

What Are The Chances? A Geospatial Tool For Predicting Nutrient Loading To Florida's Waterbodies

Kai C. Rains^{1,2}, Edgar Guerron-Orejuela¹, Moses Okonkwo³, Sara Davis³, Michael Knight¹, and Mark Rains¹

¹ School of Geosciences, University of South Florida

² University of South Florida Water Institute

³ Florida Department of Environmental Protection



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Richard Graulich/The Palm Beach Post via AP
<https://www.dailycommercial.com/story/news/state/2017/05/04/floridas-building-boom-threatens-wildlife-rich-indian-river-lagoon/21208769007/>



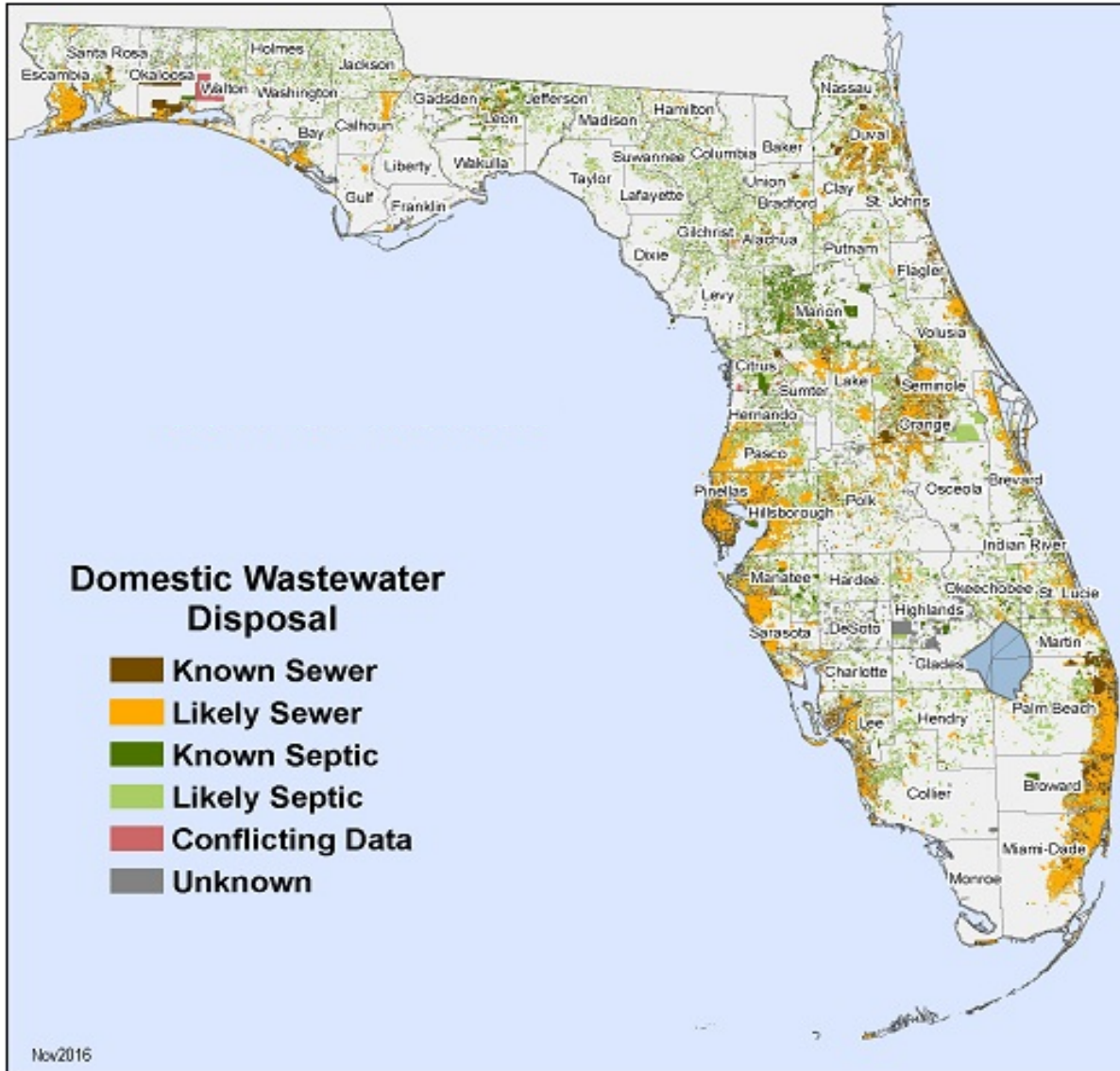
<https://www.fox13news.com/news/piney-point-study-shows-contaminated-water-spread-further-than-predicted>



