETINGS (10 selected, students and postdocs underlined)

Collins, B. 2010. Natural disturbance and forest structure, Ecological Restoration Panel. Southern Appalachian Man and Biosphere annual meeting, Gatlinburg, TN, November.

Bourdon, J. 2010. Location and simulated harvest/disturbance effects on the medicinal herb *Chamaelirium luteum* L. ASB annual meeting, Asheville, NC, April.

Parrish, N. and **B. Collins**. 2010. Habitat connectivity analysis of a disjunct population of the Carolina northern flying squirrel (Glaucomys sabrinus coloratus) utilizing vegetation surveys, GIS-based landscape analysis, and denaturing gradient gel electrophoresis techniques. ASB annual meeting, Asheville, NC, April.

White, P. and **B. Collins**. 2010. Natural disturbances and the sustainability of early successional habitat and age class diversity in the eastern upland hardwood forest region. ASB annual meeting, Asheville, NC, April.

Elliot, K., C. Harper, and **B. Collins**. 2010. Herbaceous layer response to type and severity of disturbance over time. ASB annual meeting, Asheville, NC, April.

Allman, N. and **B. Collins**. 2009. Connectivity of Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*) foraging habitat. WCU Graduate Research Symposium.

Collins, B., and D. Pittillo. 2009. Does flowering phenology of native plants indicate climate warming? ASB annual meeting, Birmingham, AL, April

Collins, B., T. Schuler, W. M. Ford, D. Hawkins. 2009. Stand Dynamics of Relict Red Spruce in the Alarka Creek Headwaters. Conference on Ecology and Management of High-Elevation Forests of the Central and Southern Appalachian Mountains. May 14-15, Snowshoe Mountain Resort Slatyfork, West Virginia

Allman, N.D. and **B. Collins**. 2008. Lichen and vegetation surveys of a disjunct population of the Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*). Poster presentation, WCU Faculty Research Awards Reception, April.

Allman, N.D. and **B. Collins**. 2008. Lichen and vegetation surveys of a disjunct population of the Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*). Poster presentation, 18th Colloquium on the conservation of mammals in the southeastern United States. Blacksburg, VA, February.

GRANTS AND AWARDS (selected, last 5 years, students and postdocs underlined)

2009-2010: **Collins, B**. Analysis of Forest Vegetation and Wildlife Habitat in the South: An analysis for the Southern Forest Futures Project. USDA-FS-SRS $ 11,878

2008: **Collins, B**. Travel to LiCor Li-6400 training. WCU Microgrants $ 534.
2007: **Collins, B**. and J. Bourdon. Location and simulated harvesting effects on the medicinal herb *Chamaelirium luteum*. USDA-FS-SRS Minigrants 2007-2008. $ 3,349.
2007: **Collins, B**. and N. Allman. Carolina northern flying squirrel movements and den site selection along the Cherohala Skyway. Cooperative Agreement with NC Wildlife Resources Commission, 2007-2008, $ 10,000.
2007: **Collins, B**. Proposal to: LEEF Program for Undergraduate Teaching and Research. LiCor ($ 25,000)
2006: **Collins, B**. Visiting scholar proposal for Winston P. Smith. WCU visiting scholar proposal.
2005-2006: **Collins, B.** On-site Field Study Coordination, Data Acquisition, Data Analysis, Monitoring Support, and Technology Integration Assistance in support of continuing Ecological Studies at Ft. Benning Georgia. CESU with DoD/SERDP, $ 329,460

SELECTED COMMITTEE SERVICE AT WCU (college level or above, since 2006)
2009-2012, College of Arts and Sciences Tenure, Promotion, and Review Committee
2009-2012, UNC Faculty Assembly Delegate
2009-2012, WCU Faculty Senate
2010, WCU Faculty Senate, Faculty Affairs Council
2010, Post Tenure Appeals Committee
2010, Search Committee for Vice Chancellor for Finance (Fall semester)
2009, Faculty Senate College Review Council member
2009, Graduate student appeals Committee (July)
2008, Search Committee, Summer Ventures Director
2008, College level committee to evaluate low-productivity programs for UNC Tomorrow II
2008, Poster display and participated in Faculty Research Awards Reception, April 9
2007, Prepared display and participated in Teacher Appreciation Day, April 23, 2007

SELECTED PROFESSIONAL & REGIONAL SERVICE
2010. Panelist, Ecological Restoration. Southern Appalachian Man and Biosphere annual meeting, Gatlinburg, TN, November.
2009-2010. Chair, Local Arrangements Committee for Association of Southeastern Biologists annual meeting, Asheville, NC, April.
2005-present: Editorial Board, Environmental Management
2002-present: Associate Editor, Journal of Vegetation Science
2007-present: Board member, NC Bartram Trail Society
2008: Panel member, USDA Invasive species panel, May.
2008: Earthday field trip leader to Whitewater Falls for Foothills Trail Association
2007: Participant in Public School Project for Math/Science
2006: Acting Chief Editor, Journal of Vegetation Science.

Thomas H. Martin
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Biology Department
Western Carolina University
Cullowhee, NC 28723
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Education:

North Carolina State University, Raleigh, North Carolina, Ph.D., 1990. Dissertation title: Direct and Indirect Effects of Fish Predation on Fresh-Water Littoral Benthos.

East Tennessee State University, Johnson City, Tennessee, M.S., 1986. Thesis title: Diets of Bluegill and Redear Sunfish in Bay's Mountain Lake.

Lincoln Memorial University, Harrogate, Tennessee, B.S., 1980.

Professional Experience:

Associate Professor of Aquatic Ecology, Biology Department, Western Carolina University, Cullowhee, NC, 2005-present.

Assistant Professor of Aquatic Ecology, Biology Department, Western Carolina University, Cullowhee, NC, 2001-2005. Served as a member of the graduate faculty in the Biology MS program.

Assistant Professor of Aquatic Ecology, School of Forest Resources, The Pennsylvania State University, University Park, PA, 1996-2001. I serve as a member of the graduate faculty in the Ecology, Environmental Pollution Control, and Wildlife and Fisheries Science graduate programs.

Assistant Professor of Biology, Biology Department, Clarion University of Pennsylvania, Clarion, PA, 1992-1996. I served as a member of the graduate faculty for the Biological Sciences graduate program.

Assistant Researcher, Center for Limnology, University of Wisconsin, Madison, WI, 1991-1992.

Visiting Instructor, Department of Zoology, North Carolina State University, Raleigh, NC, 1990.

Teaching:

Courses Taught:

Fisheries Science: A senior-level course required of all fisheries science majors at NCSU. Offered during fall semester, 1990 .

Principles of Ecology: A sophomore-level course required of all biology majors at Clarion University. Offered each fall semester, 1992 through 1995.

Entomology: A senior-level course offered during fall semester 1992.

Fisheries Biology: A senior/graduate-level course offered in fall semester 1992 and 1994.

Experimental Design: A graduate-level biometry course offered each spring semester, 1993 through 1995.

Basic Biology: A non-majors course offered in spring semester 1993.

Classics in Ecology: A graduate-level course offered spring semester 1993.

Experimental Ecology: A senior/graduate-level course offered at the Pymatuning Ecology Lab, University of Pittsburgh during summer 1993 and 1995.

Environmental Biology: A non-majors course offered in spring semester 1994 and 1995.
Ecology of Large Rivers: A graduate-level course offered spring semester 1994.
Ecology of Fishes: A senior/graduate-level course offered at the Pymatuning Ecology Lab, University of Pittsburgh during summer 1994.
Population Biology: A graduate-level course offered during spring semester 1995.
Experiments in Ecology: A graduate level course offered in 1998.
Case Studies in Ecosystem Management: A senior-level course required of all Environmental Resource Management majors at Penn State, offered each semester, 1996 through spring semester 2001.
Pollutant Impacts on Aquatic Systems: A senior-level course that may be selected as part of a 2-credit selection in pollution impacts; offered each semester 1996 through spring semester 2001.
Current Concepts in the Ecology and Management of Large Rivers: A graduate-level course offered in alternate years, 1997 through spring semester 2001.
General Ecology: A junior-level course required of all Biology majors at Western Carolina University, offered each semester – I offered the course each fall semester, 2001 through 2006.
Biostatistics: A senior/graduate-level course offered each fall semester, 2001 through the present.
Aquatic Ecology: A senior/graduate-level course offered during alternate spring semesters, 2002 through present.
Environmental Biology: A non-majors course offered occasionally, 2002 through present.
Introduction to Graduate Studies: A graduate-level course offered fall, 2003.
Classics Readings in Ecology: A graduate-level course offered during alternate spring semesters, 2003 through present.
Invertebrate Zoology: A junior-level course offered during alternate fall semesters, 2004 through 2009.
Contemporary Fisheries: A senior/graduate-level course offered during alternate spring semesters, 2006 through present.
Introduction to Ecology and Evolution: A sophomore level course offered as part of the Biology core curriculum each spring semester, 2007 through present.

Theses directed:
Clarion University of Pennsylvania:
Lutch, J.J. 1995. Interactions between native brook trout, *Salvelinus fontinalis*, and wild brown trout, *Salmo trutta*, during spawning. (currently employed by Idaho Fish & Game)
Woomer, A.A. 1995. Effects of big bass regulations on the largemouth bass (*Micropterus salmoides*) population of Kahle Lake, Clarion-Venango Counties, Pennsylvania. (currently employed by Pennsylvania Fish Commission)
Wright, C.L. 1995. A comparison of basinwide and index station population estimates of salmonids and individual selection of microhabitat from fall to winter by juvenile Atlantic salmon, *Salmo salar*, in a Vermont stream. (currently employed by National Marine Fisheries Service)
Terrick, T.D. 1996. A survey of the habitat and associated fish populations of East Fork Run, Allegheny National Forest, Pennsylvania. (currently employed by NSF International, a private consulting company)
Schmittlein, C.S. 1999. Application of an index of biotic integrity to western Pennsylvania streams.

The Pennsylvania State University:

Podey, A. 2000. An assessment of the relative effectiveness of artificial reefs constructed from waste tires for small Pennsylvania impoundments. (currently employed by Florida Fish and Wildlife Conservation Commission)

Custer, S.W. 2001. The relationship between historic land-use and current stream particle size in Allegheny National Forest streams. (currently a stay-at-home mother)

Western Carolina University:

Yates, E.L. 2003. Observations on the Odonata of a stream bog complex in Panthertown Valley, North Carolina. (currently seeking Ph.D. at UNC Chapel Hill)

Kavenagh, M. 2004. A comparison of fish passage through highway culverts. (currently employed by US Fish and Wildlife)

Hanks, R.D. 2004. Short and long-term movement of benthic stream fishes. (currently employed by Presbyterian College and seeking PhD at Clemson Univesrity)

Cornelison, J.W. 2005. An ecological comparison between two strains of wild brook trout, *Salvelinus fontinalis*. (currently employed by EBCI as a watershed planner)

Wesner, J. 2005. The effect of sub-lethally low pH on growth and survival of northern and southern strain brook trout, *Salvelinus fontinalis*. (currently seeking Ph.D. at University of Oklahoma)

LaVoie, Michael J. 2007. Spatial and temporal patterns of drifting fish larvae in the upper Pigeon River, Haywood County, North Carolina. (currently employed by EBCI as a biologist)

Irwin, N.R. 2007. The short-term effects of stream restoration on fish species composition and microhabitat use near in-stream structures in western North Carolina. (recently employed by Center For Environmental Management of Military Lands - Fort Drum, NY as an aquatic ecologist)

Ferrell, Sheree. 2009. A comparison of lmacroinverterate and meiofauna biomonitoring metrics for streams potentially affected by the Upper Tellico OHV area, Nantahala National Forest, NC. (currently volunteering for the NC Museum of Natural History)

Research:

Articles published in refereed journals.

1. Johnson, D.M., R.E. Bohanan, C.N. Watson, **T.H. Martin**. 1984. Competition between *Enallagma divagans* and *Enallagma traviatum* (Zygoptera: Coenagrionidae) in Bay's Mountain Lake, Tennessee: An in situ enclosure experiment. Advances in Odonatology 2:57-70.
2. Johnson, D.M., P.H. Crowley, R.E. Bohanan, C.N. Watson, **T.H. Martin**. 1985. Competition among larval dragonflies: A field enclosure experiment. Ecology 66(1):119-128.
3. Johnson, D.M., C.L. Pierce, **T.H. Martin**, C.N. Watson, R.E. Bohanan, P.H. Crowley. 1987. Prey depletion by odonate larvae: Combining evidence from multiple field experiments. Ecology 68(5):1459-1465.

4. **Martin, T.H.**, R.A. Wright, and L.B. Crowder. 1989. Non-additive impact of blue crabs and spot on their prey assemblages. Ecology 70(6):1935-1942.
5. **Martin, T.H.**, D.M. Johnson, and R.D. Moore. 1991. Fish-mediated alternative life-history stategies in the dragonfly, *Epitheca (Tetragoneuria) cynosura*. Journal of the North American Benthological Society 10(3):271-279.
6. **Martin, T.H.**, L.B. Crowder, C.F. Dumas*, and J.M. Burkholder. 1992. Indirect effects of fish on macrophytes in Bays Mountain Lake: Evidence for a littoral trophic cascade. Oecologia 89:476-481.
7. Wright, R.A., L.B. Crowder, and **T.H. Martin**. 1993. Effects of predation on the survival and size-distribution of estuarine fishes: An experimental approach. Environmental Biology of Fishes 36:291-300.
8. Crowder, L.B., D.T. Crouse, S.S. Heppell, and **T.H. Martin**. 1994. Predicting the impact of turtle excluder devices on loggerhead sea turtle populations. Ecological Applications 4:437-445.
9. Williams, C.E., D.M. Pavuk, D.H. Taylor, and **T.H. Martin**. 1995. Parasitism and disease incidence in the green cloverworm (Lepidoptera: Noctuidae) in strip-intercropped soybean agroecosystems. Environmental Entomology 24(2):253-260.
10. Harris, S.C., **T.H. Martin**, and K.W. Cummins. 1995. A model for aquatic invertebrate response to Kissimmee River Restoration. Restoration Ecology 3(3):181-194.
11. Johnson, D.M., **T.H. Martin**, M. Mahato, L.B. Crowder, and P.H. Crowley. 1995. Predation, density dependence, and life histories of dragonflies: a field experiment in a freshwater community. Journal of the North American Benthological Society 14(4):547-562.
12. Wright, R.A., L.B. Crowder, and **T.H. Martin**. 1996. Selective predation by blue crabs on the gastropod, *Bittium varium*: confirmation from opercula found in the sediments. Estuaries 19(1):75-81.
13. Johnson, D.M., **T.H. Martin**, M. Mahato, L.B. Crowder, and P.H. Crowley. 1996. Link strength in lake littoral food webs: net effects of small sunfish and larval dragonflies. Journal of the North American Benthological Society 15:271-288.
14. Garcia, E.F., R.J. McPherson, **T.H. Martin**, R.A. Poth, M.S. Greeley, Jr. 1997. Liver cell estrogen receptor binding in prespawning female largemouth bass, *Micropterus salmoides*, environmentally exposed to polychlorinated biphenyls (PCBs). Archives of Environmental Contamination and Toxicology 32:309-315.
15. Trebitz, A., S.Carpenter, P. Cunningham, B. Johnson, R. Lillie, D. Marshall, **T. Martin**, R. Narf, T. Pellett, S. Stewart, C. Storlie, and J. Unmuth. 1997. A model of bluegill-largemouth bass interactions in relation to aquatic vegetation and its management. Ecological Modeling 94:139-156.
16. Moore, A.L., C.E. Williams, **T.H. Martin**, and W.J. Moriarity. 2000. Influence of season, geomorphic surface and cover item on capture, size, and weight of *Desmognathus ochrophaeus* and *Plethodon cinereum* in Allegheny Plateau riparian forests. American Midland Naturalist 145:39-45.
17. McPherson, R.J., F.K. Ammer, **T.H. Martin**, and L. Bernatchez. 2002. Use of single strand conformation polymorphism analysis to identify sequence variation In a 356-base region of brook trout (*Salvelinus fontinalis*) mitochondrial DNA. Journal of the Pennsylvania Academy of Science 76(1):22-26.
18. Galbreath, P.F., N.D. Adams, and **T.H. Martin**. 2004. Influence of heating rate on measurement of time to thermal maximum in trout. Aquaculture 241:587-599.
19. Galbreath, P.F., N.D. Adams, L.W. Sherrill III, and **T.H. Martin**. 2006. Thermal

tolerance of diploid versus triploid rainbow trout and brook trout assessed by time to chronic lethal maximum. Environmental Biology of Fishes 75:183-193.

Book Chapters:

Crowder, L.B., R.A. Wright, K.A. Rose, **T.H. Martin**, and J.A. Rice. 1994. Direct and indirect effects of southern flounder predation on a spot population: experimental and model analyses. In *Theory and application in fish feeding ecology*, D.J. Stouder, K.L. Fresh, R.J. Feller, and M. Duke (eds.). The Belle W. Baruch Library in Marine Science; no. 18, University of South Carolina Press.

Crowder, L.B., E.W. McCollum, and **T.H. Martin**. 1998. Changing perspectives on food web interactions in lake littoral zones. Pages 240-249 in E. Jeppesen, Ma. Sondergaard, Mo. Sondergaard, and K. Christoffersen (eds.). The structuring role of submerged macrophytes in lakes. Ecological Studies, Volume 131, Springer-Verlag, New York.

Papers presented at technical and professional meetings (presenter denoted by *):

Johnson*, D.M., R.E. Bohanan, C.N. Watson, and **T.H. Martin**. 1983. Exploitation competition between small sunfish and dragonfly larvae. Bulletin of the Ecological Society of America 64:90.

Watson*, C.N., **T.H. Martin**, and R.E. Bohanan. 1985. A community food web for the littoral zone of an East Tennessee lake. Bulletin of the Ecological Society of America 66:114.

Martin*, T.H. 1987. Fish predation on the Odonata of Bays Mountain Lake. Bulletin of the North American Benthological Society 4:96.

Wright*, R.A., **T.H. Martin**, and L.B. Crowder. 1988. Interactions between predators: effects on a marine soft-sediment prey assemblage. Bulletin of the Ecological Society of America 69:318.

Martin*, T.H. and L.B. Crowder. 1988. Direct and indirect effects of fish predation on fresh-water littoral benthos. Invited paper for the Complex Interactions in Benthic and Littoral Communities symposium. Bulletin of the Ecological Society of America 69:218.

Martin*, T.H., L.B. Crowder, C.F. Dumas. 1988. The effects of sunfish on submersed macrophytes in Bays Mountain Lake: Evidence of trophic cascading. Bulletin of the North American Benthological Society 5:101.

Johnson*, D.M. and **T.H. Martin**. 1988. Experimental demonstration of fish effects on dragonfly life histories. Bulletin of the North American Benthological Society 5:85.

Martin*, T.H., C.N. Watson, and M. Heyn. 1989. Chironomid response to experimental manipulation of fish presence and absence. Bulletin of the North American Benthological Society 6:69.

