Traits that Facilitate Invasion of Native Habitat

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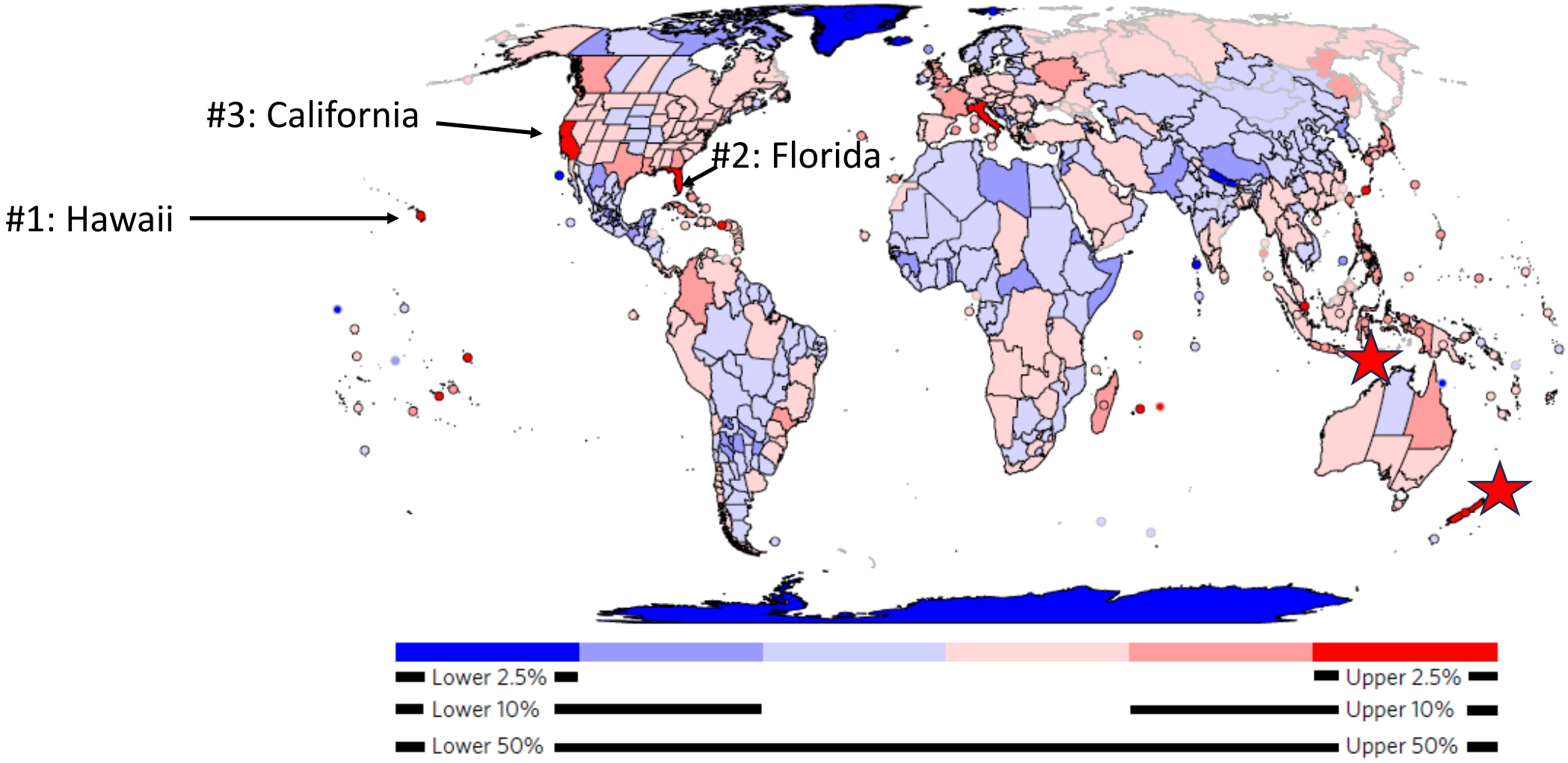
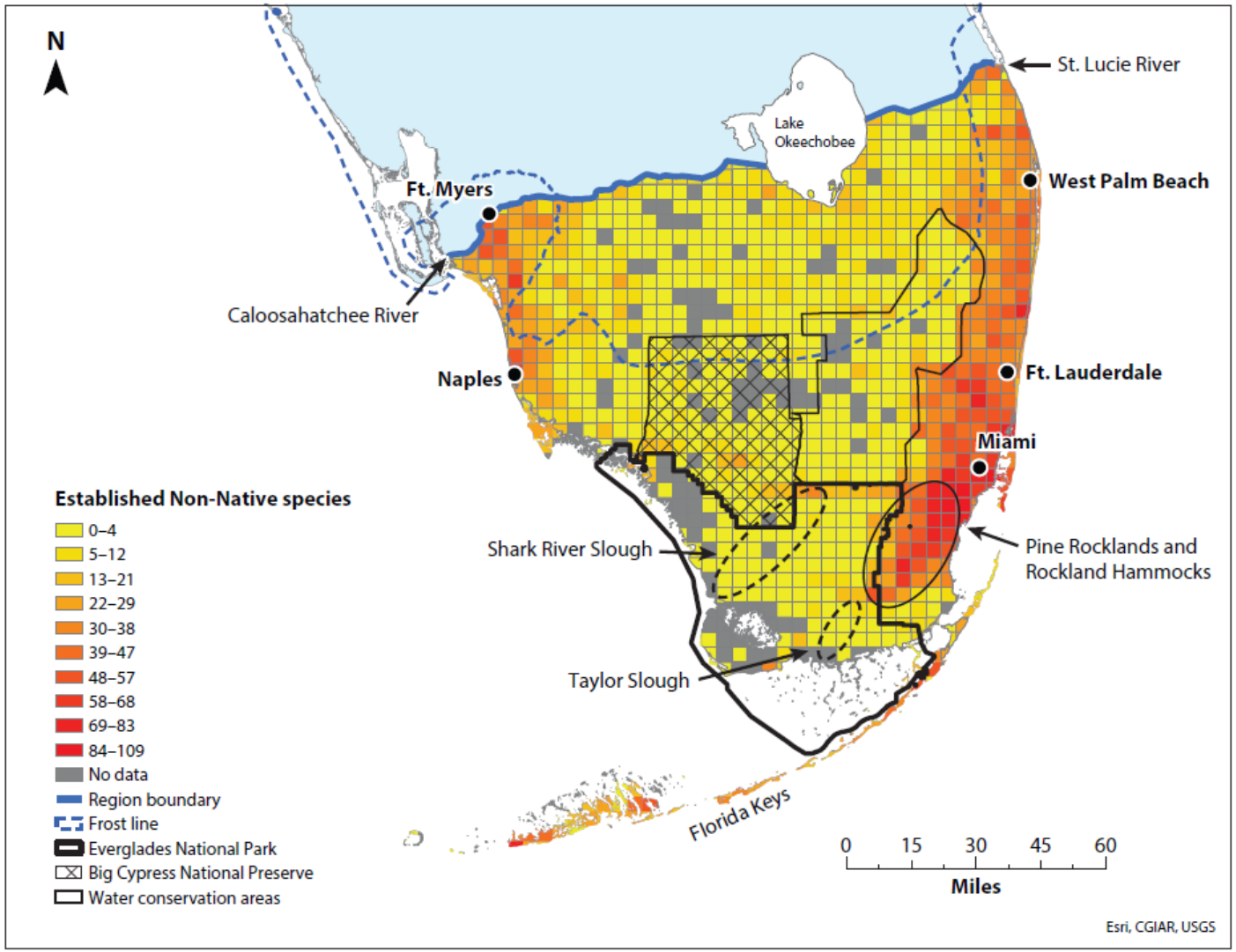
Global Hotspots of Invasive Biodiversity



