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ENSC 360.01: Applied Ecology

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 TA Thomas.Sentner@umontana.edu, M-5 Rankin, (has an EVST mailbox), office hours = TR 2-4pm + by appointment

Purpose: Understanding the principles & concepts of ecology & how they inform real life decisions about human interactions with the environment. Emphasizes conservation of watersheds & biodiversity and design/interpretation of field studies.

Prerequisites: college level general biology & chemistry, statistics, ENST 201 (or similar courses)

References: EOE8 = Smith & Smith's Elements of Ecology 8th edition (at library reserve, bookstore & online in many options)
 (OR ANY basic ecology text – just read appropriate sections based on topic)
 AND AEEM = E. Newman's Applied Ecology & Env. Management 2nd ed In bookstore & on library reserve
Cox's General Ecology 'Lab' Manual – read chs 1-4 (emailed to you). Entire manual on reserve—read based on interest.
 Cox, G. W. 2002. General Ecology Laboratory Manual. Eighth Edition. McGraw Hill. 312pp
 Additional readings will be emailed to you during the semester

Week Lecture Topics Overview & references (select your readings using table of contents & index)

8/30 **VW** --Course goals/mechanics. **What is Applied Ecology? How to design field studies?** *Text—ch 1 ; Cox manual chs 1-4*

Ecological Literacy--Ecological concepts (& methods) that inform human decisions

9/13 **Ecosystem concepts** *EOE8 Part 1 & Part 6*

to All life and economic activity depends on earth support systems (ecosystem services).

9/29 Resources/services come from ecosystems & depend on their health/integrity/**condition**.
 Support systems have limited **capacity** to supply goods/services & to assimilate change.
 Natural **change** contributes to diversity but makes it hard to identify human-caused change.
 Support systems are **connected**, so our actions have unexpected, indirect effects.

Local populations/communities/ecosystems are linked in regional & global systems
 (whole > sum of parts); importance of incremental, cumulative effects
 Energy flow & productivity *EOE8 ch 21* *Focus on how humans have altered watersheds*

Material cycles (especially the water cycle) -- *EOE8 ch 3 & ch 22-23*

Env. fate of chemicals *AEEM ch 9 (p 263-80)*

10/4 **LB** **Community concepts** *EOE8 ch14-19 (fig 17.12);*

& in Part 7, read about the type of ecosystem/community at your study site

to Niche & Habitat—every species has multiple roles (keystone, foundation, indicator, umbrella species, etc)
 (physiological niche vs ecological niche)

10/20 Interactions/connections—competition, predation, mutualism/symbiosis, coevolution

Change (ch 19)– succession, disturbance, stability, resilience, flexibility, predictability, shifting baselines
 Diversity (ch 29)—types & significance of diversity; Why and how to maintain biodiversity

10/25 Organisms & their adaptations (contrast with acclimation); *EOE8 ch5-7;*

10/27 **LB** **Population concepts** *EOE8 Ch 5, 8-12, Newman Ch 10*

to What are populations (local & meta), subspecies, and species? *EOE8 Ch 5,8,12 (especially p 233)*

11/17 change in quantity—rate/regulation of growth (exponential & logistic), carrying capacity, ecofootprint *EOE8 ch 9-11*
 change in quality—evolution, genetic diversity, flexibility, pop. viability, MVP analysis *EOE8 ch5& 29 esp p576-7*

11/29-12/6 **VW?** **Ecological Literacy for a sustainable society. See EOE8 (part 8 Human Ecology) & AEEM**

Possible topics (reading will be assigned after class selects topics): Energy, Carbon and Climate: N ch2, EOE8 ch 30
 Achieving Sustainability EOE8 Ch 28; Population Policy, carrying capacity, ecofootprint (assigned reading)

Conservation of Biodiversity N ch10 & EOE8 Ch 29; **Ecological restoration**-- N ch11 and SER web site

Pollution Ecology, Ecotoxicology and setting standards N ch9; Forest Management N ch7

Ecology of Food Production N ch4 (also 3,5,6); Pest management N ch 8 2014 **Topics are in bold**

Env. Impact & Risk Assessment; Superfund www.epa.gov/region8/superfund-sites-region-8

OR papers selected from Frontiers in Ecology or other key journals by class

12/8 last regular class day -- wrap up/evaluations; **Tom Sentner presentation**

12/15 (Thurs) 10-noon pm. Final class meeting. **Grad student presentations** (topics TBD)

*** 10/31 last day to drop or change grading 'easily'; last day to drop at all is last day of classes Dec 9 ****

See academic calendar with all deadlines at www.umt.edu/registrar/PDF/OfficialDatesandDeadlinesfall2016.pdf

Grade based on percentage of 550 points earned**HOW to earn points (maximum possible points shown):**

400 pts 4 Take home essay exams (100 pts each); a 5th exam is optional

50 pts Participation in class

100 pts Field trips & reports on same (10 pts/hr of trip & per ½ page of single spaced 10pt font)

reports due about one week after field trip. Sign up in class or at **M-2 Rankin**

See EVST Conservation calendar for times & meeting places.

