NRM 470 – Terrestrial Carbon Management
Spring 2016

Instructor - John Yarie
Lectures - MWF 9:15-10:15 (305 O'Neill Bldg)
Office Hrs - 337 O'Neill, 8A – 11A MTWT.
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Textbook and additional reading material:

Wackernagel, Mathis and William Rees. 1996. Our Ecological Footprint. New Society Publishers, British Columbia, Canada. 160 pgs.

Walker, Brian and David Salt. 2006. Resilience thinking: sustaining Ecosystems and People in a Changing World. Island Press. Washington, D.C. 174 pgs.

Ravindranath, N. H. and Madelene Ostwald. 2008. Carbon Inventory Methods; Handbook for Greenhouse Gas Inventory, Carbon Mitigation and Roundwood Production Projects. Vol 29. Advances in Global Change Research. Springer. 304 pgs.

Hoover, Coeli M. (ed). 2008. Field Measurements for Forest Carbon Monitoring: A landscape-Scale Approach. Springer. 240 pgs.

Griffiths, Howard and Paul G. Jarvis. 2005. The Carbon balance of Forest Biomes. Taylor and Francis Group. New York, New York. 356 pgs

Course Description

Climate change and its relation to carbon dynamics have become an element of potential natural resource management options of land owners within the state and across the country and the globe. The course will present a broad scale description of the direction for forest carbon management and proposed methods for inventorying and documenting carbon dynamics attached to industry and down to the landowner.

Course Goals

This course focuses on environmental factors and ecological processes that drive forest carbon dynamics. Lectures will cover the basic concepts of forest carbon cycling and affects of silvicultural practices. Major areas of emphasis will be on: (a) establishment of a forest carbon site, (b) measurement of above- and below-ground pools, (c) measurement of above- and below-ground carbon fluxes, and (d) potential use of remote sensing and modeling techniques. Each lecture will have corresponding reading assignments that should be completed prior to the lecture. Class discussions on selected reading assignments will occur

periodically. Students are responsible for all information covered in lectures, reading assignments, and discussions.

A planning exercise will be assigned as part of the course work and will be focused on development of a carbon monitoring system tied to a selected silvicultural prescription within the University Forest. Data analysis will be performed during the semester, concluding with the submission of a report by each student describing the proposed silvicultural practices for the University Forest and their potential affect on landscape carbon dynamics.

Student Learning Outcomes

Upon completion of this course students should be able to:

1) Develop an understanding of forest stand dynamics
2) Use the stand dynamics knowledge to devise carbon management objectives and activities to obtain a desired outcome
3) Understand natural and human caused abrupt and gradual changes that can occur in forest ecosystem carbon dynamics
4) Discuss the application of ecological knowledge to carbon management objectives of forest ecosystems

Instructional Methods

Presentation of material for this course will include lectures, instructor led discussions, student led discussions, and assignments. Students are expected to complete reading assignments prior to each lecture. Assigned homework is expected as scheduled on the course outline. Development of “Concept Maps” will be used throughout the course.

Course Calendar – Lecture Schedule

Lecture #	Topic	Assignment
1	Basic Course Introduction and Concept Map Presentation	
2	Global Carbon Cycle	Chapter 1, 2 & 3 – Carbon Inventory Methods;
3	Landscape Considerations	Chapter 1 – Field Measurements
4	Activities, Programs and Projects	Chapter 3 – Carbon Inventory

Lecture #	**Topic**	**Assignment**
		Methods
5	Project Development, etc.	Chapter 5 – Carbon Inventory Methods
6	Methodological Issues – Baseline, Permanence, Additionality and Leakage	Chapter 6 – Carbon Inventory Methods
7	Carbon Inventory Baseline and Project Directions	Chapter 7 – Carbon Inventory Methods
8	Project Areas and Boundary	Chapter 8 – Carbon Inventory Methods
9	Methods Overview	Preface – Field Measurements
10	Introduction to Class Project	
11	Carbon Pools and Measurement Frequency	Chapter 4 – Carbon Inventory Methods
12	Class project discussion	
13	**First Exam**	
14	Generic Methods of Inventory	Chapter 9 – Carbon Inventory Methods
15	Aboveground Biomass - Trees	Chapter 10 – Carbon Inventory Methods; Chapter 4 –Field Measurements
16	Discussion period	
17	Aboveground Biomass - Shrubs	Chapter 10 – Carbon Inventory Methods; Chapter 5 – Field Measurements
18	Belowground Biomass	Chapter 11 – Carbon Inventory Methods; Chapter 10 – Field Measurements
19	Discussion period	
20	**Second Exam**	

