

Studies of Apple Snails and Snail Kites -

Toward sustainable management of a range-wide habitat network

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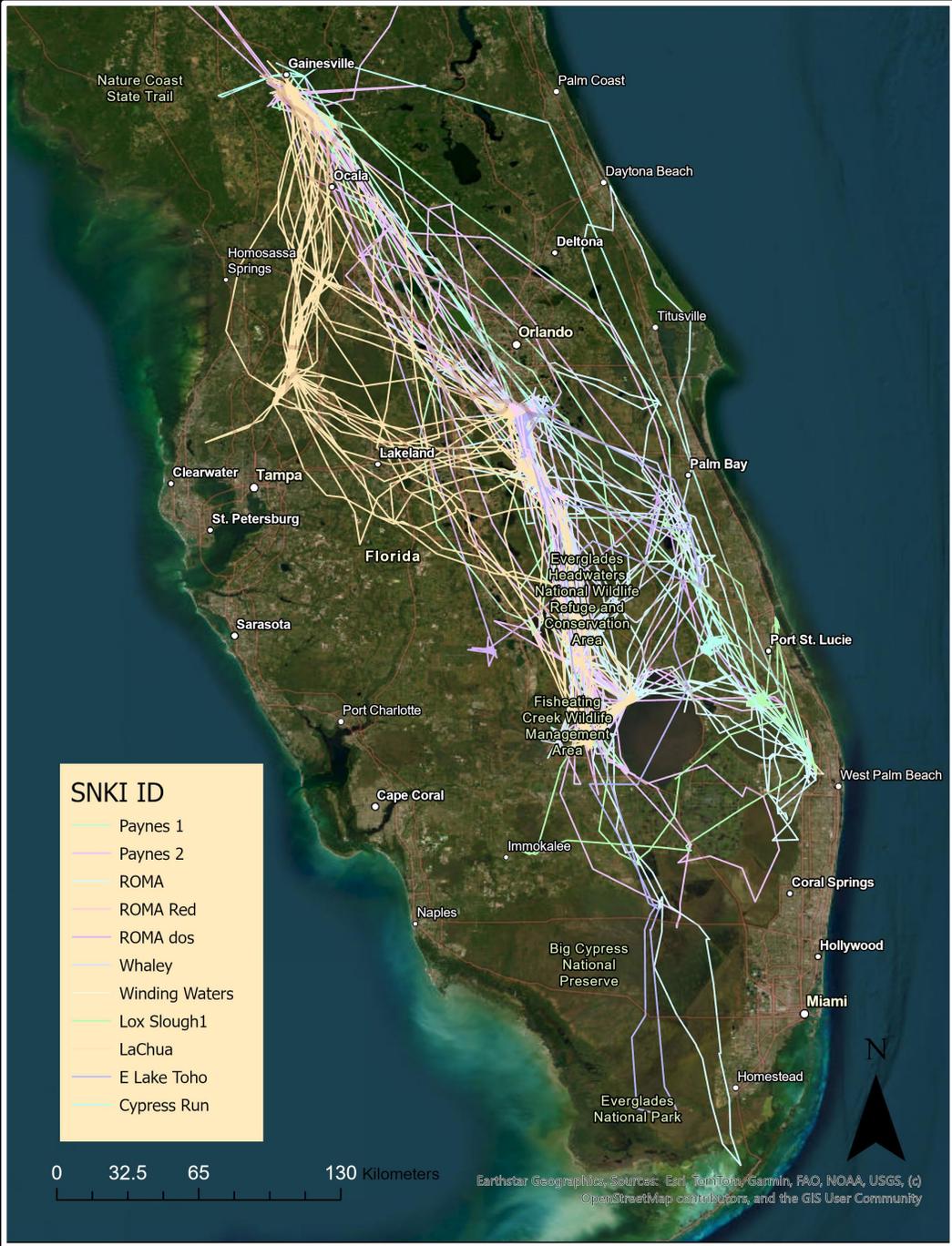
University of West Florida



Movements of 37 adult Snail Kites remotely tracked in peninsular Florida since 2007



Tracks of 12 adult
Snail Kites from
2020 to 2025



Earthstar Geographics, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community



Satellite and GPS fixes of 22 Snail Kites tagged as adults, 2007-2015

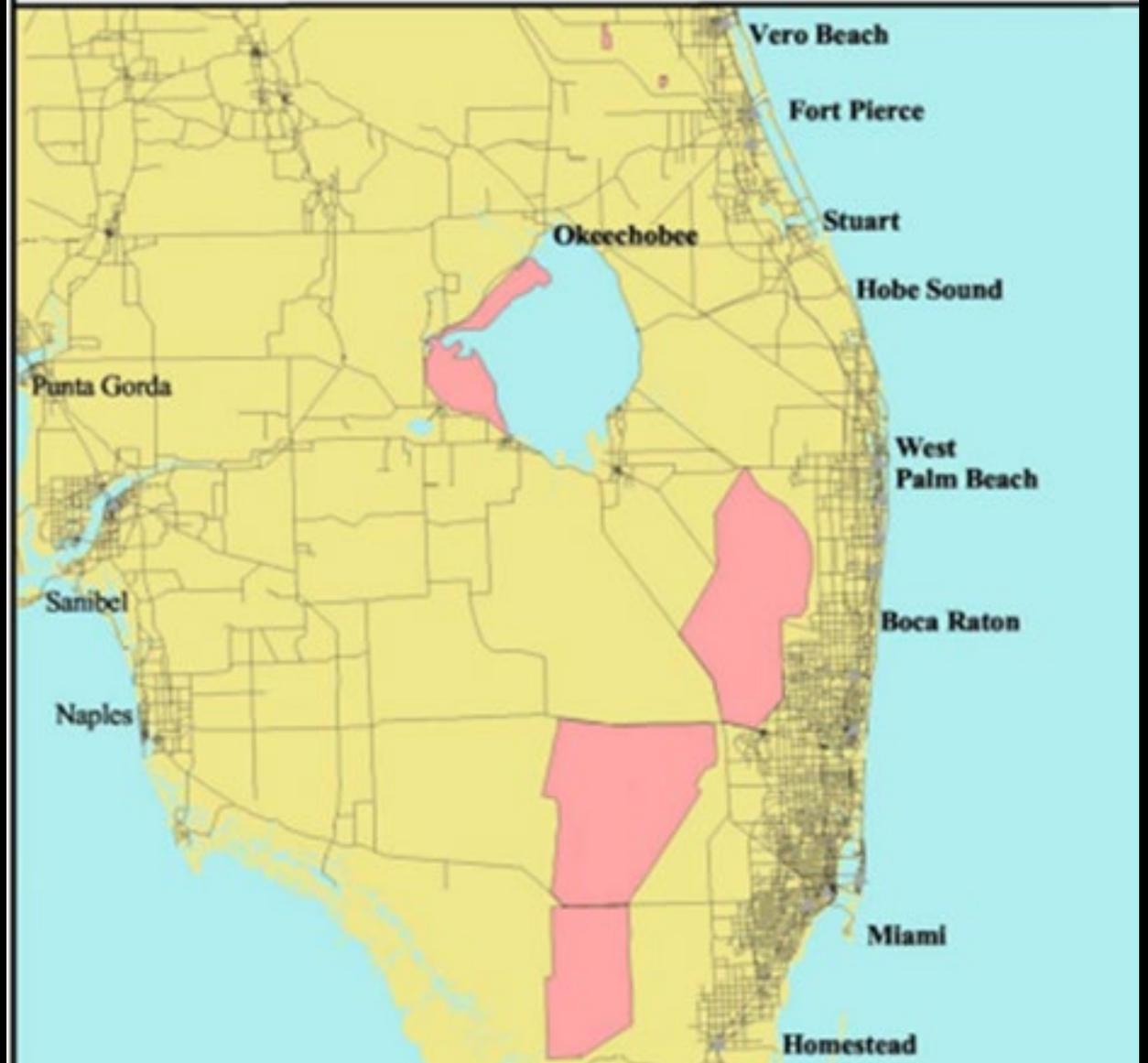


Tracks of 12 adult Snail Kites from 2020 to 2025

Tracks of 12 Snail Kites from 2020 to present



General locations of the designated critical habitat for the Everglade snail kite.





