**Ecological theory and its applications**

Ecology theory and its applications explores the major pathways of ecological theory from competition between individual species to global ecosystems. Each week, we will explore an ecological theory and then examine how that ecological theory is applied outside of the classroom through a specific case study. These case studies include examining human interactions through the lens of competition theory, conservation policy in desert systems, water management and rewilding in important Dutch ecosystems, ecological restoration across landscapes, and global climate policy. The final project for the course will examine humans as drivers of ecological processes in urban/suburban ecosystems.

Objectives –

1. Understand basic ecological theories
2. Understand how modeling is used to further ecological theory
3. Apply ecological theory to conservation, resource management, and restoration
4. Synthesize ecological theory to understand the role of ecology in climate research
5. Gain perspective on humans as actors in ecological systems
6. Develop an independent research project in an urban ecosystem
7. Gain proficiency in using R for exploration of ecological theory

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| **Week** | **Topic** | **General notes on execution** |
| 1 | How humans interact – Niche theory and competition | Introduction to the course, introduction of competition and niche theory,  **Case study** - how competition/ niche theory have been applied to humans   * **Link to Yann/Ecology 1 – Final model** |
| 2 | Facilitation - conservation policy in drylands | Introduction of facilitation into a simple competition and niche models (a la Bruno et al. 2003)  **Case study** - apply to conservation of desert/aridland systems, look at direct policy links   * **Link to Yann/Ecology 1 – kicking lotka-volterra models up a notch** |
| 3 | Soil feedbacks – water management in the NL | Add possibility of soil feedbacks into models (PSFs but also other positive feedback mechanisms)  **Case study** – Water management in peat in the NL?   * **link to Mariet on peatlands?** * **link to George/Microbial Ecology - microbial feedbacks** |
| 4 | Populations to metapopulations – Rewilding in the Netherlands (Reintroducing wolves) | Embed simple population dynamic model (probably from week 1) in a metapopulation  **Case study** – rewilding, reintroducing wolves in the NL? Field trip to the Oostvardersplassen (?)   * **Link to Edwin/Taxonomy course from BoTu - ID – major Dutch plant families** * **Link to Merel in BioLand, plant ID major Dutch plant families** |
| 5 | Communities to metacommunities – Restoration and the role of big data | Imbed simple community model (variation on week 3) in a metacommunity  **Case study** - apply metacommunity theory to restoration efforts across landscapes   * **Link to Merel/BioLand - landscape scale processes/gradients** * **Link to Edwin/Spatial ecology** |
| 6 | Scaling up to the globe and dynamic vegetation models - Climate policy | Look at assumptions of global climate models, talk about how they differ from the models we’ve been working with. Think about the impact of those differences on climate policy and predictions. Discussion - how can we bridge the gap?   * **Link to Marijke/Tropical Ecology - REDD+, mitigation efforts, tropical forest examples** * **Link to Edwin/Spatial Ecology** |
| 7 | Developing projects/collecting data | Applying ecological theory across socioeconomic gradients in Utrecht, socio-ecological systems, backyard ecology, biodiversity and health, plant ID  My idea – Have students collect data on front yard floristic diversity around Utrecht, examine against trends in socioeconomic and climate factors from public Dutch databases.   * **Link to Yann/Sustainable development goals course** |
| 8 | Collecting/analyzing data/developing projects |  |
| 9 | Presenting/discussing results | Final project – Science communication about humans as ecological actors based on data collected |
| 10 | Exam week ☺ |  |

Weekly structure –

Day 1 – Lecture/exploration

Day 2 – Practice materials

Day 3 (.5 day) – Synthesis materials