The Digitization Experience at Florida State University's Robert K. Godfrey Herbarium

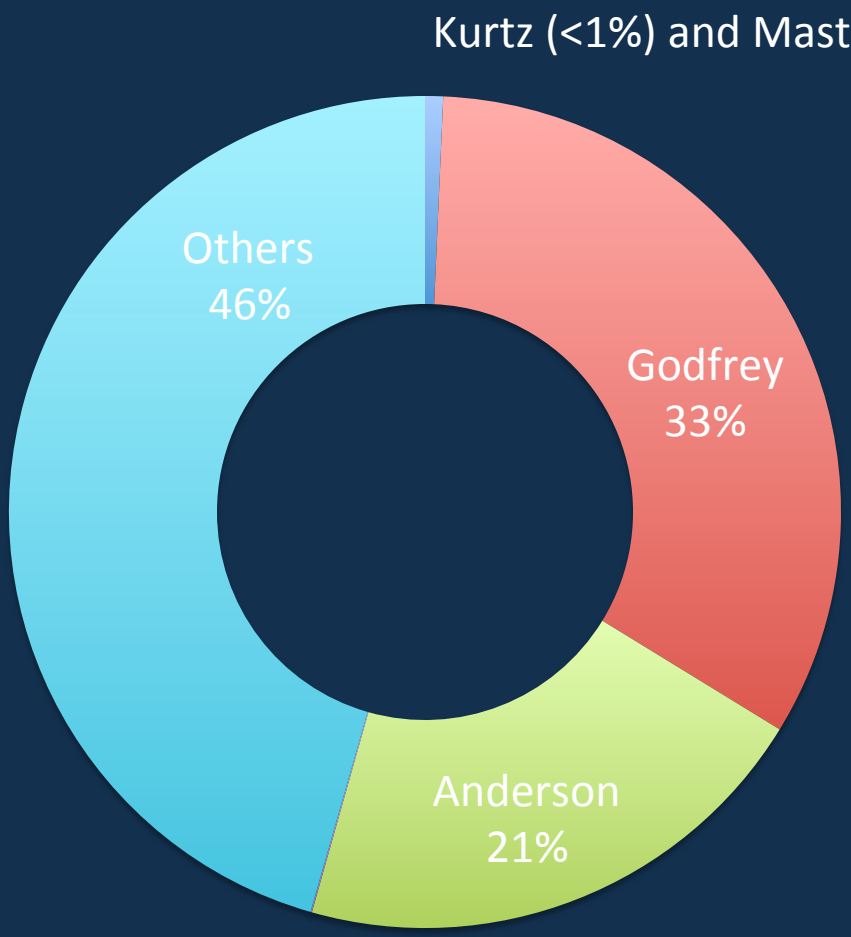
Austin Mast
Director, Robert K. Godfrey Herbarium
Associate Professor, Department of Biological Science
Florida State University

Outline

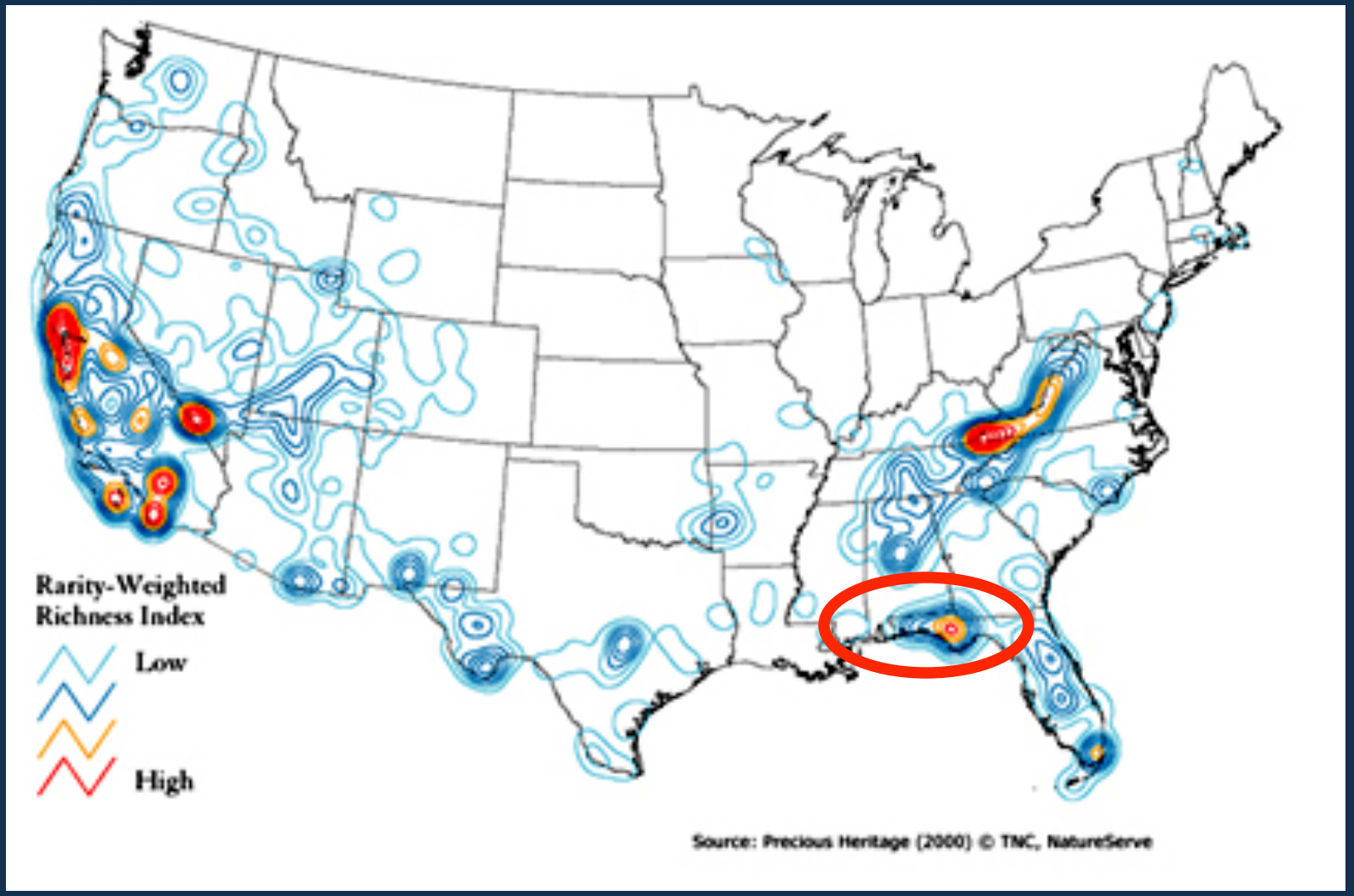
- Intro to the herbarium
- Our history of digitization
- The front-end
- Notes from Nature Project
- General observations
- General recommendations

Robert K. Godfrey (1911–2000)

Godfrey was a prolific collector.



Portion of 76,577 digitized specimens (of ca. 210,00 total) collected by herbarium directors.



The herbarium is arguably the most extensive plant collection documenting this biotic hotspot: a region with ca. 2864 spp. of native vascular plants.
125 plant taxa are endemic to it.

Sarracenia leucophylla
Photo: Gil Nelson

Magnolia macrophylla var. *ashei;*
Photo: Gil Nelson

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Microalgae Collection

The bulk of the Microalgae Collection originates from samples of phytoplankton in Florida's coastal and inland waters. In addition to plankton samples, the collection also includes benthic diatoms that are associated with submersed aquatic plants (epiphytic), sediments (epipelic), and artificial substrates, such as glass slides (periphytic). These samples were collected by Professor Robert J. Livingston and Dr. A. K. S. K. Prasad of FSU's Department of Biological Science over a period of 25 years. Florida collection localities include the drainage basins of the Perdido, Choctawhatchee, Chipola, and Suwannee Rivers, the Econfina and Fenholloway estuaries, and Florida Bay, among others. The collection also includes specimens from elsewhere along the Gulf and Atlantic coasts of the southeastern US, the Caribbean Sea, the Indian Ocean, the Equatorial Pacific (including the Galápagos Islands), and the South China Sea. The collection includes over 8000 permanent diatom slide preparations mounted in Naphrax or Zrax, over 7000 scanning and transmission electron microscope images, and over 40,000 light microscopic images. Extensive research publications and manuals of diatoms (ca. 2000) from the personal libraries of Dr. Greta A. Fryxell (formerly of Texas A&M University), William Miller III (formerly of FSU EM lab), and Dr. Prasad provide added value to these important collections.

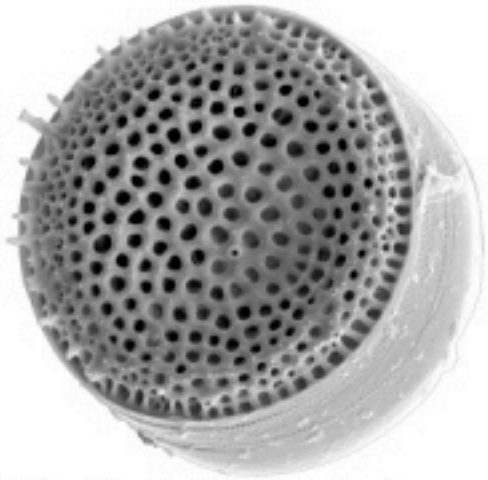

Photo: Thalassiosira cedarkeyensis
Photo Credit: Akshintal Prasad

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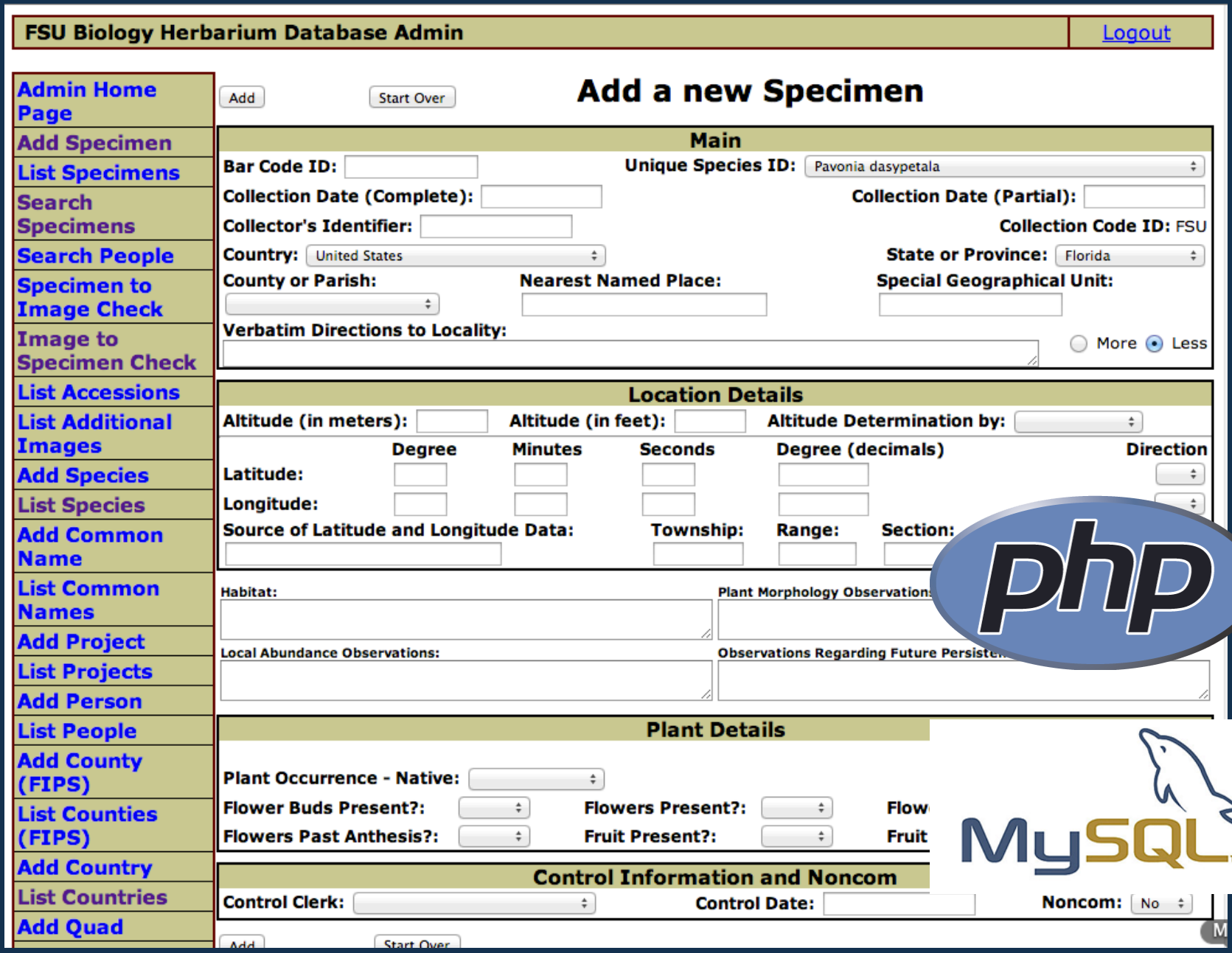


We began work on the database and front-end in Fall 2003.

