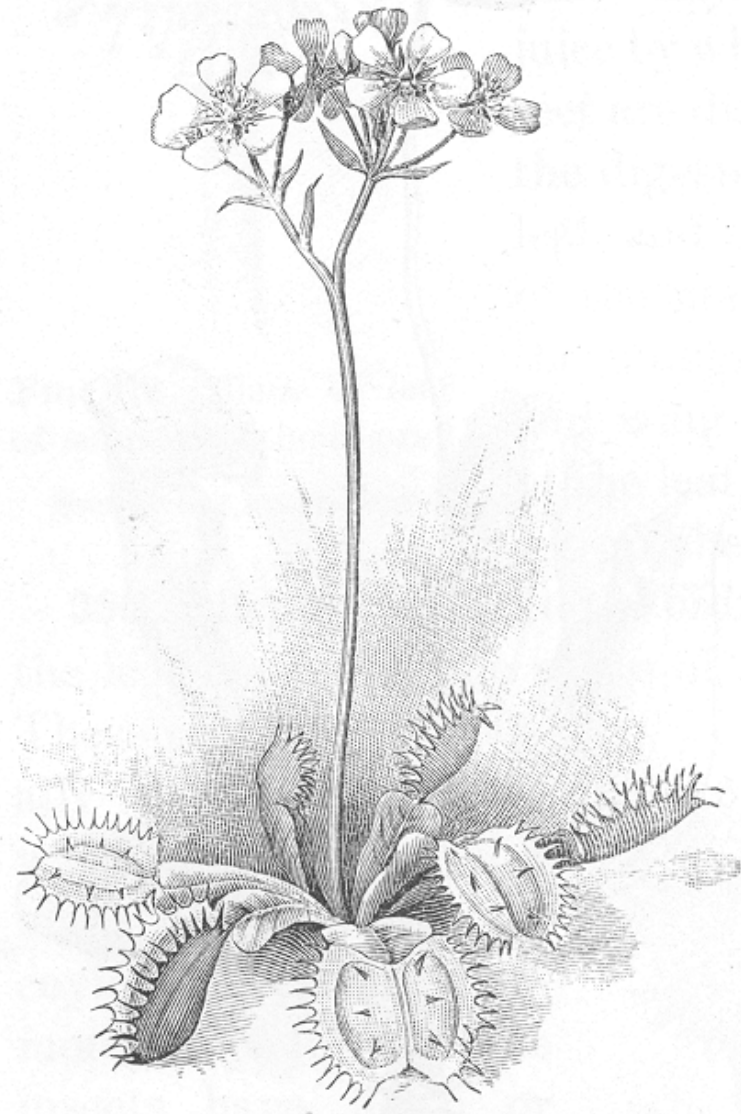





Who needs to identify plants?

“Not your Grandfather’s
Field Manual”:
Taxonomy, Floras, Apps,
and Data Tools
for Biodiversity
Conservation in the
2020s

The Southeastern Flora
Team at NCBG



The University of North Carolina
HERBARIUM (NCU)

A department of the
 NORTH CAROLINA BOTANICAL GARDEN



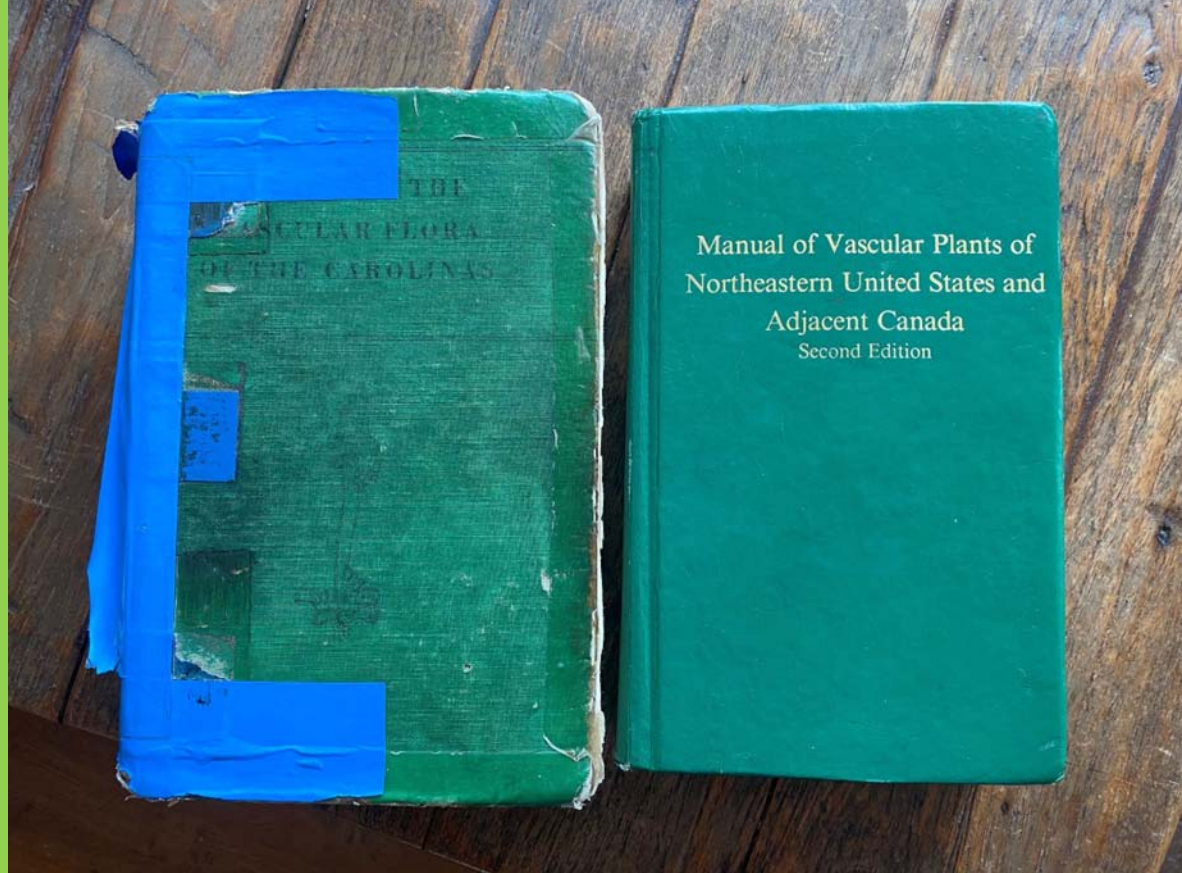
NORTH CAROLINA
**BOTANICAL
GARDEN**

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

Taxonomy matters: avoiding both Type I and Type II errors in conservation

- The conservation of biodiversity is urgent
- We have limited resources (of all kinds) for land conservation and species conservation, and we need to apply those resources as strategically and effectively as possible
- Type I error: we falsely DO NOT recognize a species as “good” that is, and therefore take no action to conserve it
- Type II error: we falsely DO recognize a species as “good” that isn’t, and waste resources (of all kinds) on its conservation

“The Flora” (“Mycota”, “Fauna”)



- The plants in an area, state, or region
- A BOOK about the plants in an area, state, or region -- as a TOOL and practical, useful summary of information (often identification keys, names, description, habitat, distribution)

Not your
grandparent's...

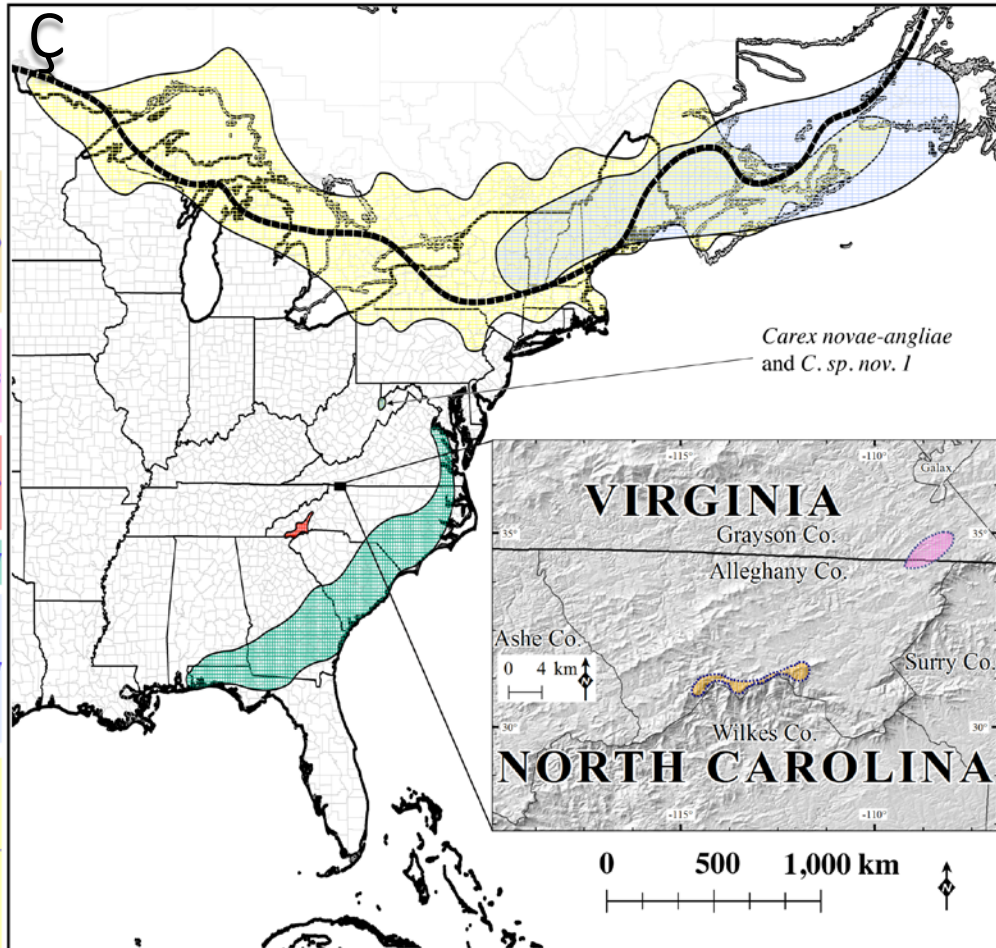
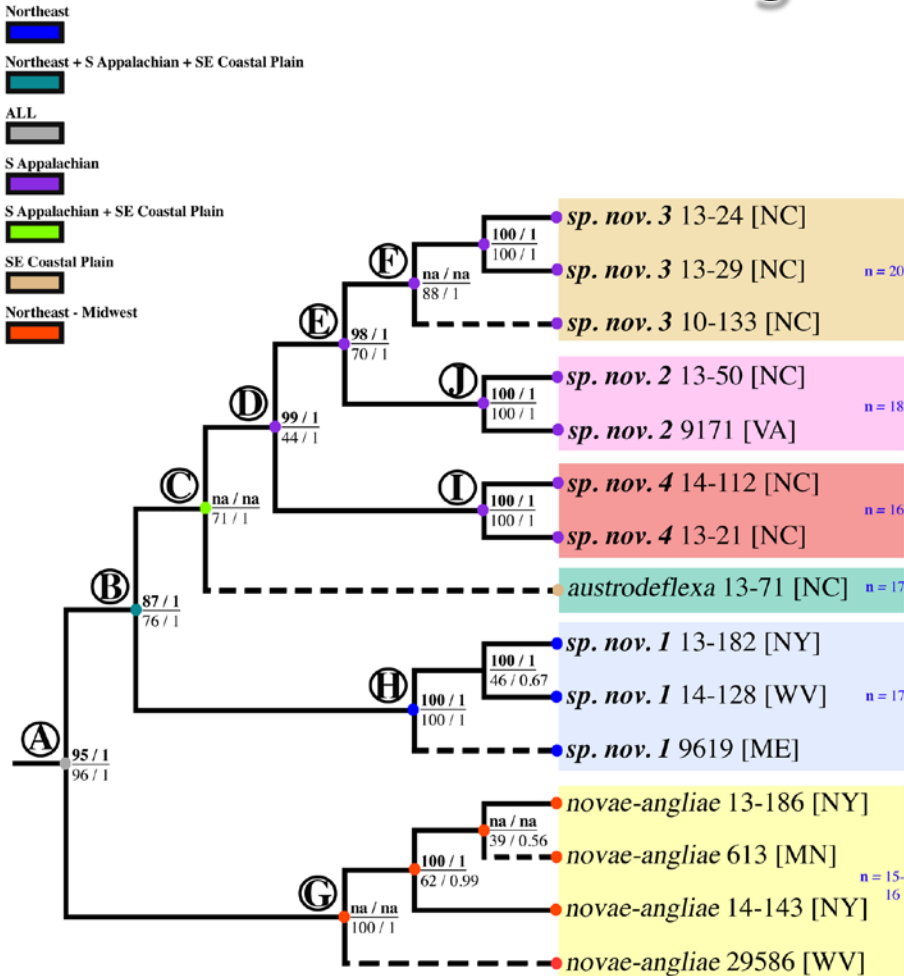


- Taxonomy
- Flora (the set of plants in an area)
- Flora (a book about the set of plants in an area)
- A.I. and “Flora tools”
- Biodiversity “elements” for conservation

Lumping and splitting
of genera and
families...



C. novae-angliae Species Complex



Trichostema (Blue Curls) new species... -- Kevan Schoonover McClelland



Trichostema sp. 8 ("microphyllum")
Trichostema suffrutescens



Trichostema sp. 7 ("hobe")



Trichostema sp. 3 ("fruticosum")



Trichostema sp. 5 ("bridgesii-
orzellii")



Trichostema sp. 6 ("gracile")

Trichostema
suffrutescens
complex



Trichostema sp. 4 ("latens")

Trichostema setaceum
complex

Trichostema setaceum



Trichostema sp. 2 ("floridanum")

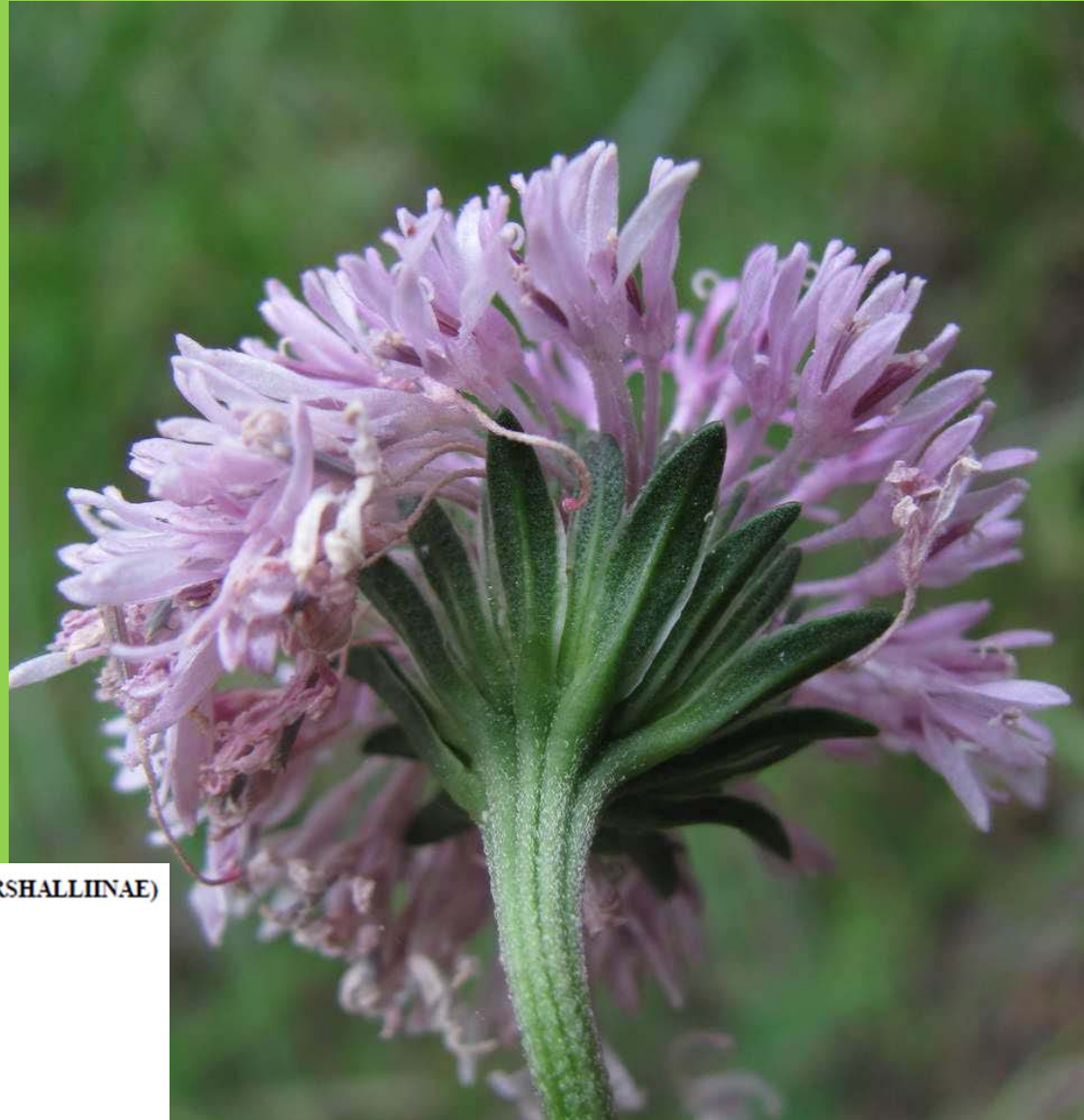
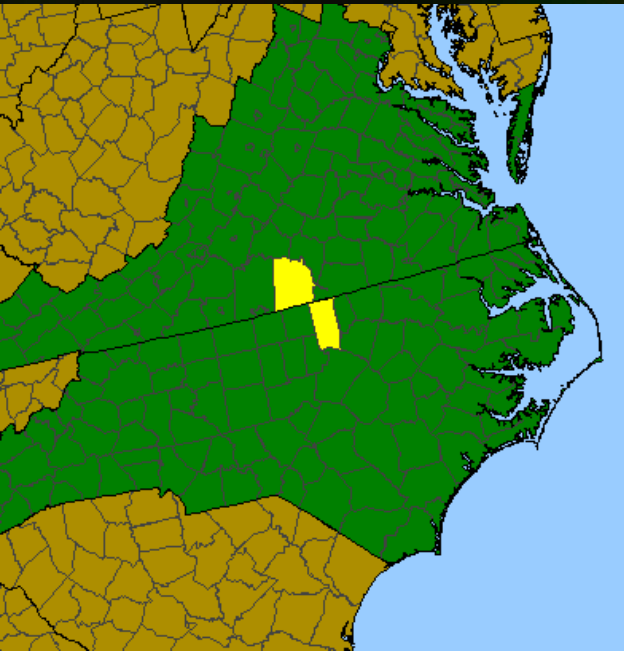
Trichostema dichotomum

Trichostema nesophilum

Trichostema
dichotomum
complex

All photos by R. Kevan Schoonover McClelland

Marshallia legrandii (Oak Barrens Marshallia)



**A NEW SPECIES OF *MARSHALLIA* (ASTERACEAE, HELENIEAE, MARSHALLIINAE)
FROM MAFIC WOODLANDS AND BARRENS
OF NORTH CAROLINA AND VIRGINIA**

ALAN S. WEAKLEY & DERICK B. POINDEXTER
UNC Herbarium (NCU)
North Carolina Botanical Garden
University of North Carolina
Chapel Hill, North Carolina 27599-3280
weakley@unc.edu

Here's (part of) the goal... Reinventing "the Flora" as a 21st Century Tool for biodiversity inventory...

- Make it as easy as possible for a wide diversity of people to correctly identify and learn basic information about any of the 10,730 plant species in the Southeast
 - Current and constantly updated with the latest warranted taxonomy
 - Completely crosswalked to other floras and monographs
 - Conservation focused
 - Technical jargon minimized
 - Visual (photos, maps)
 - Using modern technology wisely and well

Flora of the Southeastern United States Project

- Collaborative (ca. 500-1000 individuals have contributed treatments, edits, locations, suggestions)
- Open access
- Scientifically rigorous
- Kept current based on latest scientific literature (> 7000 references) and other information (including citizen science)
- Supported by diverse funding (private, NGO, state, federal)

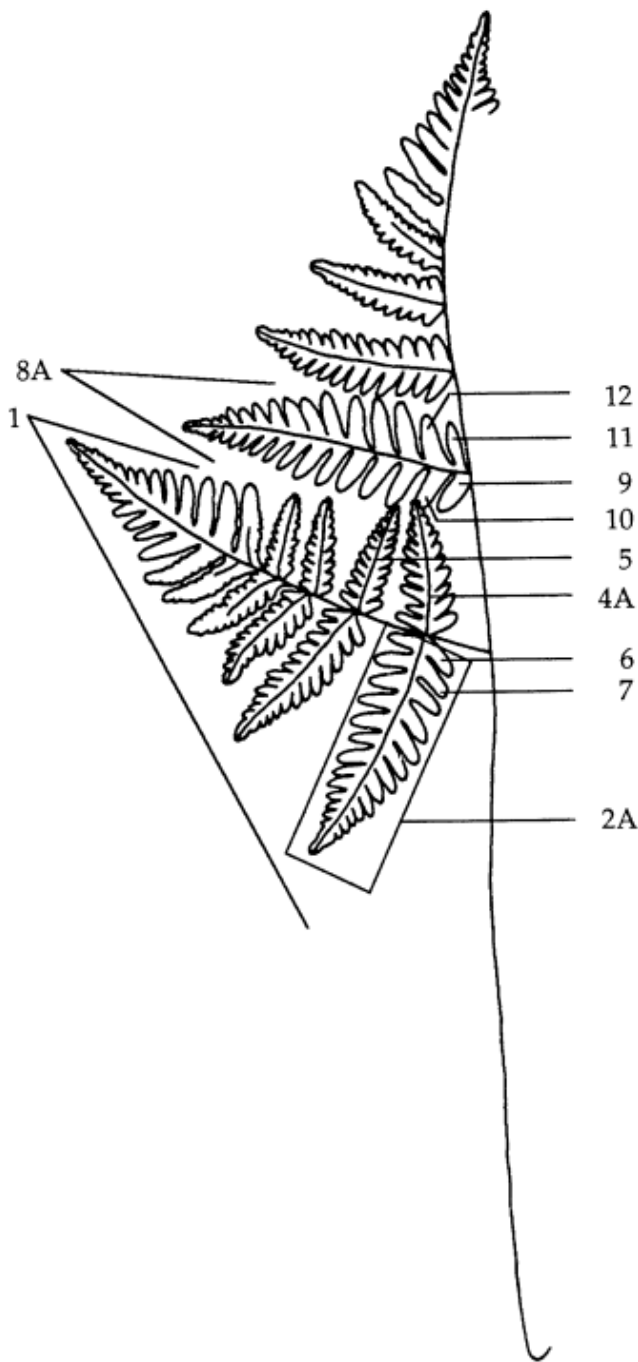
Flora tools for all

- Updatability
 - Information that changes can be revised
 - Current taxonomy and with crosswalk to alternative systems
- Information useful to the biodiversitarian
 - Keys based as much as possible on vegetative features
 - Alternative ID tools to dichotomous keys (multiple access keys, illustrated keys, Machine Learning / Artificial Intelligence)
 - Traits
 - GRanks and SRanks (NatureServe)
 - Wetland status, Coefficients of Conservatism (CoC) / Floristic Quality Index (FQI), Invasiveness status
 - Heliophily ratings (HR) / Grasslandiness Index (GRI)
 - Ability to create species lists

Dichotomous keys

- Be defiant against the saying: “keys are written by those who don’t need them for those who won’t be able to use them”
- Design keys to work throughout the growing season, relying only as necessary (and as late in the key as possible) on transitory characters of flower and fruit
- Minimize unnecessary technical language that acts as a barrier to protobotanists: vallecular, porrect, persicolor...
- Don’t follow strict system of “key to the family, then key to the genus, then key to the species, then key to the variety” -- juxtapose plants that are similar even if not closely related (*Cassytha* v. *Cuscuta*; *Podophyllum* v. *Diphyllia* v. *Hydrastis*; *Polygonatum* v. *Uvularia* v. *Streptopus* v. *Maianthemum* v. *Prosartes*)
- In other words -- a Flora BY Field Botanists FOR Field Botanists

Gymnocarpium appalachianum vs. *G. dryopteris*



- 1 Sessile basal basisconic pinnule of the proximal pinnae with basal basisconic pinnulet shorter than the adjacent pinnulet; pinnae of the second pair of pinnae sessile, with basal pinnules shorter than the adjacent pinnule (or second basal pinnae rarely stalked); spores 27-31 μm in diameter.....
.....*Gymnocarpium appalachianum*

- 1 Sessile basal basisconic pinnule of the proximal pinnae with basal basisconic pinnulet more or less equal in length to the adjacent pinnulet; pinnae of the second pair usually sessile, with basal pinnules more or less equal in length to the adjacent pinnule; spores 34-39 μm in diameter....*Gymnocarpium dryopteris*



Dream Team – floras, apps, website for the full region and state by state

- Michael Lee, Data Scientist
- Katie Gibson, App Developer
- Derick Poindexter, Plant Systematics Researcher
- Chris Ludwig, Botanist
- Scott Ward, Botanist
- Eric Ungberg, Botanist
- Dax Ledesma, Computer Scientist (Artificial Intelligence / Machine Learning)
- Bruce Sorrie, Botanist
- Richard LeBlond, Botanist
- Milo Pyne, Botanist
- Brandon Fuller, Botanist
- Wes Knapp, NatureServe Chief Botanist
- Carol Ann McCormick, Herbarium Curator
- Alan Weakley, Lead
- photographers across the region
- many other collaborators and contributors across the region

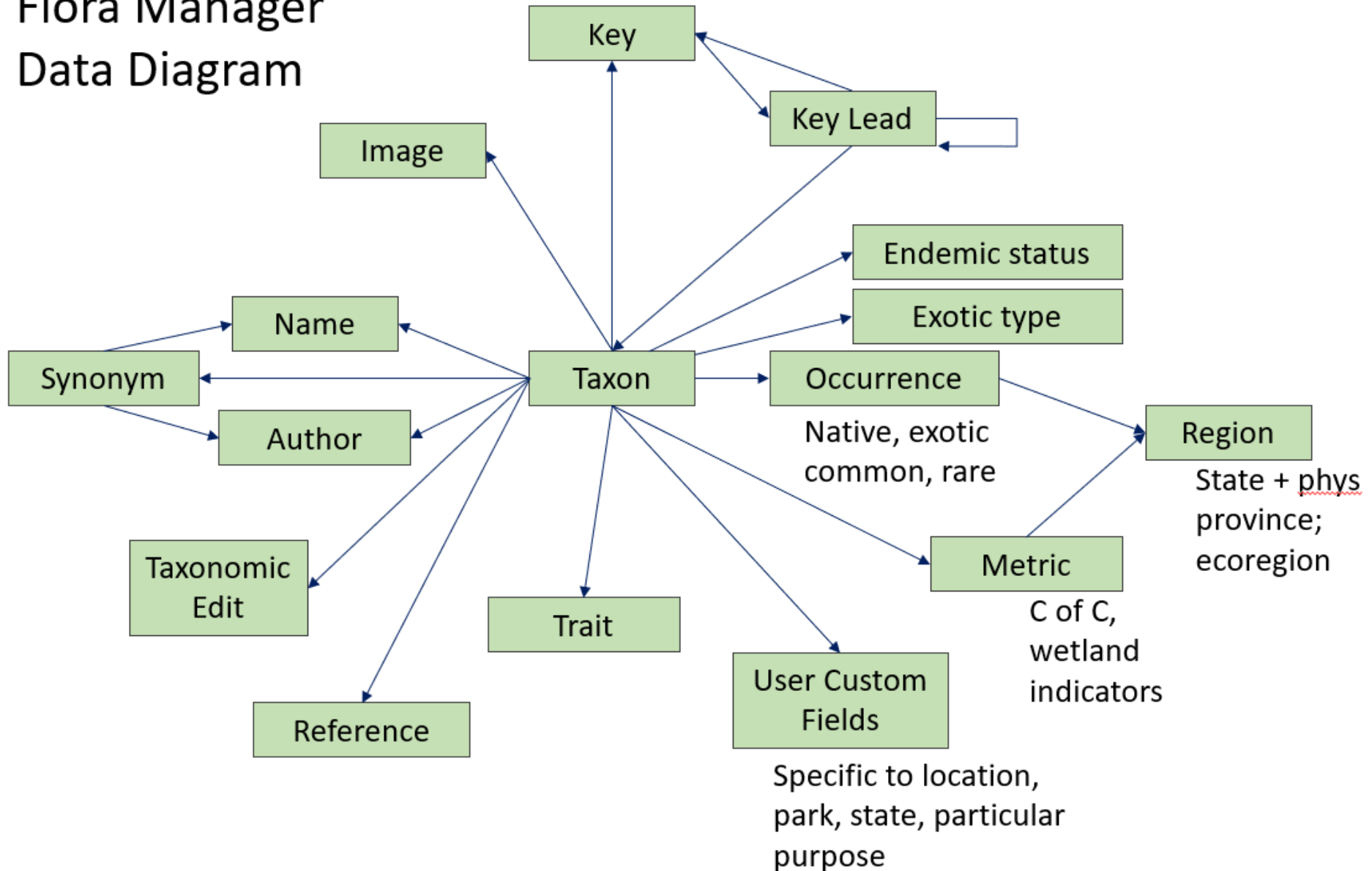
Funding and collaborations

- NatureServe and Heritage Programs
- National Park Service (regional office and various Networks)
- Mount Cuba Center
- Southeastern Grasslands Initiative
- Flora of Virginia Foundation
- State governments (AR, GA, NC, PA, VA, etc.)
- A private conservation philanthropist and other UNC Herbarium / NC Botanical Garden donors

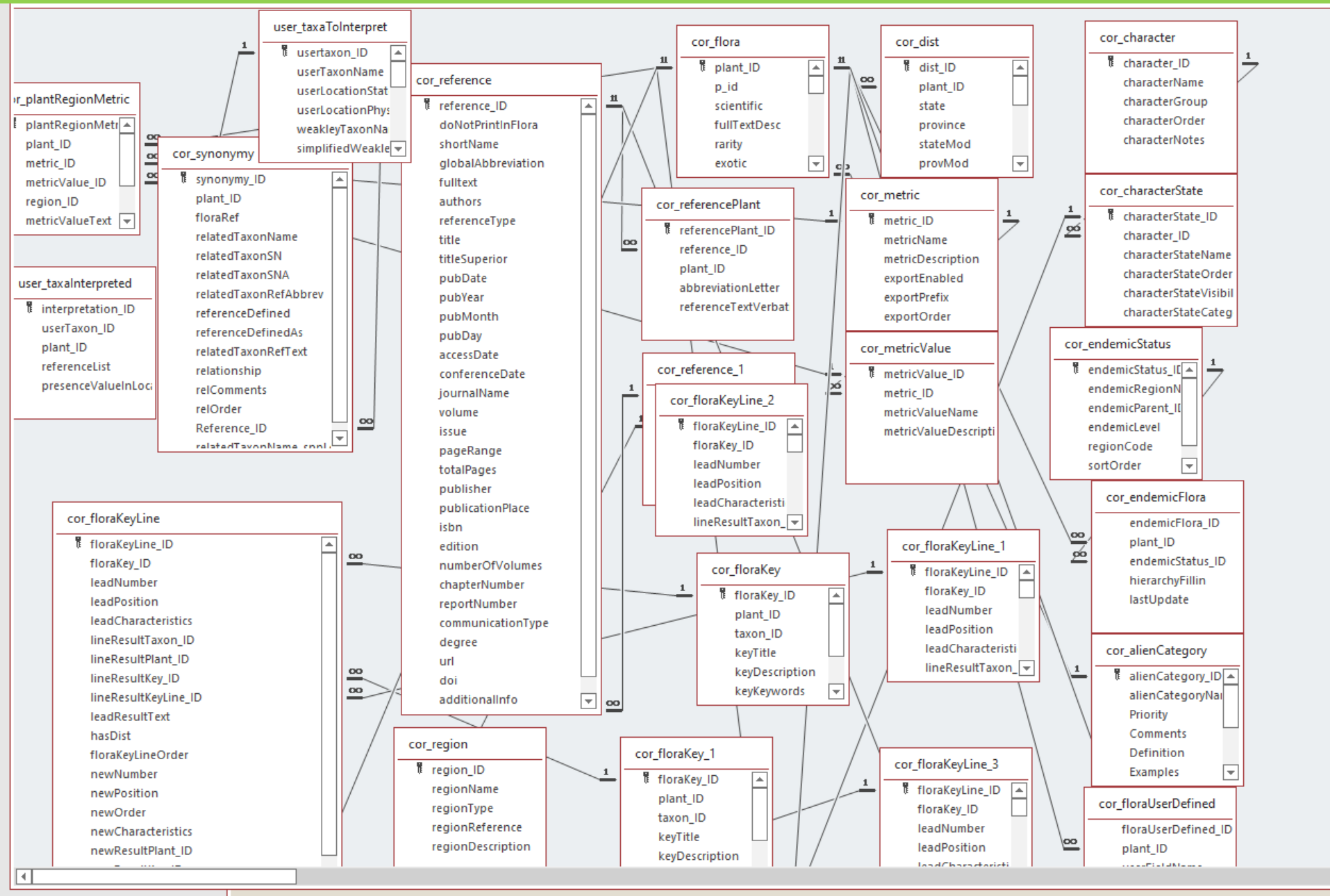
WE WELCOME ADDITIONAL COLLABORATIONS AND PROJECTS!

weakley@unc.edu

Flora Manager Data Diagram



FloraManager 4.45



Flexafloras, Florulets, Florulas

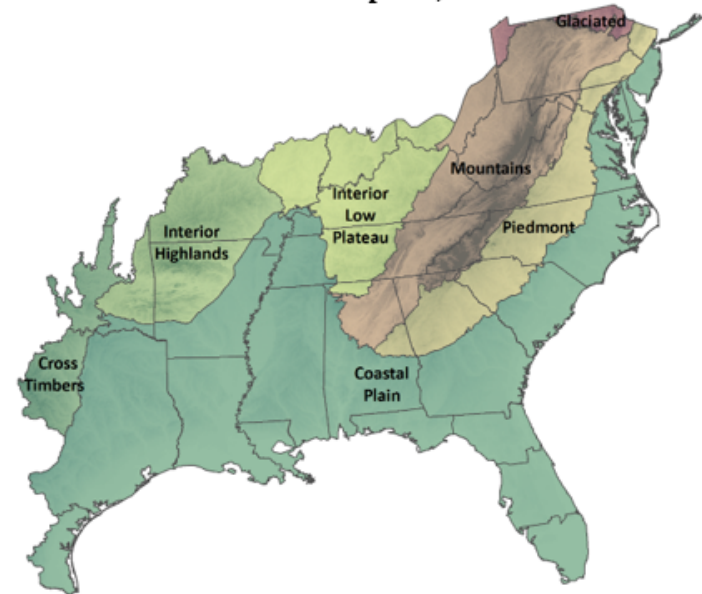
- Flora of any area or any taxonomic group, or based on a species list (Flora of Carolina Beach State Park)
 - Keys auto-simplify
- Waif exclusion (or “graying”)
- With or without maps (regional or customized)
- Pictures, line drawings, or neither
- Custom information for an area (Shenandoah, Delaware)
- Wetland status, FQI (CoC), Grank, Srank, etc.

Flora of the Southeastern US

- <https://ncbg.unc.edu/research/unc-herbarium/floras/>
- 10,791 Species
- 2,007 Pages
- 7,367 downloads since 10/20/2020
- 5 Physiographic Regions
 - Appalachian
 - Eastern Coastal Plain
 - Interior Low Plateau and Interior Highlands
 - Southern Coastal Plain
 - Florida
- 25 States: AL, AR, DE, FL, GA, KY, LA, MD, MS, NJ, NC, PA, SC, TN, VA, WV, DC, and parts of TX, OK, MO, KS, IL, IN, OH, and NY

Flora of the Southeastern United States

Edition of April 5, 2022



by

Alan S. Weakley and the Southeastern Flora Team*

University of North Carolina at Chapel Hill Herbarium (NCU)

North Carolina Botanical Garden

University of North Carolina at Chapel Hill

Campus Box 3280

Chapel Hill NC 27599-3280

Produced from the FloraManager database system
by Michael T. Lee

27 Floras available for download

Select Flora (required)

Choose a flora using the radio buttons below.