Dawson et al. (2017)

South Florida: The World's Most Invaded Continental Ecoregion

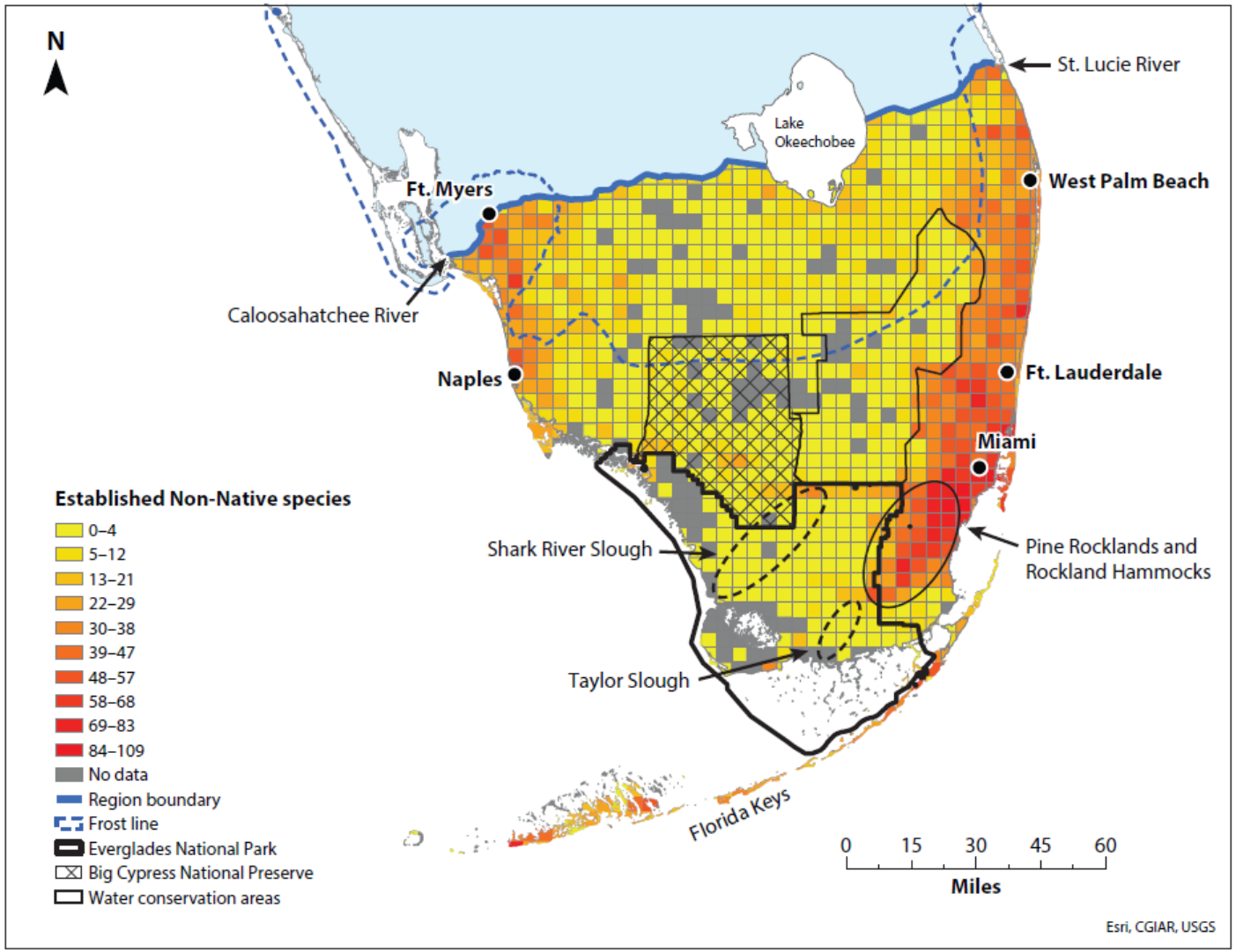
- Hotspot for all 8 taxonomic groups in Dawson et al. (2017)
- >500 non-native animals and >1500 non-native plants
- Most established non-native reptiles and amphibians in the world (>1/4 of all established non-native reptiles worldwide)



