

Introduction to Earth Systems and Physical Geography

GEOG/ENVR 250



Instructor:

Dr. Todd Lookingbill

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Office hours: Wed 4:30-5:30; Fri 11:00-noon

Course Schedule:

Lecture: Tues/Thur, 3:00-4:15, GOTW C114

Lab: Wed 6:00-8:30, INTC 230 or Fri, 1:30-4:00, INTC 230

Bioblitz: Saturday, Oct 1 8:30-12:30 OR 1:00-5:00 p.m.

Course Description and Objectives:

Physical geography is the spatial analysis of environmental systems. It is an interdisciplinary science that brings together elements of climatology, hydrology, oceanography, geology, geomorphology, and ecology to understand (1) the spatial aspects of the environment and (2) the processes responsible for creating these spatial patterns.

This course introduces the characteristics and interrelationships of the Earth's climates, landforms, soils, and natural vegetation, with special emphasis on human relationships with their environment. A geographic approach emphasizes interconnectedness and spatial components of these relationships. The subject matter is particularly relevant to current scientific interest in global climate change. The course is divided into five units: (1) concepts and tools of physical geography, (2) the atmosphere, (3) the hydrosphere, (4) the lithosphere and pedosphere, and (5) the biosphere. We will take a systems perspective and sequentially study each of these systems. However, we also will emphasize linkages between the Earth's systems. Human and other components of the biosphere will be discussed throughout the semester. The material is global in scale, though we will illustrate many of the concepts using examples from National Parks of the United States.

Field of Study Natural Science Biological Sciences (FSNB)

The field of natural science is concerned with the physical universe from subatomic to cosmic levels of organization, including inanimate as well as living systems, their structure, diversity, interaction, and evolution. Based upon the generation and testing of hypotheses, scientific inquiry is restricted to the study of repeatable, measurable, and verifiable phenomena. Within this field, knowledge may be gained either by controlled experiment or diligent observation, depending upon the phenomena being studied. Similarly, some of the field's methodologies rely upon quantitative analysis, while others are primarily qualitative. The natural science requirement is designed to enhance your appreciation of the beauty of science as well as your understanding of the challenges of doing science. Students gain experience in the formulation and testing of hypotheses and are introduced to scientific methodology.

Course Materials:

The required textbook for the course is *Geosystems: An Introduction to Physical Geography*. 9th ed. 2015. Robert W. Christopherson & Ginger H. Birkeland. Prentice-Hall. Additional readings from other sources will be assigned during the semester. These readings will be accessible through the course web page.

The web site for the class can be found on Blackboard: <http://blackboard.richmond.edu/>

Lab material also will be available on Blackboard. Some labs require additional material and you will be notified of these requirements ahead of time.

Student Evaluation:**550pts Exams**

The course grade will be based in part on two mid-terms and the final exam. Mid-term exams will combine short answer, fill-in, multiple choice, and three to four half-page essay questions. Each mid-term will be worth 15% of the final grade. If you must miss an exam for a legitimate, documented reason you must inform the instructor ahead of time to schedule a make-up. Students missing a mid-term exam for a non-legitimate reason will be assigned a zero.

The final exam will be cumulative but will emphasize the biosphere section of the course. The format of the final exam will be similar to the two mid-term exams. The final exam is worth 25% of your grade. No make-up final exams will be given. Labs are intended to reinforce lecture material and provide a deeper understanding of geographic principles. The material from lab exercises therefore may also be included in the exams, though the majority of questions will come directly from the lecture portion of the class. Questions from In-the-News and National Park presentations will appear on the final exam.

250pts Laboratory exercises

Labs are intended to be inquiry driven exercises that focus on scientific methods including the development of testable hypotheses. This is an interactive course and students are expected to fully engage in the learning process by working out each laboratory exercise with the help of the lab material, textbook and lecture notes. There will be a short introduction preceding each lab; this is an excellent opportunity to ask any questions or ask for clarification. Many of the labs require write-ups to be handed in at the conclusion of the lab

period. There will also be homework components to many of the labs including formal lab write-ups that will be completed as homework assignments. Most of the labs will involve working in pairs or groups. However, each student must submit their own write-up with the names of other group members listed at the top of the page for all assignments. There is one required field trip for the laboratory portion of the class on Saturday, October 1. You will have the opportunity to sign up to attend either in the morning or the afternoon.

