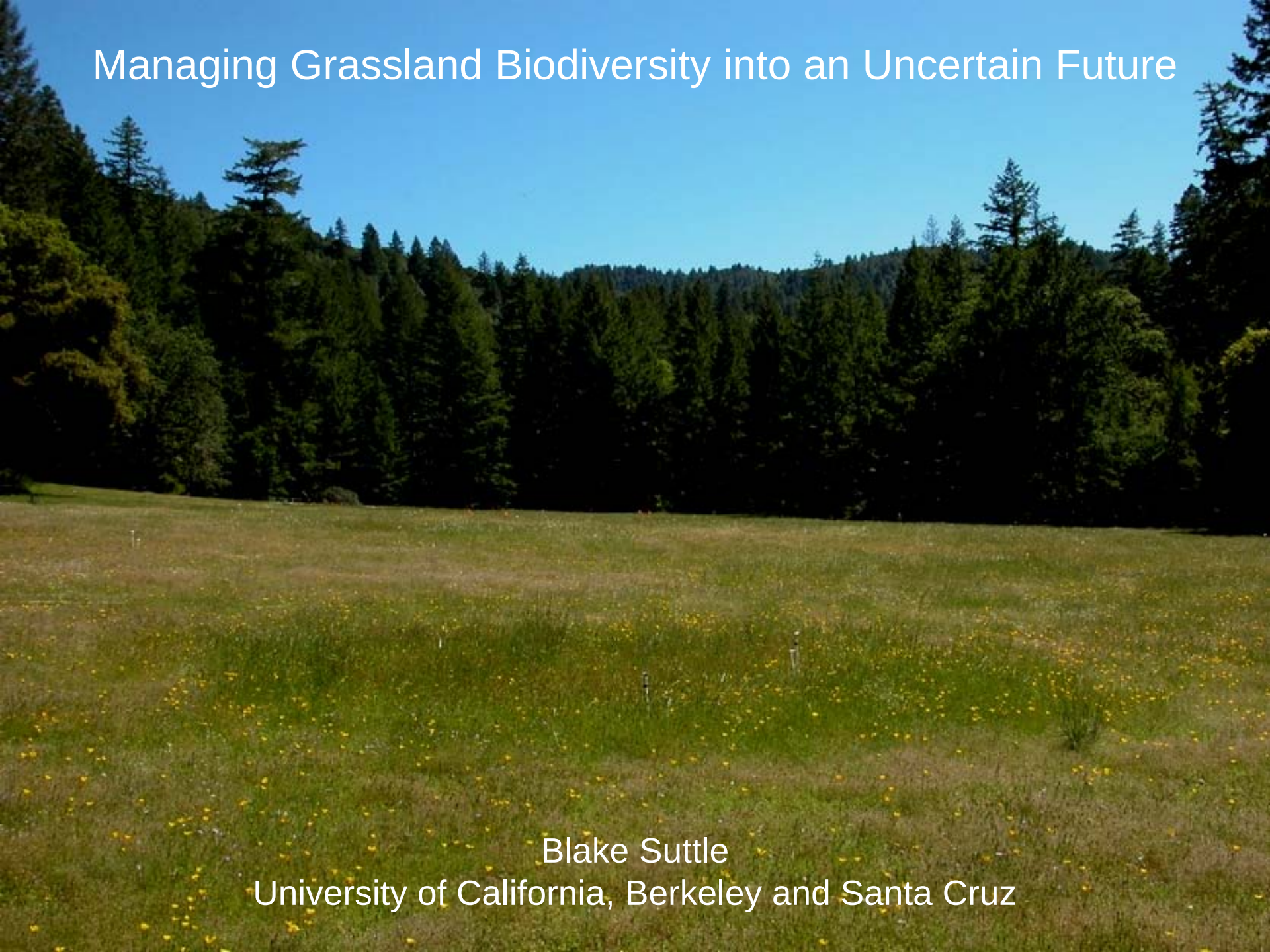
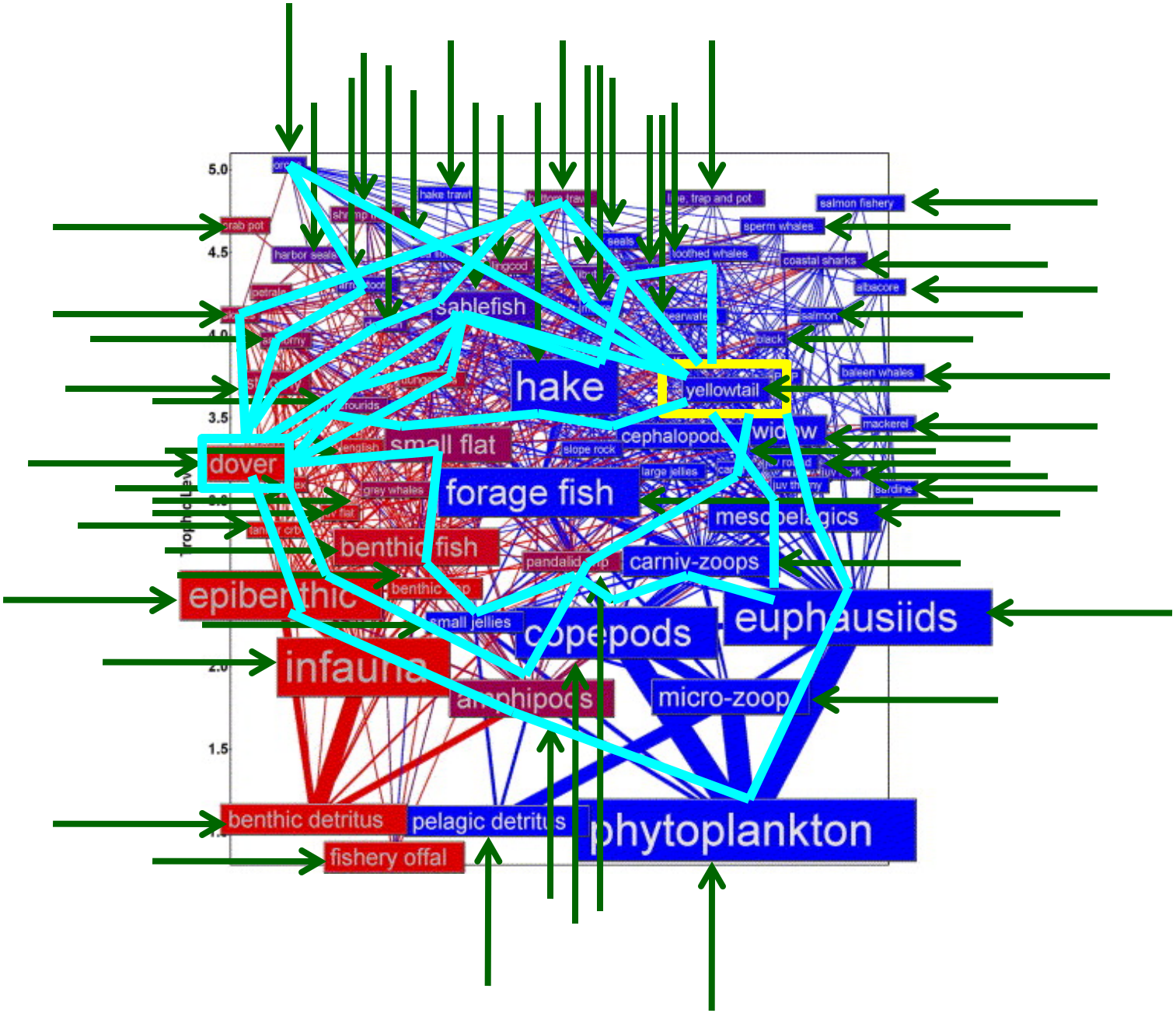
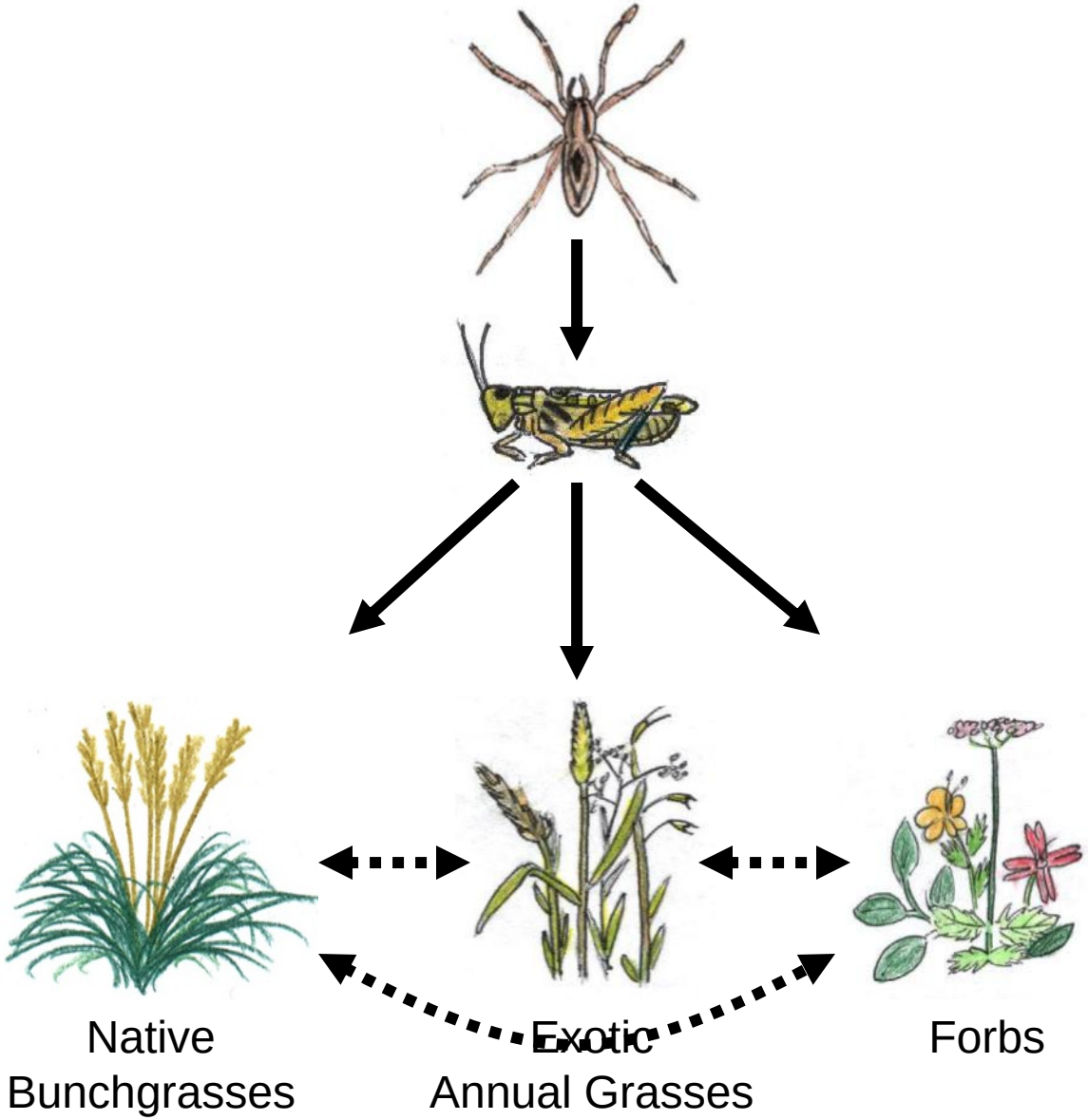


