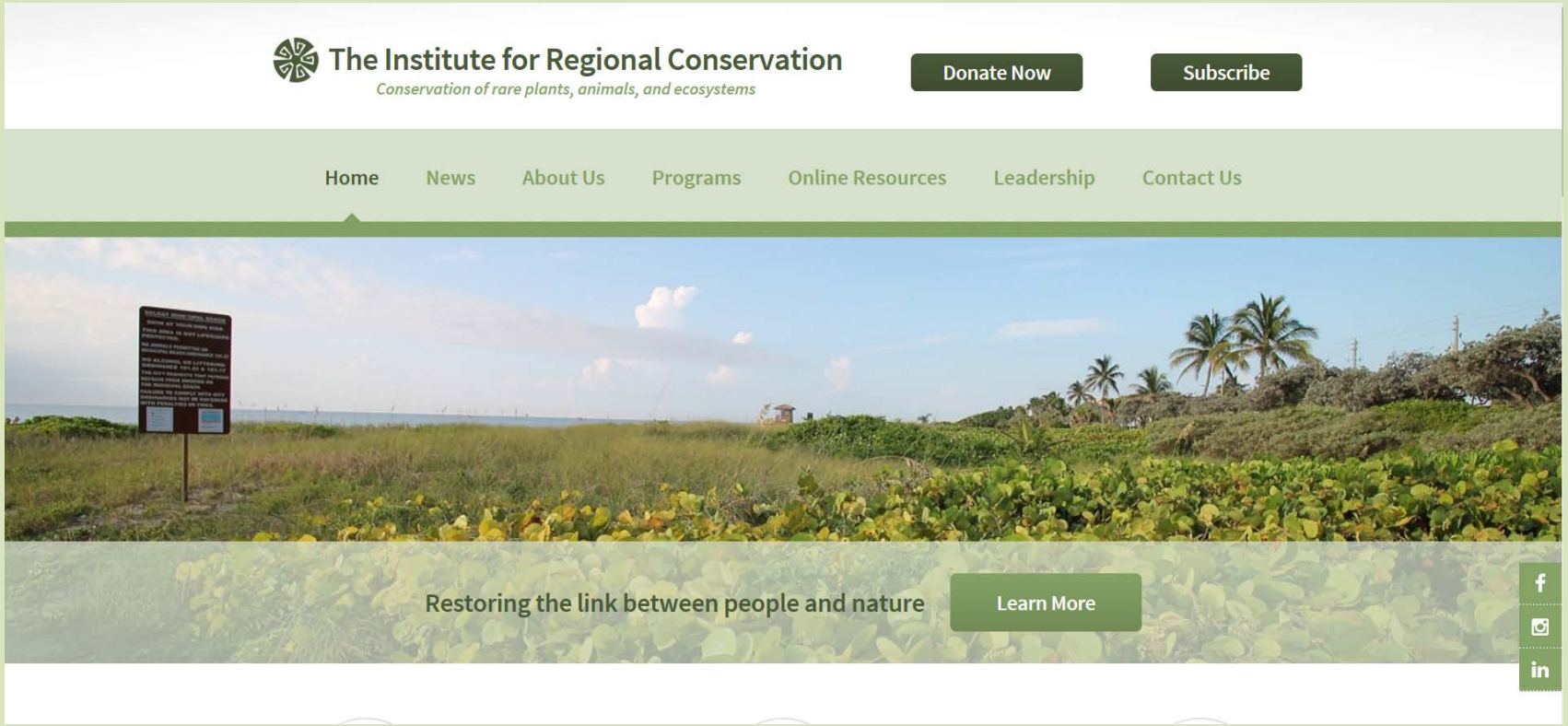
Native Plant Species and Ecosystems
Are Some Native Plants in Danger of Regional Extinction?

NatureScape Meeting, Broward County Florida
September 18, 2018

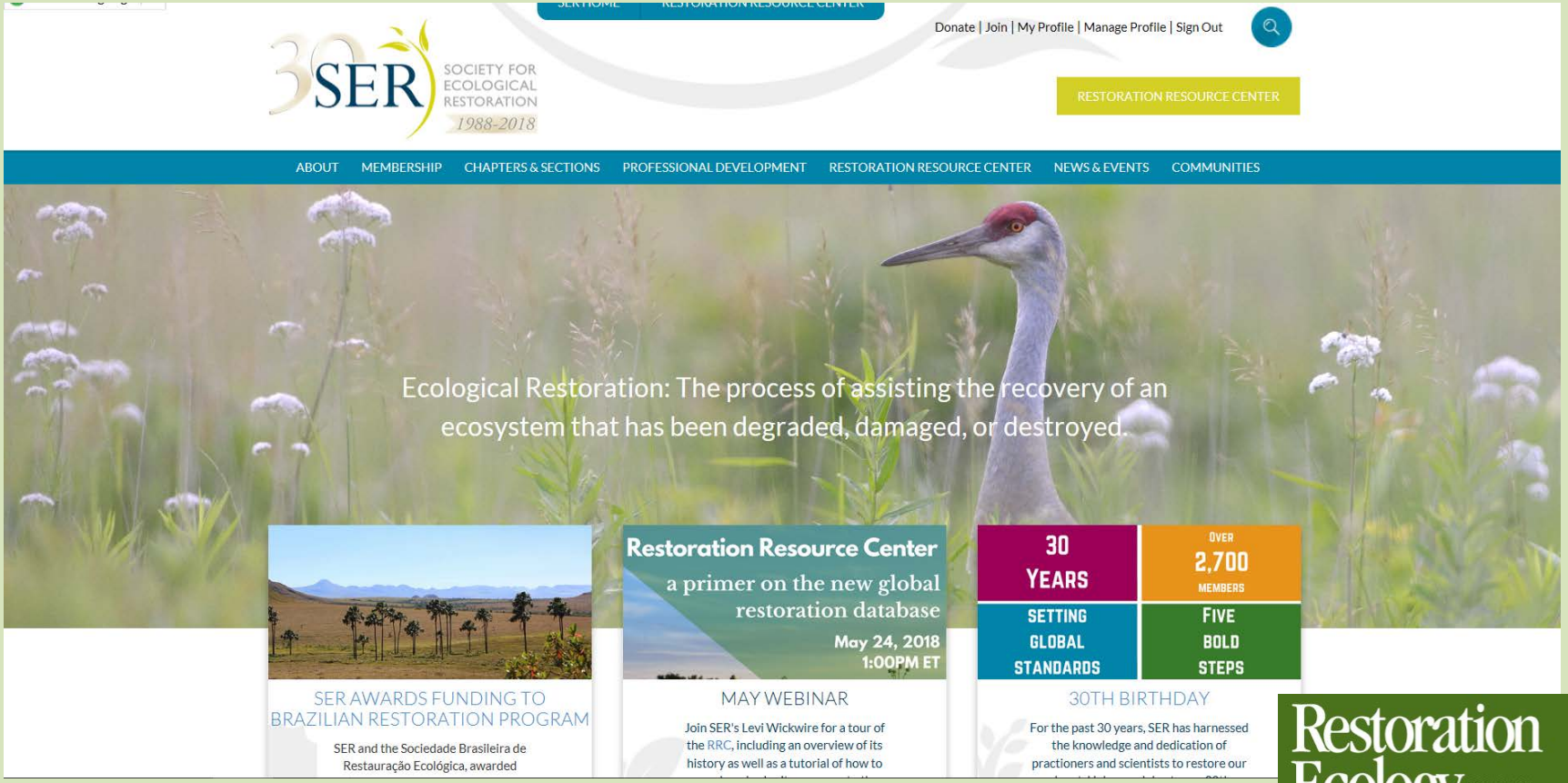
SER SOCIETY FOR ECOLOGICAL RESTORATION

George D. Gann
www.regionalconservation.org
www.ser.org

Institute for Regional Conservation

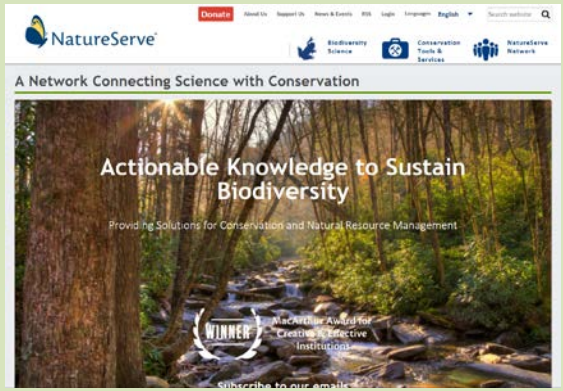


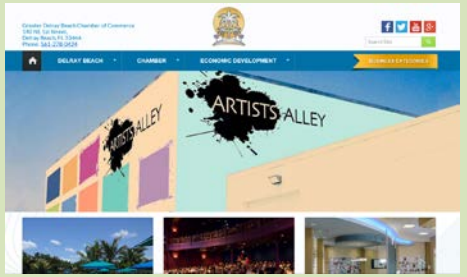
Rather than focusing on charismatic animals or plants with narrow global ranges, IRC seeks to protect, restore and manage all biodiversity on a regional basis, and to **prevent regional extinctions of rare plants, animals and ecosystems**. All conservation is ultimately local.



SER advances the science, practice and policy of ecological restoration to sustain biodiversity, **improve resilience in a changing climate**, and re-establish an ecologically healthy relationship between nature and culture. All conservation is also global.

Collaborate, Collaborate, Collaborate!



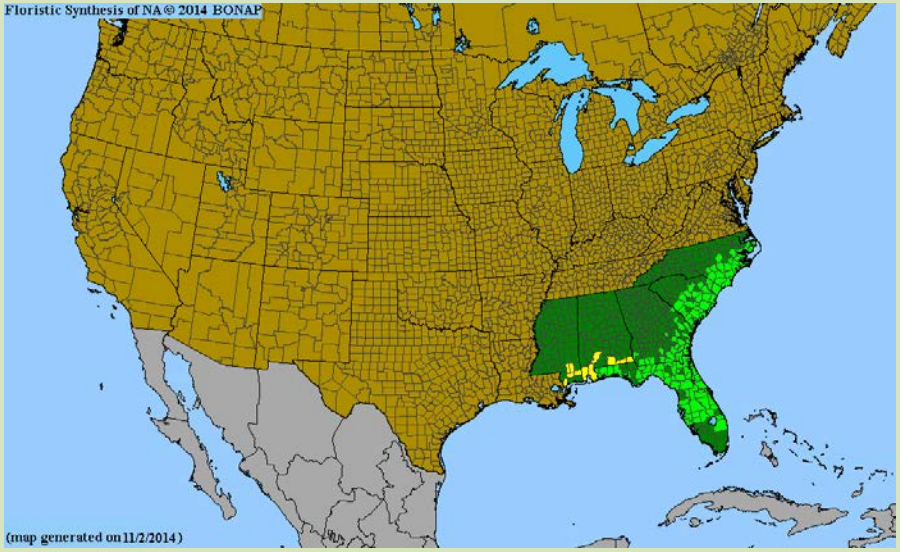


My Objective is to accomplish 3 things

- **Review** what we know about plant conservation and extinctions in Broward County.
- **Explore** the potential direct and indirect effects of climate change, and what that means for the remaining ecological and botanical resources in Broward County**.**
- Have a **conversation** about things we can do to move forward in a positive and meaningful way.

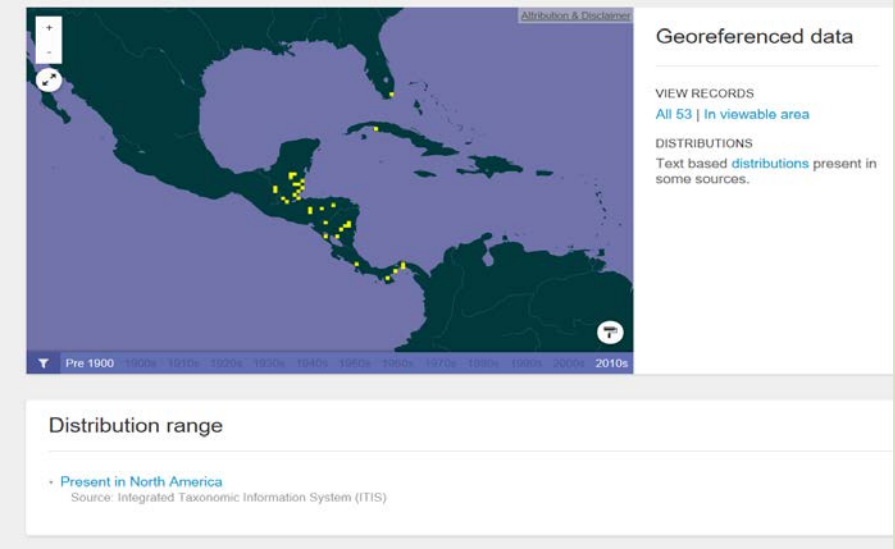
- Photographers: Keith Bradley, Richard Brownscombe, Dennis de Zeeuw, George Gann, Shirley Denton, Roger Hammer, Jimmy Lange

South & North Range Limits in South Florida



Gordonia lasianthus (BONAP.org)

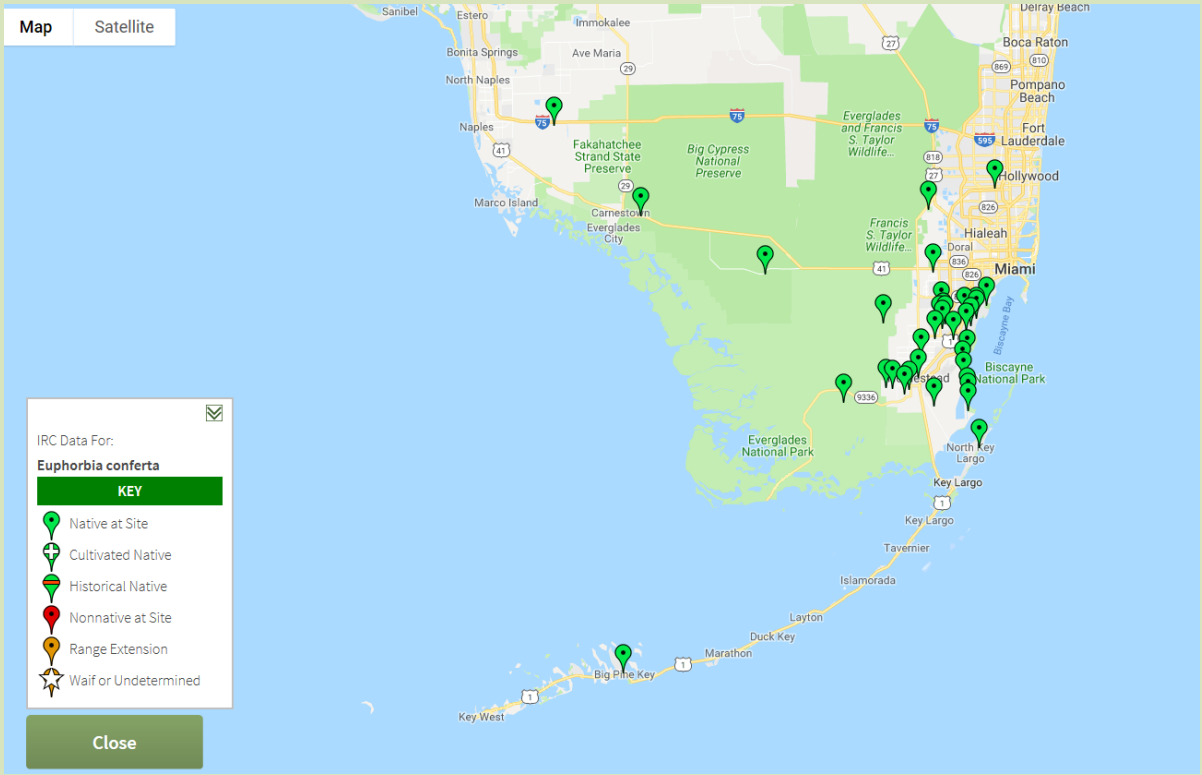
K. Bradley



Oncidium ensatum (GBIF.org)

