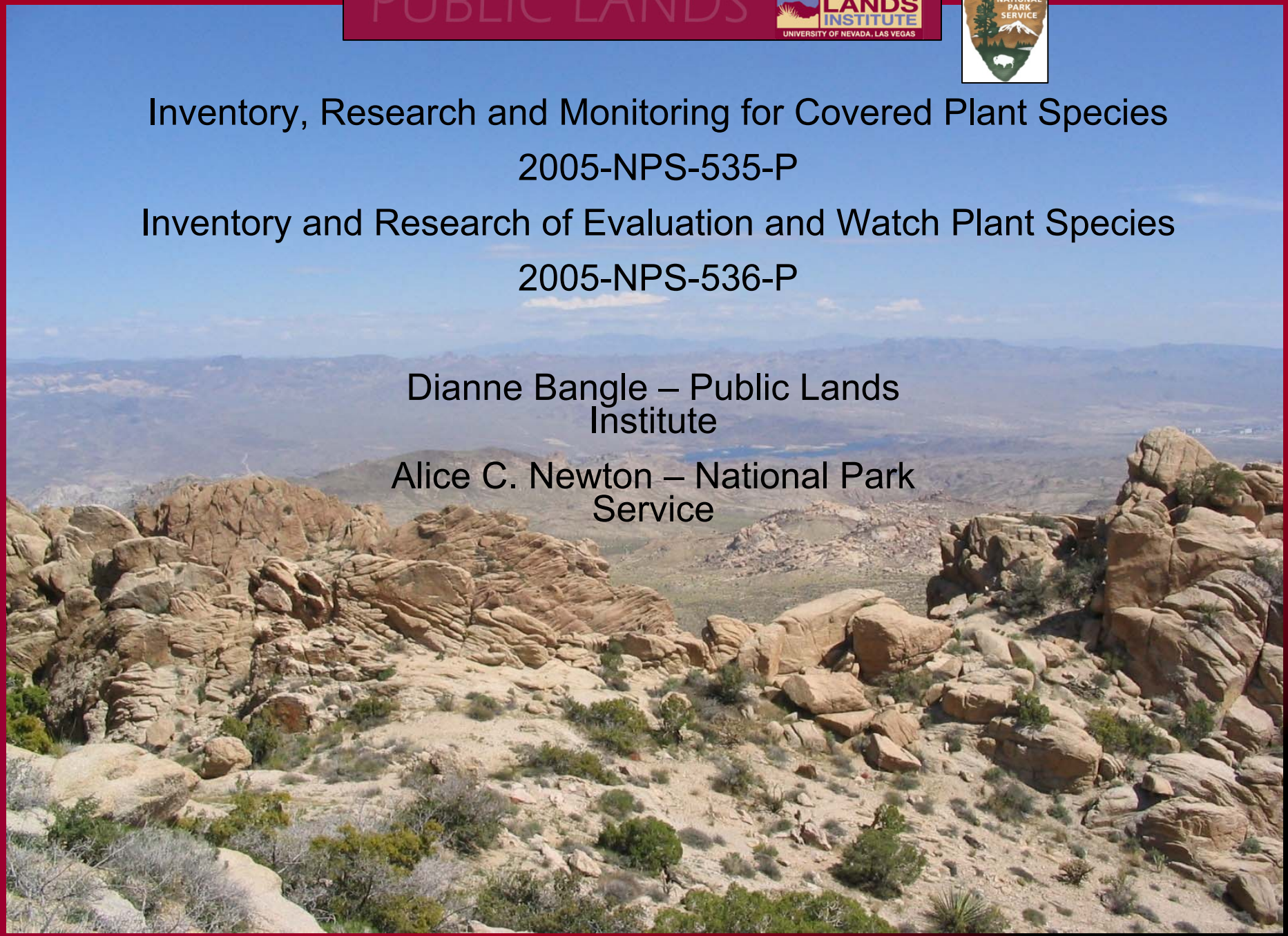


Inventory, Research and Monitoring for Covered Plant Species

2005-NPS-535-P

Inventory and Research of Evaluation and Watch Plant Species

2005-NPS-536-P

Dianne Bangle – Public Lands Institute

Alice C. Newton – National Park Service

Rare Plant Monitoring and Research

MSHCP covered species

- –Las Vegas bearpoppy
- –Ringstem
- –Threecorner milkvetch
- –Sticky buckwheat


Ringstem


Las Vegas bearpoppy


Threecorner milkvetch


Sticky buckwheat

Project Outline

Rare Plant Monitoring

Gypsum Species

- *Las Vegas bearpoppy* – 6 sites on NPS/BLM lands (Blue Point Springs, Gale Hills, Rd 100, Sunrise Hills, Valley of Fire, Gold Butte)
- *Ringstem* – 3 sites on NPS/BLM (Rd 100, Sunrise Hills, Valley of Fire)

Sand Species

- *Threecorner milkvetch* – 3 sites on NPS/BLM lands (Sandy Cove, Ebony Cove, Weiser Wash)
- *Sticky buckwheat* – 2 sites on NPS land (Glory Hole, Lime Cove)

Project Outline

Rare Plant Research

Abiotic plots – data collected across a gradient in and out of rare plant habitat

→ weather data
→ soil chemistry
→ biological crust cover and depth
→ soil compaction

Rare Plant Monitoring

Project Goals

- Maintain the current density of target rare plant
- Maintain native community status
- Determine the abiotic factors that may influence the community


Photo: Bruce Lund

Sampling Objective

- We want to be 90% sure of detecting a 30% change in the confidence interval and are willing to accept a 10% chance that a change did not take place (in good rainfall years).

Rare Plant Monitoring


Photo: Bruce Lund

Management Goals

- If change is >30%, we will attempt to determine the cause
  - Stochastic event – such as change in climate or soil chemistry– No management action has been determined
  - Threat induced event – remove threat (invasive species, OHV access, trespass cattle/burros)

What type of data are we collecting?

Rare plant plots

- Number of individuals
- Spatial distribution
- Frequency of occurrence
- Size class
- Condition
- Presence/absence of trails (natural and unnatural)

Community ecology plots

- Frequency of occurrence
- Species richness
- Cover – perennials and annuals
- Number of rare plants
- Presence/absence of trails (natural and unnatural)

Las Vegas bearpoppy- *Arctomecon californica*

Unique Characteristics

- Gypsum endemic
- Thrives in extreme environments
- Hairy “paw” shaped leaves
- Unique pollinators

Las Vegas bearpoppy

Threats at Lake Mead NRA:

1. Illegal OHV use
2. Invasive Species
3. Trampling and Habitat Degradation

Las Vegas bearpoppy

Challenges:

Habitat

- Delicate gypsum
- Biological soil crusts

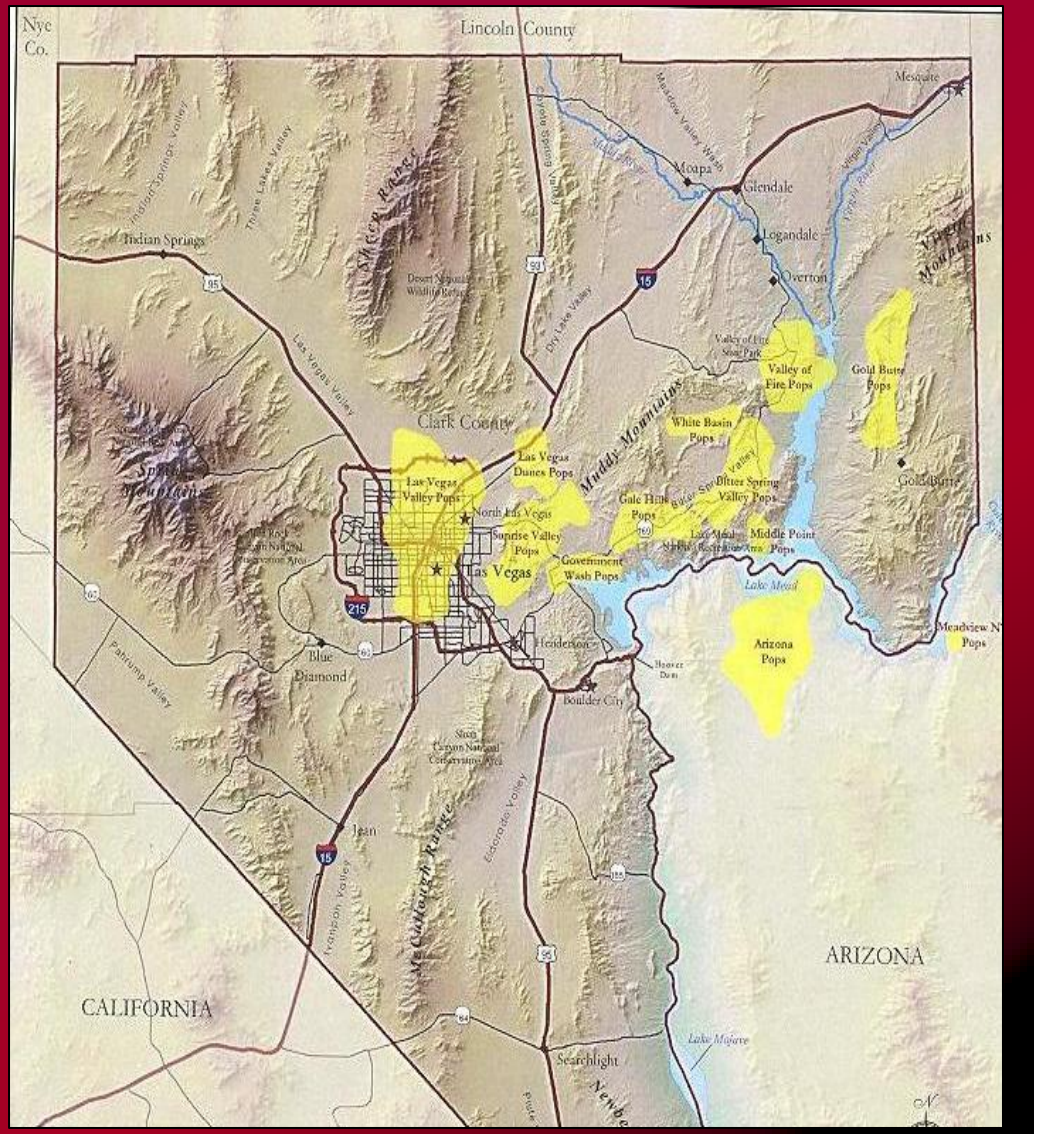
Solutions:

Modify Methods

- Utilize existing trails and drainages
- Range finders and pin flags in lieu of measuring tapes
- Time consuming

How did we choose the sites?

- We started with the distribution map from the County CMS*
- Re-evaluated most known LV bearpoppy populations described in the NNHP status report for Las Vegas bearpoppy and determined which patches (sub-populations) would be suitable for monitoring (≥ 300 plants, no private land, City of Las Vegas, or Mohave Co. populations).
- Randomly selected from remaining (sub-populations) so that select populations defined in the County CMS would have monitoring plots.

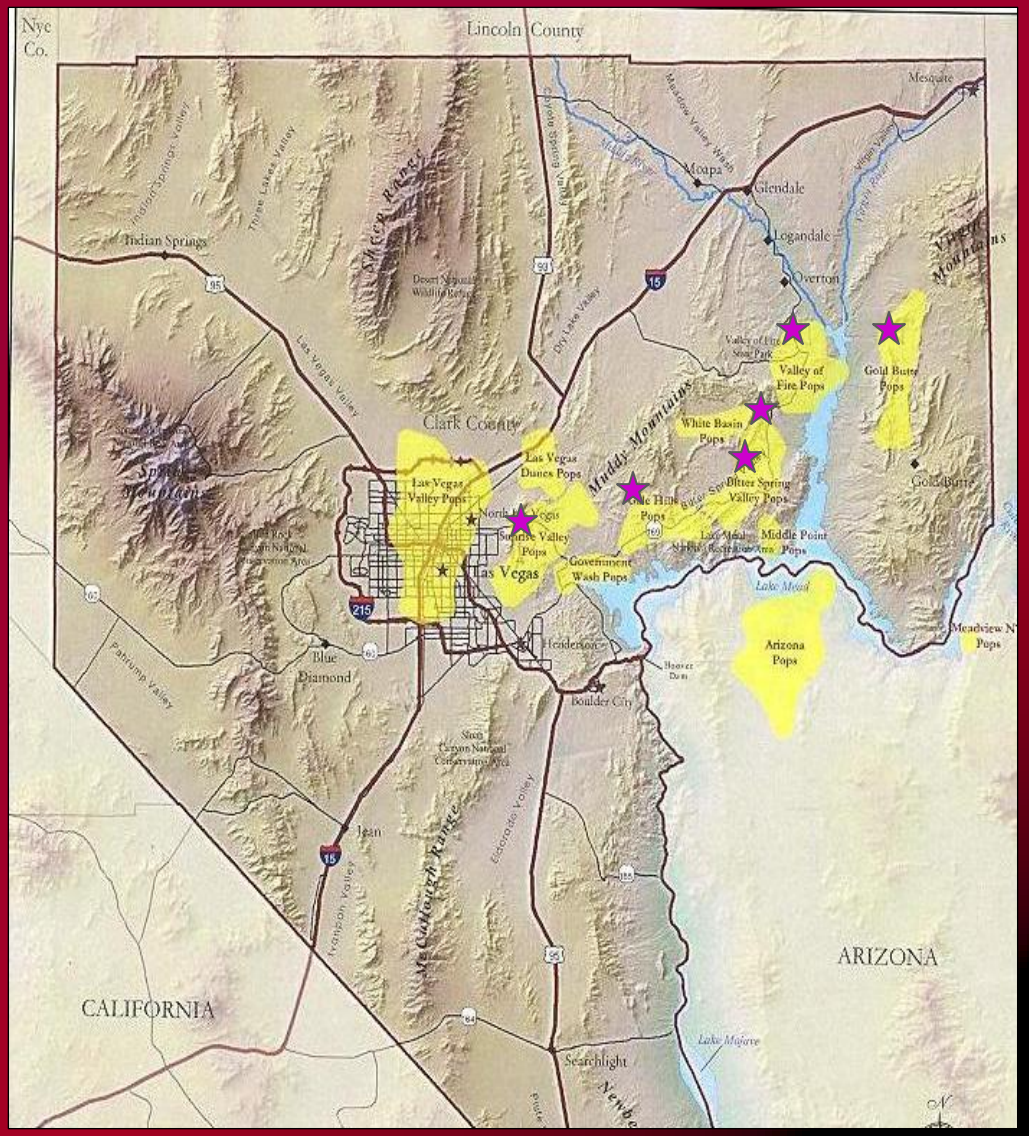


* Copied from - "A conservation management strategy for nine low elevation rare plants" (County CMS)

