

Snail Kite satellite telemetry reveals large-scale movements and concentrated use of “peripheral” wetlands: Implications for habitat management and population monitoring.



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Kristen Hart, Autumn Sartain – U. S. Geological Survey
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**Snail Kite capture locations
for satellite tracking**

 Doppler  GPS

Doppler data:
10 kites
12,106 locations
32 months

GPS data:
12 kites
80,843 locations
35 months

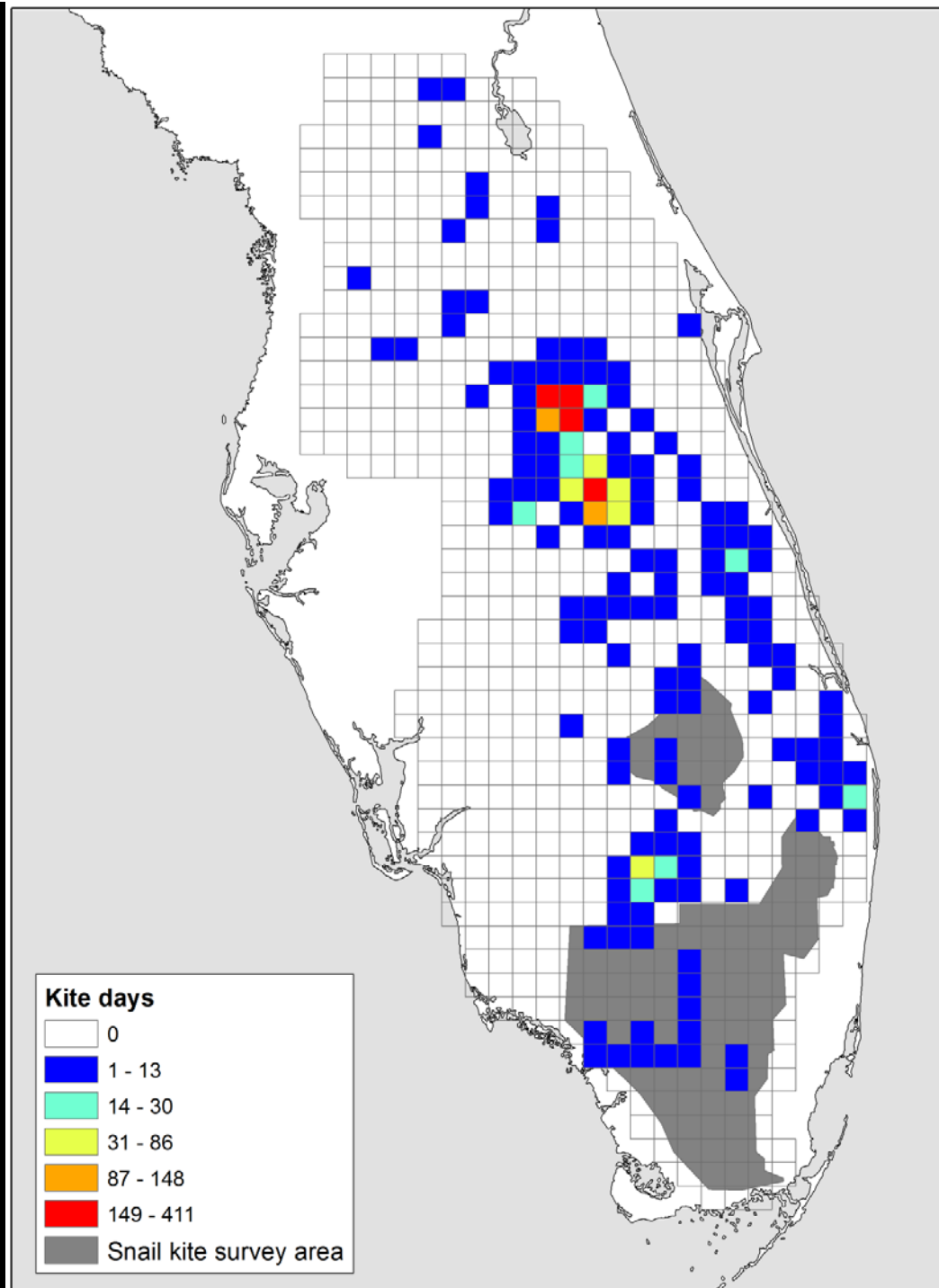


© 2014 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

Imagery Date: 4/10/2013 lat 26.801075° lon -81.315791° elev 20 ft eye alt 216.38 mi

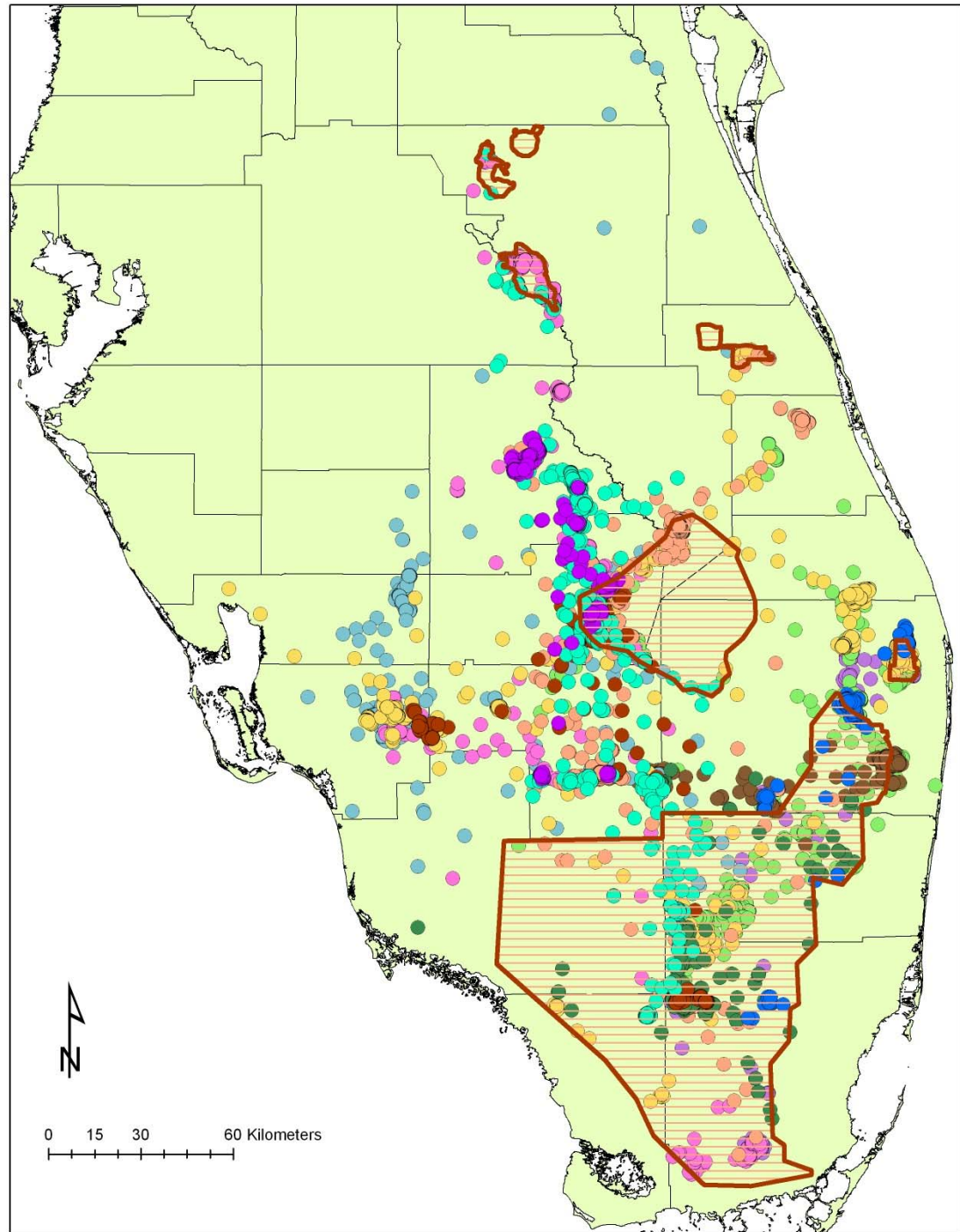
Kite-days per 10-km grid cells
(Doppler only, 12,106 locations)
for 10 Snail Kites tagged on lakes
Tohopekaliga and Kissimmee, 2007.





Satellite/GPS data
12 kites, 80,843 locations
February 2012 – 11/20/14

52% of the breeding-season locations (Feb-July) and 54% year round were outside focal areas for management and population monitoring.





Will Randall

Doppler and GPS satellite fixes
for 22 Snail Kites tagged as adults.
92,949 locations, 2007-2015

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Image U.S. Geological Survey
Image © 2012 TerraMetrics

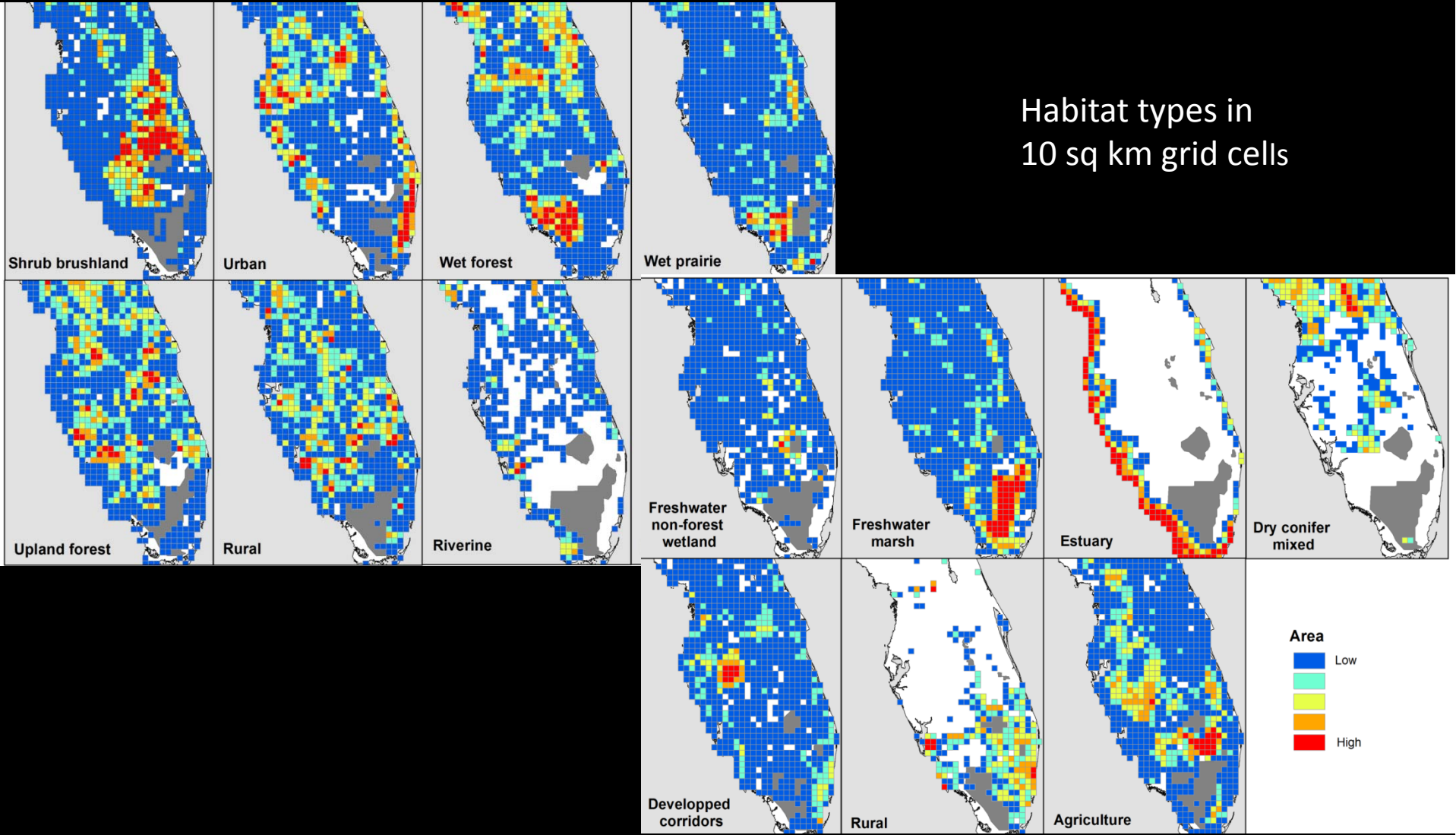
lat 27.422945° lon -81.940001° elev 88 ft

