Analyzing Vegetation Cover Change in Barrow, Alaska at the Landscape Level

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Current Knowledge Gaps

- Most research done at plot level not landscape level
- How vegetation communities will respond to warming across a moisture gradient in Barrow and the implications associated with that change

Research Objectives

1. How has vegetation changed at the landscape level in Barrow from 2010 to 2013?
2. How does vegetation change relate to abiotic changes?
3. How will plant communities change across a moisture gradient due to anticipated warming?

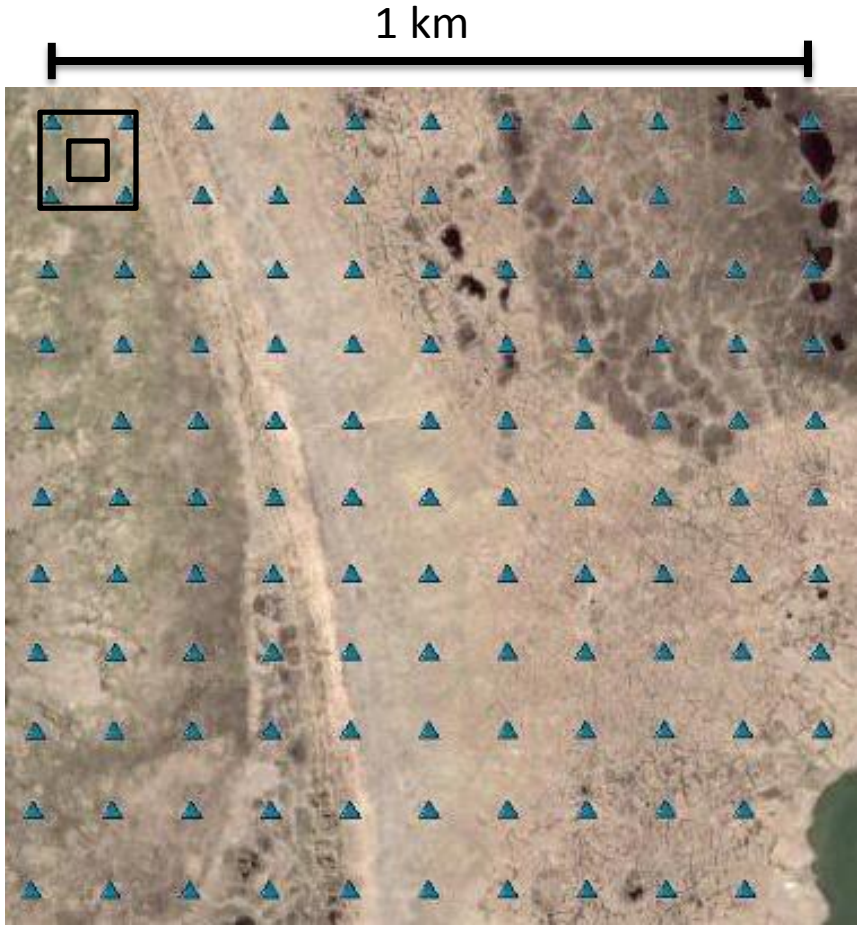
Study Locations

- *Barrow
  - High Arctic
  - 3.7°C, 12.1mm
- Atqasuk
  - Low Arctic
  - 9°C, 20.8mm