Martin*, T.H. and D.M. Johnson. 1990. Density dependent survival and growth of *Epitheca cynosura* (Corduliidae: Odonata). Bulletin of the North American Benthological Society 7:134.

Jackson*, J.R., **T.H. Martin**, and J.A. Rice. 1991. Zooplankton availability and diet shifts in juvenile gizzard shad. Invited paper for the Cohort Development and Recruitment in Shad Populations symposium. Abstract Bulletin of the 121st Annual Meeting of the American Fisheries Society. Honorable mention, Best Student Paper Award.

Martin*, T.H. and D.A. Marshall. 1992. Integrated management of macrophytes and fisheries. Annual meeting of the Midwest Aquatic Macrophyte Management Society.

Terrick*, T.D. and **T.H. Martin**. 1995. A comparison of the woody debris, fish, and macroinvertebrates between reaches of East Fork Run within old-growth and harvested forests. North Coast Environmental Conference.

Lee*, C., R. Reda, **T.H. Martin**, R.D. Overath, and R.J. McPherson. 1996. Genetic structure of brook char populations. The Pennsylvania Aquarium Consortium Environmental Conference II.

Lee*, C., **T.H. Martin**, R.D. Overath, and R.McPherson. 1997. Genetic structure of brook char populations in a watershed affected by acid mine drainage. Annual Meeting of the Pennsylvania Academy of Sciences.

Martin, T.H. 1997. Large woody debris effects on fish and invertebrates. Fourth Conference on Ancient Eastern U.S. Old Growth Forests.

Moore, A.L., C.E. Williams*, **T.H. Martin**, and W.J. Moriarity. 1997. Species composition and distribution of salamanders in headwater riparian forests of the Allegheny Plateau. Symposium on Conservation Ecology of Amphibians of the Mid-Atlantic Region, McCann Wetlands Study Center.

Ammer*, F., R. McPherson, L. Bernatchez, C. Lee, **T.H. Martin**, and C. Phillips. 1998. Mitochondrial dna analysis in brook char (salvelinus fontinalis) with PCR-SSCP. Annual Meeting of the Pennsylvania Academy of Sciences.

Lee, C.J.*, R.J. McPherson, F. Ammer, **T.H. Martin**, and L. Bernatchez. 1998. Estimation of genetic variability of a fragmented population of brook char (*Salvelinus fontinalis*) in western Pennsylvania using microsatellites. American Society of Ichthyologists and Herpetologists 78th Annual Meeting.

Ammer, F.K.*, R.J. McPherson, C.J. Lee, **T.H. Martin**, and L. Bernatchez. 1998. Mitochondrial DNA analysis of wild brook char (*Salvelinus fontinalis*) populations in northwestern Pennsylvania using PCR-SSCP. American Society of Ichthyologists and Herpetologists 78th Annual Meeting.

Martin, T.H.* and C.P. Ferreri. 1999. Ecology and management of riverine fisheries in the eastern United States: a review of the recent literature. 1999 American Fisheries Society Annual Meeting.

McPherson, R.J.*, F.K. Ammer, C.J. Lee, and **T.H. Martin**. 1999. Estimation of Brook Char (*Salvelinus fontinalis*) movement in a fragmented stream system. 1999 American Fisheries Society Annual Meeting.

Martin, T.H.* and A. Podey. 2002. Macroinvertebrate colonization of materials commonly used In freshwater artificial reef construction (wood and waste tires). 50th Annual Meeting of the North American Benthological Society, Pittsburgh, PA.

Galbreath, P.F.*, N.D. Adams, and **T.H. Martin**. 2003. Effect of heating rate on measurement of chronic lethal maxima in rainbow trout, brook trout, and brown trout. Southern Division of the American Fisheries Society, Wilmington, NC.

Yates, E.L.* and **T.H. Martin**. 2003. The Odonata of a southern Appalachian stream-bog complex. Annual Meeting of the North American Benthological Society, Athens, GA.

Galbreath, P.F.*, N.D. Adams, and **T.H. Martin**. 2003. Effect of heating rate on measurement of chronic lethal maxima in rainbow trout, brook trout, and brown trout. Annual Meeting of the American Fisheries Society, Quebec City, Quebec, Canada.

Galbreath, P.F., J.W. Cornelison, J. Wesner, and **T.H. Martin***. 2006. Are northern strain brook trout really different? 2006 North Carolina Chapter of the American Fisheries Society annual meeting.

LaVoie, M.* and T.H. Martin. 2006. Spatial and Temporal Patterns of Fish Larvae in the Pigeon River, North Carolina. Annual Meeting of the American Fisheries.

Participation in seminars and workshops:

Martin, T.H. 1992. Management of aquatic macrophytes. A workshop presented for the annual meeting of the Wisconsin Lakes Association. *(Invited presenter)*

Martin, T.H. 1993. Making lemonade: living with aquatic invasions. A seminar presented to the Ecology Group, Clarion University.

Martin, T.H. 1993. Predatory effects of fish in the littoral zone: trophic cascades, alternative life-histories, and more! A seminar presented to the Ecology Group at The Pennsylvania State University.

Martin, T.H. 1993. Predatory effects of fish in the littoral zone: trophic cascades, alternative life-histories, and more! A seminar presented to the Biology Department at SUNY at Fredonia.

Martin, T.H. 1993. Predatory effects of fish in the littoral zone: trophic cascades, alternative life-histories, and more! A seminar presented to the Biology Department at Indiana University of Pennsylvania.

Martin, T.H. 1994. Complex interactions in freshwater littoral systems. A seminar presented to the Biology Department at Tennessee Technological University.

Martin, T.H. 1995. Complex interactions in freshwater littoral systems. A seminar presented to the School of Forest Resources, The Pennsylvania State University.

Crowder*, L.B., E.W. McCollum, and **T.H. Martin**. 1996. Changing perspectives on food web interactions in lake littoral zones. Workshop on "The roles of submerged macrophytes in structuring the biological community and biogeochemical dynamics in lakes." Freshwater Centre, Silkeborg, Denmark, 16-20 June 1996.

Martin, T.H. 1997. Habitat issues. Invited plenary talk for "Water quality, habitat and trout: the watershed approach." State College, PA, 8 February 1997.

Martin, T.H. 1998. Report on the use of artificial nesting structures by largemouth bass in Lake Marburg and Blue Marsh Lake. Adopt-a-Lake Cooperator Workshop, Pennsylvania Fish and Boat Commission, October 7 & 8, 1998.

Martin, T.H. 1999. Stream characteristics of an old-growth forest. 1999 Eastern Region Watershed and Aquatic Ecology Workshop, USDA Forest Service, June 15-18, 1999.

Martin, T.H. 2000. The ecological significance of large woody debris in streams. Keystone Coldwater Conference: a primer on instream habitat. February 19, 2000.

Martin, T.H. 2002. Genetic structure of brook trout populations among and within watersheds In western Pennsylvania: hatcheries, mining, and acid - oh my! Paul Burton Seminar Series, Biology Department, Western Carolina University.

Funded Projects:

Completed:

May 1995-June 1996. A comparison of the large woody debris, fish, and macroinvertebrates between reaches of East Fork Run within old growth forest and harvested forest. Allegheny National Forest, $10,007.

September 1995-September 1997. The influence of past land-use on forest-stream linkages. NRI CGP - USDA. $49,510.

July 1997 - June 1998. Evaluating the effectiveness of artificial nesting cover on nesting and reproduction of black bass in Pennsylvania reservoirs. Pennsylvania Fish and Boat Commission, $7,500.

June 1998 - December 2001. Whole-lake study of the effectiveness of waste-tire artificial reefs. Pennsylvania Department of Environmental Protection, Division of Waste Management, Contract ME #94583 Task #39, $124,489.

June 1999 - May 2000. Evaluation of fish assemblage and benthic macroinvertebrate response to removal of two run-of-the-river dams in the Susquehanna River drainage, Pennsylvania. Pennsylvania Fish and Boat Commission, $61,244.

September 2002- June 2003: Yates, E. (graduate student) and T.H. Martin. The Odonata of a southern Appalachian stream-bog complex. WCU Faculty Research Grant program. $7,000.

October 2003-June 2005: Martin, T.H. Genetic identification of Southern Appalachian brook trout populations in North Carolina. North Carolina Wildlife Resources Commission. $68,850.

January 2005-June 2006. Martin, T.H. Pigeon River fish habitat and larval drift assessment. Pigeon River Fund and State Wildlife Grants through the NC Wildlife Resource Commission. $47,597.47

October 2003-January 2007. Miller, J.R., R.C. Kochel, and T.H. Martin. Identification and evaluation of stream restoration projects in North Carolina. Clean Water Management Trust Fund. $167,000.

July 2008-June 2009. Martin, T.H. Aquatic invertebrate identifications from high elevation streams in Great Smoky Mountains National Park. US Park Service. $20,179.

July 2008-August 2009. Martin, T.H. and K. Kandl. Genetic identification of southern Appalachian brook trout populations in North Carolina. NC Wildlife Resources Commission. $10,000.

<u>In Progress:</u>

May 2007-October 2009, Martin, T.H. Macroinvertebrate monitoring of the Tellico OHV area. USDA Forest Service. $30,000.

<u>Professional Societies:</u>

American Fisheries Society
Association of Southeastern Biologists
North American Benthological Society

Brian D. Byrd
Environmental Health Sciences Program; Phone: (828) 227-2607; E-mail: bdbyrd@wcu.edu

EDUCATION

Ph.D., Tulane University School of Public Health & Tropical Medicine 2009
Dissertation: "Molecular phylogeny and evolutionary relationships among the subfamily Culicinae (Culicidae) with emphasis on genera *Aedes*, *Ochlerotatus* and *Orthopodomyia* in North America."
M.S.P.H, Tulane University School of Public Health & Tropical Medicine 2002
B.A., University of North Carolina at Asheville (Biology) 2000

PROFESSIONAL EXPERIENCE

Assistant Professor, Western Carolina University, Cullowhee, NC 2008-Present
Graduate Research Assistant, Tulane University, New Orleans, LA 2003-2008
Staff, Dept. of Tropical Medicine, Tulane University, New Orleans, LA 2002-2003

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

My area of expertise is public health entomology. My research focuses on domestic mosquito-borne diseases, particularly in the western region of North Carolina. I use an eco-epidemiological approach to current and emerging issues. Specifically, my recent research activities focus on La Crosse Encephalitis. This viral disease is responsible for the majority of human mosquito-borne disease in NC and is found predominately in the western counties. Ongoing research efforts with students at WCU include the development of molecular techniques to identify vectors of public health importance, the impact on an invasive mosquito species on the ecology of native rock pool mosquitoes, and the impact of human disturbance on mosquito-borne disease risk.

RELEVANT COURSES TAUGHT (2008-2010)

ENVH 470 Principles of Epidemiology (Instructor)
ENVH 430 Vectors and Public Health Pests (Instructor)
ENVH 431 Vectors and Public Health Pests Laboratory (Instructor)
ENVH 260 Etiology of Infectious Diseases (Instructor)
ENVH 261 Etiology of Infectious Diseases Laboratory (Instructor)
ENVH 190 From Black Death to Bioterrorism (Instructor)
ENVH 130 Environmental Health Science: Systems and Solutions (Instructor)
ES 150 Introduction and Approaches to Environmental Science (Team Taught)

PUBLICATIONS (Since 2004)

Byrd BD, Harrison BA, Zavortink TJ, and Wesson DM. Sequence, secondary structure, and phylogenetic analyses of the ribosomal internal transcribed spacer 2 (ITS2) in the *Orthopodomyia signifera* group (Diptera: Culicidae). Manuscript in review (*Journal of Medical Entomology*; submitted November 2010)

O'Meara GF, Bustamante DM, Peskol KN, Nishimura N, and **Byrd BD**. Oviposition and Egg Hatching Behavior of the Rock Pool Mosquito, *Aedes atropalpus*. Manuscript in preparation for submission to the *Journal of Vector Ecology* (Spring 2011)

Byrd BD, Wesson DM, and Harrison BA. Regional Problems Identifying the Fourth Instar Larvae of *Orthopodomyia kummi* (Coquillett) and *Orthopodomyia signifera* Edwards

(Diptera: Culicidae). *Proceedings of the Entomologic Society of Washington*. 111(3), 2009, 751-753

Colborn JM, **Byrd BD**, Koita OA, and Krogstad DJ. Estimation of Copy Number using SYBR Green: Confounding by AT-rich DNA and by Variation in Amplicon Length. *American Journal of Tropical Medicine and Hygiene*, 79(6), 2008, pp. 887-892

Kang S, Sim C, **Byrd BD**, Collins FH, and Hong Y. *Ex vivo* promoter analysis of antiviral heat shock cognate 70B gene in *Anopheles gambiae*. *Virology Journal*. 2008 5: 136

Palmisano CT, Taylor V, Caillouet K, **Byrd BD**, and Wesson DM. Impact of West Nile Virus outbreak upon St. Tammany Parish Mosquito Abatement District. *Journal of the American Mosquito Control Association* 2005 21 (1) 33-38.

Carlson JC, **Byrd BD**, Omlin FX. Field assessments in western Kenya link malaria vectors to environmentally disturbed habitats during dry season. *BMC Public Health*. 2004 4 (1):33.

PRESENTATIONS/ABSTRACTS AT PROFESSIONAL MEETINGS (10 Most Recent; Undergraduate Students Underlined)

Byrd BD, White L, Sither CB, Goggins JA, Harrison BA, Wasserberg G. Comparison of *Four Traps to Sample Ae. triseratus, Ae. albopictus and Ae. j. japonicus in a La Crosse Virus Endemic Area.* Abstract Accepted for the American Mosquito Control Annual Meeting in Anaheim, CA, March 2011.

Byrd BD. *Abundance and Gonotrophic Status of Ae. triseratus, Ae. albopictus and Ae. j. japonicus in a La Crosse Virus Endemic Area*. The North Carolina Mosquito and Vector Control Association Annual Meeting, Atlantic Beach, NC, November 2010

Kunze SE, Sither CB, Goggins JA, **Byrd BD**, Bustamante D, Pesko K, O'Meara G. *Impact of Thermal Conditions on the Relative Abundance of Aedes atropalpus and Ae. japonicus in the Southern Appalachians.* The Society for Vector Ecology Annual Meeting, Raleigh, NC, September 2010.

Byrd BD. *La Crosse Encephalitis in Western North Carolina*. The Mid-Atlantic Mosquito Control Association Annual Meeting, Savannah, GA, January 2010.

O'Meara G, **Byrd BD**, Bustamante D, Pesko K. *Relative Abundance of Aedes japonicus and Aedes atropalpus in Riverine Rock Pools in the Southern Appalachians.* Entomologic Society of America Annual Meeting, Indianapolis, IN, 2009

Byrd BD. *Additional Insights into the North American Orthopodomyia*. The North Carolina Mosquito and Vector Control Association Annual Meeting, Greenville, NC, 2009

Goggins JA, Singleton M, Wyatt J, Wiseman W, Foster H, and **Byrd BD**. *Undergraduate Vector-Borne Disease Education and Research at Western Carolina University: Preparing the Next Generation of Environmental Health Professionals.* The North Carolina Public Health Association Annual Meeting, Asheville, NC, 2009.

Zontek T and **Byrd BD**. *Vector-Borne Disease Education in Undergraduate Environmental Health Science Programs.* National Environmental Health Association Annual Meeting, Atlanta, GA, 2009.

Byrd BD and Wesson DM. *Sequence, secondary structure, and phylogenetic analyses of the ribosomal internal transcribed spacer 2 (ITS2) in the Orthopodomyia signifera group (Diptera: Culicidae).* The Entomological Society of America Annual Meeting, Reno, NV, 2008.

Rider MA, **Byrd BD**, Caillouët KA, and Wesson DM. *Persistence of Plasmodium DNA in desiccated Anopheles mosquitoes as determined by real-time PCR.* The American Society of Tropical Medicine and Hygiene Annual Meeting, New Orleans, LA, 2008.

GRANTS AND AWARDS (Selected, last 3 years)

2009-2010: **Byrd, B.** Development of a Multi-Plex PCR Assay to Identify Container-Inhabiting *Aedes.* Western Carolina University Faculty Research Grant ($5,000)

2010: **Byrd, B**. QEP Faculty Development Grant, Western Carolina University ($750)

2009-2010: **Byrd, B.** Association of Environmental Health Academic Programs Recruitment Grant, AEHAP ($4,000)

2007-2009: Wesson, D. and **Byrd, B**. Toward Resolving Aedine Mosquito Phylogeny: A Molecular Study of North American *Aedes* Mosquitoes and their Phylogenetic and Evolutionary Relationships, Tulane University Research Enhancement Fund II ($45,000)

AWARDS AND NOMINATIONS

Centers for Disease Control/Tulane University Graduate Research Training Fellowship
Louisiana Board of Reagents Doctoral Incentive Award
UNC-Asheville "Order of Pisgah" Alumni Award
Louisiana Mosquito Control Association Student Research Grant Award
E.C. Faust Award for Outstanding MSPH Student (Tropical Medicine), Tulane University
UNC-Asheville Undergraduate Research Scholar
Tri-Beta Biological Honor Society, Chapter, Charleston Southern University

SELECTED COMMITTEE SERVICE AT WCU

2010, Steering Committee Member and Conference Speaker, Rooted In the Mountains Symposium (1st Annual Symposium Integrating Indigenous Science, Health and Environment)
2010, Member, School of Health Sciences Website Review Committee
2009, Member, University Web Advisory Committee
2010, Poster display for WCU Board of Trustees Meeting
2009, Member, Committee to Review and Update the School of Health Science Collegial Review Document

SELECTED PROFESSIONAL & REGIONAL SERVICE

2010-Present, Member, Eastern Band of Cherokee Indians Encephalitis Recovery Service Steering Committee
2010-Present, Member, North Carolina Vector-Borne Disease Taskforce
2010-Present, Board of Directors, Mid-Atlantic Mosquito Control Association
2009-Present, Board of Directors, North Carolina Mosquito and Vector Control Association
2009-2010, Reviewer *EcoHealth* journal

Ronald W. Davis
Department of Geosciences and Natural Resource Management

EDUCATION

Ph.D., Natural Resources and Environmental Sciences, University of Illinois, December 2005.
Master of Arts, Physical Geography, Indiana State University, December, 1999.
Bachelor of Science, Life Sciences and Science Education, Indiana State University, May, 1991.

ACADEMIC EXPERIENCE

Western Carolina University August 2006–present. Assistant Professor, Department of Geosciences and Natural Resource Management.

University of Illinois/U.S. Army Civil Engineering Research Laboratory. Research Contractor: July 2005–December 2006.

SEROS (Science Education and Research Opportunities for Students—a 501c3 organization) April 2004-June 2006, Acting Director:

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

My research involves the use of GIS and remote sensing technologies in the evaluation of natural resources particularly wildlife habitats in forested ecosystems. Ongoing challenges in this field is include a) relating resource distribution models directly to the ecology of the wildlife species and communities, b) accounting for issues of inaccuracy and uncertainty associated with modeling habitats over large extents, and c) implications of uncertainty for management decisions made using geospatial models.

