Searching for a polar bear in a snowstorm: distribution of Arizona Black Rattlesnakes in southwestern New Mexico

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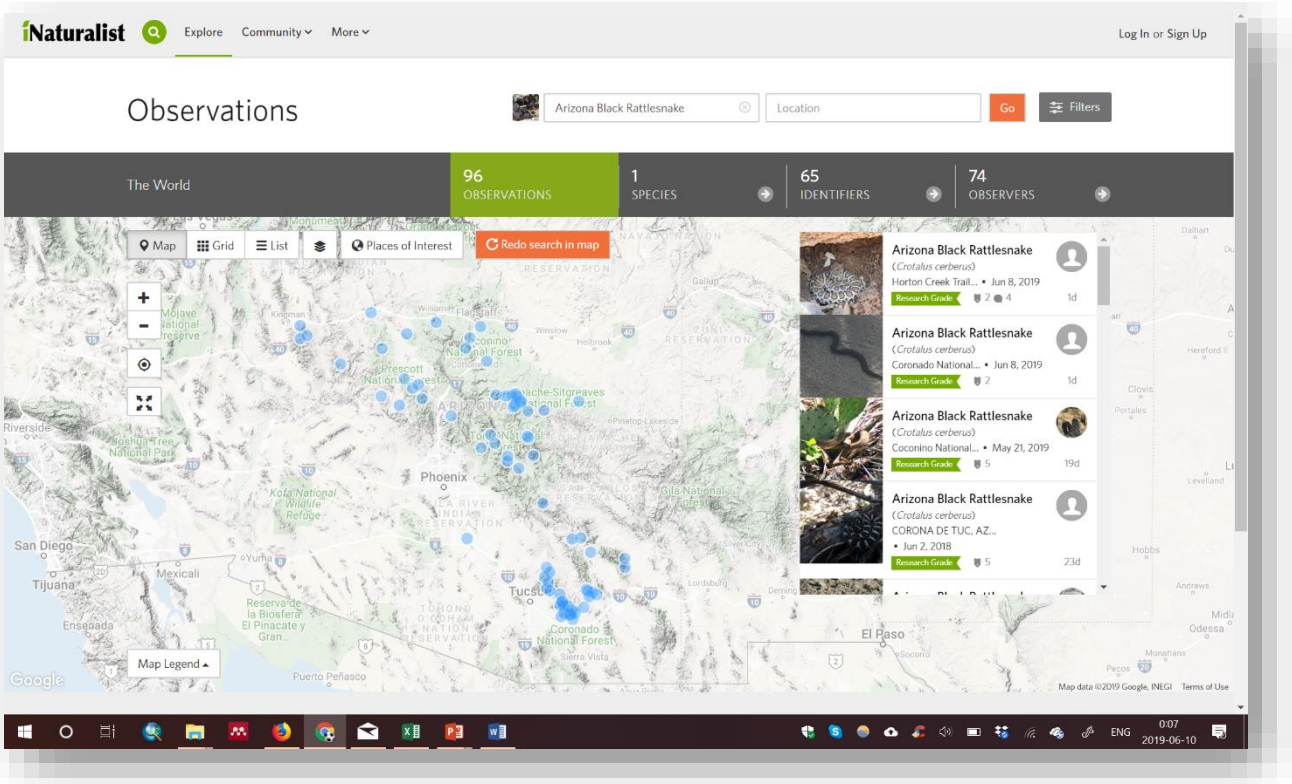
Introduction

- Value of natural history specimens enhanced by data
  - Availability: enhance and provide data to wide audiences
  - Quality: QA/QC and standardized data likely to be used repeatedly



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Value of natural history specimens