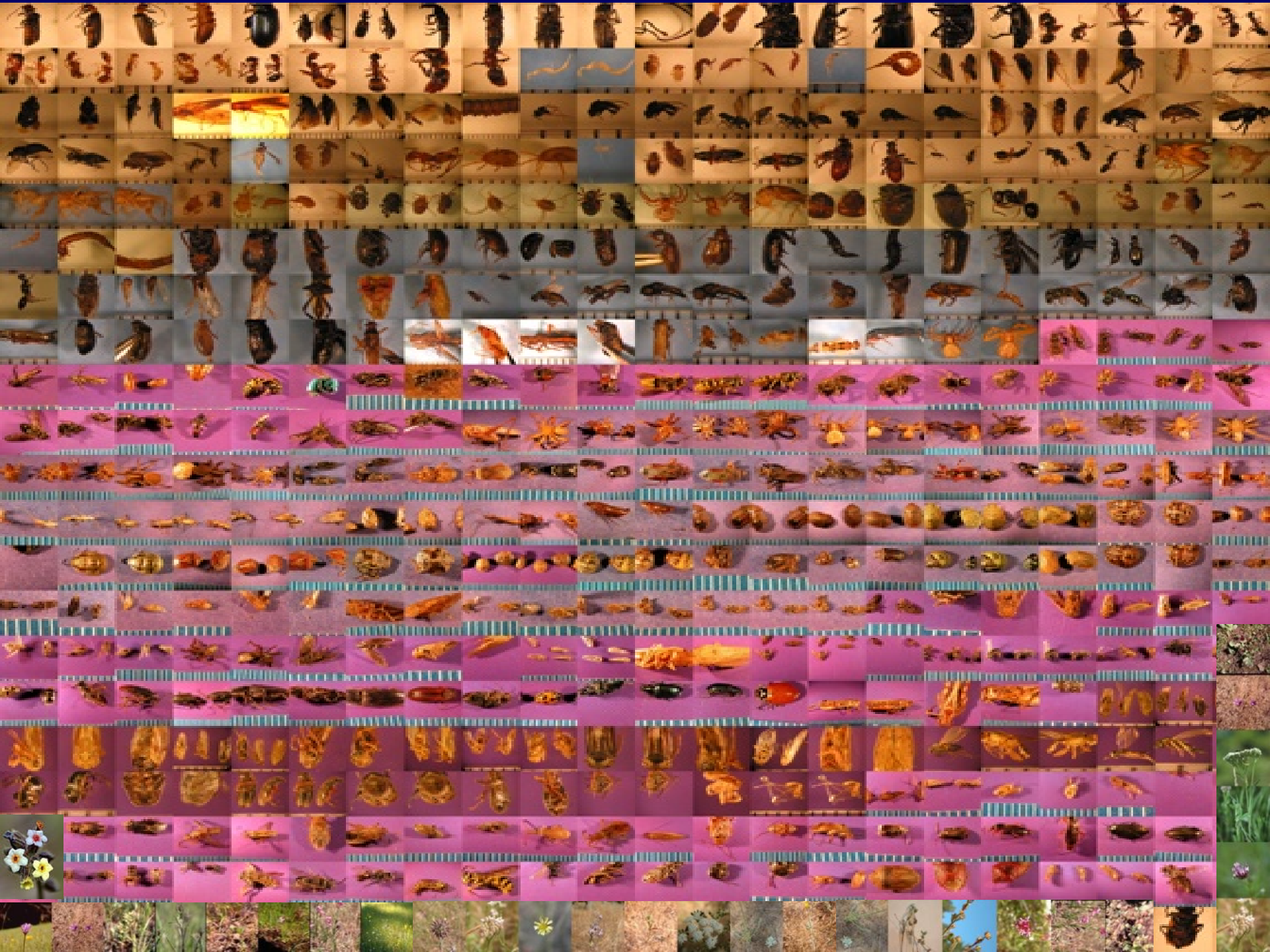
# Managing Grassland Biodiversity into an Uncertain Future

Blake Suttle
University of California, Berkeley and Santa Cruz

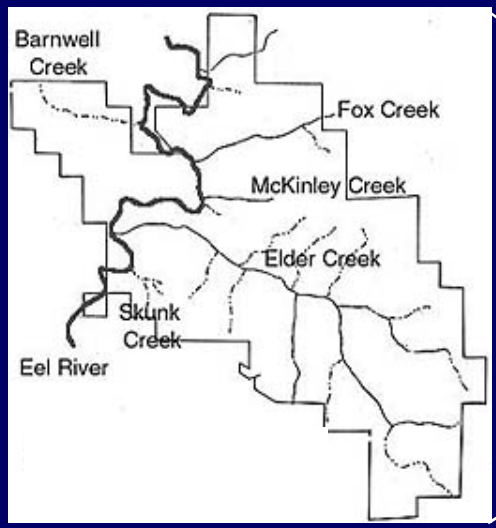



(Field JC et al., Prog Ocean, 2006 68:238-270)


Native
Bunchgrasses
Exotic
Annual Grasses
Forbs

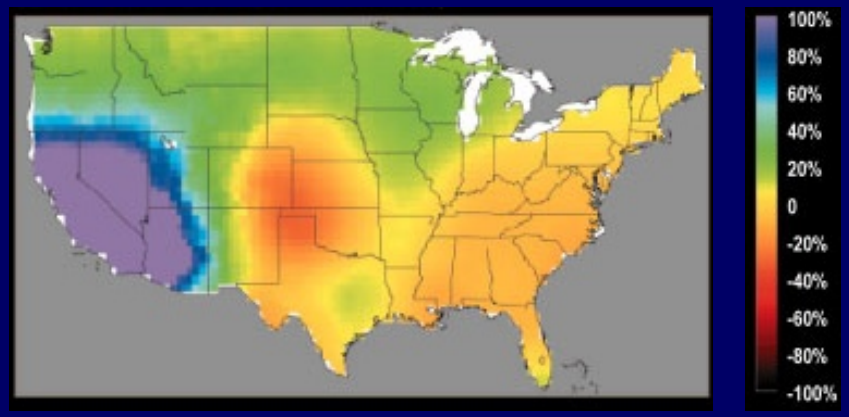


# Angelo Coast Range Reserve

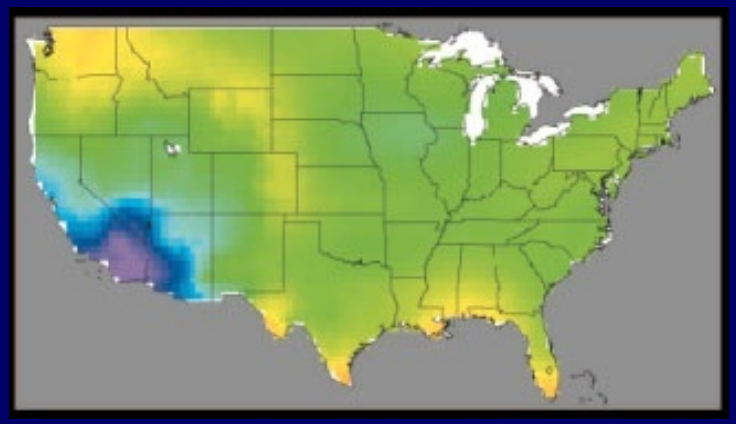


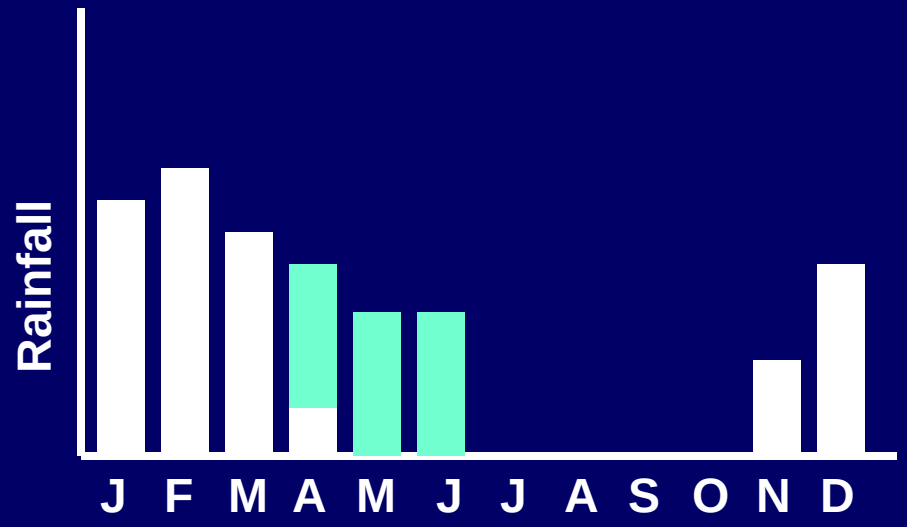
# Big Changes in CA Precipitation

Canadian Model 21st Century (CGCM1)

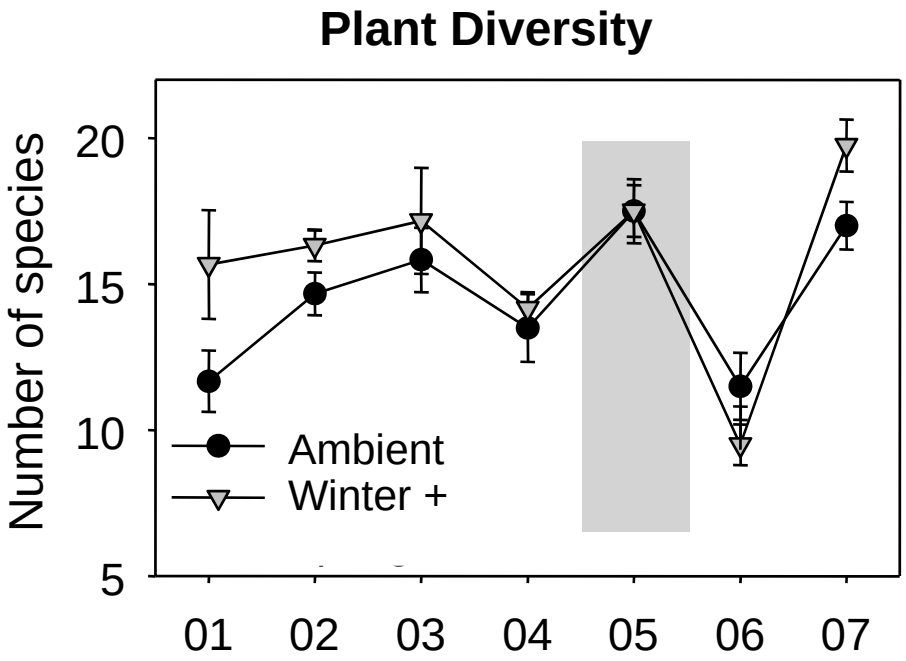



Hadley Model 21st Century (HadCM2)