Evaluating Apple Snail Population Responses to Hydrologic Changes Associated with Everglades Restoration Transition Plan

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Avian Research and Conservation Institute
Phil Darby, University of West Florida**



**USFWS MULTI-SPECIES TRANSITION STRATEGY
FOR
WATER CONSERVATION AREA 3A**



Prepared by:

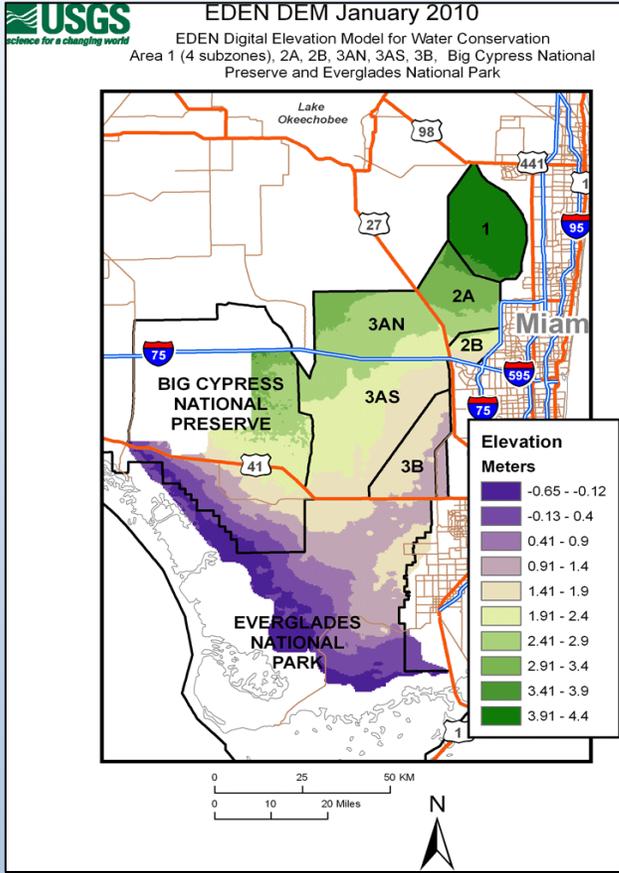
U.S. Fish and Wildlife Service
South Florida Ecosystem Services Office
Vero Beach, FL

July 1, 2010

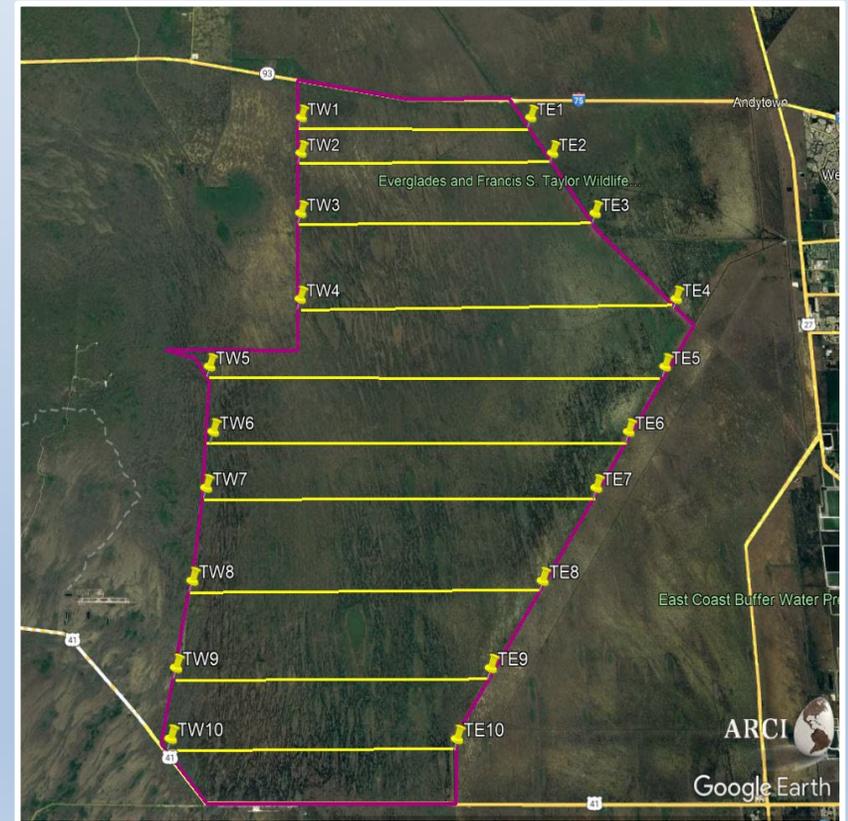


U.S. Fish and Wildlife Service

Draft Snail Kite Management Guidelines
February 21, 2006



Study Area: Water Conservation Areas 3A South and 3B, with Apple Snail sampling centroids (center) and egg-cluster survey transects (right)



US Army Corps of Engineers®

Apple Snail sampling protocols and rules were those of Darby et al:

- *Literature Review of Florida Apple Snails and Snail Kites, and Recommendations for their Adaptive Management.* November 2012. The Pomacea Project, Inc., U.S. Department of the Interior.
- Unpublished reports and personal communications, 2013 to present.

