Implications of Population Demographics on the Management of *Sigmodon arizonae plenus* Habitat

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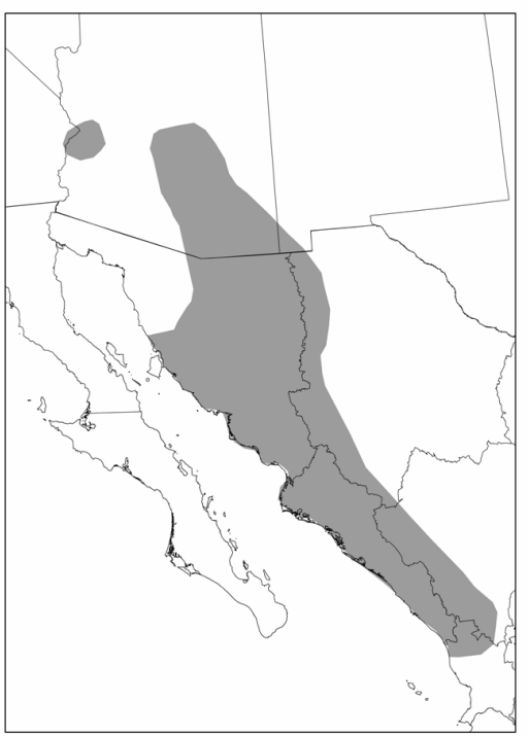
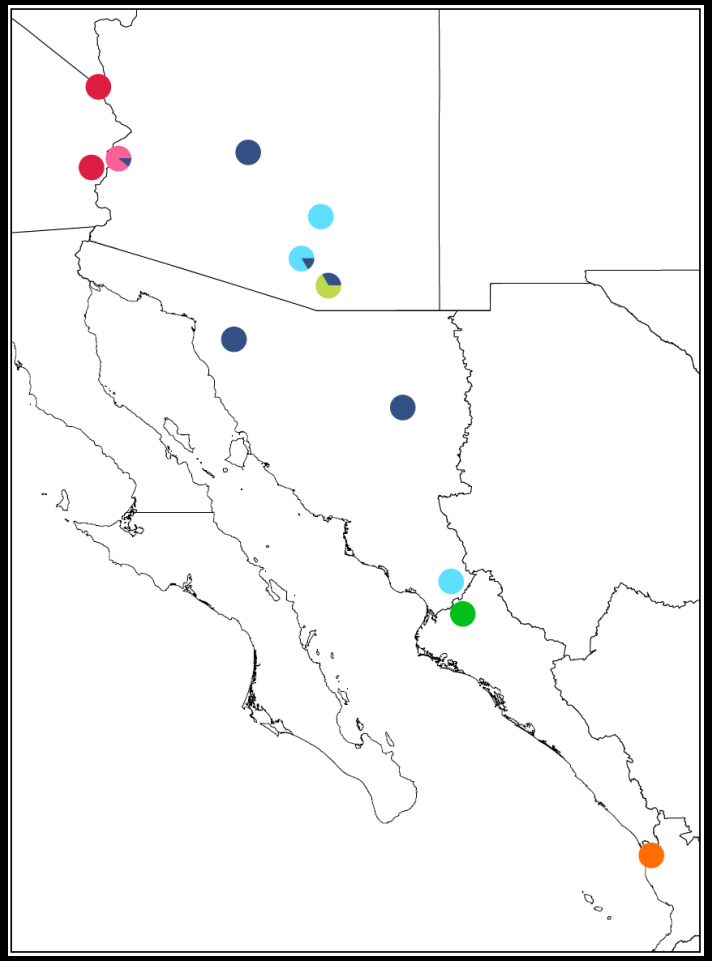
Intro

- *Sigmodon arizonae* distribution
- Historically part of *S. hispidus*
- Ecologically probably very similar



Introduction



- mtDNA haplotypes
- Unique LCR
- Subspecies
- Some Recent dispersal possible

Intro

- MSCP HCP
  - 125 acres for *S. a. plenus*

- Marsh veg, also “Weedy”, “Old-field”
  - Grinnell 1914, 1933 – *S. hispidus*
  - Bradley 1964
  - Zimmerman 1970
  - Anderson and Nelson 1999
  - Blood 1991