Las Vegas bearpoppy Monitoring Sites

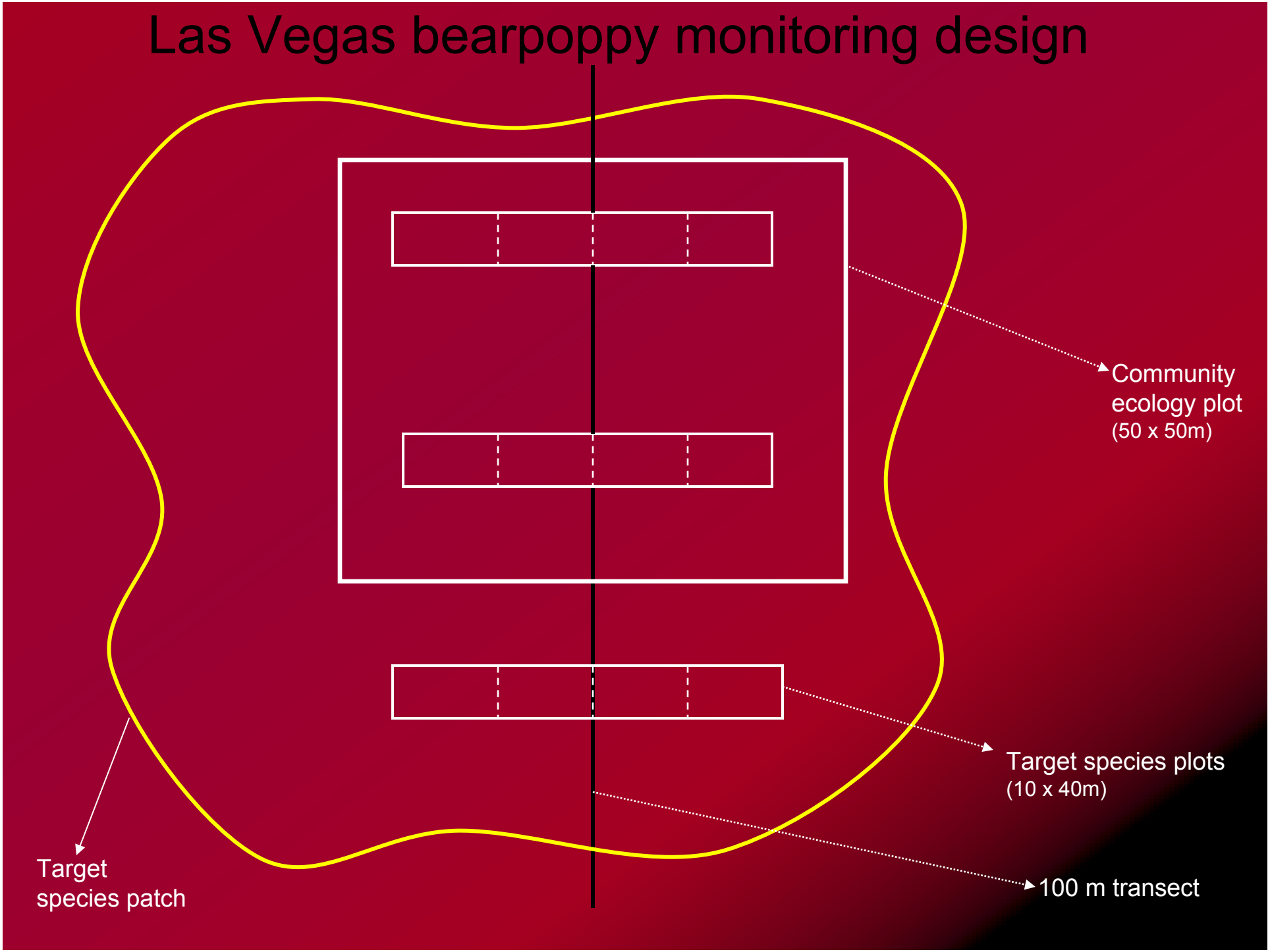
(NPS and BLM lands)

- LV bearpoppy distribution
- LV bearpoppy sites (6 sites)



* Copied from - “A conservation management strategy for nine low elevation rare plants” (County CMS)

Las Vegas bearpoppy monitoring design

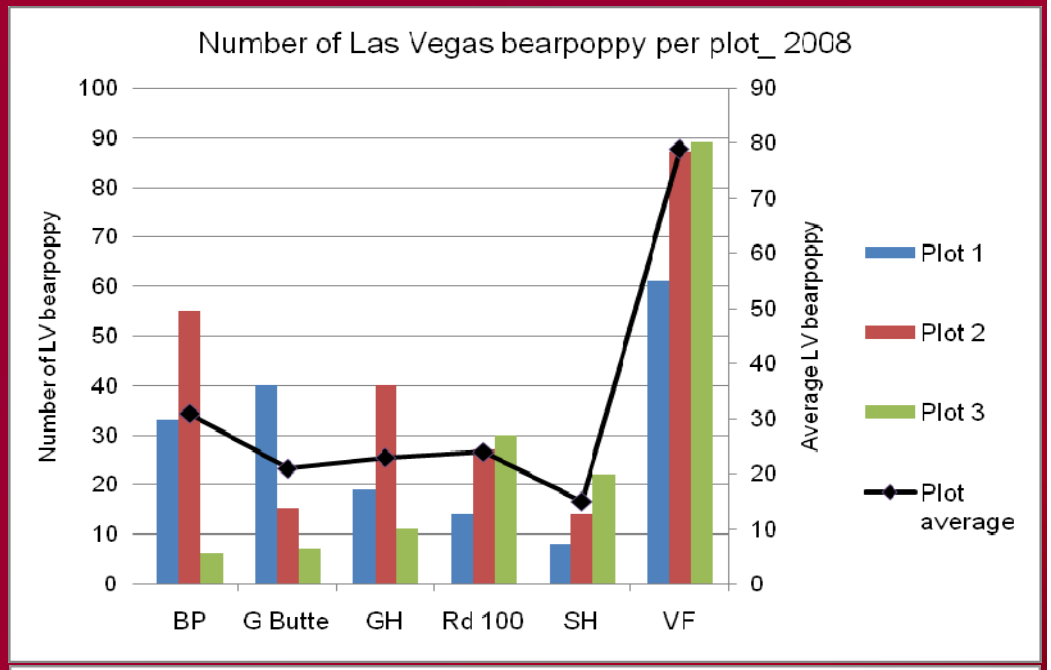


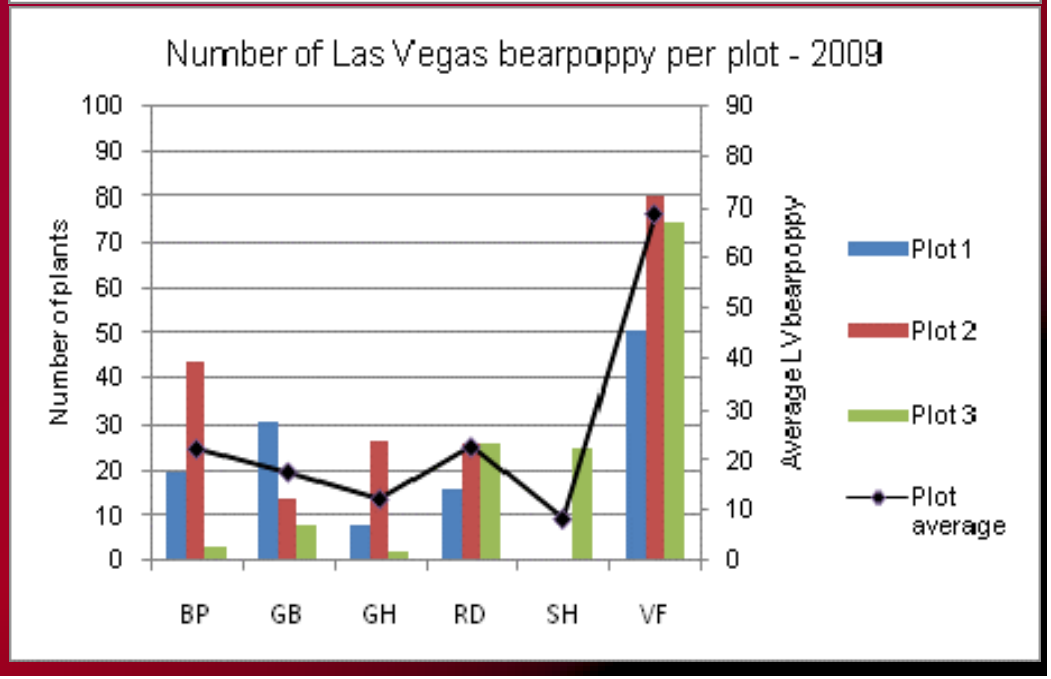
Results

Poppy abundance:

Rare plant plots (10 x 40m)

- 4 - 47% loss of LV bearpoppy across sites
- Very little recruitment either year
- Need more data

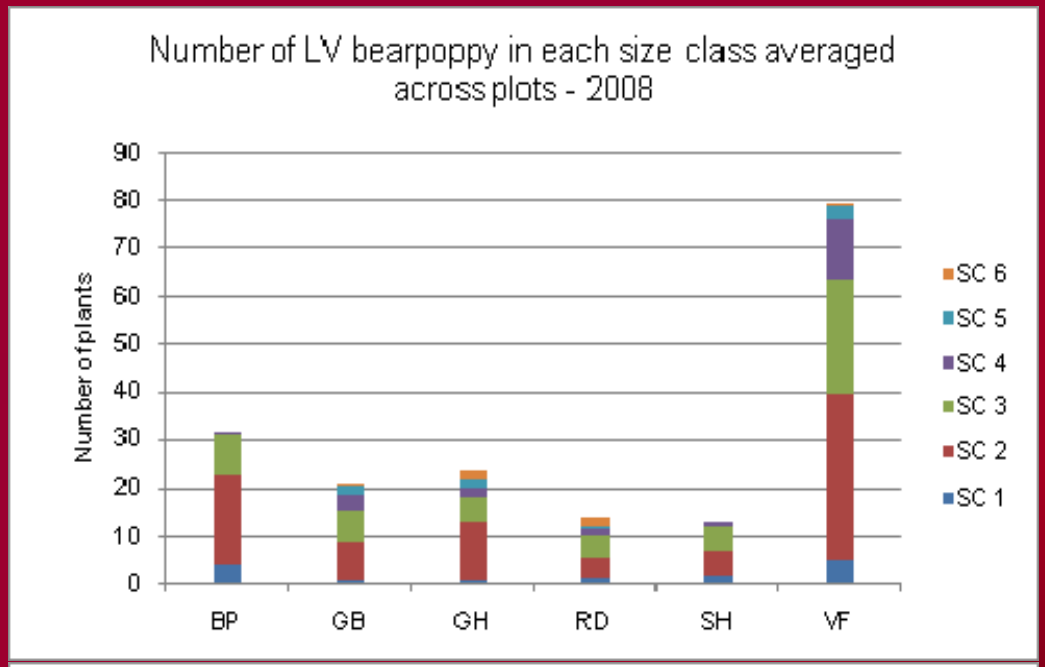


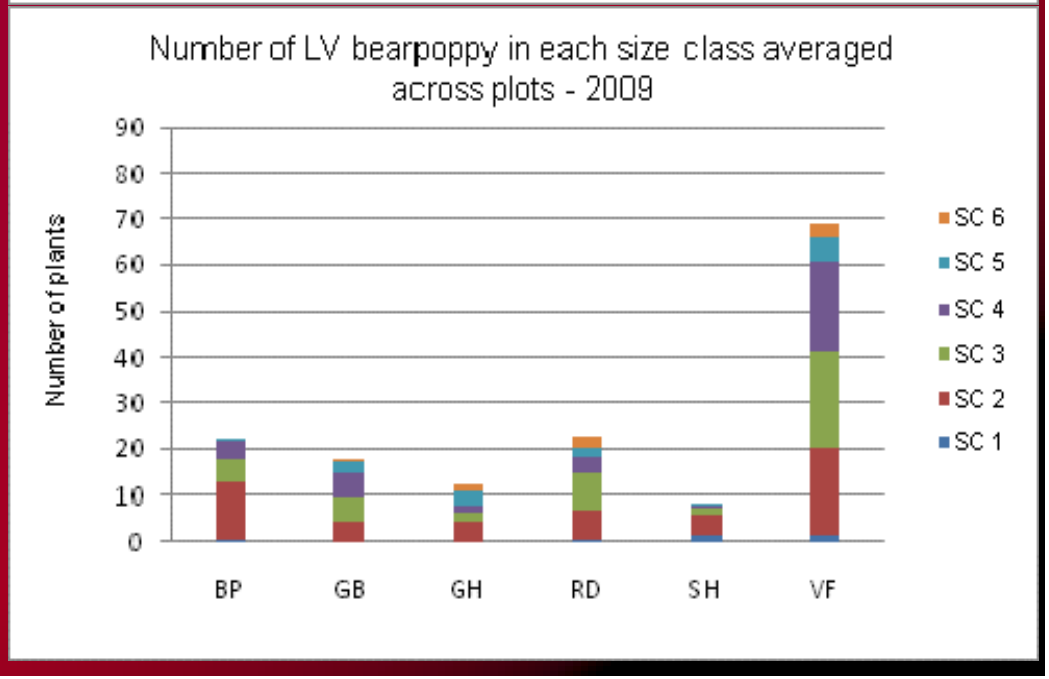


Results

Poppy size classes:
(rare plant plots)

- We assigned size classes to all individuals within plots.
- The size classes were chosen to express the potential growth of a single LV bearpoppy plant in one year (Powell 1999).
- Size class delineation may need to be altered with more data.
  - SC1 – 0-5cm (seedling)
  - SC2 – 6-12cm (juvenile- 2nd yr)
  - SC3 – 13-19cm (juvenile- 3rd yr)
  - SC4 – 20-26cm (adult- 2nd or 3rd yr)
  - SC5 – 27-32cm (adult- 4th yr)
  - SC6 – >32cm (adult- 5+ yrs)



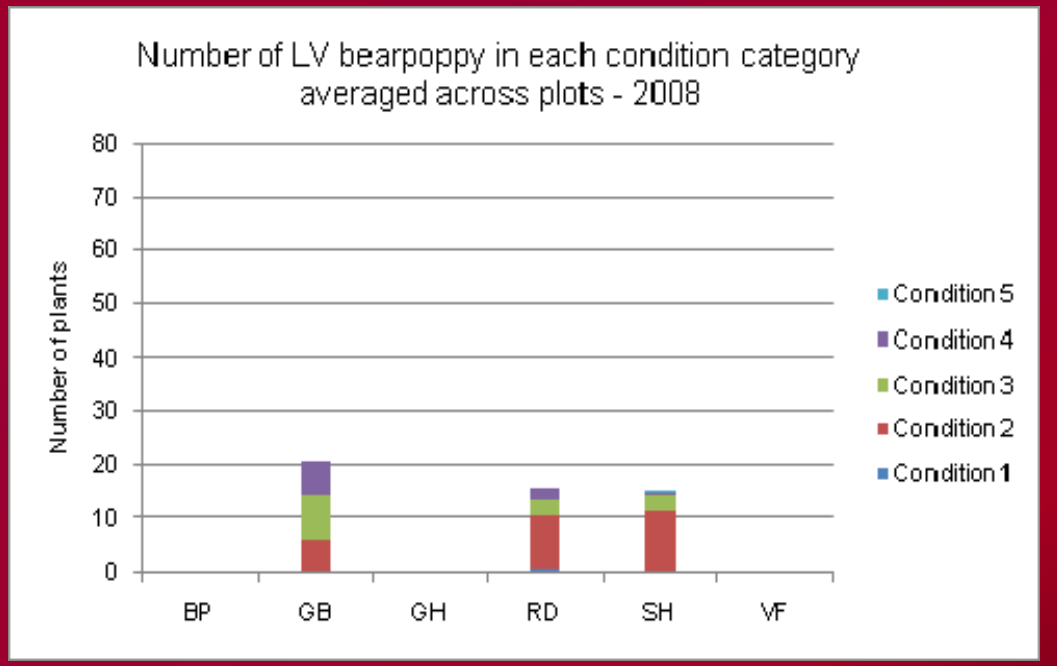


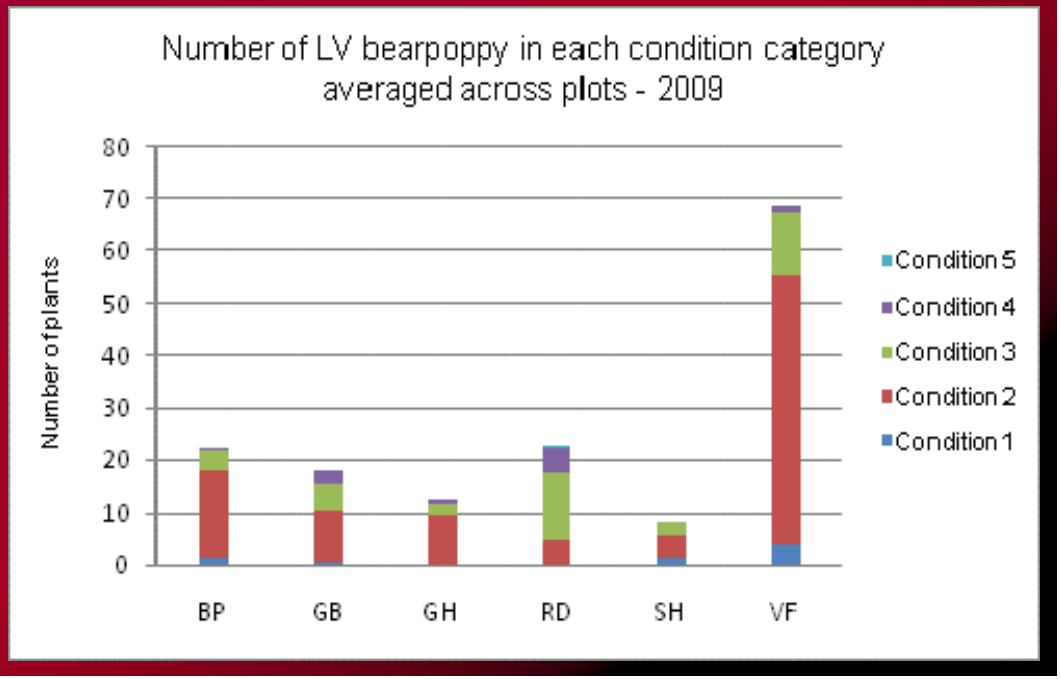
Results

Poppy condition:
(rare plant plots)

We rated each individual by condition.

