



# Managing Forage and Grazing Lands for Multiple Ecosystem Services

## Pasture Systems and Watershed Management Research Unit, University Park, PA

### •Personnel

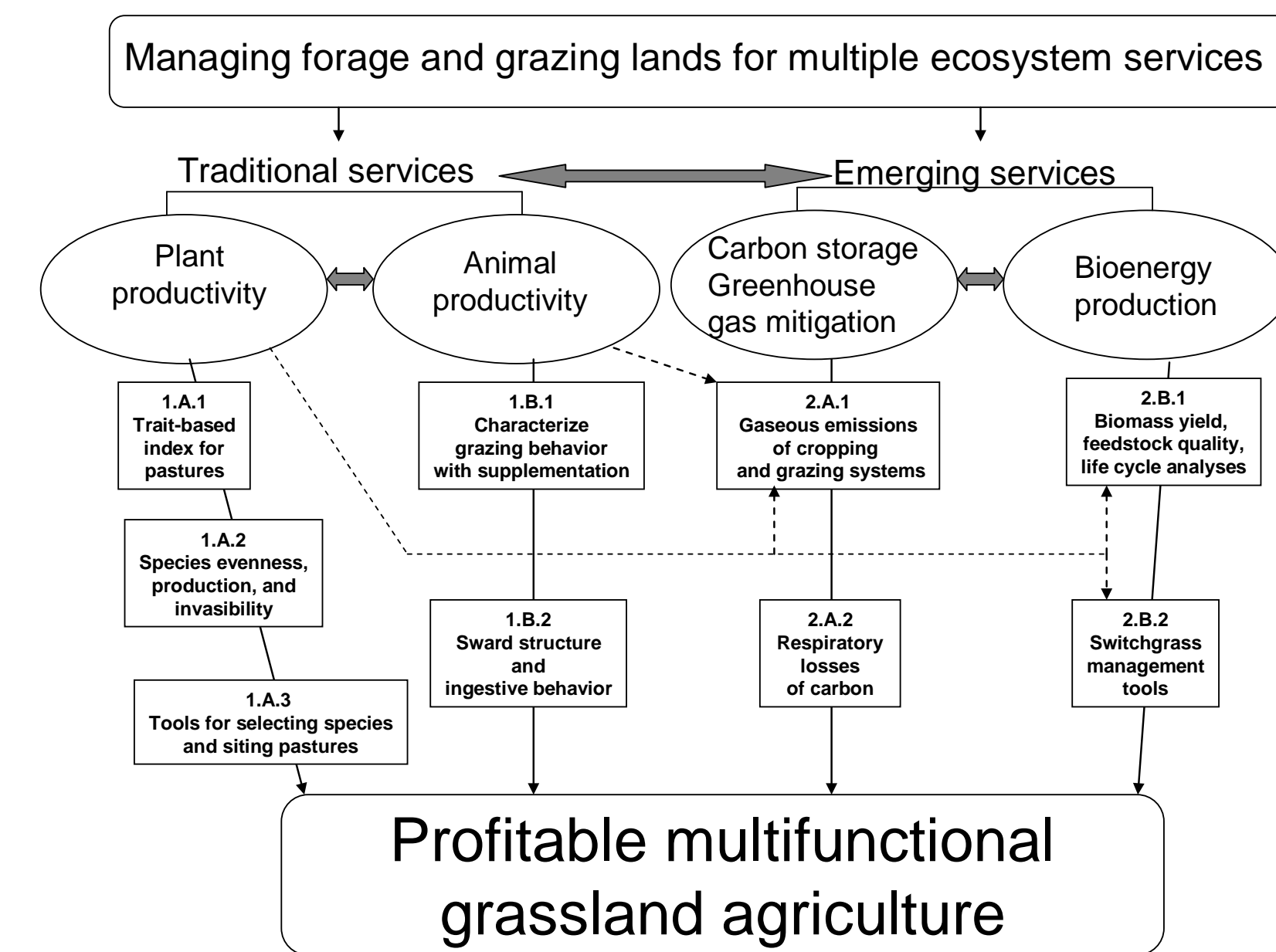
- Matt Sanderson, Lead Scientist, Agronomist
  - Paul Adler, Agronomist, Biofuels
  - Sarah Goslee, Landscape ecologist
  - Kathy Soder, Animal scientist
  - Howard Skinner, Plant physiologist (40% time)
  - Curtis Dell, Soil carbon scientist (30% time)
- ### •Technical Support
- John Everhart, Agricultural technician
  - Jeff Gonet, Biologist, support scientist
  - Steve Lamar, Agricultural technician
  - Matt Myers, Agricultural technician
  - Melissa Rubano, Agricultural technician
  - Rob Stout, Agronomist, support scientist