Anderson and Nelson 1999. Rodent use of anthropogenic and ‘natural’ desert riparian habitat, lower Colorado River, Arizona. Regulated Rivers: Research and Management 15:377-393.
Blood 1990. Taxonomy and distribution of Sigmodon in California. Bulletin of Southern California Academy of Sciences.
Bradley 1966. Status of the cotton rat in Nevada. Journal of Mammalogy 47:349:350.
Grinell 1914 An Account of the mammals and birds of the lower Colorado Valley. University of California Publications in Zoology.
Grinnell 1933. A review of the recent mammal fauna of California. University of California Publications in Zoology.
Zimmerman 1970. Karyology, systematics, and chromosomal evolution in the rodent genus Sigmodon. Publication of the museum Michigan State university

Intro

- From *S. hispidus*
  - prefer grasslands, old-field habitat (Cameron and Spencer 1981)
  - High herbaceous cover (Stokes 1995)
  - Shun areas where tree canopy shades ground cover (Geortz 1964)
  - early successional clear-cuts (Brown et al. 1999)

Browne et al. 1999. Effects of landscape spatial structure on movement patterns of the hispid cotton rat (*Sigmodon hispidus).* Landscape Ecology 14:53–65.
Cameron, G.N. and Spencer, S.R. 1981. *Sigmodon hispidus. Mammalian* Species 158:1–9.
Geortz, J.W. 1964. Influence of habitat quality upon density of cotton rat populations. Ecological Monographs 34:359–381.
Stokes, M.K. 1995. Selection of refuge sites by sympatric *Microtus ochrogaster* and *Sigmodon hispidus.* Journal of Mammalogy 76: 83–87.

Observations

- *Sigmodon arizonae* appear to occupy habitat with different vegetation characteristics along the lower Colorado River

- *S. arizonae* population demographics appear to be different in the different habitats it occupies

Question 1

- Are there differences in the vegetation structure at sites were we find *S. a. plenus* populations?

Question 2

- Do the population demographics of *S. a. plenus* differ among the locations?

Question 3

- How do we monitor for *Sigmodon* long term?

Objectives

- Quantify microhabitat characteristics and compare among 3 localities
- Estimate demographic parameters at each locality
- Design a monitoring strategy

Methods

- Mark-recapture study
  - Permanent trapping grids at each site
    - 60 or 75 Stations ~10m apart
  - 24 occasions (6 primary, 4 secondary)
- Vegetation quantification
  - Each station at $1m^2$ measure vegetation cover
    - Species
    - Life Form
    - VD

Methods

- Site Vegetation comparisons
  - MANOVA
    - Site X Seasonal
- Microhabitat Characteristics
  - Logistic Regression
    - VD

Methods

- Population Demographics
  - Population Size
  - Survival (and Recapture Probability)

- Program Mark
  - Cormack-Jolly-Seber model
    - Issues
    - Why it's appropriate
  - Robust Design
    - Issues
    - Why it's appropriate

Question 1: Are there differences in the vegetation structure at sites were we find *S. a. plenus* populations?