- C1 – Excellent (No dead material, looking very vigorous)
- C2 – Good (little dead material and live material looking healthy)
- C3 – Fair (a lot of dead material and live material with low vigor)
- C4 – Poor (mostly dead or dying)



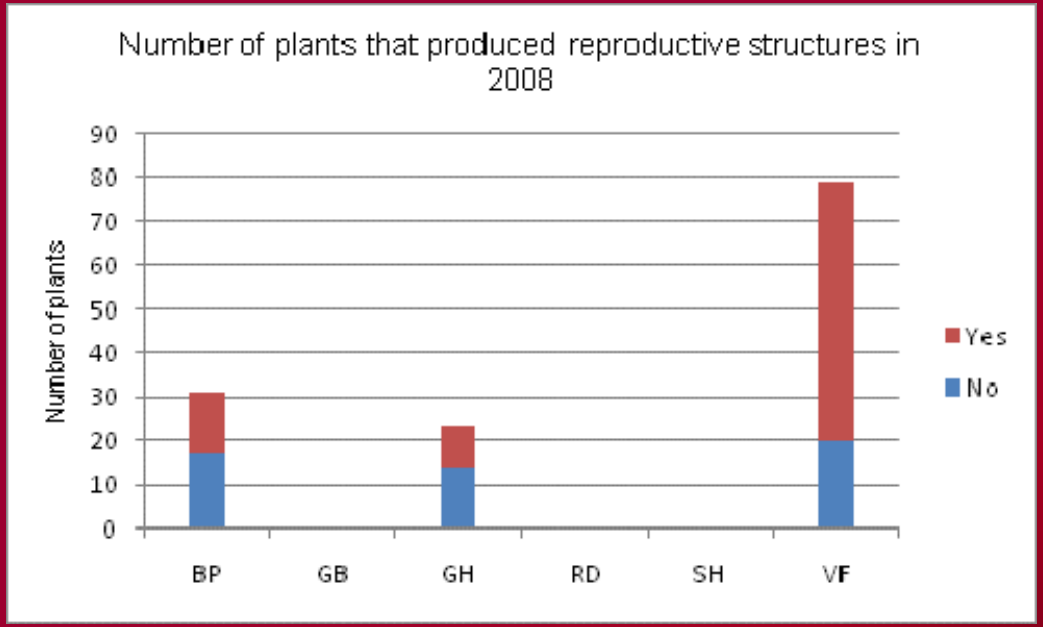


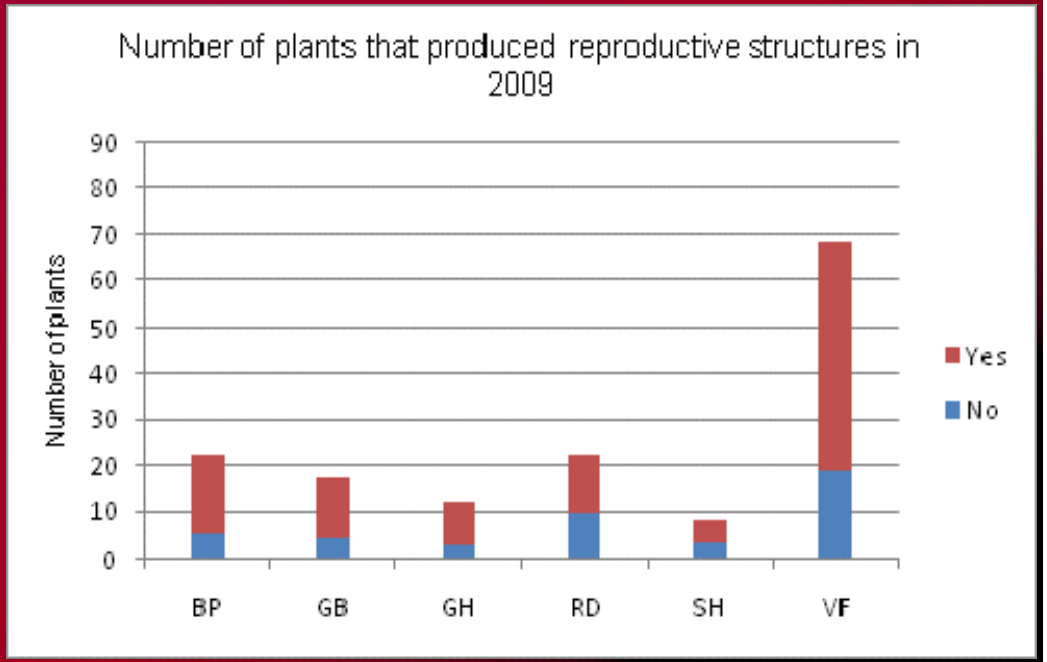
Results

Reproductive status:
(rare plant plots)

We recorded whether individuals produced reproductive structures each year.

- Indicates the health of the plant
- Only 3 sites in 2008 due to time of year that data were collected

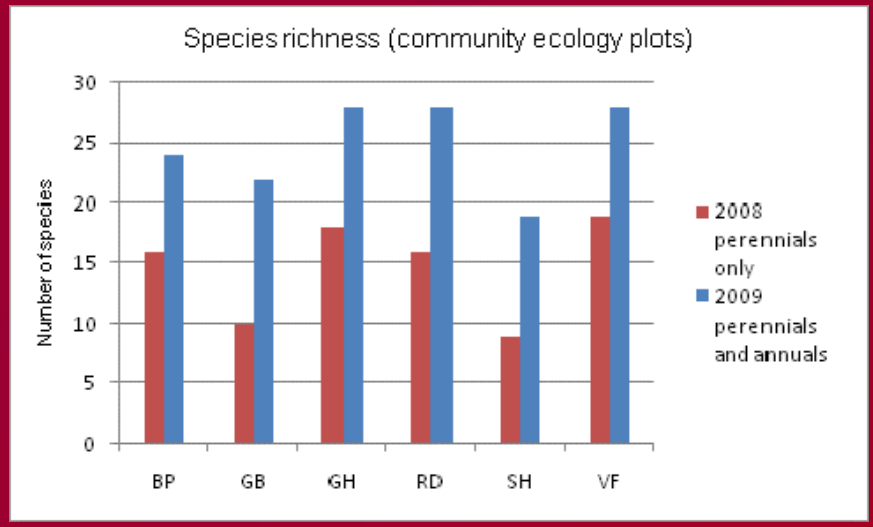




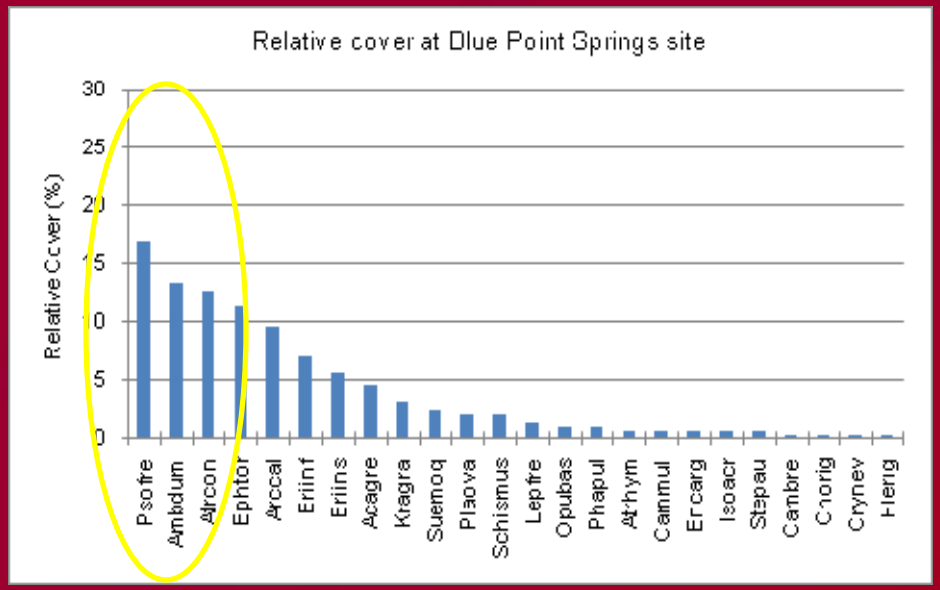
Results

Species Richness

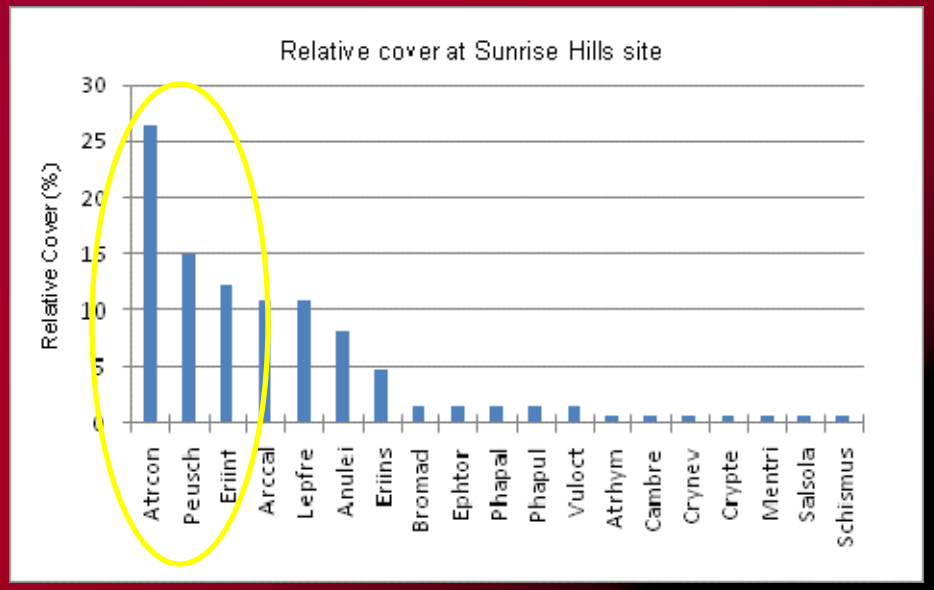
- Perennials only in 2008
- Perennials and annuals in 2009



Relative Cover (an example from 2 sites-2009)



Psorothamnus fremontii, Ambrosia dumosa, Atriplex confertifolia



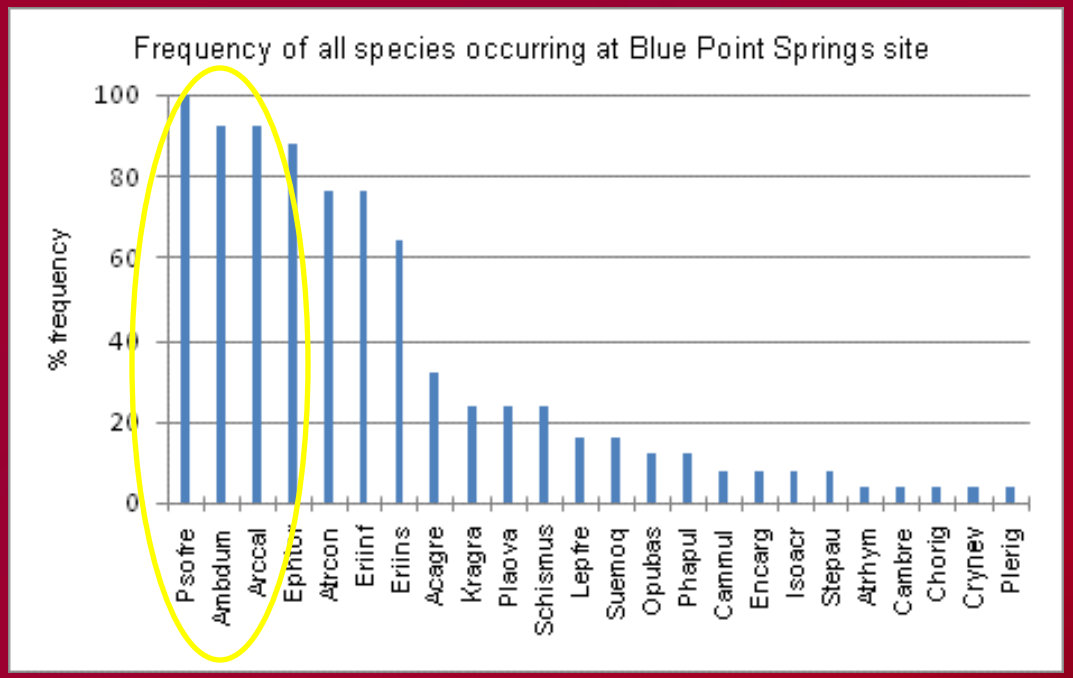
Atriplex confertifolia, Peucephyllum schottii, Eriogonum inflatum

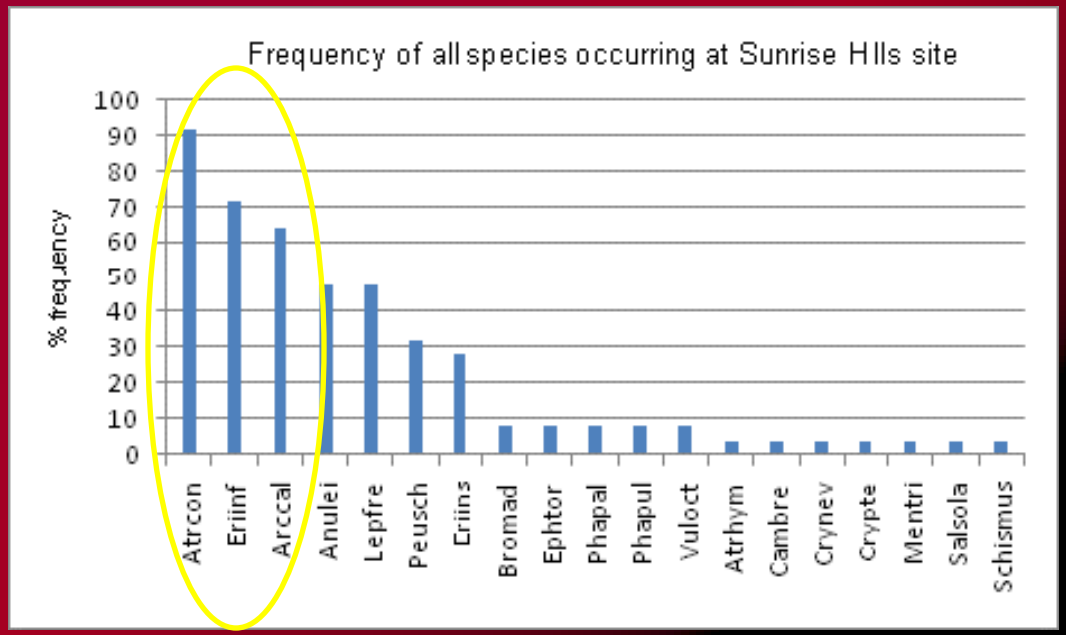
Frequency:
(community ecology plots)

An example of frequency from 2 sites- 2009

Most abundant species vary by site

- Blue Pt – *Psorothamnus fremontii, Ambrosia dumosa, Arctomecon californica*
- Sunrise Hills – *Atriplex confertifolia, Eriogonum inflatum, Arctomecon californica*





Ringstem – *Anulocaulis leiosolenus* var. *leiosolenus*

Unique Characteristics

- Gypsum endemic
- Moth pollinated – white-lined sphinx moth (*Celerio lineate*)
- Sticky rings along the stems
- Prolific seed producer

Ringstem

Challenges:

Habitat

- Delicate gypsum
- Biological soil crusts

Solutions:

Modify Methods

- Utilize existing trails and drainages
- Range finders and pin flags in lieu of measuring tapes
- Time consuming