### •Research Objectives

1. Develop tools to aid the selection of species mixtures for pastures and the distribution of pasture types across a farm.
2. Identify new grazing management and supplementation strategies that complement grazing preferences of dairy cattle on mixed-species cool-season pastures.
3. Identify management systems that minimize net greenhouse gas emissions in forage, grassland, and energy crop systems.
4. Determine optimal management and environmental outcomes of perennial and annual bioenergy cropping systems.



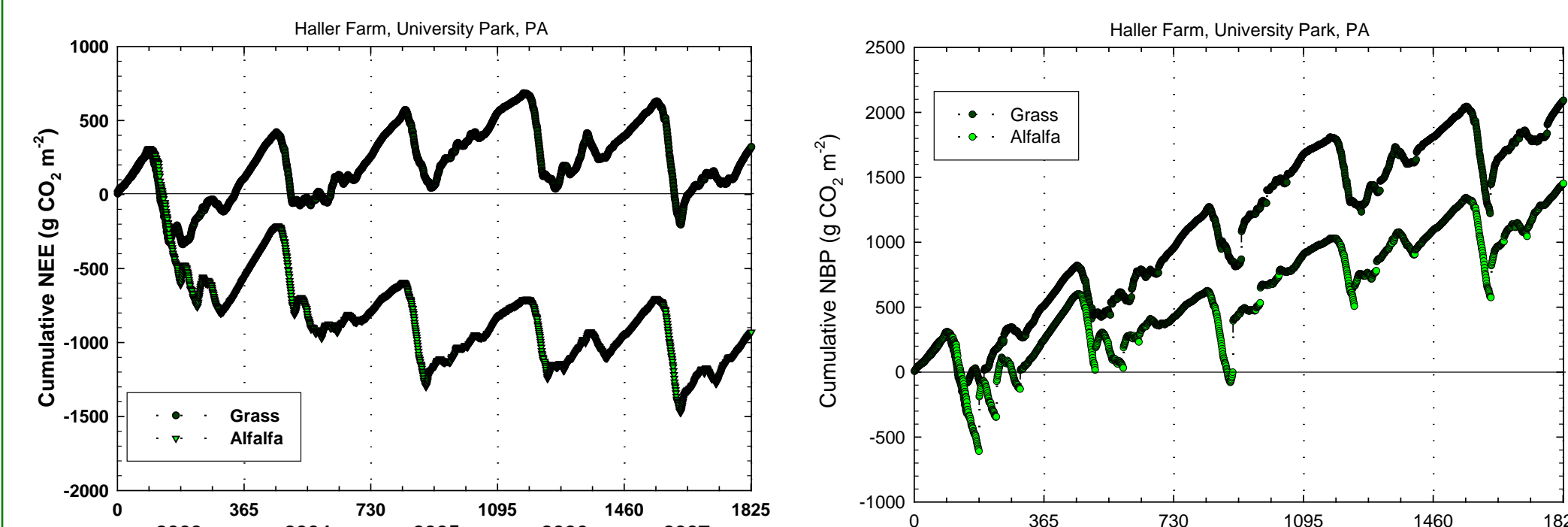
Our research seeks to improve the productivity and sustainability of forage-livestock systems by managing and enhancing forage diversity.



We are part of a nation-wide effort in ARS to identify management systems that are productive and profitable with reduced greenhouse gas emissions and other environmental benefits.