Lecture #	Topic	Assignment
21	Deadwood and Litter	Chapter 11 – Carbon Inventory Methods; Chapters 6 & 7 – Field Measurements
22	Soil Organic Carbon	Chapter 13 – Carbon Inventory Methods; Chapter 10 – Field Measurements
23	Discussion period	
24	Litter Decomposition	Chapter 8 – Field Measurements
25	Deadwood Decomposition	Chapter 9 – Field Measurements
26	Soil Respiration	Chapter 11 – Field Measurements
27	Dissolved Organic Carbon	Chapter 13 – Field Measurements
28	Methane Fluxes	Chapter 12 – Field Measurements
29	Discussion periiod	
30	Remote Sensing and GIS	Chapter 14 – Carbon Inventory Methods; Chapter 16 – Field Measurements
31	Modeling Carbon Dynamics – Online carbon balance software; COLE, COMET-VR, CENTURY	Chapter 15 – Carbon Inventory Methods
32	National Carbon Inventory	Chapter 16 – Carbon Inventory Methods
33	National Carbon Inventory	Chapter 16 – Carbon Inventory Methods
34	Carbon Stock Estimation and Changes	Chapter 17 – Carbon Inventory Methods
35	Discussion	
36	Uncertainty Estimation, Quality Assurance	Chapter 18 – Carbon Inventory Methods

Lecture #	Topic	Assignment
37	Landscape-Scale Carbon Sampling	Chapter 17 Field Measurements
38	1605(b) guidelines	
39	Carbon Markets – Do we need financial or ecological expertise?	
40	Project Discussion	
41	Project Discussion	
42	Project Discussion	
Finals Week	**Final Exam**	

Course Policies

1. **Attendance**: As part of the "Learning Community" all students are expected to attend and participate in class.
2. **Absences and Make-ups**: If necessary, excused absences must be arranged ahead of time with the Instructor.
3. **Tardiness**: Students are expected to arrive in class prior to the start of each class. If a student does arrive late, they are expected to do so quietly.
4. **Participation and Preparation**: Students are expected to come to class with assigned reading and other assignments completed as noted in the Syllabus.
5. **Assignments:** All assignments must be received by the Instructor no later than 12 p.m. on the due date as noted in the Schedule unless otherwise prior-arranged. Each assignment must have the following: Your Name; Date; Assignment Title.
6. **Graded Assignments**: It is the instructor's intention to grade and respond to student assignments within seven days of their receipt. At any time you may call and ask what you received on a specific assignment if you haven't yet received it back.
7. **Reporting Grades**: All student grades, transcripts and tuition information are available on line at http://ww.uaonline.alaska.edu and in the blackboard grades section. If you have difficulty accessing this web site, contact the registrar at your local campus.
8. **Written paper assignments**: All papers are expected to be typed and double spaced, with no misspelled words. Sentences should be grammatical and the paper easy to read. The burden is always on the writer to communicate with the reader. UAF has a writing lab and other tutoring services available to students (474-5314). It is also recommended that you have another person review your

draft before final submission for a grade. Written assignments may be emailed or turned in during class to the instructor.

9. **Plagiarism**: Plagiarism is using what another person has written, and using it as your own words and thoughts. Plagiarism is never acceptable. According to the University, plagiarism is preventable by students "not representing the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses and other reports." The UAF Honor Code (Student Code of Conduct) defines the academic standards expected at UAF and is adhered to in this class as well.
10. All UA student academics and regulations are adhered to in this course. You may find these in UAF/UAS Catalogs.
11. **Confidentiality:** An important part of this course is the sharing of insights and experiences with other students. To benefit from this discussion, it is essential that we all maintain the confidentiality of children, families, programs and staff. We do not use names. We talk and write about children, families and staff in respectful ways.
12. **Incompletes, Withdrawal and No Basis Grading**: A student may request an Incomplete grade if there are factors beyond his/her control that effect the completion of the course AND the student has a C grade or higher at the end of the semester/course. A Faculty-Initiated Withdrawal is done by the instructor when the student has not met the criteria for passing the class, and is within the University-allowed drop period. A No Basis (NB) grade is provided if the student has not met attendance/assignment criteria, in lieu of a failing grade, provided it is after the University-allowed drop period. All are at the discretion of the Instructor.

Attendance

The student is responsible for all material distributed and presented in lectures and laboratory. Lecture attendance is important. Depending on the number of students, you will be part of a carbon dynamics working group and your lack of participation not only reflects upon you, but your entire group.

The student code of conduct can be found in the current UAF catalog and at the following website: http://www.uaf.edu/catalog/current/academics/regs3.html.

Grading

Your course grade consists of the following:

Concept Map development	55%
Class presentation of carbon project	15%
Term Paper on carbon project	30%
Total	100%

Letter grades for the course will be determined as follows and will reflect the Grading System and Grade Point Average Computation policy stated in the current UAF Catalog

A+ 100–97%	A 96–93%	A-..... 92–90%
B+ 89–87%	B 86–83%	B-..... 82–80%
C+.....79–77%	C.....76–73%	C- 72–70%
D+.....69–67%	D.....66–63%	D- 62–60%
	F.....less than 60%	

Student Support Services

The University has many student support programs. If you need assistance please contact any of the following service programs or departments. The instructor is available during posted office hours and upon appointment for additional assistance outside session hours.

Disabilities Services

The Forest Sciences Department will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities. Disability Services provide a variety of services to assure equal access for all students. Interpreting services, educational assistants, note taking, and exam accommodations for students are the most frequently provided accommodations. Disability services also provides assistance to the university's rural campuses; Tanana Valley Campus, Bristol Bay, Chukchi, Interior-Aleutians, Kuskokwim, and Northwest.
The staff of Disability Services works with faculty in arranging appropriate services in the classroom. Questions should be directed to the Director of Disability Services at (907)-474-5655.
http://www.uaf.edu/disability/
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