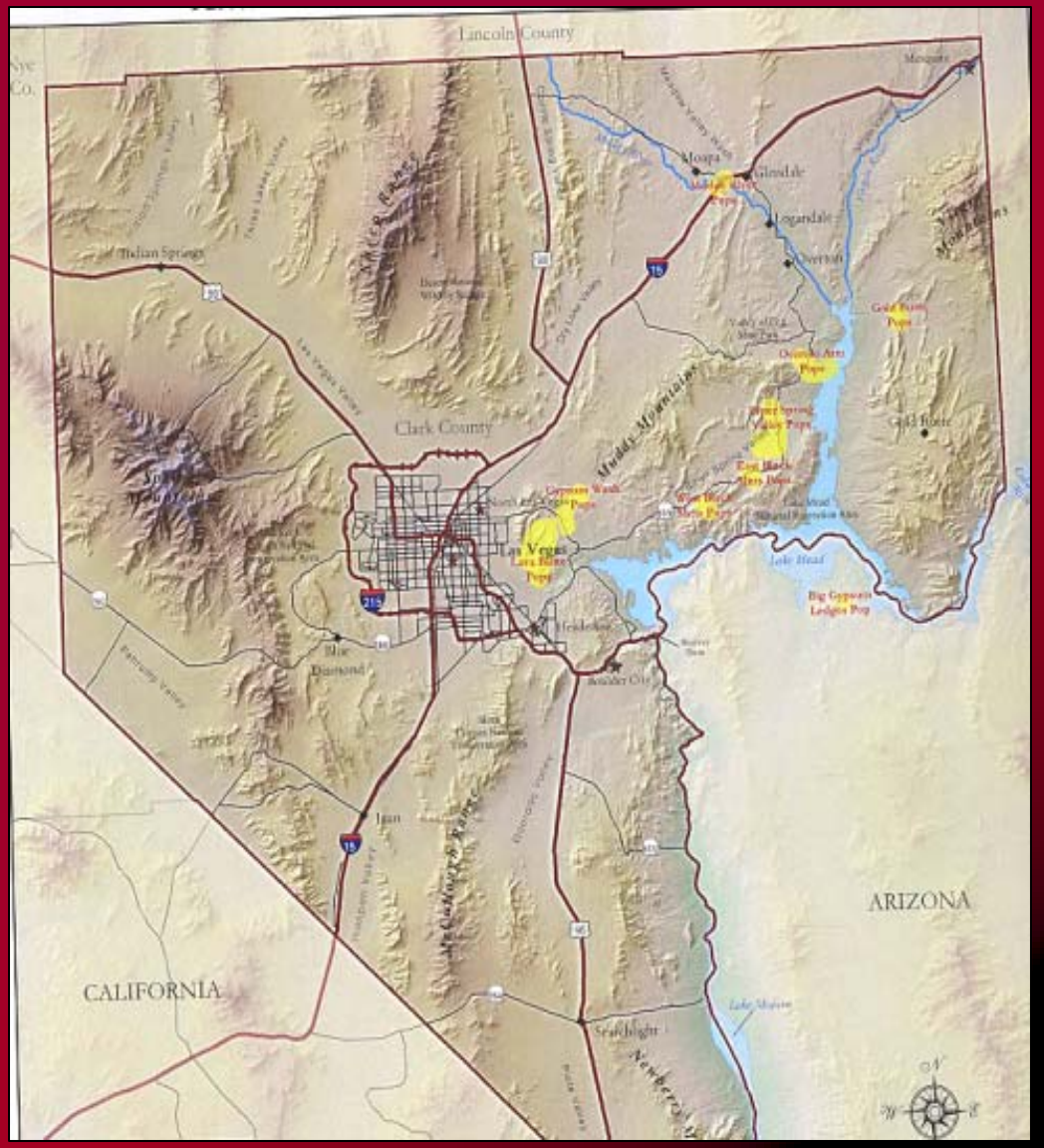
Ringstem

Threats at Lake Mead NRA:

1. Illegal OHV use
2. Invasive Species
3. Trampling and Habitat Degradation

How did we choose these sites?

- We randomly selected 3 populations identified on the distribution map from the County CMS* .
- We did not include private land or Mohave Co. population.

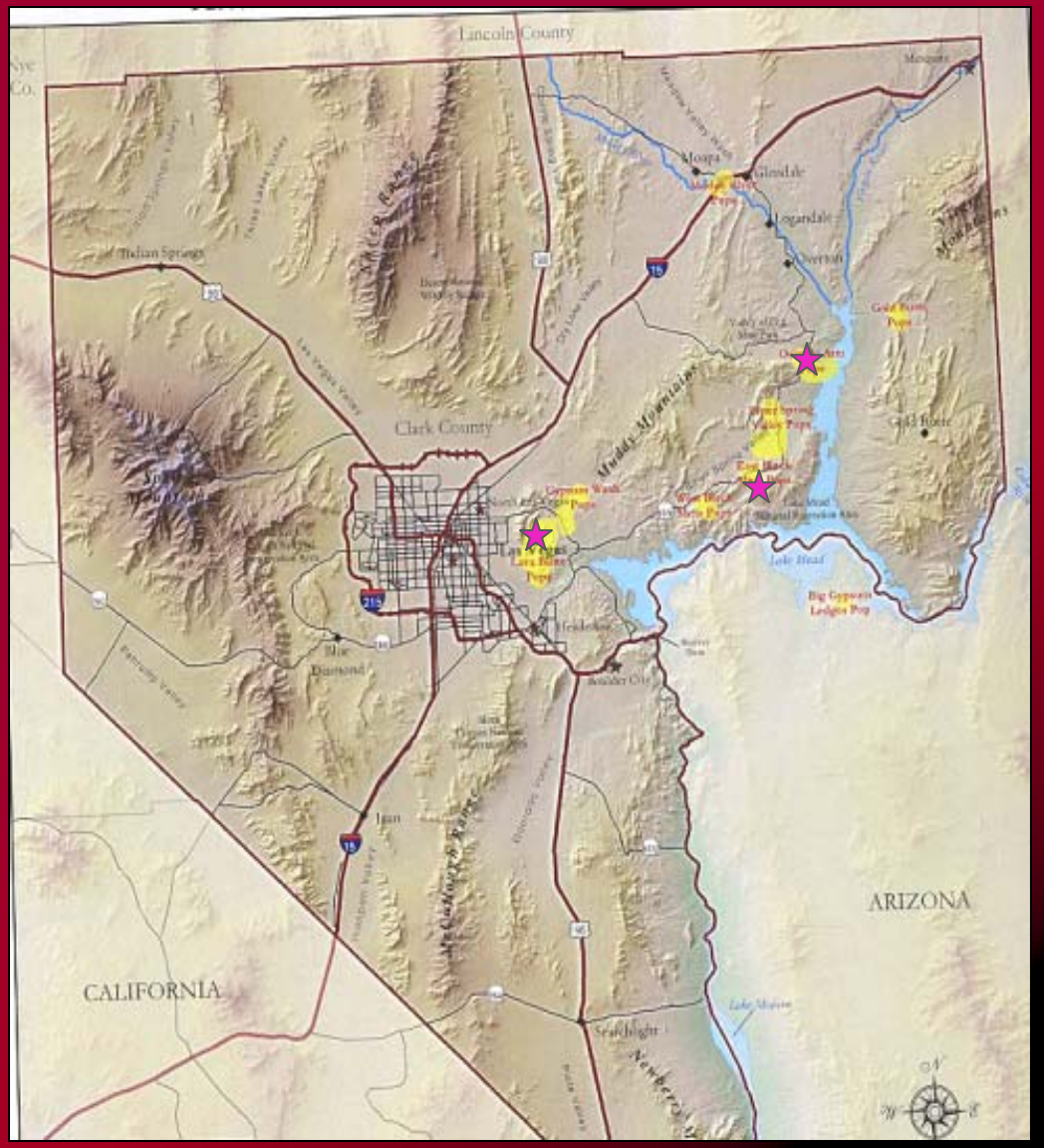


* Copied from - “A conservation management strategy for nine low elevation rare plants” (County CMS)

Ringstem Monitoring Sites

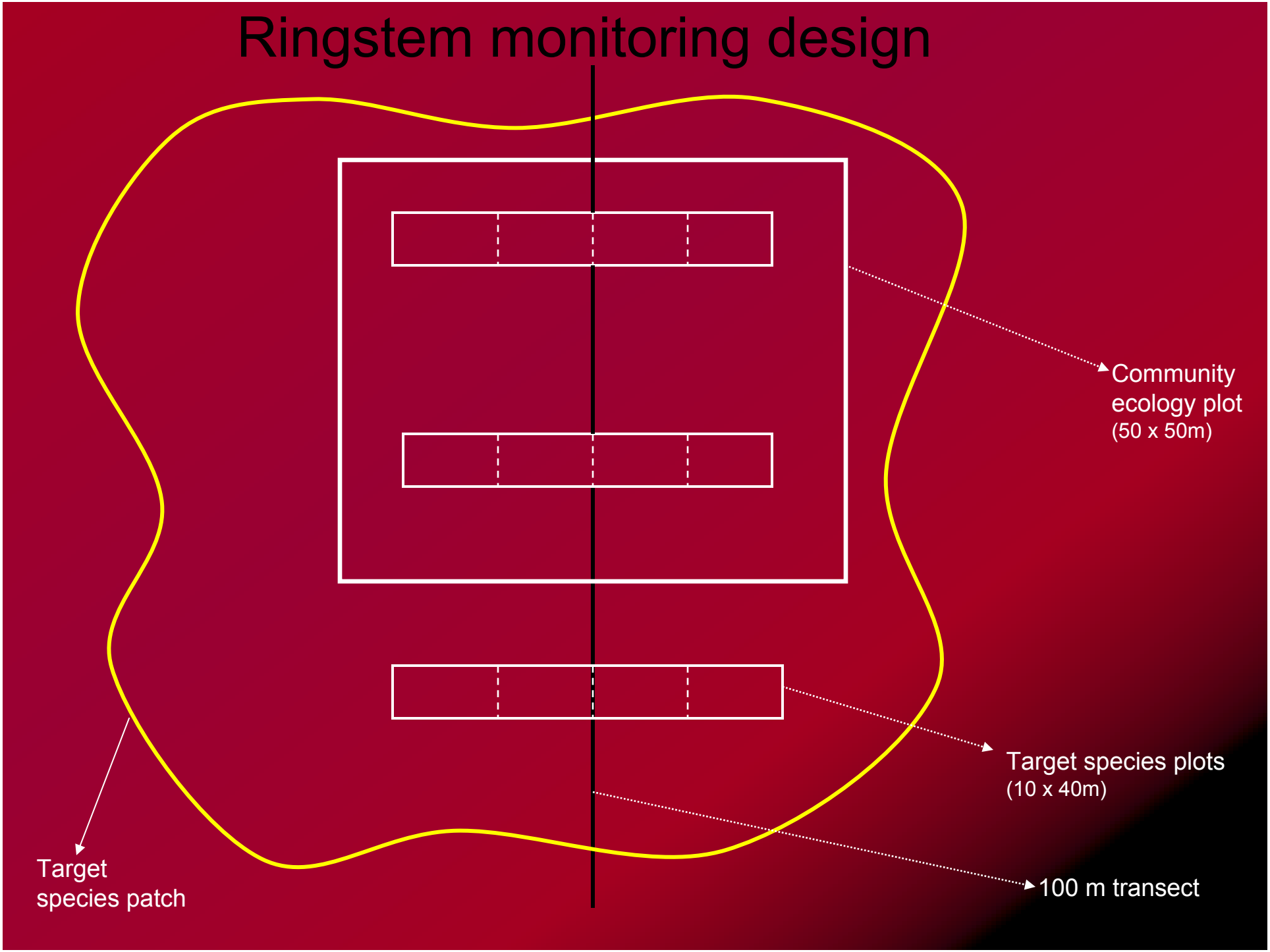
(NPS and BLM lands)

- Ringstem distribution
- ★ Ringstem sites (3 sites)



* Copied from - “A conservation management strategy for nine low elevation rare plants” (County CMS)

Ringstem monitoring design

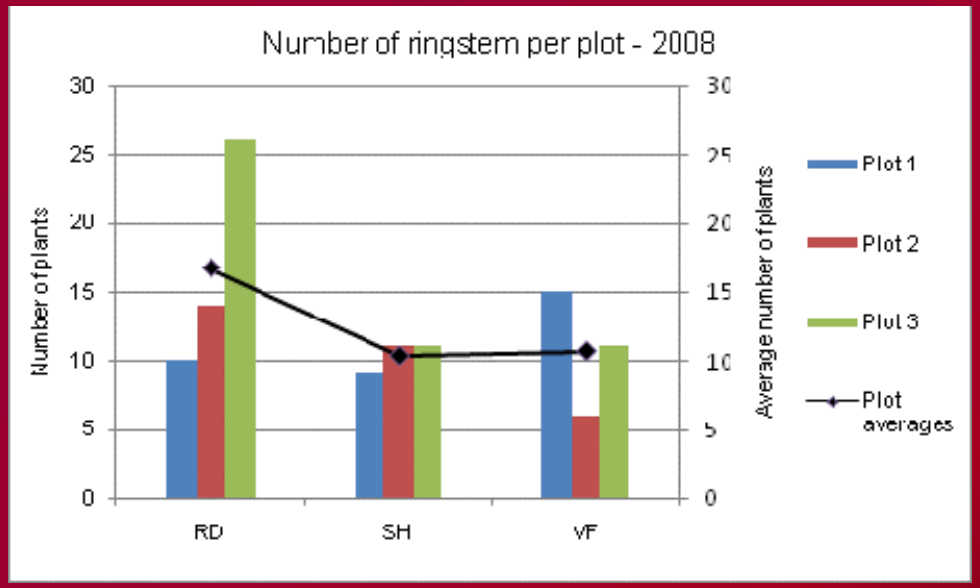


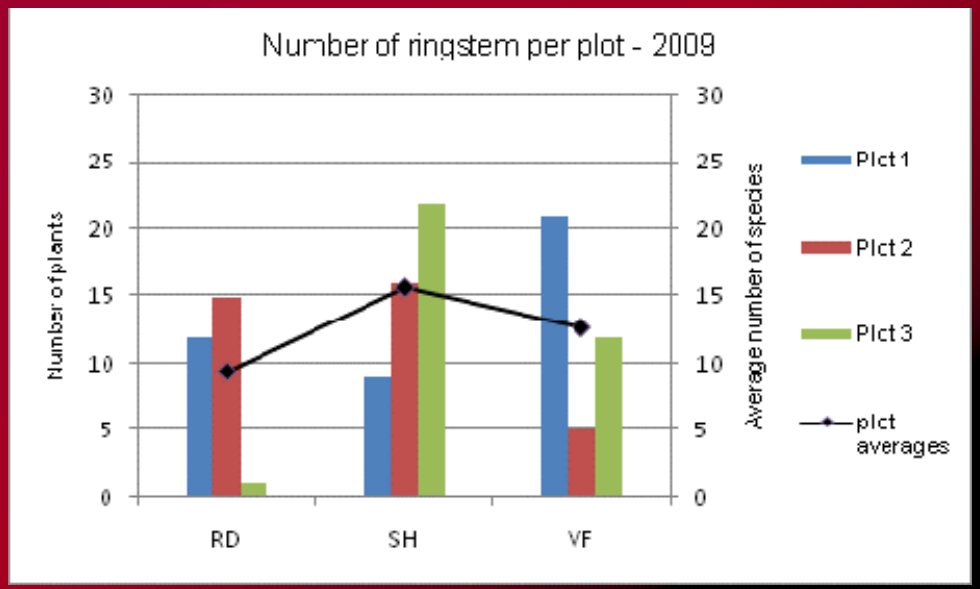
Results

Ringstem abundance:

Rare plant plots (10 x 40m)

- 47% loss of ringstem at Road 100
- 60% and 20% gain at Sunrise Hills and Valley of Fire respectively
- Need more data