Searcy et al. (2023)

South Florida: The World's Most Invaded Continental Ecoregion

- Invasives account for 33% of Florida's plant biomass
- Non-native birds account for 33% of Christmas Bird Count sightings in Miami-Dade
- Non-native reptiles and amphibians account for 92% of individuals encountered in urban Miami-Dade parks and preserves



Searcy et al. (2023)

Correlates of Establishment and Spread

- Larger range size (birds & herpetofauna)

Diversity and Distributions, (Diversity Distrib.) (2007) **13**, 519–526

BIODIVERSITY RESEARCH

Patterns of non-randomness in the exotic avifauna of Florida

Tim M. Blackburn* and Phillip Cassey

Global Ecology and Biogeography, (Global Ecol. Biogeogr.) (2013) **22**, 889–899

RESEARCH PAPER

Predictors of regional establishment success and spread of introduced non-indigenous vertebrates

Craig R. Allen[1], Kristine T. Nemec[2]*, Donald A. Wardwell[2], Justin D. Hoffman[4]†, Mathew Brust[3], Karie L. Decker[2], Daniel Fogell[4], Jennifer Hogue[4], Aaron Lotz[2], Thaddeus Miller[2], Marcy Pummill[4], Luis E. Ramirez-Yañez[4] and Daniel R. Uden[2]

Searcy et al. (2023)

Correlates of Establishment and Spread

- Larger range size (birds & herpetofauna)
- Climate match (birds & herpetofauna)

Biol Invasions (2009) 11:713–724
DOI 10.1007/s10530-008-9285-3

ORIGINAL PAPER

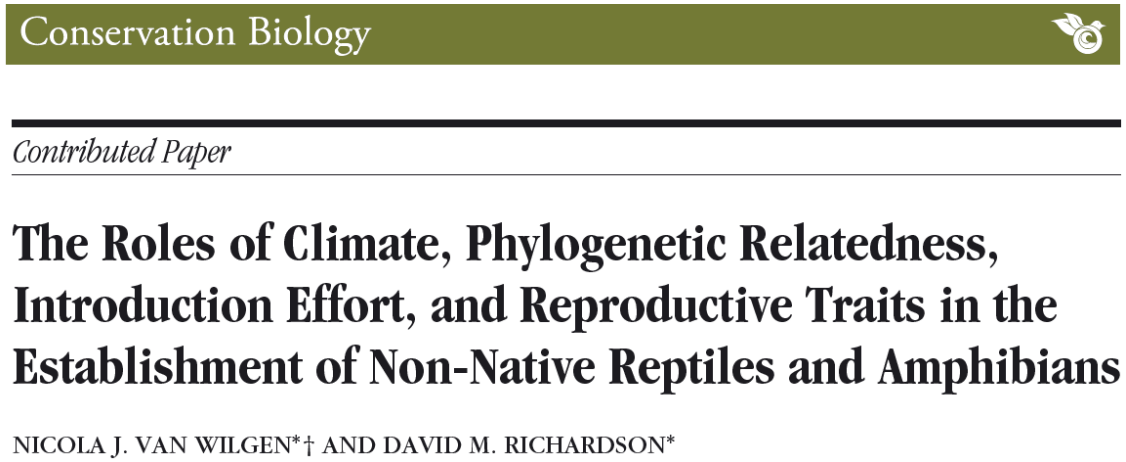
Predicting establishment success for alien reptiles and amphibians: a role for climate matching

