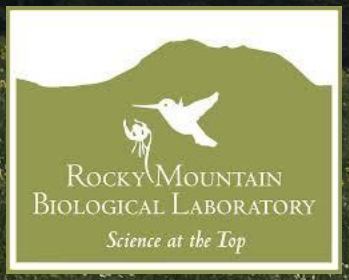
Plant species removal decreases magnitude and variation in nitrogen mineralization in mountains

Kenna Rewcastle, Jeremiah A. Henning, Quentin D. Read, Rebecca Irwin, Nathan J. Sanders, Aimée T. Classen

September 12, 2019

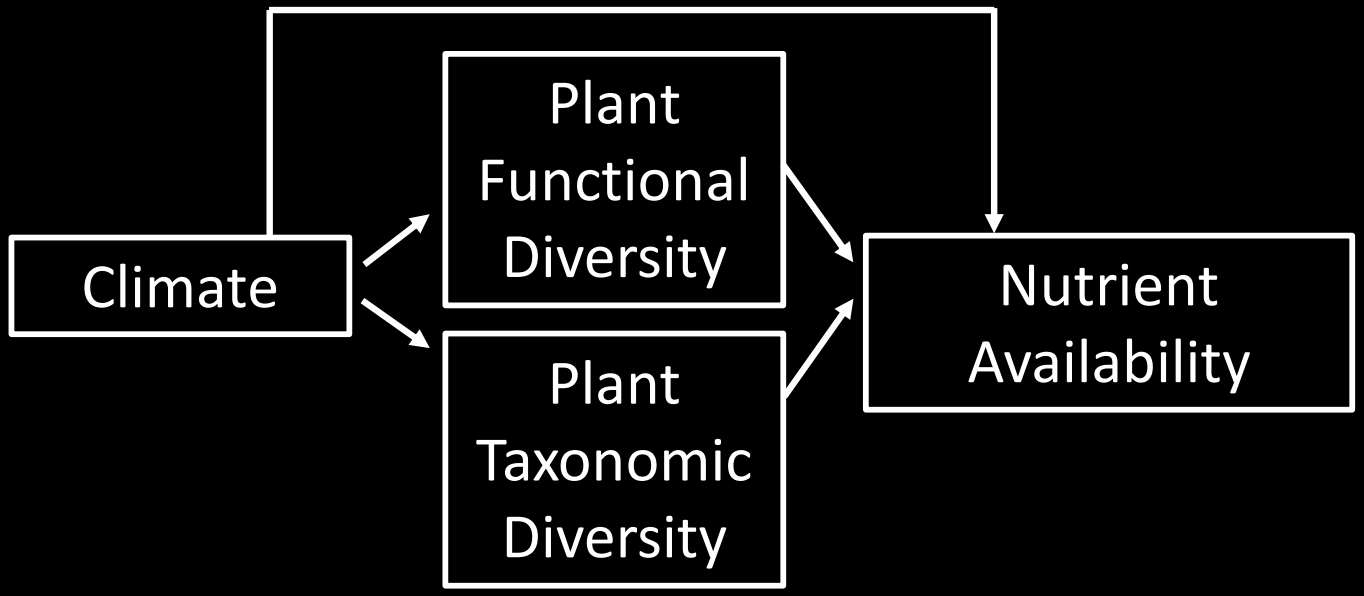
ITEX 2019 Meeting



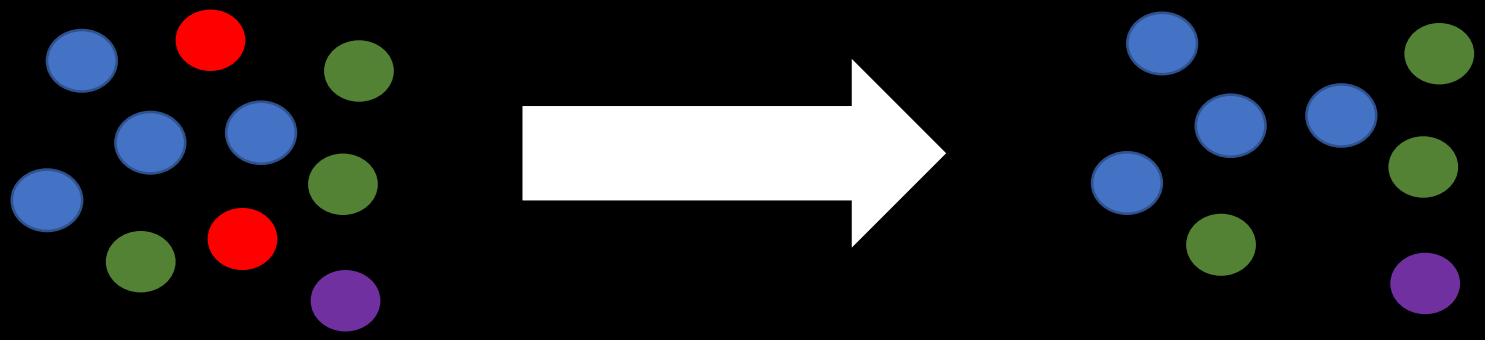
We know a lot more about direct vs. indirect impacts of climate change on the N-cycle.

We know a lot more about direct vs. indirect impacts of climate change on the N-cycle.