RELEVANT COURSES TAUGHT

Introduction to GIS (undergraduate and graduate)
Applied GIS (undergraduate and graduate)
Wildlife Ecology and Management
Landscape Ecology
Introduction to Natural Resource Management

RESEARCH PUBLICATIONS

Davis, R. W. 2010. *Crotalus horridus* (timber rattlesnake) habitat use. Herpetological Review 41(2): 235.

Davis, R. W., L. C. Bender, R. W. Warner, J. G. Cook, and R. Cook. 2010. Uncertainty in Habitat Quality Maps for Elk: Implications for Estimates of Carrying Capacity. Proceedings of the 9th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences: 365-368.

Davis, R. W., L.C. Bender, P. Mausel, L. Chapa and R. E. Warner, 2010. Habitat changes for black-tailed deer in a portion of the Mount St. Helen's blast zone. Pages 11-28 In Pullen,

N. and M. Patterson editors. Geotechnologies in Environmental Management. Springer. New York, NY. USA.

Barbour Wood, Susan L., **Ronald W. Davis**, **Matthew Kerfonta** and Gwen M. Daley, 2008. Spatial Prediction of Paleoenvironments Using GIS. Abstract. Geological Society of America Abstracts with Programs, vol. 40, no. 6, p. 424.

PROFESSIONAL PRESENTATIONS

Davis, R. W., L. C. Bender, R. W. Warner, J. G. Cook, and R. Cook. 2010. Uncertainty in Habitat Quality Maps for Elk: Implications for Estimates of Carrying Capacity. Poster. 9th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental.

Donaldson, W. and R. Davis 2010. Box turtle habitat use in relation to roads and traffic intensity. American Assoc. of Biologists Conference, Asheville, NC

Willard, E. 2010 and R. Davis. Box turtle habitat use in an developing Southern Appalachian landscape. SEPARC. Montreat, NC.

Davis R. W. 2008. Reptile habitat use in a developed Southern Appalachian Landscape. Invited Speaker. Western Carolina University Biology Department Paul Burton Seminar Series.

O'Connell, S. and R. W. Davis. 2008. Undergraduate Research and Creative Scholarship at Western Carolina University. Poster. Council on Undergraduate Research Conference. June 2008.

Extine, J. L., L E. DeWald, and Ronald W. Davis. 2007. Ability of Golf Courses to Provide Landscape Connectivity in Western North Carolina. Abstract. Sixth Annual Southern Forestry and Natural Resources GIS Conference.

Davis, R. W. 2006. Assessing forage values of plants used by the Nooksack elk herd in northern Washington. Invited Speaker. U.S. Forest Service, Regional Botany Meeting. Portland, Oregon.

Davis, R. W. October 2002. Population studies on a maternity colony of little brown myotis in west-central Indiana. Conference Presentation. Indiana Academy of Sciences, Butler University, Indianapolis, Indiana.

EXTERNAL FUNDING

Davis, R. W. 2010. Proposal to Continue Wildlife Studies at the Balsam Mountain Preserve. Balsam Mountain Trust, Balsam, NC. Contract. 3810.00 (funded 2010).

Davis, R. W. 2009. Proposal to Conduct Wildlife Habitat Studies at the Balsam Mountain Preserve. Balsam Mountain Trust, Balsam, NC. Contract. 3200.00 (funded 2009).

Davis, R. W., P. Bates and R. Lamb. Smoky Mountain Center Inc. Student Geodatabase Development and Mapping. Contract. 3800.00 (funded 2008).

Davis, R. W. 2008. Proposal to Conduct Wildlife Habitat Studies at the Balsam Mountain Preserve. Balsam Mountain Trust, Balsam, NC. Contract. 4,510.00. (funded 2008).

Bates, P., Davis R. W. and R. Lamb. 2006. Proposal to design a sustainable forest management plan for the Balsam Mountain Preserve. Balsam Mountain Trust, Balsam, NC. Contract. 38,400 (funded 2006)

PROFESSIONAL ASSOCIATIONS
International Spatial Accuracy Research Association
National Chapter of The Wildlife Society.
NC Chapter of The Wildlife Society
Society for the Study of Amphibians and Reptiles

AWARDS AND HONORS
Jonathan Baldwin Turner Graduate Research Fellowship, College of Agricultural Consumer and Environmental Sciences, University of Illinois, 1999-2002
Graduate Fellows Recognition of Academic Excellence, Gamma Sigma Delta and College of Agricultural Consumer and Environmental Sciences, University of Illinois 1999, 2000 and 2001.
Gamma Sigma Delta: Honor Society of Agriculture, Induction Fall 2002
Phi Kappa Phi: Academic Honor Society, Induction Fall 2003

Scott W. Huffman
Department of Chemistry and Physics; Phone: (828) 227-3669; E-mail
shuffman@email.wcu.edu

EDUCATION

Ph.D., University of Rhode Island 2001
Dissertation: "Noval peptide spectra-structure relationships derived from Generalized 2D Correlation Spectroscopy"
M.S., University of North Carolina at Wilmington 1997
Thesis: Development of a stochastic model for predicting chemical fate of chlorpyrofos in an aquatic environment"
B.S., University of North Carolina at Wilmington 1994

PROFESSIONAL EXPERIENCE

Assistant Professor, Western Carolina University	2005-present
Research Fellow, Laboratory of Chemical Physics, National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health	2001-2005

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTERESTS

My area of expertise is vibrational spectroscopy, quantum chemistry and chemometrics. My research focuses on the identification and characterization of materials utilized in works of art. In particular we focus on the development of measurement methods that are non-destructive to the sample, and on the development of advanced data analysis for extracting chemical information from measurements.

RELEVANT COURSES TAUGHT

Quantitative Analysis
Instrumental Analysis I
Instrumental Analysis II

PUBLICATIONS

Nicole J. Crane, **Scott W. Huffman**, Peter A. Pinto, Ira W. Levin, Eric A. Elster; "Evidence of a Heterogeneous Tissue Oxygenation: Renal Ischemia/Reperfusion Injury in a Large Animal Model," *The American Journal of Physiology - Renal Physiology submitted* (2010).

Scott W. Huffman, Arthor Salido, and David Evanoff; "Quantitative Infrared Spectroscopy in the Undergraduate Laboratory via Multivariate Mixture Analysis of a Simulated Analgesic," *Spectroscopy Letters in press*.

Ned H. Martin, Ruth M. Floyd, H. Lee Woodcock, **Scott Huffman**, Chang-Kiu Lee; "Computation of through-space NMR shielding effects in aromatic ring p-stacked complexes," *Journal of Molecular Graphics and Modeling* **26**, 1125-1130, (2008).

Nicole J. Crane, Edward G. Bartick, Rebecca Schwartz Perlman, **Scott W. Huffman**; "Infrared Spectroscopic Imaging for Non-Invasive Detection of Latent Fingerprints," *Journal of Forensic Sciences* **52**, 48-53, (2007).

Donsheng Bu, **Scott W. Huffman**, John Seelenbinder and Chris W. Brown; "Enhancement of Infrared Hyperspectral Images for Maximizing Chemical Information; Minimizing Baseline Interference," *Applied Spectroscopy* **59**, 575-583 (2005).

PRESENTATIONS/ABSTRACTS AT PROFESSIONAL MEETINGS

Scott W. Huffman and Caitlin G. Williams; "Archaeometry and Other Cultural Heritage Object Characterizations with Hand-Held Spectroscopy"; Easter n Analytical Symposium 2010.

Scott W. Huffman, Caitlin Williams, Nicole J. Crane, Ira W. Levin an d Eric A. Elster; "The Development of Infrared Spectroscopic Imaging-based His tochemical Methods for the Prediction of Kidney Ischemia"; The Federation of Analytical Chemistry and Spectroscopy Socieities Conference 2010.

Scott W. Huffman Jessica Spear, and Renske Leenders; "Authenticatio n of Cremation Remains with Infrared Spectroscopy and Chemometrics." The Pitts burgh Conference 2010.

Jessica Spear and **Scott W. Huffman**; "Authentication of Cremation Re mains with Infrared Spectroscopy"; National Council on Undergraduate Research C onference 2009.

Tyler Jones William R. Kwochka, and **Scott W. Huffman**; "Surface Atta chment and Characterization of Boroxines on Glass"; South Eastern Regional Meeting of the American Chemical Society 2008.

Tyler Jones and **Scott W. Huffman**; "Self Assembled Monolayers as Foundations for Chemical Sensors"; Science in the Mountains 2008.

Scott W. Huffman, Erika Sesti, Laura Cleveland, Kyle D. Beard, and Brian Dinkelmeyer; "Using Spectroscopy and Chemometrics to Extract Chemical Information about Mixtures"; The Pittsburgh Conference 2008.

Erika Sesti and **Scott W. Huffman**; "Nondestructive Measurements of Museum Artifacts"; South Eastern Regional Meeting of the American Chemical Society 2007.

Scott W. Huffman, Erika Sesti, and Laura Cleveland; "Mixture Analysis with Spectroscopy and Chemometrics"; South Eastern Regional Meeting of the American Chemical Society 2007.

Amy Cagle and **Scott W. Huffman**; "Authenticity Determination: Spectroscopic Analysis of Traditional Cherokee and Modern Synthetic Dyes"; National Conference for Undergraduate Research 2007.

Scott W. Huffman and Suzanne McDowell; "We are Dying to Know, Where Did You Get Those Colors? "; North Carolina Museums Council Annual Meeting 2007.

Scott W. Huffman; "Mixture analysis of textiles with vibrational spectroscopy and chemometrics"; South Eastern Regional Meeting of the American Chemical Society 2006.

Scott W. Huffman; "Questionable Document Analysis with Fourier Transform Infrared Spectroscopic Imaging"; The Pittsburg Conference 2006.

Ira W. Levin, Quan Li, Frank Howard, **Scott W. Huffman**; "Biomembrane Structural Determinations using Infrared Spectroscopy and Ultra-Sound: Effects of Lipid Microdomains on Integral Membrane Protein Reorganizations"; *Abstracts of Papers of the American Chemical Society* 228; ANYL 41 2005.

Ira W. Levin, Rohit Bhargava, Nicole J. Crane, Stephen W. Hewitt, **Scott Huffman**; "Applications of Vibrational and Visible Reflectance Spectroscopic Imaging: Tissue Pathology and Tissue Perfusion"; The Pittsburgh Conference 2006.

GRANTS RECEIVED

2010-2012: Scott W. Huffman and David Evanoff. National Science Foundation Major Research Instrumentation grant entitled "MRI: Acquisition of a Raman Microscope for Undergraduate Research and Education". $306 175

2008: Scott W. Huffman and Brian Dinkelmeyer. TERAGRID allocation Grant entitled "Calculation of the Intrisic Reaction Coordinate of Butadiene derivatives in Solid State Reactions". 20,000 hours 2008.

2005: Ocean Optics Educational Grant entitled "Reaction Monitoring in an Organic and Inorganic Synthesis Undergraduate Laboratory with Raman Spectroscopy" $5714.73

SELECTED COMMITTEE SERVICE AT WCU

2010-present, Information Technology Council.
2009-Present, Institutional Animal Care and Use Committee
2008-2009, Academic Technology Advisory Committee 2008-2009.

SELECTED PROFESSIONAL & REGIONAL SERVICE

2007, Chair for a session at the South Eastern Regional Meeting of the American Chemical Society.

2006, Chair for 2 sessions at the South Eastern Regional Meeting of the American Chemical Society.

2006, Organizer of one session for the region conference South Eastern Regional Meeting of the American Chemical Society.

Brian D. Kloeppel
Department of Geosciences and Natural Resources; Phone: (828) 227-2888; E-mail: bkloeppel@wcu.edu

EDUCATION

Ph.D., University of Wisconsin-Madison, Forest Ecology 1998
Dissertation: "Carbon and Nitrogen Allocation and Resource Use Efficiency in Mixed *Larix* spp. and Evergreen Conifer Forests Along a Resource Availability Gradient"
M.S., Pennsylvania State University, Tree Physiology 1992
Thesis: "Seasonal Plant Ecophysiology and Morphology of Four Successional Pennsylvania Barrens Species in Open Versus Understory Environments"
B.S., University of Wisconsin-Madison, Forest Science 1989

PROFESSIONAL EXPERIENCE

Associate Professor, Western Carolina University 2008-present
Graduate Faculty, Western Carolina University 2004-present
Graduate Faculty, University of Georgia 2000-2008
Assistant Research Scientist / Coweeta LTER Site Director
University of Georgia, Institute of Ecology 2000-2008
Program Coordinator / Coweeta LTER Site Director
University of Georgia, Institute of Ecology 1995-2000

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

My interests include watershed ecology, carbon and water cycling, forest growth and dynamics, and the policies regulating the conservation of these resources. Current research with students at WCU includes the assessment of secondary succession in North Carolina: advancing understanding of successional vegetation through coupled field and remote sensing studies, long-term forest vegetation dynamics in the southern Appalachians, and the impact of climate changes on watershed carbon pools and fluxes.

RELEVANT COURSES TAUGHT (since coming to WCU in 2008)

Watershed Management (NRM 460)
Natural Resource Policy and Administration (NRM 442)
Forest Resource Measurements (NRM 352)
Soil Conservation (NRM 320)
Natural Resource Conservation and Management (NRM 140)
Introduction to Environmental Science (ES150) {team taught w/ Pete Bates, Laura DeWald, etc.)

PUBLICATIONS (since 2004, students and postdocs underlined)

Nuckolls, A.E., N. Wurzburger, C.R. Ford, R.L. Hendrick, J.M. Vose, and **B.D. Kloeppel.** 2009. Hemlock declines rapidly with hemlock woolly adelgid infestation: impacts on the carbon cycle of southern Appalachian forests. **Ecosystems** 12: 179-190.

Beckage, B., **B.D. Kloeppel**, J.A. Yeakley, S.F. Taylor, and D.C. Coleman. 2008. Differential effects of understory and overstory gaps on tree regeneration. **Journal of the Torrey Botanical Society** 135: 1-11.

Kloeppel, B.D., M.E. Harmon, and T.J. Fahey. 2007. Estimating aboveground net primary production in forest dominated ecosystems. Chapter 5 in T. Fahey and A. Knapp, editors. **Principles and Standards for Measuring Primary Production**. Pp. 63-81. Oxford University Press, New York. 268 pp.

Ford, C.R., R.M. Hubbard, **B.D. Kloeppel**, and J.M. Vose. 2007. A comparison of sap flux-based evapotranspiration estimates with catchment-scale water balance. **Agricultural and Forest Meteorology** 145: 176-185.

Clark, J.S., M. Wolosin, M. Dietze, I. Ibanez, S, LaDeau, M. Welsh, and **B.D. Kloeppel.** 2007. Tree growth inference and prediction from diameter censuses and ring widths. **Ecological Applications** 17: 1942-1953.

Oleksyn, J., **B.D. Kloeppel**, S. Lukasiewicz, P. Karolewski, and P.B. Reich. 2007. Ecophysiology of horse chestnut (*Aesculus hippocastanum* L.) in degraded and restored urban sites. **Polish Journal of Ecology** 55: 245-260.

Ellison, A.M., M.S. Bank, B.D. Clinton, E.A. Colburn, K. Elliott, C.R. Ford, D.R. Foster, **B.D. Kloeppel**, J.D. Knoepp, G.M. Lovett, J. Mohan, D.A. Orwig, N.L. Rodenhouse, W.V. Sobczak, K.A. Stinson, J.K. Stone, C.M. Swan, J. Thompson, B. Von Holle, and J.R. Webster. 2005. Loss of foundation species: consequences for the structure and dynamics of forested ecosystems. **Frontiers in Ecology and the Environment** 3: 479-486.

PRESENTATIONS/ABSTRACTS AT PROFESSIONAL MEETINGS (ten most recent, students and postdocs underlined)

2010 Fifth Hemlock Woolly Adelgid Symposium. Asheville, NC. "Potential changes in transpiration with shifts in species composition following the loss of eastern hemlock in southern Appalachian riparian forests" with C.R. Ford and J.M. Vose.

2010 Ecological Society of America - 95th Annual Meeting. Pittsburgh, PA. "Potential changes in transpiration with shifts in species composition following hemlock loss" with C.R. Ford and J.M. Vose.

2008 Chapman Conference. Edgbaston, Birmingham, England. "Dissolved organic matter composition and dynamics in headwater streams of an eastern deciduous biome under different forest management regimes: applications of EEM-PARAFAC" with Y. Yamashita, J. Knoepp, and R. Jaffe.

2008 Ecological Society of America - 93rd Annual Meeting. Milwaukee, WI. "Diurnal and seasonal variation in canopy transpiration among evergreen and deciduous species in the southern Appalachians" with C.R. Ford, R.M. Hubbard, and J.M. Vose.

2008 Ecological Society of America - 93rd Annual Meeting. Milwaukee, WI. "Integrated research and education projects of the Coweeta Hydrologic Laboratory" with S. Farinas.

2008 Florida Coastal Everglades All Scientists Meeting. Miami, FL. "Inter-LTER collaboration - Assessing the dynamics of dissolved organic matter at the Coweeta LTER using EEM-PARAFAC: preliminary result" with Y. Yamashita, G. Zausen, J.D. Knoepp, and R. Jaffé.

2008 Fourth Hemlock Woolly Adelgid Symposium. Hartford, CT. "Effects of eastern hemlock mortality on riparian ecosystems in the southern Appalachians" with J.M. Vose, C.R. Ford, B.D. Clinton, K.J. Elliott, and J.D. Knoepp.

2007 National Sience Foundation, Division of Environmental Biology - Invited Seminar. Arlington, VA. "Ecosystem water use and carbon flux in a changing environment".

2007 Ecological Society of America - 92th Annual Meeting. San Jose, CA. "Soil carbon dioxide efflux in forested ecosystems: the comparison of evergreen vs. deciduous watersheds" with R.M. Hubbard, C.R. Ford, J.M. Vose, and G.L. Zausen.

2007 North American Forest Biology Workshop, Bloomington, IN. "Interactions of resin flow, sap flow, and climatic variables in two pine species" with S. Cladis, C.R. Ford, J.T. Costa, and Kier D. Klepzig.

GRANTS AND AWARDS (selected, last 5 years, students and postdocs underlined)

National Science Foundation. 2009-2011. Assessment of secondary succession in North Carolina: advancing understanding of successional vegetation through coupled field and remote sensing studies. $199,938. Ryan Emanuel PI (Appalachian State University), B.D. Kloeppel (Collaborator).

USDA Forest Service. 2010. Coweeta permanent plot vegetation plot changes: sucession and Exotic insect and disease impacts from the 1930s to 2000s. $17,786. B.D. Kloeppel (PI).

USDA Forest Service. 2009. Coweeta permanent plot vegetation plot changes: sucession and Exotic insect and disease impacts from the 1930s to 2000s. $16,088. B.D. Kloeppel (PI).

National Science Foundation. 2004-2007. Field Stations and Marine Laboratories (FSML) Competition: Conference and Office Structure at Coweeta Hydrologic Laboratory $125,000. B.D. Kloeppel (PI), J.M. Vose, and T.L.Gragson.