Mary Bomford · Fred Kraus · Simon C. Barry · Emma Lawrence

Searcy et al. (2023)

Correlates of Establishment and Spread

- Larger range size (birds & herpetofauna)
- Climate match (birds & herpetofauna)
- Smaller body size (birds & herpetofauna), greater fecundity (birds), younger mean age at maturity (herpetofauna)



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- Larger body size, larger egg diameter, greater parental care, longer time to hatch (fish)


RESEARCH ARTICLE

Diversity and Distributions WILEY

Life history strategies differentiate established from failed non-native freshwater fish in peninsular Florida

Katelyn M. Lawson | Jeffrey E. Hill

Searcy et al. (2023)

Correlates of Establishment and Spread

- Larger range size (birds & herpetofauna)
- Climate match (birds & herpetofauna)
- Smaller body size (birds & herpetofauna), greater fecundity (birds), younger mean age at maturity (herpetofauna)
- Larger body size, larger egg diameter, greater parental care, longer time to hatch (fish)
- More distant relationship to native species (herpetofauna & plants), different body mass from natives (birds)

BIODIVERSITY RESEARCH

Diversity and Distributions WILEY

The role of phylogenetic scale in Darwin's naturalization conundrum in the critically imperilled pine rockland ecosystem

Lauren B. Trotta[1] | Zachary A. Siders[2] | Emily B. Sessa[3] | Benjamin Baiser[1]

Biological Invasions (2006) 8: 491–500
DOI 10.1007/s10530-005-6409-x

Predictors of introduction success in the South Florida avifauna

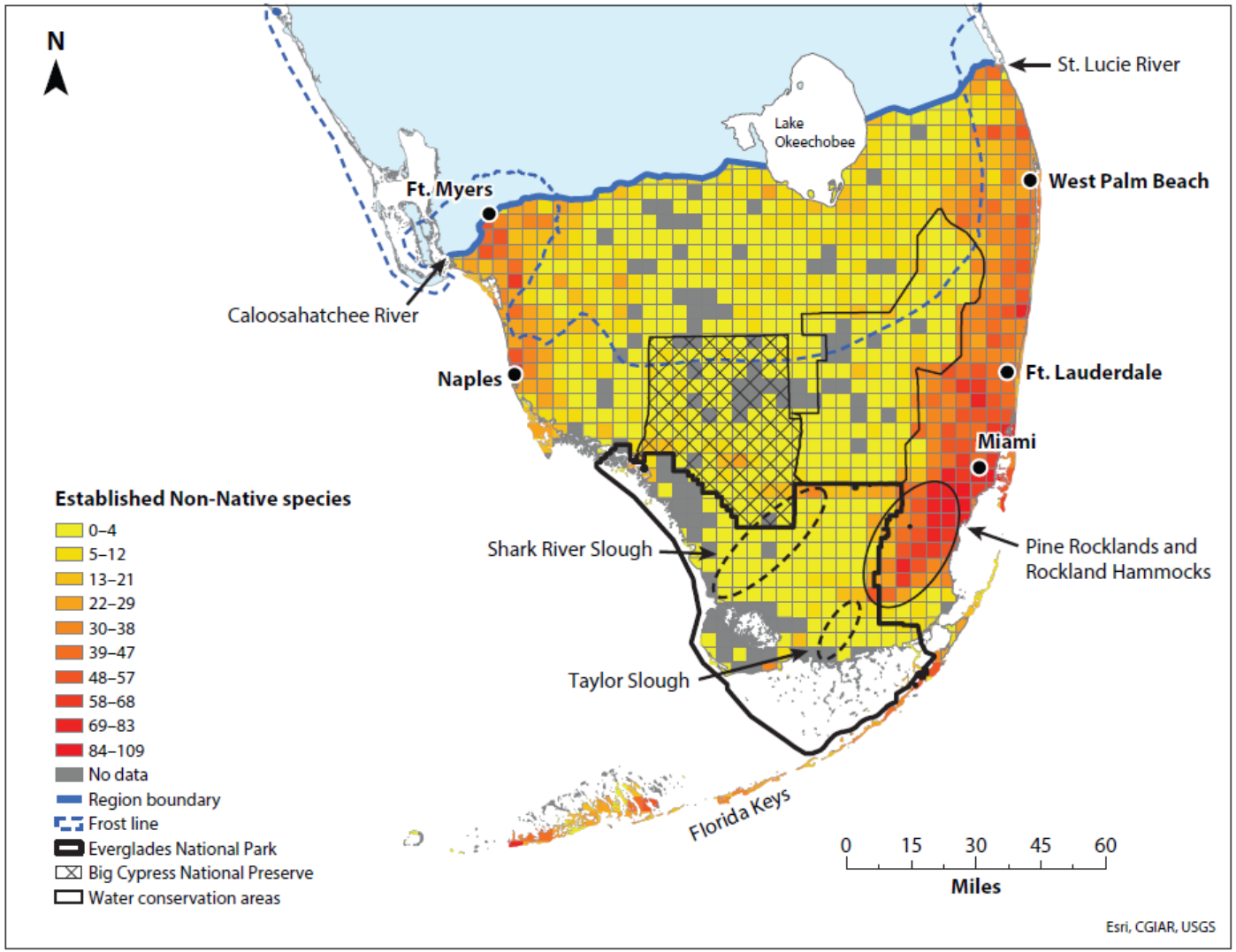
Craig R. Allen

Searcy et al. (2023)