Greg Lovett/ The Palm Beach Post via AP

<https://www.jacksonville.com/story/news/2017/05/04/over-2900-species-look-florida-s-indian-river-lagoon/15753633007/>

Florida Water Management Inventory



Onsite Sewage Treatment Disposal System (OSTDS)

- ~ 2.6M statewide
- ~ 19K new permits annually

State assistance to local governments

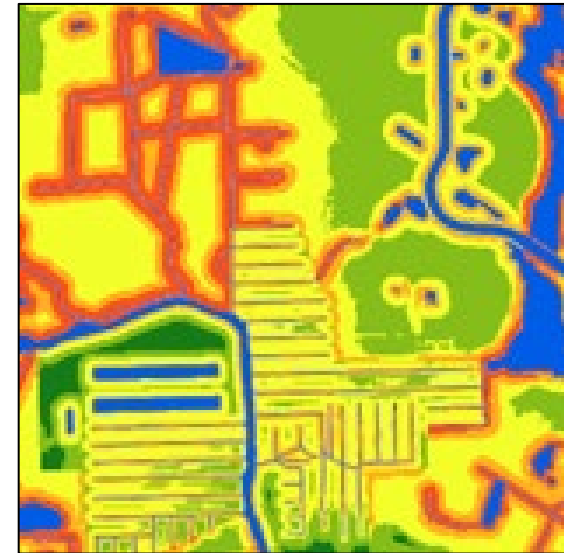
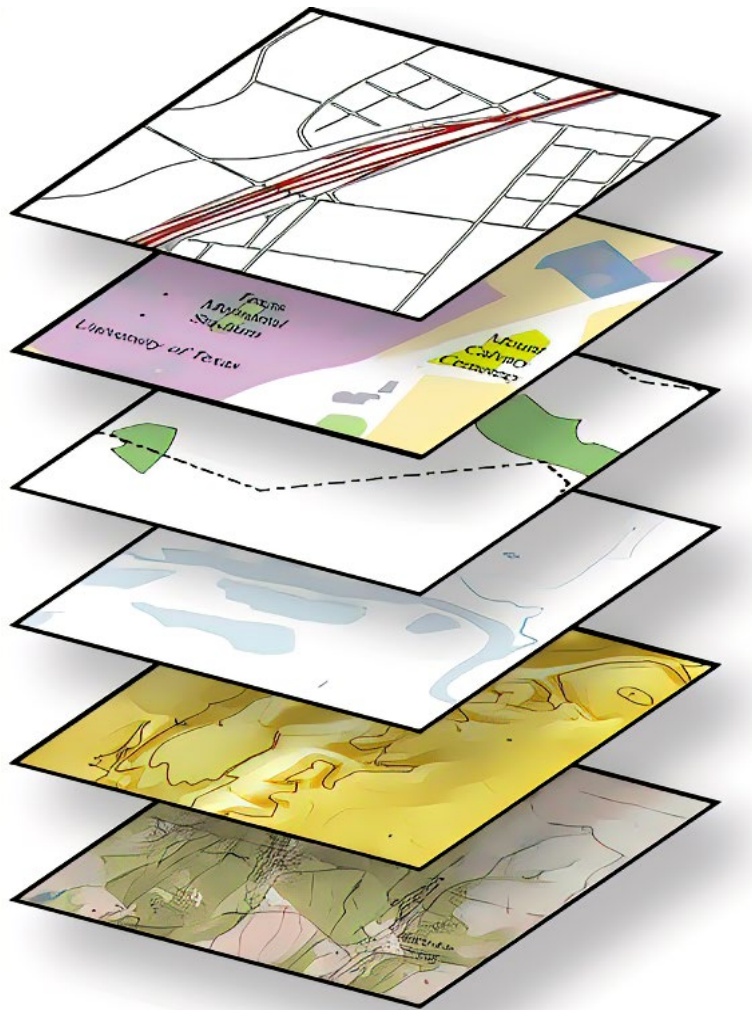
- ~ \$1.2B invested in state grants between 2019 – 2024