HOW to lose points: Unexcused absence from field trip once signed up – drop letter grade.

Late work – Assignments lose half their value after 5pm day due.

Assignments lose rest of their value at 5pm a week later.

Take Home Exam Essays ARE DUE THE DAYS/TIMES INDICATED on the exam;

Field Trip options for ENSC 360 class Fall 2015 (note these are shared with other classes)

For trips with UM vans (*), Students in ENSC 105, 360 & 540 may register for a space in a UM van on a sign up list at Rankin Hall room M-2. Other UM students can ride in the UM van if there is space. Non-students need to provide their own transportation.

Aug 31 (Wed, walk) & Sept 2 (Fri, van ride)--**Clark Fork River sampling**--meet at 102 Natural Science at 2:10pm

(Sept 3-5 (Sat-Mon), – **sampling on upper & lower river.** Sign up for available space in vehicle – field class gets first chance)

* Sept 17, Sat – **Clark Fork Superfund tour.** meet at 8am at north end of Van Buren br. (East Gate parking lot). return 6pm.

Sept 16-17– Missoula Hazardous Waste Collection Days (volunteers needed, great experience & counts for field trip hours)

* Sept 24 Sat – Public Land Day (volunteers needed; ecological service work may count as field trip; check with Watson)

* Oct 1 or 8, Sat, **Blackfoot Restoration Tour** – meet at 8am at north end of Van Buren Br. (East Gate parking lot). return 6pm.

* **Oct (TBD) Tour Missoula Wastewater Treatment plant,** Ekocompost (composts Missoula's sewage sludge; started over 30 years ago by an EVST alum) and new land application/poplar plantation by the treatment plant (also started by EVST alums)

Note: Some field trips of ngos, government agencies or other departments may count as 360 field trips – get them approved & arrange your own transportation. For more info (time, location, contacts) on field trips, see -- www.umt.edu/conservationcalendar
See trips offered by Clark Fork Coalition, Audubon, Sierra, Great Burn, MPG Ranch, etc . Also trainings by WEN. 9/19,9/23,9/26
Ecological Restoration field trips (courtesy of Cara Nelson) are also recommended. Info on these will be emailed.

First Take Home Exam question (Rest of Essay Exams will be emailed to class; note—students work in TEAMS)

Remember to Cite your sources using the Council of Science Editors style that was used in ENST 201 (ask for a guide if needed). Lectures, ecology texts, Newman text, Cox manual are good sources, but find some journal articles also if you can.

Point allocation & due dates for the remaining questions are specified on the later exam questions which will be emailed to you.

Restate each part of the question just before you give your answer to it. Using the e-version of the exam saves retyping questions.

1) Scientific methods/approaches used in ecological field studies (part A due Sept 17; part B due Sept 29 at start of class)**A..Identify a published primary research article on an ecological FIELD study and use it to answer all exam questions:**

State the main overall question addressed by the research project (ATTACH a copy of the published study you are using);

Briefly outline the study design – why do it? what is observed/measured, when, where, how and why do it this way?

How were data analyzed? That is, what statistical tests or other data analysis methods were used and why? 10 pts

B...Explain the following terms (ie define, give importance to scientific process) and ILLUSTRATE using your study):

The scientific cycle (10pts), induction vs deduction (10pts), description vs experimental manipulation (10), reductionist vs holistic approaches (10, include advantages/disadvantages of each), control/reference (5), replication (5), QA/QC (accuracy, precision, representativeness, comparability, completeness --20) and use of models (10, what are they & how are they used in ecological field studies like yours?). Even if a concept does not seem directly applicable to your study, give a short definition & example. (use info in Cox manual & lectures).

2 points for each relevant, credible, correctly cited source up to 10 pts

Note –I recommend you select study sites in the US (in MT even better) –easier to find info needed for questions.

You will form into **small research teams** that will select a single study based on common interests. You can work together on researching the questions, but each person will produce his/her own essay answers in his/her own words. A list of recommended studies will be emailed.