Palmers Chipmunk Ecology Project

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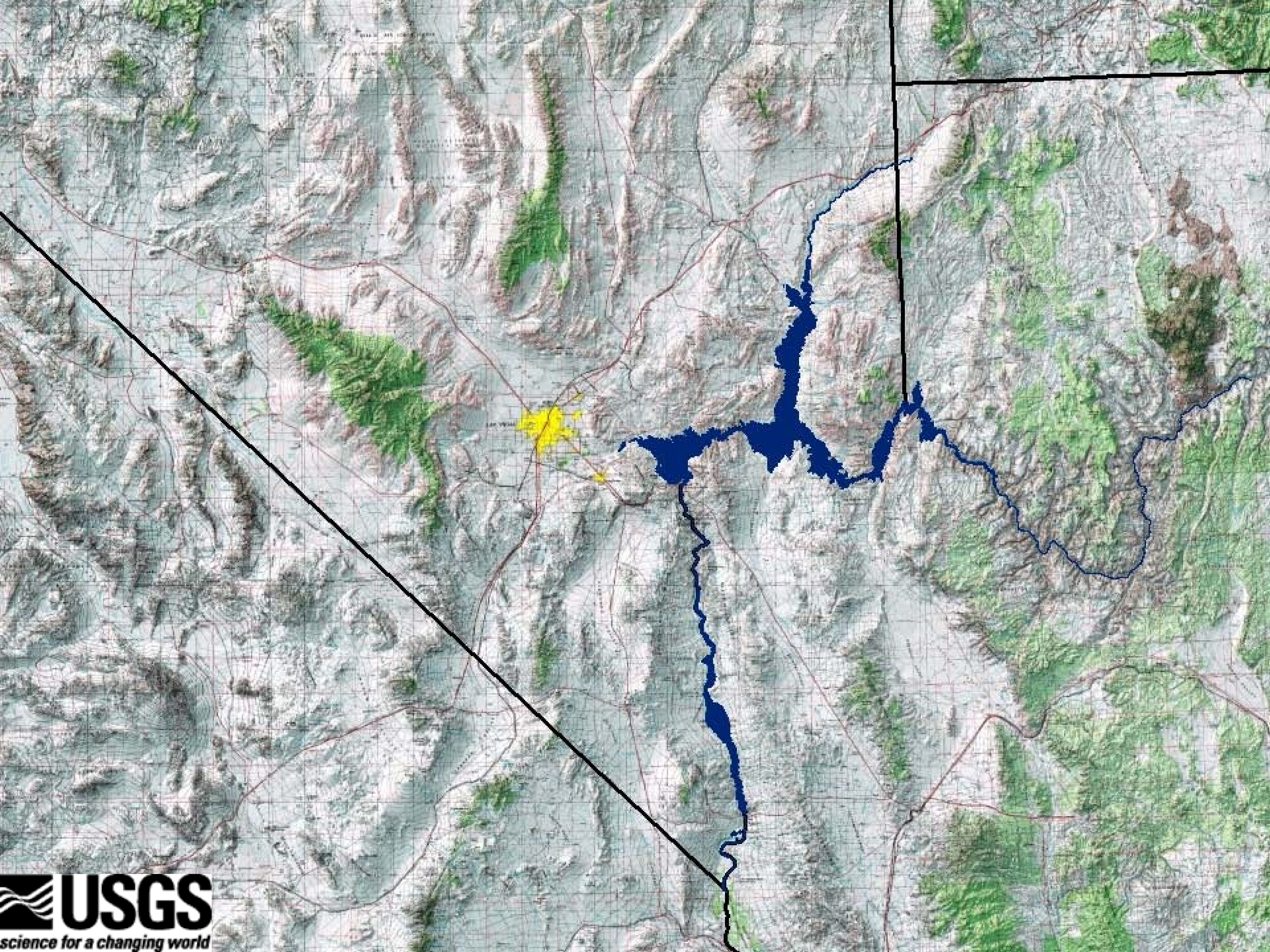
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Tamias palmeri

- Diurnal Ground squirrel
- Hibernator
- Food
- Seed disperser
- Prey species
- Social structure

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Broader Justification

- A Unique Island in a Sea of Desert
- Contribution to Biodiversity
- Growing Human Impacts

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Earlier Development: Research conducted by UNLV and Nevada Division of Wildlife from (Before) 2000 to 2002.