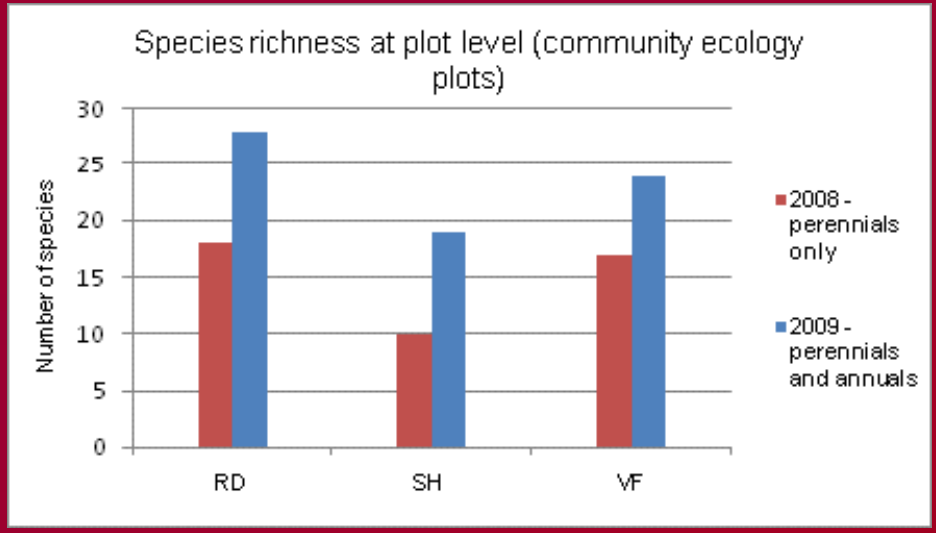




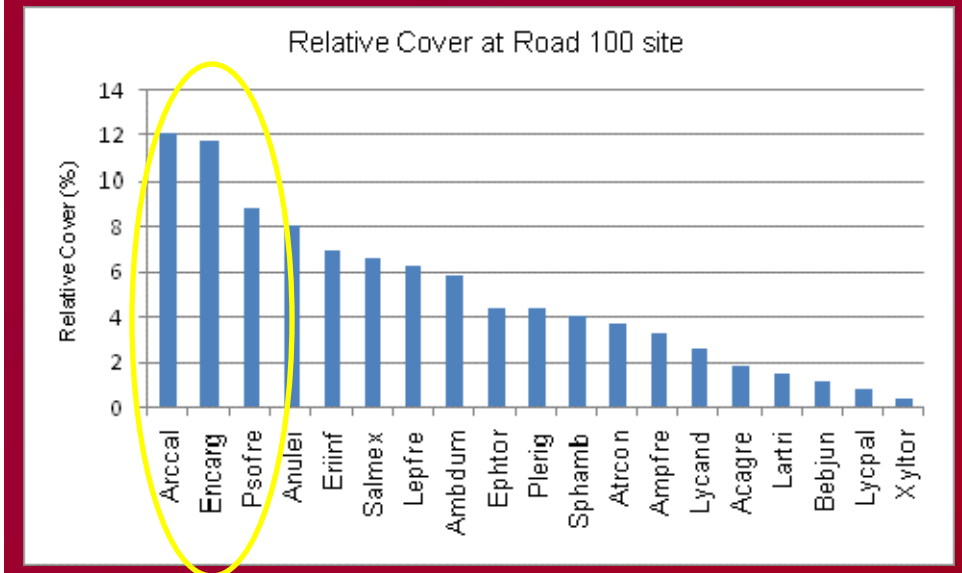
Results

Species Richness

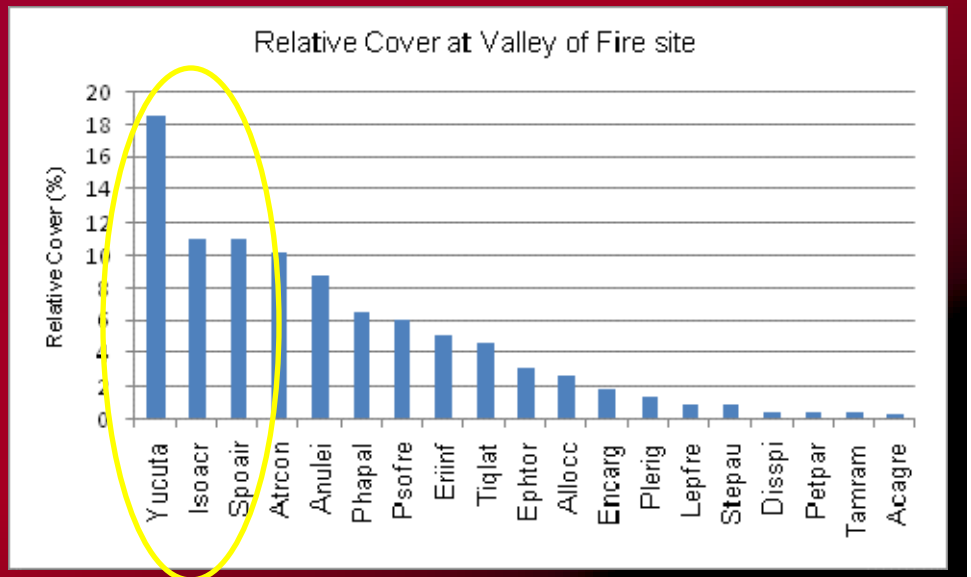
- Perennials only in 2008
- Perennials and annuals in 2009



Relative Cover (an example from 2 sites-2009)



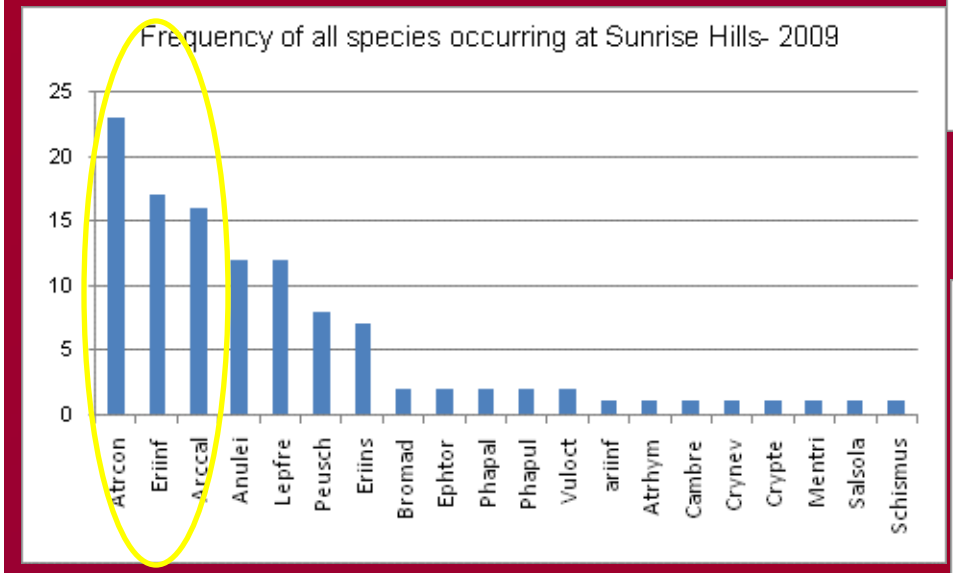
Arctomecon californica, Enceliopsis argophylla, Psorothamnus fremontii



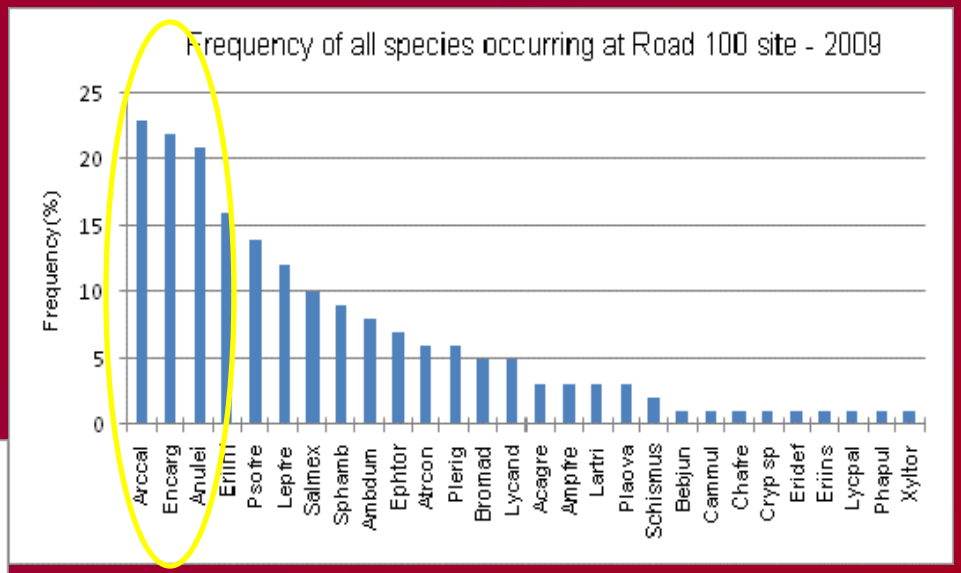
Yucca utahensis, Isocoma acradenia, Sporobolus airoides

Frequency:
(community ecology plots)

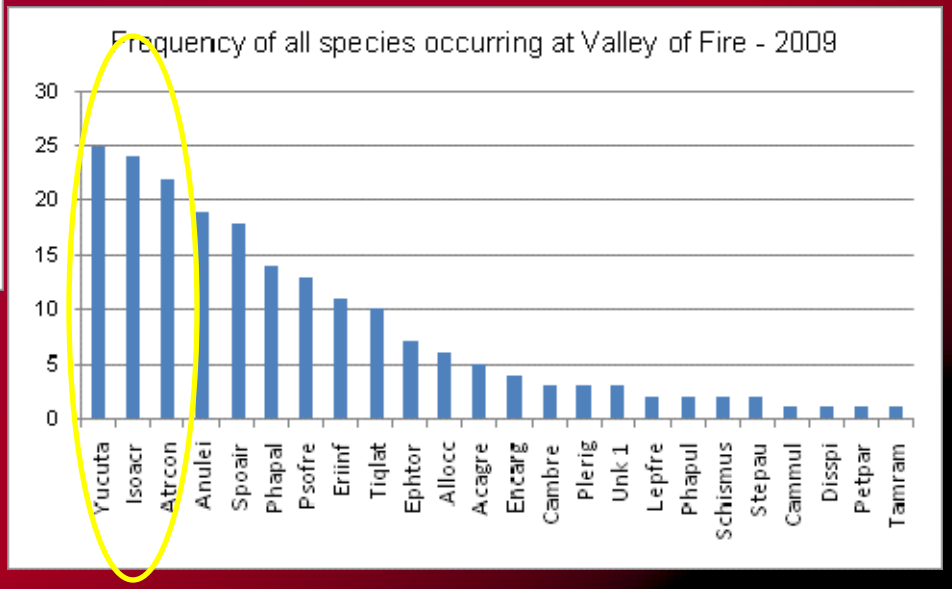
Most abundant species vary by site



Atriplex confertifolia, Eriogonum inflatum, Arctomecon californica



Arctomecon californica, Enceliopsis argophylla, Anulocaulis leiosolenus

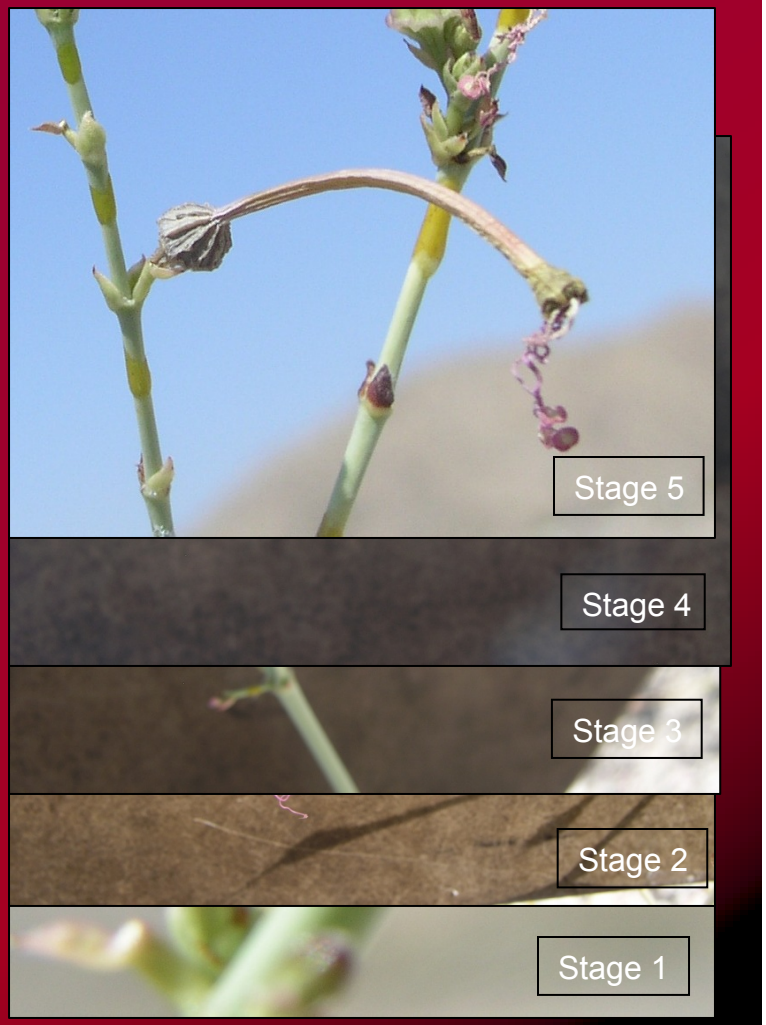


Yucca utahensis, Isocoma acradenia, Atriplex confertifolia

Rare Plant Research: Ringstem phenology

Project Objectives:

- Track 3 populations, 21 plants/site
- Develop flowering phenological stages
  - Stage 1: Buds; perianth closed, bud stem visible
  - Stage 2: Perianth open, stamens/style straight or slightly curled
  - Stage 3: Perianth closed, stamens/style tightly curled; ovary NOT swollen
  - Stage 4: Perianth closed, stamens/style tightly curled; ovary swollen
  - Stage 5: fruit (brown/dry)
- Timing of flowering and fruit set
- Duration of flowering and fruit set
- Number of flowers and fruit produced per plant



Ringstem phenology

Progress to date:

2009 data collection is not complete

- Prolific seed producer throughout the season (May-October)
- Flowers are open ~ 12 hours (8pm to 8am)
- Flowers are night pollinated
- Fruit maturation ~ 11 days

Threecorner milkvetch (*Astragalus geyeri var. triquetrus*)

Unique characteristics

- Small white flowers
- Three sided, sharply angled fruit
- Habitat – requires loose or active sand

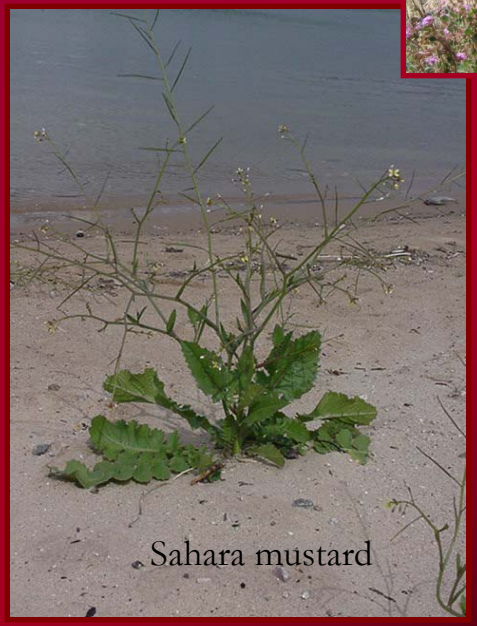
Threecorner milkvetch

Threats at Lake Mead:

Invasive Species

- Sahara mustard – crowds natives, early germinant, prolific seed producer
- Mediterranean grass – sand dune stabilization