Google earth

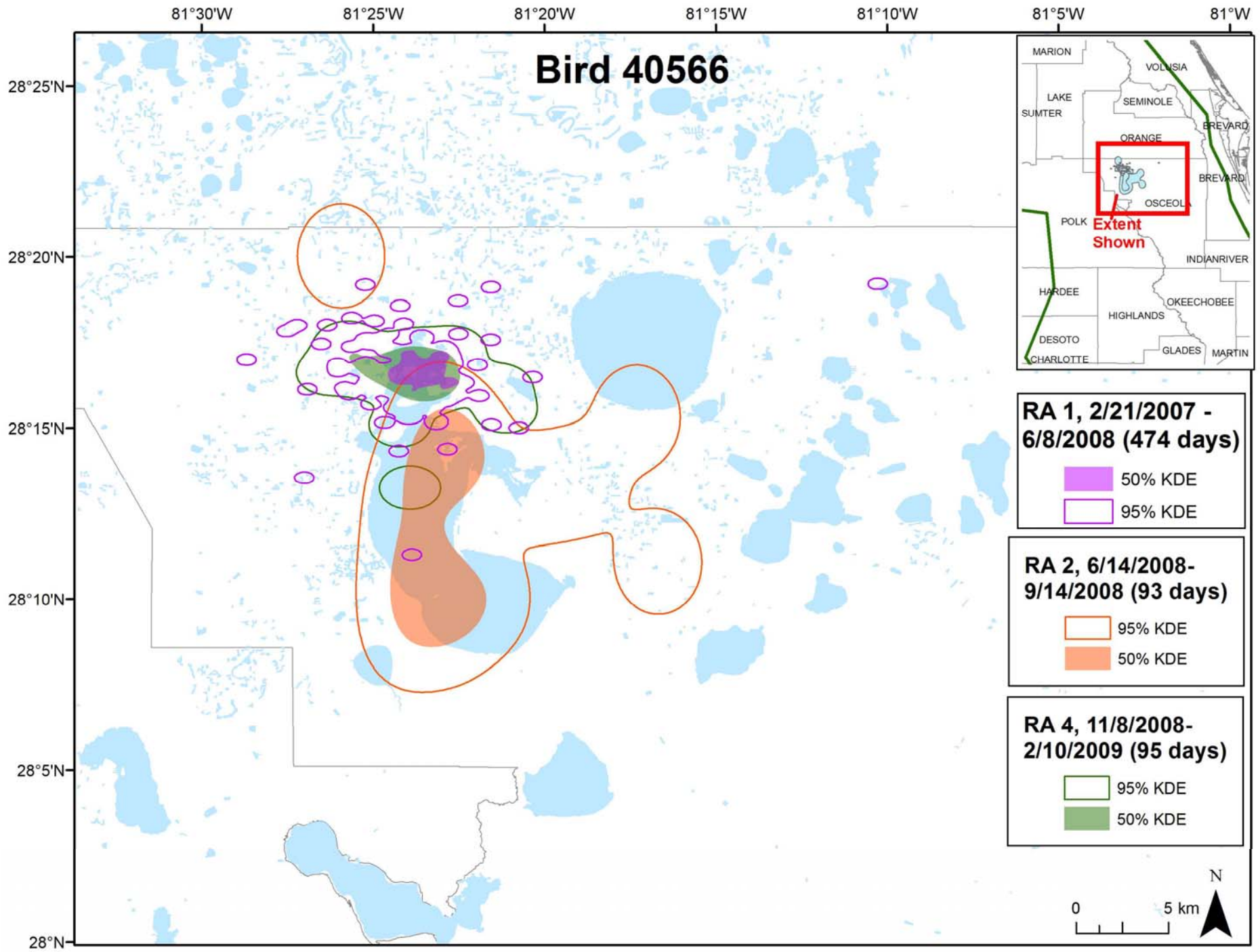
Eye alt 290.76 mi



Habitat types in 10 sq km grid cells



Bird 40566



RA 1, 2/21/2007 - 6/8/2008 (474 days)

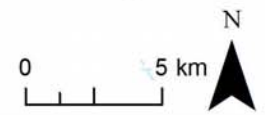
- 50% KDE
- 95% KDE

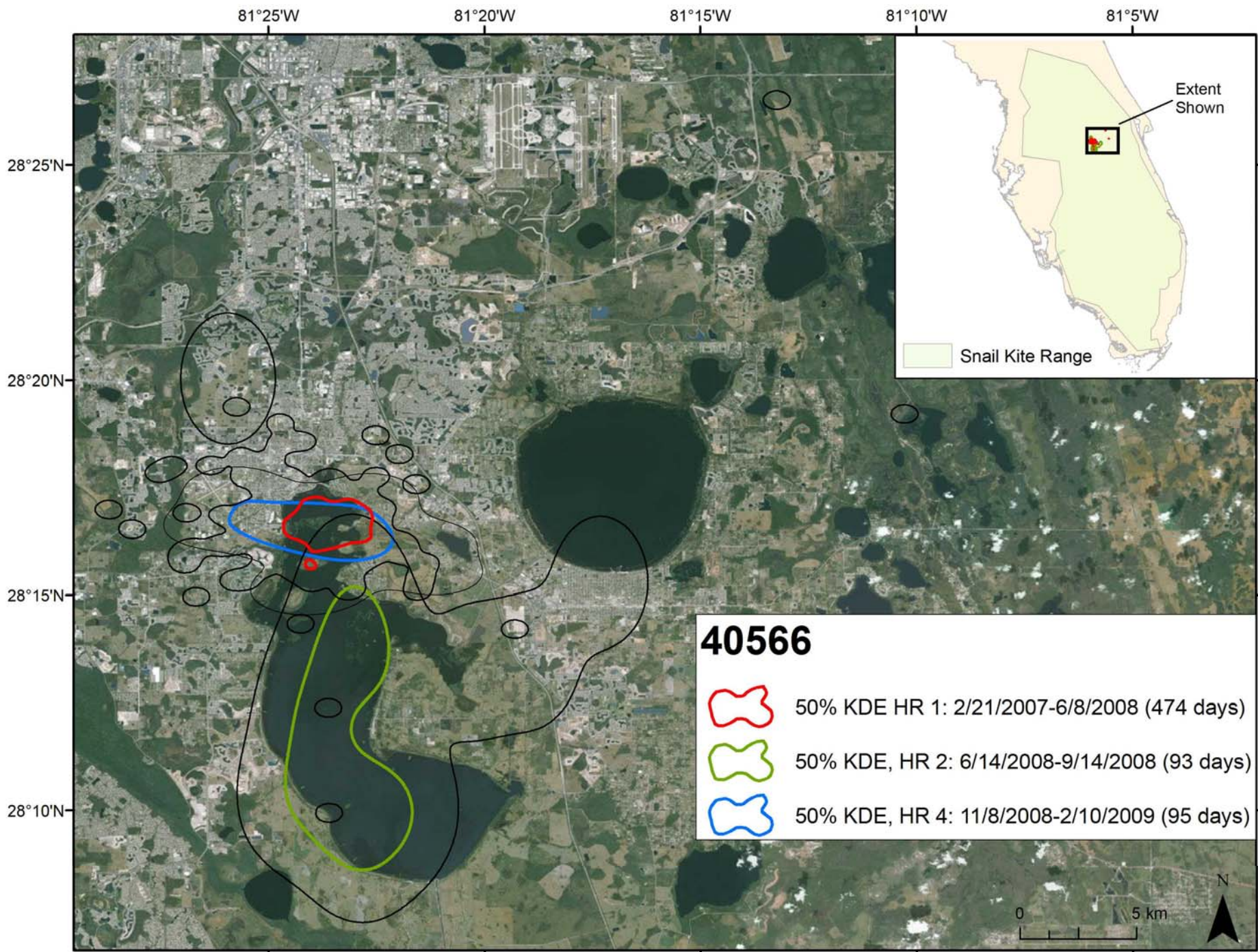
RA 2, 6/14/2008 - 9/14/2008 (93 days)

- 95% KDE
- 50% KDE

RA 4, 11/8/2008 - 2/10/2009 (95 days)

- 95% KDE
- 50% KDE





81°25'W

81°20'W

81°15'W

81°10'W

81°5'W

28°25'N

28°20'N


28°15'N

28°10'N

Extent Shown

Snail Kite Range

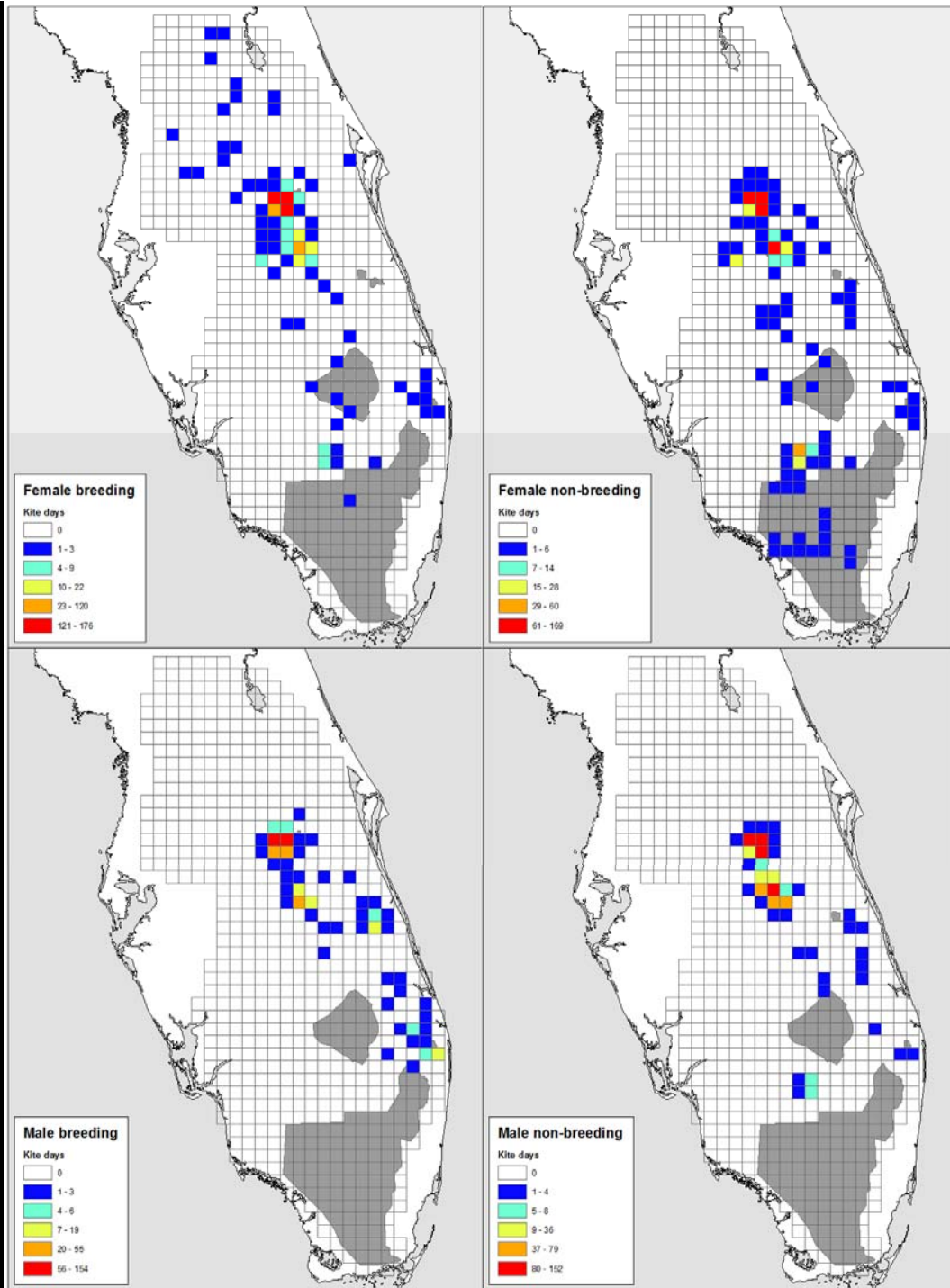
40566

-  50% KDE HR 1: 2/21/2007-6/8/2008 (474 days)
-  50% KDE, HR 2: 6/14/2008-9/14/2008 (93 days)
-  50% KDE, HR 4: 11/8/2008-2/10/2009 (95 days)

