

Environmental drivers affecting river use by large predatory fishes in southwest Florida



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Top predators SW Florida Rivers....



Freshwater Species



FLAPB Fisheries



Florida gar
Lepisosteus platyrhincus
Photo by Chuck Cichra
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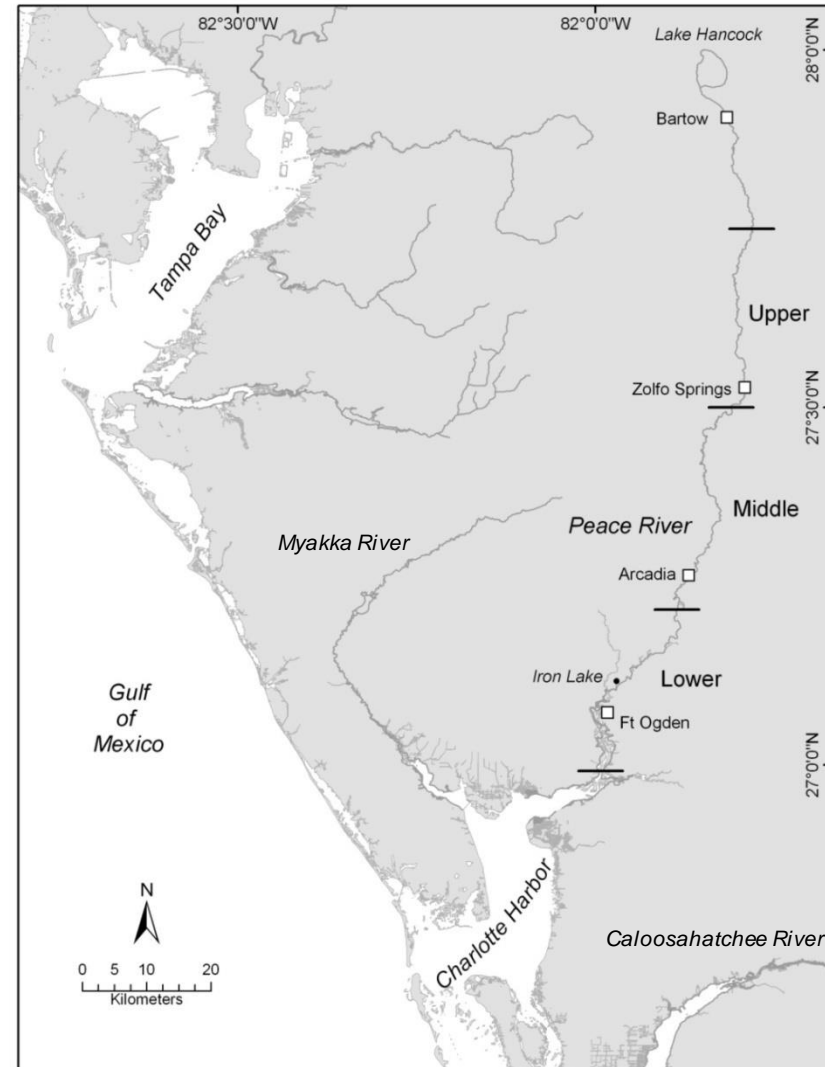
Euryhaline Species



In SW Florida Rivers....



FWC sampling large predatory fish in SW Florida rivers (2004-15)



Collaboration between freshwater and marine sections of FWC

FRESHWATER Electrofishing

Most of the sampling has occurred in the Peace River



Published three studies:

- 1 Addressed the overwintering paradigm regarding seasonal use of rivers by snook

Blewett, D.A., Stevens, P.W., Taylor, R.G., and Champeau, T.R.. 2009. Use of rivers by common snook, *Centropomus undecimalis*, in southwest Florida: a first step in addressing the overwintering paradigm. *Florida Scientist* 72:310-324.
- 2 Comparative ecology: seasonal use, habitat, and diet of predatory fishes throughout the Peace River

Blewett, D.A., Stevens, P.W. and Call, M.E., 2013. Comparative ecology of euryhaline and freshwater predators in a subtropical floodplain river. *Florida Scientist*, 76:166-190.
- 3 Snook abundance in the Peace River is primarily driven by river flow

Blewett, D.A., Stevens, P.W. and Carter, J., 2017. Ecological effects of river flooding on abundance and body condition of a large, euryhaline fish. *Marine Ecology Progress Series*, 563:211-218.

Comparative Ecology – large stretch of the Peace River

Used a generalized mixed linear model to determine what was driving predator abundance in the Peace River

Important factors:

Season and year

River section

Temperature

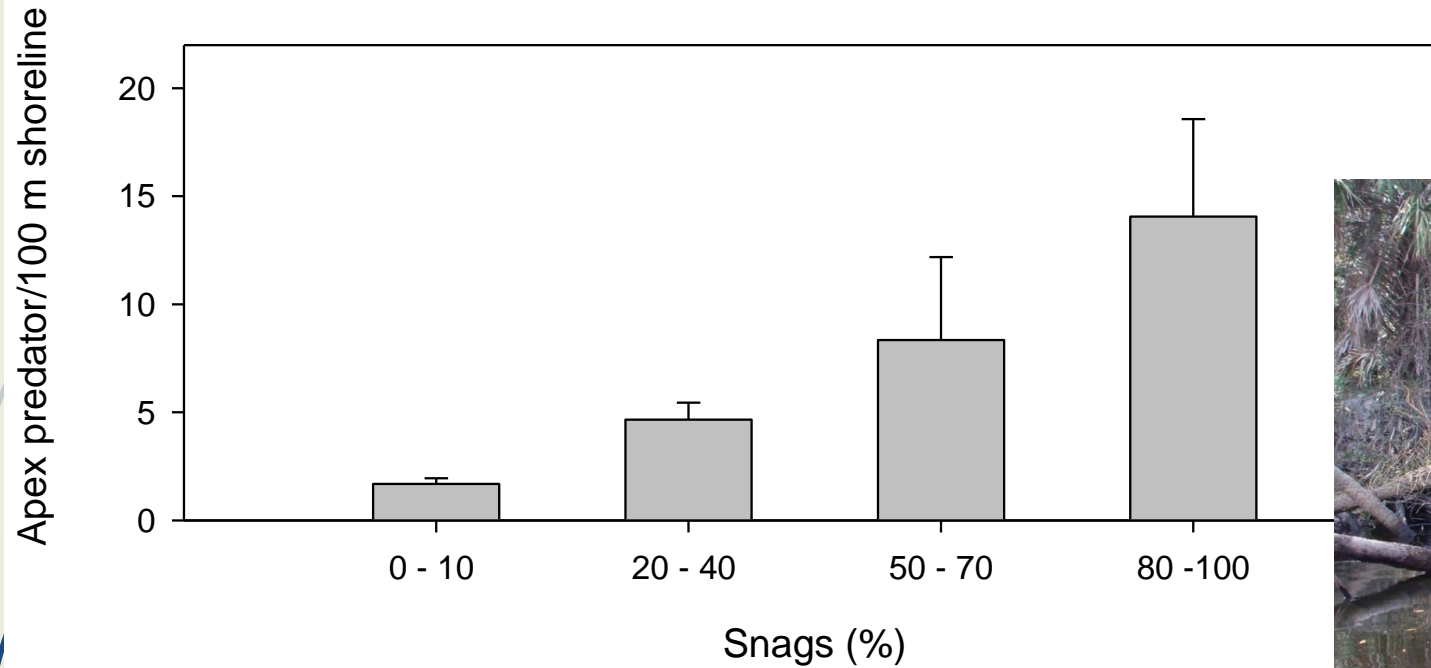
Depth

% snag habitat



Comparative Ecology – large stretch of the Peace River

Abundance vs. % snag habitat



- Snags – fallen trees
- habitat for aquatic insects
- ambush points for predators
- relief from high currents



Comparative Ecology – seasonal differences in abundance

Fall/winter abundances much higher than summer

During summer:

- Many snook leave the river to spawn
- Bass and gar have more habitat to use off the main stem



Comparative Ecology – distribution in the river

All three species are abundant throughout the river but.....