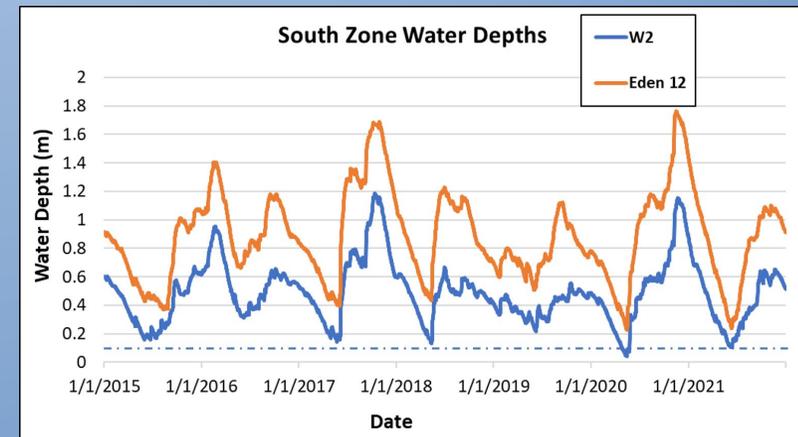
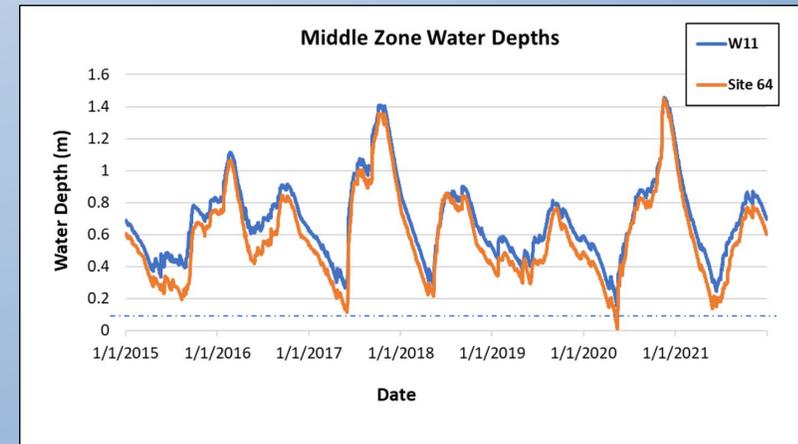
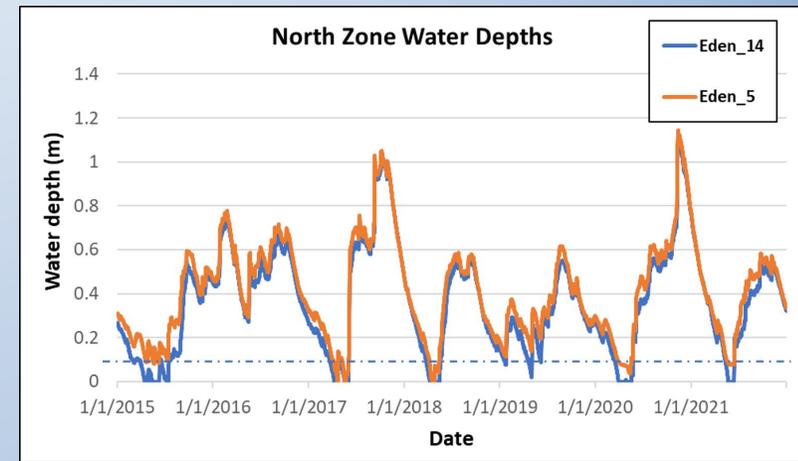


Apple Snail throw trap, courtesy of Phil Darby



***Seasonal changes in water depths over 7 years
in three latitudinal zones of Water Conservation Area 3A***

- Depth graphs from 2 stations in each of the 3 zones.
- Elevation readings adjusted to show actual depth
- Dotted line at the 10 cm mark represents depth at which native snails estivate.



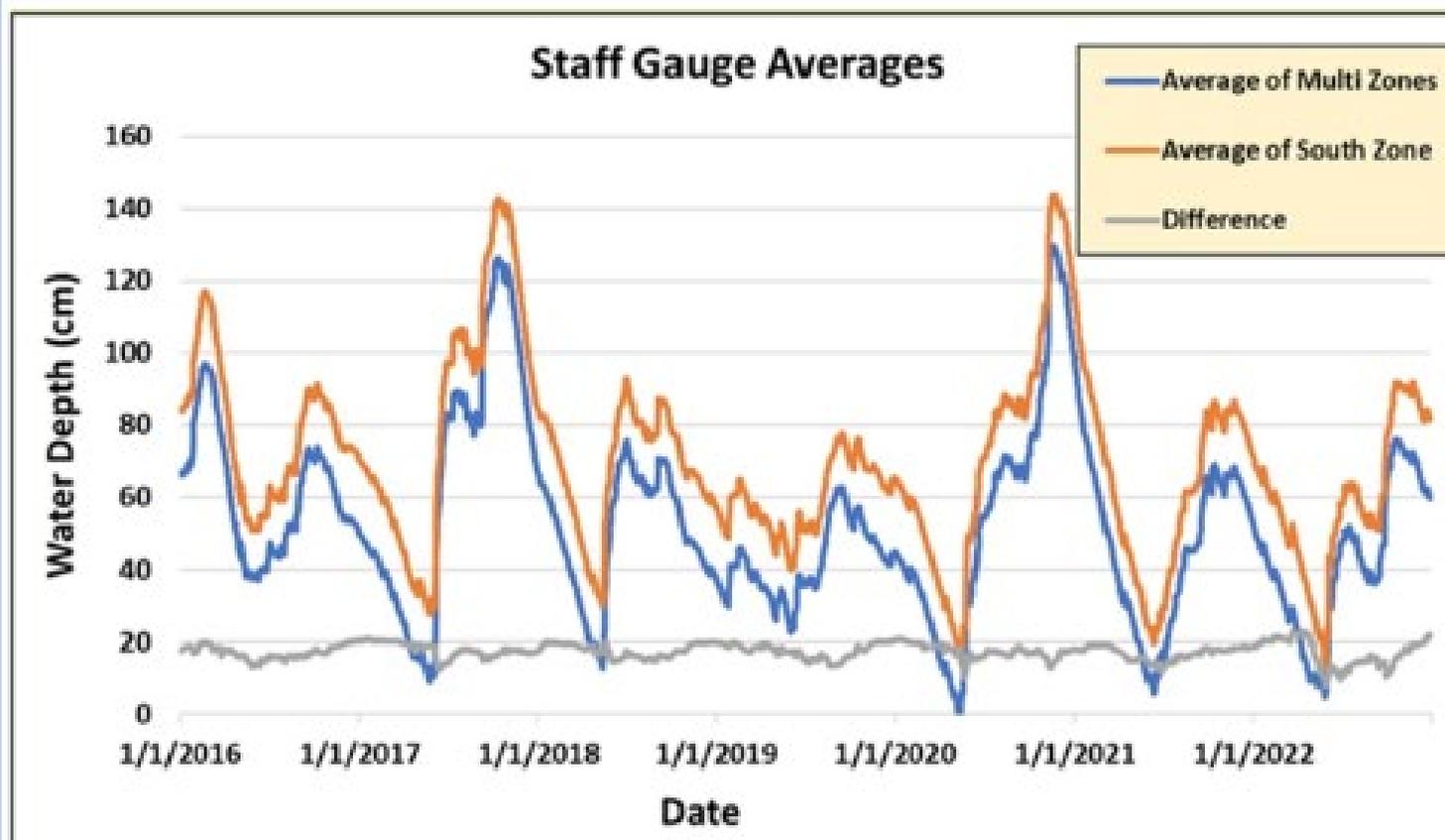
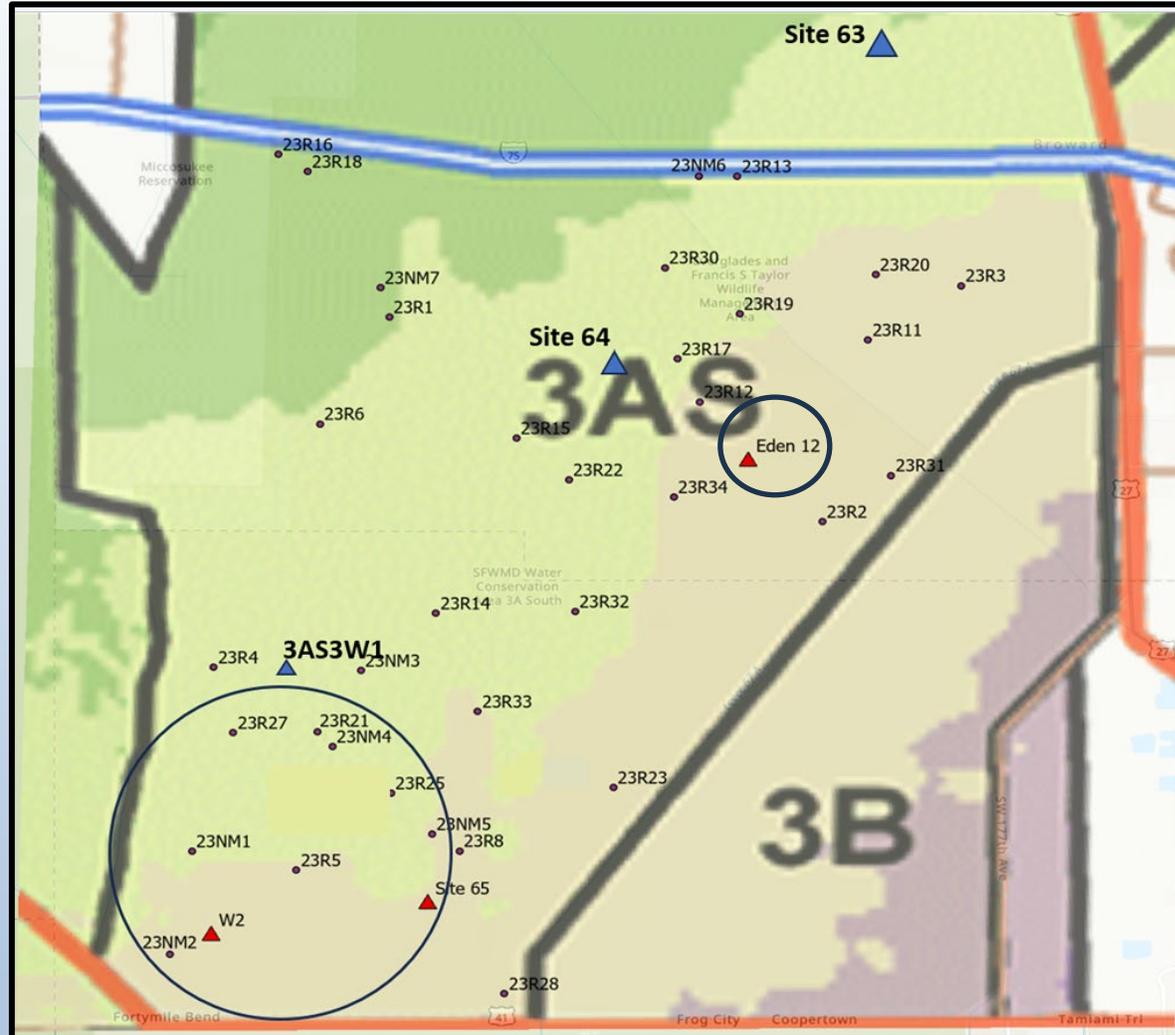


