# *Opportunities and Challenges for Prescribed Fire in Everglades Restoration*

**Brian Benscoter**
**Associate Professor & Certified Wildland Ecologist**
**Department of Biological Sciences**
**Florida Atlantic University**

# The Paradox of Fire in Fire-Adapted Ecosystems

*"the herbaceous Everglades and the surrounding pinelands were born in fires…they can survive only with fires…they are dying today because of fires."*

*– Egler 1952 (sensu Gunderson and Snyder 1994)*

Photo: J Wallace

# The Role of Fire: *Composition*

*"The importance of fire and its influence on the vegetation of the Everglades can hardly be over-emphasized"*

*– Loveless 1959*

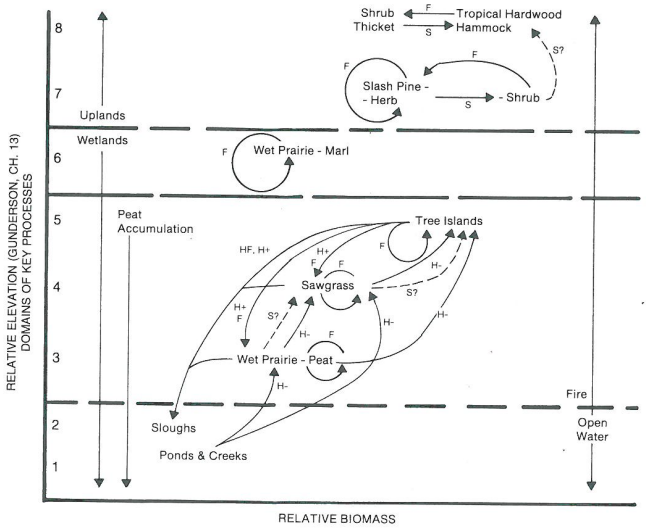


*Diagram from White 1994*

# The Role of Fire: *Structure*

(Photo Credit: *NPS, via WildfireToday.com)*

# The Role of Fire: *Structure*

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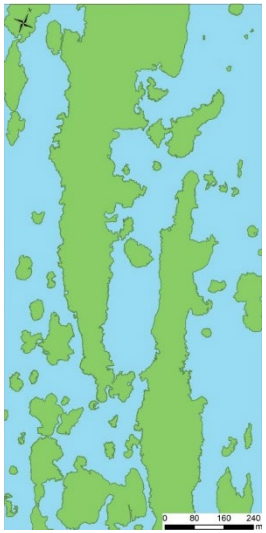

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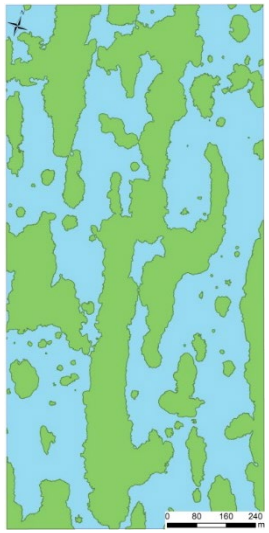