0 5 km

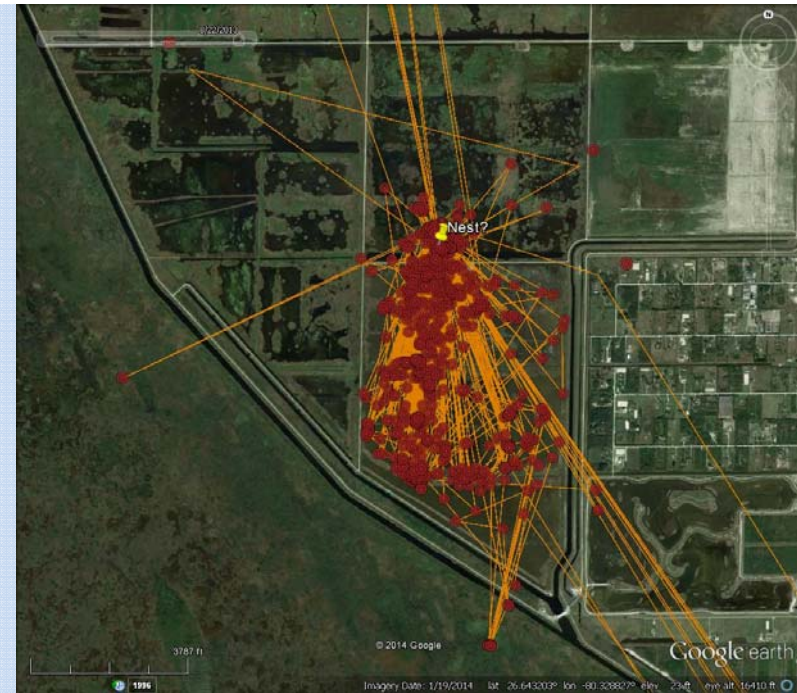


Kite days by gender and breeding vs non-breeding seasons per 10-km grid cells. Doppler only, 12,106 locations, 10 Snail Kites.