Figure 32. WCA 3A staff gauge averages after adjusting for minimum ground elevation.



USGS elevation zones in WCA 3A reflecting 0.5-meter differences between zones (shallowest north, deepest south). Circled gauge stations should be used for targeting desired depths for Apple Snail production in southwestern WCA 3A, where Snail Kite nesting was greatest historically.

WCA 3A adjusted snail densities per year, 2017-2024

2017	0.07 snails/sq m
2018	0.17
2019	0.10
2020	0.04
2021	0.18
2022	0.01
2023	0.02
2024	0.03

2017-2021 comprehensive final report, ARCI to ACOE
2022-2024 annual reports.

Total trap throws through 2024 = 3,577 (mean 447/year, 410-575)

WCA 3A adjusted snail densities per year, 2017-2021

2017 0.07 snails/sq m

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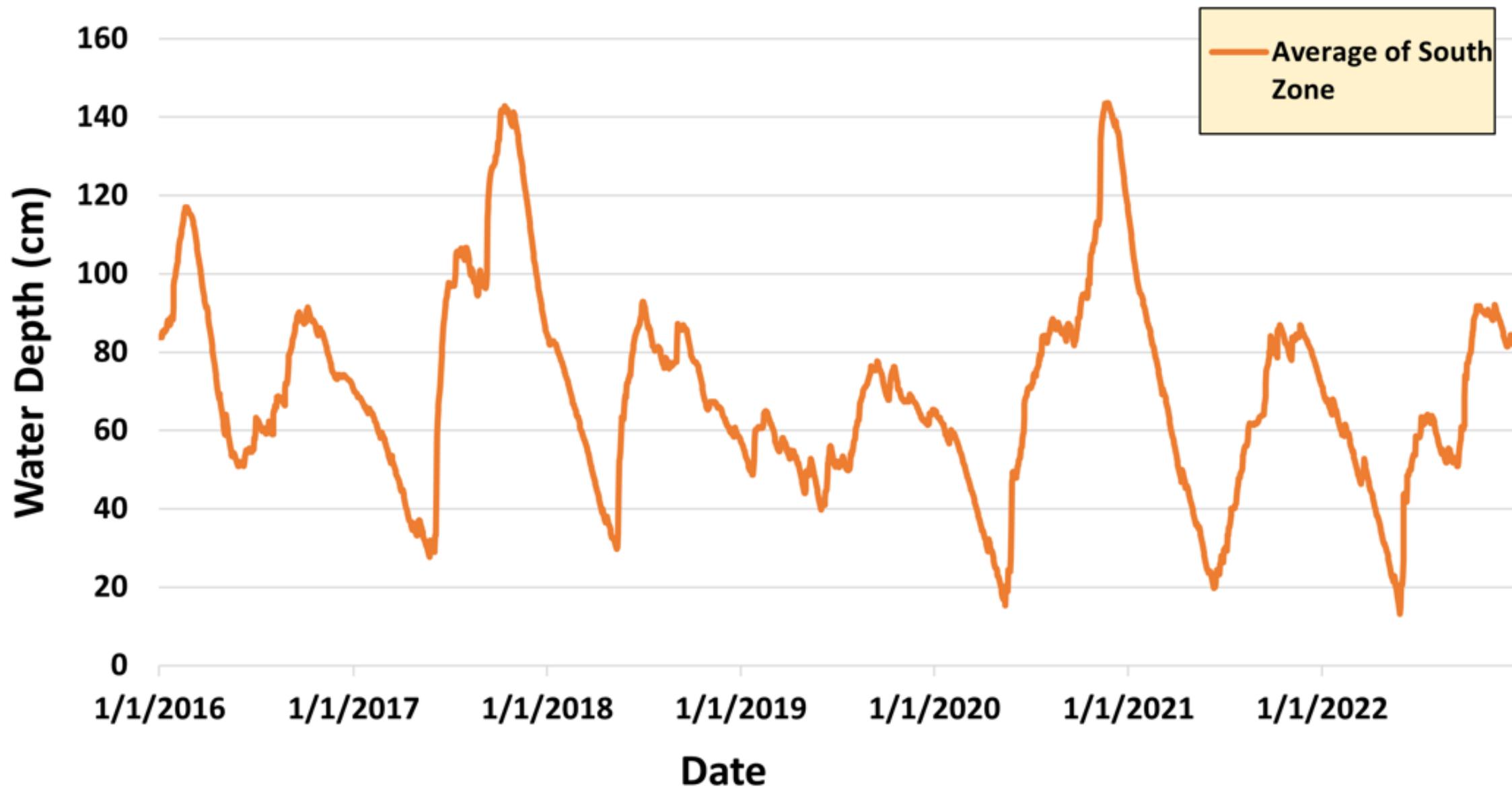
2022 0.01