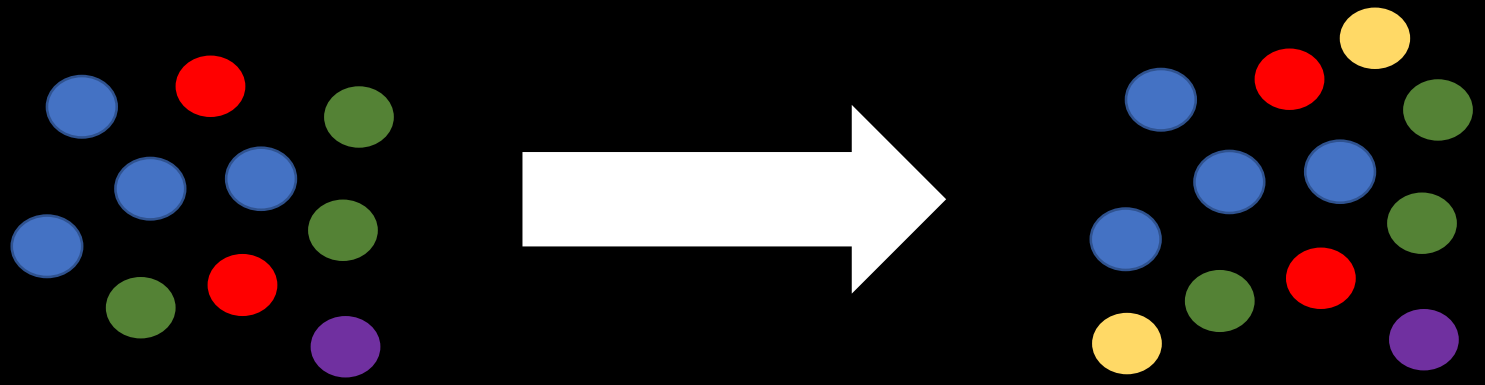
We know a lot more about direct vs. indirect impacts of climate change on the N-cycle.



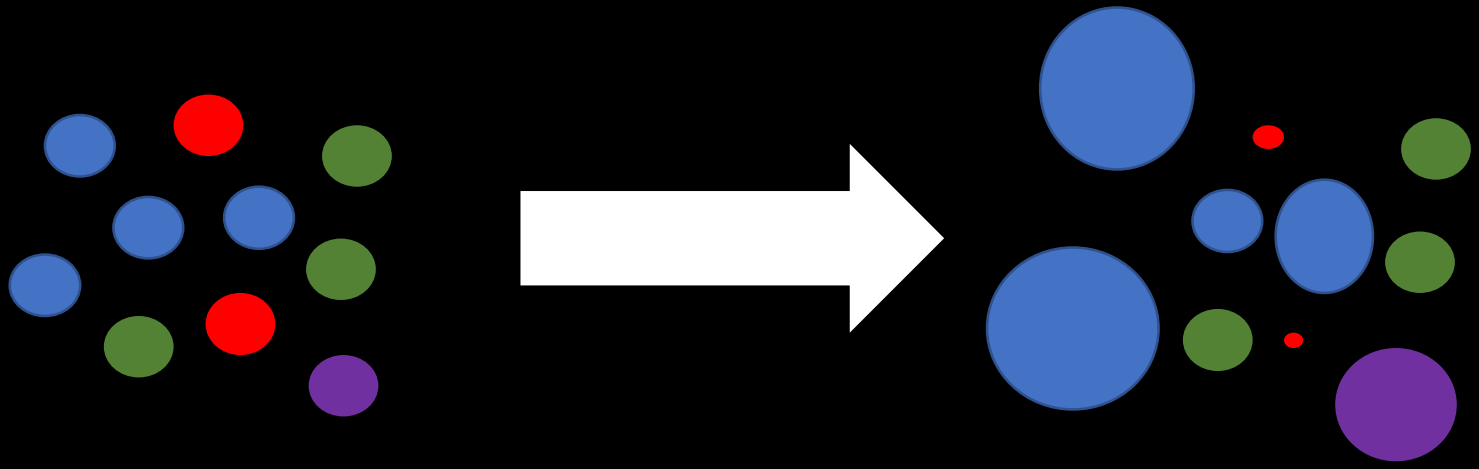
Shifts in plant communities can be a stronger driver of functional shifts than changes in climate alone.



Shifts in plant communities can be a stronger driver of functional shifts than changes in climate alone.



Shifts in plant communities can be a stronger driver of functional shifts than changes in climate alone.



How will climate change impact N dynamics through shifts in the plant community?

How will climate change impact N dynamics through shifts in the plant community?