HISPID

Herbarium Information Standards and Protocols for Interchange of Data

---

HISPID is a standard format for the interchange of electronic herbarium specimum information. **HISPID** has been developed by a committee of representativies from all Australian Herbaria. This interchange standard was first published in 1989, with a revised version published in 1993.

HISPID3 (published 1996) is available here. For later versions, go to new HISCOM Wiki pages

See also document on Reduction of Costs in Herbarium Data-entry in Australia Using HISPID3

HISPID3

The **HISPID3** document is provided in two forms. **HISPID3** can be accessed as a complete document or by logical groups of field descriptors and related comments. Also a description is provided for the design of the transfer codes used in **HISPID3**.

HISPID3 is available as a printed document from HISCOM

- **HISPID3 The complete document [267k]**
- **HISPID3 In Bits**
- **HISPID3 & ITF2 Transfer Codes - Design Notes**

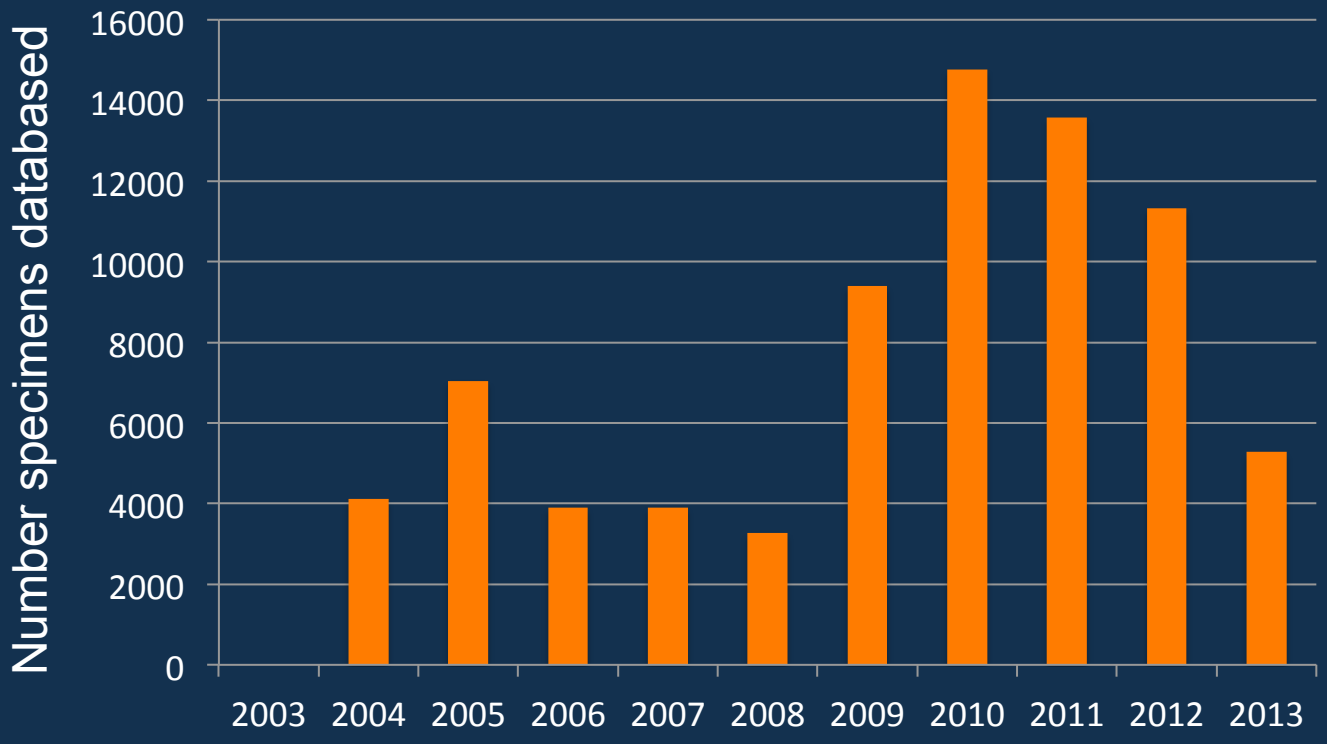
http://plantnet.rbgsyd.nsw.gov.au/HISCOM/HISPID/HISPID3/hispidright.html

An important resource for us at the time has HISPID 3 due to its fairly exhaustive representation of specimen qualities. Darwin Core (and DC Extensions) would be a good place to start today.

Digitization began on February 3, 2004.

Digitization began on February 3, 2004.

We are on our second digital camera, but we are still using the same lights, copy stand, and (in some cases) computers.



Number of specimens databased in each of 10 years.
Total = 76,577; Range = 3,279 – 14,767; Mean = 7,658.

Graduate Researchers - Past

Sarah Braun

Graduate Student, Department of Biological Sciences, Florida State University.

Research: Invasive plant management; Species distribution modeling of invasive plants of Florida; Preservation of natural history collections; Georeferencing primary species occurrence records.

Jessica Clopton

Graduate Student, Department of Biological Science, Florida State University.

Morphbank, Ontologies, Legumes of Florida.

Ryan Druyor

Graduate Student, Department of Geography, Florida State University

Research: Georeferencing primary species occurrence records from the FLEPPC database

Tania Kim

Graduate Student, Department of Biological Sciences, Florida State University

Amanda Kubes

Graduate Student, Department of Biological Science, Florida State University

Research: Effect of climate change on threatened species and their pollinators. As a past MorphBank RA, she focused on designing functionality in the system for biological research collections.

http://herbarium.bio.fsu.edu/people.php

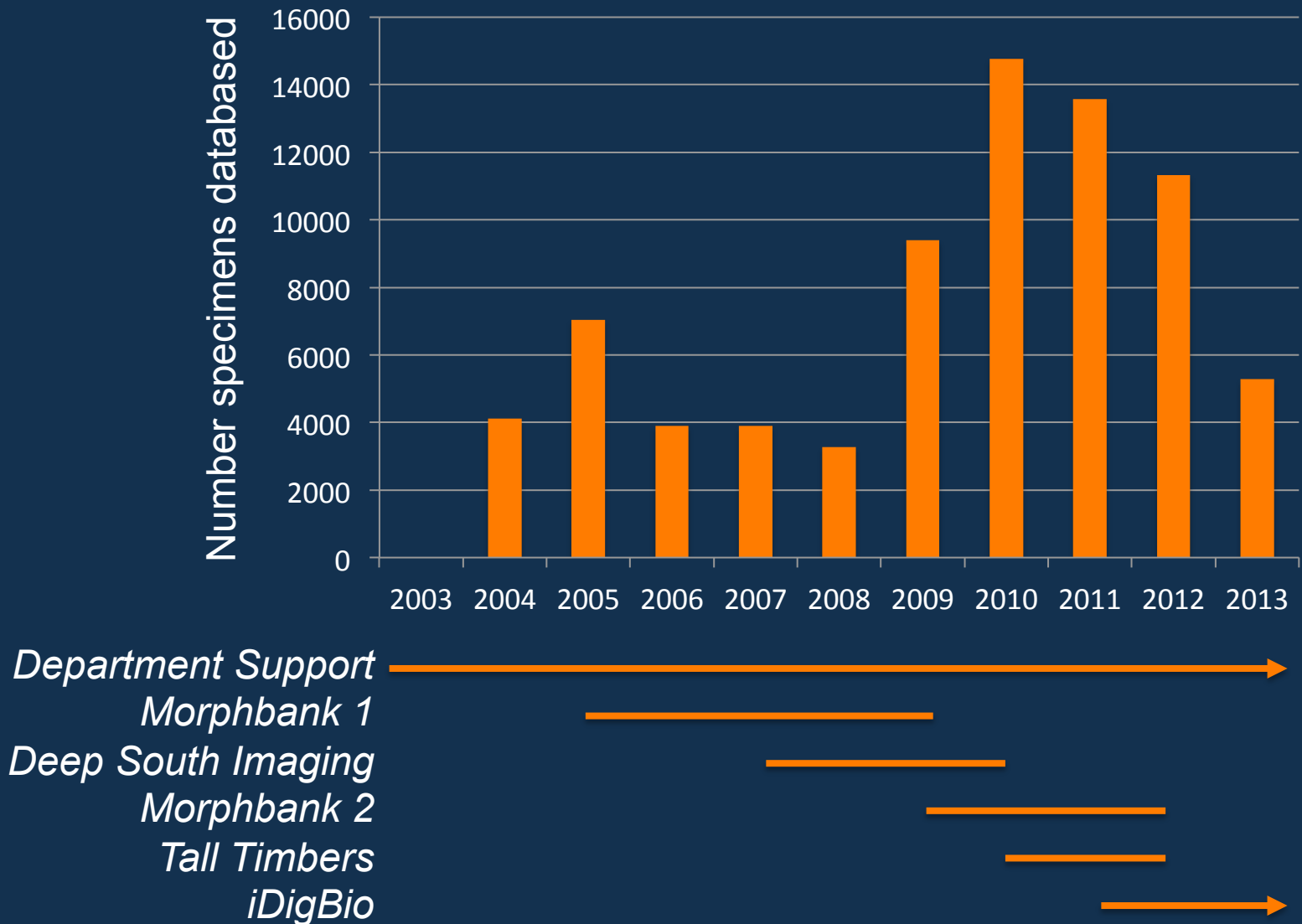
Digitization has involved 12 graduate students, 59 undergraduate students, and others.

Types of Undergraduate Participation

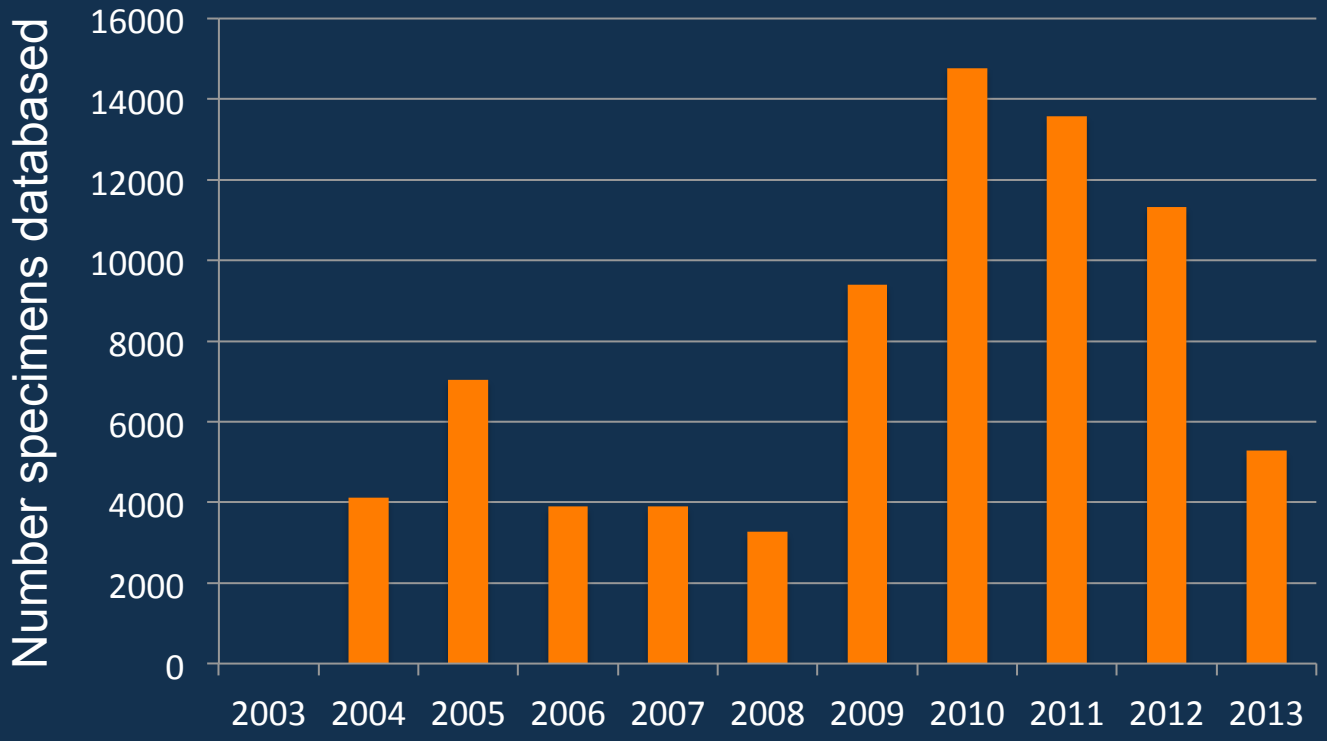
- Volunteers *(sparingly)*
- Directed Independent Study
- Federal Work Study
- FSU's Women in Math, Science, and Engineering Program
- FSU-TEACH Program

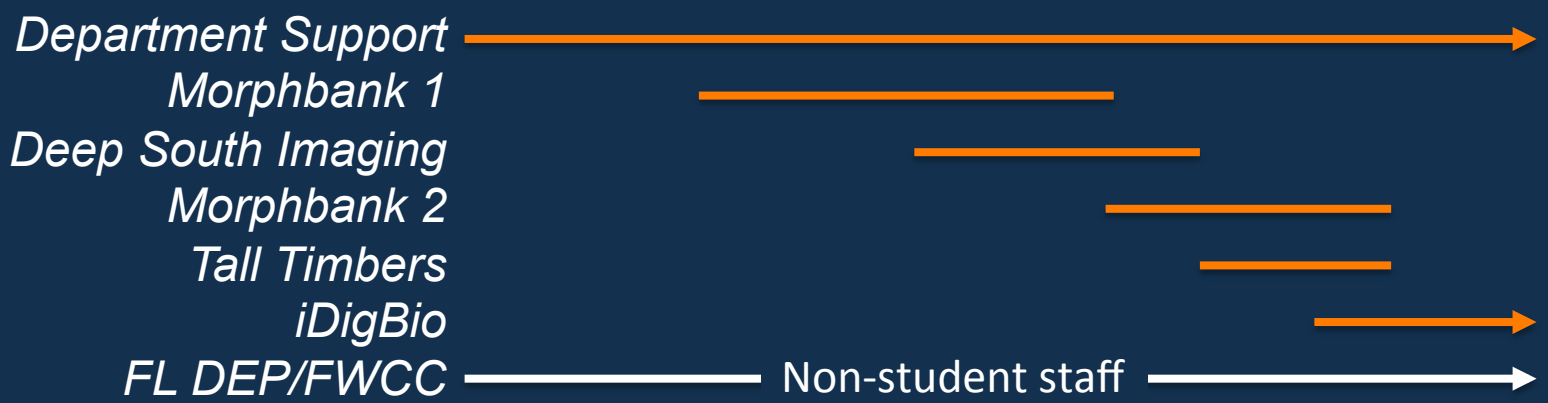
Types of Undergraduate Participation

Volunteers are typically trained to mount new specimens.



