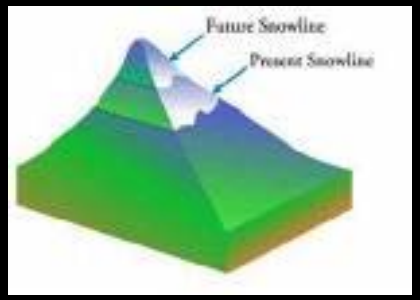
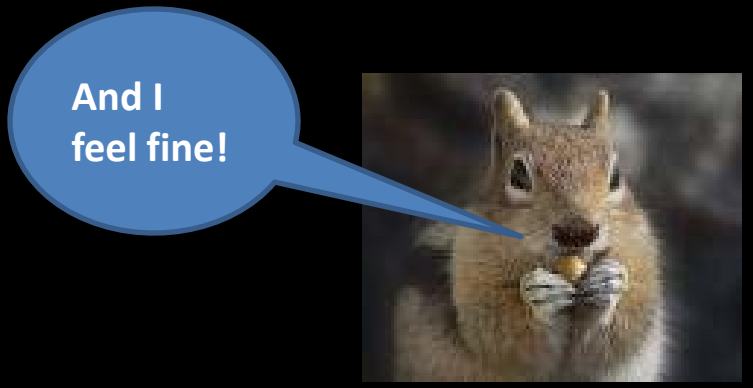
The “Rapture Hypothesis” Scenario

(…with apologies to REM)



- The planet heats up…
- Snowline rises…
- Alpine mammals are trapped…
- Unable to adapt physiologically ….
- Habitat changes…
- Many populations appear doomed to disappear…
- But some may not ascend to the heavens from the mountains



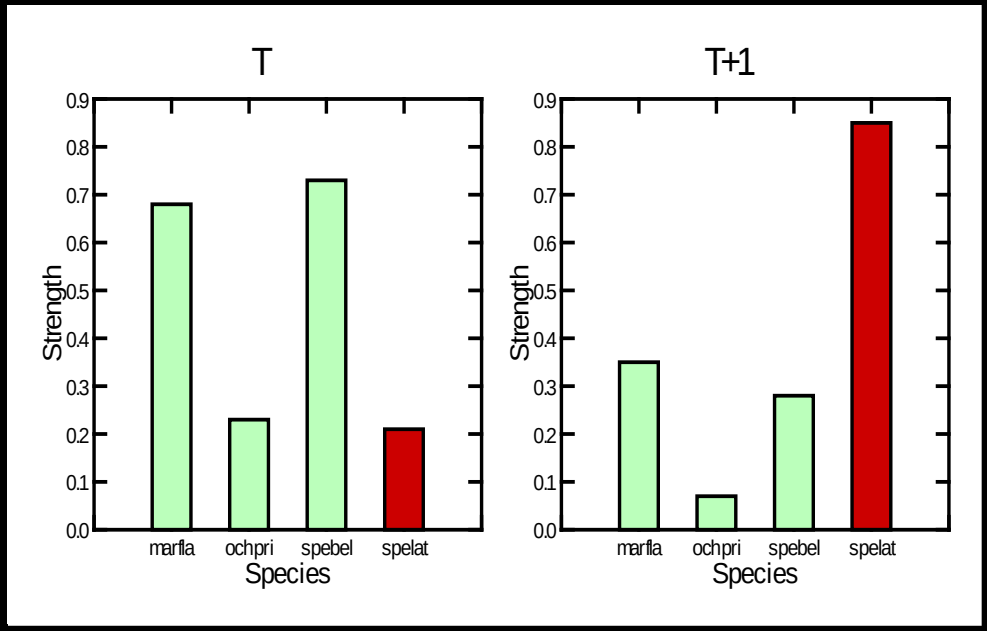
Sierra Nevada/White Mountain Alpine Mammal Study

- 7-10 year study
- Multi-species study
  - Bighorn sheep
  - Yellow-bellied marmot
  - American pika
  - Belding's ground squirrel
  - Golden-mantled ground squirrel
- Multi-scale
  - Rangewide
  - Regional
  - Local
- Estimate:
  - Occupancy
  - Habitat associations
  - Density
  - Demographic rates

- Model:
  - Resource selection
  - Species distributions
    - Climate
    - Topography
    - Vegetation
  - Population dynamics
  - Persistence
- Compare:
  - Among species
  - Among mountain ranges
  - Temperature gradient

What Are Implications Of Potential Range Changes Of Mammals On Vegetation States?