- Flora of the Southeastern United States (309.1 MB, PDF)
- Regional Floras (150-200 MB, PDF)
- State Floras (80-150 MB, PDF)


State Floras

State derivatives of the Flora of the Southeastern United States (FSUS).

Terms of Use (required)

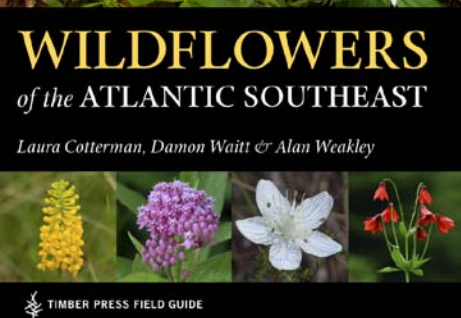
These floras are posted under the [creative commons by-nc-nd license](#).

I agree to the terms of use



<https://ncbg.unc.edu/research/unc-herbarium/flora-request/>

Floras, apps, guides,...



FNA Vol. 20 Page 472, 501, 525, 526

FNA | Family List | FNA Vol. 20 | Asteraceae * | Symphyotrichum *

58. *Symphyotrichum rhiannon* Weakley & Govus, Sida. 21: 828, fig. 1. 2004.

Rhiannon's aster

Perennials, 15–40(–60) cm, colonial; thinly long-rhizomatous. **Stems** 1, erect (straight), hirsute to hispid-hirsute, hirsutulous distally. **Leaves**: margins shallowly crenate to serrate-crenate, abaxial faces strigillose, adaxial scabrous; basal withering by flowering, petiolate, petioles winged, clasping to subclasping, shallowly auriculate, blades subspatulate or oblanceolate-elliptic. 30–70 × 10–15 mm. bases attenuate to cuneate. apices acute; proximal

Verizon 9:02 AM 95%

FloraQuest

Juglandaceae

Carya carolinae-septentrionalis

Flowers and Fruits:
 JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Native

Synonymy:
 [= C. G, K, RAB, Va; = *C. ovata* (P. Miller) K. Koch var. *australis* (W.W. Ashe) Little – FNA; = *Hicoria carolinae-septentrionalis* W.W. Ashe – S; = *C. ovata* var. *carolinae-septentrionalis* (W.W. Ashe) Reveal; = *C. australis* W.W. Ashe]

Create Observation



Flora of the Southeastern United States: Pennsylvania

Edition of 20 October 2020

by
Alan S. Weakley
 University of North Carolina at Chapel Hill Herbarium (NCU)
 North Carolina Botanical Garden
 University of North Carolina at Chapel Hill
 Campus Box 3280
 Chapel Hill NC 27599-3280

Produced from the FloraManager database system
 by Michael T. Lee

Search

All Floras Advanced Search

Login | eFloras Home | Help



App features

- Three ID methods (plus combinations)
 - Dichotomous keys with embedded images (!)
 - Graphic / polyclave / flexible entry keys
 - Artificial Intelligence (via iNaturalist?)
 - From any set of species, then jump to custom dichotomous key of remaining species, or to AI
 - Images: 2-5 photos per species, illustrating important features
- Traditional information
 - Habitats, maps of distribution, native/nonnative, taxonomic discussion
 - Clickable illustrated glossary
- Ability to create site species lists by ‘clicking’: LITU
- Less-traditional information
 - Wetland status, CoC / FQI values, Grasslandiness ratings, invasiveness ratings, GRanks and Srank, synonymy
“crosswalk”

Graphic key (polyclave or multiple access or flexible key)

- Enter easily observable information about the plant, and let the computer do the sorting
- Enter from menu:
 - In unglaciated montane Pennsylvania
 - Growing in a wet place
 - Broad-leaved woody plant
 - A shrub (not a tree)
 - Leaves opposite
 - Leaves compound
 - → you've gone from 10,000 possibilities to 2

Derivative and collaborative projects

- Weakley, Ludwig, & Townsend, 2013, Flora of Virginia
- McAvoy, Highland, & Weakley, Flora of Delaware
- Witsell, Baker, Ogle, Soteropoulos, and Weakley, Guide to the Flora of Arkansas
- Medley & Weakley, Flora of Georgia
- Bridges & Weakley, Ecological Flora of Florida
- Legal basis for Pennsylvania's state listing of rare, threatened and endangered species
- Flora of Shenandoah National Park
- Flora of the National Park Service CUPN Network Units
- Flora of Little River Canyon National Preserve
- Etc...

By Alan S. Weakley, J. Christopher Ludwig, and
John F. Townsend. Bland Crowder, editor

Flora of VIRGINIA



With photos, new data,
more illustrations, range maps, and
an easy-to-use Graphic Key

Flora of Virginia Project and
High Country Apps LLC
Copyright © 2017 All rights reserved

Flora of Virginia App

- Graphic “key”
- Dichotomous keys
- Lots of illustrations
- Geographic filtering by county
- Nearly all content from the Flora of Virginia book
- \$19.99
- iOS and Android

Flora of Virginia

Browse Plants / Favorites >

Graphic Key >

Botanical Help >

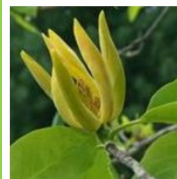
Reference Library >

About / Contact Us >

[Back](#)

Plant Families

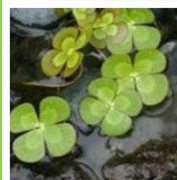
M

**Magnoliaceae (Magnolia Family) -- 7 species**

A family of 6-12 genera and about 220 species, tropical and warm-temperate, of e. and se. Asia and from e. North America through the West Indies and south through Central America to Brazil.

**Malvaceae (Mallow Family) -- 24 species**

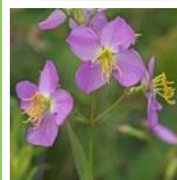
If circumscribed broadly (as here) to include the Sterculiaceae and Tiliaceae, the Malvaceae comprise about 243 genera and 4000-4500 species, cosmopolitan but especially diverse in the tropics and subtropics. This family includes several economically important species, including cotton (*Gossypium* spp.), cacao or chocolate, *Theobroma cacao* Linnaeus, and cola, *Cola acuminata*.

**Marsileaceae (Water-clover Family) -- 1 species**

A family of 3 genera and about 50 species, cosmopolitan.

**Melanthiaceae (Bunchflower Family) -- 10 species**

A family of about 16 genera and 170 species, mostly temperate and of the northern hemisphere, but extending into South America.

**Melastomataceae (Melastome Family) -- 5 species**

A family of about 150 genera and about 3,000 species, from tropical, subtropical, and warm-temperate areas.

Flora of Virginia Graphic Key



Select observed characteristics. [\(Instructions\)](#)

Reset

3164 Found

Show

Plant Group:



Location:

tap to select

Use current location

Moisture Regime:



Light Regime:



Flora of Virginia Graphic Key



Select observed characteristics. [\(Instructions\)](#)

Reset

474 Found

Show



Plant Group: Broad-leaved woody plants



Shrubs and trees with broad leaves.

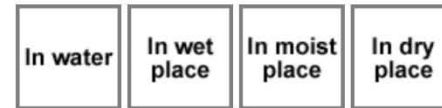


Location:

tap to select

Use current location

Moisture Regime:



Light Regime:

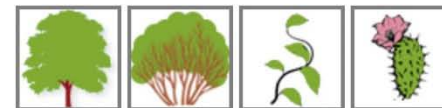


Flowering period:



Use current month

Growth form:



Armed with spines?



Flora of Virginia Graphic Key

Select observed characteristics. (Instructions)

Reset **10 Found** Show



Fruit type:



Leaf arrangement: Opposite

Leaves opposite each other on the stem.



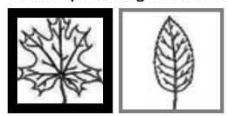
Leaf division: Simple

Leaves are not divided into leaflets.



Leaf vein pattern: Palmate

Veins spreading from a common point, recalling the fingers of a hand.



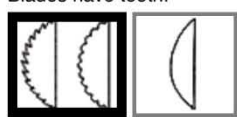
Leaves lobed? Lobed

A simple leaf that has lobes.



Leaves toothed? Toothed

Blades have teeth.



Leaf length:



Graphic Key

Browse Favorites

Sort

A



Acer rubrum
Maple, Red
Acer (Maple)
Sapindaceae (Soapberry Family)



Acer saccharinum
Maple, Silver
Acer (Maple)
Sapindaceae (Soapberry Family)



Acer saccharum
Maple, Sugar
Acer (Maple)
Sapindaceae (Soapberry Family)



Acer spicatum
Maple, Mountain
Acer (Maple)
Sapindaceae (Soapberry Family)

V



Viburnum acerifolium
Viburnum, Maple-leaf
Viburnum (Viburnum)
Adoxaceae (Moschatel Family)



Viburnum opulus var. opulus
Viburnum, Guelder-rose
Viburnum (Viburnum)
Adoxaceae (Moschatel Family)

A
V

[Back](#)***Acer nigrum* Michaux f.**

Black Maple

Native

[Acer \(Maple\)](#)[Sapindaceae \(Soapberry Family\)](#)

© Gary P. Fleming



© Gary P. Fleming



Images



Description



Range Map

[Back](#)***Acer nigrum* Michaux f.**

Black Maple

Native

[Acer \(Maple\)](#)[Sapindaceae \(Soapberry Family\)](#)**Description**

Trees to 36 m. Bark dark, furrowed and often platelike; twigs orangish brown and lustrous the first year, becoming pale gray-brown. Leaves 7.5-15 × 7.5-20 cm, palmately 3(-5)-lobed, teeth obtuse to rounded; lower surfaces green and pubescent. Inflorescences umbels, drooping, lateral and terminal. Samaras 1.2-3 cm.

Phenology

March to July

Habitat

Mesic to dry, calcareous upland forests and woodlands; rich floodplain forests.

Status

Frequent in the Ridge and Valley province below 600 m (2000 ft) elevation (rarely to 1200 m), often locally common in limestone or dolomite areas; rare elsewhere in the mountains and the Piedmont.

Synonymy

[= C, F, G, K, Pa., W, W.Va.; = *A. saccharum* Marshall ssp. *nigrum* (Michaux f.) Desmarais - R, Z; = *Saccharodendron nigrum* (Michaux f.) Small - S]

Search Characteristics (tap icons)

Images



Description



Range Map

[← Back](#)**Phenology**

March to July

Habitat

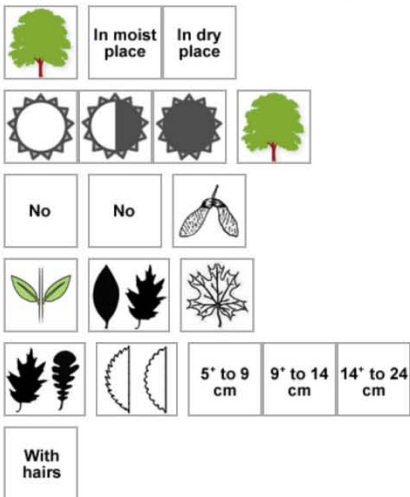
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Search Characteristics (tap icons)

Images



Description



Range Map

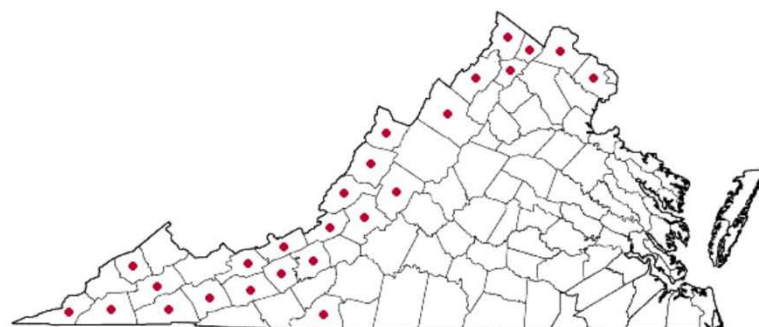
[← Back](#)***Acer nigrum* Michaux f.**

Black Maple

Native

Acer (Maple)

Sapindaceae (Soapberry Family)



Distribution data from the Digital Atlas of the Virginia Flora. © 2017 Virginia Botanical Associates. A dot in a given county signifies that a voucher specimen exists for that county.



Images



Description



Range Map

Identify further with dichotomous key

***Ribes cynosbati***

Gooseberry, Prickly

Ribes (Currant, Gooseberry)

Grossulariaceae (Currant Family)

***Ribes rotundifolium***

Gooseberry, Appalachian

Ribes (Currant, Gooseberry)

Grossulariaceae (Currant Family)

***Ribes missouriense***

Gooseberry, Missouri

Ribes (Currant, Gooseberry)

Grossulariaceae (Currant Family)


[Key to > Key G: > Key G2: > Ribes >](#)
Ribes
[SEE GENUS PROFILE](#)

1a. Flowers solitary or in [corymbs](#) of 2-4; [pedicels](#) not [jointed](#) just beneath the [ovary](#) or [fruit](#), the fruit not [disarticulating](#) at maturity and thus the fruit shed with the [entire](#) pedicel; [stems](#) generally with (0-) 1-3 [nodal spines](#) and sometimes also with [internodal bristles](#) (especially on young, vigorous growth) (though these sometimes absent or nearly so in some [species](#)); [subgenus *Grossularia*, "gooseberries"].

[SEE 3 MATCHING SPE...](#)
[GO BACK](#)
2a. Ovary and [fruit glabrous](#).
[SEE 2 MATCHING SPE...](#)
[CHOOSE THIS LEAD](#)
2b. Ovary and [fruit hairy](#) or bristly.
[SEE 1 MATCHING SPE...](#)
[CHOOSE THIS LEAD](#)
[SHOW ALL COUPLETS](#)

Wildflowers of the Atlantic Southeast

Laura Cotterman

Damon Waitt

Alan Weakley

“We do the hard work, so you won’t have to”

Or, actually: “We try to give you better tools to make your hard work more effective, efficient, and fun”

But, here's the REST of the goal...

Learning and Teaching

**PLANTS TO THE
PEOPLE!**

Building a community of...

- Magizoologists
- Plant Wizards
- Data Mages
- Biodiversity Explorers
- Phytophylophilosophers
- Conservation Persuaders
- Transformational Diversifiers
- Protectors of the Real World
- Just Plain Folks (Who Care)



Diversity,
resilience,
learning,
place,
conservation

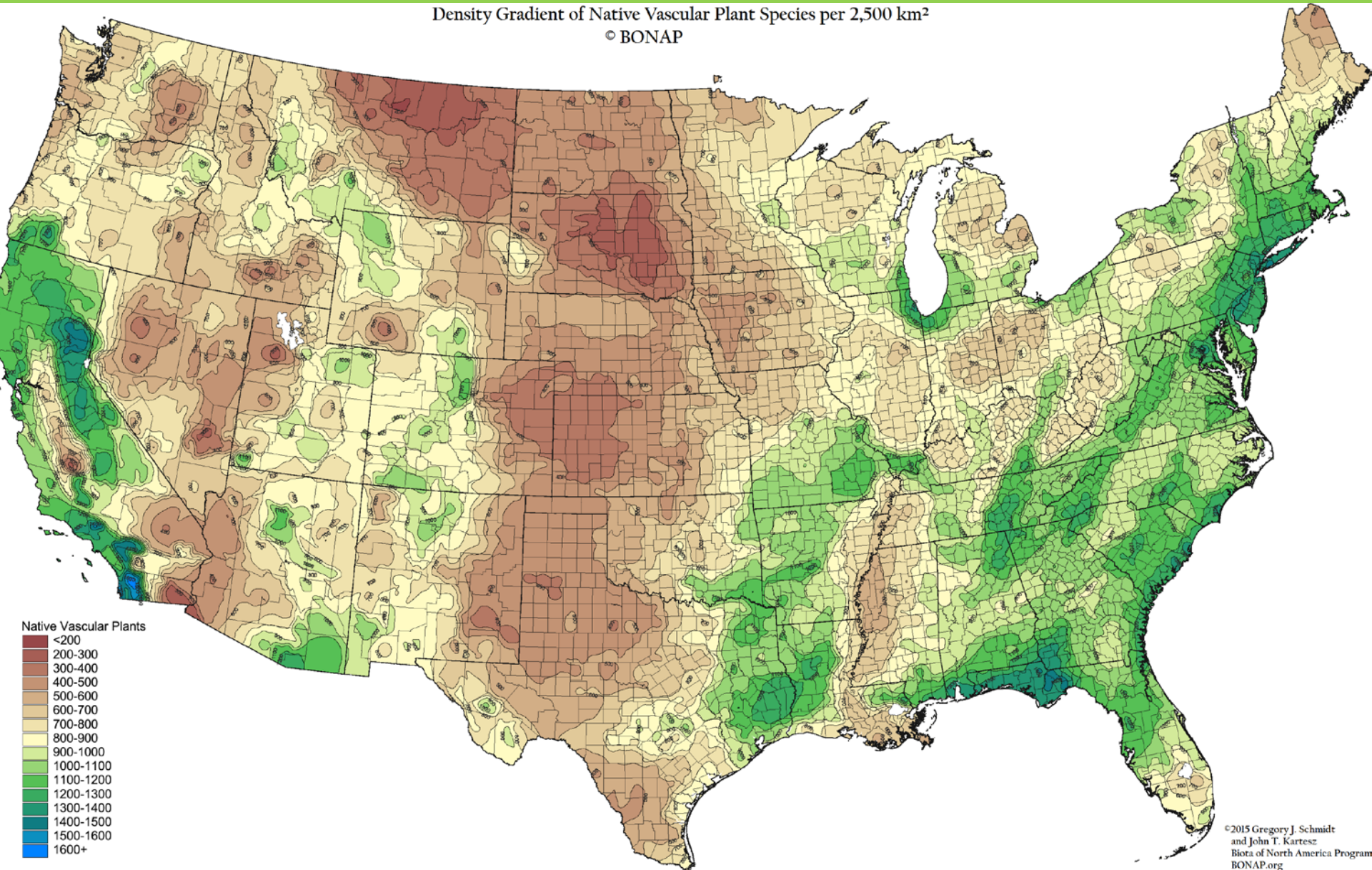
Alan Weakley

UNC Herbarium (NCU), North Carolina Botanical Garden
University of North Carolina at Chapel Hill



Plant species diversity

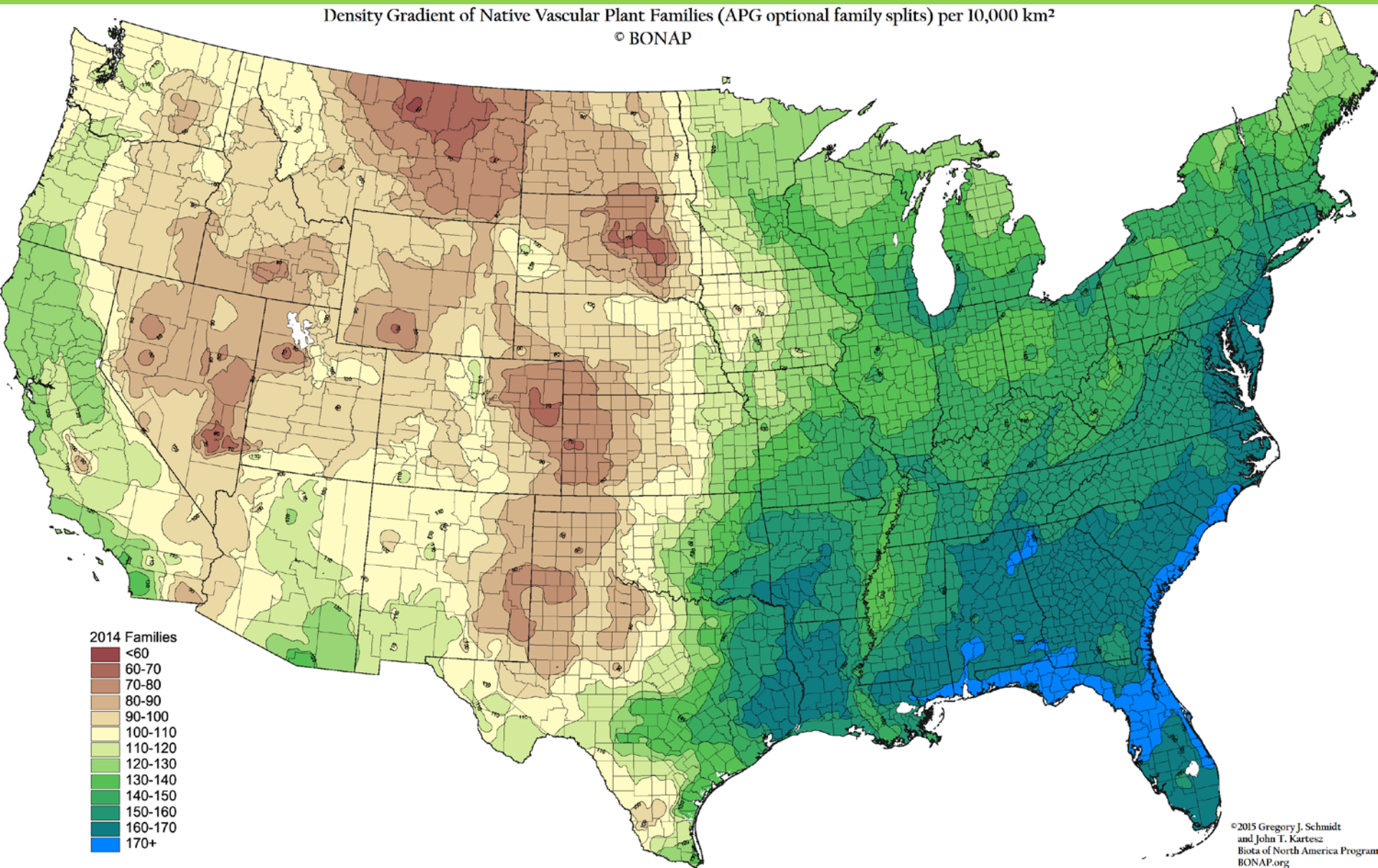
Density Gradient of Native Vascular Plant Species per 2,500 km²
© BONAP



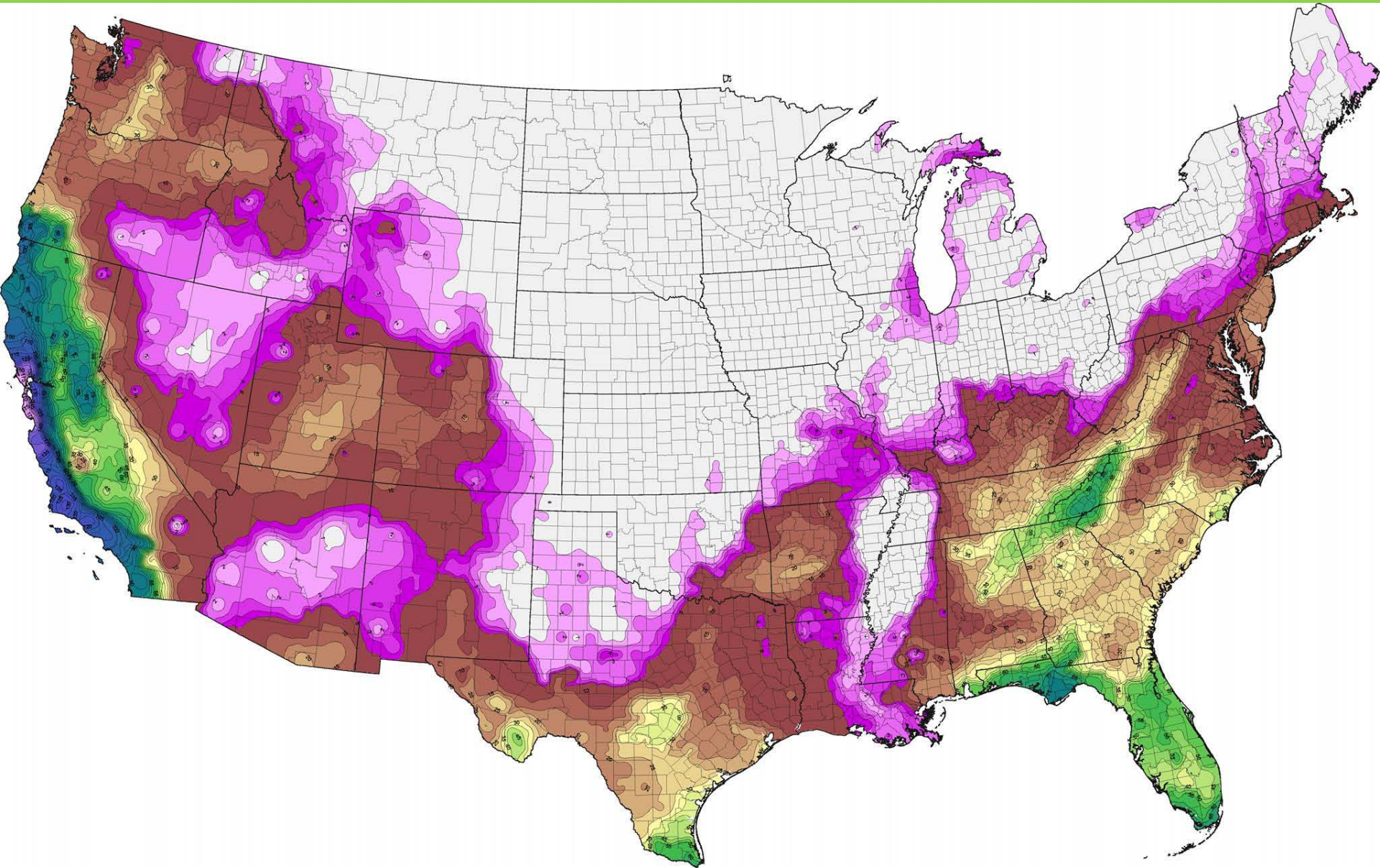
Plant family diversity

Density Gradient of Native Vascular Plant Families (APG optional family splits) per 10,000 km²

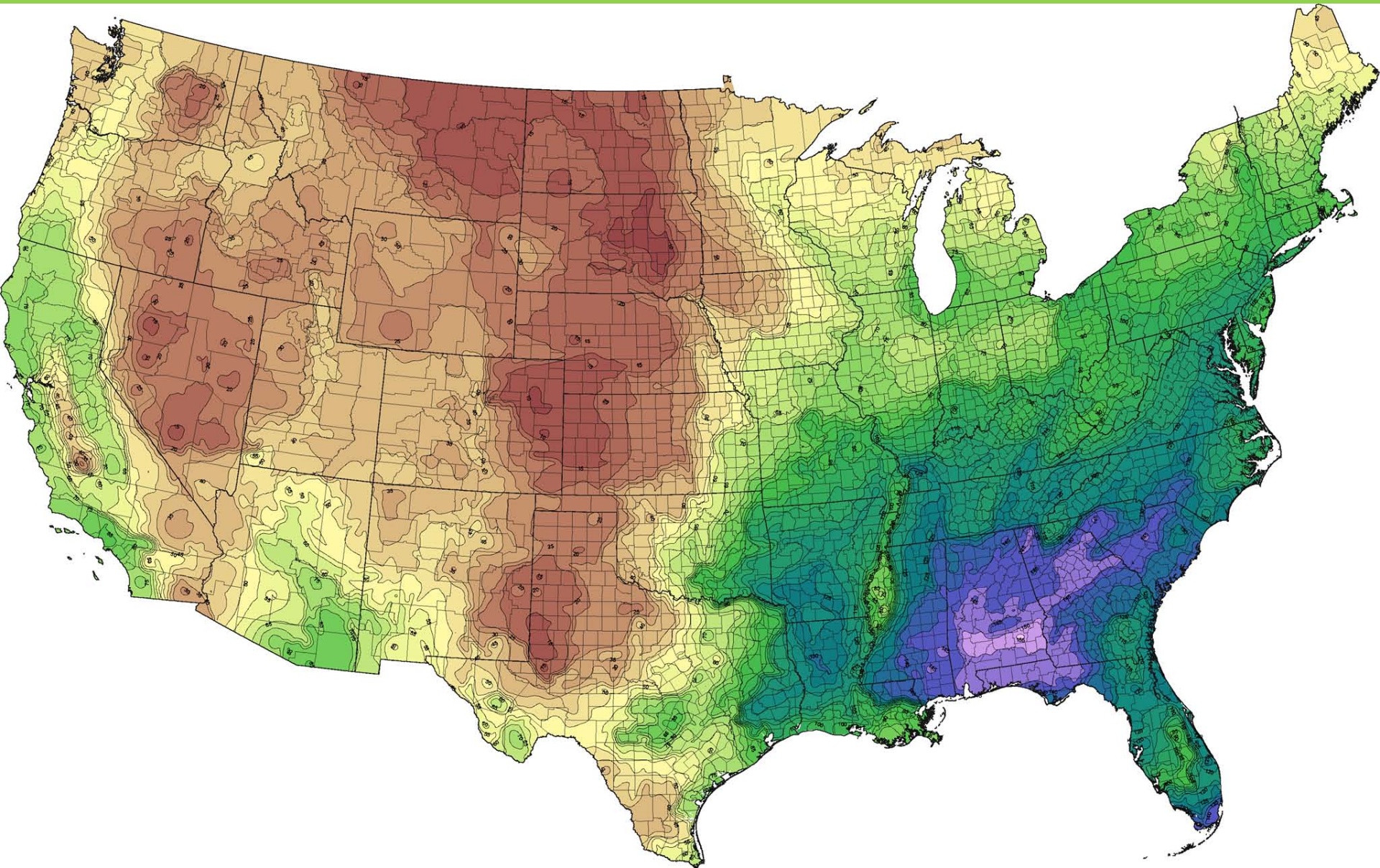
© BONAP



Plant narrow endemics

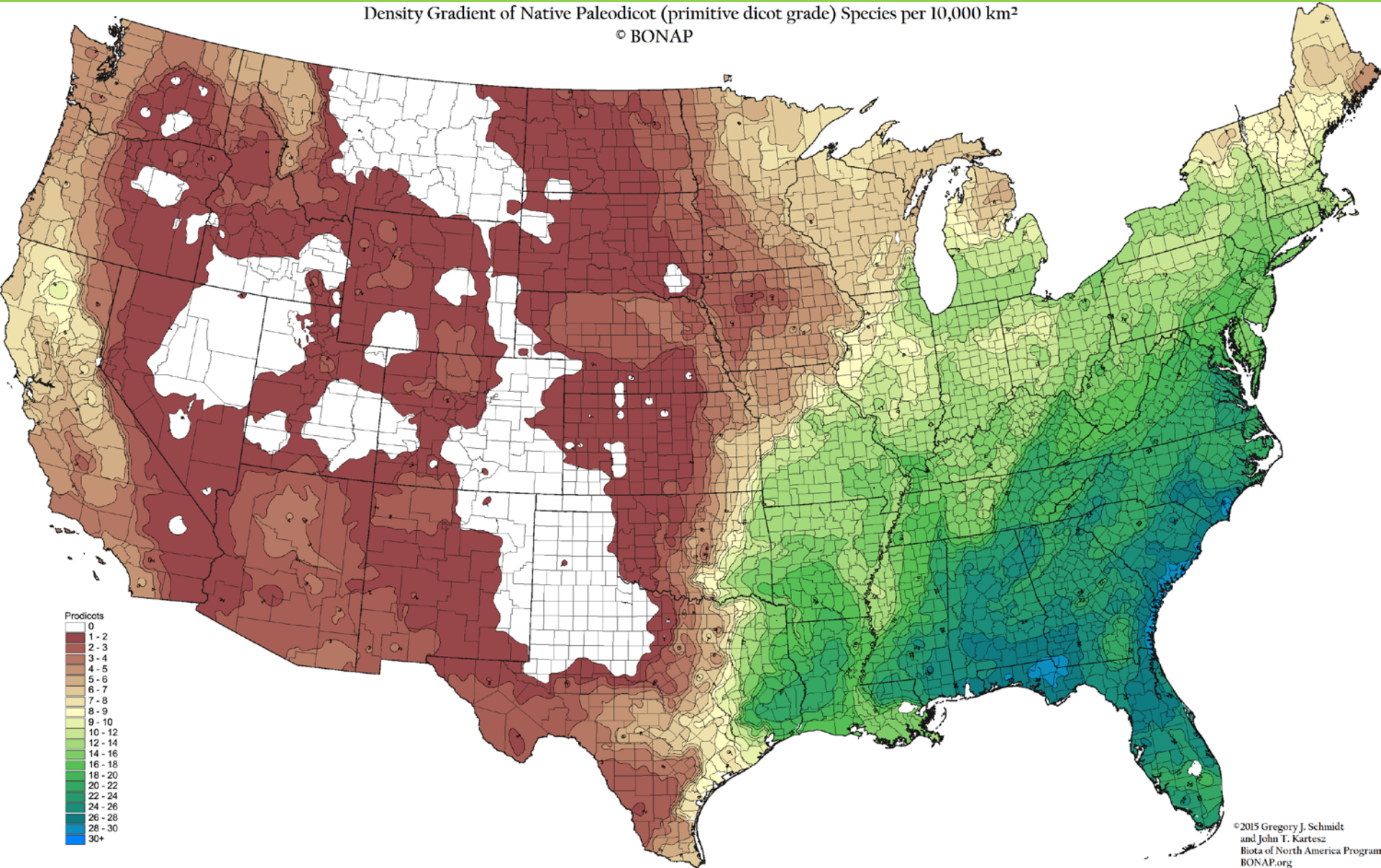


Tree diversity



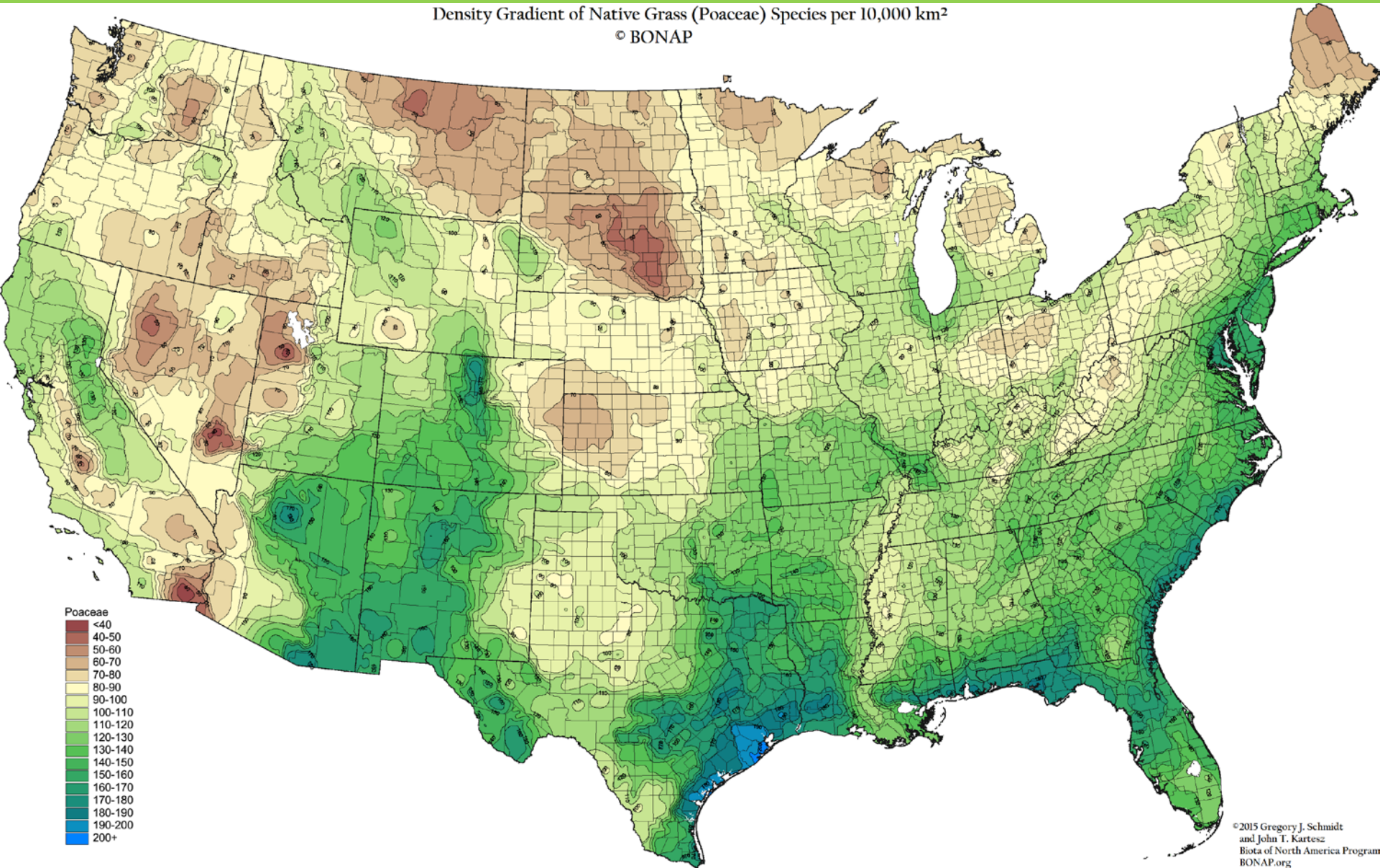
Paleodicot diversity

Density Gradient of Native Paleodicot (primitive dicot grade) Species per 10,000 km²
© BONAP