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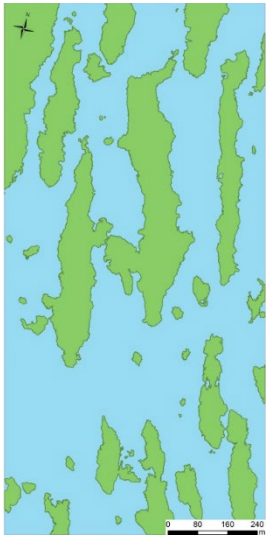
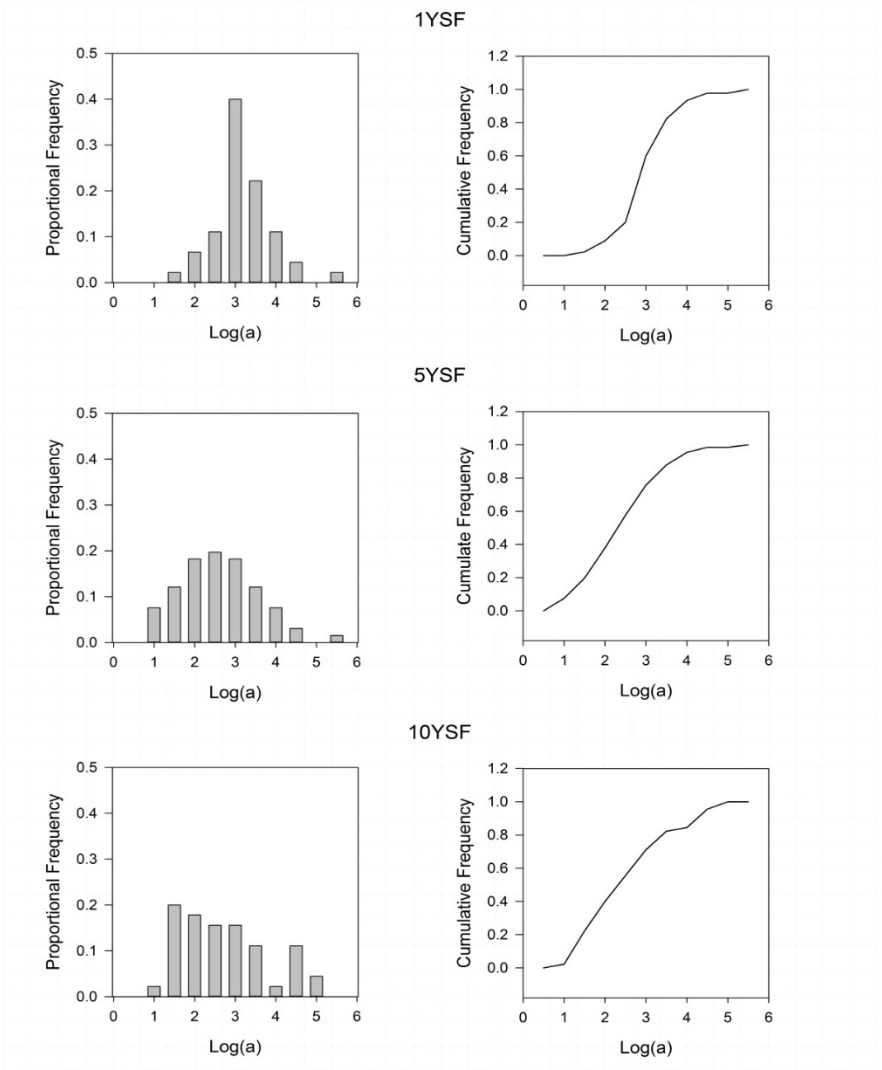