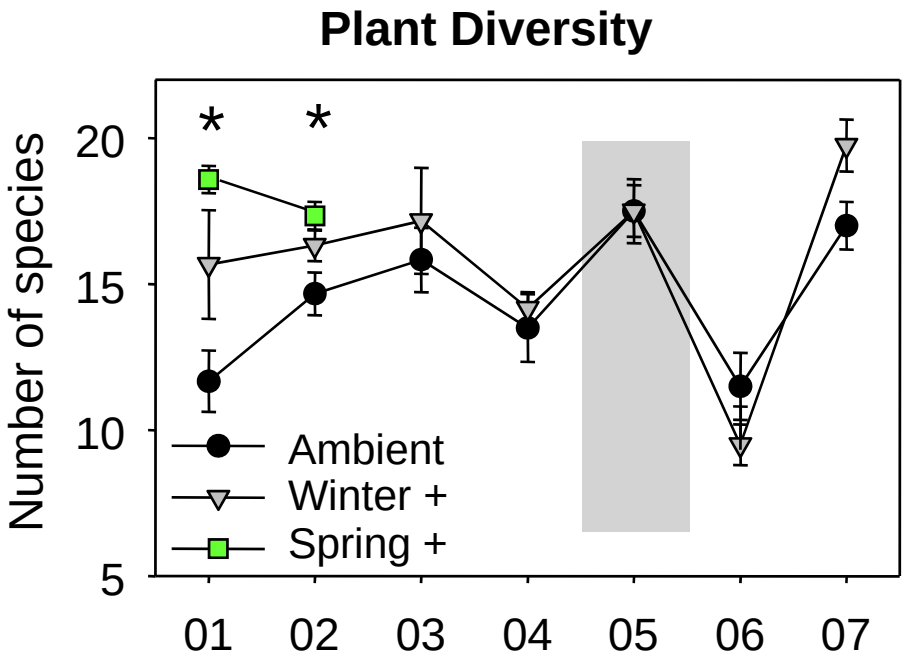




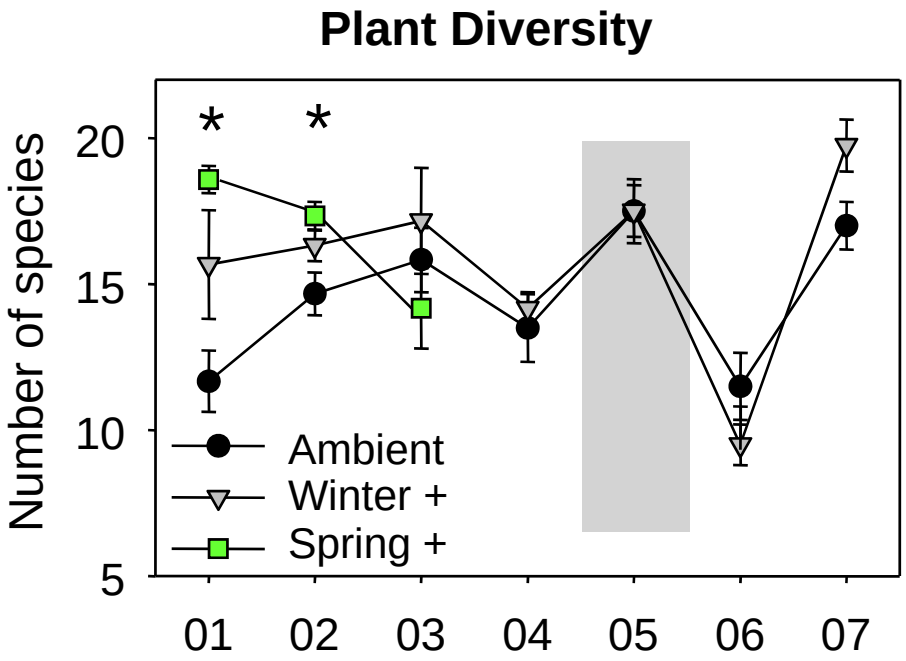
# Grassland Biodiversity



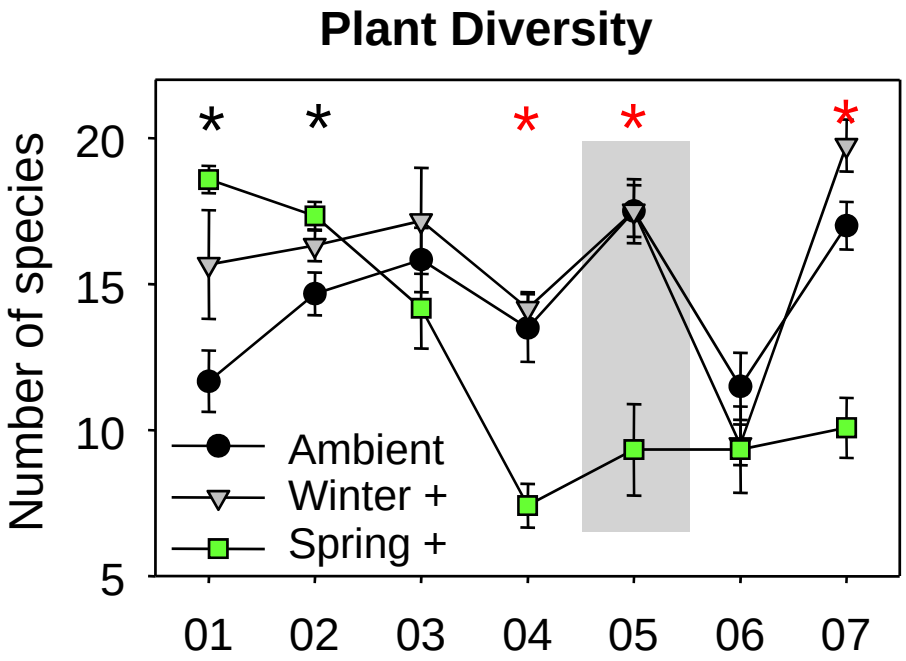

**Suttle, Thomsen & Power 2007, *Science***



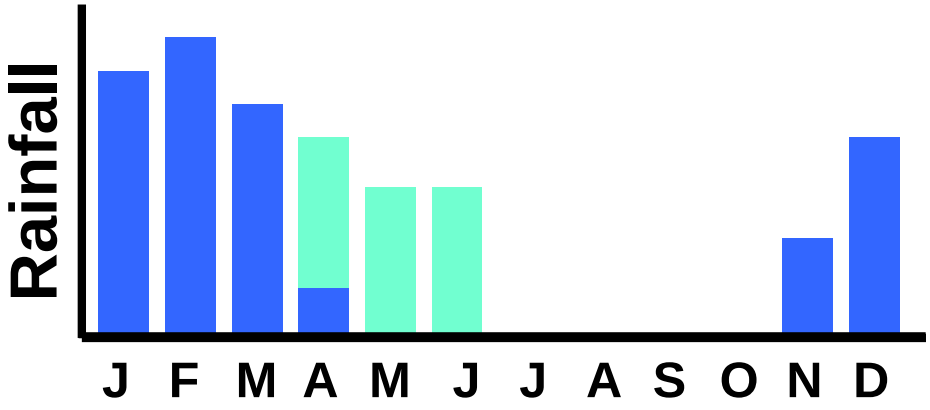

**Suttle, Thomsen & Power 2007, *Science***




**Suttle, Thomsen & Power 2007, *Science***



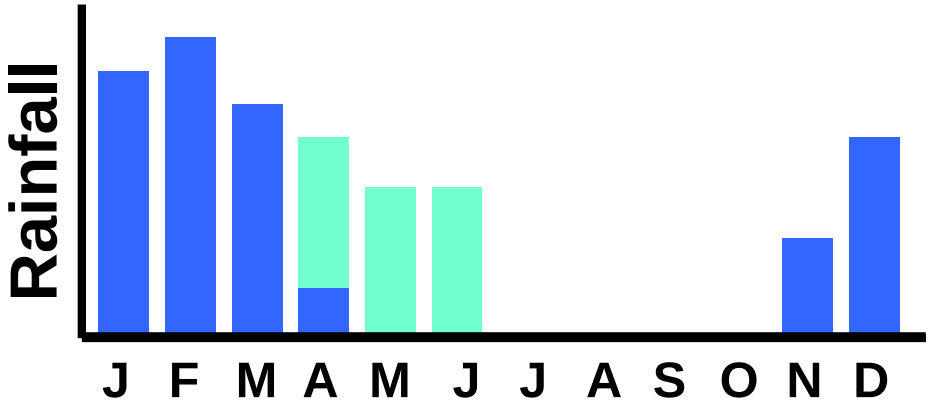

Suttle, Thomsen & Power 2007, *Science*



N-Fixers

Exotic
Annual Grasses

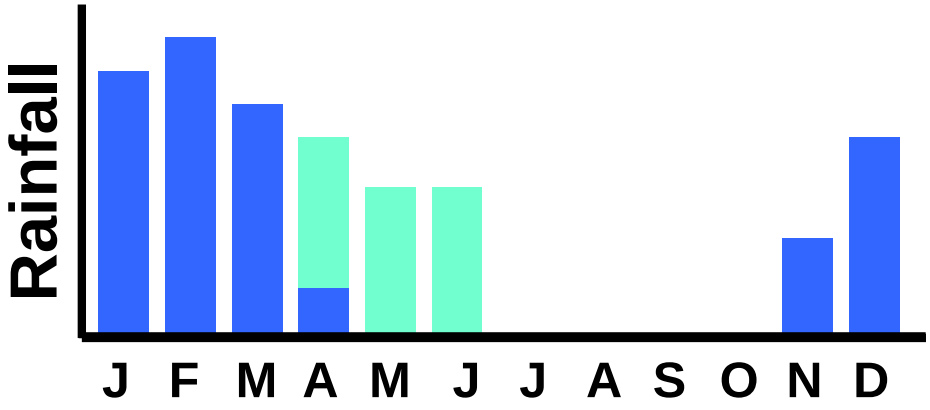