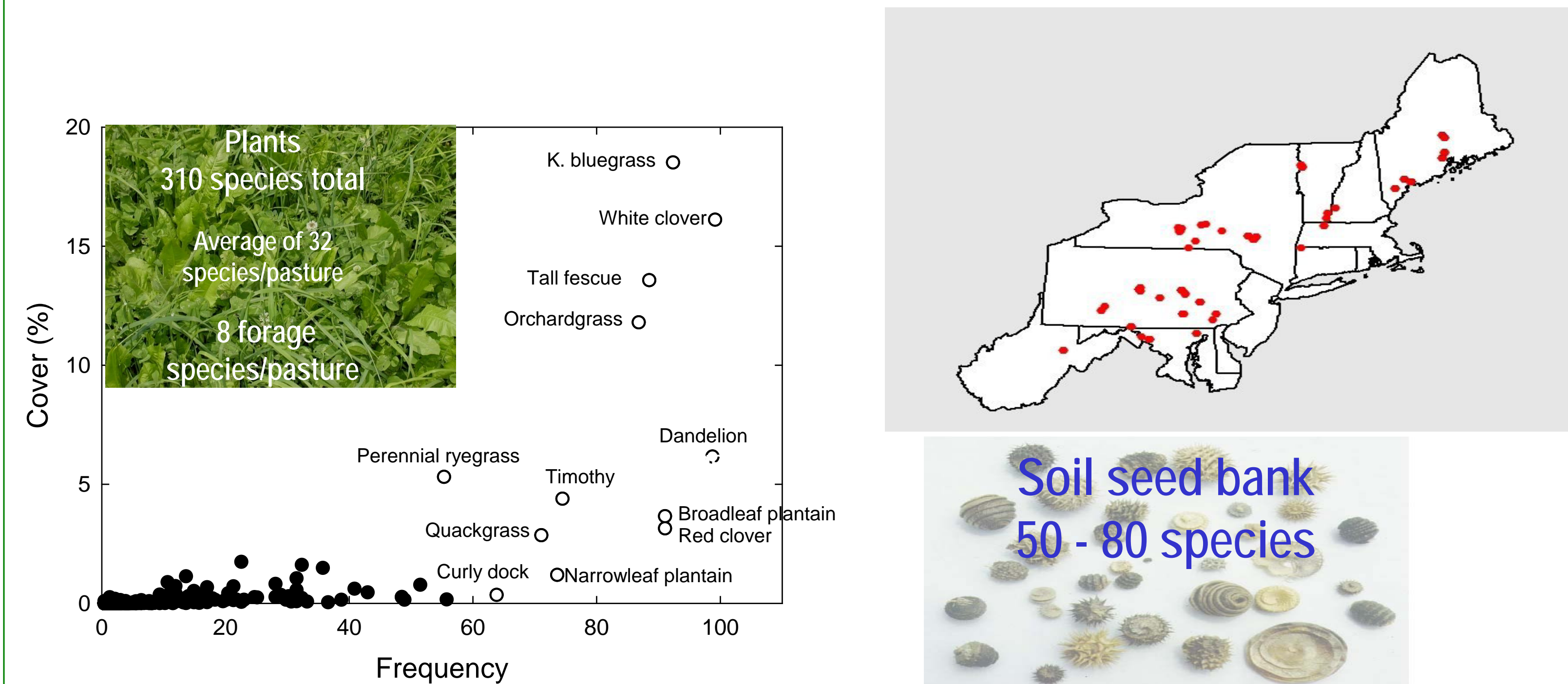
Measuring plant respiration (left) and carbon dioxide flux (right) from forage and pasture.



