

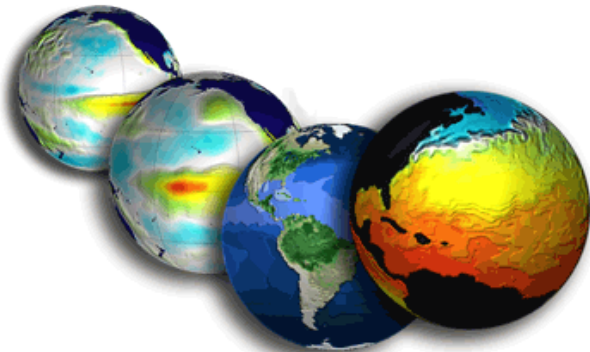
Collections as a source of data for education, conservation and monitoring change in a time of extinction: an amphibian example

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Outline

- How to increase our visibility and importance?
 - Shift focus from documenting species to conserving species:
 - Enhance and provide data to wide audiences
 - Integrate data into education & conservation
 - AIM-UP! project
 - Conservation case studies: amphibians



Increase visibility and importance

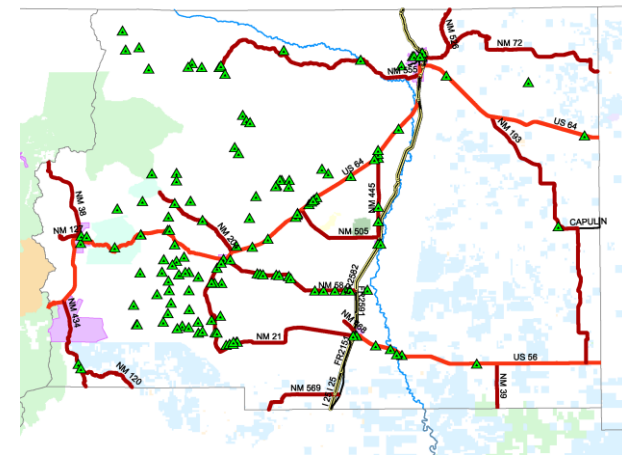
- Enhance specimen data

- Georeferencing
- Collection digitization
 - Specimen imaging
 - Scanning of original documentation
 - Transcription of field notes



provides context and allows for new approaches in applied research and conservation

49320	<i>Rana caudescens</i>	C.W. Painter, C.G. Schmitt	17 Sep. 1986	"	Union Co.: Long Canyon, ~½ mi. upstream of Dry Cimarron River (210°-R11E-S10)	ESP 644
49321	<i>Rana blairi</i>	"	18 Sep. 1986	"	Small pond beside Dry Cimarron River, NM 225, ~1.2 mi. W of jct with	ESP 644
49322	<i>Rana catesbeiana</i>	"	"	"	"	ESP 644
49323	"	"	1 Apr. 1986	"	Corozaco creek at NM/OK border, 200 m. N bridge	ESP 647
49324	"	"	"	"	OKlahoma-Cimarron Co.: Dry Cimarron River, ~ 7 km. downstream of 60th bridge, W of Ketchikan	ESP 647
49325	<i>Hypsiglena torquata</i>	J.P. Minkler, J. Knight	21 Feb. 1987	"	New Mexico-Union Co.: Dry Cimarron River, ~ 0.5 km. upstream of 60th bridge, W of Ketchikan	ESP 647
49326	"	C.W. Painter, B.R. Tomberlin	2 Aug. 1986	"	Central Co.: San Francisco River Valley, ~½ mi. downstream of US Hwy. 80 bridge,	ESP 542
49327	<i>Dadophis punctatus</i>	B.R. Tomberlin	1 Jul. 1986	"	Hedley Co.: NM Hwy. 338, 1 mi. S Animas	ESP 518
49328	<i>Sedopsis jarrovi</i>	B.R. Tomberlin	4 Aug. 1986	"	NM Hwy. 9, 4 mi. W NM Hwy. 338 at Animas	ESP 518
49329	<i>Aneides fitchii</i>	C.W. Painter, B.R. Tomberlin	4 Aug. 1986	"	Stoblen Canyon, ~½ mi. upstream of jct. with Pine Canyon	ESP 518
49330	"	C.W. Painter, S.E. Stebbins	22 Jun. 1987	"	Lincoln Co.: Captain Mts., Lincoln Nat. Forest, Radio facility at Summit, US 29, 10.5 mi. S of	ESP 1006
					Lincoln Co.: Captain Mts., Lincoln Nat. Forest, Along Summit Trail, ~½ mi. E of	ESP 1006