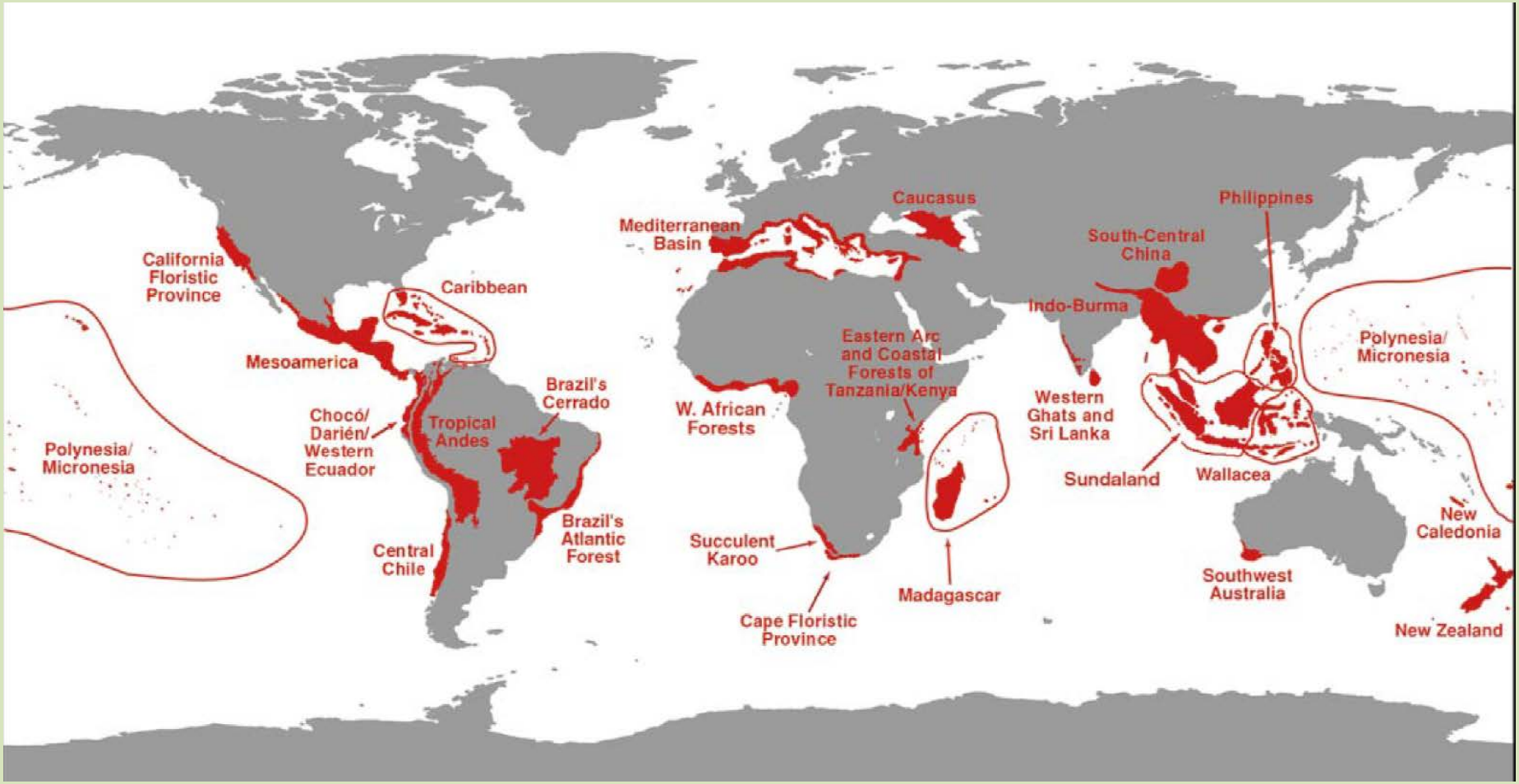
C. McCartney

Euphorbia conferta
(*Chamaesyce conferta*)

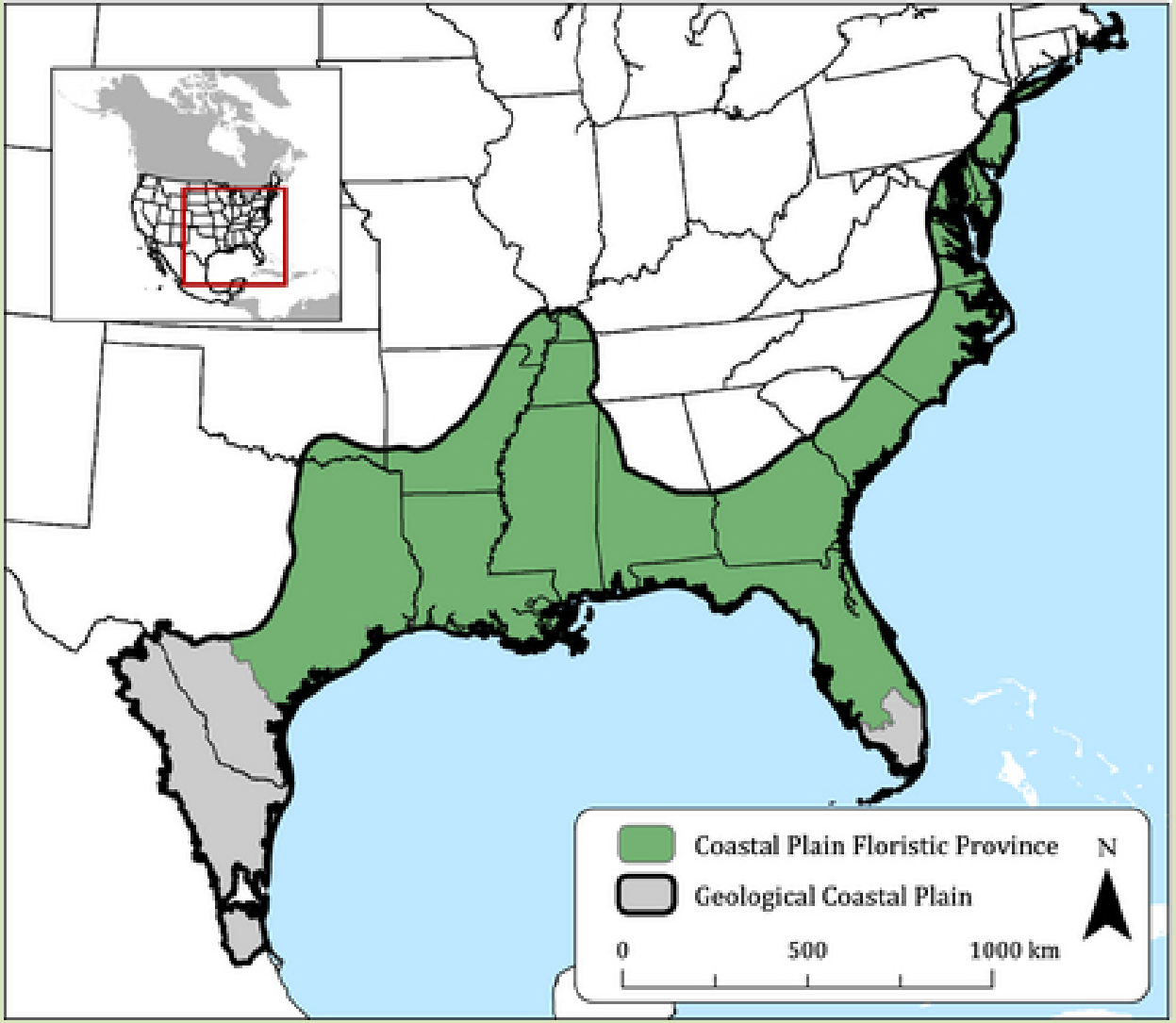


South Florida and Florida Endemics, >110 taxa in South Florida, of which >30 have been recorded in Broward County

Conservation Geography of South Florida

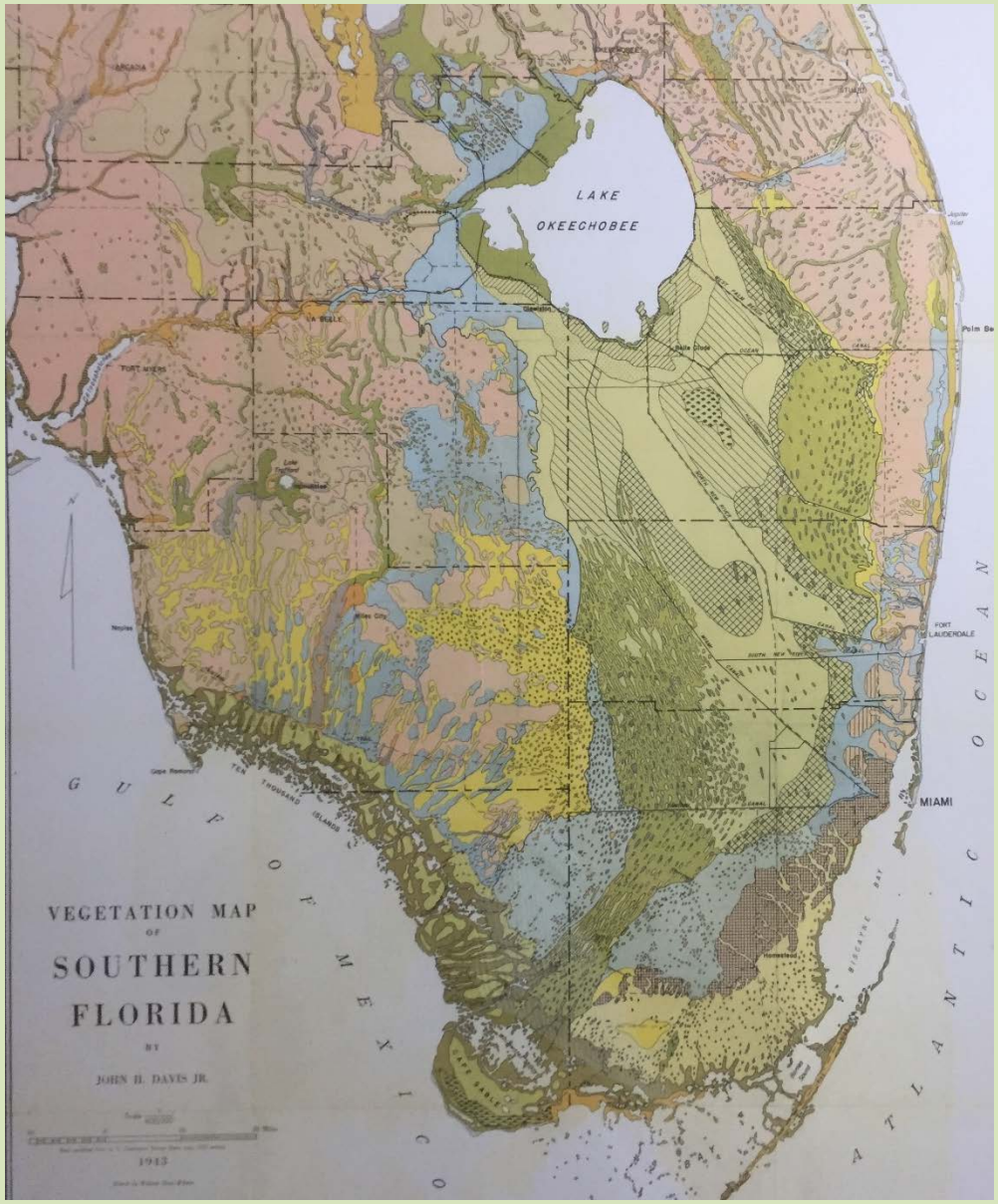


From: Myers et al. 2000. Biodiversity Hotspots for Conservation Priorities. Nature. 44% of plants and 35% of vertebrate animals in 25 hotspots covering 1.4% of global land area.

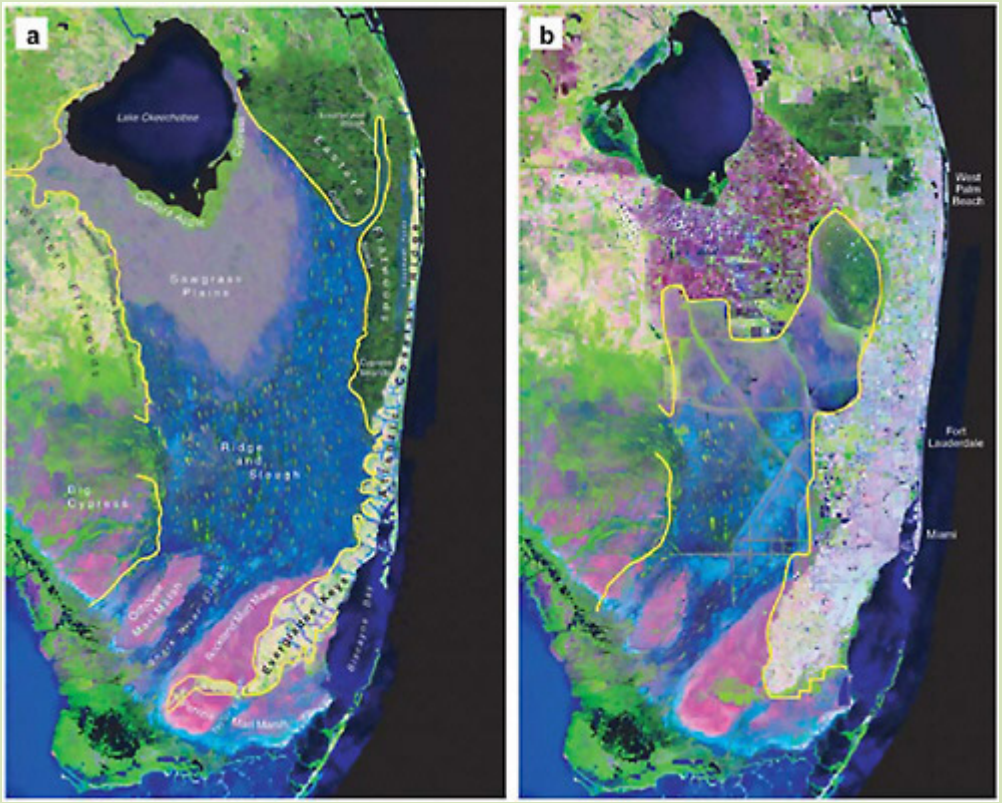


North American Coastal Plain Global Hotspot

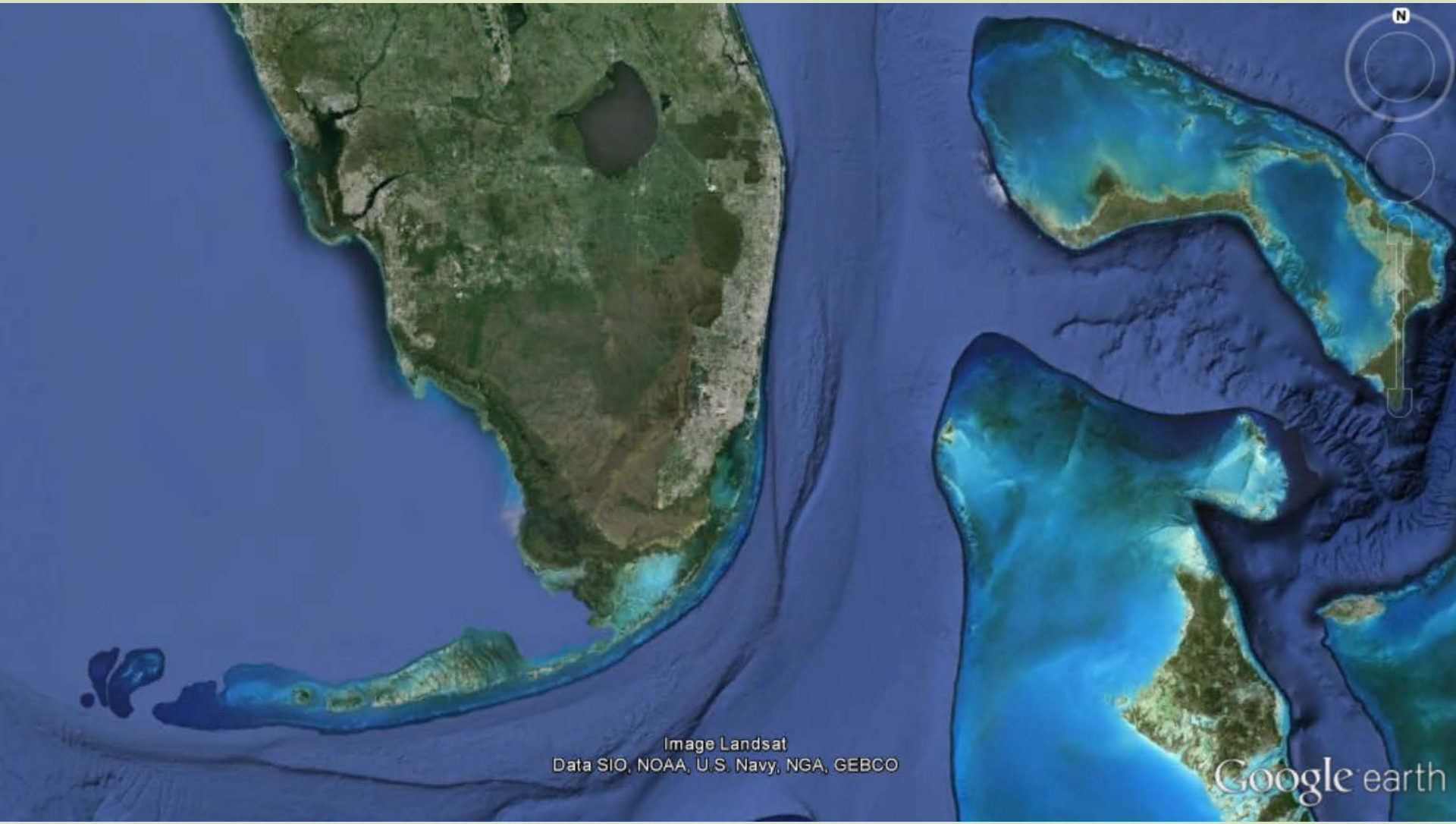
Noss et al. 2014


LAKE
OKEECHOBEE
MIAMI
VEGETATION MAP
OF
SOUTHERN
FLORIDA
BY
JOHN H. DAVIS JR.
1943
GULF OF MEXICO
ATLANTIC OCEAN

Davis, 1943



- Everglades transformation
- Coastal development & erosion
- Destruction of critical upland habitat in the interior

