

# AIM-UP!

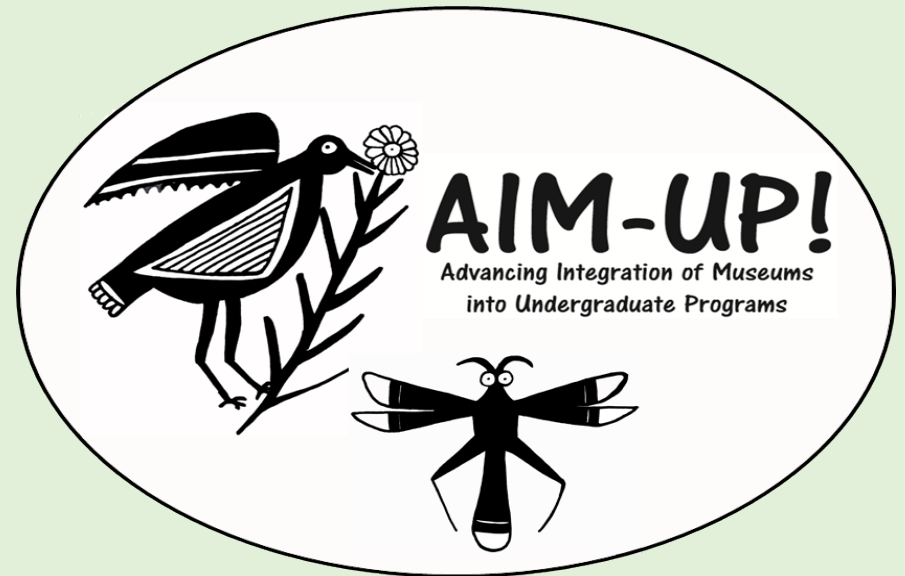
Bringing big data to educators at  
small institutions

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Northern Michigan University

**Joseph Cook**

Museum of Southwestern  
Biology



# Traditional Roles for Museums in Education



Student  
experiences in  
field work and  
specimen curation



# Traditional Roles for Museums in Education



Classroom/lab  
demonstrations  
and public  
exhibits



# Traditional Roles for Museums in Education



Specimen-based  
student research  
experiences



# What does collections-based teaching add to undergraduate education?

- Inspiration!
- Fundamental skills
  - Natural history
  - Manipulating data
  - Scientific process
- Integration...
  - across time and space
  - between biotic and abiotic
  - from genomes to organisms to ecosystems



# Obstacles to collections-based teaching

Educators often...

