Research Opportunities Using Data from Small Collections

Pamela S. Soltis
Florida Museum of Natural History
University of Florida

iDigBio is funded by a grant from the National Science Foundation's Advancing Digitization of Biodiversity Collections Program (Cooperative Agreement EF-1115210). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. All images used with permission or are free from copyright.

FLMNH Genetic Resources Repository

>55,000 databased accessions

FLMNH GRR: the Genetic Resources Repository
Florida Museum of Natural History

Collections: The Library of Life

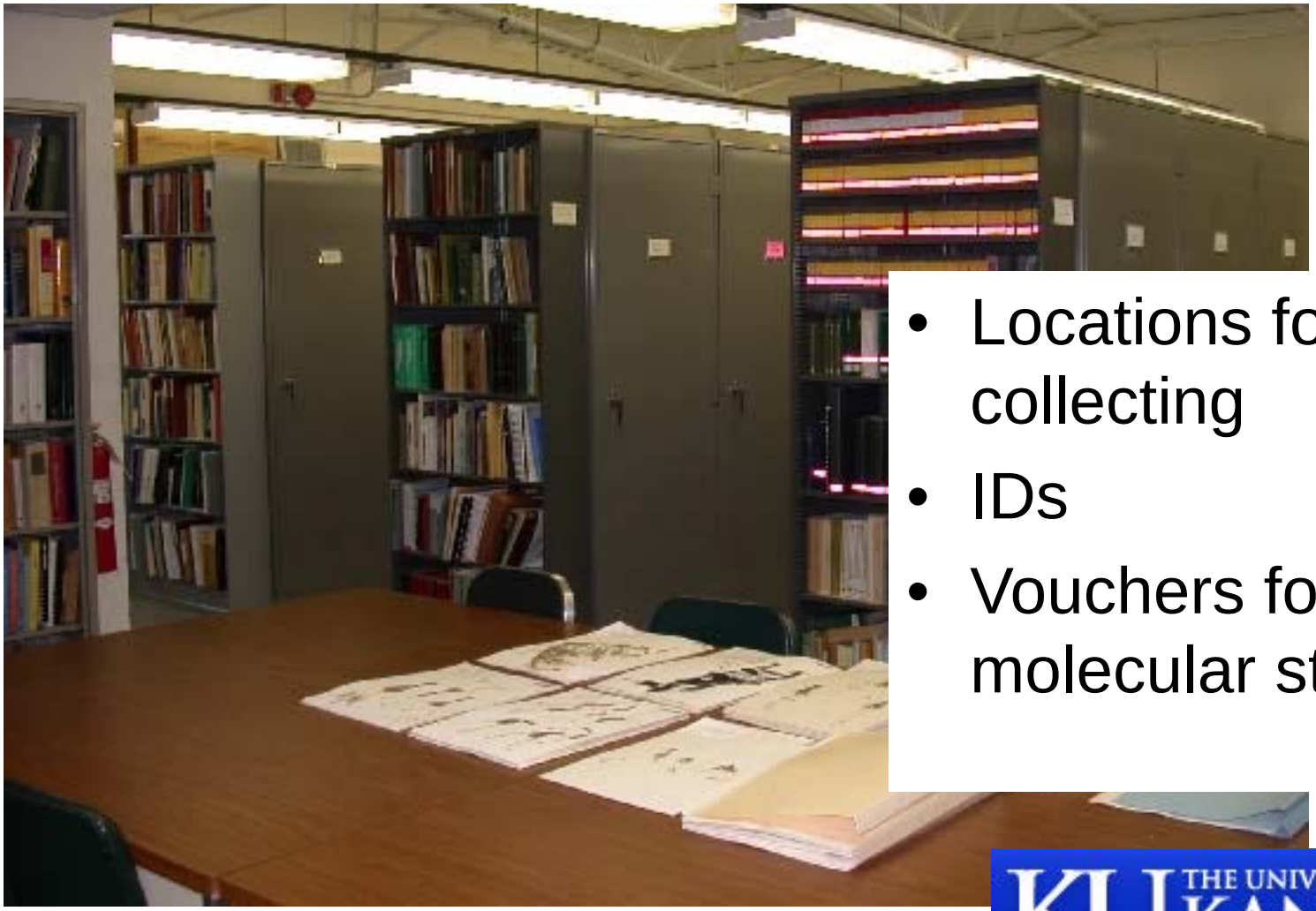
1500 natural history collections
in the US alone
1-2 billion specimens
in the US
3-4 billion specimens
worldwide

Systematics and Taxonomy

Carl Linné, aka Carolus Linnaeus

Linnea (twinflower)

KU THE UNIVERSITY OF KANSAS



- Locations for collecting
- IDs
- Vouchers for molecular studies

KU THE UNIVERSITY OF KANSAS

Many Research Uses for Specimens

- Taxonomy/systematics
- Distribution maps – rare species, invasives
- Source of chemical/DNA data
- Source of parasites/microbes

Many Research Uses for Specimens

- Taxonomy/systematics
- Distribution maps – rare species, invasives
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- Source of parasites/microbes

Digitized Specimen Data:

- Ecological niche modeling
- Integrated workflows with phylogenies, etc.
- Analysis of traits – related to ENMs, adaptation, phylogeny, etc.