Graduate student participation is by means of a permanent half-time curator line and research assistantships. Funding for just some of the projects shown here included RA support (iDigBio does not).





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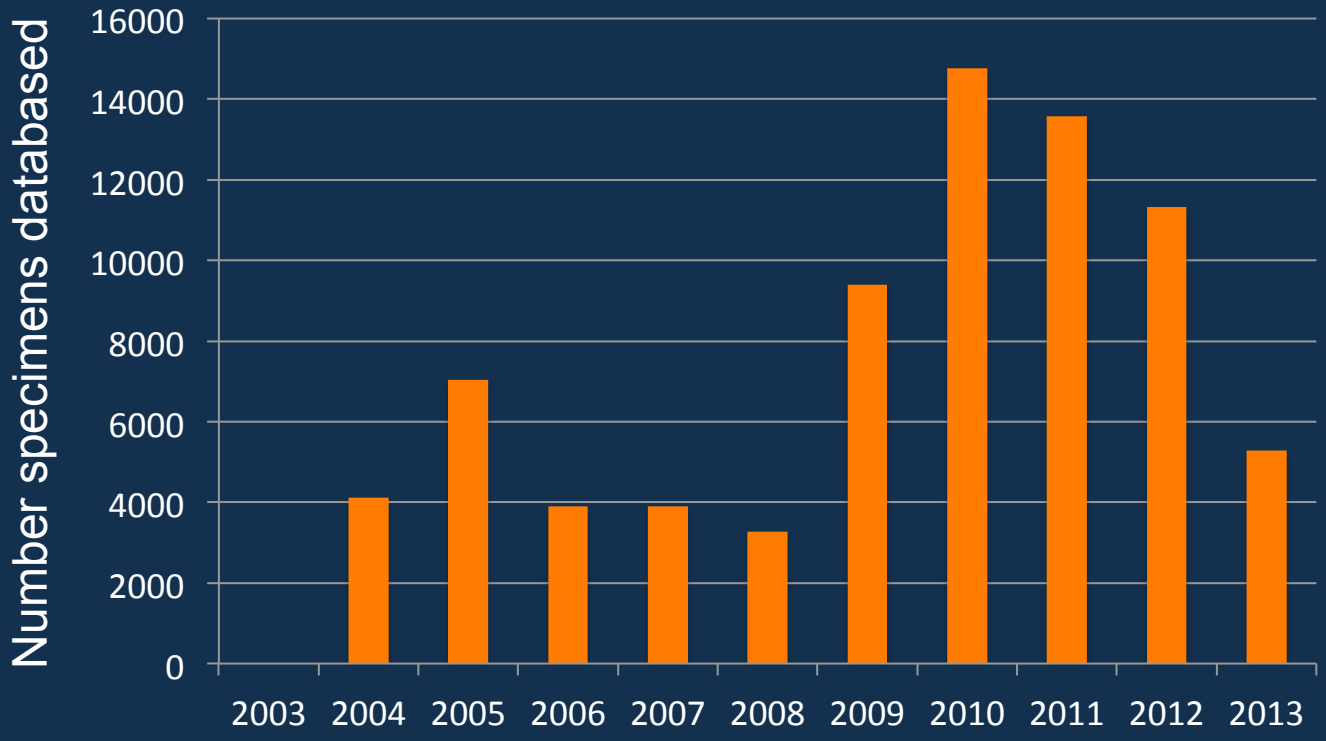
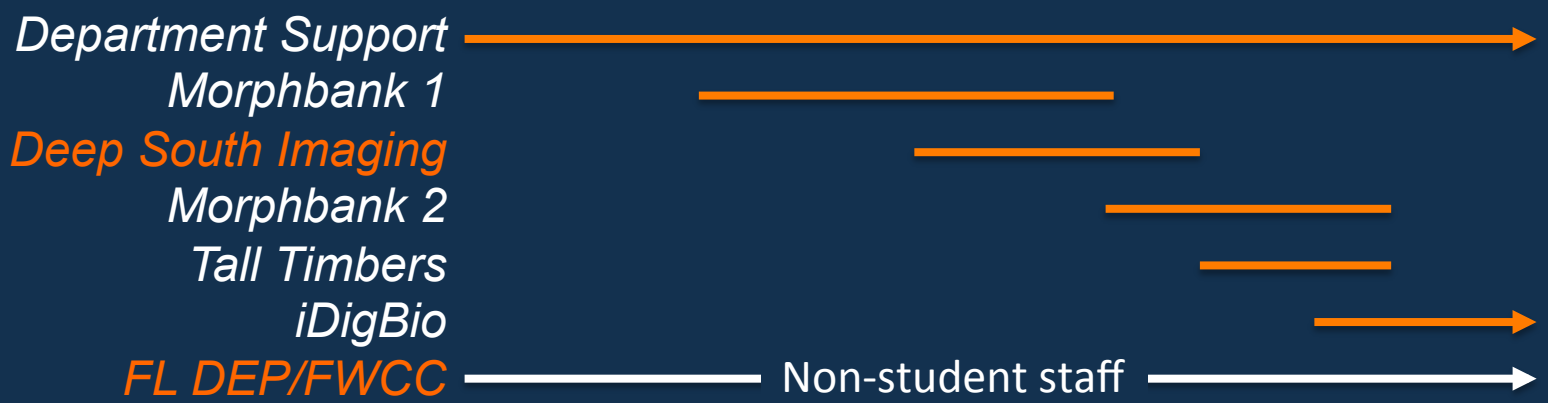
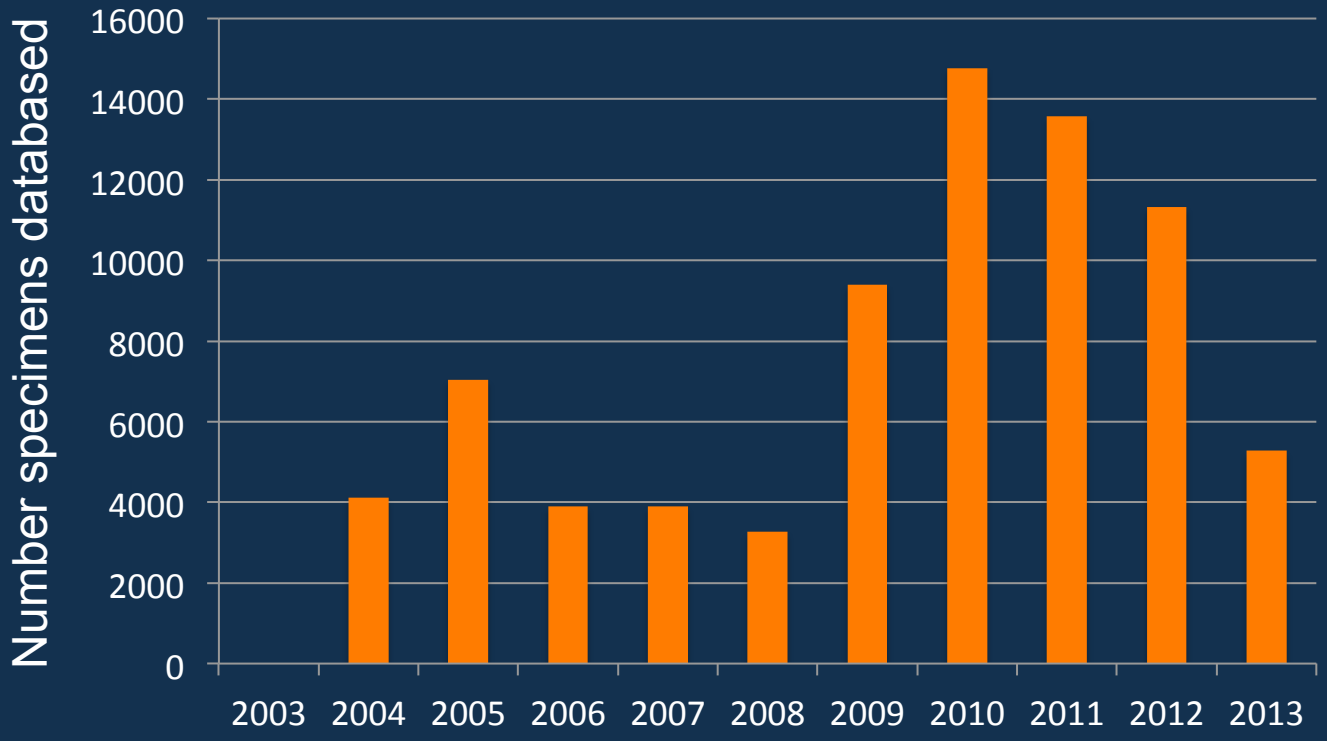
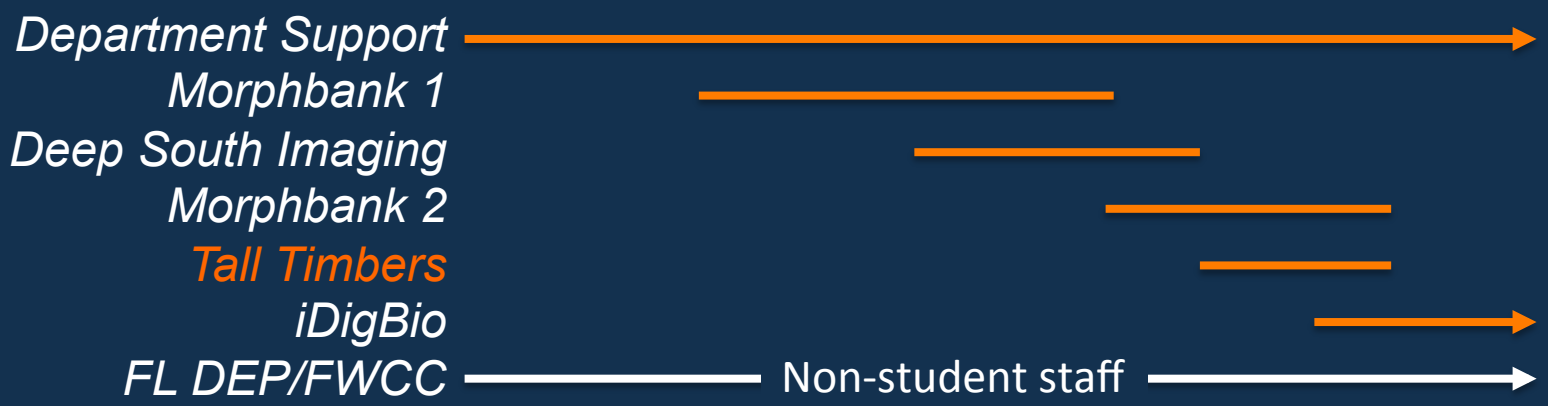




The greatest number of specimens digitized occurred with the Deep South Project, which involved imaging first then databasing (hence the lag), and the DEP/FWCC contract. The iDigBio grant does not pay for digitization.





The Tall Timbers grant resulted in a wave of new functionality for the front-end.

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The Robert K. Godfrey Herbarium at Florida State University

Florida State University's Robert K. Godfrey Herbarium is a museum-quality collection of over 200,000 plant and microalgae specimens. These document the distribution and natural variation of the 2,400 species of flowering plants, ferns, conifers, and cycads found in northern Florida-one of North America's biodiversity hotspots-and the microalgae of Florida's Gulf and Atlantic coasts. Each plant specimen is carefully identified, pressed, dried, and mounted to archival standards, with accompanying data on where and when it was collected. The specimens are a valued resource to local, state, national, and international biologists studying plant and microalgae systematics, ecology, evolution, biogeography, conservation biology, anatomy, and morphology. New specimens are added to the collection each week. In August 2003, Austin Mast became the new director of the herbarium. Though now retired, Loran Anderson remains active in the herbarium. The current curator is Chris Buddenhagen.

