



Fine Scale Tracking of Water Level by Sunfish: Implications for Wading Bird Foraging

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PIT Tag: Passive Integrated Transponder



- electronic microchip (biocompatible glass case)
- Unique Identifier
- No power source required

Used to study fish of all shapes.....



Small



Medium

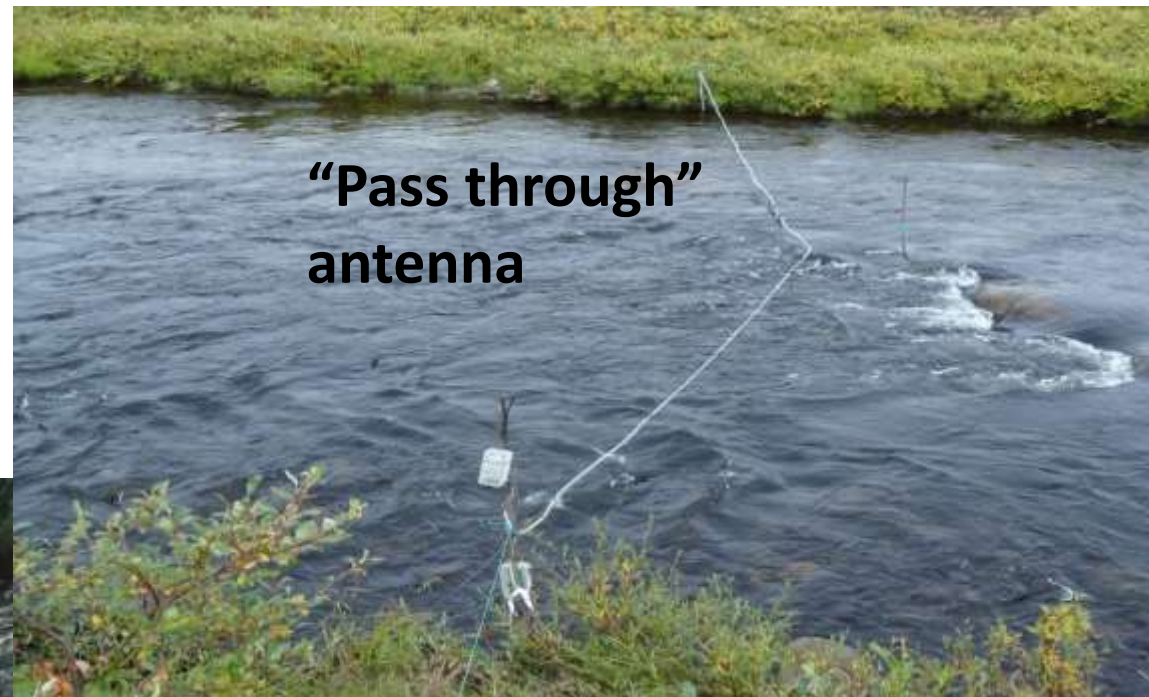
....and sizes



Large

Passive Antenna System ("Fish tollway")

- 12V Battery
- Reader (data logger)
- Tuning adjuster
- Antenna



**"Pass through"
antenna**



**"Pass over"
antenna**

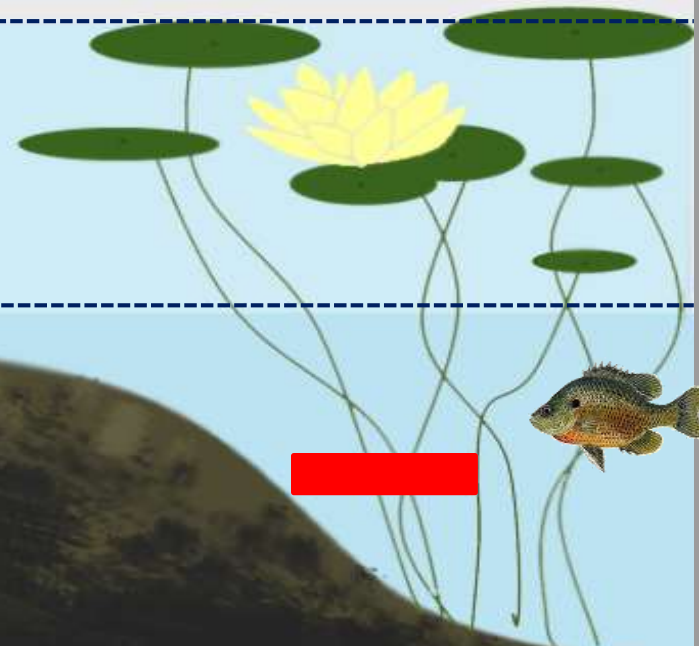
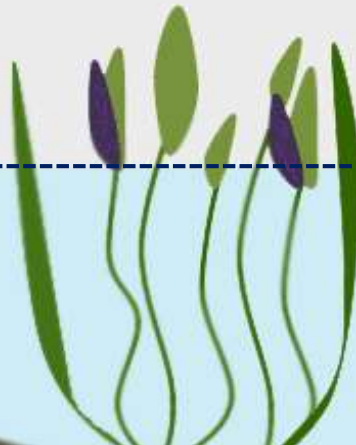


PIT Technology: “Sun-Pass for Sunfish”