Sahara mustard vs. natives


Sahara mustard

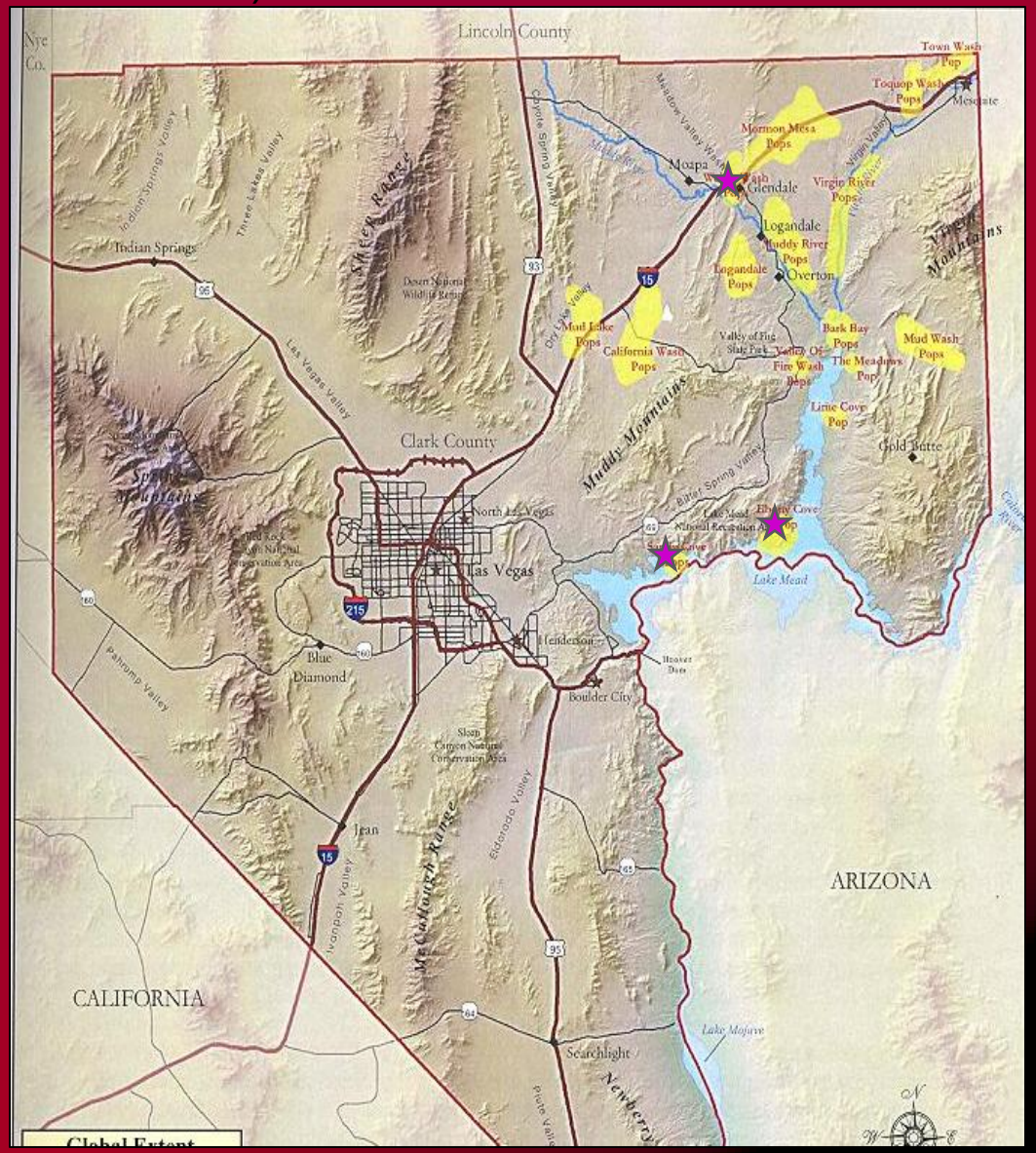

Sahara mustard stand


Mediterranean grass

Threecorner milkvetch Monitoring Sites

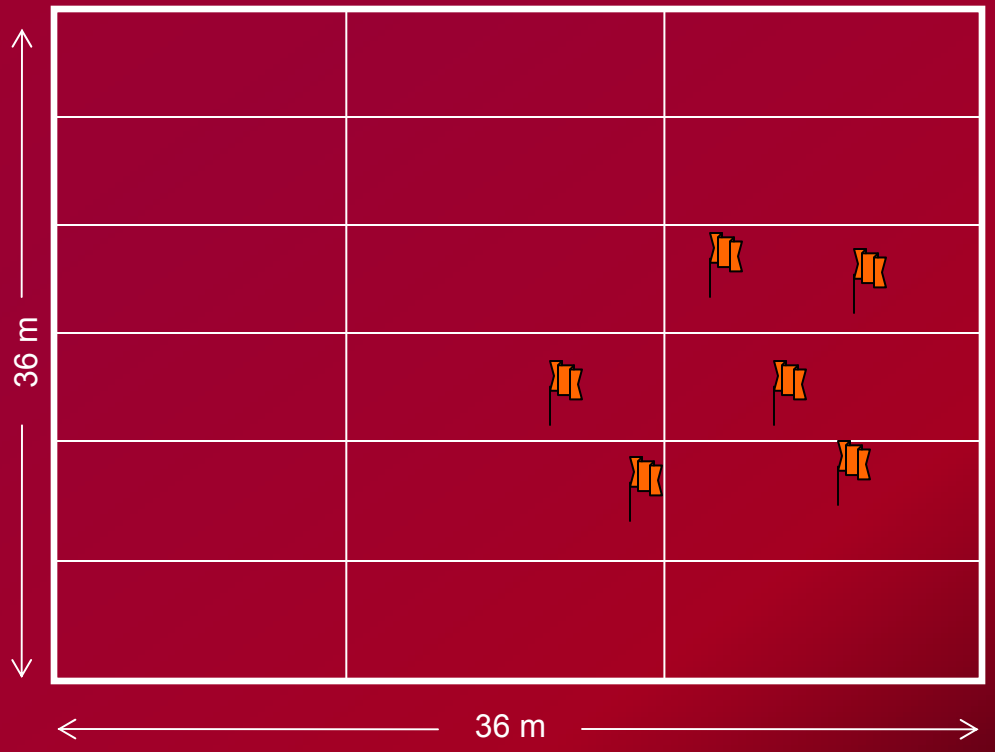
(NPS/BLM lands)

- Threecorner milkvetch distribution
- ★ Threecorner milkvetch sites (3 sites)



* Copied from - “A conservation management strategy for nine low elevation rare plants” (County CMS)

Threecorner milkvetch monitoring design



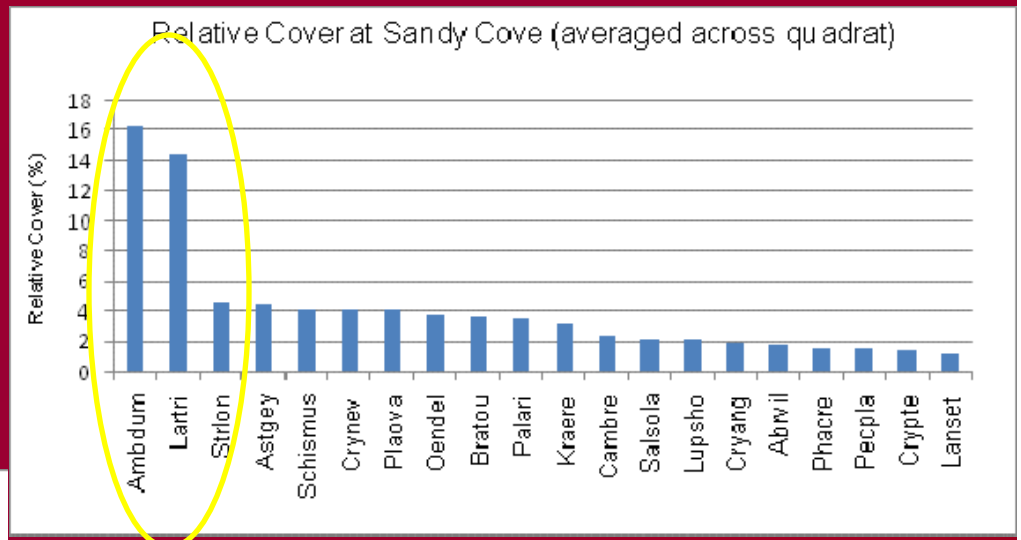
Grid-cell method

- 36 x 36m grids, 18 quadrats each
- Target species and community ecology data collected

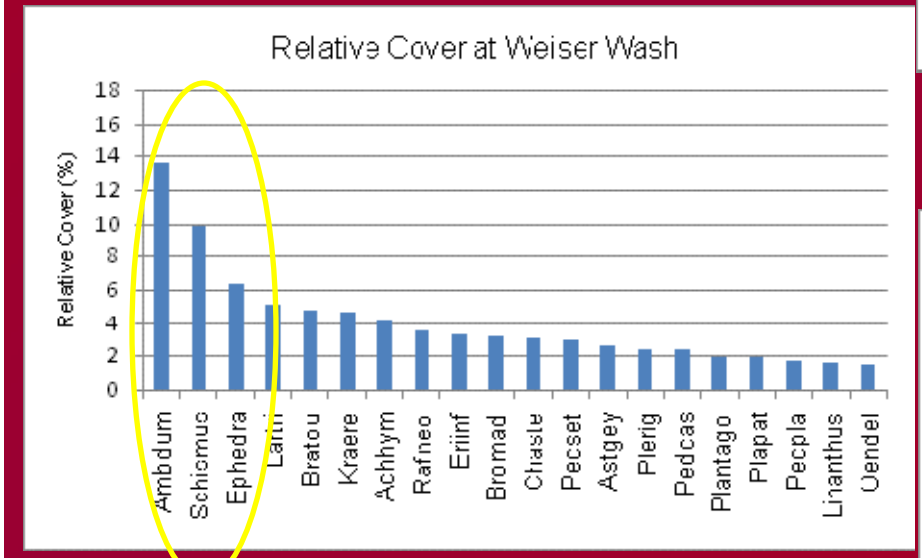
Results

Relative Cover (2009)

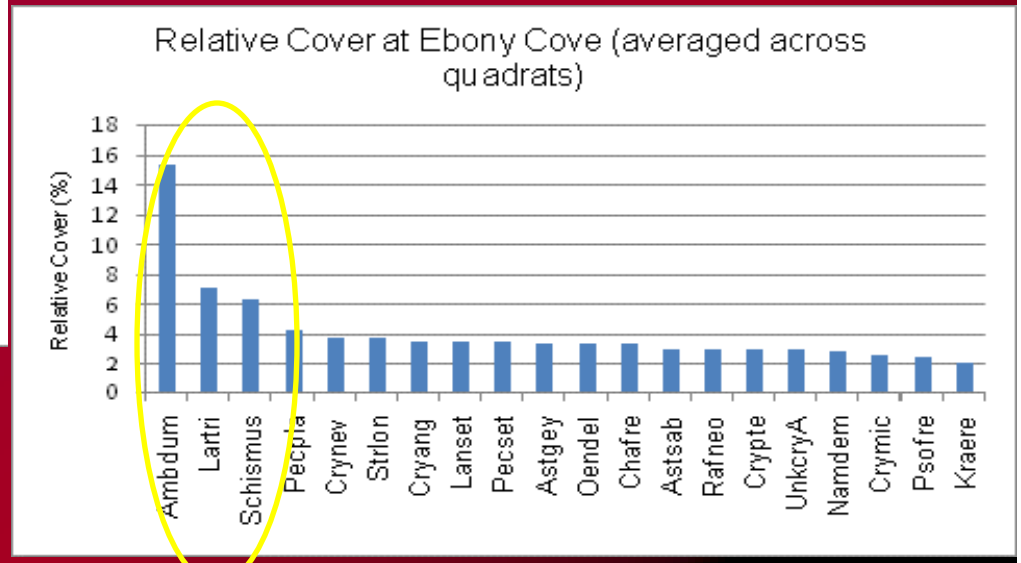
- Top 20 species shown from each site
- Annuals and perennials included



Ambrosia dumosa, Larrea tridentata, Streptanthella longirostris



Ambrosia dumosa, Schismus sp., Ephedra sp.



Ambrosia dumosa, Larrea tridentata, Schismus sp.

Results

Threecorner milkvetch abundance:

2009

- Weiser Wash – 78 plants (2 grids)
- Sandy Cove – 2, 027 plants (8 grids)
- Ebony Cove – data are currently being analyzed

Sticky buckwheat (*Eriogonum viscidulum*)

Unique characteristics

- Sticky surface near the base of the plant usually covered by sand particles
- Very fine flowering stalks gives delicate appearance
- Habitat – open areas, loose sand

Sticky buckwheat

Threats at LMNRA:

1. Invasive species

- *Sahara mustard* – crowds out natives, germinates early in the season, prolific seed producer
- *Salt cedar* – chokes habitat, degrades soil, depletes soil moisture
- *Tumbleweed* – chokes habitat, depletes soil moisture


Sahara mustard


Tumbleweed


Salt cedar stand

Sticky buckwheat

2. Trespass cattle and burros

- Trampling and grazing
- Overall habitat degradation


Photo: Fredrik Sandberg

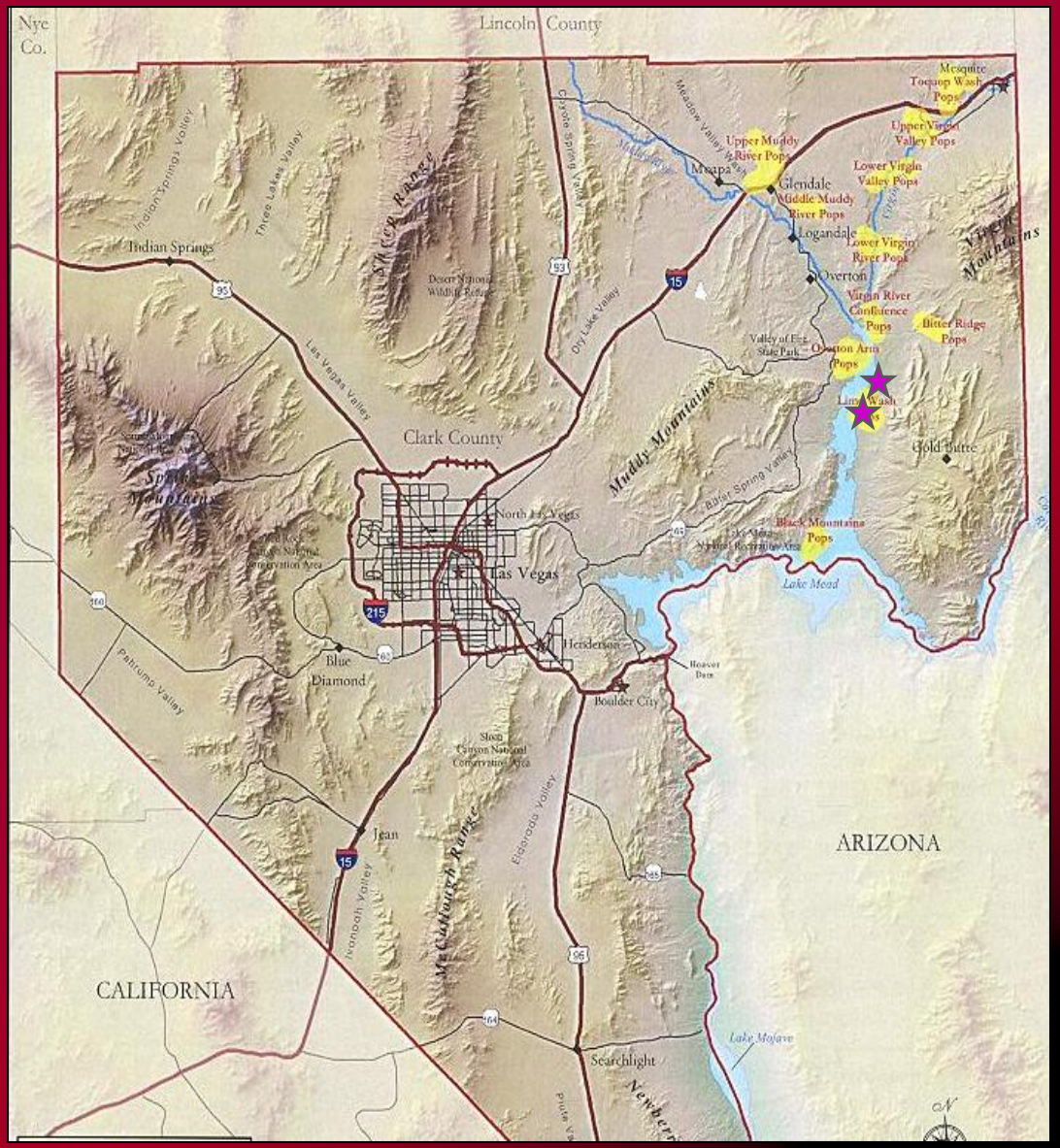

Photo: Nancy Hendricks


Photo: Joe Barnes

Sticky buckwheat Monitoring Sites

(NPS lands)