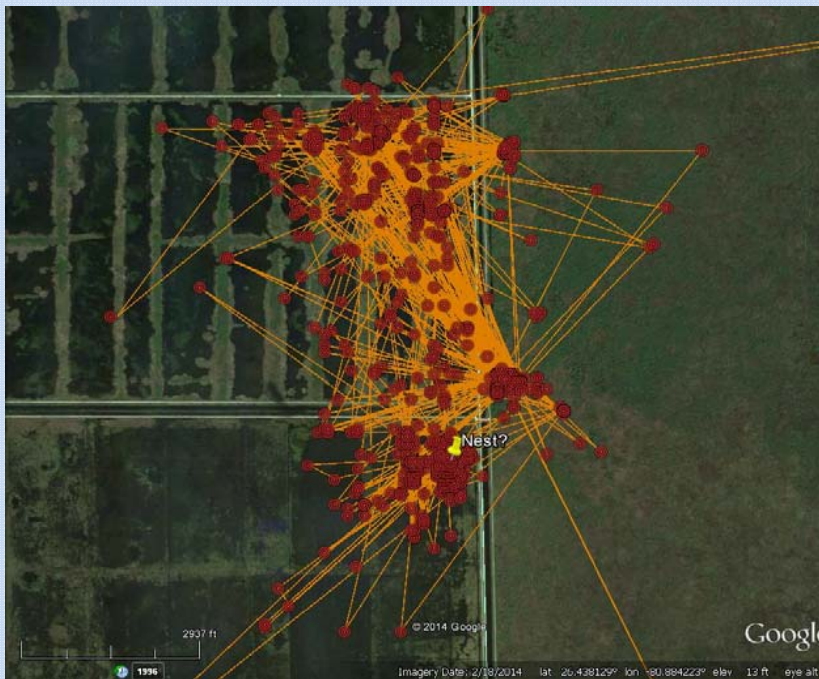


Possible Snail Kite nest locations based on satellite/GPS fixes

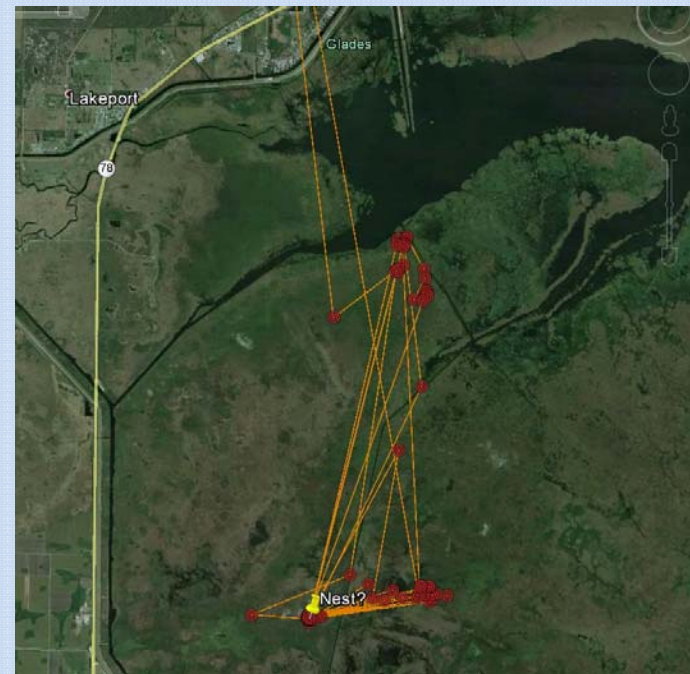
Male
STA 1E

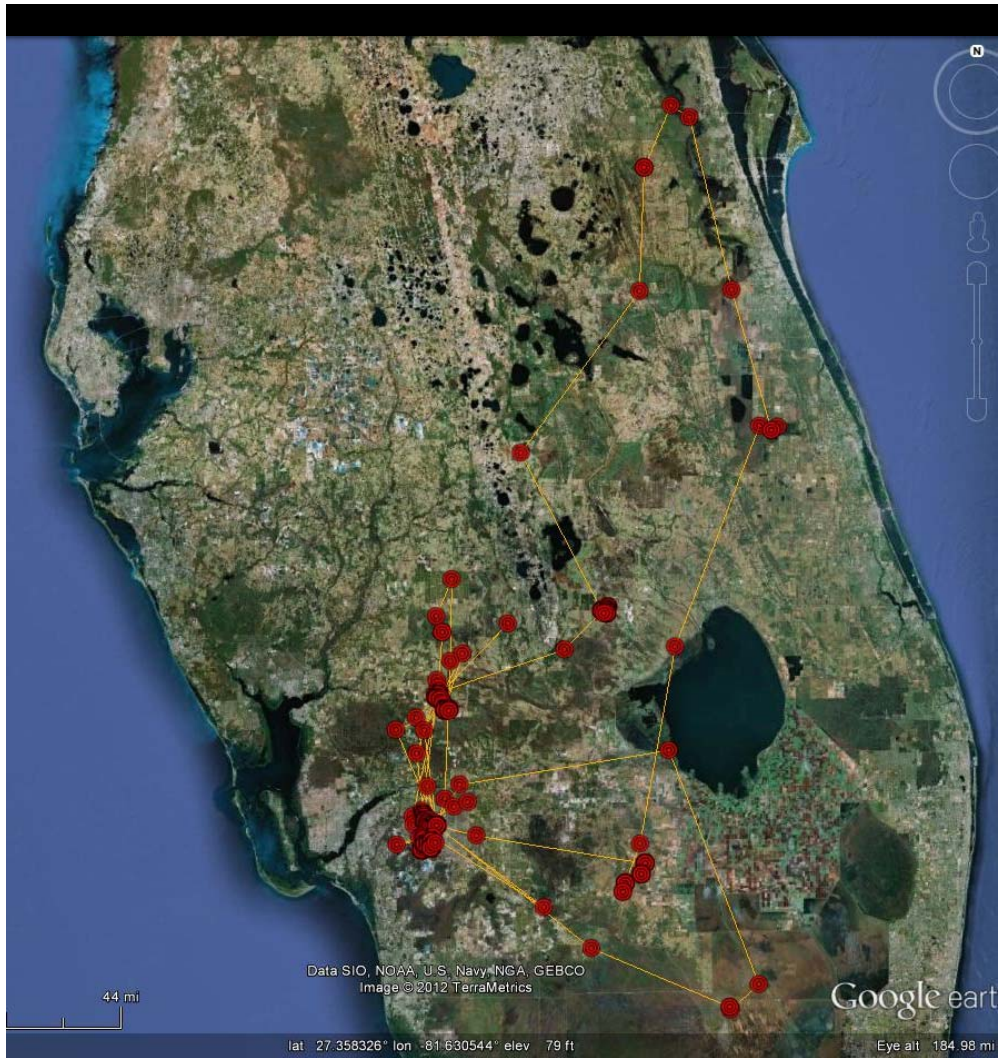


Male
STA 5

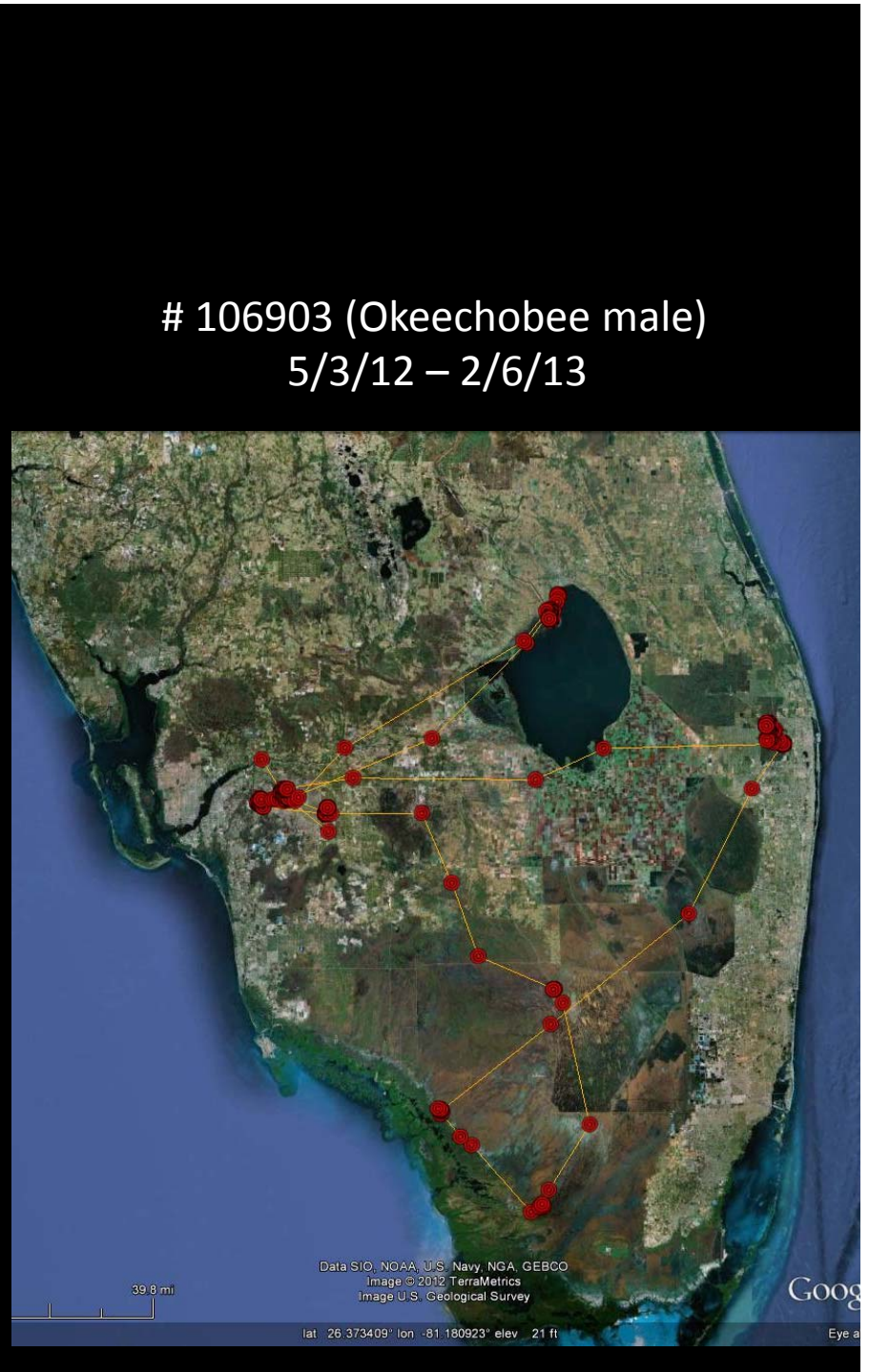


Female
Lk. Okeechobee





106900 (Harns Marsh)
4/1/12 – 1/5/13

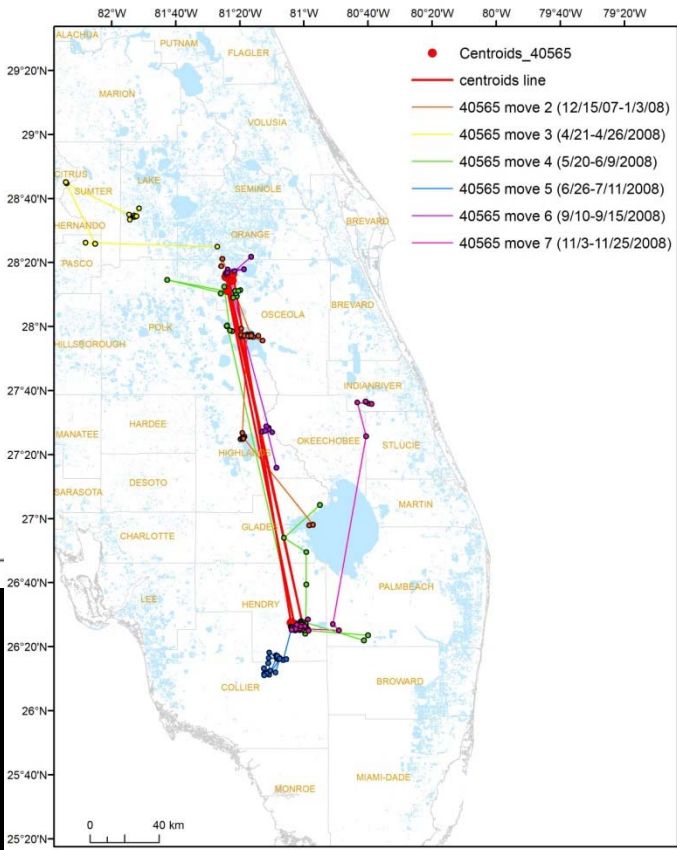
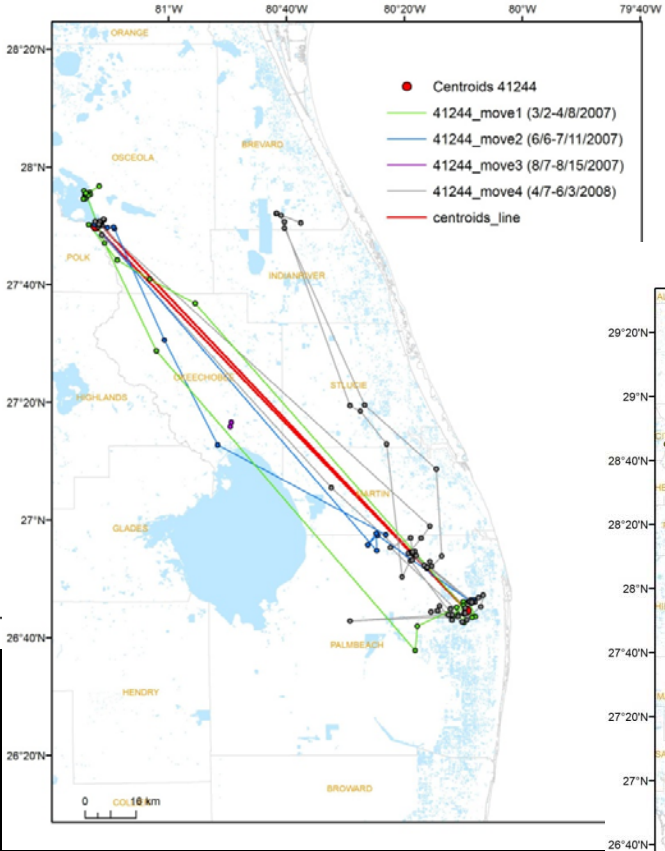
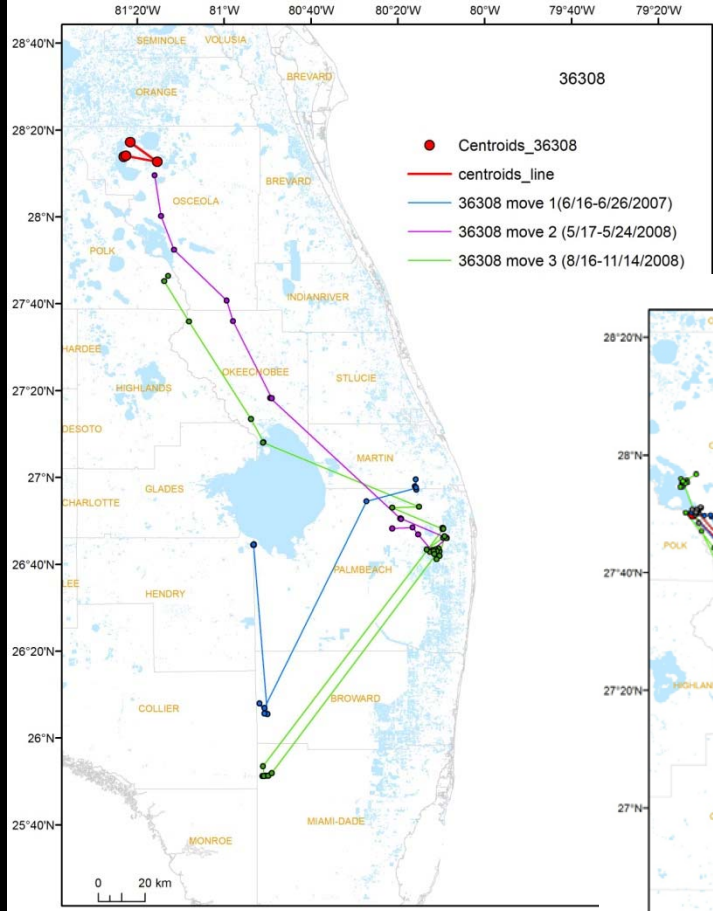


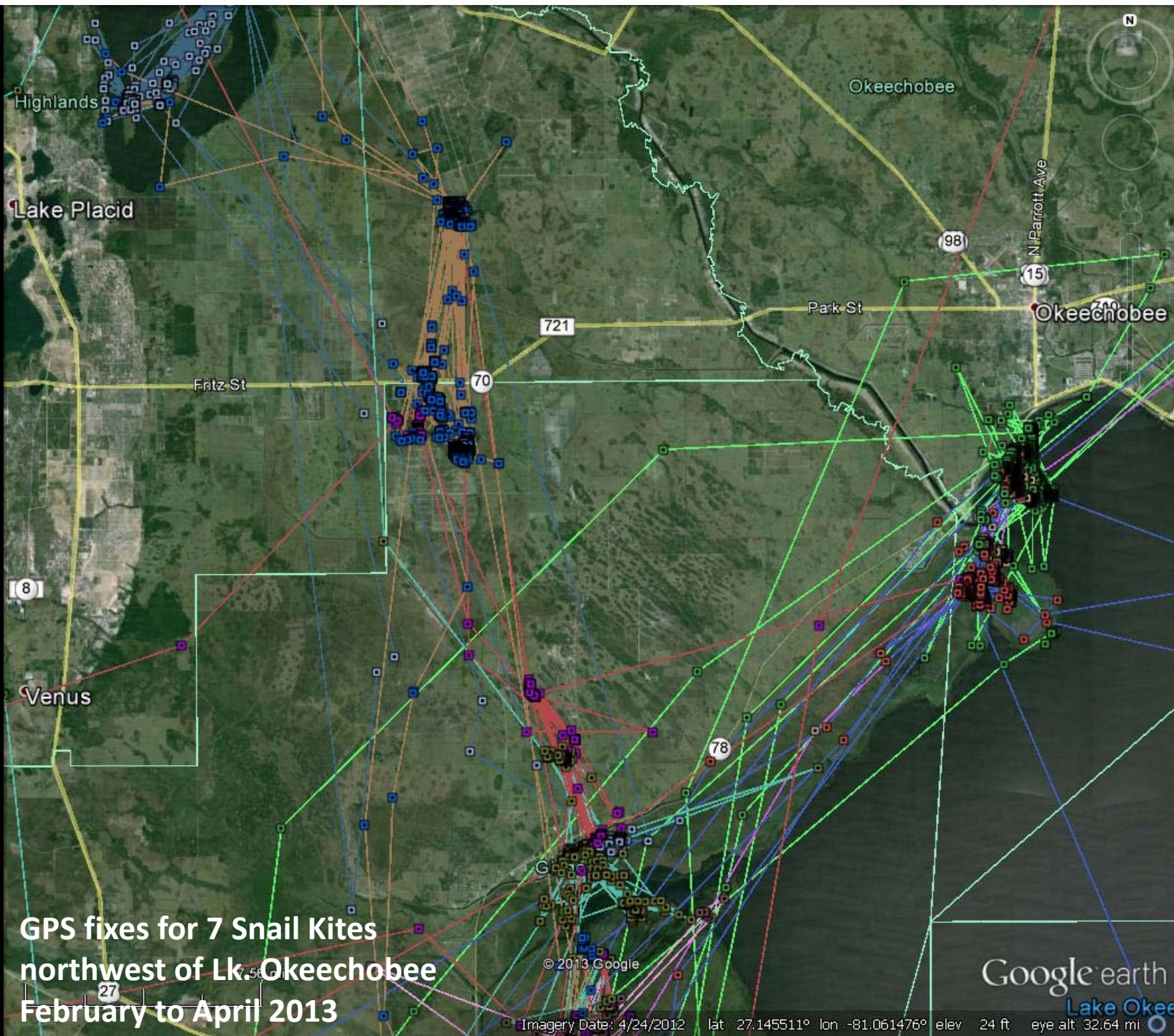


From: J. Martin, J. Nichols, W. Kitchens, and J. Hines. 2006. Multi-scale patterns of movements in fragmented landscapes and consequences on demography... *Journal of Animal Ecology* 75:527-539.