Photo: Hymenocallis henryae, Photo Credit: Gary Knight

In August of 2003 the Robert K. Godfrey Herbarium set up a digital imaging system and SQL database. Currently 71,998 of our 200,000+ specimens have been entered into the herbarium's database. In late 2010, Tall Timbers Research Station's Herbarium began serving specimen data and images on this site as well. Currently, data and images for 10,344 of Tall Timbers Research Station's 10,000+ herbarium specimens are being served.

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STRENGTH SKILL CHARACTER STRENGTH SKILL CHARACTER STRENGTH SKILL CHARACTER STRENGTH SKILL CHARACTER STRENGTH SKILL CHARACTER STRENGTH SKILL CHARACTER STRENGTH SKILL CHARACTER

© The Florida State University , Department of Biological Science , 319 Stadium Drive, Tallahassee, FL 32306-4295
Phone: (850) 644-3700 Fax: (850) 645-8447

www.herbarium.bio.fsu.edu

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Specimen Database Search

Please cite!

Submit | Undo Changes | Clear All

Search Criteria — Show: ◉ Hide: ○

Institution: ✓ Any Institution / FSU's Robert K. Godfrey Herbarium / Tall Timbers Research Station's Herbarium

Family: ting.

Genus:

Species: Vernicia fordii — The scientific name (e.g., Pinus palustris).

Common Name:

Collection Date: = (YYYY-MM-DD *or* MM-DD)

Collection Date: =

Collector Name:

Collector's Identifier:

Barcode:

Country:

State:

County:

Nearest Named Place:

Flowers present:

Fruit present:

Habitat:

More Options: Show: ○ Hide: ◉

Sort By: Species

Output Type: Thumbnails

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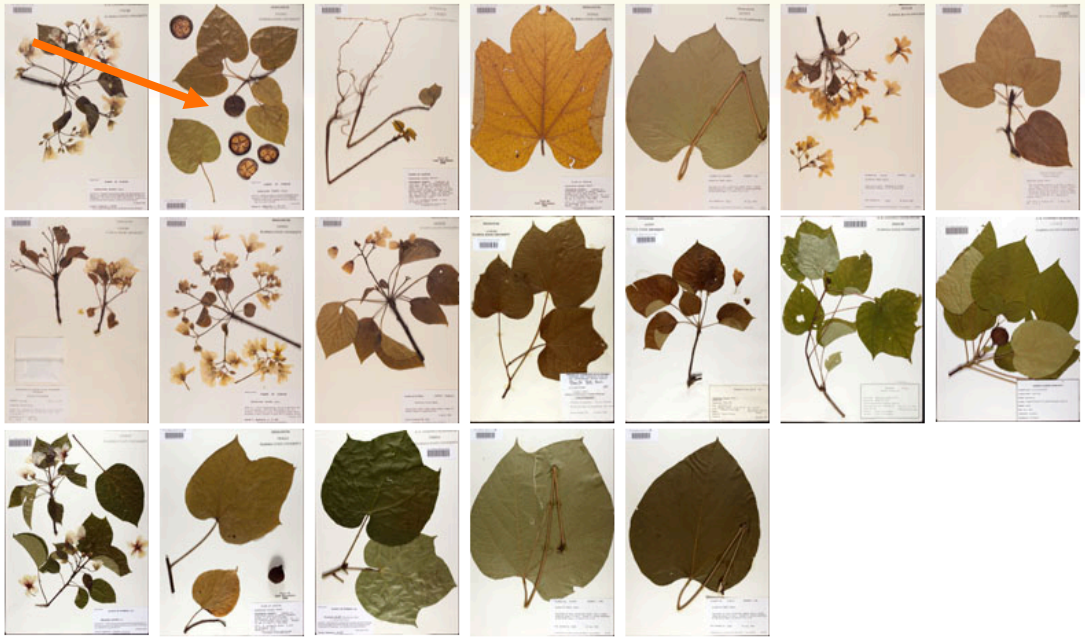
Sort By: Species

To modify your search choose the "Show" radio button above. If you would like to sort your results differently, change the field in "Sort by" above.

Search Results

Results 1-19 of 19 [1] Page 1 of 1



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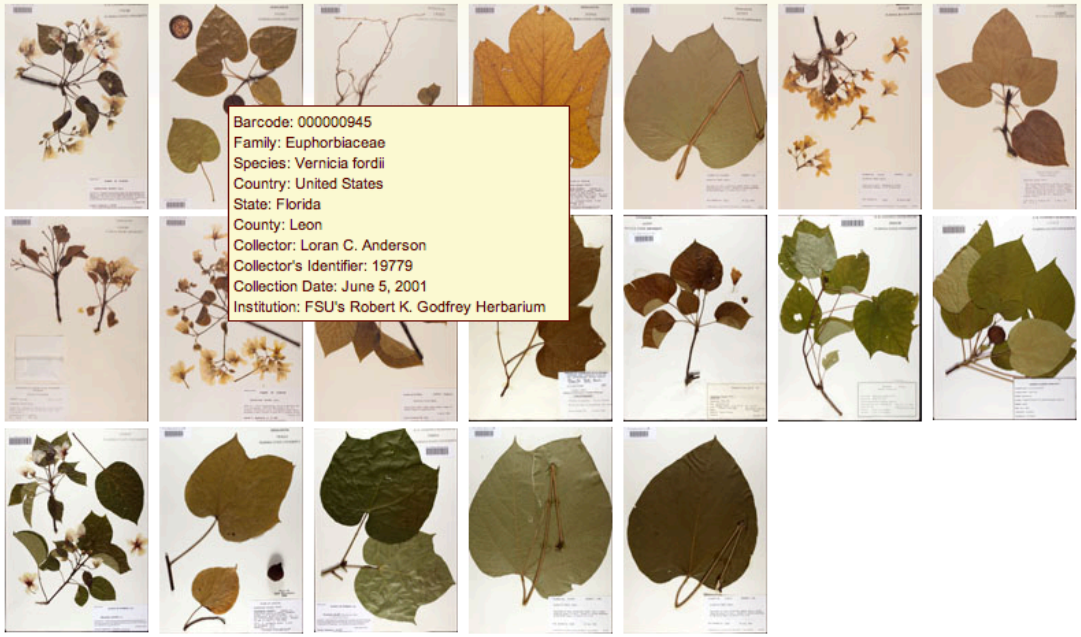

Barcode: 000000945
Family: Euphorbiaceae
Species: Vernicia fordii
Country: United States
State: Florida
County: Leon
Collector: Loran C. Anderson
Collector's Identifier: 19779
Collection Date: June 5, 2001
Institution: FSU's Robert K. Godfrey Herbarium

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Florida Torreya is restricted to 3 counties in the Florida Panhandle and an adjacent county in Georgia.

Specimen Details

Report a Problem

Has been proofread:**No** Mark as proofread: Edit View

Species:	Vernicia fordii
Annotated Since Imaged?:	True
Collection Date:	June 5, 2001
Bar Code ID:	000000945
Collectors:	Loran C. Anderson
Collector's Identifier:	19779
Flower Buds Present?:	False
Flowers Present?:	False
Fruit Present?:	True
Country:	United States
State or Province:	Florida
County or Parish:	Leon
Fips Code:	12073
Nearest Named Place:	Tallahassee
Verbatim Directions to Locality:	bordering the railroad tracks just E of Capital Circle NW in NW sector of Tallahassee.
Latitude - degree:	0
Latitude - minutes:	0
Latitude - seconds:	0
Latitude - degree with decimals:	0
Longitude - degree:	0
Longitude - minutes:	0
Longitude - seconds:	0
Longitude - degree with decimals:	0
Habitat:	woody area bordering the railroad tracks.
Plant Morphology Observations:	small tree; all fruits on this tree are 5-carpellate, but a few of them have only 3 or 4 seeds by abortion.
Non digital information?:	N

View Image View JPEG
Download JPEG (1.27 MB)
Download TIFF (30.83 MB)

Identification Records

Identifier's Name:	Loran C. Anderson
Formal Identification Date:	2001-06-05


HERBARIUM
104402
FLORIDA STATE UNIVERSITY
KODAK Color Control Patches
KODAK Gray Scale
PLANTS OF FLORIDA
Loran C. Anderson no. 19,779

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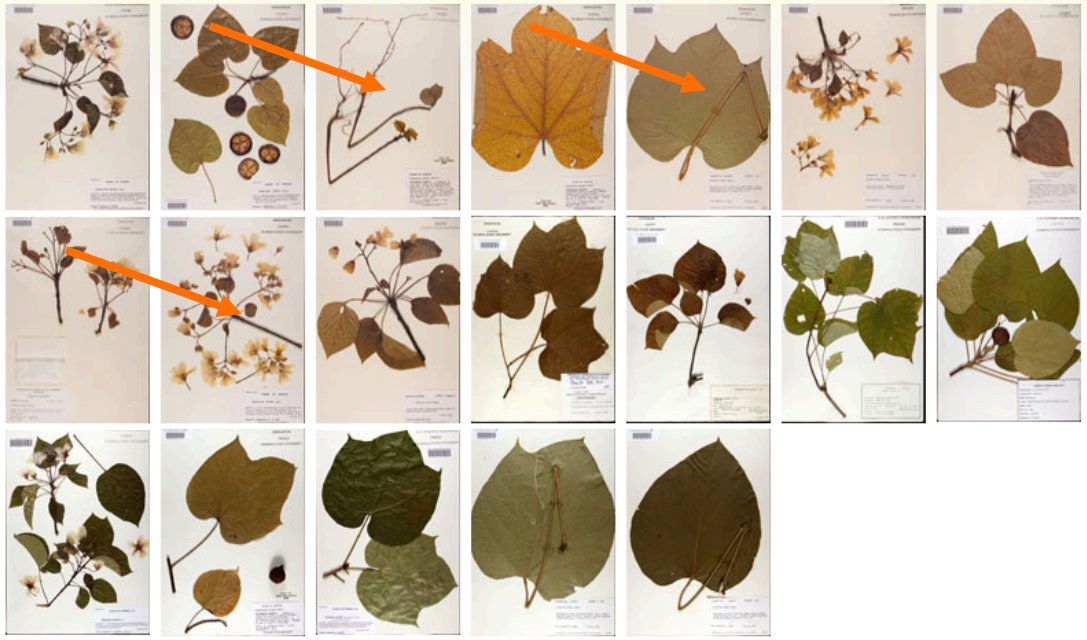

HERBARIUM
153427
FLORIDA STATE UNIVERSITY

Flora Of
Lake Miccosukee
1992

PLANTS OF FLORIDA

Aleurites fordii Hemsl.

JEFFERSON COUNTY: Frequent in tree-fall gaps, as seedlings and saplings, of mesic hammock off N side of U.S. 90, ca. 0.5 mi. W of [illegible] Creek bridge, grading to Lake Miccosukee floodplain. NE corner Sec 31, T2N R4E. Part of this site was apparently a tung tree grove some 40-50 yrs. ago.

Coll. R. Craddock Burks # 414
11 February 1996

Herbarium, Florida State University (FSU)
Tallahassee, FL, U.S.A.


KODAK Color Control Patches
Kodak
KODAK Gray Scale
HERBARIUM
153321
FLORIDA STATE UNIVERSITY
PLANTS OF FLORIDA
COUNTY: LEON
ALEURITES FORDII Hemsl.
R.K. Godfrey no.
24 July
HERBARIUM OF FLORIDA STATE UNIVERSITY, TALLAHASSEE

HERBARIUM

189001

FLORIDA STATE UNIVERSITY

PLANTS OF FLORIDA

Aleurites fordii

Loran C. Anderson no. 17,365

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Search Criteria — Show: ◉ Hide: ○

Institution:	Any Institution	
Family:		Spacebar yields full listing.
Genus:		
Species:	Vernicia fordii	The scientific name (e.g., Pinus palustris).
Common Name:		
Collection Date:	=	(YYYY-MM-DD *or* MM-DD)
Collection Date:	=	
Collector Name:		
Collector's Identifier:		
Barcode:		
Country:		
State:		
County:		
Nearest Named Place:		
Flowers present:		
Fruit present:		
Habitat:		
More Options:	Show: ○ Hide: ◉	
Sort By:	Species	
Output Type:	Map	

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Sort By: Species

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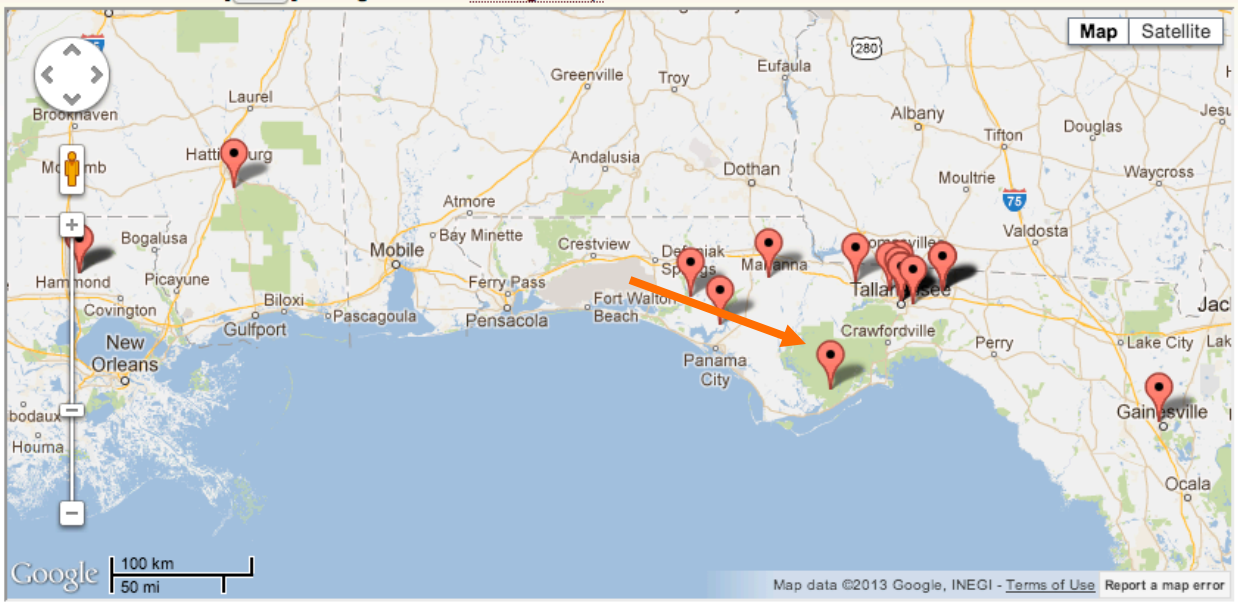
Search Results

