

Citizen science as a tool for expanding biodiversity research across ecological fields

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Kimberly, Kevin Love, Justin Mann, Nelson
Rios, Katja Seltmann, Austin Mast

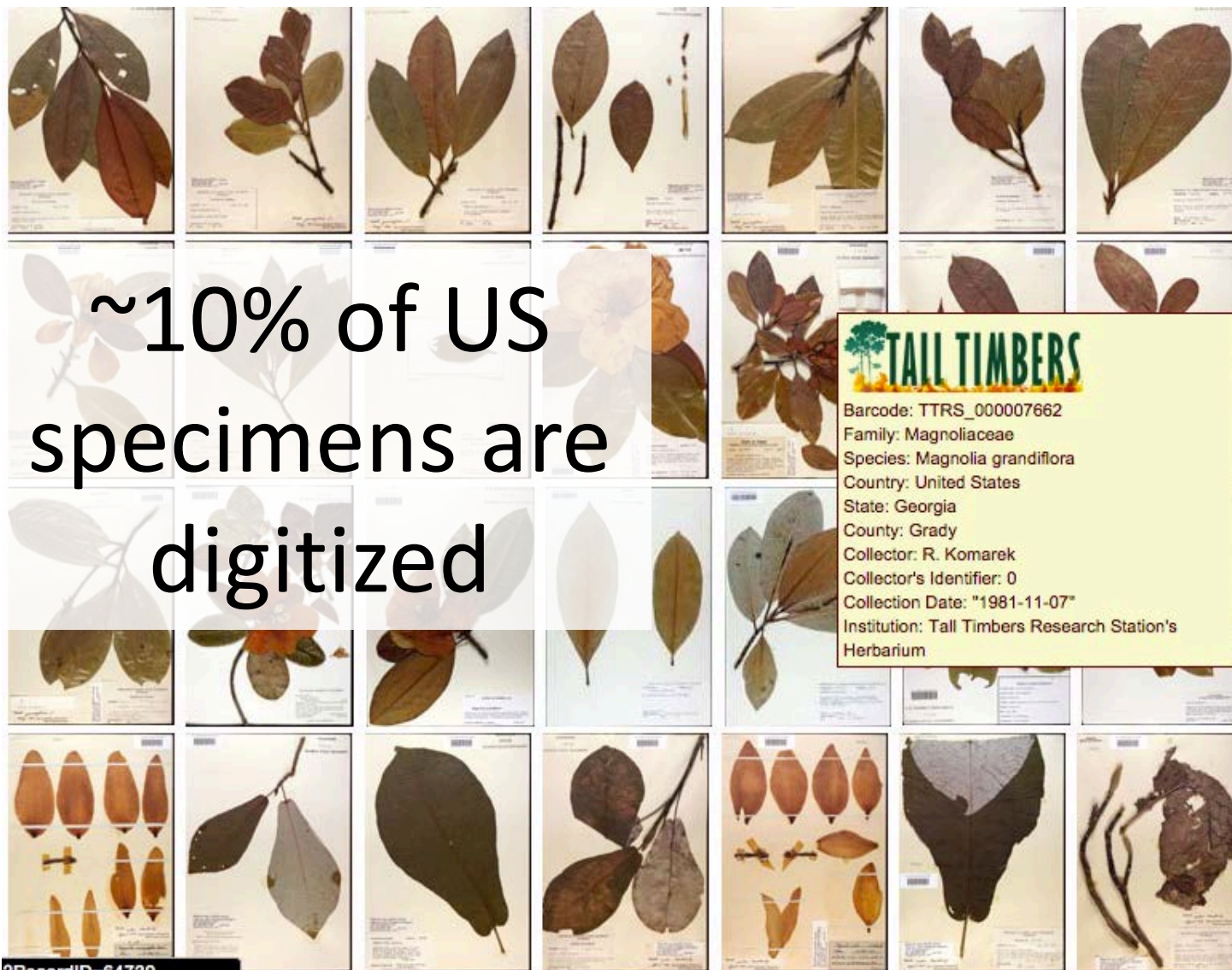


The Big Challenge





?RecordID=64739



: projects in which volunteers partner with scientists to answer real-world questions

(Cornell Lab of Ornithology)

: the systematic collection and analysis of data; development of technology; testing of natural phenomena; and the dissemination of these activities by researchers on a primarily avocational basis

(OpenScientist)

Clay Shirky's "Cognitive Surplus"

200 billion hours
a year spent watching TV by US adults



100 million hours
to create Wikipedia

<http://www.informationisbeautiful.net/2010/cognitive-surplus-visualized/>

Digitizing Biodiversity Specimens

- Transcribing Specimen Label and Ledger Text
- Georeferencing
- Annotating

Digitizing Biodiversity Specimens

- **Transcribing Specimen Label
and Ledger Text**
- Georeferencing
- Annotating

No. 323 Locality. Arendal

NAME, SYNONYMS, AND PECULIARITIES.

Radiated brown Stillite
in calcolite, from
primitive Rocks.

Bicucullaria (L.) Bernh.
E of *Bicucullaria occidentalis* Rydb.
r. Bot. Club 29(3):160. (1902)
Legler, 1 Sep 2005 WTU

FLORA OF NORTH AMERICA
Bicucullaria (L.) Bernh.
by R. Stern (CHSC) 1993

Revision acc. to International Rules
Bicucullaria (L.) Bernh.
Munich 1923.

Cl. 29:160:1902.

PLANTS OF OKLAHOMA
ROBERT BEBB HERBARIUM
The University of Oklahoma

Oklahoma County

Scrophulariaceae

Penstemon oklahomensis Penn.

SE corner of Tinker AFB. T11N R2W Sec. 26.
Topography: rolling upland. Habitat: Mixed-Grass Prairie.
Herbaceous perennial. 2-3 dm tall. Flowers white.

F. L. Johnson
TNK017

4 May 1994

Plant Inventory of Tinker Air Force Base by Oklahoma Biological Survey

[COOK DISTRICT]

Natural Order: Rutacea
Generic name: Citrus
Specific name: Garrawayi, Bail.
Vernacular name:
Habitat: W. White, Coon.
Collector: R. W. Garraway
Remarks: May 1904

F. M. BAILEY.



107
Oxytropis Halleri - Bunge
Sea. cliffs
Melrich
Sutherlandshire.
10. VII. 85. H. E. Fox

Ex Herb. CHARLES BAILEY,
Hempstead, C/o 100, Gloucestershire.