- Snook more abundant in the lower portion of the river, deeper in lower river, avoid entrapment during low water conditions
- Bass and gar more abundant in the upper portion the river, less competition with euryhaline species during low water, can thrive in low flow pools that form during the dry season

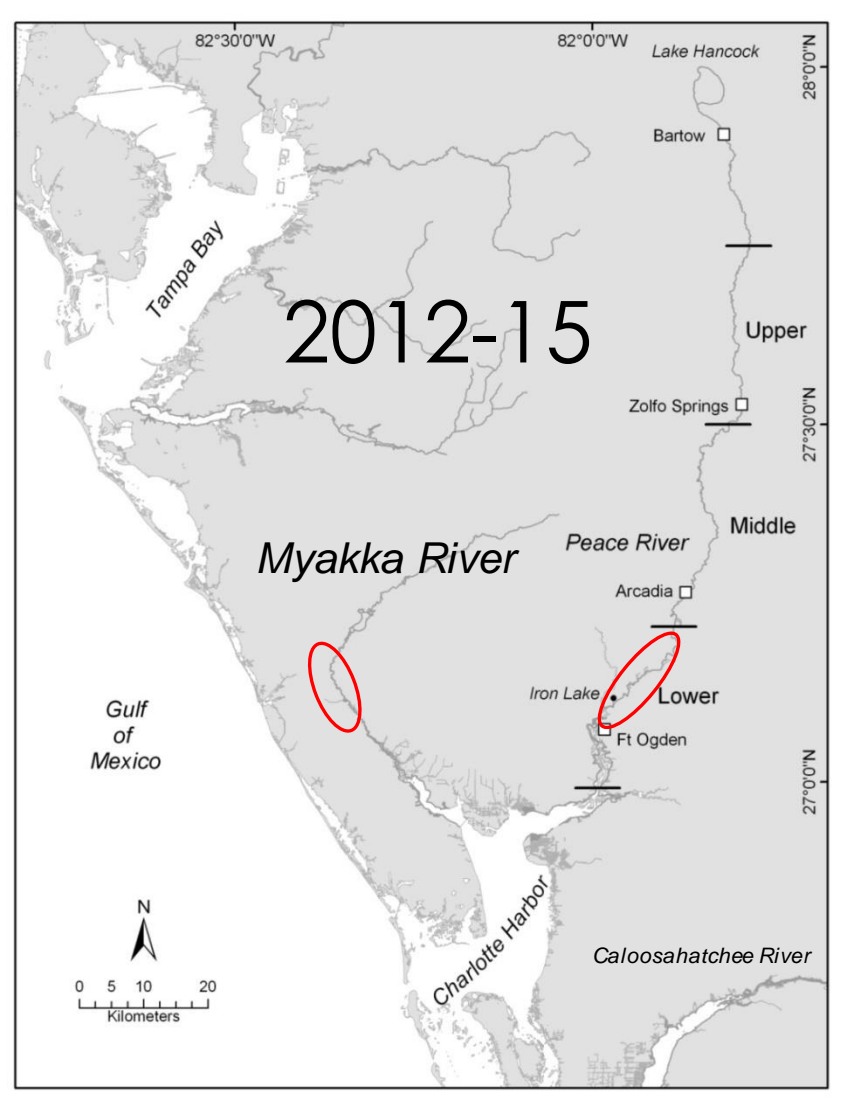


Comparative Ecology – prey

Adult snook and bass diet were similar



FWC sampling large predatory fish in SW Florida rivers (2004-15)



Could we apply what we learned from the Peace River?

Questions about the bass population?

Summer sampling
2012-13

Peace and Myakka sampling
Summer and Fall 2012-15

Regional Water
Supply Facility

Image © 2016 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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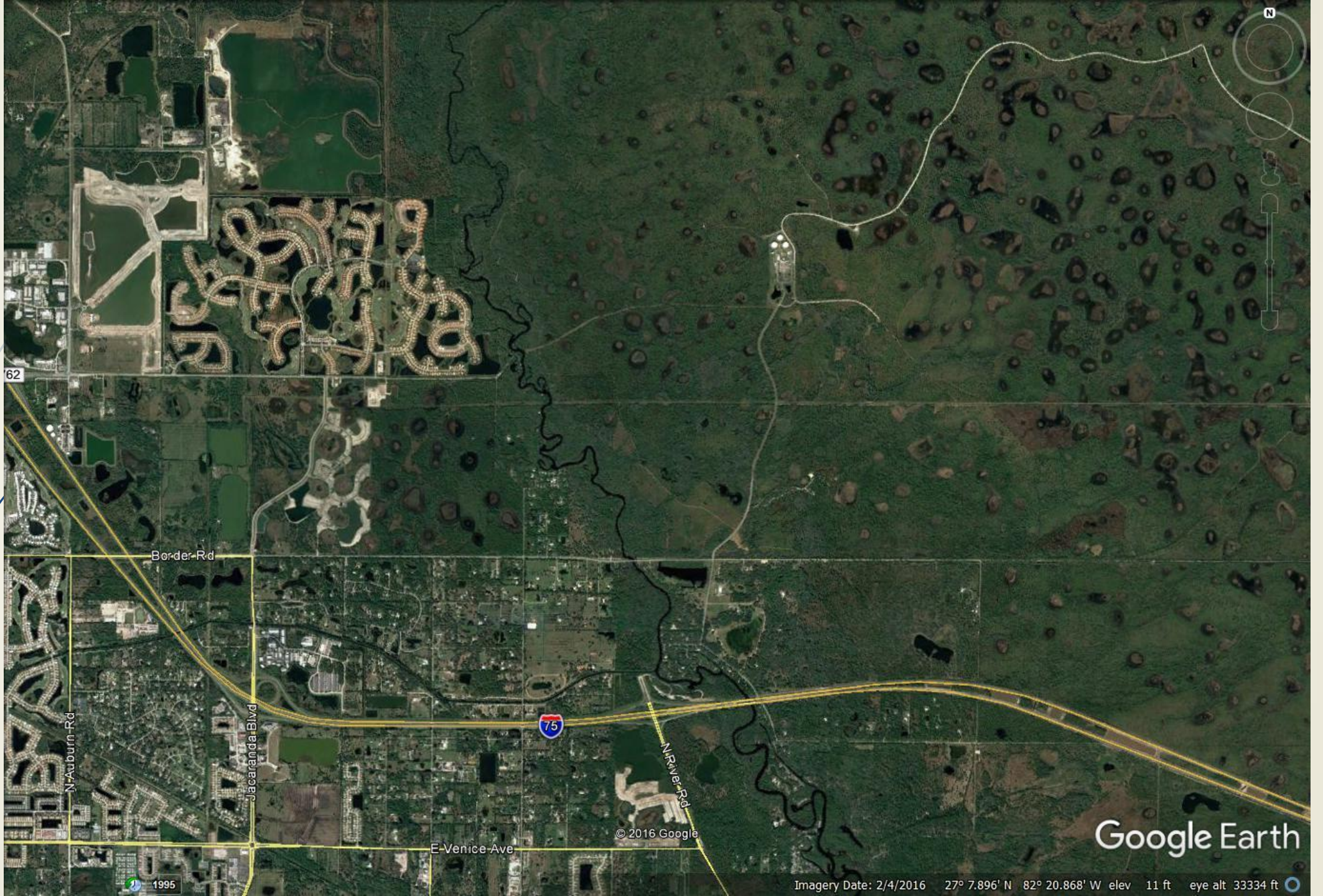
Google Earth