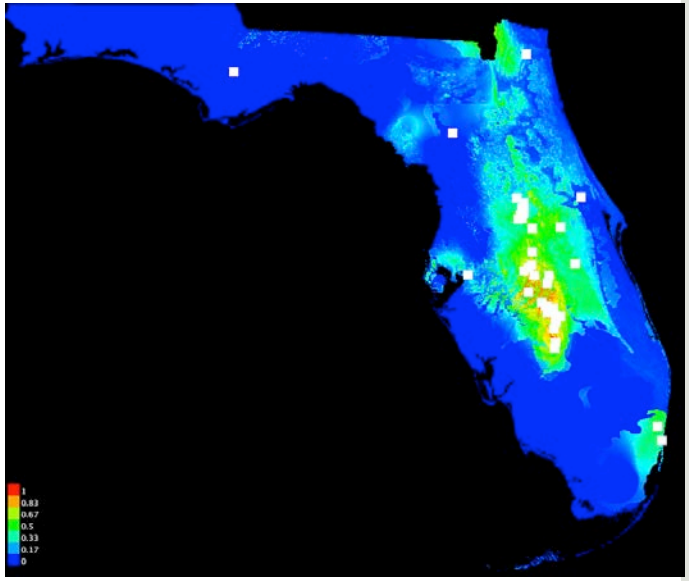
Specimen Records AND Images

GEOLocate 29.65, -82.32

number,dwc:preparations,dwc:identificationVerificationStatus,idigbio:subfamily,idigbio:preparationCount,fcc:pickedBy,dwc:eventRemarks,dwc:VerbatimEventDate,dwc:associatedReferences,idigbio:endangeredStatus,dwc:locationAccordingTo,dwc:georeferenceSources,dwc:associatedSequences,dwc:formation,dwc:higherClassification,dwc:catalogNumber,dwc:verbatimSRS,dwc:higherGeography,dwc:individualCount,dwc:decimalLongitude,dwc:datasetName,dwc:month,dwc:georeferencedBy,dwc:eventTime,dwc:identificationQualifier,idigbio:

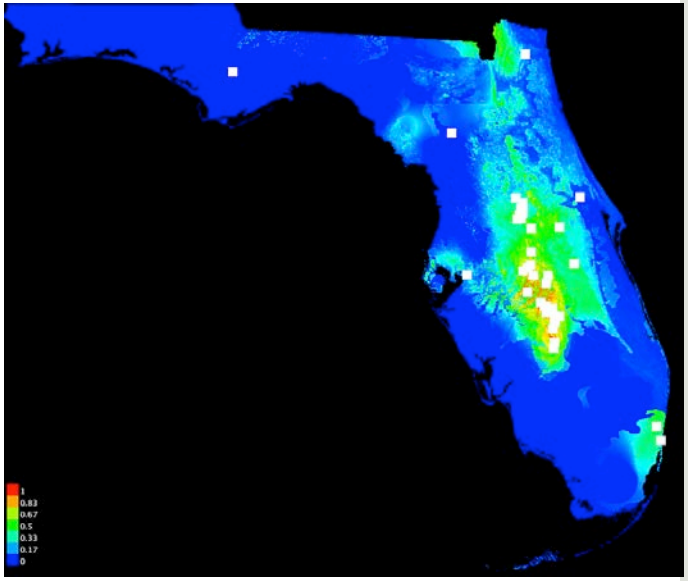
Florida Plant Diversity in a Changing Climate

Integrating herbarium specimen data, ENM, climate change models, and phylogeny



Florida Plant Diversity in a Changing Climate

Integrating herbarium specimen data, ENM, climate change models, and phylogeny



Charlotte Germain-Aubrey

Connecting Trees, Specimens, Tools

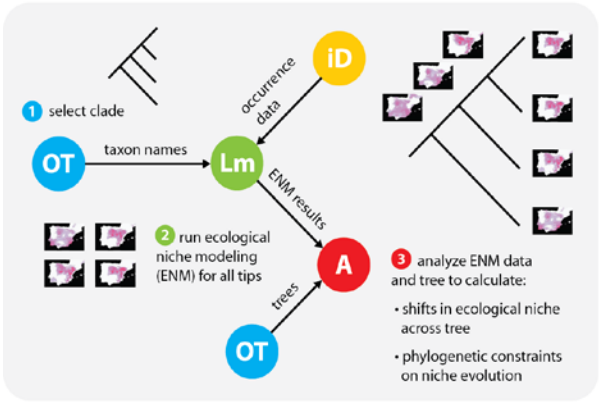
iDigBio
Integrated Digitized Biocollections

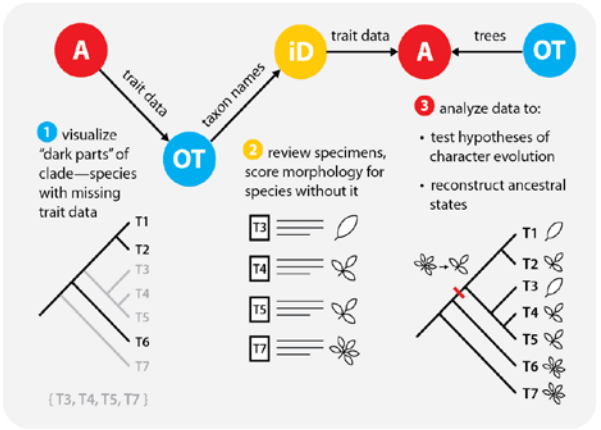
OPEN
Tree of Life
A community-assembled ToL

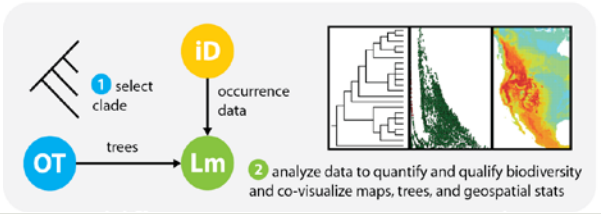
Lifemapper

ARBOR
revolutionary workflows

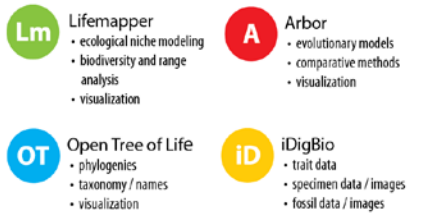
EXAMPLE WORKFLOWS:

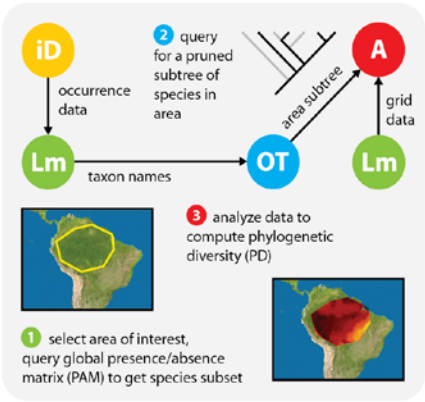


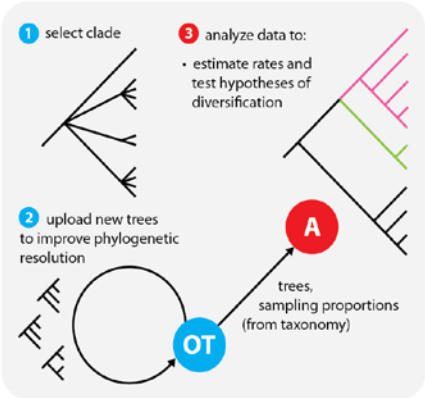




RESOURCES:







Connecting Trees, Specimens, Tools

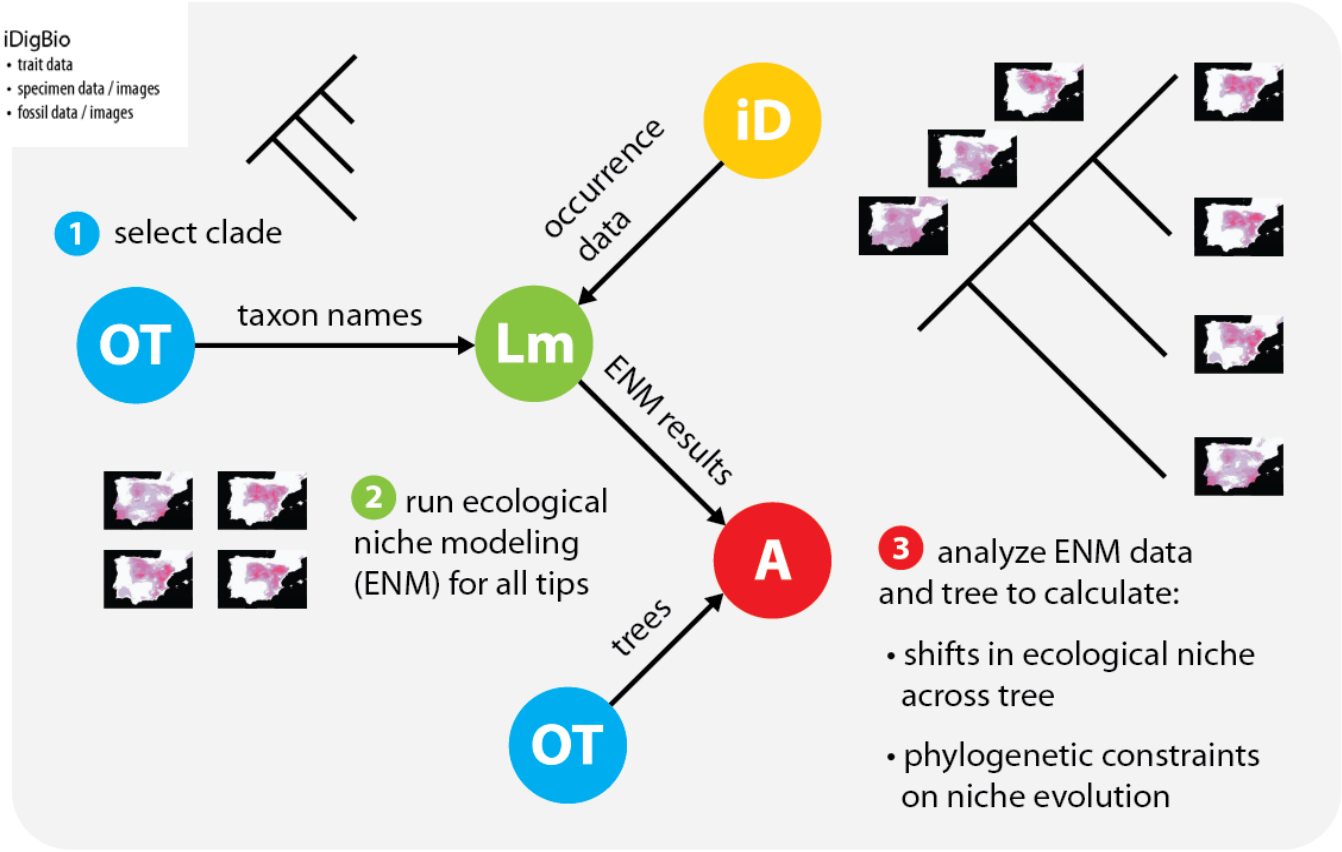
RESOURCES:

Lm Lifemapper
- ecological niche modeling
- biodiversity and range analysis
- visualization

A Arbor
- evolutionary models
- comparative methods
- visualization

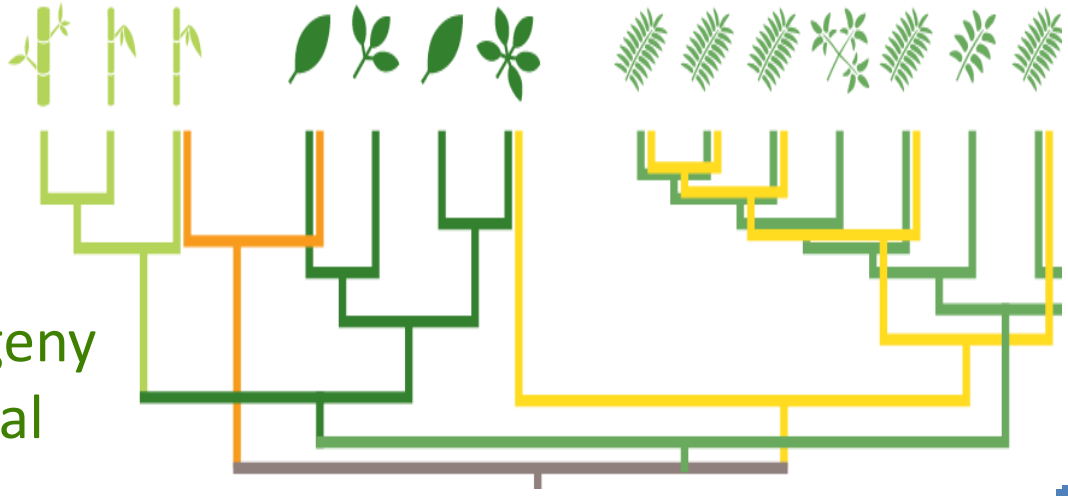
OT Open Tree of Life
- phylogenies
- taxonomy / names
- visualization