2023 0.02

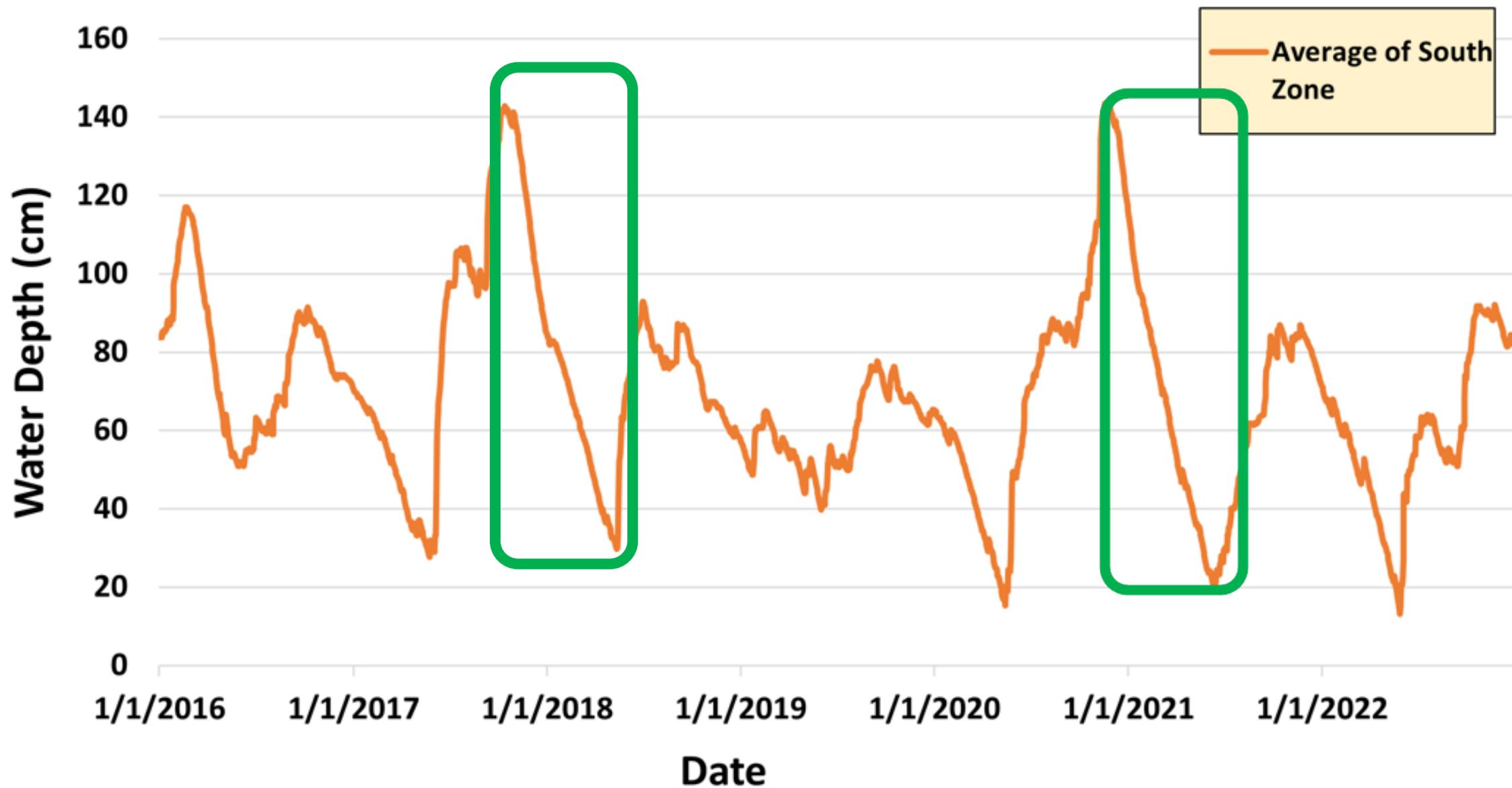
2024 0.03

Red indicates densities above threshold for supporting Snail Kite nesting, **0.14 snails/sq m** (Darby et al).