Cinnamon Mountain, 3500 m

Gothic Townsite, 2900 m

Maxfield Meadow, 2700 m

Almont, 2405 m

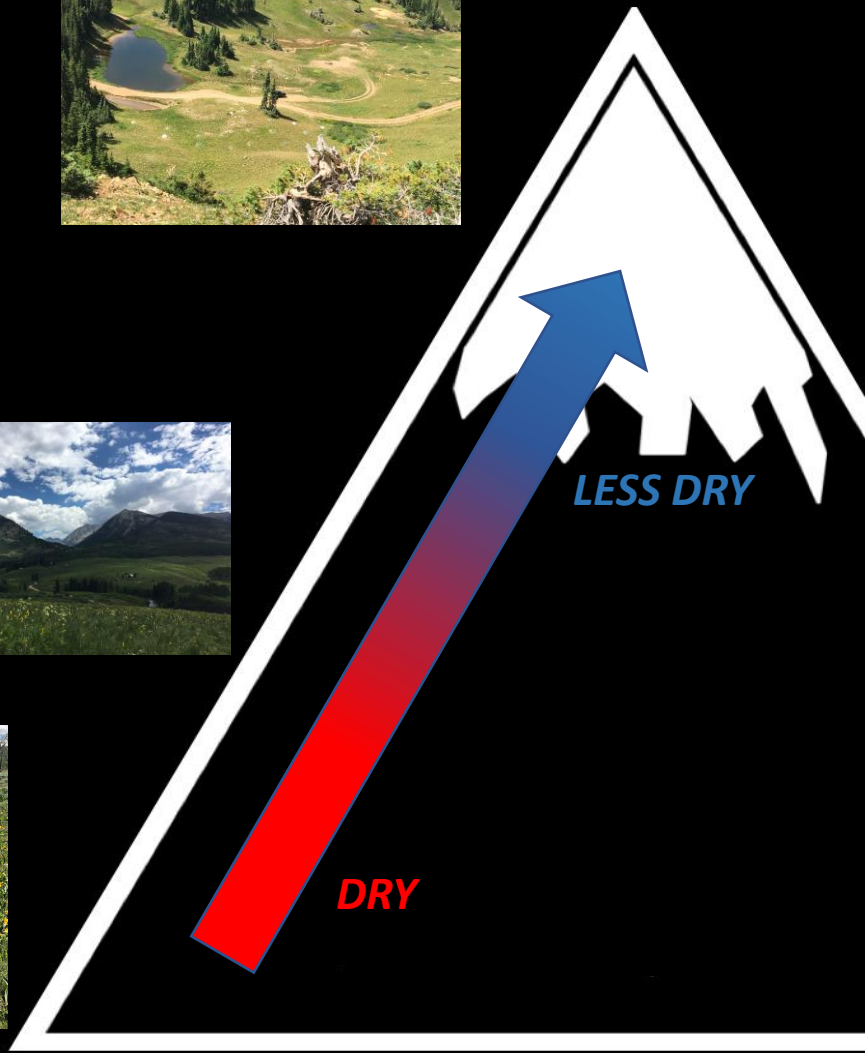
How will climate change impact N dynamics through shifts in the plant community?

Cinnamon Mountain, 3500 m

Gothic Townsite, 2900 m

Maxfield Meadow, 2700 m

Almont, 2405 m



How will climate change impact N dynamics through shifts in the plant community?

Juncus drummondii

Linaria vulgaris

Festuca thurberi

Wyethia amplexicaule

How will climate change impact N dynamics through shifts in the plant community?

Juncus drummondii

Linaria vulgaris

Festuca thurberi

Wyethia amplexicaule

Random biomass removals control for disturbance effects at two mid-elevation sites.

