

# ECOL 8000- Module 3

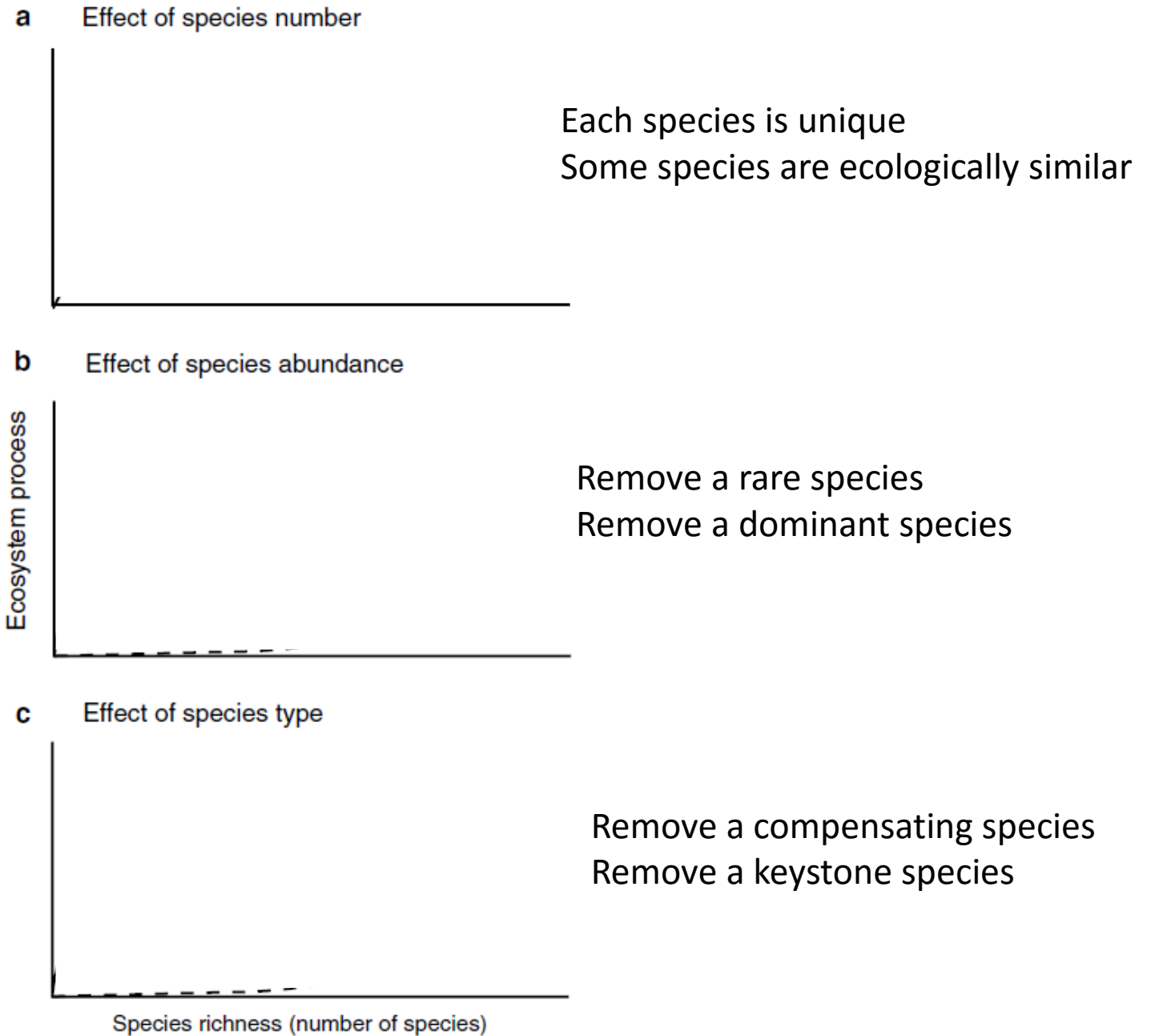
## Biodiversity and Ecosystem Functioning



# Questions

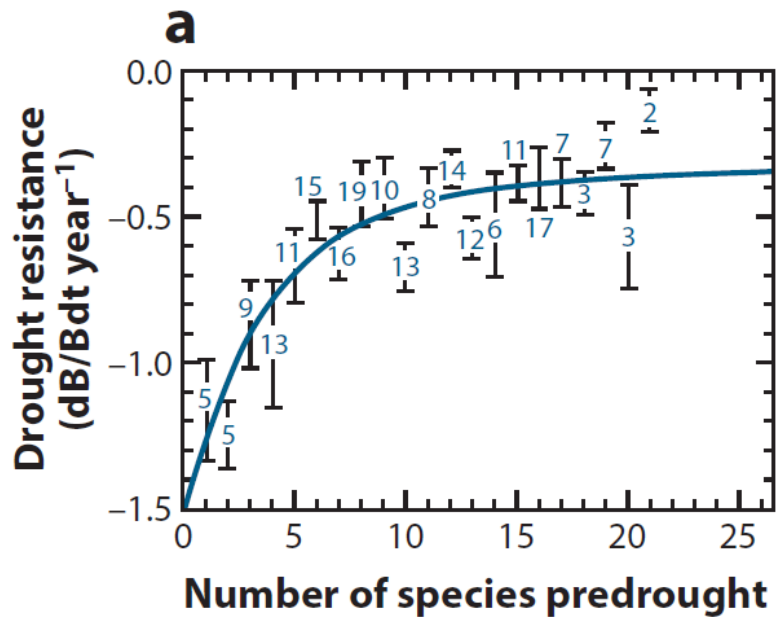
- What is biodiversity?
- Why does biodiversity matter (in ecology)?
- What is an ecosystem?
- What are “ecosystem functions”?
- How does (or how might) biodiversity affect an ecosystem?