- Abundance estimates occurred across 14 randomly placed grids of 3 hectares each (8 used for analyses)

- Estimated habitat variable correlations with relative abundance and occurrence

- Preliminary track plate comparison to relative abundance

- Preliminary GIS models developed from results

Earlier Study Results

- Abundance between 2 - 45 animals per hectare
- Palmers' chipmunk abundance positively correlated with lower slopes and greater shrub cover
- Potential positive correlation with water sources
- Preliminary GIS models developed predicting areas of greatest abundance and survivorship

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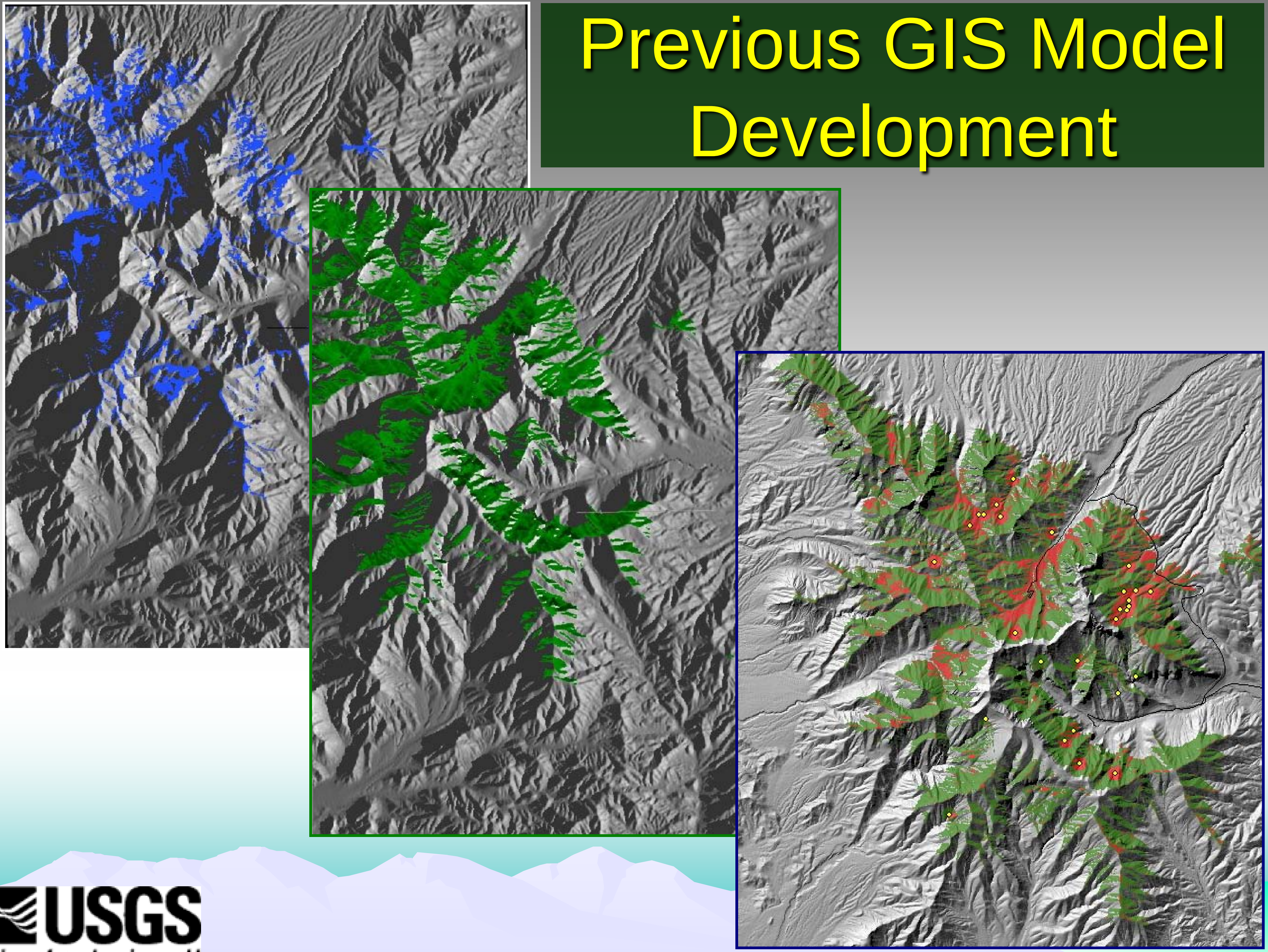
Previous GIS Model Development