Invasives Along the Natural-to-Anthropogenic Habitat Gradient

- 92% of herpetofauna are non-native in urban Miami-Dade compared to 15% in the adjacent Everglades

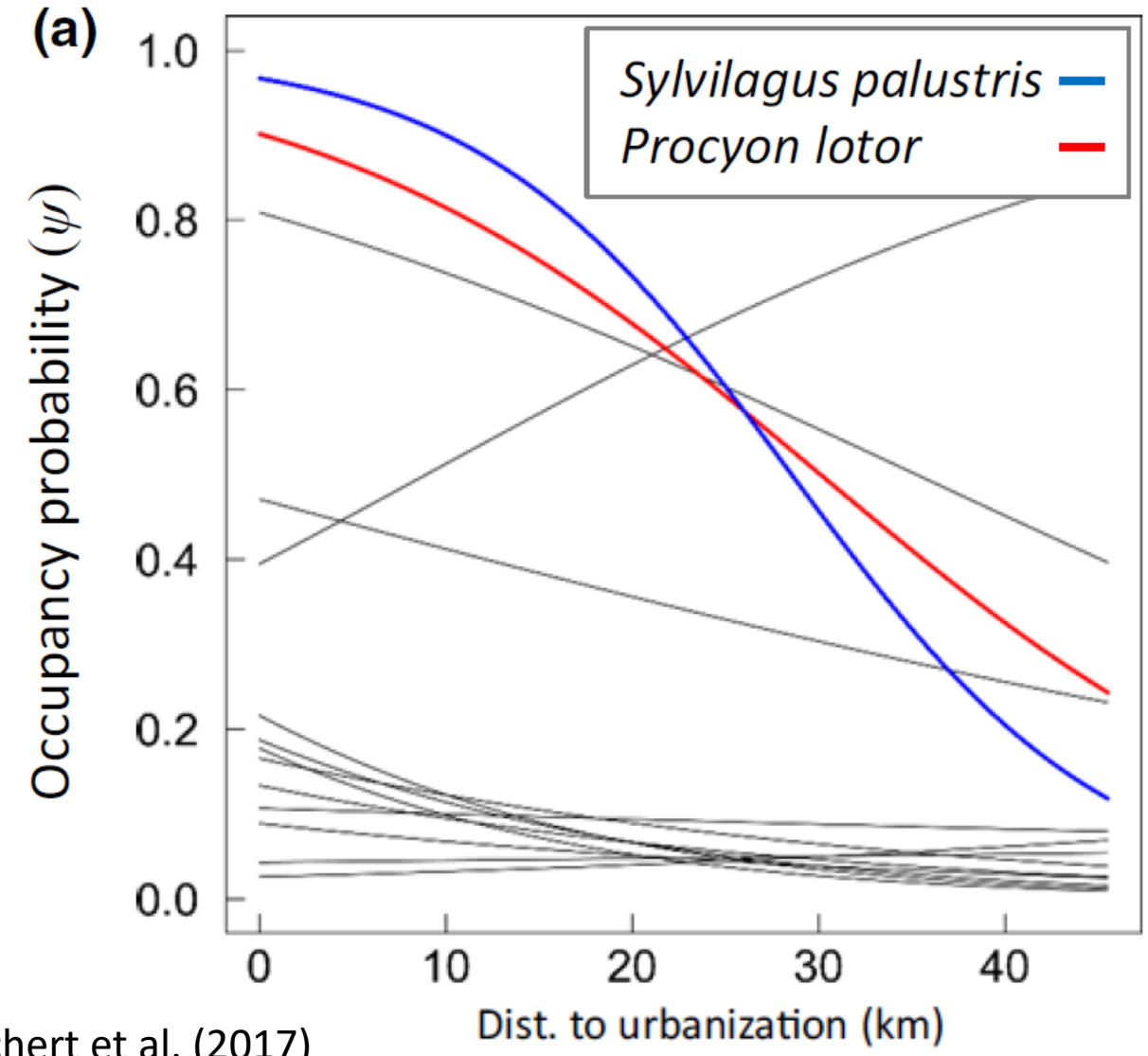
- Non-native fish are 3x more common in canal samples compared to marsh samples



Invasives Along the Natural-to-Anthropogenic Habitat Gradient

- However, a subset of invasive species are able to penetrate the native habitat (e.g. Burmese python)

- These species have profound impacts on native ecosystems



Reichert et al. (2017)