Forbs

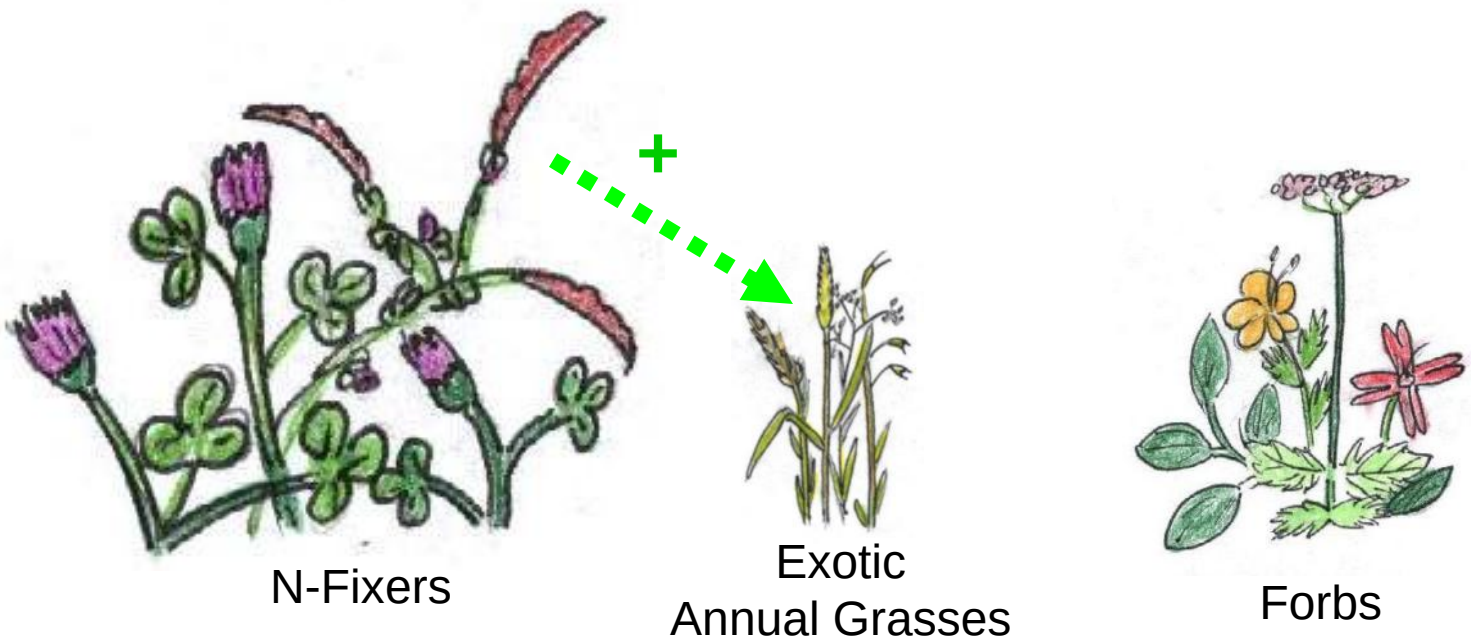


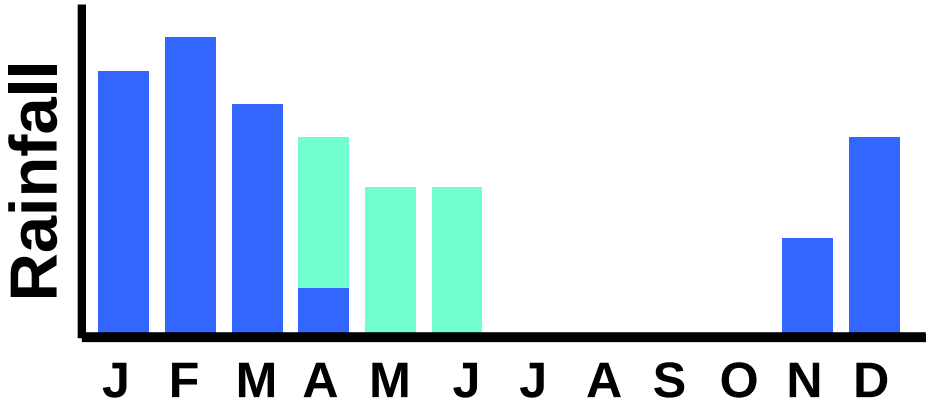
N-Fixers

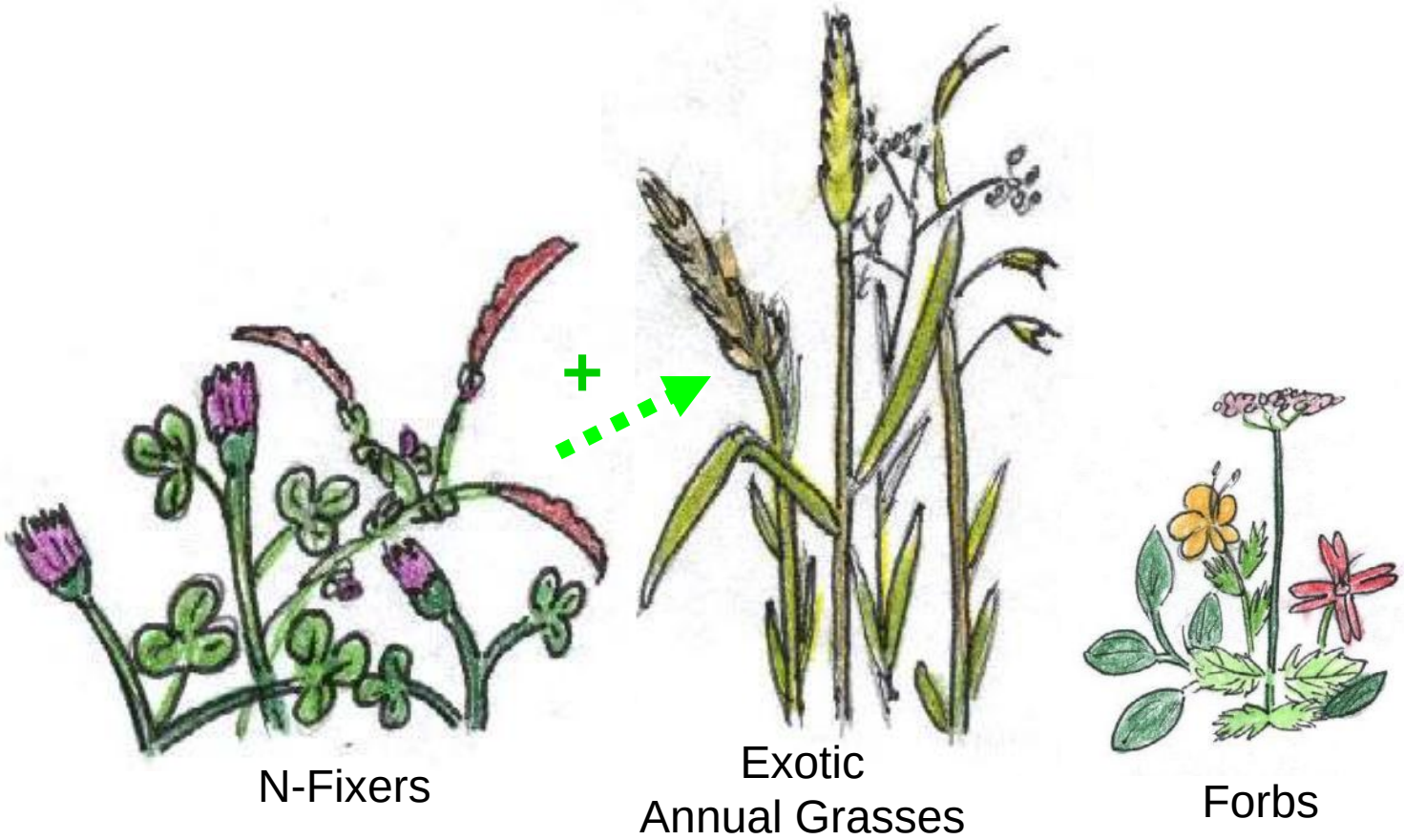
Exotic
Annual Grasses

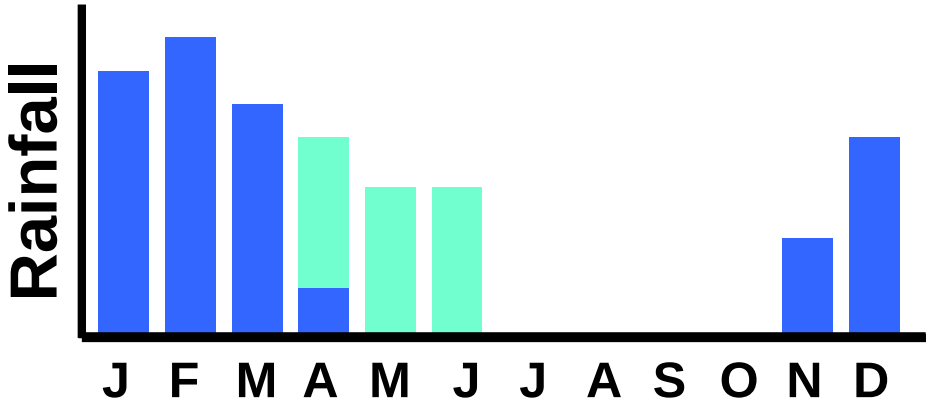
Forbs

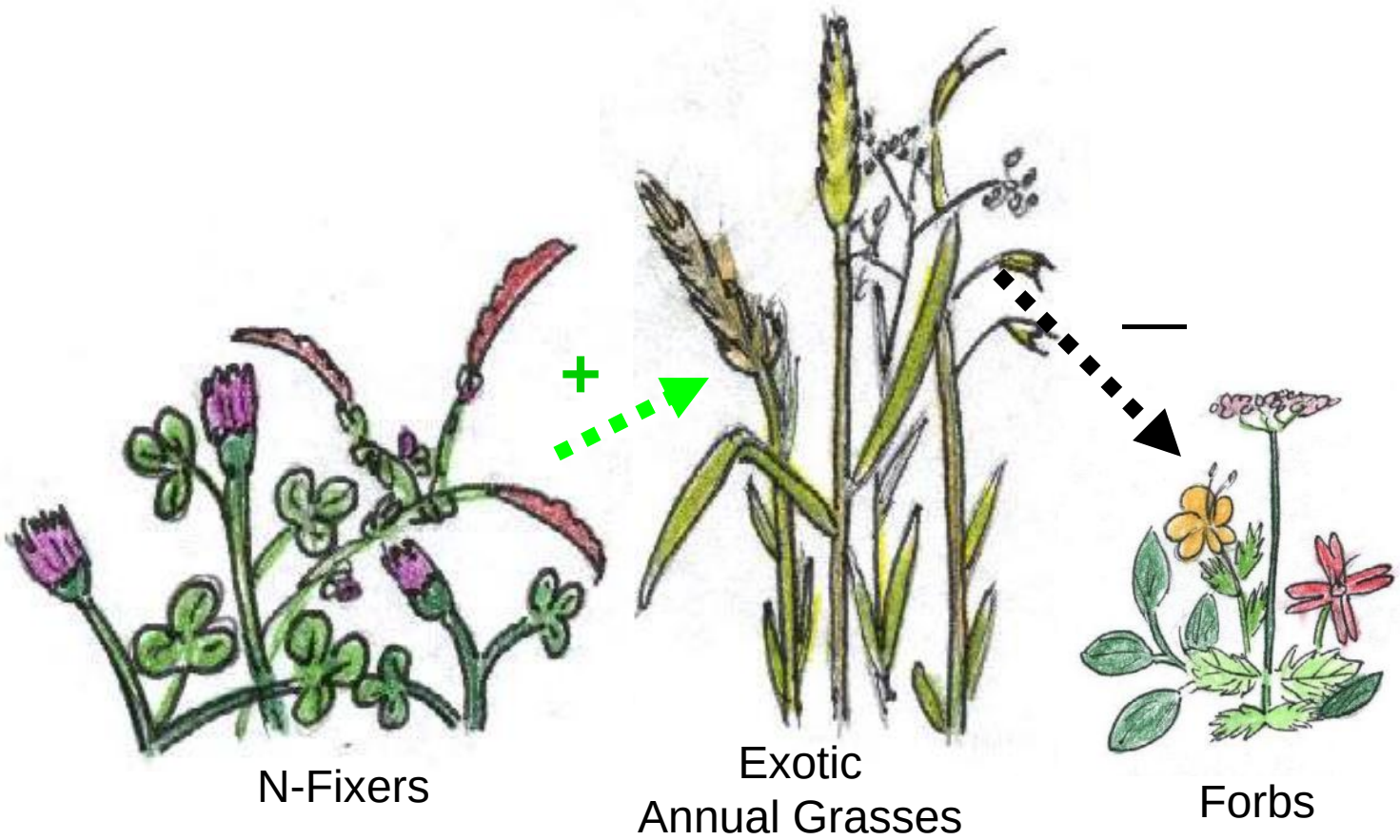

Rainfall
J F M A M J J A S O N D

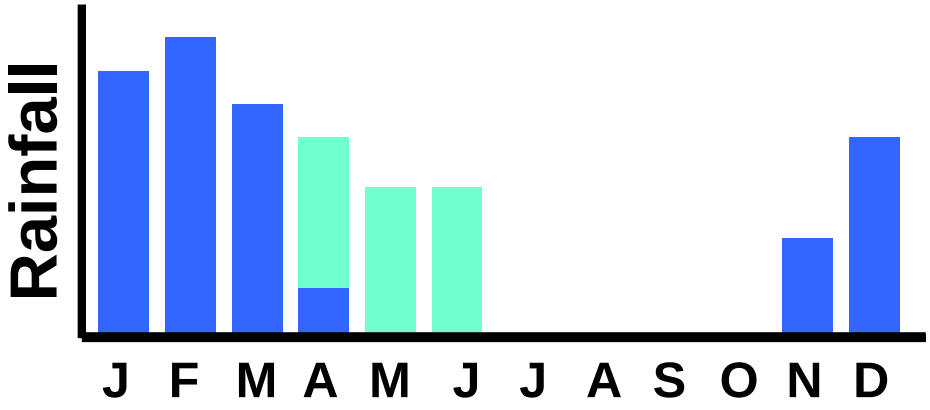

+
N-Fixers
Exotic
Annual Grasses
Forbs

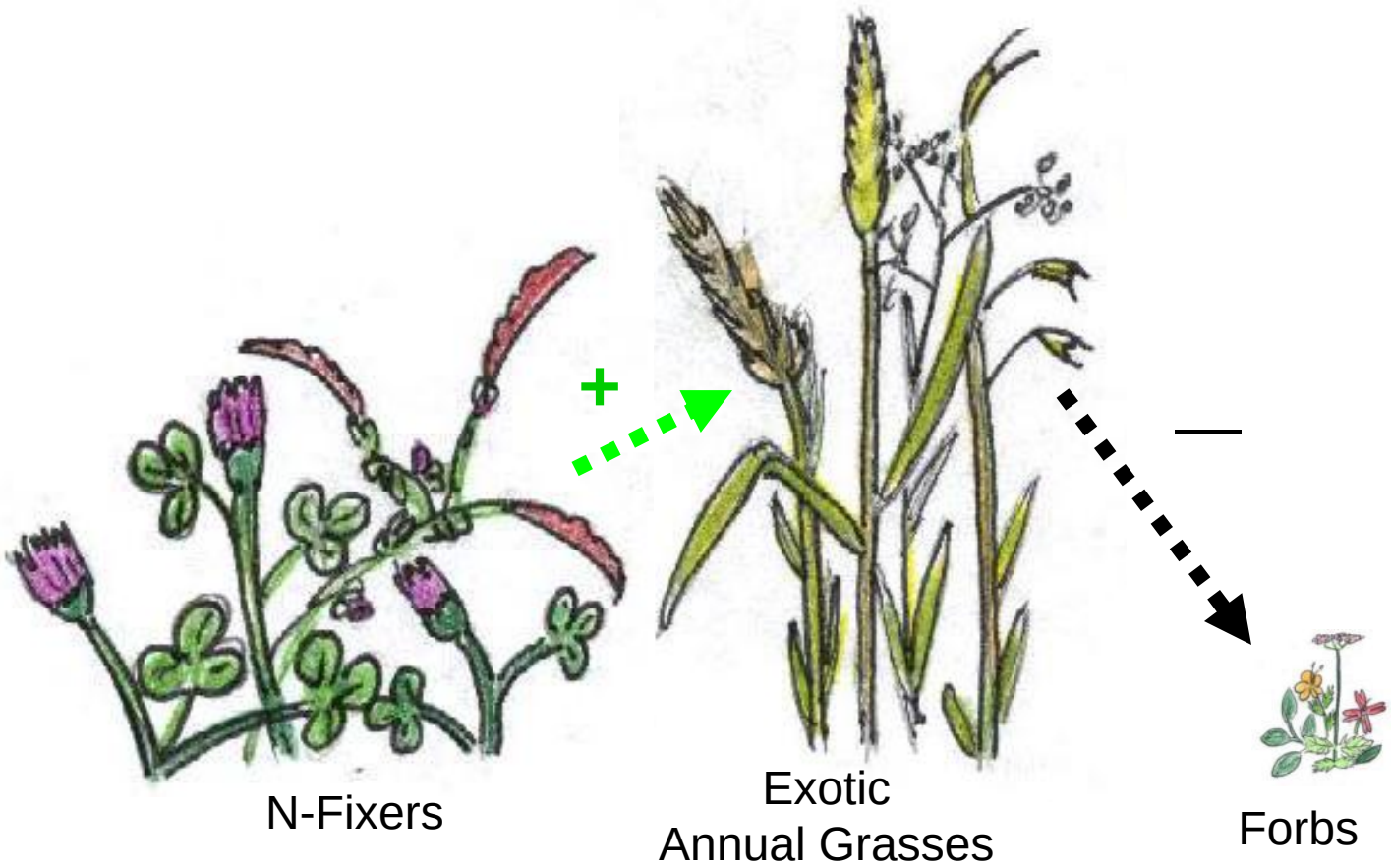

Rainfall
J F M A M J J A S O N D


+
N-Fixers
Exotic