Imagery Date: 2/17/2016 27° 6.260' N 82° 7.290' W elev 26 ft eye alt 35.11 mi

Peace River



Myakka River



Google Earth

Imagery Date: 2/4/2016 27° 7.896' N 82° 20.868' W elev 11 ft eye alt 33334 ft

© 2016 Google

1995

Myakka River



© 2016 Google

Google Earth

1995

Imagery Date: 2/4/2016 27° 12.829' N 82° 19.796' W elev 3 ft eye alt 26035 ft

Electrofishing



General methods

- Random sampling design (200 m transects)
- Approximately 9 transects completed along the shoreline (≥ 1 m depth) each season in each river
- Transects completed in the river's main stem (not in side tributaries or inside sloughs)
- Recorded depth, shoreline vegetation, and basic water parameters (temp., D.O., conductivity, pH)
- All large predators enumerated and a subsample measured, weighed, and diet removed non-lethally

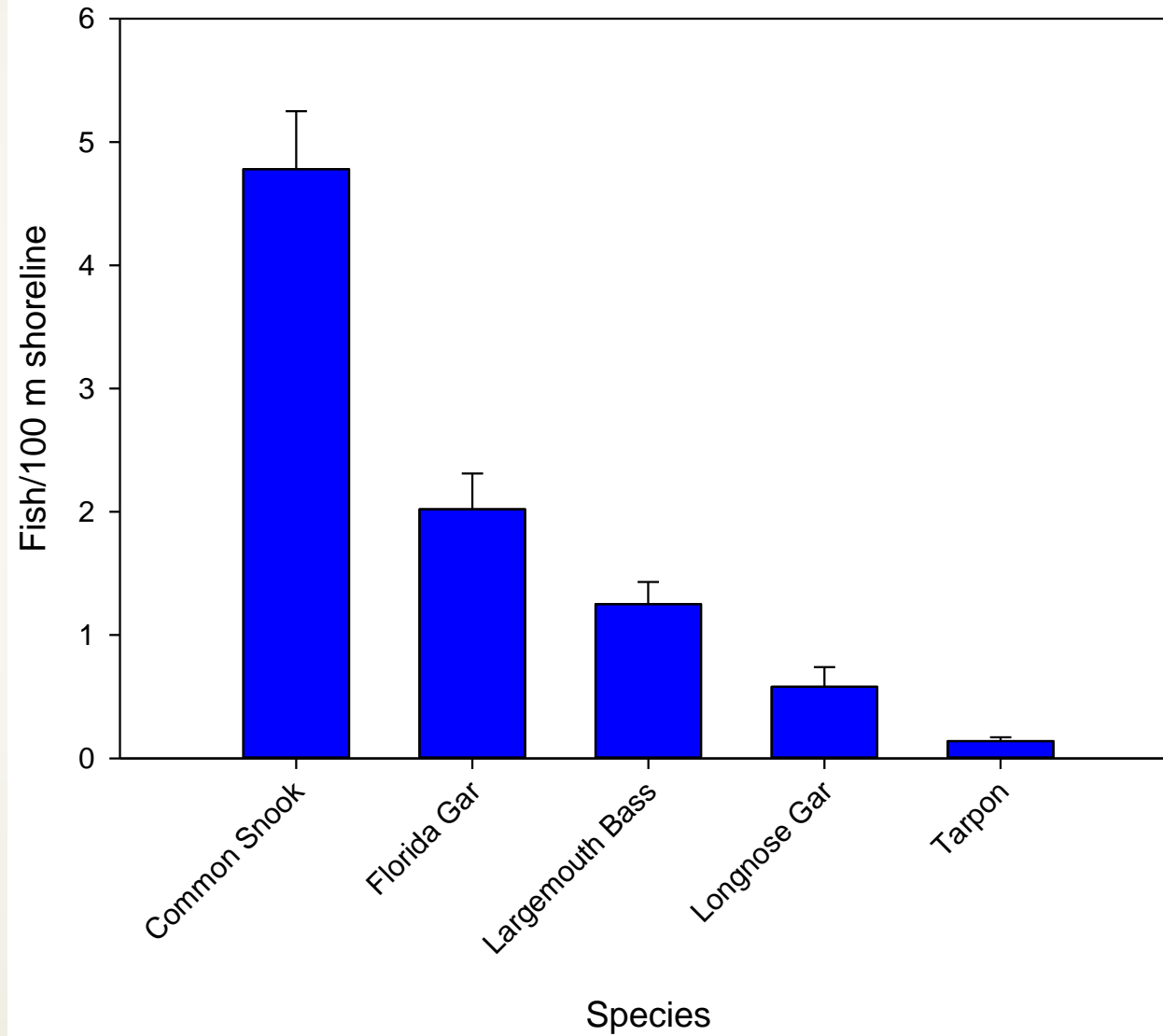


We collected over 2,700 large predatory fish during the four year study

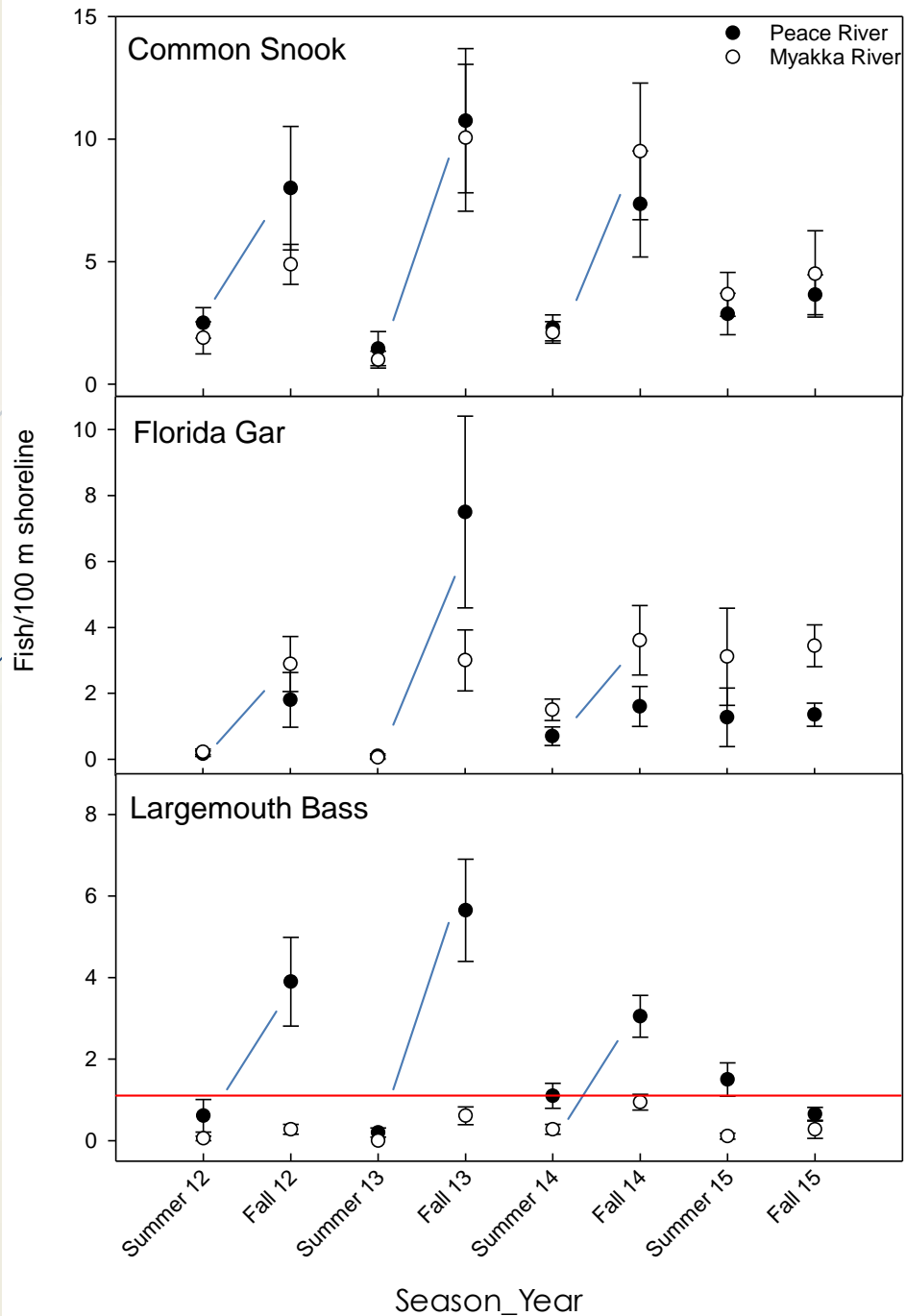


Florida
Lepidosteus platyrhynchos
Photo by Chuck

Top five most abundant large predators



Seasonal and annual abundance



Low summer/high fall pattern