# Consider the relationships between species richness and ecosystem processes



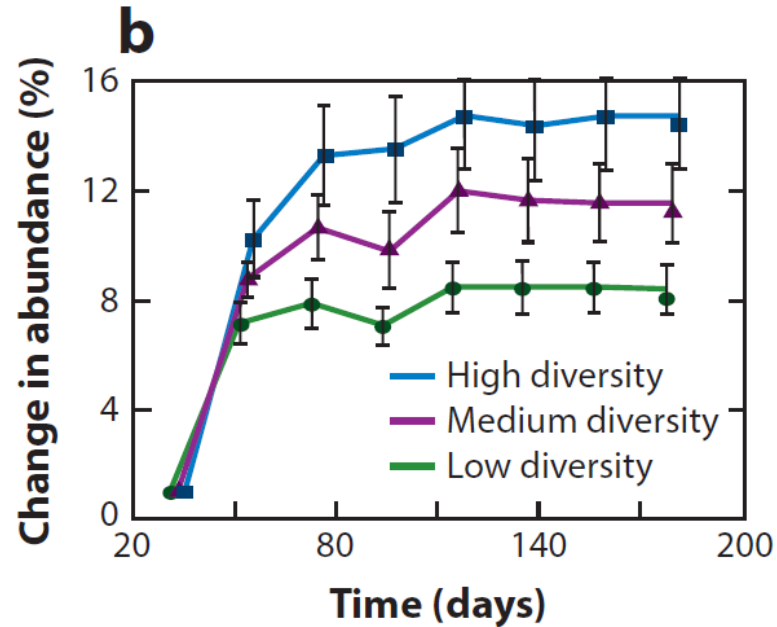
# How it began-

Explain the significance, and why the controversy?