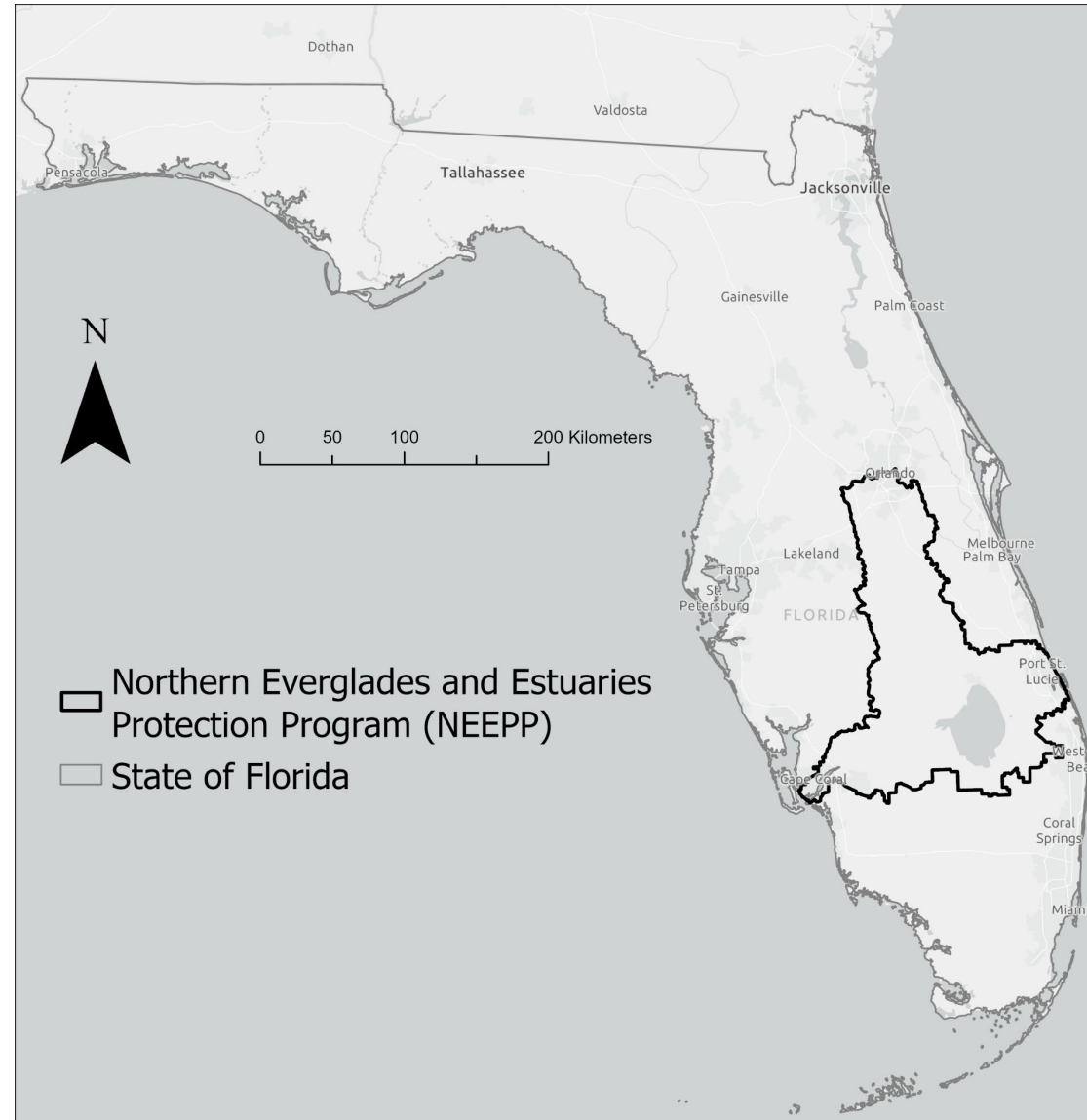
There is an urgent need for an easy to use, scientifically grounded tool to assist with prioritizing septic to sewer conversion projects