Snook and gar abundance track for both rivers

Bass abundance in the Myakka is much lower than the Peace (<1 fish/100m)

Environmental factors driving predator abundance

Factors used in the statistical model:

Season and year

Temperature

Dissolved oxygen

Depth

% snag habitat

% overhanging vegetation

% slough habitat

Results of the generalized mixed linear model

Common Snook

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
season_year	7	133	28.32	<.0001
% snags	7	133	11.02	<.0001
% sloughs	3	133	29.93	<.0001
temp	1	133	38.43	<.0001

Largemouth Bass

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
season_year	7	142	7.16	<.0001
DO	1	142	39.38	<.0001
depth	1	142	23.35	<.0001

Florida Gar

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
season_year	7	129	11.36	<.0001
% snags	7	129	8.13	<.0001
%overhang	7	129	3.35	0.0026
depth	1	129	11.13	0.0011

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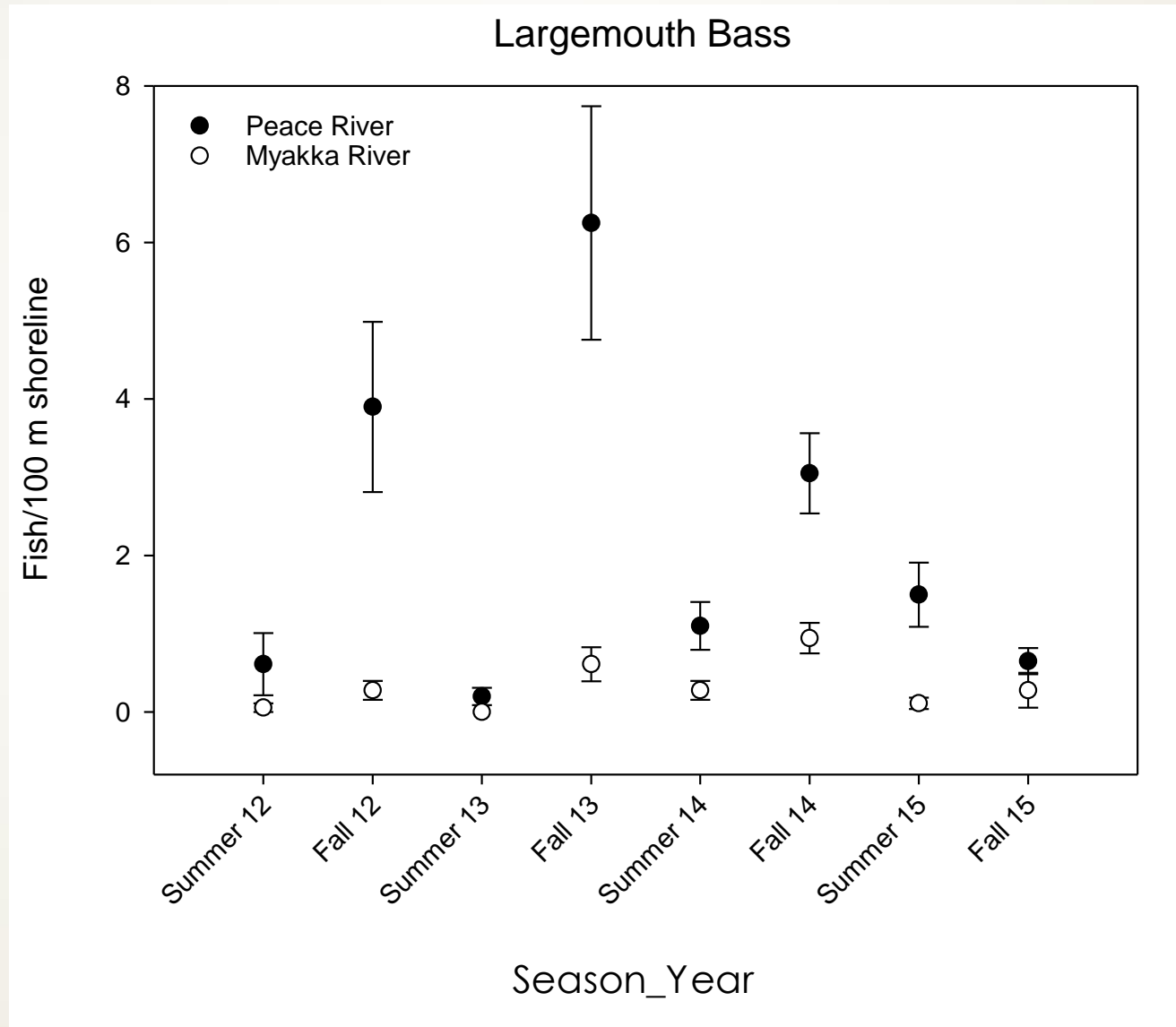
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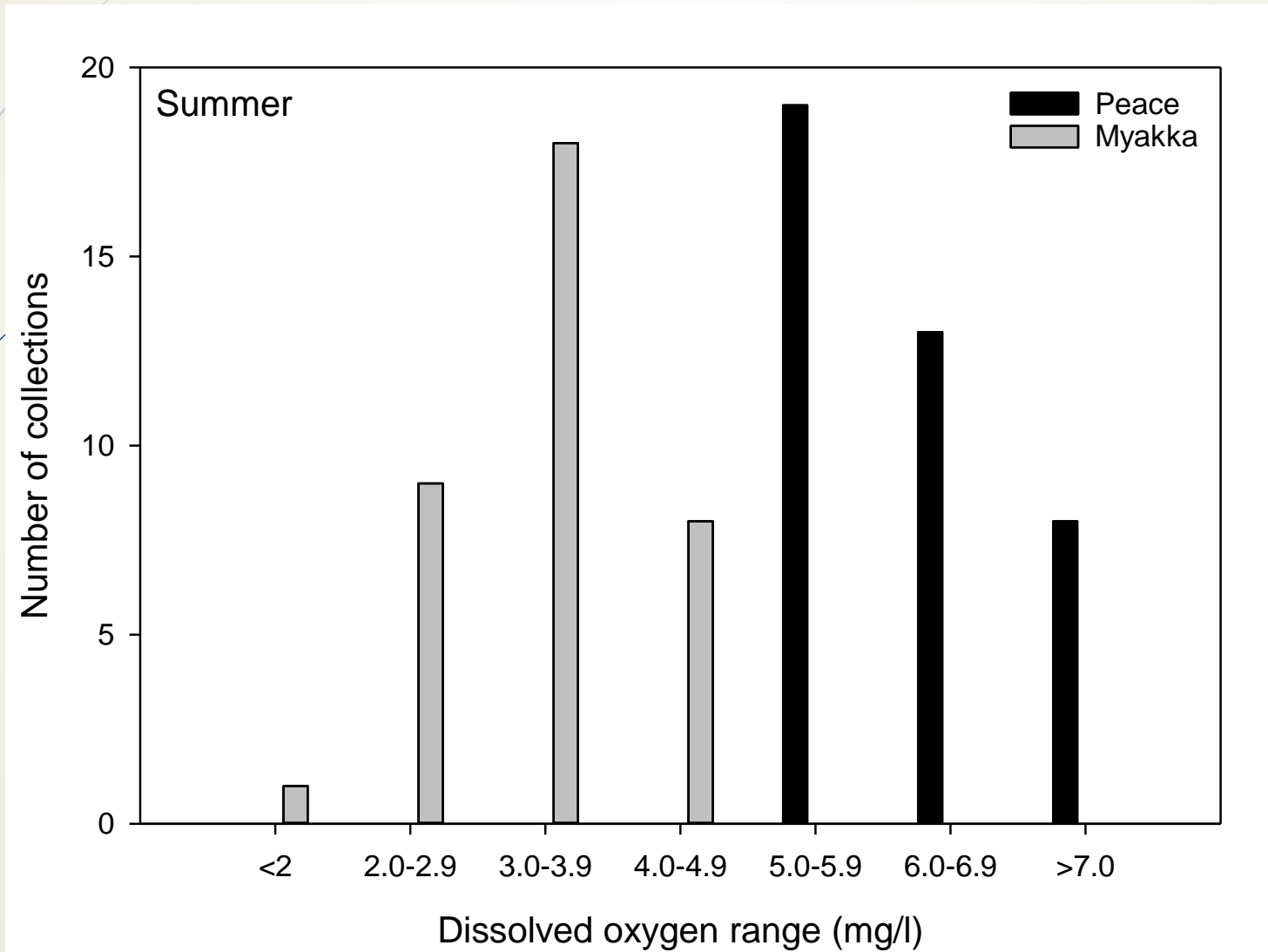
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Seasonal and annual abundance