Results 1-19 of 19 [1] Page 1 of 1 Enlarge Map



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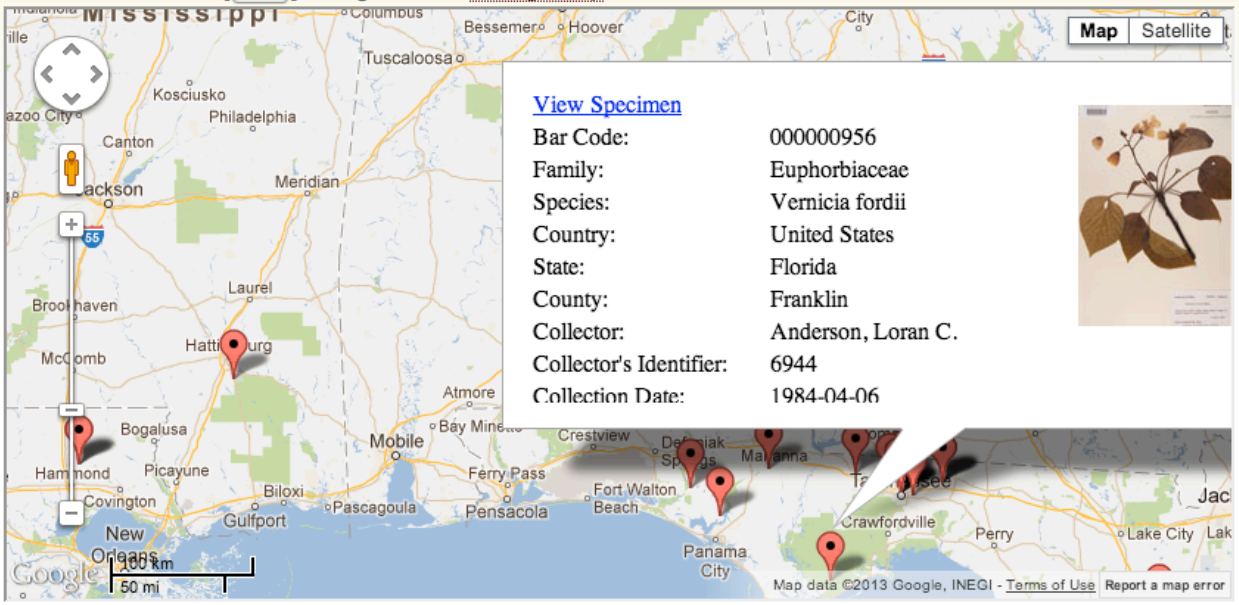
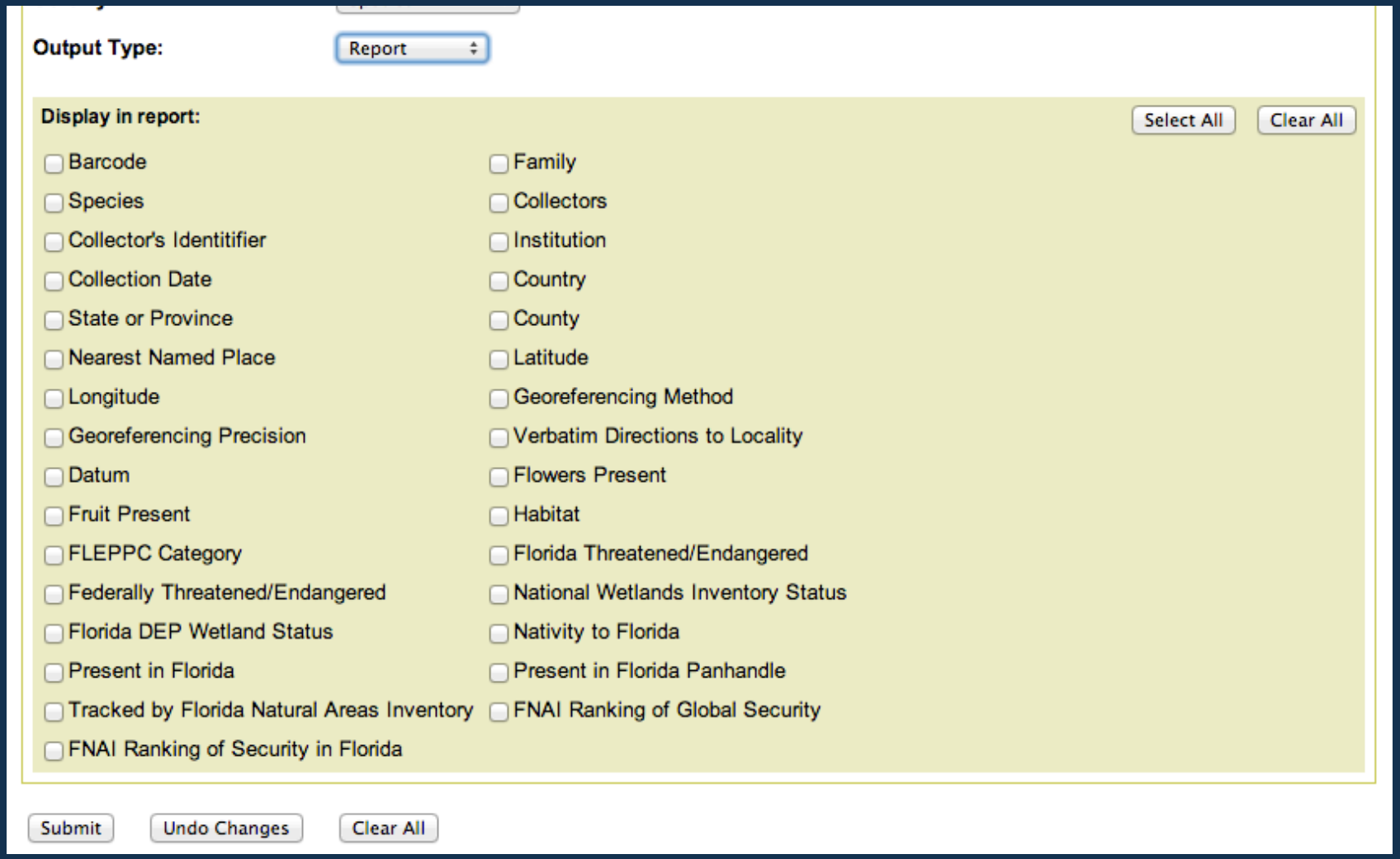


[View Specimen](#)

Bar Code:	000000956
Family:	Euphorbiaceae
Species:	Vernicia fordii
Country:	United States
State:	Florida
County:	Franklin
Collector:	Anderson, Loran C.
Collector's Identifier:	6944
Collection Date:	1984-04-06



The user can also choose “Report” as output type and download a tab-delimited file to open in Excel.

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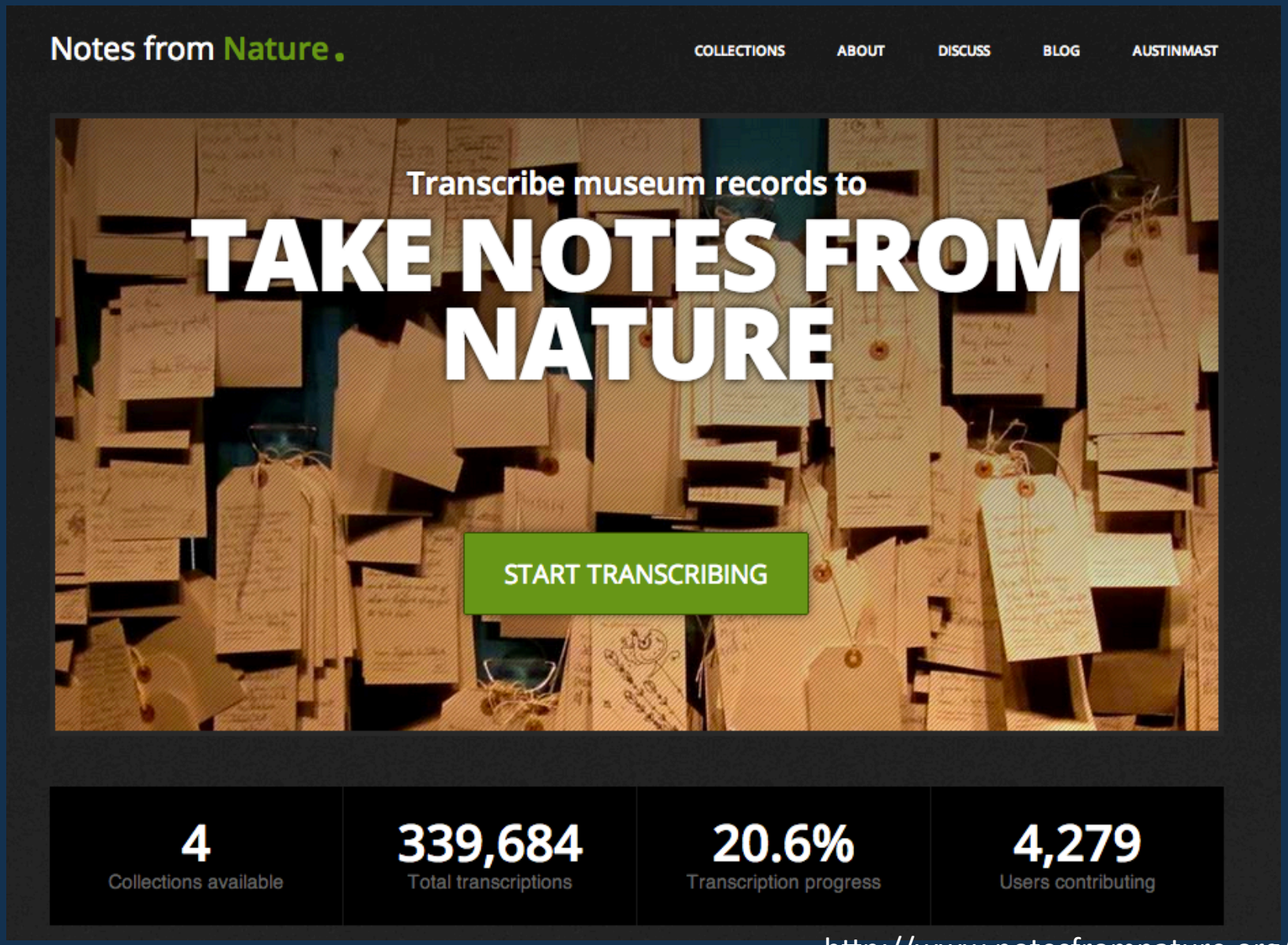
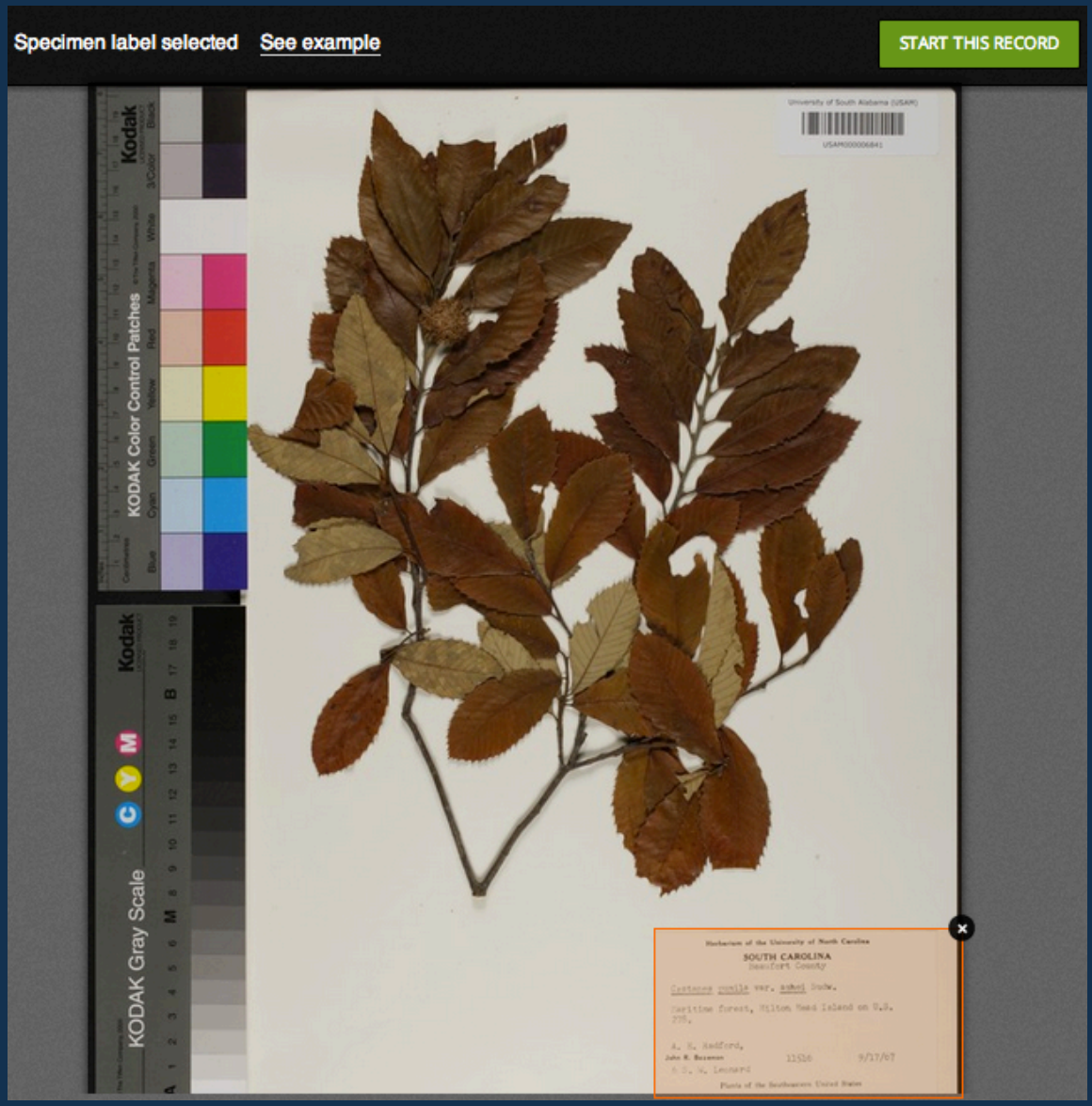