Moving from past work to the present project

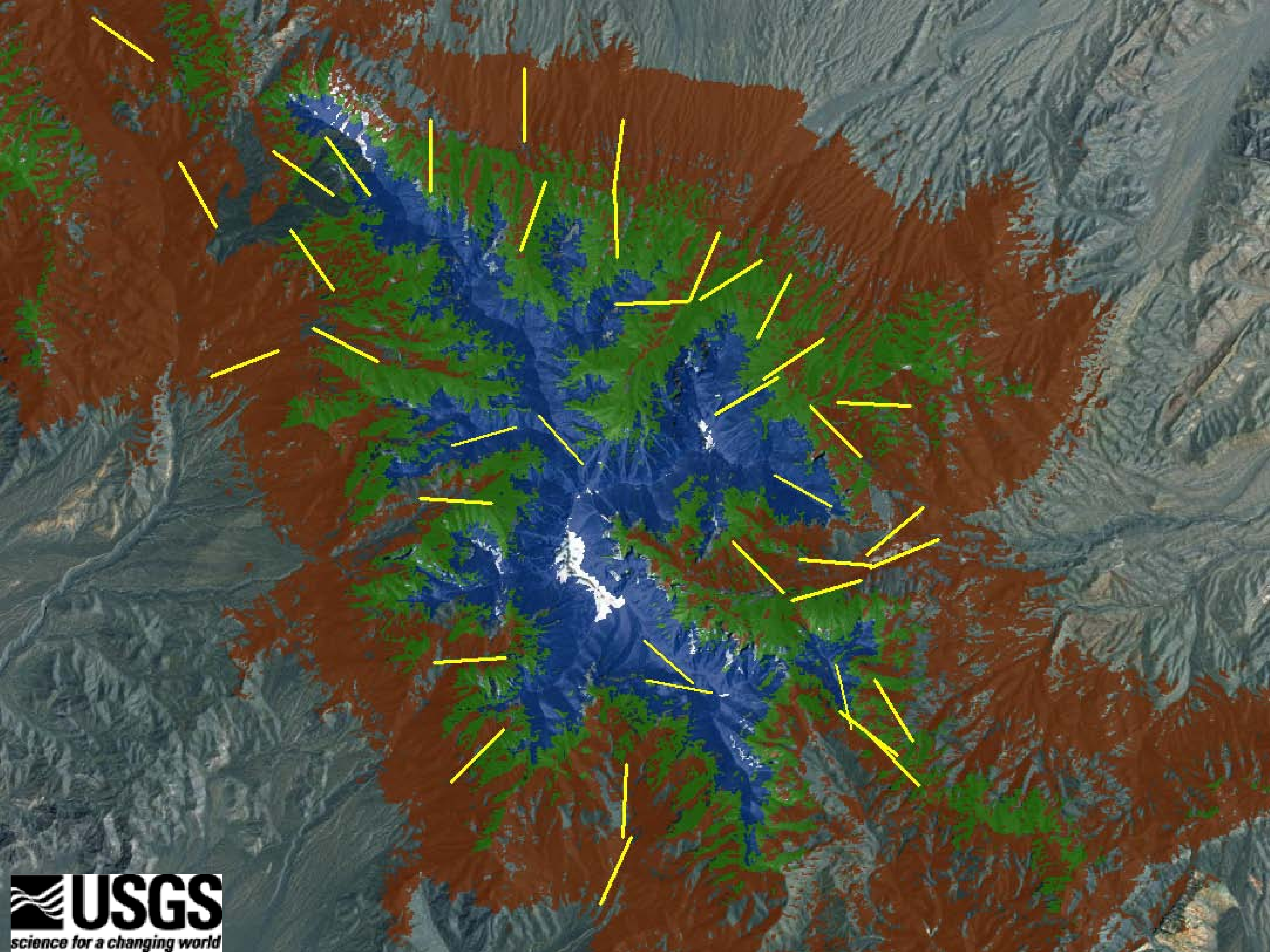
- Previous findings allow us to directly address hypotheses about Palmers chipmunk conservation