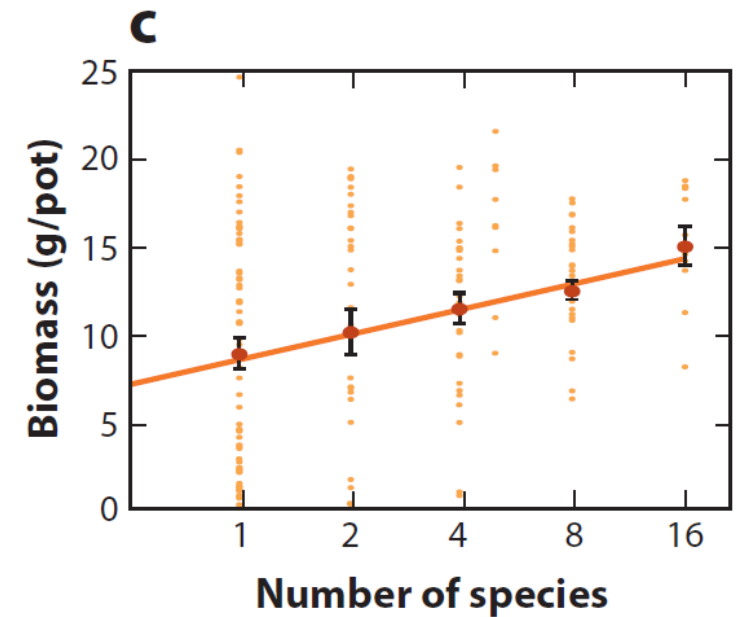
Tilman & Downing 1994

Grassland plots differing in diversity



Naeem et al. 1994

Experimentally assembled laboratory foodwebs



Naeem et al. 1995

Greenhouse experiment, plants in pots

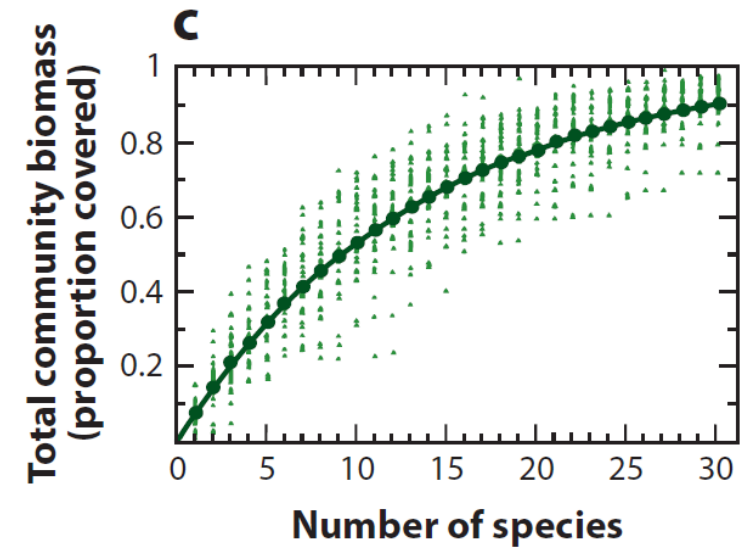
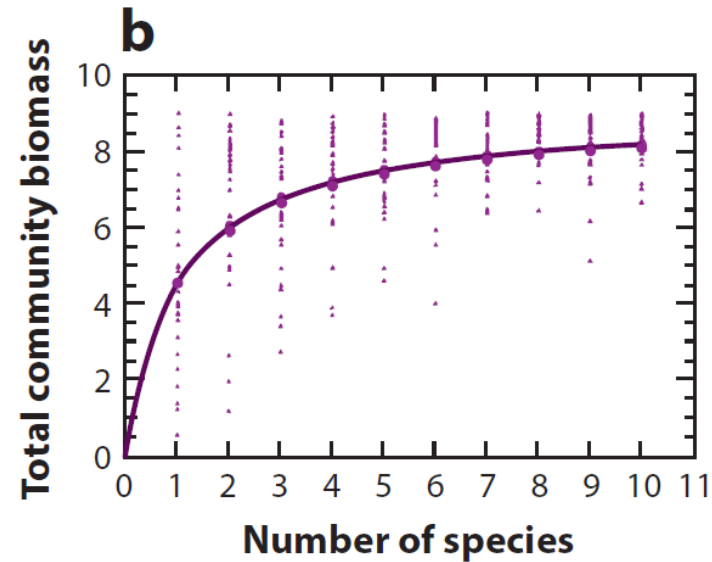