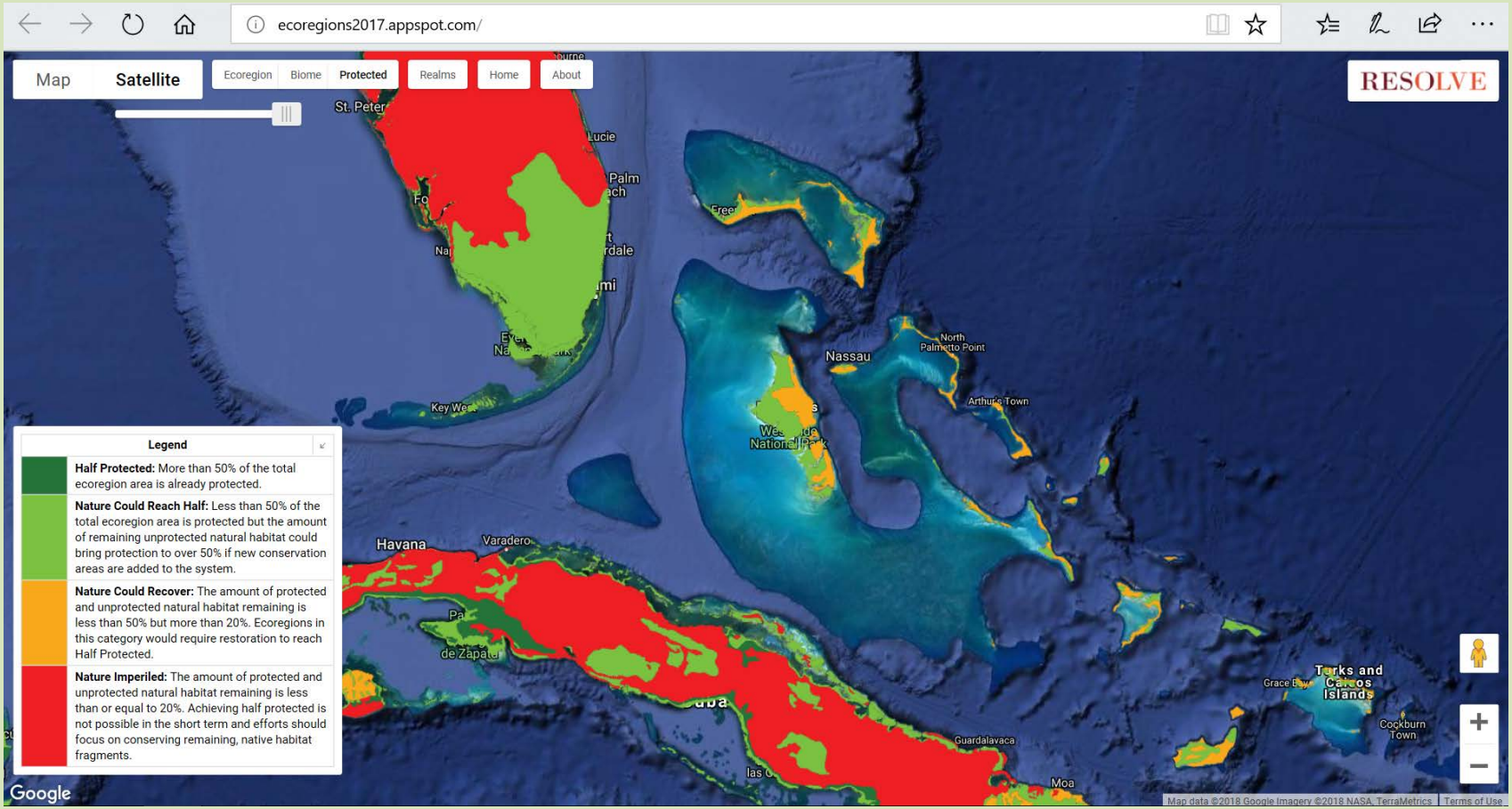


What we have to work with

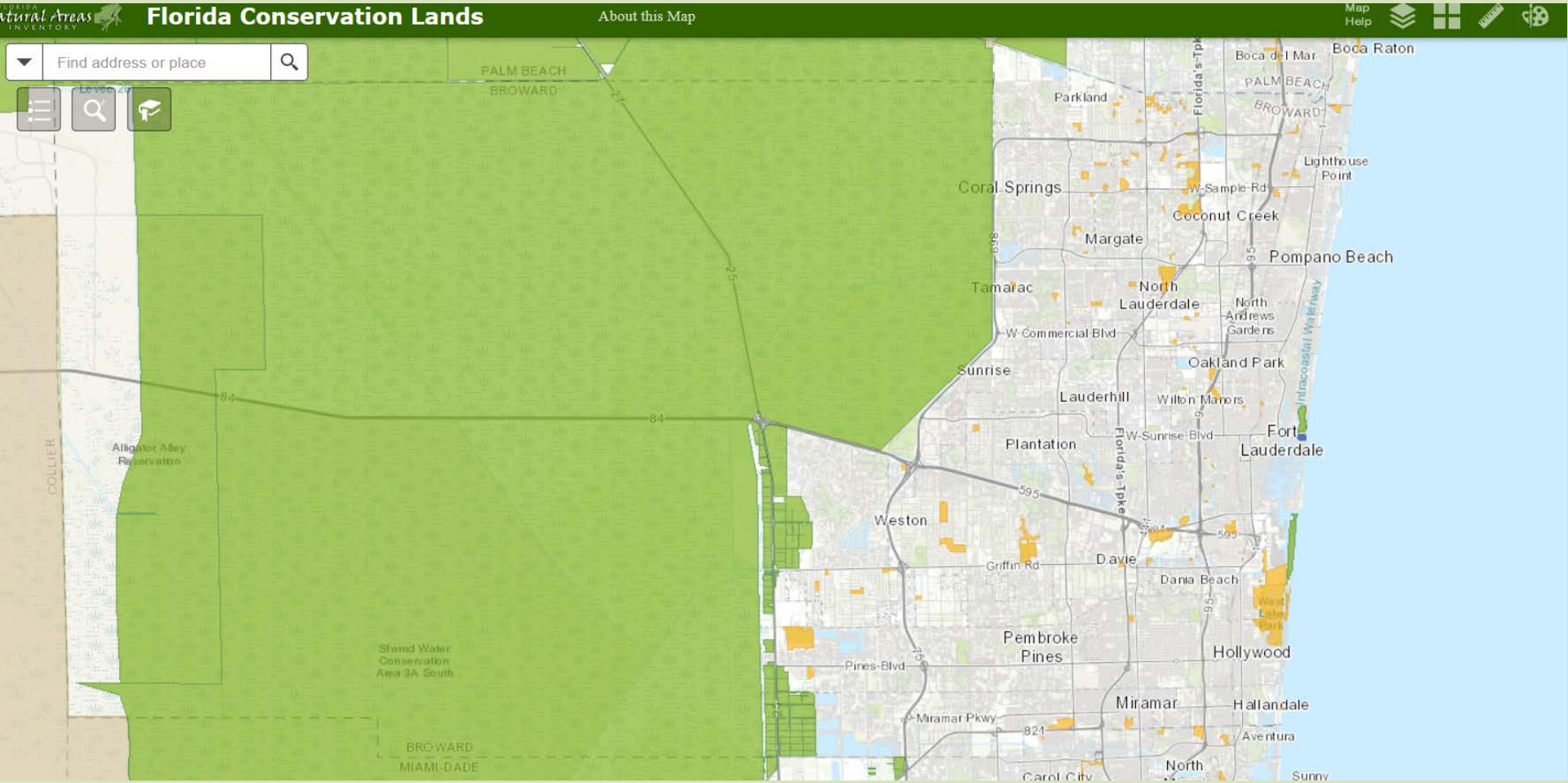
>50% of region in conservation; CBD 2020 Protected Areas Target = 17%.

Nature Needs Half

846 Ecoregions, Protect 50% by 2050

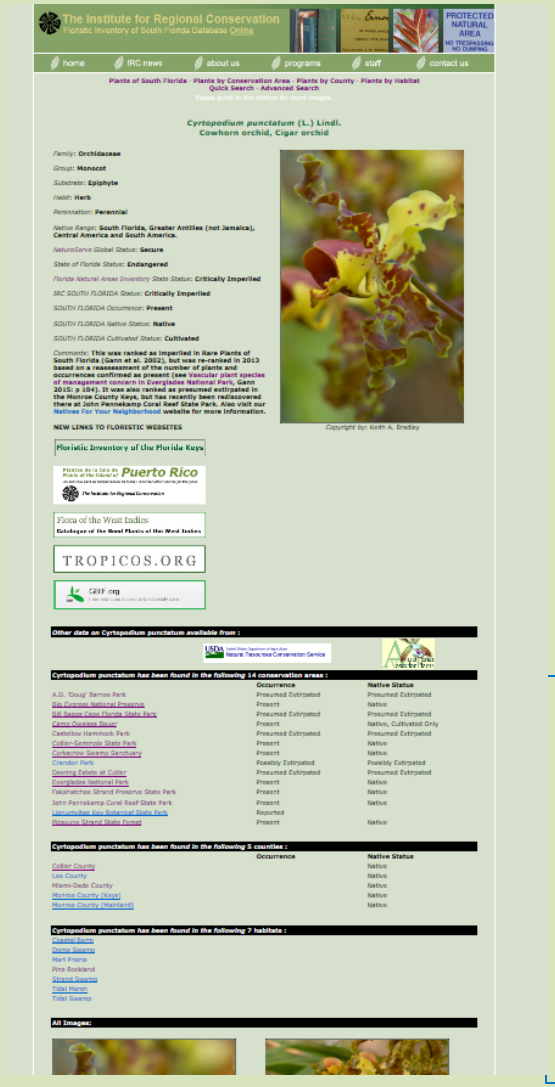


Conservation lands along the Atlantic Coastal Strip are few and scattered



Broward County Conservation Areas

The Floristic Inventory of South Florida
1995 – present


The Institute for Regional Conservation
Florida Inventory of South Florida Database Online

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Plants of South Florida · Plants by Conservation Area · Plants by County · Plants by Habitat
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Cyrtopodium punctatum (L.) Lindl.
Cowhorn orchid, Cigar orchid

Family: Orchidaceae
Group: Monocot
Substrate: Epiphyte
Habit: Herb
Perennation: Perennial
Native Range: South Florida, Greater Antilles (not Jamaica), Central America and South America.
NatureServe Global Status: Secure
State of Florida Status: Endangered
Florida Natural Areas Inventory State Status: Critically Imperiled
IRC SOUTH FLORIDA Status: Critically Imperiled
SOUTH FLORIDA Occurrence: Present
SOUTH FLORIDA Native Status: Native
SOUTH FLORIDA Cultivated Status: Cultivated
Comments: This was ranked as imperiled in Rare Plants of South Florida (Gann et al. 2002), but was re-ranked in 2013 based on a reassessment of the number of plants and occurrences confirmed as present (see Vascular plant species of management concern in Everglades National Park, Gann 2015: p 104). It was also ranked as presumed extirpated in the Monroe County Keys, but has recently been rediscovered there at John Pennekamp Coral Reef State Park. Also visit our Natives For Your Neighborhood website for more information.

Copyright by: Keith A. Bradley

NEW LINKS TO FLORISTIC WEBSITES

Floristic Inventory of the Florida Keys
Puerto Rico
Flora of the West Indies
TROPICOS.ORG

Other data on Cyrtopodium punctatum available from :

Cyrtopodium punctatum has been found in the following 14 conservation areas :

	Occurrence	Native Status
A.D. 'Doug' Barnes Park	Presumed Extirpated	Presumed Extirpated
Big Cypress National Preserve	Present	Native
Bill Baggs Cape Florida State Park	Presumed Extirpated	Presumed Extirpated
Camp Owaissa Bauer	Present	Native, Cultivated Only
Castellow Hammock Park	Presumed Extirpated	Presumed Extirpated
Collier-Seminole State Park	Present	Native
Corkscrew Swamp Sanctuary	Present	Native
Crandon Park	Possibly Extirpated	Possibly Extirpated
Deering Estate at Cutler	Presumed Extirpated	Presumed Extirpated
Everglades National Park	Present	Native
Fakahatchee Strand Preserve State Park	Present	Native
John Pennekamp Coral Reef State Park	Present	Native
Lignumvitae Key Botanical State Park	Reported	
Royal Palm Hammock	Present	Native

Cyrtopodium punctatum has been found in the following 5 counties :

	Occurrence	Native Status
Collier County		Native
Lee County		Native
Miami-Dade County		Native
Monroe County (Keys)		Native
Monroe County (Mainland)		Native

Cyrtopodium punctatum has been found in the following 7 habitats :

Cypress Swamp
Dome Swamp
Marl Prairie
Pine Rockland
Strand Swamp
Tidal Marsh
Tidal Swamp

All Images:


Castellow Hammock Park

County: **Miami-Dade County**
Size: **114.79** acres
Latitude: **25.55972°** *Longitude:* **-80.45528°**
Section: **17** *Township:* **56** *Range:* **39**
Notes: **Historically spelled as Costello Hammock or Costello's Hammock. For a map and more information click here.**
Managing Agency: **Miami-Dade County Department of Parks and Recreation**

There are 379 taxa reported for Castellow Hammock Park

Group By Family: ☑ Show Results

Scientific Name:	Occurrence:	Native Status:	Introduced Status:	Invasive Status:	Cultivated Status:	Reference:	Voucher:
Acanthaceae							
Barleria cristata	Present	Not Native, Naturalized	Introduced	Potentially Invasive		2772	2772
Ruellia blechum	Present	Not Native, Naturalized	Introduced	Ruderal		14757	
Ruellia simplex	Present	Not Native, Naturalized	Introduced	Potentially Invasive		14757	
Ruellia succulenta	Present	Native	Not Introduced	Native		14757	
Amaranthaceae							
Achyranthes aspera var. aspera	Present	Not Native, Naturalized	Introduced	Ruderal		14757	
Amaranthus spinosus	Present	Not Native, Naturalized	Introduced	Ruderal		14757	
Anacardiaceae							
Mangifera indica	Present	Not Native, Naturalized	Introduced	Invasive		14757	
Metopium toxiferum	Present	Native	Not Introduced	Native		14757	
Rhus copallinum	Present	Native	Not Introduced	Native		14757	
Schinus terebinthifolius	Present	Not Native, Naturalized	Introduced	Invasive		14757	
Toxicodendron radicans	Present	Native	Not Introduced	Native		14757	
Anemiaceae							
Anemia adiantifolia	Present	Native	Not Introduced	Native		14757	
Annonaceae							
Annona glabra	Present	Native	Not Introduced	Native		14757	
Apiaceae							
Cyclospermum leptophyllum	Present	Not Native, Naturalized	Introduced	Ruderal		14757	
Apocynaceae							
Angadenia berteroi	Present	Native	Not Introduced	Native		14761	
Asclepias curassavica	Present	Not Native, Naturalized	Introduced	Invasive		14757	
Asclepias viridis	Present	Native	Not Introduced	Native		14761	
Catharanthus roseus	Present	Not Native, Naturalized	Introduced	Ruderal		14756	
Echites umbellatus	Present	Native	Not Introduced	Native		14757	
Metastelma scoparium	Present	Native	Not Introduced	Native		14757	
Aquifoliaceae							
Ilex cassine	Present	Native	Not Introduced	Native		14757	
Ilex krugiana	Present	Native	Not Introduced	Native		14757	
Araceae							
Epipremnum pinnatum	Present	Not Native, Cultivated Only	Not Introduced				
Epipremnum pinnatum cv. Aureum	Present	Not Native, Naturalized	Introduced	Invasive		14757	
Monstera deliciosa	Present	Not Native, Cultivated Only	Not Introduced	Cultivated Only	Cultivated	14756	

SOME QUESTIONS

- Are very small, fragmented conservation areas important?
- How well does the current conservation system protect rare vascular plants?
- Have there been regional extirpations?

South Florida

The Floristic Inventory of South Florida

Conservation of rare plants, animals, and ecosystems

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Plants of South Florida · Plants by Conservation Area · Plants by County · Plants by Habitat

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Please scroll to the bottom for more images.