Tag 12345-
1/12/2015 @ 18:00

Tag 12345-
1/12/2015 @ 17:00

Tag 12345-
1/12/2015 @ 16:00



Ridge

Slough

Alligator hole

Lotic Systems

- Flowing water (i.e. rivers, streams)
- Aquatic faunal movements well studied

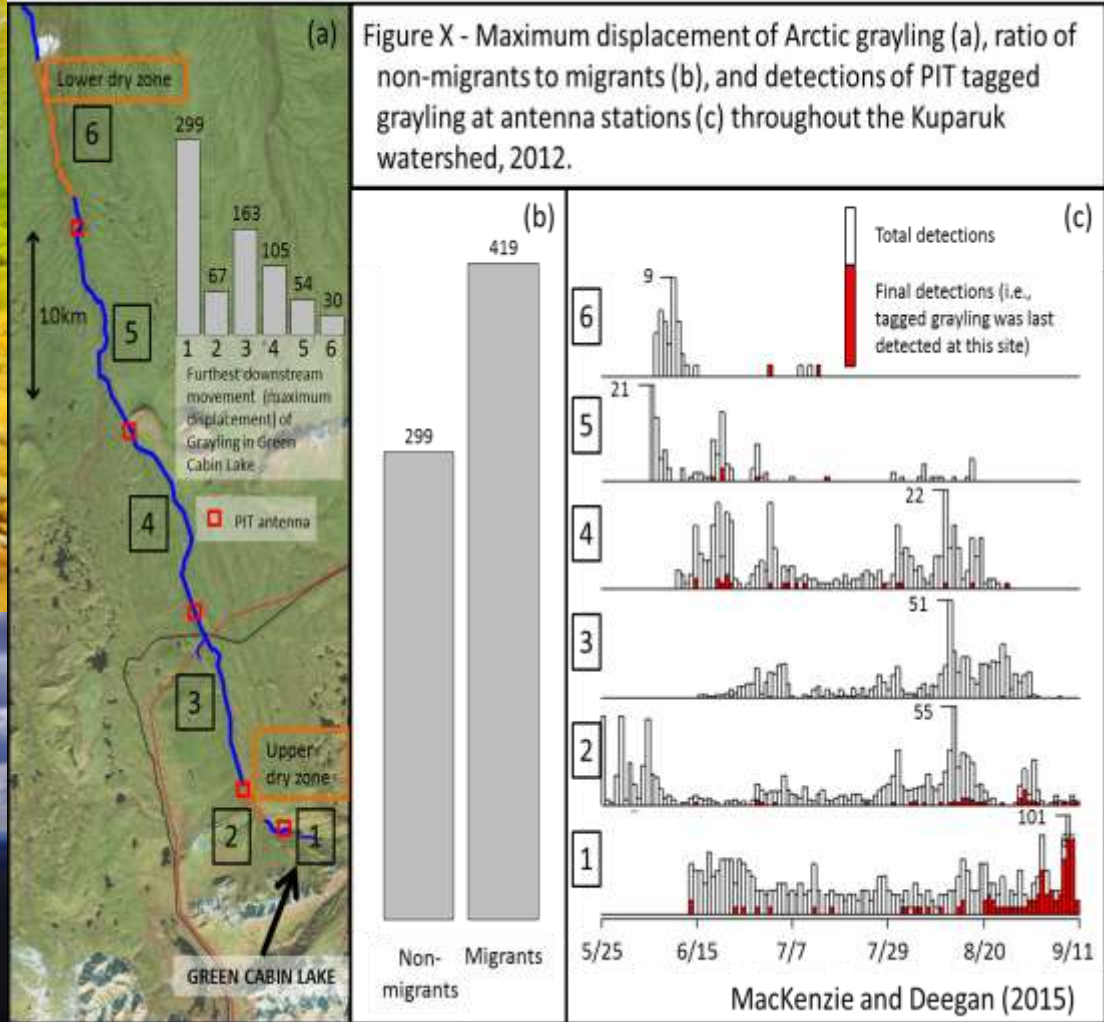


Lentic Systems

- static water (i.e. lakes, ponds, wetlands)
- Aquatic faunal movements less well understood



Arctic Grayling (*Thymallus Arcticus*)

