ZOL 897 Ecosystem Ecology & Global Change (4 credits)
Course Information and Requirements (Spring 2015)

Time and place: Tues & Thurs, 10:20 AM–12:10 PM, 150 Natural Sciences Bldg.

Instructor: Steve Hamilton, Kellogg Biological Station, Office hours by appointment. Tel. 269/671-2231 office. Email: hamilton@kbs.msu.edu.

Synopsis: An understanding of ecology at the ecosystem level provides the "big picture" that is essential to protect and manage ecosystems, particularly as we grapple with global environmental change. In this course, we study the fundamentals of ecosystem structure and function, including primary and secondary production, food webs, biogeochemical cycles, managed ecosystems, and ecosystem interactions with climate. Throughout the course topics are considered in the context of global change and the pervasive influences of human activity. In the discussion part of the course we will work through a comprehensive survey of climate change science, policies, and politics (Henson 2014; see below).

Texts: Lectures will be accompanied by electronic copies of slides and lists of references. Only one text is required:

Henson, Robert. 2014. The Thinking Person's Guide to Climate Change. American Meteorological Society**. ~**$20 (when ordered in bulk).

Discussions: Discussions will be based on readings from the recent scientific literature and the above text, and will be led by students. Readings should be made available a week in advance, usually as pdf files. Images from the Henson book are found at http://www2.ametsoc.org/ams/index.cfm/publications/ams-online-store/the-thinking-person-s-guide-to-climate-change-figures/

Handouts: These will be available through the http://netfiles.msu.edu. Log in with your MSU ID, click "Change" for the location, and input "/afs/msu/user/h/a/hamilton/ZOL 897-15"

Grades: Grades will be based on 4 short tests (15 points each, 60% of total grade), participation in discussions (10%), and a comprehensive final examination (30%). Questions on tests and the final exam will be mostly short-essay format. Grades will be assigned as shown below.

Final Average (%)	Grade	Final Average (%)	Grade
90-100	4.0	70-74	2.0
85-89	3.5	65-69	1.5
80-84	3.0	60-64	1.0
75-79	2.5	<60	0.0

A note on procedures for SIRS forms: "Michigan State University takes seriously the opinion of students in the evaluation of the effectiveness of instruction, and has implemented the SIRS (Student Instructional Rating System) process to gather student feedback. This course utilizes the "online SIRS" system, and you will receive an e-mail sometime during the last two weeks of class asking you to fill out the SIRS web form at your convenience. This course is being considered for participation in a new program for the administration of online SIRS. If it is included, the following procedure will be followed. As a reminder to be sure to fill out the SIRS evaluation form, the final grade for this course will not be accessible on STUINFO during the week following the submission of grades for this course unless the SIRS online form has been filled out. You have the option on the online SIRS form to decline to participate in the evaluation of the course – we hope, however, that you will be willing to give us your frank and constructive feedback so that we may instruct students even better in the future."

Schedule for ZOL 897 (2015)

Jan 13	Overview of course; Introduction to ecosystem ecology and biogeochemistry
Jan 15	Current understanding of climate change
Jan 20	The Carbon Cycle: Forms of C; Global budgets; Human perturbation
Jan 22	Discussion: Climate change basics and GHG effect: Henson pp. 3-58. Also Solomon et al. 2009 PNAS "Irreversibility of climate change"
Jan 27	Primary and secondary production: Carbon balances and flows in ecosystems
Jan 29	Introduction to stable isotopes: Energy flow and food webs in ecosystems
Feb 3	**Test 1;** Discussion: Stable isotope applications in ecology
Feb 5	Decomposition of organic matter: Processes, controlling factors, and role in climate forcing
Feb 10	Discussion: Heat, floods, droughts: Henson pp. 59-96
Feb 12	The Nitrogen Cycle: Forms of N; Nitrogen limitation; Human perturbation
Feb 17	Discussion: Novel nitrogen cycling pathways [*Hamilton attends GLBRC retreat at KBS*]
Feb 19	The Phosphorus Cycle: P as a limiting nutrient; Eutrophication
Feb 24	**Test 2;** Discussion: Nutrient cycles and eutrophication
Feb 26	Discussion: Ice and snow: Henson pp. 97-140
Mar 3	Restoration of ecosystems: The ultimate challenge for ecologists
Mar 5	Discussion: Oceans: Henson pp. 141-170
--	*[Spring Break is March 9-13]*
Mar 17	Remote sensing and GIS in ecosystem ecology
Mar 19	**Test 3;** Discussion: Hurricanes and storms: Henson pp. 171-196
Mar 24	Ecosystem manipulations as an experimental approach
Mar 26	The effects of contaminants on ecosystems: Acid rain, trace metals, organics
Mar 31	Discussion: Ecosystems & agriculture: Henson pp. 197-230; Also consider Hatfield et al. 2011, Dawson et al. 2011
Apr 2	Discussion: Tracking climate change: Henson pp.231-256; Also Berkeley temperature project, Wild 2012
Apr 7	National Climate Assessment: Midwest US report chapter
Apr 9	**Test 4;** Discussion: A walk through climate history: Henson pp. 257-296
Apr 14	Discussion: Modeling climate change: Henson pp. 297-318
Apr 16	*Attend LTER Symposium talks at Kellogg Center*
Apr 21	Discussion: Debates & solutions I: Henson pp. 319-366
Apr 23	Discussion: Debates & solutions II: Henson pp.367-438
Apr 28	Discussion: What can you do: Henson pp. 439-466
Apr 30	**Final Exam:** 10:20 AM-12:10 PM