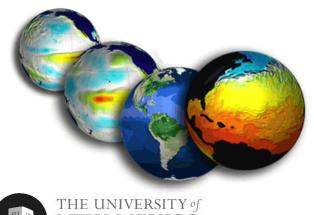
## Collections as a source of data for education, conservation and monitoring change in a time of extinction: an amphibian example

J. Tomasz Giermakowski, Mason J. Ryan, Joseph A. Cook Museum of Southwestern Biology, University of New Mexico Albuquerque, New Mexico, USA



## Outline

- How to increase our visibility and importance?
  - Shift focus from documenting species to <u>conserving</u> 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

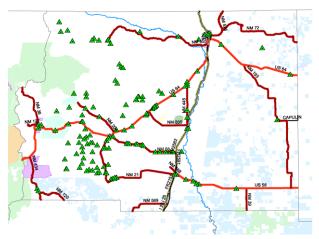
- Georeferencing
- Collection digitization
  - Specimen imaging
  - Scanning of original documentation
  - Transcription of field notes



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

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## 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



## Increase visibility and importance

- Emphasize collections as an educational <u>resource</u>
  - 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



 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

<u>Comparative Biology Educational Module</u> Written by Bryan McLean and Libby Beckman ( Museum of Southwestern Biology) Spring 2013

#### Part I - Data Acquisition

Navigate to **'dryad'** data repository (http://datadrya Data repositories like dryad are an important sourc studies, which allow scientists to further test and b others.

Available on this page are data from a study by Ma frequency of polyploidy in vascular plants. Polyploi number of chromosomes an organism has. It is ac

#### University of Alaska Fairbanks

#### LESSON PLAN: Range and Distribution

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

#### Overview

ALASKA

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.

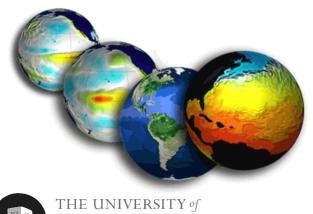
#### Materials

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 <u>conserving</u> species:
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    - 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 21<sup>st</sup> 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





#### 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

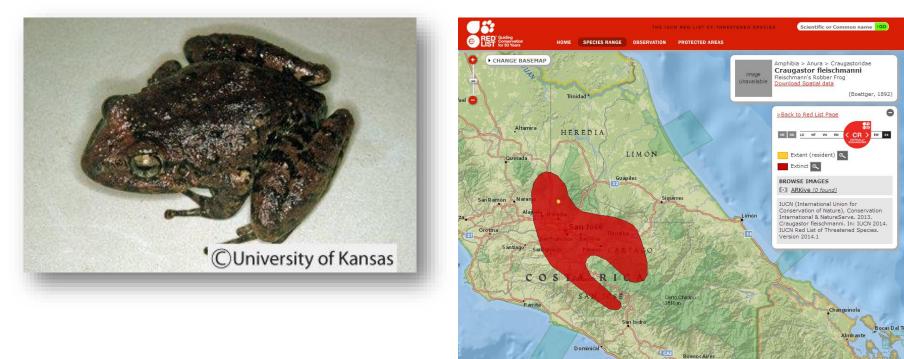


- Determined high priority to be rediscovered
  - Survey efforts began in 2005





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







C INSET MAP

DONATE NOW

- 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)