Increase visibility and importance

- Provide data
 - Examples of efforts:
 - Vertnet
 - Arctos (Cicero's presentation)
- Integrate collections into education
 - AIM-UP!
 - Create & disseminate specimen-based educational modules

VertNet

 Arctos

Increase visibility and importance

- Emphasize collections as an educational resource
 - Teachers & students can study biodiversity by examining specimens and their associated data
 - Promote multiple core competencies in biology
- AIM-UP!
(poster presentation)



AIM-UP!

- Advancing Integration of Museums into Undergraduate Programs
 - Research Coordinating Network funded by the US National Science Foundation
 - Specific goals:
 1. train students in specimen-based research
 2. develop instructional tools based on online databases
 3. inform educators at non-museum institutions of the learning potential of museum collections
 4. interact with the public to increase awareness of the educational importance of natural history museums



AIM-UP!

- Themes over five years:
 1. Integrative inventories: complex biotic associations across space & time
 2. Geographic variation
 3. Evolutionary dynamics of genomes
 4. Biotic response to climate change
 5. Co-evolving communities of pathogens and hosts as related to emerging disease



AIM-UP!

- Educational modules (available @ aim-up.org)
 - Explore many topics in ecology & evolution
 - e.g. geographic variation, genome evolution, response to environmental change, range shifts, etc
 - Focus on upper-level undergraduates

Comparative Biology Educational Module

Written by Bryan McLean and Libby Beckman (Museum of Southwestern Biology)
Spring 2013

Part I - Data Acquisition

Navigate to 'dryad' data repository (<http://datadryad.org>)
Data repositories like dryad are an important source of data for ecological studies, which allow scientists to further test and build on the work of others.

Available on this page are data from a study by McLean and Beckman (2013) on the frequency of polyploidy in vascular plants. Polyploidy is the presence of more than two sets of chromosomes an organism has. It is a common phenomenon in plants.



University of Alaska Fairbanks

LESSON PLAN: **Range and Distribution**

Laura Conner (Research Assistant Prof., ESTES, ldconner@alaska.edu)
Steffi Ickert-Bond (Associate Prof., Dept. Biology & Wildlife, smickertbond@alaska.edu)

Overview

In this activity, students will explore the effects of geography and other abiotic factors on plant range and distribution.

Objectives

The student will:

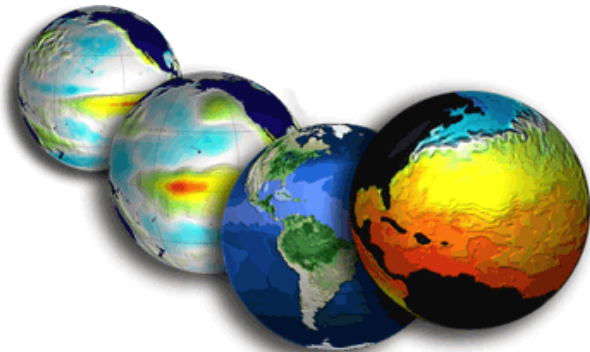
- Compare ranges of three different plant species;
- Examine temperature, precipitation, and elevation maps of Alaska; and
- Explain what abiotic factors are responsible for plant ranges.