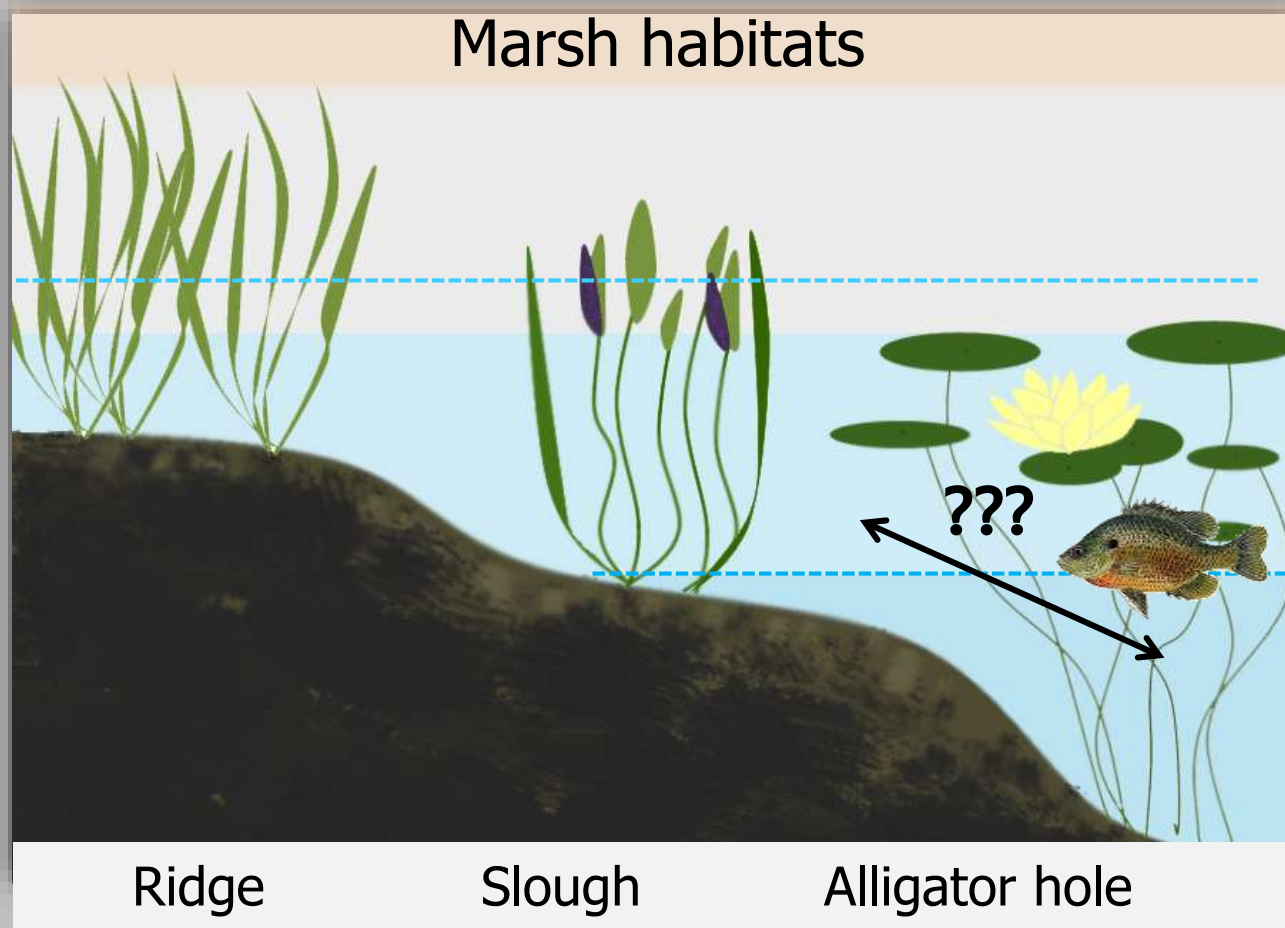


- PIT System application to river systems
- Large scale tracking of seasonal migratory patterns

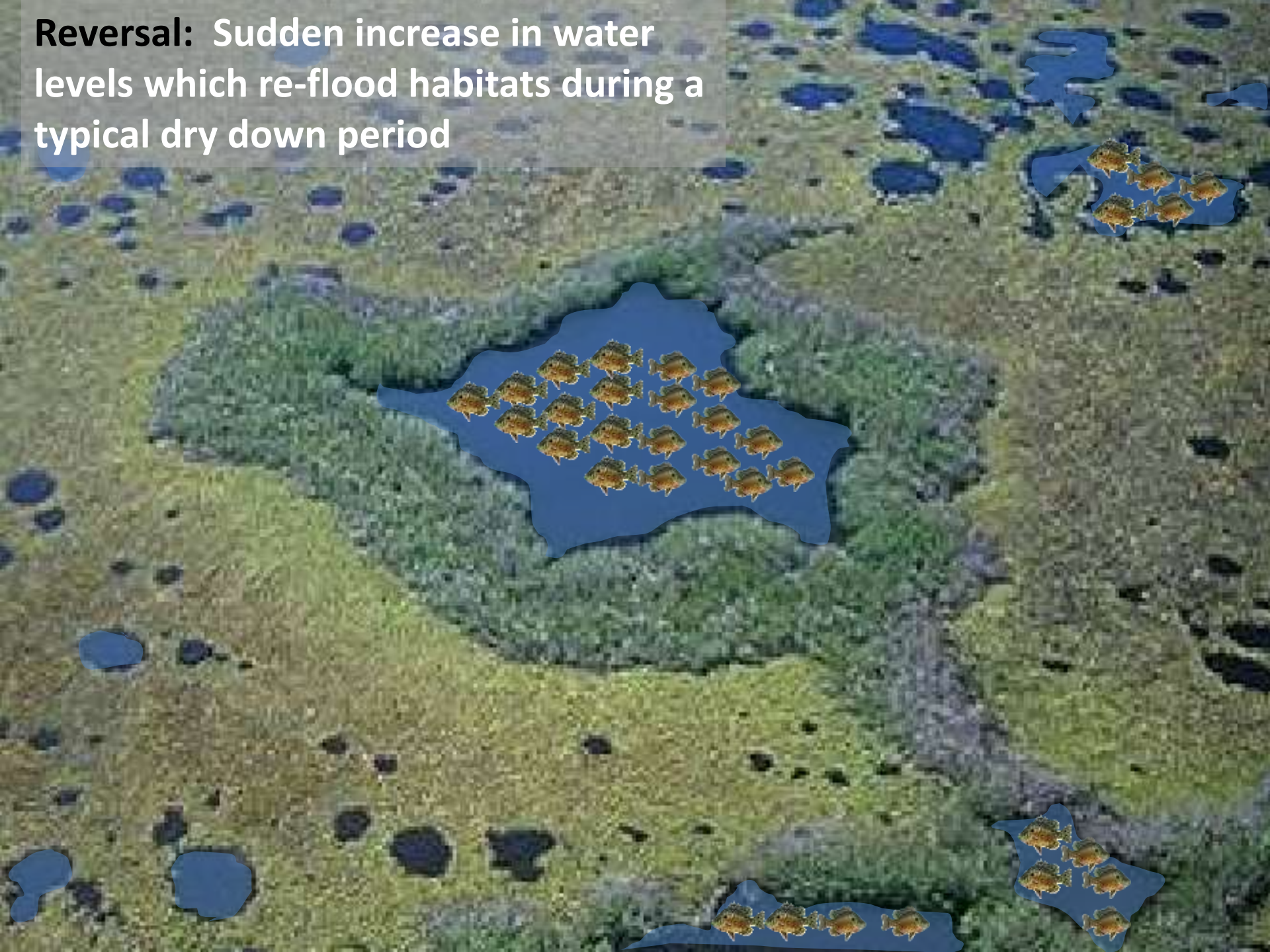
How do Everglades fish respond to changing water levels?