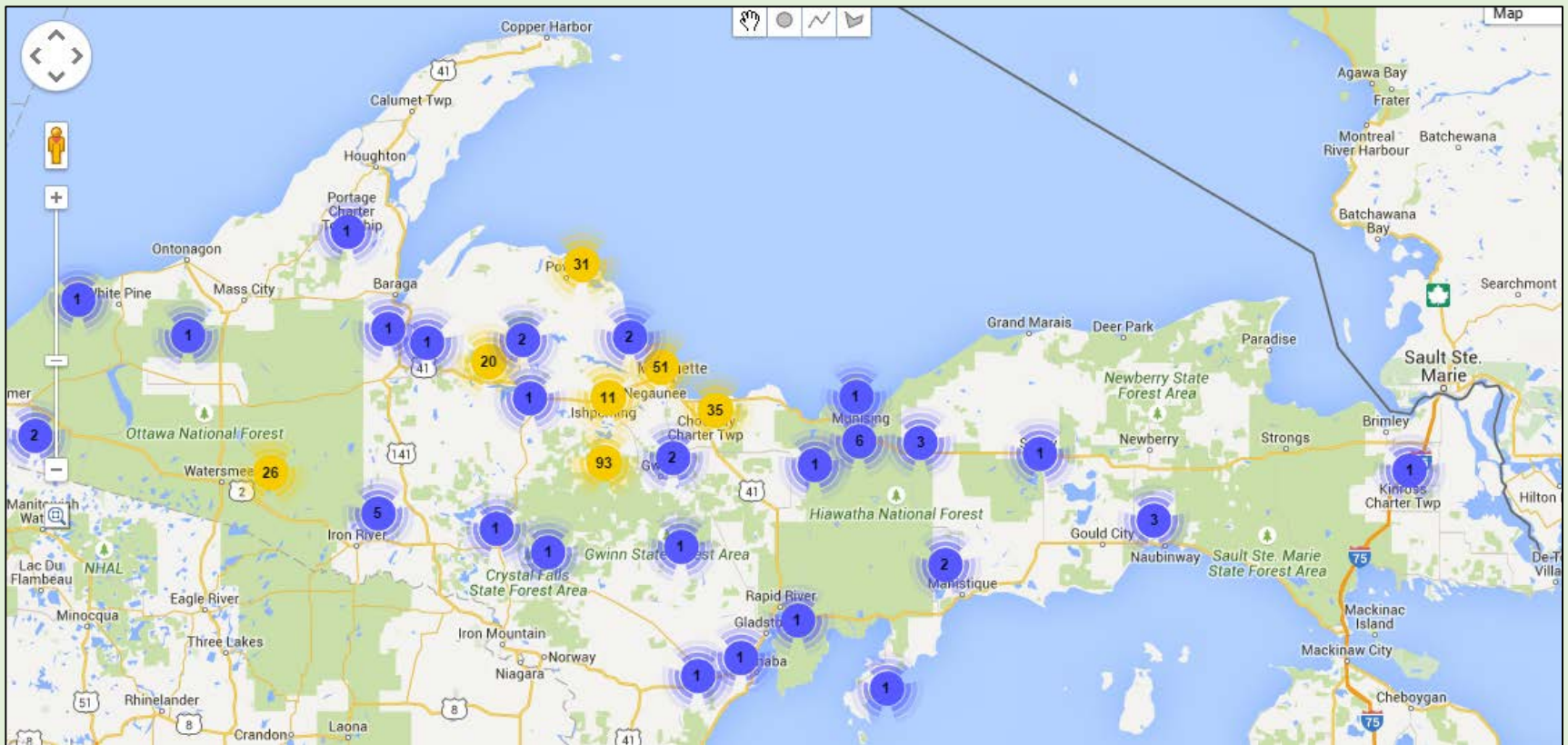
- don't understand how museums contribute to science and society
- don't have access to robust natural history collections
- don't know how to access museum data

Problems are especially acute at small institutions



## E. g., Northern Michigan University

- ~7800 students; ~750 student biology majors
- Small collections with limited resources



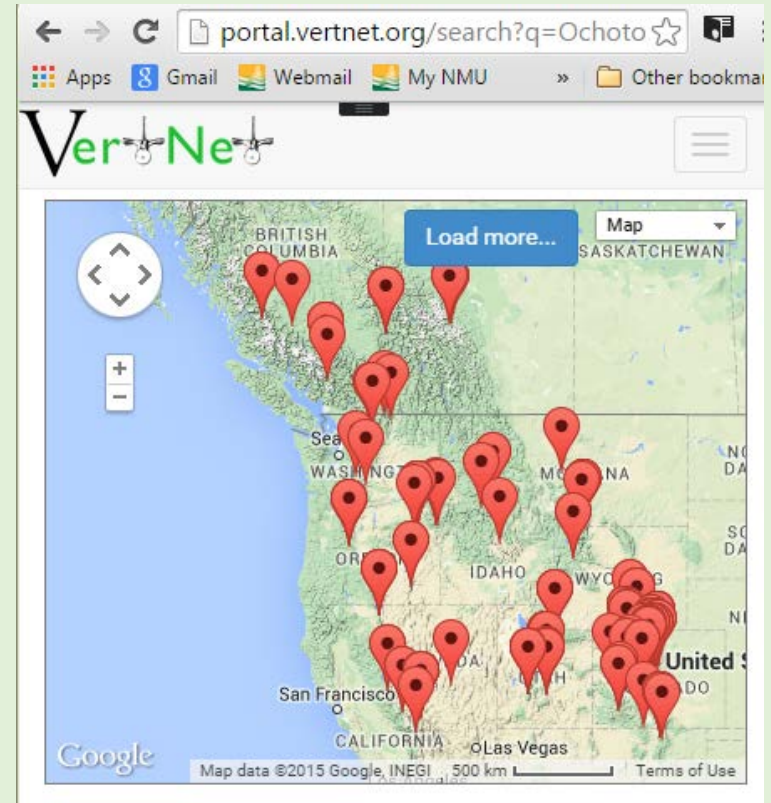
Mammal collection currently has <500 specimens.