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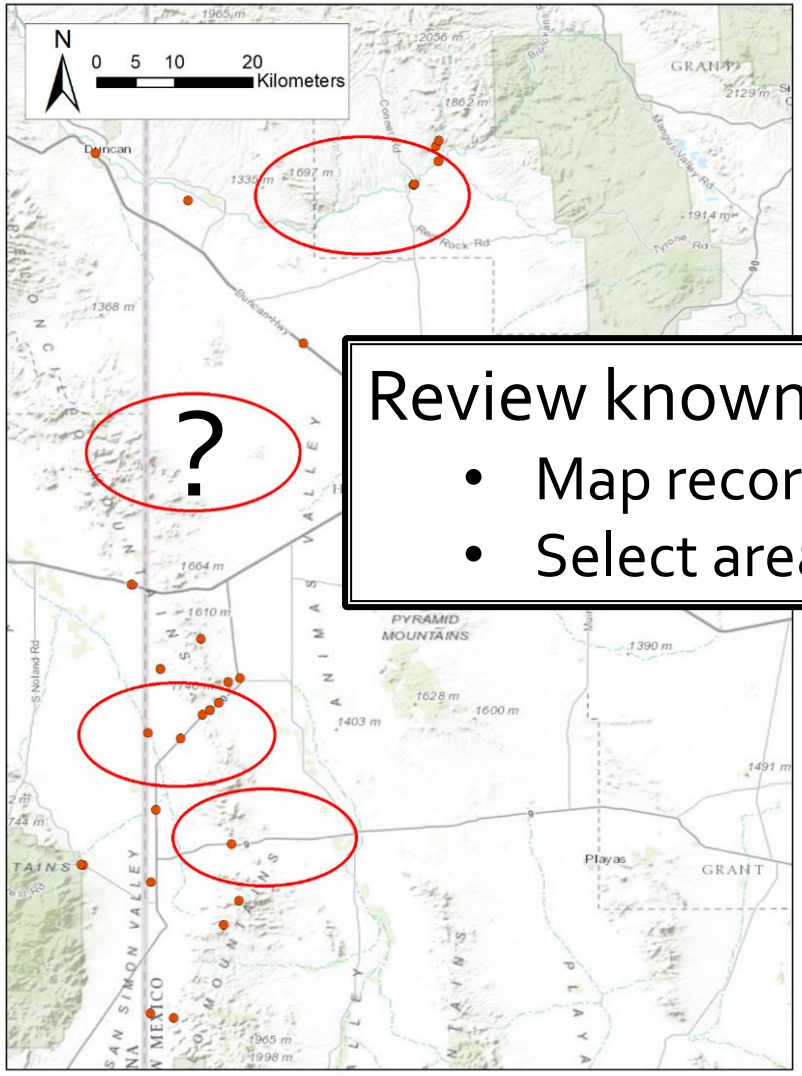
Example: Gila Monster in NM



Review known occurrences

- Map records and observations
- Select areas of interest

Value of specimens

1. Gather records from databases and aggregators
   - 173 data columns → 81 for analyses
2. Combine all data into one spreadsheet
   - Add data from several institutions → missing
3. Identify and fix data deficiencies
   - Contact collections and modify records
4. Map specimen data to identify areas for surveys
   - Use GIS software to import specimen data

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140 hours to produce a high quality map

Conclusions

- Research grade means a need to review specimens and associated data for errors and omissions
  - Accuracy of data associated with specimens potentially overlooked by both curators and users of specimens
  - Quality of data increases value & credibility of collections

There's a cost/burden to increase availability and quality of data associated with specimens → the challenge is to create effective mechanisms for data flows both ways

Arizona Black Rattlesnake

Crotalus cerberus

Κέρβερος – is the three-headed dog which guards the gates to the Underworld in Greek and Roman mythology

Coues (1875), in naming the original subspecies, notes "the great size to which it attains, the caliber of the body, and black color combine to render it particularly repulsive".