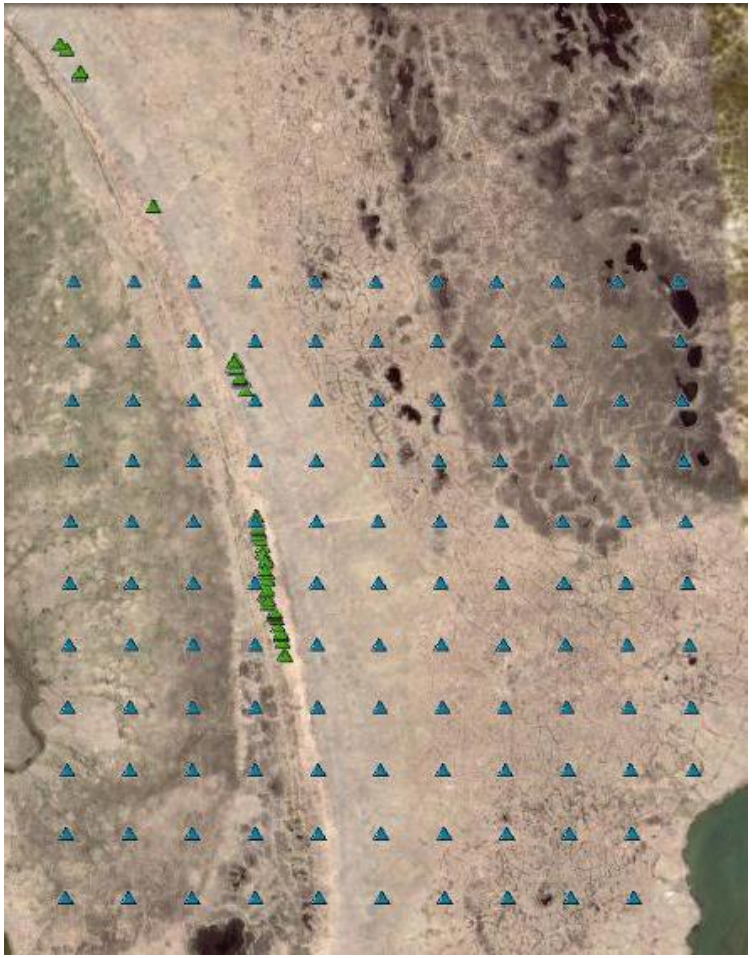
* Project focus

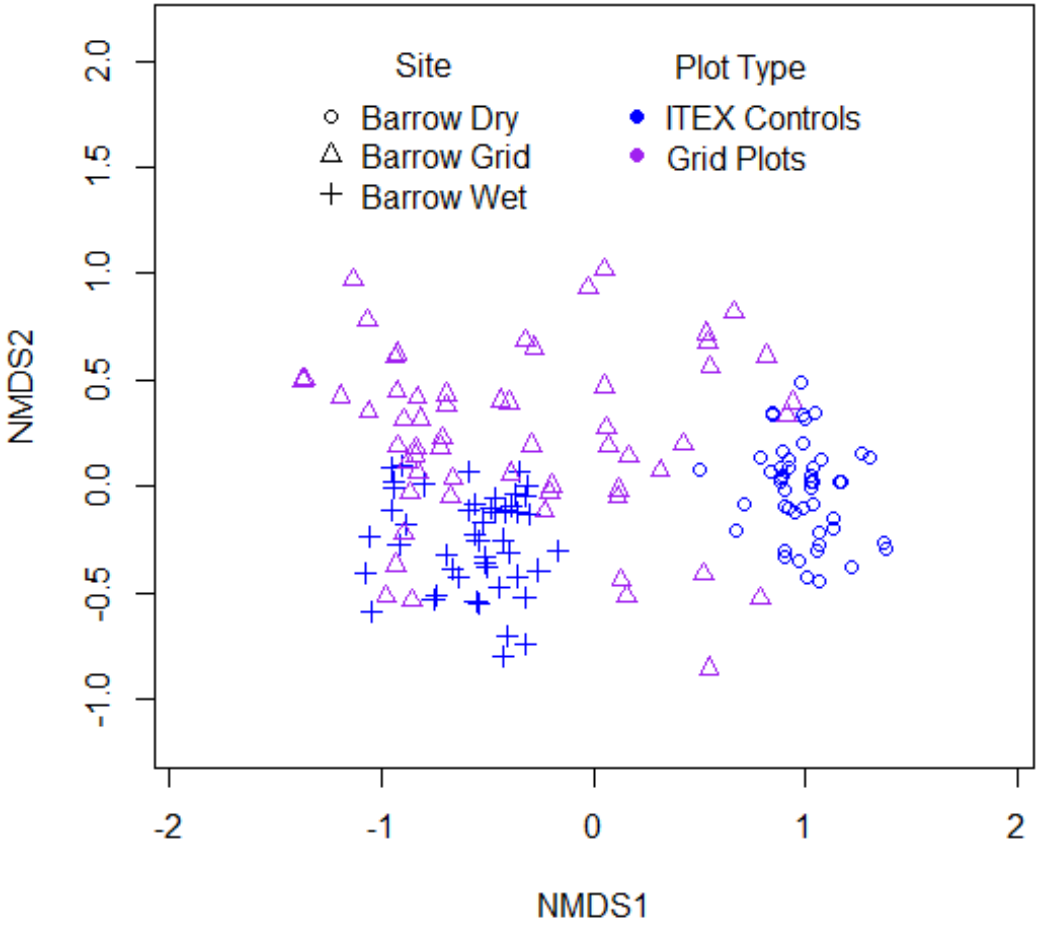
Study Area

- Arctic Systems Science (ARCSS) grid established in the early 1990's
- Permafrost, soil and ecological data
- 98 vegetation plots
- 1-m^2 plots, spaced 100m apart, spanning 1 km