**What can be accomplished with this?**

# Improvements to data accessibility offer potential to engage a broader audience...

E. g., VerNe

- 17,727,066 records
- 276 collections
- 87 publishers
- user-friendly search and mapping tools

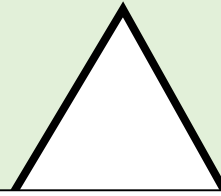


... but alone fall short of educational tools.



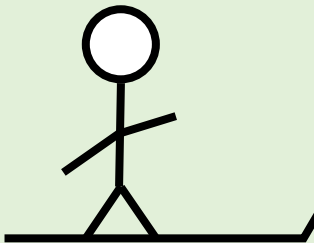
# The challenge educators face:

Educational  
Goal



- What's the question?
- What data do I need?
- Where do I get data from?
- How do I use the database?
- How do I manipulate the data so that they are useful to me?
- How do I analyze the data?
- How do I interpret the results?
- What concepts will not be taught to make time during the semester?
- Did I achieve the educational goal?

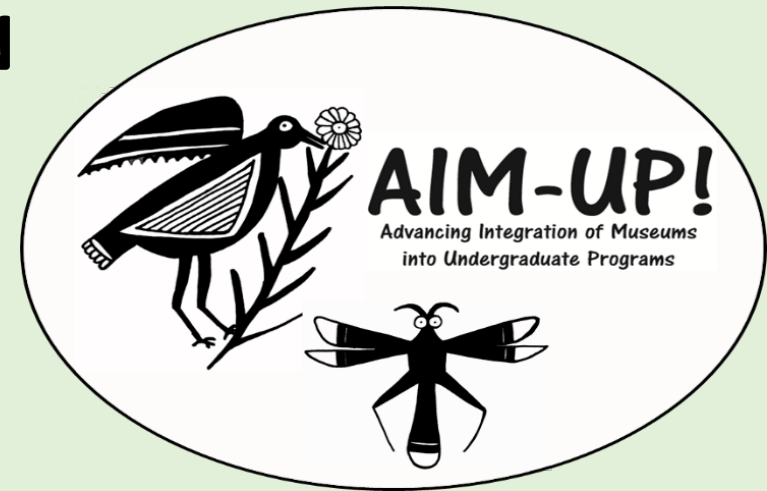
Student



# AIM-UP! NSF-funded RCN

Expanding beyond traditional museum experiences by...

- promoting museum literacy
- increasing accessibility of natural history collections to educators/public
- developing tools to facilitate database use by educators/students
- partnering with non-traditional museum users (e.g., Behavior, Geography, Art)



# AIM-UP! – the network

**Universities, Community Colleges and Tribal Colleges:** U Alaska, UC Berkeley, Harvard U, U New Mexico\*, U Michigan, Texas A&M, U Texas, U Colorado, U Arizona, U Kansas, CNM, NM Highlands University, Ohio State U, Occidental College, Northern Arizona U, U of Florida, Massachusetts College of Liberal Arts, U of Idaho, Arizona State U, U of Florida, Tulane, Idaho State U, Northern Michigan U, Central Michigan U, U Nebraska, College of Southern Nevada, U of Hawai'i, City U of New York, U of Oklahoma, U Nevada, Michigan State U