Annual Grasses
Forbs

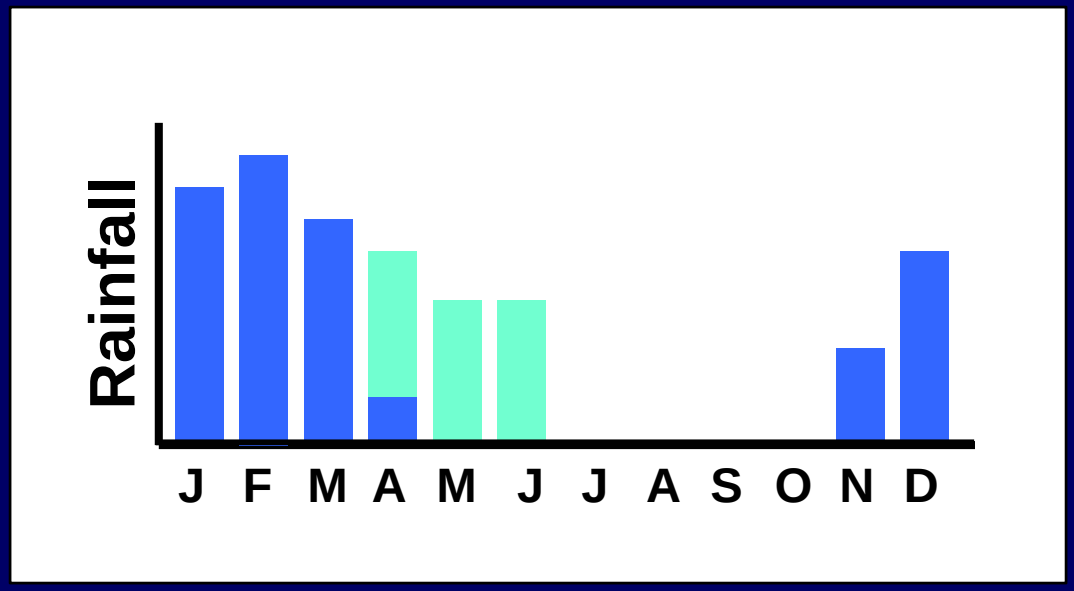

Rainfall
J F M A M J J A S O N D


+
—
N-Fixers
Exotic
Annual Grasses
Forbs

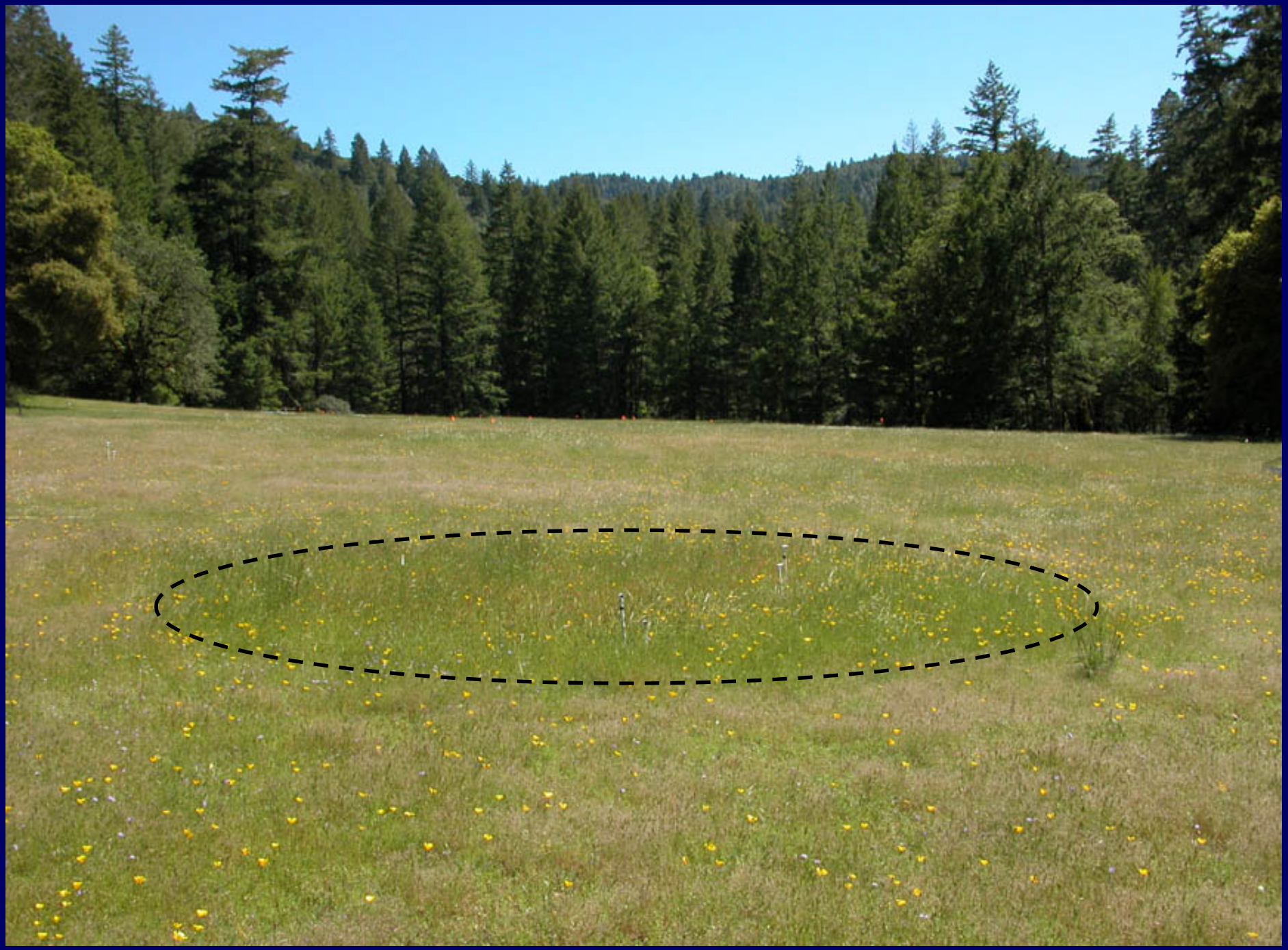

Rainfall
J F M A M J J A S O N D

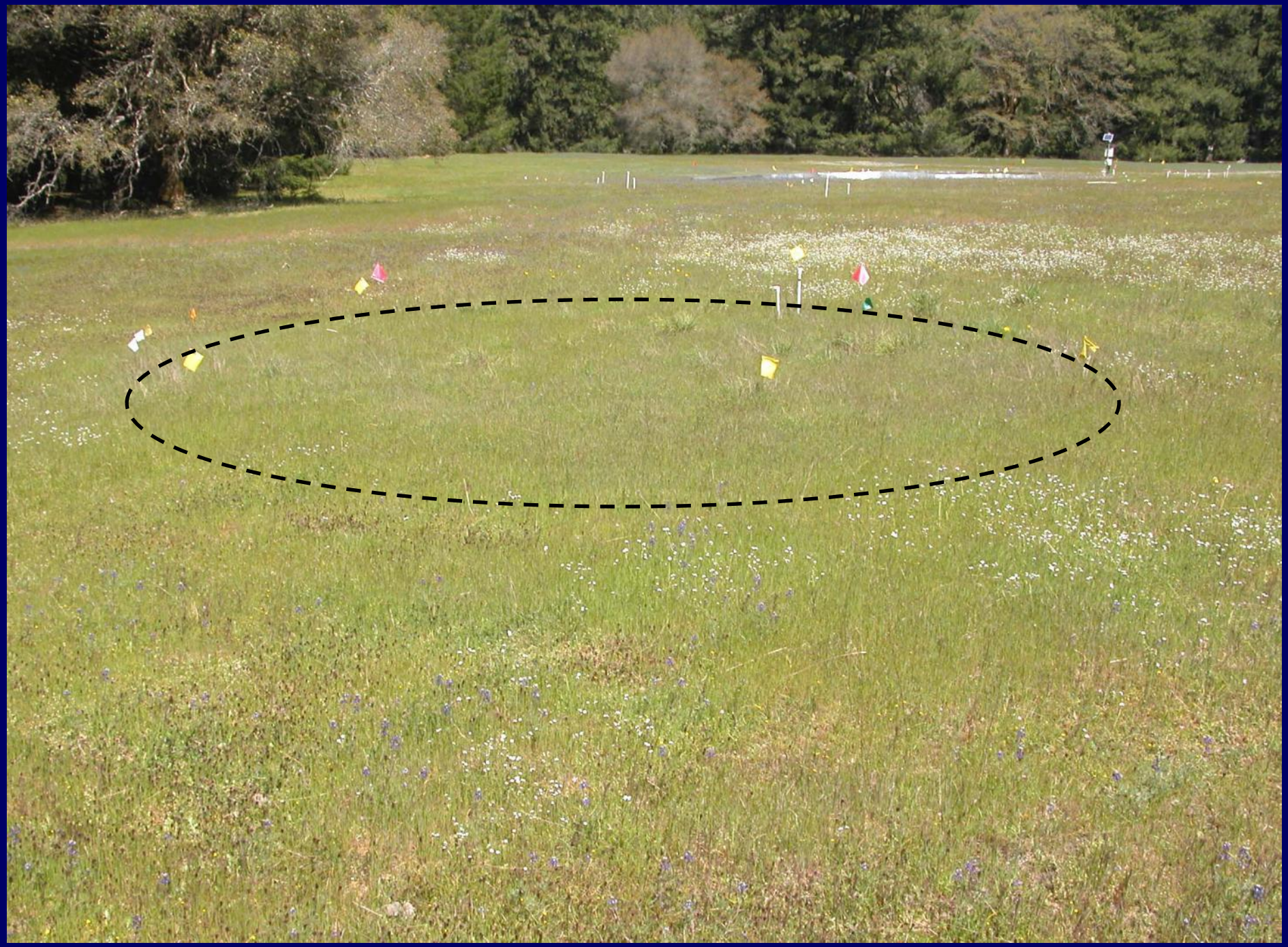

+
—
N-Fixers
Exotic
Annual Grasses
Forbs

Expectation from responses of individual species



Response from community of interacting species





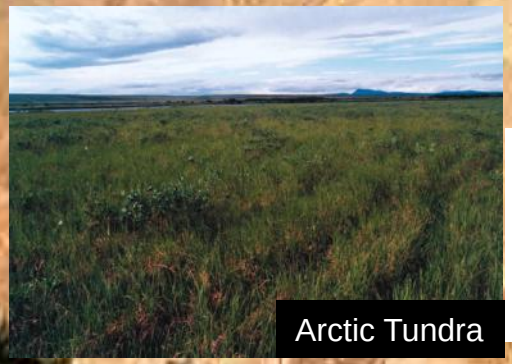
# Inferences

- Timing matters