Questions

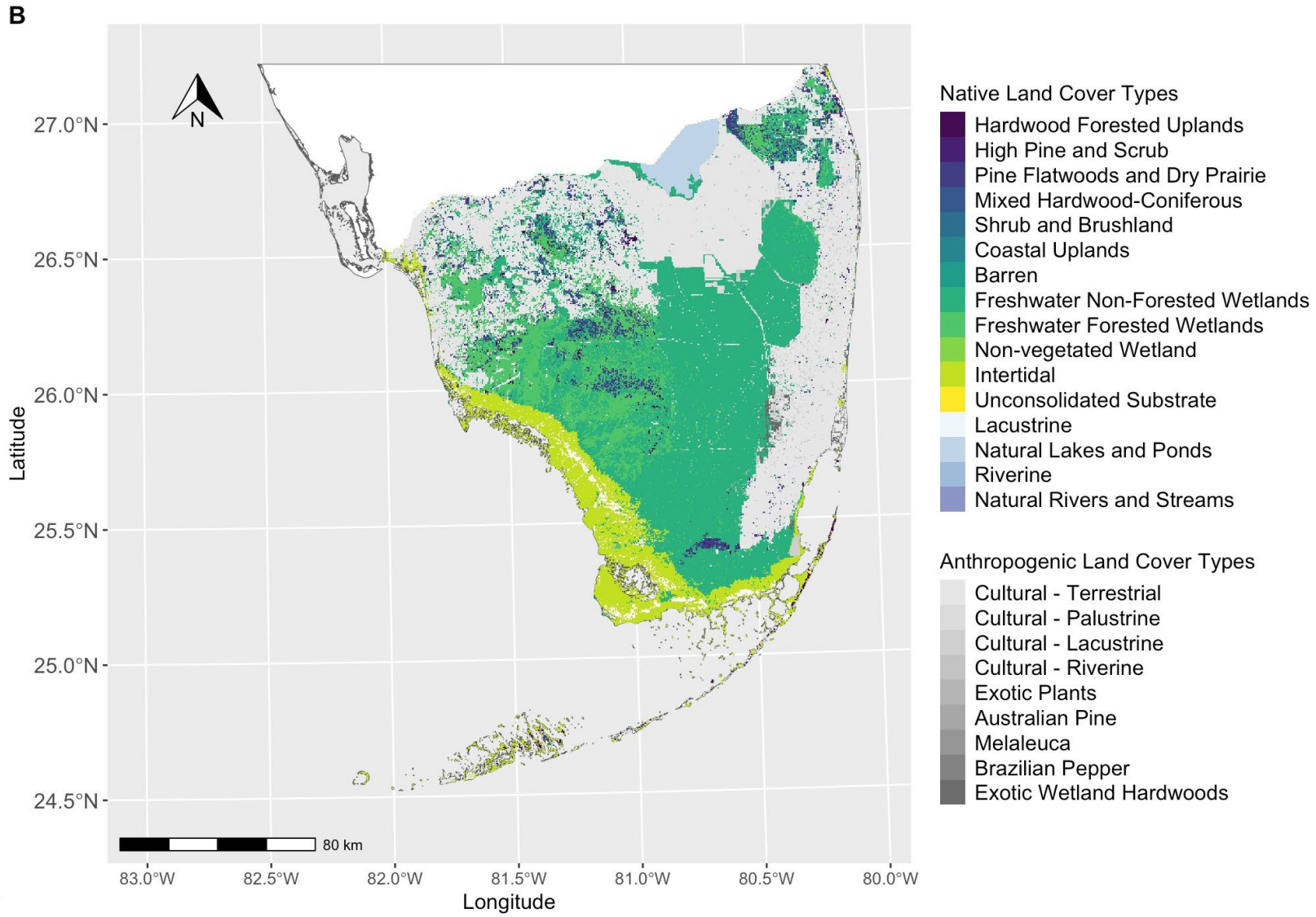
1) What non-native species have had the most success penetrating native habitats? Are these generally the species that we consider to be the worst invaders?

2) What traits best predict ability to penetrate native habitat?

3) Does native habitat patch size provide resistance to non-native species penetration?

Geospatial Data

- ~1,200,000 locality records (GBIF and EDDMapS)
- GIS layer that differentiates native vs. non-native habitat types



Trait Data

	All Taxa	Plants	Birds	Herpetofauna	Fish
Native Range Size	x	x	x	x	x
Body Size	x	x	x	x	x
Cold Tolerance	x	x	x	x	x
Wetland Tolerance	x	x	x	x	x
Salinity Tolerance	x	x	x	x	x
Pet/Horticultural Trade	x	x	x	x	x
Native Congener	x	x	x	x	x
Invasive Congener	x	x	x	x	x
Primarily Selfing or Outcrossing	x	x	x	x	x
Date of Introduction	x	x		x	x
Diet Breadth			x	x	x
Fecundity			x	x	x
Age at Maturity				x	x
Mating System			x		
Hypoxia Tolerance					x

Best Penetrators of Native Habitat

Grey-headed swamphen (21%, +2.6 SD)

Old World climbing fern (94%, +2.5 SD)

Argentine black and white tegu (39%, +2.5 SD)

Brown hoplo (63%, +1.3 SD)

Feral hog (52%, +1.0 SD)

Traits Associated with Native Habitat Penetration

All Taxa (N = 134)

	Estimate	P-value
Wetland Tolerance	0.57	0.0033
Date of Introduction	-0.16	0.0547

Plants (N = 59)