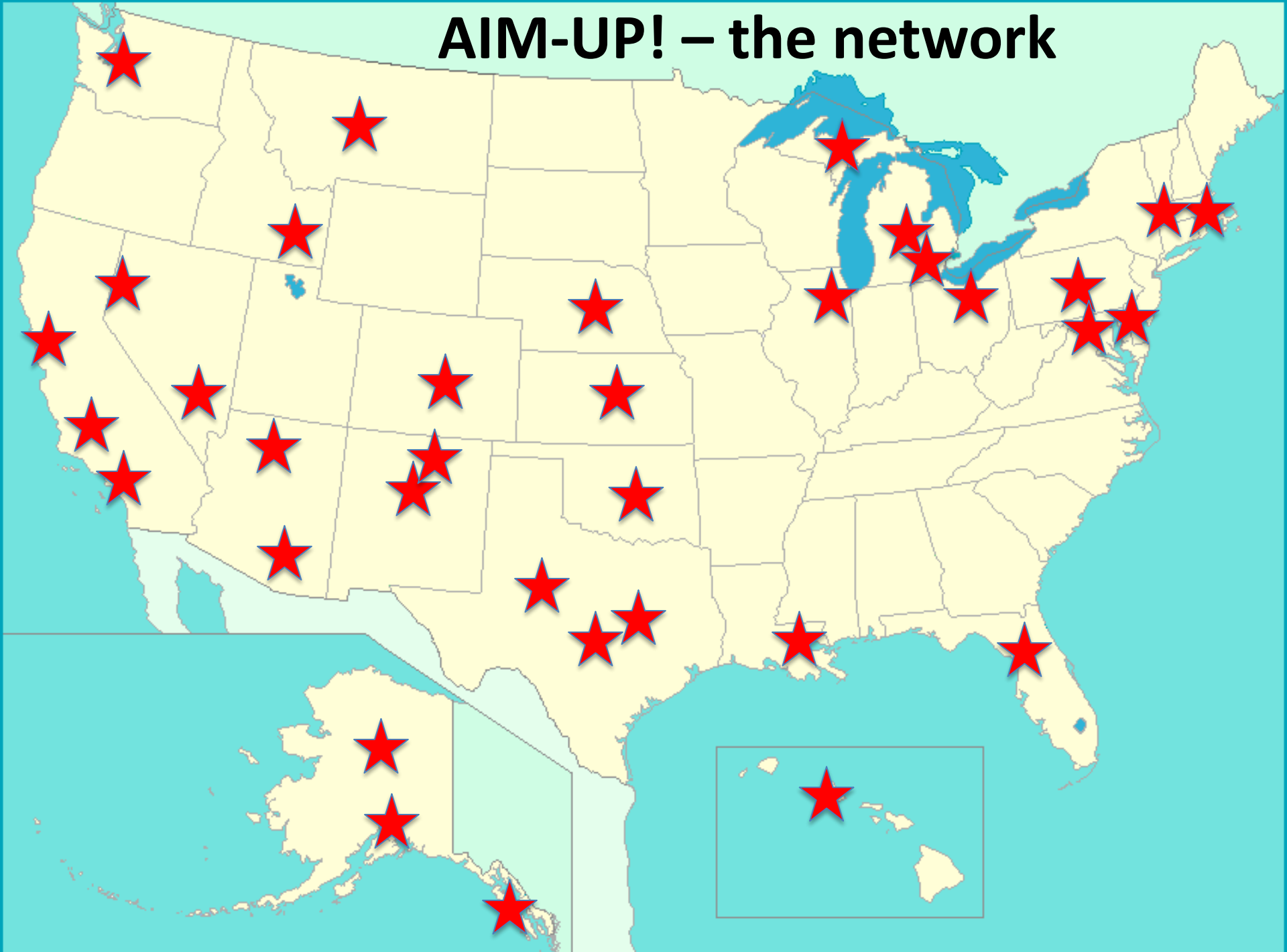
**Agencies and Free-standing Museums:** USDA National Parasite Lab, USGS Molecular Ecology Lab, US NMNH, Denver Museum of Nature & Science, NY State Museum, NPS, Florida MNH, NMMNH