Moisture Gradient





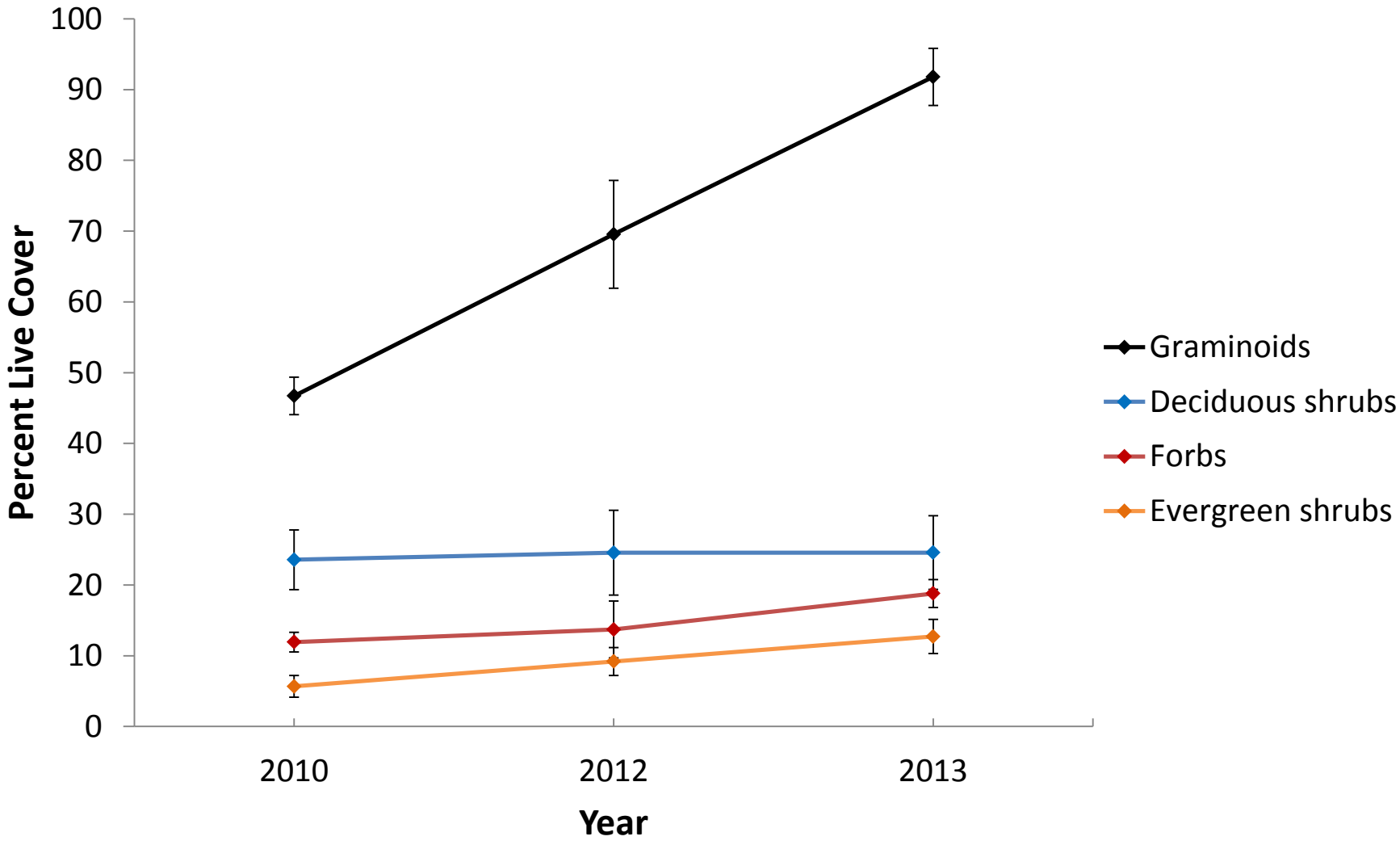
1. Vegetation Change

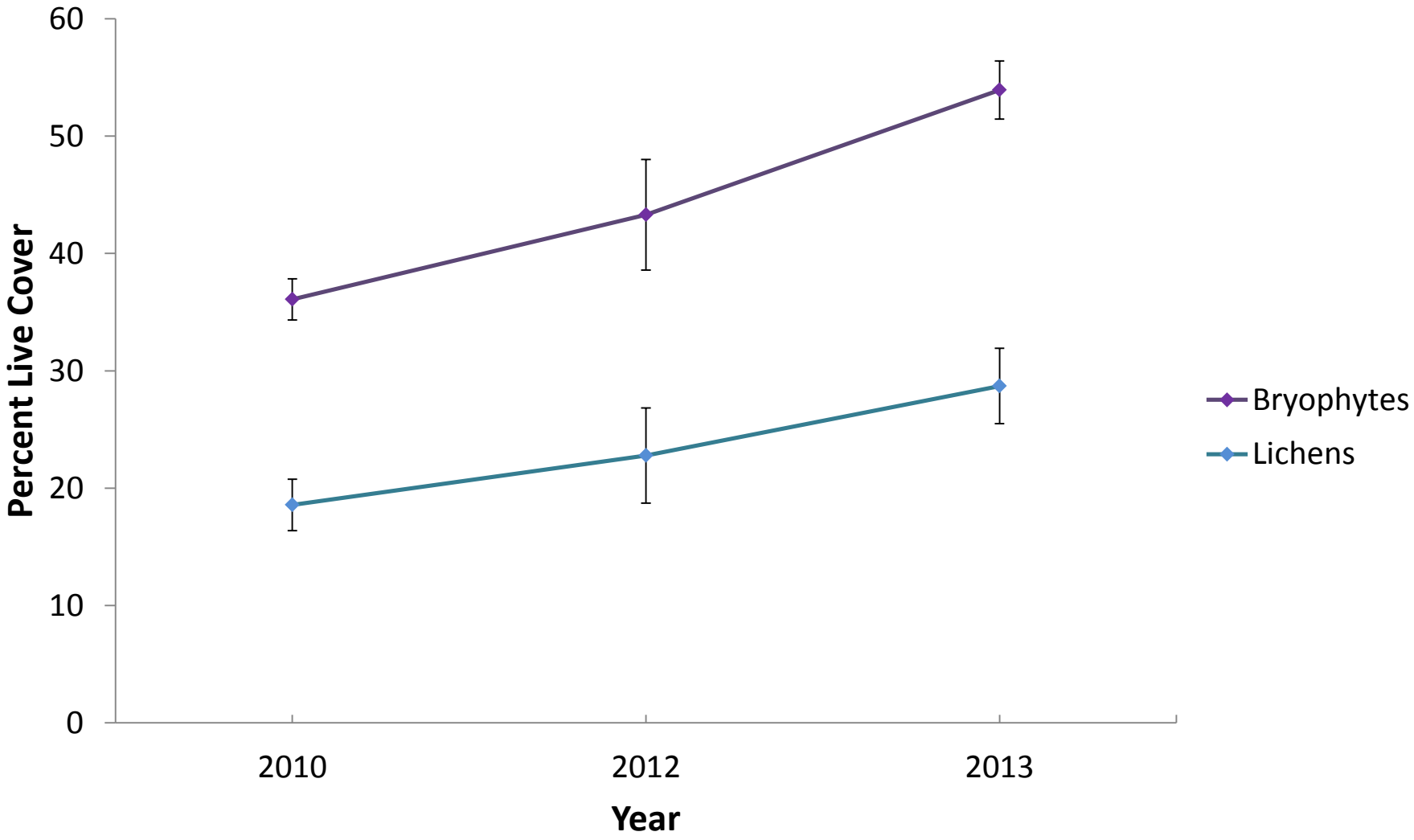
- Measures to be used to document vegetation change from 2010 to 2013
  - Change in cover, leaf area index and species richness
  - Alpha, beta and gamma diversity
  - Similarity indices