Eryngium aromaticum **Baldwin**

Fragrant eryngium, Fragrant Eryngo

***Family*:** Apiaceae

***Group*:** Dicot

***Substrate*:** Terrestrial

***Habit*:** Herb

***Perennation*:** Perennial

***Native Range*:** Southeastern United States.

Map of select IRC data for peninsular Florida

***IRC SOUTH FLORIDA Status*:** Rare

***SOUTH FLORIDA Occurrence*:** Present

***SOUTH FLORIDA Native Status*:** Native

***SOUTH FLORIDA Cultivated Status*:** Cultivated

***Comments*:** Visit our **Natives For Your Neighborhood** website for more information and images.

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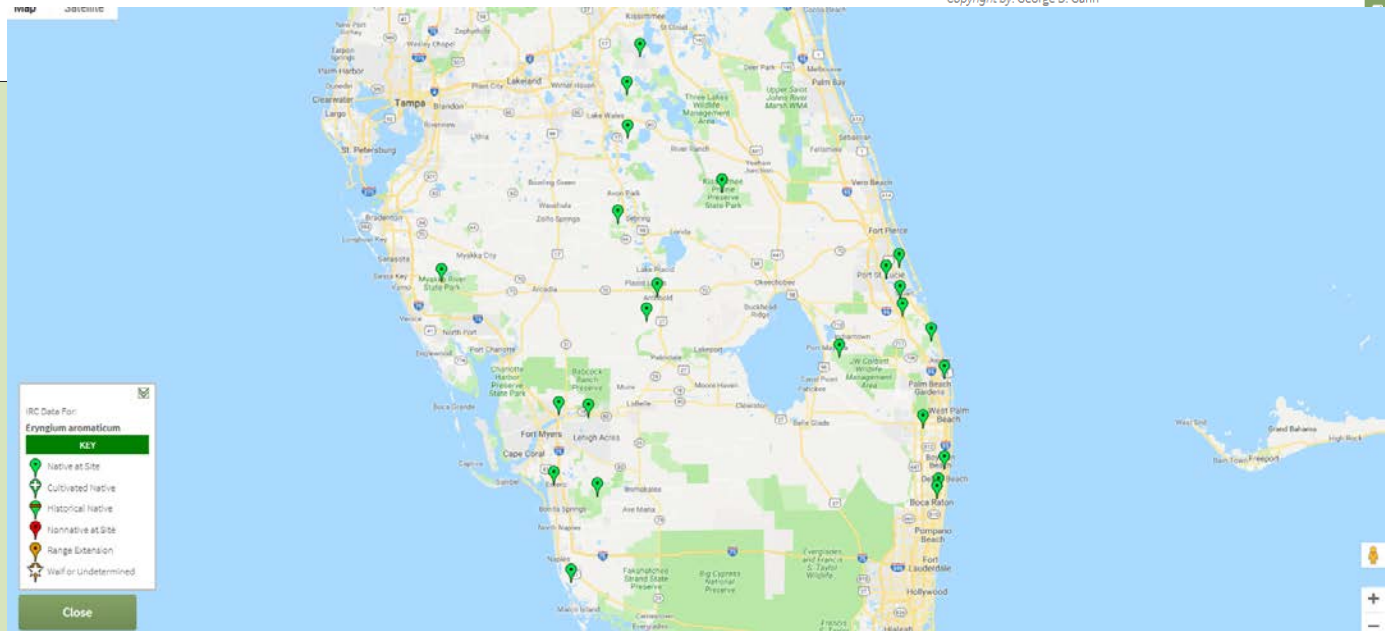
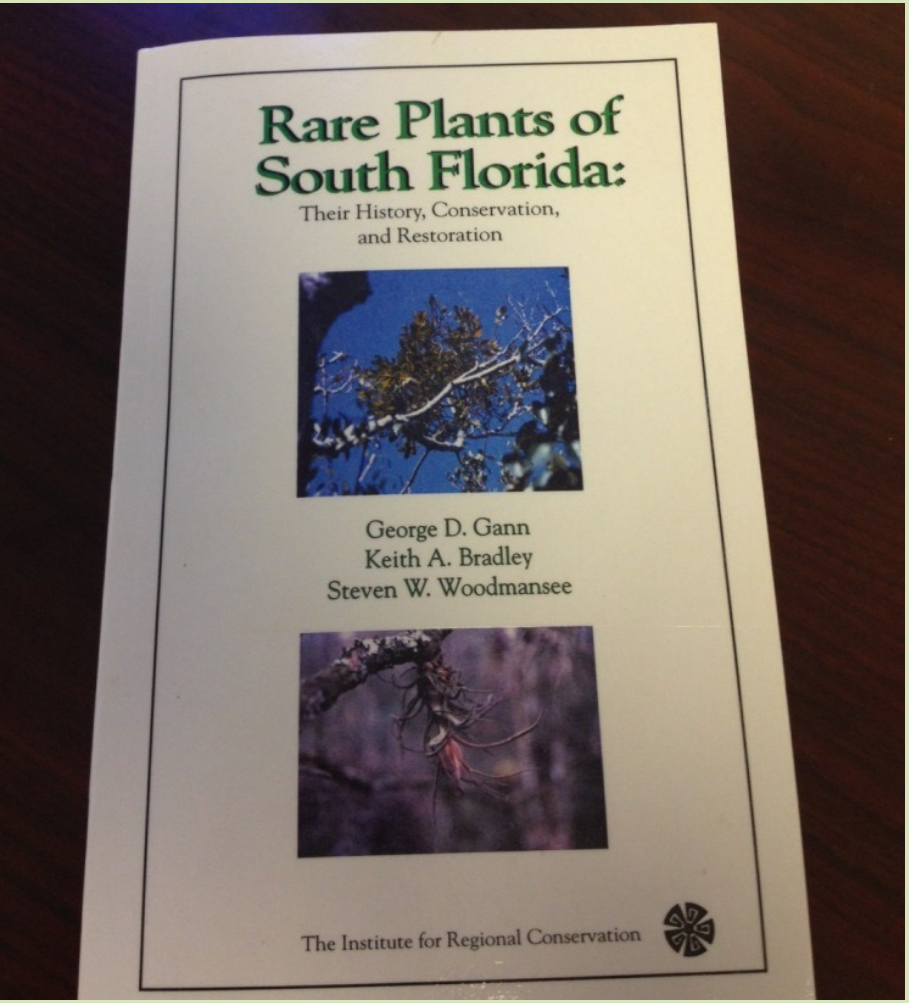


Online since 2001

>400 Conservation Areas

>2500 Species

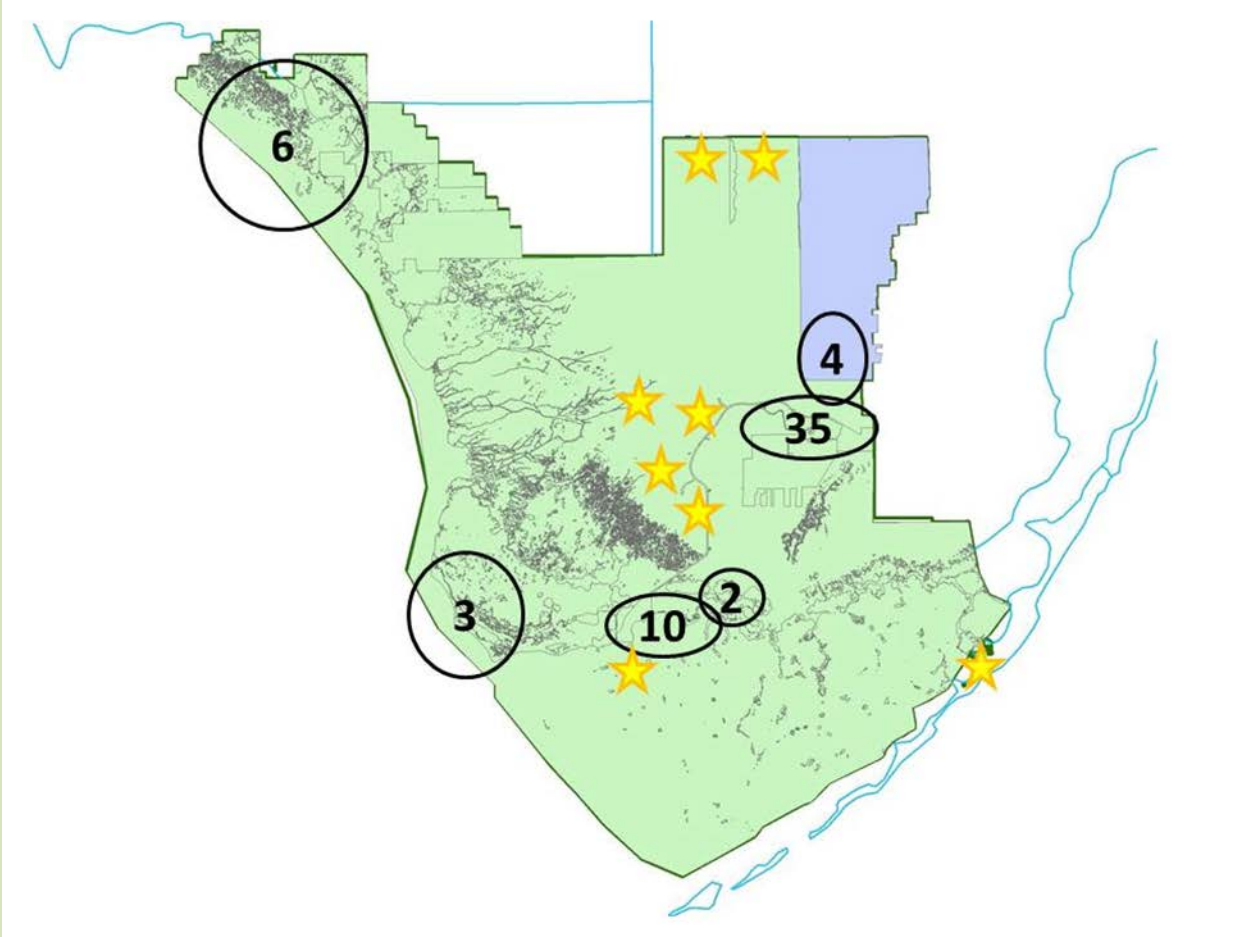
2002



Rare Plants of South Florida published

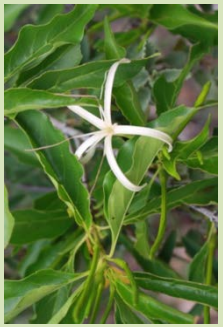
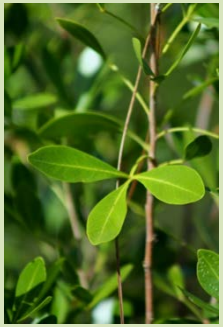
- About 1,435 native plant taxa in South Florida.
- About 1/4 either critically imperiled or possibly extirpated (the super rare). Only 1/4 were thought to be secure. About 8% were reported as possibly extirpated.
- The importance of both large and small conservation areas were documented.
- Patterns of rarity were explored (Pteridophytes, epiphytes, tropical plants)

Confirmed or hypothesized locations of SOMCs in Everglades National Park



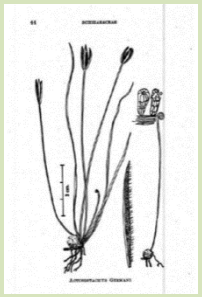
About 2/3 of SOMCs are found only in the interior of the park.

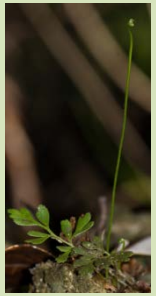
Only 10% of SOMCs are found exclusively in wetlands.

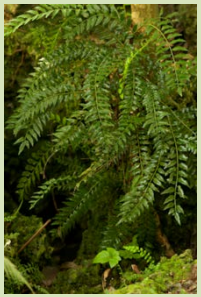







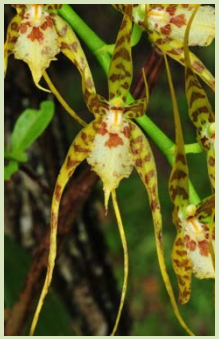














56% of SOMC's occur in hardwood hammocks.

Flora of Broward County

(today's numbers)

731 native taxa
10-20% are likely extirpated already

Working list of 150+ taxa in need of review
****

Extirpations in South Florida
(2002-present)
6%, slight increase expected

Extirpations in Florida Keys
(2007-present)
13%, likely to go up


Bidens laevis


Pleopeltis astrolepis


Calopogon multiflorus


Carya floridana

Two South Florida Extirpations

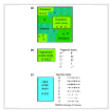
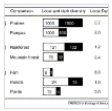
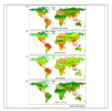
Quercus x *succulenta* (*Q. geminata* x *Q. minima*). Collected once in 1903 by John Kunkel Small and Joel J. Carter in a pineland in Fort Lauderdale (1044, NY).

Discovered in Sarasota County in 2008 by Alan Franck.

Pleopeltis astrolepis. Discovered by Dan Austin in Parkland in 1976, but extirpated by 1986.

Outline

Figures (3)

Trends in Ecology & Evolution

Volume 26, Issue 3, March 2011, Pages 124-128

Opinion

Dark diversity: shedding light on absent species

Meelis Pärtel ✉, Robert Szava-Kovats, Martin Zobel

https://doi.org/10.1016/j.tree.2010.12.004

Ecological theory and nature conservation have traditionally relied solely on observed local diversity. In this review, we recommend including those species that are absent from an ecosystem but which belong to its species pool; that is, all species in the region that can potentially inhabit those particular ecological conditions. We call the set of absent species 'dark diversity'. Relating local and dark diversities enables biodiversity comparisons between regions, ecosystems and taxonomic groups, and the evaluation of the roles of local and regional processes in ecological communities. Dark diversity can also be used to counteract biodiversity loss and to estimate the restoration potential of ecosystems. We illustrate the dark diversity concept by globally mapping plant dark diversity and the local:dark diversity ratio.

- Conservation has traditionally relied solely on observed local diversity.
- Species that are absent from an ecosystem but which belong to its species pool are called 'dark diversity'.
- Recognizing local and dark diversities enables biodiversity comparisons between regions, ecosystems and taxonomic groups.
- Dark diversity can also be used to counteract biodiversity loss and to estimate the restoration potential of ecosystems.
- The local:dark diversity ratio can be calculated and can be a useful tool.

An example of Dark Diversity in Broward County

Tephrosia chrysophylla Pursh
Scurf Hoarypea

South Florida Status: Critically imperiled. One occurrence at Jonathan Dickinson State Park.
Taxonomy: Dicotyledon; Fabaceae.
Habit: Perennial terrestrial herb.
Distribution: Native to the southeastern coastal plain. Wunderlin (1998) reports it as frequent in Florida from the northern counties to the central peninsula.
South Florida Distribution: Lee, Martin, and Miami-Dade counties.
South Florida Habitats: Flatwoods and pine rocklands.
Protection Status: Not listed by any agency.
Identification: Taylor (1992) has a color photo.
References: Chapman, 1883; Small, 1933a; Wood, 1949; Isely, 1990; Taylor, 1992; Wunderlin, 1998.
Synonyms: *Cracca carpenteri* Rydb.; *Cracca chapmanii* (Vail) Small; *Cracca chrysophylla* (Pursh) Kuntze.

Historical Context in South Florida: Albert S. Hitchcock collected scurf hoarypea first in 1900 in Fort Myers in Lee County (81, NY). Walter M. Buswell collected it again in Fort Myers in 1930 (s.n., FTG). In 1948, Roy O. Woodbury made the only collection in Miami-Dade County at Cutler (s.n., FTG), in the vicinity of Deering Estate at Cutler and Ludlam Pineland Tract. In 1978, John Popenoe collected scurf hoarypea at Jonathan Dickinson State Park in Martin County (778, FTG), where it is assumed to be extant.

Major Threats: Fire suppression; exotic pest plant invasions.

Comments: *This is a temperate species at the southern end of its range, and it always may have been uncommon in South Florida.*

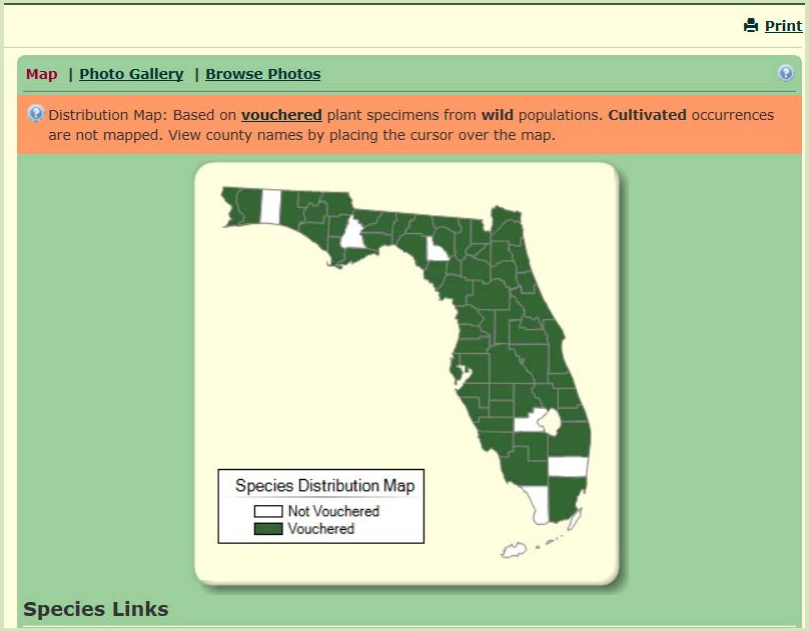
Preliminary recommendations:
- Map and monitor known stations on a regular basis.
- Consider restoring pine rocklands near the Miami River and introducing scurf hoarypea.