100pts Class participation

Class attendance and participation is absolutely essential to keeping up with the material, and is worth 10% of your grade. The class participation grade is made up of equal parts (1) engaged participation in class, (2) completion of class exercises and homeworks, and (3) “In the News” reporting. Absence from these class exercises will reflect negatively on your participation grade.

Engaged participation will be evaluated using the following guidelines (adapted from JA Schatzel, Stonehill College):

<u>Points</u>	<u>Behavior</u>
30-33	Always well prepared for class; facilitates productive peer discussions; offers reasoned responses of high quality and asks thoughtful questions on an ongoing basis.
25-30	Contributes regularly; generally prepared; asks questions and provides occasional responses of moderate quality; handles direct questions satisfactorily.
20-25	Participates infrequently; needs to be prodded; weak preparation; allows other to carry the ball in class discussions.
10-20	Often inadequately prepared; little involvement in class discussions; repeatedly late or leaves during class.
0-10	Unprepared; disruptive in class; unauthorized use of computers during class – e.g. e-mail or instant messaging; repeated talking with other students about topics not related to class.

Class exercises and homeworks: Class exercises may occur at any time during scheduled classes. These exercises and homeworks are evaluated on a pass/fail basis based on whether you are present for the activity and hand-in assignments on time. These assignments can not be made up unless your absence is excused by the instructor before class. Homework assignments will include attendance at least three of six presentations offered during the semester (dates of talks are provided as asterisks in schedule below). Extra credit will be provided for attendance at additional presentations. To confirm attendance at a talk, a short (one-paragraph) essay must be submitted to Box relating some part of the presentation to the theory and practice of physical geography discussed in class. Write-ups should also include one question that you have for the speaker (extra class participation credit for also asking the question at the presentation). File naming convention should be your last name followed by the speakers last name: e.g., Lookingbill_Myer.docx

In the News: As part of the participation grade, you must find and review 3 different physical geography stories from different media sources. To celebrate the 100-year anniversary of the National Park Service this year, all stories should include some mention of National Parks:

1. One story from a newspaper, magazine (National Geographic), radio or television.
2. One from a peer-reviewed journal (a list of acceptable peer-reviewed journals is available at <http://libguides.richmond.edu/content.php?pid=56049&sid=410096>).
Overviews for these first two articles should be provided orally at the beginning of class. Written summaries should clearly describe how our course content relates to the issue being described in the article, and should be no more than 1 page in length. Written summaries must be submitted to Box before the story can be presented in class. Each student will be allotted class time for a maximum of 1 review per week, so do not wait until the end of the semester to begin. File naming convention should be your last name followed by the type of source used: e.g., Lookingbill_journal.docx, Lookingbill_radio.docx...
3. One geography related website. This summary should be posted to our course blog <http://blog.richmond.edu/geog250/> instead of handing in a write-up. Please categorize your entry into one or more of the following categories: Atmosphere, Biosphere, Hydrosphere, Lithosphere, and Tools of the Geographer. Instead of presenting this description orally to the class, you must review and post comments on at least 2 additional sites posted by your classmates by the last day of class. The blog entries receiving the top three highest number of comments will receive extra credit on the final exam.

50pts Online reading quizzes

A total of 10 online quizzes will be evaluated as an accountability check. These quizzes, which will be administered on Blackboard, will be brief, multiple choice and true/false questions and will be open book. You can take the quizzes any time before class, at which point the quiz shuts down (i.e. you cannot complete a quiz after the class meeting).

50pts National park presentations

National Parks will be used to explore many of the concepts in class. Once we have finished the first unit, you will have the opportunity to select one of the 59 National Parks of the United States for a 15-minute group presentation. The presentation should clearly document linkages between the park's geography and at least one of the Earth's systems studied in class. A 250-word abstract with at least 3 scientific references should be submitted to Box 24-hours before the presentation. Any powerpoint or other presentation slides should be submitted to Box before the time of your presentation. Files should be named by the park (e.g., Sequoia.docx, Sequoia.pptx) with all presenters names included on the title slide of the presentation and below the title on the abstract.

Final grades will therefore be calculated as follows:

(150 pts each) Two in-class mid-terms
 (250 pts) Cumulative final exam (emphasizing biosphere unit)
 (100 pts) Class participation
 (50 pts) Online quizzes
 (50 pts) National Park presentation
 (250 pts) Laboratory assignments
 1000 pts

- The grading scheme will follow standard University of Richmond guidelines (<http://registrar.richmond.edu/services/policies/grading.html>).