- Present Study…..
  - What is the actual distribution of this species?
  - What is the fundamental niche? (Macrohabitat modeling)
  - How do specific topographic and habitat components affect population size and survival? (Realized niche or Microhabitat analyses)
  - What is the potential of GIS technology to both predict species occurrence and formulate a conservation plan?
  - Can track plates be used to estimate relative abundance instead of trapping?

Methods - Distribution

- Distribution
- Use of vegetation transition zones
- Genetic identification of sympatric zones between the 2 chipmunk species

- 35 2-km transects/year placed along vegetation transition zones, low elevation, and high elevation areas
- Locations (of both species) were mapped, underlying variables measured, distribution will be determined by a combination of elevation extent constrained by vegetation and/or topographical features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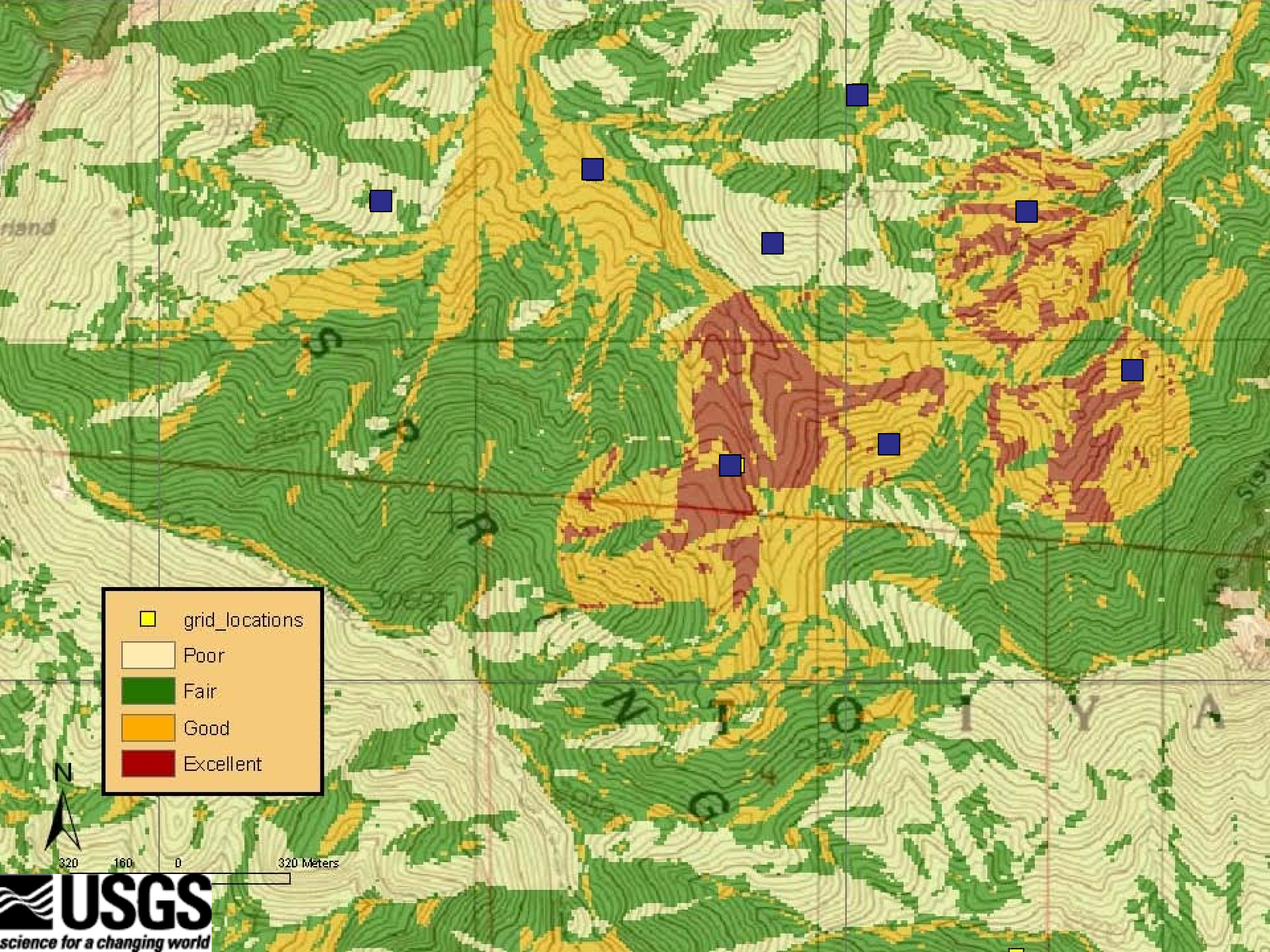
Methods – Population Parameters, Microhabitat, Track Plates