Unlike Miami-Dade County and the Florida Keys, **Broward County was not well botanized prior to development.**

The historical species pool was probably much bigger than we realize.

Miramar Pineland area
1963 and today

Thus, new discoveries are to be expected



(more dark diversity)

Spiranthes vernalis, discovered in Broward County by Richard Brownscombe & Chuck McCartney, 2018

Major Causes of Local Species Extinctions in South Florida, Including Broward County

Historically
Habitat destruction
Poaching
Drainage

Now
Invasive species
Fire suppression
Water quantity and quality
Fragmentation effects
(e.g., loss of pollinators,
inbreeding depression,
stochasticity)
Sea level rise

Near Future
Now + Climate change


Sericocarpus tortifolius

Early(er) Climate Change Models 2001-2002

Climatic Change
February 1999, Volume 41, Issue 2, pp 213–248 | Cite as

Predicted Effects of Climatic Change on Distribution of Ecologically Important Native Tree and Shrub Species in Florida

Authors | Authors and affiliations

Elgene O. Box, David W. Crumpacker, E. Dennis Hardin

Article 1 Shares 318 Downloads 39 Citations

Abstract

A previously developed plant species-climatic envelope model was evaluated furth
predict effects of hypothesized climatic change on the potential distribution of 124

Climate Envelope Model to Predict Effects of Warming and Drying Scenarios on Florida Ecosystems

Coauthors:
D. Wilson Crumpacker, Dept. Environmental, Population and Organismic Biology, University of Colorado

Elgene O. Box, Dept. of Geography and Institute of Ecology, University of Georgia

E. Dennis Hardin, FL Dept. Agriculture & Consumer Services, Division of Forestry

E.D. Hardin, 5/2007

Conservation Biology

Implications of Climatic Warming for Conservation of Native Trees and Shrubs in Florida

Implicaciones del Calentamiento Global en la Conservación de Arboles y Arbustos Nativos de Florida

David W. Crumpacker, Elgene O. Box, E. Dennis Hardin

First published: 21 March 2002 | https://doi.org/10.1046/j.1523-1739.2001.0150041008.x | Cited by: 25

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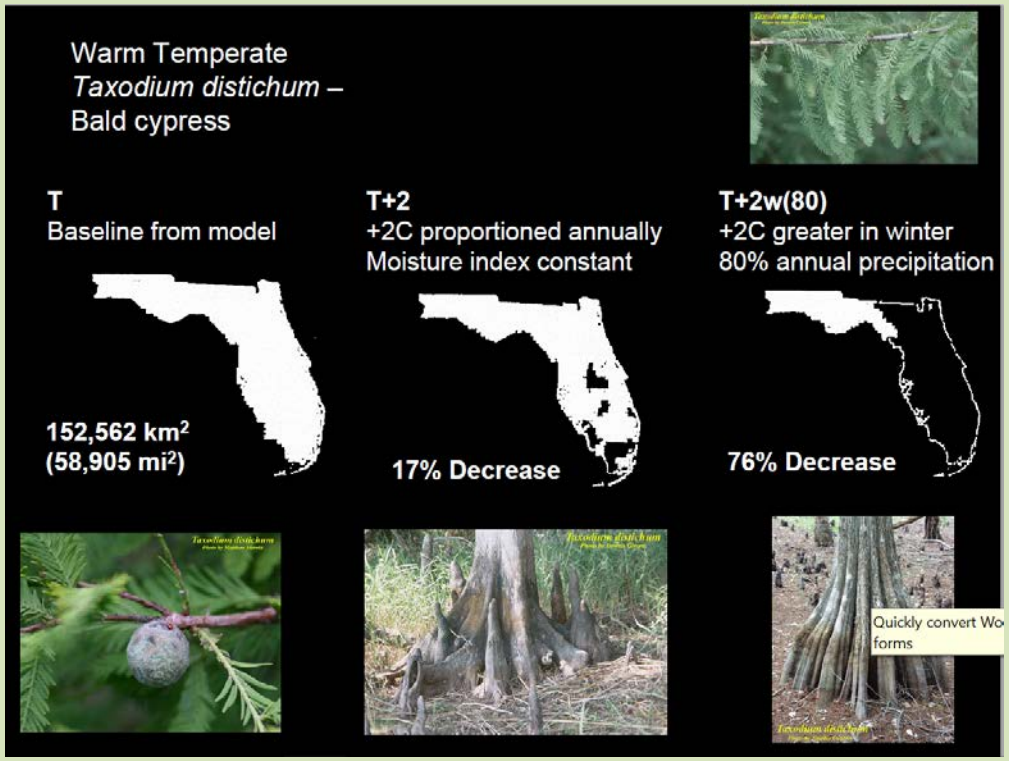
Abstract EN ES

Abstract: Ecological process models and empirical envelope models have been used to relate climatic-change predictions to effects on plant species and vegetation. Climatic-envelope models are useful for simultaneous investigation of many plant species whose range-limiting mechanisms are poorly known. They are most effectively applied in regions with strong temperature and moisture gradients and low relief. Their required databases are often relatively easy to obtain. We provide an example involving the effect of six annual warming scenarios, ranging from +1° C to +2° C and from +10% to −20% annual precipitation (some have greater warming in winter than in summer), on 117 native woody species in Florida (U.S.A.). Tree species at their southern range boundaries

THE FLORIDA PLANT SPECIES - CLIMATIC ENVELOPE MODEL (from Crumpacker et al.)

Winter and summer temperatures, overall moisture balance and dry-season precipitation have important direct and/or indirect effects on the natural distribution of many important native, woody plant species in Florida.

A climate-envelope is the climatic space corresponding to the geographical range of a species (community, type, etc.). The basic assumption is that a species will not grow at a place if the local value of any climatic variable exceeds that used to define its envelope.



So what will fill this space and functional role?

…and tropical species march north

Subtropical

Bursera simaruba – gumbo limbo

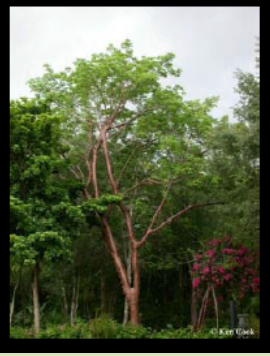
T	T+2	T+2w(80)
Baseline from model	+2C proportioned annually Moisture index constant	+2C greater in winter 80% annual precipitation

39,701 km²
(15,329 mi²)

84% increase

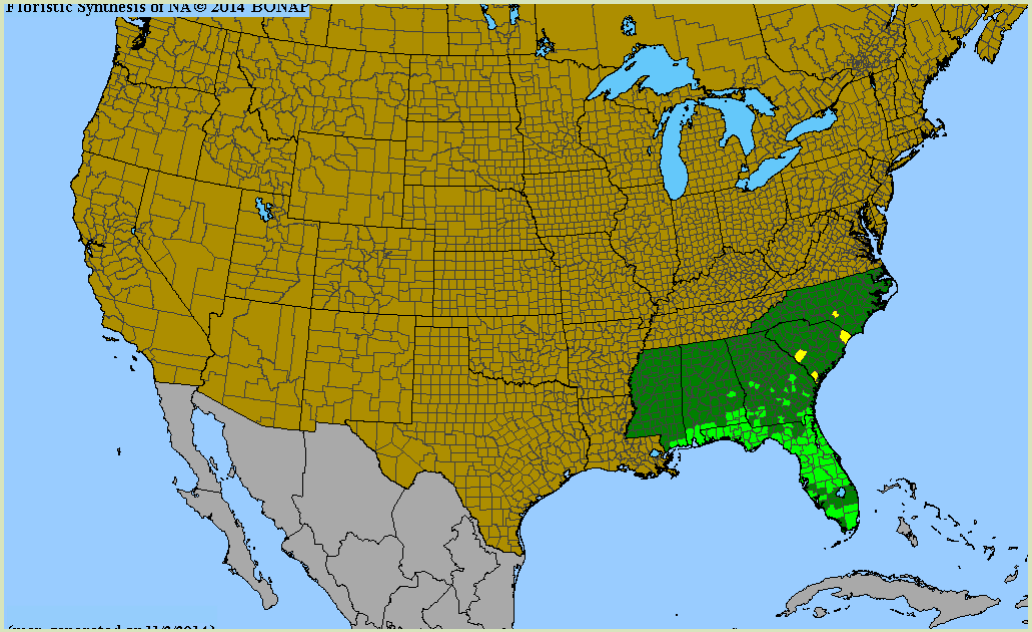
109% increase

not Gumbo-limbo!



In **Rare Plants of South Florida (2002)**, we annotated many species with this message:

“This is a temperate species at the southern end of its range, and may have always been rare in South Florida.” And if just one of two localities were known, we were modest in our recommendations for active restoration.



Polygonella pinicola
(*P. gracilis*)

Without Ecological Restoration to Counter Degradation Extirpations and Extinctions Will Continue

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Restoration Ecology
THE JOURNAL OF THE SOCIETY FOR ECOLOGICAL RESTORATION

Free Access

Ecological Restoration and Global Climate Change

James A. Harris, Richard J. Hobbs, Eric Higgs, James Aronson

First published: 18 May 2006 | https://doi.org/10.1111/j.1526-100X.2006.00136.x | Cited by: 317

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Abstract

There is an increasing consensus that global climate change occurs and that potential changes in climate are likely to have important regional consequences for biota and ecosystems. Ecological restoration, including (re)afforestation and rehabilitation of degraded land, is included in the array of potential human responses to climate change. However, the implications of climate change for the broader practice of ecological restoration must be considered. In particular, the usefulness of historical ecosystem conditions as targets and references must be set against the likelihood that restoring these historic ecosystems is unlikely to be easy, or even possible, in the changed biophysical conditions of the future. We suggest that more consideration and debate needs to be directed at the implications of climate change for restoration practice.

Citing Literature

Major Points Here

- Ecological restoration is included in the array of potential human responses to climate change.
- The usefulness of historical ecosystem conditions as targets and references must be set against the likelihood that restoring these historic ecosystems is unlikely to be easy, or even possible, in the changed biophysical conditions of the future.
- This discussion has only been amplified as time has gone on.

INTERNATIONAL STANDARDS FOR THE PRACTICE OF ECOLOGICAL RESTORATION – INCLUDING PRINCIPLES AND KEY CONCEPTS

FIRST EDITION: December 2016

Tein McDonald, George D. Gann, Justin Jonson, Kingsley W. Dixon

SER SOCIETY FOR ECOLOGICAL RESTORATION

"…adopting a reference ecosystem should not be viewed as an attempt to immobilize an ecological community at some point in time, or to 'turn back the clock'. Rather [it] is to optimize the potential for local species and communities to recover through well-targeted restoration actions and continue to reassemble and evolve in the face of change."

UN BIODIVERSITY CONFERENCE

COP13-COPMOP8-COPMOP2

CANCUN, MEXICO 2016

MAINSTREAMING BIODIVERSITY FOR WELL-BEING

The International Standards is a Living Document

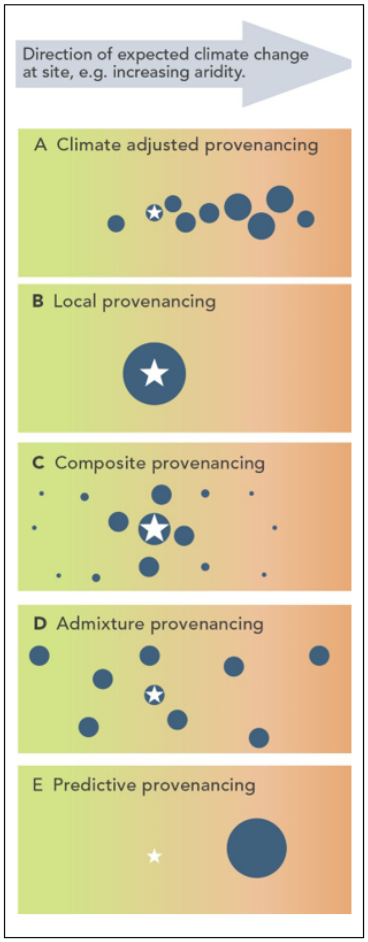


Figure 5. Provenancing strategies for revegetation, (Reproduced here from Prober et al 2015) The star indicates the site to be revegetated, and the circles represent native populations used as germplasm sources. The size of the circles indicates the relative quantities of germplasm included from each population for use at the revegetation site. In the case of the climate-adjusted provenancing the relative quantities of the germplasm from the various populations will depend upon factors such as genetic risks, and the rate and reliability of climate change projections. For simplicity this represents the major direction of climate change in a single dimension (e.g., aridity, to combine influences of increasing temperature and decreasing rainfall), but multiple dimensions could be considered as required.

First revision due out by the end of 2018

Among other items, we are:

Considering **provenance issues –** note that this pertains within species ('assisted migration' is largely not accepted).

From Nany Shaw, USFS: "**Trailing edges** of a distribution relative to climate change are most vulnerable to loss of a species. Longevity, dispersal, breeding system etc., determine ability to adapt/migrate. When sourcing, consider material from currently adapted sources plus sources adapted to projected near future conditions to hopefully provide current adaptation plus ability to adapt."

In other words, for us local propagules + propagules from the south is better than propagules from the north.

Two Slides from

Don Falk
University of Arizona, USA

SER 2018 EUROPE | Restoration in the Era of Climate Change

It's the end of a very full week…

"Mr. Osborne, may I be excused? My brain is full."

So here are ~~seven~~ ~~five~~ three* principles for restoring the future.

* plus one extra

And on Ecological Resilience

To predict future responses to climate change, we need to understand the mechanisms of resilience, which is an **emergent phenomenon**

- **persistence** (individual survives)
- **recovery** (population survives, community persists)
- **reorganization** (community- and biome-level change)

Most ecologists would put the banner "resilience" over the first two

What about the third?

D. Falk, 2018

Received 18 Mar 2016 | Accepted 2 Dec 2016 | Published 20 Jan 2017

DOI: 10.1038/ncomms14163 OPEN

Anthropogenic ecosystem disturbance and the recovery debt

David Moreno-Mateos[1,2,3], Edward B. Barbier[4], Peter C. Jones[5], Holly P. Jones[5,6], James Aronson[7,8], José A. López-López[9], Michelle L. McCrackin[10], Paula Meli[3,11], Daniel Montoya[12,13] & José M. Rey Benayas[3,14]

Ecosystem recovery from anthropogenic disturbances, either without human intervention or assisted by ecological restoration, is increasingly occurring worldwide. As ecosystems progress through recovery, it is important to estimate any resulting deficit in biodiversity and functions. Here we use data from 3,035 sampling plots worldwide, to quantify the interim reduction of biodiversity and functions occurring during the recovery process (that is, the 'recovery debt'). Compared with reference levels, recovering ecosystems run annual deficits of 46–51% for organism abundance, 27–33% for species diversity, 32–42% for carbon cycling and 31–41% for nitrogen cycling. Our results are consistent across biomes but not across degrading factors. Our results suggest that recovering and restored ecosystems have less abundance, diversity and cycling of carbon and nitrogen than 'undisturbed' ecosystems, and that even if complete recovery is reached, an interim recovery debt will accumulate. Under such circumstances, increasing the quantity of less-functional ecosystems through ecological restoration and offsetting are inadequate alternatives to ecosystem protection.