EM332166

Bicucullaria cucullaria (L.) Millsp.

FLORA OF WASHINGTON.
W. ELICHTAY CO.

10612

FIDE
PIPER FL. WASH.
PAGE 284



107
Oxytropis Halleri - Bunge
Sea. cliffs
Melrich
Sutherlandshire.
10. VII. 85. H. E. Fox

No. Oxytropis Halleri - Bunge
Cyclop. Brit.: Ex Herbarium W. L. Nisbet, Cheltenham.
Locality: Shrove,
County: Wiltshire.
Collected by R. Dick, comm. W. L. Nisbet
Communicated by Charles Bailey, Manchester.

EM332160



herbaria@home
recording historical biodiversity

log in | register

Notes from Nature.

ZOO NIVERSE
REAL SCIENCE ONLINE

ATLAS of LIVING AUSTRALIA
sharing biodiversity knowledge

Les herbonautes
L'herbier numérique collaboratif citoyen

Smithsonian



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SMITHSONIAN DIGITAL VOLUNTEERS: TRANSCRIPTION CENTER

TRANSCRIBE MUSEUM RECORDS

Notes from Nature

Choose a Group and Start Transcribing!



5

Expeditions Available

1,223

Registered Volunteers

34,608

Classifications

21,033

Subjects

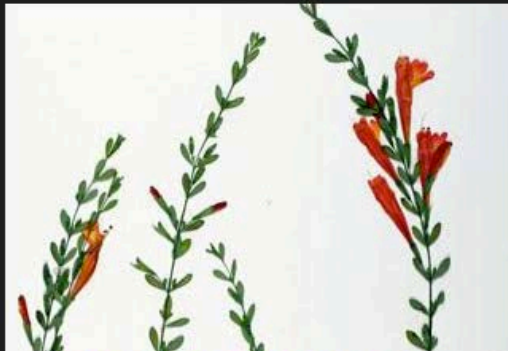
10,394

Retired Subjects

WeDigFLPlants on Notes from Nature

Notes from Nature

Active Expeditions for Herbaria



**WeDigFLPlants' Mints of
Florida—More than Mojitos**

90.00% complete

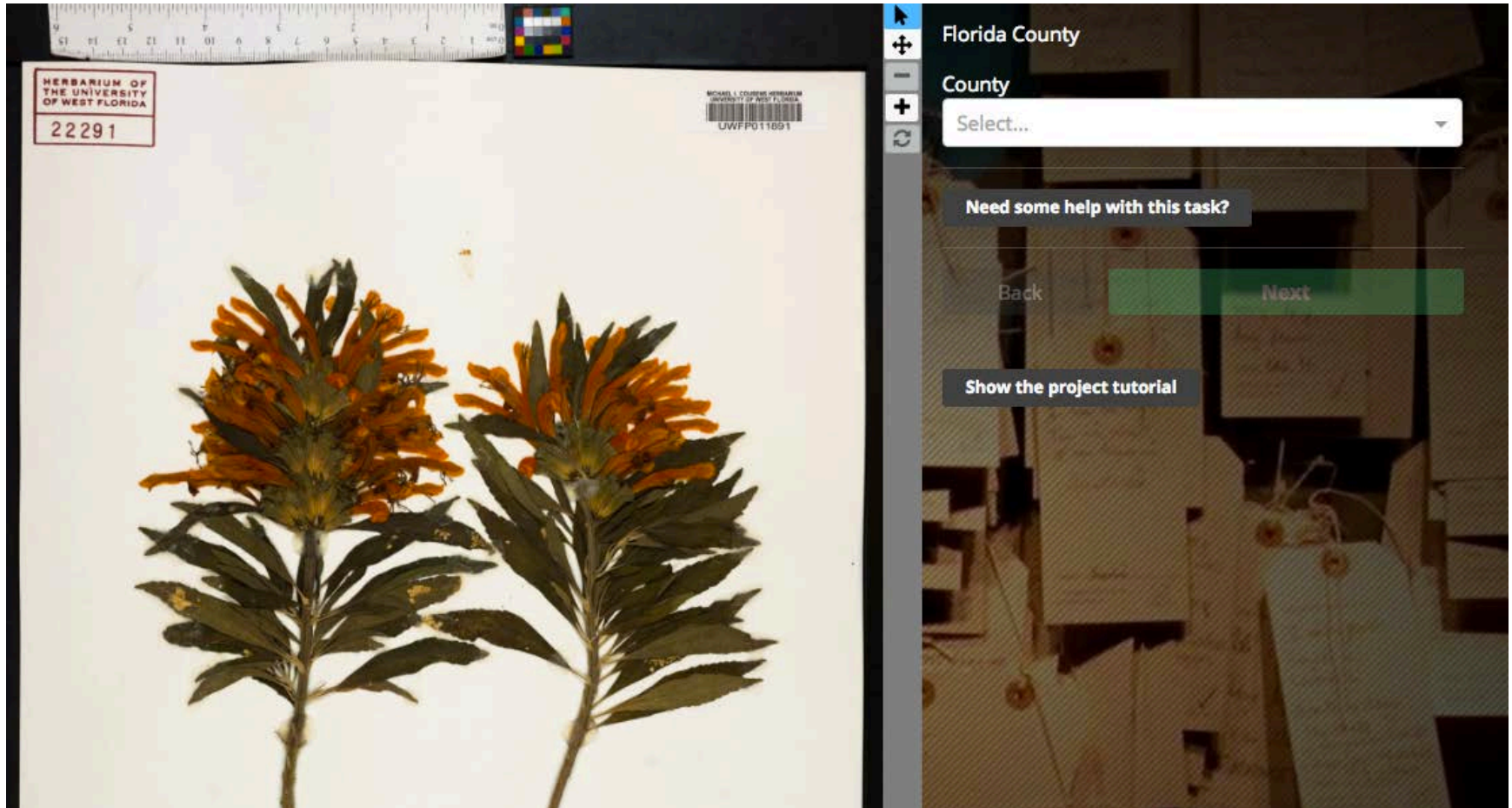


**WeDigFLPlants' Laurels of
Florida—Fight Laurel Wilt**

79.79% complete



WeDigFLPlants on Notes from Nature



WeDigFLPlants on Notes from Nature

MICHAEL I. COUSENS HERBARIUM
University of West Florida

Plants of Florida

Leonotis leonurus R. Br.