A > 93 pts	B 87-83	C 77-73	D 67-63
A- 93-90	B- 83-80	C- 73-70	D- 63-60
B+ 90-87	C+ 80-77	D+ 70-67	F < 60 pts

Fall 2016 Class Schedule

This schedule will be followed approximately. Some changes may be made as the class proceeds but the exam dates will not change. Time permitting, we will conclude each major section with an in-class review. Chapter readings in *Geosystems* textbook provided in parentheses.

Unit: Week of: Topics covered:

INTRODUCTORY MATERIAL - Concepts and Tools of Physical Geography

Week 1: Aug 23 Introduction to course. Definitions. Spheres. Scientific method.

Week 2: Aug 30 The Earth in the Solar System. Earth geometry. Map projections. Contour Maps. Observation. Remote sensing. GIS. GPS. Scale and scale interaction. (Ch. 1)

THE ATMOSPHERE

Week 3: Sept 6 Energy. The Sun. Radiation Balance. Seasons. Surface energy balance and temperature. Atmospheric composition and structure. (Ch. 2-5)

Week 4: Sept 13 General circulation of the atmosphere and oceans. (Ch. 6) Precipitation processes.

Week 5: Sept 20 FIRST EXAM (on Thurs)

* Saturday, September 17, Ukrop's Theater, Business School, any of the films being screened as part of the African Film Festival (Theme - *Africa: the Preservation of the Planet and its Cultures*):

<http://llc.richmond.edu/majors-minors/african-film-weekend/index.html>

* Monday, September 19, noon-1:15 pm, Gottwald Auditorium, Francis Kilkenny, USDA Forest Service, "Post-fire restoration in the Great Basin of the United States: the development and use of genetically appropriate native species to restore plant communities"

THE HYDROSPHERE

Week 6: Sept 27 Precipitation continued... Hydrologic Cycle. Distribution of Earth's water (Ch. 7-9)

Week 7: Oct 4 Watersheds. Water supply and demand. Water balance. Climate change (Ch. 7-9 cont., 11)

Fall Break Oct 11 (no class)

Week 8: Oct 13 River systems, floods, hurricanes and extreme weather.
(Ch. 15)

* Thursday, September 29, 6:30-7:45pm, International Center Commons, Garth Myer, Trinity College, “Urban Environments in Africa: Sustainable Development and Grassroots Socio-Environmental Justice”

* Monday, October 3, noon-1:15 pm, Gottwald Auditorium, [Kristin Winchell](#), University of Massachusetts, “Adapting to the Anthropocene: How cities impact ecology and evolution of reptiles”

THE LITHOSPHERE AND PEDOSPHERE

Week 9: Oct 18 Introduction to the Lithosphere. Geologic structure of the Earth. Geologic cycles. Plate tectonics. (Ch. 12)

Week 10: Oct 25 Endogenic Processes. Crustal formation/deformation processes. Volcanism. Earthquakes. Mountain building. (Ch. 13)

Week 11: Nov 1 Exogenic Processes. Soils, weathering and mass movement. Erosion, transport, and deposition. (Ch. 14-17)

Week 12: Nov 8 SECOND EXAM (on Thurs) (Election Day on Tuesday!)

* Thursday, November 3, 4:45-6:00 p.m., Gottwald Auditorium, [Nancy Tuana](#), Penn State University, “Ethics of changing climate”

THE BIOSPHERE AND EARTH LINKAGES

Week 13: Nov 15 Ecosystem Essentials. Biogeography. Biological gradients. Biomes and biodiversity. (Ch. 19, 20)

Week 14: Nov 22 (yes, there’s class) Movement and migrations.
Thanksgiving Nov 24 (no class)

Week 15: Nov 29 Biotic processes and disturbance. Protected areas management.

* Monday, November 28, noon-1:15 p.m., Gottwald Auditorium, [Tyrone Hayes](#), UC Berkeley, “Environmental toxins and amphibian development”

FINAL EXAM Tuesday, December 13, 7:00-10:00 p.m.

All one-page external speaker write-ups and In-the-News write-ups must be submitted to Box by **December 1 at 5:00 p.m.** The blog entries and comments on blog entries (<http://blog.richmond.edu/geog250/>) are also due by Dec 1 at 5:00 p.m.