"Even if complete ecosystem recovery is reached, disturbed ecosystems typically incur decades of lost biodiversity and ecosystem function such as carbon and nitrogen cycling." Media Release – SESYNC, 2017

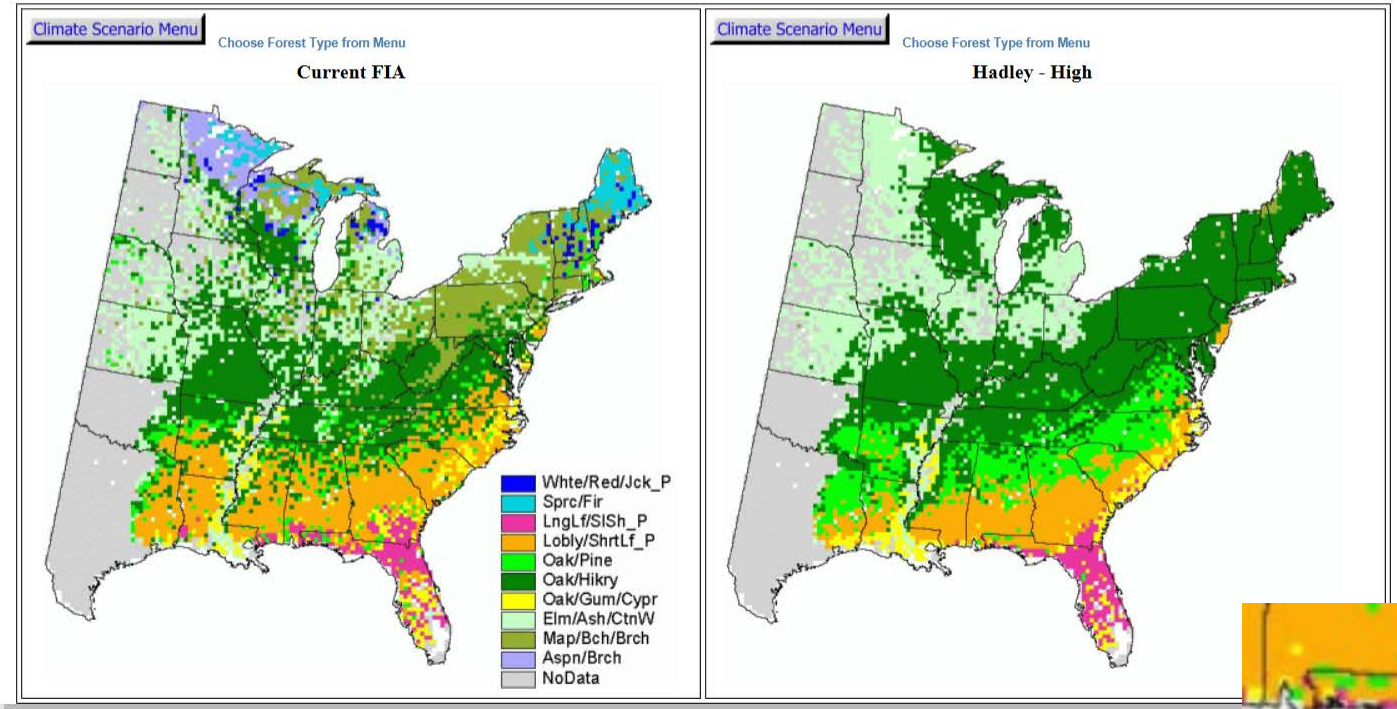
https://www.nrs.fs.fed.us/atlas/tree/fut_fortypes.html#

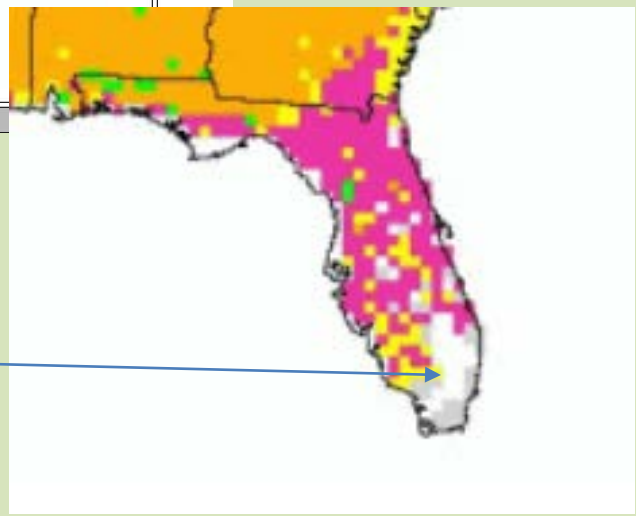
Find on page | Enter text to search | No results | Options

Potential Future Forest Type Changes

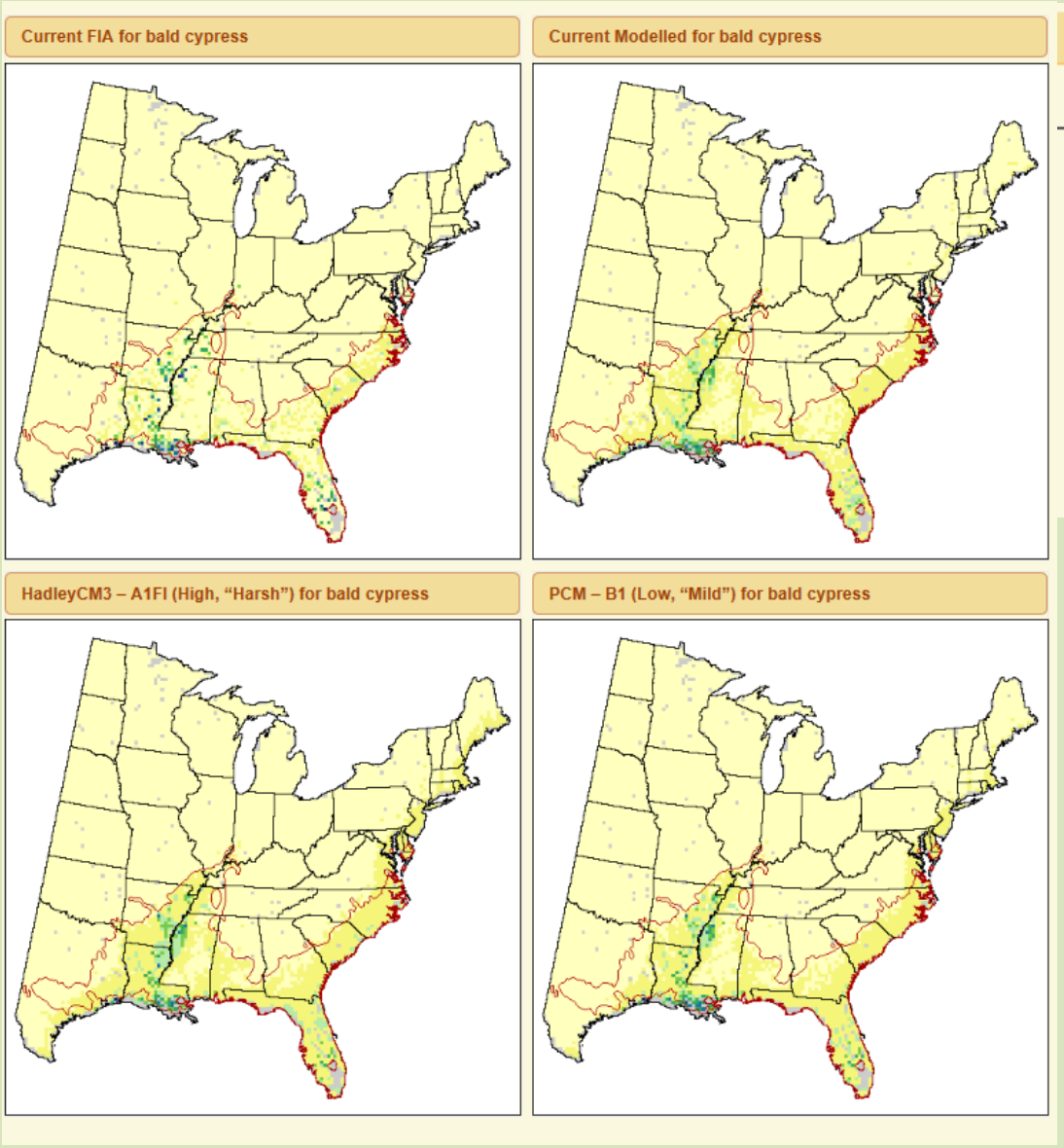
The links below allow comparison of maps of potential forest-type changes according to the various GCM scenarios.
IMPORTANT: Make sure you read the help file before interpreting the changes.

View Summary of Changes





WHAT???



Current *Taxodium distichum* Models in USDA Climate Change Tree Atlas

What to Expect

(from Dennis Hardin 2007)

Predict northward movement of species with warming
•contraction of southern boundaries of temperate species
•expansion of northern boundaries of subtropical species
•no changes for some species (e.g., saw palmetto)?

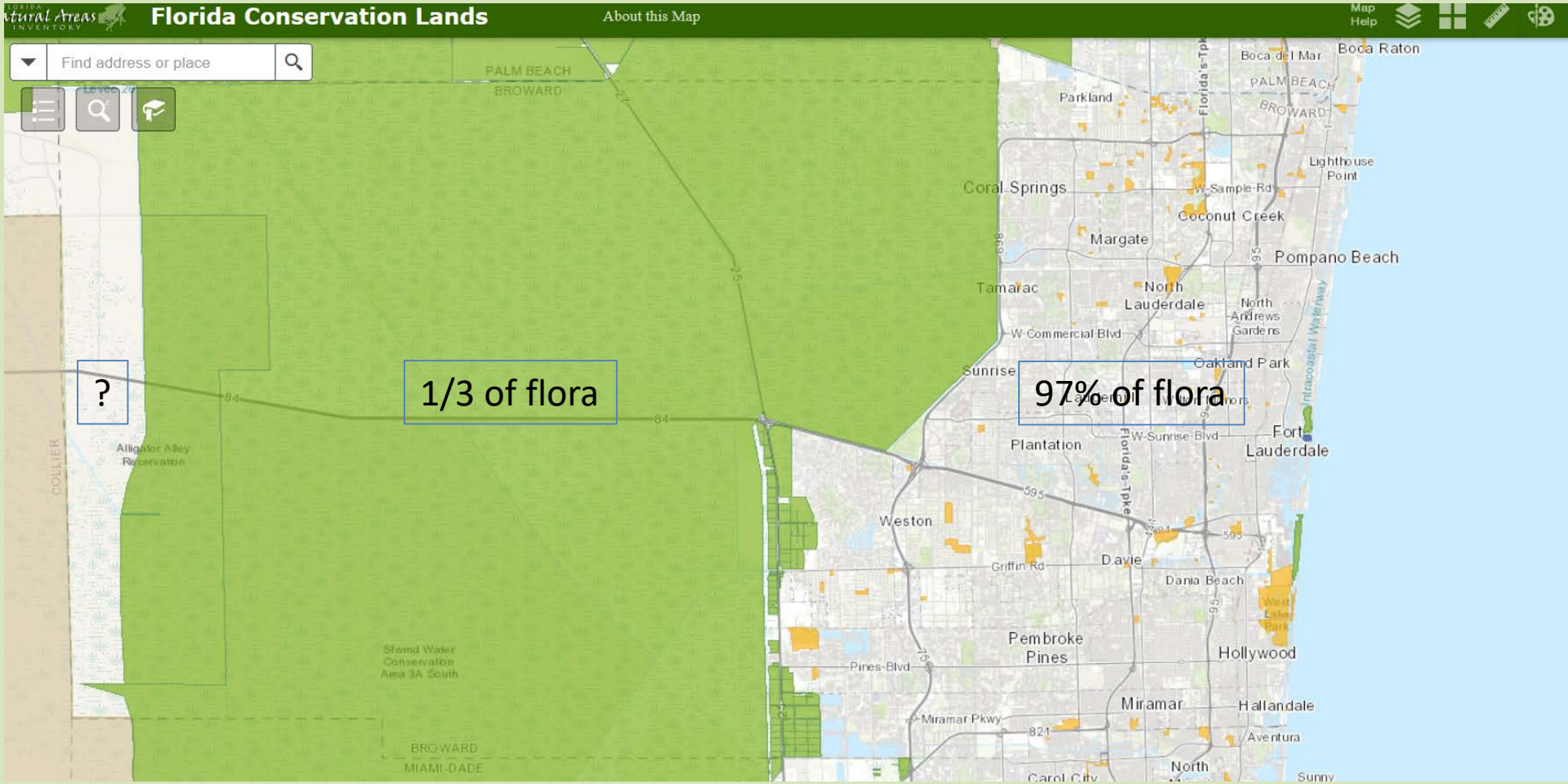
Natural movement of species may be slow, less than 200 km/century at most, perhaps more in the range of 20-50 km/century.

Movement of species will be complicated or prevented by
•Fragmentation due to development
•Competition from non-native invasive exotics
•Competition from native invasive species (weeds)
•Diseases and insects, both native and exotic
•Filtration and inertia of existing stands
•Ecotypic/genetic variation
•Fire
•Soil variation

Predict changes in plant community composition, structure and function.
Predict losses of biodiversity and resulting ecological and economic impacts.

Back to the Future
(in Broward that is)

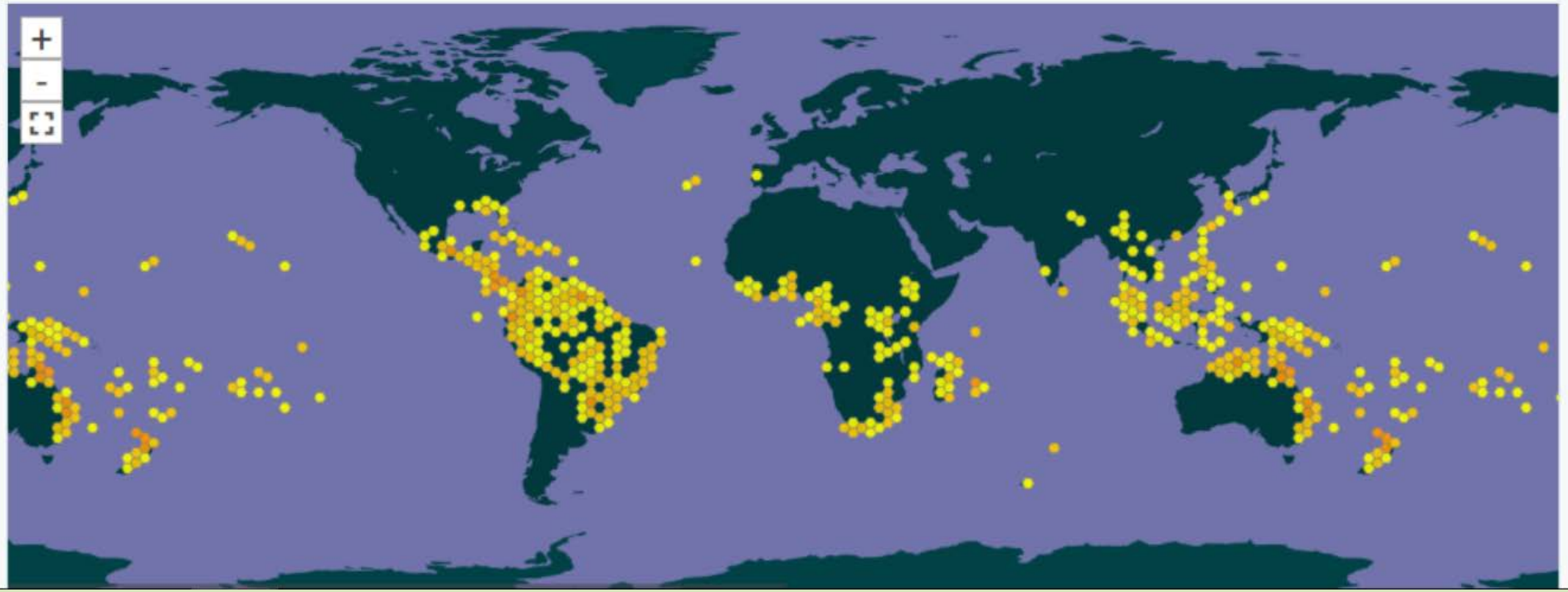
Broward County Regions
and Proportions of the Native “Local Diversity”