Escambia Co., Pensacola.
W side of Jefferson St, N of intersection with
Pine St. Ornamental plant ca 2 ft tall by park-
ing lot. Flws orange.

7 Oc 2009
James R. Burkhalter 22404

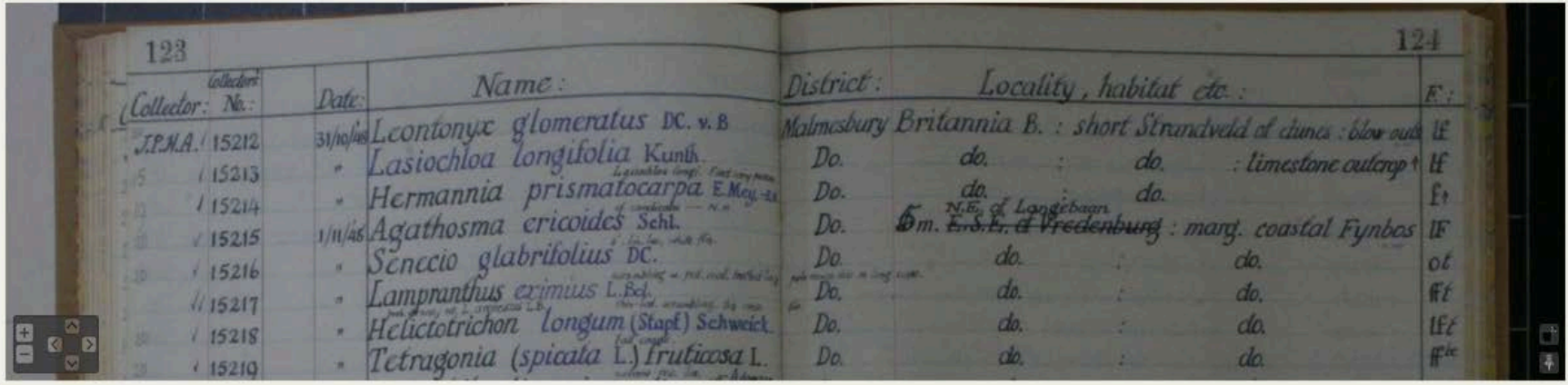
Florida County
County
Select...
Need some help with this task?
Back Next
Show the project tutorial

← show previous journal page

show next journal page →

Rotate ↻

A A A



1. Verbatim Text ?

2. Where a species or common name appears in the text please enter any relevant information into the fields below

[Shrink](#)

3. Notes Record any comments here that may assist in validating this task

[Shrink](#)

Atlas of Living Australia

volunteer.ala.org.au/

Digitizing Biodiversity Specimens

- Transcribing Specimen Label and Ledger Text
- **Georeferencing**
- Annotating

Experiment at FSU and Tulane

- How accurate are student georeferencers compared to software and to experts?
- What method is most effective at estimating the most accurate georeference?

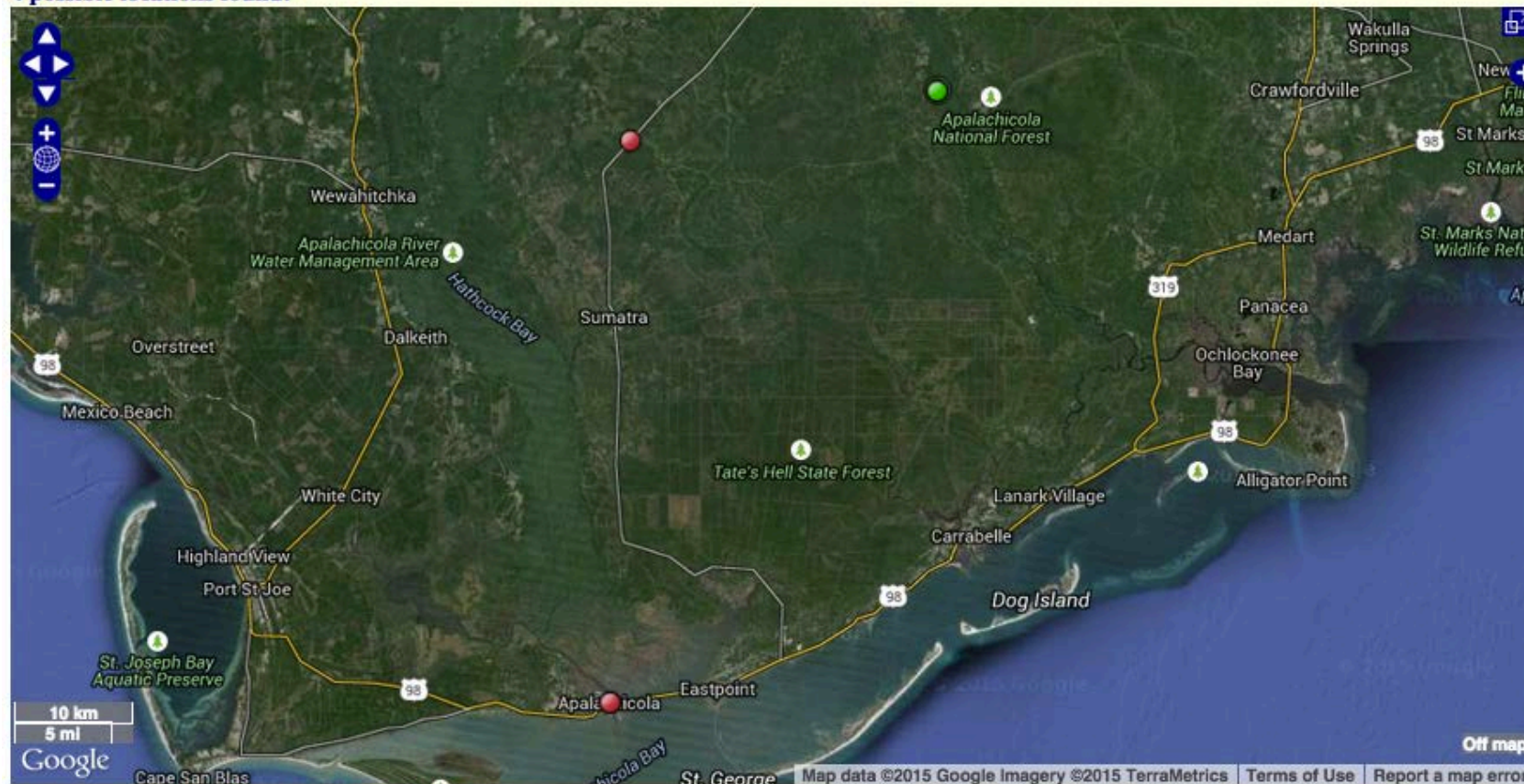
Verbatim Locality: titi bog, Apalachicola National Forest, near Wilma.
Habitat: in a sphagnous area, presently dry, titi bog



GEOLocate Web Application



4 possible locations found.