+ Random Biomass Removal

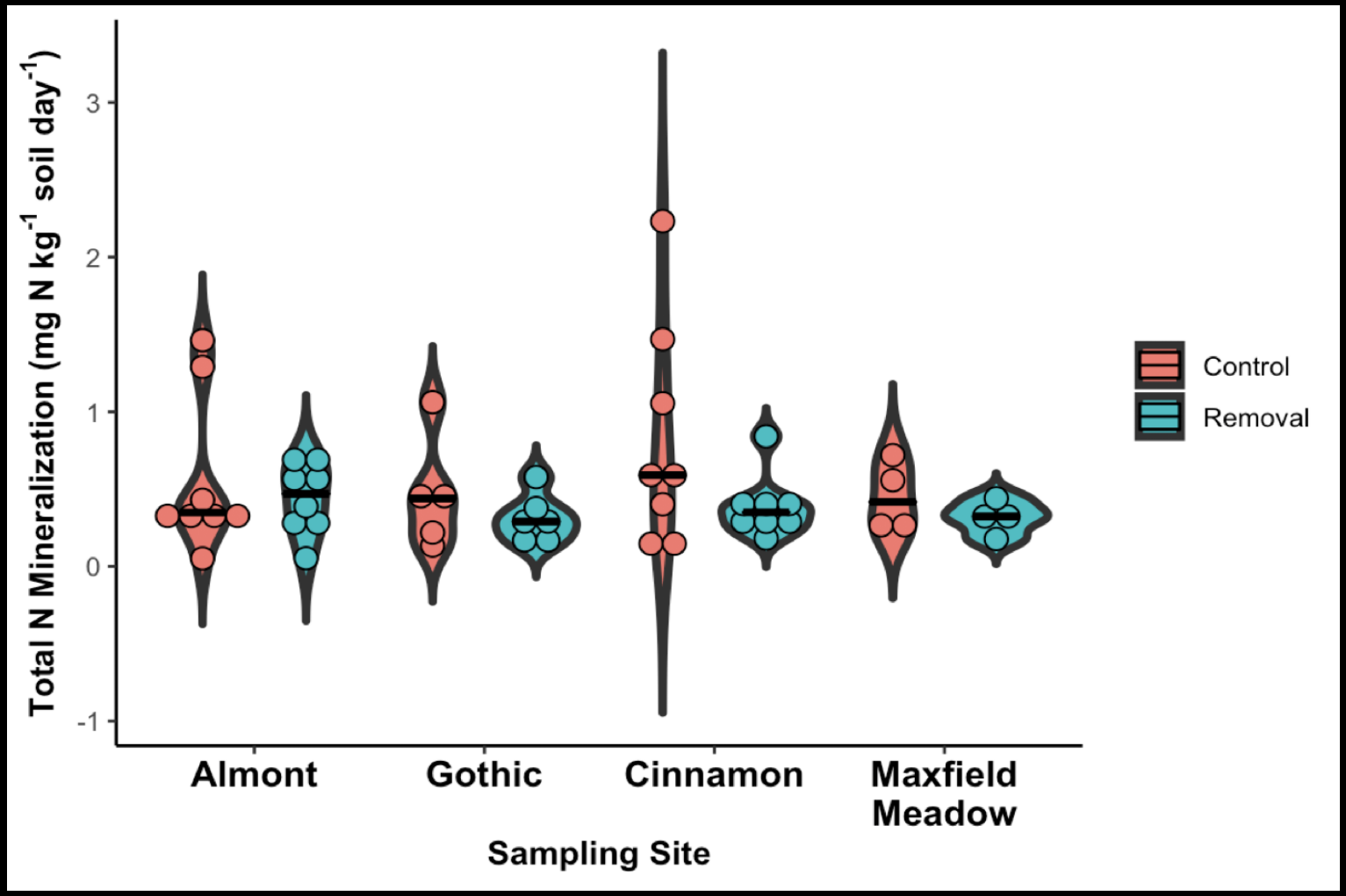
Linaria vulgaris

+ Random Biomass Removal

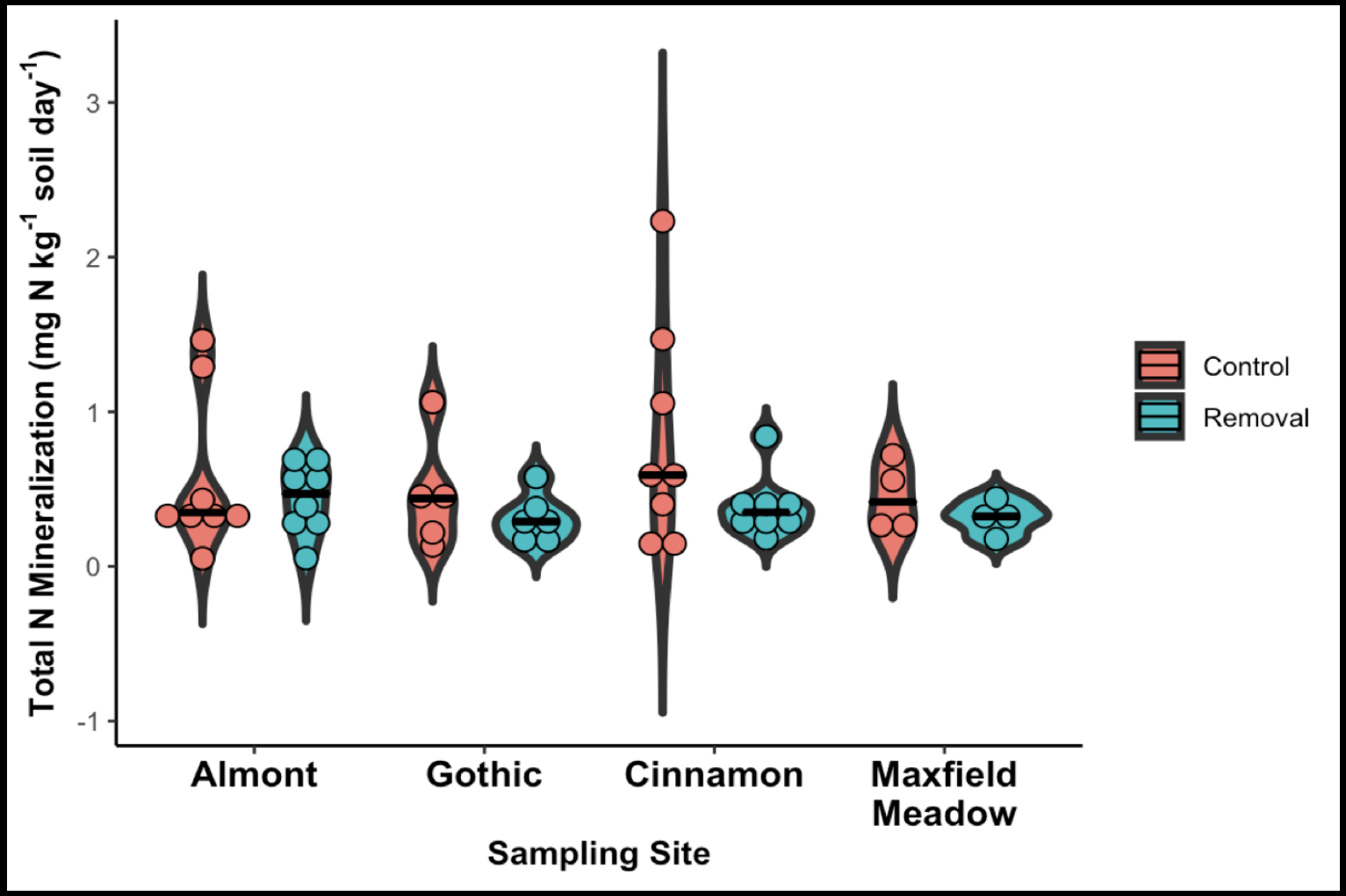
Festuca thurberi

Incubated soils from each experiment to measure potential N-mineralization rates.