Tropical and Widespread Species Are Not Immune From Local Extinction

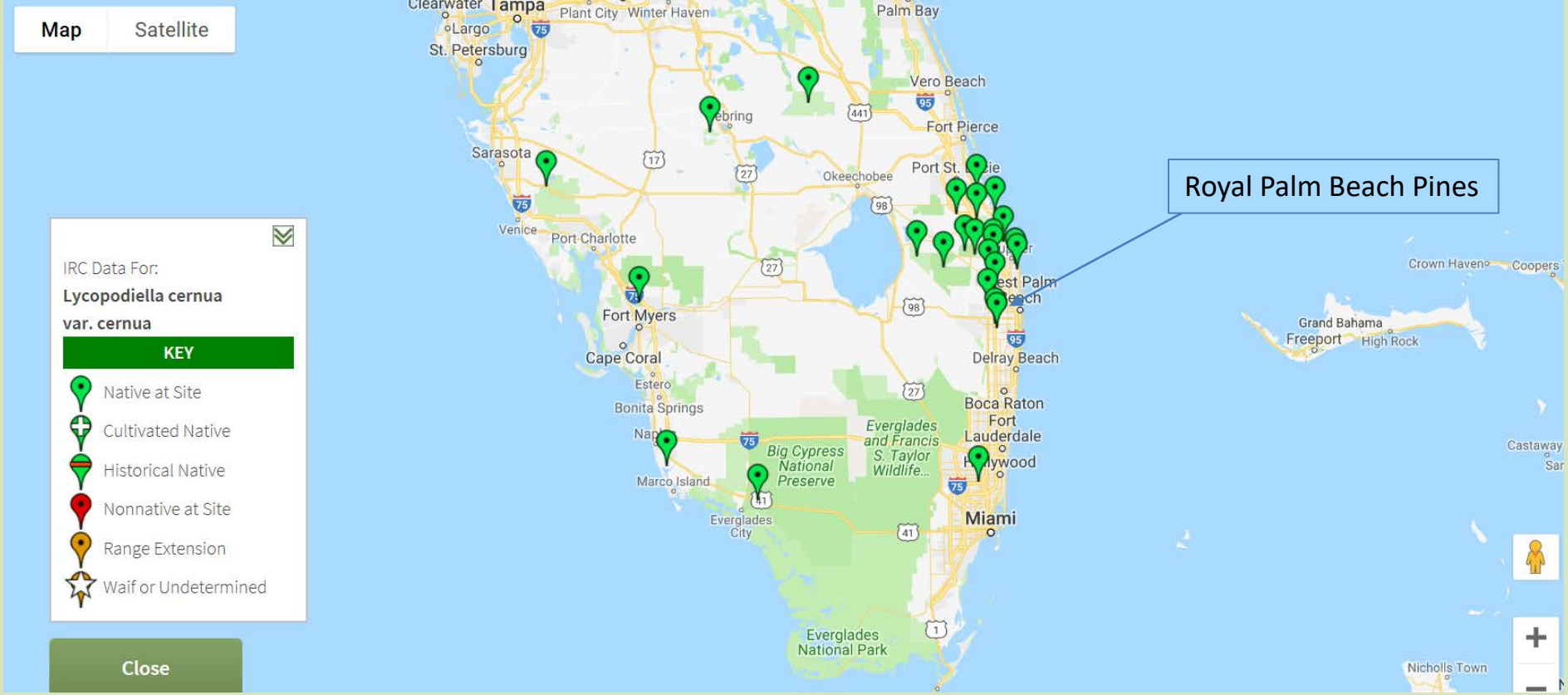
3,863 OCCURRENCES WITH IMAGES

4,698 GEOREFERENCED RECORDS



Lycopodiella cernua* (L.) Pic. Serm. var. *cernua

Nodding club-moss


Map
Satellite
IRC Data For:
Lycopodiella cernua
var. cernua
KEY
Native at Site
Cultivated Native
Historical Native
Nonnative at Site
Range Extension
Waif or Undetermined
Close
Royal Palm Beach Pines
Tampa
Clearwater
Largo
St. Petersburg
Plant City
Winter Haven
Palm Bay
Vero Beach
Fort Pierce
Sarasota
Okeechobee
Venice
Port Charlotte
Fort Myers
Cape Coral
Estero
Bonita Springs
Marco Island
Everglades City
Big Cypress National Preserve
Everglades and Francis S. Taylor Wildlife...
Everglades National Park
Delray Beach
Boca Raton
Fort Lauderdale
Miami
Grand Bahama
Freeport
High Rock
Crown Haven
Coopers
Castaway
Nicholls Town

But Temperate Species Are Really at Risk

(today's numbers)

About 1/3 of the Broward are temperate species at the southern ends of their ranges, or peninsular Florida endemics.

20-30% of those species are likely extirpated already

Working list of 70+ taxa in need of review

So these species have already been hard hit by development and degradation, before the effects of climate change are really felt.

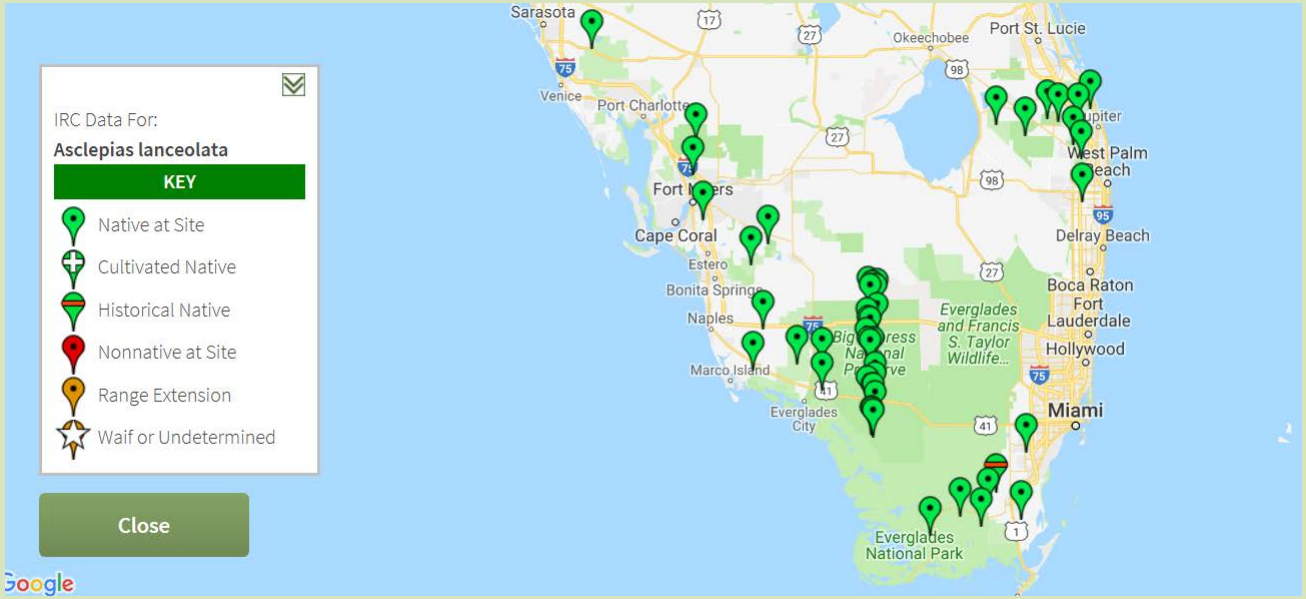

Asclepias lanceolata


Carya floridana

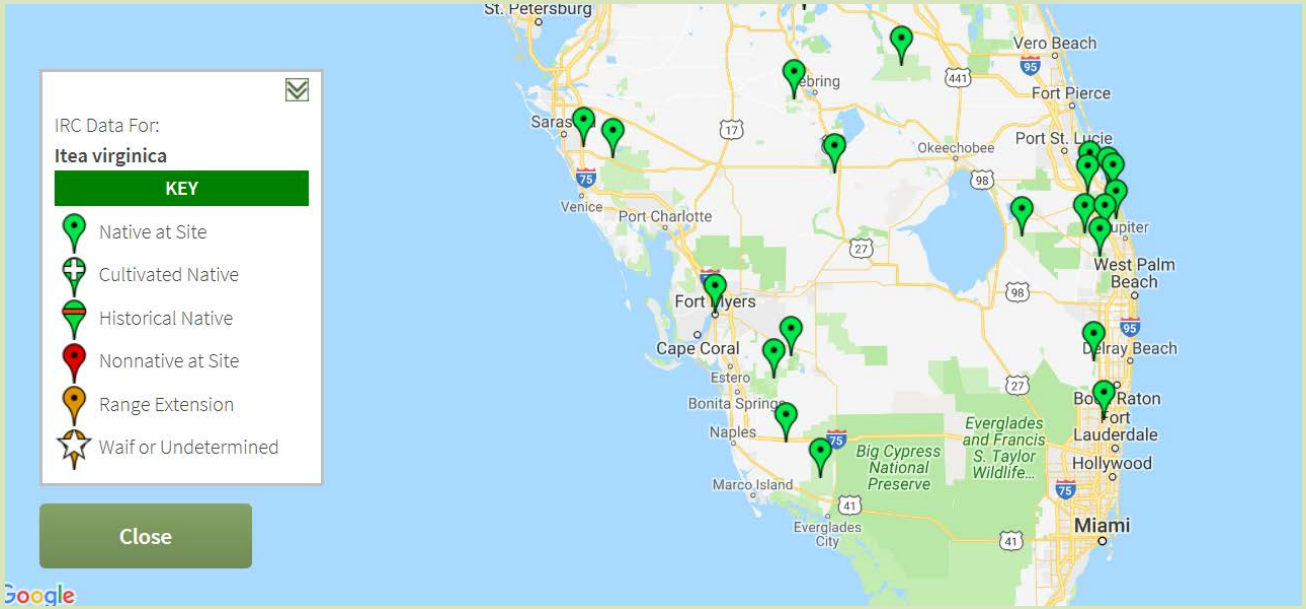

Calopogon multiflorus


Eryngium aromaticum

Asclepias lanceolata



Itea virginica



*Catopsis floribu*nda

Our Issues (to name a few)

- Habitat destruction
- Collecting and poaching
- Destruction of natural hydrology
- Urbanization and fragmentation
- Coastal erosion
- Invasive species
- Fire suppression
- Loss of pollinators and dispersers
- Sea level rise
- Extreme weather
- Climate change
- Ignorance
- Apathy
- Greed

Our Solutions (in part)

- We document the extinction of species and the destruction of ecosystems, the depletion of rare species and the degradation of habitats
- We acquire protected areas and write management plans
- We fence, collect, grow, plant, chop, burn, spray, weed, bulldoze, rip, tear, water, augment, reintroduce and garden
- We learn, study, collate, disseminate and experiment
- We develop tools and new technologies
- We educate, volunteer, advocate and protest
- We hope and plan for a better future

Some Things To Consider

Carica papaya

Humility is important. What we know today may not be what we understand tomorrow.

We must aspire to More!

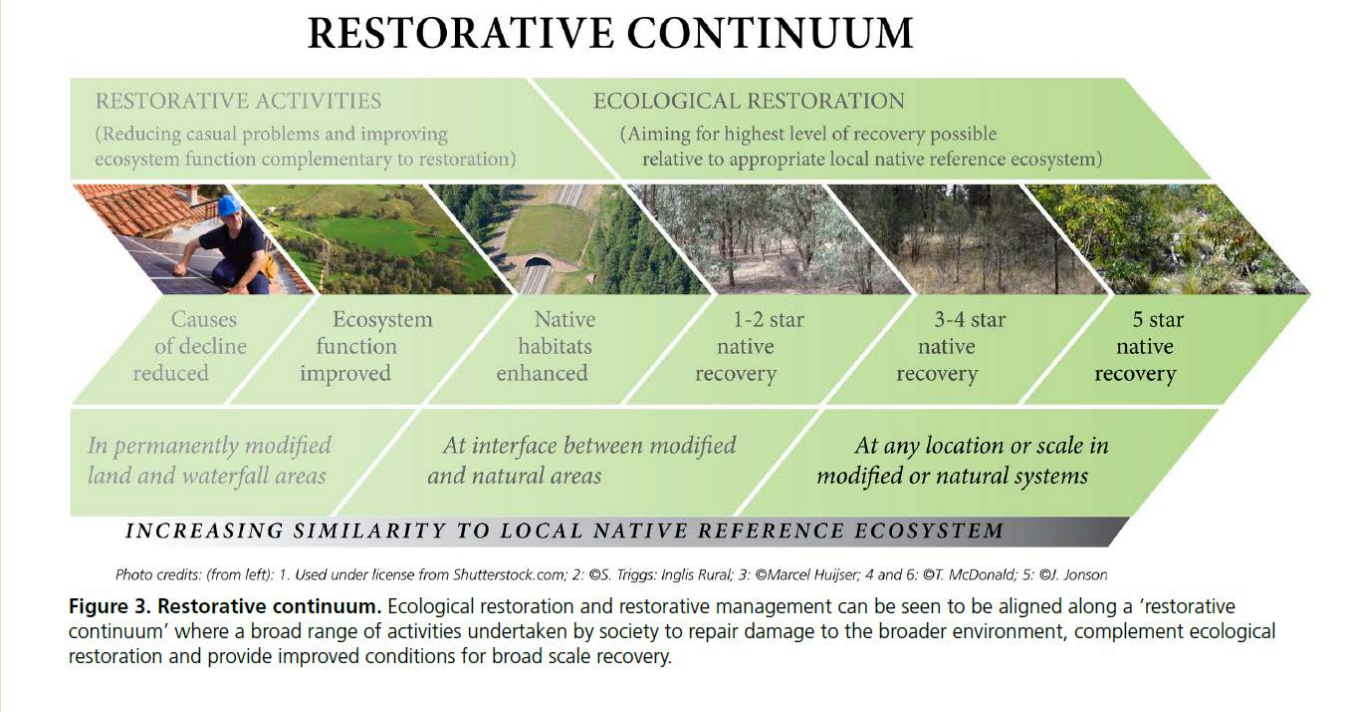


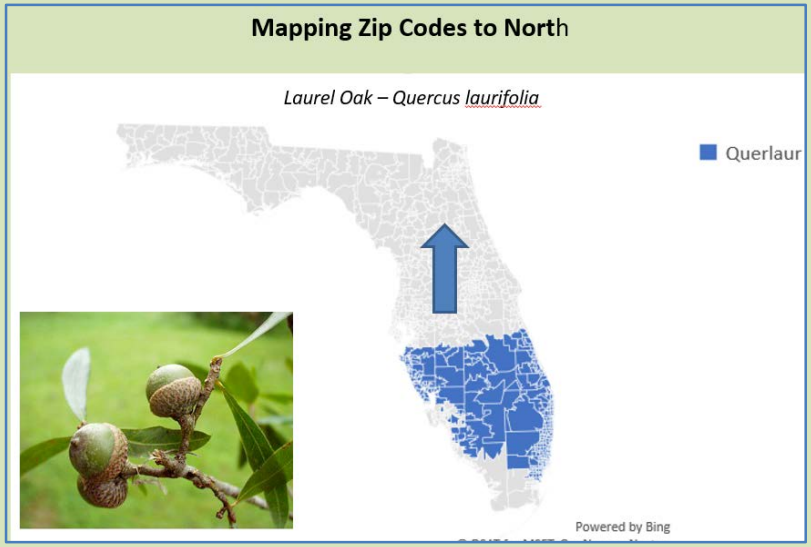
Photo credits: (from left): 1. Used under license from Shutterstock.com; 2: ©S. Triggs: Inglis Rural; 3: ©Marcel Huijser; 4 and 6: ©T. McDonald; 5: ©J. Jonson

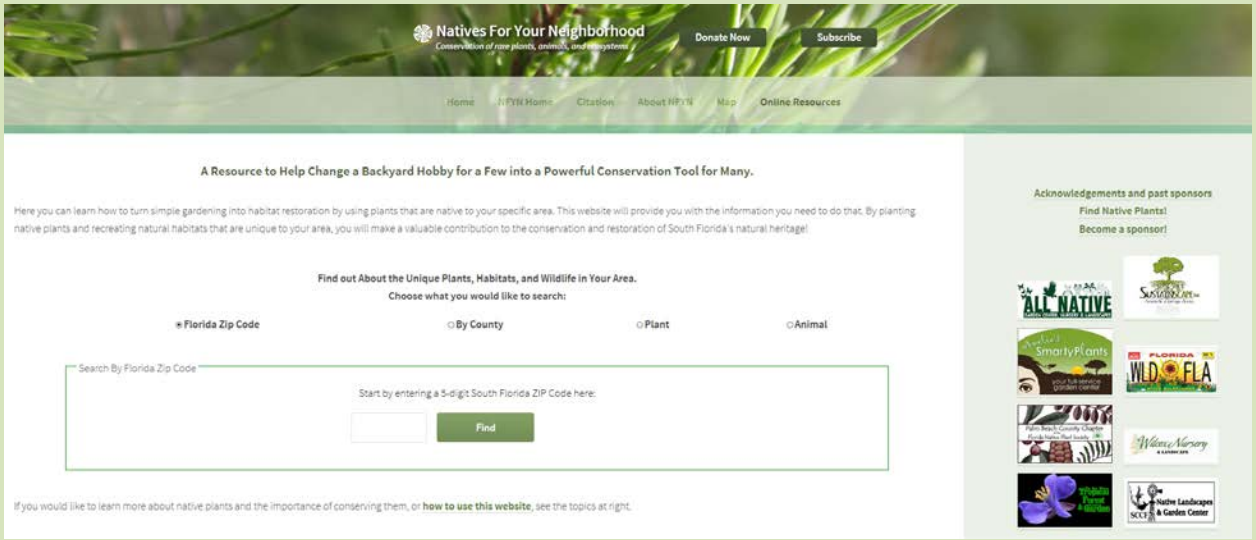
Figure 3. Restorative continuum. Ecological restoration and restorative management can be seen to be aligned along a 'restorative continuum' where a broad range of activities undertaken by society to repair damage to the broader environment, complement ecological restoration and provide improved conditions for broad scale recovery.

All restorative activities matter, no matter how small. But some activities many not be restorative at all (e.g., some mitigation, afforestation of native savanna).

Identify Opportunities

Use Available Tools
(and make them better!)



