Systems Thinking & Systems Modeling

Meets Tuesdays, 15:30 - 18:00

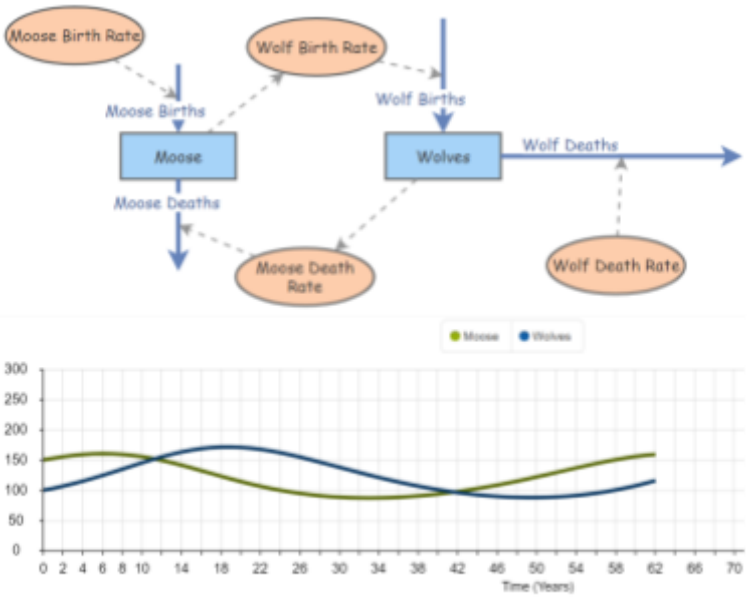
New Cabell 211

GSVS 3559 New Course, Spring 2022

Instructor: Spencer Phillips, PhD

***Short Description*:** Life, including ecosystems, social interactions, and policy interventions are complex, and while some *simplification* of reality to try to make sense of it all is necessary, *simplistic* thinking and modeling can lead to market, design, planning, and policy actions doomed to fail. In Systems Thinking/Systems Modeling, we will dive into the complexity to understand the dynamics inherent in various systems (predator-prey, demand-supply, investment-returns, education-equality). And, by using visually and quantitatively rich software tools, we will learn how to build models that help us do a better job in our thinking and in our design of solutions to societal challenges.

Students with childhood memories of playing "Oregon Trail'' or "Sim Safari", and those who have taken GSVS 2150 have experience with complex systems models , possibly without knowing it. Those games, and our in-class exercises looking at the effect of policies to slow the spread of COVID-19 or to avert climate-induced disaster, are built on mathematical models of complex systems. Such models are particularly useful where relationships and outcomes are variable, where information is scarce, and when we cannot wait for certainty before taking informed action, like setting out for Oregon, or rolling out a vaccine.



Predator-Prey Population Dynamics

In this new class, students can go beyond just *using* such models to actually building their own and using the building process and the finished models to gain insight into real-world, complex problems involving and affecting people and the local, regional, or global environment.

We will start by mastering terms, concepts, and habits of thinking by using case studies and drawing conceptual diagrams — essentially a pencil-and-paper exercise — and progress to puting the logic and the math behind our diagrams and gain the ability to build increasingly rich and useful models. No coding experience is necessary, but you will learn some coding along the way as we use desktop and cloud-based modeling software.

Course projects (individual or groups, TBD) will tackle real-world projects, potentially for live clients, with topics ranging from natural resource management (e.g., wildlife population dynamics, as in the simple model above (and if you want to see it in action, by clicking this link), drought, flooding, estuary restoration, wildland fire), to public health, migration, food systems, and commerce (e.g., the present supply chain crisis). Past student projects have tackled e-waste recycling on a global scale, how the U.S. military's own fuel use might cause climate-related conflict that then requires more military intervention (and fuel use), how redlining and other legacies of racism affects trash collection and flood control in U.S. Cities, and how solarization in Charlottesville can become more inclusive and "Pro-Poor" .to name a few.

The instructor is an assistant professor of Global Studies, Environments & Sustainability, and founder of Key-Log Economics, (Charlottesville and Hanoi), where he has developed systems models to help NGOs and other clients evaluate and improve conservation, ecosystem management, and development strategies.