SELECTED COMMITTEE SERVICE AT WCU (college level or above, since 2008)

2010-2012, WCU Graduate Council Member

2009-2011, College of Arts and Sciences Representative for Board of Governor's Teaching Award, Chairperson 2010-2011

2008, Faculty Representative for Chancellor's Review

2004-present, Highlands Biological Station, Board of Scientific Advisors, WCU Representative

SELECTED PROFESSIONAL & REGIONAL SERVICE

2008-2010 Organization of Biological Field Stations, President

2010-2012 Organization of Biological Field Stations, Past-President

2010 Strategic Review Team Leader, Cincinnati Center for Field Studies; University of Cincinnati; Cincinnati, OH

2008 Strategic Review Team Leader, Taylor Wilderness Field Station; Cascade, Idaho

2010-present: Editorial Board Member, **Dendrobiology**

2009 National Science Foundation Panelist, Academic Research Infrastructure (ARI) Competition

2007 NEON Network Site Visit Review Team Member

2007 National Science Foundation Panelist, Field Station and Marine Laboratories (FSML) Competition

Burton R. Ogle
School of Health Sciences – Environmental Health Program; Phone: (828) 227-3517; E-mail: bogle@wcu.edu

EDUCATION

Virginia Commonwealth University. Richmond, VA	
Ph.D. in Urban Services: Public and Environmental Health	1998
East Tennessee State University, Johnson City, TN	
M.S.E.H (Masters of Science in Environmental Health)	1985
University of Tennessee, Knoxville, TN	
B.S. in Food Science and Technology	1979

PROFESSIONAL EXPERIENCE

Western Carolina University, Associate Professor and Program Director	2002-Present
School of Health Sciences, Environmental Health Program	
McKee Environmental Inc. Virginia Beach, VA	1990 - Present
Industrial Hygiene Consultant	
East Carolina University, Assistant Professor	2000-2002
Department of Environmental Health	
Virginia Commonwealth University – Medical College of Virginia, Richmond, VA	
Associate Director, Office of Environmental Health and Safety	1988 - 2000
Virginia OSHA	1985-1987

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

My area of expertise is occupational health and safety, more specifically, industrial hygiene. My research interest is in nanotechnology health and safety. I have been awarded a faculty fellowship the past 8 years at Oak Ridge National Laboratory to support my research in this area.

RELEVANT COURSES TAUGHT

Introduction to Public Health (ENVH 200); Introduction to Environmental Health (ENVH 230); Air Quality and Lab (ENVH 440); Global Disparities in Public Health (ENVH 210); Environmental Toxicology (ENVH 375); Biosafety and Bioterrorism (ENVH 380); Noise and Hearing Conservation (ENVH 317); Personal Protective Equipment (ENVH 215); Radiation Safety (ENVH 410); Environmental Issues in Construction (ENVH 390); From Black Death to Bioterrorism: The Public Health Response (ENVH 190); Solid and Hazardous Waste Management (ENVH 312); Environmental Sciences: Systems and Solutions (ENVH 130); Senior Seminar (ENVH 460); Independent Study (ENVH 480); Internship (ENVH 483) Special Topics (MHS 693); Epidemiology (ENVH 570)

PUBLICATIONS

Ogle, B. & Zontek, T. (2010). Chapter 6: Introduction to Industrial Hygiene in Fundamentals of Occupational Safety and Health (5th Ed), Friend, M.A., & Kohn, J.P. (editors). Government Institutes: Rockville, MD.

Jankovic, J.T., Zontek, T.L., Ogle, B.R., and Hollenbeck, S. (2010). Characterizing aerosolized particulate as part of a nanoprocess exposure assessment. International Journal of Occupational and Environmental Health, volume 16.4.

Jankovic, J.T., Ogle, B.R., Hall, M., Hollenbeck, S., and Zontek, T.L. (2010). Particle loss in a scanning mobility particle analyzer sampling extension tube. International Journal of Occupational and Environmental Health, volume 16.4.

Zontek, T., Ogle, B., & Ogle, R. (2010, March). Evaluation of an air monitoring protocol for nanoscale materials. Professional Safety (55)3.

Zontek, T., Isernhagen, J. & Ogle, B. (2009, August). Psychosocial factors contributing to occupational injury in direct care workers. American Association of Occupational Health Nursing Journal (57) 7.

Zontek, T. Ogle, B., & DuVernois, C. (2009). Job satisfaction and issues related to the retention of environmental health professionals. Manuscript undergoing final revisions for publication in Journal of Environmental Health.

Zontek, T., Ogle, B., & Ogle, R. (2008). Evaluation of an air monitoring protocol for nanoscale materials. Manuscript undergoing final revisions for publication in Professional Safety journal.

Ogle, B. & Zontek, T. (2007). Chapter 6: Introduction to Industrial Hygiene in Fundamentals of Occupational Safety and Health (4th Ed), Friend, M.A., & Kohn, J.P. (editors). Government Institutes: Rockville, MD.

R.L. Uebler, S. Berkowitz, P. Beusher, M. Avery, B. Ogle, K. Arrington and B. Grimes - Performance of Chamber and EZ1203H Systems Compared to Conventional Gravel Septic Tank Systems in North Carolina. 22nd Annual NC Onsite Wastewater Conference Proceedings. April 2006.

Ogle, B. (2003). Chapter 6: Introduction to Industrial Hygiene in Fundamentals of Occupational Safety and Health (3th Ed), Friend, M.A., & Kohn, J.P. (editors). Government Institutes: Rockville, MD.

Ogle, B. (2002). Chapter 7: Solid and Hazardous Waste Management in Environmental Health. Monroe T. Morgan (editor). Wadsworth Publishing Company.

Mukoda, T., Ogle, B., Cregger, B., Pearson, R., and Morgan, R. (1999). Collaborative Approaches to Environmental Health and Safety Programs at the Virginia Microelectronics Center. Proceedings of the 13th Biennial University/Government/Industry Microelectronics Symposium. Institute of Electrical and Electronics Engineers, Minneapolis, MN.

PRESENTATIONS/ABSTRACTS AT PROFESSIONAL MEETINGS

Presentations:

Ogle, B.R. and Zontek, T.L. (2010). Occupational health and safety impacts of nanoscale materials. Presentation at Western NC Safety and Health School conference. November 10, 2010, Asheville, NC.

Ogle, B. (March 2009). *Communicating Risk and Managing Risk Assessment for the Nanoscale Materials Research Environment*. American Chemical Society Annual Meeting, Salt Lake City, UT.

Ogle, B. (July 2008). *Communicating Risk and Managing Risk Assessment for the Nanoscale Materials Research Environment*. DOE Symposium, Safe Handling of Engineered Nanoscale Materials. Argonne National Laboratory, Chicago, IL.

Ogle, B. and J. Scifers (May 2007). *Environmental Health Concerns for Athletic Trainers.* Mid-Atlantic Athletic Trainers' Association (MAATA) annual meeting and symposium in Virginia Beach, VA.

Ogle, B., and J. Scifers (March 2006). *Epidemiology and Differential Diagnoses of Environmental Illnesses*. South East Athletic Trainers' Association (SEATA). Regional Meeting, Atlanta, GA.

Ogle, B. (March 2003). *Understanding Bioterrorism Agents and the Role of the Clinical Laboratory Professional*., Greenville, SC.

Ogle, B. (October 2002). *Understanding Bioterrorism Agents and the Potential Role of the Clinical Laboratory*. North Carolina Society for Clinical Laboratory Science (NCSCLS) and the North Carolina State Society of American Medical Technologists (NCSSAMT), Morganton, NC.

Ogle, B. (January 2002). *Bioterrorism in the Workplace*. American Society of Safety Engineers, Eastern Carolina Chapter Meeting, Greenville, NC.

Ogle, B. (October 2001). *Legionella: An Update on Public Health Risks* – North Carolina Public Health Association, Northeastern District Environmental Health Section, Greenville, NC.

Ogle, B. (November 2000). *Understanding and Managing Bird Hazards.* American Society of Safety Engineers, Eastern Carolina Chapter Meeting, Greenville, NC

<u>Refereed Poster Presentations</u>

Zontek, T., Ogle, B., Jankovic, J. & Hollenbeck, S. (2010). An updated protocol for nanoscale material air monitoring. Poster presentation at National Environmental Health Association Annual Educational Conference and Exposition, June 5-9, 2010, Albuquerque, NM.

Ogle, B., Zontek, T., Jankovic, J. & Hollenbeck, S. (2010). Freeware contour mapping of ambient nanoscale particles. Poster presentation at National Environmental Health Association Annual Educational Conference and Exposition, June 5-9, 2010, Albuquerque, NM.

Ogle, B. & Zontek, T. (2009). Chinese drywall: Are your walls making you sick and ruining your heat pump? Poster presentation at American Society of Safety Engineers National Professional Development Conference, San Antonio, TX, June 28 – July 11, 2009.

Zontek, T. & Ogle, B. (2009). Psychosocial factors contributing to injuries in direct care workers.

Poster presentation at American Society of Safety Engineers National Professional Development Conference, San Antonio, TX, June 28 – July 11, 2009.

Zontek, T., Byrd, B., Ogle, B. & Anderson, A. (2008). A review of vector-borne disease education in undergraduate environmental health programs. Accepted for poster presentation at National Environmental Health Association Annual Educational Conference and Exposition.

Zontek, T. & Ogle, B. (2008). Evaluation of an air monitoring equipment for reengineered nanoscale materials. Poster presentation at American Society of Safety Engineers National Professional Development Conference, Las Vegas, NV, June 9 - 11, 2008.

Ogle, B. (2006). Research Control Limit for Nano-size particles. International Conference on Nanotechnology Occupational Health and Safety, Cincinnati, OH.

GRANTS AND AWARDS

The Northwest Partnership for Public Health, Internship Grant – Spring 2007. $5,000. A study of qualifications for septic system evaluations and installations in surrounding states. Renee Brown, student researcher.

The Northwest Partnership for Public Health, Internship Grant – Fall 2006. $5,000. A study of job satisfaction among environmental health specialists in North Carolina. Melissa Harrison, student researcher.

Eastern Band of Cherokee Indians/Environmental Protection Agency – 2005-Present. A Study of the Relationships Between Hospital Admissions for the Quala Boundary Reservation and Community-Level Ozone Measures.

Environmental Protection Agency (EPA) (Grant Extension) – 2004-2005. Hikers Health Study. Co-Investigators: Cynthia Atterholt and Philip Kneller. Approximate award: $60,000.

Association of Environmental Health Academic Programs (AEHAP). 2004-2006. "Innovative Recruiting and Teaching Strategies" Total Award: $4,500 (renewable for 3 years @$3,000 per year)

Environmental Protection Agency (EPA) (Grant Extension) – 2004-2005. Hikers Health Study. Co-Investigators: Cynthia Atterholt and Philip Kneller. Approximate award: $60,000.

Association of Environmental Health Academic Programs (AEHAP) – Travel and Education Scholarship Grant. Amount awarded: $1,500

Teacher- Research Award. Summer 2003. Granting Agency: Western Carolina University, Office of Research and Graduate Studies. Award: $1,500.

North Carolina Department of Crime Control and Public Safety – Education Grant for Biosafety/Bioterrorism Education and Preparation. Amount: $15,100

"Enhancement of Environmental Health Program Recruiting Strategies" – Principal Investigator, Granting Agency: Association of Environmental Health Academic Programs (AEHAP). Award: $5,000/year, renewable for 3 years.

"Use of Landfill Gas in the Incineration of Biomedial/Radioactive Waste and the Development of an Environmental Technology Program" Granting Agency: North Carolina Department of Energy. Co-Principal Investigator (along with Dr. Daniel Sprau). Award: $117,000.

ACADEMIC AWARDS AND NOMINATIONS

Faculty Fellowship - Oak Ridge Institute for Science and Education (ORISE), Higher Education Research Experiences (HERE) at Oak Ridge National Laboratory, Oak Ridge, TN. Assignment: Center for Nanophase and Materials Sciences (CNMS). Dr. Linda L. Horton, Director; Dr. Michael Simonson, Interim Director.	2006 – 2010
Board of Governor's Innovative Teaching Award (tenured faculty) – College of Health and Human Sciences	2009
Faculty Service Award –College of Health and Human Sciences	2009
Chancellor's Distinguished Teaching Award - Western Carolina University	2008

Finalist, Chancellor's Distinguished Teaching Award - Western Carolina University	2007
Finalist, Chancellor's Distinguished Teaching Award - Western Carolina University	2006
Don C. Morgan Faculty Scholar – College of Applied Sciences - Western Carolina University	2006
Faculty Fellowship - Oak Ridge Institute for Science and Education (ORISE), Higher Education Research Experiences (HERE) at Oak Ridge National Laboratory, Oak Ridge, TN. Assignment: Metals and Ceramics Division (M&C). Dr. Everett Bloom, Director.	2004 - 2005
Excellence in Teaching award – College of Applied Sciences - Western Carolina University	2005
Board of Governor's Innovative Teaching Award (non-tenured faculty) – College of Applied Sciences - Western Carolina University	2005

SELECTED COMMITTEE SERVICE AT WCU

Post Tenure Review Appeals Committee, Western Carolina University. 2010.

TPR/AFE Document Review Committee, School of Health Sciences, Western Carolina University. 2010

External Member: Tenure and Promotion Committee, Department of Health Education and Promotion, College of Health and Human Performance, East Carolina University. 2009-2010.

Travel Awards Committee, School of Health Sciences, Western Carolina University. 2009-present.

Tenure and Promotion Committee, School of Health Sciences, Western Carolina University. 2006 – Present.

Tenure and Promotion Committee, College of Health and Human Sciences, Western Carolina University. 2006 to 2009.

Tenure and Promotion Committee, Department of Criminal Justice, Western Carolina University. 2007 0 2008.

Tenure and Promotion Committee, Department of Physical Therapy (Post Tenure Review), Western Carolina University. 2007.

Tenure and Promotion Committee, Department of Construction Management, Western Carolina University. 2006 – 2008.

Institutional Biosafety Committee (Chair). Western Carolina University. 2003 – Present.

Dean's Faculty Advisory Committee, College of Health and Human Sciences, Western Carolina University. 2003 – 2007.
College Safety Committee, College of Health and Human Sciences, Western Carolina University. 2003 – 2007.
Educational Technologies Advisory Council. Western Carolina University. 2004 – 2008.
Chancellor's Honor's College Task Force. Western Carolina University. 2004.
Faculty Advisor: Alpha Lambda Delta (National Freshman Honor Society), Western

SELECTED PROFESSIONAL & REGIONAL SERVICE

NC State Board of Registered Environmental Health Specialists (formerly the NC State Board of Sanitarian Examiners) – Appointed by Governor Mike Easley, 2003 – Present
Association of Environmental Health Academic Programs (AEHAP) Board of Directors, 05-07
American Industrial Hygiene Association, Toxicology Committee. 1990 – 1993
American Industrial Hygiene Association, Confined Spaces Committee. 1986 – 1989

Benjamin Tanner
Geosciences & Natural Resources; phone 828-227-3915; Email: btanner@wcu.edu

EDUCATION

Ph.D., Earth and Planetary Sciences, University of Tennessee 2005
Dissertation Title: "C3/C4 Variations in Higher Salt Marsh Sediments: An Application of Compound Specific Isotopic Analysis of Lipid Biomarkers to Late Holocene Paleoclimatic Research" Committee Chair: Maria E. Uhle, Ph.D.
M.S., Quaternary and Climate Studies, University of Maine 2001
Thesis Title: "Lithic Analysis of Chipped Stone Artifacts Recovered from Quebrada Jaguay, Peru" Committee Chair: Daniel H. Sandweiss, Ph.D.
B.S., Anthropology, Florida State University 1999

PROFESSIONAL EXPERIENCE

Assistant Professor of Geology, Western Carolina University	2005-Current
Adjunct Professor of Natural Sciences, Maryville College	2005
Teaching Associate, University of Tennessee	2003-2005
Teaching Assistant, University of Tennessee	2001-2003
Research Assistant, University of Maine	1999-2001
Laboratory Technician, Museum of Florida History	1998-1999

TEACHING PHILOSOPHY

I believe that it is a teacher's responsibility to present academic material in a way that is accessible, interesting, and applicable to students. I have found that field-based didactic approaches encourage direct involvement in the subject matter, and it is this kind of hands-on learning that reinforces concepts discussed in lecture and clarifies difficult ideas. Also, I find that students are better engaged in the material when they see that it is relevant and applicable to their local surroundings. When students are engaged in their local surroundings they become curious about the processes and mechanisms that have brought about what they are seeing, and ultimately, I believe, they become much more open to the larger learning process.

COURSES TAUGHT

GEOL 140, Investigations in Environmental Geology,WCU	2005-2010
GEOL 150, Methods in Geology, WCU	2006-2010
GEOL 191, Geology, Landscapes and the Human Psyche, WCU	2010
GEOL 310 Lab, Soils and Hydrology, WCU	2008-2009
GEOL 465/565, Wetlands, WCU	2007, 2009
GEOL 491/591, Environmental Geochemistry, WCU	2006, 2008
GEOL 495, Senior Research Seminar, WCU	2008
GEOL 491, Topics in Geology: Coastal Fieldtrip, WCU	2006
GEOL 491, Topics in Geology: Global Climate Change, WCU	2010
Natural Science: Earth Science and the Environment, Maryville College	2005
Environmental Geology, University of Tennessee	2001-2005
Physical Geology, University of Tennessee	2003

RESEARCH INTERESTS

My research interests have always focused on the interactions between humans and the physical environment. I employ geochemical techniques including stable isotopic analysis, organic geochemical analysis, and bulk chemical analysis to the solution of environmental problems and I have focused my research on wetland environments. Several of my current research projects include salt marsh response to climate and sea level change (Maine, USA), climate and environmental reconstruction using wetland peat deposits (Locally), and the determination of ideal conditions for the restoration of rivercane for Cherokee artisans (Locally).

PUBLICATIONS CURRENTLY IN REVIEW AT PEER-REVIEWED JOURNALS (Students in Bold)

Tanner, B.R., Kinner, D.A., Griffith, A.D., Young, R.S., and **Sorrell, L.M**., In Review, Presence of *Arundinaria gigantea* (rivercane) on Numerous Non-wetland Sites Suggests Improper Classification of the Species, *Wetlands Ecology and Management*.

PEER REVIEWED PUBLICATIONS

Wilson, K.R., Kelley, J.T., Tanner, B.R. and Belknap, D.F., 2010, Examining North-Temperate Salt-Marsh Geologic Records: Determining Origin of and Defining a Unique Stratigraphic Signature for Salt Pools of Six Maine Salt Marshes, U.S.A., *Journal of Coastal Research* v. 26, p. 1007-1026.

Song, X., Tanner, B.R., and Neff, K.E., 2010, Exploring Possibilities for Using UV/Vis and Fourier –Transform Infrared Spectroscopy to Directly Differentiate Soil Organic Matter in a Soil Profile, *Spectroscopy Letters* v. 43, p. 561-566.

