



Course Name: Scientific Methods for Analyzing Natural Resource Problems

Course Number: NR 325

Credits: 3

Instructor name: Chris Still

Instructor email: chris.still@oregonstate.edu

Instructor phone: 541-737-4086

Catalog Description

Approaches to disciplinary and interdisciplinary problem analysis in natural resources. Introduces systems thinking and the benefits and limitations of different tools used to integrate information from multiple disciplines and stakeholders. Applications of alternative analysis tools are illustrated through selected forest-related case studies. Lec/lab.

Prerequisites or Corequisites

Prerequisite: MTH 111 or equivalent

Recommended: ST 201 or ST 351 or equivalent

Course Description

This course introduces students to the assumptions and approaches of different scientific methods to interdisciplinary problem solving. Students will explore the benefits and challenges of using interdisciplinary perspectives and tools to analyze complex natural resource and social-environmental problems. Students will learn how different interdisciplinary approaches, concepts, and decision support tools have been used to evaluate alternative solutions to these problems. Case study examples will be used to illustrate particularly effective approaches, including systems thinking, scenario modeling, and agent-based modeling. Students will select a preferred approach (or combination of approaches) and apply to developing a proposed study of a specific natural resource-related problem.

Communication

Please post all course-related questions in the Q&A Discussion Forum so that the whole class may benefit from our conversation. Please contact me privately for matters of a personal nature. I will reply to course-related questions within 24 hours. I will strive to return your assignments and grades for course activities to you within five days of the due date.

Time Expectations

This course combines approximately 90 hours of instruction, online activities, and assignments for 3 credits.

Technical Assistance

If you experience any errors or problems while in your online course, contact 24-7 Canvas Support through the Help link within Canvas. If you experience computer difficulties, need help downloading a browser or plug-in, or need assistance logging into a course, contact the IS Service Desk for assistance. You can call (541) 737-8787 or visit the [IS Service Desk](#) online.

Learning Resources

There is no required textbook for this course. Relevant readings and resource materials (i.e., popular media, news articles, videos) are provided via the Canvas course site.

Note: Check with the OSU Beaver Store for up-to-date information for the term you enroll ([OSU Beaver Store website](#) or 800-595-0357). If you purchase course materials from other sources, be very careful to obtain the correct ISBN.

Measurable Learning Outcomes

After completion of this course, students will be able to:

1. Explore and apply interdisciplinary scientific concepts and methods to analyze complex social-ecological natural resource problems.
2. Use concepts from systems thinking to describe a natural resource problem, including boundaries, scale, components and types of connections among components of the problem to be analyzed.
3. Describe and critique case study examples of interdisciplinary tools used to analyze social-ecological natural resource problems.
4. Identify and analyze the types of assumptions and uncertainty involved in problem analysis.
5. Apply concepts and tools learned to develop a conceptual model of issues related to a natural resource problem (like forest thinning or salmon management) and propose a scientific study that could address one or more issues related to this problem.
6. Effectively communicate the proposed study in written form.

Evaluation of Student Performance

Students are assessed on these assignments:

- Modeling Labs (1 @ 10 points; 4 @ 40 points each) – 170 points
- Final Exam (Research Project) – 180 points
 - Topic selection – 10 points
 - Model schematic – 10 points
 - Final paper and model – 160 points
- Discussions (5 @ 10 points each) – 50 points
- **Total – 400 points**

Letter Grade

Grade	Percent Range
A	92-100
A-	90-91.9
B+	88-89.9
B	82-87.9
B-	80-81.9
C+	78-79.9
C	72-77.9
C-	70-71.9
D+	68-69.9
D	62-67.9
D-	60-61.9
F	< 60

Course Schedule

Module	Topics and Concepts Addressed	Required Resources	Learning Activities
Module 1 Weeks 1 and 2	Introduction to Systems Thinking and Modeling of the Water Cycle <ul style="list-style-type: none"> What does it mean to conduct "interdisciplinary" analysis? What is a model? What are some different modeling approaches? Introduction to systems modeling of the global water cycle with Insight Maker Concepts: modeling, box models, turnover times, stocks and flows, systems modeling 	Lectures: Introduction to Modeling Introduction to Box Models Exponential Growth – Introduction to Insight Maker Introduction to the Water Cycle Videos: The Water Cycle Water Cycle Process Insight Maker Overview Websites: NASA Science Insight Maker	Discussion: Introduce Yourself Self-Check Practice Quiz Discussion: Water Cycle and Climate Change Lab 1: Basic Systems Model of the Global Water Cycle
Module 2 Weeks 3 and 4	Carbon Cycle Modeling and Global Warming <ul style="list-style-type: none"> Introduction to the global carbon cycle, climate change, and feedbacks in 	Lectures: Carbon Cycle Modeling Part 1, 2, and 3 Simulation/Videos:	Self-Check Practice Quiz