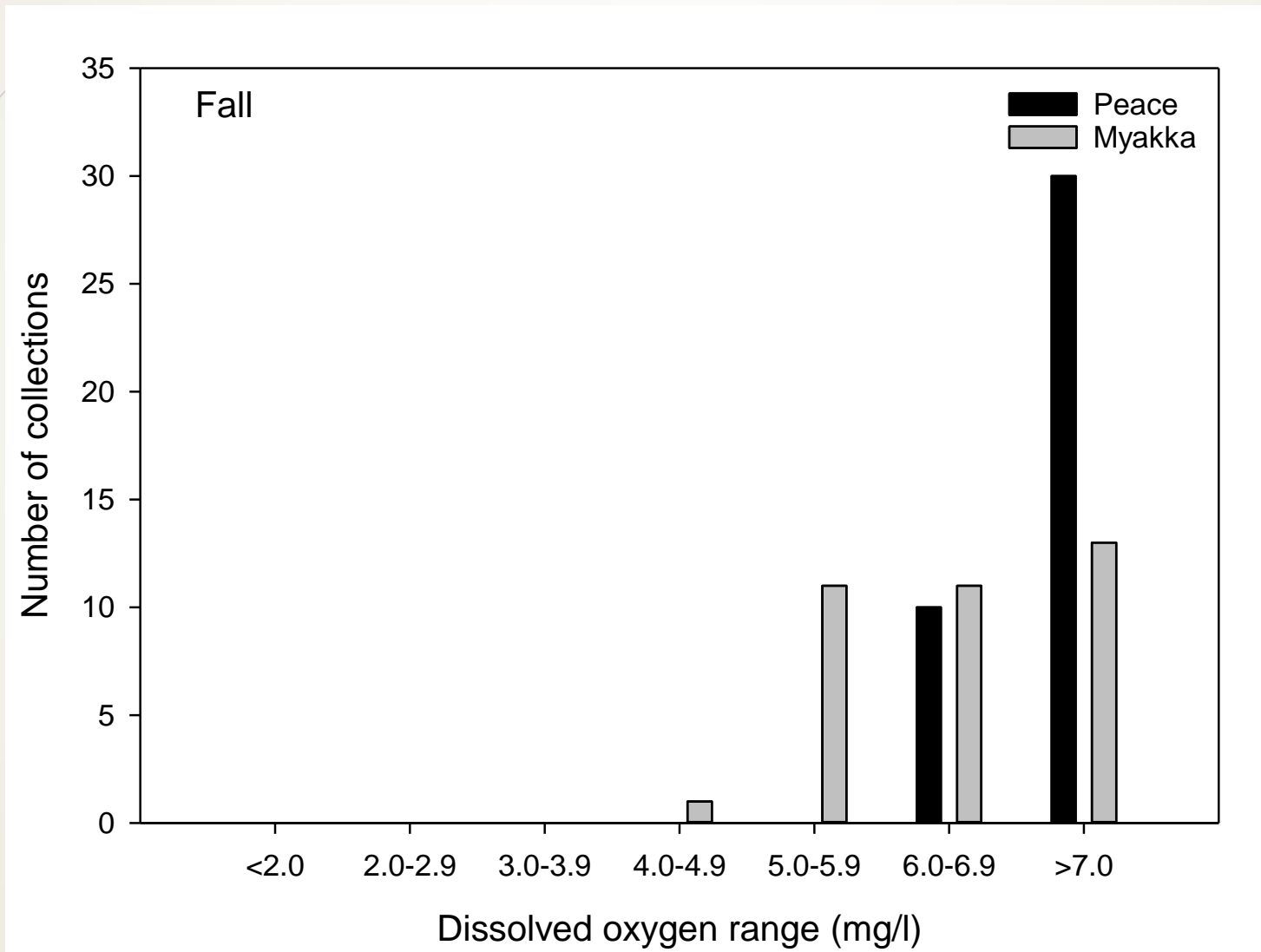
Summer dissolved oxygen levels



Myakka – instream marshes

Peace – many tributaries

Fall dissolved oxygen levels



What effects might low DO have on bass?



- Decrease fitness and spawning?
- Affect juvenile survival?
- Maybe other factors than just DO?