Tanner, B.R., Kelley, J.T, Uhle, M.E., Mora, C.I., Lane, C., Schuneman, P.J., and **Allen, E.S**., 2010, Comparison of Bulk and Compound-Specific $\delta^{13}C$ Analyses and Determination of Carbon Sources to Salt Marsh Sediments Using *n*-Alkane Distributions (Maine, USA), *Estuarine, Coastal and Shelf Science* v. 86, p. 283-291.

Griffith, A.D., Kinner, D.A., Tanner, B.R., **Moore, A.**, Mathews, K.G., and Young, R.S., 2009, Nutrient and Physical Soil Characteristics of River Cane Stands, Western North Carolina, *Castanea*, v. 74, p. 224-235.

Tanner, B.R., Uhle, M.E., Kelley, J.T., and Mora, C.I., 2007, C3/C4 Variations in Salt Marsh Sediments: An Application of Compound Specific Isotopic Analysis of Lipid Biomarkers to Late Holocene Paleoenvironmental Research, *Organic Geochemistry* v. 38, p. 474-484.

Tanner, B.R., Perfect, E., and Kelley, J.T., 2006, Fractal Analysis of Maine's Glaciated Shoreline Tests Four Compartment Coastal Classification Scheme, *Journal of Coastal Research* v. 22, p. 1300-1304.

CONFERENCE PRESENTATIONS AND PUBLISHED ABSTRACTS

Griffith, A., Kinner, D., Tanner, B., and Young, 2010, Restoration of Arundinaria Gigantea (Rivercane) to the Oconaluftee River Floodplain, Cherokee, NC. This abstract has been officially accepted and will be published in GSA Abstracts with Programs Vol. 42, No. 5.

Tanner, B.R., Kinner, D.A., Barbour, S., and Young, R., 2010, Radiocarbon Dates Reveal a High Elevation, Early Holocene Wetland Deposit in the Southern Appalachian Mountains, Geological Society of America Abstracts with Programs, Vol. 42, No. 1, p. 188

Sorrell, L.M. and Tanner, B.R., 2010, Carbon Sequestration Rates of Different Marsh Zones in the Schoodic Marsh of Acadia National Park, Maine, Geological Society of America Abstracts with Programs, Vol. 42, No.1, p. 141

Wilson, K.R., Kelley, J.T., Belknap, D.F., and Tanner, B.R., 2009, Maine Salt Pools: Dynamic Agents of Coastal Change, Coastal and Estuarine Research Federation 20th Biennial Conference.

Wilson, K.R., Kelley, J.T., Belknap, D.F. Tanner, B.R., 2009, Salt Pools in the Stratigraphic Record and Their Role in Governing Surficial Change in Five Maine Salt Marshes: Geological Society of America Abstracts with Programs v. 41, no. 3, p. 18.

Allen, E.S., Tanner, B.R., Wilson, K.R., and Kelley, J.T., 2008, Finding a Fingerprint for Salt Pool Deposits in Maine Salt Marshes, Geological Society of America Abstracts with Programs v. 40, no. 4, p. 57.

Tanner, B.R., **Griffith, A.D**., Kinner, D.A., and Young, R.S., 2008, Presence of *Arundinaria gigantea* on Non-hydric Soils Suggests Improper Classification of the Species, Eos Transactions, Fall Meeting Supplement v. 89, no. 53, abstract B43A-0428.

Tanner, B.R., Sanger, D., Yates, M., and Sandweiss, D., 2008, Lithic Analysis of Chipped Stone Artifacts Recovered from Quebrada Jaguay, Peru, Society for American Archaeology Annual Meeting (Invited).

Wilson, K.R., Kelley, J.T., Belknap, D.F., **Allen E.S.**, and Tanner, B.R., 2008, Identifying a Unique, Stratigraphic Signature for Maine's Salt Pool Environments, New England Estuarine Research Society Fall Meeting.

Griffith, A., Kinner, D., **McDowell, K**., Tanner, B., and Young, R., 2007, Soil characterization for rivercane (Arundinaria Gigantea (Walter Muhl.)) restoration in Western North Carolina [abs]: GSA Abstracts with Programs, v. 39, no. 6, p. 243.

Tanner, B.R, Perfect, E., and Kelley, J.T., 2007, Fractal Analysis of Maine's Formerly Glaciated Shoreline Tests Established Coastal Classification Scheme, Geological Society of America Abstracts with Programs v. 39, no. 1, p. 103.

McDowell, K.L., Griffith, A.D., Kinner, D.A., Tanner, B.R., and Young, R.S., 2007, Restoration of Rivercane (Arundinaria Gigantea) in Western NC: A Step Towards the Identification of Ideal Environmental Conditions, Geological Society of America Abstracts with Programs v. 39, no. 2, p. 29.

GRANTS and CONTRACTS – PRINCIPLE INVESTIGATOR or CO-PI

Cherokee Preservation Foundation, 2010-2011"Rivercane Restoration Project", $12,000 -B. Tanner is not an author on this grant but is a close collaborator and partner and will be in charge (w/Dave Kinner) of money allocated to WCU through a contract from this grant.

Schoodic Research Fellowship, Acadia National Park, 2009 "Determination of Carbon Sequestration Rates in Salt and Freshwater Marshes in the Schoodic Section of Acadia National Park", $5,000

QEP Faculty Development Grant, 2008 QEP Development Grant in Support of Course Related Fieldtrip, $770.44

Cherokee Preservation Foundation, 2007-2008 "Western Carolina University Rivercane Project", $50,000

Maine Sea Grant, 2007-2008 "Use of Biomarkers to Determine Life Cycles of Maine Salt Marsh Pannes", $3,000

Baruch Marine Field Laboratory, 2007 Visiting Scientist Award (Salt Marsh Carbon Sequestration Study), $3,000
WCU Faculty Research Grant, 2006-2007 "Oxygen Isotope Record of Hurricane Activity Recorded in Tree Rings of Longleaf Pine", $12,500
Cherokee Preservation Foundation, 2006-2007 "Western Carolina University Rivercane Project", $101,000
WCU Arts & Sciences Technology Committee, 2006 "Technology Development Grant for acquisition of Geochemist's Workbench v.6 software", $1,000
Sigma Xi Grants-in-Aid of Research, 2004 "Maine Salt Marsh Project", $752
UT Department of Earth and Planetary Sciences, 2004 Discretionary Funds Award Supporting Maine Salt Marsh Research, $650
Geological Society of America, 2004 "Maine Salt Marsh Project", $2,000

ACADEMIC HONORS

Chancellor's Meritorious Award for Engaged Teaching, WCU	2007
Outstanding Achievement in Interdisciplinary Research**,** University of Tennessee	2005
Gene Tipton Graduate Mineralogy Award, Knoxville Gem & Mineral Society	2004
Highest Graduate Student GPA, departmental award, University of Tennessee	2003

SERVICE

Faculty Scholarship Task Force (Univ. Level)	Current
Faculty Scholarship Advisory Council (Univ. Level)	Current
University Research Council	2009-2010
College of Arts & Sciences Technology Committee	2007-2009
College of Arts & Sciences Safety Committee	2007-Current
Geosciences & NRCM Faculty Affairs Committee	2007-Current
Chair of Committee	2009, 2010
Geosciences & NRCM Resources Committee	Current
Geosciences & NRCM AFE Committee	2007-2008
Geosciences & NRCM Business and Space Affairs Committee	2006/2007
Departmental Liaison for Career Services	2006-Current
Departmental Liaison for State Employees Combined Campaign	2006-2007
Geosciences QEP Point Person	2009-Current

Tracy L. Zontek
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EDUCATION

Ph.D., University of Nebraska - Lincoln 2006
Dissertation: *Factors Contributing to Occupational Injuries in Direct Care Workers*
M.S.P.H., University of North Carolina at Chapel Hill 1994
Environmental Science and Engineering, Thesis: *A Method to Determine the Homogeneity of Noise Exposure Groups and Criteria for Enrollment into a Hearing Conservation Program*
B.S., Clarkson University 1992
Biology / Environmental Toxicology

PROFESSIONAL EXPERIENCE

Assistant Professor, Western Carolina University	2003-present
Faculty Research Fellow, Oak Ridge National Lab	2006-present
Adjunct Professor, East Carolina University	2001-2002
Adjunct Professor, Virginia Commonwealth University	1998-2000
Safety Manager, East Carolina University	2000-2002
Occupational Health and Safety Consultant	1997-present
Assistant Director, EHS, Virginia Commonwealth University	1998-2000
Industrial Hygienist, Kemper National Insurance Company	1996-1997
Industrial Hygienist, MELE Associates, U.S. Air Force	1994-1996

SUMMARY OF DISCIPLINARY EXPERTISE AND RESEARCH INTRESTS

Dr. Zontek teaches courses such as Industrial Hygiene, Water Quality, Noise and Hearing Conservation, Global Disparities in Public Health, From Black Death to Bioterrorism – the Public Health Response, Radiation Safety, Occupational Health, and Principles of Personal Protective Equipment. Her research focuses on the occupational health and safety aspects of nanoscale materials in the research and development environment. She was chosen as a Faculty Research Fellow by the Materials Science and Technology Division at Oak Ridge National Lab each summer since 2006. She has published her research on nanoscale material health and safety in a number of peer reviewed journals and presented at national conferences: American Chemical Society, National Environmental Health Association, and the American Society of Safety Engineers. She works with undergraduates on occupational health and safety topics according to the students' interest (second hand smoke, industrial hygiene studies). She also has a strong focus on service learning and community service, involving her students in regional water issues to both identify problems and find solutions.

RELEVANT COURSES TAUGHT

ENVH 483 – Environmental Health Internship
ENVH 480 – Independent Study
ENVH 460 – Senior Seminar
ENVH 457 – Industrial Hygiene
ENVH 450 – Quantitative Air Analysis

ENVH 410 – Radiation Safety
ENVH 317 – Noise and Hearing Conservation
ENVH 310 – Water Quality and Lab
ENVH 300 – Occupational Health
ENVH 230 – Introduction to Environmental Health
ENVH 215 – Principles of Personal Protective Equipment
ENVH 210 – Global Disparities in Public Health
ENVH 200 – Introduction to Public Health

PUBLICATIONS

Hubble, M.W., **Zontek**, T.L., & Richards, M. E. (2010). Predictors of influenza vaccination among EMS personnel. *Prehospital Emergency Care*. Accepted 8/23/2010, currently in press.

Jankovic, J.T., **Zontek**, T.L., Ogle, B.R., and Hollenbeck, S. (2010). Characterizing aerosolized particulate as part of a nanoprocess exposure assessment. *International Journal of Occupational and Environmental Health,* volume 16.4.

Jankovic, J.T., Hollenbeck, S., and **Zontek**, T.L. (2010). Ambient air sampling during quantum-dot spray deposition. *International Journal of Occupational and Environmental Health,* volume 16.4.

Jankovic, J.T., Ogle, B.R., Hall, M., Hollenbeck, S., and **Zontek**, T.L. (2010). Particle loss in a scanning mobility particle analyzer sampling extension tube. *International Journal of Occupational and Environmental Health*, volume 16.4.

Ogle, B. & **Zontek**, T. (2010). *Chapter 6: Introduction to Industrial Hygiene* in Fundamentals of Occupational Safety and Health (5th Ed.), Friend, M.A., & Kohn, J.P. (editors). Government Institutes: Rockville, MD.

Zontek, T., Ogle, B., & Ogle, R. (2010, March). Evaluation of an air monitoring protocol for nanoscale materials. *Professional Safety (55)3*.

Zontek, T. Ogle, B., & DuVernois, C. (2009, October). Job satisfaction and issues related to the retention of environmental health professionals. *Journal of Environmental Health 19*(6).

Zontek, T., Isernhagen, J. & Ogle, B. (2009, August). Psychosocial factors contributing to occupational injury in direct care workers. *American Association of Occupational Health Nursing Journal (57)* 7.

PRESENTATIONS/ABSTRACTS AT PROFESSIONAL MEETINGS

Ogle, B.R. and **Zontek**, T.L. (2010*). Occupational health and safety impacts of nanoscale materials.* Presentation at Western NC Safety and Health School conference. November 10, 2010, Asheville, NC.

Connell, S., Ogle, B. & **Zontek**, T. (2010). *Using the Condensation Particle Counter (CPC) to evaluate clean room particle counts during high and low occupancy and developing contour maps to help characterize clean room control technology at CNMS*. Presentation at American Society of Safety Engineers Region VI Professional Development Conference, Myrtle Beach, SC, September, 2010.

Craig, D., Ogle, B. & **Zontek**, T. (2010). *The use of RFID to improve the effectiveness, efficiency and safety of chemical inventories at CNMS*. Presentation at American Society of Safety

Engineers Region VI Professional Development Conference, Myrtle Beach, SC, September, 2010.

Arnold, L., **Zontek**, T., Ogle, B., & Lynn, D. (2010). *Identifying deficiencies in construction safety injury/illness reporting.* Presentation at American Society of Safety Engineers Region VI Professional Development Conference, Myrtle Beach, SC, September, 2010.

Hammond, N., **Zontek**, T. & Lynn, D. (2010). *Exploring sustainability in health and safety*. Presentation at American Society of Safety Engineers Region VI Professional Development Conference, Myrtle Beach, SC, September, 2010.

Zontek, T.L. (2010). *Making sense of nanomaterials*. Presentation at American Society of Safety Engineers, Region VI Professional Development Conference, September 22 – 24, 2010, Myrtle Beach, SC.

Zontek, T., Ogle, B., Jankovic, J. & Hollenbeck, S. (2010). *An updated protocol for nanoscale material air monitoring*. Poster presentation at National Environmental Health Association Annual Educational Conference and Exposition, June 5-9, 2010, Albuquerque, NM.

Ogle, B., **Zonte**k, T., Jankovic, J. & Hollenbeck, S. (2010). *Freeware contour mapping of ambient nanoscale particles*. Poster presentation at National Environmental Health Association Annual Educational Conference and Exposition, June 5-9, 2010, Albuquerque, NM.

Sanxhaku, A. Ogle, B. & **Zontek,** T. (2009). *Hazard evaluation and PPE assessment at Student Health Services.* Presentation at American Society of Safety Engineers Region VI Professional Development Conference, Myrtle Beach, SC, September, 2009.

Waldron, C., **Zontek**, T. & Ogle, B. (2009). *Comparing integrated sampling results with photoionization detector to encourage real-time monitoring of solvents.* Presentation at American Society of Safety Engineers Region VI Professional Development Conference, Myrtle Beach, SC, September, 2009.

GRANTS AND AWARDS (selected, last 5 years, students and postdocs underlined)

2007-2008: Association of Environmental Health Academic Programs**,** *Meeting Students on Their Own Turf: Podcasting as a Method to Recruit Environmental Health Majors*. $4000

Fall 2006: Grant participant under principle investigator B. Ogle. The Northwest Partnership for Public Health, Internship Grant, *A study of job satisfaction among environmental health specialists in North Carolina*. $5,000. Provided consultation on methodology design and completed statistical analysis. Wrote study final report.

Fall 2005: Grant participant under principle investigator P. Kneller. Eastern Band of Cherokee Indians/Environmental Protection Agency, *A Study of the Relationships Between Hospital Admissions for the Quala Boundary Reservation and Community-Level Ozone Measures.* $40,000. Completed statistical analysis and interpretation of results.

ACADEMIC AWARDS AND NOMINATIONS

Student Engagement Award, College of Health and Human Sciences, Spring 2010
Student Organization Advisor of the Year, Western Carolina University, Spring 2010
Don C. Morgan Faculty Scholar Award, College of Health and Human Sciences, Spring 2008

Chancellor's Distinguished Teaching Award, Western Carolina University, Spring 2007
Excellence in Teaching Liberal Studies Award, Western Carolina University, Spring 2007
Meritorious Service to Students Award, Western Carolina University, Fall, 2007
Nominated, *Jay M. Robinson Teaching Award for eLearning*, Spring 2007
Nominated, *Excellence in Teaching Liberal Studies Award*, Spring 2006
Faculty of the Year Award, Western Carolina University Student Affairs, Spring 2005

SELECTED COMMITTEE SERVICE AT WCU
eLearning Faculty Mentor, Coulter Faculty Center
Member, UNC-T Health Committee
Member, Western Carolina University Liberal Studies Oversight Committee
Member, Undergraduate Research Committee, Honors College
Chair, School of Health Sciences CRD Review Committee
Member, AIDS Quilt Committee
Chair, Chancellor's Distinguished Teaching Award Committee
Member, Excellence in Teaching Liberal Studies Award Committee
Chair, Health Services Study Group, Western Carolina University
Member, Sexual Health sub-committee, Western Carolina University
Member, Wellness Council, Western Carolina University
Member, Nutrition sub-committee, Western Carolina University
Member, College of Applied Sciences Safety Committee, Western Carolina University
Member, College of Applied Sciences Gerontology Group, Western Carolina University

SELECTED PROFESSIONAL & REGIONAL SERVICE
Exam Reviewer, Centers for Disease Control and Prevention (CDC) Environmental Public Health Online Courses (EPHOC).
Faculty liaison to the American Society of Safety Engineers, Piedmont Section.
Member, Nursing Assistant Conference Committee, Mountain Area Health and Education Center, Asheville, NC
Faculty liaison to the Western North Carolina Safety School.

4.5 Environmental Science Collegial Review Document

Department /Division: Environmental Science Program Director
Department Collegial Review Document
Effective 2010-2011 Academic Year only

Policies, Procedures, and Criteria for Faculty Evaluation:
Annual Faculty Evaluation, Reappointment, Tenure, Promotion, and Post-Tenure Review

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I. Overview

The purpose of this document is to describe the policies, procedures, and criteria for faculty performance evaluation in the Environmental Science Program. The document is guided by *The Code* of the UNC system and by the Faculty Handbook of Western Carolina University.

The environmental science (ES) program is interdisciplinary; the degree program represents a deliberate blending of courses and faculty expertise across several science disciplines within the College of Arts and Sciences (Biology, Chemistry, Geology, Natural Resource Conservation and Management), and one program in the College of Health and Human Sciences (Environmental Health). The ES program is governed by a Program Director and an Executive Committee consisting of faculty from the disciplines listed above. We recognize that faculty vary in their teaching, scholarly and service activities, and that there is not a single model that defines success. This AFE/TPR document for faculty with an ES appointment reflects the interdisciplinary nature of the appointments that ES faculty hold.

For purposes of AFE and TPR for ES faculty:

- The Department Head (DH) for ES faculty is the DH of the administrative home of the ES Program, currently Chemistry and Physics.
- The AFE and TPR committees for ES faculty will consist of the same individuals.
- Evaluation of ES faculty will reflect the teaching, scholarship and service contributions to Departments in which the ES faculty being evaluated hold teaching appointments.
- Where ES faculty hold interdisciplinary appointments, separate AFE/TPR evaluations by Departments outside of ES will not be done, because the interests of these Departments will be represented by their DHs and by individuals from these Departments on the ES AFE/TPR committee.
- The AFE/TPR committee for ES faculty will consist of tenured individuals as follows: 1 faculty from each Department in which the ES faculty has a teaching appointment but who are <u>not</u> on the ES Executive Committee, 3 people from the ES Executive Committee <u>excluding</u> the DH for ES, and the DH of ES as the nonvoting committee chair.
- Individuals on the AFE/TPR committee from outside the ES Executive Committee will be appointed by their respective Department Heads. Individuals on the AFE/TPR committee from within the ES Executive Committee will be selected by election within the ES Executive Committee.