Module	Topics and Concepts Addressed	Required Resources	Learning Activities
	<p>the earth system</p> <ul style="list-style-type: none"> • Concepts: box models, feedbacks, systems dynamics, complex systems • Apply systems thinking ideas to better understand complex systems. 	<p>A Year in the Life of Earth's CO₂ The Global Carbon Cycle</p> <p>Websites: Global Carbon Project NASA Earth Observatory: The Carbon Cycle Carbon and Climate: Carbon and the Global Carbon Cycle Global Carbon Atlas: Carbon Story</p>	<p>Discussion: Gloal Carbon Cycle and Human Equity</p> <p>Lab 2: Modeling the Global C Cycle</p> <p>Research Paper: Part 1, Topic Selection</p>
<p>Module 3</p> <p>Weeks 5 and 6</p>	<p>Daisyworld: Planetary Energy Balance and Temperature</p> <ul style="list-style-type: none"> • Introduction to Earth's energy balance and temperature with Daisyworld model • Concepts: systems boundaries and thinking, temporal and spatial scale, components and connections, rates of change, types of models, feedbacks 	<p>Lectures: Introduction to Energy Balance: Daisyworld Part 1, 2, and 3</p> <p>Websites: Modeling Daisyworld Universite Catholique de Louvain - Daisyworld</p> <p>Videos: Daisy World – Complete Animated Video NASA – This World is Black and White</p>	<p>Discussion: Daisyworld, Climate Change, and Sustainability</p> <p>Lab 3: Modeling the Planetary Energy Balance of Daisyworld</p> <p>Research Paper: Part 2, Model Schematic</p>
<p>Module 4</p> <p>Weeks 7 and 8</p>	<p>Predator-Prey Dynamics in Natural Systems</p> <ul style="list-style-type: none"> • Introduction to predator-prey dynamics, management issues and implications • Modeling predator-prey cycles in Insight Maker • Concepts: stable and unstable equilibria points, socio-ecological systems, trophic interactions, 	<p>Lectures: Intro to Predator-Prey Dyamics Intro to NetLogo</p> <p>Websites: Wolves and Moose of the Isle Royale Wolves of Isle Royale: The Quest for Survival Wolf-Moose Predator Model in Insight Maker</p>	<p>Discussion: Wolves on Isle Royale</p> <p>Lab 4: Modeling Predator-Prey Interactions</p>

Module	Topics and Concepts Addressed	Required Resources	Learning Activities
	conservation of endangered species	<p>Wolf Sheet Predation Model in NetLogo</p> <p>Videos: Wolves of Isle Royale: The Quest for Survival Return of the Wolves: Restoring Ecological Balance to Isle Royale</p> <p>Article: The Isle Royale Wolf-Joose Project (1958-present) and the Wonder of Long-Term Ecological Research</p>	
<p>Module 5</p> <p>Weeks 9 and 10</p>	<p>Fire Ecology and Management</p> <ul style="list-style-type: none"> • Introduction to fire ecology • Agent-based modeling using NetLogo • Concepts: feedbacks, stable and unstable equilibria points 	<p>Lectures: Fire Ecology, Parts 1, 2, and 3</p> <p>Insight Maker Tutorials: Agent-Based Modeling Agent-Based Modeling of Disease Dynamics</p> <p>Videos: NetLogo – Intro to Agent-Based Modeling Introduction to Fire Ecology Fire and Forest Health</p> <p>Articles: Fire in the Earth System Fire as a Fundamental Ecological Process</p>	<p>Discussion: Fire Ecology and Management Challenges</p> <p>Lab 5: Modeling Fire Ecology</p>
Finals Week	Research paper (final exam)		Research Paper: Part 3, Final Paper (final exam) and Model

Course Policies

Discussion Participation

Students are expected to participate in all graded discussions. While there is great flexibility in online courses, this is not a self-paced course. You will need to participate in discussions on at least two different days each week, with your first post due no later than Wednesday, and your response posts due by the end of each week.