Upper Myakka can be a shallow system during the dry season



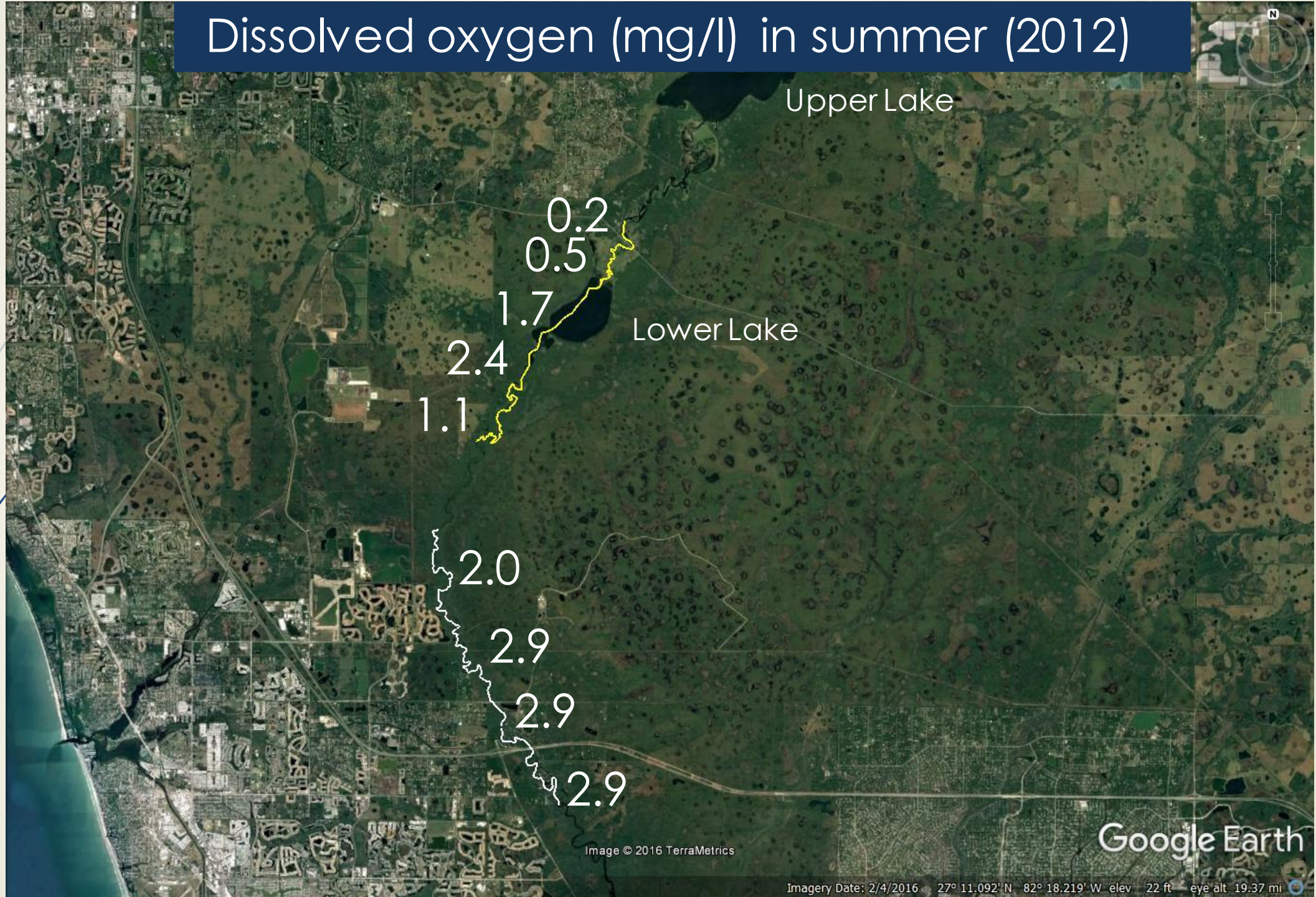
A summer day on the Myakka River

(a more detailed look at dissolved oxygen levels)



Dissolved oxygen (mg/l) in summer (2012)

Myakka River



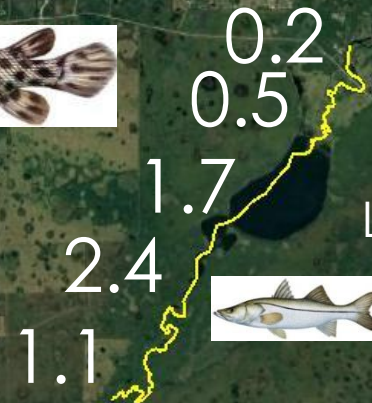
Google Earth

Image © 2016 TerraMetrics

Imagery Date: 2/4/2016 27° 11.092' N 82° 18.219' W elev 22 ft eye alt 19.37 mi

Florida Gar dominated low DO areas, bass catches were rare throughout the river

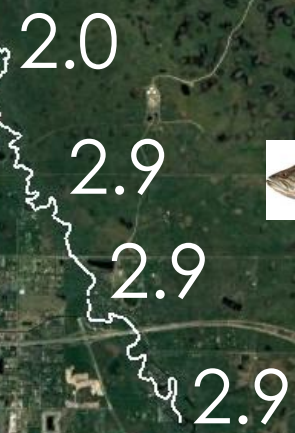
Myakka River



Also some juvenile Tarpon



Lower Lake



Dissolved oxygen (mg/l) in summer (2012)