- Sticky buckwheat distribution
- ★ Sticky buckwheat sites

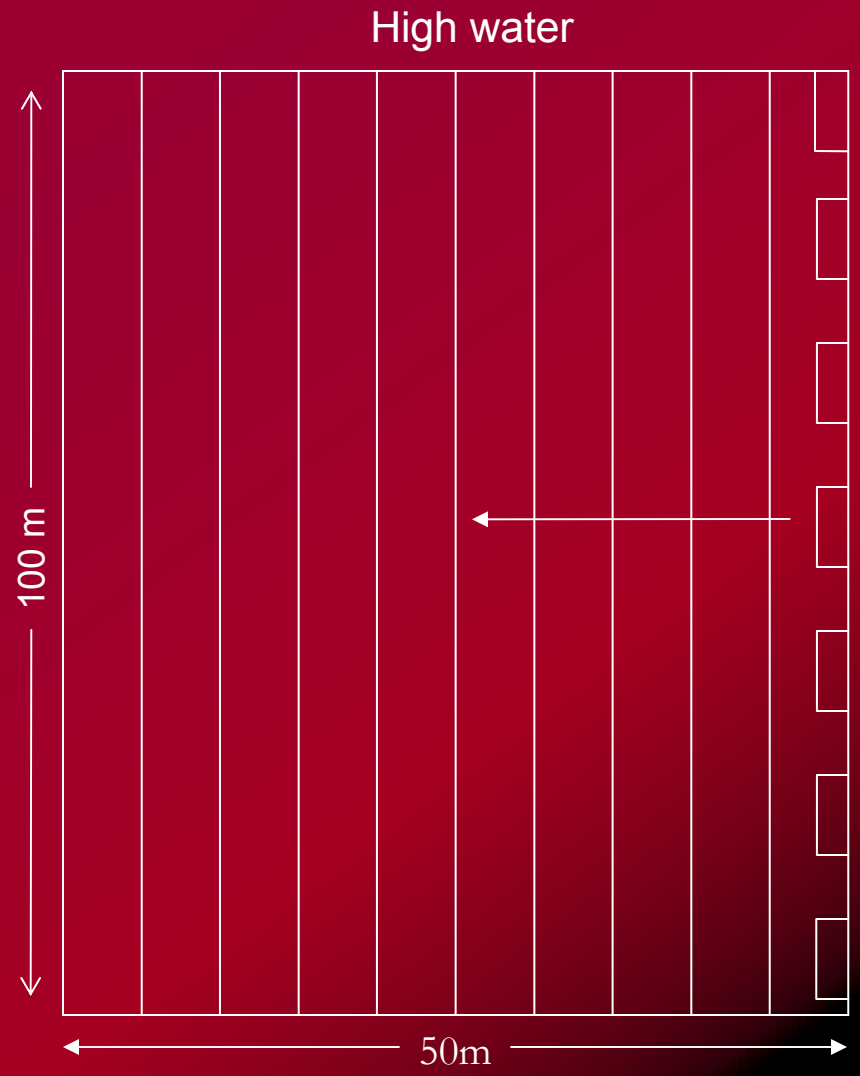


* Copied from - “A conservation management strategy for nine low elevation rare plants” (County CMS)

Sticky buckwheat monitoring design

Systematic sampling

- 1 Macroplot per site (50x100m)
- 10 - 1 x 100m transects
- 70 - 1 x 10m quadrats
- CE data and rare plant data were collected using same quadrats



Sticky buckwheat

Challenges:

1. Difficult Terrain

- Landscape tiered
- Steep and rocky
- Cattle presence
- Invasive species

Glory Hole

Lime Cove

Sticky buckwheat

2. Plant Morphology

- Lime Cove – plants ranged from ~ 5- 40cm ht (we identified 3 size classes)
  - → Original quadrat size (5 x 20 m) - we found ~1,200 size class 1 (≤ 6cm) plants in one quadrat
  - → Modified design to accommodate smaller quadrat size (1 x 10m)

Results

Currently analyzing 2009 data…

Thoughts from the 2009 season

- Should consider modifying design because of damage to habitat by investigators (difficult terrain)
- New design should consider sticky buckwheat habitat on BLM lands and not be specific to shoreline habitat

Weather Data

- New HOBO rain/temp/rh gauges were installed in 2008 and 2009 at 12 rare plant monitoring sites
- Older HOBO rain and temperature gauges from prior field studies remain installed at 4 Las Vegas bearpoppy sites (1 of these sites overlaps with one of the current monitoring sites)

Rare Plant Monitoring

This fall…

- Collect soil samples
- Soil compaction data (gypsum sites)
- Crust depth and cover (gypsum sites)

Rare Plant Inventory Project

Ten MSHCP Watch Species:

- Mokiak milkvetch
- Virgin River thistle
- Unusual catseye
- Hoffman's cryptantha
- Chalk liveforever
- Silverleaf sunray
- Las Vegas buckwheat
- Barrel cactus
- Beaverdam breadroot
- Rosy twotone beardtongue

Mokiak milkvetch

Virgin River thistle

Barrel cactus

LV buckwheat

Silverleaf sunray

Rosy twotone beardtongue

Chalk liveforever

Beaverdam breadroot

Project Goals and Objectives:

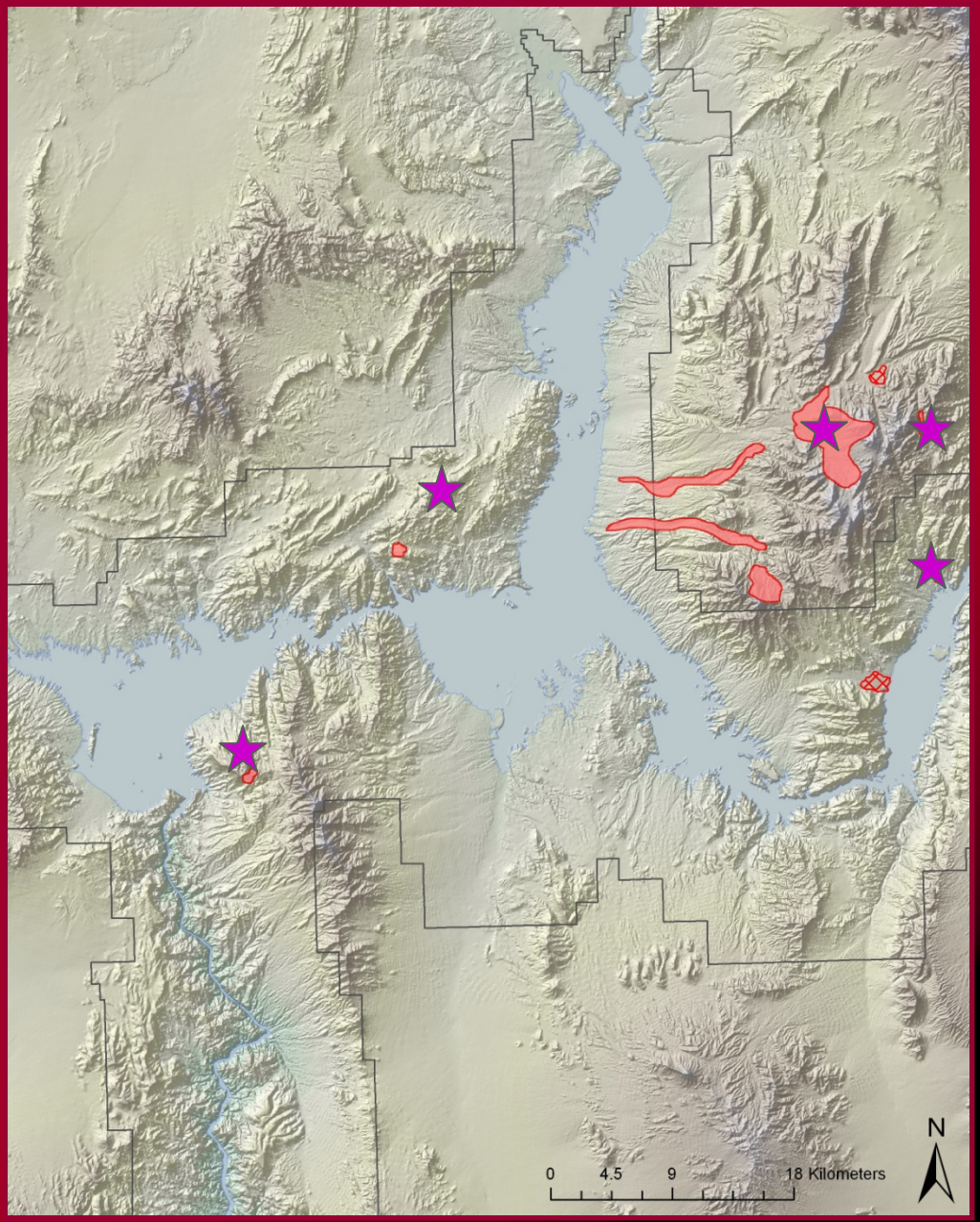
- Gain information about the locations and population sizes to facilitate conservation
- Baseline habitat descriptions
- Ecological community assessments
- Prioritize these species and their habitats for status re-assessments

Project Methods:

- Inventories conducted throughout LMNRA and surrounding areas
- Populations estimated at each location
- Associated species recorded
- 20% survey effort conducted in areas with no known occurrences of each species

Mokiak milkvetch - *Astragalus mokiacensis*

- These areas represent known and potential locations based on suitable habitat
- ★ Areas surveyed



Virgin River thistle– *Cirsium virginensis*

Taxonomic status has been resolved……

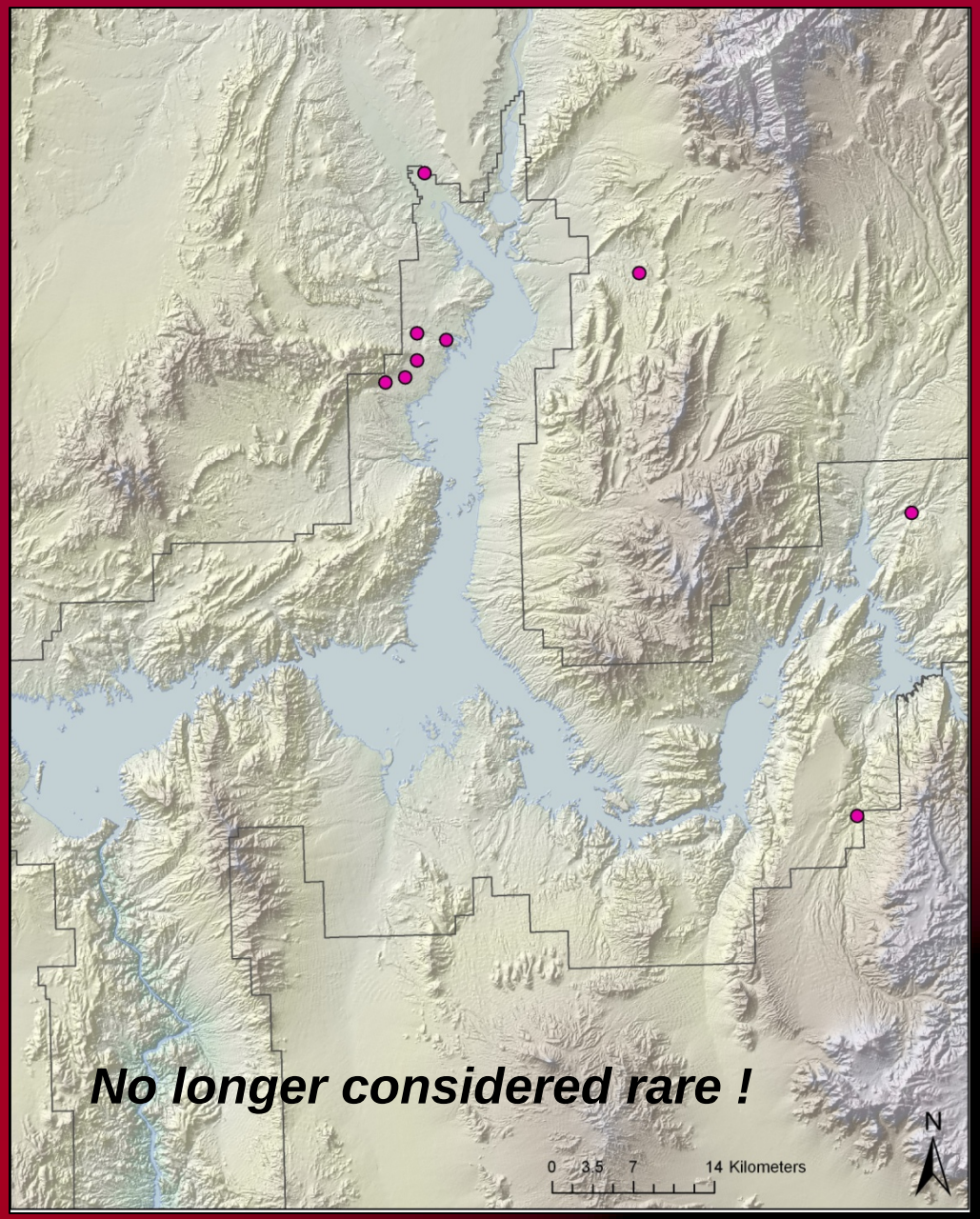
Cirsium virginensis is synonymous with *C. mohavense*

North American Flora - David Keil

- The only character used to distinguish the two (Utah Flora) was life span of the plants: biennial (*C. mohavense*) versus perennial, spreading by creeping roots (*C. virginensis*).
- Distinction of two taxa on the basis of duration is impractical and probably inaccurate.
- The plants are very similar or overlap extensively.

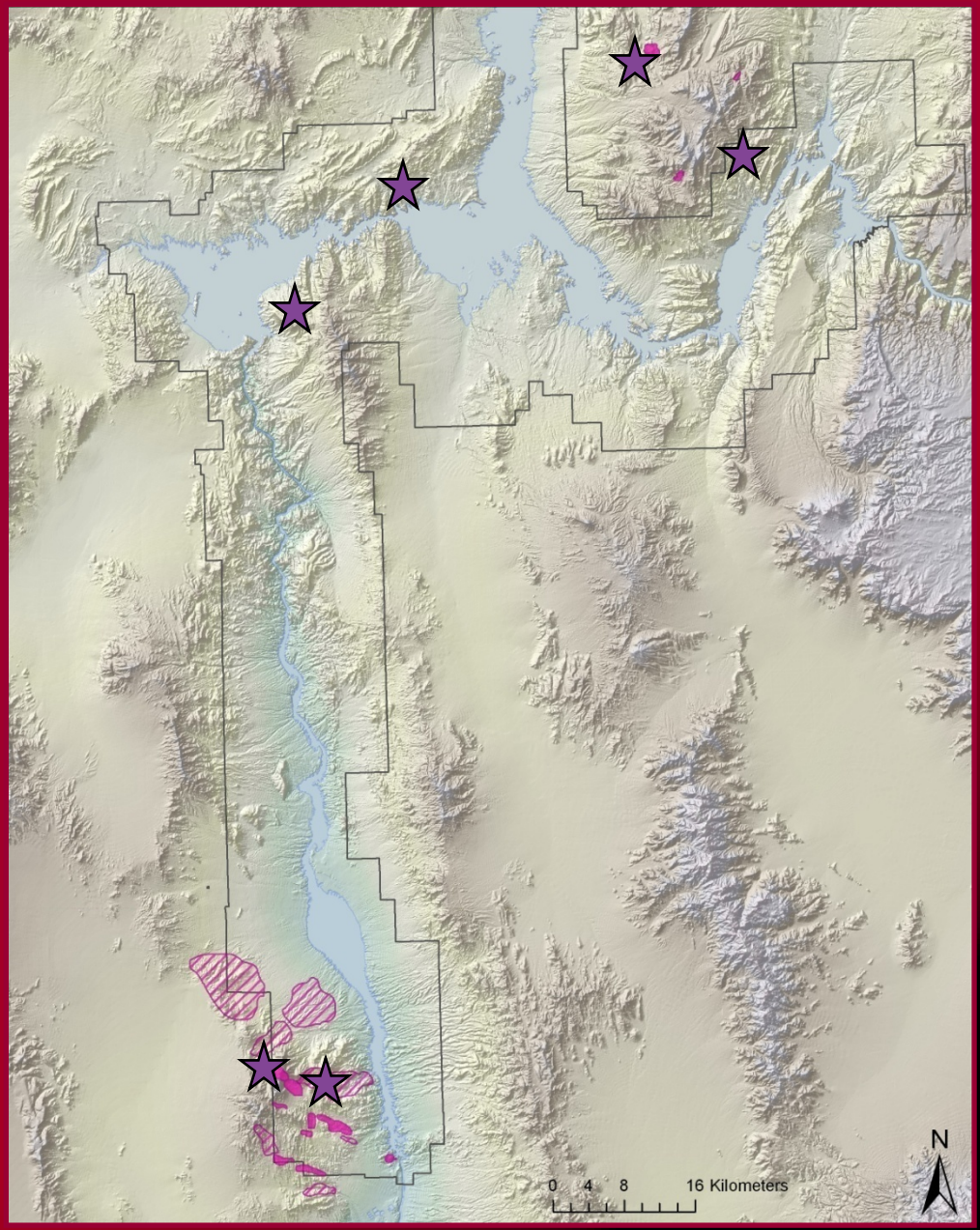
Mojave thistle– *Cirsium mohavense*

- Mojave thistle locations at Lake Mead NRA (and adjacent areas)