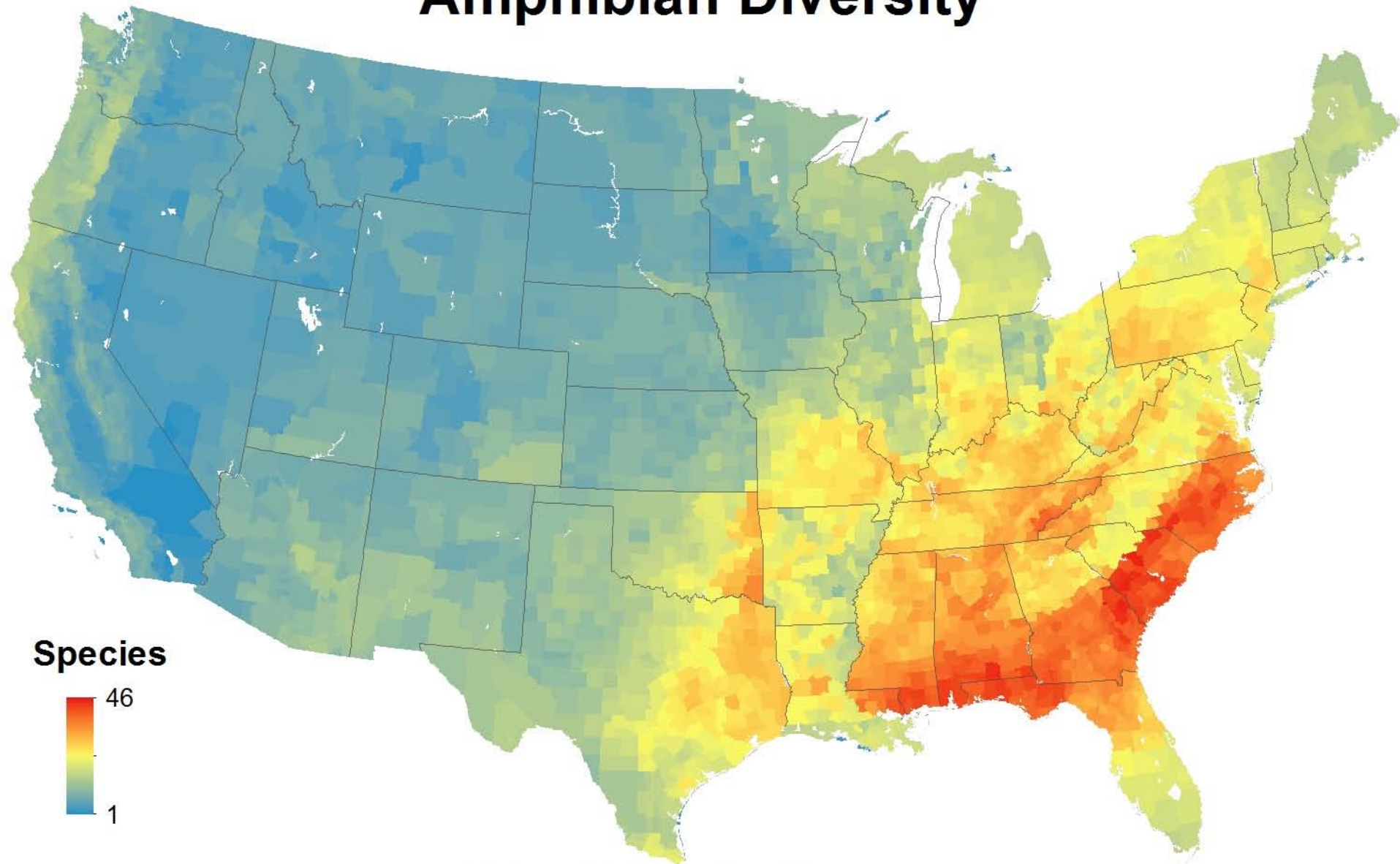


Native grass diversity

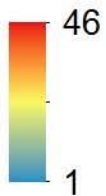
Density Gradient of Native Grass (Poaceae) Species per 10,000 km²
© BONAP



Amphibian Diversity

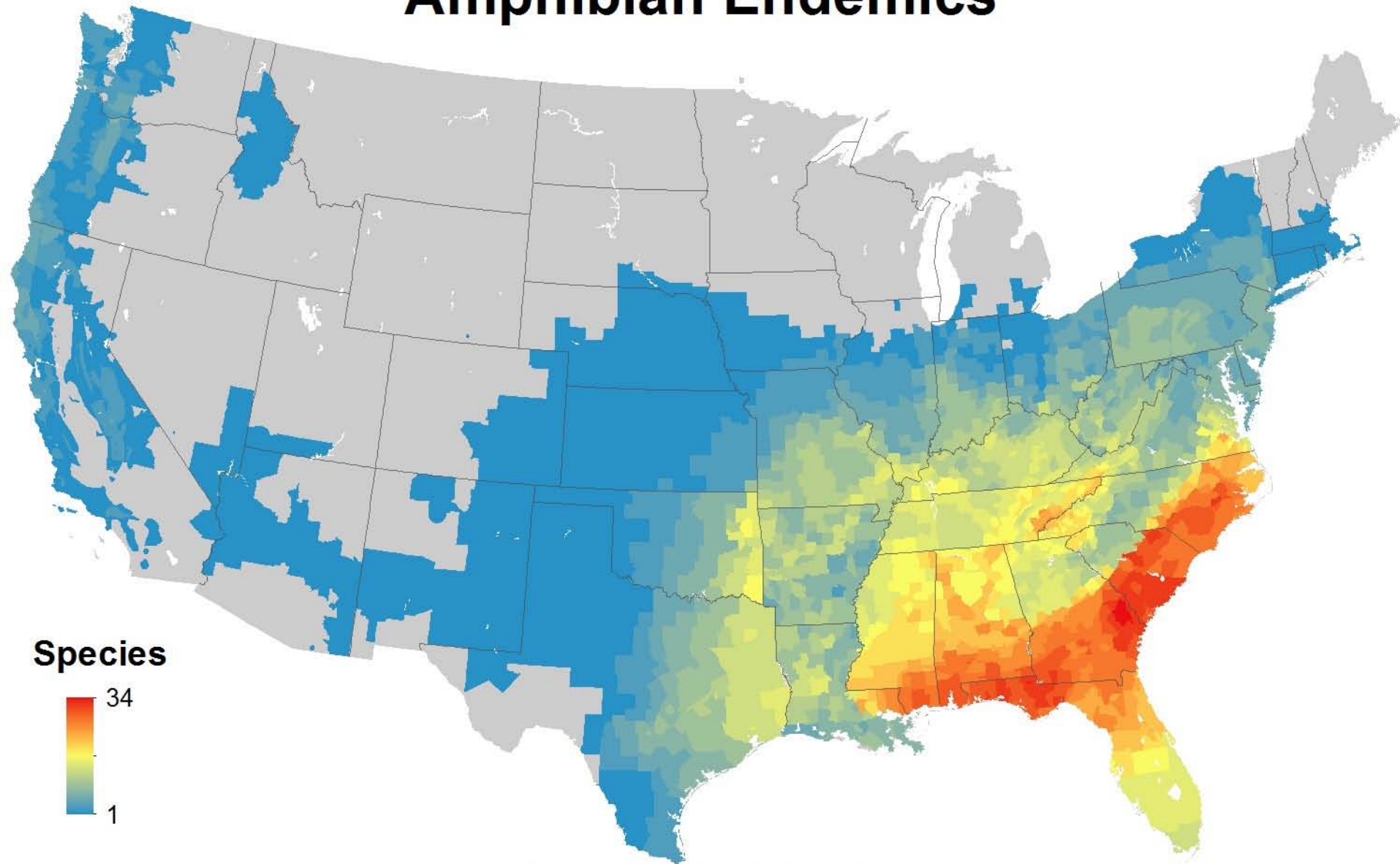


Species



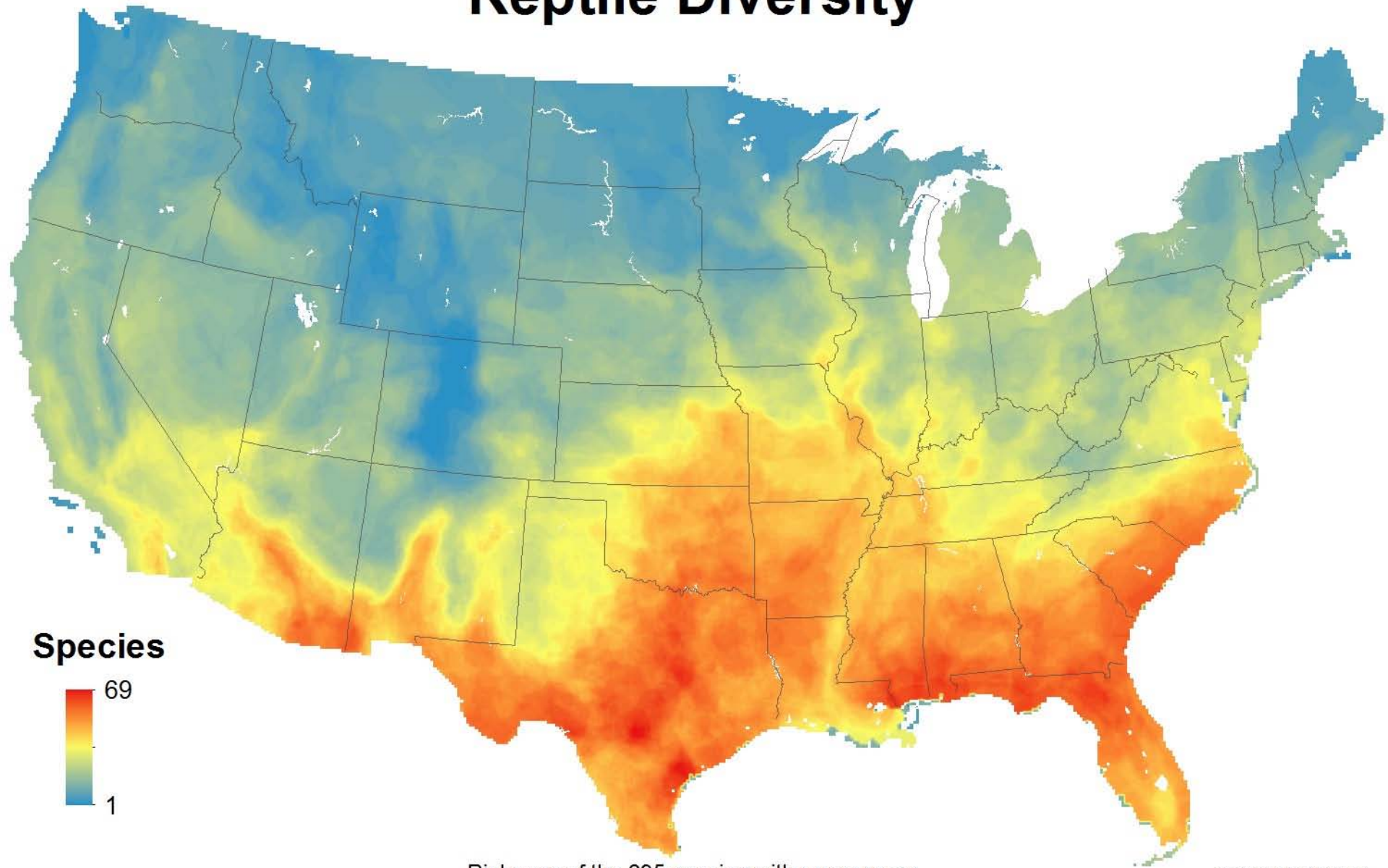
Richness of the 270 species with range maps

Amphibian Endemics

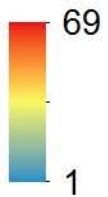


Richness of the 188 endemic species

Reptile Diversity

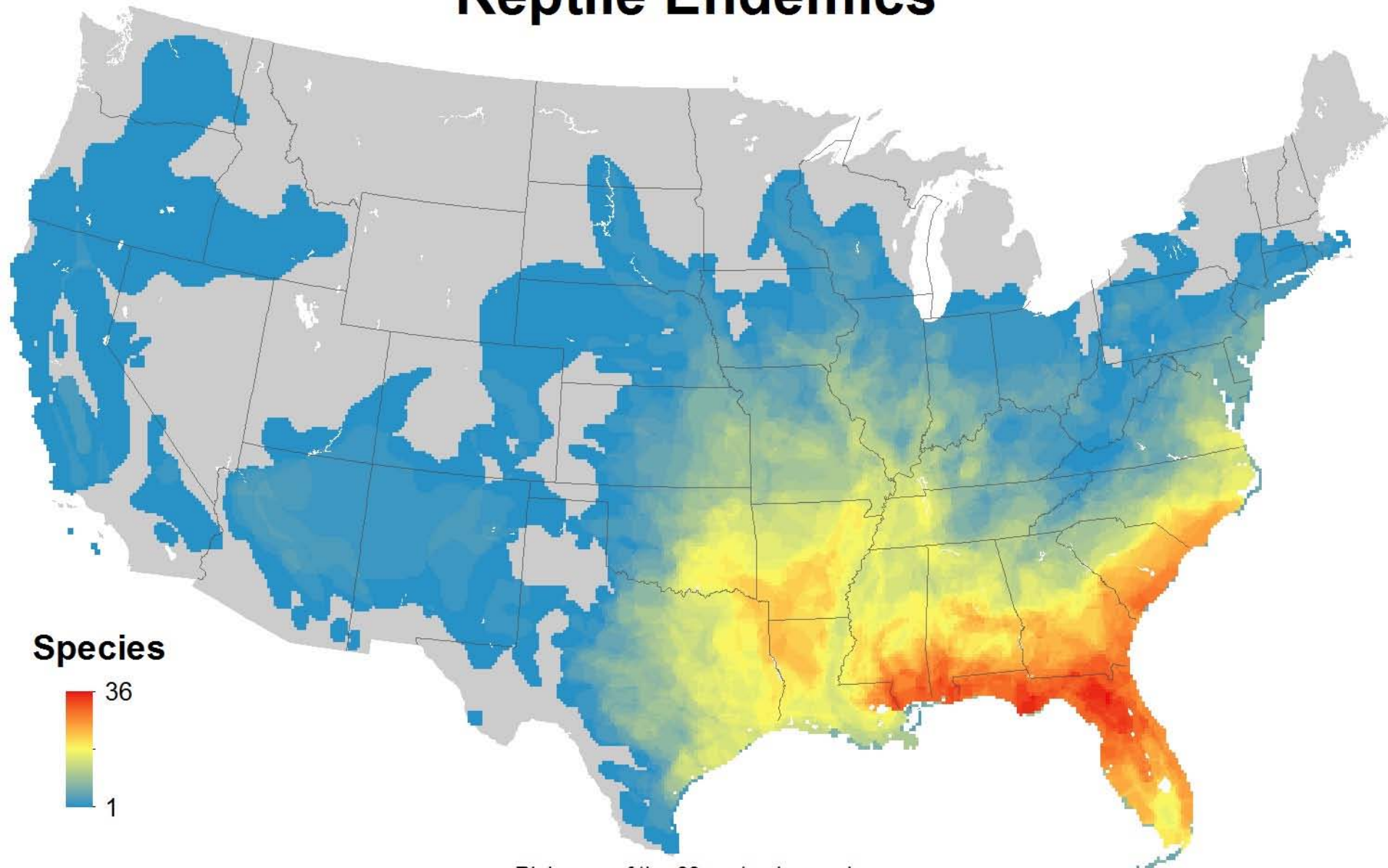


Species



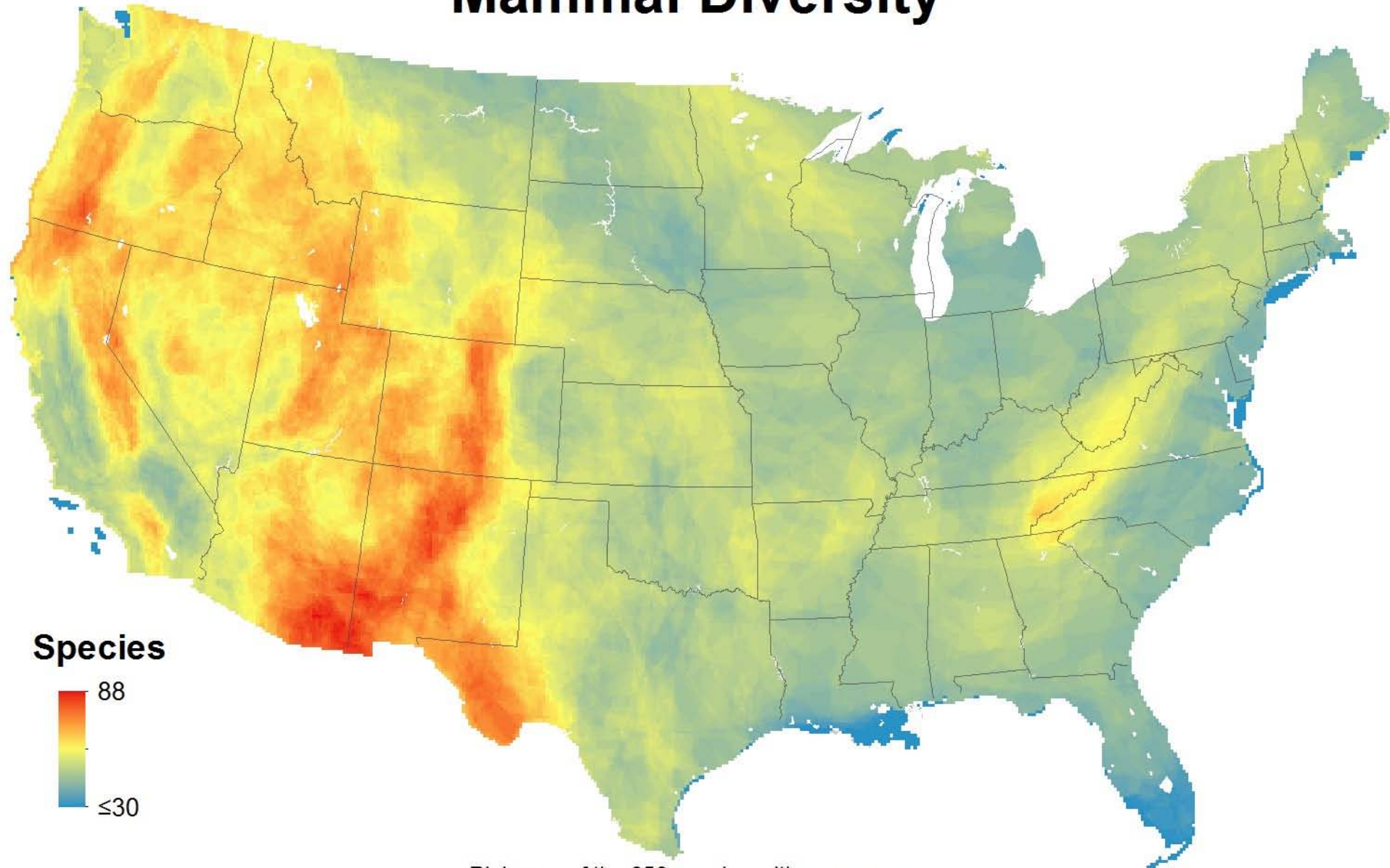
Richness of the 295 species with range maps

Reptile Endemics



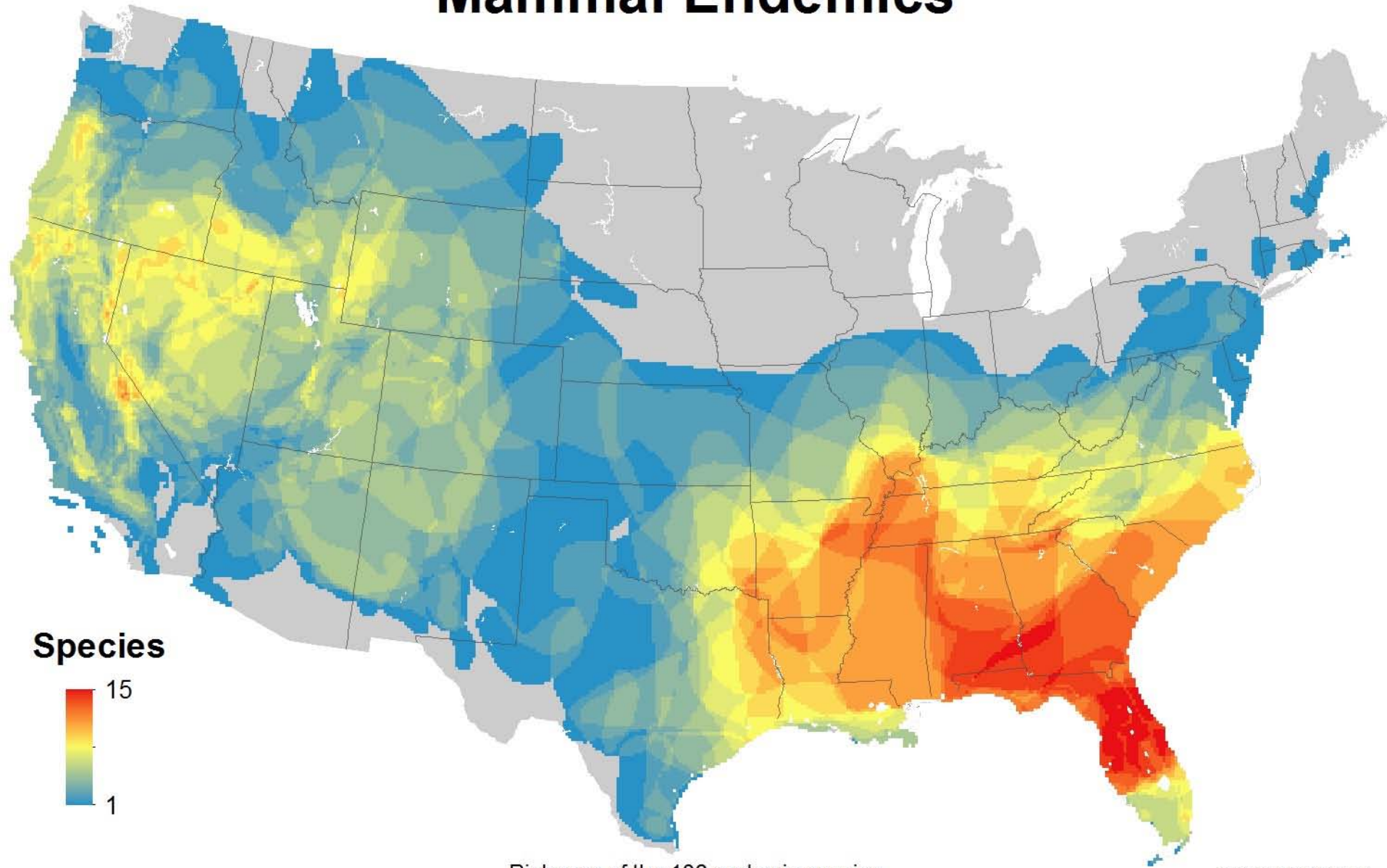
Richness of the 89 endemic species

Mammal Diversity



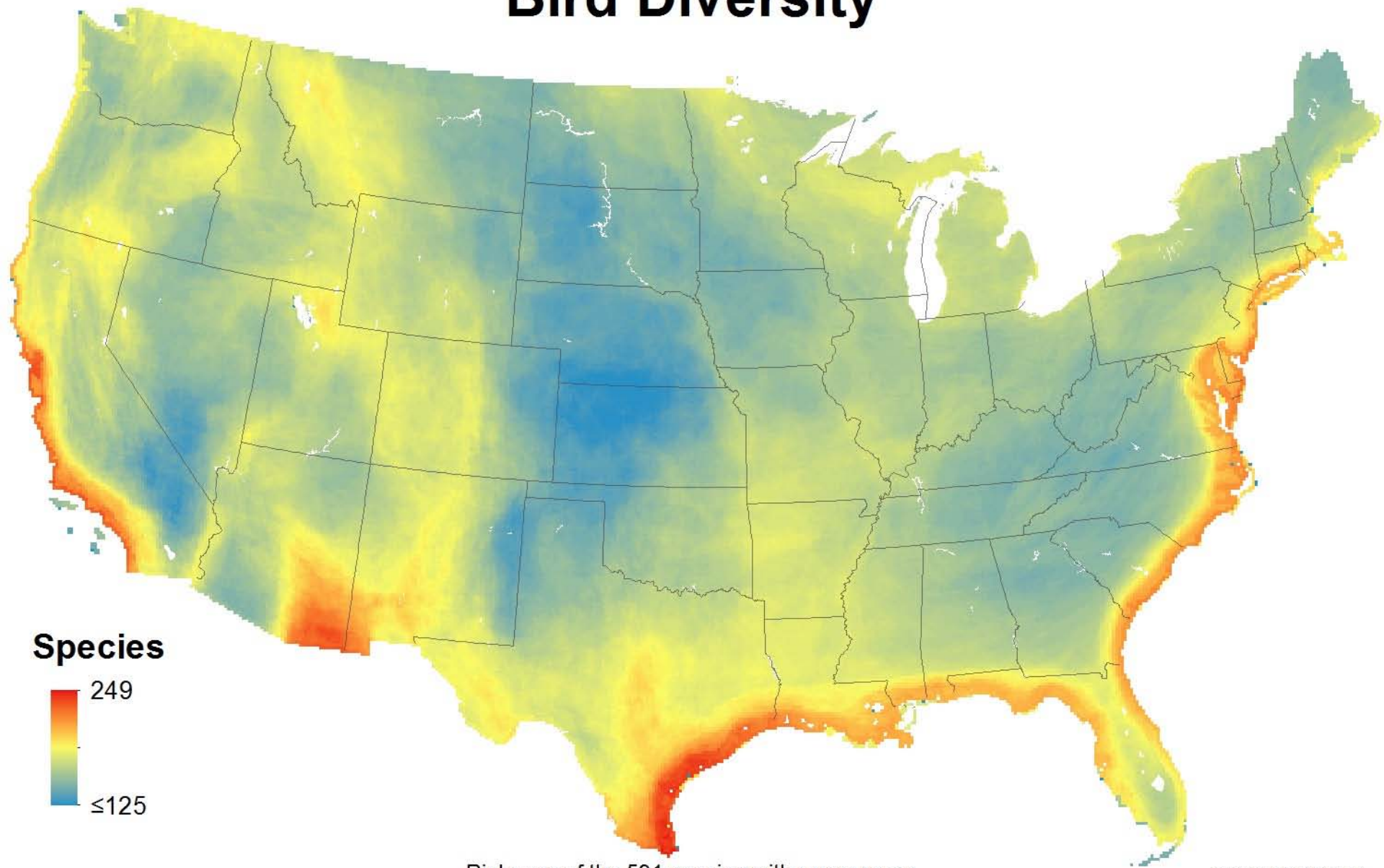
Richness of the 359 species with range maps

Mammal Endemics



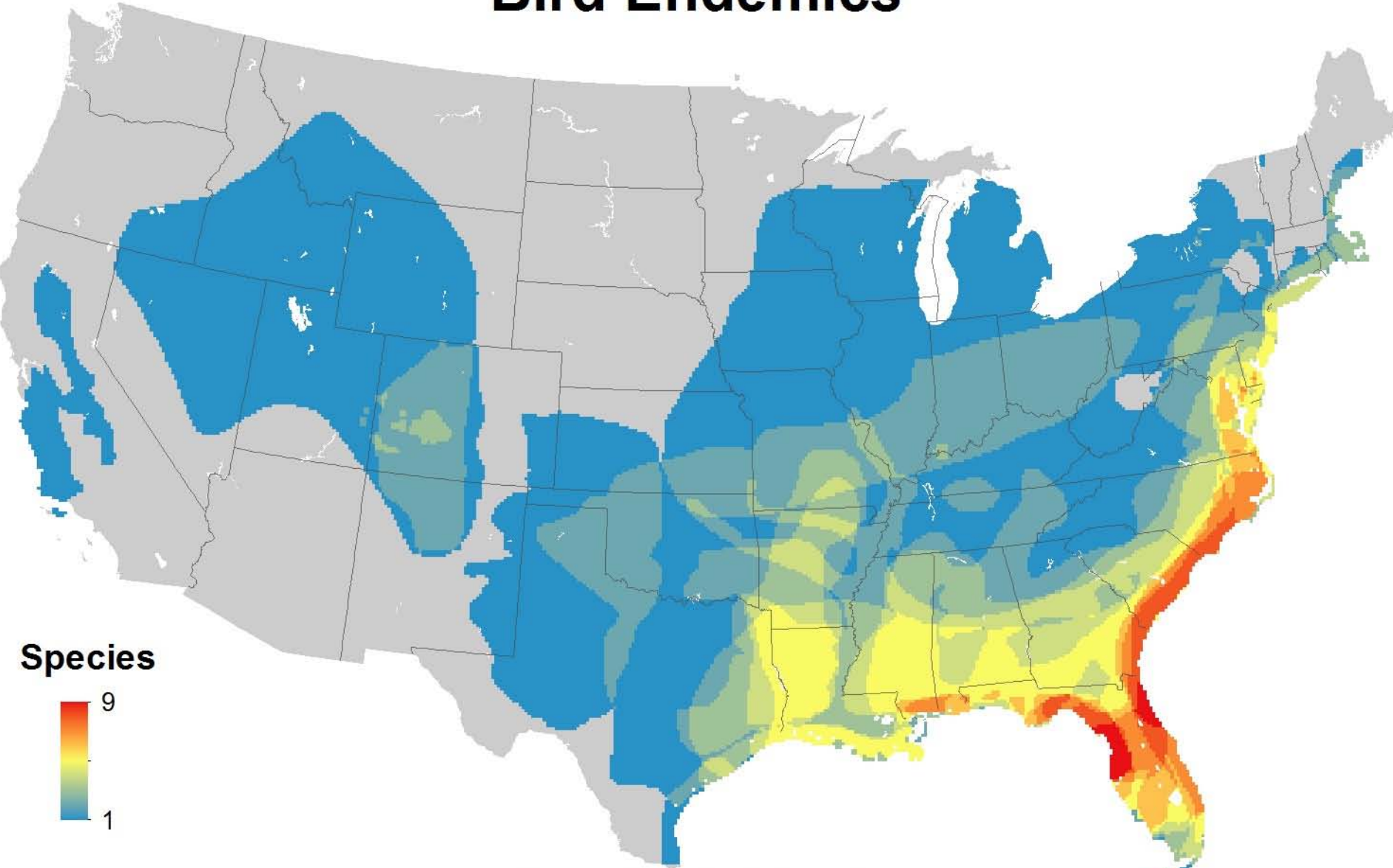
Richness of the 102 endemic species

Bird Diversity



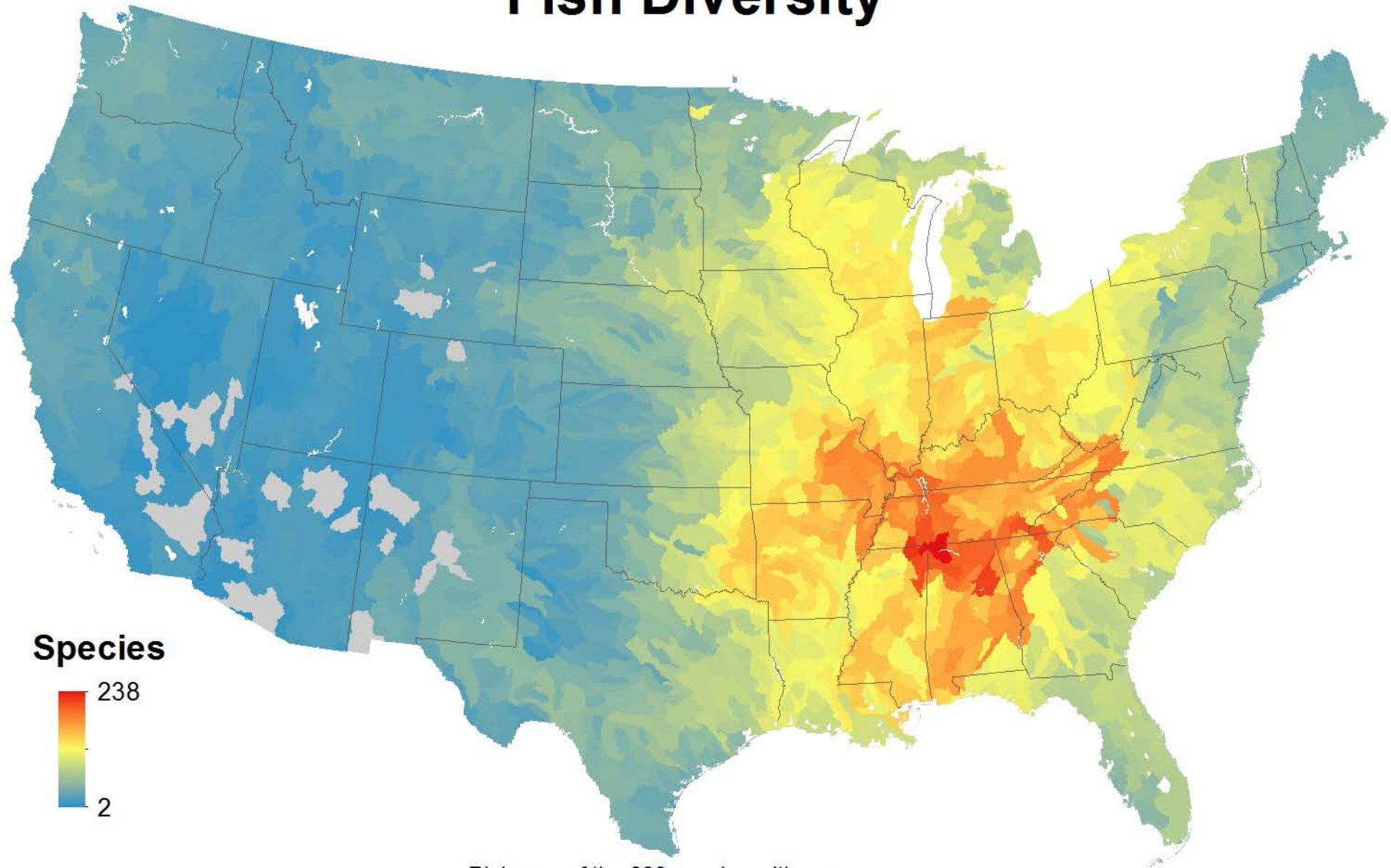
Richness of the 591 species with range maps