Myakka River

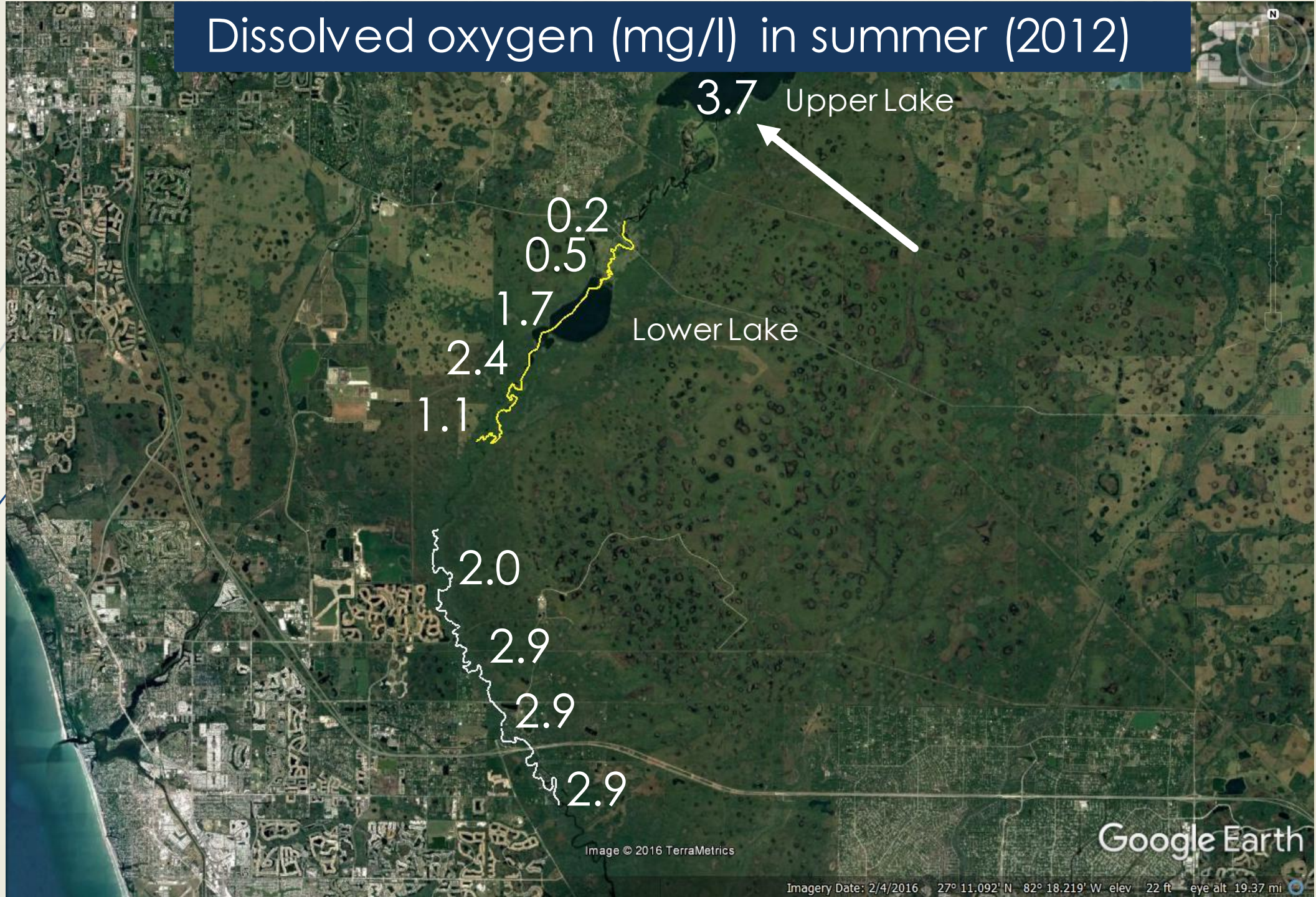
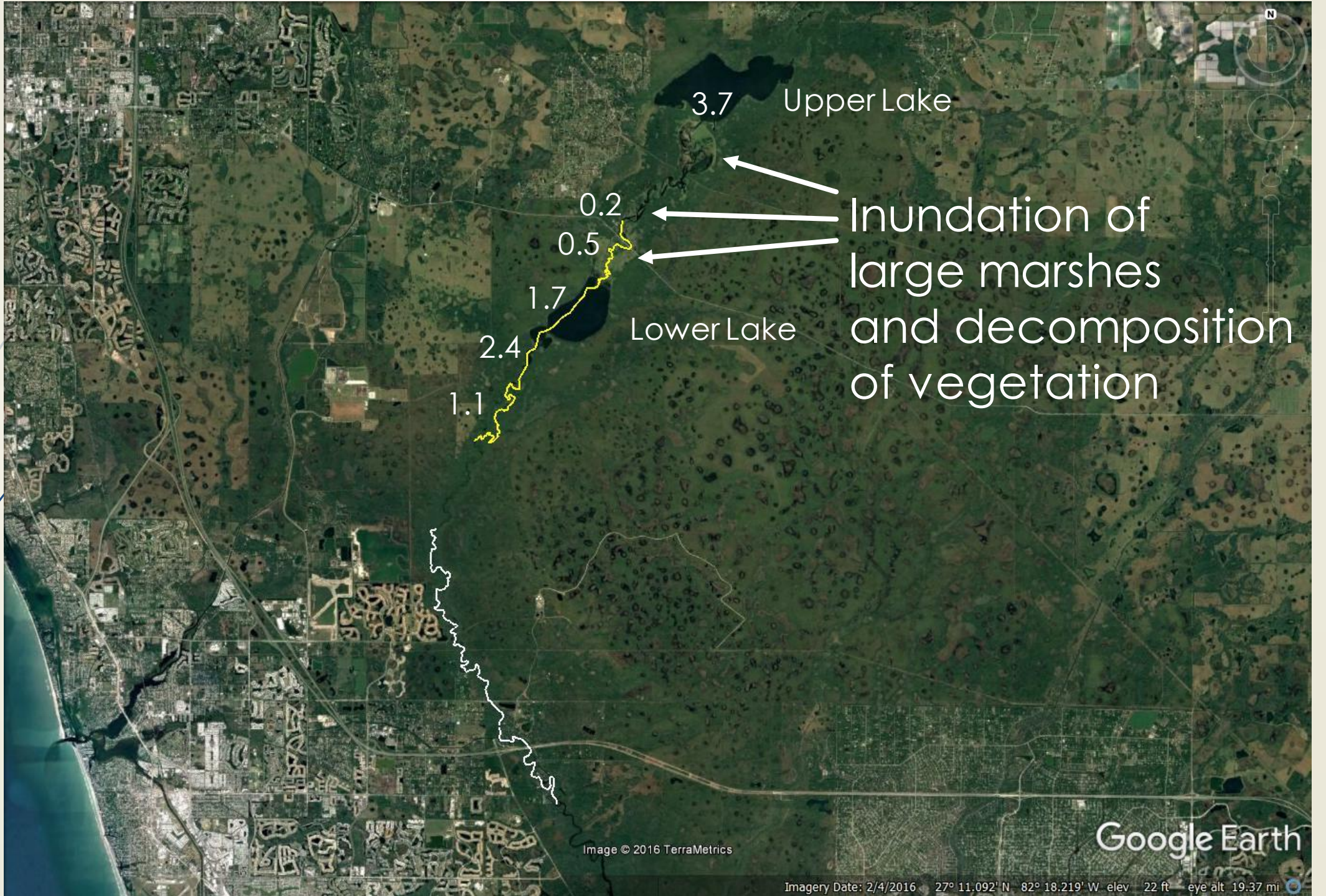


Image © 2016 TerraMetrics

Google Earth

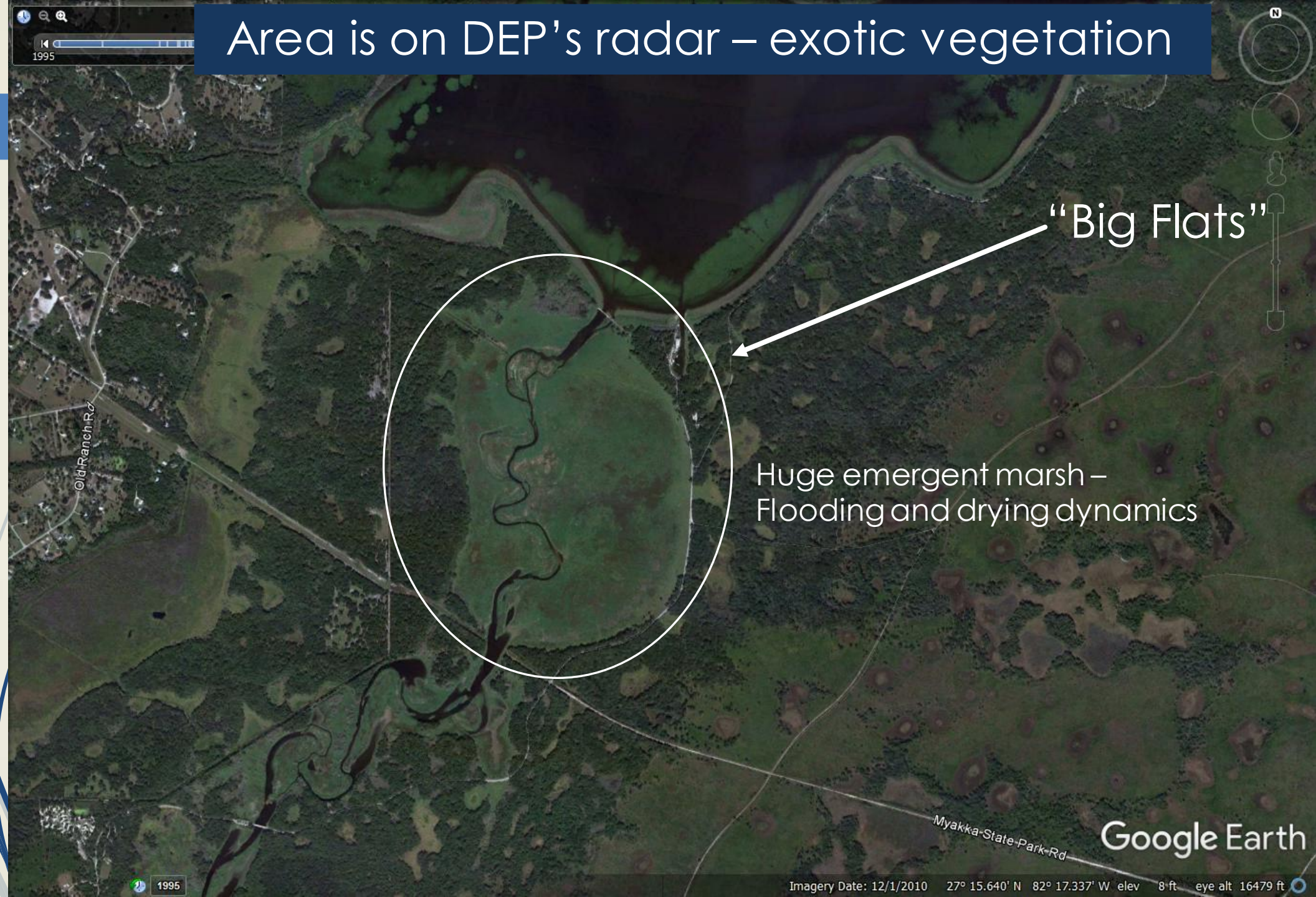
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Myakka River