Workbench

4 possible locations found

Georeference | Options | Draw polygon Place marker Measure

Locality String:

Country:

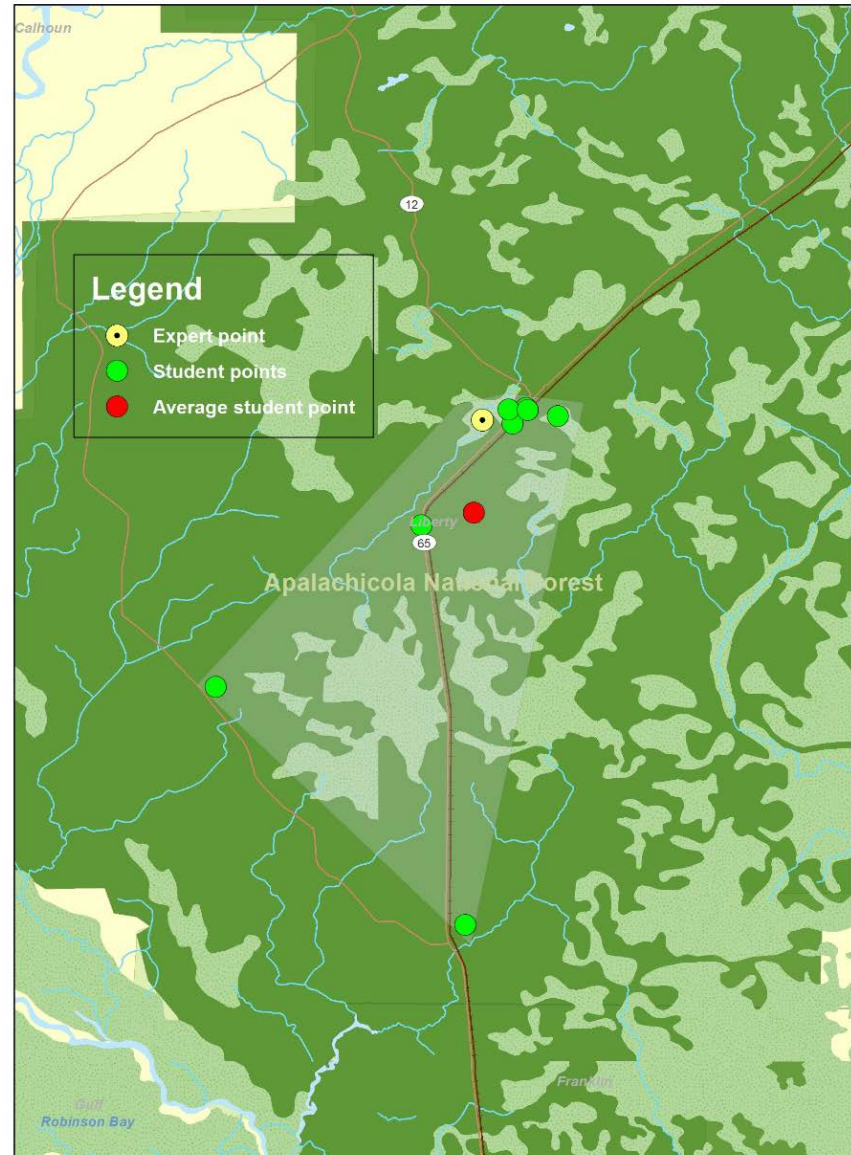
latitude: 30.193106 longitude: -84.693956 uncertainty: 1189 m error polygon

State:

County:

Student georeferences
averaged 4.62km from
experts

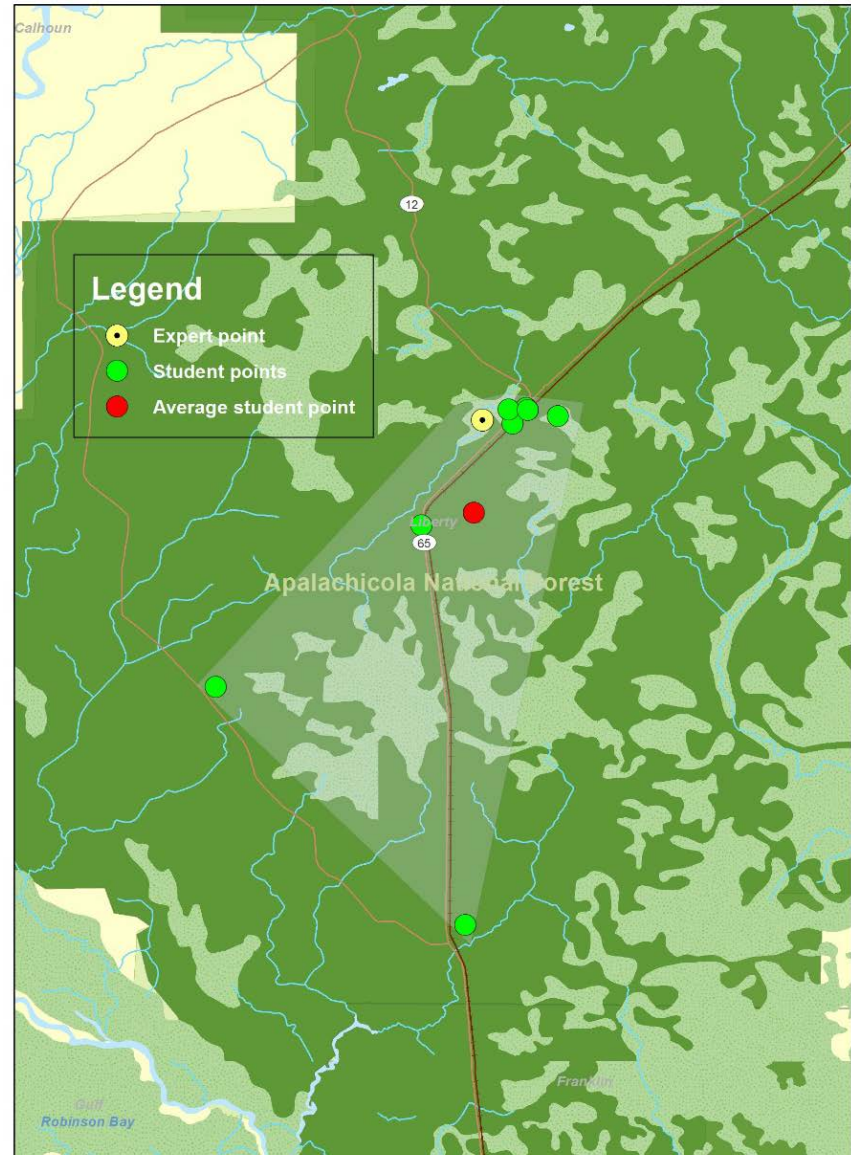
(range 0.18–37.08 km)