- The DH statements for AFE and TPR will be prepared by the DH for the ES program. Heads of Departments in which the ES faculty being evaluated has a teaching appointment will sign the statement prepared by the DH for ES, with an option to include an addendum to the ES DH statement that reflects additional information regarding the ES faculty members' contribution to their Department.

Summary of Responsibilities of the Director of the Environmental Science Program

In addition to teaching and scholarship, primary responsibilities of the ES Program Director are to provide leadership and coordination for the ES program including (1) recruiting, retention and job placement, (2) curriculum, (3) advising, (4) ES Executive Committee, and (5) equipment and budget.

Recruitment/retention/job placement leadership includes overseeing the development and updating of open house and other promotional materials such as FAQ sheets, brochures, etc.; coordinating participation in open house and majors fairs, coordinating participation in summer orientation programs, coordinating oversight of the ES website, coordinating development and maintenance of career opportunity resources and career advising; assisting WCU with relations with alumni who have a BS degree in ES from WCU.

Curriculum leadership includes coordination with participating disciplines; coordinating ongoing evaluation of courses for inclusion in the program; coordinating degree audit revisions.

Leadership in advising includes working with the ES Executive Committee on advising procedures and assignment of advisees; providing oversight for ES student graduation paperwork; coordinating junior/senior course plans and presenting these plans to the ES Executive Committee for approval; coordinating advising for the Environmental Stewardship club; coordinating development of advising materials such as progress check sheets, etc.

Leadership with the ES Executive Committee includes organizing and chairing committee meetings and providing leadership for ES-related issues and administrative activities.

Leadership with the equipment and budget includes making sure ES supplies and equipment needed to run the program are ordered and maintained within the budget.

II. Domains of Evaluation

A. Teaching (Faculty Handbook Section 4.04 & 4.05)

1. **Teaching effectiveness is evaluated according to the following 7 dimensions:**
   a) **Content expertise –** Effective teachers display knowledge of their subject matters. Content expertise includes the skills, competencies, and knowledge in a specific subject area in which the faculty member has received advanced experience, training, or education.
   b) **Instructional delivery skills –** Effective teachers communicate information clearly, create environments conducive to learning, and use an appropriate variety of teaching methods.

c) **Instructional design skills –** Effective teachers design course objectives, syllabi, materials, activities, and experiences that are conducive to learning.
d) **Course management skills –** Effective teachers give timely feedback to students, make efficient use of class time, and handle classroom dynamics, interactions, and problematic situations (e.g., academic dishonesty, tardiness, etc.) appropriately.
e) **Evaluation of students –** Effective teachers design assessment procedures appropriate to course objectives, ensure fairness in student evaluation and grading, and provide constructive feedback on student work.
f) **Faculty/student relationships –** Effective teachers display a positive attitude toward students, show concern for students by being approachable and available, present an appropriate level of intellectual challenge, sufficient support for student learning, and respect diversity**.**
g) **Facilitation of student learning –** Effective teachers maintain high academic standards, prepare students for professional work and development, facilitate student achievement, and provide audiences for student work.

2. **Methods of evaluation and sources of evidence**
   a) Self-evaluation of teaching, addressing the 7 dimensions of effective teaching (4.05A)
   b) Peer review of teaching materials --including syllabi, examinations, study guides, handouts, assignments, etc. (4.05B2b)
   c) Direct observation of instruction using the departmental protocol. (4.3.1.1) Direct observation of non-tenured faculty will occur once per year. The observation will be performed by a tenured member (other than the DH) of Department in which the ES faculty is teaching. The results of the observation will be presented in the form of a letter to the ES AFE/TPR committee.
   d) Student assessment of instruction, using a form of the university-wide SAI instrument--required of all sections of all courses taught by untenured faculty (4.05A)
3. **General comments**
   Faculty should have the ability to create an atmosphere for learning, and stimulate learning by students. This ability can best be assessed through the University criteria outlined above. In addition to satisfactorily meeting these University expectations, the cumulative record of ES faculty should reflect their contributions to meeting the teaching loads within the Departments in which they have teaching appointments. Depending on the Department, these contributions can include teaching service and core courses: 100-300 level; teaching 300-600 elective level courses; teaching courses involving individual instruction at the undergraduate and/or graduate level.
   a) Professional Development
   Documentation of professional development to enhance teaching includes activities such as participation in pedagogy-related conferences and workshops, and observing other faculty teaching (especially in courses within Departments in which ES faculty hold teaching appointments).

B. Scholarship and Creative Works (4.05C)

1. WCU recognizes as legitimate forms of scholarly activity the four types described by Boyer. Specific departmental perspectives on these categories, relative valuations of various forms of scholarly activity, and department-specific examples of each, are described in #2 below.
   a) **Scholarship of discovery** – Original research that advances knowledge. Also includes creative activities such as artistic products, performances, musical, or literary works.
   b) **Scholarship of integration** – Synthesis of information across disciplines, across topics, or across time.
   c) **Scholarship of application** – Application of disciplinary expertise with results that can be shared with and/or evaluated by peers.
   d) **Scholarship of teaching and learning** – Systematic study of teaching and learning processes.

2. **Methods of evaluation and sources of evidence—including acceptable processes for peer review**

   Scholarship productivity of untenured tenure-track faculty must be dominated by discovery. Scholarship productivity of tenured faculty may reflect any mixture of the four types described above. Evidence of productivity is indicated by the following:

   * participation in research;
   * number, and quality of publications;
   * recognition by professional organizations such as invitations to speak or participation in panel discussions, election to office, requests for critical reviews of research proposals, requests to referee articles by other scientists;
   * evidence of participation in student research such as the production of reports, student oral or poster presentations, theses, or published articles;
   * evaluation of work by peers outside the ES Program and the University. All scholarship must be peer reviewed defined as evaluation of scholarly work by people with knowledge and expertise in the discipline in order to determine the quality of the work; and where the results of that assessment are made known to the faculty member and others, as appropriate for the work being evaluated. Scholarly work must be disseminated to a broad audience so that knowledge is advanced. In cases where scholarly work does not fit the traditional academic peer review model it is the responsibility of the faculty member to document in writing how their scholarship fits into the model;
   * presentation of papers or posters at professional meetings;
   * evidence of keeping abreast of the developments in the discipline;

   To meet expectations in the area of scholarship, the faculty member must show productivity in the scholarship of discovery prior to obtaining tenure. Scholarship of application, integration, and of teaching and learning are also recognized and valued by the ES program. However, productivity in these other areas must not be the sole source of scholarship for the granting of tenure.

3. **General comments** – Scholarship is expected of all tenure-track and tenured faculty in the ES Program though the type, amount, and role of scholarship may vary between faculty members due to stage of career, expertise, interests, and/or needs of the University; Department; or Program. Because appointments in ES are interdisciplinary, scholarship may reflect a broad range of topics across the disciplines within which ES faculty have appointments.
   a) **Grant proposals and awards** – The cumulative record of faculty should show evidence of active attempts to obtain funding if required to maintain their research/teaching programs.
   b) **Professional development** in scholarship is enhanced by a faculty member's participation in activities such as grant writing workshops, short courses that demonstrate use of new technology within their discipline, working with and/or using equipment (that WCU does not have) of colleagues at other institutions or agencies. Participation in a mentoring program as the person being mentored is also considered professional development.

C. Service (4.04C3 & 4.05D)

1. **Types of service**
   a) **Institutional service** is general expertise service done as an act of good citizenship such as serving on committees, recruiting students, mentoring new faculty members and advising administrators.
   <u>This type of service might include</u> participation in committee work at the program, departmental, college and university level; participation in open house activities for ES, orientation and other forms of student recruitment for ES; helping new faculty members succeed in their new positions by providing advice regarding teaching, research and service; advising administrators regarding the needs of the program; department; college; university (this can include advice regarding changes in curriculum, programs, student enrollments, grant requests, challenges associated with resources for advising, teaching and research, personnel issues etc.); helping each other by presenting guest lectures in other faculty's classes, if a faculty is unable to hold class.
   b) **Community engagement** might include professional activities such as participation in local primary or secondary school activities, presentations to local community groups, aid to local organizations that require disciplinary expertise, mentoring elementary, middle and high school students, participation in science fair judging, professional volunteer work and interactions with media.
   c) **Special expertise, unusual time commitments, or exceptional leadership can include:**
      * <u>Service related to</u>: ES program director duties; seminar series coordination; hosting special speakers; operation and management of core facilities; library liaison; invited presentations at the local, state, national or international level; grant proposal review, manuscript reviews; editor positions for books, chapters and journals; professional societies as an officer, committee member or program organizer.
      * <u>Service on committees</u> that require an extraordinary amount of time, such as faculty senate, over-sight or advisory committees.

* Service related to exceptional leadership that provides an improved instructional quality, administration, or research capabilities.

d) **Advising students** includes being informed about curriculum and related processes, being available to advisees, and assisting academic and career planning. ES faculty should have familiarity of the different disciplines in which they hold teaching appointments. Familiarity may include:
   * specific degree requirements and options for each program in which the faculty member has advisees;
   * where to direct students to find research options for students in programs requiring a senior research project;
   * how science and math courses fit into the liberal studies requirements;
   * requirements for liberal studies, junior/senior courses and total hours toward graduation;
   * requirement of availability to meet with advisees during advising time and during the drop/add period of the semester;
   * responsibility for timely responsiveness to email and telephone inquiries regarding advising; where to direct students to find out about career opportunities.

2. **Methods of evaluation and sources of evidence –**Administrative professional judgment can appropriately be applied in this area of evaluation. The workload of Committee Chairpersons will be taken into account. Other evidence such as letters of appreciation can be taken into account.

3. **General comments** – ES faculty should have the ability to serve the University and the public in ways appropriate to their discipline and an educational institution of our type. The service load of ES faculty should reflect their interdisciplinary appointments and thus be distributed across the Departments in which ES faculty hold teaching appointments.
   a) **Professional development** for service may be enhanced by participation in activities that improve leadership, advising, or engagement skills (e.g., workshops, conferences, training sessions, formal courses)

III. Specific Procedures for Review Events

A. Annual Faculty Evaluation (4.05)

1. Overview

The statements in Section I of this document apply to the AFE review process. The Domains of Evaluation for teaching, scholarship and service expectations described in Section II of this document serve as the basis for evaluation of the 1-calendar-year reflected in each AFE portfolio. In addition:

* It is expected that all tenured ES faculty will serve on AFE committees of Departments in which they have teaching appointments on a rotating basis, with a length of service consistent with the policies of the respective Departments.
* The AFE Committee for ES faculty will review materials submitted by each ES faculty member and will make written comments regarding teaching, scholarship, and

service. A single written statement prepared by the AFE committee and signed by the Chair of the Committee will be forwarded to the Department Head for ES. The Department Head will use information provided in the ES faculty member's AFE document plus the ES AFE Peer Review Committee's statement in preparing his/her letter. Further, input and review of this letter will be solicited by the home Department Head for ES from all other Department Heads where the ES faculty member holds an appointment. This letter will be signed by all contributing Department Heads.

* The ES faculty member will be given statements from the ES Department Head and the Committee. The faculty member has one week to respond to the Committee and Department Head reports. If requested by the faculty member, or offered by the Department Head, a consultation can occur where the Department Head and faculty meet to review the evaluation and discuss ways to improve performance if necessary. The faculty member must sign the Department Head and Committee reports to indicate receipt, but has the right to add a written statement of acceptance, clarification, or rebuttal to be included with the Department Head's report. The Head shall, following the meeting with the individual and receipt of any additional written statement from the faculty member, reconsider his/her report and either amend, or forward it as previously written.
* A summary of the year's departmental AFE results from the Department Head, the Review Committee, and any written statements by the faculty member shall be prepared and submitted by the Department Head to the Dean of Arts and Sciences by the deadline established by the Dean.

2. Composition of review committee

The composition of the AFE committee is identical for the TPR committee for the calendar year. The composition of this committee is described in "Section I. Overview" of this document. When the AFE of a member of this committee is being reviewed, that member will excuse him/herself from the process.

3. Procedures and preparation of documentation

a. All full-time faculty members must prepare an AFE document that includes:

1) Teaching

a) self-evaluation addressing seven teaching dimensions of teaching (as outlined in Section II.A.1), statement of teaching philosophy, description of goals, methods, and strategies used; selected teaching materials for courses taught during the review period.

b) copies of peer evaluations of teaching materials.

c) direct observation of classroom teaching (if required)

d) Student Assessment of Instruction

2) Scholarship and Creative Activity

a) one-paragraph self-evaluation summary of scholarship

b) scholarship activities (as outlined in Section II B above) listed in a template provided by the DH.

3) Service

a) one-paragraph self-evaluation summary of service

b) service activities (as outlined in Section II C above) listed in a template provided by the DH.

b. Specific guidelines for preparation of the AFE document

The AFE Portfolio is due to the ES AFE committee by the last Friday in February each year. The portfolio will include information for items
III. A.3.a.1-3, along with course syllabi and exams from the previous two semesters assembled in a binder. Faculty may include other instructional-related materials in addition to syllabi and exams if they so choose.

A blank template will be provided each year by the Department Head and will include tables and a standard format to document teaching load and activities, scholarship productivity and activities, and service load and activities with categories reflecting items III. A. 3. a. 1-3 of this document.

c. Evaluation of part-time/non tenure-track instructors (4.05F) whose only responsibility is teaching:

* Teaching effectiveness will be evaluated based on the 7 dimensions, using data from the following sources:
  1. **Direct observation of teaching by tenured peers**
  2. **Peer review of teaching materials**, using the Department AFE format for teaching, with review occurring each spring
  3. **Student Assessment of Instruction**, using the University approved instrument, for each course taught.
* The Department Head will write an evaluation summary of teaching effectiveness during AFE preparation in the spring
* The Department Head shall place in the part-time faculty member's file the evaluation summary, the peer teaching observation report, peer review of teaching materials, and a summary of all available SAI reports.

III. B. Reappointment, Tenure and Promotion (4.06 & 4.07)

1. **Overview – S**tatements in Section I of this document apply to the reappointment, tenure and promotion review process. The Domains of Evaluation for teaching, scholarship and service described in Section II of this document serve as the basis for evaluation of a faculty member's cumulative record.

   Faculty are expected to show improvement or continued excellence in teaching during their five years leading up to tenure application as reflected in peer evaluations and student evaluations.

   Faculty are expected to increase their service as they progress through their tenure track period. Faculty initially serve only on departmental committees and have few advisees, by the third and fourth year faculty are expected to also serve on college and/or university wide committees and to carry an increased advising load.

   Faculty are expected to begin their scholarship with grant application and submissions and gathering of preliminary data. Subsequently faculty are expected to work with an increasing number of students and have obtained necessary funding to support their work. Lastly, faculty are expected to have their work accepted for publication in externally reviewed journals by the last years leading up to their tenure application.

2. **Composition of review committee (4.07D1) is** described in Section I of this document and is expected to be consistent with provisions in the faculty handbook. It is expected that all tenured ES faculty will serve on TPR committees of the Departments within which they hold teaching appointments on a rotating basis, with a length of service consistent with the policies of the respective Department.
3. **Procedures and preparation of documentation** – The candidate list for each college is prepared by the Office of the Provost and distributed to the deans for review. The list is finalized by the Office of the Provost in conjunction with the Dean's office. Detailed instructions for preparing the dossier are issued annually from the Office of the Provost including the TPR schedule for when documents are due and decisions are made at the various review levels.

C. Post-Tenure Review (4.08)

1. **Overview -** The philosophy statement in Section I of this document applies to post-tenure review. The Domains of Evaluation for teaching, scholarship and service described in Section II of this document serve as the basis for evaluation of a faculty member's cumulative record.
2. **Composition of review committee –** The post-tenure review committee will consist of the same individuals as the TPR committee. The membership of the TPR committee will be consistent with the provisions in the faculty handbook.
3. **Procedures and preparation of documentation –** The post-tenure review documents will consist of a faculty member's CV, copies of all AFE Committee reports during the review period, and copies of the Department Head's AFE reports during the review period.

Criteria for Annual Faculty Evaluation, Reappointment, Tenure, Promotion, and Post Tenure Review

IV. The criteria for meeting expectations in the Environmental Science Program

A. Annual Faculty Evaluation (4.05)

1. **Teaching** – Faculty must satisfy the criteria outlined in Section II of this document that are consistent with the nature of his or her appointment and rank as described below.
2. **Scholarship** – Faculty must satisfy the criteria outlined in Section II of this document that are consistent with the nature of his or her appointment and rank as described below.
3. **Service** – Faculty must satisfy the criteria outlined in Section II of this document that are consistent with his or her appointment and rank as described below.
4. **General comments –** ES faculty should be contributing to the Departments in which they hold teaching appointments as described in Section II and III of this document.

B. Reappointment (4.06)

1. **Teaching -** To achieve the teaching mission and aspiration of WCU and the strategic goals of the Departments within which ES faculty hold teaching appointments, we expect that in addition to satisfactorily meeting definitions of load and the seven dimensions of teaching, the cumulative record of faculty should reflect that they regularly update their courses, maintain good tudent course evaluations, and contribute to one or more of the following:

* Teaching service and core courses: 100-300 level
* Teaching 300-600 elective level courses
* Teaching courses involving individual instruction at the undergraduate and/or graduate level

2. Scholarship – faculty must show evidence they are developing a research program dominated by the scholarship of discovery. This evidence may include peer-reviewed publications; oral and poster presentations; grants applied for; grants funded; research in progress; research conducted with students; unpublished research and manuscripts; lectures based on discovery research presented at non-professional meetings; other indications of keeping current in the field; workshop or short course attendance; review of grants and manuscripts. The most critical of these components are involvement of students in research, peer reviewed publications, active pursuit of funding necessary to support their work (either internally or externally) and invited presentations.

Although scholarship of untenured faculty must be dominated by discovery, productivity related to the other three types of scholarship described in section II. B. 1. of this document is also valued and will be considered in evaluating of meeting scholarship expectations. Evidence of scholarship will be those activities listed in the above paragraph.

3. Service - faculty must show meaningful participation in program and departmental activities, especially where the faculty member can make substantive contributions (e.g. program director, curriculum, advising). In addition, faculty are expected to contribute to college and/or university wide service activities (e.g., graduate council, governance, awards, student recruitment, etc.). It is expected that faculty increase their service as they progress through their tenure track period. Initially faculty serve only on departmental committees and have few advisees, by the third and fourth year faculty are expected to also serve on college and/or university wide committees and to carry an increased advising load.

4. General comments – Faculty should refer to Section II of this document for criteria describing domains of teaching, scholarship and service evaluation. Determination of whether faculty are meeting expectations for reappointment is not solely gauged by the sum of selected accomplishments Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth.