- Interactions matter

- Lags matter

California Coast



Arctic Tundra

**“If people look for these effects, they will find them everywhere”**
**- Marcel Visser**

Pacific Northwest Lakes

Wolves & Moose on Isle Royale

Borneo Fig Trees

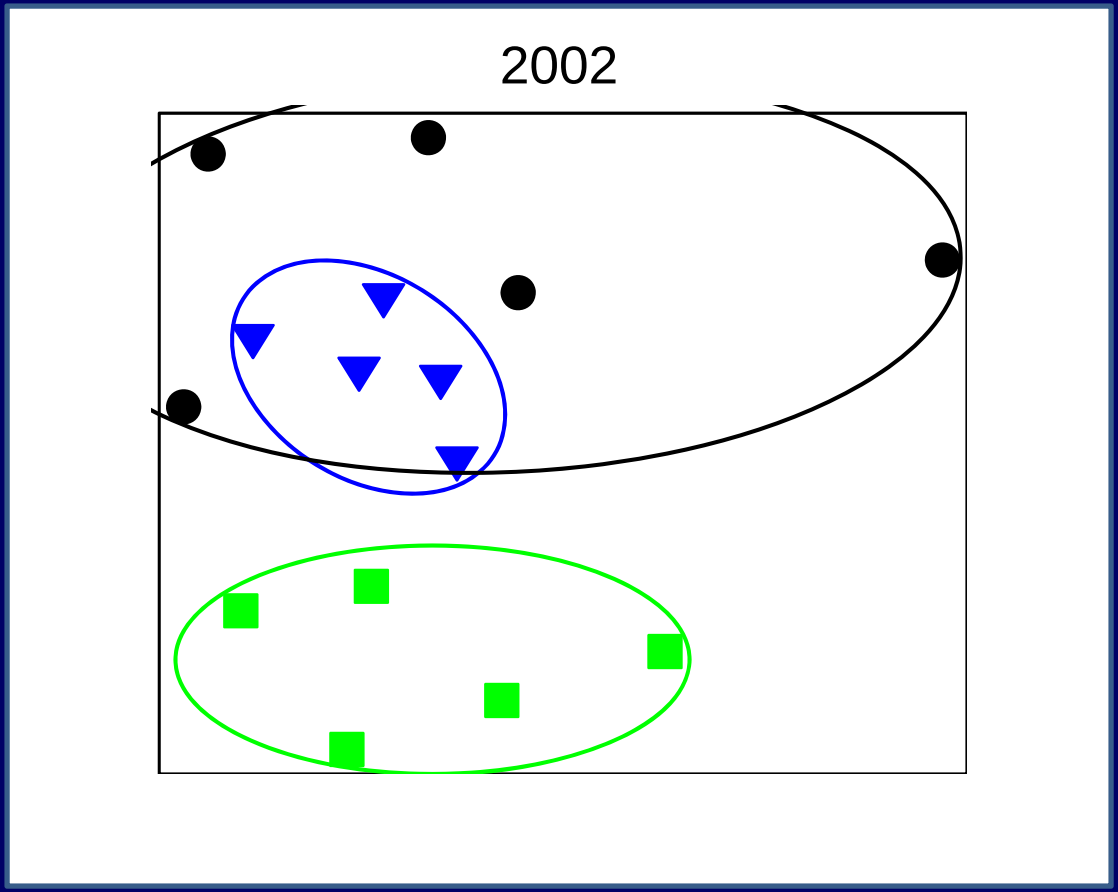
Canadian Forests

Alaskan Forests

British Birds

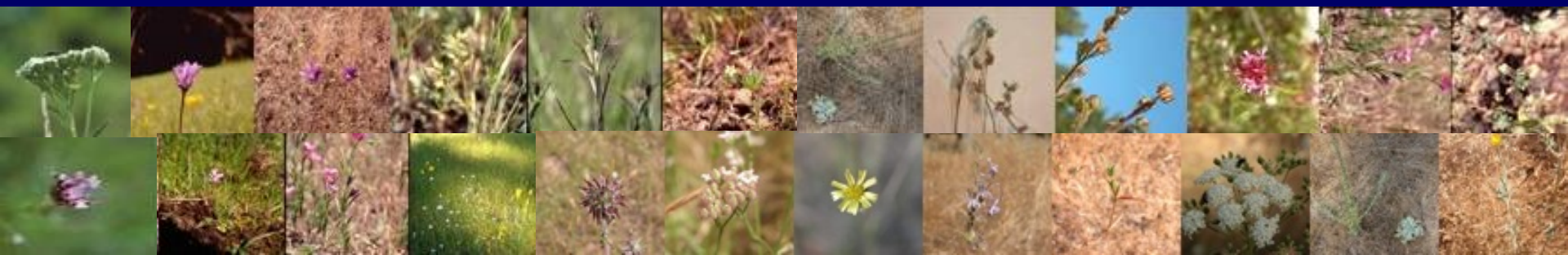
European Moths

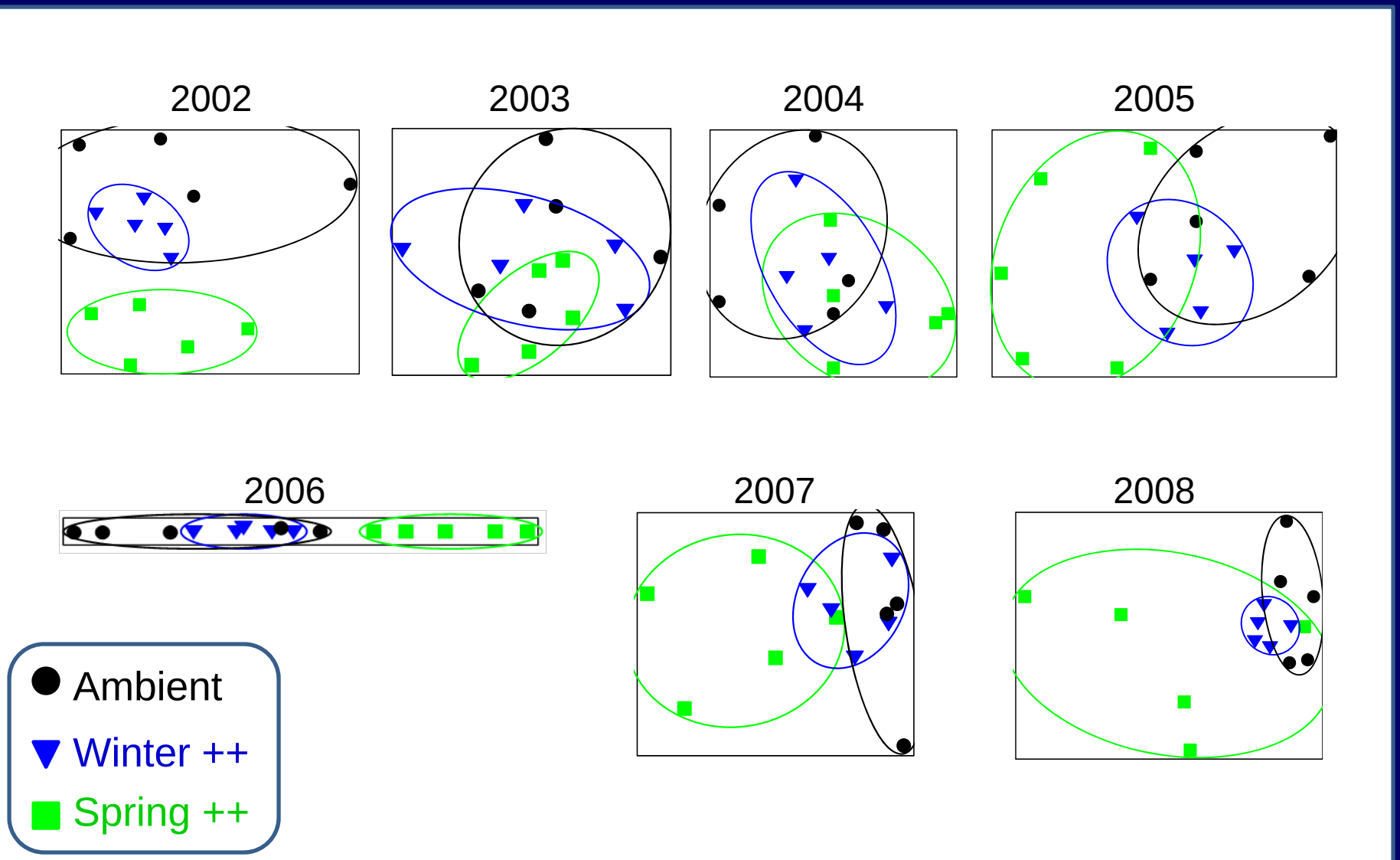
# Biodiversity as opposed to **Actual Species Composition**