Materials

Access to ARCTOS herbarium database (<http://arctos.database.museum/SpecimenSearch.cfm>)
Student Worksheet: "Range and Distribution"

Outline

- How to increase our visibility and importance?
 - Shift focus from documenting species to conserving species:
 - Enhance and provide data to wide audiences
 - Integrate data into education & conservation
 - AIM-UP! project
 - **Conservation case studies: amphibians**



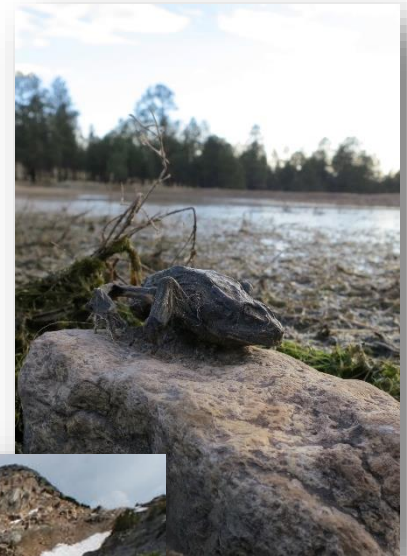
Amphibian conservation

■ Current status of amphibians

- Single greatest taxa-focused conservation crisis of 21st century
- >32% of 6,300 species in immediate threat of extinction
- >43% species in decline
- Occurring rapidly with hundreds of die-offs in last 30 yrs

■ Shifting role of collections

- Historical, specimen-based records
- Access to field notes
- Opportunity to make well-informed surveys & management decisions



Amphibian conservation

- Direct role of collections
 - Examination of specimens and data
 - Species distributions – collecting localities
 - Field notes
 - Qualitative treatment of abundance
 - If rare – set as low priority
 - If common – set as a high priority
- Two case studies:
 - Rediscovery of *Craugastor fleischmanni* in Costa Rica
 - Status of *Anaxyrus microscaphus* in New Mexico, USA



Amphibian conservation – Case Study 1

- Rediscovery of *Craugastor fleischmanni* in Costa Rica
 - Considered extinct and not detected for 26 years
 - Threatened by disease & habitat loss
 - Examination of historical field notes determined that species was common and easily detected at collection localities

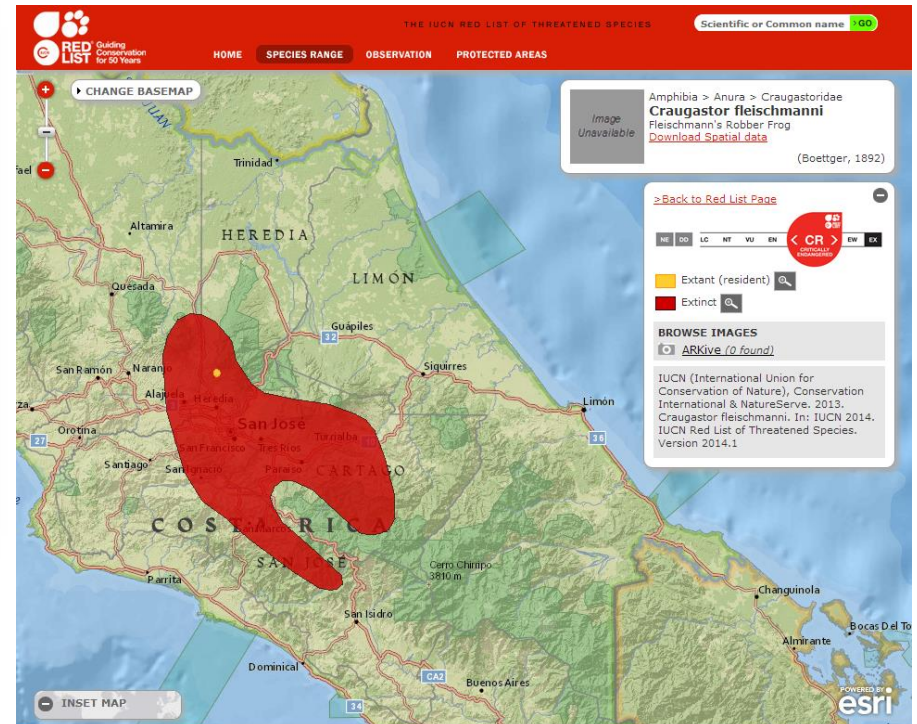


- Determined high priority to be rediscovered
 - Survey efforts began in 2005



Amphibian conservation – Case Study 1

- Rediscovery of *Craugastor fleischmanni* in Costa Rica
 - Rediscovered in 2010!
 - Instant conservation improvement & proof that it is not extinct