C. Tenure (4.07)

1. Teaching - In addition to the criteria described for reappointment, a faculty member must have demonstrated a consistent and commendable record of teaching over several years. The faculty member must have demonstrated proficiency in a range of teaching preparations, which might include teaching at different levels (introductory and liberal studies courses to upper level and graduate courses in the major) and class types (traditional lecture courses, independent studies, field investigation courses, etc.). Peer evaluations must be consistently positive for the last three years prior to tenure application and student evaluations for all class sections should indicate a majority of students believe the instructor is an effective teacher.

2. Scholarship - In addition to the criteria described for reappointment, a faculty member must demonstrate evidence of 1) an on-going, established research program dominated by

scholarship of discovery 2) that has been productive, and 3) shows promise of continued productivity in the future. Such a record is typically evidenced by publications in peer-reviewed journals, production of MS graduates if the faculty member conducts research within a Department that has a graduate program, involvement of undergraduate students in research activities, and the ability to obtain external funds if necessary to carry out scholarly activities. The scholarship of application, integration, and of teaching and learning are also valued but must not represent the sole form of scholarship. All forms of scholarship should be both disseminated and subject to external peer review (see section II.B.2.). Most faculty will use their first few years to establish their research laboratory and/or field sites, gather data, and to obtain the necessary funding for their research. Later years are expected to be more productive in terms of publications.

The ES program expects ES designated faculty to actively engage students in learning using a teacher-scholar mode. This requires that faculty are active, productive scholars and that their scholarly activity provides students with opportunities to enrich their educational experiences. It is not feasible to establish a standard publication expectation for tenure because 1) the Departments faculty will affiliate with a wide range of disciplines; 2) the highly variable and sometimes lengthy time it may take from project initiation to publication; some research programs require extensive data for publication; and 3) the expectation of student involvement in research, which requires significant time and may decrease scholarly productivity.

The typical successful case for tenure will include at least two manuscripts accepted for publication in peer-reviewed journals. However, the number of publications is not the sole source of evidence that will be considered in granting tenure. It is the responsibility of the faculty member being considered for tenure to demonstrate that their scholarship is 1) ongoing, 2) productive, and 3) has promise for continued productivity.

3. Service – In addition to the criteria described for reappointment, a faculty member will have engaged in service beyond the department prior to promotion to associate professor. This type of service should include serving on college level or university level committees and can also include discipline-based service to the community or society or service to the profession. Faculty must show meaningful participation in the programs and/or departments they are affiliated with. In addition, faculty are expected to contribute to college and/or university wide service activities (e.g., graduate council, governance, awards, student recruitment, etc.)

4. General comments – Faculty should refer to Section II of this document for criteria describing domains of teaching, scholarship and service evaluation. Determination of whether faculty are meeting expectations for tenure is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth.

D. Promotion to Associate Professor (4.07)

1. **Teaching** – Criteria for meeting expectations are the same as for tenure
2. **Scholarship** – Criteria for meeting expectations are the same as for tenure

3. **Service** – Criteria for meeting expectations are the same as for tenure
4. **General comments –** see general comments listed under expectations for tenure.

E. Promotion to Full Professor (4.07)

1. Teaching - Faculty should show continued progress on the trajectory established in earning tenure as described by the expectations in Section IV C of this document. They should demonstrate leadership as a teacher. Evidence of this leadership could include publications related to pedagogy, mentoring of young faculty, or participation (as a leader) in teaching workshops or seminars. Evidence of superior classroom performance can be reflected in peer evaluation, student evaluations and students learning assessment data, if available.

2. Scholarship - It is expected that a faculty member's research program will continue to include scholarship of discovery, but productivity in scholarship of integration, application and of teaching and learning are also highly valued. Faculty should show continued progress on the trajectory established in earning tenure as described by expectations in Section IV C of this document. However, faculty scholarship should also show evidence that their scholarship is having a broader and long-lasting impact on their discipline, education, and community. Evidence of broader and long-lasting impact includes being recognized by professional organizations such as *invitations* to speak or participate in panel discussions; election to office at the state or national level in professional/scientific organizations; performing critical reviews of research programs and proposals; refereeing articles for peer-reviewed journals.

3. Service – In addition to meeting expectations described in Section IV C of this document, faculty should show broadening contributions to service. This service should reflect clear evidence of a superior level of performance, which should include the evolution of the faculty member from a participant to a leader in service activities.

4. General comments – Faculty should refer to Section II of this document for criteria describing domains of teaching, scholarship and service evaluation. Determination of whether faculty are meeting expectations for promotion is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth.

F. Post-Tenure Review (4.08)

1. Teaching- a faculty member must have demonstrated a consistent and commendable record of teaching over several years. The faculty member must have demonstrated proficiency in the range of teaching preparations he or she has been assigned. This range might include different levels (introductory and liberal studies courses to upper level or graduate courses) and class types (laboratory, field, lecture).

2. Scholarship – A faculty member must demonstrate continued productivity in scholarship. Scholarly productivity is defined in Section II.B. It is expected that the faculty member's scholarly activities will have a broader and long-lasting impact on their discipline, education, and community.

3. **Service –** A faculty member must demonstrate service contributions above the program/department level. Faculty should demonstrate service internal and external to the University. This service should reflect clear evidence of a wide range of activities such as (but not limited to) application of scholarship to serve regional needs, collaborative projects with government and nongovernment agencies, and bringing forth new education models.

4. **General Comments -** Determination of whether faculty are meeting expectations for post-tenure review is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth. The ES program recognizes that a faculty member may not perform equally well in all areas each year, but each individual must make an effort to make a contribution across the board over time. Furthermore, the ES program recognizes that tenured faculty who have been at WCU for lengthy careers have much to offer given their experience and institutional knowledge. In consultation with the Department Head(s) where ES faculty have teaching appointments, these faculty may choose to engage in significantly increased levels of service such as serving on major WCU or UNC committees or establishing and facilitating important professional contacts. The Program fully values this level of service.

Faculty failing to meet Program standards for any category must develop, in conjunctions with the approval of the DH in which the program resides, an action plan to address the specified deficiencies. Progress on the action plan will be assessed in the next AFE.

Approved by (includes all Department Heads where ES faculty hold teaching appointments):

_____ _____
Department Head – Environmental Science Date

_____ _____
Department Head of: _____ Date

_____ _____
Department Head of: _____ Date

_____ _____
Dean Date

4.6 **Student Credit Hour (SCH) production for ES faculty combined since 2007.**
Data from Office of Institutional Planning

2007-2008		2008-2009		2009-2010		2010
Fall	Spring	Fall	Spring	Fall	Spring	Fall
1565	1722	1990	1933	2895	2336	2803

Standard 5 **Appendix**

5.1a **Number of students admitted.** Data from Office of Institutional Planning

	Fall 2008	Fall 2009	Fall 2010
Undergraduate	13	10	17
New Freshman	9	6	10
New Transfer	4	4	7
Grand Total	13	10	17

5.1b **Academic qualifications of admitted students.** Data from Office of Institutional Planning

	2007-2008				2008-2009				2009-2010			
	Avg ACT	Avg HS GPA	Avg HS Rank	Avg SAT	Avg ACT	Avg HS GPA	Avg HS Rank	Avg SAT	Avg ACT	Avg HS GPA	Avg HS Rank	Avg SAT
New Freshman	16	2.92	44	1005	18	3.28	57	1076	—	2.94	43	950
New Transfer	—	1.73	50	860	28	1.67	63	1000	19	3.32	42	955
Total or Average	16	2.56	45	984	21	2.74	58	1061	19	3.03	43	951

5.1c **Number of women, minority, and international students.** Data from Office of Institutional Planning

	2007-2008 # Enrolled	2008-2009 # Enrolled	2009-2010 # Enrolled
New Freshman	7	8	6
Female			
Race and Ethnicity Unknown			
U.S. Citizen			1
White			
U.S. Citizen	2	3	2
Male			
White			
U.S. Citizen	5	5	3
New Transfer	3	4	4
Female			
American Indian or Alaskan Native			
U.S. Citizen			1
White			
U.S. Citizen	2	2	1
Male			
White			
U.S. Citizen	1	2	2
Grand Total	10	12	10

5.1d **Number of students graduated each year**

	# in Cohort	# Graduated
Fall 2004	1	
Spring 2005	5	
Fall 2005	14	
Spring 2006	7	
Fall 2006	7	
Spring 2007	2	2
Fall 2007	13	1
Fall 2008	12	0
Fall 2009	11	6
Fall 2010	19	1
Spring 2008	2	1
Spring 2009	7	1
Spring 2010	3	3
Grand Total		**16**

5.2 Entry requirements for admission to the program

WCU Admission Requirements

When reviewing applications, we look at the whole student, including past academic record, test scores, and other achievements. Before applying, be sure to review WCU's admission requirements:

Computer Requirement -- Beginning with the Fall 1998 semester, all newly admitted degree-seeking undergraduate students are required to have an appropriate, networkable computer. This requirement also applies to readmitted students beginning with the Fall 2001 semester. read the complete requirement

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Freshmen

Your application to WCU begins with a strong high school record. We particularly look for:

- Excellent academic performance
- High class rank
- Strong ACT or SAT scores

We also look for:

- Students who have completed honors coursework
- Well-rounded students who have distinguished themselves outside of the classroom in leadership, community service, or other activities

To be considered for admission, you must have earned a high school diploma or its equivalent and satisfy the UNC minimum course requirements (MCR).

- Four units of English
- Two units of social studies (one in U.S. history)
- Four units of mathematics (algebra I, algebra II, geometry, and an advanced unit of mathematics beyond algebra II)
- Three units of science (life science, physical science, and a laboratory course)
- Two units of a language other than English

You'll also need to submit scores for the SAT or ACT, including a writing score, so be sure to sign up for a testing date well in advance.

Transfers

The successful transfer applicant to Western Carolina University will have a cumulative college GPA of 2.0 or better and be eligible to return to the college or university attended most recently. Those under the age of 24 must meet the University of North Carolina system's minimum course requirements (MCR). These can be met in high school by completing the following:

- Four units of English
- Four units of mathematics, including algebra I and II, geometry and an advanced math for which algebra II is a prerequisite
- Three units of science
- Two units of social science, including one unit of US or American history

- Two units of the same foreign language

Minimum course requirements can also be met by

- Earning an Associate of Arts or Associate of Science degree
- Completing the 44-hour general education core at a North Carolina Community College or
- Completing six semester hours each of transferable credit in English, math, science, social science and foreign language.

*Please note that the Associate of Applied Science does not count towards minimum course requirements.

International Students

At WCU, we welcome students with diverse educational backgrounds. We've designed our application process with the goal of evaluating your academic achievements in context.

Minimum requirements for international students include:

• Completion of secondary-school coursework. You'll need to submit the courses you took, your grades, graduation date, and any diplomas or certificates you received. Usually, students need an original transcript of courses and grades, and a copy (not original) of a diploma is helpful. All transcripts must be in English or translated using World Education Services or a similar translation company.

• A TOEFL score of 550 (paper-based), 213 (computer-based), or 79 (Internet-based). If English is your native language the Scholastic Achievement Test (SAT) may be submitted.

Exchange Students

To be an exchange student at WCU, your home institution needs to have an established agreement with WCU. Check with International Programs and Services to learn about participating in an exchange

5.3 **Enrollment in relevant courses**

Environmental Science courses:

	2006-07		2007-08		2008-09		2009-10		2010-11	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
ES Majors										
Student Credit Hours	47	18	47	6	59	18	23	61	40	36
# Courses	1	1	3	1	3	1	2	3	1	0
Avg Section Enrollment	14.00	6.00	11.67	2.00	21.67	6.00	14.50	14.33	32.00	0.00

Foundations – Environmental Health and Policy

	ENVH 375	**ENVH 470**	**ENVH 440**	**ENVH 310**	**ENVH 458**	**NRM 442**	**ECON 310**
2010-2011	0	4	1	3	3	4	0
2009-2010	2	1	1	5	6	3	0
2008-2009	1	1	0	1	1	2	0
2007-2008	0	0	1	2	1	2	0

Foundations – Environment and Society; Quantitative Methods

	SOC 371	**PAR 330**	**GEOG 402**	**PAR 333**	**ANTH 351**	BIOL 467	CHEM 232	MATH 375
2010-2011	4	0	0	3	1	6	0	0
2009-2010	2	3	1	2	1	5	4	0
2008-2009	1	1	0	0	0	1	1	0
2007-2008	0	1	1	0	0	2	0	0

Foundations – Field and Natural Env. Science; Analytical Methods

	GEOL 305	**GEOL 405**	**BIOL 434**	**BIOL 435**	**CHEM 330**	**CHEM 370**	**CHEM 432**	**CHEM 461**
2010-2011	5	0	0	1	6	0	0	2
2009-2010	8	0	0	0	9	0	0	0
2008-2009	2	0	0	0	2	0	0	0
2007-2008	0	0	0	0	0	0	0	4

5.4 **Number and types of minors completed by students.**

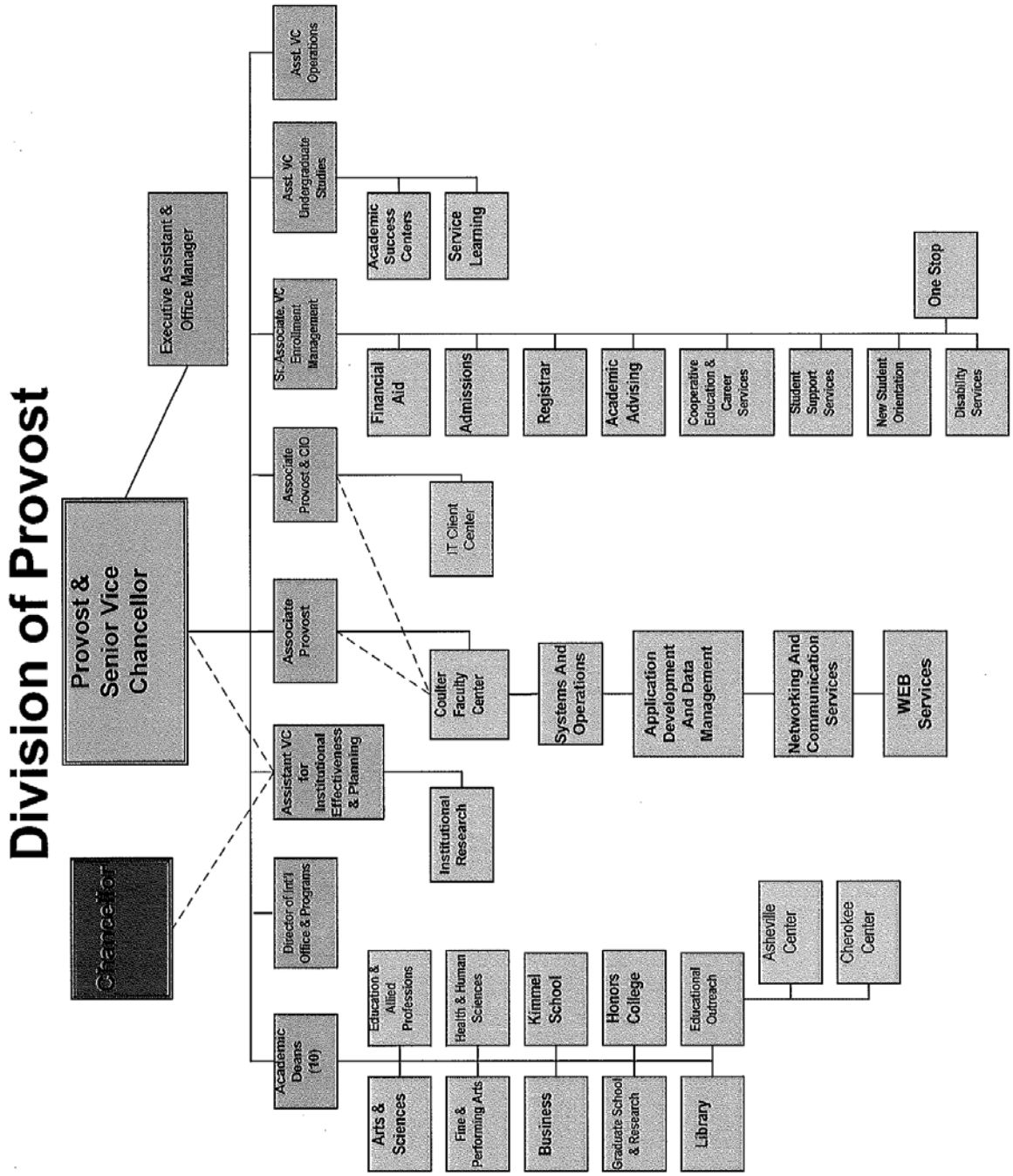
	# minor	# Graduated
Fall 2004		
Spring 2005		
Fall 2005		
Spring 2006		
Fall 2006		
Spring 2007		2
Fall 2007	1	1
Fall 2008		0
Fall 2009	1	7
Fall 2010		1
Spring 2008		1
Spring 2009		1
Spring 2010	4	3
Grand Total		**16**

5.5 **Employment positions or graduate institutions/degrees held by recent graduates (at time of graduation)**