Chalk liveforever – *Dudleya pulverulenta*

- Highlighted areas represent known and potential locations
- Areas surveyed



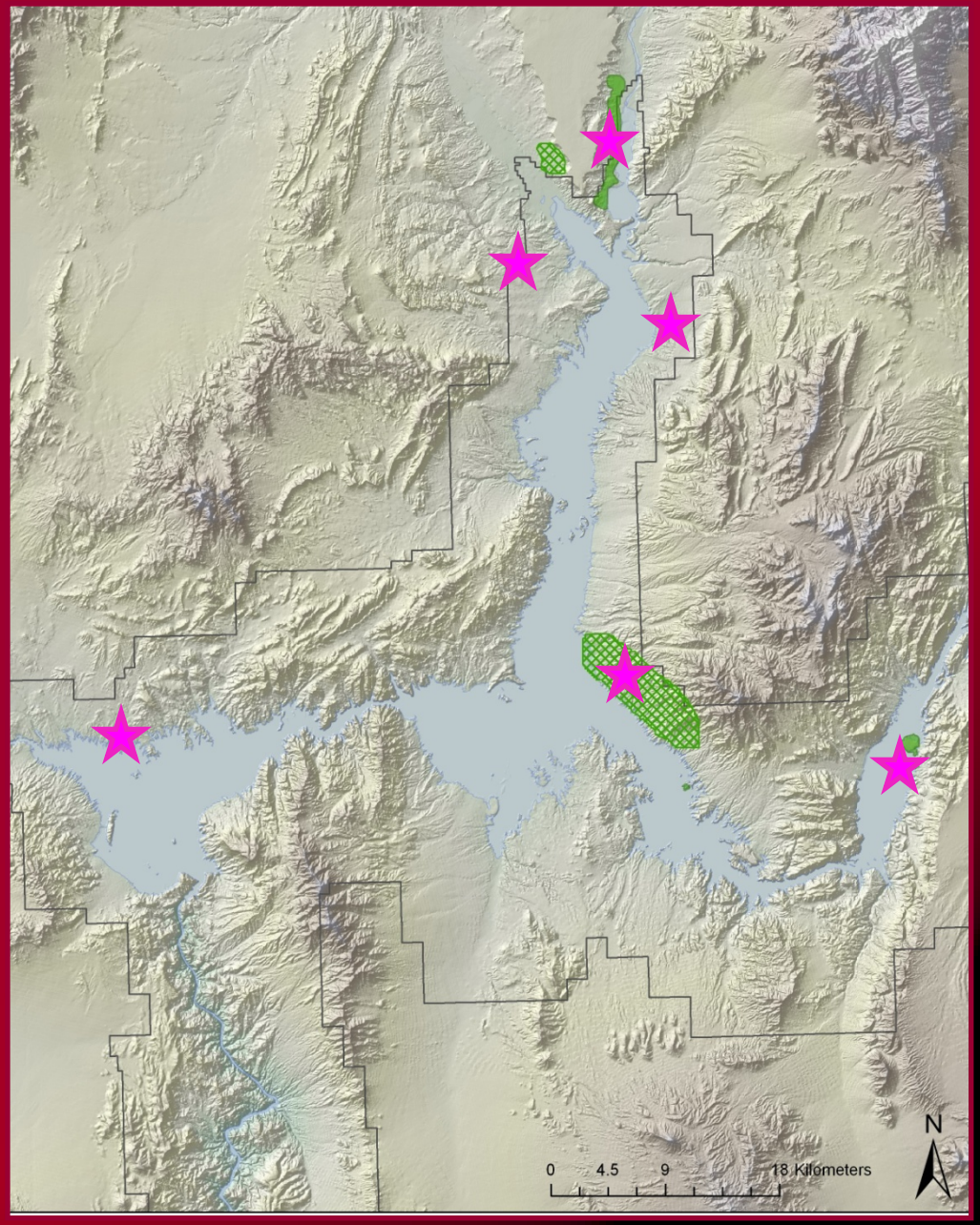
Sunray – *Enceliopsis argophylla*

- Mapping is ongoing
- 167 gypsum patches supporting sunray identified so far
- New patches recorded
- Abundant overall

Beaverdam Breadroot – *Pediomelum castoreum*

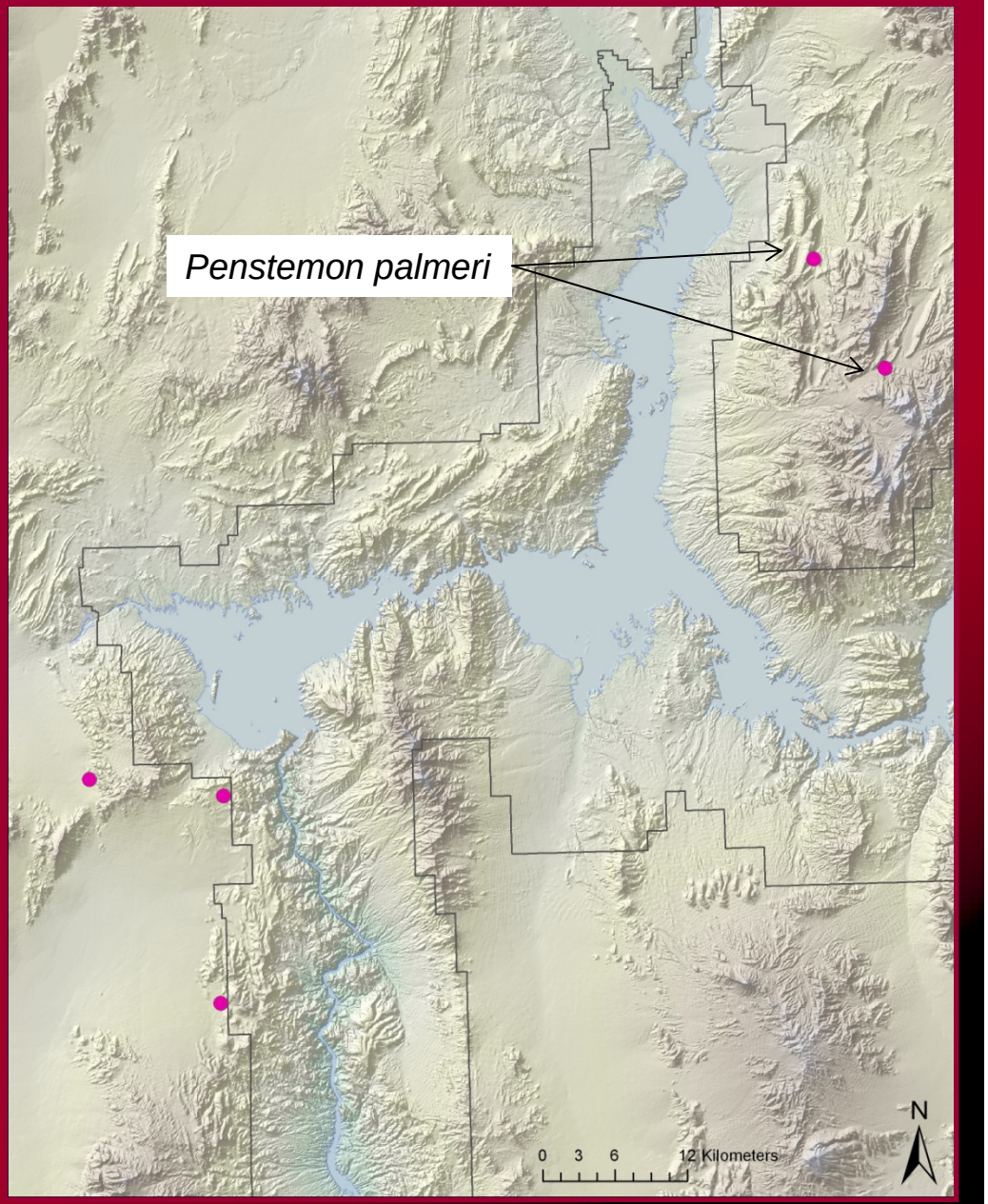
Highlighted areas represent known and potential locations

★ Areas surveyed



Rosy two-toned beardtongue – *Penstemon bicolor* ssp. *roseus*

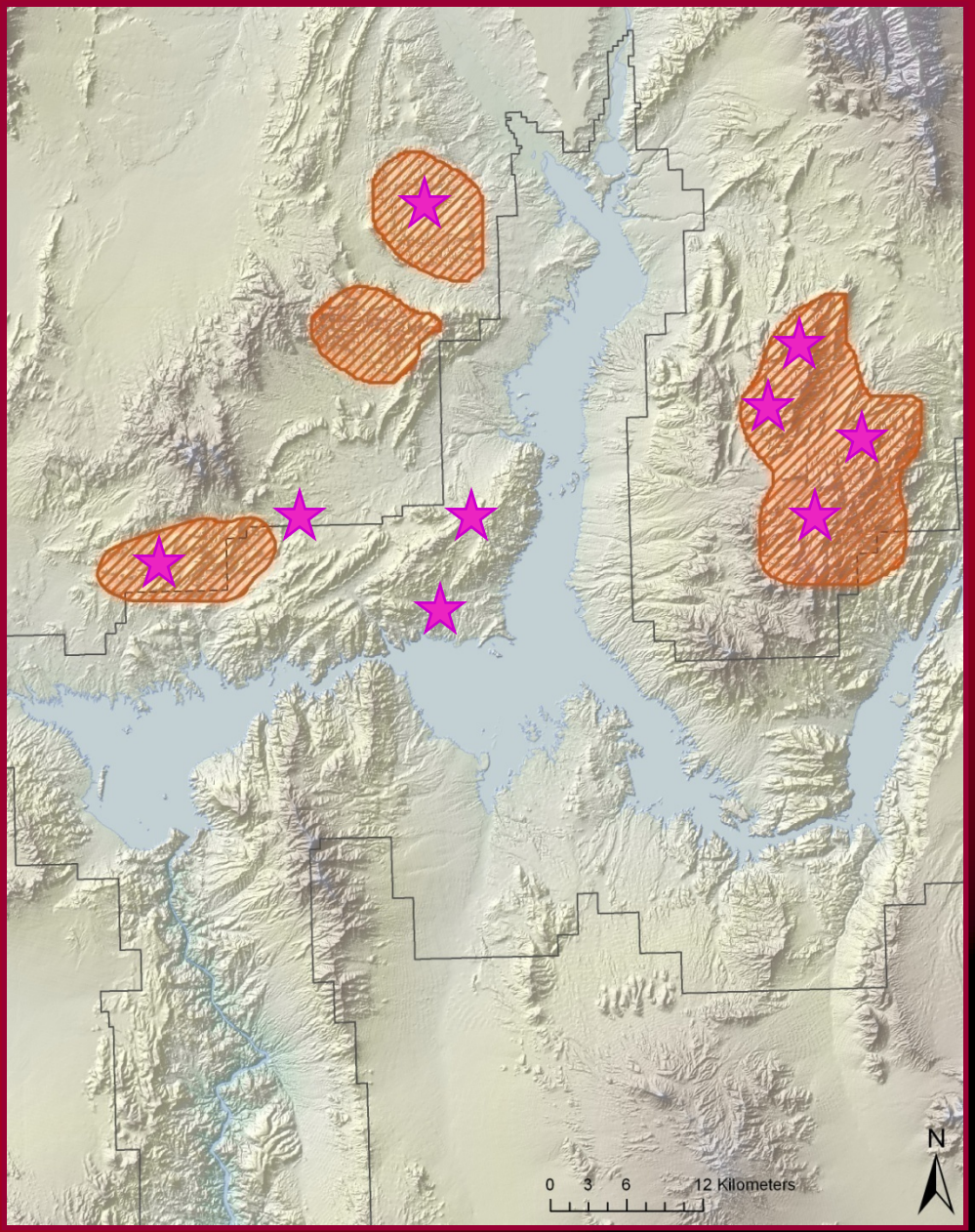
- Survey areas



Las Vegas buckwheat – *Eriogonum corymbosum* var. *nilesii*

Potential habitat

Survey areas



Barrel cactus – *Ferocactus cylindraceus* var. *lecontei*

Taxonomic status has been resolved……

- The varieties recognized by L. D. Benson (1982) are not consistently distinguishable (Flora of North America, 2007).

Our results likely support this…

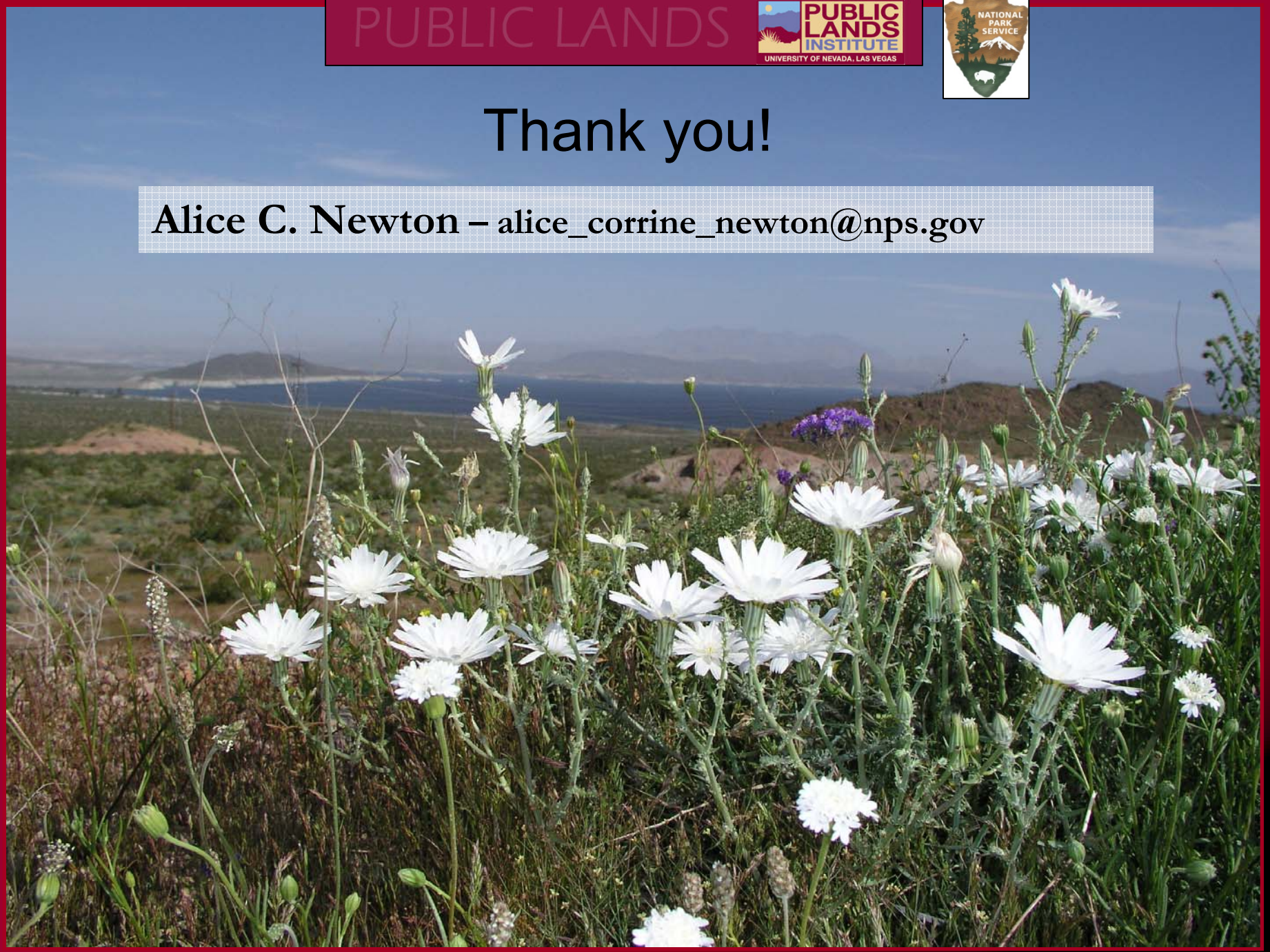
- 42 individuals evaluated from high (≥700m) and low elevations (<700m)
- Based on our observations, there were no significant differences between measurements from plants at high and low elevations (data are not yet analyzed)

Hoffman's cryptantha – *Cryptantha hoffmannii*

- Surveys were centered around suitable habitat (dry, rocky, open slopes on volcanic soil) plus additional habitat where it is not known to occur.
- No new populations found.

Unusual catseye – *Cryptantha insolita*

- Possibly extinct
- Surveys are centered around suitable habitat (white alkaline flats and hillsides plus additional habitat where it is not known to occur.
- No new populations found.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