Late Work Policy

Please submit all assignments by the stated due date. I understand that life happens, so if you encounter a time when you need to submit after the due date, you will have one free pass. Please reach out to me if needed to discuss your situation.

Incompletes

Incomplete (I) grades will be granted only in emergency cases (usually only for a death in the family, major illness or injury, or birth of your child), and if the student has turned in 80% of the points possible (in other words, usually everything but the final paper). If you are having any difficulty that might prevent you completing the coursework, please don't wait until the end of the term; let me know right away.

Diversity, Equity and Inclusion

Oregon State University strives to create an affirming climate for all students including underrepresented and marginalized individuals and groups. It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength, and benefit.

It is my intent to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture. Given the challenging nature of some Natural Resources material that might be discussed in class, it is critical that there be an atmosphere of trust and safety. I will attempt to foster an environment in which each student is able to hear and respect each other. It is critical that we show respect for all worldviews expressed. Please be respectful of others' emotions and be mindful of your own. Please let me know if something said or done, by either myself or other students, is particularly troubling or causes discomfort or offense.

While our intention may not be to cause discomfort or offense, the impact of what happens throughout the course is not to be ignored and is something that I consider to be very important and deserving of attention. If and when this occurs, there are several ways to alleviate some of the discomfort you may experience:

1. Discuss the situation privately with me. I am always open to listening to your experiences and want to work with you to find acceptable ways to process and address the issue.
2. Discuss the situation with your peers. Chances are there is at least one other student who had a similar response to the material. Discussion enhances the ability for all

participants to have a fuller understanding of the context and impact of course material and discussions.

3. Notify me of the issue through another source, such as your academic advisor, a trusted faculty member, or a peer. If for any reason you do not feel comfortable discussing the issue directly with me, I encourage you to seek out another, more comfortable avenue to address it; if you are more comfortable remaining anonymous, you may provide feedback by contacting staff at OSU [Institutional Diversity office](#) at the OSU [Equal Opportunity and Access office](#) or at the OSU [Diversity and Cultural Engagement program](#).

Furthermore, I would like to create a learning environment that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.) If you feel like your performance in the course is being impacted by your experiences outside of class, please don't hesitate to contact me. I want to be a resource for you. Remember that you can also submit anonymous feedback. If you prefer to speak with someone outside of the course, please see the resources listed above.

Statement Regarding Religious Accommodation

Oregon State University is required to provide reasonable accommodations for employee and student sincerely held religious beliefs. It is incumbent on the student making the request to make the faculty member aware of the request as soon as possible prior to the need for the accommodation. See the [Religious Accommodation Process for Students](#).

Guidelines for a Productive and Effective Online Classroom

(Adapted from Dr. Susan Shaw, Oregon State University)

Students are expected to conduct themselves in the course (e.g., on discussion boards, email) in compliance with the university's regulations regarding civility. Civility is an essential ingredient for academic discourse. All communications for this course should be conducted constructively, civilly, and respectfully. Differences in beliefs, opinions, and approaches are to be expected. In all you say and do for this course, be professional. Please bring any communications you believe to be in violation of this class policy to the attention of your instructor.

Active interaction with peers and your instructor is essential to success in this online course, paying particular attention to the following:

- Unless indicated otherwise, please complete the readings and view other instructional materials for each week before participating in the discussion board.
- Read your posts carefully before submitting them.
- Be respectful of others and their opinions, valuing diversity in backgrounds, abilities, and experiences.
- Challenging the ideas held by others is an integral aspect of critical thinking and the academic process. Please word your responses carefully, and recognize that others are expected to challenge your ideas. A positive atmosphere of healthy debate is encouraged.

Expectations for Student Conduct

Student conduct is governed by the university's policies, as explained in the Student Conduct Code (<https://beav.es/codeofconduct>). Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

Academic Integrity

Integrity is a character-driven commitment to honesty, doing what is right, and guiding others to do what is right. Oregon State University Ecampus students and faculty have a responsibility to act with integrity in all of our educational work, and that integrity enables this community of learners to interact in the spirit of trust, honesty, and fairness across the globe.

Academic misconduct, or violations of academic integrity, can fall into seven broad areas, including but not limited to: cheating; plagiarism; falsification; assisting; tampering; multiple submissions of work; and unauthorized recording and use.