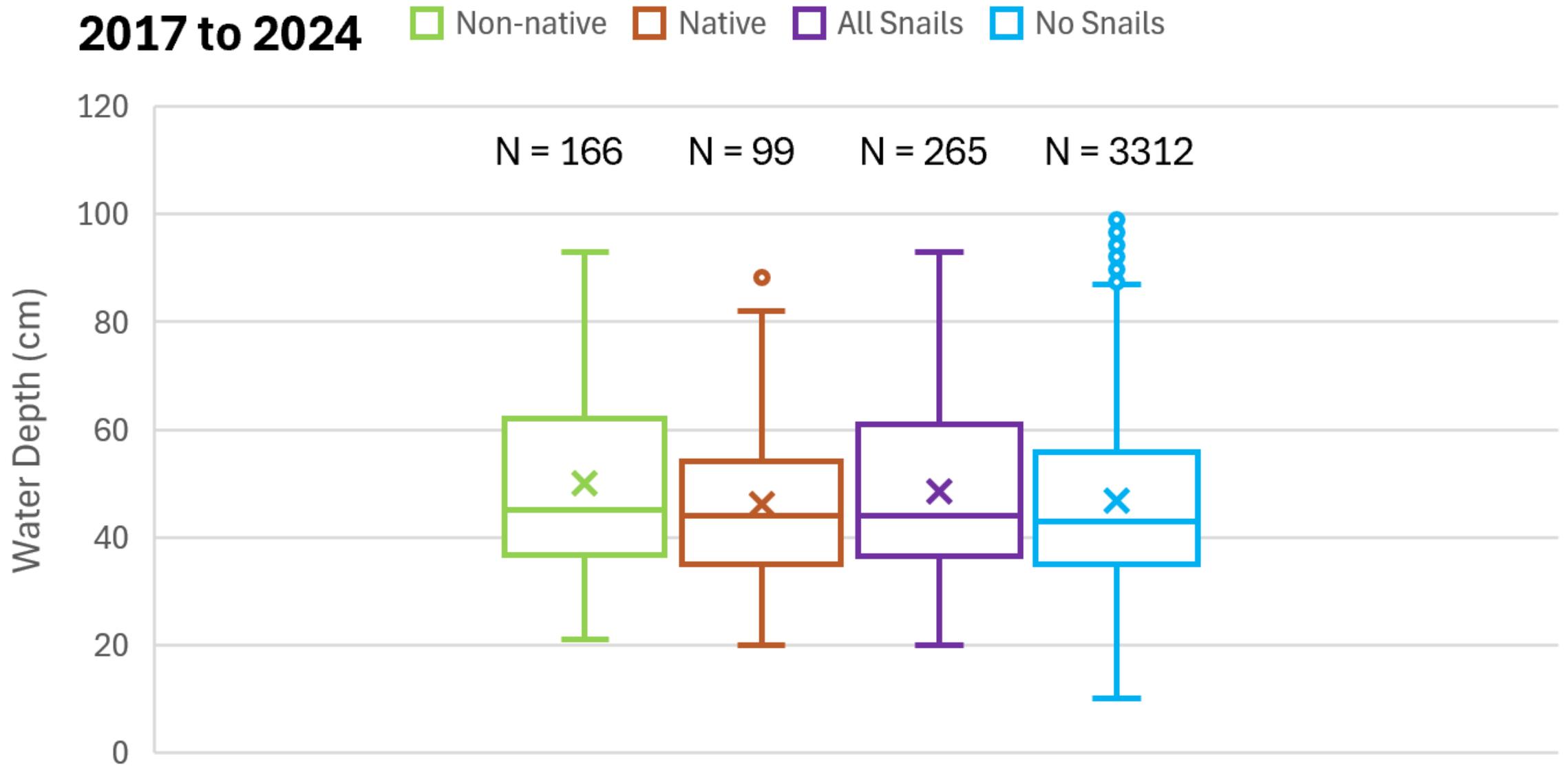
Staff Gauge Averages



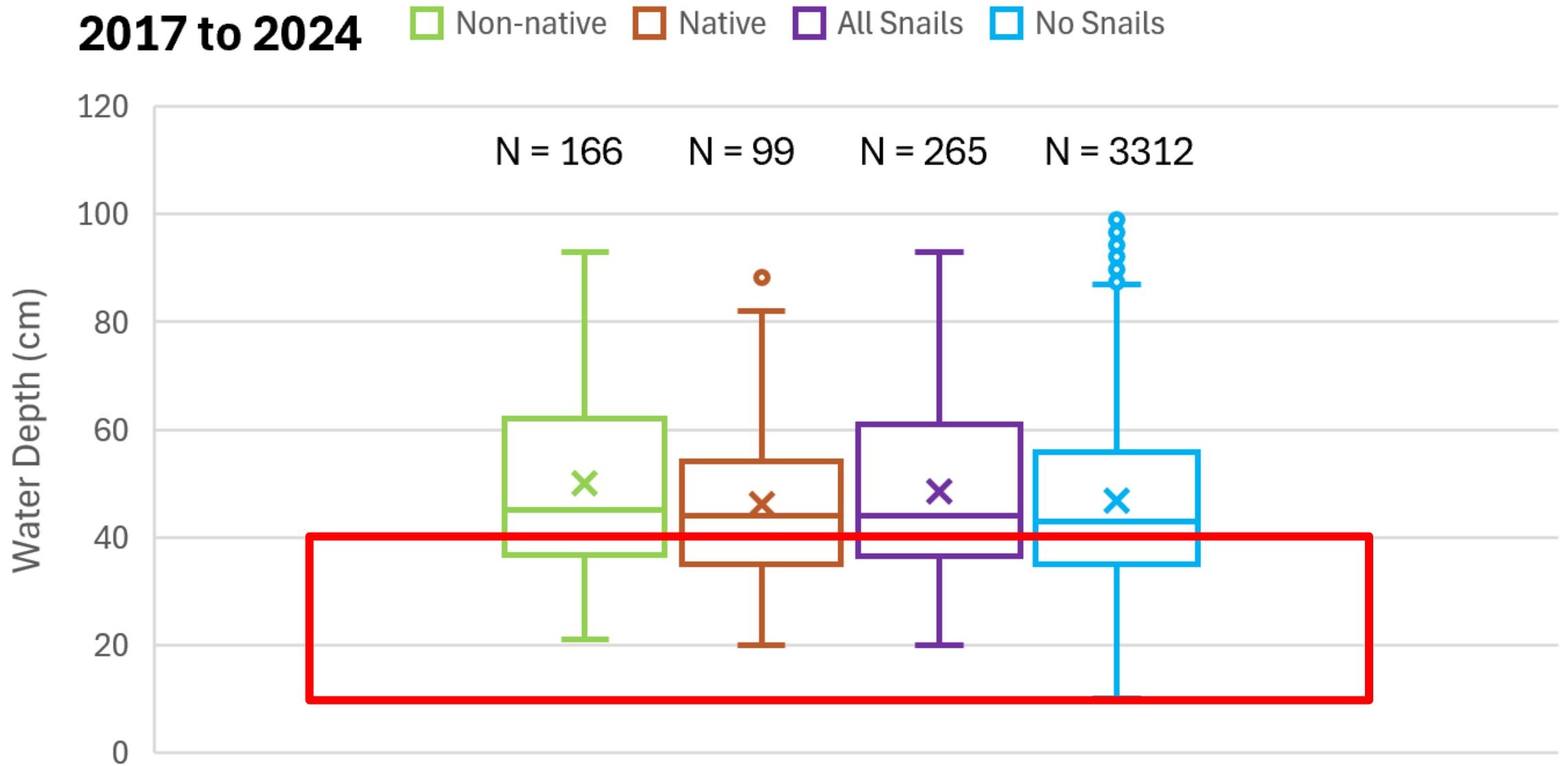
Staff Gauge Averages



Mean water depths measured in each thrown snail trap, by outcome, 2017 to 2024



Mean water depths measured in each thrown snail trap, by outcome, 2017 to 2024

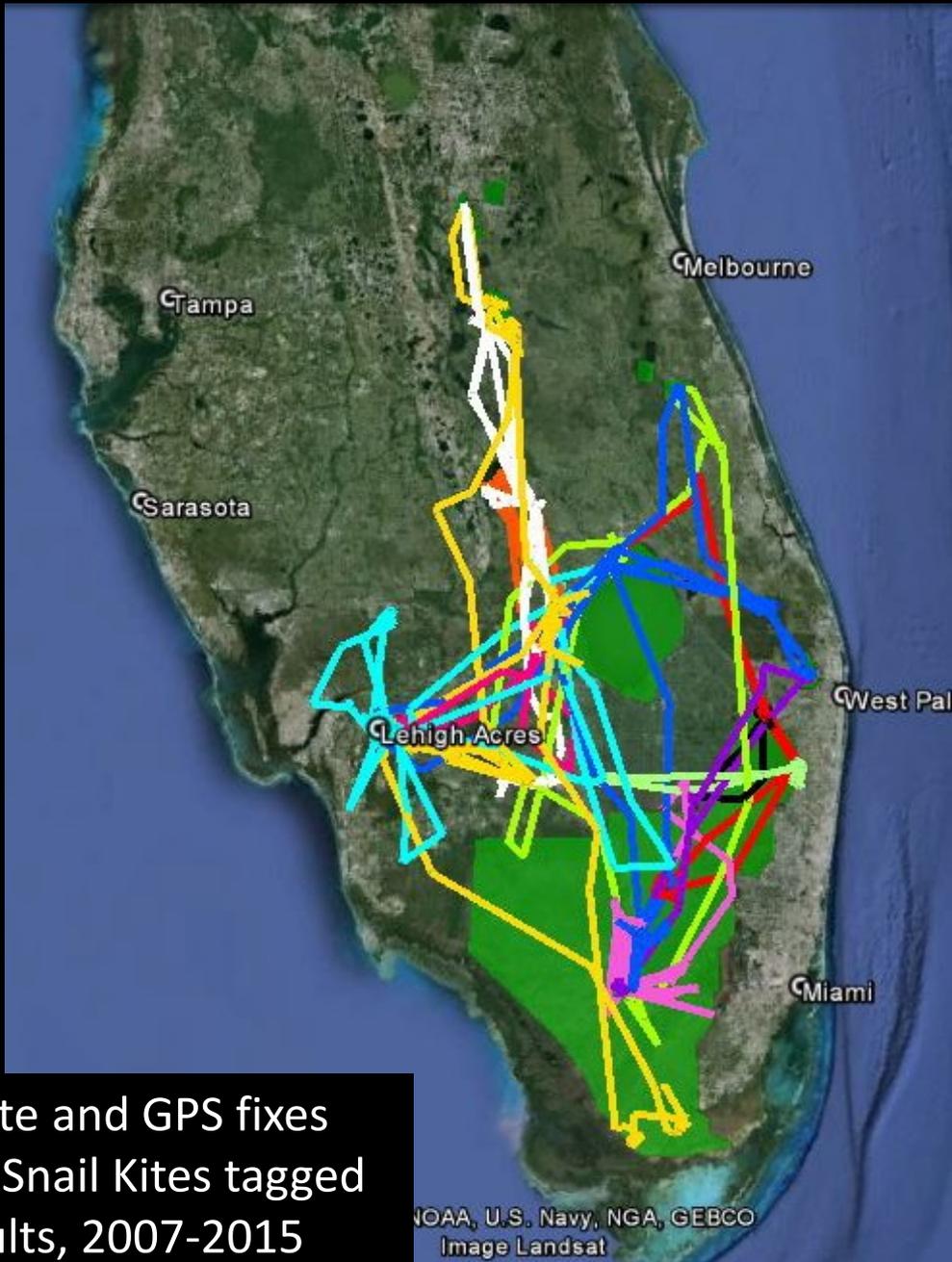


Compare UF's long-term data on Snail Kite nesting effort In WCA3 (Bennetts et al, Kitchens et al., Fletcher et al.) with annual estimates of Apple Snail densities and hydrologic records since the mid-1990s (Darby et al. Meyer and Kent).