- 48 trapping grids over 2 years, each covering 3.6 hectares and trapped for 8 days + 4 days of track plates
- Vegetation and topographical variables surrounding each trap were measured (1,920)
  - Population size, survival, other population parameters
  - Analysis of realized niche (microhabitat)
  - Track plates tested against trapping data

Methodology

- Abundance estimated with a open-population model (Jolly-Seber)
- Probability of occurrence estimated using binary logistic regression
- GIS probability maps generated from Resource Selection Functions

Track Plates: Numbers of track plates with tracks were regressed on abundance estimates from Jolly-Seber analysis



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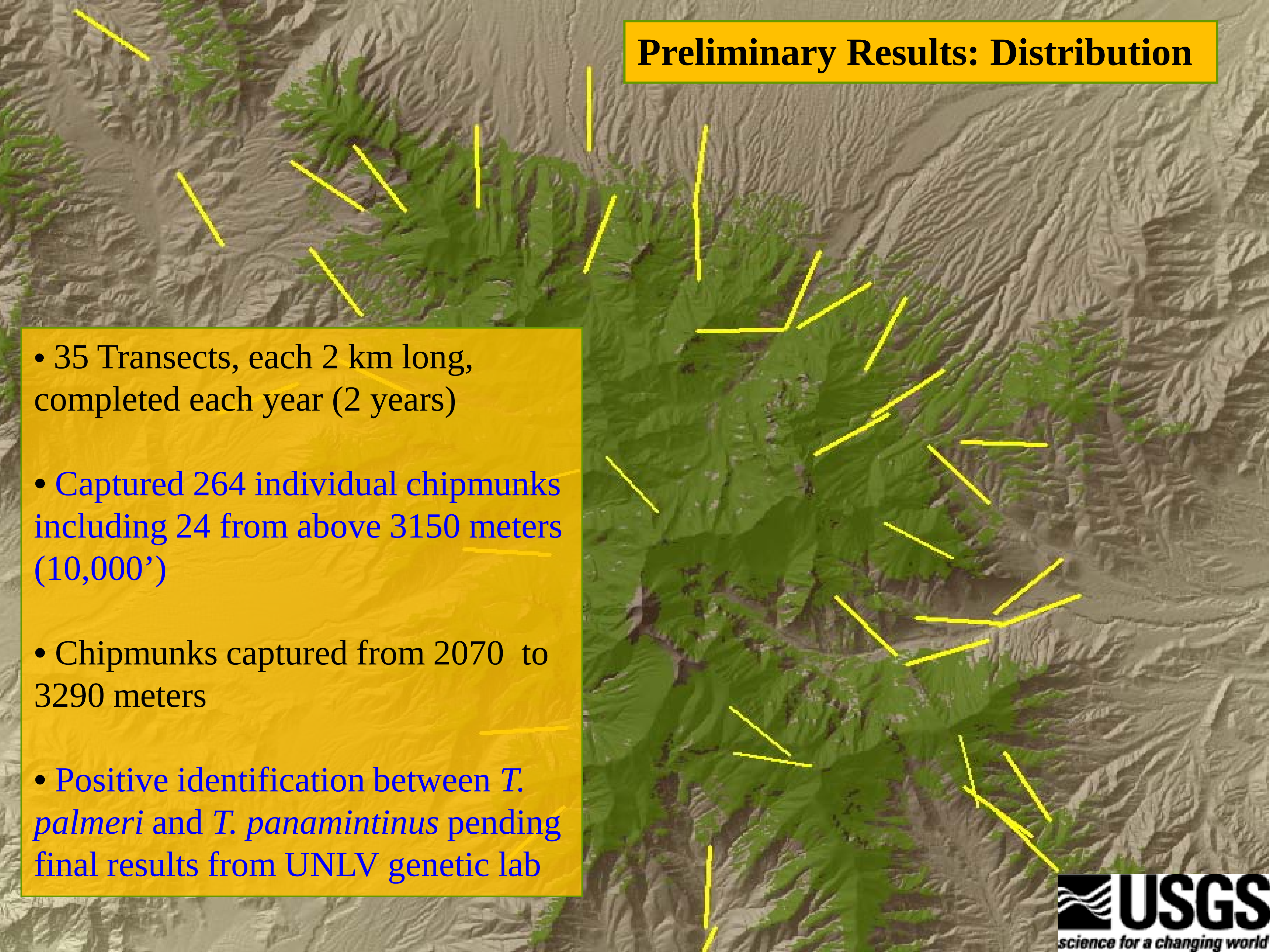
Preliminary Results: Distribution