Arizona Black Rattlesnake

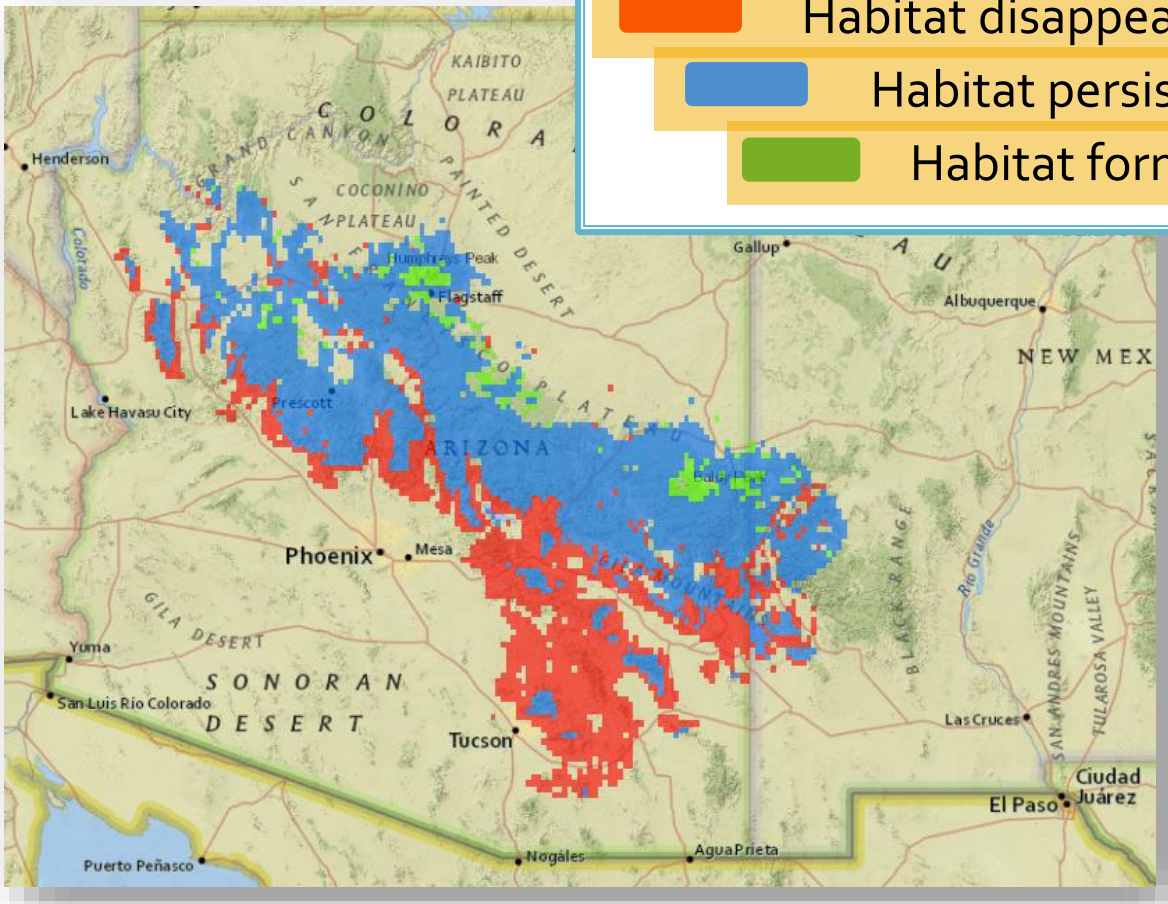
- Montane Rattlesnake
- Limited to AZ and NM
- Associated with pine-oak woodlands or chaparral
  - Volcanic outcrops and talus slopes (high)
  - Cool, moist drainages (low)

Arizona Black Rattlesnake

- Eats small mammals, birds and lizards
  - Juveniles rely on lizards
- Long-lived
- Social
  - All ages hibernate in large groups

Predicted changes

Baseline – 2099



From Van Riper et al. 2014

Predicted changes

- Potential losses of over 40% of suitable areas
  - Particularly for low-elevations
- Consistent with predictions for loss of overlapping distributions of ponderosa pine forests and pinyon-juniper woodlands