	Estimate	P-value
Body Size	1.3	0.014
Wetland Tolerance	0.719	0.0376

Birds (N = 31)

	Estimate	P-value
Body Size	0.783	0.0001
Mating System	-2.82	0.0001
Wetland Tolerance	2.97	0.0001
Fecundity	0.858	0.0011
Invasive Congener	-0.393	0.0347
Native Congener	0.44	0.0575

Fish (N = 12)

	Estimate	P-value
Body Size	-1.16	0.0021
Invasive Congener	-0.354	0.066

Herpetofauna (N = 28)

	Estimate	P-value
Wetland Tolerance	0.871	0.0851

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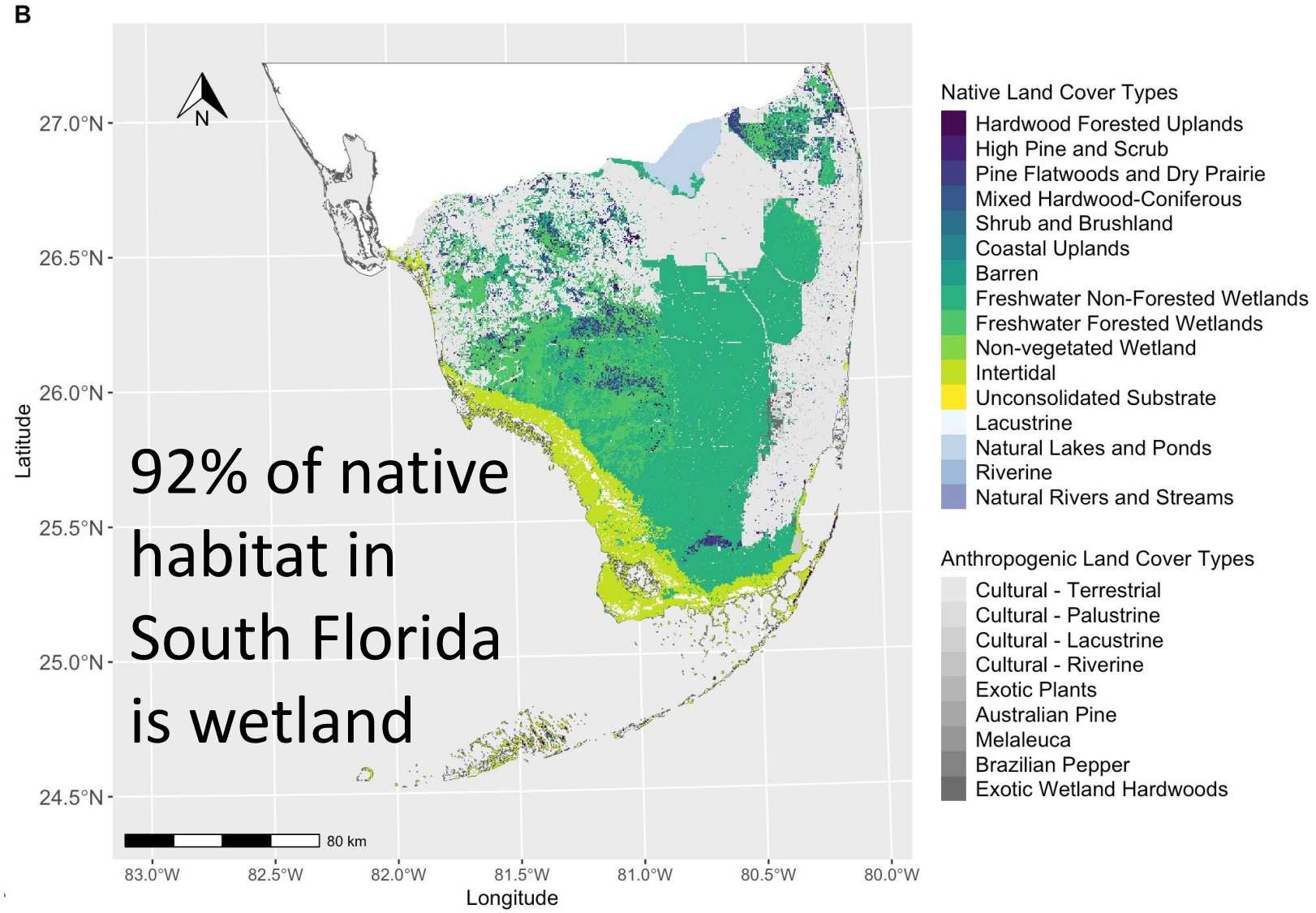
Wetland Tolerance