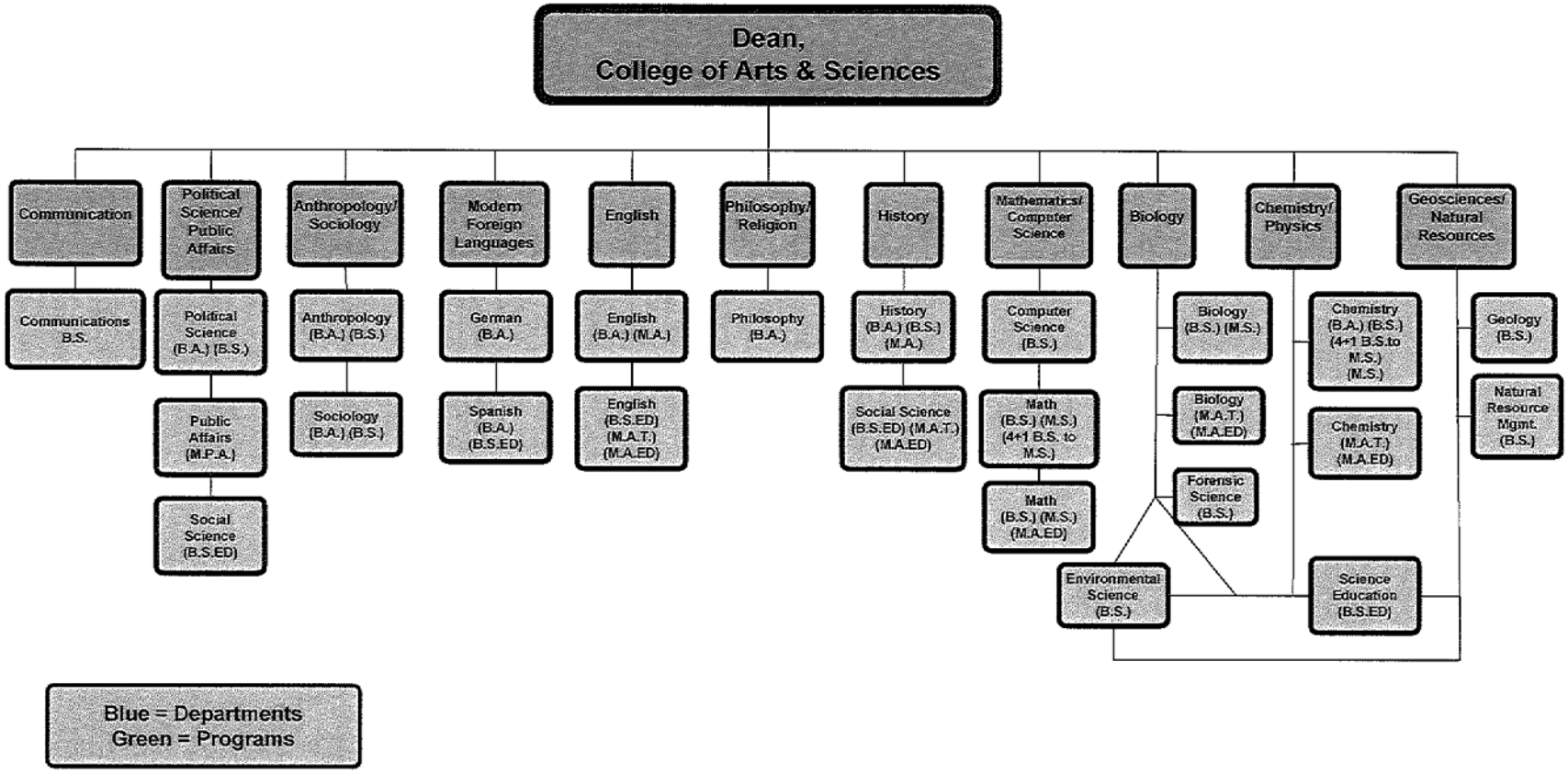
Graduation Date	Employment/Career Intent
Spring 2007	Private environmental consulting firm, laid off 2009, completed MAT, currently earth environmental science teacher Buncombe Co. Seeking employment in energy management at a university
Fall 2007	Private arboriculture company
Spring 2008	Interviewing with private environmental consulting firms, Florida
Spring 2009	US Park Service, graduate school UT-Knoxville
Fall 2009	Americorps, NE US Environmental Health career Unknown (4 students) Haywood Community College energy management
Spring 2010	Graduate school - Clemson Private environmental consulting firm GIS analyst for private firm
Fall 2010	Seeking employment in public environmental policy, CO

Standard 6 **Appendix**

6.1 **Organizational structure**



College of Arts & Sciences



Standard 7 **Appendix**

7.1 **Environmental Science Budget 2007-2011**

	2007	2008	2009	2010	2011
Student Regular Wage	$ 340	$ 4,113	$ 700		$ 1,500
Purchased Services Pool	$ 5,369		$ 3,931	$ 3,039	$ 2,613
Supplies Pool	$ 1,482	$ 3,142	$ 223	$ 4,217	$ 3,142
Property, Plant and Equipment	$ 2,329	$ 2,265	$ 4,666	$ 1,750	$ 2,265
	$ 9,520	$ 9,520	$ 9,520	$ 9,006	$ 9,520

7.2a **List of major facilities**

- An herbarium of more than 25,000 specimens
- Basic greenhouse facilities
- Two biotechnology laboratories
- Microscopy facility
- Cold rooms and centrifugation facilities
- Dark room
- DNA sequencing and RT-PCR facilities
- An aquatic research facility equipped for live aquatic animal studies
- A mammalian cell culture facility
- Helen Patton Environmental Studies Center
- Highlands Biological Station
- WCU West Campus Outdoor Laboratory
- Insect rearing facility with cages, larval trays, pupal rearing containers
- Cullowhee Creek Environmental Field Station

7.2b **List of major equipment**

Biology

Analyzer Genetic #3130-01
Akta Aktapurifier 10 W/Desktop Control
Microscope Epi-Fl3 Research Fluorescence
Realtime PCR Machine
Li-6400 Portable Photosynthesis System
Cell Counter Analyzer Cca
Vario El Elemental Analyzer

Conviron Model E8 Plant Growth Chamber
Leitz Microscope Orthoplan Research
Controlled Environmental Room Esi 6-9 Cr
Ultracentrifuge
Z2 Analyzer
Centrifuge Rc-5c Plus W/Accs
Spectramax 190 Microplate Reader
#307 Van 1996 5 Psnger White
#241 Maxiwagon 1994 B350
Centrifuge Rc5c Refrigerated
Microscope System Research
Anton Paar 1569 Automated Micro Viscometer
Leica Mz 12.5 Stereomicroscope System
Leica Mz12.5 Trinocular Stereo Microscope System
Eppendorf 5810r/4x400ml Centrifuge
Kinetic Microplate Reader W/Software
Mettler MX5 Electronic Micro Balance
Imaging System Kodakgel Logic 200
Gas Chromatograph 3740 W/Accessories
Rotor Ultracentrifuge Ti60
Freezer Upright Ultima Ii Ultralow-Temp
Nanodrop Spectrophotometer Nd1000
Photometer Control Unit-P1
Mettler Toledo Excellence Plus XP Analytical Balance
Eppendorf Concentrator W/Vacumn Pump
Spectrophotometer 8452a
Fastprep Fp 120 Instrument
Hood Safety Cabinet
Eppendorf Mastercycler Ep Gradient
Eppendorf Concentrator W/Vacuum Pump
Projector Lite Pro 720 Video
Centrifuge Rotor Swinging Bucket 6-Place
Battery Powered Backpack Electrofisher Kit
Detector Spectral 87 UV Vis Analytical
Eppendorf 5804 Centrifuge With 4x100
M J Research Thermal Cycler Pct-100
Ts100-F Trinocular Microscope W/Objectives
Ts100-F Trinocular Microscope W/Objectives
Ts100-F Trinocular Microscope W/Objectives
Laminar Flow Hood 4'

Environmental Health

GENERAL USE EQUIPMENT INVENTORY

FISHER MODEL S-400 ELECTRONIC SCALES

SYBRON NUOVA II HOT STIRRING PLATE
CAHN ELECTRONIC BALANCE
MODEL 100 INCUBATOR
CORNING MEGA PURE STILL
75 WATT DRY HEAT INCUBATOR
POWER MAC PC WITH INTERNET CONNECTIONS
COMPU-ADD CP90P POWER PC WITH INTERNET CONNECTIONS
PANASONIC SUPER VHS CAMCORDER

ETIOLOGY AND ARTHROPOD VECTORS CLASS

MICROCENTRIFUGES
GRADIENT THERMOCYCLER
ULTRA-LOW FREEZER
UPRIGHT FROST-FREE FREEZERS
DEDICATED REFRIGERATOR
INCUBATORS
SHAKERS,
VARIOUS HORIZONTAL ELECTROPHORESIS UNITS
FUME HOOD
BIOLOGICAL HOOD FOR TISSUE CULTURE AND VIRUS ISOLATION
CLEAN HOOD FOR PCR
ANALYTICAL ELECTRONIC BALANCES
HEATING BLOCKS
REFRIGERATED WATER BATH
DISSECTING MICROSCOPE WITH CAMERA ATTACHED
DISSECTING MICROSCOPES WITH FIBEROPTIC LIGHT SOURCES –3
COMPOUND MICROSCOPES-2
ICE MACHINE
DIGITAL IMAGING SYSTEM
AUTOCLAVE
STAND-ALONE SHAKER INCUBATOR

BSL-2 SUITE

BIOSAFETY CABINET
INCUBATORS

WATER QUALITY CLASS

HACH MODEL 2100 A TURBIDIMETER
HACH MODEL DREL 8000 PROTABLE WATER LAB – 4
HANNA WATER PROOF PH TESTERS – 6
HANNA HI 9142 DISSOLVED OXYGEN METER
YSI MODEL 55 DISSOLVED OXYGEN METER
MILLIPORE FILTER APPARATUS – 6

RITTER SPEED/CLAVE AUTOCLAVE
LAMOTTE SWIMMING POOL TEST KIT MODEL CP-231 – 3
LAMOTTE WATER TEST KIT MODEL AM 22
LAMOTTE WATER TEST KIT MODEL AM 24
LAMOTTE WATER TEST KIT MODEL AM 23
ACCULAB PORTABLE ELECTRONIC BALANCE
POLY SCIENCE SERIES 9500 REFRIGERATED WATER BATH
PERSCISION GRAVITY CONVECTION INCUBATOR
SWIFT FIELD MICROSCOPE MODEL FM-31
BACTERIA ANALYSIS KIT
TAYLOR INSTRUMENTS SLING PSYCHROMETER
LITTLE GIANT MODEL 13155 VACUUM PUMP – 2
TOTAL DISSOLVED SOLIDS METER
ASSORTED SIZE AQUARIA – 5
LONG HANDLED DIPNETS – 10
10’ AND 20’ SEINES – 6
Pall Magnatic Filter Funnel 300ml – 3
Hach model DR/2000 spectrophatometer-3

AIR POLLUTION CLASS

FISHER SCIENTIFIC DEGITAL TERMOMETERSX30
ALNOR VELOMETER JR. MODEL 8100 BX2
ALNOR THERMOANEMOMETERS MODEL 9850X2
ALNOR FAN VELOMETERS MODEL RVAX2
ALNOR MICORMANOMETERS MODEL 530X2
ALNOR ELECTROMANOMETER MODEL 8530D-1
GILIAN HIGH VOLUME PUMPS MODEL AIR CON 2X2
GILIAN LOW VOLUME PUMPS MODEL 513X3
GILIAN LOW VOLUME PUMP MODEL GILAIR 5
GILLIAN BUBBLE GENERATORS MODEL GILIBRATOR 2X3
ACCULAB BALANCE MODEL V-200
ACCULAB BALANCE MODEL V-1200
DENVRE INSTRUMENT BALANCE MODEL 300
QUEST HEAT STRESS MONITOR MODEL QUEST TEMP 10
PERSONAL TEMPERATURE MONITOR QUEST TEMP II
ORION ION METER MODEL 940
PROTOMETER MODEL XL71LX HYGROMETER
SE INTERNATIONAL RADIATION ALERT MONITOR 4
AIR SYS VOLUMETRIC AIR SAMPLER
LAMOTE AIR POLLUTION DETECTION KIT
MATHES TOXIC GAS DETECTOR, MODEL 801 4K
GELMAN PRESSURE VACUUM PUMP MODEL 13155X2
MATHES PRESSURE REGULATOR MODEL 408
SWIFT FIELD MICROSCOPE MODEL FM-31
SIMPSON ILLUMINATION LEVEL METER MODEL 408

ASBESTOS COUNTING MICROSCOPE
KURZ MODEL 441 AIR VELOCITY METER
WAHL MODEL HAS-1A INTRARED SFCE THERMOMETER
WILKS GAS ANALYZER
HOLDAY VDT RADIATION SURVEY METER
HAZARDOUS MATERIALS SPLASH SUIT
SCOTT SCBA
WIBGET MODEL RSS 214 HEAT STRESS MONITOR
STAPLIX HIGH VOLUME AIR SAMPLER
SIMPSON MICROWAVE LEAKAGE DETECTOR MODEL 380MX2
BENDIX TOTAL SULFUR MONITOR
SCOTT MULTIPURPOSE GAS MASK
BACHARACH CO2 INDICATOR SMAPLER X2
TAYLOR INSTURMENT SLING PSYCHROMOTER

Noise Class

QUEST NOISE LOGGING DOSIMETER X2
QUEST MODEL CA12B SOUND CALIBRATION KIT
QUEST SOUND LEVEL METER
AMETEK AUDIODOSIMETERS MODEL MK-2X5

Chemistry

DX120 ion chromatograph
DX500 HPLC system
Finnigan LTQ ESI-Mass Spectrometer
AAnalyzer300 Atomic absorption spectrometer
Optima 4100DV ICP-atomic emission spectrometer
LS55 Fluorometer
JEOL NMR spectrometer
Diamond TG-DTA
FIMS Mercury Analyzer
FT-Infrared spectrometer
HP8453, UV-Visible spectrometer
EFT-60 NMR spectrometer

Natural Resource Conservation and Management

Geochemistry
Fisher Scientific Centrifuge (Model 225)
Fisher Scientific Muffle Furnace (Fisher Isotemp Basic - 240V
Eijkelkamp Dutch Coring Apparatus (2)
Fisher Scientific Hotplate (Barnstead/Thermolyne)

Fisher Scientific Desiccator (Wheaton Dry Seal)
Fisher Scientific Salinity Refractometer
Fisher Scientific Vacuum Filtration Pump (KNF Laboport)
Rockware Geochemists Workbench v. 6 Software (2)
Fisher Scientific Soxhlet Extraction Apparatus (Klilmax) (3)
Fisher ScientificMultiprobe,YSI 556 (for pH and ORP)
Lowrance Ultrasonic Cleaner
Lowrance H2O GPS Unit
Water Filtration Unit (Cole-Parmer) (2)
Ward's Lab Oven (VWR/Sci-Ed)
Fisher Scientific Denver Instrument Balance (APX-200) 0.1mg - 200g
Fisher Scientific Denver Instrument Balance (APX-1502) 0.01g - 1500g
Fisher Scientific Pitetter set with rack
Fisher Scientific Low Pressure Liquid Chromatography Column (3)
Elementar Vario EL CNS Analyzer with Gateway Computer

Soil, hydrology, and climatology
Gravity Convection Oven
Box Furnace
Mettler M310 Analytical Balance
AQTESOLV Pro software (groundwater)
ORIGIN software (statistics)
Sears freezer
Hobo Mini-weather station logger
Hobo pressure sensors 0-30 ft of water (3) with base station
RG-2 Hobo tipping bucket rain gages with loggers (7)
Box Car Pro v. 4.3 Hobo software for data downloading
Hoboware software for data downloading
Constant well head permeameter (Ammoozemeter)
Ech2o soil moisture sensors (3)
RiverTools 3.0 Software
IDL 6.3 Windows software
Decagon Mini-Disc Infiltrometers (3)

Rock crushing and sediment analysis
3 RoTaps
Rock crusher
Rotary laps

Rock preparation
Covington 16 inch Slab Saw
Covington 8 inch Trim Saw
Thin Sectioning Equipment
Vibrilap polisher

Petrographic analysis

Polarizing microscopes
Nikon E200 Pol Binocular Heads (9)
Nikon Eclipse 50i Pol Trinocular Head (1)
Nikon Labophot Pol Scopes - Monocular (4)
Nikon Labophot Pol Scopes - Binocular (1)
Leitz Laborlux 11 Pol Scopes - Monocular (2)
Leitz Laborlux 12 Pole Scope - Trinocular (1)
Wild Pol Scopes - Monocular (2)
Stereoscopes
Leica MS5 Stereoscope (1)
Leica Zoom 2000 Stereoscope (1)
Unitron Stereoscopes (8)
Photomicrography
Nikon DS-5m Digital Color Camera, software, and control unit
Uni-slide microscope stage
Adobe software suite (image analysis)

X-ray diffraction
Rigaku MiniFlex XRD
Dell Computer for XRD with Jade Software

Field equipment
Vibracoring Unit
Wright-Livingstone Piston Coring Device
Soilmoisture Eijkelkamp Dutch Coring Apparatus
Marsh-McBriney flo-mate flow meter
Pomeroy EZ Core Drill Model D026-C and core orienting devices
Brunton compasses ()
13' Otter Whitewater Raft
BoatsToGo Aquastar Inflatable Boat (like zodiac)
Trimble GeoXM handheld GPS (2)
Soil augers, shovels, waders, rock hammers, etc. for lab use

Cullowhee Creek Environmental Field Station
Geophysical equipment
Proton Magnetometer
Geometrics Exploration Seismograph
Geoexploration Data Collection System
Resistivity Meter, handheld
RAMAC Ground Penetrating Radar System (GPR)
Antennas (200, 100, 50, MHZ RAMAC GPR)
Skid Box for GPR Antennas
Hydrologic Equipment
Portable HydroLab (with PH meter)
YSI 6600 Water Quality Logger
P4 Water Quality Monitor

~1/2 dozen water level loggers (pressure transducers)

Other
Surveying Equipment
Leica Total Station, Tripod, and Prisms
Zoom range finder (2)

7.3 **List of major hardware and software used by the program**

Hardware

Faculty Computing - All faculty in Environmental Science are provided with personal computers which are connected to a high-speed, broadband, internet connection. Each workstation is connected to (at least one) laser printer, scanner, copier. Digital cameras, video cameras and digitizers are available.

Student Computing - All on-campus WCU students have high-speed, broadband, internet connections available in their living quarters. Students are required to have their own personal computers. Numerous student computing laboratories are located throughout the campus including Moore Hall (Location of the Environmental Health Program), Forsyth 313, Technology Commons and Hunter Library.

Specialty Hardware

GIS facility with
- HP DraftPRo Plotter (largeformat)
- Summagraphics Digitizing Tablet
- Numonics 2200 Digitizing Table
- Calcomp 3348 Digitizing Tablet
- Complete ESRI software group site liscence

Specialty Software

ESRI software, including:
- ArcView 9.3.1
- ArcEditor 9.3.1
- ArcInfo 9.3.1
- ArcPad 8
- ArcEditor Student Demo 9.3.1 (Student Use Only)

Geochemist Workbench
PcOrd
Statistical software, including:

SAS – Quantitative Analysis
SPSS – Quantitative Analysis
ATLAS.ti – Qualitative Analysis

7.4 List of major library resources, databases, and journals

Databases

We have nearly twenty databases that support the Environmental Sciences program. The first set are specifically science-based and provide citations to and frequently the full text of scholarly journal articles, trade publications, technical reports, etc. The second set of databases provide information related to legislation, public opinion, and statistics on a variety of topics, including environmental sciences. Broader databases the still provide access/citations are included in this second set as well (Academic Search Premier, WorldCat, JSTOR)

1. Applied Science & Technology Abstracts
2. Biological & Agricultural Index
3. Biological Abstracts
4. GeoBase
5. GeoRef
6. Agricola
7. American Chemical Society Publications
8. ScienceDirect
9. SpringLink
10. Science In Context
11. Science Reference Center
12. SciFinder Scholar
13. Web of Science

1. CQ Researcher Online
2. LexisNexis Congressional
3. LexisNexis Statistical Insight
4. MasterFILE Premier
5. Academic Search Premier
6. WorldCat
7. JSTOR

Journals

13 journals that WCU has available specifically targeting environmental sciences. These include *Science*, *Nature*, *Advances in Environmental Research*, *American Journal of*

Environmental Sciences, *Environmental Practice*, *Environmental Sciences*, and *Frontiers In Ecology And The Environment*.
550 journals from chemistry, geosciences, and biology.

Monographs and DVDs

402 monographic titles from WCU supporting environmental sciences.
57 DVDs and videos supporting environmental sciences
11,000 books in biology, chemistry, and geology. 217 DVDs and videos supporting environmental sciences.

7.5 **List of support personnel, including non-teaching graduate assistants**

Kathy Boland – Administrative Assistant for Chemistry and Physics Department