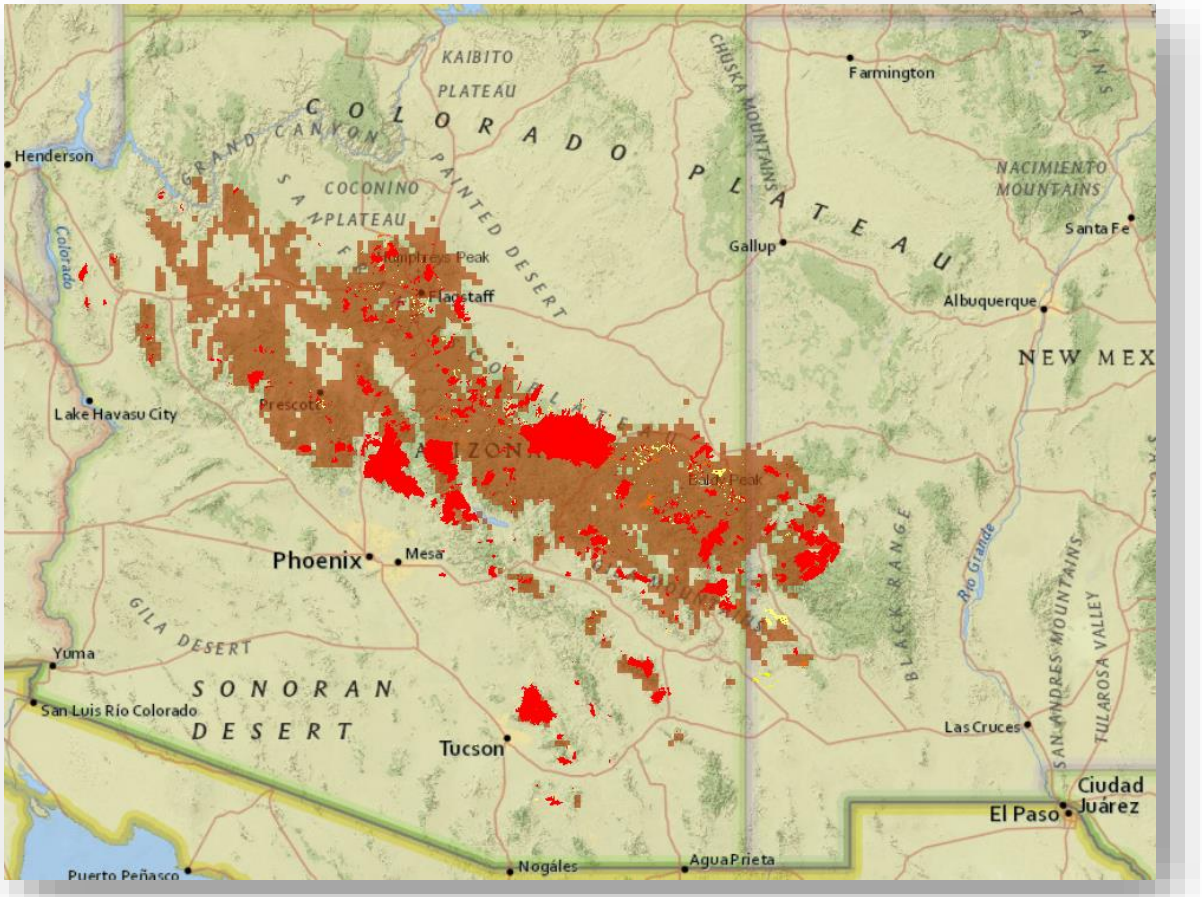
(Williams et al 2012, Nature Climate Change)

What about disturbance?

Red = Fire disturbance between 1999 and 2010

Fire and insect disturbance covers 12.7% of predicted area