**International:** U Guelph, U Nacional de la Republica (Montevideo)

**High Schools:** Highland High (urban) and Sitka High (rural)

\*original network participants

# AIM-UP! – the network



# Building the network – promoting dialogue around annual conceptual themes:

- 1) Integrative Inventories: Exploring Complex Biotic Associations Across Space and Time (MSB)
- 2) Making Sense of Geographic Variation (UAM)
- 3) Evolutionary Dynamics of Genomes (MCZ)
- 4) Biotic Response to Climate Change (MVZ)
- 5) Coevolving Communities and the Human Dimension (MSB)

## **Natural History Collections as Emerging Resources for Innovative Education**

JOSEPH A. COOK, SCOTT V. EDWARDS, EILEEN A. LACEY, ROBERT P. GURALNICK, PAMELA S. SOLTIS, DOUGLAS E. SOLTIS, COREY K. WELCH, KAYCE C. BELL, KURT E. GALBREATH, CHRISTOPHER HIMES, JULIE M. ALLEN, TRACY A. HEATH, ANA C. CARNAVAL, KIMBERLY L. COOPER, MARK LIU, JAMES HANKEN, AND STEFANIE ICKERT-BOND

*BioScience*  
2014  
64: 725–734

# AIM-UP! Educational Modules

- online resources to help educators use museum specimens and/or data to enhance their teaching


[Educational Modules & Tutorials](#) >


## Island Biogeography


### Island Biogeography Module

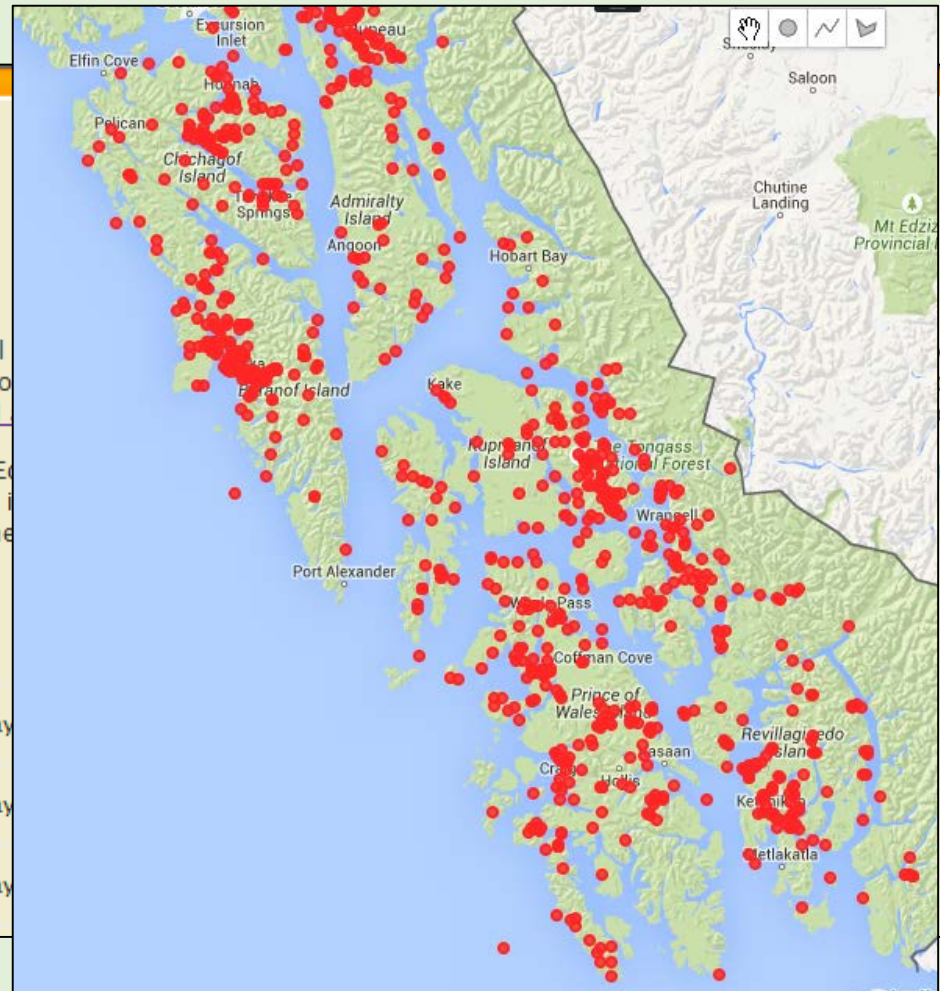
This module guides students through tests of two fundamental Archipelago in Southeastern Alaska. The module was designed for Mexico. Instructors may find it useful to also use the [How to Read](#)