- 35 Transects, each 2 km long, completed each year (2 years)

- Captured 264 individual chipmunks including 24 from above 3150 meters (10,000')

- Chipmunks captured from 2070 to 3290 meters

- Positive identification between *T. palmeri* and *T. panamintinus* pending final results from UNLV genetic lab

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RESULTS: Relative Population Abundance and Survivorship

- 48 trapping grids (24 per year), each covering 3.6 hectares of trapping area, completed across the range (> 172 hectares, 15,360 trap days)

- Chipmunks captured on every grid

- Average density of 14.7 animals per grid (SD 8.8, range 3.5 – 33.9)

- Average survival rate over the 8 day period was 0.849 (SD 0.10, range 0.601 – 1.0)

RESULTS: Relationships between Macrohabitat and Probability of Occurrence (Fundamental Niche)

- Strong ability to differentiate between *T. palmeri* and random locations in terms of tree cover type, aspect, slope, and distance to water

- Probability of chipmunk occurrence is increased by a factor of 7.7 when within the white-fir forest and by a factor of 6.9 when within ponderosa pine forest relative to the pinyon-juniper forests

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Results: Macrohabitat

- Starting at approximately 25% slope, probability of occurrence decreases by a factor of 0.36 with every 10% slope increase

- Northern aspects (< 90 º, > 270 º) increase probability by a factor of 1.34 relative to south facing aspects.

- The probability of occurrence is reduced by a factor of 0.18 for every 100 m increase in distance to dependable water (to a point)

- Greater population density contributed to increased survival rates, suggesting density dependent factors

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Results: Microhabitat (Realized Niche)

- Maturing white-fir and to a lesser extent, ponderosa forest (decreasing density of immature or understory fir trees) contributed to both increased population density and increased survival
- Increasing density of currant berry shrubs (*Ribes* spp.) also contributed to increased population density of *T. palmeri*


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Track Plates as an Alternative to Trapping

- Conducted correlation estimates between track plate numbers and population density estimates from trapping on 32 independent occasions across the 2 year study period (4,480 track-days)

- No correlation found (Pearson 0.104, P = 0.570)

Modeling

• Resource Selection Function model based on logistic regression analyses

• Slope, Distance, Tree cover type, and Aspect predictive of *T. palmeri* occurrence across the Spring Mountain range