Cumulative flux as measured by the eddy covariance system (positive=loss, negative=gain)

Cumulative carbon flux including forage harvest losses and manure additions

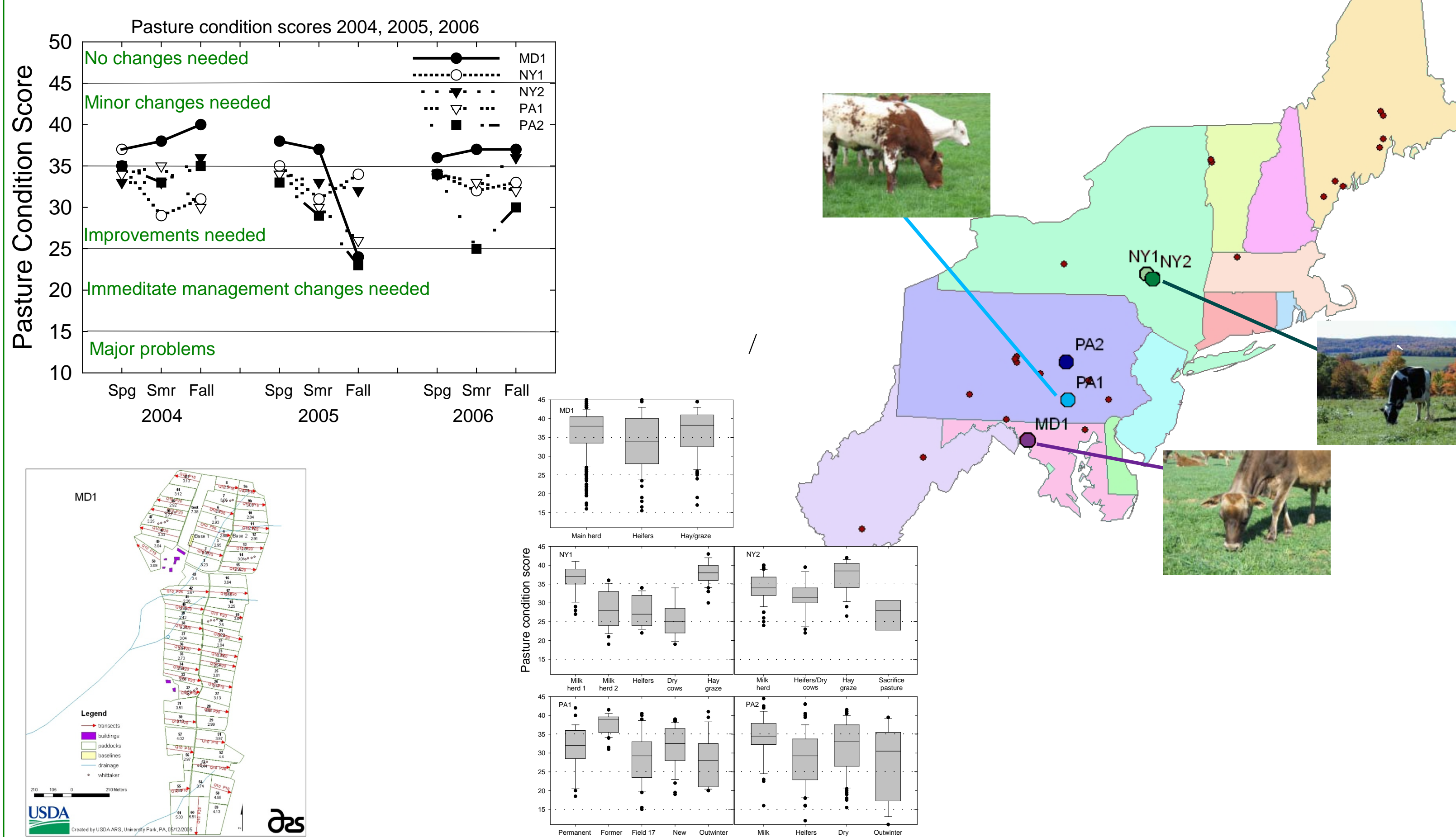
Research on plant diversity in northeastern U.S. pastures identified many plant species; however, most pastures are dominated by a few grasses and legumes.