There are three attachments at the bottom of this page. The E required to complete the activity. The Data.xls document i Module\_Feedback.doc is feedback to let us know how you used the

 [Data.xls.xls](#) (32k)

 [EducationalModule\\_2012Islands.pdf](#) (408k)

 [Module\\_Feedback.doc.doc](#) (24k)



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# **Modules leverage specimen data to teach a variety of concepts, including:**

- Introduction to natural history collection data
- Introduction to GIS
- How to read a scientific paper
- Influence of climate change on plant morphology
- Introduction to phylogenetics
- Plant biogeography and ecology

**Goal is to make the benefits of collections-based education universally available.**

# AIM-UP! Educational Collaborations



Bringing student artists into the museum to develop new ways to convey/teach biological concepts





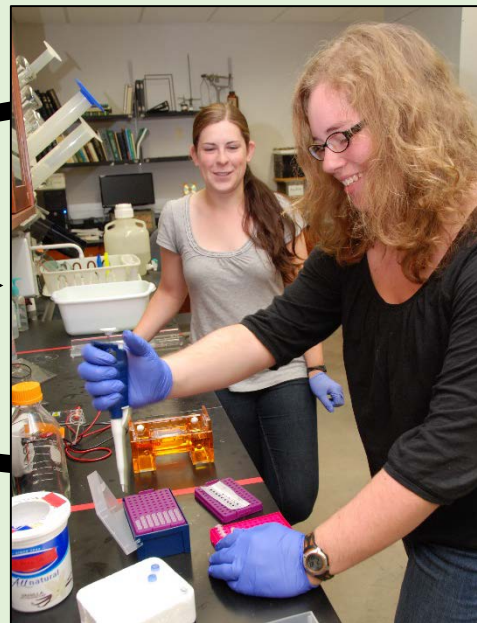


# AIM-UP! Network Participants: providing models for place-based student learning

Specimen-based, place-based discovery...



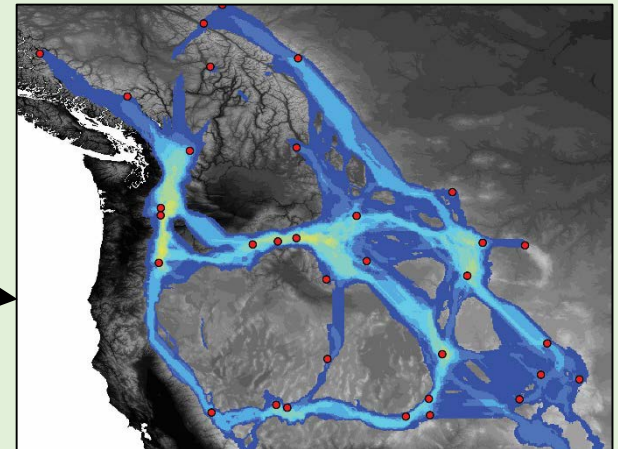
...can lead to student-centered activities focused on...



...genomic variation,...