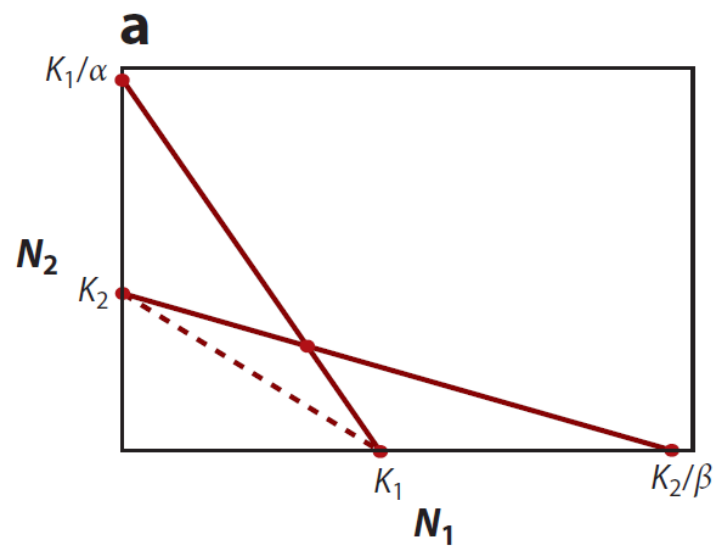
Tilman et al. 2014

# Tilman et al. - 3 theories of BEF

- Diversity-productivity
- Diversity-stability
- Diversity-invasion

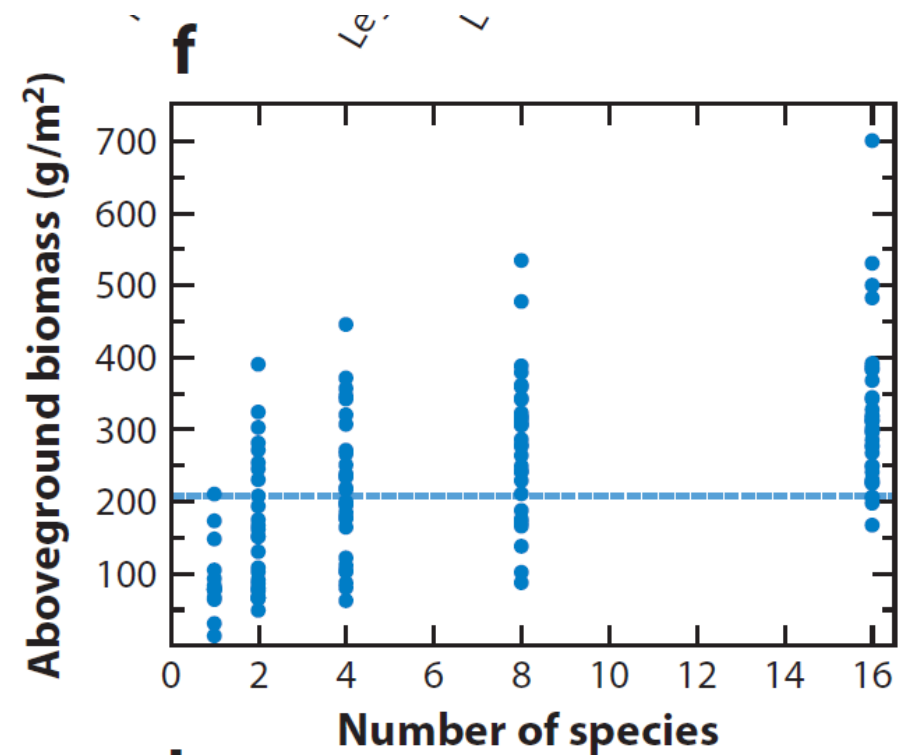
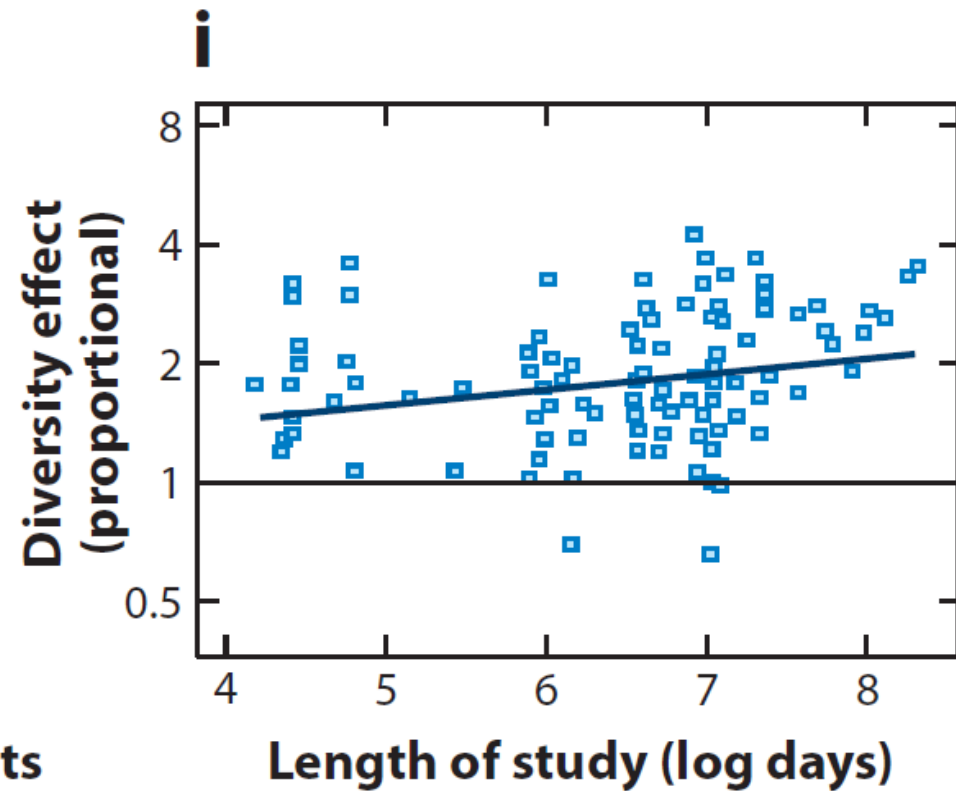
# Diversity-productivity theory –