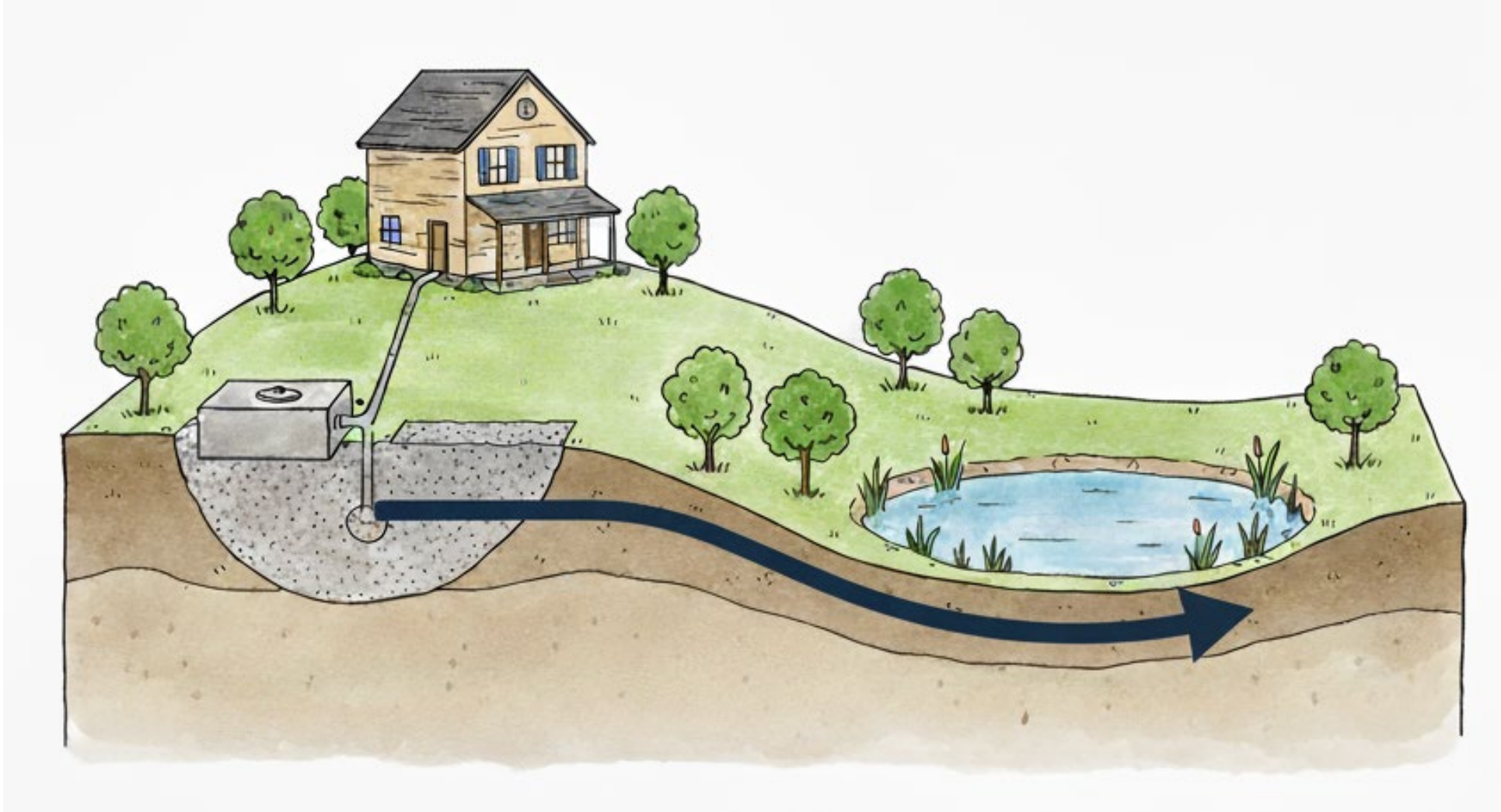
Martin County

Landscape Assessment of Nutrient Loading to Waterbodies (LANLoad)





Conceptual Model of Nutrient Fate and Transport in the NEEPP



Identification of key physical properties that drive the potential to contribute nutrient loading to waterbodies

Employment	# participants (n = 23)
State government	14
Local government	1
Academia	6
Industry	2

Physical Property
Distance to Waterbody
Depth to Groundwater
Hydraulic Conductivity
Potential for Flooding
Slope
Surficial Karstic Deposits

Determine the **Relative** Importance (“weights”) through Analytical Hierarchy Process

Physical Property	Relative Importance (%)
Distance to Waterbody	
Depth to Groundwater	
Hydraulic Conductivity	
Potential for Flooding	
Slope	
Surficial Karstic Deposits	
Total Relative Importance	

Consistency Ratios ≤ 0.1 indicate internal consistency

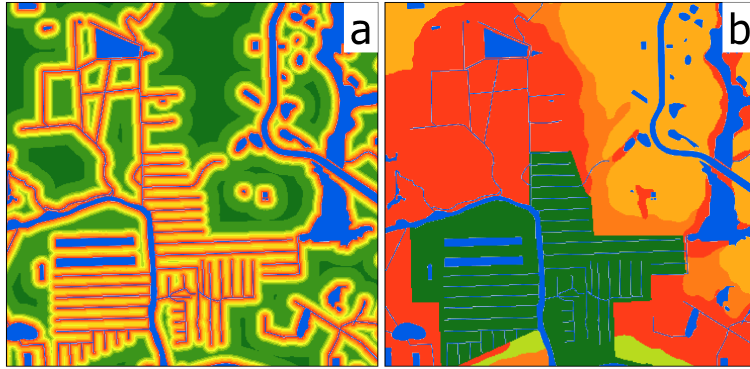
LANLoad Consistency Ratio = 0.01

Select and standardize the geospatial datasets representing each physical property

