



# Middlebury School *of the* Environment

-- *Prepare for a life of meaning*

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## **SENV 3210A: Systems Thinking Practicum**

**Course description:** This course introduces students to the concept of systems as an organizing principle of environmental science and management. Systems represent the interconnected relationships among the ecological, social, economic and political factors that create, perpetuate and can be used to manage threats to environmental sustainability. The course also encourages students to “see” through a systems lens, and builds students’ proficiencies at systems-based applications including causal loop diagramming and systems modeling with Stella, a commonly-used environmental management software program. Over the course of the term we will go into the field to observe several common environmental systems and use our systems lens to consider management options to reach desired objectives.

**Learning objectives:** We will pursue six learning objectives:

- Summarize and illustrate the value of the fundamental components of systems for environmental management;
- Apply the systems perspective to environmental management through causal loop diagramming;
- Develop effective habits of field observation, recording, reflection and analysis;
- Create simple, accurate and predictive Stella models that represent common environmental challenges and can be used to guide management decisions;
- Identify, apply, and assess outcomes of leverage points as tools for altering system dynamics;
- Build and apply collaborative problem solving skills.

**Instructor:** Dr. Curt Gervich. [Cgerv001@plattsburgh.edu](mailto:Cgerv001@plattsburgh.edu). 540-818-1896.

I am an associate professor in SUNY Plattsburgh’s Center for Earth and Environmental Science. I hold a master’s degree in Natural Resource Planning from the University of Vermont and a PhD in Environmental Planning and Design from Virginia Tech. Within the realm of environmental planning my research and teaching interests are in environmental leadership, decision making and moving beyond conflict. I study these themes as they relate to municipal energy planning, sustainable agriculture and watershed planning, among other topics. At SUNY Plattsburgh I teach courses in Sustainability, Environmental Leadership, Environmental Management and Environmental Law and Policy.

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**Course structure:** This course contains three concurrently running activities. On any given day we will take part in activities that address these three areas:

- *Basic skill development*- we will participate in several games and simulations that highlight systems as an organizing principle of environmental challenges and foster students' awareness of social-ecological systems. Additionally, we will develop introductory skills in Stella, a systems modeling computer application.
- *Field trips*- we will take several field trips to locations that highlight common systems in the fields of environmental science and studies. On each trip we will collect observations that allow us to diagram the systems we witness. We will enhance the accuracy of our observations and assumptions with secondary and tertiary sources. Our exploration of these systems will culminate in the creation of predictive models that allow us to assess opportunities for enhancing management of these cases.
- *Student projects*- Students will be placed into pairs. Using our field trips as starting points, each team will identify an environmental challenge and use the systems perspective and Stella to propose management alternatives that address that challenge. Final products will be a Stella model accompanied by a scientific poster that describes the system, walks readers through the model, provides evidence of the relationships and assumptions embedded in the model, and outlines recommendations for improving management of the system.

**Readings:** Over the course of the term we will read selected works that provide an introduction to systems thinking and modeling as well as a variety of scientific and popular press articles that provide background information to the systems we observe on field trips. Readings will be made available via moodle.

**Assessment:**

Students will be assessed in five ways (detailed instructions and rubrics will be provided):

1. *Systems thinking journal* (20%)- students will keep and turn in a journal that documents field observations, causal loop diagrams of systems observed during field trips, and other brief experiences throughout the course.
2. *Stella modeling assignments* (20%)- students will complete four assignments designed as building blocks for developing introductory level competency in Stella modeling. The models represent basic system dynamics observed on field trips.
3. *Final project* (40%)- students will work in teams to apply their systems thinking skills to research and conceptualize an environmental challenge observed on field trips. Each team will develop a series of causal loop diagrams and a predictive Stella model to guide development of recommendations for improving management of that challenge. Teams will present their work in the final week of the term. The basic components of the project on which you will be graded are a Stella model and scientific poster.
4. *Engagement* (10%)—each of you will be asked to perform a self-assessment of your engagement in all aspects of this class but especially of your role as a member of your project team. You will also be asked to perform an assessment of each member of your team. These assessments will be combined with those that the instructors perform on each student in the class. I also expect each student to demonstrate respect for each other, me as the instructor, and all guests to the School.