Explain these graphs, why were they significant for promoting BEF?

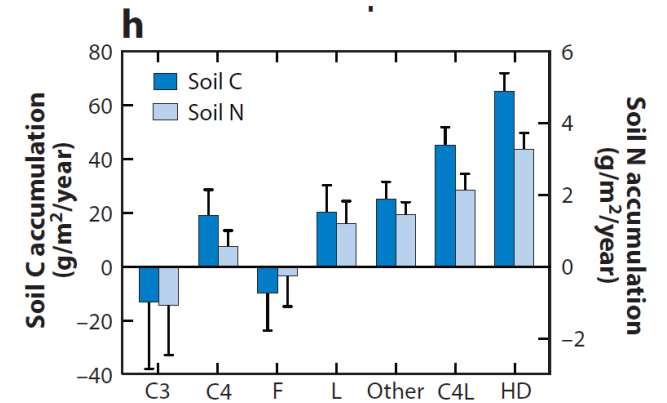
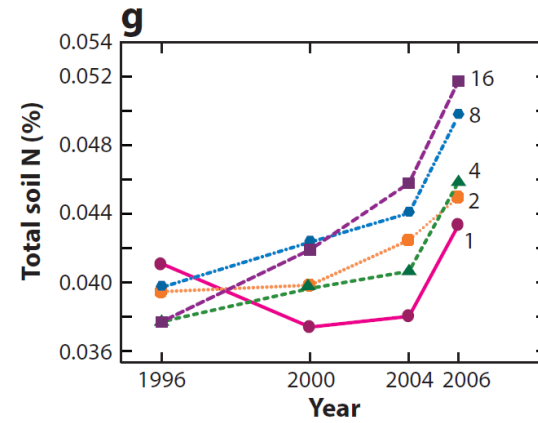
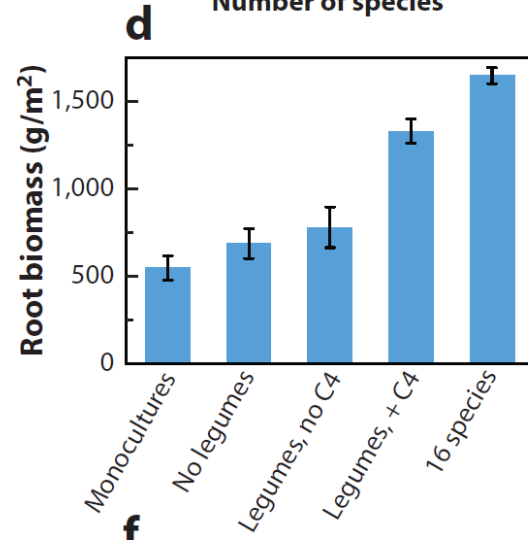
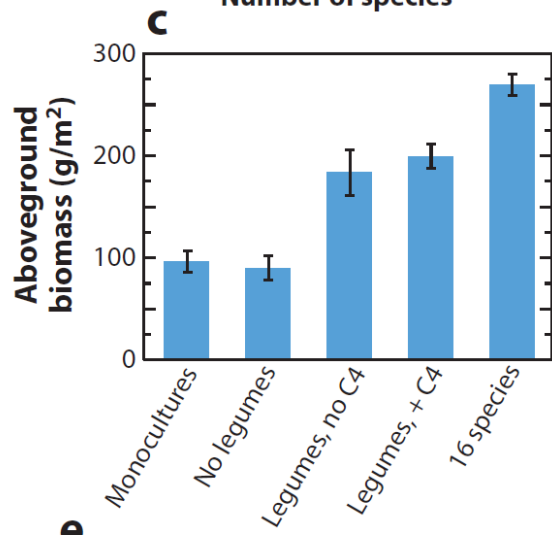
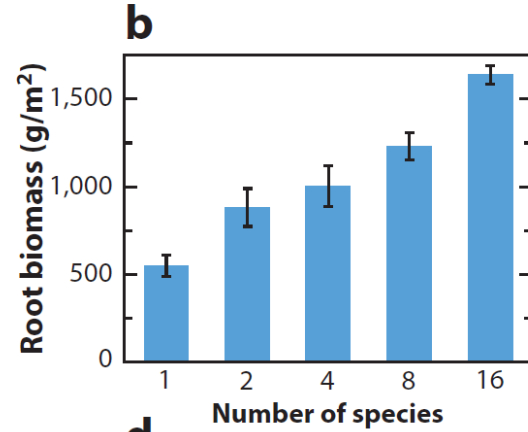
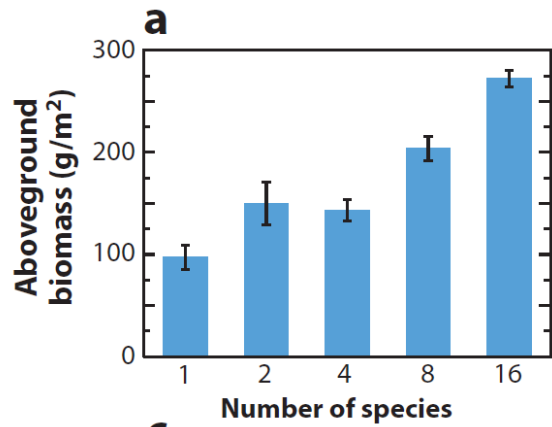