Area is on DEP's radar – exotic vegetation

2010



"Big Flats"

Huge emergent marsh –
Flooding and drying dynamics

Old Ranch Rd

Myakka State Park Rd

Google Earth

1995

Imagery Date: 12/1/2010 27° 15.640' N 82° 17.337' W elev 8 ft eye alt 16479 ft

2012



Old Ranch Rd

Myakka State Park Rd

Google Earth

1995

Imagery Date: 1/19/2012 27° 15.640' N 82° 17.337' W elev 8 ft eye alt 16479 ft

2013



Old Ranch Rd

Myakka State Park Rd

Google Earth

1995

Imagery Date: 1/26/2013 27° 15.640' N 82° 17.337' W elev 8 ft eye alt 16479 ft

2014



1995

Imagery Date: 4/1/2014 27° 15.640' N 82° 17.337' W elev 8 ft eye alt 16479 ft

2016 Large area of Paragrass in "Big Flats" was chemically treated



Novel ecosystem



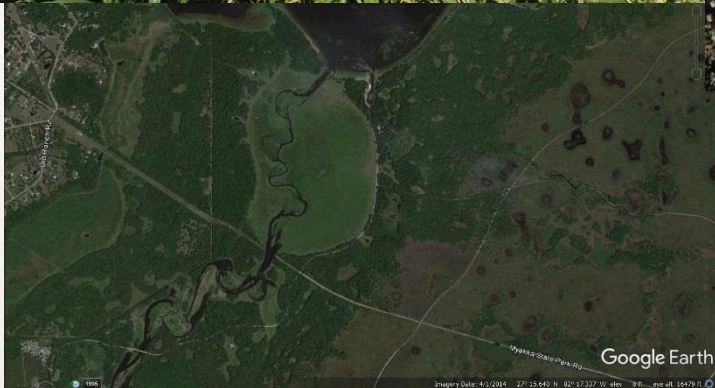
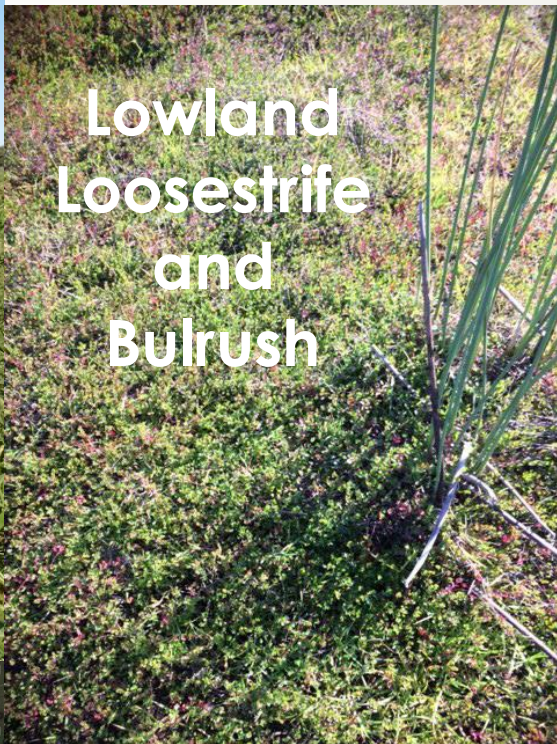
Maybe not beneficial
for bass?



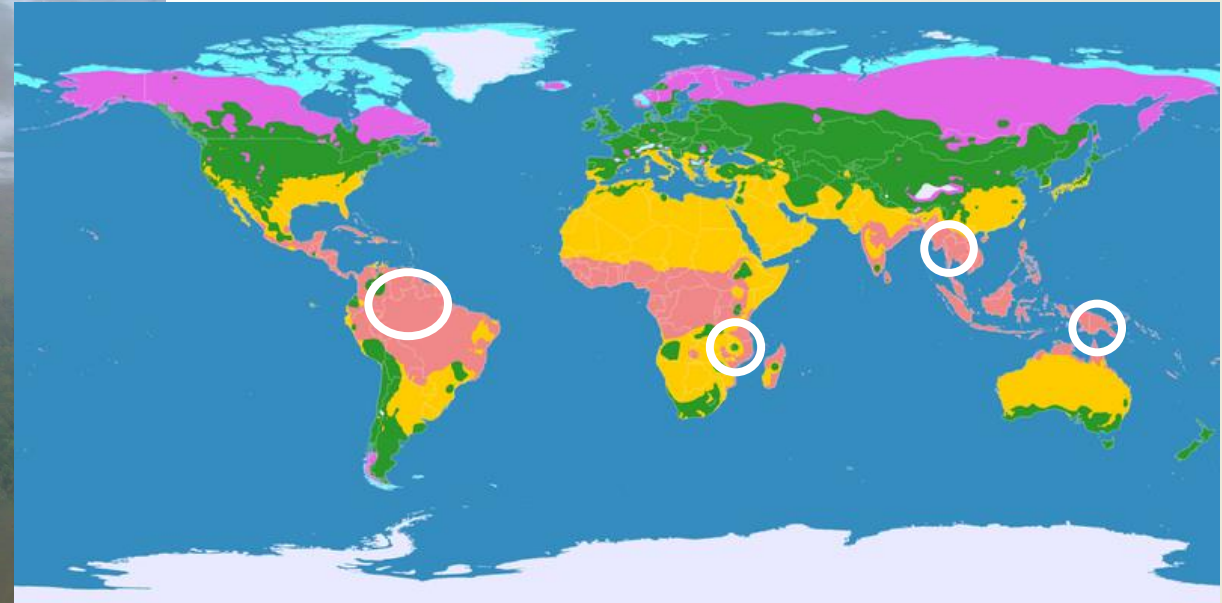
Exotic vs. native grasses (effect on D.O.)



Native grasses



The Myakka River, with native vegetation and all its marshes, may just function differently than the Peace River



Most large tropical rivers around the world have low DO in the flood season!

Next step is to monitor conditions over the next several years



Will dissolved oxygen levels increase significantly?

Will the bass population also increase as a result?

Stay tuned.....

Acknowledgements

Special thanks to Charlotte Harbor Field Lab, Freshwater Fisheries Management, and Myakka River State Park Staff, and Jerry Carter