By 2099



Disturbance data from LANDFIRE Program (www.landfire.gov)

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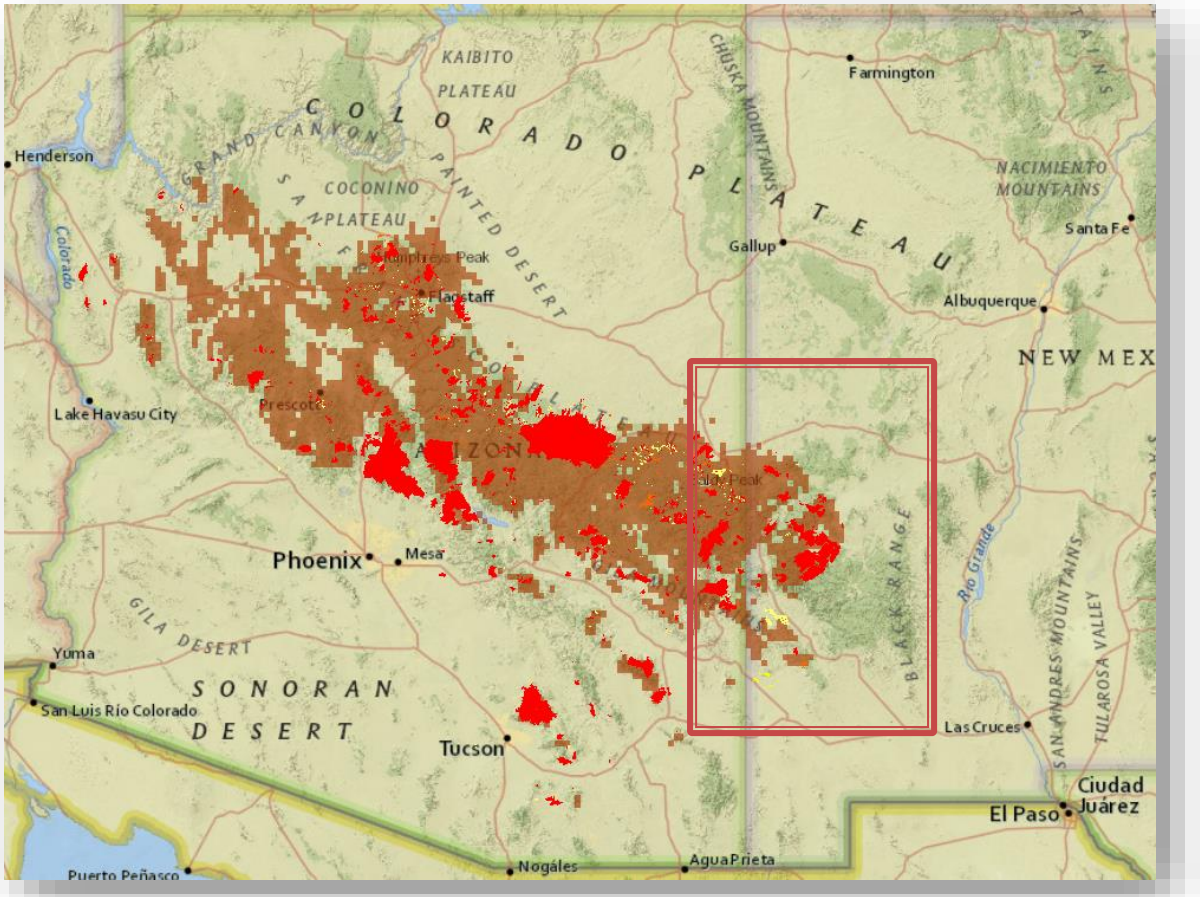