# Empirical evidence of D-P –

Explain and interpret figures

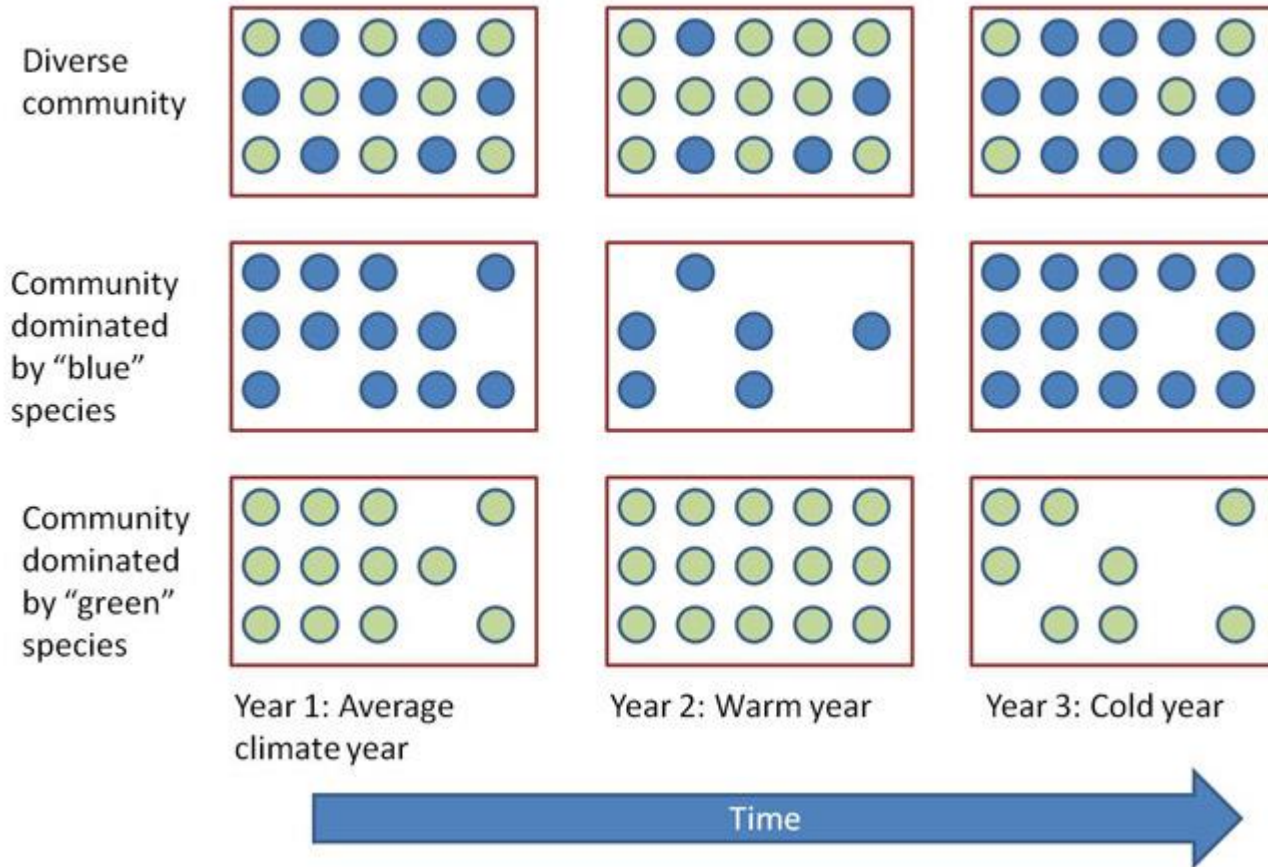


# The Big Cedar Creek, after 13 years





# Diversity-Stability Theory

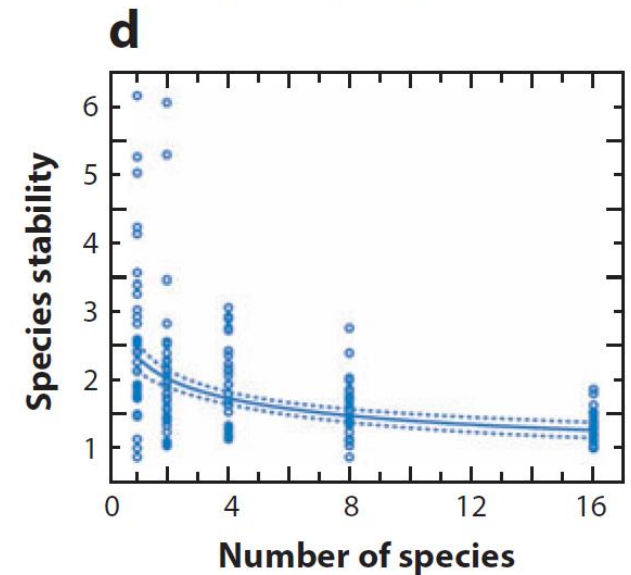
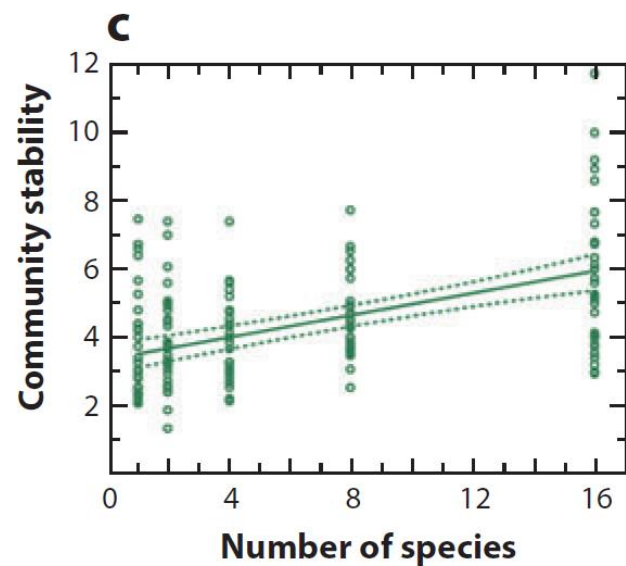
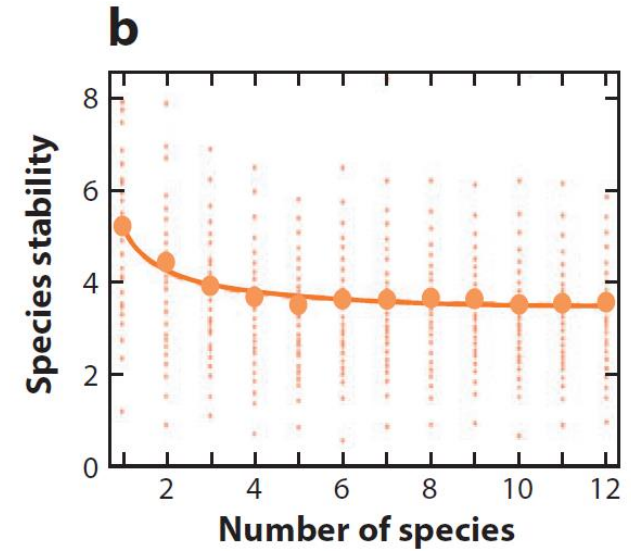
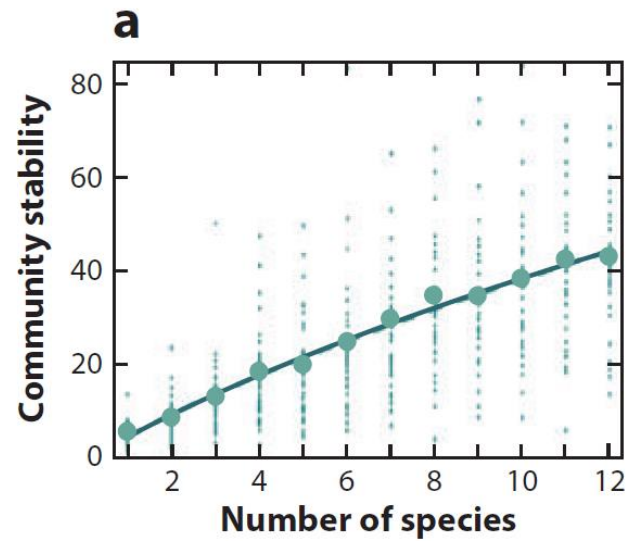