- Can mammals "manage their own habitat"
- Functional group changes
  - Changes in relative abundance
- Changes in distribution of interaction strengths
  - Herbivory → granivory dominated system
- Focus on interactions and ***feedbacks*** between climate and ecological/ecosystem ***processes***
- Combination of observational, experimental, and modeling approaches



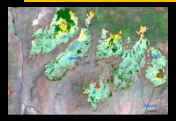
Project Linkages 2009 - 2012

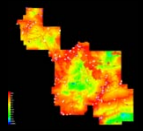
Remote Sensing Data
Climate Data

Change In Land Cover Classes

(1972 - Present)

Mammal Niche Models





Unadjusted

Adjusted by RSF's

Transects
Point Counts
Habitat Sampling

Mammal Density, Occupancy, Habitat Associations

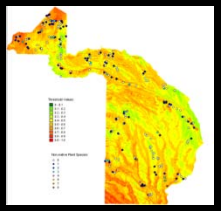
Evaluate interaction strength

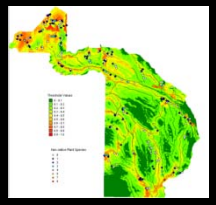
Projected Meadow Conversion Models

Exclosures
Seeding

Grazing-Herbivory Experiments

(*Pinus contorta* & *P. albicaulis*)



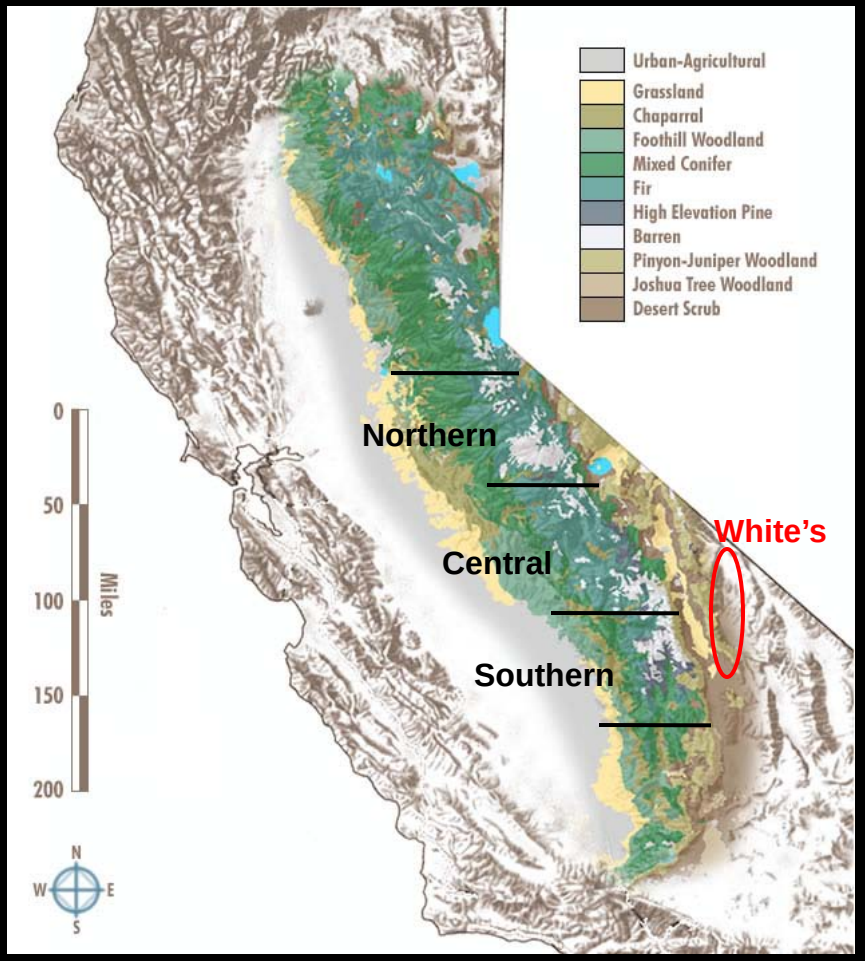


Unadjusted

Adjusted for biotic interactions

Small Mammal Survey Methods

- Distribution and abundance data
  - 18 variable-distance line transects (616 km)
    - Sierra Nevada
      - N = 12
      - 10 km
      - Sampled 4 times
      - 480 km
    - White Mountains
      - N = 6
      - 1.4 – 7.8 km
      - Sampled 5 times
      - 136 km
    - June-September
  - 5 point count stations per transect (N = 90)
    - Sampled 3 times per season



A Few (very) Preliminary Results & Next Steps

- Density
  - No geographic pattern across Sierra Nevada
  - Density in White Mountains ≈3x greater than Sierra Nevada
    - 3.8 ± 0.4 km^2 vs. 13.6 ± 1.9 km^2
  - Complex patterns of variation
- Occupancy
  - (43.3 %) 45.9 ± 5.2 %
  - Two-strata model
- Habitat associations
  - > 91% of observations in talus/meadow ecotones
- Next steps
  - Demographic studies
  - Integral projection models