Bird Endemics



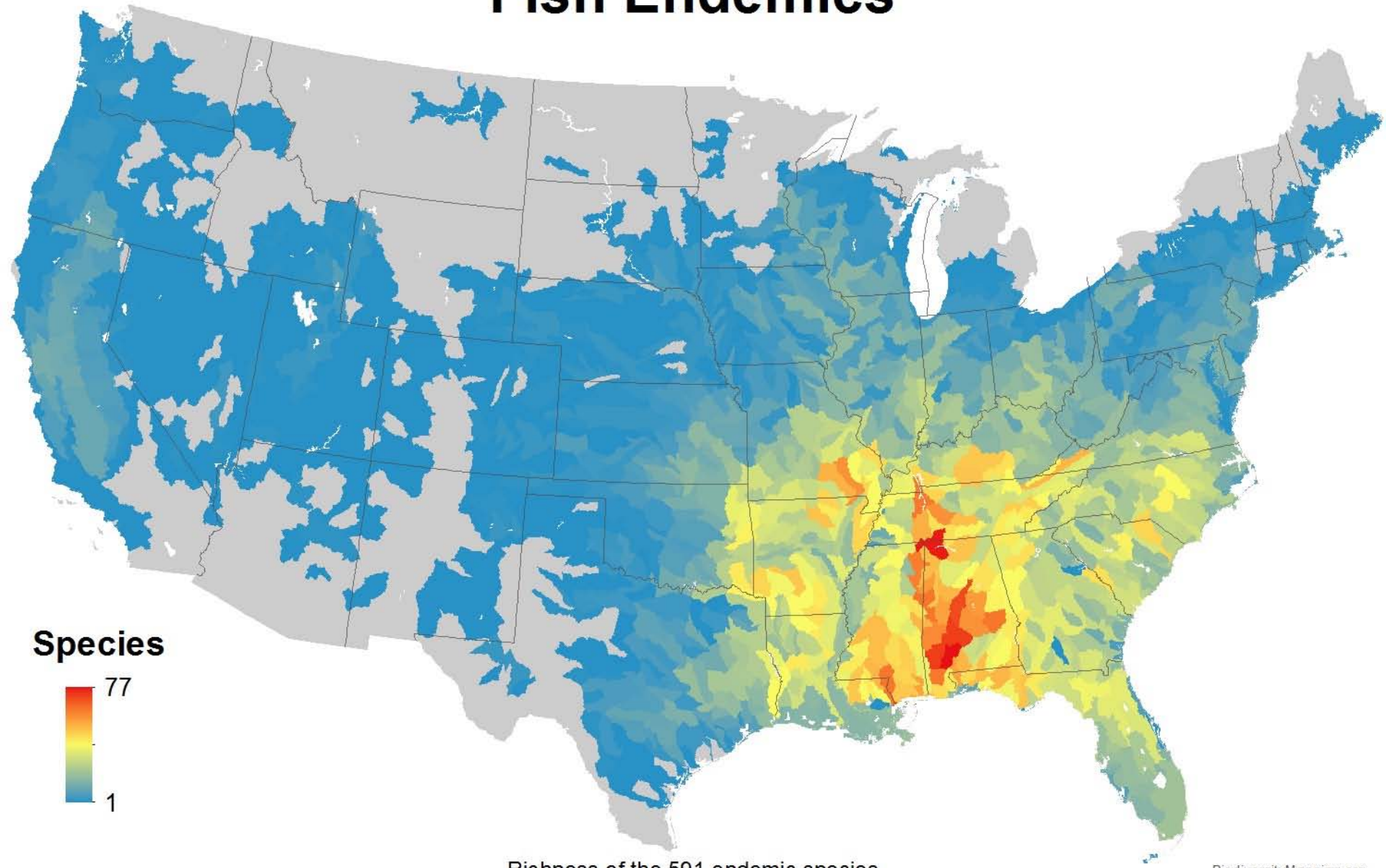
Richness of the 15 endemic species

Fish Diversity

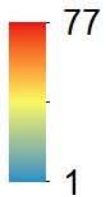


Richness of the 863 species with range maps

Fish Endemics



Species



Richness of the 591 endemic species

U.S. Karst Map

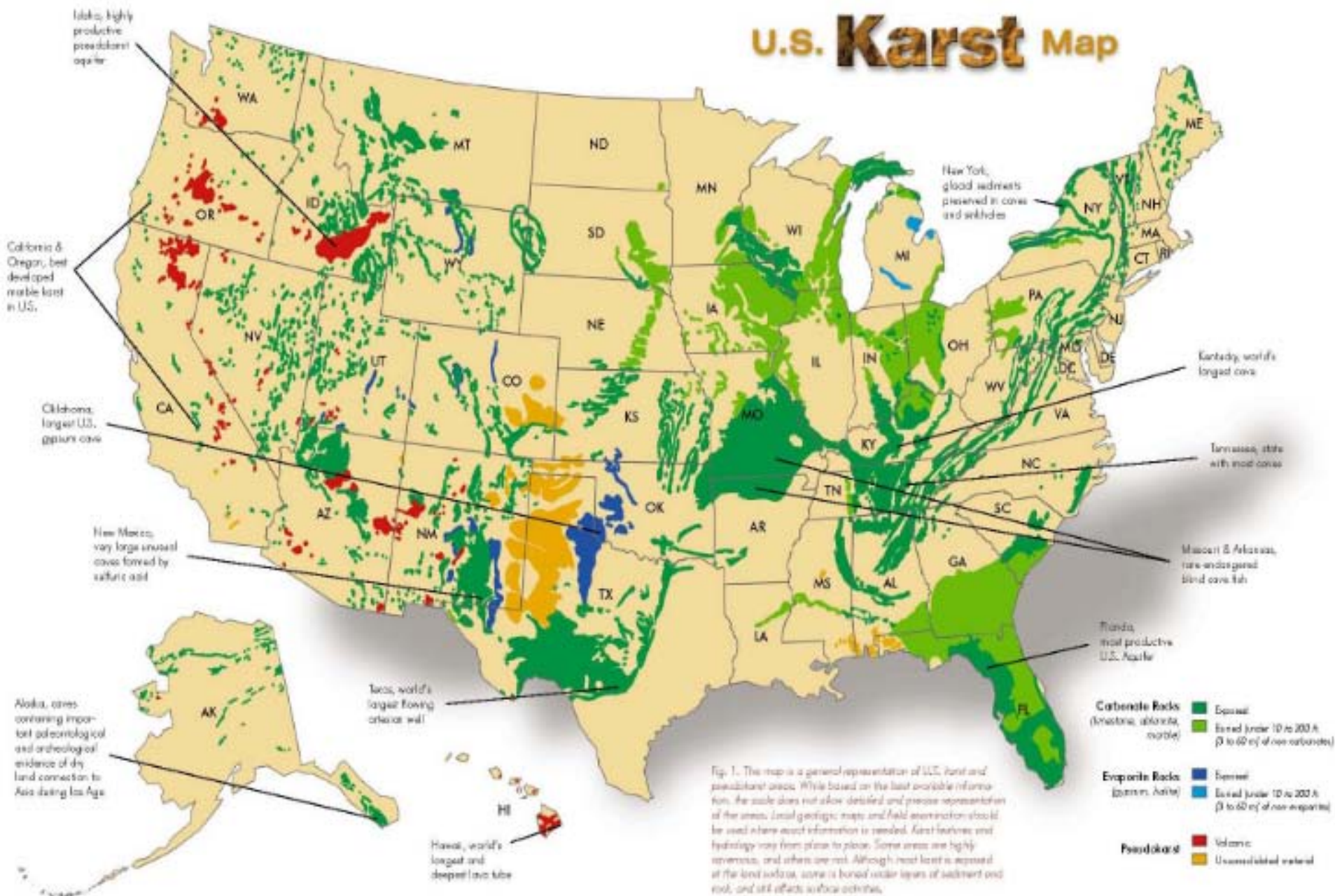
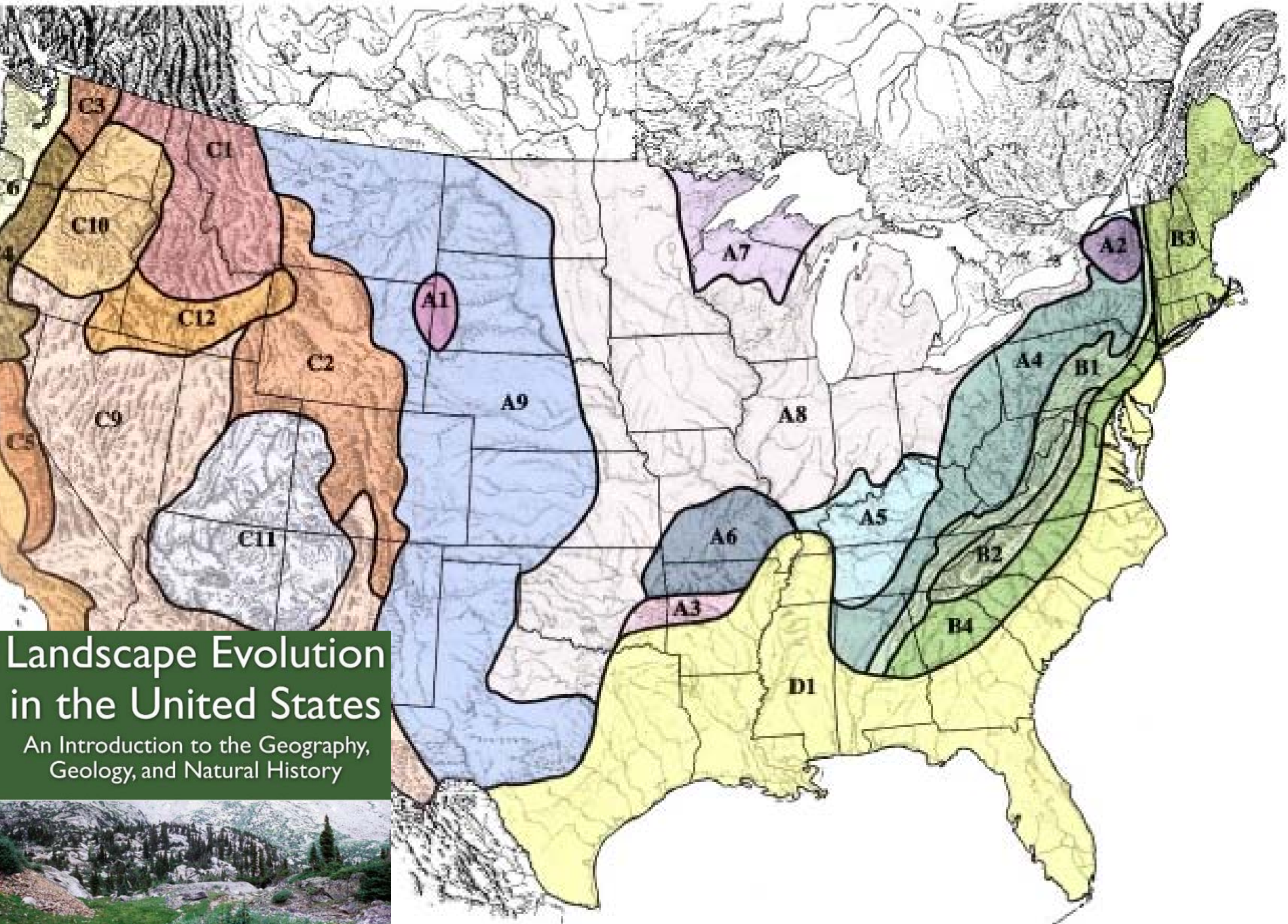


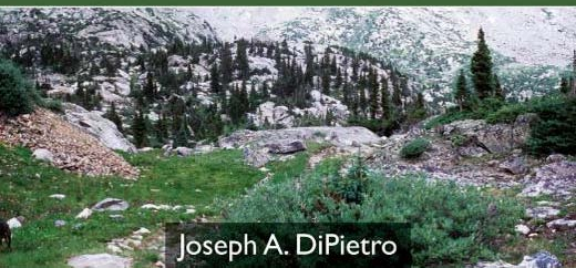
Fig. 1. The map is a general representation of U.S. karst and pseudokarst areas. While based on the best available information, the scale does not show detailed and precise representation of the areas. Local geologic maps and field examination should be used where exact information is needed. Karst features and hydrology vary from place to place. Some areas are highly over-stressed, and others are not. Although most karst is exposed at the land surface, some is buried under layers of sediment and rock, and still affects surface activities.





Landscape Evolution in the United States

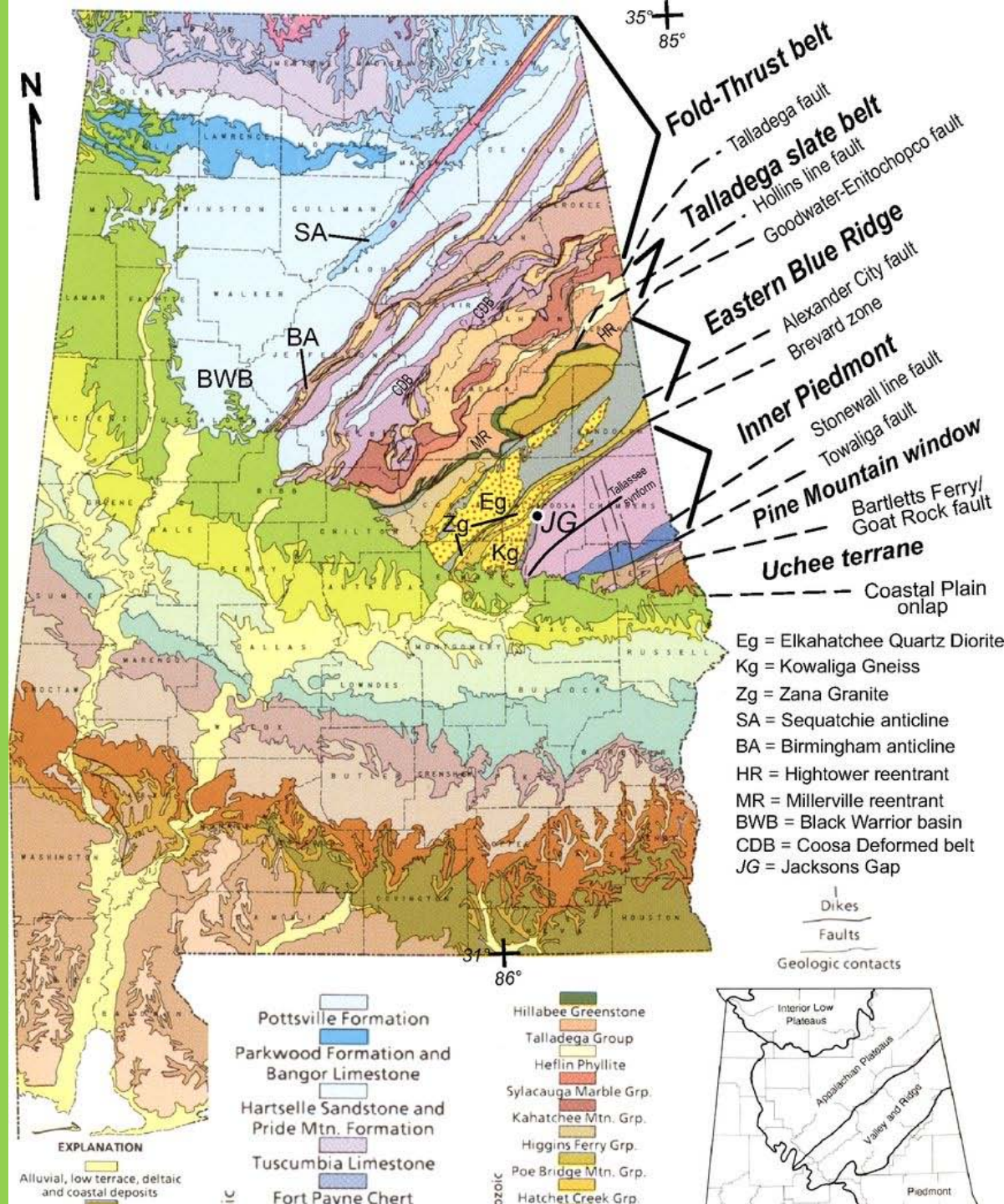
An Introduction to the Geography,
Geology, and Natural History



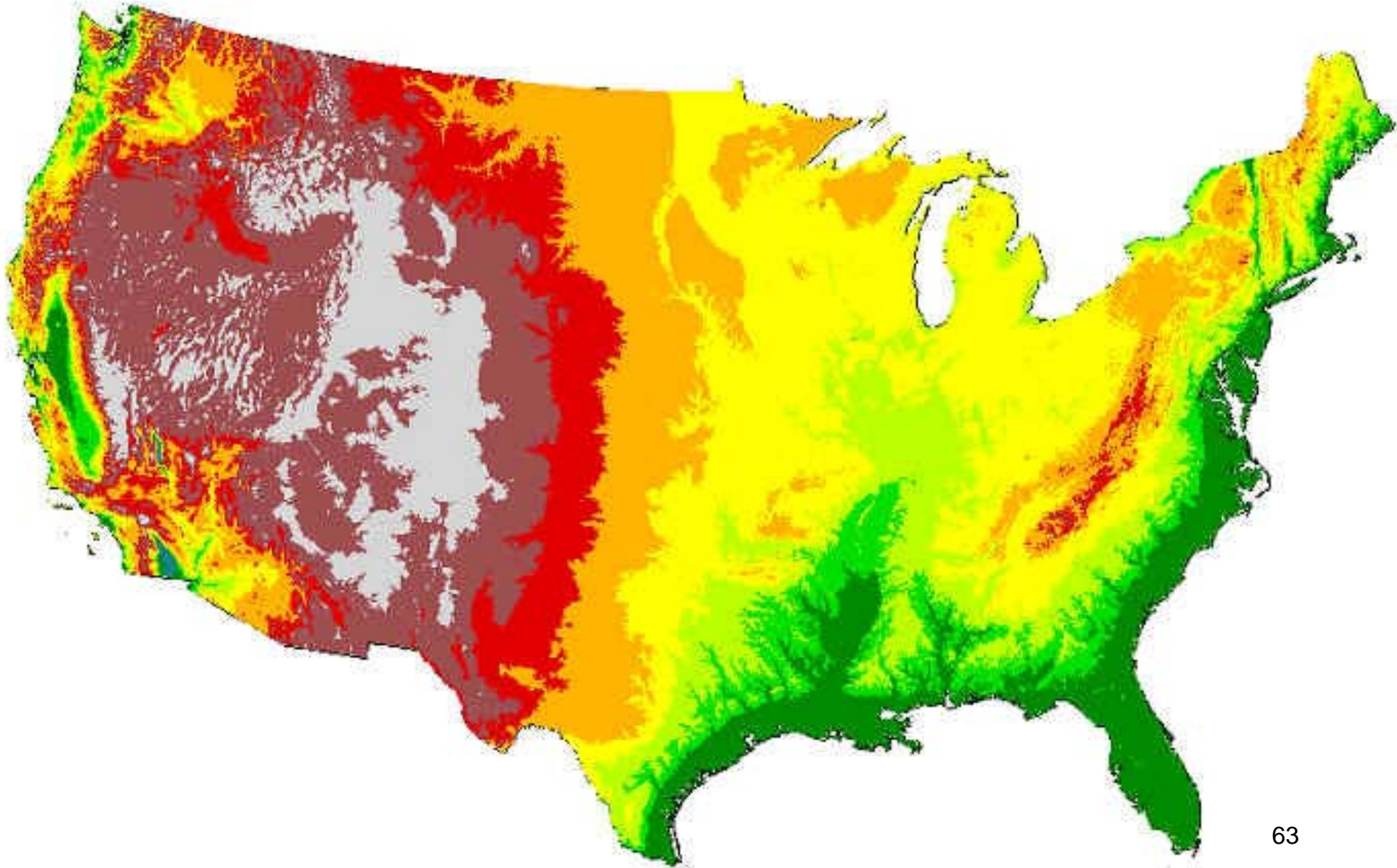
Joseph A. DiPietro

FIGURE 1.6 The 26 physiographic provinces of the United States.

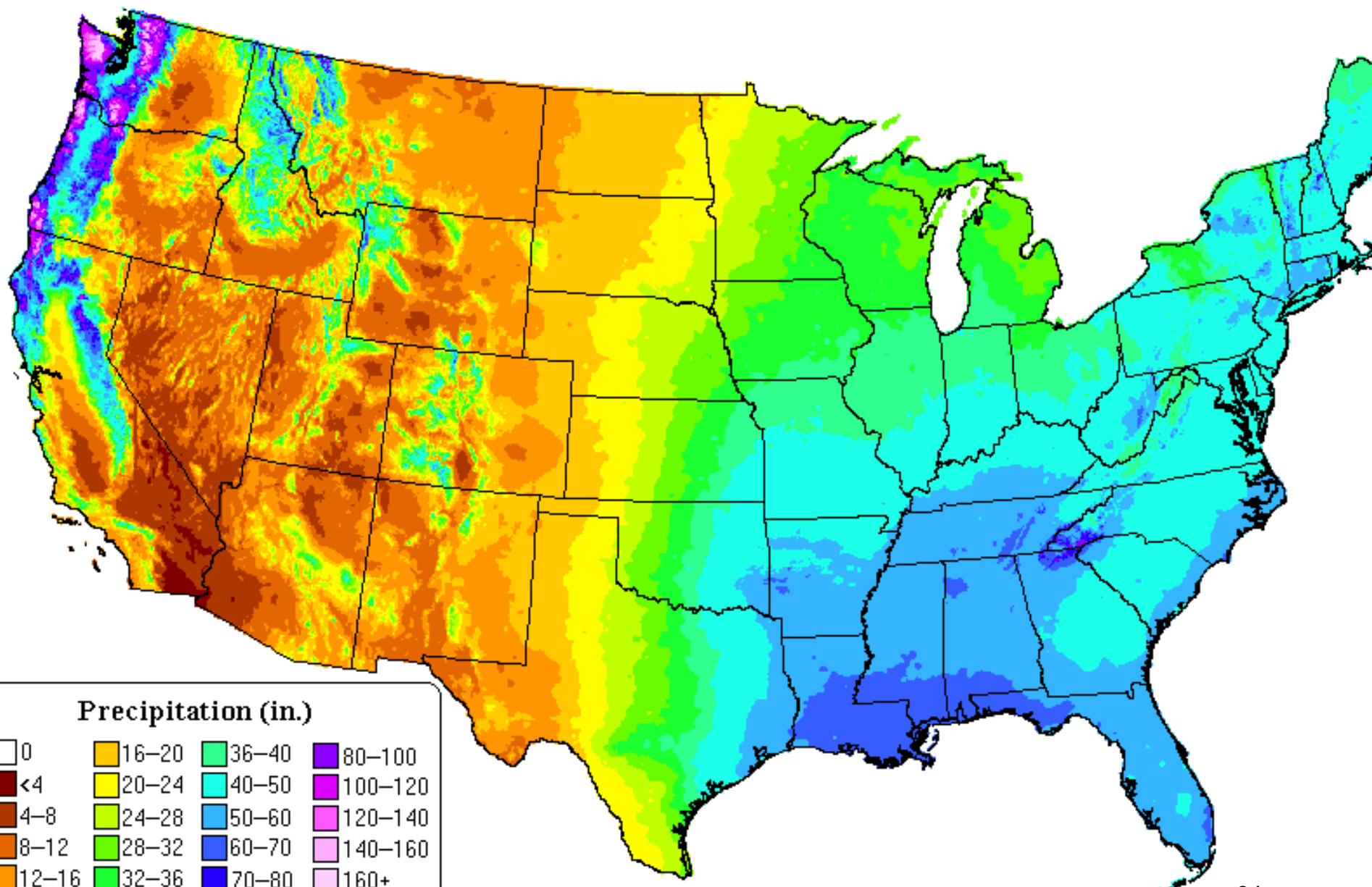
Geology



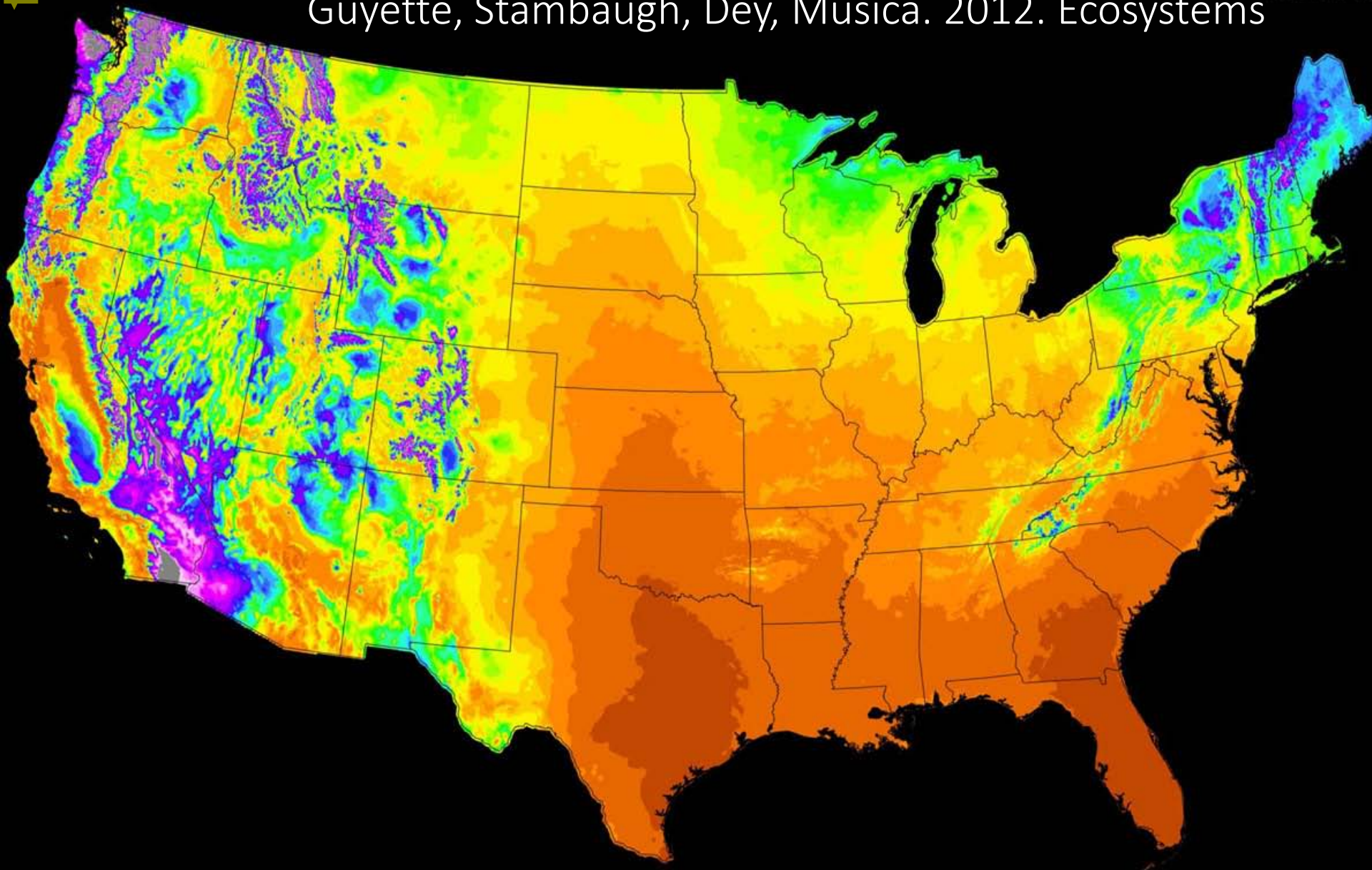
Elevation (in part a surrogate for temperature)



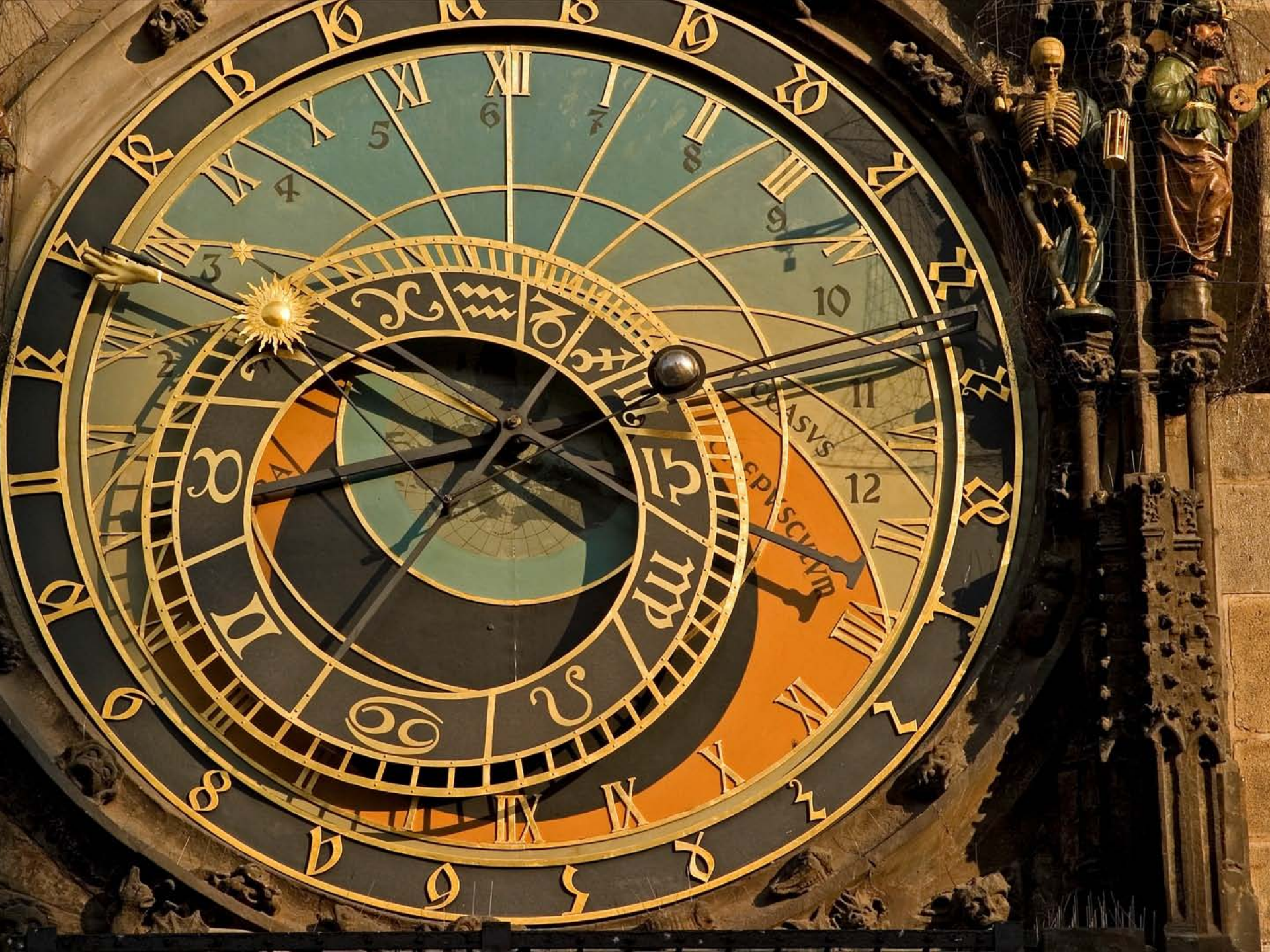
Precipitation: Annual Climatology (1971–2000)



Guyette, Stambaugh, Dey, Musica. 2012. Ecosystems



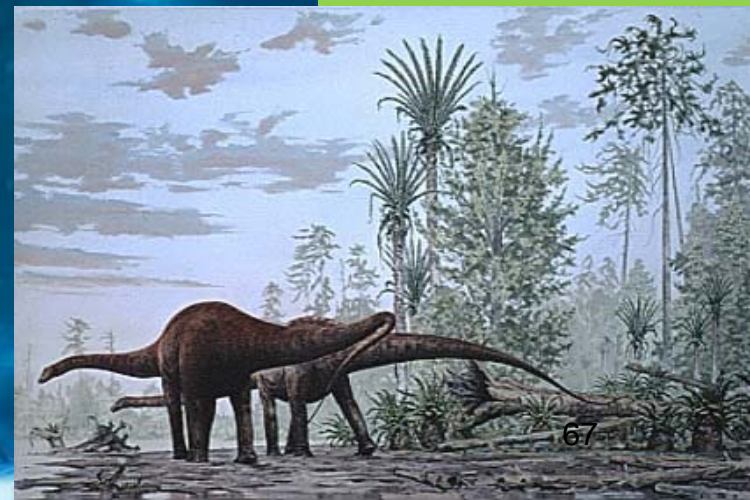
Mean Fire Interval	4.01 - 6	12.1 - 14	20.1 - 22	28.1 - 30	45.1 - 50	126 - 150
years	6.01 - 8	14.1 - 16	22.1 - 24	30.1 - 35	50.1 - 75	151 - 175
< 2.01	8.01 - 10	16.1 - 18	24.1 - 26	35.1 - 40	75.1 - 100	176 - 200
2.01 - 4	10.1 - 12	18.1 - 20	26.1 - 28	40.1 - 45	101 - 125	201 - 6,360





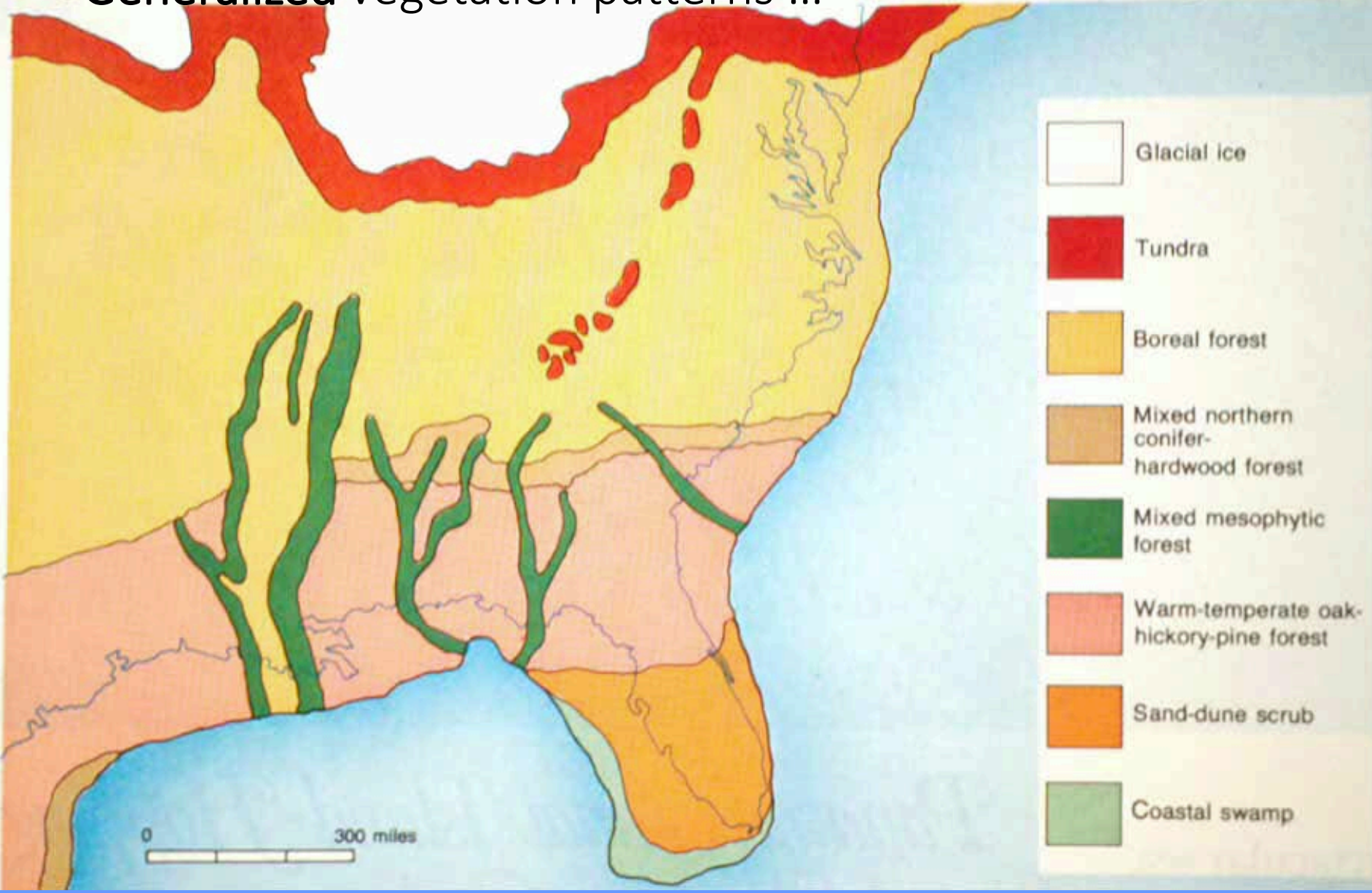
Late
Cretaceous
(75 mya)

- Ron Blakey. Paleogeography and Geologic Evolution of North America.
<http://jan.ucc.nau.edu/~rcb7/nam.html>



Vegetation Patterns in Eastern North America, 18,000 Years Ago

Generalized vegetation patterns ...