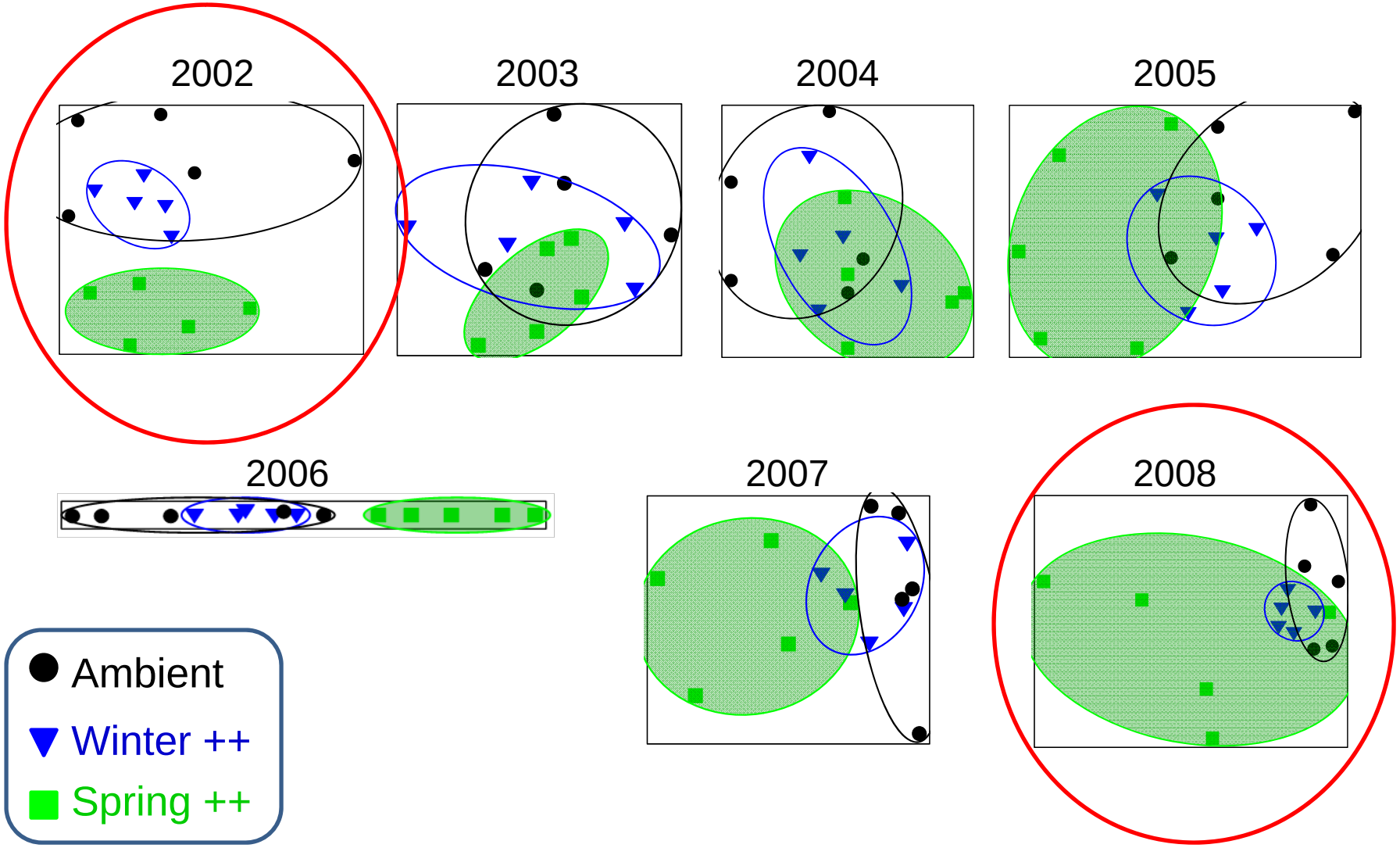

Ambient
Winter ++
Spring ++

How similar are plots in **Overall Species Composition and Abundance**?