If you experience difficulties in this course, do not hesitate to consult with me. There are also other resources that can support you in your efforts to meet course requirements.

Academic Skills Center (<http://asc.richmond.edu> or 289-8626) helps students assess their academic strengths and weaknesses; hone their academic skills through teaching effective test preparation, critical reading and thinking, information processing, concentration, and related techniques; work on specific subject; and encourage campus and community involvement.

Career Development Center (<http://cdc.richmond.edu/> or 289-8547) can assist you in exploring your interests and abilities, choosing a major, connecting with internships and learning experiences, investigating graduate and professional school options, and landing your first job. We encourage you to schedule an appointment with a career advisor during your first year.

Counseling and Psychological Services (<http://caps.richmond.edu> or 289-8119) assists students in meeting academic, personal, or emotional challenges. Services include assessment, short-term counseling and psychotherapy, crisis intervention and related services.

Speech Center (<http://speech.richmond.edu> or 289-6409): Assists with preparation and practice in the pursuit of excellence in public expression. Recording, playback, coaching and critique sessions offered by teams of student consultants trained to assist in developing ideas, arranging key points for more effective organization, improving style and delivery, and handling multimedia aids for individual and group presentations.

Writing Center assists writers at all levels of experience, across all majors. Students can schedule appointments with trained writing consultants who offer friendly critiques of written work: <http://writing.richmond.edu>

Boatwright Library Research Librarians assist students with identifying and locating the best resources for class assignments, research papers and other course projects. Librarians also assist students with questions about citing sources correctly. Students can schedule a personal research appointment, meet with librarians at the library's main service desk, email, text or IM. Link to <http://library.richmond.edu/help/ask.html> or call 289-8669.

Note: Students having special needs that require an accommodation or an academic adjustment, please arrange a meeting with Dr. Lookingbill within the first two weeks of the semester.

Academic Honesty:

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor.

Time-on-Task Expectations:

To be successful in this course, you should expect to devote an average of 10-14 hours each week to preparing for class, participating in class and lab sessions, studying course related materials, and completing course assignments.

Introduction to Earth Systems and Physical Geography GEOG/ENVR 250 (Lab)



Day and Time:	Friday, 1:30 PM – 4:00 PM
Location:	INTC 230
Instructor:	Todd Lookingbill
Email:	tlooking@richmond.edu;
Office Hours:	Wed 4:30-5:30; Fri 11-12 or by appointment
Additional help is available from:	Taylor Holden (taylor.holden@richmond.edu)

Structure of the course

Labs are intended to be inquiry driven exercises that focus on scientific methods including the development of testable hypotheses. This is an interactive course and students are expected to fully engage in the learning process by working out each laboratory exercise with the help of the lab material, textbook and lecture notes. Laboratory work is intended to complement the lecture course by providing additional opportunities to work with the different tools available when studying earth systems and geography.

There will be a short introduction preceding each lab; this is an excellent opportunity to ask any questions of clarification. Many of the labs require write-ups to be handed in at the conclusion of the lab period. There will also be several larger lab write-ups that will be completed as homework assignments. Most of the labs will involve working in pairs or small groups. Groups of students may submit one write-up for in-class assignments. However, all students must work independently and submit their own write-up with the names of other group members listed at the top of the page for all homework assignments.

Attendance at labs is obviously critical. You **MUST** contact the instructor via e-mail if you will be missing class. Even if you inform us orally of your absence, we still need an e-mail from you. Unexcused absences will result in a zero for the assignment. There is one required field trip for the laboratory portion of the class to participate in the Richmond National Battlefield Bioblitz on Saturday, October 1. You will have the opportunity to sign up to attend either in the morning (8:30-12:30) or the afternoon (1:00-5:00). If for any reason, you can absolutely not make one of these two time slots, please notify your lab instructor *by the second week of class*, and we will work with you to make alternative accommodations.

There are two opportunities for extra credit in the class. These Saturday morning trips (Sept 10 and 17) will be available to the first five students who sign up to attend (you can sign up for only one trip until September 1, at which time, you can sign up for a second extra credit trip if all five slots have not been taken). Participation will count toward 10 points of Extra Credit. The trips will be to collect additional data as part of our National Park Service Bioblitz engagement.