Species removal reduces *magnitude* of potential N-mineralization rates.



Species removal reduces ***variation*** in potential N-mineralization rates.



Possible drivers of treatment effects in removal experiments.

1. The effect of loss of a specific species

Diaz et al. 2003, TREE

Possible drivers of treatment effects in removal experiments.

1. The effect of loss of a specific species

2. Effects driven by the response of the remaining community members (plant community shifts)

Diaz et al. 2003, TREE

Possible drivers of treatment effects in removal experiments.

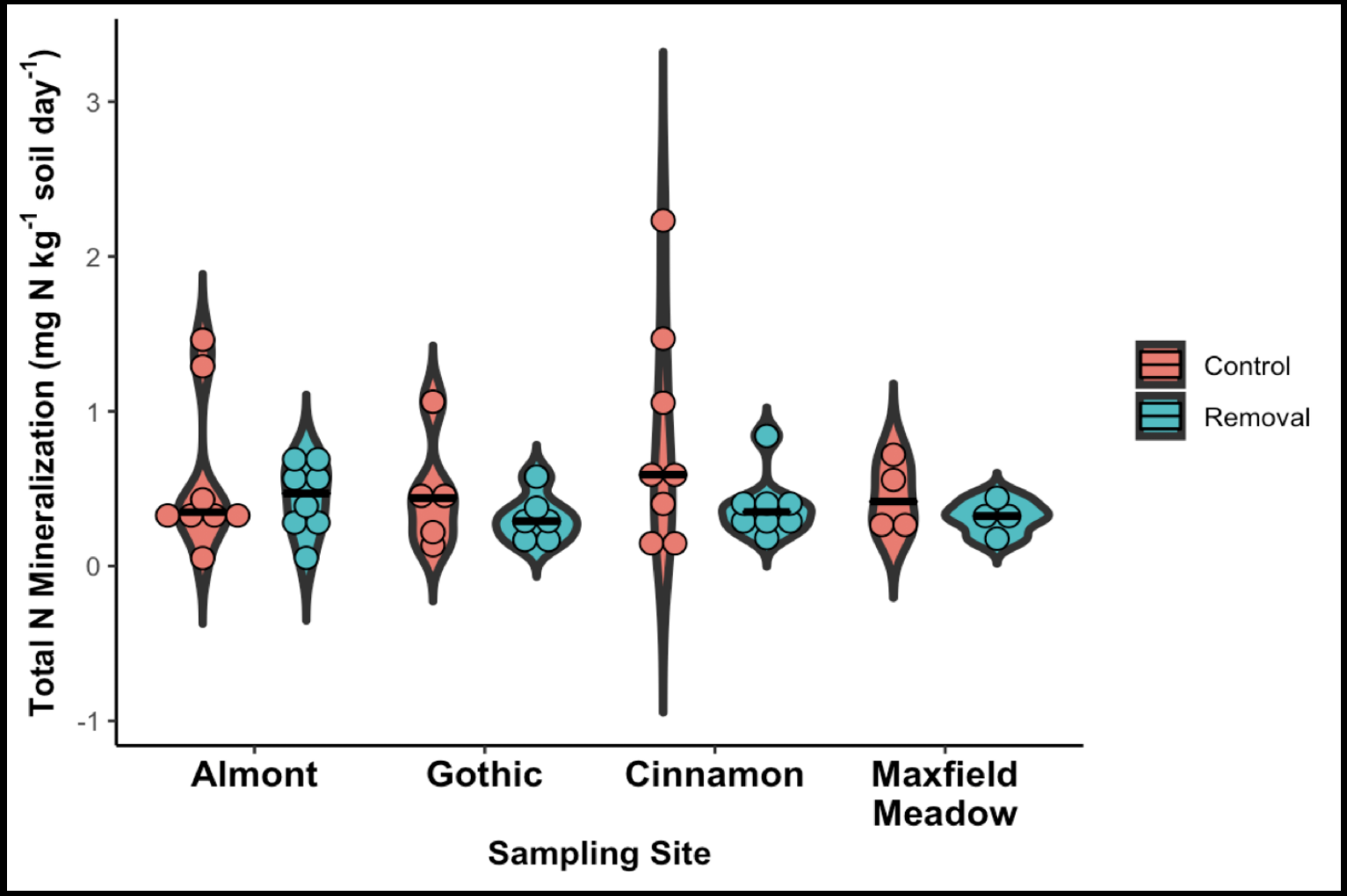
1. The effect of loss of a specific species