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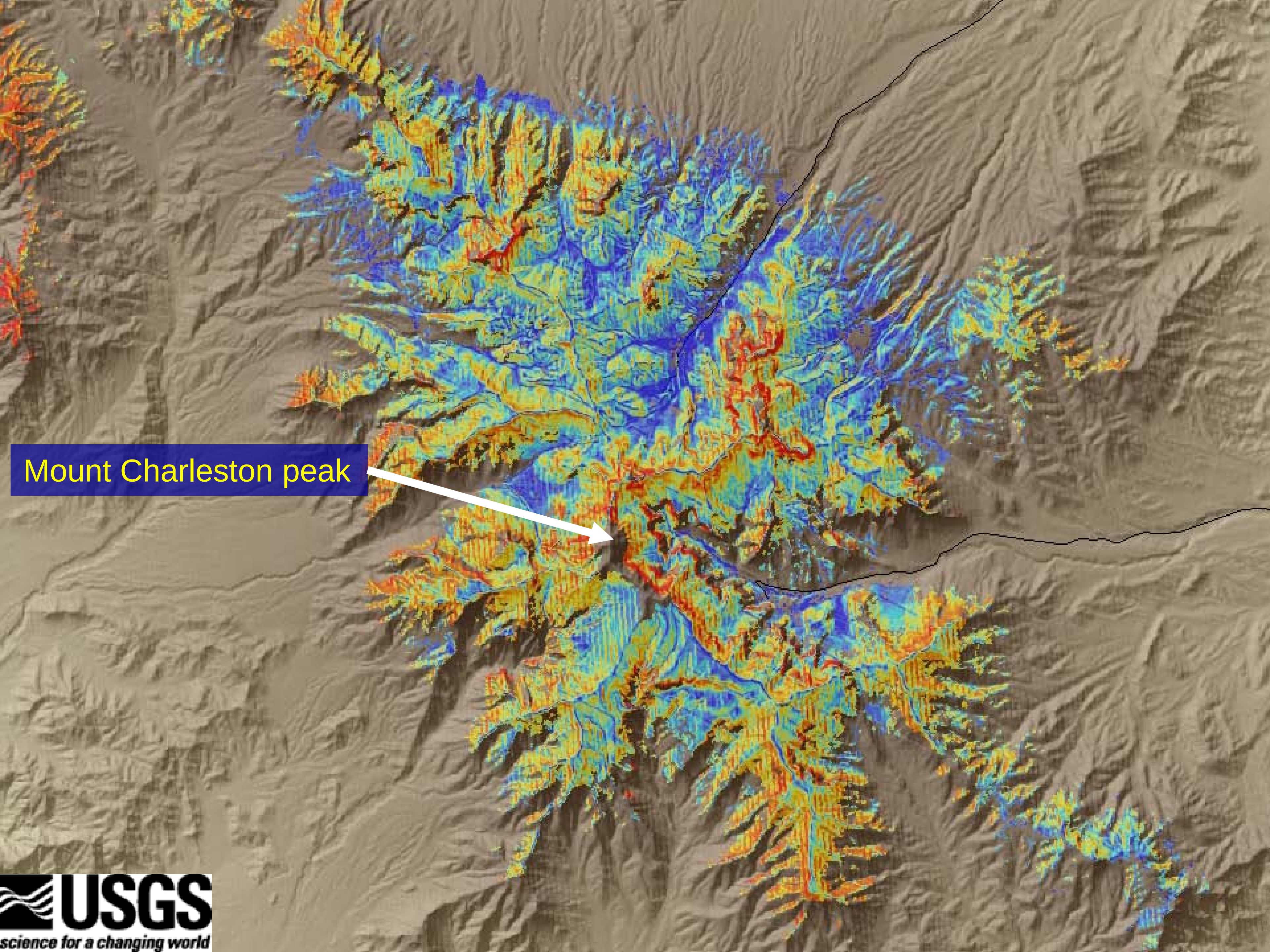
Mount Charleston peak
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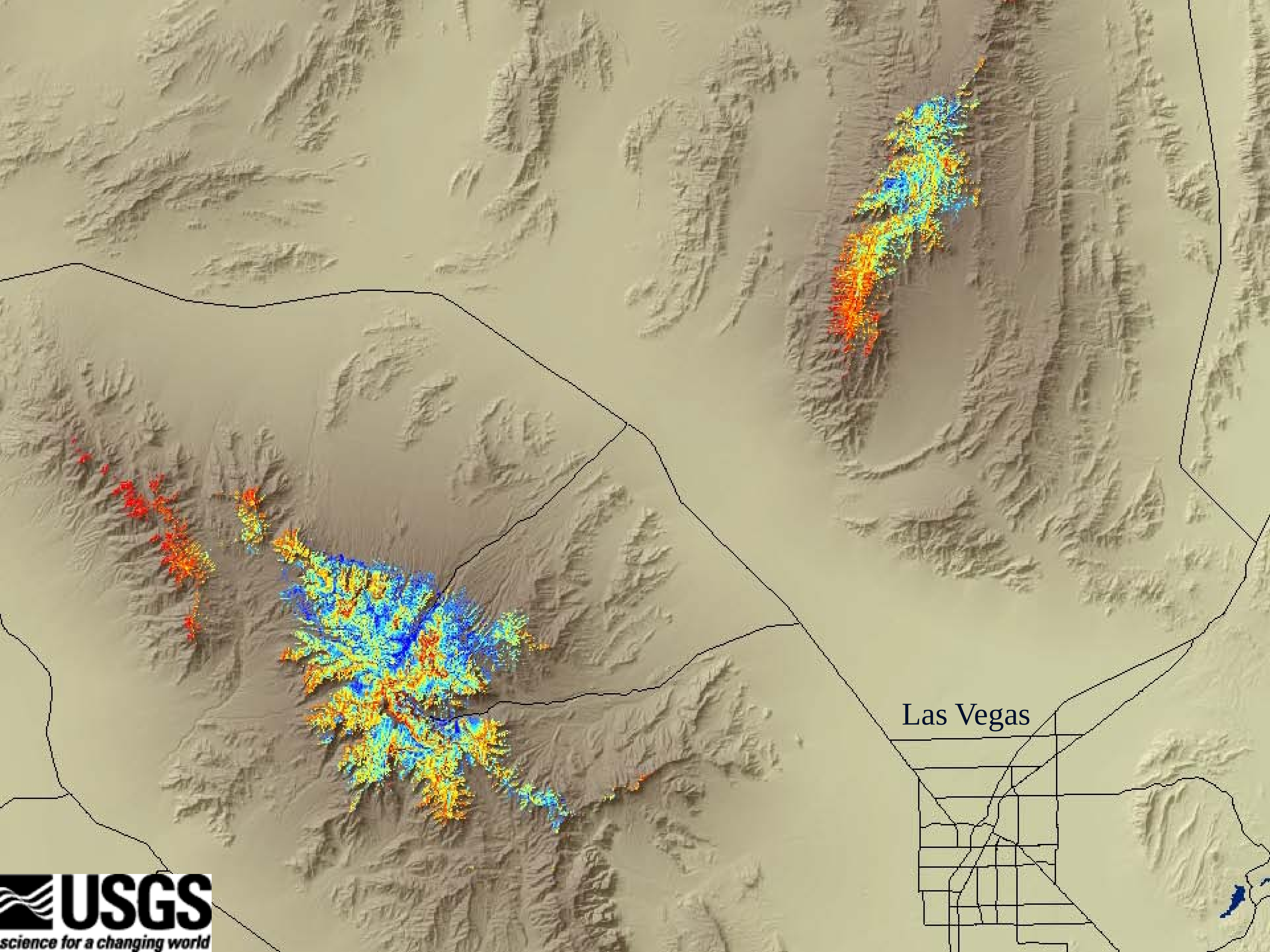

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Future Research

- How do the 2 isolated chipmunk species use the transition zones in terms of population parameters
- Interaction between species / habitat / recreation activities early and late in the active season
- Density dependent factors, effects of overwinter survival
- Predation……

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