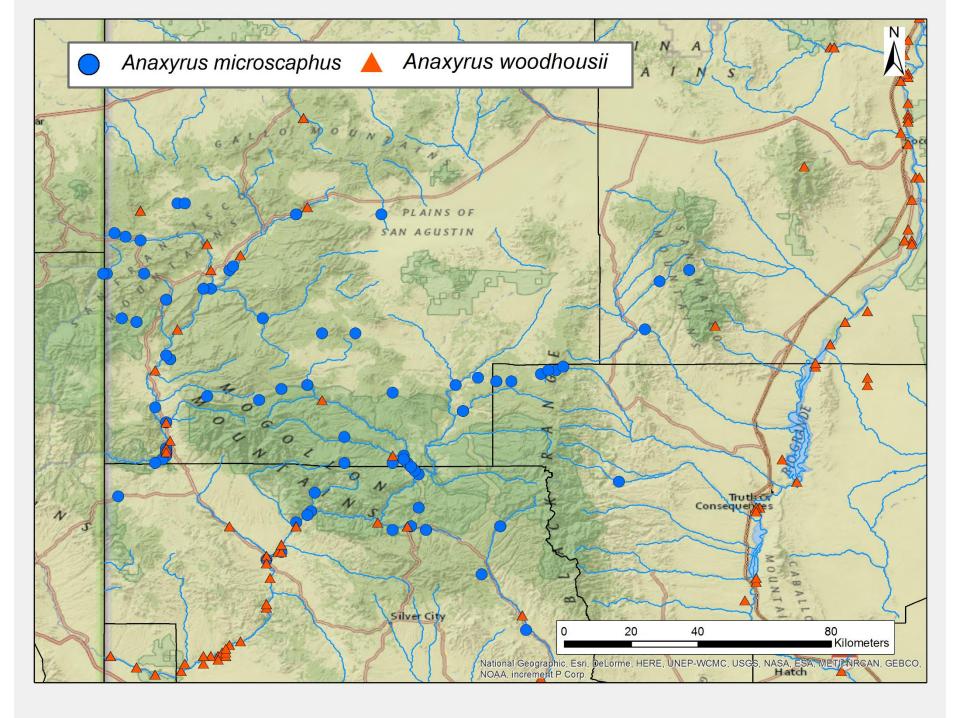


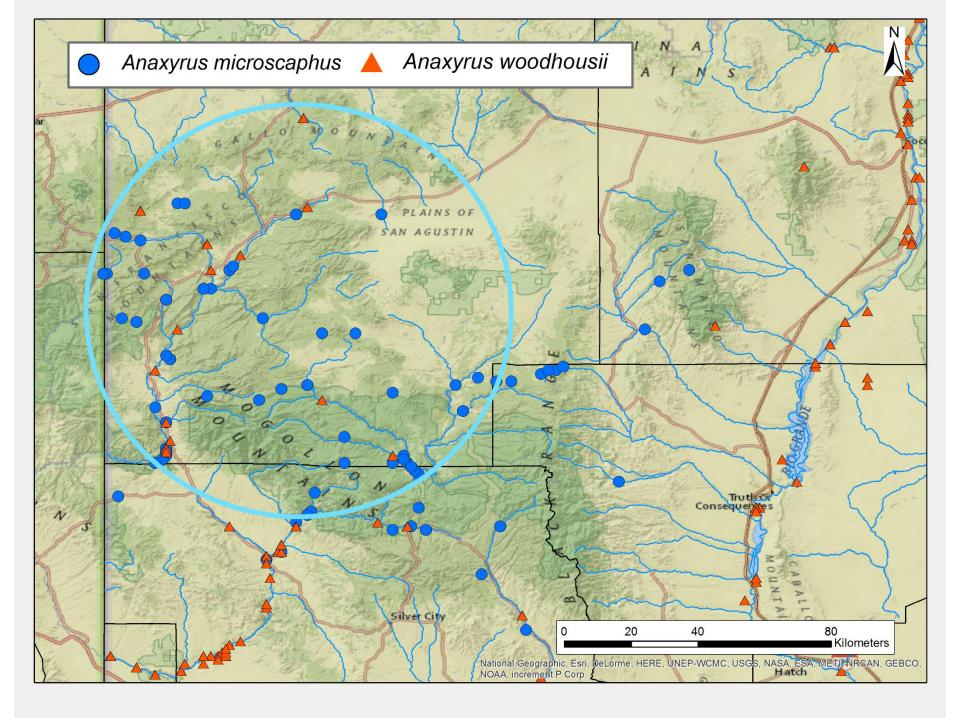
#### Established 91 survey localities

- based on historical collection data
   Identified March-April breeding seasor
- most specimens collected outside of breeding season
- Compared with distribution of Anaxyrus woodhousii
- congener known to hybridize in AZ

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- 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...

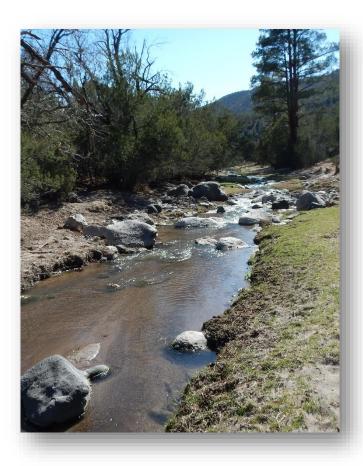




# Re-evaluate distribution of both species in New Mexico



#### 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







## Acknowledgements

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- Bin Zayed Conservation Fund
- Tinker Foundation