iD iDigBio
- trait data
- specimen data / images
- fossil data / images



PhotosyntheticPathway
Respiration LeafArea NfixationCapacity
SLA RegenerationCapacity PlantLifespan
WoodDensity GrowthForm
PhenologyType LeafN
LeafP LeafLongevity PhotosyntheticCapacity
MaxPlantHeight SeedMass

Using Images to Infer Functional Traits



Connect to ecology/phylogeny

Evolution of plant functional traits

What can small collections contribute?

- Teaching
- Training
- Local context/outreach
- RESEARCH

What can small collections contribute?

- Teaching
- Training
- Local context/outreach
- RESEARCH

What can small collections contribute?

- Unduplicated specimens – new distributional data
- Intense regional sampling
- Temporal sampling
- Focused sampling on community structure
- Hotspots

From A. Monfils

What can small collections contribute?

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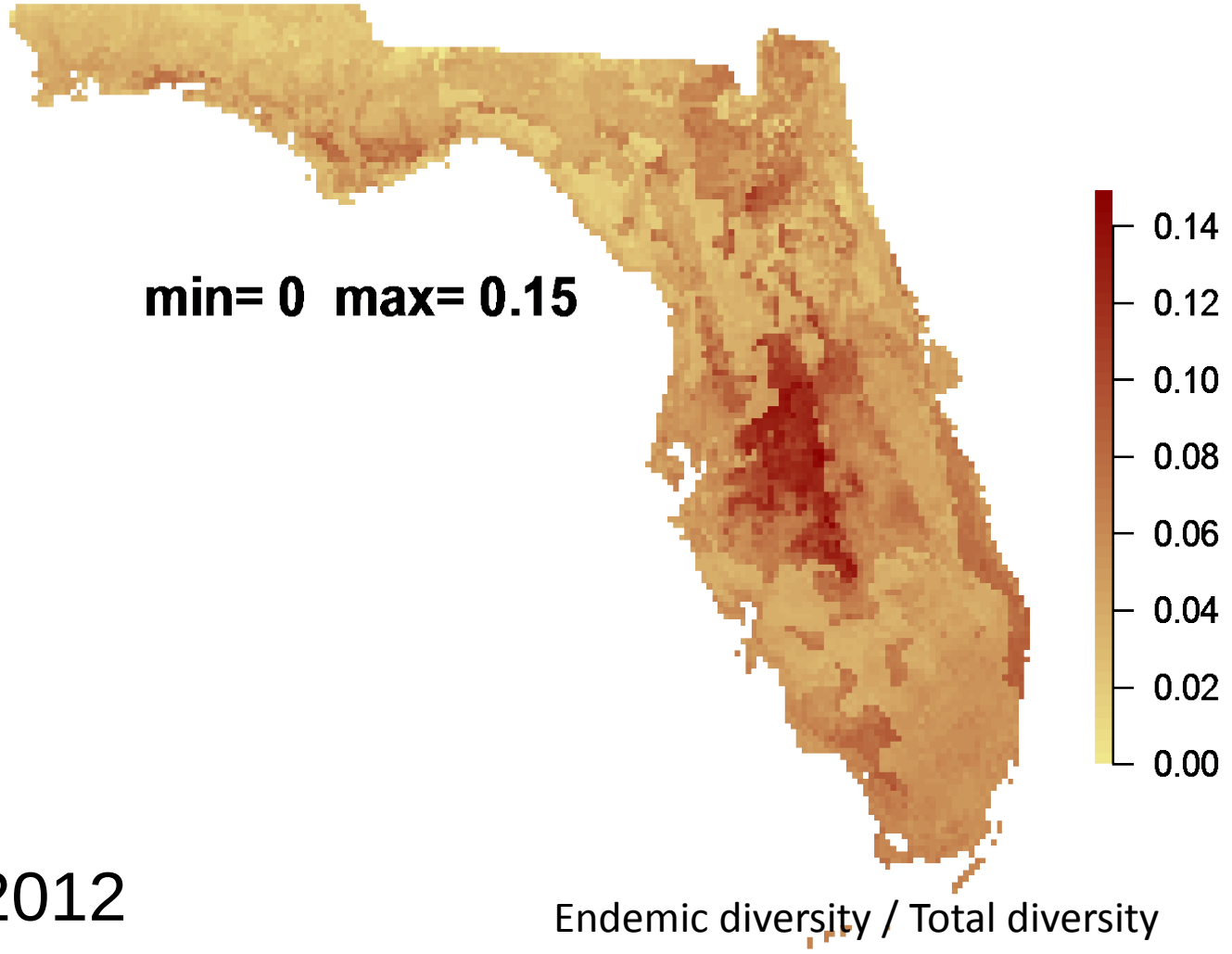
- Training
- Local context/outreach
- RESEARCH