2. Effects driven by the response of the remaining community members (plant community shifts)

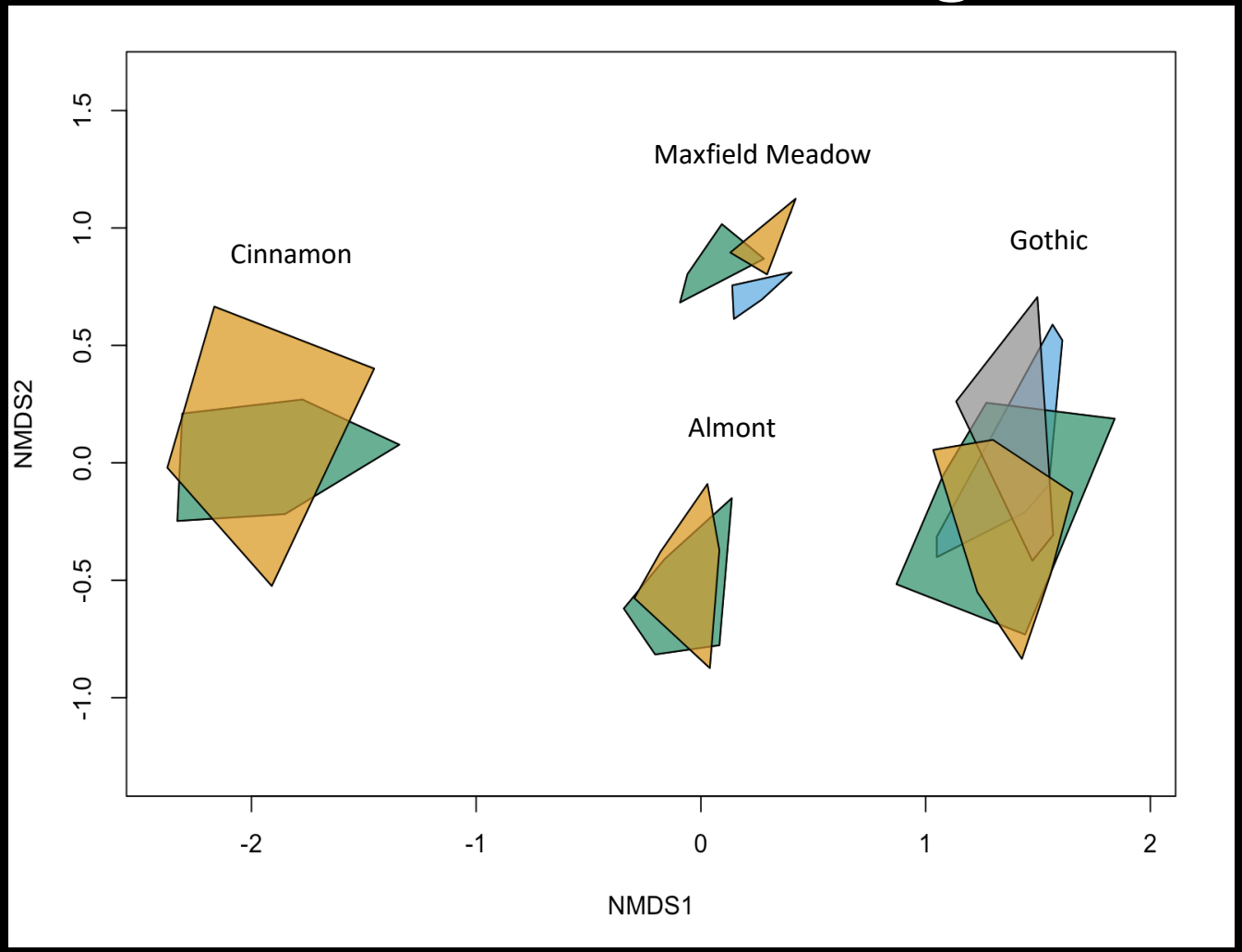
3. Disturbance effects (effects of biomass loss or disturbance from the removal itself)

Diaz et al. 2003, TREE

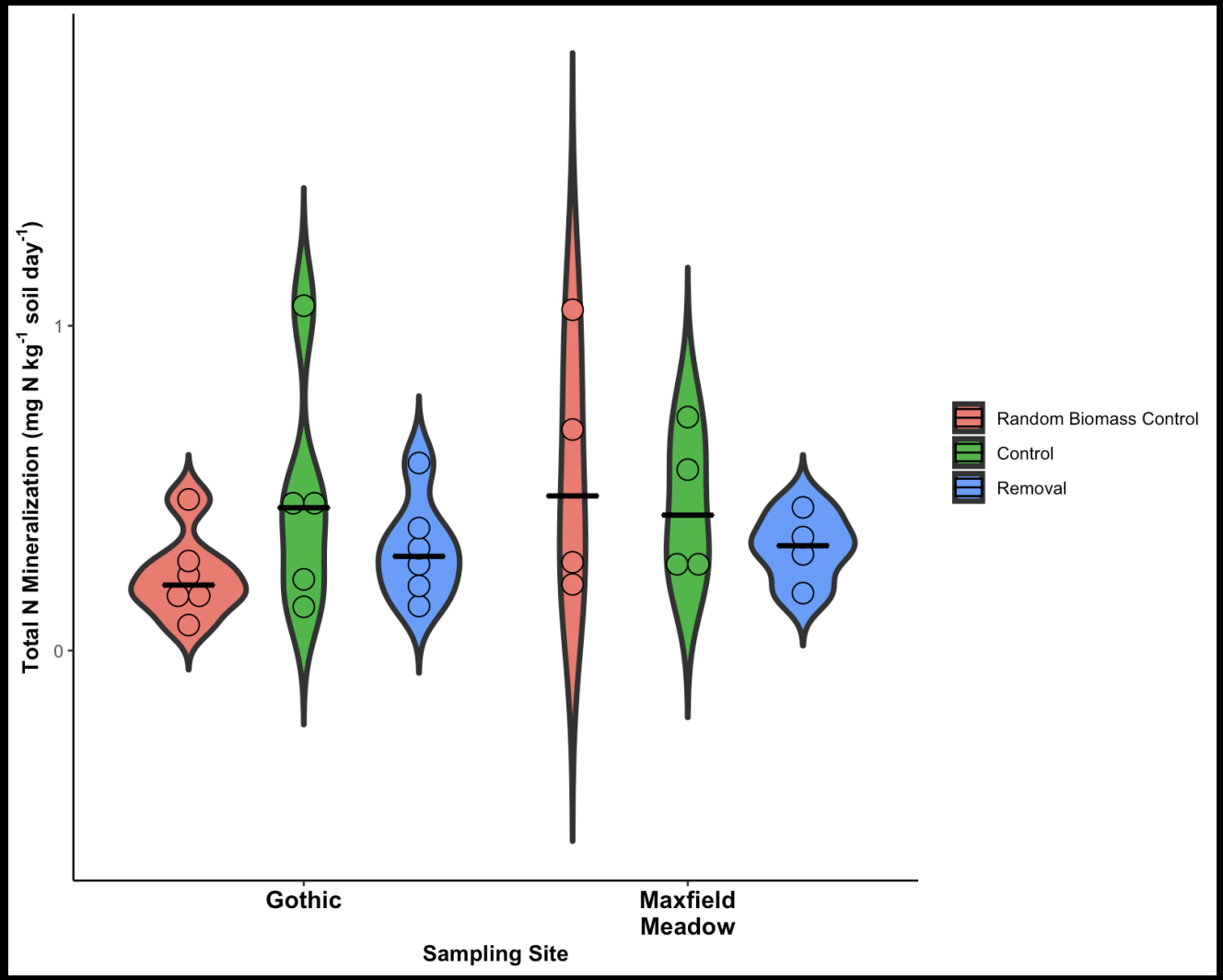
No evidence that *loss of specific species* drives N-mineralization decrease.