Student georeferences
averaged 4.62km from
experts

(range 0.18–37.08 km)

Median of student
points provides a
better locality estimate
than mean

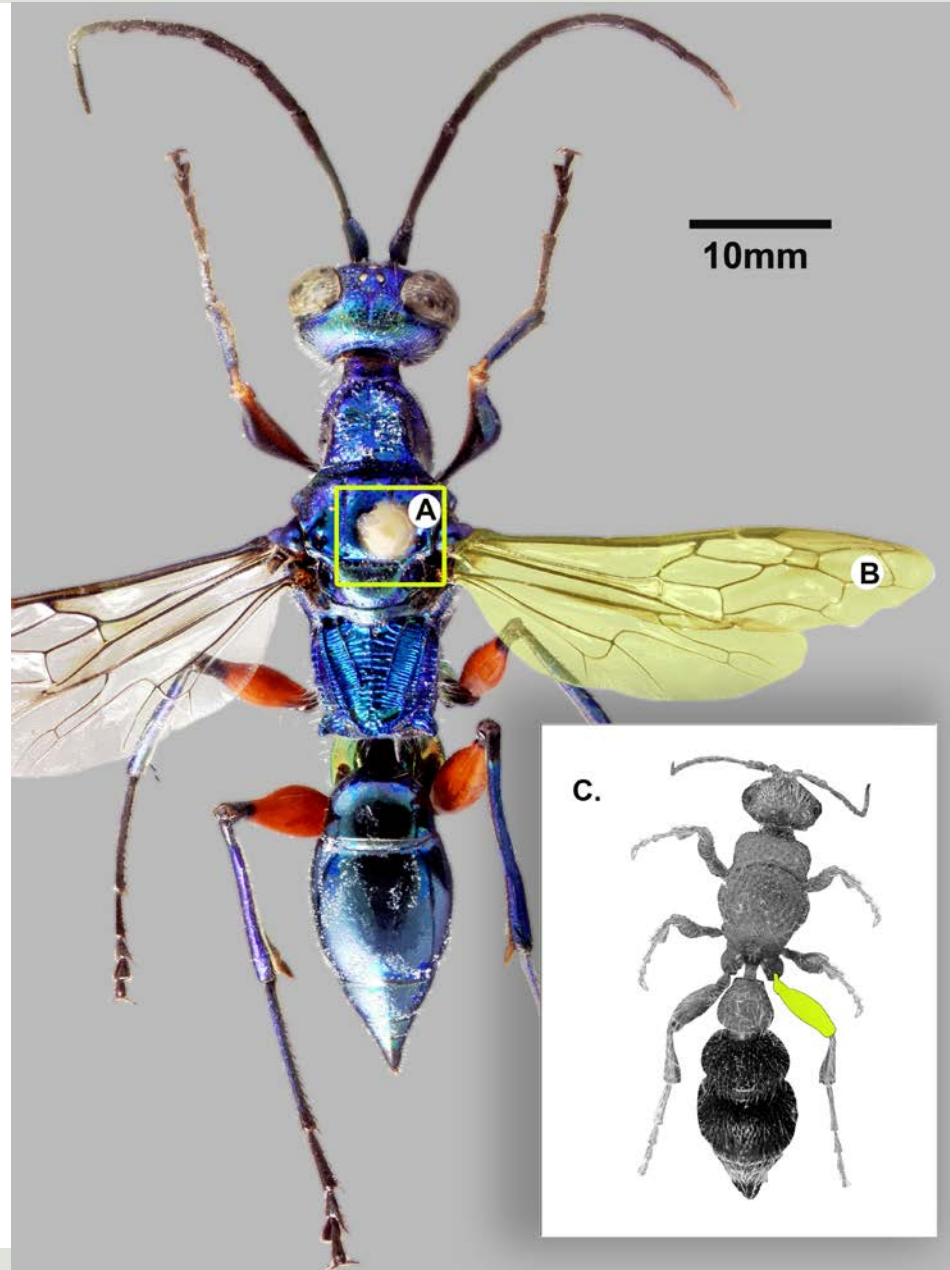


Digitizing Biodiversity Specimens

- Transcribing Specimen Label and Ledger Text
- Georeferencing
- **Annotating**

“Outline the wings of the specimen”

Ampulex compressa (F.) from the
Museum für Naturkunde Berlin
(morphbank.net/?id=102143)



Challenges

- Not all labels are citizen science-friendly
 - Illegible handwriting
 - Outdated name and place names
 - Imprecise locality information
 - Limited knowledge of
 - Collection techniques, i.e., botanists collect along roadsides
 - Habitats
 - Scientific terminology
- Innate student ability and interest

No. 323 Locality. Arrendal

NAME, SYNONYMS, AND PECULIARITIES.

Radiated brown Stillite
in calcolite, from
primitive Rocks.

Bicucullaria (L.) Bernh.
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PLANTS OF OKLAHOMA
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The University of Oklahoma

Oklahoma County

Scrophulariaceae

Penstemon oklahomensis Penn.

SE corner of Tinker AFB. T11N R2W Sec. 26.
Topography: rolling upland. Habitat: Mixed-Grass Prairie.
Herbaceous perennial. 2-3 dm tall. Flowers white.