Endemism Hotspots

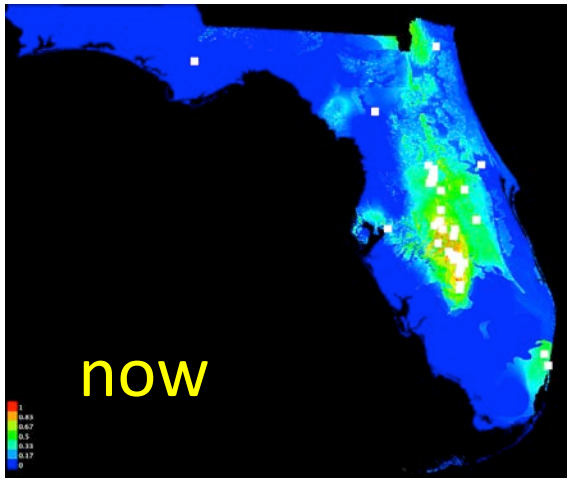


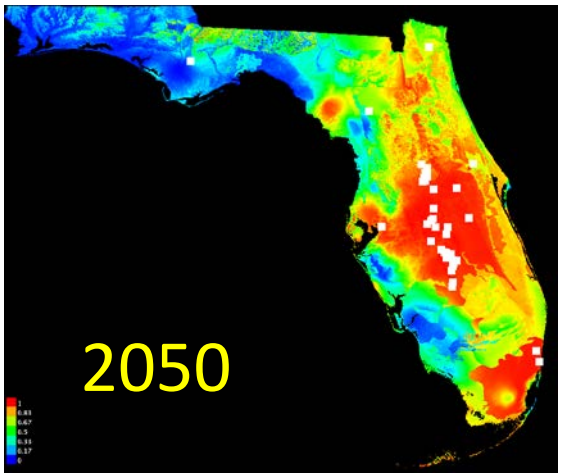
2002 - 2012

Endemic diversity / Total diversity

Responses to Climate Change

Prunus geniculata (scrub plum) – Lake Wales Ridge





Small Herbaria – FL & GA

ARCHBOLD BIOLOGICAL STATION
Research ★ Conservation ★ Education

TALL TIMBERS
Research Station & Land Conservancy

THE VALDOSTA STATE UNIVERSITY
VIRTUAL HERBARIUM

VALDOSTA STATE UNIVERSITY

Small Herbaria – FL & GA

4,162

ARCHBOLD BIOLOGICAL STATION
Research ★ Conservation ★ Education

10,344

TALL TIMBERS
Research Station & Land Conservancy

THE VALDOSTA STATE UNIVERSITY
VIRTUAL HERBARIUM

VALDOSTA STATE UNIVERSITY

66,573

Archbold Biological Station Herbarium

- Lake Wales Ridge, FL
- 4,162 specimen records
- 4,273 media records

Archbold Biological Station Herbarium

- *Ziziphus celata*
- Rhamnaceae
- Polk and Highlands Cos.
- 14 known locations
- Self-incompatible, clonal

Ziziphus celata

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Integrated Digitized Biocollections

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Search Records

Full Text Search

Search

only records with images | Hide Advanced Search

Current Results

Query: Genus = ziziphus. Specific | Clear

Records: 8

Approx. Download Time: 0hrs 0mins 10secs

Email: Enter Email to Downloac | Download

FEEDBACK

Advanced Search

Family	Scientific Name	Genus	Country
dwc:family	dwc:scientificName	ziziphus	dwc:country
Add EOL Synonyms	Add EOL Synonyms	Add EOL Synonyms	
What is EOL?	What is EOL?	What is EOL?	
Present / Missing	Present / Missing	Present / Missing	Present / Missing

State/Province	Specific Epithet	Institution Code
dwc:stateProvince	celata	dwc:institutionCode

Ziziphus celata

Table view | Label view | Images

Search Matched 8 Records

, Plantae, Rhamnaceae, United States, Florida, Bruce Hansen, R.P. Wunderlin & Kris R. Delaney, FLAS

, Plantae, Rhamnaceae, United States, Florida, Ray Garrett, FLAS

Ziziphus celata W.S. Judd & D.W. Hall, RHAMNACEAE, U.S.A., Florida, Mt. Lake (P03), C.W. Weekley, ARCH, herbarium

Ziziphus celata W.S. Judd & D.W. Hall, RHAMNACEAE, U.S.A., Florida, Mt. Lake (P03), C.W. Weekley, ARCH, herbarium

Ziziphus celata W.S. Judd & D.W. Hall, RHAMNACEAE, U.S.A., Florida, Friedlander (P04), C.W. Weekley, ARCH, herbarium

Ziziphus celata W.S. Judd & D.W. Hall, RHAMNACEAE, U.S.A., Florida, Friedlander (P04), C.W. Weekley, ARCH, herbarium

Ziziphus celata W.S. Judd & D.W. Hall, RHAMNACEAE, U.S.A., Florida, Sebring, L.J. Brass, ARCH, herbarium

Ziziphus celata W.S. Judd & D.W. Hall, RHAMNACEAE, U.S.A., Florida, Mt. Lake (P03), C.W. Weekley, ARCH, herbarium