DIVERSITY



Permutational combinatorial diversity!

Climate	Soil pH	Hydrologic regime	Fire regime	History of events	Geographic location	Community
A	1	u	α	d_3	Κ	$A_3x\beta d_3\Theta$
B	2	v	β	d_2	Ж	ETC.
C	3	x	γ	fη	Б	
D	4	y	δ	υ	Θ	
E	5	z	ε	?	β	

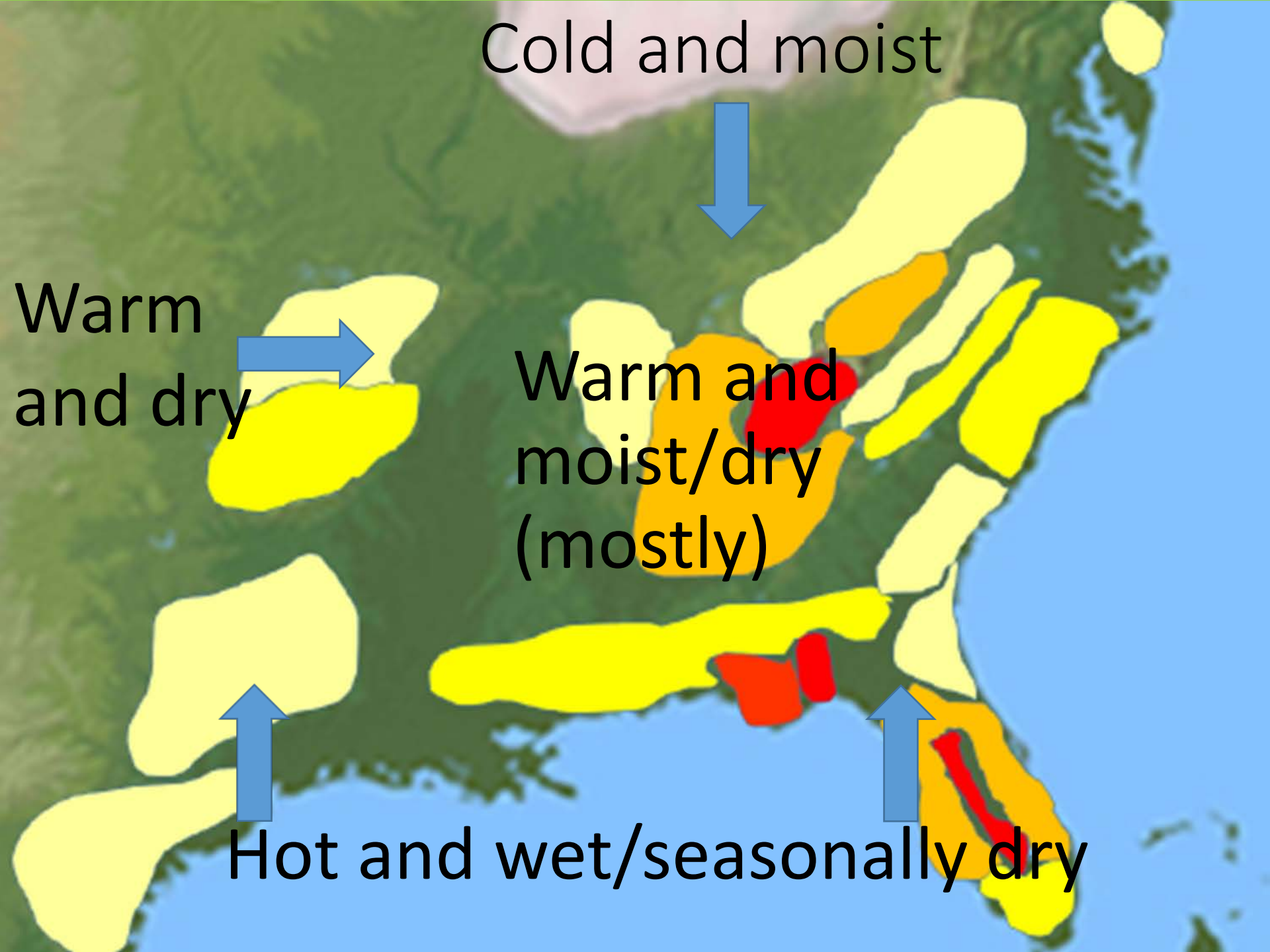


DIVERSITY is local in space



DIVERSITY is local in time

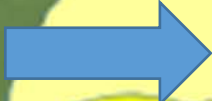




Cold and moist



Warm and dry



Warm and moist/dry (mostly)



Hot and wet/seasonally dry



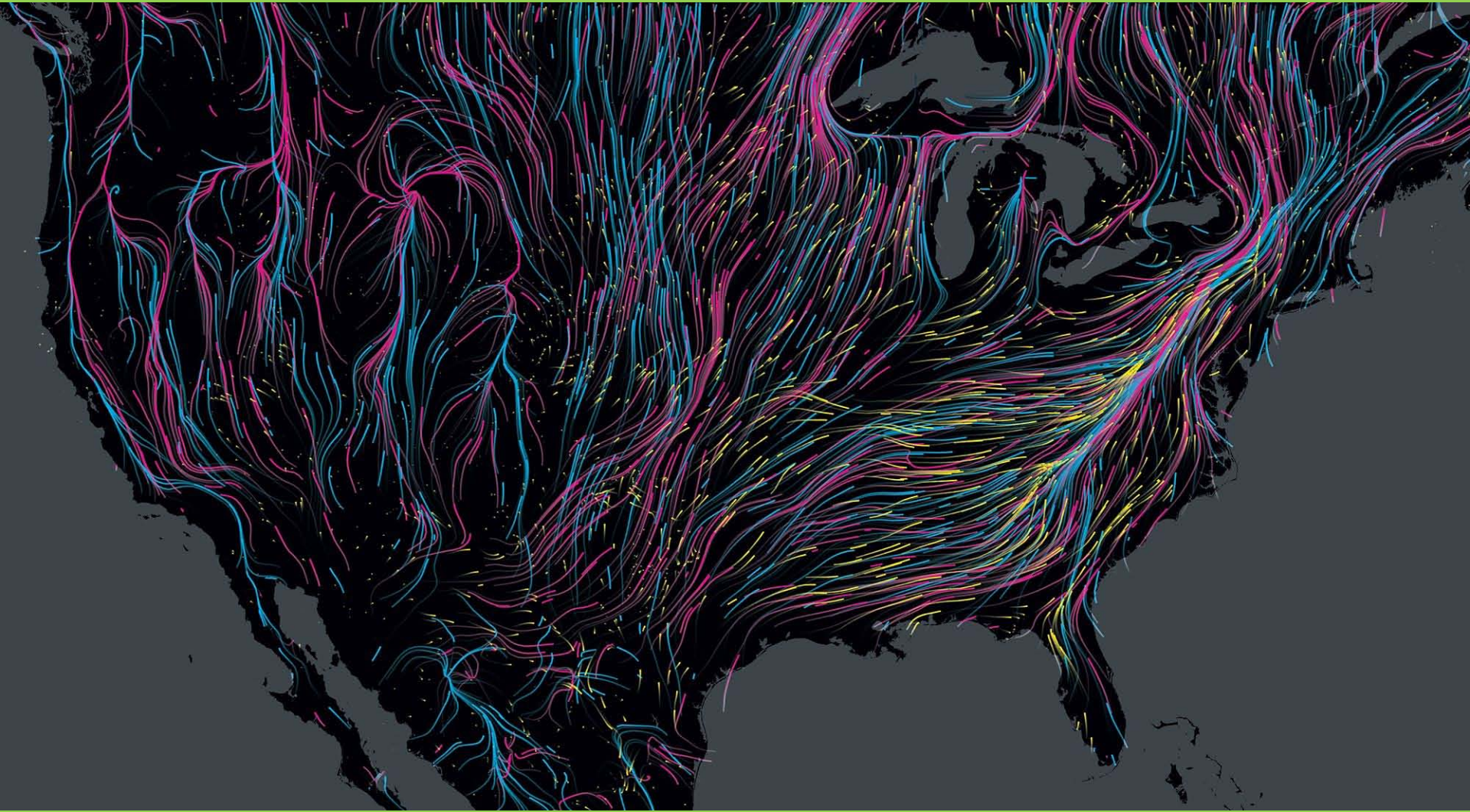
Changes have happened ...
Changes are a-comin' ...



Resilience



Regi...rest
ed by Sett...



Different approaches to judge resilience

- Model the environment (climate, substrate, etc.) and compare to the existing “envelope” of a species (Species Distribution Models = SDMs)
- Representation of “biophysical units” (substrate, elevation gradients) and plan for conservation of those units
- Conserve areas with maximum heterogeneity judged helpful in climate change scenarios (elevation gradients)
- Attention to size, connection, corridors (the more of all, the better)



HalpernFinancial

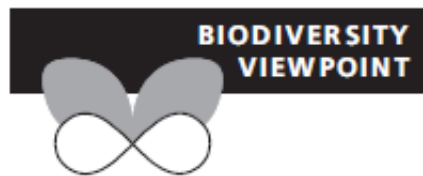


Why Past Performance is Not an Indicator of Future Results

“Past Performance Is Not An
Indicator Of Future Results”



Except, in biogeography,
perhaps it is.



How global biodiversity hotspots may go unrecognized: lessons from the North American Coastal Plain

Reed F. Noss^{1*}, William J. Platt², Bruce A. Sorrie³, Alan S. Weakley³,
D. Bruce Means⁴, Jennifer Costanza⁵ and Robert K. Peet⁶

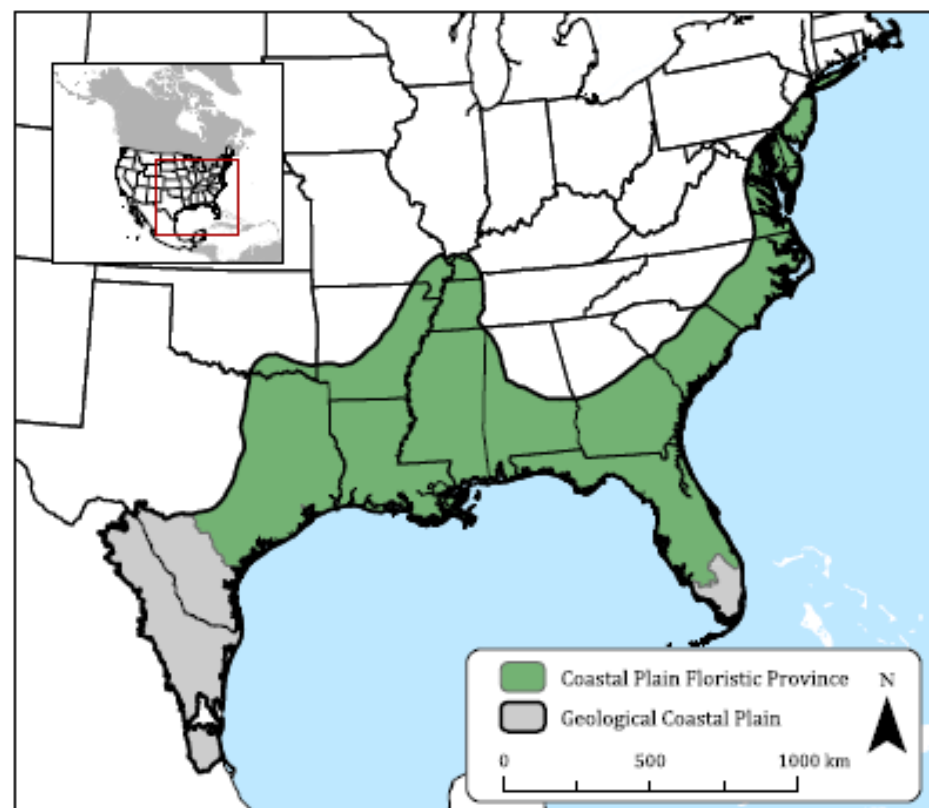
Table 1 Richness and endemism of native vascular plants and vertebrates, including infraspecific taxa* and (*in italics*) just full species within the North American Coastal Plain.

GCP = Geological Coastal Plain. CPFP = Coastal Plain Floristic Province. The full lists of vascular plant and vertebrate taxa endemic to the GCP and CPFP are in the Supporting Information (Appendices S1 and S2). Endemic = 90% or more of distribution occurs within the GCP or CPFP.

	Species richness		Endemics (%)	
	GCP	CPFP	GCP	CPFP
Vascular plants	6200	5470	1816 (29.3)	1625 (29.7)
Freshwater fishes	424	364	138 (32.5)	83 (22.8)
(full species only)				
Amphibians	122	120	57 (46.7)	44 (36.7)
	105	105	45 (42.9)	37 (35.2)
Reptiles	291	230	113 (38.8)	80 (34.8)
	177	123	50 (28.2)	33 (26.8)
Breeding Birds	N/A	N/A	51	43
	274	233	6 (2.2)	5 (2.1)
Mammals	306	204	114 (37.3)	70 (34.3)
	148	85	9 (6.1)	5 (5.9)

Noss et al. 2014

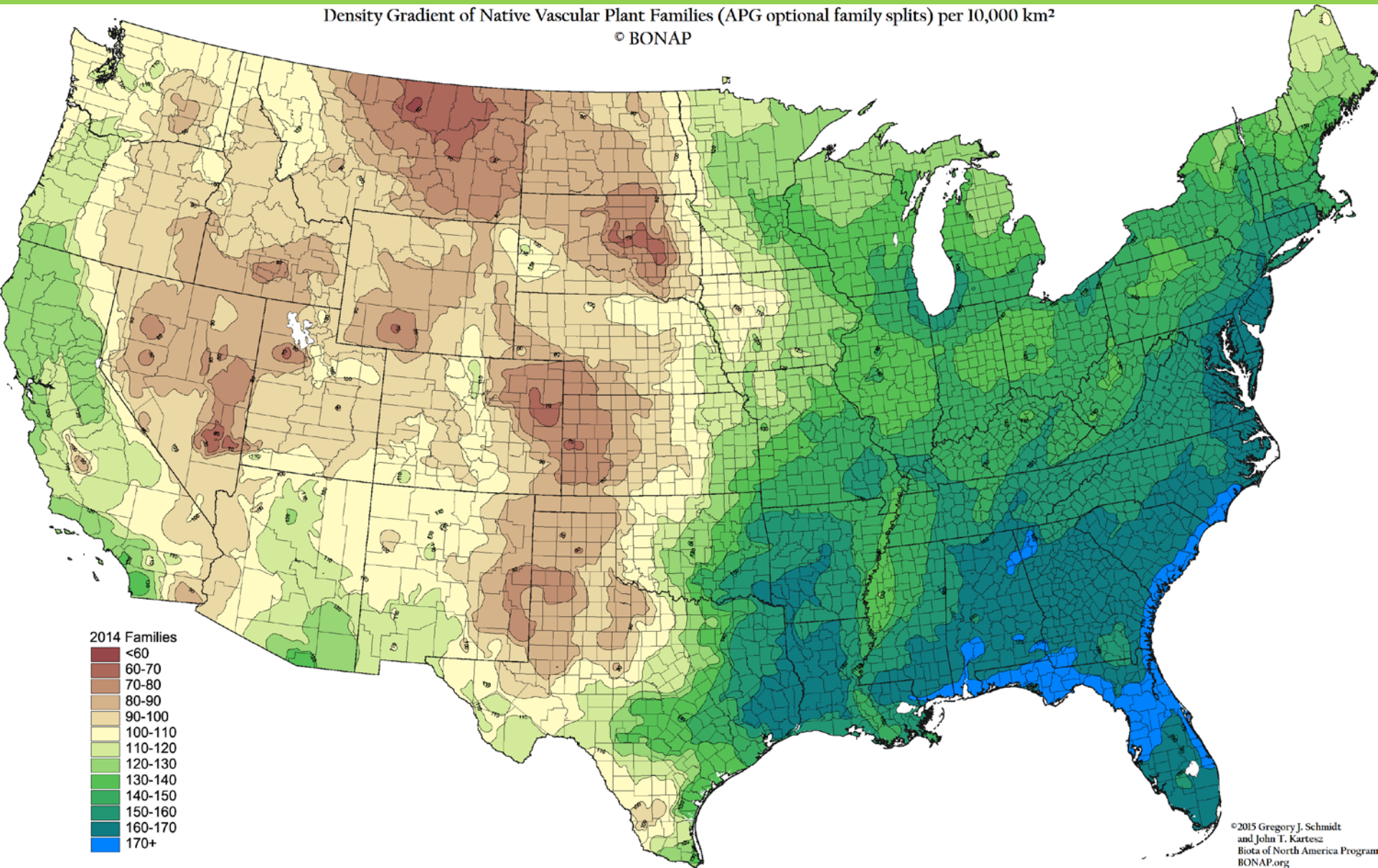
- The World's 35th Biodiversity Hotspot



Plant family diversity

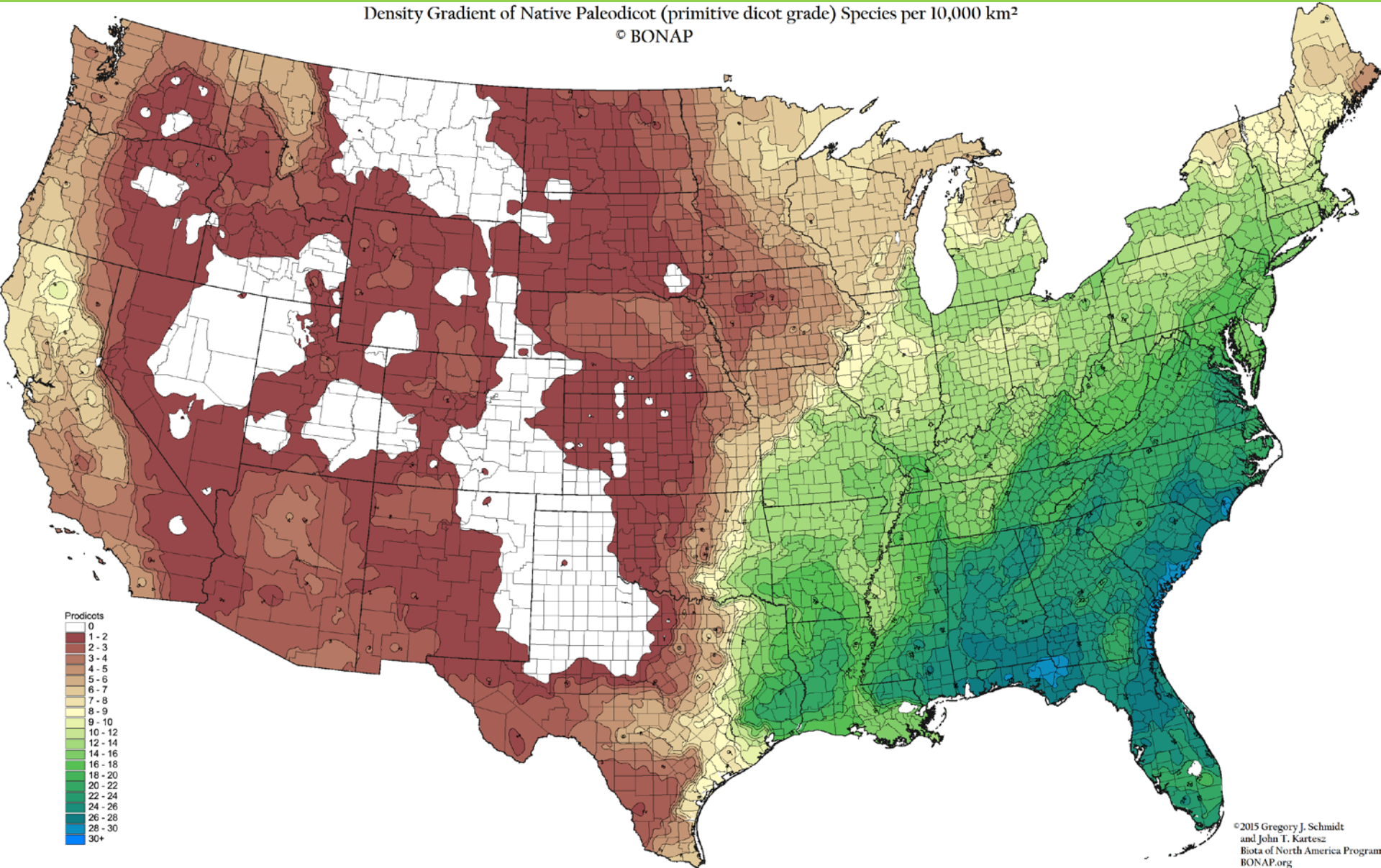
Density Gradient of Native Vascular Plant Families (APG optional family splits) per 10,000 km²

© BONAP



Paleodicot diversity

Density Gradient of Native Paleodicot (primitive dicot grade) Species per 10,000 km²
© BONAP



Biodiversity hotspots – let's listen to the organisms

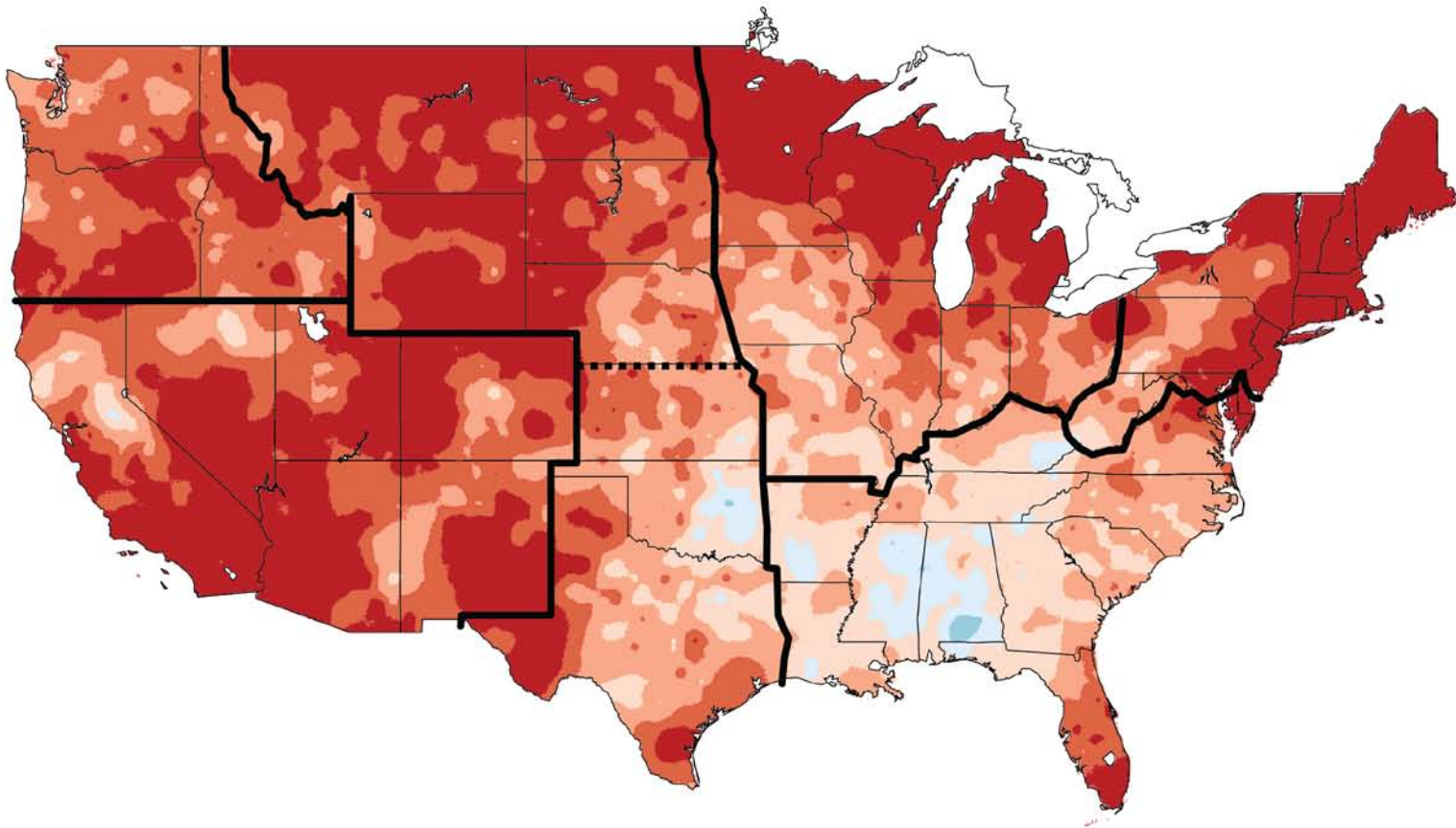
- Biogeography and resilience
- Do biodiversity conservation where there's biodiversity
- There is no shame in standard sites



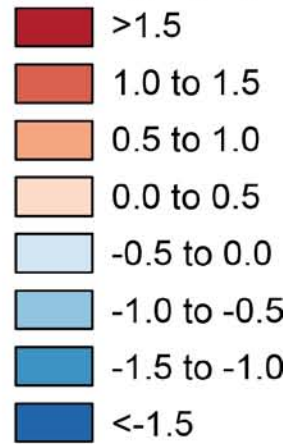
Resilience, connectivity, corridors...

- Let the “elements of biodiversity” tell you what’s resilient!
- Connectivity and corridors need careful consideration (corridors require destinations and a realistic assessment that they can be used for the positive purposes intended)
- “postage stamps” = mini-arcs of biodiversity laid out across the landscape

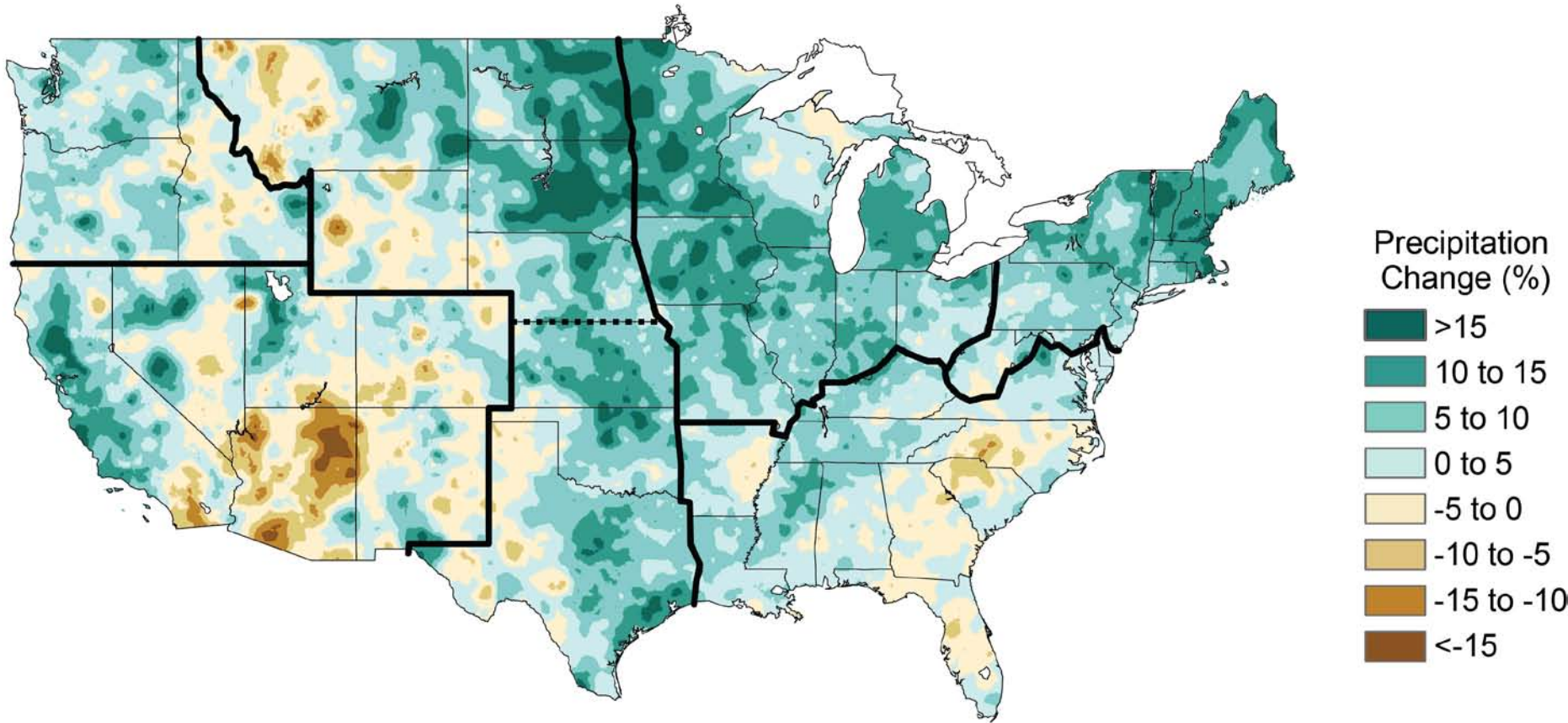
Observed U.S. Temperature Change



Temperature Change (°F)

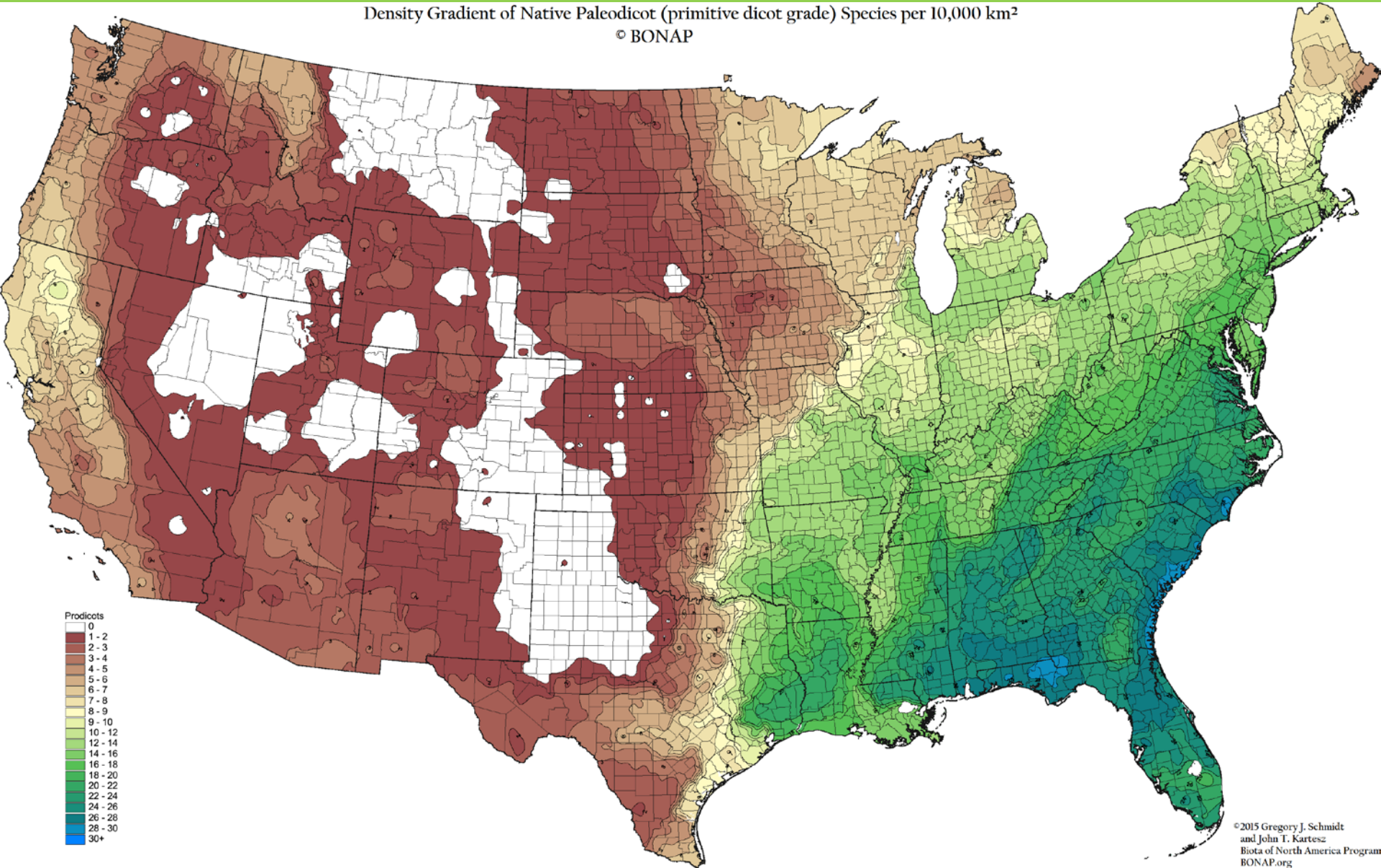


Observed U.S. Precipitation Change



Paleodicot diversity

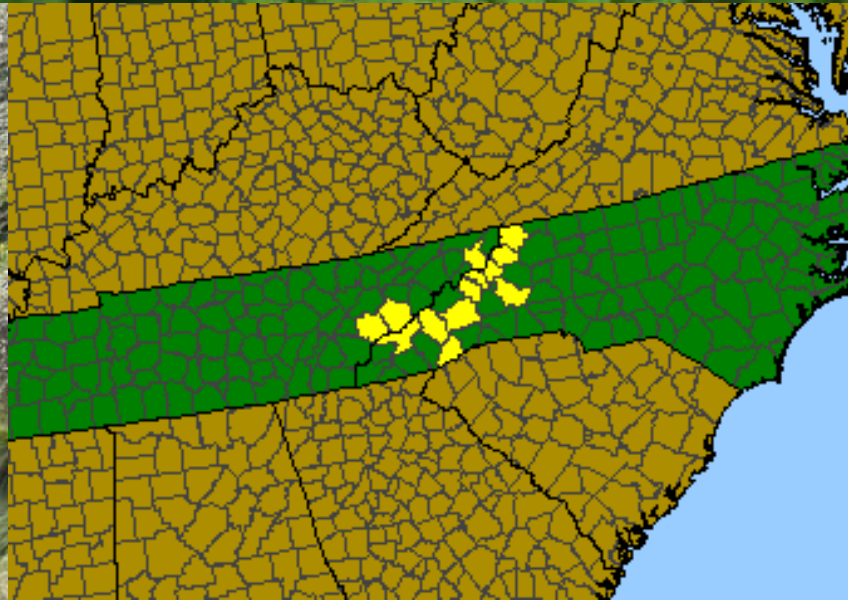
Density Gradient of Native Paleodicot (primitive dicot grade) Species per 10,000 km²
© BONAP



Sea
level
rise



Geum radiatum
(Mountain Avens;
Rosaceae)

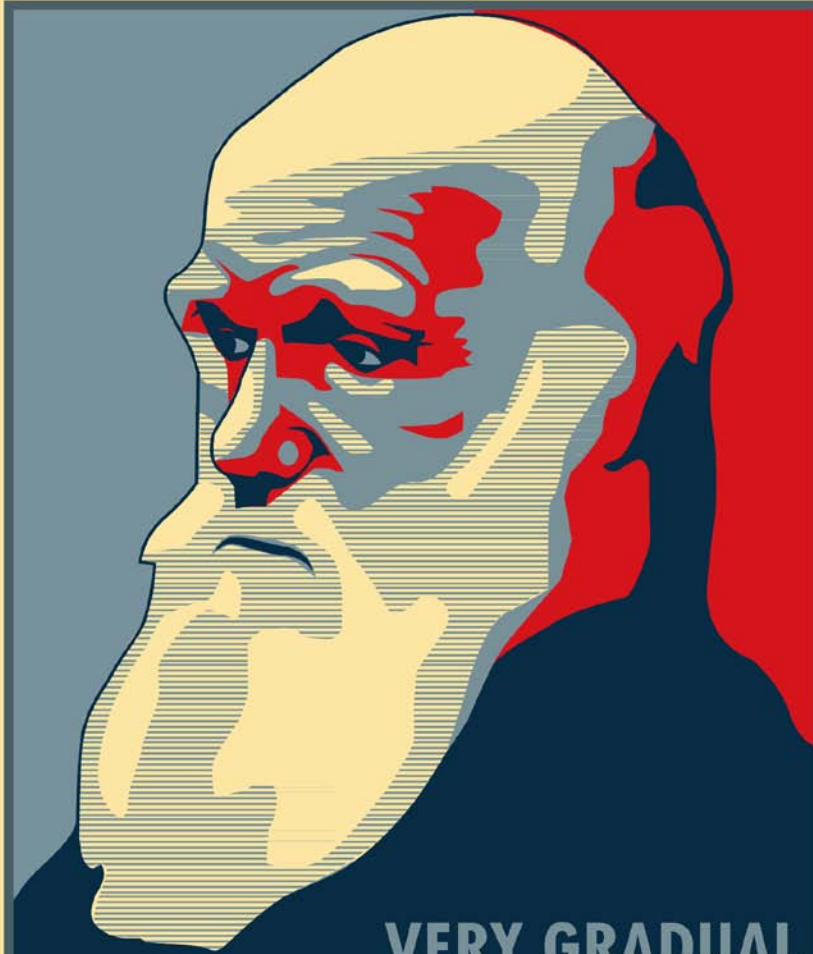


- 
- High Elevation communities of the Southern Blue Ridge at peril
 - They'll be pushed off the tops of the mountains by cloud immersion failure and everything will go extinct

A landscape photograph of a mountain range. The foreground and middle ground are covered in dense, vibrant green forests. The mountains in the distance are partially obscured by a thick layer of white mist or low-hanging clouds, creating a sense of depth and mystery. The sky is overcast with soft, grey clouds. The overall atmosphere is serene and somewhat somber due to the weather conditions.