Fine-scale movement & habitat selection

Fish distribution & concentration across the landscape



Reversal: Sudden increase in water levels which re-flood habitats during a typical dry down period



Study Site

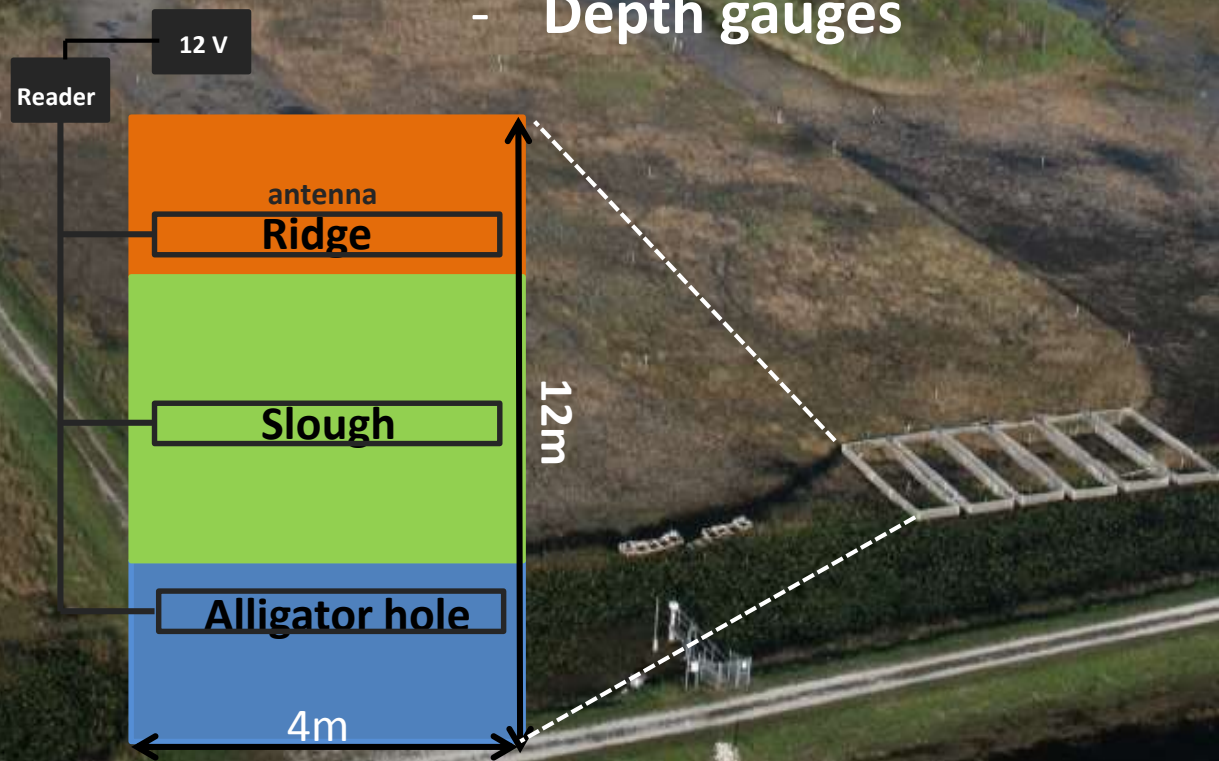
- **Loxahatchee Impoundment Landscape Assessment (LILA)**
 - Working model of Everglades freshwater marsh
 - Controlled water delivery system

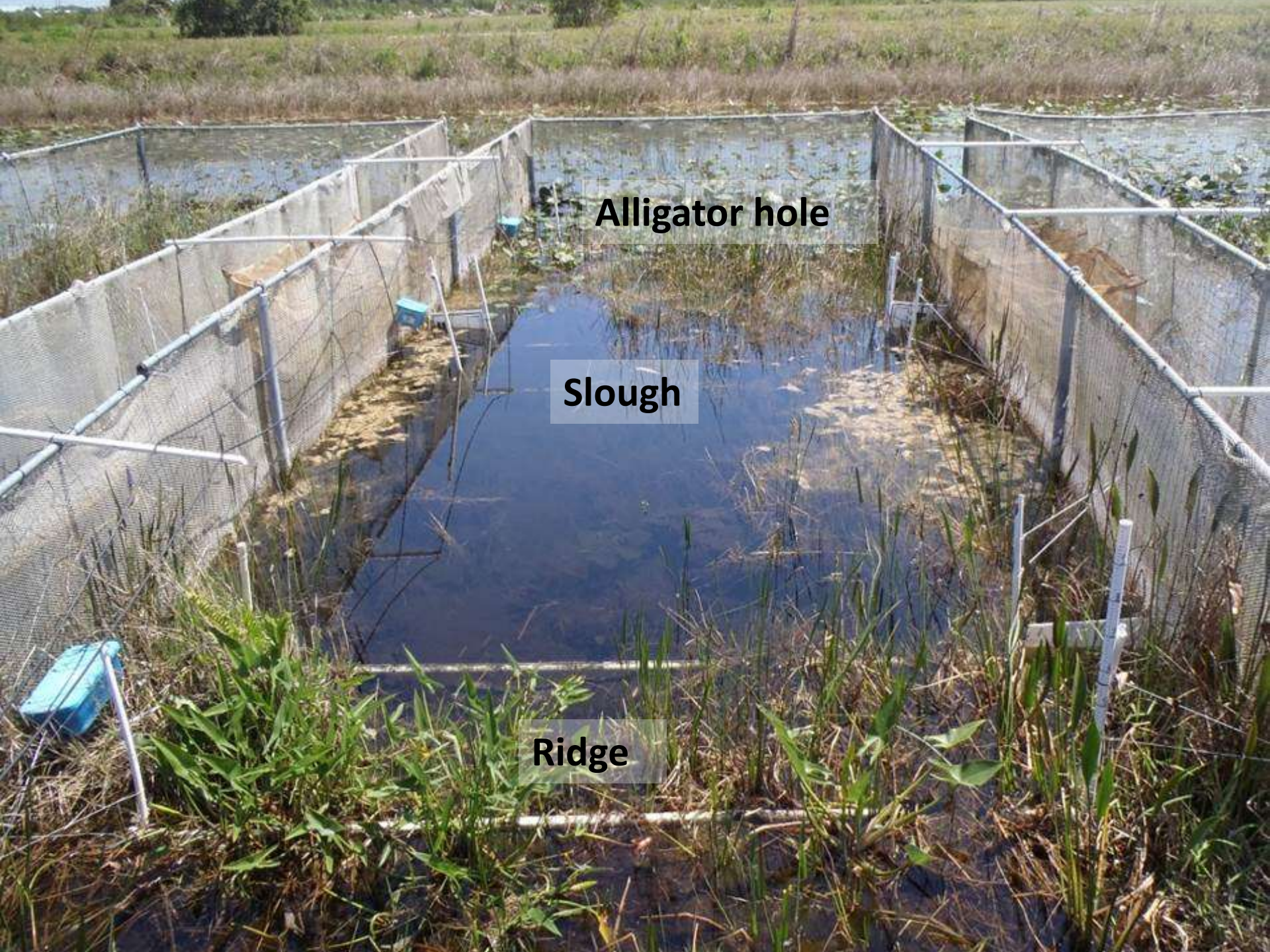




Field Enclosures:

- habitat & depth gradient
- Mesh Lining
- 5-6 fish/enclosure (30-36 total)
- Depth gauges





Alligator hole

Slough

Ridge

Research Questions

How do fish respond to:



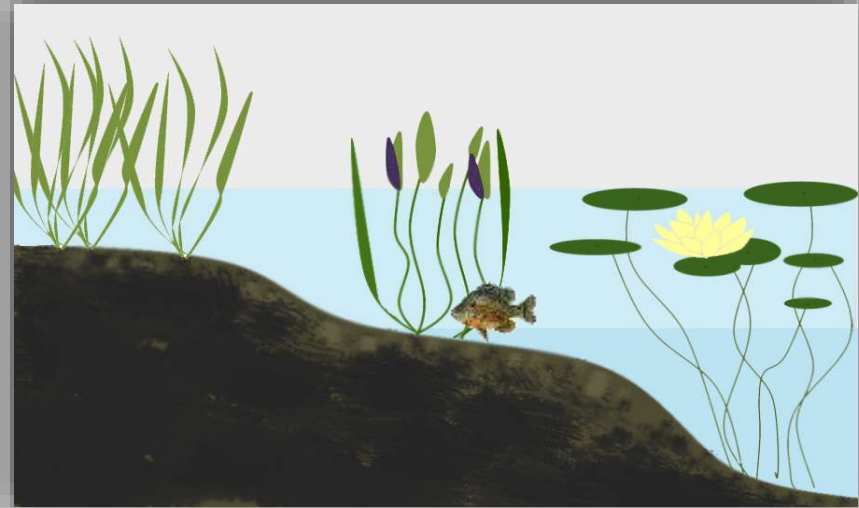
- 1.) Increasing vs. decreasing water levels
- 2.) Seasonal vs disturbance (reversal) changes in water level
- 3.) Varying rates of change in water level

Fish Detection Data

Response variables:

Activity Level:

of movements between habitats
(Daily average, adjusted for depth)

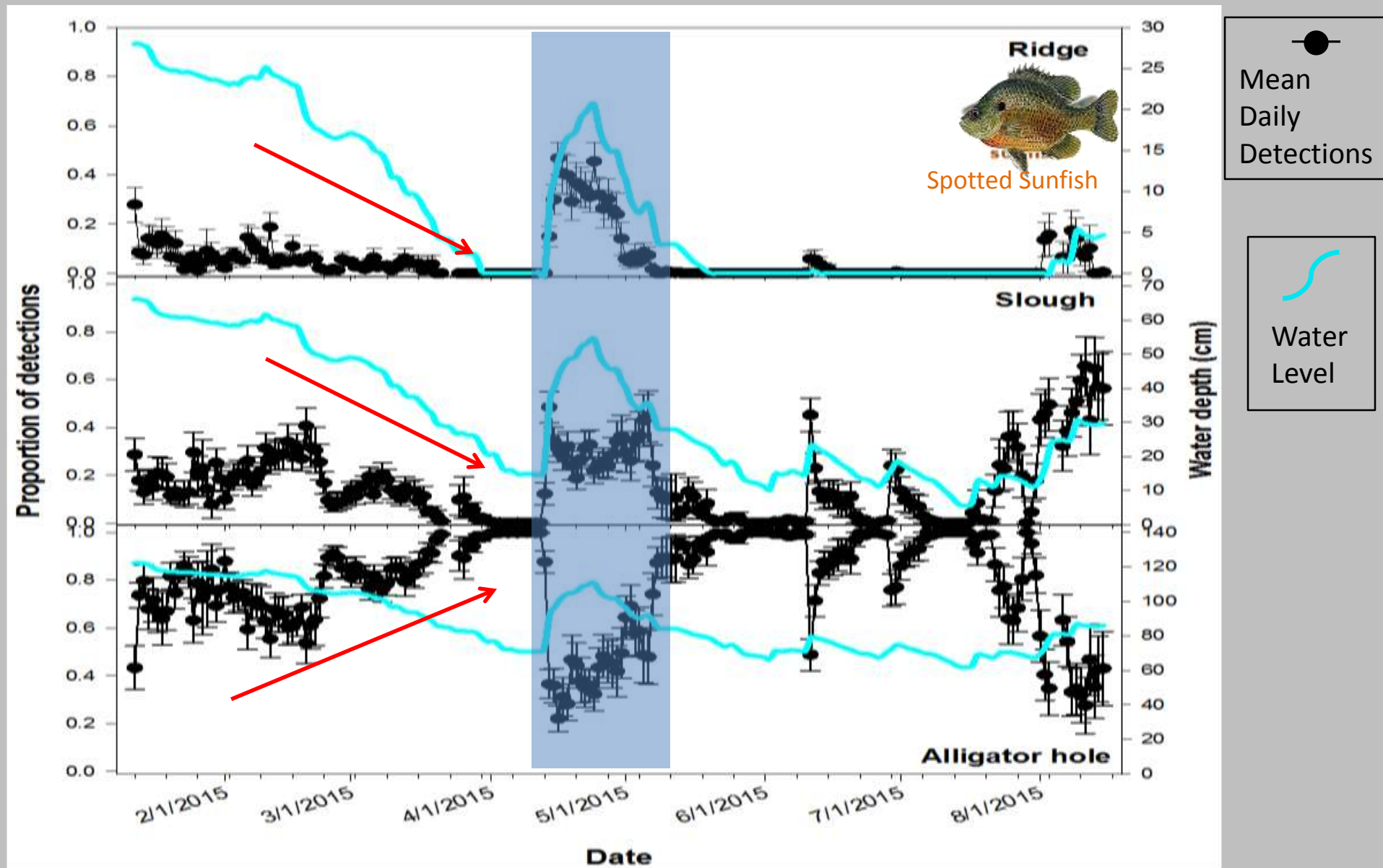


Habitat Use:

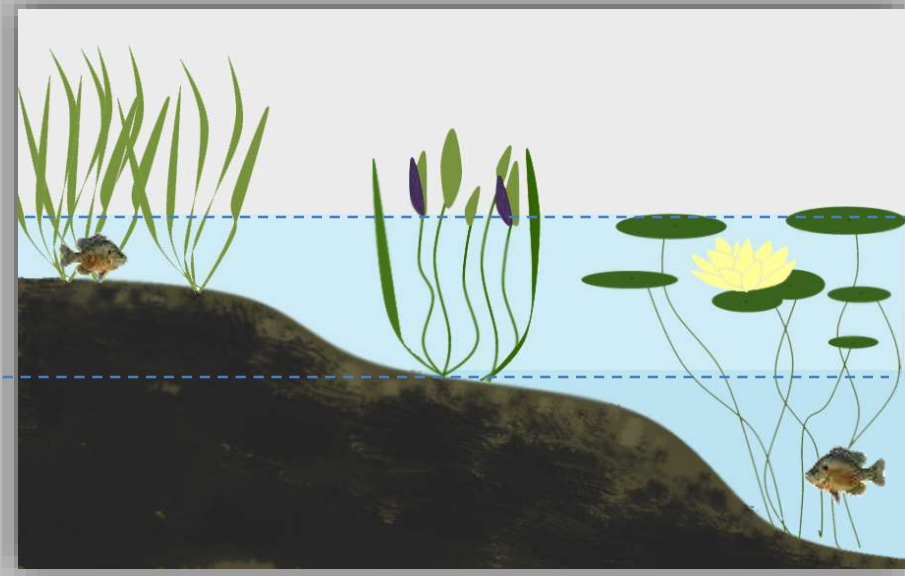
Proportion of detections in each habitat
(Daily average across all fish)



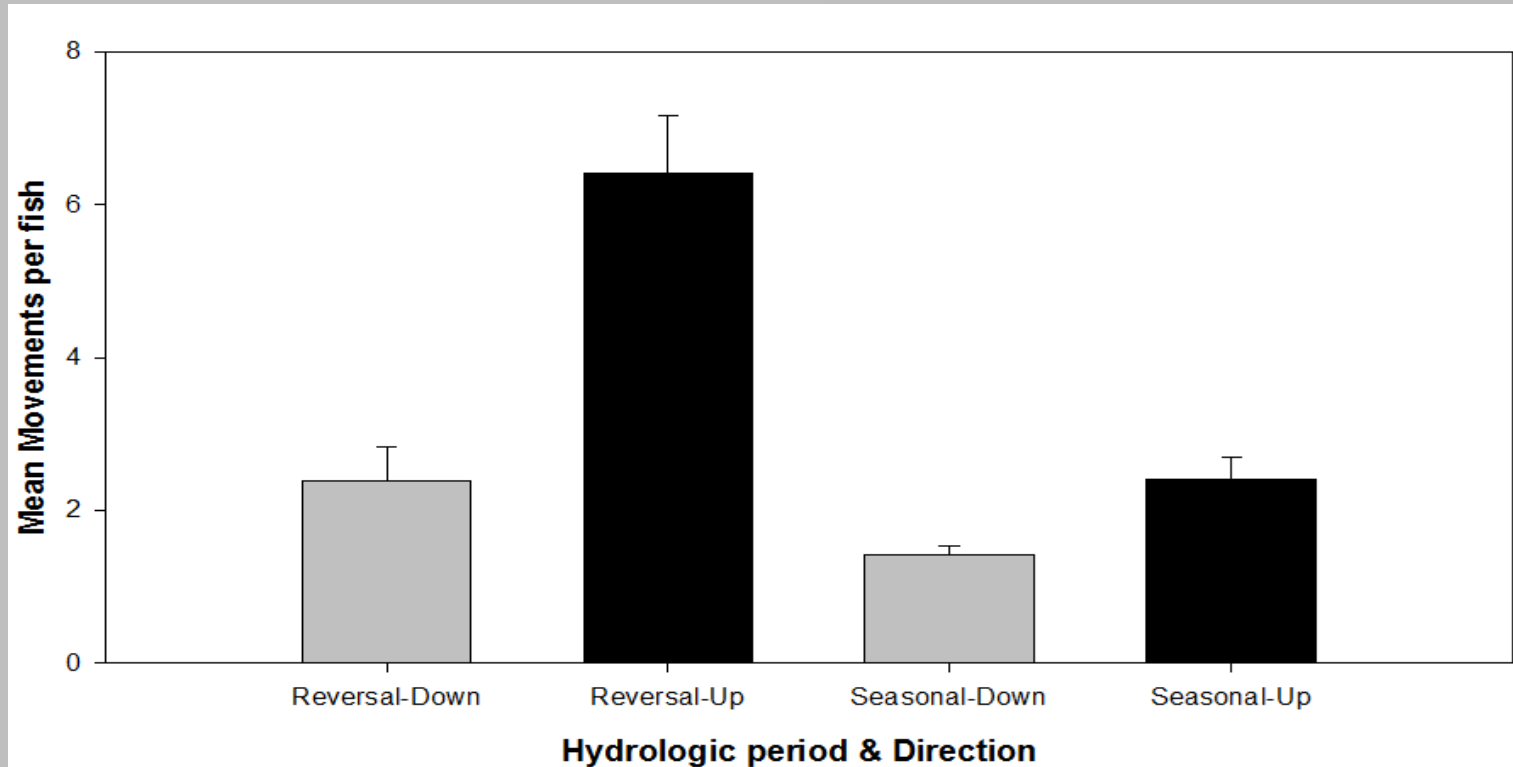
Habitat use variation with season



- How do fish respond to increasing vs. decreasing water levels?
- How do fish respond to seasonal vs Reversal changes?