- “Kites moved extensively among contiguous wetlands... but significantly less among isolated wetlands.”
- “Only a small proportion of kites escaped a regional drought by moving to refugia... Many individuals died after the drought.”
- “...fragmentation may decrease the kite’s resistance to drought by restricting exploratory behavior.”

Long-distance movements connecting widespread focal areas of three Snail Kites





**GPS fixes for 7 Snail Kites
northwest of Lk. Okeechobee
February to April 2013**

Google earth
Lake Okee

Lehigh Acres

Buckingham

Lehigh Acres

106900HM

Gateway

Kites tagged at:
Harns Marsh

CR 846

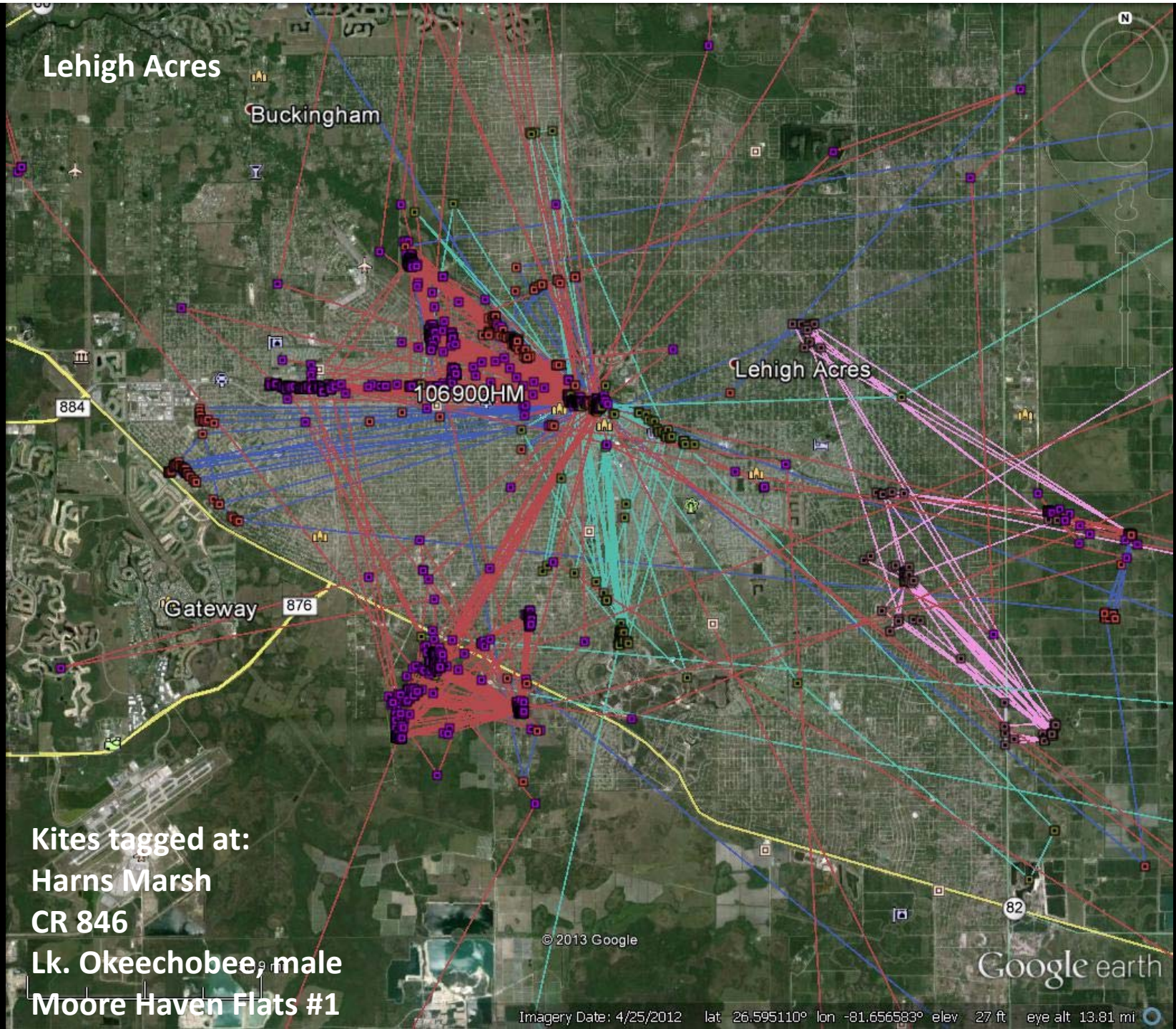
Lk. Okeechobee, male

Moore Haven Flats #1

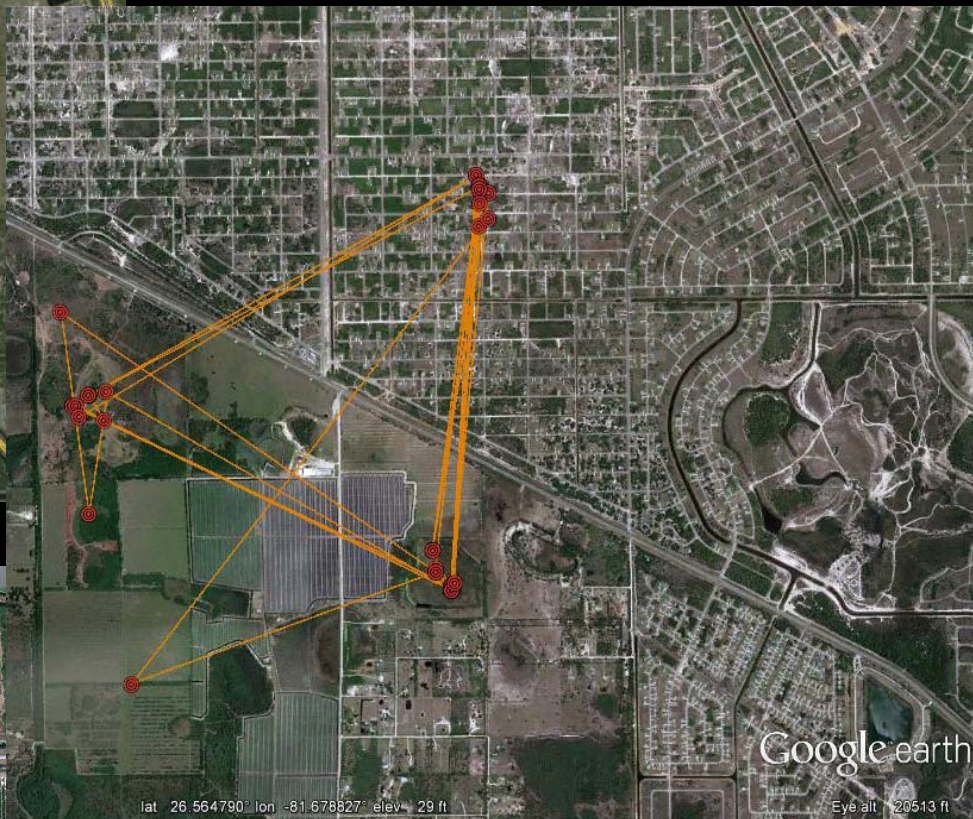
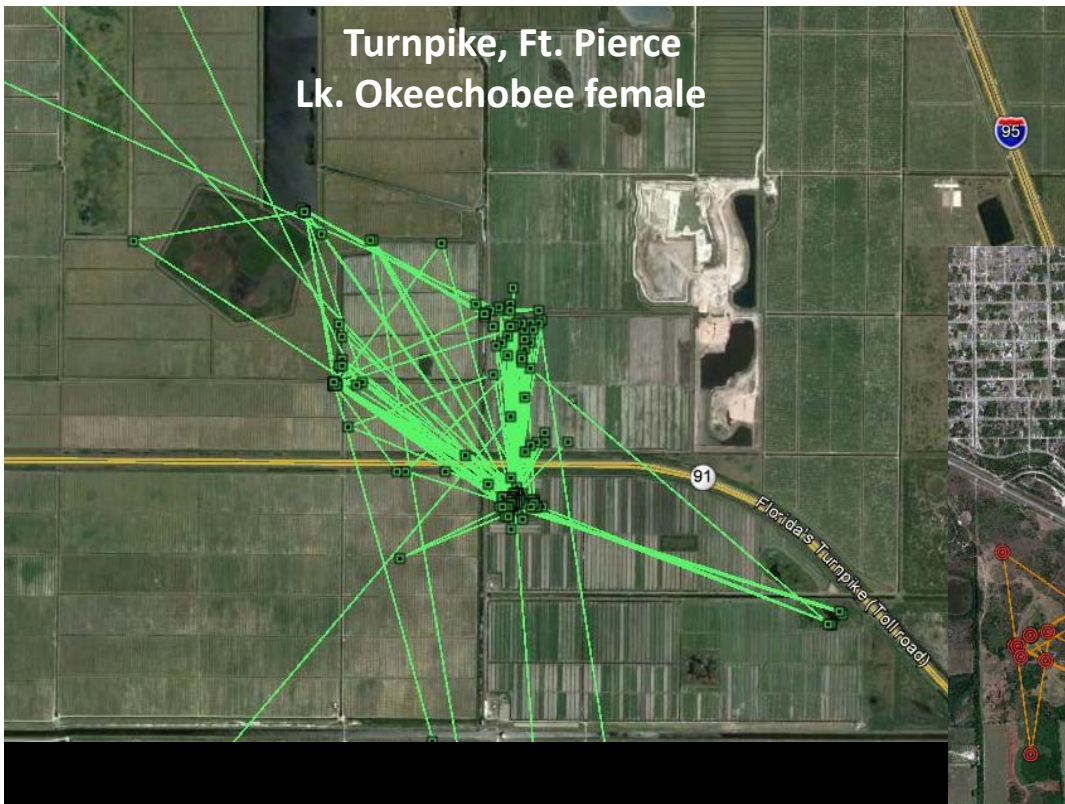
© 2013 Google

Google earth

Imagery Date: 4/25/2012 lat 26.595110° lon -81.656583° elev 27 ft eye alt 13.81 mi