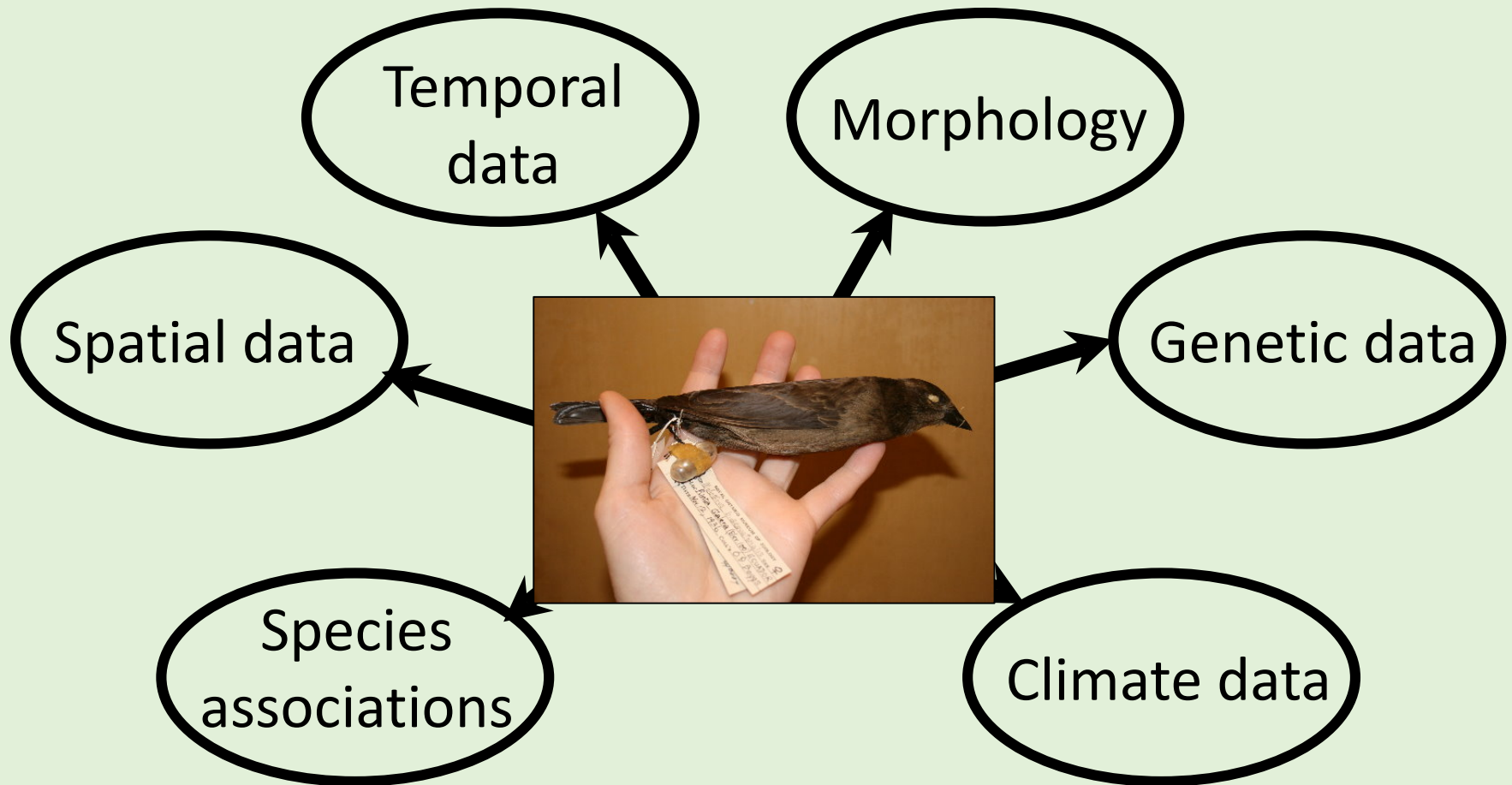


...morphology,...



...gene flow, ecological niche, biogeography, etc.

# What does Big (collections) Data bring to small institutions (the front lines for undergraduate biology education)?



# The opportunity at small institutions:

To train the next generation of museum biologists...

...and ecologists, wildlife managers, teachers, conservation biologists, economists, doctors, neuroscientists, climate change scientists, veterinarians, chemists, business owners, etc...



**Are you interested in helping to build a  
biologically-literate and museum-aware  
society?**

New members of the AIM-UP! network  
are welcome and encouraged!

Contact Joseph Cook - [cookjose@unm.edu](mailto:cookjose@unm.edu)  
Museum of Southwestern Biology  
University of New Mexico