FEEDBACK

Ziziphus celata

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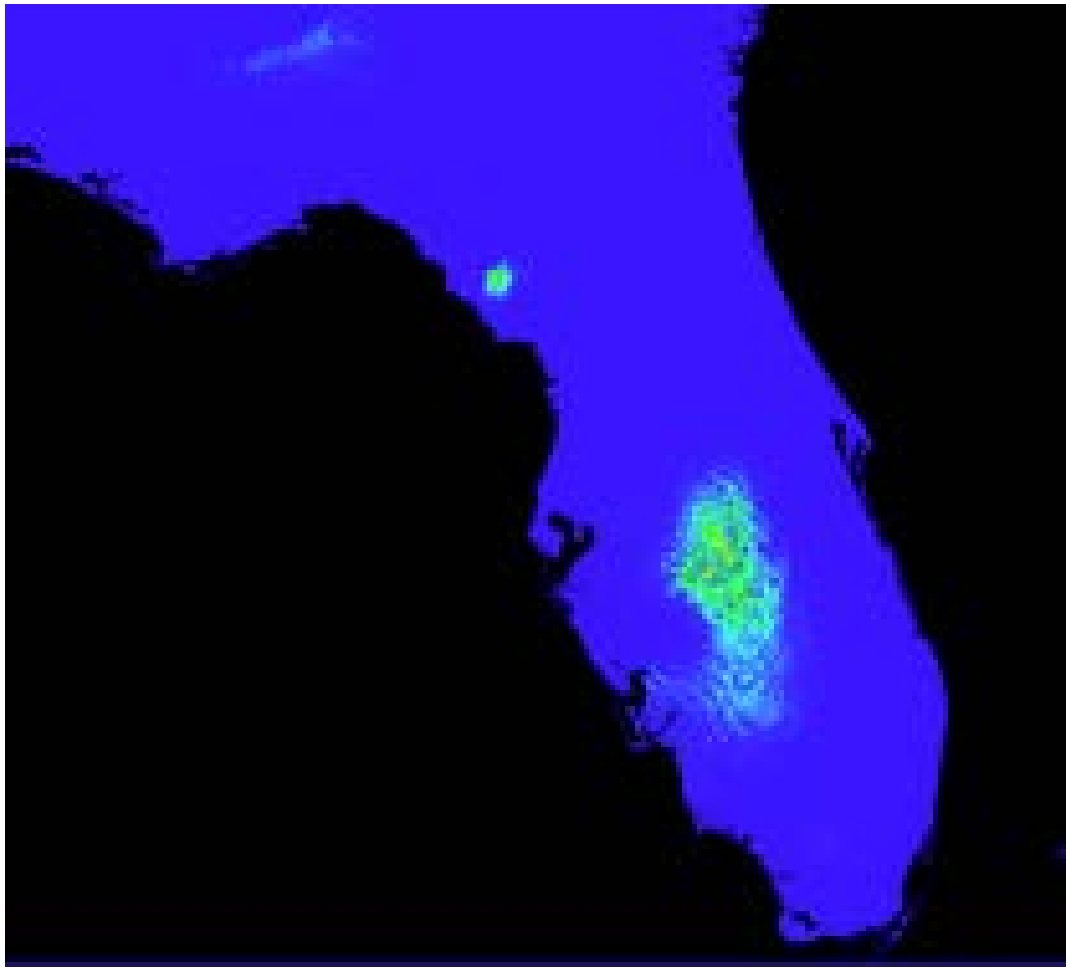
Ziziphus celata W.S. Judd & D.W. Hall, RHAMNACEAE, U.S.A., Florida, Sebring, L.J. Brass, ARCH, herbarium

Ziziphus celata W.S. Judd & D.W. Hall, RHAMNACEAE, U.S.A., Florida, Mt. Lake (P03), C.W. Weekley, ARCH, herbarium

FEEDBACK

6 of 8 specimens from ARCH!
(5 more at USF)