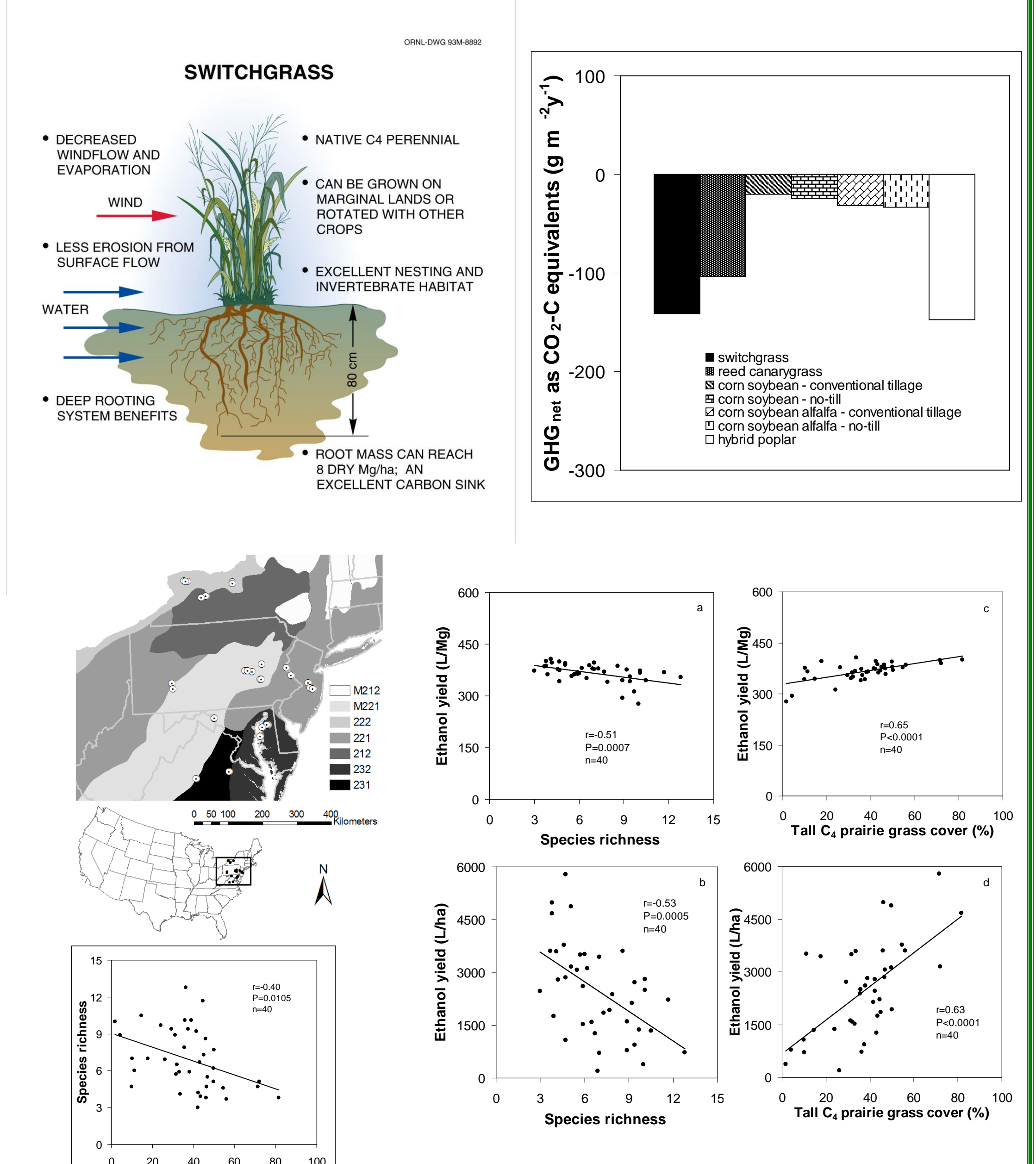
Grazing behavior research will help us understand why animals select certain forages and how that affects performance and management.



Research on pasture monitoring methods in the northeastern U.S. focuses on developing tools, such as the Pasture Condition Score System, for on-farm use.



Research on biofuels focuses on switchgrass, cropping systems of perennial and annual crops, greenhouse gas emissions, and life cycle analyses.



Much of our research is conducted on farms across the northeast, at several universities, and other ARS sites across the U.S.