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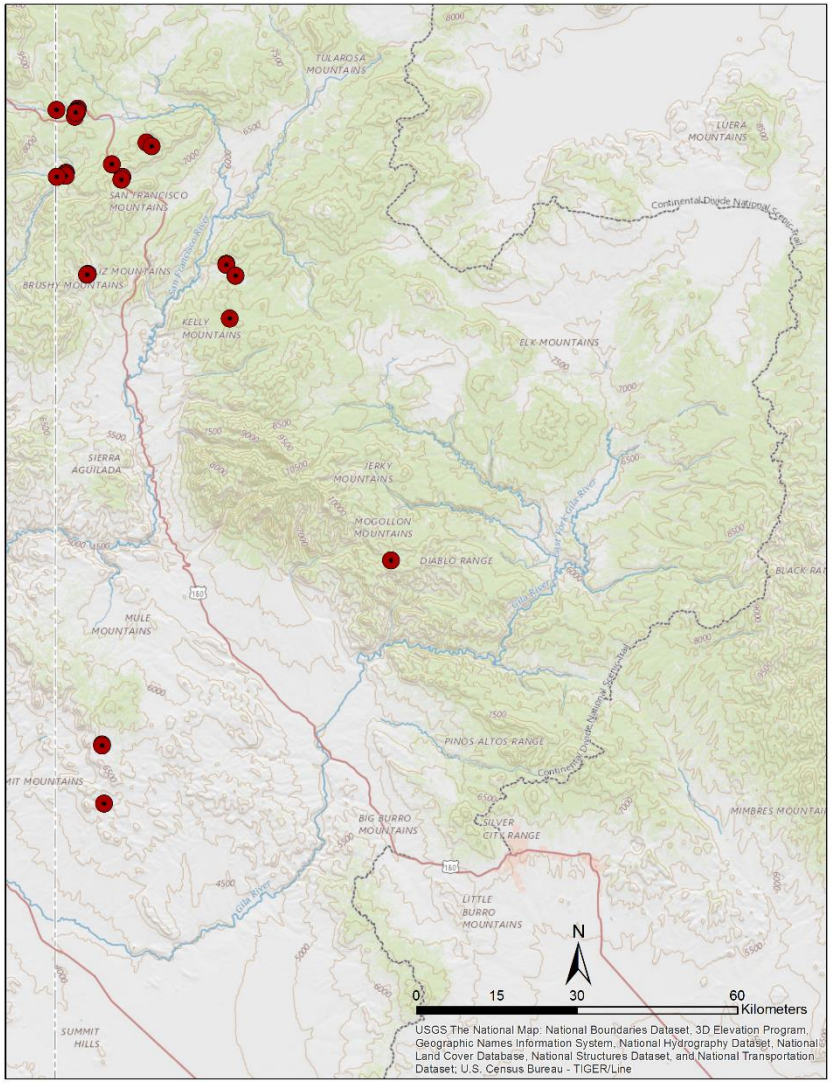
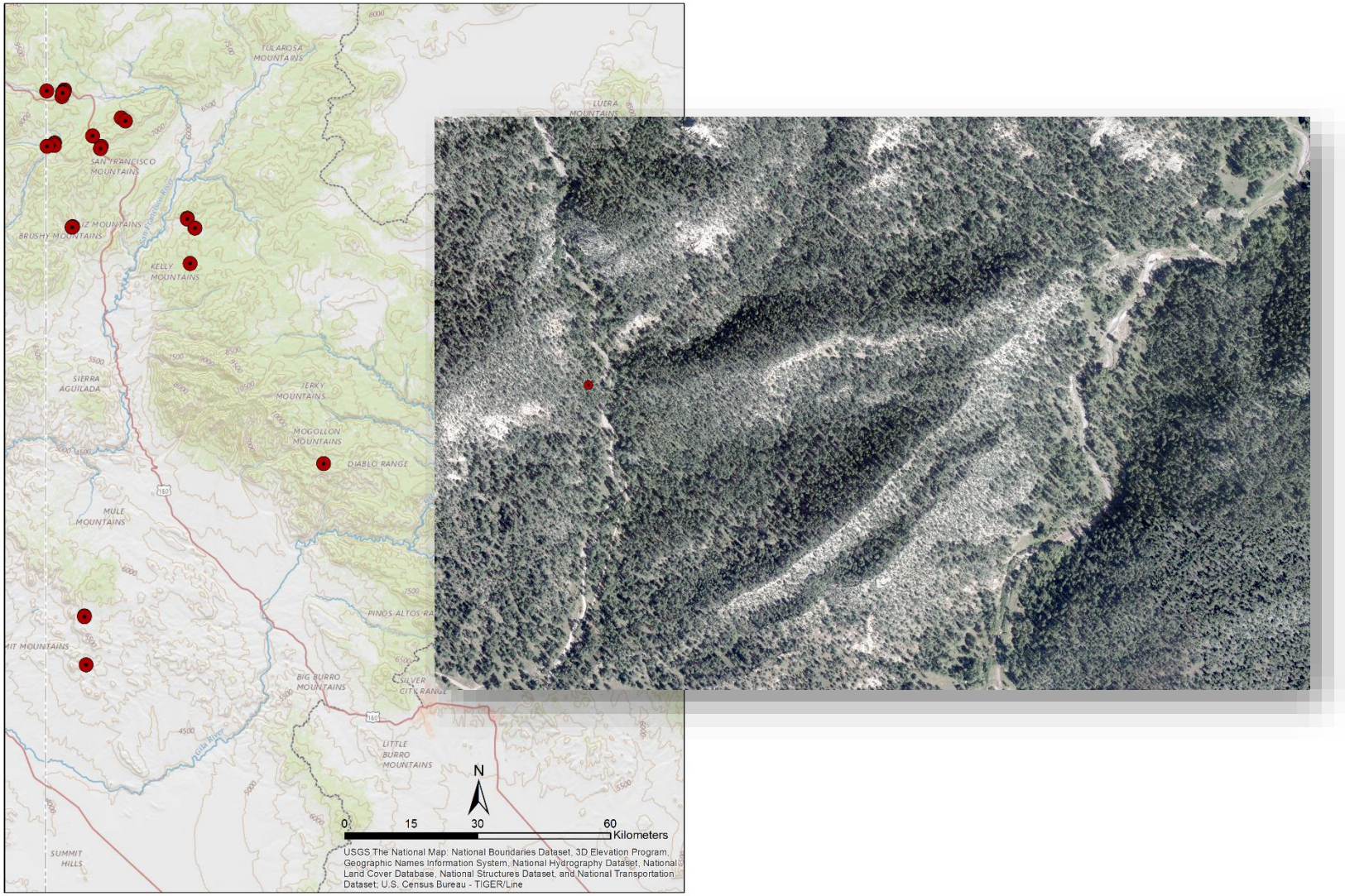
Distribution in New Mexico