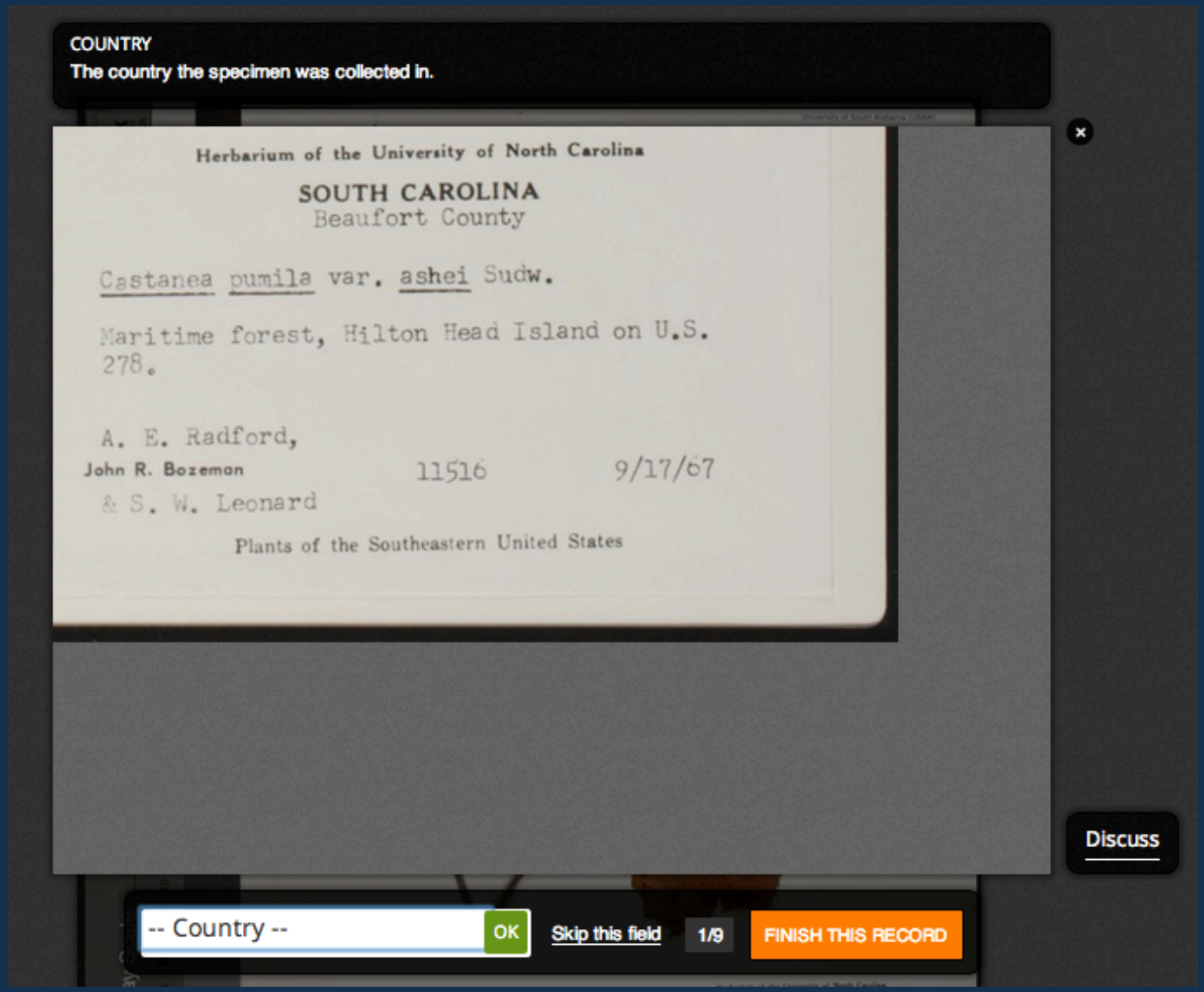
http://www.notesfromnature.org/

Public participants could help the community digitize its HUGE backlog of specimens.



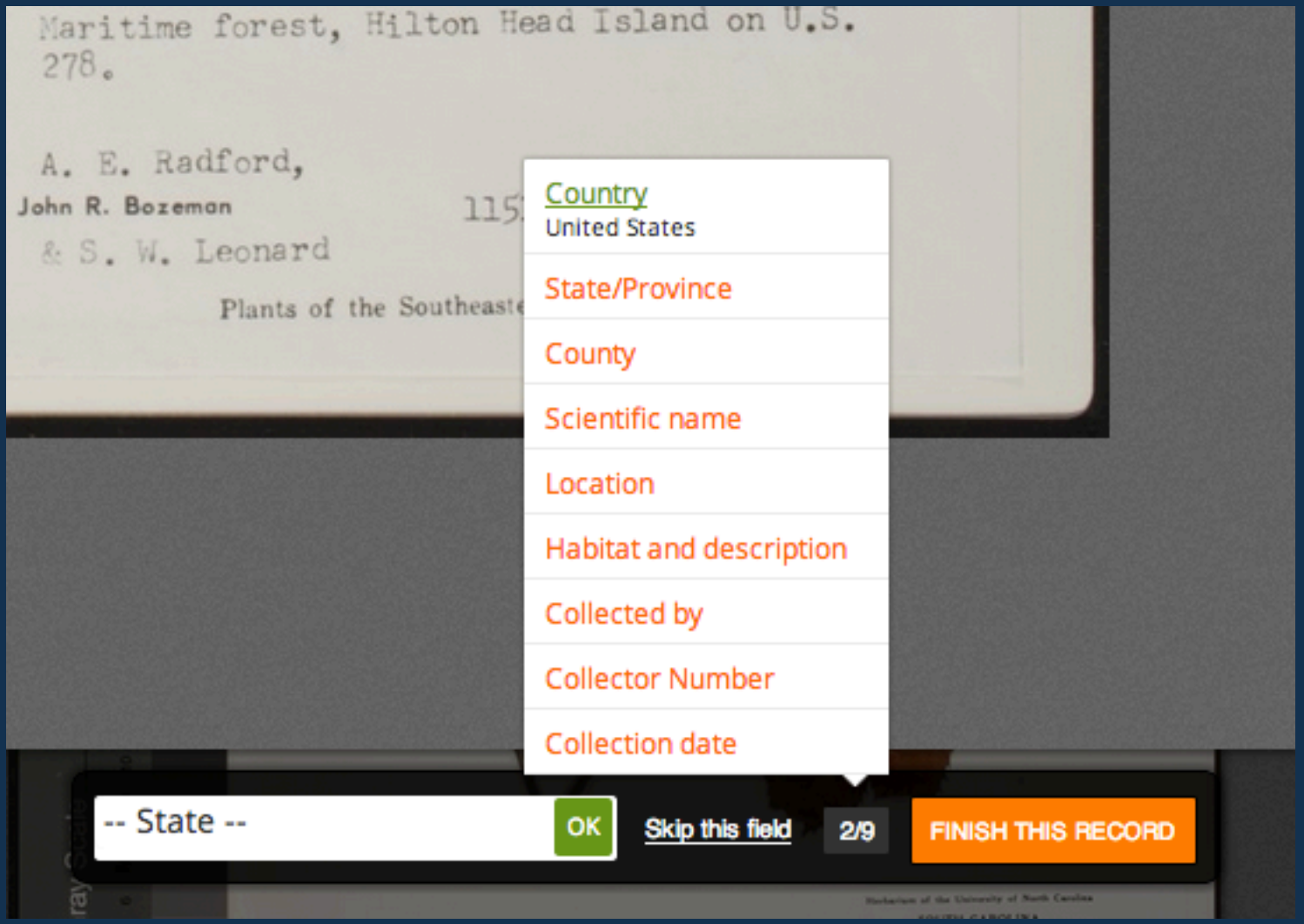
http://www.notesfromnature.org/

In this tool, the user first draws a box around the label.



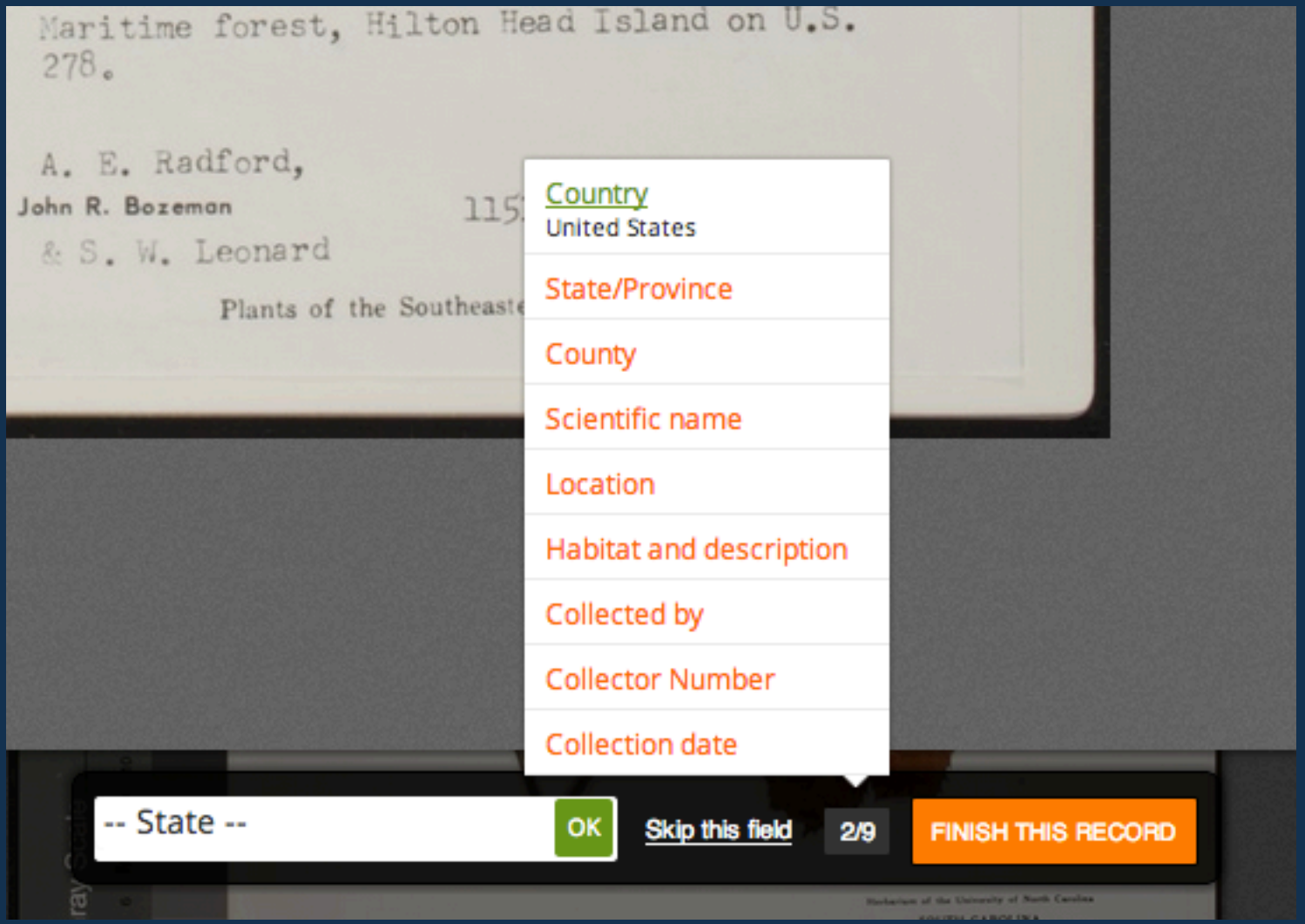
http://www.notesfromnature.org/

The label is then shown blown-up, and the user enters information into 9 fields from it.