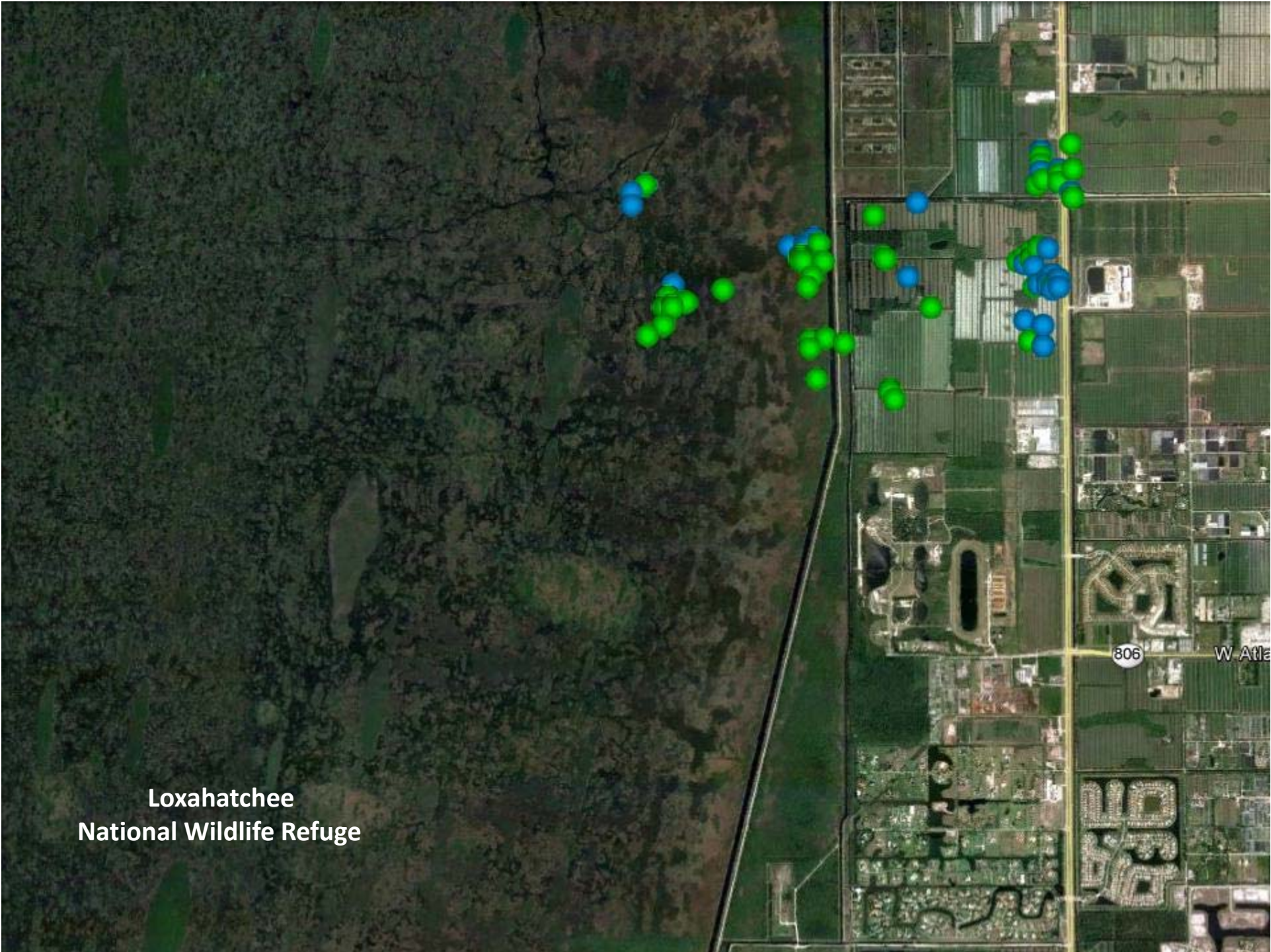


Turnpike, Ft. Pierce
Lk. Okeechobee female



Southern Lehigh Acres
Lee County

CR 846, Hendry County



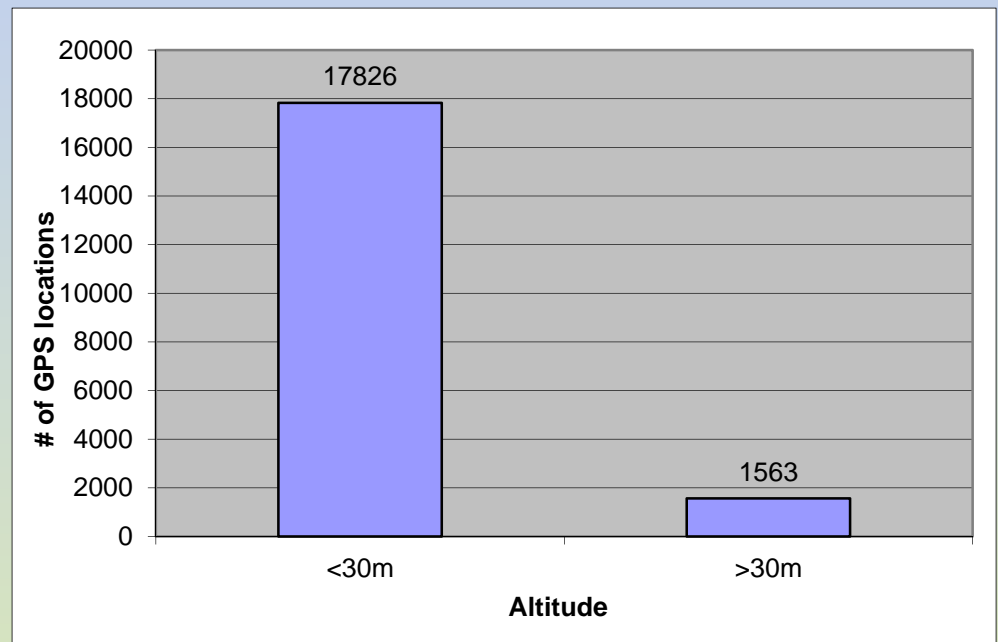
Loxahatchee
National Wildlife Refuge

Altitudes and activities of Snail Kites associated with movements between core areas



Based on Sat-GPS data , 12 Snail Kites spent an average of 9% of their time at altitudes above 30 meters MSL.

- Within 5 km of a local core area
- Daily commutes
- Day excursions
- Sleep-overs
- Extended stays
- Relocations





From: J. Martin, J. Nichols, W. Kitchens, and J. Hines. 2006. Multi-scale patterns of movements in fragmented landscapes and consequences on demography...
Journal of Animal Ecology 75:527-539.

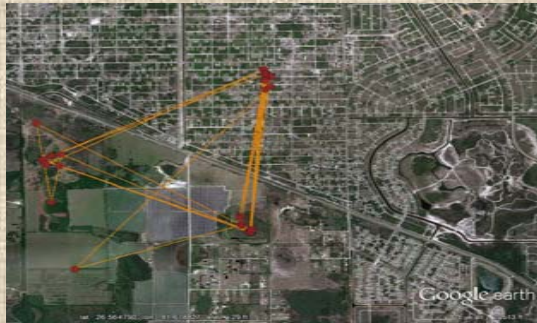
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Summary

- Since 2007, we collected >90,000 satellite locations for 22 Snail Kites tagged throughout the species' Florida range.
- Of the ~80,000 GPS locations, 52% during the breeding season were outside the natural wetlands representing the Snail Kite's historic range (54% in the non-breeding season).
- These “peripheral wetlands” include canals, drainage ditches, retention ponds, and altered natural areas that are not managed as suitable kite habitat or included in monitoring efforts.
- Snail Kites regularly travel long distances, often rapidly with very directed flight. They cross or settle in habitats previously considered unsuitable. This poses management challenges.
- However, this behavior may benefit Snail Kites, which historically depended upon a vast network of wetlands in which local prey availability varied with unpredictable and continuously changing hydrologic conditions.

Some questions...

What portion of the Snail Kite population extensively uses or nests in non-traditional (‘peripheral’) wetlands”?

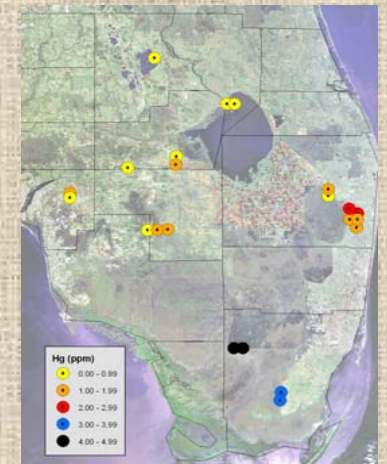


Are these wetlands sources or sinks?

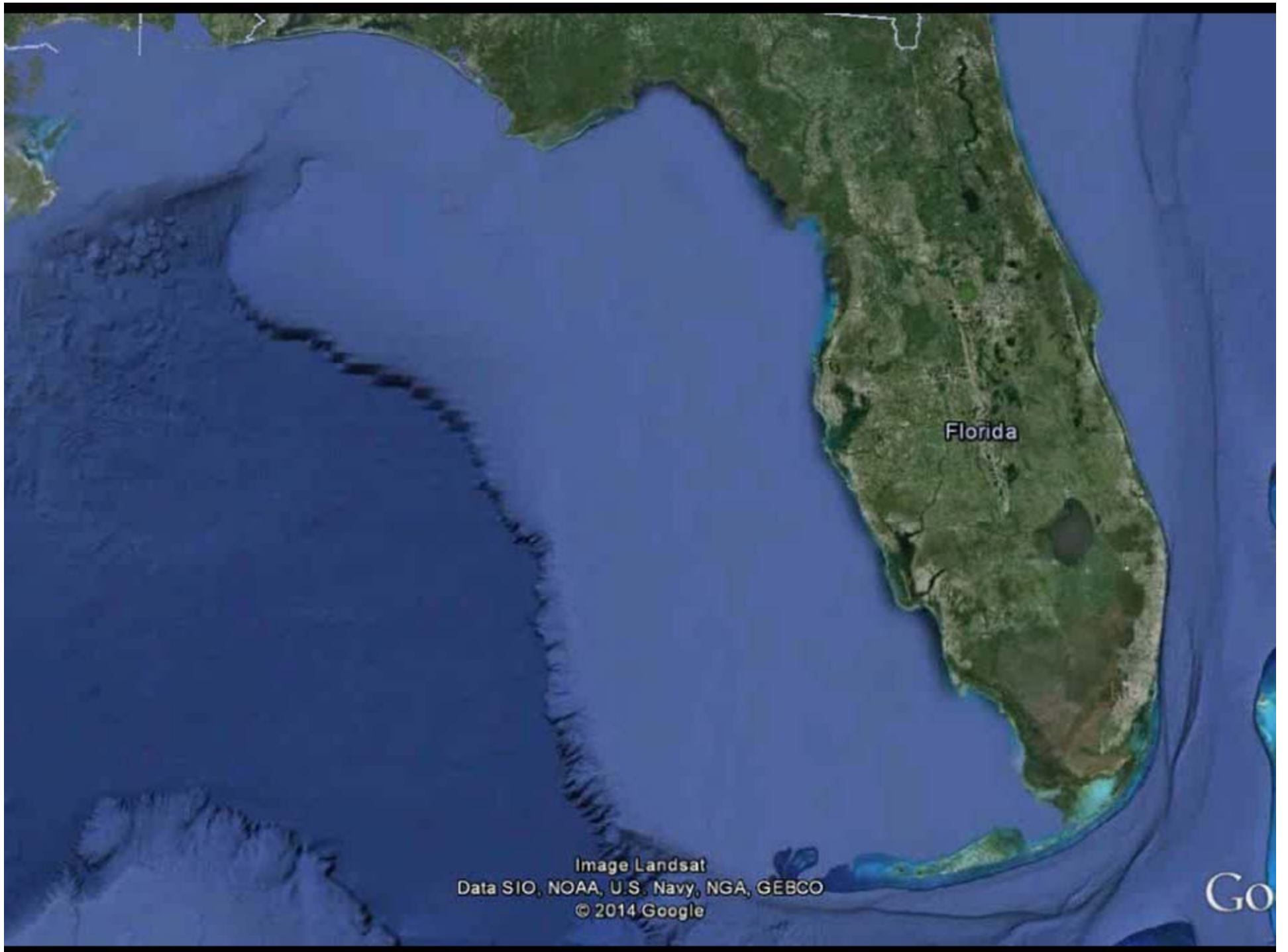
How can satellite-tracking data help assess detection probabilities for other marking methods?