There will be five different blocks throughout the semester that will be ordered sequentially. Assignments become more involved as the semester progresses, building from worksheet exercises to short papers to final projects that will be self-designed and include all parts of a standard scientific paper. One of the primary learning objectives of this course is to learn how to write a scientific paper. Laboratory assignments include studies of global, long-term climate records; the James River hydrologic record; water quality of Little Westham Creek; and the diversity and distribution of campus trees.

Fall 2016 Lab Schedule

1. (I) *Introduction and Foundation*. This block will set the stage for the remainder of the semester. Scientific reporting, both as reports and peer-reviewed journal articles, will be introduced, along with the specific tools to be used throughout the semester. These tools include computer programs, such as ArcGIS for mapping and spatial analysis and Microsoft Excel for graphing and management of tabular data. We will also along with GPS equipment. The emphasis of this block is on mapping, and different types of digital and physical maps will also be introduced. We will conclude with calculations to estimate the amount of carbon storage by trees on campus.
2. (H) *Hydrosphere*. The hydrosphere block will require downloading and working with primary weather and streamflow data from NOAA and the USGS. We will also practice measuring nutrients in the aquatic environment. Following a field visit to the James River, the relationship between precipitation and flooding will be investigated for this water body by developing rating curves and flood frequency curves to assess the risk of floods of differing magnitudes to the City of Richmond. As part of this block, we will practice crafting the motivation for our research studies by writing an Introduction section and will process our findings at a deeper contextual level by writing Discussions.
3. (M) *Natural Resource Management*. During the semester we will visit several urban parks managed by different agencies including the City of Richmond and the National Park Service. As part of these visits, we will be exposed to the variety of natural resource amenities provided by these parks and the types of stressors that they confront. We will meet and participate in management activities with natural resource practitioners. The final project for this block will require the application of geographic theory to the management of these resources by drafting a natural resource brief for these managers.
4. (CC) *Climate Change*. This block will introduce the concepts of climate change, heat balance, and atmospheric forcings. Different climate data sets (NASA GISS, Hadley CRU, NOAA NCDC) will be used to evaluate change in temperature at differing temporal scales. At the end of this block, we will develop hypotheses about the forcings responsible for global temperature changes and test these hypotheses using available data. An extended abstract will be created that succinctly summarizes all parts of a scientific study (Introduction, Methods, Results and Discussion).
5. *Final Independent Project*. The last weeks of the semester will be spent in small project teams working on self-designed assignments to address hypotheses developed on your own related to the physical environment. A final lab report along with an oral assignment will be due at the completion of this block.

Fall 2016 Lab Schedule (subject to change)
Friday Section (1:30-4:00 pm)
250 pts

<u>Semester Week</u>	<u>Lab Date</u>	<u>Lab Topic</u>
01	8/26	(I) Introduction & GPS assignment (10 pts)
02	9/2	(I) Vegetation mapping
03	9/9	(I) Maps, graphing, and library (10 pts)
(Due at the beginning of Week 4 lab: Hypothesis, Methods, Results from campus vegetation mapping (including at least 1 map and 1 graph) (25 pts)		
04	9/16	(H) Precipitation and weather (10 pts)
05	9/23	(H) Flooding and stream flow
Due at beginning of Week 6 lab: Introduction leading to a hypothesis, and Discussion of hydrology graphing exercise results (25 pts)		
06	9/30	(M) Bioblitz set-up at Totopotomoy Creek (10 pts)
**Sat 10/1 8:30-12:30 or 1-5		(M) NPS Bioblitz at Richmond National Battlefield
07	10/7	(M) No class; Analysis of Bioblitz data on own
08	10/14	(M) Invasive species management at Huguenot Flatwater unit of James River Park (10 pts)
Due at beginning of Week 9 lab: Management Essays (20 pts)		
09	10/21	(A) Remote sensing and climate change (10 pts)
10	10/28	(A) Climate change continued
Due at beginning of Week 11 lab: Extended Abstracts about climate change study (20 pts)		
11	11/4	Development of final lab project ideas
12	11/11	Data collection for final lab
13	11/18	Data collection for final lab
14	Thanksgiving	
15	12/2	Group presentations
Final Lab Write-up Due at Beginning of Class in Week 15 (75 pts paper and 25 points presentation)		

Extra Credit Trips

Saturday morning, September 10: Beaver Dam Creek, Richmond National Battlefield. Small mammal trapping, seine for fish, and turtle trapping.

Saturday morning, September 17: Gaines Mills, Richmond National Battlefield. Birding, trees, bugs, and amphibian and reptile coverboard collection.