

ENTM 798K Topic Seminar
**“Challenges and Prospects for Sustainability in Agriculture:
Contribution of Plant Diversity on Insect Biodiversity and their Ecosystem Services”**
Spring, 2023

We can all appreciate the need for sustainability in the face of global change on our planet. Agriculture has not really risen to the challenge although there is a lot of lip service for ecological responses to agricultural intensification – think current foci on pollinator health and conservation biological control. And there is a rising recognition of the value of biodiversity, especially insects, for maintaining our planetary ecosystem. Here I ask a simple question: how can agriculture become more sustainable? The seminar is designed to answer the question with an equally simple answer: the addition of plant diversity to farms.

I have been lucky to become part of a transdisciplinary effort to significantly impact sustainability on farms through what we call the RESILIENCE CAP, or RCAP for short. The ENTM 798K Topic Seminar has been developed to aid education of graduate students with regard to the USDA Sustainable Agriculture Systems grant entitled, “Fostering Resilience and Ecosystem Services in Landscapes by Integrating Diverse Perennial Circular Systems (RESILIENCE CAP).” The overall hypothesis of the grant is based on diverse, perennial, circular systems: these three practices, to be explained at the first meeting of the seminar, are hypothesized to increase biodiversity and ecosystem services, as well as improve soil health. In turn, these environmental benefits will help lead to climate resilience and improved socioeconomic benefits. The seminar is designed to focus each semester on a topic that can be addressed with a coordinated approach, centered on performing a review of a major question. I include a summary of the grant at the end of this topic seminar description.

The seminar for this spring is open to all entomology graduate students, and has a focus on understanding the **role of plant diversity to increase ecosystem services on farms provided by arthropods**. It is a simple concept: increasing plant diversity on any farm will lead to increased arthropod biodiversity, ecosystem services, soil health, and environmental and socioeconomic benefits. We will define plant diversity at the start of the seminar, then explore ways in which plant diversity interacts with arthropods, in both positive and negative ways.

The seminar will start with background on the RESILIENCE CAP grant and defining “plant diversity on farms”, scaling from within crops (genetic and plant species diversity) to the farmscape (crop diversity, habitat diversity on a farm) to regional diversity (crop diversity, habitat diversity, managed vs unmanaged areas). We will also list and describe ecosystem services on farms, focusing on pollination, natural enemies, decomposition, but also consider the value of other types of services by arthropods. From there, we can start weekly discussions of papers contributed by students. My goal, eventually, is to prepare a review paper on the topic with all students as authors.

Details:

- Instructor: Dr. Bill Lamp, Department of Entomology, lamp@umd.edu
- 1 credit
- Maximum of 12 seats

- We will discuss the need for online format, but I prefer in-person
- We will meet each week for 90 minutes at a time determined by the students during the first week of classes (M-F, 8:00am-5:00pm).
- Information will be posted on ELMS for ENTM 798K in January, and communication will be by email.
- Permission is required for registration. Contact Amy Yaich to get permission.

Summary of the RESILIENCE CAP Grant, 2021-2026:

Goal. The prevailing agricultural systems in the US are dominated by annual crop monocultures and are challenged by lack of resilience to extreme weather, degradation of soil, water, and air, reduction in biodiversity, negative impacts on human health, and social and economic exclusion. A landscape transformation towards increasing crop diversity, by integrating annual and perennial crops and forages with livestock in circular systems has the potential to solve these problems, but substantial policy, economic, and social barriers need to be addressed. Our vision is to transform the current agricultural landscape through a process of change by engaging a network of stakeholders and researchers to promote the environmental and socioeconomic benefits that will arise from the adoption of diverse perennial forage systems in the landscape. Our transdisciplinary team's goal is to foster climate resilience, ecosystem services, profitability, social inclusion, and human health by identifying, assessing, incentivizing, and promoting diverse perennial circular systems across the US.

Objectives. *In the short and medium term we aim to:* 1) identify and characterize prevailing and diverse perennial circular systems in major US agro-ecoregions; 2) quantify and compare the resilience and ecosystem services offered by these systems; 3) quantify and analyze direct and indirect economic, health, and social implications of increased adoption of diverse perennial systems; 4) analyze the economic conditions, social structures, and public policies that prevent wider adoption of these systems and develop strategies to overcome these constraints; 5) develop extension media, activities, and actionable decision tools to communicate concepts about the benefits of diverse perennial circular systems to farmers, consumers, lenders, and policy makers; and 6) develop and incorporate educational materials on the importance of resilience, ecosystem services, and economic value of integrating diverse perennial systems on the K-12 and university curricula. *In the long-term we aim to increase support to farmers, consumers, students, and society for adoption of these systems, recommend federal and state policies to incentivize them, and increase land area in diverse perennial forage systems across the US.]*

For more information on the background of this grant, read: Picasso, V.D., M. Berti, K. Cassida, S. Collier, D. Fang, A. Finan, M. Krome, D. Hannaway, W. Lamp, A.W. Stevens, and C. Williams. 2022. Diverse perennial circular forage systems are needed to foster resilience, ecosystem services, and socioeconomic benefits in agricultural landscapes. *Grassland Research* 2022.1: 123-130. DOI: 10.1002/blr2.12020