But... “we don’t know Jack...”

- We know nothing about the species biology of the high elevation endemics
- They’ve been through hotter and drier already -- since even the last glaciation
- Although most are of northern lineages, they’ve been steadily evolving ...



VERY GRADUAL

CHANGE

WE CAN RELIABLY AND
REPEATEDLY DEMONSTRATE
WITH EMPIRICAL EVIDENCE

Note the often RAPID evolution in plants!

- Within generations (centuries or faster) if under strong selective pressure and if there is genetic diversity for selection to work on...



DON'T PANIC



LOOKING BACK
LOOKING FORWARD

“When the dynamics of history... are incorporated [we appreciate that] **what we are actually or additionally doing is setting aside way stations. The biotas within these sites will be temporary because of both anthropogenic and non-anthropogenic causes. From a geologic perspective, ecosystems of varying composition will be passing through them and at an ever-quickenning pace. The essential point is that these way stations be available in the future to accommodate the new arrivals.**”



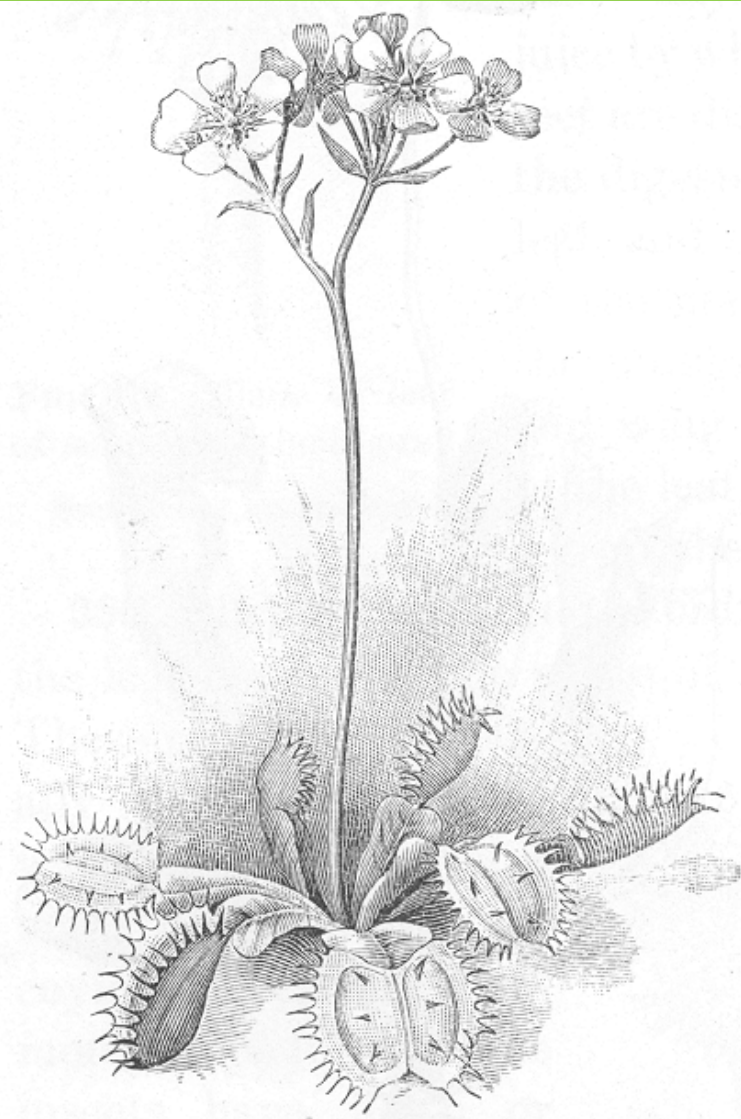


Learning and Teaching


**PLANTS TO THE
PEOPLE!**

“Not your Grandfather’s
Field Manual”:
Taxonomy, Floras, Apps,
and Data Tools
for Biodiversity
Conservation in the
2020s

The Southeastern Flora
Team at NCBG



The University of North Carolina
HERBARIUM (NCU)

A department of the
 NORTH CAROLINA BOTANICAL GARDEN



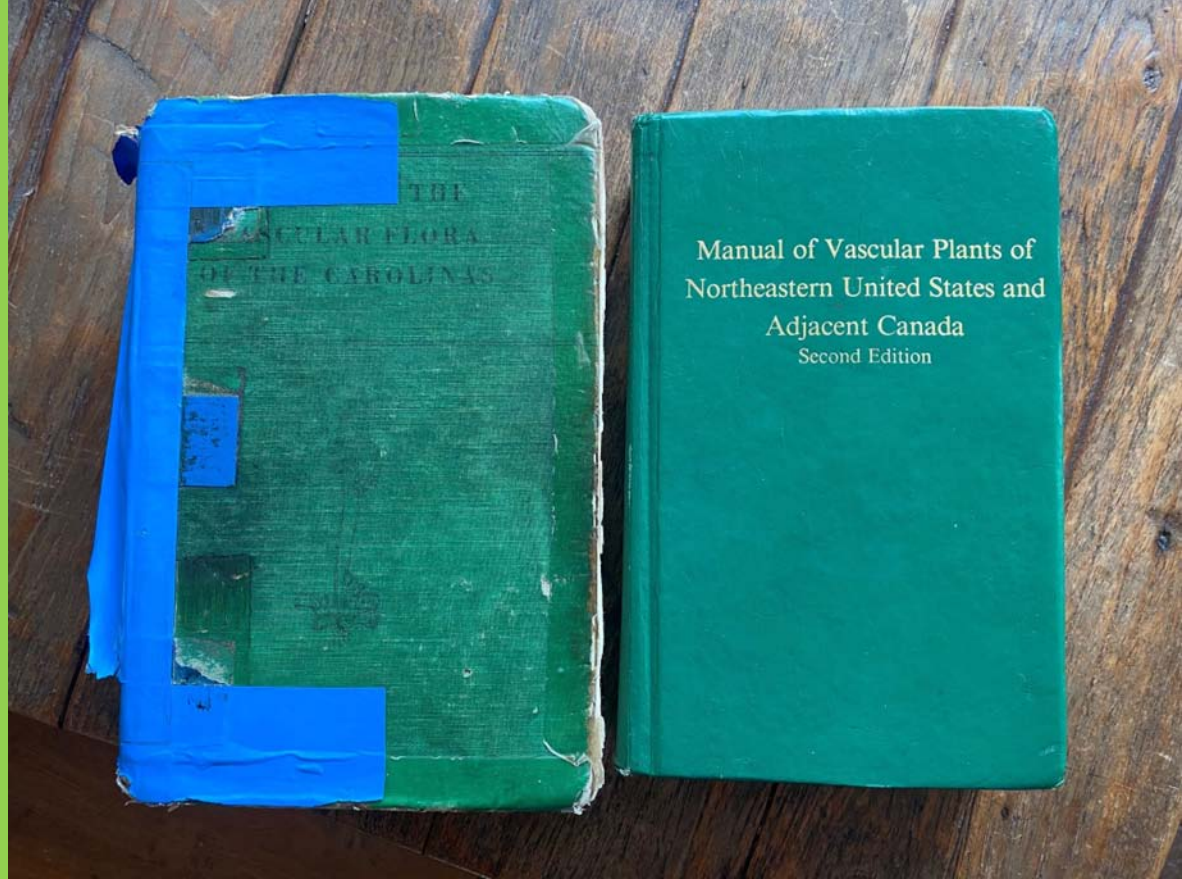
NORTH CAROLINA
**BOTANICAL
GARDEN**

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

Taxonomy matters: avoiding both Type I and Type II errors in conservation

- The conservation of biodiversity is urgent
- We have limited resources (of all kinds) for land conservation and species conservation, and we need to apply those resources as strategically and effectively as possible
- Type I error: we falsely DO NOT recognize a species as “good” that is, and therefore take no action to conserve it
- Type II error: we falsely DO recognize a species as “good” that isn’t, and waste resources (of all kinds) on its conservation

“The Flora” (“Mycota”, “Fauna”)



- The plants in an area, state, or region
- A BOOK about the plants in an area, state, or region -- as a TOOL and practical, useful summary of information (often identification keys, names, description, habitat, distribution)

Not your
grandparent's...

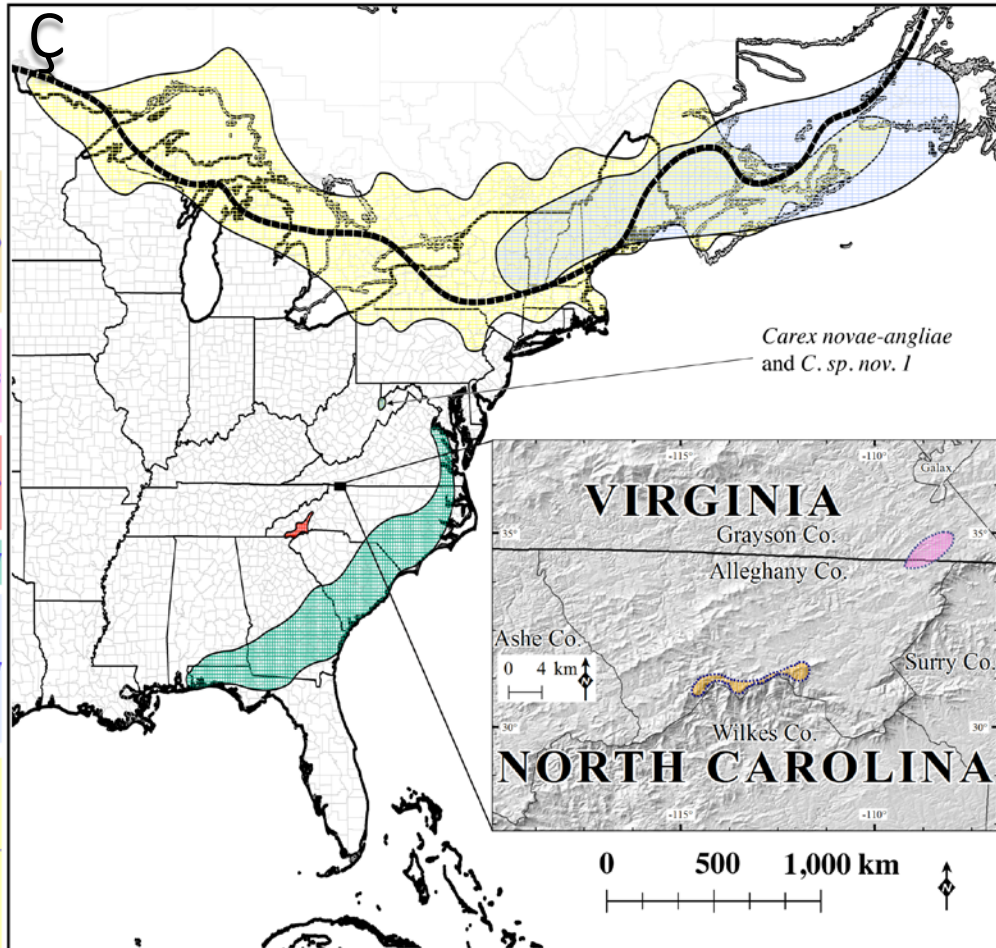
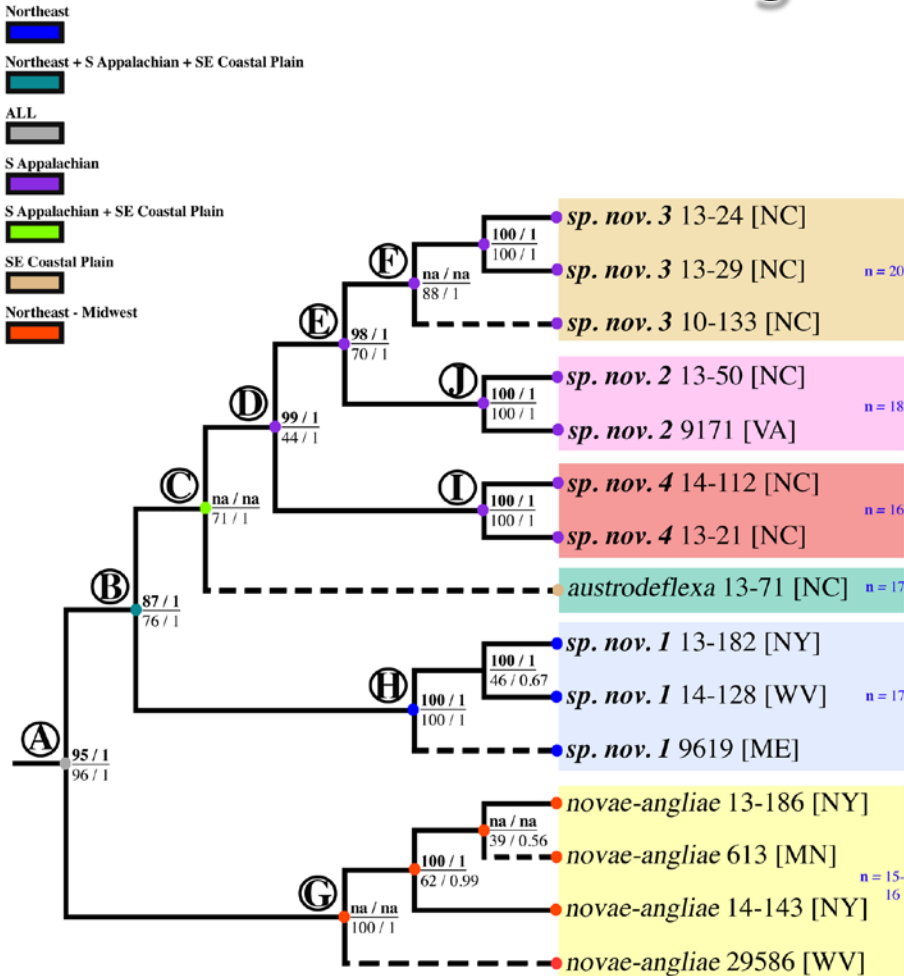


- Taxonomy
- Flora (the set of plants in an area)
- Flora (a book about the set of plants in an area)
- A.I. and “Flora tools”
- Biodiversity “elements” for conservation

Lumping and splitting
of genera and
families...



C. novae-angliae Species Complex



Trichostema (Blue Curls) new species... -- Kevan Schoonover McClelland



Trichostema sp. 8 ("microphyllum")
Trichostema suffrutescens



Trichostema sp. 7 ("hobe")



Trichostema sp. 3 ("fruticosum")



Trichostema sp. 5 ("bridgesii-
orzellii")



Trichostema sp. 6 ("gracile")

Trichostema
suffrutescens
complex



Trichostema setaceum
complex

Trichostema sp. 4 ("latens")

Trichostema setaceum



Trichostema sp. 2 ("floridanum")

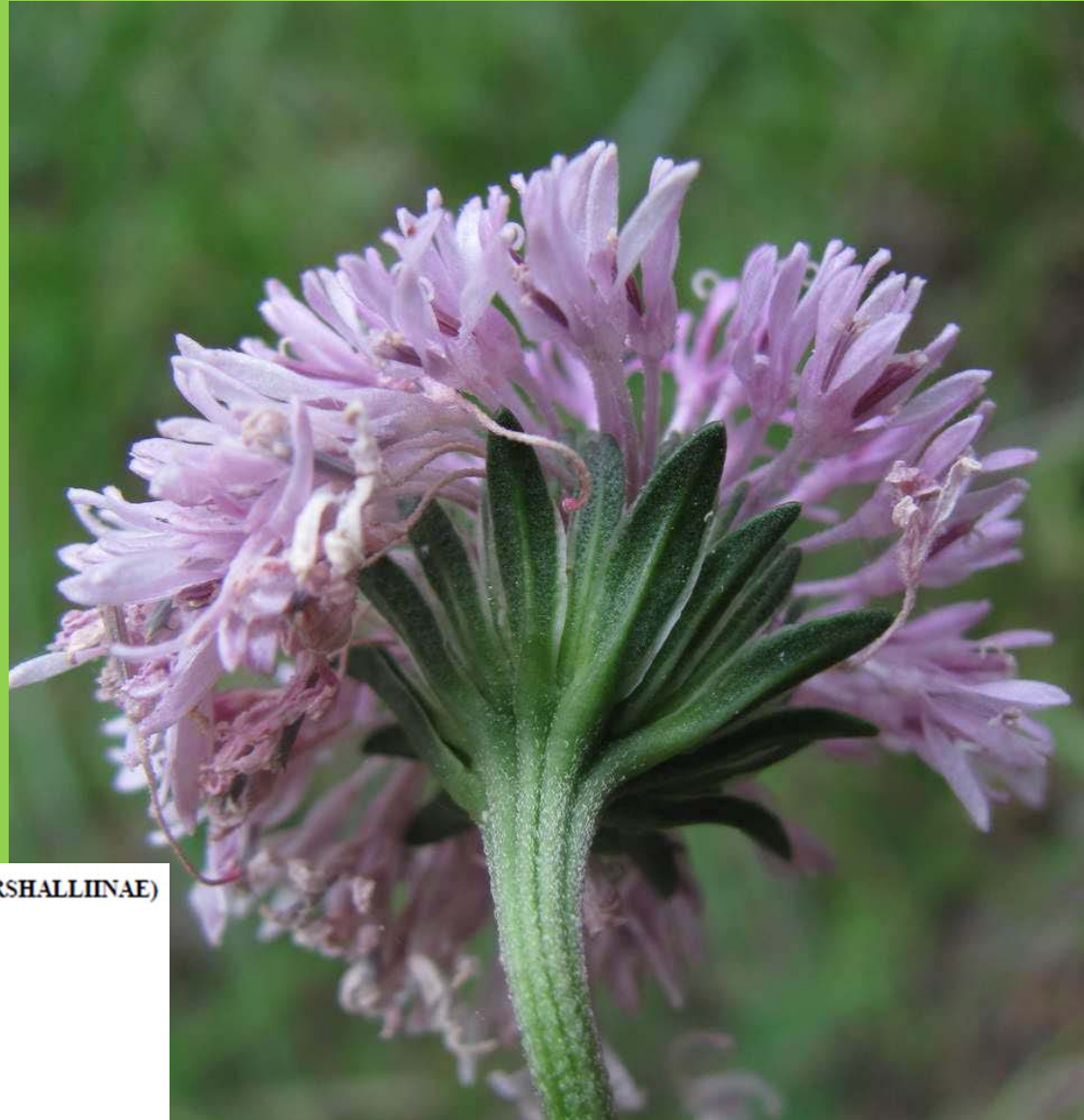
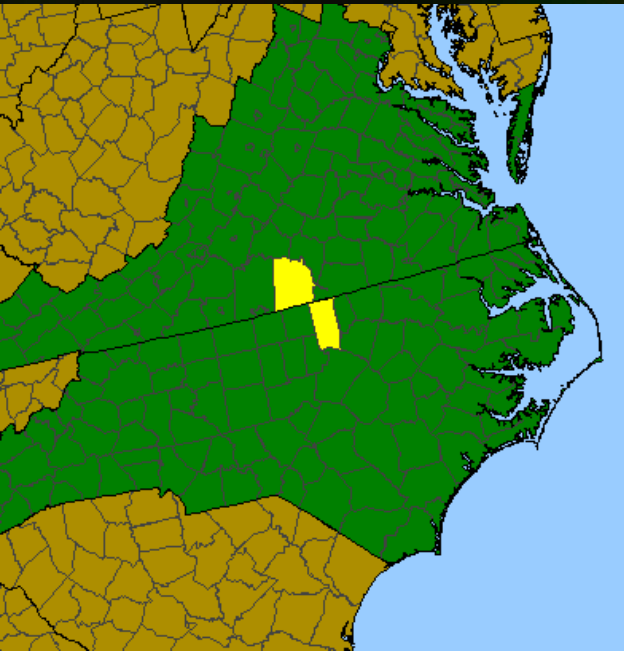
Trichostema nesophilum

Trichostema
dichotomum
complex

Trichostema dichotomum

All photos by R. Kevan Schoonover McClelland

Marshallia legrandii (Oak Barrens Marshallia)



**A NEW SPECIES OF *MARSHALLIA* (ASTERACEAE, HELENIEAE, MARSHALLIINAE)
FROM MAFIC WOODLANDS AND BARRENS
OF NORTH CAROLINA AND VIRGINIA**

ALAN S. WEAKLEY & DERICK B. POINDEXTER
UNC Herbarium (NCU)
North Carolina Botanical Garden
University of North Carolina
Chapel Hill, North Carolina 27599-3280
weakley@unc.edu

Here's (part of) the goal... Reinventing "the Flora" as a 21st Century Tool for biodiversity inventory...

- Make it as easy as possible for a wide diversity of people to correctly identify and learn basic information about any of the 10,730 plant species in the Southeast
 - Current and constantly updated with the latest warranted taxonomy
 - Completely crosswalked to other floras and monographs
 - Conservation focused
 - Technical jargon minimized
 - Visual (photos, maps)
 - Using modern technology wisely and well

Flora of the Southeastern United States Project

- Collaborative (ca. 500-1000 individuals have contributed treatments, edits, locations, suggestions)
- Open access
- Scientifically rigorous
- Kept current based on latest scientific literature (> 7000 references) and other information (including citizen science)
- Supported by diverse funding (private, NGO, state, federal)

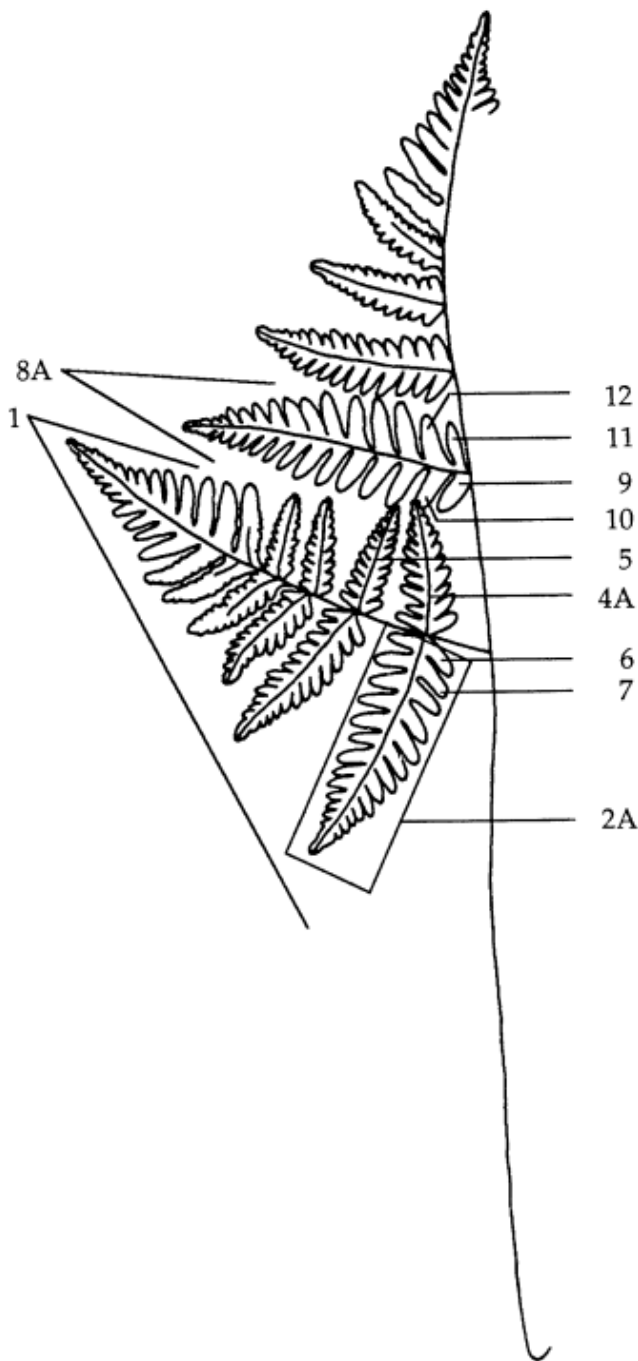
Flora tools for all

- Updatability
 - Information that changes can be revised
 - Current taxonomy and with crosswalk to alternative systems
- Information useful to the biodiversitarian
 - Keys based as much as possible on vegetative features
 - Alternative ID tools to dichotomous keys (multiple access keys, illustrated keys, Machine Learning / Artificial Intelligence)
 - Traits
 - GRanks and SRanks (NatureServe)
 - Wetland status, Coefficients of Conservatism (CoC) / Floristic Quality Index (FQI), Invasiveness status
 - Heliophily ratings (HR) / Grasslandiness Index (GRI)
 - Ability to create species lists

Dichotomous keys

- Be defiant against the saying: “keys are written by those who don’t need them for those who won’t be able to use them”
- Design keys to work throughout the growing season, relying only as necessary (and as late in the key as possible) on transitory characters of flower and fruit
- Minimize unnecessary technical language that acts as a barrier to protobotanists: vallecular, porrect, persicolor...
- Don’t follow strict system of “key to the family, then key to the genus, then key to the species, then key to the variety” -- juxtapose plants that are similar even if not closely related (*Cassytha* v. *Cuscuta*; *Podophyllum* v. *Diphyllia* v. *Hydrastis*; *Polygonatum* v. *Uvularia* v. *Streptopus* v. *Maianthemum* v. *Prosartes*)
- In other words -- a Flora BY Field Botanists FOR Field Botanists

Gymnocarpium appalachianum vs. *G. dryopteris*



- 1 Sessile basal basisconic pinnule of the proximal pinnae with basal basisconic pinnulet shorter than the adjacent pinnulet; pinnae of the second pair of pinnae sessile, with basal pinnules shorter than the adjacent pinnule (or second basal pinnae rarely stalked); spores 27-31 μm in diameter.....
.....*Gymnocarpium appalachianum*

- 1 Sessile basal basisconic pinnule of the proximal pinnae with basal basisconic pinnulet more or less equal in length to the adjacent pinnulet; pinnae of the second pair usually sessile, with basal pinnules more or less equal in length to the adjacent pinnule; spores 34-39 μm in diameter....*Gymnocarpium dryopteris*



Dream Team – floras, apps, website for the full region and state by state

- Michael Lee, Data Scientist
- Katie Gibson, App Developer
- Derick Poindexter, Plant Systematics Researcher
- Chris Ludwig, Botanist
- Scott Ward, Botanist
- Eric Ungberg, Botanist
- Dax Ledesma, Computer Scientist (Artificial Intelligence / Machine Learning)
- Bruce Sorrie, Botanist
- Richard LeBlond, Botanist
- Milo Pyne, Botanist
- Brandon Fuller, Botanist
- Wes Knapp, NatureServe Chief Botanist
- Carol Ann McCormick, Herbarium Curator
- Alan Weakley, Lead
- photographers across the region
- many other collaborators and contributors across the region

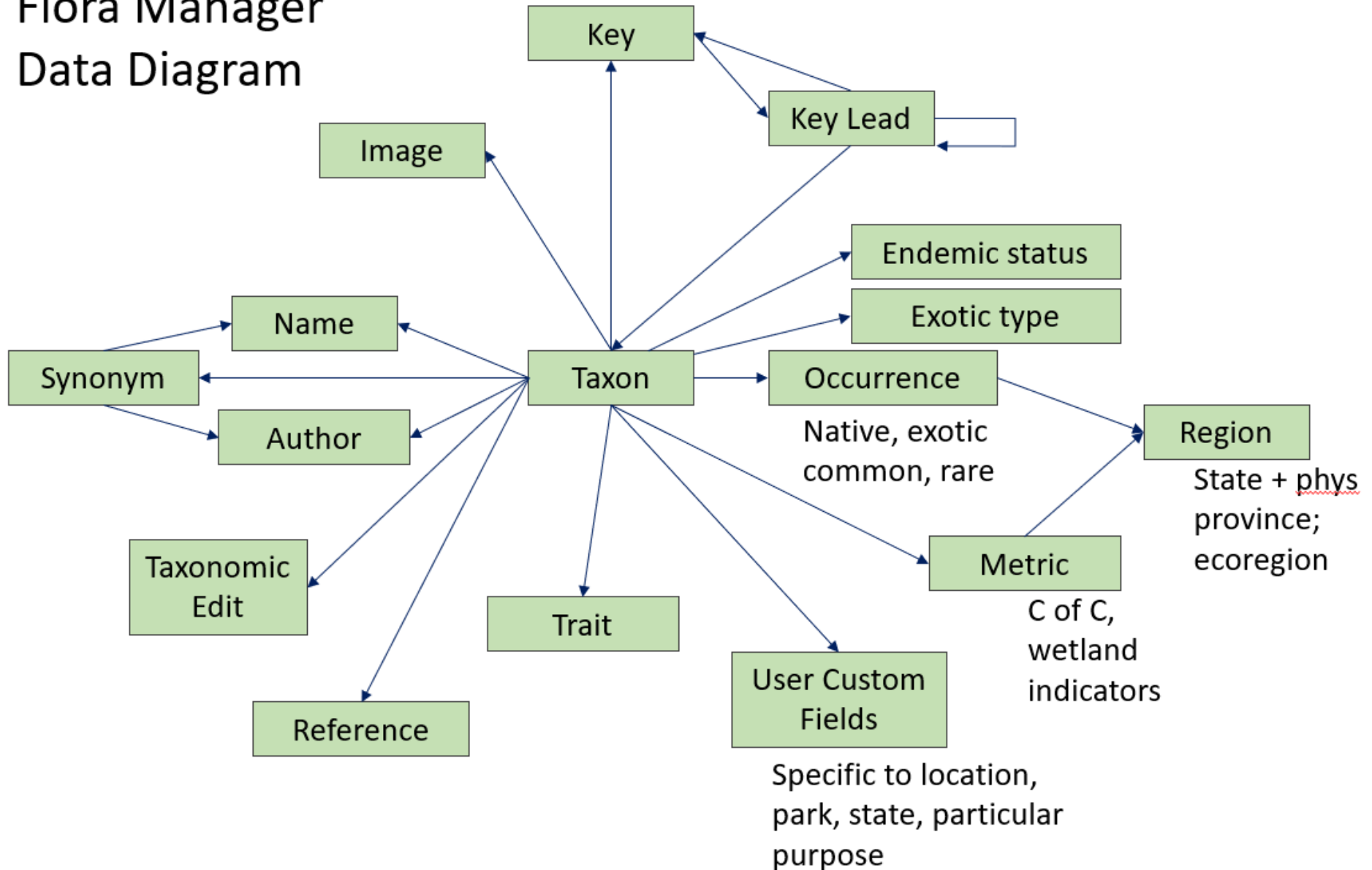
Funding and collaborations

- NatureServe and Heritage Programs
- National Park Service (regional office and various Networks)
- Mount Cuba Center
- Southeastern Grasslands Initiative
- Flora of Virginia Foundation
- State governments (AR, GA, NC, PA, VA, etc.)
- A private conservation philanthropist and other UNC Herbarium / NC Botanical Garden donors

WE WELCOME ADDITIONAL COLLABORATIONS AND PROJECTS!

weakley@unc.edu

Flora Manager Data Diagram



Flexafloras, Florulets, Florulas

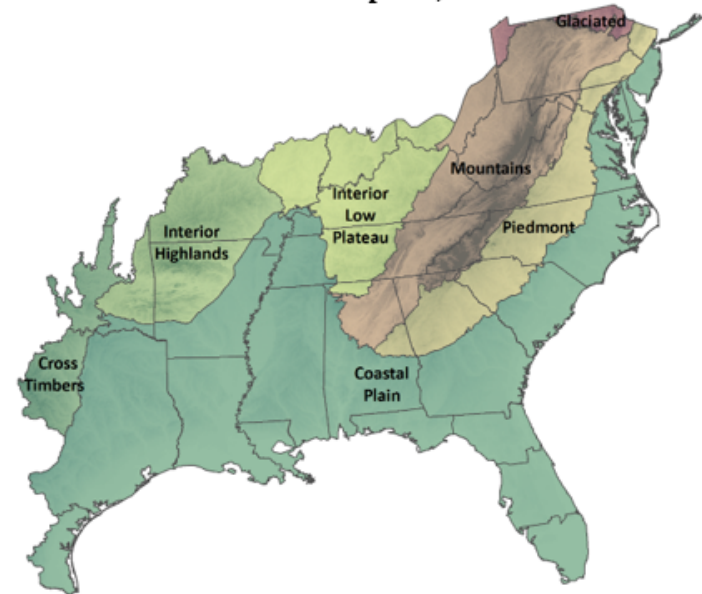
- Flora of any area or any taxonomic group, or based on a species list (Flora of Carolina Beach State Park)
 - Keys auto-simplify
- Waif exclusion (or “graying”)
- With or without maps (regional or customized)
- Pictures, line drawings, or neither
- Custom information for an area (Shenandoah, Delaware)
- Wetland status, FQI (CoC), Grank, Srank, etc.

Flora of the Southeastern US

- <https://ncbg.unc.edu/research/unc-herbarium/floras/>
- 10,791 Species
- 2,007 Pages
- 7,367 downloads since 10/20/2020
- 5 Physiographic Regions
 - Appalachian
 - Eastern Coastal Plain
 - Interior Low Plateau and Interior Highlands
 - Southern Coastal Plain
 - Florida
- 25 States: AL, AR, DE, FL, GA, KY, LA, MD, MS, NJ, NC, PA, SC, TN, VA, WV, DC, and parts of TX, OK, MO, KS, IL, IN, OH, and NY

Flora of the Southeastern United States

Edition of April 5, 2022



by

Alan S. Weakley and the Southeastern Flora Team*

University of North Carolina at Chapel Hill Herbarium (NCU)

North Carolina Botanical Garden

University of North Carolina at Chapel Hill

Campus Box 3280

Chapel Hill NC 27599-3280

Produced from the FloraManager database system
by Michael T. Lee

27 Floras available for download

Select Flora (required)

Choose a flora using the radio buttons below.

- Flora of the Southeastern United States (309.1 MB, PDF)
- Regional Floras (150-200 MB, PDF)
- State Floras (80-150 MB, PDF)


State Floras

State derivatives of the Flora of the Southeastern United States (FSUS).

Terms of Use (required)

These floras are posted under the [creative commons by-nc-nd license](#).

I agree to the terms of use



<https://ncbg.unc.edu/research/unc-herbarium/flora-request/>

Floras, apps, guides,...