No evidence that *community shifts* following removals drive N-mineralization changes.



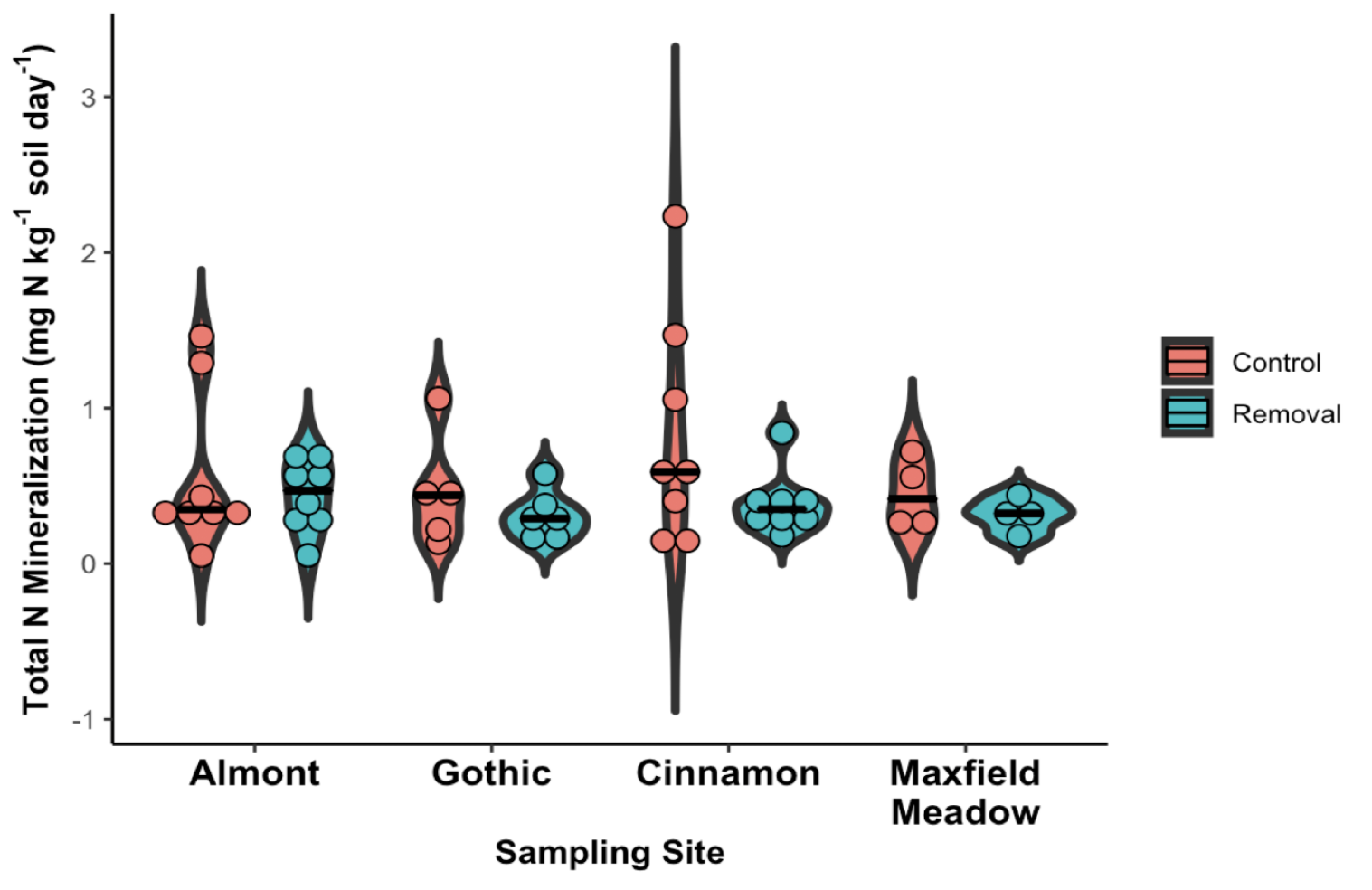
Contribution of *disturbance effects* is unclear.