Distribution in New Mexico



Project objectives

- Assess current distribution in New Mexico through surveys
- Develop a map of landscape suitability
  - evaluate its accuracy with additional surveys

Taxonomic woes

Crotalus cerberus

- Historically, a subspecies of *Crotalus viridis*, Prairie Rattlesnake
- More recently, a subspecies of *Crotalus oreganus*, Western Rattlesnake

Taxonomic woes

Compile all possible records to find *C. cerberus*!

1. Gather records from databases and aggregators
2. Combine all data into one spreadsheet
3. Identify and fix data deficiencies
4. Map specimen data to identify areas for surveys

Taxonomic woes

Compile all possible records to find *C. cerberus*!

1. Gather records from databases and aggregators
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4. Map specimen data to identify areas for surveys

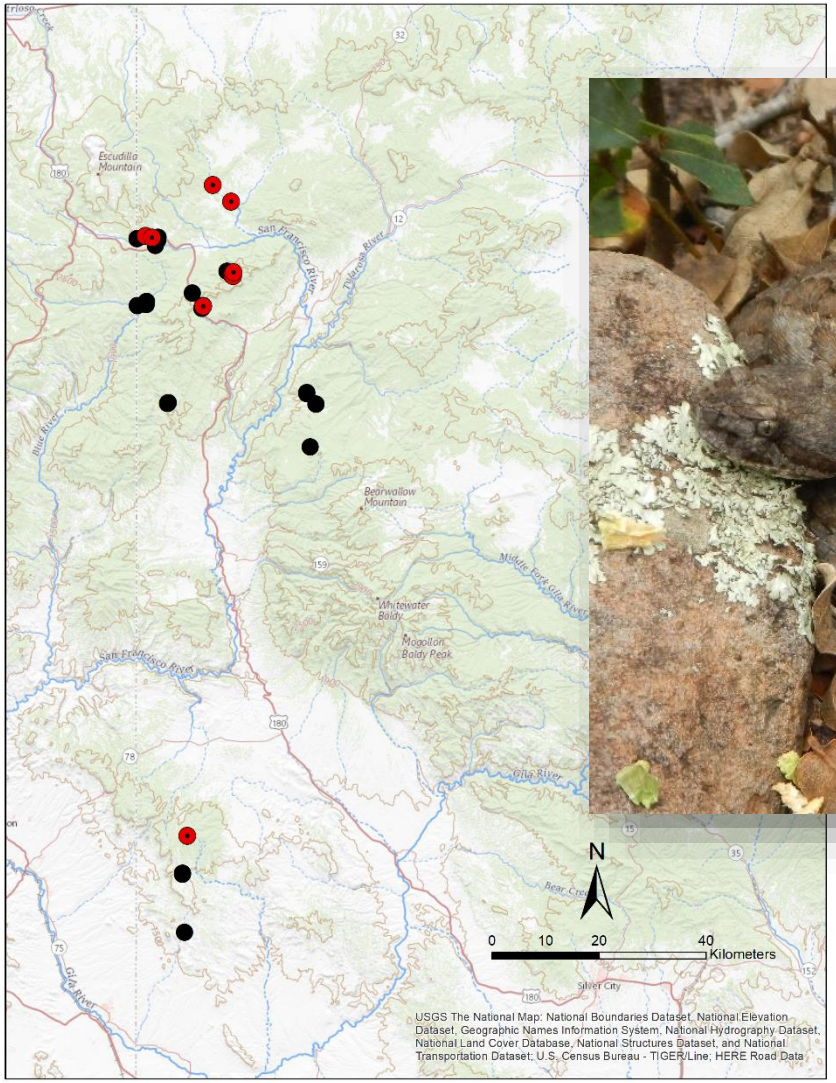
48 hours to produce a high quality map

Taxonomic woes

Compile all possible records to find *C. cerberus*!

1. Gather records from databases and aggregators
   - 564 records
2. Combine all data into one spreadsheet
   - 35 mappable and identifiable as *C. cerberus*
3. Identify and fix data deficiencies
   - Still pursuing identification of at least 6 specimens
4. Map specimen data to identify areas for surveys
   - Surveys in 2019 yielded 8 more snakes!

Distribution in New Mexico



Conclusions

- Research grade means a need to review specimens and associated data for errors and omissions
  - Gila monsters → geographical data missing
  - Arizona Black rattlesnakes → taxonomic problems

- Taxonomy can be a problem in biodiversity data

  - There's a cost to increase availability and quality of data
  - The challenge is to create effective mechanisms for data flow between curator and researcher

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