F. L. Johnson
TNK017

4 May 1994

Plant Inventory of Tinker Air Force Base by Oklahoma Biological Survey

[COOK DISTRICT]

Natural Order: Rutacea
Generic name: Citrus
Specific name: Garrawayi, Bail.
Vernacular name:
Habitat: W. White, Coon.
Collector: R. W. Garraway
Remarks: May 1904

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107
Oxytropis Halleri - Bunge
Sea. cliffs
Melrich
Sutherlandshire.
10. VII. 85. H. E. Fox

Ex Herb. CHARLES BAILEY,
Hempstead, Ch. 100, Gloucestershire.

EM332166

Bicucullaria cucullaria (L.) Millsp.

FIDE
PIPER FL. WASH.
PAGE 284

FLORA OF WASHINGTON.
W. KLICKITAY CO.

10612

100 white flowers / collected
Paulo, California 187
Coll. R. Field
Gen. H. S. G. Hunt

No. Oxytropis analensis, R.
Cyclop. Brit.: Ex Herbarium W. L. Nuttall, Cheltenham.
Locality: Thurso,
County: Cairn.
Collected by R. Dick, comm. W. L. Nuttall
Communicated by Charles Bailey, Manchester.

EM332160

Considerations and Future Directions

- Citizen scientists make valuable contributions to data mobilization efforts
- Usefulness dependent on downstream use
- Room to grow:
 - Reach out to new volunteers, e.g., experienced naturalists, armchair geographers
 - Improve training and online platforms
 - Sort labels regionally or taxonomically to provide volunteers local specimens
- Broaden participation through interactive events like...



What is WeDigBio?

Worldwide Engagement for Digitizing Biocollections

A citizen science event of **mass digitization** that focuses on science, biodiversity, community building, and our collections.



2015 WeDigBio event at the Field Museum, Chicago, Ill.

WeDigBio Goals

- Increase the rate of digitization of biodiversity collections
- Raise the profile of collections and their significance in science, society, and education
- Build our global biodiversity crowdsourcing community



2015 WeDigBio event at BRIT, Fort Worth, TX

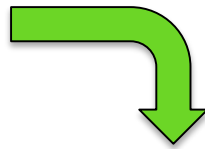
Citizen scientist participation

Onsite

at museums,
universities,
and schools

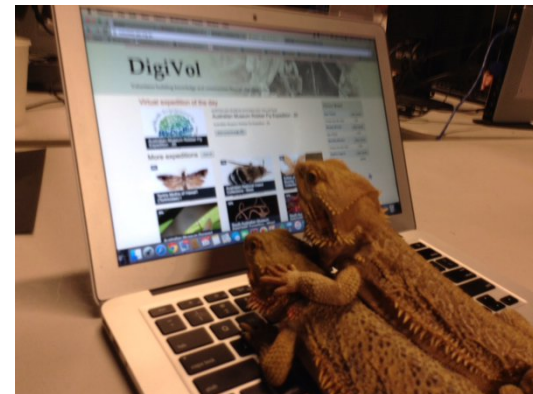
Online

distributed
around the
world



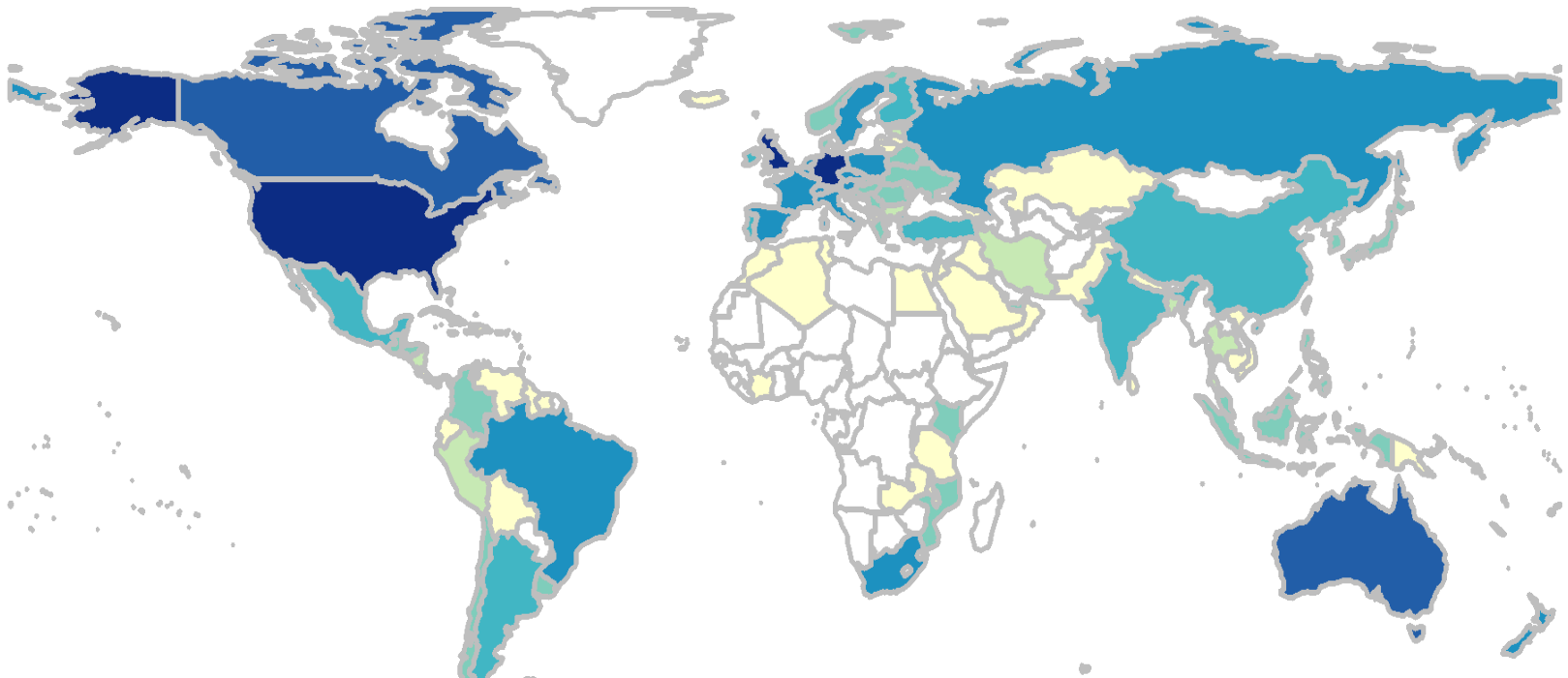
Online Transcription Platform

- DigiVol (Atlas of Living Australia)
- Les Herbonautes (Paris Herbarium)
- Notes from Nature (Zooniverse)
- Smithsonian Transcription Center
- Symbiota



