Trees and the Environment 11:216:456

FALL 2015
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The main goal here is to learn something about trees and something about forests as plant communities dominated by trees. We will explore plant function and occurrence in response to environmental loadings, and discuss various plant adaptations and specializations within the response to physical and chemical laws.

Learning Goals:

- Goal 1: Explain basic population, community ecology, and ecosystem-level concepts.

- Goal 2: Think criticially and solve problems using evidence-based reasoning.

- Goal 3: Communicate effectively orally and through written text and graphics.

Lecture schedule:

Week One   Introductions, some definitions, walking on Cook Campus, calendar plan for other campus walks. Assigned sketching

Week Two   energy, Ohm/Fourier/D'Arcy/Fick the dangers of strict mass flow and diffusion electric analogues the Soil-Plant-atmospheric Continuum.

Week Three   Livingston Campus: Tree architecture modeling (pipe model/skin-core model/hormonal flow models and wood organization: Of forms, fractals, code and pine needle moments of inertia

Week Four   Hand in Pine needle models , hand in DaVinci measureson water flow models Cook Douglass, water and light in architectural form sponges and bridges

Week Five   Exam I due   Helyar woods, light and soils, lessons in transitions within a dynamic plant community on an energy budget, invasions.

Week Six,   Busch Campus: Thigmomrphogenesis, reconfigurations are a drag, twistiness to bendiness ratio

Week Seven   College Avenue campus: Glaciers, climate change "nativeness" (popular vs forestry ecology), provenance, metapopulations and speciation.

Week Eight   Forest soils, techno-sols,

Week Nine   reproduction and abscission

Week Ten   Exam II due

Week Eleven   Student Forest type presentations

Week Twelve   Student Forest Type presentations due

Week Thirteen Climate shifts and migrations

Week Fourteen Exam III due   wrap-ups

Grading: Exam I 20%
A 90%+   Exam II 20%
B+ 87-89.9%   Exam III 20%
B 80-86.9%   Forest presentation 20%
C+ 77-79.9%   Class activities 20%
C 70-76.9%
D 65-69.9
F less than 64.9%

Assessment Plan

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Goals:

1. Understand basic anatomic organization of woody plants; vascular system//roots shoots and leaves. Let's draw plant parts and trees.

2. Gain an appreciation for the environment influences plant form, and the balance of principal plant functions
    a. Mass flow and the impracticality of time in diffusion: How redwoods are different from giant algae, why pine needles are cool: an introduction to biomechanics and the balance of plant principal functions; gravity and fluid movements like wind
    b. Was Da Vinci wrong, or just really misunderstood and misquoted in an age of computer coding? Water, vascular flow, trees, fractals and L-system models//The modified pipe model:
    c. A trick of the light: Tropical versus boreal forest forms; understory versus dominant canopy forms, sun leaves and shade leave; fall color, dormancy, photosynthetic adaptation…. invasive edges

3. Develop an understanding of how geology and soils influence plant community development. Pine forest – hardwood forest: How do soils impact tree communities, how do tree communities impact soils: Helyar woods hike// Liberty State Park

4. Gain an understanding of major forest types in the North American continent
    a. Soils to water….SE bottomland forests, west Appalachian rib, the dispersion of the mixed mesophytic hardwood complex
    b. Case study in red and sugar maple: meta populations and provenance: nativism within species
    c. A march to the sea: Pinelands, Piedmonts and the Delaware water gap
    d. So you like it cold? Oaks to maples to birch/larch
    e. So you like it really cold? A look at the Boreal, or maybe the Adirondacks?
    f. Yup its location, location, location…aspect and elevation in the pacific northwest forests The Adirondack dome
    g. Synthetic systems and patience LSP
5. Develop a sense of forests and plant communities as dynamic systems
    a. Global vegetation mapping: What are the levers controlling BIG organization for food and forest, and how might they be shifting?
    b. A glacier, tectonic plates and why East coast forests organize to what we see: Or why Europe has low historic tree diversity but US and China does. Nativism and resilience in a cosmopolitan world
    c. Let's talk about sex and seed dispersions
    d. What's wrong with a good invasion anyhow? Community transitions and value sets

e. Climate change and forest transitions …glacial time versus decades in scenarios: An ethical case for assisted migrations/invasions?

Rubric	Exercise, Assessment Criteria	Exceeded (A, B+)	Achieved (B, C+, C)	Not achieved (D,F)
Understand basic anatomic organization of woody plants; vascular system//roots shoots and leaves. Let's draw plant parts and trees.	**Quizzes** **Deliverables: Weekly quizzes on readings assigned or digital uploads of sketching** **Evaluation criteria: rather than –click attendances, which will be tracked only if deemed a method for proving numbers/attendance, the quizzes track student following of content and assigned reading as a series of 5 Multiple choice questions on the readings.**			
	Exam I **Deliverables:** Exam consisting of 20-30 questions which include graphics labeling for wood/tissue organization. Interpretation of drawings for forest structures or plant responses. Multiple choice, T/F, matching as well. **Evaluation criteria:** Straight grading and comparison in post exam question analysis.			
	Exercise : **Deliverables:** Rough drawings and the development of observational skills **Evaluation criteria:** Participation and self-reporting			
Gain an appreciation for the environment influences plant form, and the balance of	**Field Challenges** **Deliverables:** **Evaluation criteria:** Written responses to field observations/ questions during class walks			

principal plant functions	**Exam 1** **Deliverables:** Exam consisting of 15-18 short answer questions, or 5-6 deeper synthesis questions **Evaluation criteria:** Ability to draw class discussions and assigned readings into a synthesized response in a scenario-based question series format			
	Exercise : Modeling pine needles and developing data on L-system algorithm **Deliverables:** hand in model outputs on needles and contribution to a shared class data set **Evaluation criteria:** .Check plus/minus for participation			
Develop an understanding of how geology and soils influence plant community development.	**Deliverables:** examination questions **Evaluation criteria:**			
Gain an understanding of major forest types in the North American continent	**Field Challenges/ assigned forests** **Deliverables:** Development of short presentation on a forest type, and how it informs field discussions during late-semester walks **Evaluation criteria:** Presentation evaluation on format and content, class relevance in late walk discussions when questioned directly in the field			
Develop a sense of forests and plant communities as dynamic systems	**Exam 2** **Deliverables:** Exam consisting of 15-18 short answer questions, or 5-6 deeper synthesis questions **Evaluation criteria:** Questions specific to a logic in plant selection in reference to site. Questions with respect to canopy transition from over-mature to replacement interval. Display understanding of urban canopy service life and site capacity influence on performance expectations.			

Target Rutgers Core Curriculum:

- 21st Century Challenges
- Natural Sciences
- Writing Communication