Physical Property	Low Ranks	High Ranks
Distance to Waterbody	<p>Lower potential to contribute nutrient loading to waterbodies</p>	<p>Higher potential to contribute nutrient loading to waterbodies</p>
Depth to Groundwater		
Hydraulic Conductivity		
Potential for Flooding		
Slope		
Surficial Karstic Deposits		

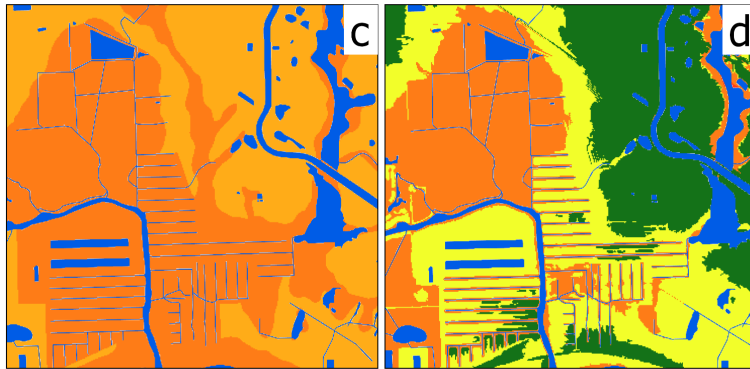
Distance to
Waterbody

30%



Hydraulic
Conductivity

20.7%



Slope

9.8%



Ranks - Relative contribution to
nutrient loading

2
Kilometers



Depth to
Groundwater

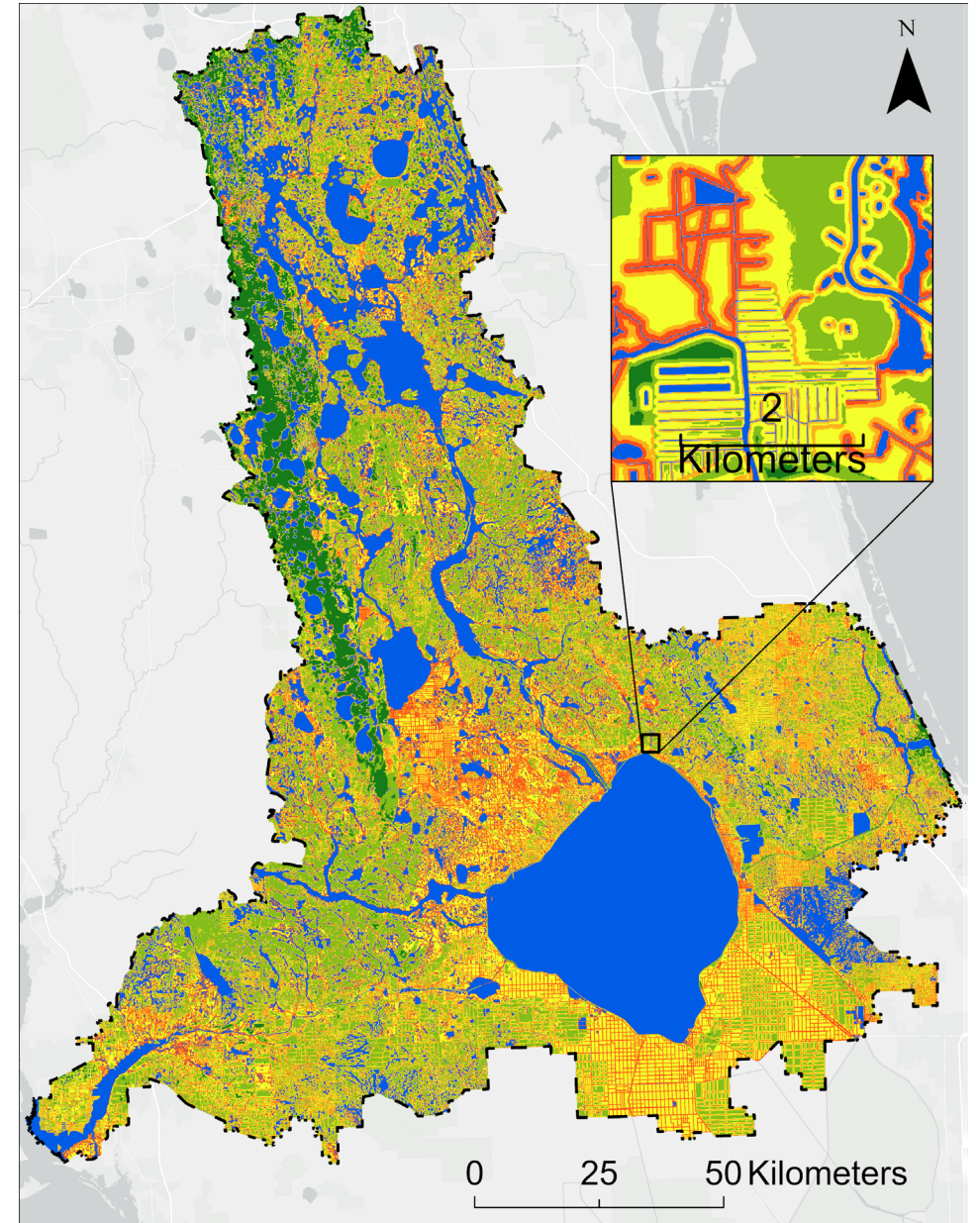
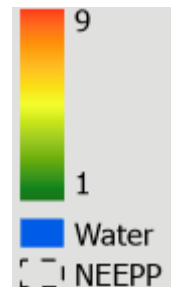
21.6%