Pilot Year: WeDigBio October 22-25, 2015

- Hundreds of participants from >150 countries
- 50,000+ transcription tasks
- 20 onsite events



Enhancing the Experience

- Onsite participants received tattoos, stickers, and prizes
- Researchers gave lectures and tours of collections
- University classes used WeDigBio lesson plans and games
- Everyone shared photos and stories via social media, AdobeConnect

Twitter feed

NSCAlliance and 3 others Retweeted
NSF Biology @NSF_BIO · Oct 24
 And make sure you check out all the [#WeDigBio](#) events this weekend! [wedigbio.org](#) @WeDigBio

NYT Science @NYTScience
 Out of storage and onto the Internet: a guide to digitized natural history collections [nyti.ms/1PHweLV](#)

NMNH_Entomology and 2 others Retweeted
The Field Museum @FieldMuseum · Oct 24
 Since Thursday, we've transcribed over 1,000+ records for [#WeDigBio](#)! Here's how you can help remotely: [field.mu/TLyBb](#)

SI Transcription Ctr and 1 other Retweeted
NMNH_Entomology @NMNH_Entomology · Oct 24
 Follow along live as @NMNH hosts a live transcription event! [#BeeByBee](#) [#WeDigBio](#)

SI Transcription Ctr @TranscribeSI
 LIVE on [#Periscope](#): WeDigBio at Smithsonian Natural History - [#BeeByBee](#) [periscope.tv/w/aPu05TF6WUti...](#)



Online transcriber's view



WeDigBio tattoos



Logistical Documents at wedigbio.org

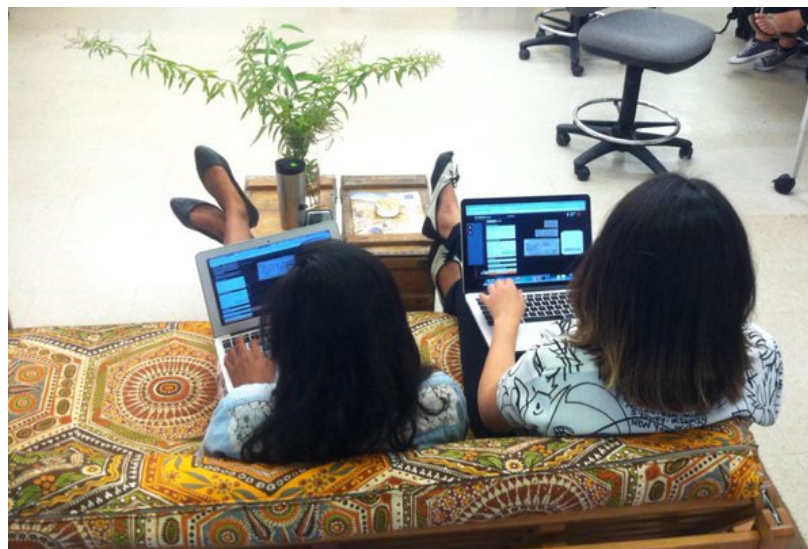
For onsite hosts

- Press Kit
- Event Planning
- Tasklist
- Timeline

For participants

- Find a project
- Find an onsite event

Follow along with visualizations, twitter feed, videos, recently transcribed images, and more.



2015 WeDigBio Event at Natural History Museum of LA County

Education and Outreach in WeDigBio 2015

Games

- Habitat bingo and morphology bingo
- GEOLocator
- Timeline Tracker



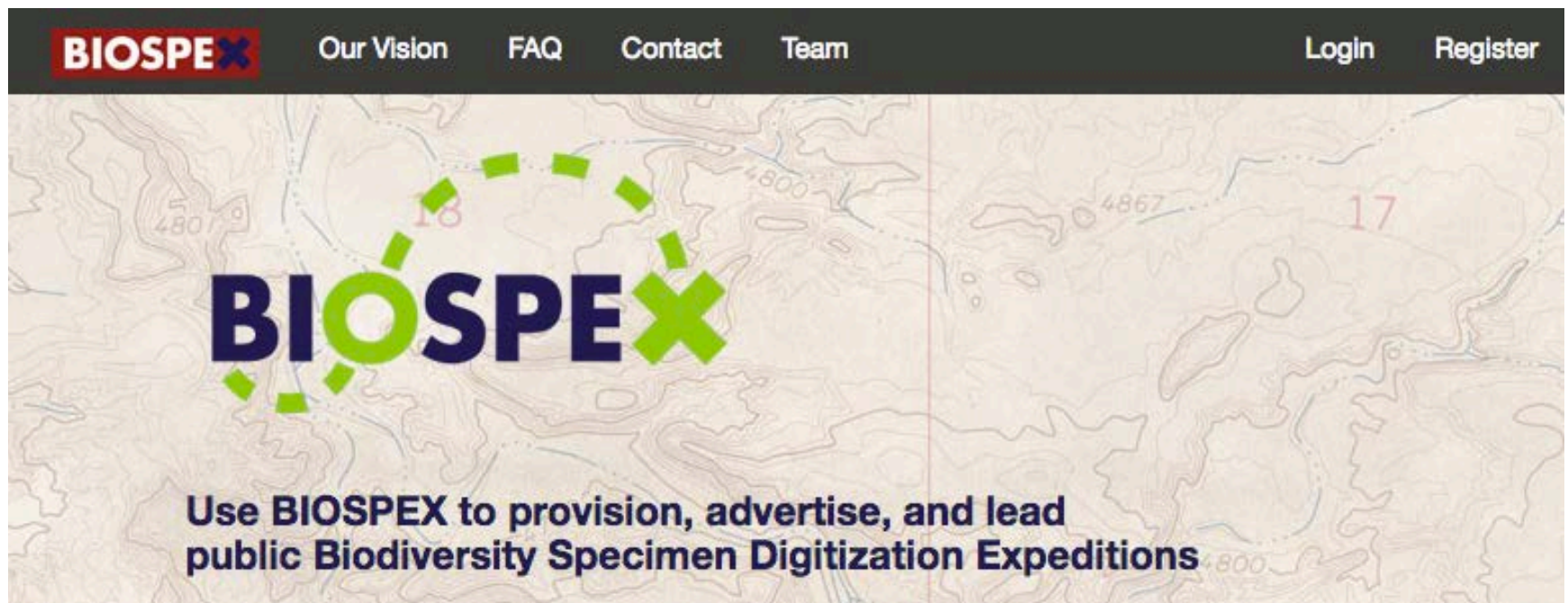
2015 WeDigBio Event with University of Florida Plant Taxonomy class