Other factors that could be limiting native Apple Snail populations:

- Water temperature
- Water chemistry (phosphorus, calcium)
- Water quality
- Larval predation by native and non-native fish
- Declines in periphyton communities (abundance and diversity)
- Changes in wetland plant communities
- Chemical deterrents to growth and survival, produced by non-native snails

Recolonization and recovery of native Apple Snail populations could take a very long time.



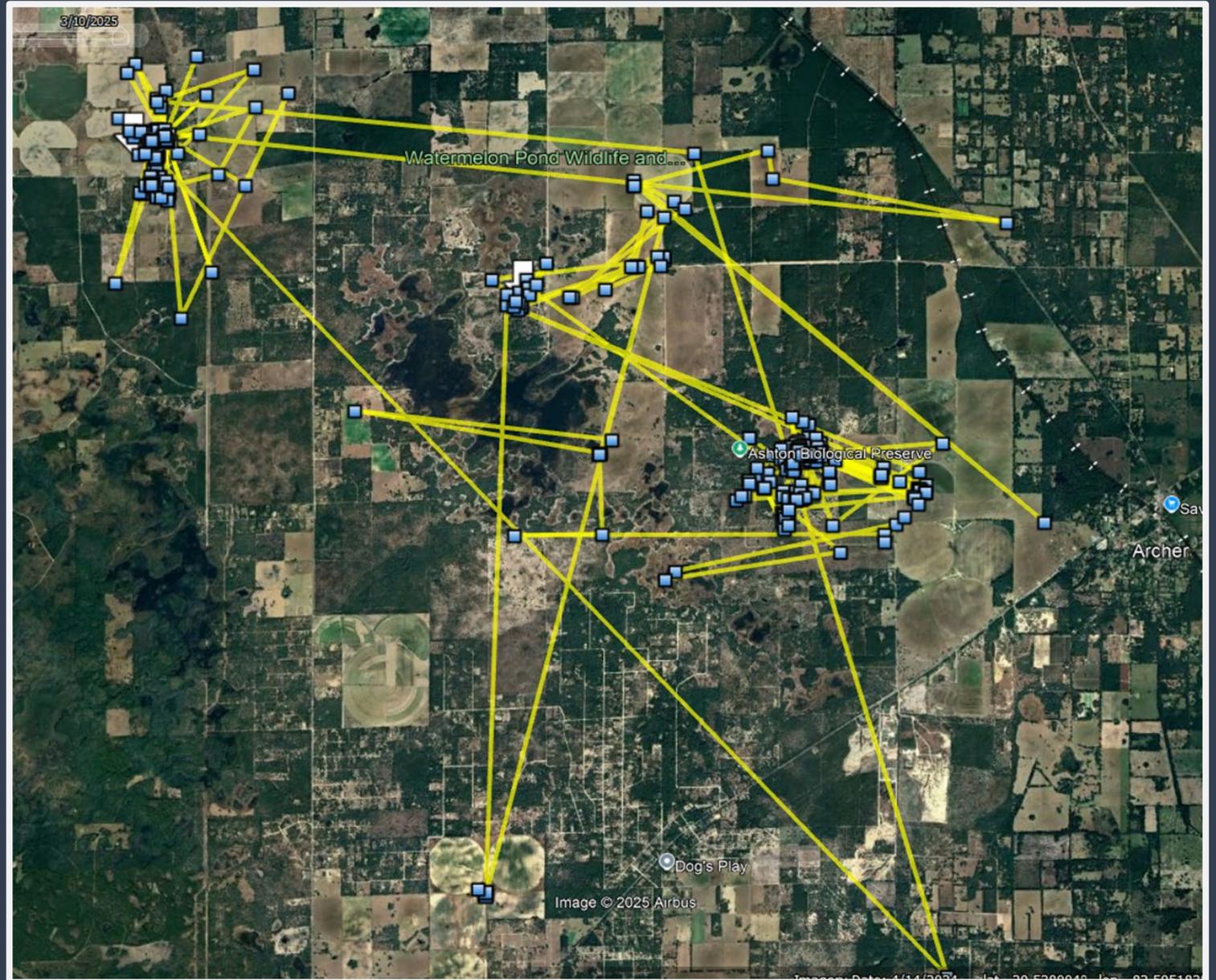
Satellite and GPS fixes of 22 Snail Kites tagged as adults, 2007-2015