5. *SoE Co-curricular activities (10%)*- a portion of your grade will be determined by your participation in the MSoE co-curricular activities. As part of your enrollment in the Middlebury School of the Environment, you will be participating in a diverse program of leadership training activities, including workshops and informal meetings with environmental practitioners. All of these activities will have associated assignments. Credit for completion of these assignments by the stated due dates will be attached to your grade in this course.

It is expected that all work submitted will be your own new and original work (or new and original work of approved teams). Reusing work created by others or by you for a different assignment, either here at the Middlebury School of the Environment or your home institution, is not allowed.

**Grading:** Grades will be assigned on a straight percentage basis: 90-100% is an A, 80-89% is a B, 70-79% is a C, 60-69% is a D, and <60% is an F, with + and - grades assigned to high and low scores within those ranges.

### ***Course Calendar***

#### **Week 1**

##### **Readings:**

Meadows, Donella. *Thinking in Systems*. Parts 1&2.

**Monday, 6/27. 9am-12pm:** Introduction to systems through games; causal loop diagramming. Assignment: Games for Change systems thinking exercise.

**\*\*\*Wednesday evening, 6/29. 7:30pm-9:30pm:** Fishbanks Simulation

**Wednesday, 6/29. 9am-11am:** Games for Change debrief; Stella workshop. Assignment: 1hr system observation

**Friday, 7/1. 9am-11am:** I will not be in class. Use this time to complete the 1hr observation assignment in your journal.

#### **Week 2**

**Readings:** Kimball, Kristen. Selected readings from *The Dirty Life*.

**Monday, 7/4. 8am-12pm:** Field trip 1- Essex Farm. Skill development- cause and effect relationships.

**Wednesday, 7/6. 9am-11am:** Essex Farm causal loop diagramming and model development.

**Friday, 7/8. 9am-11am:** Essex Farm presentations. Shacksbury Cider Prep.

#### **Week 3**

**Readings:** TBD

**Monday, 7/11. 8am-12pm:** Field trip 2- Shacksbury Cider/Orchard. Skill development- thresholds.

**Wednesday, 7/13. 9am-11am:** Middlebury River and Snow Bowl causal loop diagramming and model development.

**Friday, 7/15. 9am-11am:** Shaftsbury Cider presentations. Middlebury River and Snow Bowl Prep. Introduce final projects.

#### **Week 4**

**Readings: TBD**

**Monday, 7/18. 9am-12pm:** Field trip 3- Middlebury River Watershed and Snow Bowl. Skill development- feedback loops.

**Wednesday, 7/20. 9am-11am:** Causal loop diagramming and model development.

**Friday, 7/22. 9am-11am:** Middlebury River and Snow Bowl presentations. Lake Champlain Prep. Final project progress reports.

#### **Week 5**

**Readings: TBD**

**Monday, 7/25. 8am-12pm:** Field trip 4- Lake Champlain aboard Folger. Skill development-leverage points.

**\*\*\*Monday evening, 7:30pm-9:30pm: Toxic Release! Simulation**

**Wednesday, 7/27. 9am-11am:** Causal loop diagramming and model development.

**Friday, 7/29. 9am-11am:** Lake Champlain presentations. Final project progress reports/work day.

#### **Week 6**

**Readings: TBD**

**Monday, 8/1. 9am-11am:** final project work day.

**Wednesday, 8/3. 9am-11am:** final project work day.

**\*\*\*Wednesday evening, 7:30pm-9:30pm. Wicked Game Night**

**Thursday 8/4. 9:30am-10:30am:** poster session.