WILDFLOWERS of the ATLANTIC SOUTHEAST

Laura Cotterman, Damon Waitt & Alan Weakley



TIMBER PRESS FIELD GUIDE



www.eFloras.org

Flora of North America

FNA Vol. 20 Page 472, 501, 525, 526

FNA | Family List | FNA Vol. 20 | Asteraceae * | Symphyotrichum *

58. *Symphyotrichum rhiannon* Weakley & Govus, Sida. 21: 828, fig. 1. 2004.

Rhiannon's aster

Perennials, 15–40(–60) cm, colonial; thinly long-rhizomatous. **Stems** 1, erect (straight), hirsute to hispid-hirsute, hirsutulous distally. **Leaves**: margins shallowly crenate to serrate-crenate, abaxial faces strigillose, adaxial scabrous; basal withering by flowering, petiolate, petioles winged, clasping to subclasping, shallowly auriculate, blades subspatulate or oblanceolate-elliptic, 30–70 × 10–15 mm, bases attenuate to cuneate, apices acute; proximal

Verizon 9:02 AM 95%

FloraQuest


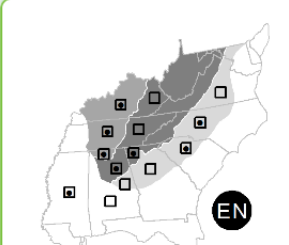
Juglandaceae

Carya carolinae-septentrionalis

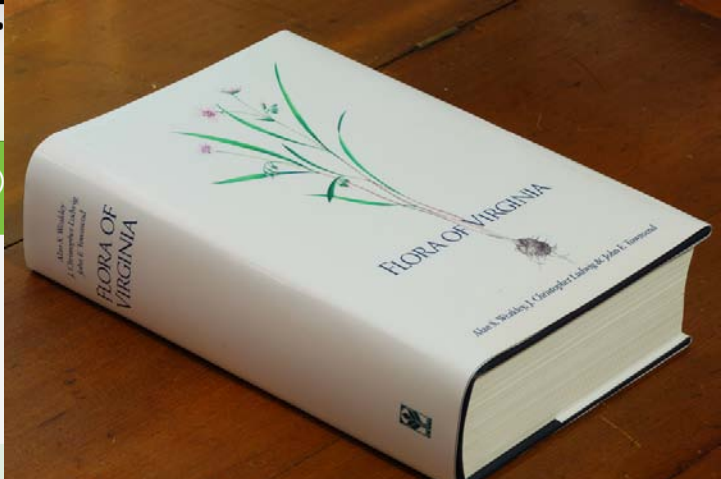
Flowers and Fruits:
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Native

Synonymy:
[= C. G, K, RAB, Va; = *C. ovata* (P. Miller) K. Koch var. *australis* (W.W. Ashe) Little – FNA; = *Hicoria carolinae-septentrionalis* W.W. Ashe – S; = *C. ovata* var. *carolinae-septentrionalis* (W.W. Ashe) Reveal; = *C. australis* W.W. Ashe]

Create Observation



Flora of the Southeastern United States: Pennsylvania

Edition of 20 October 2020



by
Alan S. Weakley
University of North Carolina at Chapel Hill Herbarium (NCU)
North Carolina Botanical Garden
University of North Carolina at Chapel Hill
Campus Box 3280
Chapel Hill NC 27599-3280

Produced from the FloraManager database system
by Michael T. Lee

Search

All Floras Advanced Search

Login | eFloras Home | Help



App features

- Three ID methods (plus combinations)
 - Dichotomous keys with embedded images (!)
 - Graphic / polyclave / flexible entry keys
 - Artificial Intelligence (via iNaturalist?)
 - From any set of species, then jump to custom dichotomous key of remaining species, or to AI
 - Images: 2-5 photos per species, illustrating important features
- Traditional information
 - Habitats, maps of distribution, native/nonnative, taxonomic discussion
 - Clickable illustrated glossary
- Ability to create site species lists by ‘clicking’: LITU
- Less-traditional information
 - Wetland status, CoC / FQI values, Grasslandiness ratings, invasiveness ratings, GRanks and Srank, synonymy
“crosswalk”

Graphic key (polyclave or multiple access or flexible key)

- Enter easily observable information about the plant, and let the computer do the sorting
- Enter from menu:
 - In unglaciated montane Pennsylvania
 - Growing in a wet place
 - Broad-leaved woody plant
 - A shrub (not a tree)
 - Leaves opposite
 - Leaves compound
 - → you've gone from 10,000 possibilities to 2

Derivative and collaborative projects

- Weakley, Ludwig, & Townsend, 2013, Flora of Virginia
- McAvoy, Highland, & Weakley, Flora of Delaware
- Witsell, Baker, Ogle, Soteropoulos, and Weakley, Guide to the Flora of Arkansas
- Medley & Weakley, Flora of Georgia
- Bridges & Weakley, Ecological Flora of Florida
- Legal basis for Pennsylvania's state listing of rare, threatened and endangered species
- Flora of Shenandoah National Park
- Flora of the National Park Service CUPN Network Units
- Flora of Little River Canyon National Preserve
- Etc...

By Alan S. Weakley, J. Christopher Ludwig, and
John F. Townsend. Bland Crowder, editor

Flora of VIRGINIA



With photos, new data,
more illustrations, range maps, and
an easy-to-use Graphic Key

Flora of Virginia Project and
High Country Apps LLC
Copyright © 2017 All rights reserved

Flora of Virginia App

- Graphic “key”
- Dichotomous keys
- Lots of illustrations
- Geographic filtering by county
- Nearly all content from the Flora of Virginia book
- \$19.99
- iOS and Android

Flora of Virginia

Browse Plants / Favorites >

Graphic Key >

Botanical Help >

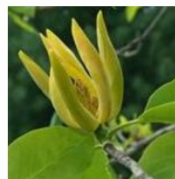
Reference Library >

About / Contact Us >

[Back](#)

Plant Families

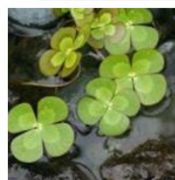
M

**Magnoliaceae (Magnolia Family) -- 7 species**

A family of 6-12 genera and about 220 species, tropical and warm-temperate, of e. and se. Asia and from e. North America through the West Indies and south through Central America to Brazil.

**Malvaceae (Mallow Family) -- 24 species**

If circumscribed broadly (as here) to include the Sterculiaceae and Tiliaceae, the Malvaceae comprise about 243 genera and 4000-4500 species, cosmopolitan but especially diverse in the tropics and subtropics. This family includes several economically important species, including cotton (*Gossypium* spp.), cacao or chocolate, *Theobroma cacao* Linnaeus, and cola, *Cola acuminata*.

**Marsileaceae (Water-clover Family) -- 1 species**

A family of 3 genera and about 50 species, cosmopolitan.

**Melanthiaceae (Bunchflower Family) -- 10 species**

A family of about 16 genera and 170 species, mostly temperate and of the northern hemisphere, but extending into South America.

**Melastomataceae (Melastome Family) -- 5 species**

A family of about 150 genera and about 3,000 species, from tropical, subtropical, and warm-temperate areas.

Flora of Virginia Graphic Key



Select observed characteristics. [\(Instructions\)](#)

Reset

3164 Found

Show

Plant Group:



Location:

tap to select

Use current location

Moisture Regime:



Light Regime:



Flora of Virginia Graphic Key



Select observed characteristics. [\(Instructions\)](#)

Reset

474 Found

Show



Plant Group: Broad-leaved woody plants



Shrubs and trees with broad leaves.

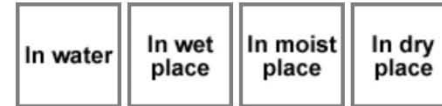


Location:

tap to select

Use current location

Moisture Regime:



Light Regime:



Flowering period:



Use current month

Growth form:



Armed with spines?



Flora of Virginia Graphic Key

Select observed characteristics. (Instructions)

Reset **10 Found** Show

Fruit type:



Leaf arrangement: Opposite

Leaves opposite each other on the stem.



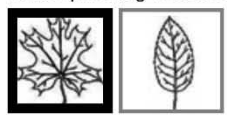
Leaf division: Simple

Leaves are not divided into leaflets.



Leaf vein pattern: Palmate

Veins spreading from a common point, recalling the fingers of a hand.



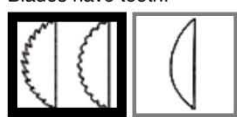
Leaves lobed? Lobed

A simple leaf that has lobes.



Leaves toothed? Toothed

Blades have teeth.



Leaf length:



Graphic Key

Browse Favorites

Sort

A



Acer rubrum
Maple, Red
Acer (Maple)
Sapindaceae (Soapberry Family)



Acer saccharinum
Maple, Silver
Acer (Maple)
Sapindaceae (Soapberry Family)



Acer saccharum
Maple, Sugar
Acer (Maple)
Sapindaceae (Soapberry Family)



Acer spicatum
Maple, Mountain
Acer (Maple)
Sapindaceae (Soapberry Family)

V



Viburnum acerifolium
Viburnum, Maple-leaf
Viburnum (Viburnum)
Adoxaceae (Moschatel Family)



Viburnum opulus var. opulus
Viburnum, Guelder-rose
Viburnum (Viburnum)
Adoxaceae (Moschatel Family)

A
V

[Back](#)***Acer nigrum* Michaux f.**

Black Maple

Native

[Acer \(Maple\)](#)[Sapindaceae \(Soapberry Family\)](#)

© Gary P. Fleming



© Gary P. Fleming



Images



Description



Range Map

[Back](#)***Acer nigrum* Michaux f.**

Black Maple

Native

[Acer \(Maple\)](#)[Sapindaceae \(Soapberry Family\)](#)**Description**

Trees to 36 m. Bark dark, furrowed and often platelike; twigs orangish brown and lustrous the first year, becoming pale gray-brown. Leaves 7.5-15 × 7.5-20 cm, palmately 3(-5)-lobed, teeth obtuse to rounded; lower surfaces green and pubescent. Inflorescences umbels, drooping, lateral and terminal. Samaras 1.2-3 cm.

Phenology

March to July

Habitat

Mesic to dry, calcareous upland forests and woodlands; rich floodplain forests.

Status

Frequent in the Ridge and Valley province below 600 m (2000 ft) elevation (rarely to 1200 m), often locally common in limestone or dolomite areas; rare elsewhere in the mountains and the Piedmont.

Synonymy

[= C, F, G, K, Pa., W, W.Va.; = *A. saccharum* Marshall ssp. *nigrum* (Michaux f.) Desmarais - R, Z; = *Saccharodendron nigrum* (Michaux f.) Small - S]

Search Characteristics (tap icons)

Images



Description



Range Map

[← Back](#)**Phenology**

March to July

Habitat

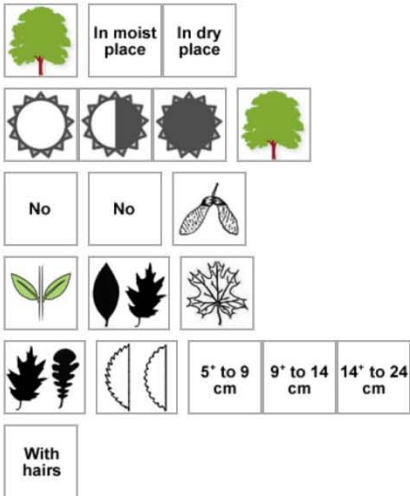
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Search Characteristics (tap icons)

Images



Description



Range Map

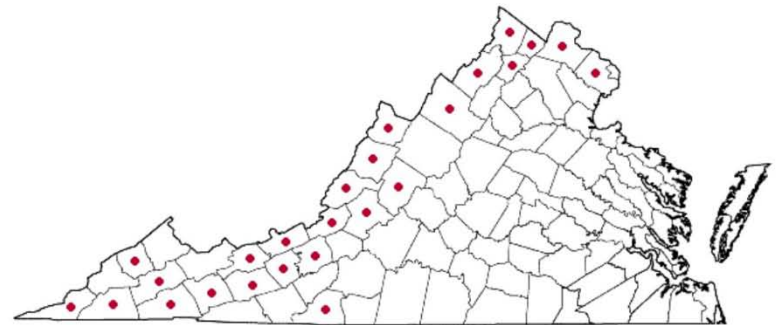
[← Back](#)***Acer nigrum* Michaux f.**

Black Maple

Native

Acer (Maple)

Sapindaceae (Soapberry Family)



Distribution data from the Digital Atlas of the Virginia Flora. © 2017 Virginia Botanical Associates. A dot in a given county signifies that a voucher specimen exists for that county.



Images



Description



Range Map

5:04


[← Graphic Key](#)

Browse plants



Identify further with dichotomous key

***Ribes cynosbati***

Gooseberry, Prickly

Ribes (Currant, Gooseberry)

Grossulariaceae (Currant Family)

***Ribes rotundifolium***

Gooseberry, Appalachian

Ribes (Currant, Gooseberry)

Grossulariaceae (Currant Family)

***Ribes missouriense***

Gooseberry, Missouri

Ribes (Currant, Gooseberry)

Grossulariaceae (Currant Family)



5:07


[← Browse plants](#)
[Jump to Key](#)
[Key to > Key G: > Key G2: > Ribes >](#)
Ribes
[SEE GENUS PROFILE](#)

1a. Flowers solitary or in [corymbs](#) of 2-4; [pedicels](#) not [jointed](#) just beneath the [ovary](#) or [fruit](#), the fruit not [disarticulating](#) at maturity and thus the fruit shed with the [entire](#) pedicel; [stems](#) generally with (0-) 1-3 [nodal spines](#) and sometimes also with [internodal bristles](#) (especially on young, vigorous growth) (though these sometimes absent or nearly so in some [species](#)); [subgenus *Grossularia*, "gooseberries"].

[SEE 3 MATCHING SPE...](#)
[GO BACK](#)
2a. Ovary and [fruit glabrous](#).
[SEE 2 MATCHING SPE...](#)
[CHOOSE THIS LEAD](#)
2b. Ovary and [fruit hairy](#) or bristly.
[SEE 1 MATCHING SPE...](#)
[CHOOSE THIS LEAD](#)

Ruler

[SHOW ALL COUPLETS](#)

Wildflowers of the Atlantic Southeast

Laura Cotterman

Damon Waitt

Alan Weakley

“We do the hard work, so you won’t have to”

Or, actually: “We try to give you better tools to make your hard work more effective, efficient, and fun”

But, here's the REST of the goal...

Building a community of...

- Magizoologists
- Plant Wizards
- Data Mages
- Biodiversity Explorers
- Phytophylophilosophers
- Conservation Persuaders
- Transformational Diversifiers
- Protectors of the Real World
- Just Plain Folks (Who Care)



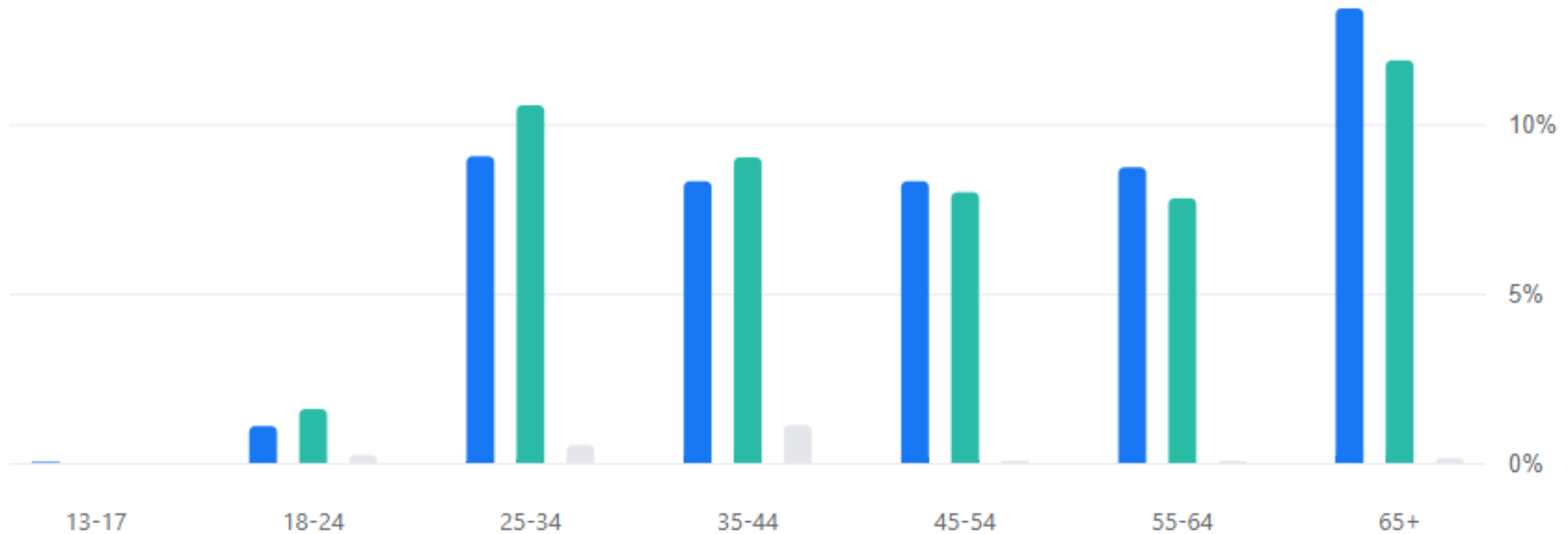
Weakley's Flora of the Southeastern United States

Private group · 3.5K members




Age and gender i

49% Female 49% Male 2% Custom





A person is holding a black sign with white text. The sign is held by two hands, one on the left and one on the right. The background is a solid green color.

If you were a plant I
would remember your
name!



Place

- A sense of place and landscape
- “Natural Heritage” and Cultural Heritage
- Urban and rural
- Conservation and conservatives

ON BELONGING IN OUTDOOR SPACES

a FREE speaker series on access, inclusion, & connection in nature

Dr. J. Drew Lanham

Alumni Distinguished

Professor of Wildlife

Ecology and Master Teacher

at Clemson University

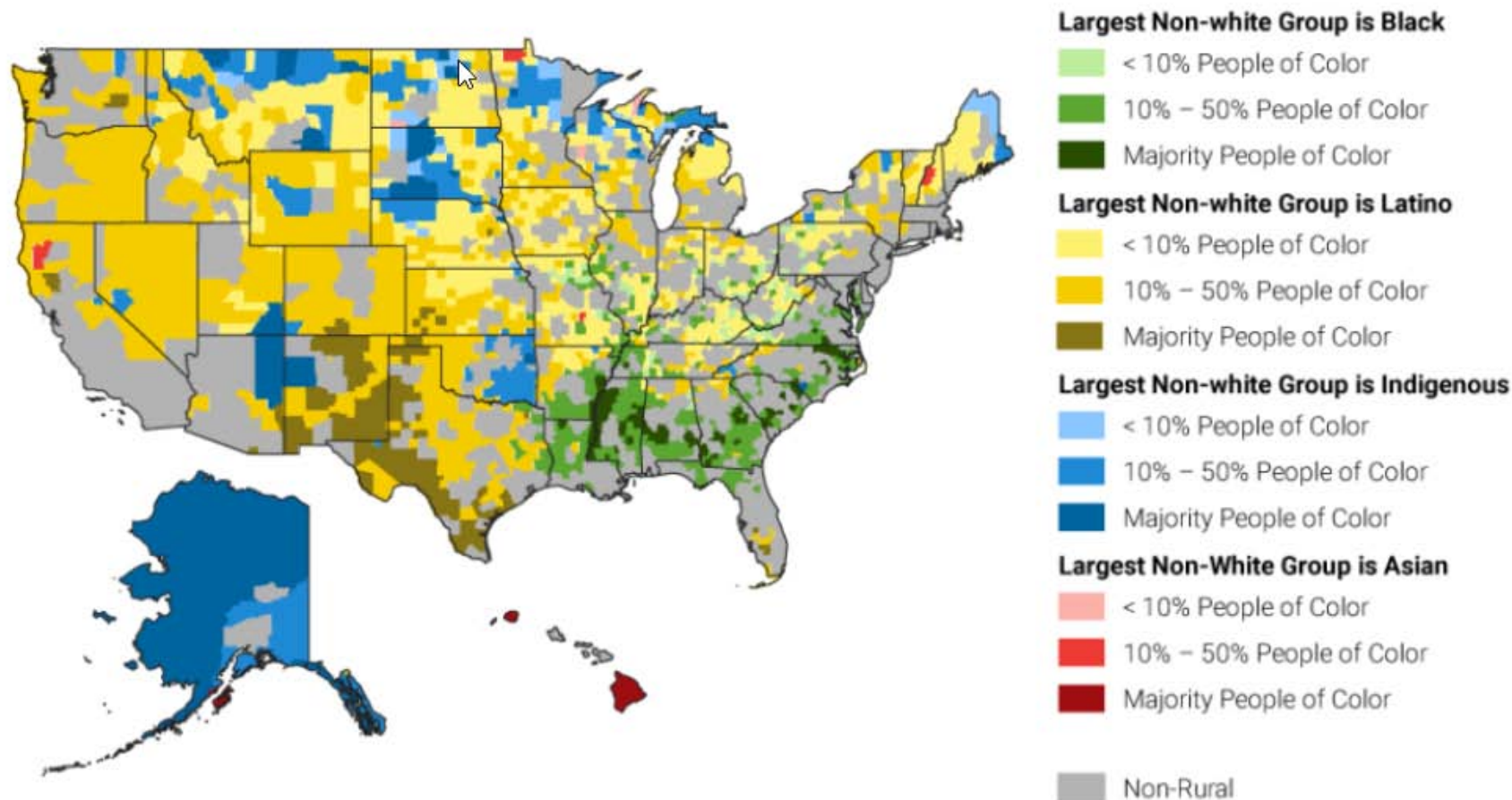
June 2, 2021 | 7:00 PM EST



For more information on the speaker series, please visit:

WWW.ONBELONGINGOUTDOORS.ORG

Figure 2. Rural Americans of Color in 2020



Source: Brookings analysis of 2020 Census data.

Cultural diversity of the South

- Different foodways
- Different folkways
- Different landways
- But commonalities as well...

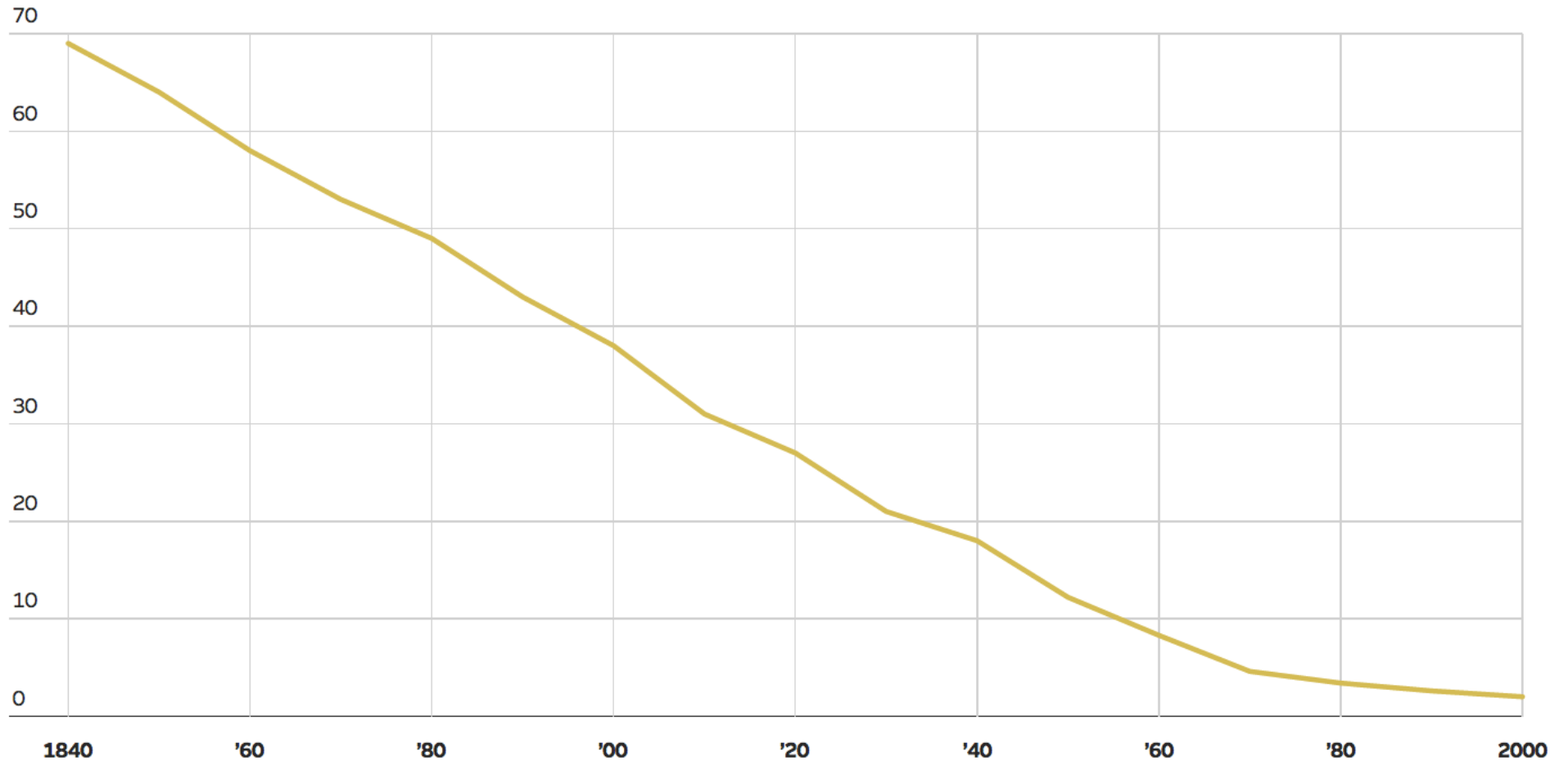




DIPPING AND SCRAPING PINE TREES, TURPENTINE INDUSTRY,
IN FLORIDA.

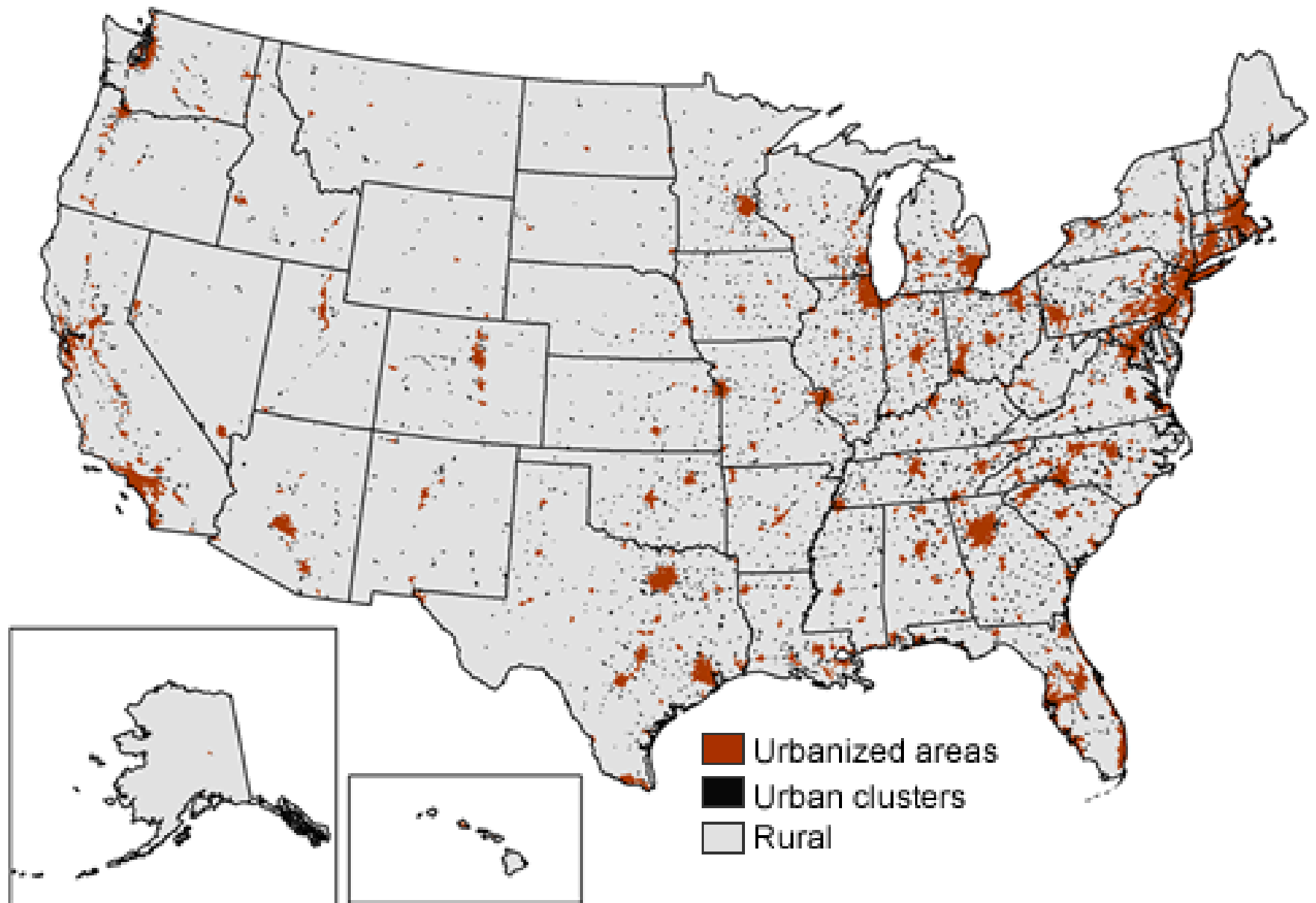
Rural and urban

% of American workforce in agriculture, 1840-2000



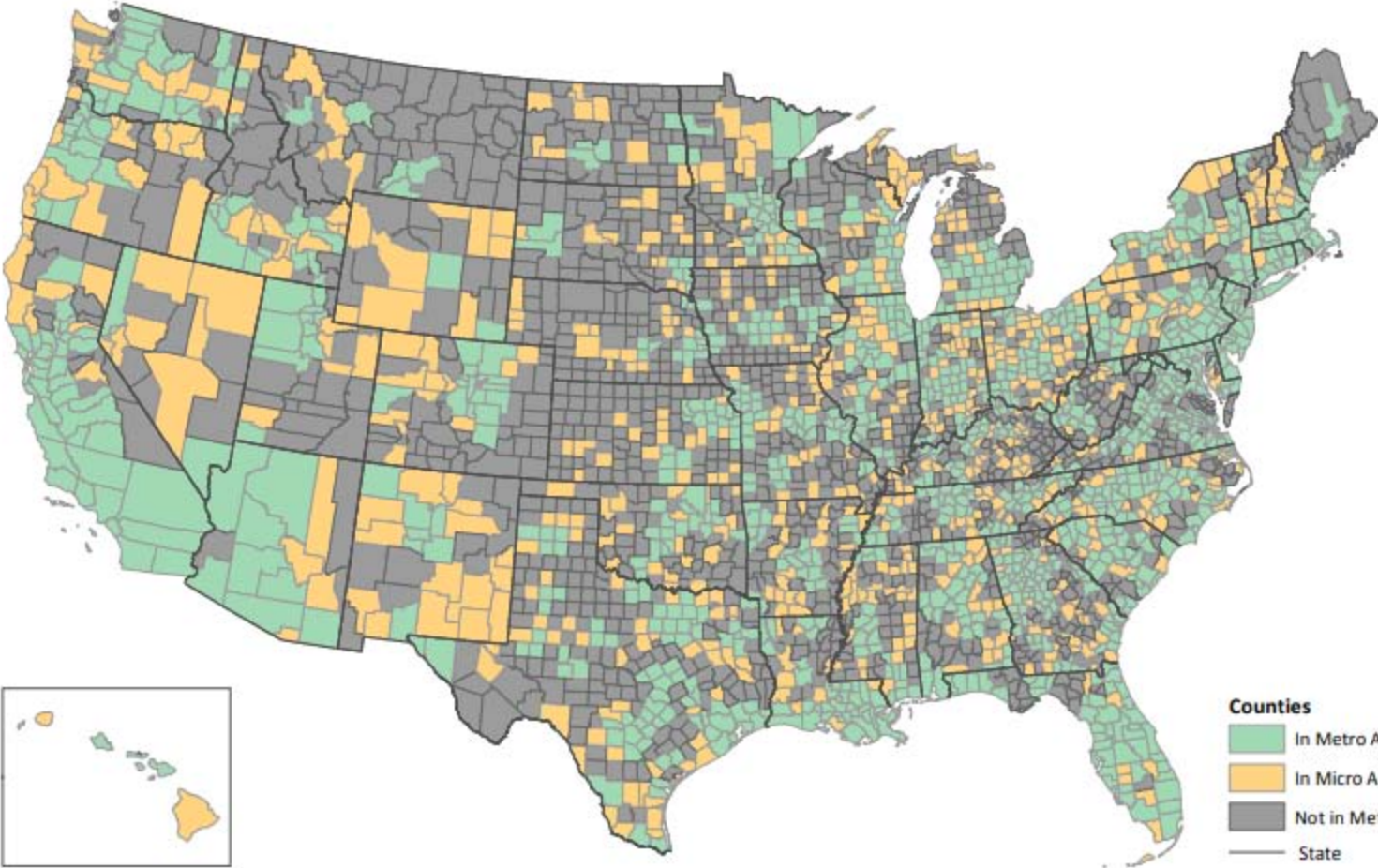
Source: USDA,

U.S. Census Bureau's urban and rural areas, 2012



Source: USDA, Economic Research Service using data from the U.S. Census Bureau.

Counties by Metro/Micro Area Status: 2019



- Counties**
- In Metro Area
 - In Micro Area
 - Not in Metro/Micro
 - State

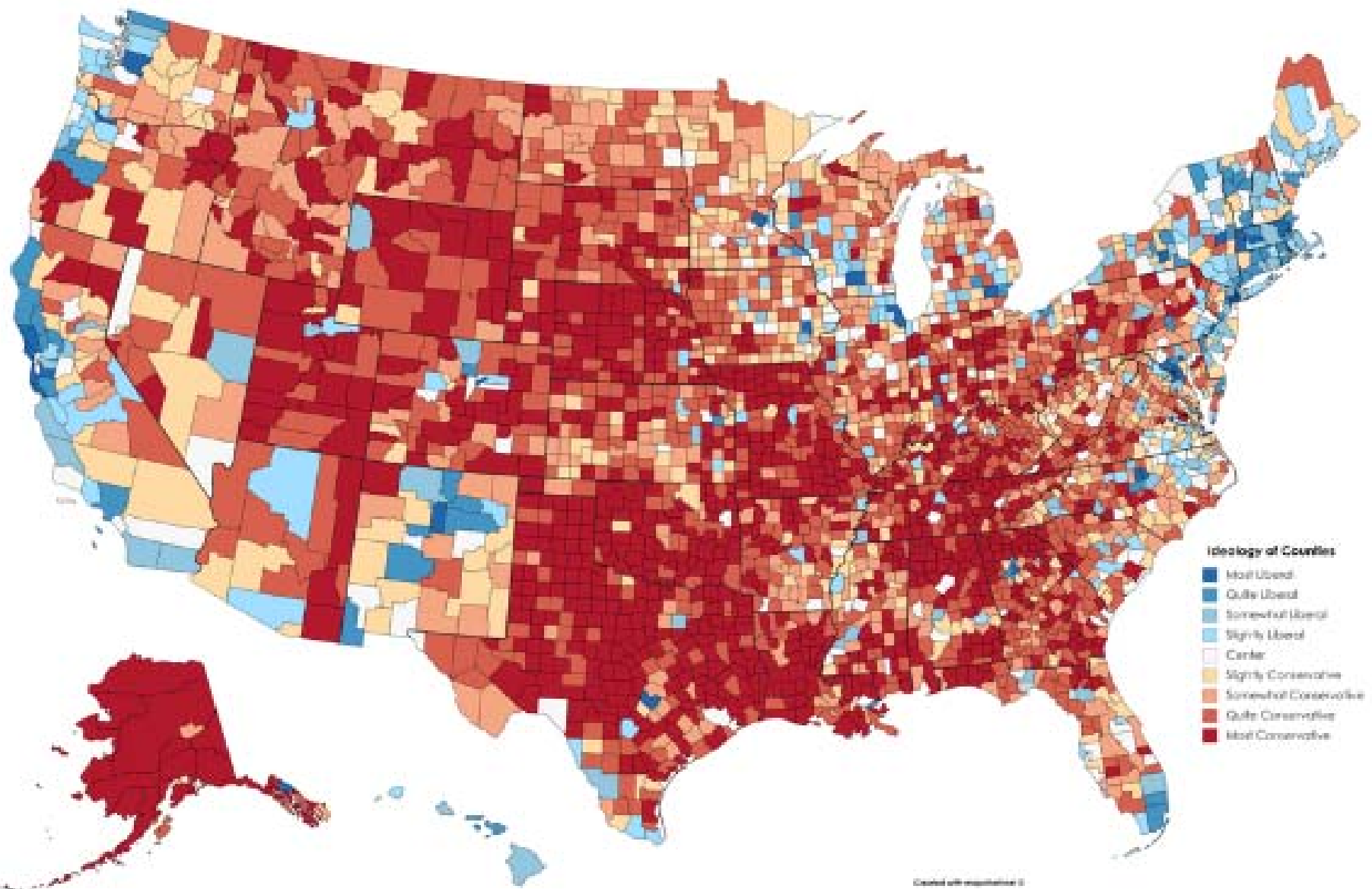
Note: Metropolitan and micropolitan statistical areas defined by the Office of Management and Budget as of September 2018, using U.S. Census Bureau county boundaries effective as of July 2015.
Source: U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program, December 2020.