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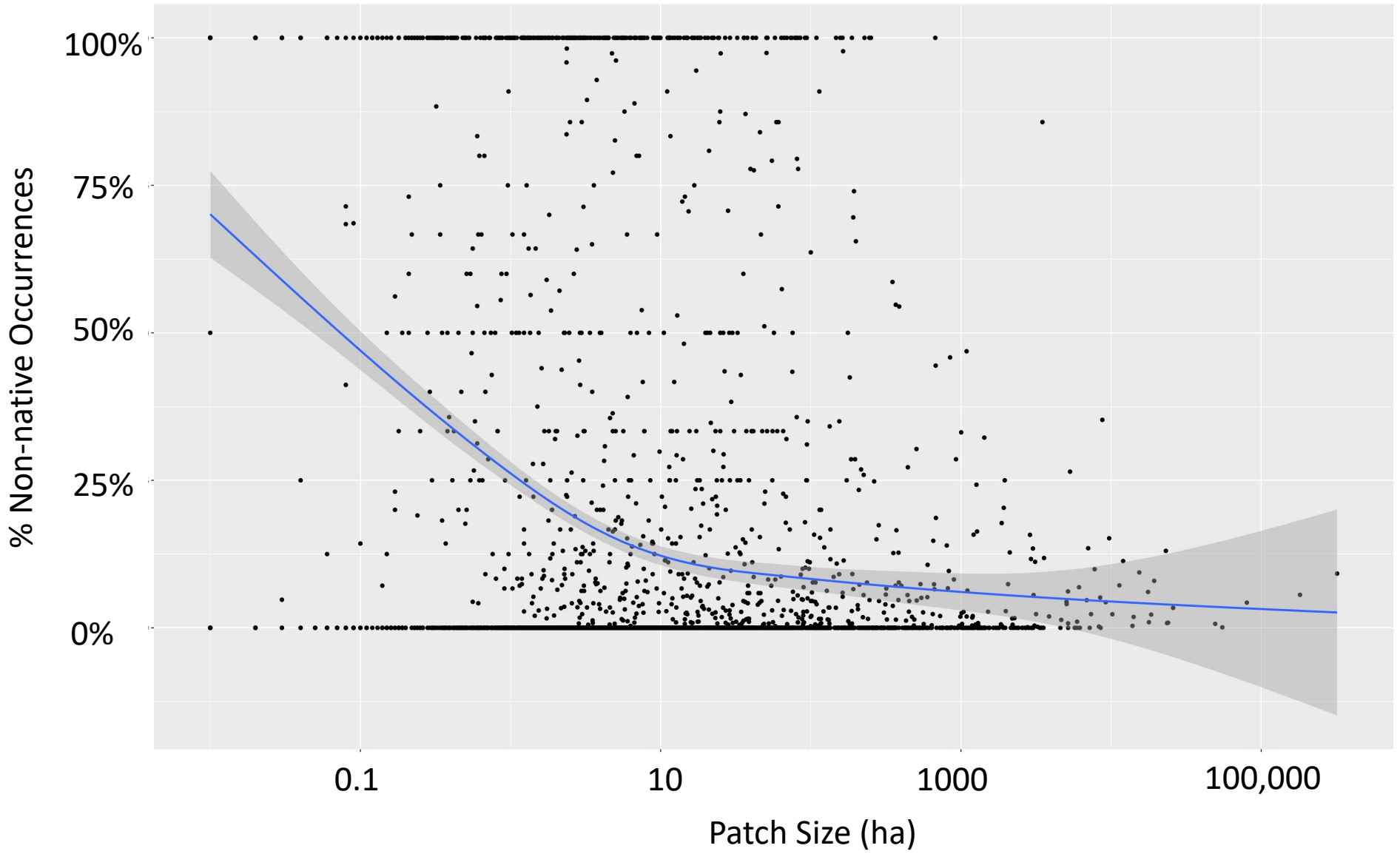
Patch Size


100%
75%
50%
25%
0%
% Non-native Occurrences
0.1
10
1000
100,000
Patch Size (ha)

Conclusions

1) High penetration of native habitat does seem to be characteristic of many of the worst invasives.

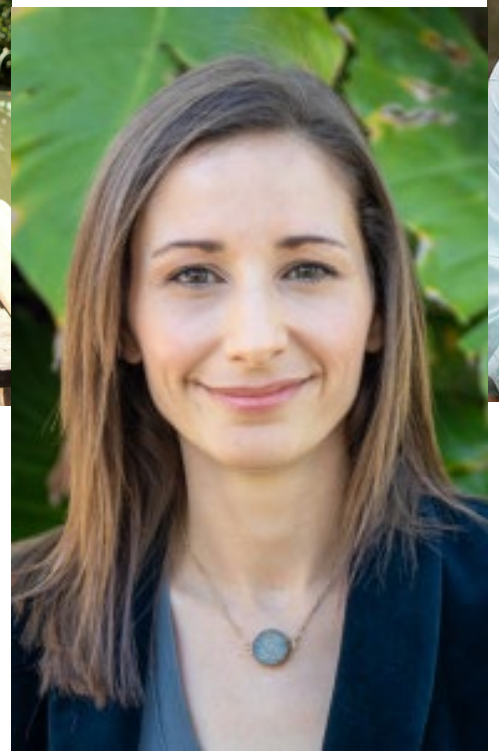
2) Preadaptation to wetlands, the largest native habitat type in South Florida, is the best predictor native habitat penetration.

3) Native habitat patches >10 ha have much lower frequencies of non-native occurrences, suggesting a target for future habitat protection.

Stephanie Clements

Leyna Stemle

Reid Rumelt



Michelle Afkhami

Aaron David