Conceptual diagram showing how increasing diversity can stabilize ecosystem functioning

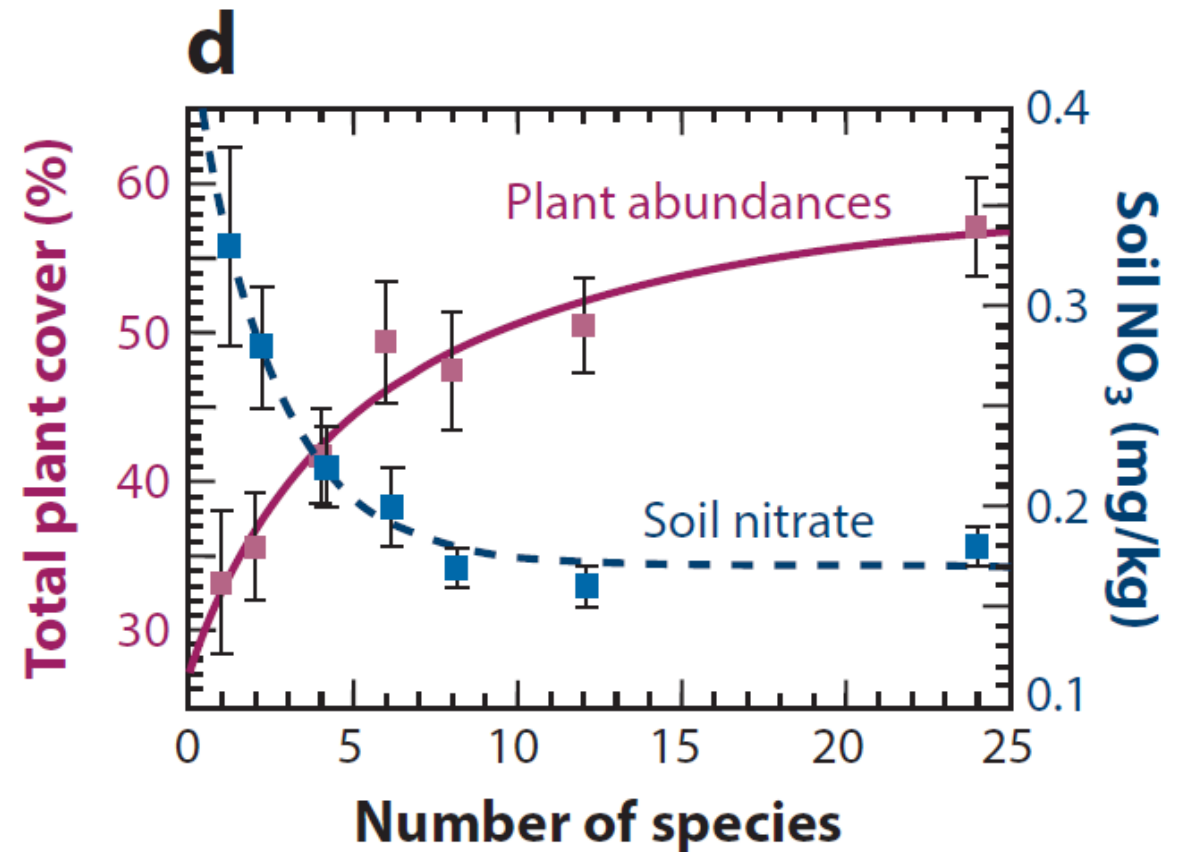
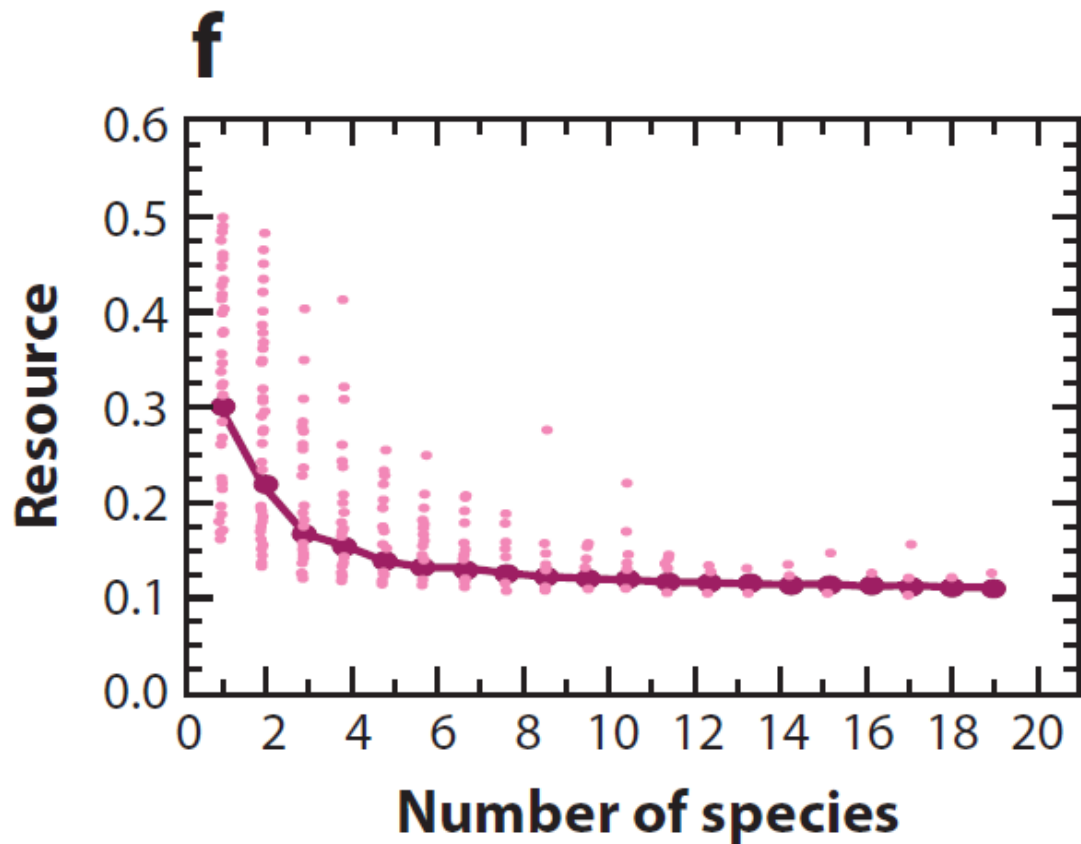
Each rectangle represents a plant community containing individuals of either blue or green species and the total number of individuals corresponds to the productivity of the ecosystem. Green species increase in abundance in warm years, whereas blue species increase in abundance in cold years such that a community containing only blue or green species will fluctuate in biomass when there is interannual climate variability. In contrast, in the community containing both green and blue individuals, the decrease in one species is compensated for by an increase in the other species, thus creating stability in ecosystem productivity between years. Note also that, on average, the diverse community exhibits higher productivity than either single-species community. This pattern could occur if blue or green species are active at slightly different times, such that competition between the two species is reduced. This difference in when species are active leads to complimentary resource utilization and can increase total productivity of the ecosystem.