Amphibian conservation – Case Study 2

- Status of *Anaxyrus microscaphus* in New Mexico, USA
 - Declining in Arizona, Nevada, & Utah
 - Threatened by hybridization, drought, and habitat loss
 - Restricted to mountainous areas of southwestern New Mexico
 - Population status unknown
 - Systematic surveys began in 2013 and continuing (2014)



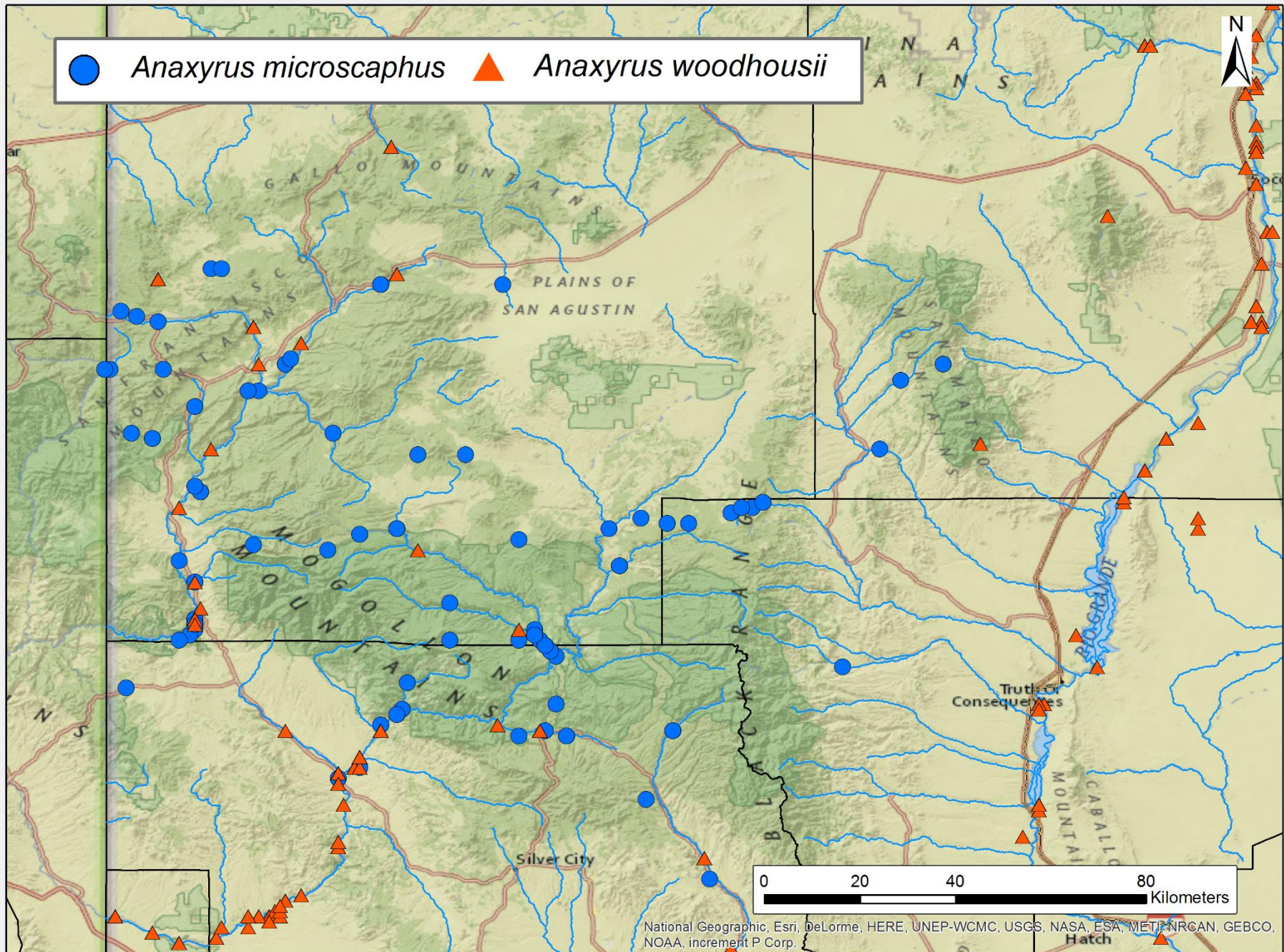
Amphibian conservation – Case Study 2

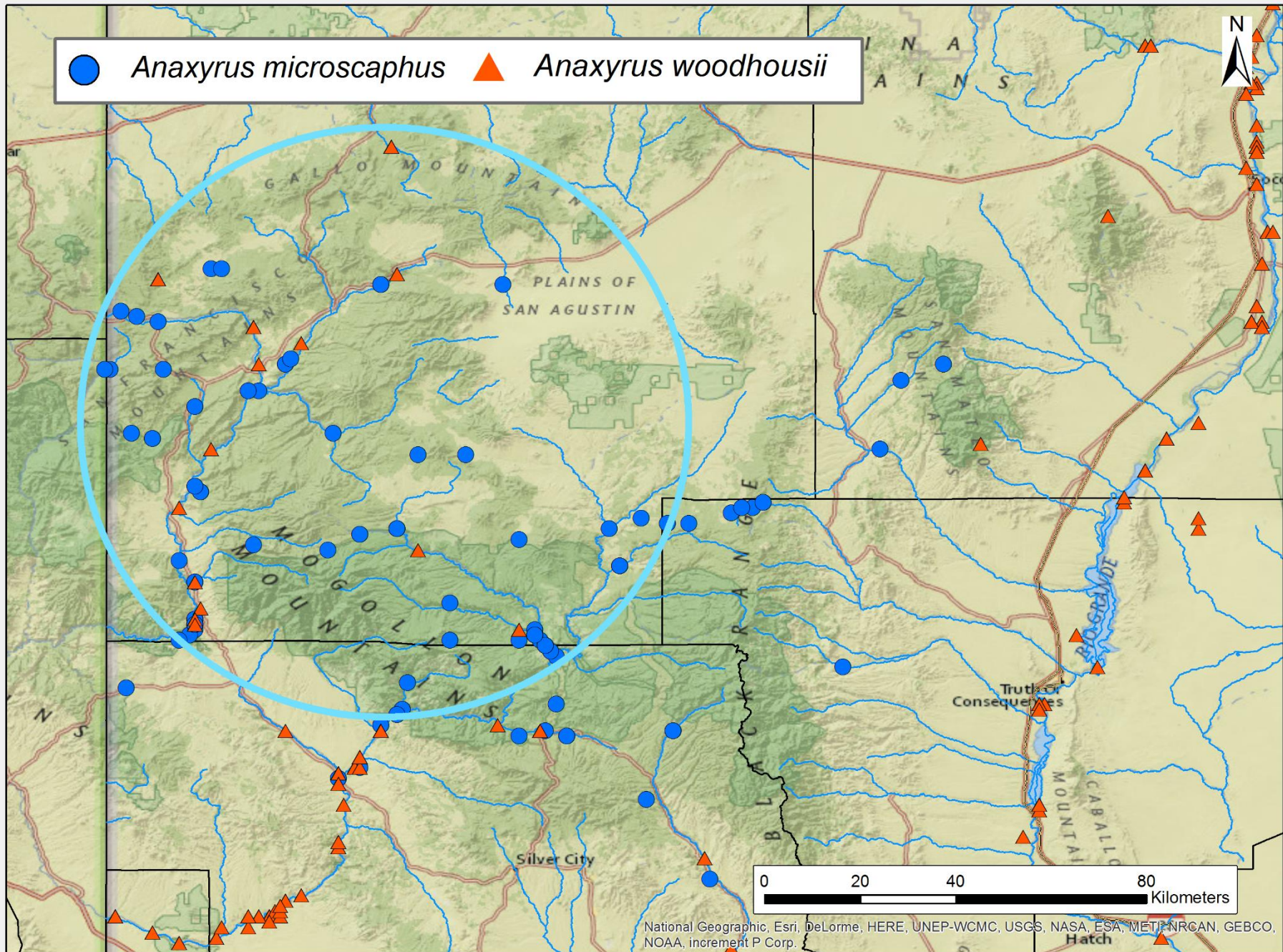
- Established 91 survey localities
 - based on historical collection data
- Identified March-April breeding season
 - most specimens collected outside of breeding season