- Site Differences
  - Species composition
  - Life Form
  - Vertical Density

- They occur at 3 sites that have different types and densities of vegetation

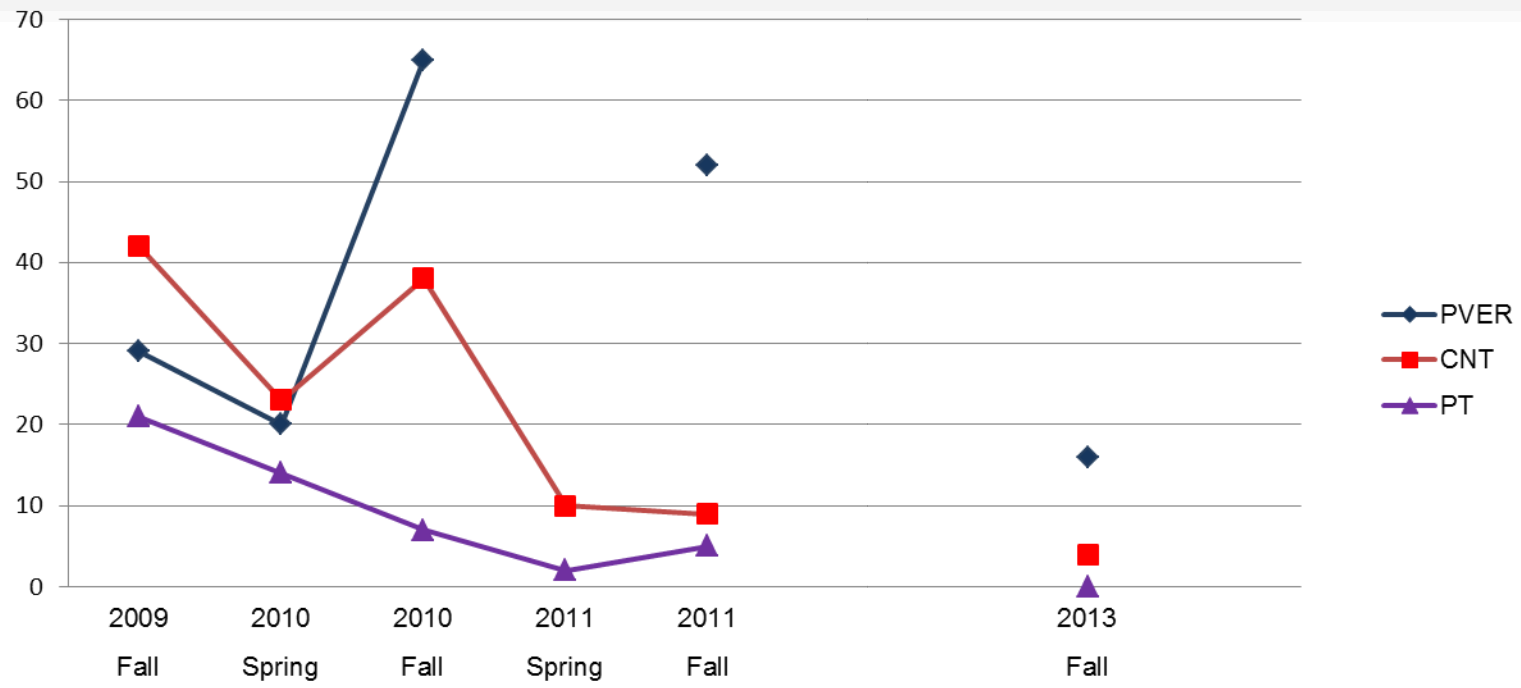
Question 1: Are there differences in the vegetation structure at sites were we find *S. a. plenus* populations?

- Microhabitat modeling
  - Density of Vegetation within 1 meter of the ground
  - Can identify areas that need managing

S. hispidus prefer sites with tall (>1m) shrubs and high percent cover but no selection for particular vegetation type (Browne et al. 1999)

Question 2: Do the population demographics of *S. a. plenus* differ among the locations?

Number of *S.a. plenus* marked during each sampling occasion.



CJS modeling results

- 2 models have >99.9% of the AIC weight:
  - {Phi(.) p(t)}
  - {Phi(g) p(t)}
  - {Phi(t) p(t)}
  - {Phi(t) p(.)}
  - {Phi(t) p(g)}
  - {Phi(t) p(g*t)}
  - {Phi(.) p(g)}
  - {Phi(g) p(g)}
  - {Phi(.) p(.)}
  - {Phi(g) p(.)}
  - {Phi(gs*t) p(gs*t)}

Both have time dependent recapture rates

Survival is the same among all populations = 0.027 (95% CI =0.018 – 0.04)

Implications on Habitat Management

- Population Size *may* differ between sites
  - Is bigger *always* better?
- Survival *may be* the same
- *Chlorocantha* patches among mature trees
  - Size
  - Survival
  - Low water use

This is good cotton rat habitat

This is not

Question 3: How do we monitor for *Sigmodon* long term?

- 1. System wide – vegetation
  - How many samples per plot?
  - What intensity do we sample?

- 2. Intentional *Sigmodon* habitat
  - 125 acres total
  - Rotate grid of live trapping and vegetation plots
  - Yearly may be sufficient
  - Predict/Decide when it is necessary to manage

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