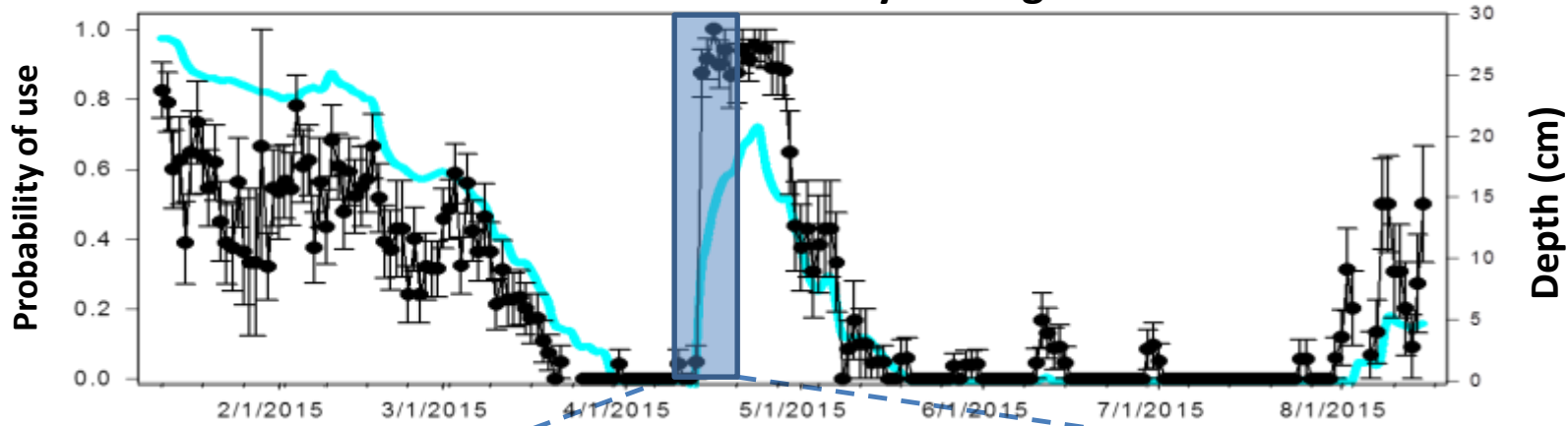


Fish were most active during the reversal and increasing water levels

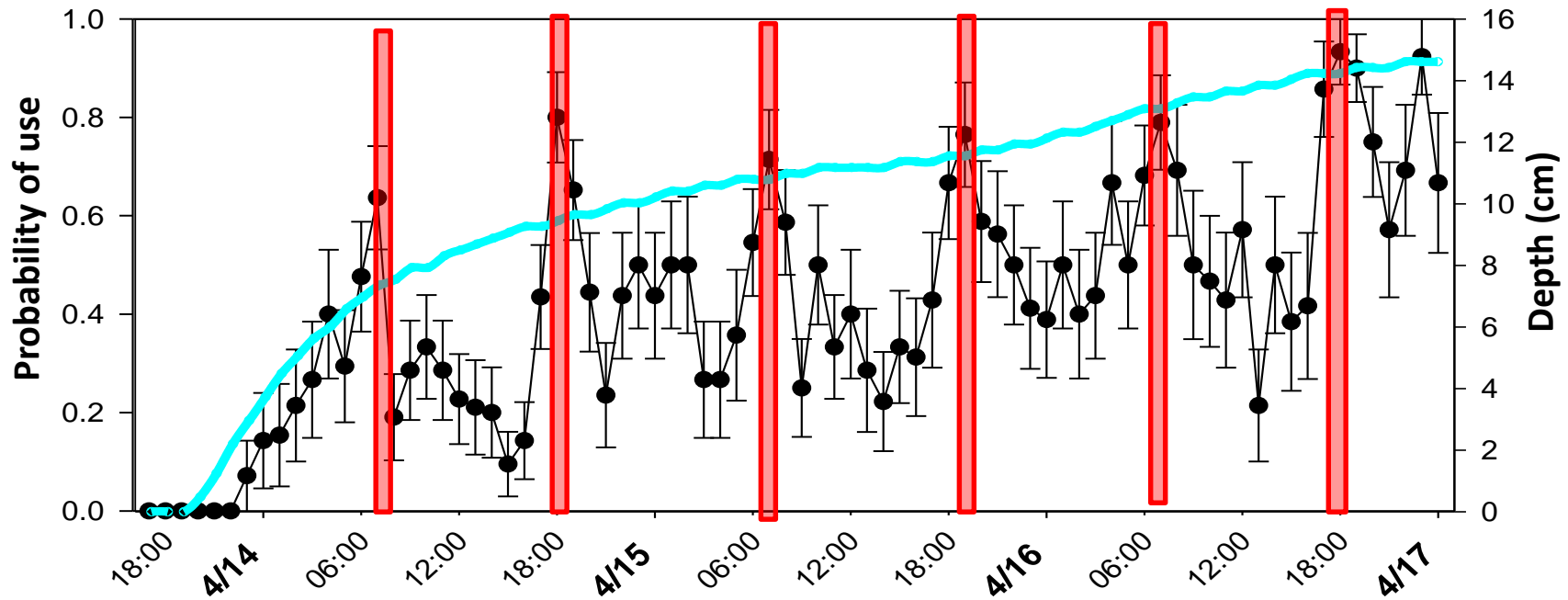


Diel Habitat Use Patterns

Seasonal Probability of Ridge Use

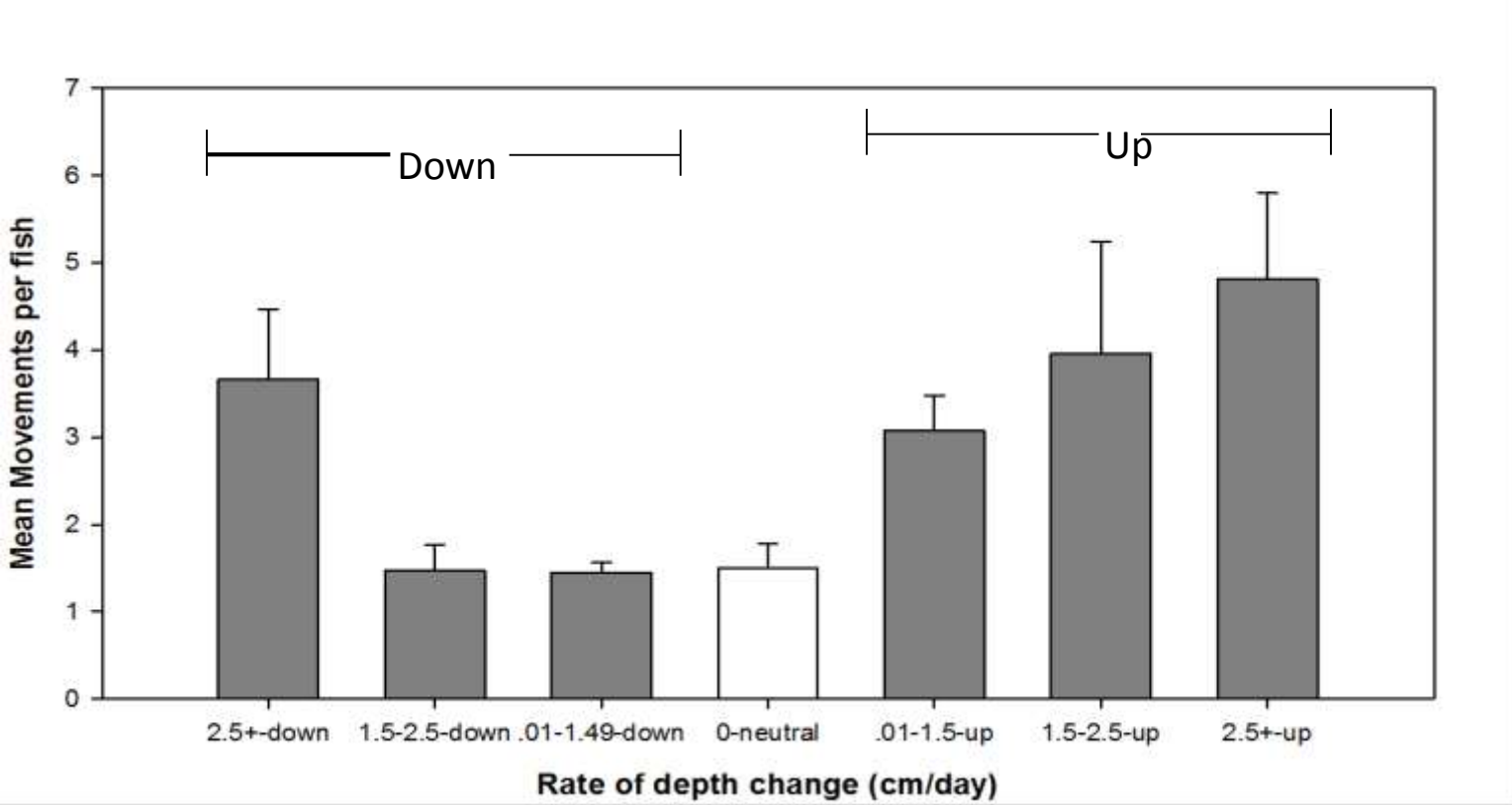
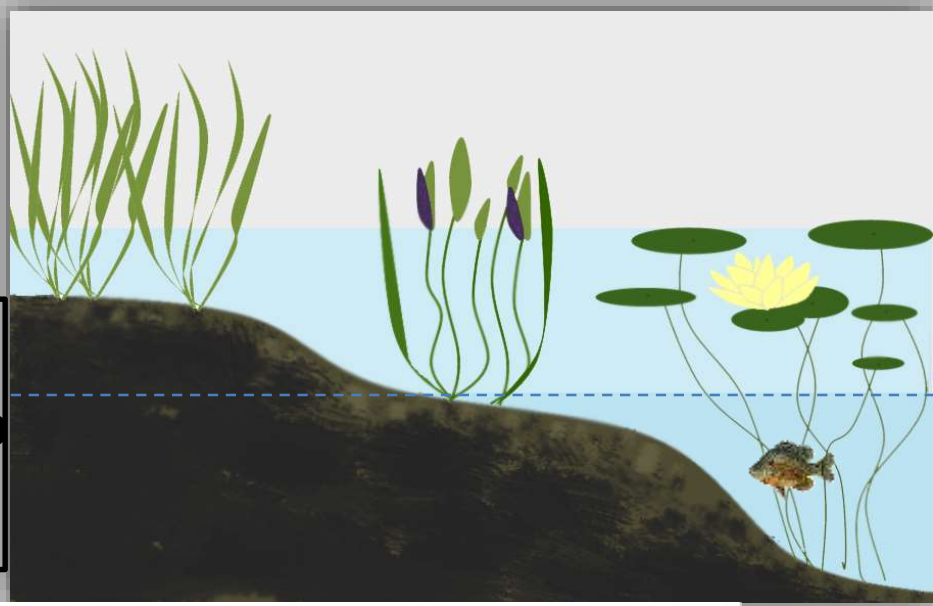


Probability of Ridge use by hour- 2015 Reversal



How do fish respond to varying rates of depth change?

Fish were active during all increasing rates but only respond to recessions during rapid change



Why Relevant?



Food Web Dynamics

- More active fish = harder to catch, harder to locate and more energy expended for predators
- More spread out fish populations = lower quality foraging patches

Conservation Implications

An aerial photograph of a vast wetland area, likely in the Everglades, showing a massive colony of wading birds, including many pink and white birds, scattered across the water and marshy ground. The landscape is a mix of shallow water and greenish-brown vegetation.

Re-flooding events causes immediate responses in fish

- Dispersal and re-distribution of fish populations
- Loss of dense prey concentrations

- Recovery of wading bird colonies
- Metric of success for Everglades restoration
- Importance of freshwater inflows, water management

FIU

FLORIDA
INTERNATIONAL
UNIVERSITY



Thank You!



Loxahatchee
National
Wildlife Refuge



Frequency of recession rates across 3 hydrostations (9, 63, P33) in cm for 2009 (strong recession), 2010 (wet year) and 2011 (drought year). Dashed line = rates above 1.5 cm.