What threats do these non-traditional wetlands pose (e.g., increased exposure to predators, toxins, disturbance, etc.)?

What are the sub-lethal reproductive effects of documented mercury concentrations, particularly in WCA 3A and ENP?



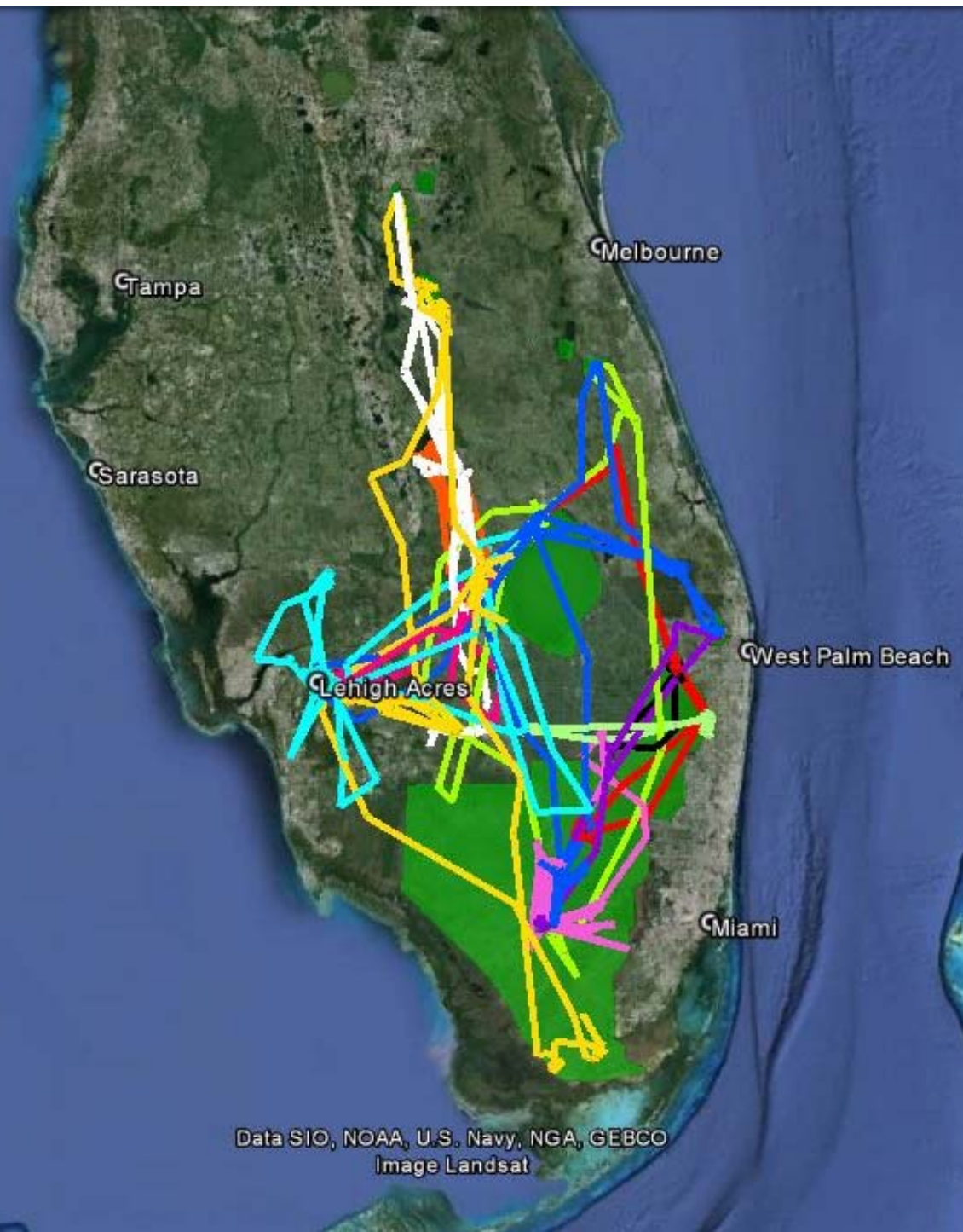
SNKI mercury concentrations
K. Meyer, G. Kent, and D. Evers




Florida

Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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GO



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

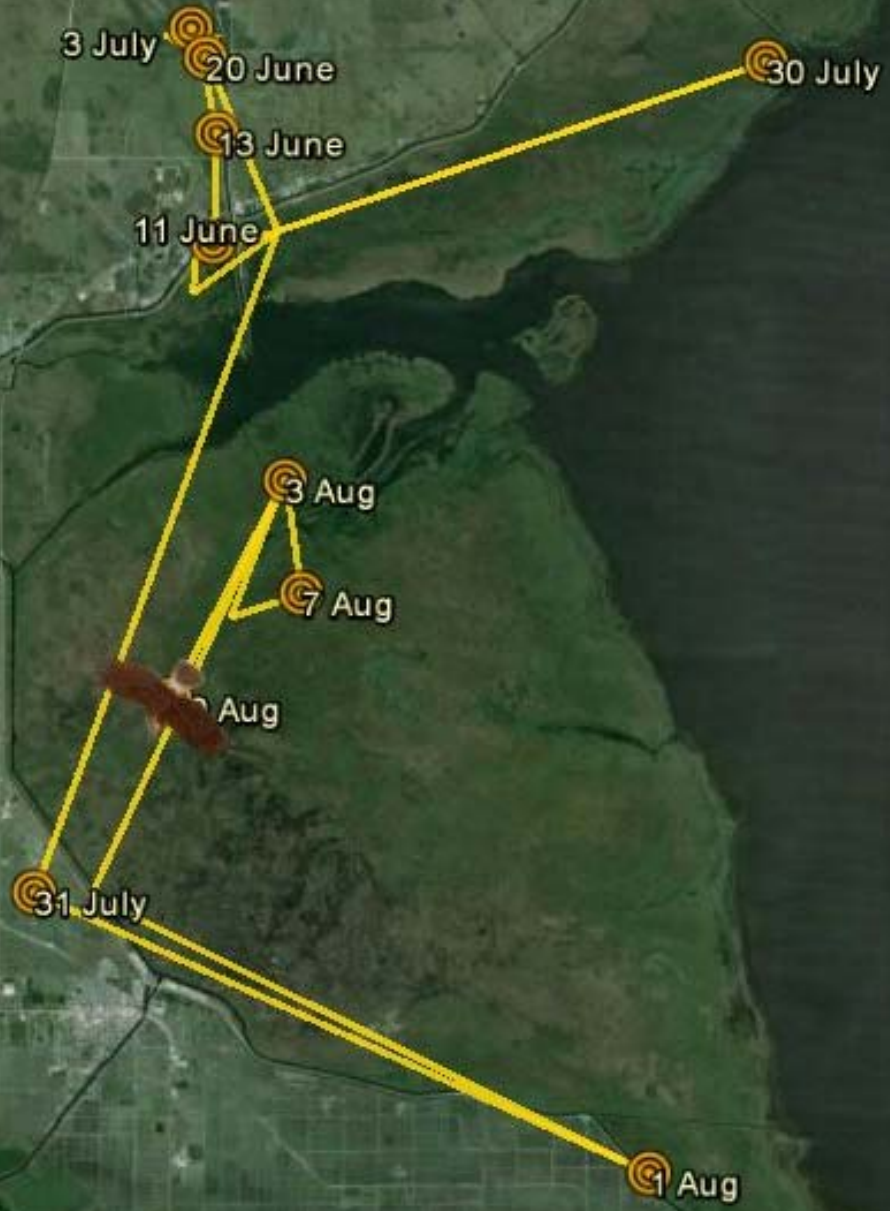


Thank you ~

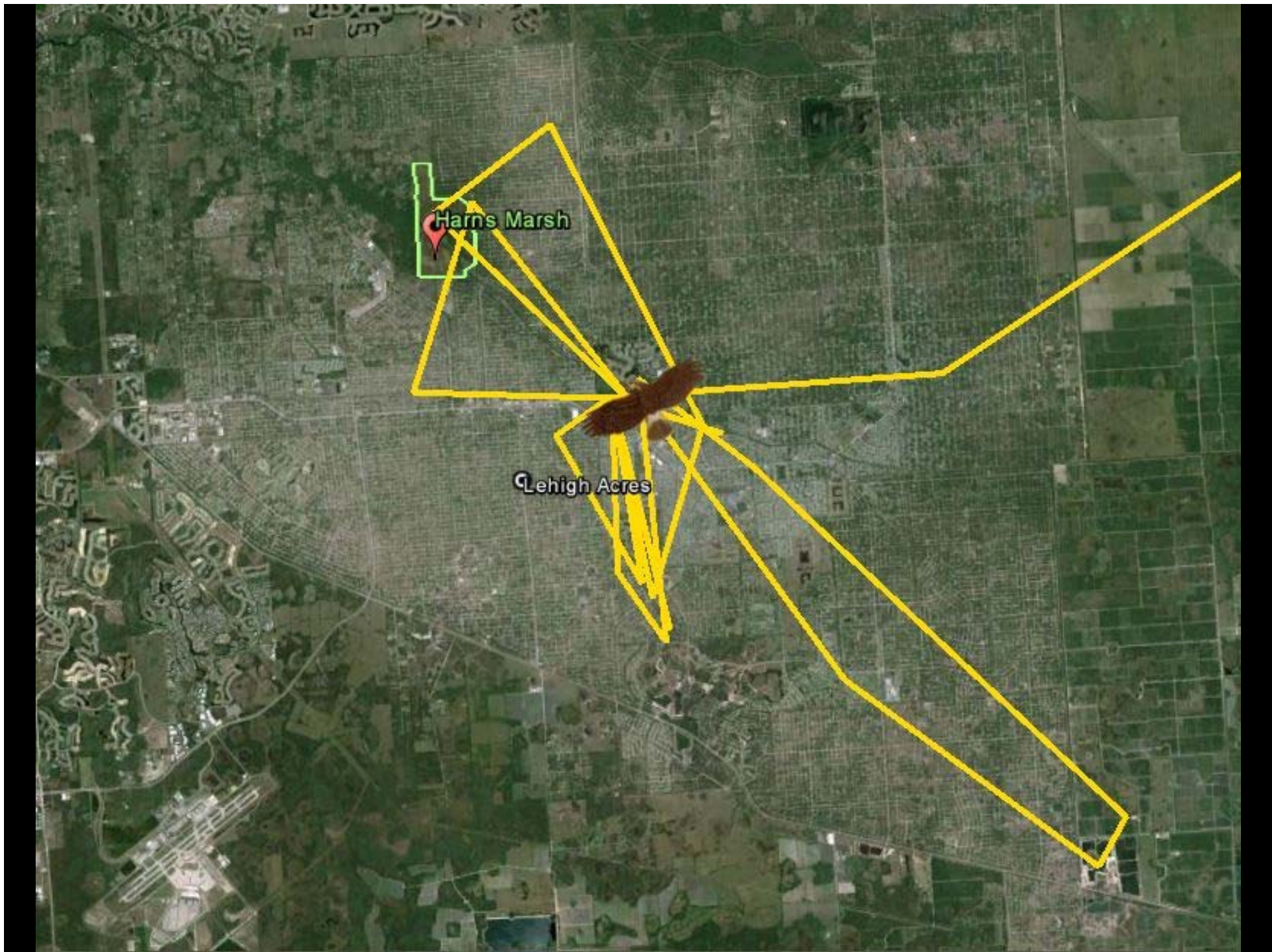
- U.S. Fish and Wildlife Service (Tylan Dean, (now NPS))
- U.S. Geological Survey (Ronnie Best, Nick Aumen)
- Amanda Powell, Marjesca Brown, Peter Mahoney (ARCI)
- Phil Darby, Mike Therien (University of West Florida)
- Stephanie Romanach, Paul Gray (SNKI Coordinating Comm)