Undergraduate lesson plan developed with collectionseducation.org

BIOSPEX

BIOdiversity SPecimen digitization EXpeditions
easily contribute images from a collection to an online
transcription platform

biospex.org



The screenshot shows the BIOSPEX website homepage. At the top, there is a dark navigation bar with the BIOSPEX logo on the left and links for "Our Vision", "FAQ", "Contact", "Team", "Login", and "Register" on the right. Below the navigation bar is a large banner image featuring a topographic map background. The BIOSPEX logo is prominently displayed in the center of the banner, with the letters "BIO" in blue and "SPEX" in green, and a green dashed line forming a circle around the "O". Below the logo, the text reads: "Use BIOSPEX to provision, advertise, and lead public Biodiversity Specimen Digitization Expeditions".

Follow us!

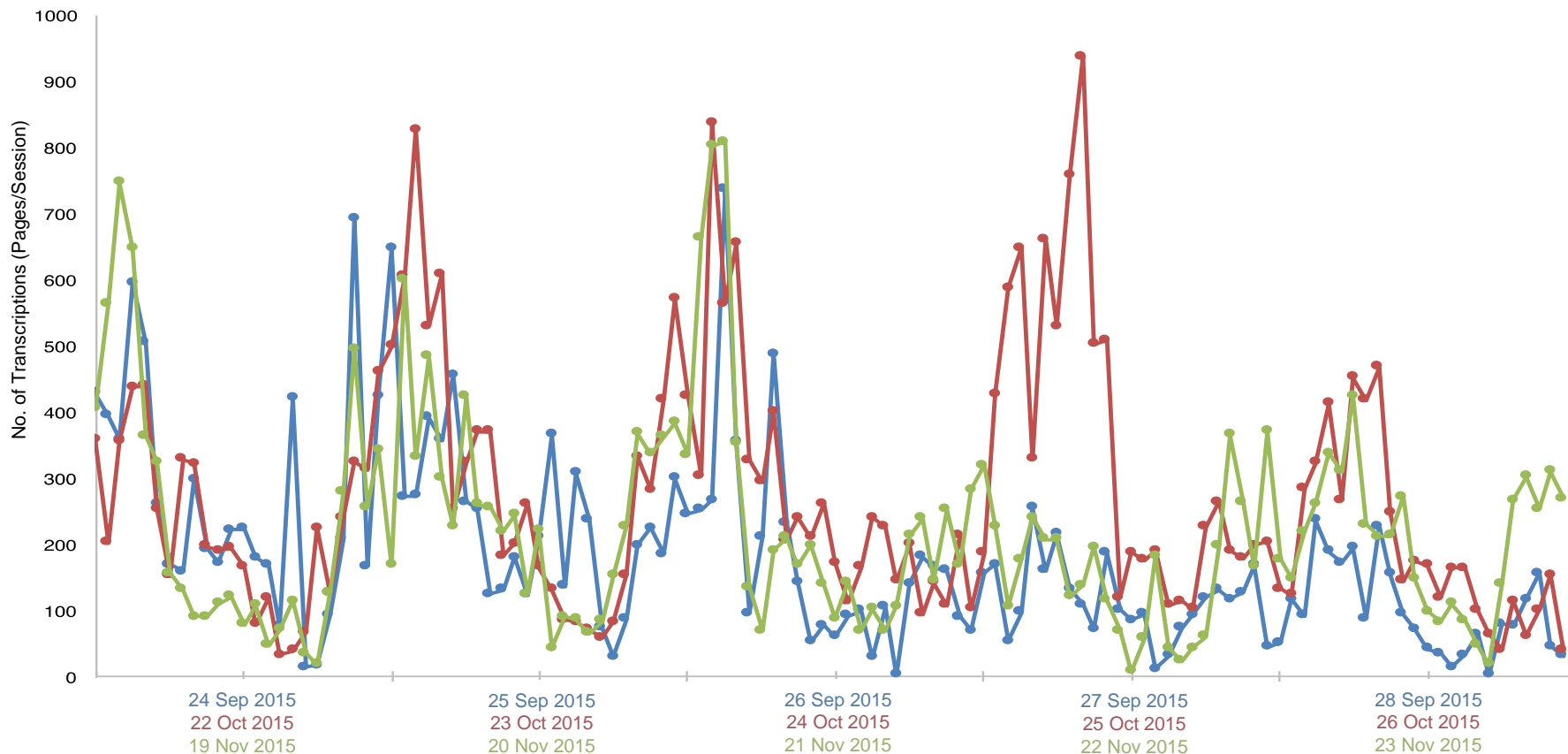


wedigbio.org
biospex.org

Thank you!

o.fsu.edu

Hourly Transcription Rates Before (Blue), During (Red), and After (Green) WeDigBio



Enhancing the Experience

Q?rius Lab at the Smithsonian



Agents of Change at BRIT

C	R	A	B	S
Mary Wicksten	Santa Monica	California	Santa Monica	Cancriidae
Washington	Cancer borealis	Bodega Bay	Cancer porteri	Santa Cruz
Point Fermin	Mexico	*Allan Hancock	Peru	California
Cancer gracilis	Cancer oregonensis	Cancer antennarius	Cancer plebejus	Cancer anthonyi
Corona del Mar	Playa del Rey	Cancer magister	Mexico	Cancer branneri

CRABS bingo at Natural History Museum of LA County



Virtual tour of the Smithsonian to middle school students in Tallahassee, FL



Visit from a researcher (Paul Mayer) at the Field

Participant motivations

I already volunteer as a transcriber for the NYBG and wanted to bring a friend along.

I love bees and I wanted to help people to get more information about them.

I wanted to know more about the various different types of specimens that exist and help catalogue them so others can access them.

The Doctor Soltis family made me do it.

After listening to the presentation given during my biology lecture, I was interested in learning about the specimen preserved in the institution.

I wanted to help with the research efforts after hearing a presentation about the number of undocumented specimens.

I thought it would be interesting to see how to organize data about species.

I like the idea of contributing to scientific knowledge.

Also, donuts, volunteer hours, class credit, just for fun...