It is important that you understand what student actions are defined as academic misconduct at Oregon State University. The OSU Libraries offer a [tutorial on academic misconduct](#), and you can also refer to the [OSU Student Code of Conduct](#) and [the Office of Student Conduct and Community Standard's website](#) for more information. More importantly, if you are unsure if something will violate our academic integrity policy, ask your professors, GTAs, academic advisors, or academic integrity officers.

TurnItIn

Your instructor may ask you to submit one or more of your writings to Turnitin, a plagiarism prevention service. Your assignment content will be checked for potential plagiarism against Internet sources, academic journal articles, and the papers of other OSU students, for common or borrowed content. Turnitin generates a report that highlights any potentially unoriginal text in your paper. The report may be submitted directly to your instructor or your instructor may elect to have you submit initial drafts through Turnitin, and you will receive the report allowing you the opportunity to make adjustments and ensure that all source material has been properly cited. Papers you submit through Turnitin for this or any class will be added to the OSU Turnitin database and may be checked against other OSU paper submissions. You will retain all rights to your written work. For further information, visit [Academic Integrity for Students: Turnitin – What is it?](#)

Statement Regarding Students with Disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval, please contact DAS immediately at 541-737-4098 or at <http://ds.oregonstate.edu>. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While

not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Accessibility of Course Materials

All materials used in this course are intended to be accessible. This course uses several external, third-party resources that may or may not be fully accessible. If you require accommodations, please contact [Disability Access Services \(DAS\)](#).

Additionally, Canvas, the learning management system through which this course is offered, provides a [vendor statement](#) certifying how the platform is accessible to students with disabilities.

Tutoring and Writing Assistance

TutorMe is a leading provider of online tutoring and learner support services fully staffed by experienced, trained and monitored tutors. Access TutorMe from within your Canvas course menu.

The Oregon State [Online Writing Suite](#) is also available for students enrolled in Ecampus courses.

Mental Health and Personal Well-Being

Take care of yourself, especially in these challenging times. Do your best to maintain a healthy lifestyle by eating well, exercising, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress. Diminished mental health, including significant stress, mood changes, excessive worry, or problems with eating and/or sleeping can interfere with optimal academic performance. The source of symptoms might be strictly related to your course work; if so, please speak with me. However, problems with relationships, family worries, loss, drug/alcohol abuse, or a personal struggle or crisis can also contribute to decreased academic performance. OSU provides mental health services to support the academic success of students. Counseling and Psychological Services (CAPS) offers free, confidential services to help you manage personal challenges. Getting help is a smart and courageous thing to do; for yourself and for those who care about you. All of us benefit from support during times of struggle. Asking for support sooner rather than later is almost always helpful. [CAPS website](#); Phone: 541-737-2131

Basic Needs

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the [Human Services Resource Center](#) (HSRC) for support (541-737-3747). The HSRC has a food pantry and other programs to help. Additionally, the HSRC Textbook Lending Program offers eligible students the opportunity to check out required textbooks for the academic term. Furthermore, please notify the professor about your concerns if you are comfortable in doing so. This will enable them to provide any resources that they may possess.

Ecampus Reach Out for Success

University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about [resources that assist with wellness and academic success](#).

Ecampus students are always encouraged to discuss issues that impact your academic success with the [Ecampus Success Team](#). Email ecampus.success@oregonstate.edu to identify strategies and resources that can support you in your educational goals.

If you feel comfortable sharing how a hardship may impact your performance in this course, please reach out to me as your instructor.

- **For mental health:**

Learn about [counseling and psychological resources for Ecampus students](#). If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

- **For financial hardship:**

Any student whose academic performance is impacted due to financial stress or the inability to afford groceries, housing, and other necessities for any reason is urged to contact the Director of Care for support (541-737-8748).

Academic Calendar

All students are subject to the registration and refund deadlines as stated in the Academic Calendar: <https://registrar.oregonstate.edu/osu-academic-calendar>.

Student Evaluation of Courses

During Fall, Winter, and Spring term, the online Student Evaluation of Teaching system opens to students the Wednesday of week 8 and closes the Sunday before Finals Week. Students will receive notification, instructions and the link through their ONID email. They may also log into the system via Online Services. Course evaluation results are extremely important and used to help improve courses and the learning experience of future students. Responses are anonymous (unless a student chooses to "sign" their comments, agreeing to relinquish anonymity) and unavailable to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.