Ziziphus celata



B. Marchant

Hypericum cumulicola

- Hypericaceae
- Lake Wales Ridge
- Polk and Highlands Cos.
- White-sand endemic

Hypericum cumulicola

Table view | Label view | Images

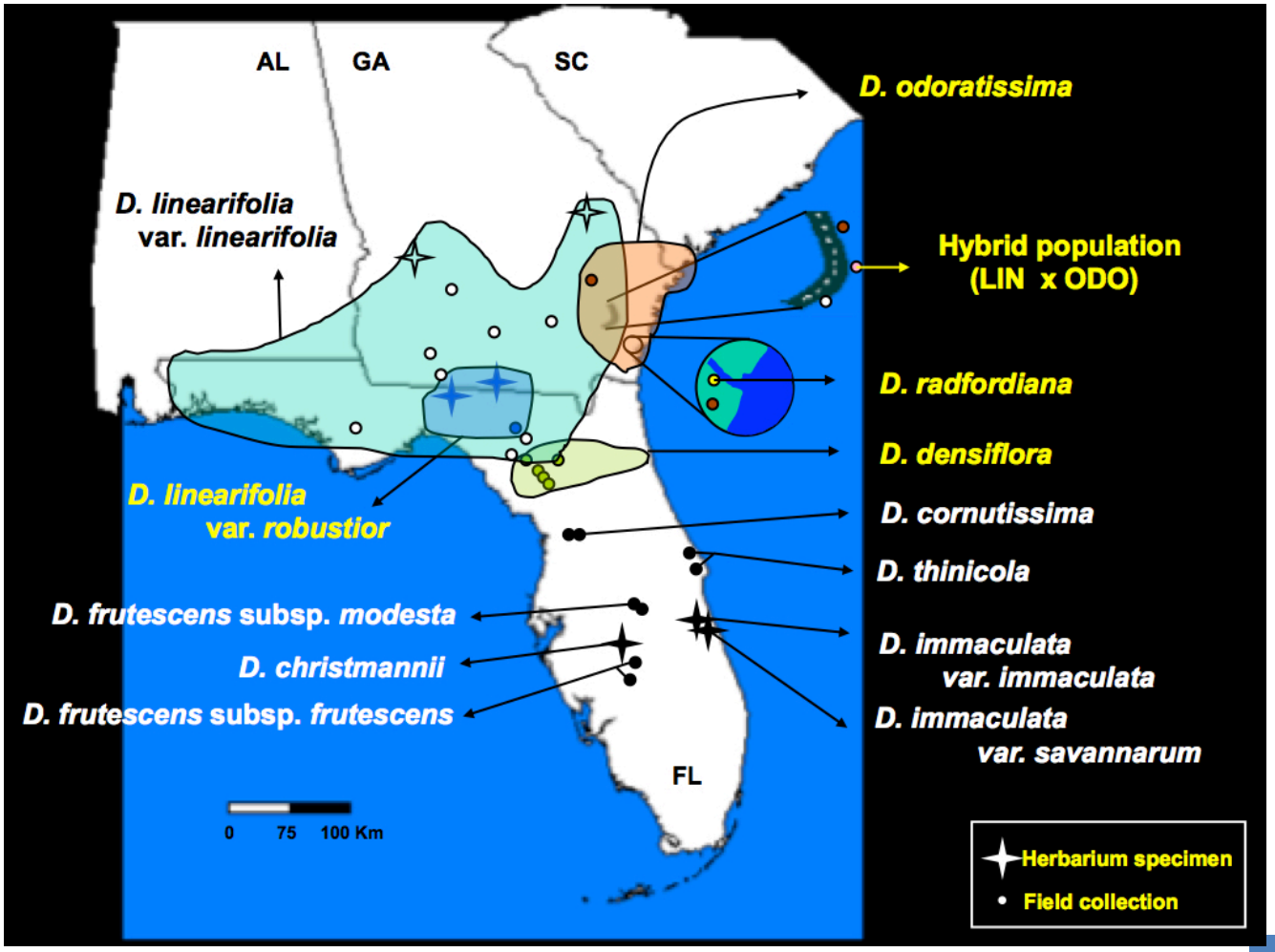
Search Matched 48 Records

Hypericum cumulicola (Small) W. P. Adams, Plantae, Clusiaceae, United States, Florida, none., W. P. Adams, FSU, FSU	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Near Lake Placid, L.J. Brass, ARCH, herbarium	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station; Tract 31, Vander Kloet, ARCH, herbarium
Hypericum cumulicola (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Route 27 between Childs & Venus., L.J. Brass, ARCH, herbarium	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station; Tract 31, Vander Kloet, ARCH, herbarium	***Hypericum cumulicola*** (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station; Tract 31 center, Vander Kloet, ARCH,	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station; Tract 7, Vander Kloet, ARCH, herbarium	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS
, Plantae, Hypericaceae, United States, Florida, Robin B. Huck, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) W. P. Adams, Plantae, Clusiaceae, United States, Florida, W. P. Adams, FSU, FSU	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station; Hufty Tract, Vander Kloet, ARCH, herbarium
Hypericum cumulicola (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station; Tract 6, Vander Kloet, ARCH, herbarium	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) W. P. Adams, Plantae, Clusiaceae, United States, Florida, Walter S. Judd, D. B. Ward, Beverly Judd, FSU, FSU	, Plantae, Hypericaceae, United States, Florida, Robin B. Huck, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS
, Plantae, Hypericaceae, United States, Florida, Paul Corogin, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS
, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) W. P. Adams, Plantae, Clusiaceae, United States, Florida, Walter S. Judd, Beverly Judd, FSU, FSU	, Plantae, Hypericaceae, United States, Florida, S.F. Brockington, FLAS	***Hypericum cumulicola*** (Small) W. P. Adams, Plantae, Clusiaceae, United States, Florida, O. Lakela, FSU, FSU	***Hypericum cumulicola*** (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station; Hufty Tract, Vander Kloet, ARCH, herbarium	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Robin B. Huck, FLAS
Hypericum cumulicola (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station, C.M. Yero, ARCH, herbarium	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) P. Adams, HYPERICACEAE, U.S.A., Florida, Archbold Biological Station, Vander Kloet, ARCH, herbarium	, Plantae, Hypericaceae, United States, Florida, Steven P. Christman, FLAS	***Hypericum cumulicola*** (Small) W. P. Adams, Plantae, Clusiaceae, United States, Florida, James D. Ray, Jr., FSU, FSU	

48 specimens,

11 specimens from ARCH!

Dicerandra (Lamiaceae)



Dicerandra

Table view | Label view | Images

Search Matched 17 Records

Dicerandra christmanii R.B. Huck & W.S. Judd, LAMIACEAE, U.S.A., Florida, T 35 S, R29E, Sect. 2, S. Christman & M.A. Deyrup, ARCH, herbarium 

Dicerandra christmanii R.B. Huck & W.S. Judd, LAMIACEAE, U.S.A., Florida, T 35 S, R29E, Sect. 2, S. Christman & M.A. Deyrup, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Archbold Biological Station; Tract 30 & 19, Vander Kloet, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Lake Apthorpe Scrub, S. Neimeister & T. Hmielowski, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Lake Apthorpe Scrub, S. Neimeister & T. Hmielowski, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Lake Apthorpe Scrub, S. Neimeister & T. Hmielowski, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, YMCA camp Florida, Hwy 27 just south of juct. with CR 29, on east side of hwy, B. Dayton, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Lake Apthorpe Scrub, S. Neimeister & T. Hmielowski, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Lake Placid, L.J. Brass, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Archbold Biological Station; Tract 18, Vander Kloet, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Lake Apthorpe Scrub, S. Neimeister & T. Hmielowski, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Lake Placid, L.J. Brass, ARCH, herbarium 

Dicerandra frutescens Shinners, LAMIACEAE, U.S.A., Florida, Lake Apthorpe Scrub, S. Neimeister & T. Hmielowski, ARCH, herbarium 

Dicerandra frutescens ssp. modesta R.B. Huck, LAMIACEAE, U.S.A., Florida, Needy Creek scrub, E.S. Menges, ARCH, herbarium 

Dicerandra immaculata Lakela, LAMIACEAE, U.S.A., Florida, Vero Beach, O. Lakela, ARCH, herbarium 

Dicerandra immaculata Lakela, LAMIACEAE, U.S.A., Florida, J. Fitzpatrick, ARCH, herbarium 

Dicerandra linearifolia var. robustior R.B. Huck, LAMIACEAE, U.S.A., Florida, Panhandle near Greensboro, Fl, J. Fitzpatrick, ARCH, herbarium 

FEEDBACK

17 specimens from ARCH!