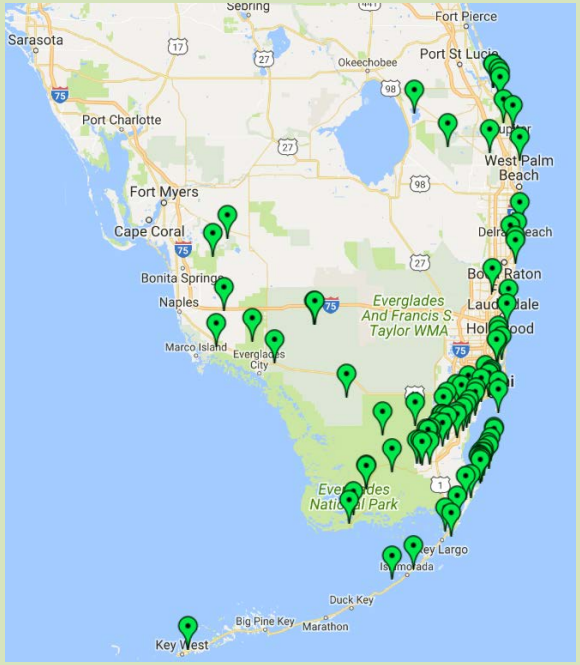


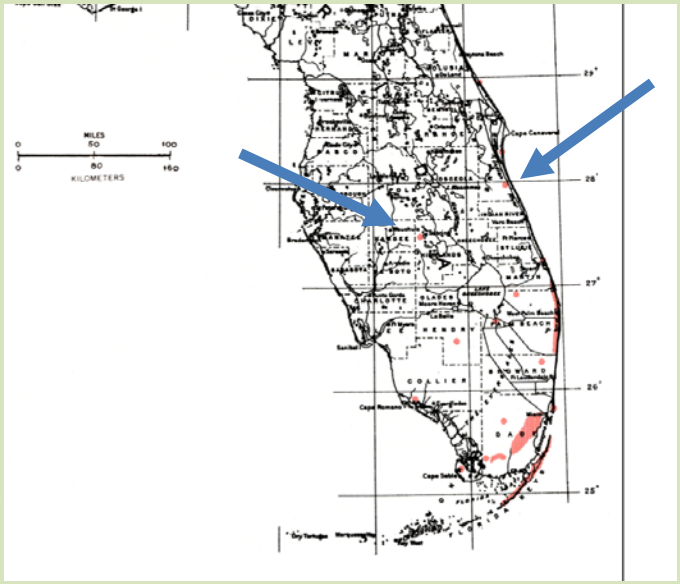
How Does It Work?

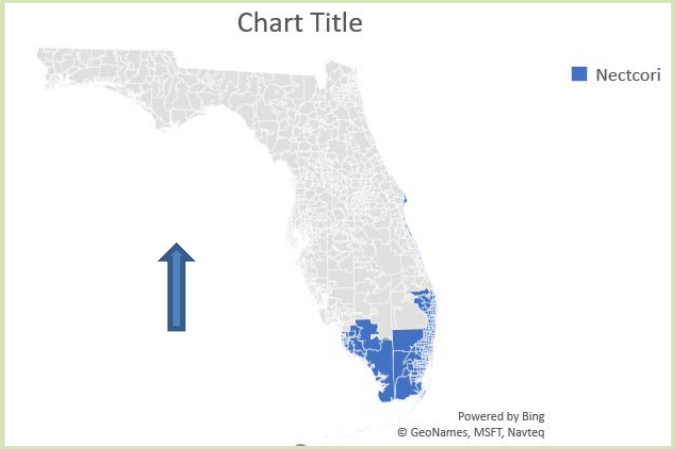
- County Lists – Ecological generalist with broad ranges (95% rule)
- ZIP Code Lists – Ecological generalists + generalists within local habitats
- Habitat Lists – Generalists + habitat specialists within historical range within ZIP Code

And Thank You Broward County!

Plan for Change (e.g., Climate Change and Sea Level Rise)

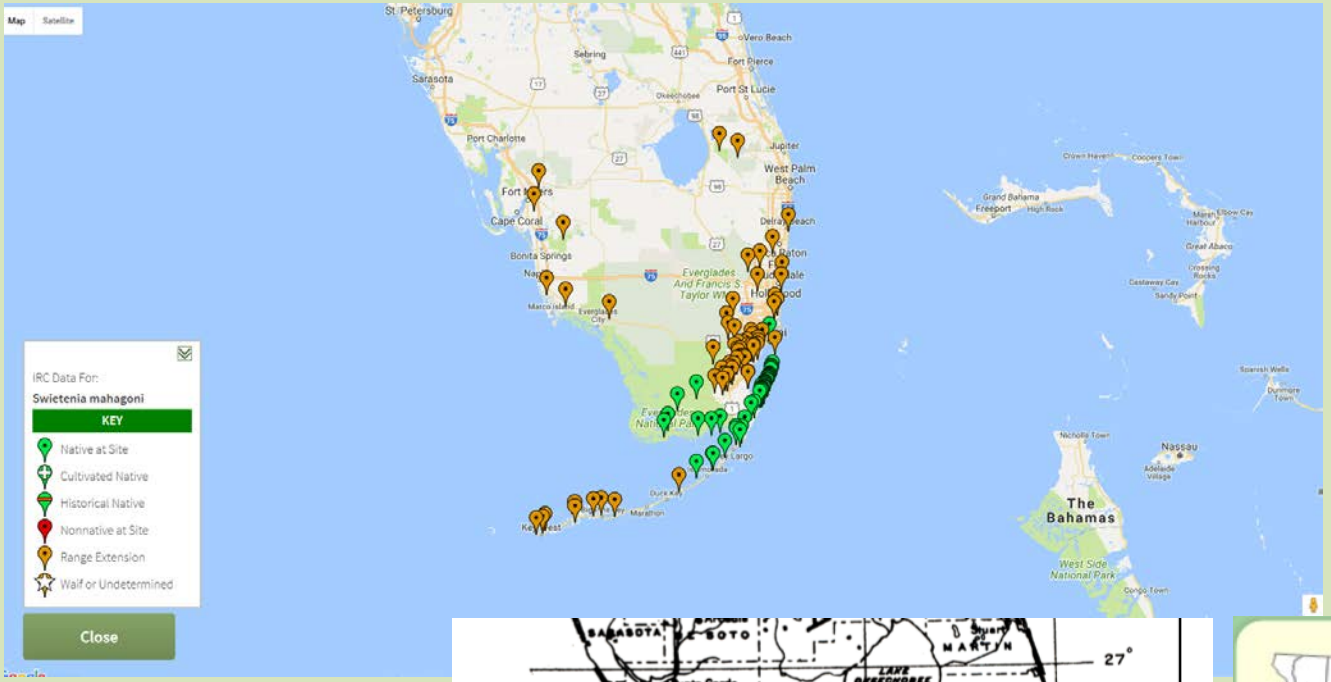




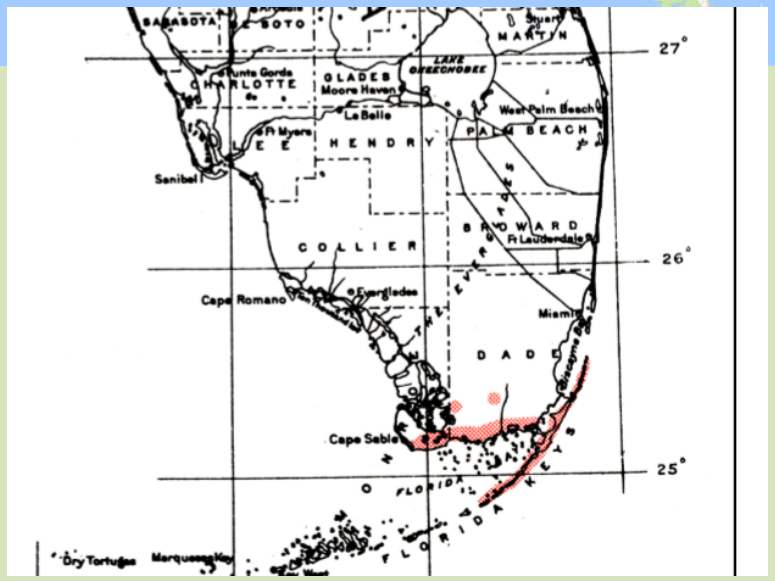


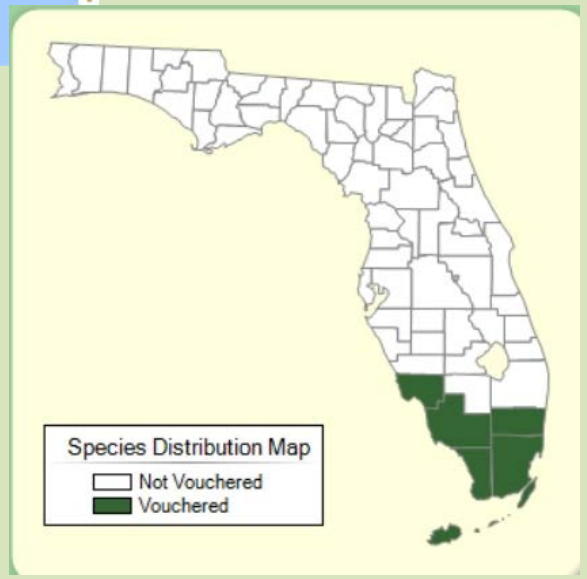
Lancewood – *Nectandra coriacea*

And Be Thoughtful

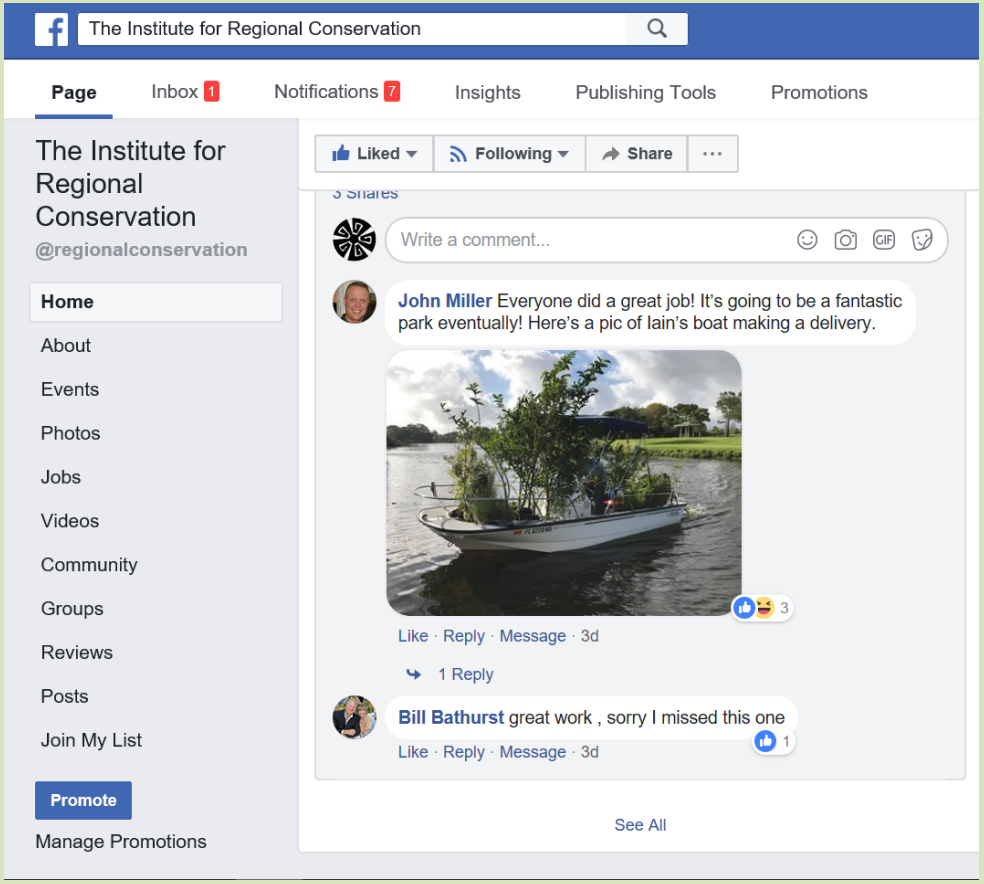


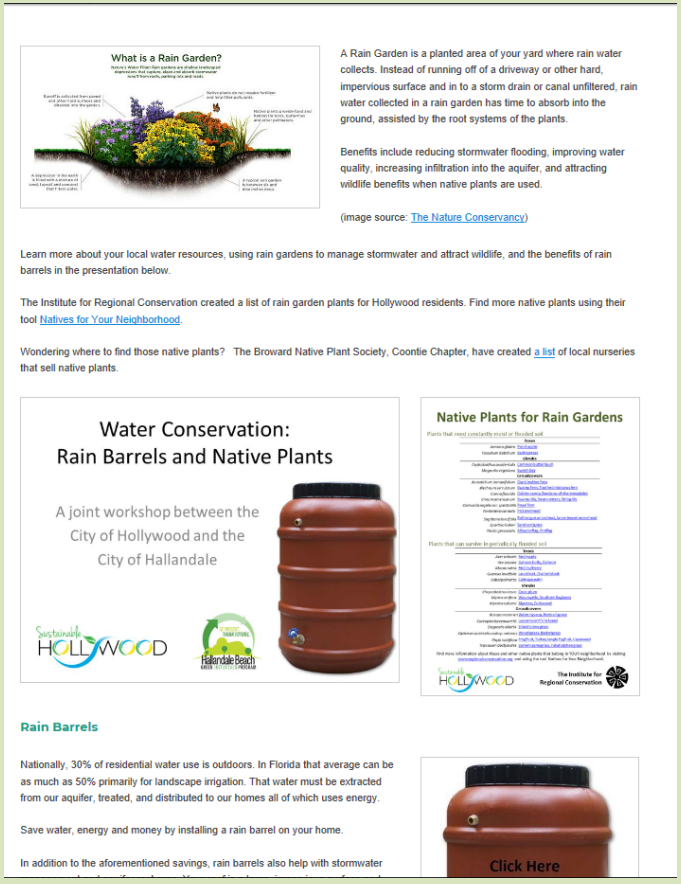
West Indian Mahogany
Swietenia mahagoni





Be Creative and Have Fun

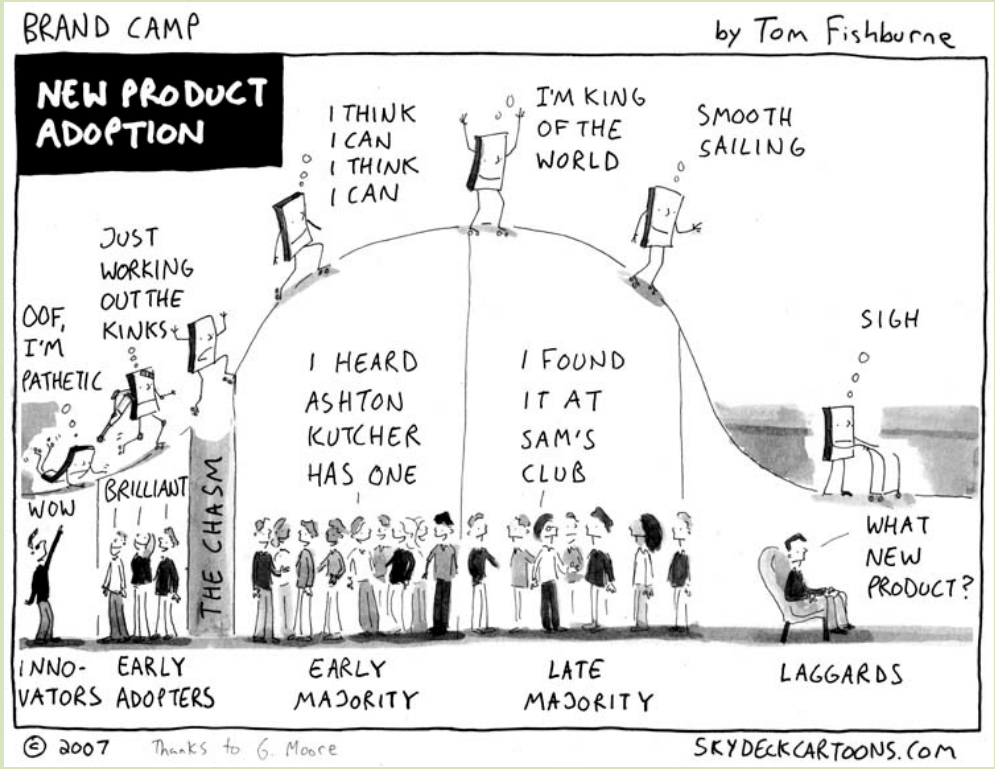




Celebrate Success!

Delray Beach c. 1980,
Delray Beach 2016

Play the Long Game



Thanks!


Vote
Our
Planet
Defend Our Air, Our Water, Our Soil
74%
of U.S. adults said "the country should do whatever it takes to protect the environment."
73%
of registered voters believe that climate change is happening.