8/20/13

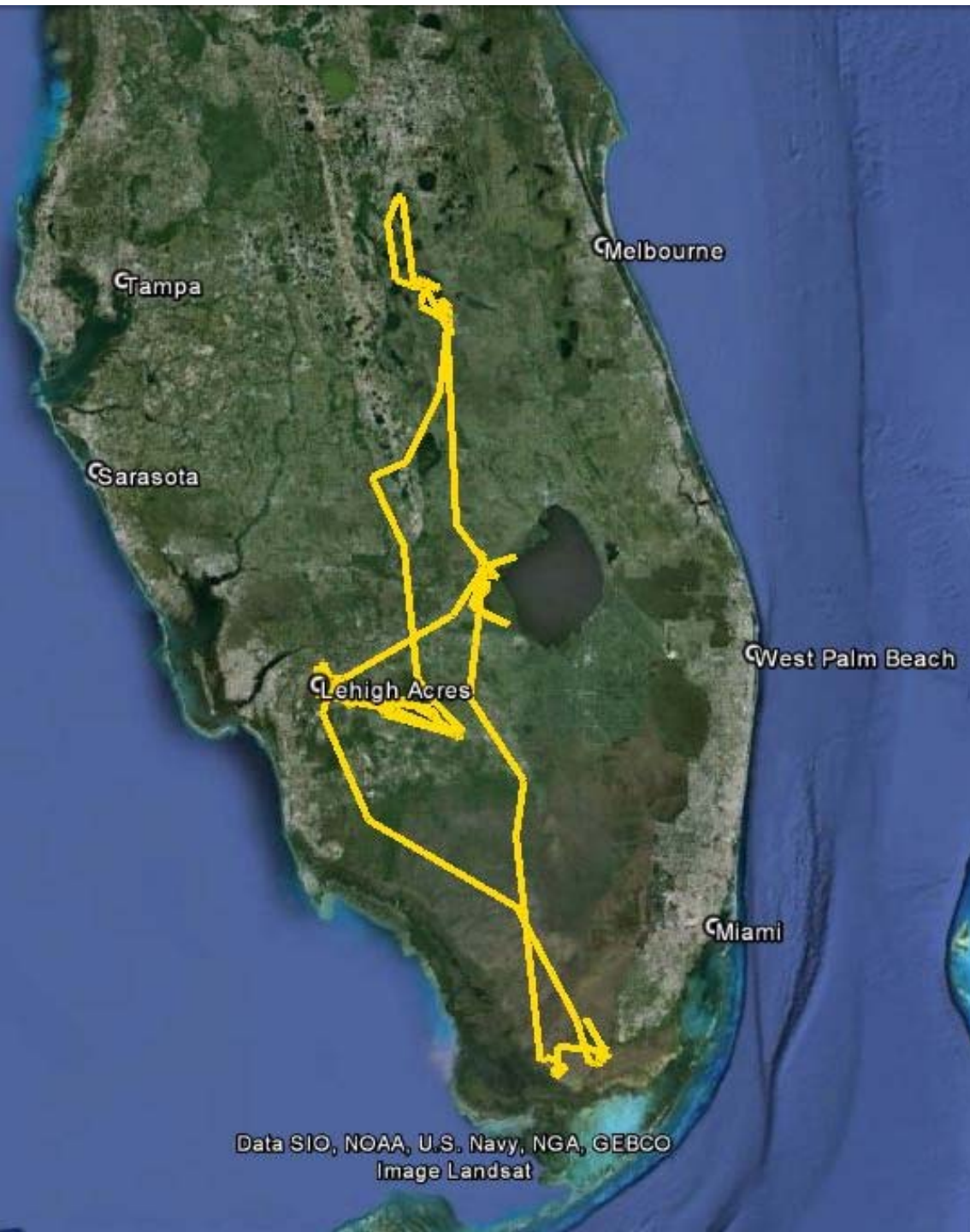




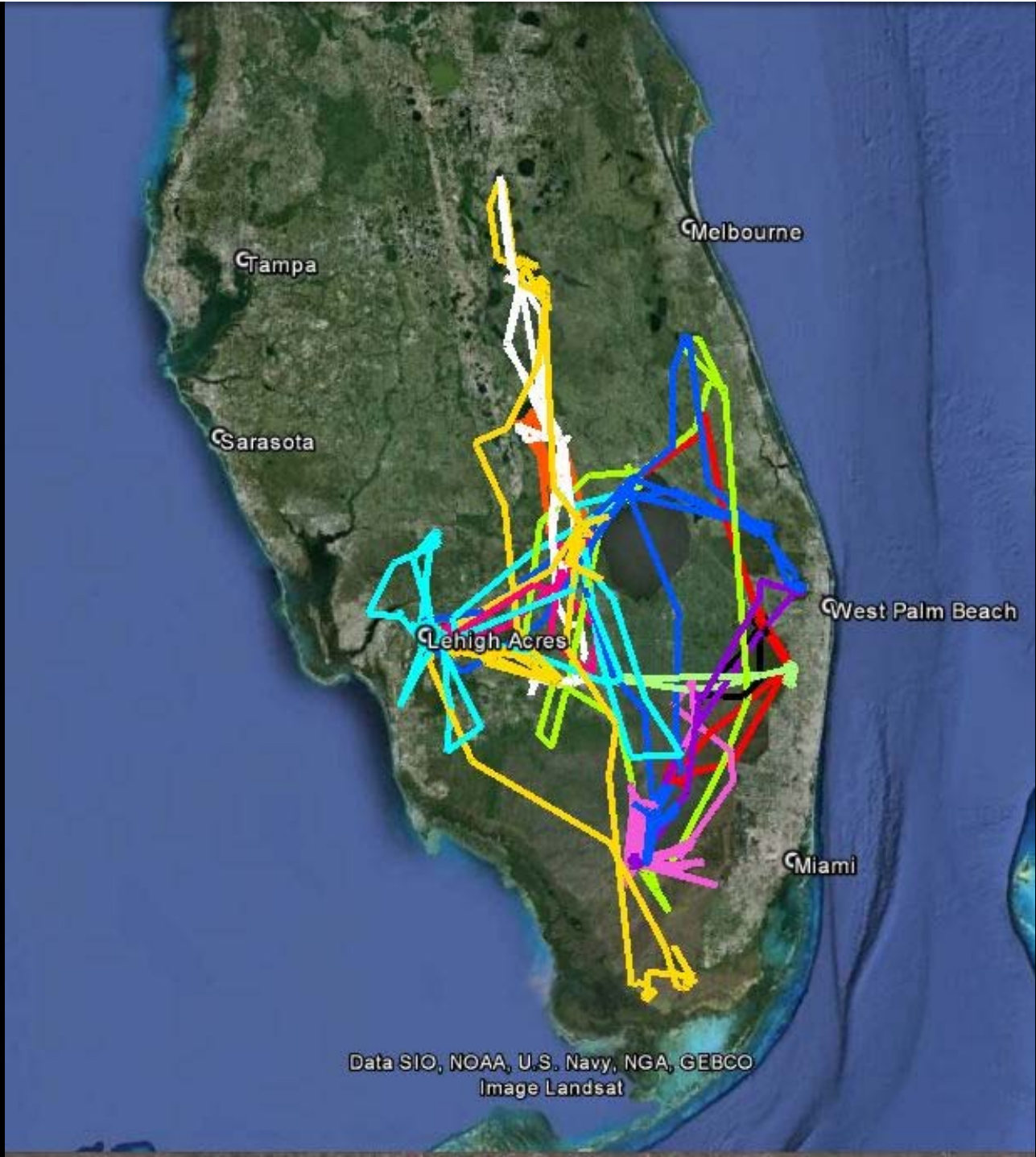


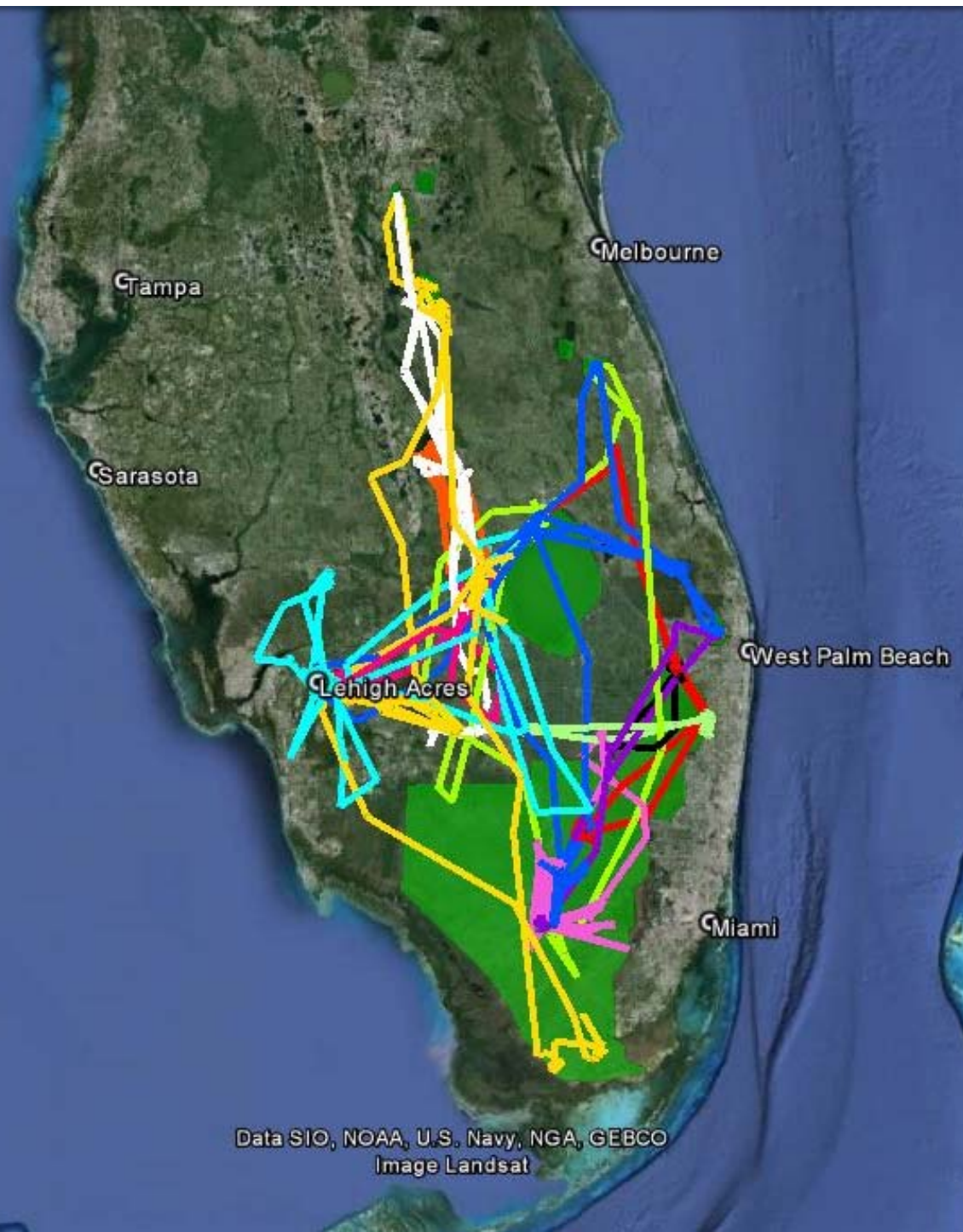
Harns Marsh

Lehigh Acres



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat





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Image Landsat

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