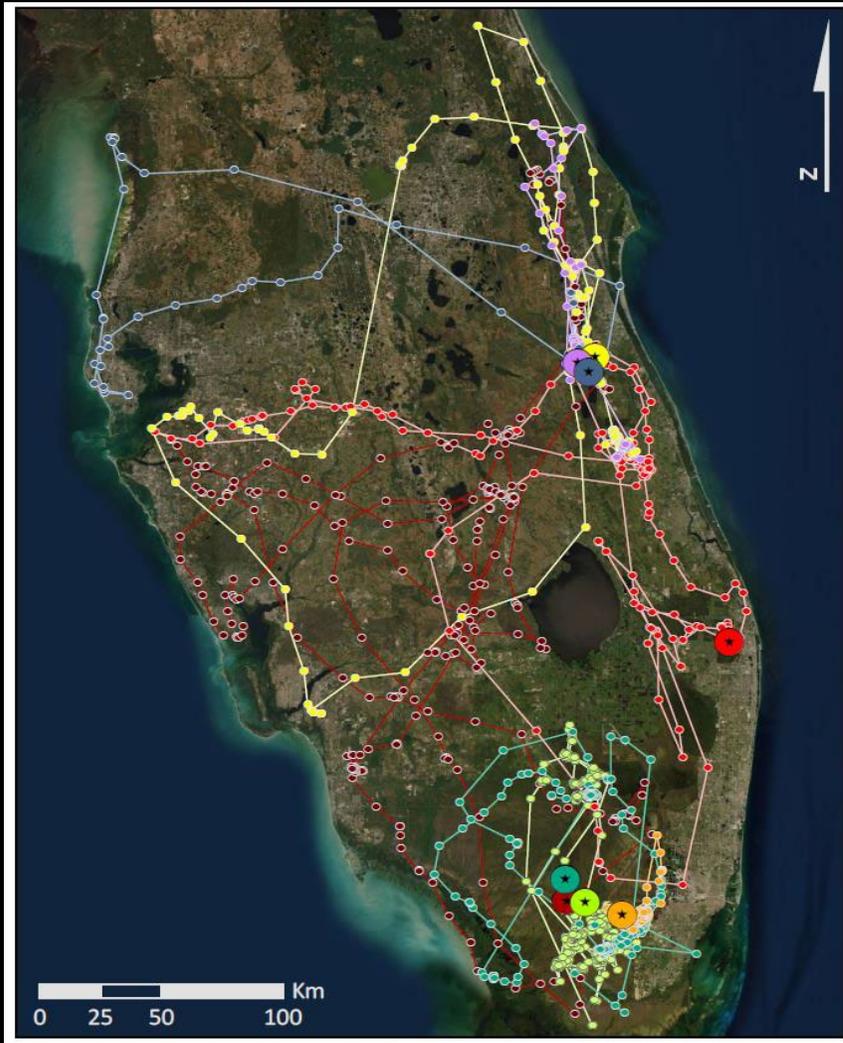


Tracks of 12 adult Snail Kites 2020 to 2025

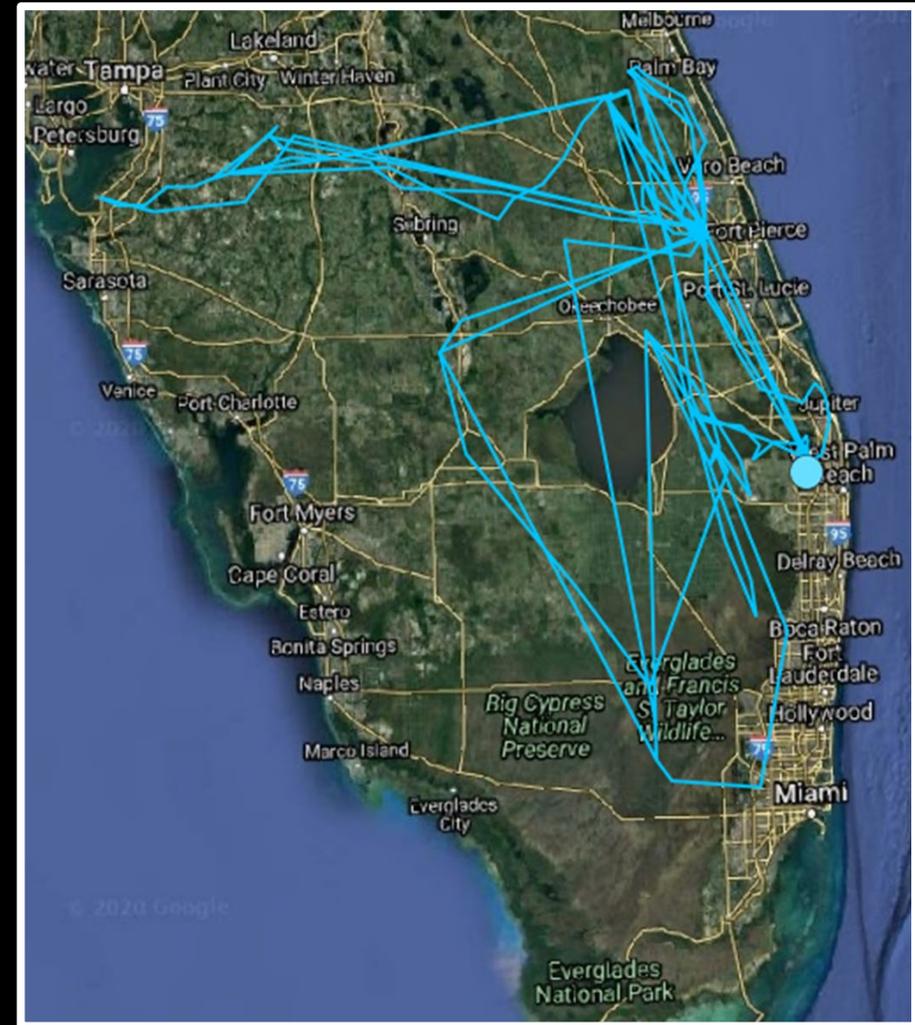


Movements of a first-year male Southeastern American Kestrel tracked by remote GPS telemetry



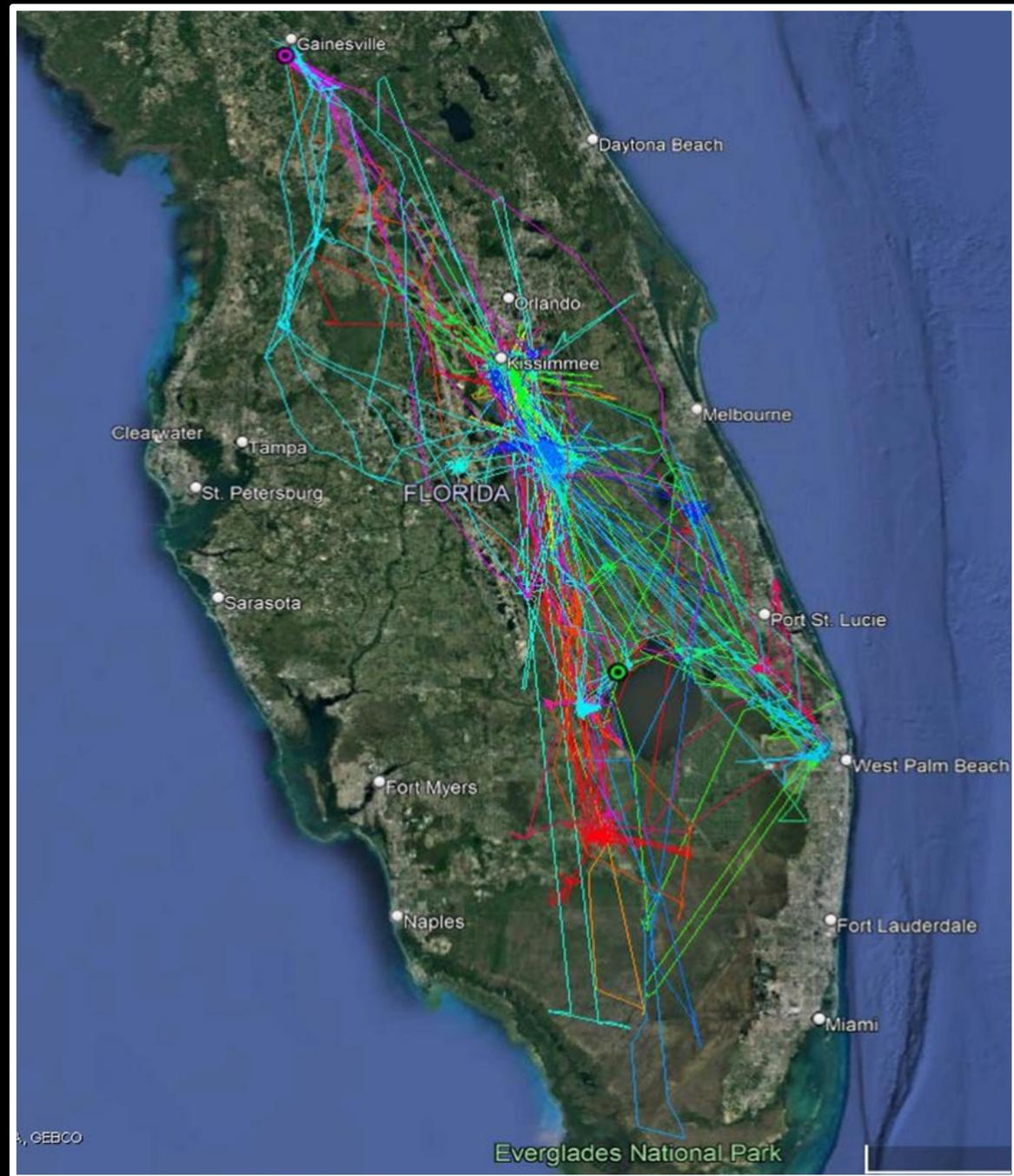


Foray movements of post-fledging Snail Kites. 2024. *Ecology and Evolution*. Poli, Meyer, Darby, Dudek, Kent, Fletcher.



Movements of a first-year Snail Kite tagged prior to fledging, Palm Beach County, Florida

Tracks of 9 adult Snail
Kites from 2015 to 2020





Thanks to ...

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