CDC: “Preventing Tick Bites on People”

- **Know where to expect ticks.** Ticks live in grassy, brushy or wooded areas, or even on animals. Spending time outside walking your dog, camping, gardening or hunting could bring you in close contact with ticks. Many people get ticks in their own yard or neighborhood.
- **Avoid Contact with Ticks**
 - Avoid wooded and brushy areas with high grass and leaf litter.
 - Walk in the center of trails.

Liberalness/Conservativeness of US Counties (Data From American Ideology Project) [6900 x 4275]





Bumperstickers
seen in NC ca.
1970s-1990s

“Honk if you’re from Carolina,
moo if y’all f’um State”

“Hunters and fishermen – the
first conservationists and still
the best”

Conservation is conservative

- Conserving the past and basing the future on it
- Reserving precious and irreplaceable resources for future generations
- Stewarding {God's} {evolution's} creation
- Behaving cautiously about losing precious parts [“If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering” – Aldo Leopold]

Alphabet Soup

- USESA (1973). Senate 92-0; House 390-12.
- LWCF reauthorization (Dingell Conservation, Management, and Recreation Act, 2019). Senate 92-8; House 363-62
- LWCF funding. Great American Outdoors Act. Senate 73-25; House voice vote.
- RAWA (Recovering America's Wildlife Act) 2022..... House 231-190; Senate?
- RSGCN (Regional Species of Greatest Conservation Need). In development
- SWAPs (State Wildlife Action Plans). NC adding plants...



NATIONAL ASSOCIATION OF
State Foresters



COALITION OF
PRESCRIBED
FIRE COUNCILS, INC.

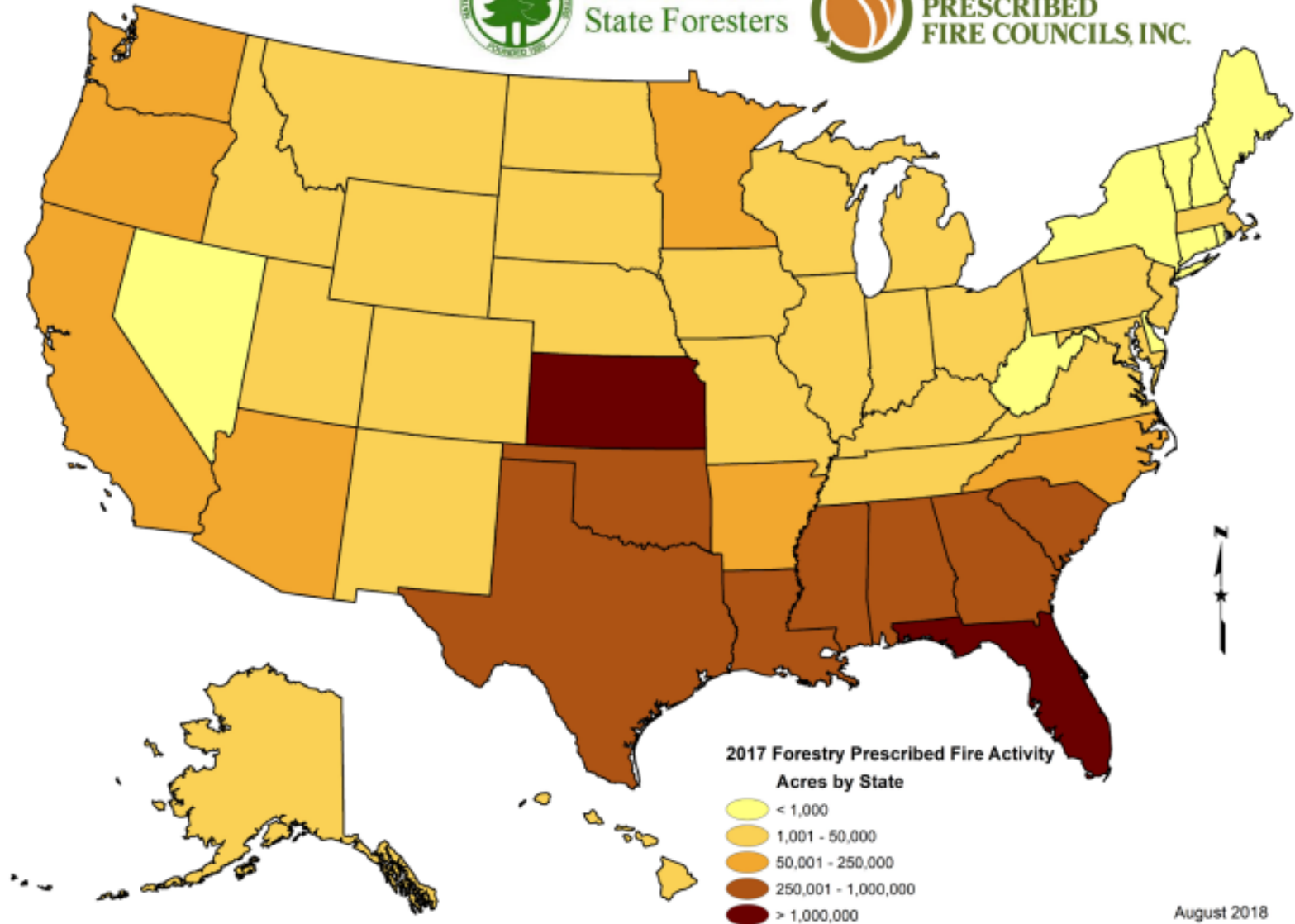


Figure 10. Acreage of prescribed fire use for forestry objectives by state. Coarse acreage classes were created using a histogram that determined the most significant breaking points in acres reported.





**GERONIMO INTERAGENCY HOTSHOT CREW
2017**

The Bitter Southerner



**WE STAND FOR A
BETTER SOUTH.**

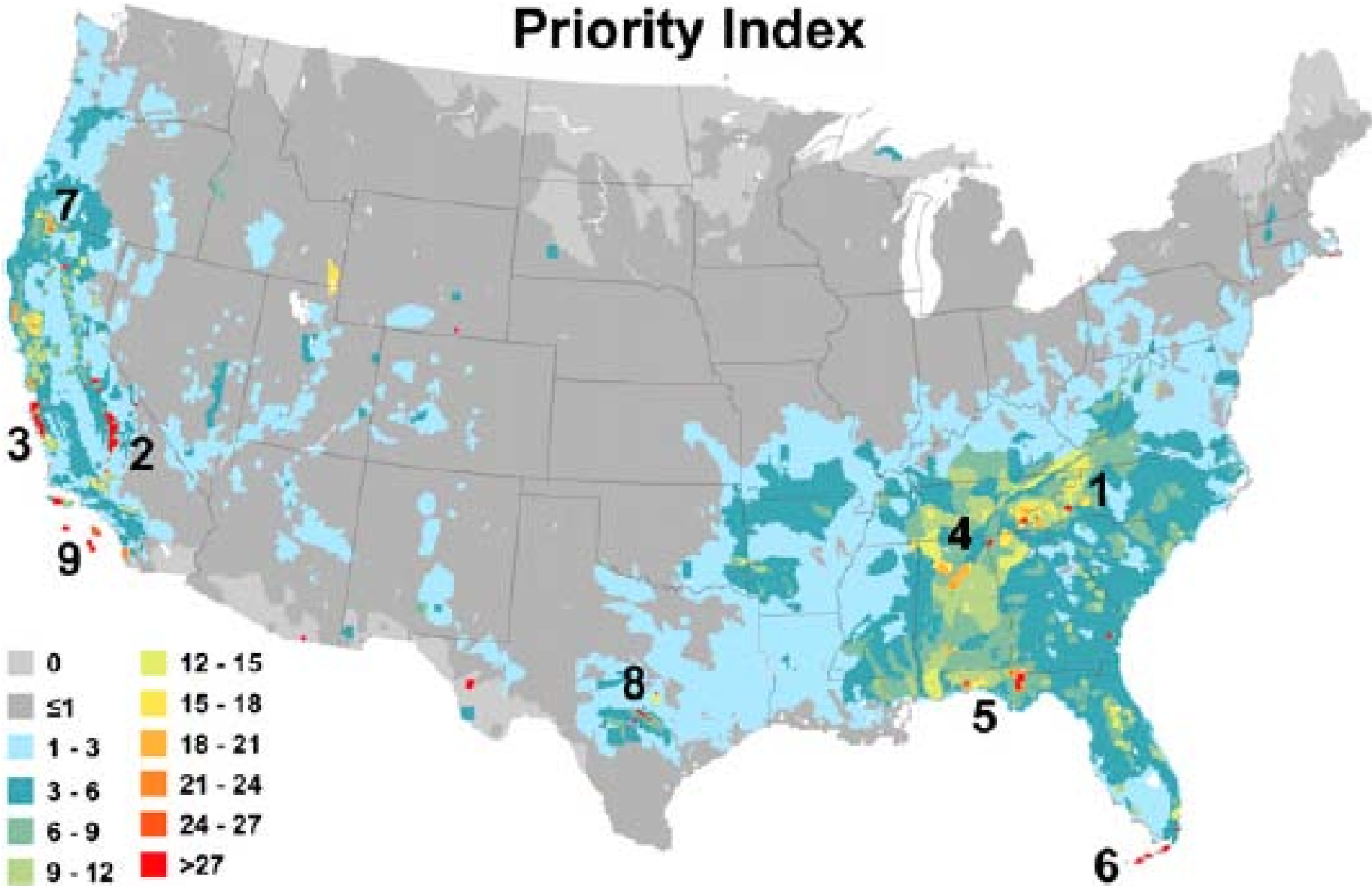
Conservation

- The long game...
- The critical next decades...

US protected lands mismatch biodiversity priorities

Clinton N. Jenkins^{a,1}, Kyle S. Van Houtan^{b,c}, Stuart L. Pimm^c, and Joseph O. Sexton^d

Priority Index



Alteration and Conversion

Table 2 Estimates of habitat alteration and conversion for the North American (Geologic) Coastal Plain and three major vegetation classes: Forests; Grasslands, Marshes, and Glades; and Savannas/Woodlands. See Supporting Information (Appendix S3 and Table S3.1) for methods and more information on results.

Habitat	Area (km ²)	Highly altered (%)	Converted (%)	Highly altered plus converted (%)
Forests	46494.25	29.04	43.47	72.50
Grasslands, Marshes, and Glades	11991.88	46.31	51.29	97.60
Savannas/Woodlands	43710.27	55.00	41.08	96.07
All Habitats (excluding water and sparsely vegetated areas)	102196.40	42.20	43.40	85.50





THE GREAT TRIAGE

The Three DOMAINS

Domain 1: Natural areas, with the potential for full restoration

Nothing short of full restoration across these lands will provide for survival of most or all our native species of birds, plants, and animals (from the largest National Forest down to the smallest local preserve)

Domain 2: Multifunctional Landscapes (or “Working Landscapes”)

Domain 3: Lands Fully Converted to meet human wants and needs





Domain 3: San Francisco, Shanghai, Kuwait

Gowdy & O'Hara 1997





Also Domain 3:
Standard Row
Crop Agriculture
& Intensive
Silviculture





The Nature Conservancy's Matador Ranch in Montana

Domain 2: Multifunctional Landscapes = "Working Landscapes" (Includes most Novel Ecosystems and the New Ecology)

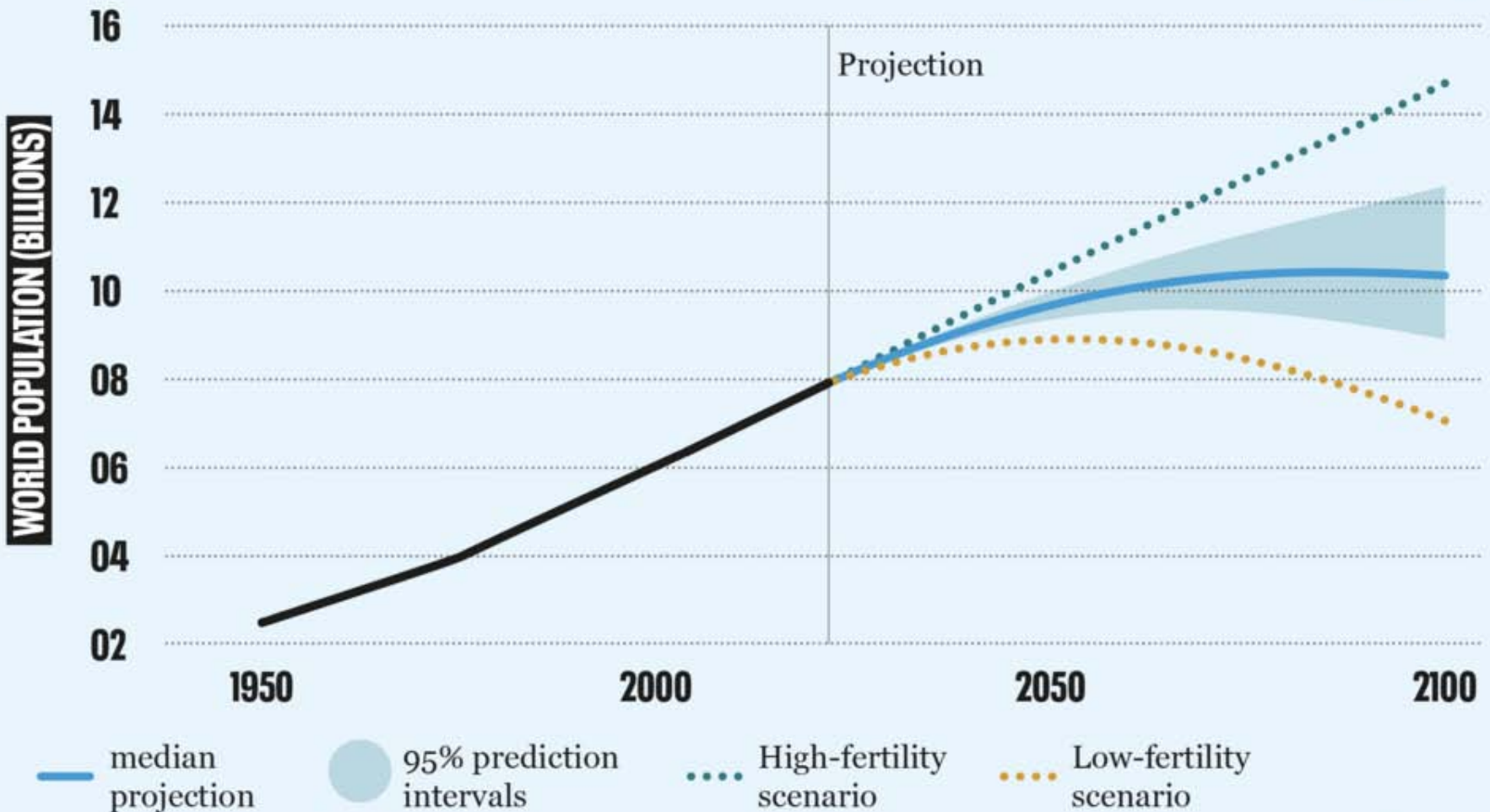


A socio-economic approach to conservation. 60,000 acres and 266,000 acres under voluntary conservation easements with local ranchers

A wide-angle landscape photograph of a mountain range. The foreground is a lush, green grassy field with some small plants and rocks. In the middle ground, a large, rounded mountain peak is covered in dense green forest. The background shows more rolling green hills under a bright blue sky with scattered white clouds. The text "Domain 1 – Round Bald (USDA Forest Service)" is overlaid in the top left corner in a bold, orange font.

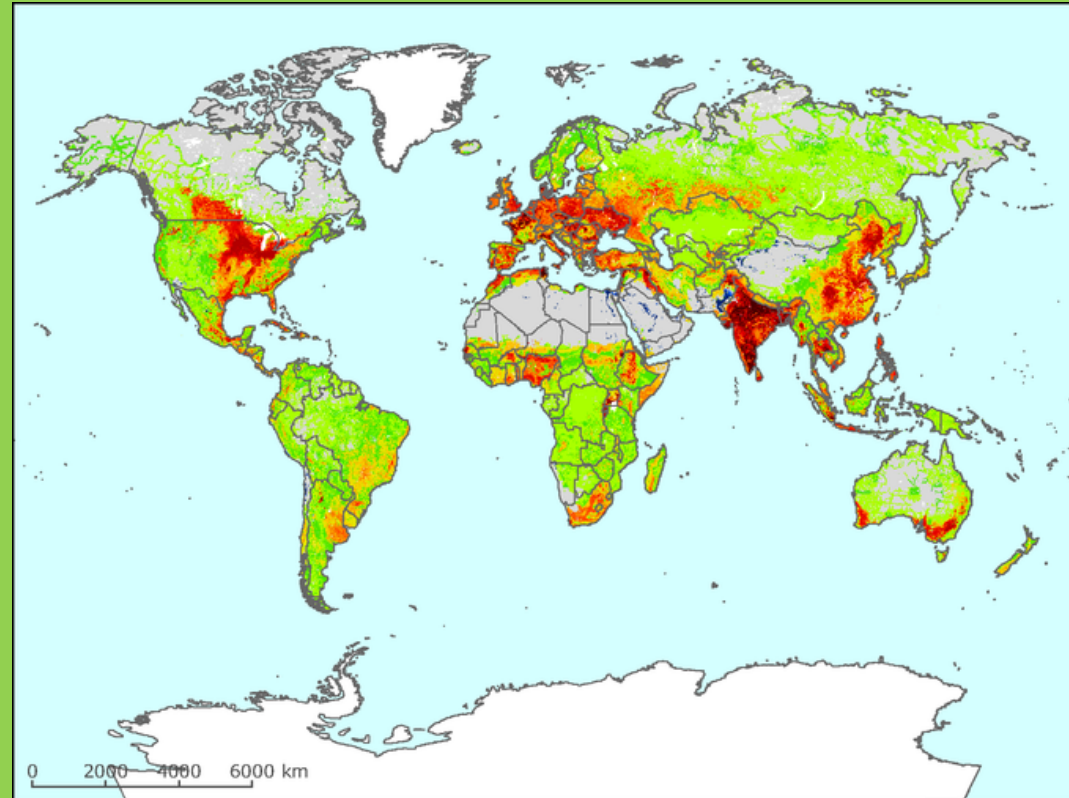
Domain 1 – Round Bald (USDA Forest Service)

UNITED NATIONS POPULATION TO 2100: 95% CERTAINTY RANGE

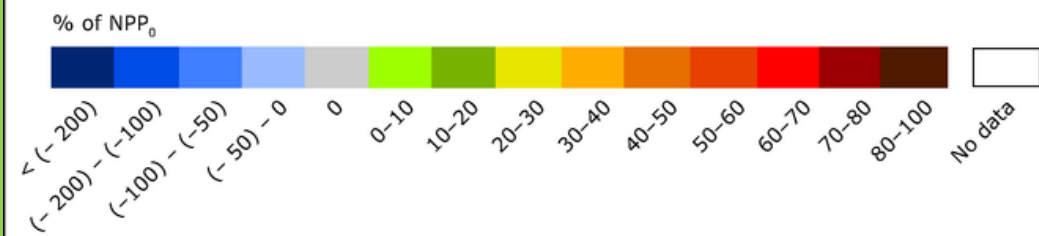


Source: UN, 2022

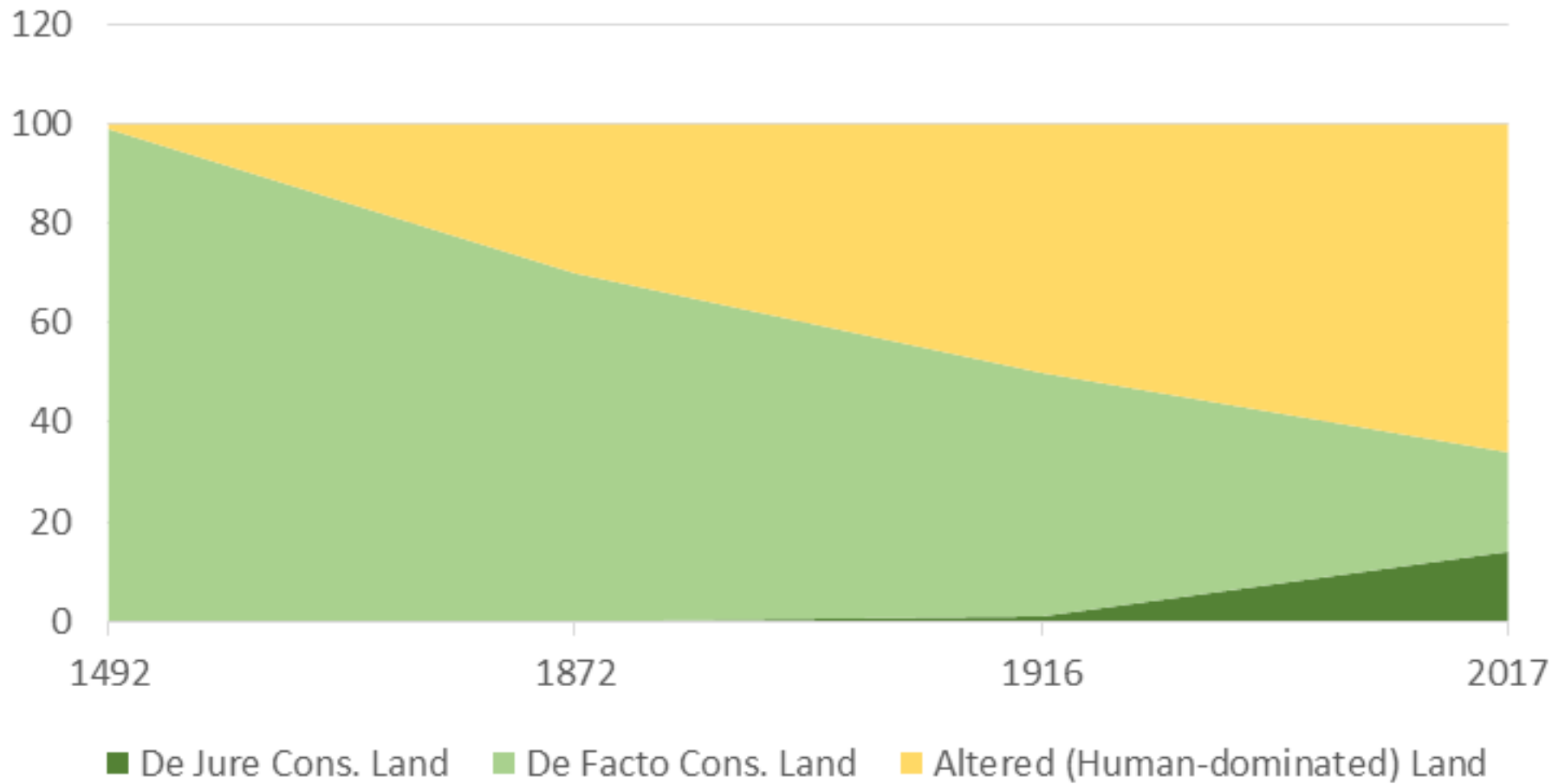
NPP, and space and resources for other species



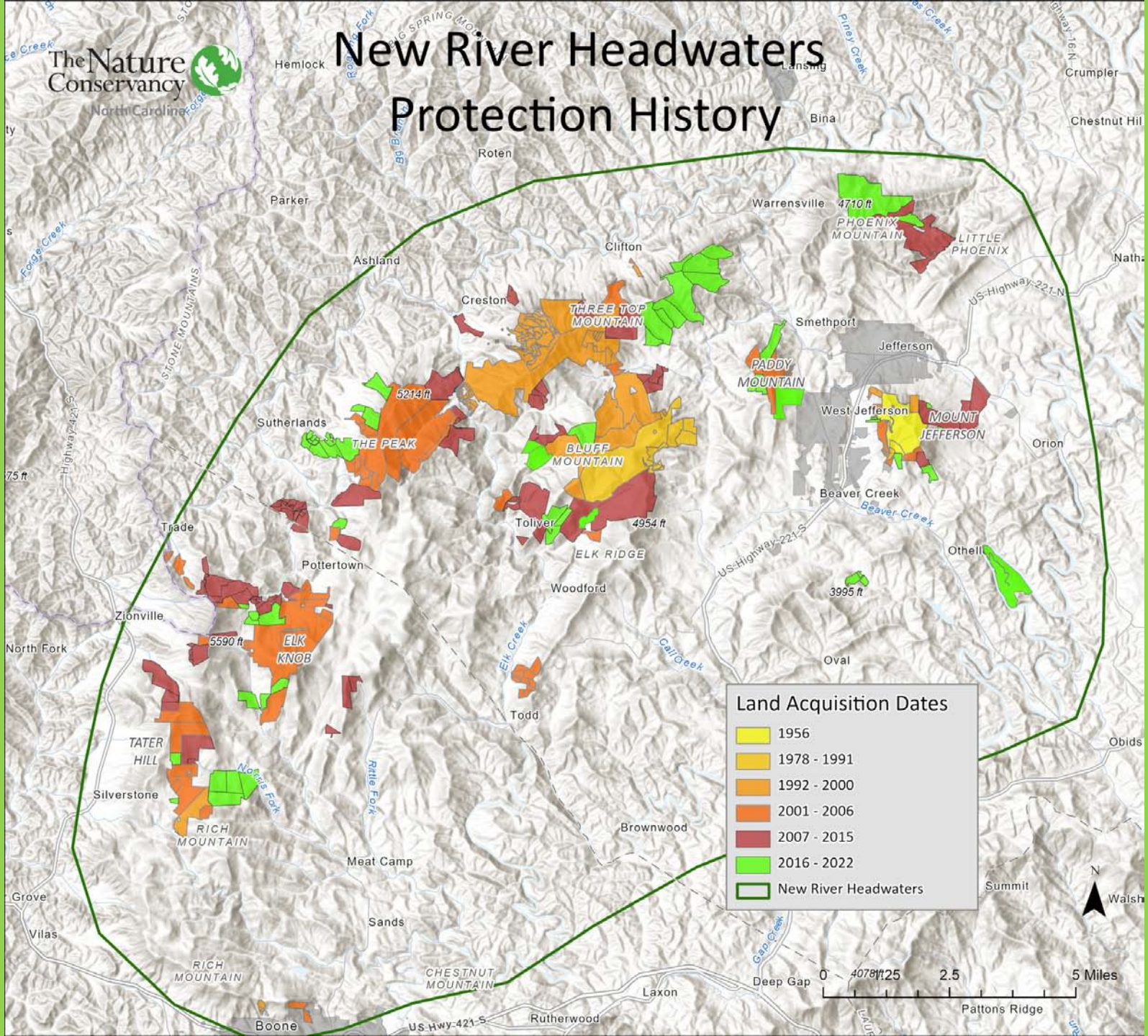
Global human appropriation of potential net primary production (NPP₀)



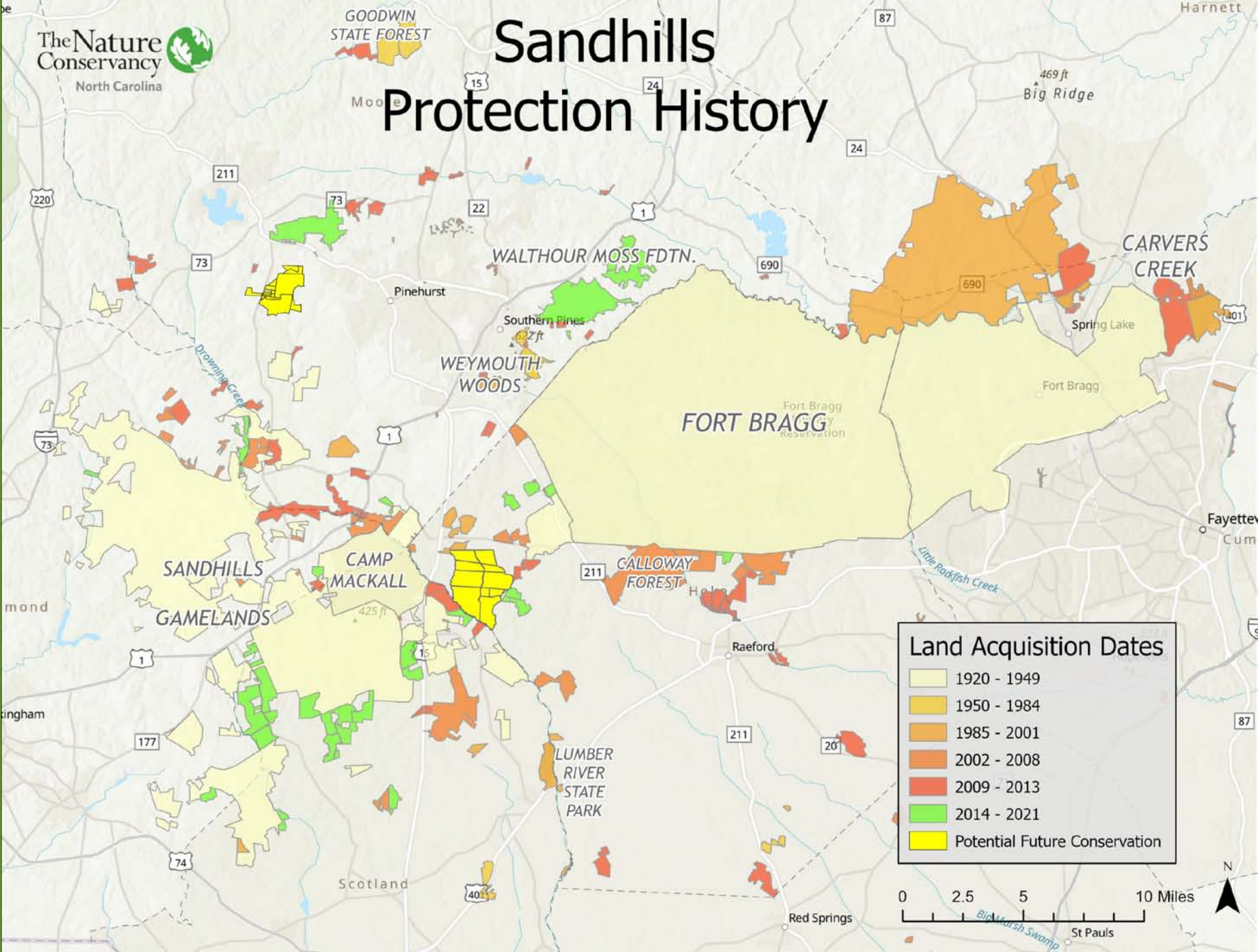
Land Use



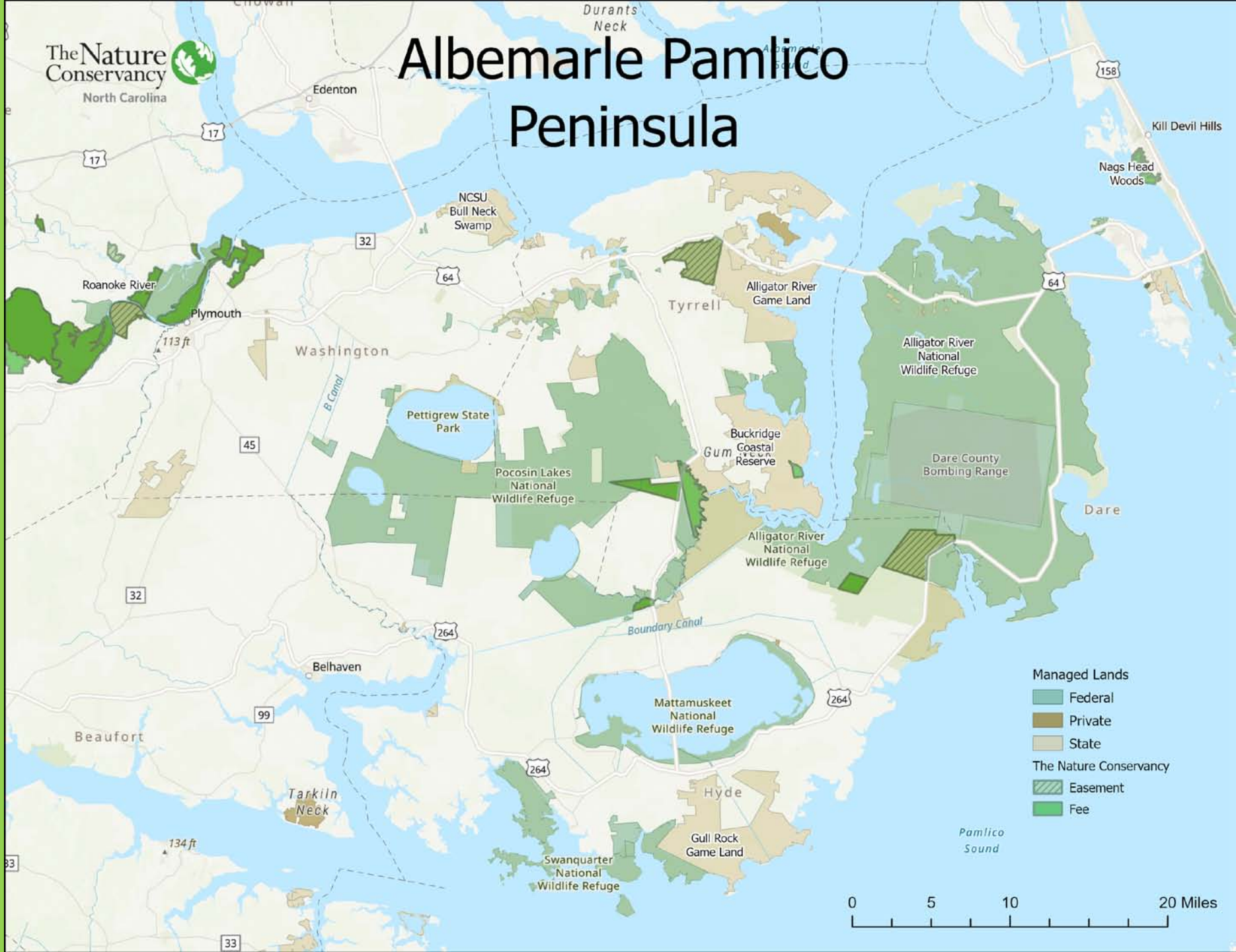
New River Headwaters Protection History



Sandhills Protection History



Albemarle Pamlico Peninsula



- Managed Lands**
- Federal
 - Private
 - State
- The Nature Conservancy**
- Easement
 - Fee





Resilient Diversity

- The ancient lineages of the Southeast's biodiversity
- Where that ancient biota came from, and hope forward
- The evolutionary virtues of habitat archipelagos in deep time (why natural fragmentation can be good and why we can work with recent human fragmentation)
- The urgency of naming new species (taxonomic research) change the agenda! We can't conserve what we don't know exists...
- Important biodiversity is all around us: the remnants we drive past every day and do not even see – roadsides and powerlines are nodes to expand from
- Patch habitats as biodiversity bombs left scattered over the landscape – a landscape prepared for any future possibility (because it has been shaped by every past possibility)
- Resilient and diverse people can do resilient and diverse conservation!