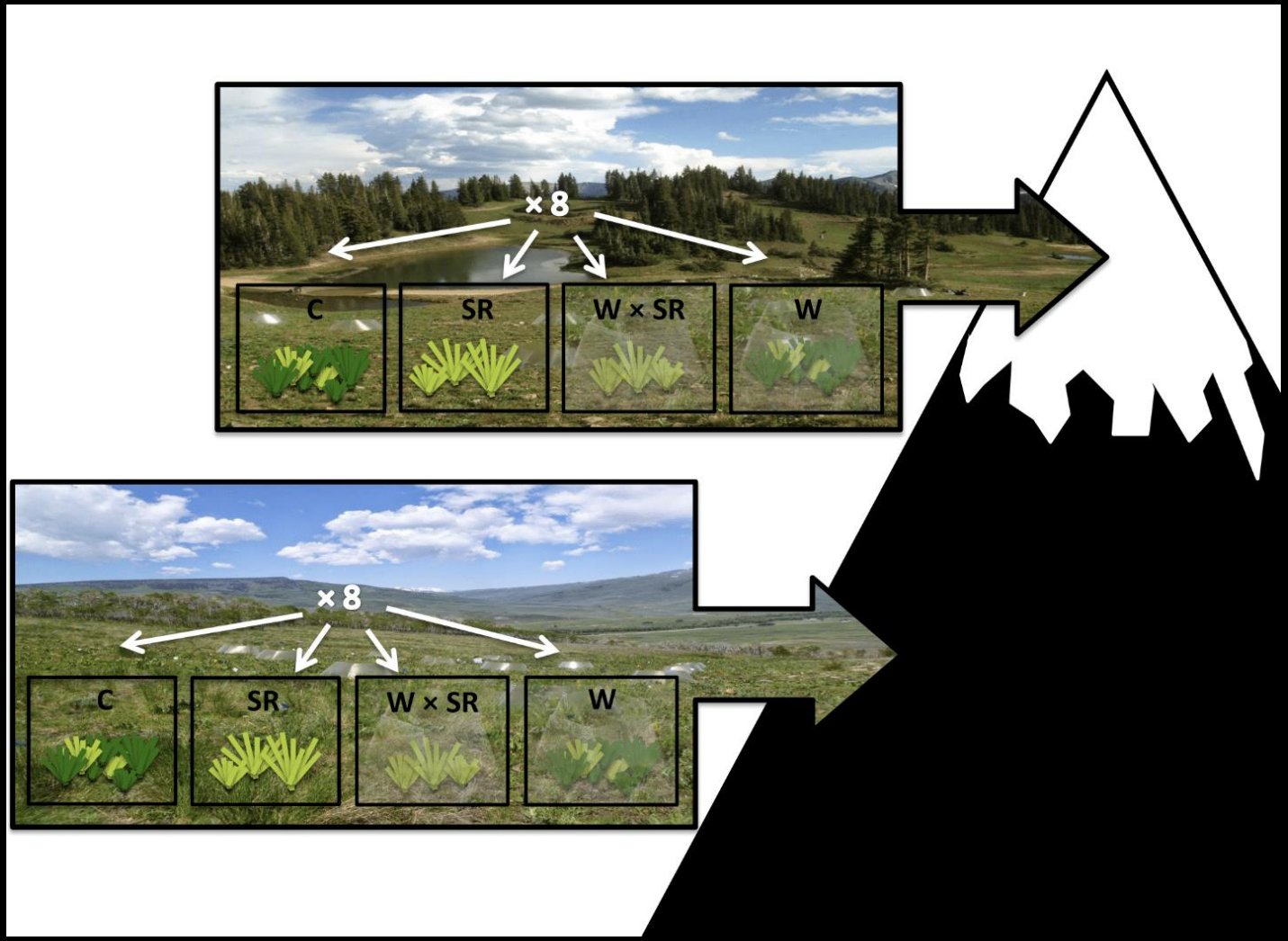
Biodiversity loss decreases ***resilience*** of ecosystem function in the face of drought?

Biodiversity loss decreases ***resilience*** of ecosystem function in the face of drought?

Biodiversity loss decreases *resilience* of ecosystem function in the face of drought?



Comparing direct and indirect impacts of climate change in the WaRM Network.



The WaRM Network: Warming and Removal in Mountains

Thank you!

Classen-Sanders Lab Group:
Aimée Classen
Nate Sanders
Case Prager
Xin Jing

RMBL Collaborators:
Jeremiah Henning
Quentin Read
Rebecca Irwin

WaRM Network Collaborators

NSF

Green Mountain Club Long Trail 1910 Vermont

Rocky Mountain Biological Laboratory
Science at the Top

The University of Vermont
Rubenstein School of Environment and Natural Resources