Potential for
Flooding

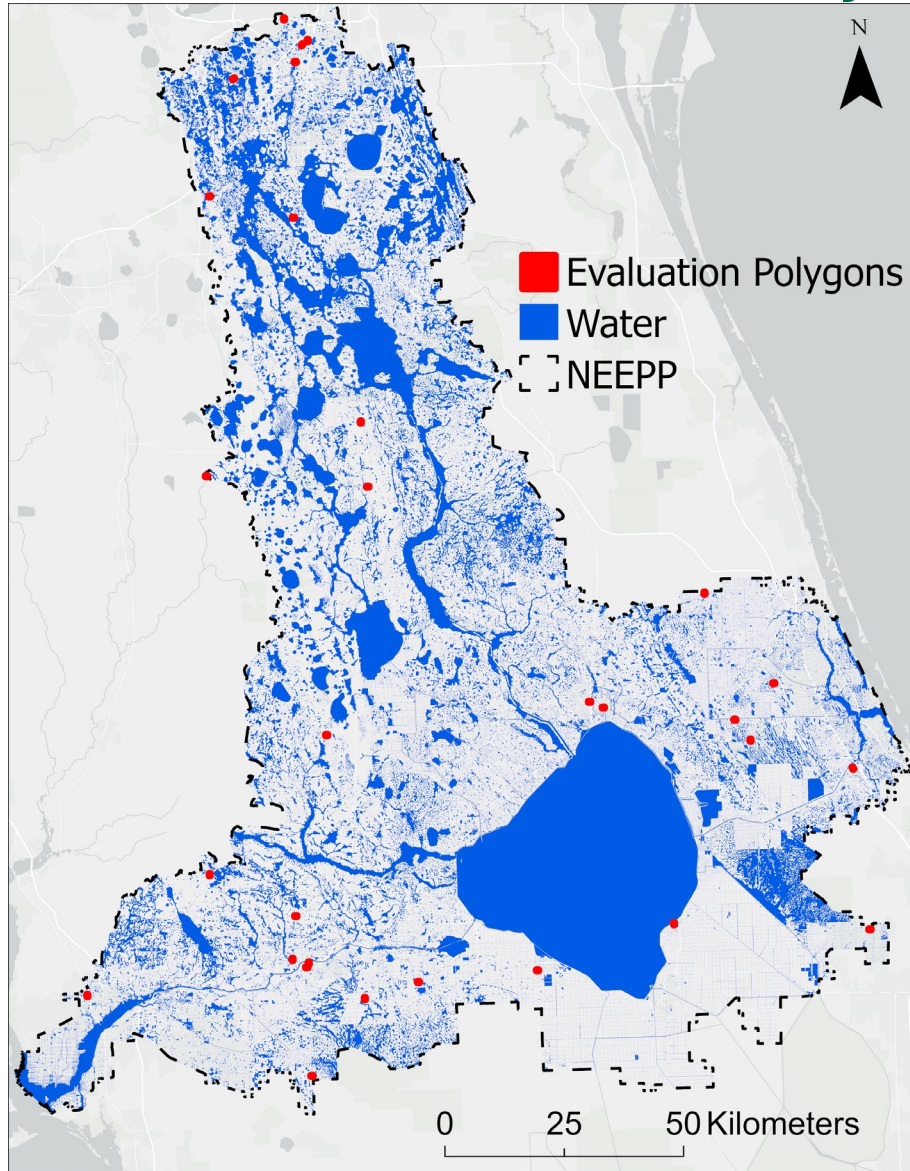
10.9%

Surficial Karstic
Deposits

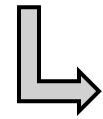
7%



LANLoad was evaluated by comparing its results with standard practice

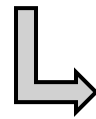


Expert's professional judgement



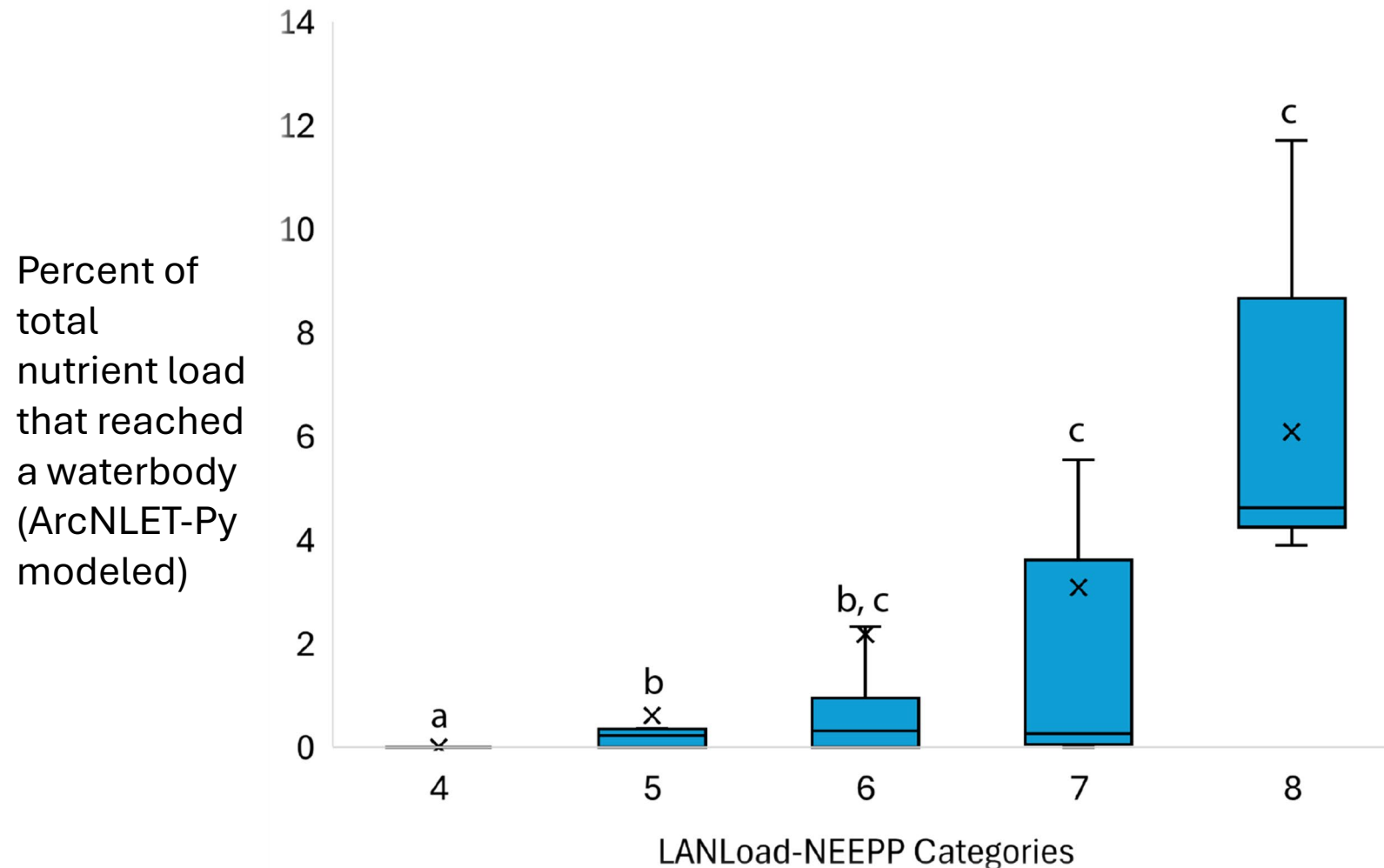
92% consistent with expert opinion

Nutrient-load predictions from a process-based numerical model