# A test of diversity-stability theory

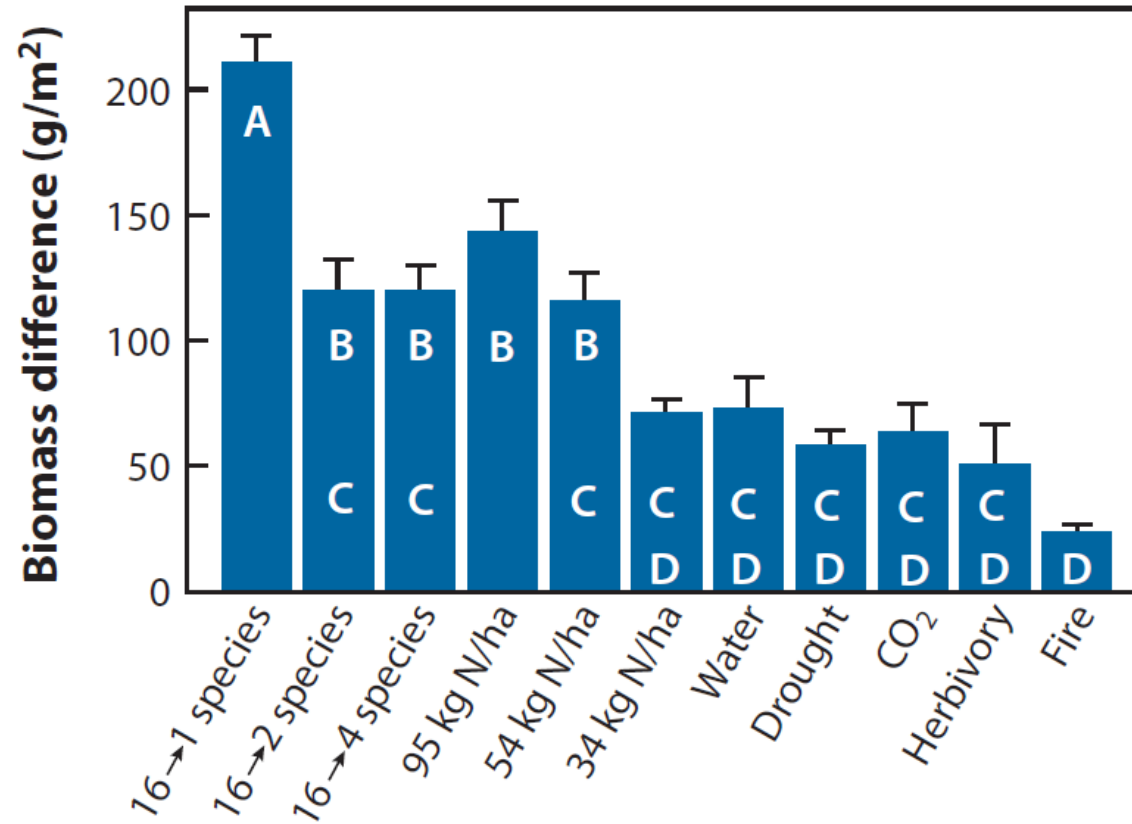
Why the difference between population & community?



# Diversity- Invasion theory and partial test



# How important is biodiversity?



- To be continued