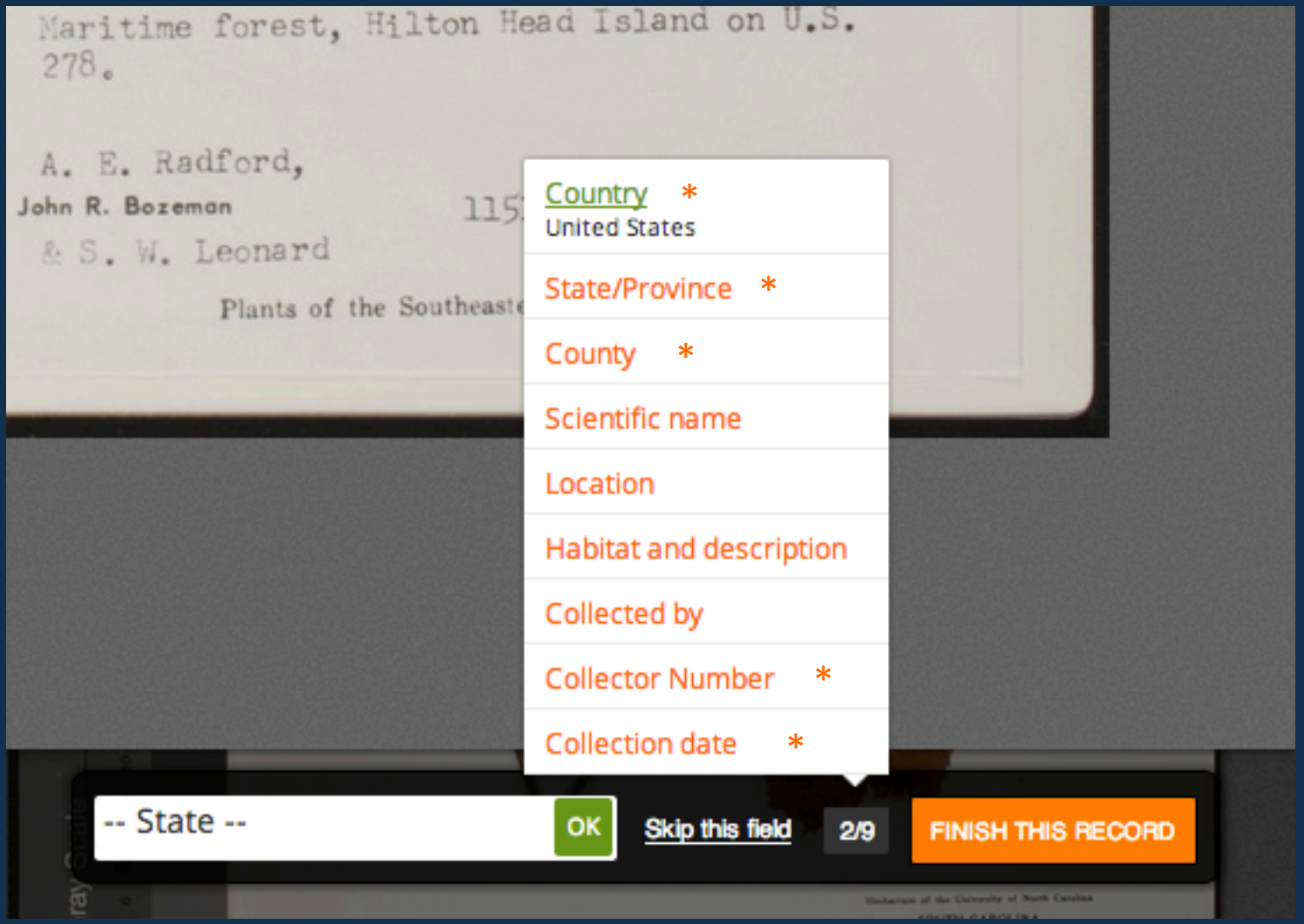
http://www.notesfromnature.org/

These 9 fields were chosen to maximize the specimen's discoverability and value for a large fraction of specimen-based research.



http://www.notesfromnature.org/

FSU contributed the first 3531 specimen images for the Notes from Nature herbarium interface. The average number of transcriptions for those specimens was 6.3.



http://www.notesfromnature.org/

Inter-replicate agreement was highest in those starred (*) fields.

https://www.idigbio.org/content/hackathon-enable-public-participation-online-transcription-biodiversity-specimen-labels

Notes from Nature and iDigBio's *CITSCribe Hackathon* next week will develop new functionality to enable public participation in the transcription of specimen labels. Remote participants are welcome.

Outline

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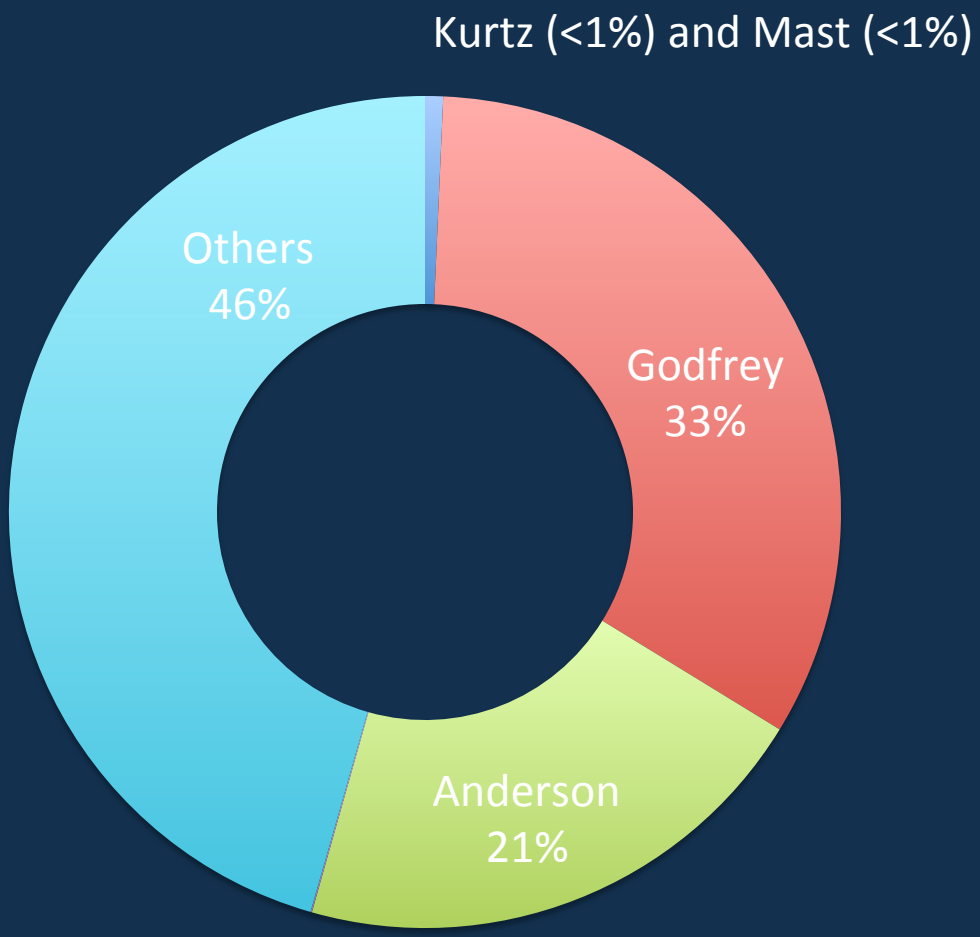
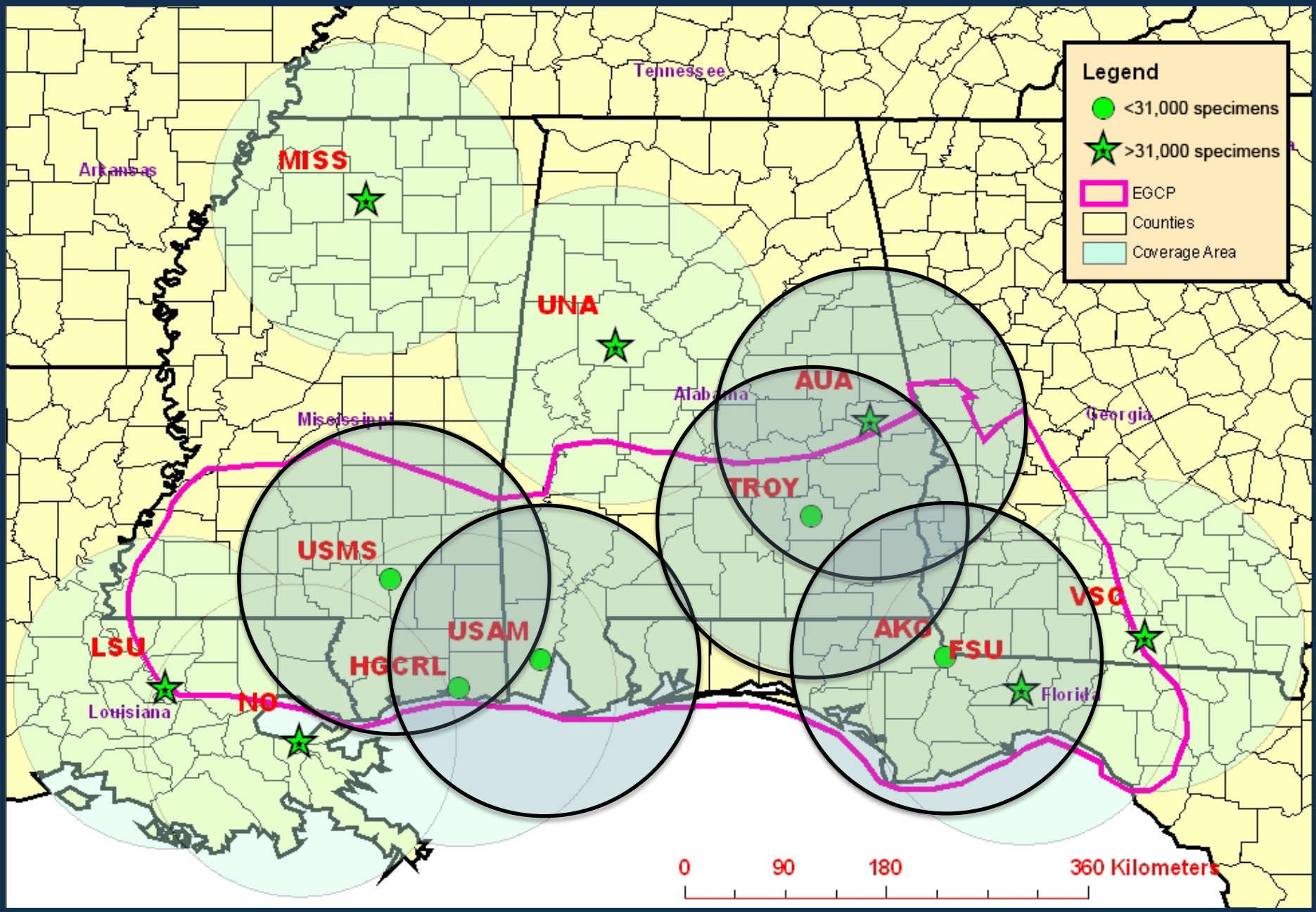
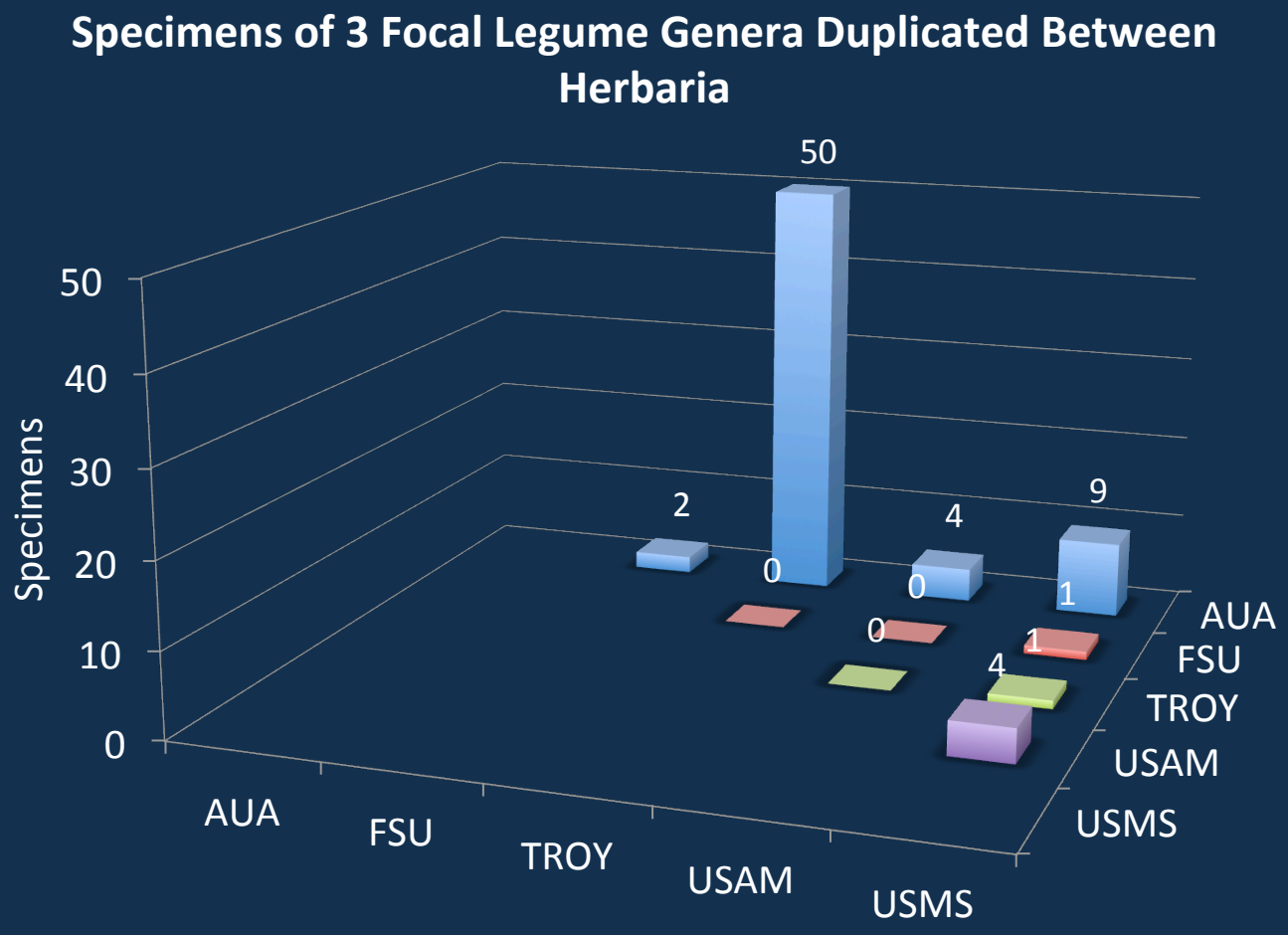