- Compared with distribution of *Anaxyrus woodhousii*
 - congener known to hybridize in AZ

The image shows a HerpNet search results page for 'microscaphus' and a corresponding spreadsheet of collection data. The spreadsheet has columns for InstitutionCode, CollectionCode, CatalogNumber, InstitutionalNumber, ScientificName, Family, PopulationType, and Locality. The data lists various specimens of *Anaxyrus* species, including *Anaxyrus microscaphus*, *Anaxyrus woodhousii*, and *Anaxyrus* sp.

InstitutionCode	CollectionCode	CatalogNumber	InstitutionalNumber	ScientificName	Family	PopulationType	Locality
TUCV	Herps	27028	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27029	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27030	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27031	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27032	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27033	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27034	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27035	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27036	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27037	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27038	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27039	1	<i>Bufo microscaphus</i>	Bufo	Shard	
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TUCV	Herps	27047	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27048	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27049	1	<i>Bufo microscaphus</i>	Bufo	Shard	
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TUCV	Herps	27099	1	<i>Bufo microscaphus</i>	Bufo	Shard	
TUCV	Herps	27100	1	<i>Bufo microscaphus</i>	Bufo	Shard	





Amphibian conservation – Case Study 2

- All records of *A. woodhousii* in Catron Co. are those of *A. microscaphus*!
- 15 localities
- Combination of tadpoles, juveniles and adults
- Different collections, collecting dates, collectors, etc...



Amphibian conservation – Case Study 2

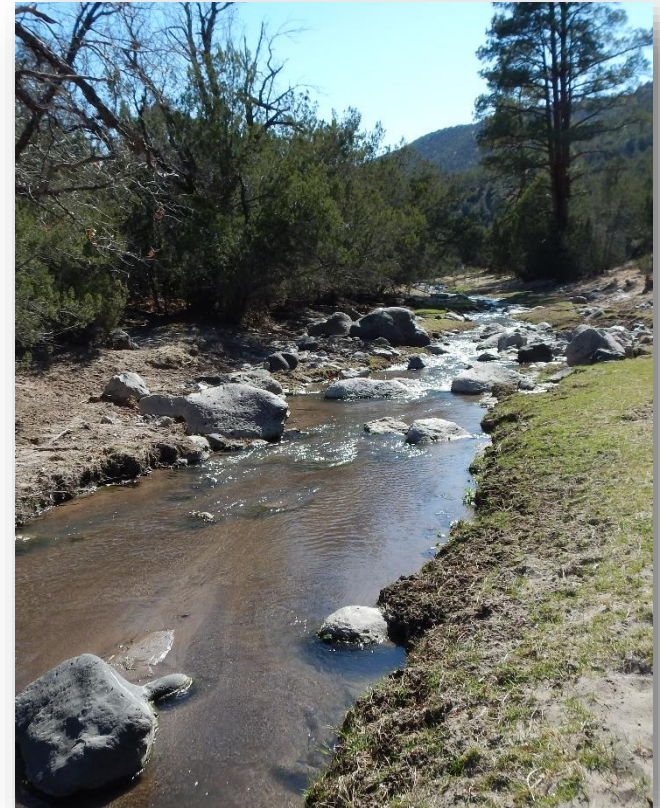
- Re-evaluate distribution of both species in New Mexico



Importance of data quality

AND

Responsibility of researchers/end users



Conclusions

- Need to expand educational and scientific potential of natural history collections
 - Collections have much potential for integration into curricula (university and other)
 - Train students to think beyond traditional role of museums
- Expand role to conservation
 - Specimens & field notes as a crucial aid in setting conservation priorities
 - Can help in evaluation of conservation status of ALL endangered species

Conclusions

- In both education and research need to review specimens and associated data for errors
 - Quality of data increases value & credibility of collections
 - Accuracy of data associated with specimens potentially overlooked by both keepers and users of collections



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