100% consistent with ArcNLET Py

Modeled nutrient loading to waterbodies increases with LANLoad category



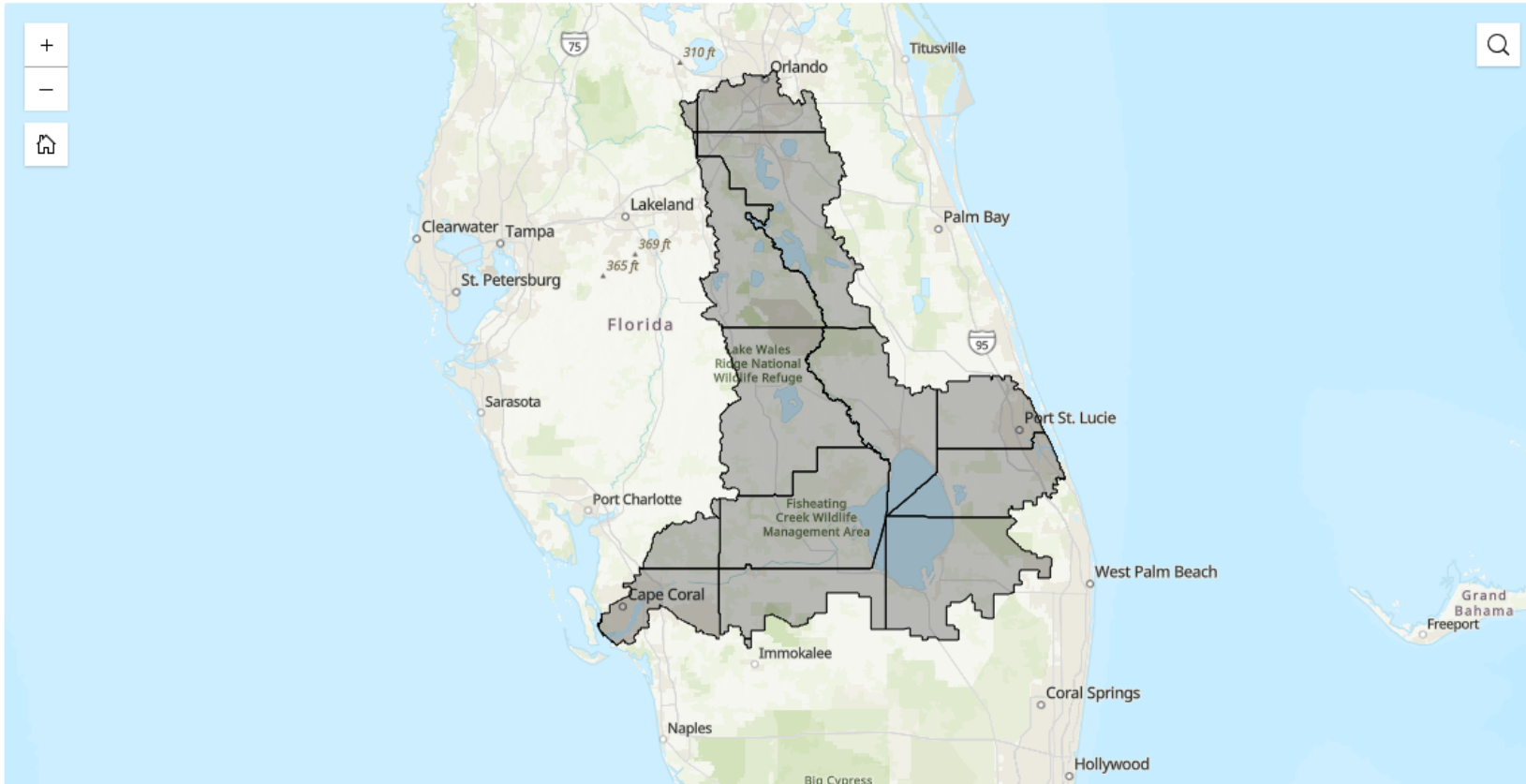
Kruskal-Wallis test
($H(4) = 283.46, p < 0.001$)

LANLoad

- Landscape assessment of the potential for nutrient loading to waterbodies
 - Based on physical factors
- Results are consistent with current tools – expert opinion and modeling
 - Not a replacement
- Geospatial Product
 - Readily integrated with other GIS datasets



Explore Data



Esri, USGS | University of South Florida, FDEP, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS | The University of South Florida - Ecohydrology Research Group conducted this work. Powered by Esri



Florida Geographic Information Office

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Thank you!



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