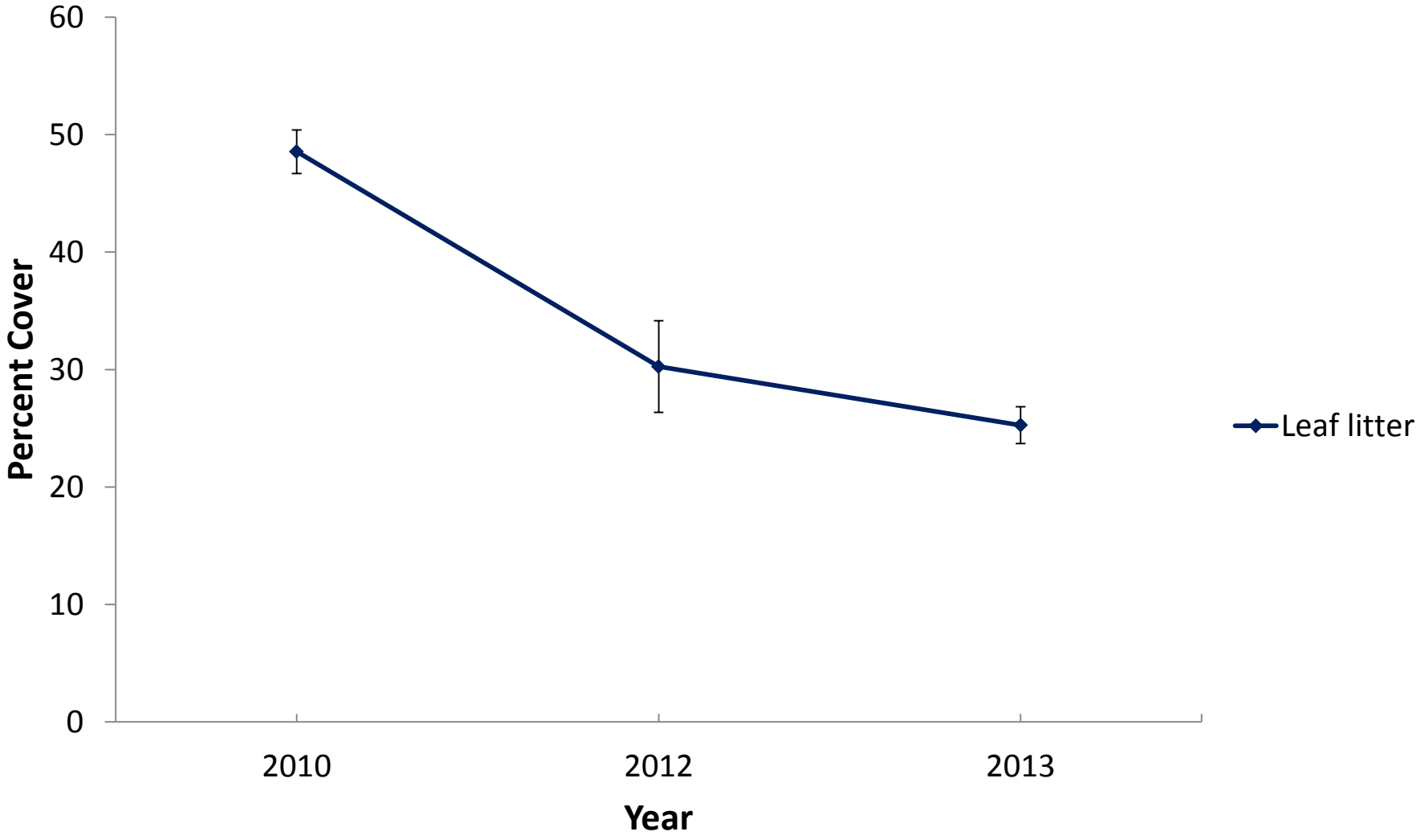
Cardamine pratensis

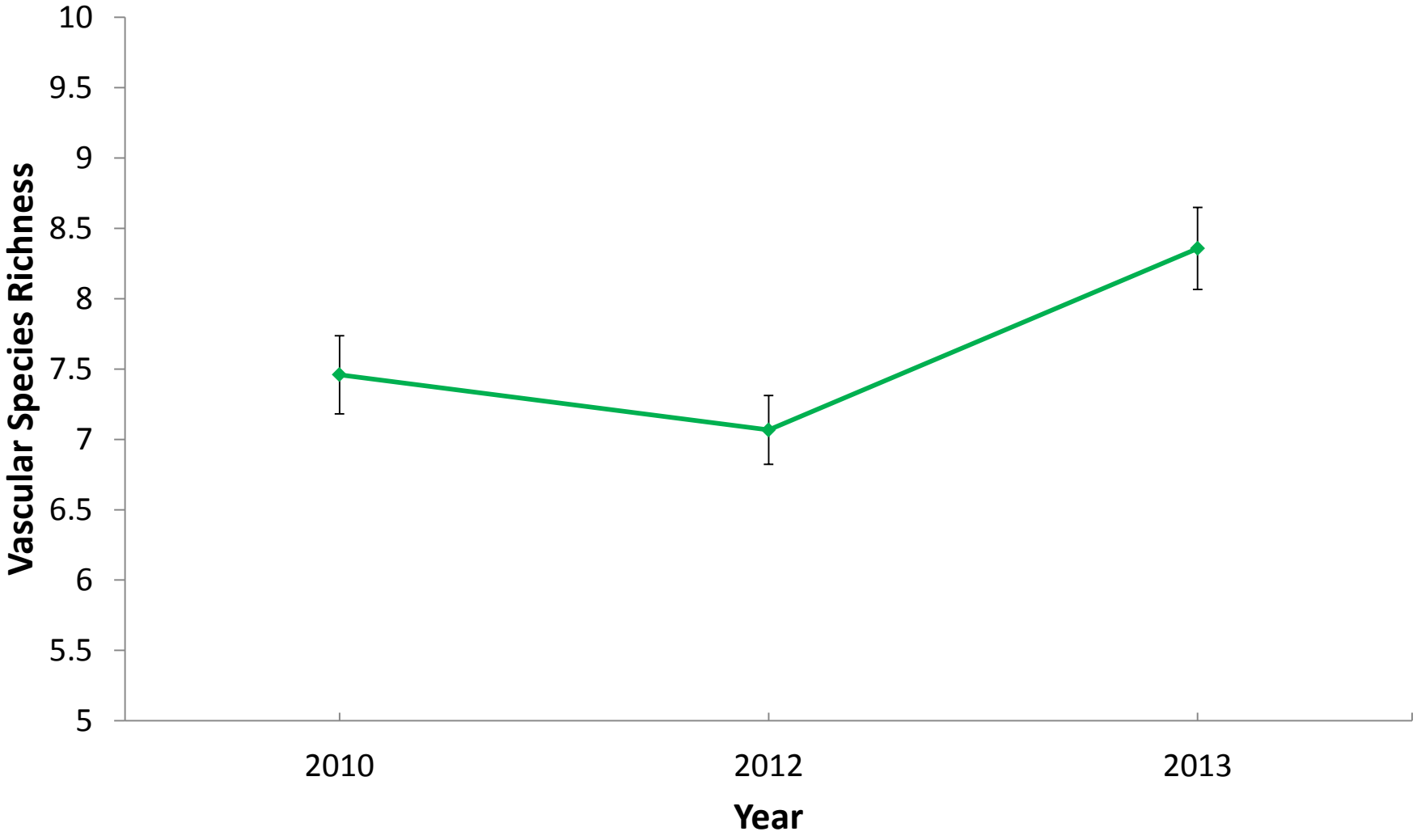
Cover Analysis

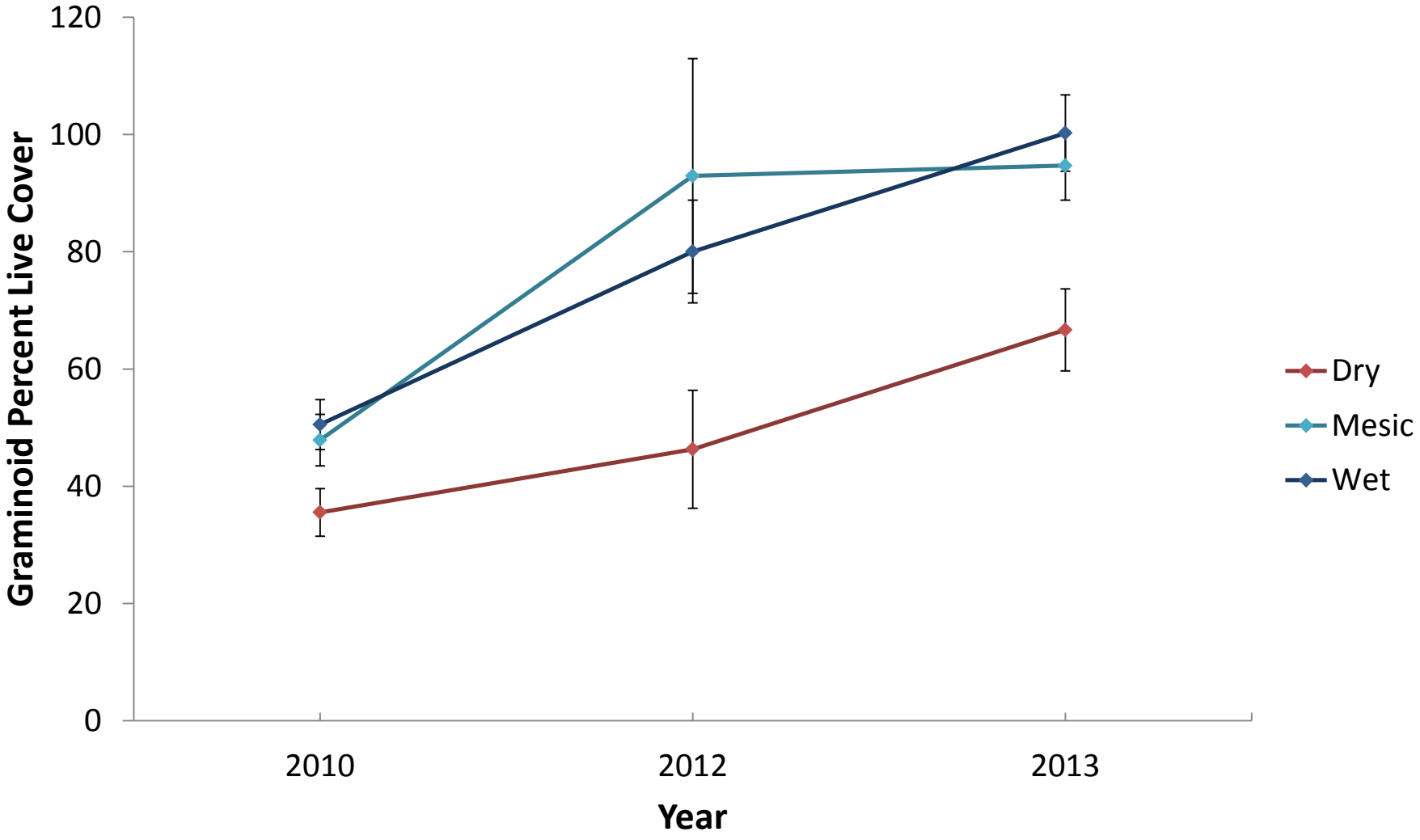
- Point frame method
  - 75 cm^2 grid with 100 points
  - Data collected in 2010, 2012 (subset) and 2013
- Change in cover and species richness


100
90
80
70
60
50
40
30
20
10
0
Percent Live Cover
2010
2012
2013
Year
Graminoids
Deciduous shrubs
Forbs
Evergreen shrubs


60
50
40
30
20
10
0
Percent Live Cover
2010
2012
2013
Year
Bryophytes
Lichens


60
50
40
30
20
10
0
Percent Cover
2010
2012
2013
Year
Leaf litter


Vascular Species Richness
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
2010
2012
2013
Year