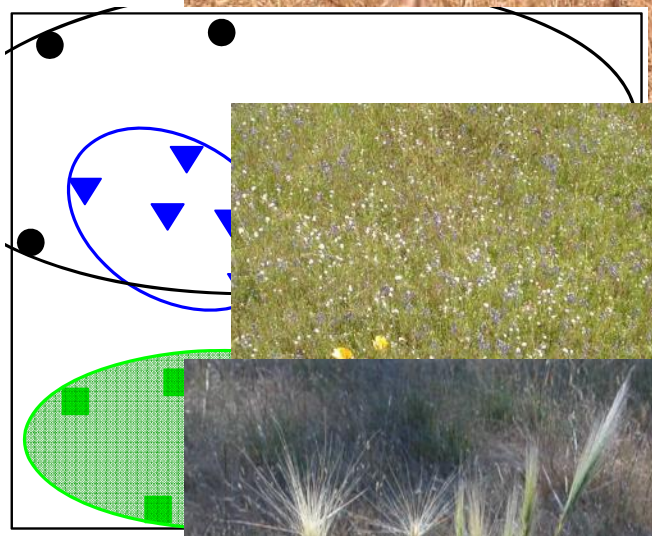

Suttle, *unpublished*




Suttle, *unpublished*

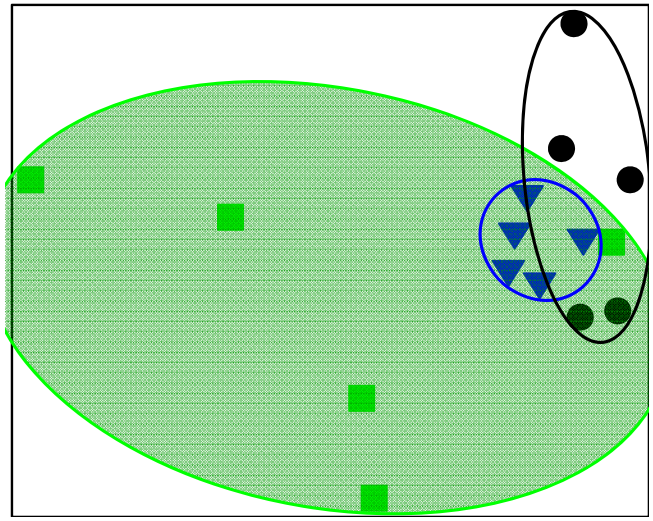
Initial Effects of Extended Rainfall

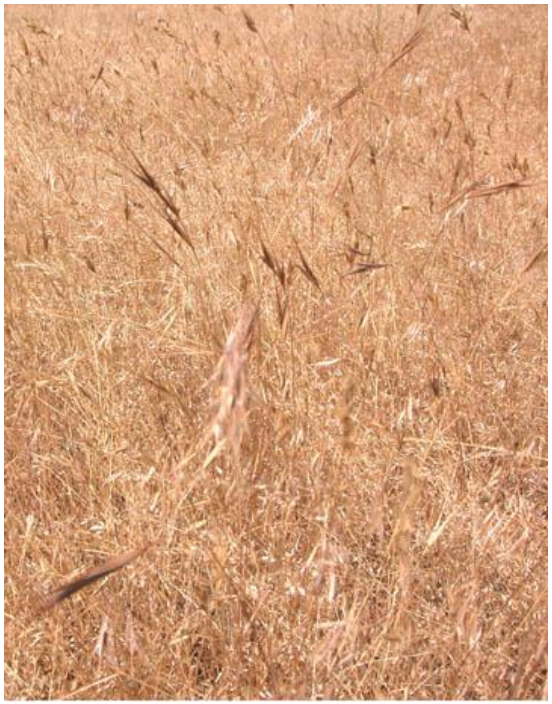
2002



Longer-Term Effects of Extended Rainfall

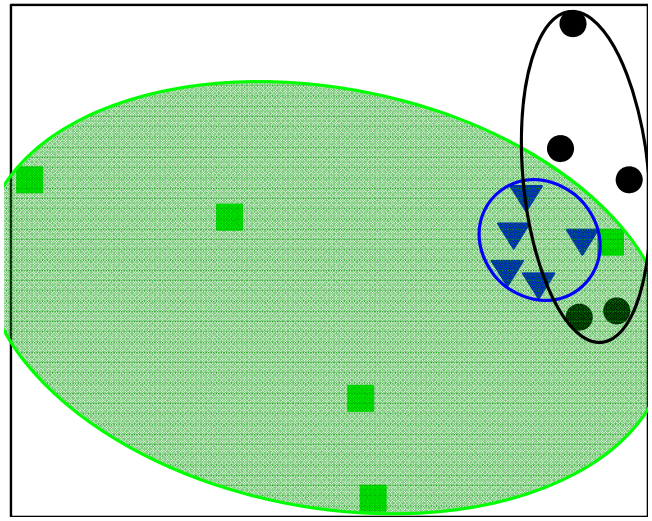
2008

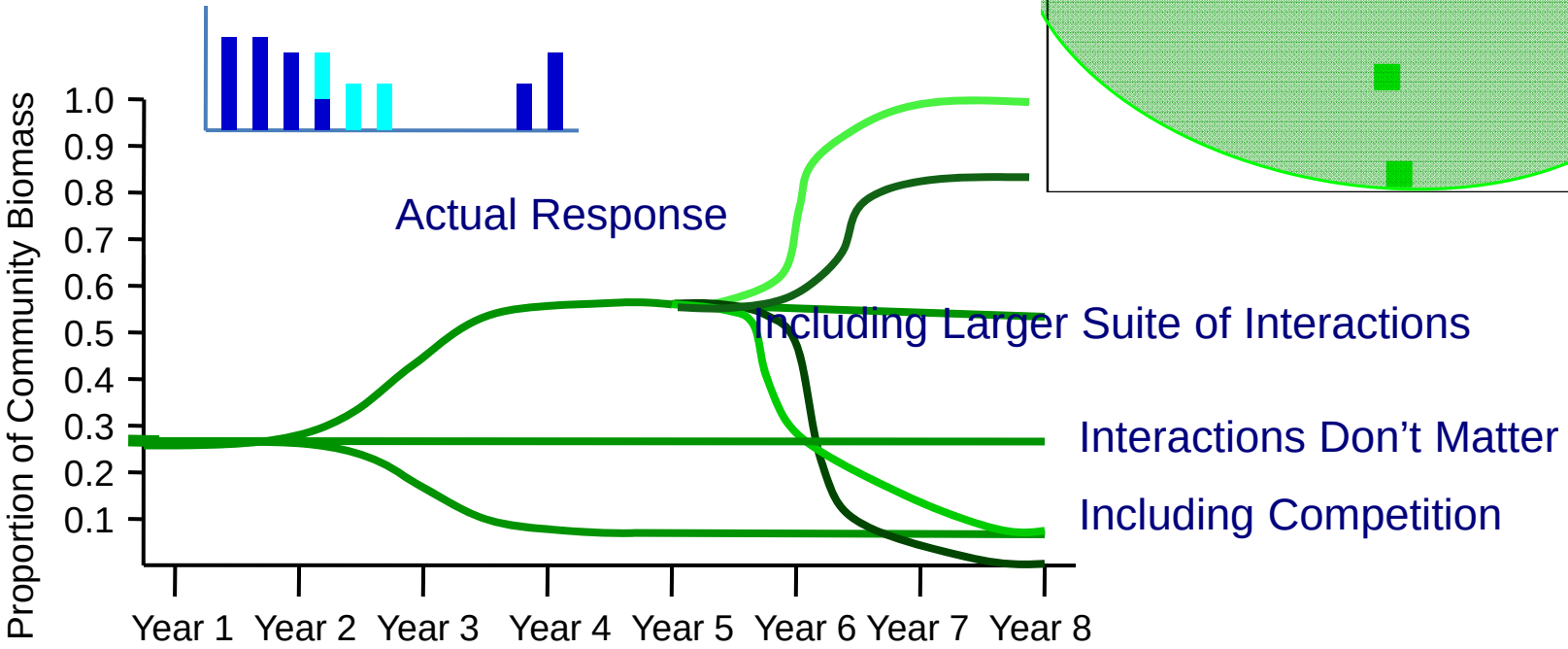


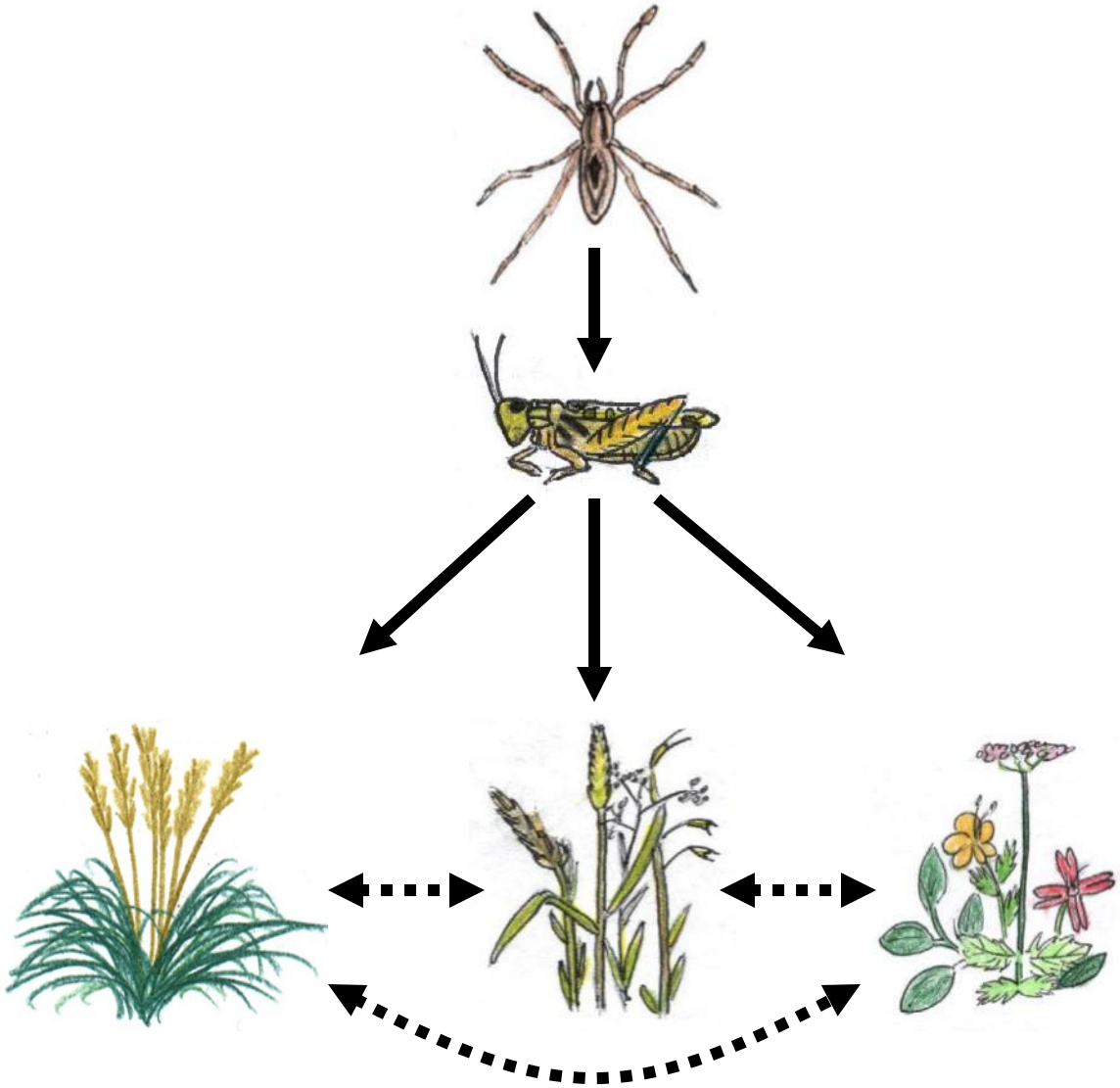


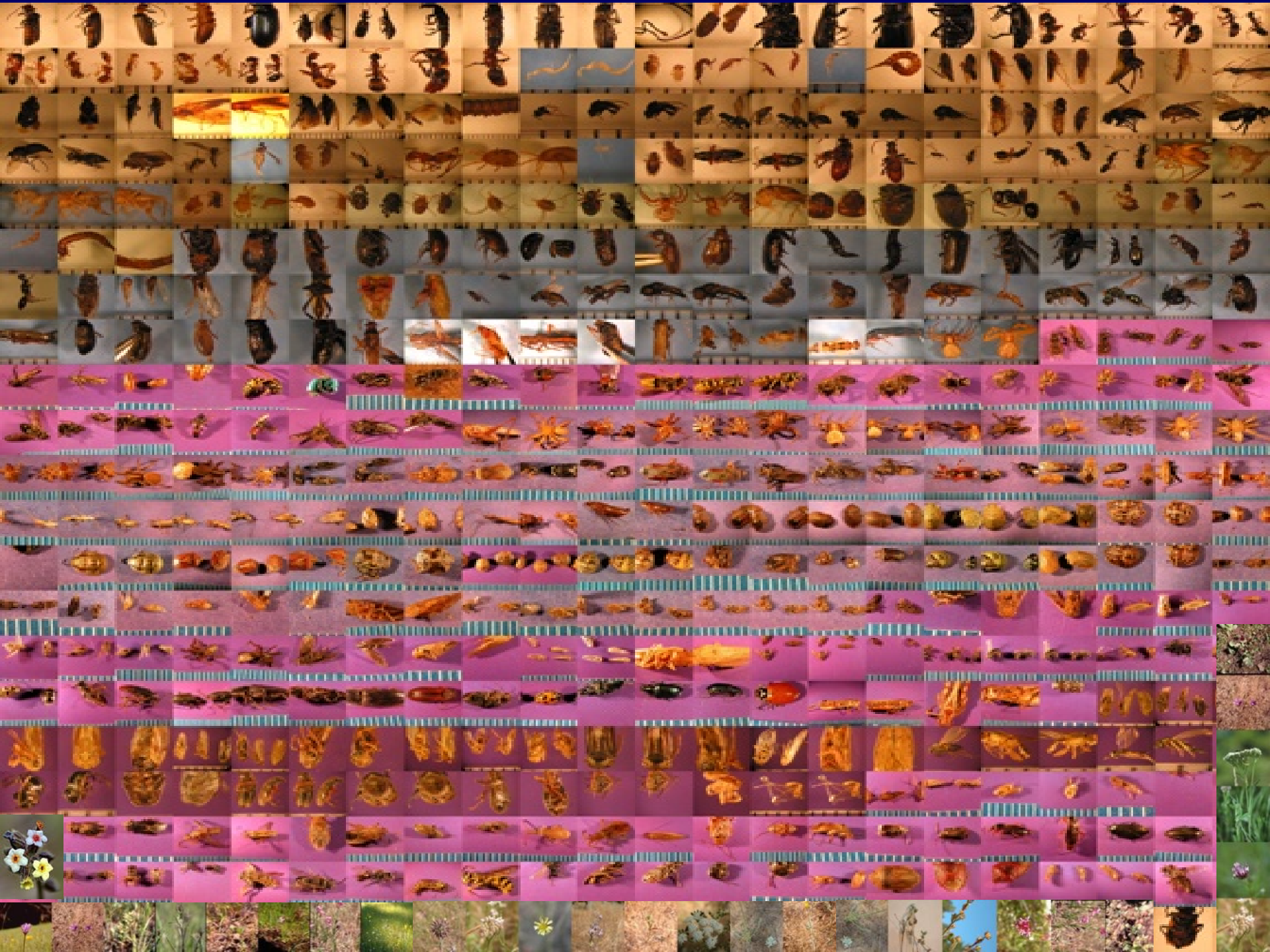
Longer-Term Effects of Extended Rainfall

2008









# Inferences

- Timing matters

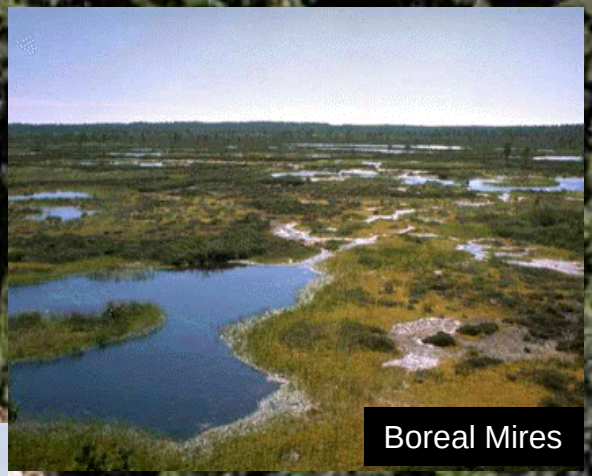
- Interactions matter

- Lags matter

Context Matters

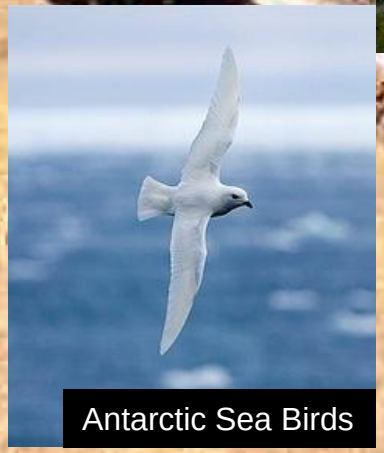
Antarctic Tundra

Canadian Lakes


Boreal Mires

Arctic Tundra

Caribbean Lizards & Spiders


Antarctic Sea Birds

Serpentine Grassland

New England Salt Marshes

European Red Deer

Canada Lynx

Coral Reefs

# What Does This Mean for Conservation and Restoration Planning?

Consider Our Targets

Define Undesirable Conditions

Game Alternative Scenarios

Expect Surprises

# Thank you

pier
PUBLIC INTEREST ENERGY RESEARCH
"Research Powers the Future"

STATE OF CALIFORNIA
ENERGY COMMISSION

BICCCA
BIOLOGICAL IMPACTS OF CLIMATE CHANGE IN CALIFORNIA

NSF
National Science Foundation
WHERE DISCOVERIES BEGIN