Dicerandra

Table view | Label view | Images

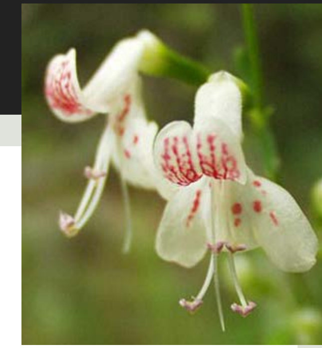
Search Matched 12 Records

Dicerandra densiflora Bentham, Plantae, Lamiaceae, United States, Florida, Deep sands at edge of fallow field, ca 1/2 miles E of the Suwannee River, by U.S. Rt 27, Robert K. Godfrey, TTRS, TTRS	***Dicerandra densiflora*** Bentham, Plantae, Lamiaceae, United States, Florida, Abundant in old field, sandy soil, by U.S. Rt 27, 3 miles E of the SuwaneeRiver at Branfor. Fresh flowers showy, rose-pink. Some	***Dicerandra linearifolia*** (Elliott) Bentham, Plantae, Lamiaceae, United States, Florida, Sandy slopes of sand ridge, I-10 right-of-way and just outside longleaf pine-scrub oak stand. Locally abundant. 1.3 miles W of I-10	***Dicerandra linearifolia*** (Elliott) Bentham, Plantae, Lamiaceae, United States, Florida, Florida, Leon co., Tallahasee Junior musuem. Roadside, Wilson Baker, TTRS, TTRS
Dicerandra linearifolia var. robustior Huck, Plantae, Lamiaceae, United States, Florida, Recentlyy clear-cut sand ridge, formerly pine-scrub oak, by Fla. Rd 255, 6 miles S of Lee; very abundant. Some	***Dicerandra linearifolia var. robustior*** Huck, Plantae, Lamiaceae, United States, Georgia, Blue Springs Plantation, Baker Co., Ga. Flowers pink, Leon Neel, TTRS, TTRS	***Dicerandra linearifolia var. robustior*** Huck, Plantae, Lamiaceae, United States, Florida, Well drained sands of pine-oak ridge, 1/2 mile S of Ochlockonee Bay bridge, by U.S. Rt 98, Robert K. Godfrey,	***Dicerandra linearifolia var. robustior*** Huck, Plantae, Lamiaceae, United States, Florida, Locally abundant at edges of mixed upland woodland and on grassy roadsides, Torreya State Park.,
Dicerandra linearifolia var. robustior Huck, Plantae, Lamiaceae, United States, Georgia, Greenwood Plantation, Mitchell Place, entrance woods west side - in old pea patch., R. Komarek, TTRS, TTRS	***Dicerandra linearifolia var. robustior*** Huck, Plantae, Lamiaceae, United States, Florida, Longleaf pine-scrub oak-wiregrass savanna, 5 miles S of Lee., Robert K. Godfrey, TTRS, TTRS	***Dicerandra linearifolia var. robustior*** Huck, Plantae, Lamiaceae, United States, Georgia, Blue springs Plantation, Baker Co., Ga. White corolla, Leon Neel, TTRS, TTRS	***Dicerandra linearifolia var. robustior*** Huck, Plantae, Lamiaceae, United States, Florida, Locally abundant at edges of mixed upland woodland and on grassy roadsides, Torreya State Park.,

FEEDBACK

12 specimens from TTRS!

iDigBio
Integrated Digitized Biocollections



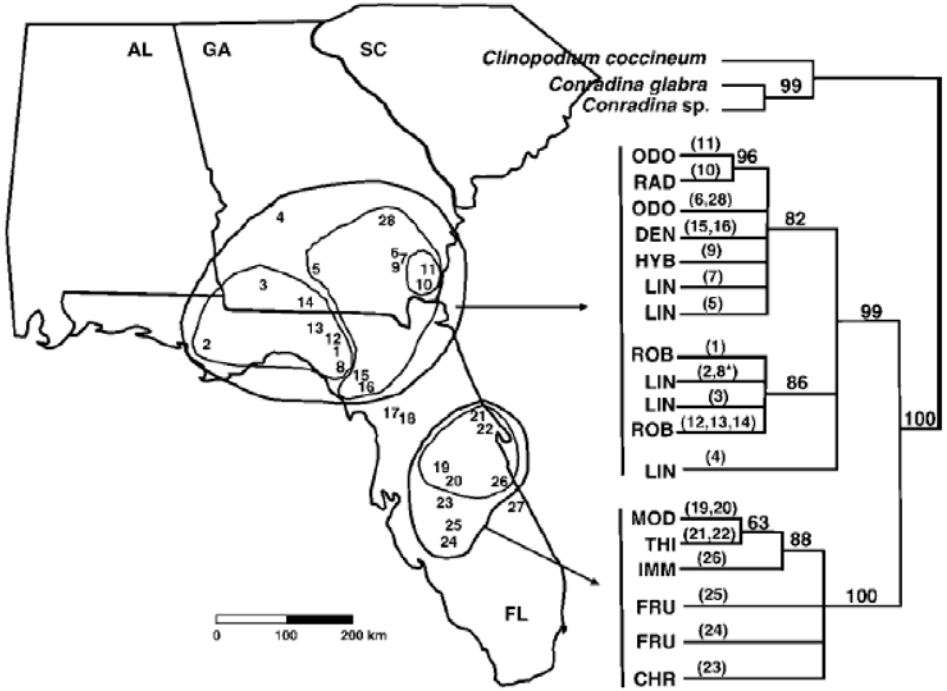
Dicerandra

44 specimens from VSC!

VALDOSTA STATE UNIVERSITY

Dicerandra: niche evolution

- Phylogeny (Oliveira et al. 2005)
- Niche models using specimen records
- Inference of ancestral niches, patterns of niche evolution
- Use data from small collections



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- Analysis of traits – related to ENMs, adaptation, phylogeny, etc.

Small Herbaria – FL & GA

ARCHBOLD BIOLOGICAL STATION
Research ★ Conservation ★ Education

TALL TIMBERS
Research Station & Land Conservancy

THE VALDOSTA STATE UNIVERSITY
VIRTUAL HERBARIUM

VALDOSTA STATE UNIVERSITY

http://scnet.acis.ufl.edu/

http://nansh.org/portal/index.php

https://www.idigbio.org/wiki/index.php/Small_Herbarium_Interest_Group

Thank you!

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