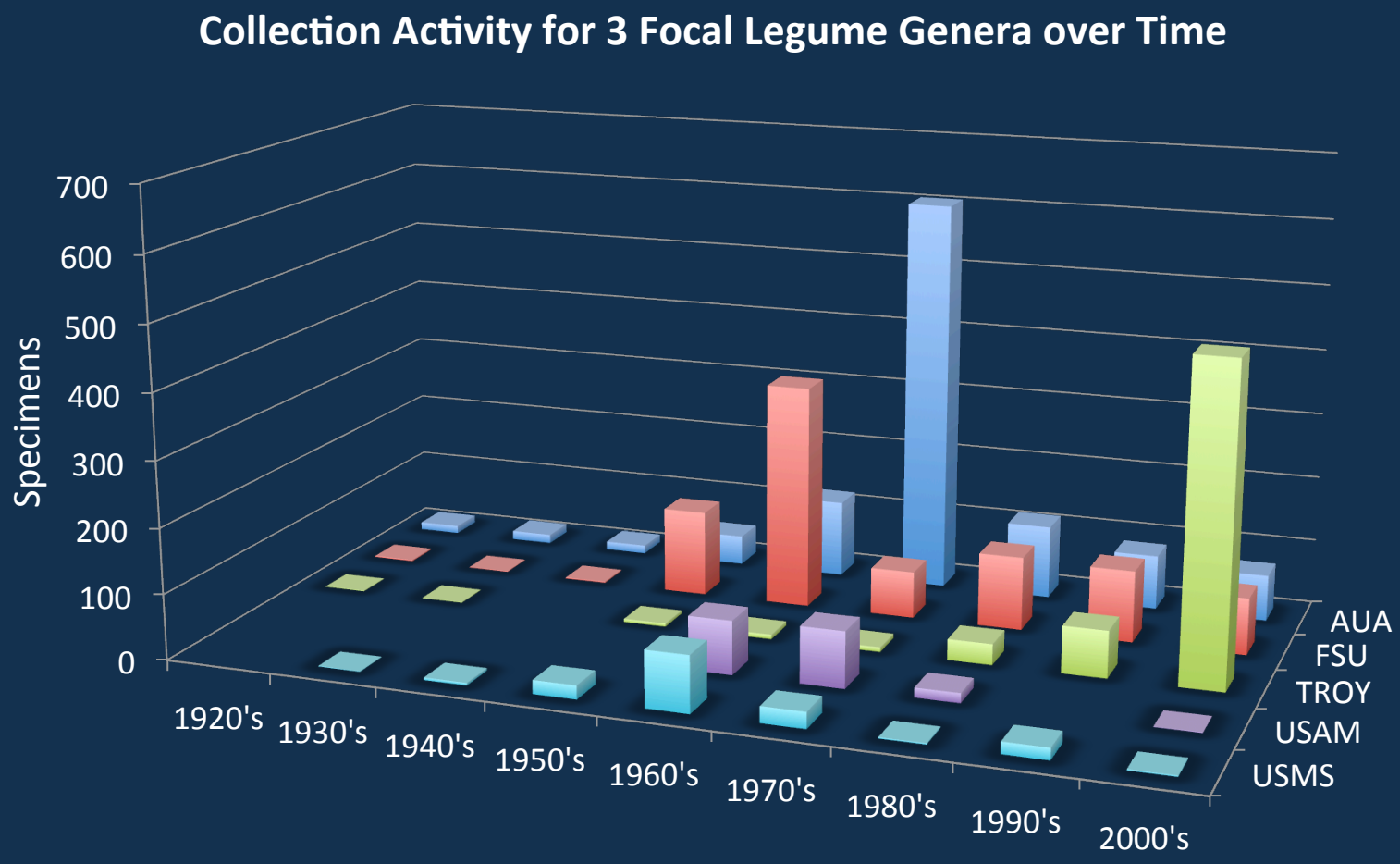
Many of FSU's specimens were collected by FSU researchers and don't appear to be widely duplicated in collections with aggressive digitization programs.



Small herbaria, such as those involved in the Deep South Imaging Project, do not appear to share a lot of duplicated specimens.



Small herbaria, such as those involved in the Deep South Imaging Project, do not appear to share a lot of duplicated specimens.



And those small herbaria can provide complementary information to build a more complete picture of diversity through time.

Project: Citrus of Florida

Project Leader: Danny F. LaBarbera

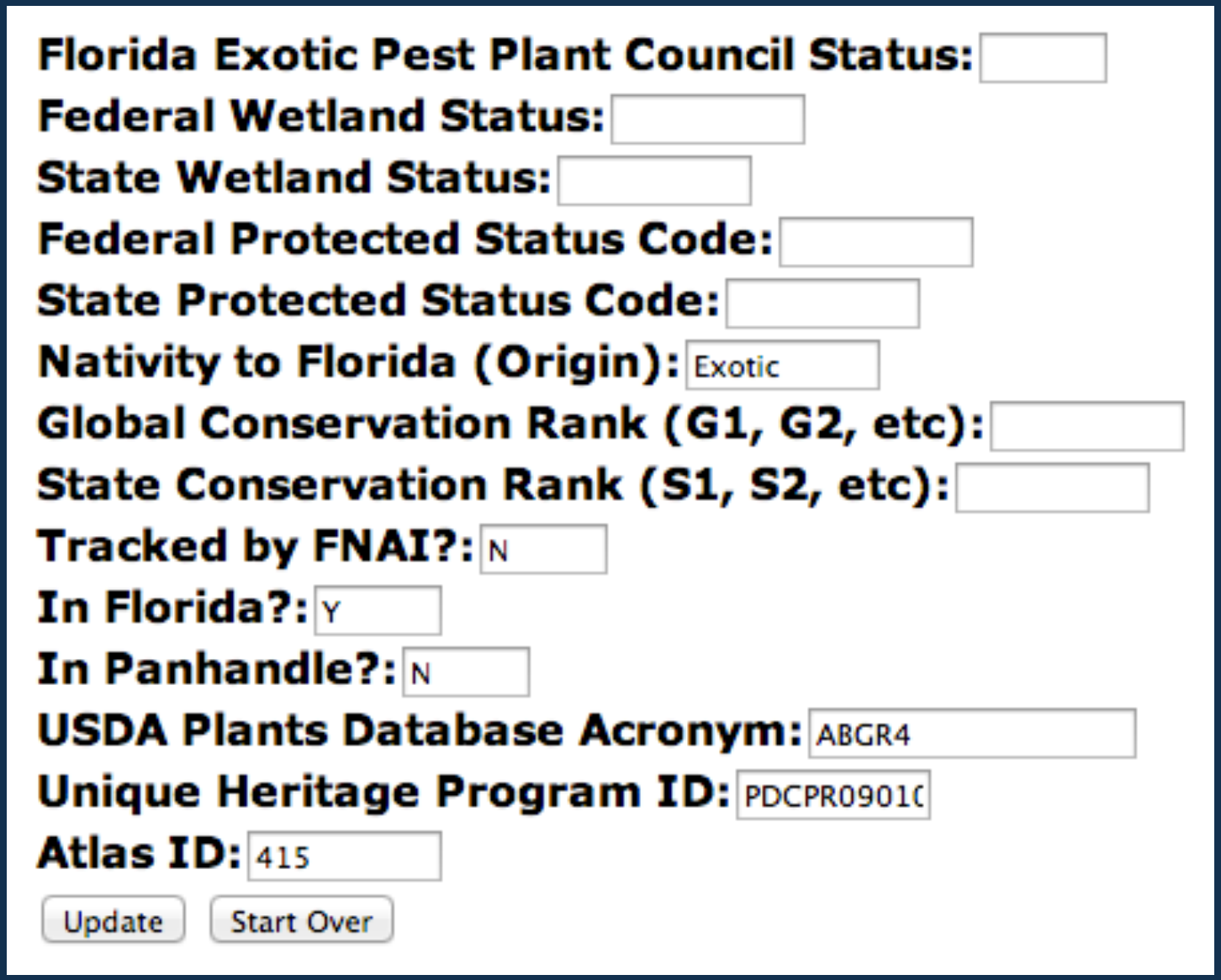
Project Description:
Florida specimens of the family Rutaceae.

Project Species (Family, Genus, Species):

Family	Species	Common Name
Rutaceae	Amyris balsamifera	BALSAM TORCHWOOD
Rutaceae	Amyris elemifera	SEA TORCHWOOD
Rutaceae	Amyris madrensis	
Rutaceae	Amyris texana	
Rutaceae	Choisya dumosa	
Rutaceae	Citrus aurantium	GRAPEFRUIT, SOUR ORANGE, SWEET ORANGE
Rutaceae	Citrus depressa	
Rutaceae	Citrus limon	LEMON
Rutaceae	Evodia nishimurae	
Rutaceae	Geijera lineariloba	
Rutaceae	Orixa japonica	
Rutaceae	Phellodendron amurense	
Rutaceae	Poncirus trifoliata	HARDY ORANGE
Rutaceae	Ptelea augustifolia	
Rutaceae	Ptelea crenulata	
Rutaceae	Ptelea trifoliata	COMMON HOPTREE, WAFER ASH
Rutaceae	Severinia monophylla	
Rutaceae	Zanthoxylum americanum	COMMON PRICKLYASH
Rutaceae	Zanthoxylum clava-herculis	HERCULES'-CLUB
Rutaceae	Zanthoxylum fagara	LIME PRICKLYASH, WILD LIME
Rutaceae	Zanthoxylum flavum	WEST INDIAN SATINWOOD, YELLOWHEART, YELLOWWOOD

Our ability to tackle taxonomically defined priorities began to diminish as the need to digitize new accessions of taxa in folders already stamped “databased” increased. Here is an example of an early undergraduate digitization project.

Another competing digitization priority are the specimens in loan requests. We image and database all specimens that are requested for loan then ask the requestor to further focus the request.



Development and enhancements of the database and front-end and curation of taxon-specific information (e.g., invasiveness) meant less time for digitization of the specimens (but also a product that we find particularly useful).

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General Recommendations

- Document the workflows and keep the documents up-to-date.
- Look over shoulders a lot at the beginning and provide feedback.
- Ask the digitizers how to streamline the process.
- Focus on making the specimens discoverable and useful for most research applications; it is not necessary to capture every specimen quality in the database initially.
- Consider adding “filed as” annotations to the specimens before photographing, if the name on the folder is not on the specimen label(s).
- Don’t worry if your names are not bleeding-edge current; synonymy relationships in databases can make them discoverable.
- Databasing from images makes remote work possible (e.g., from computer labs or Notes from Nature); this can be important when space is limited in the collection.

Acknowledgements

FSU's Robert K. Godfrey Herbarium thanks the FL Fish and Wildlife Conservation Commission for their funding of a Task Assignment in the herbarium as well as NSF for the MorphBank grants (DBI 0446224 and 0851313), the Deep South Imaging grant (DBI 0646222), the Tall Timbers Digitization grant (DBI 0956343), and the iDigBio grant (EF 1115210). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

To see the many people who have contributed to the productivity of the herbarium, visit http://herbarium.bio.fsu.edu/people.php.