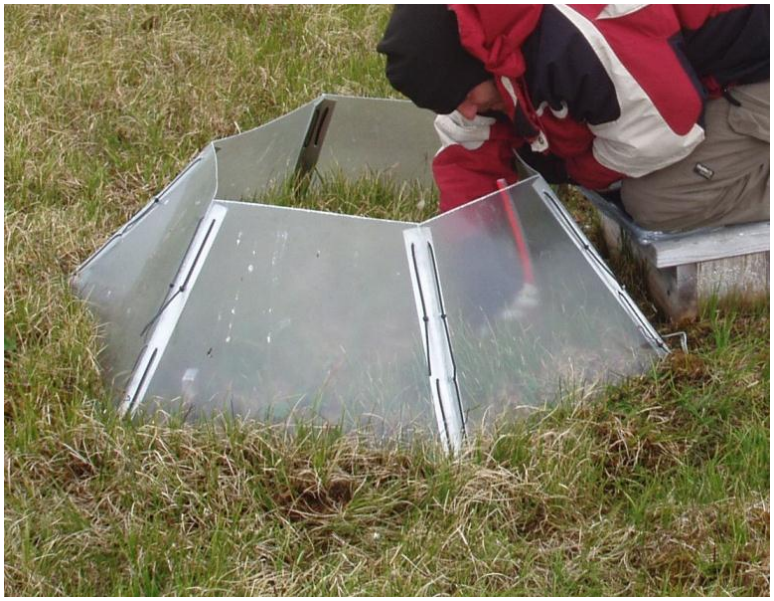
No difference for all other growth forms across moisture gradient

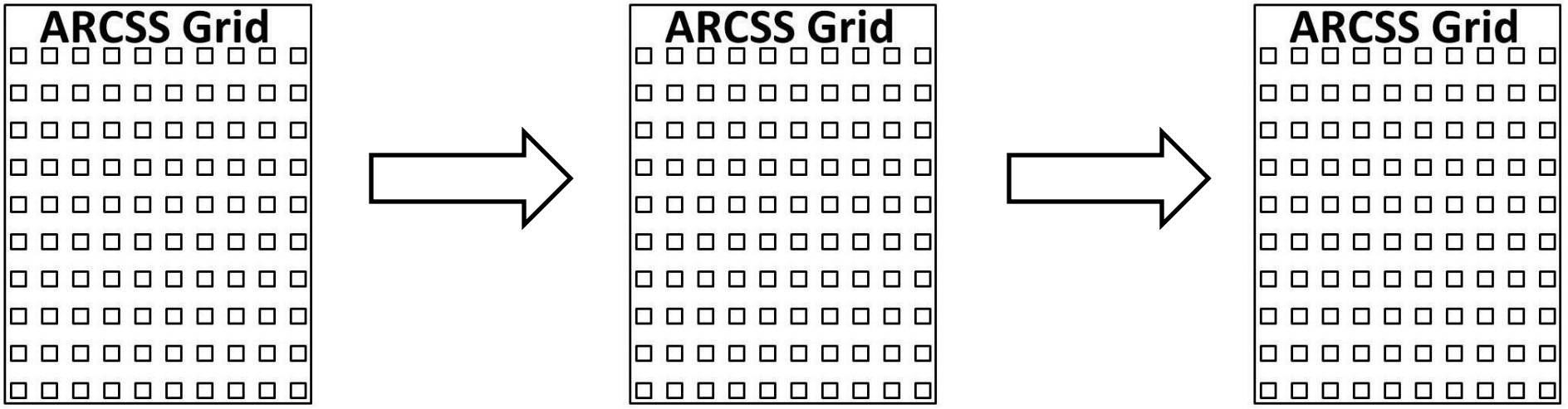
2. Ecosystem Parameters

- Measures to be used to relate vegetation change to ecosystem parameters
  - Soil temperature
  - Soil moisture
  - Active layer thickness
  - Spectral reflectance

3. Projected Change

- Average response to warming
  - Species/growth form
  - Vegetation communities
- Values will be obtained from ITEX warming data
- Suggestions appreciated





1. Vegetation change:

-Plant cover

-Diversity

-Similarity indices

2. Abiotic factors:

-Soil moisture

-Soil temperature

-Active layer thickness

-Spectral reflectance

3. Projecting future change:

-Average plant response to anticipated warming across moisture gradient

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Questions?