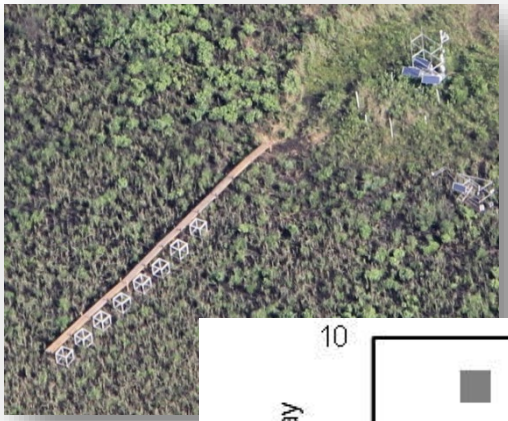

*Dombrowski 2015, FAU Thesis*

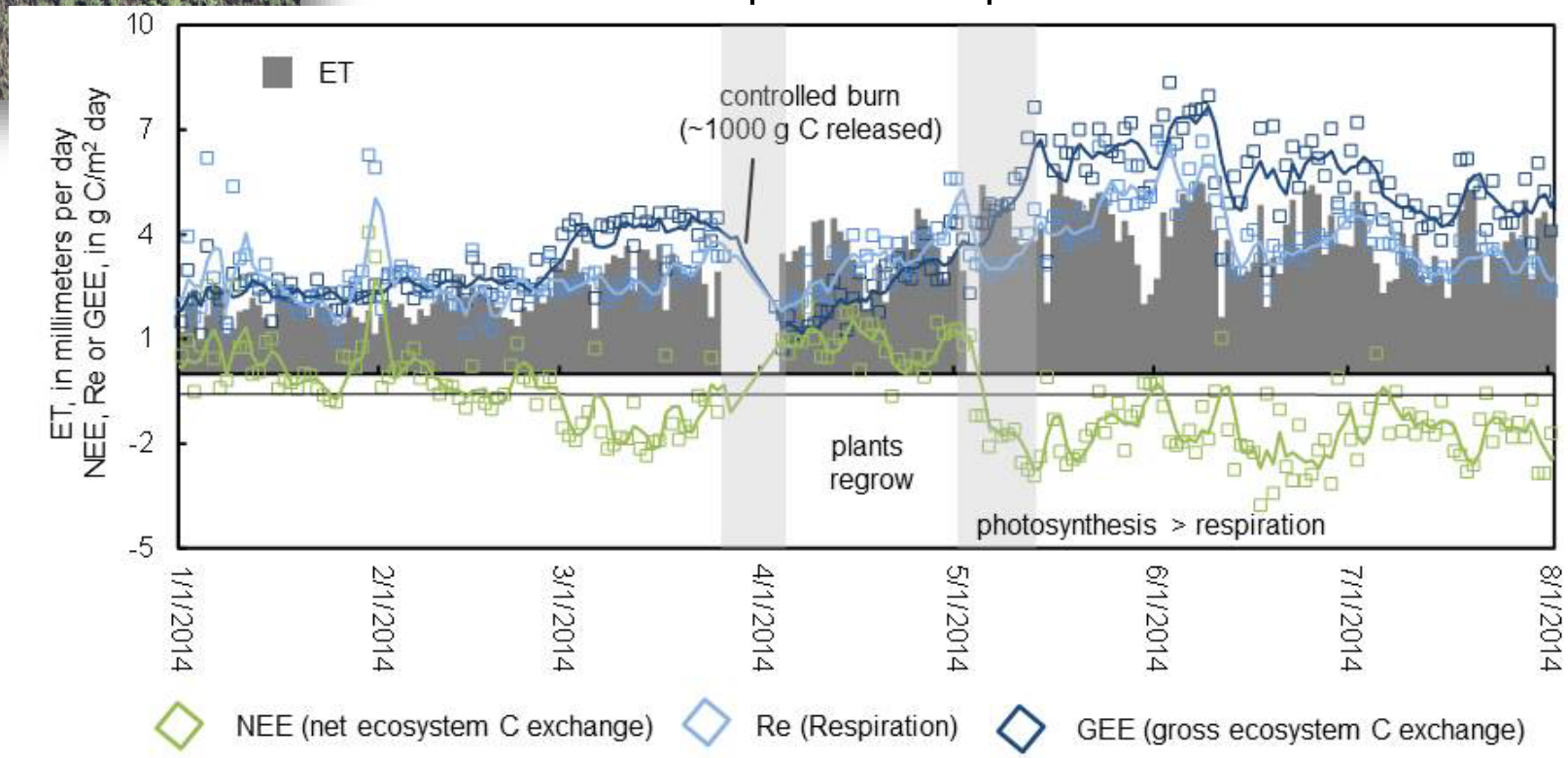
# The Role of Fire: *Function*

- Hydrology
  - Flow paths
- Microclimate
  - Temperature, ET, light
- Nutrient Release
  - Microbial activity *(Medvedeff et al. 2015)*
  - Export P *(Miao et al. 2010)*

*Jessica Dell – Thurs. 4:05p, Session 43*

# Short-lived Consequence for Carbon

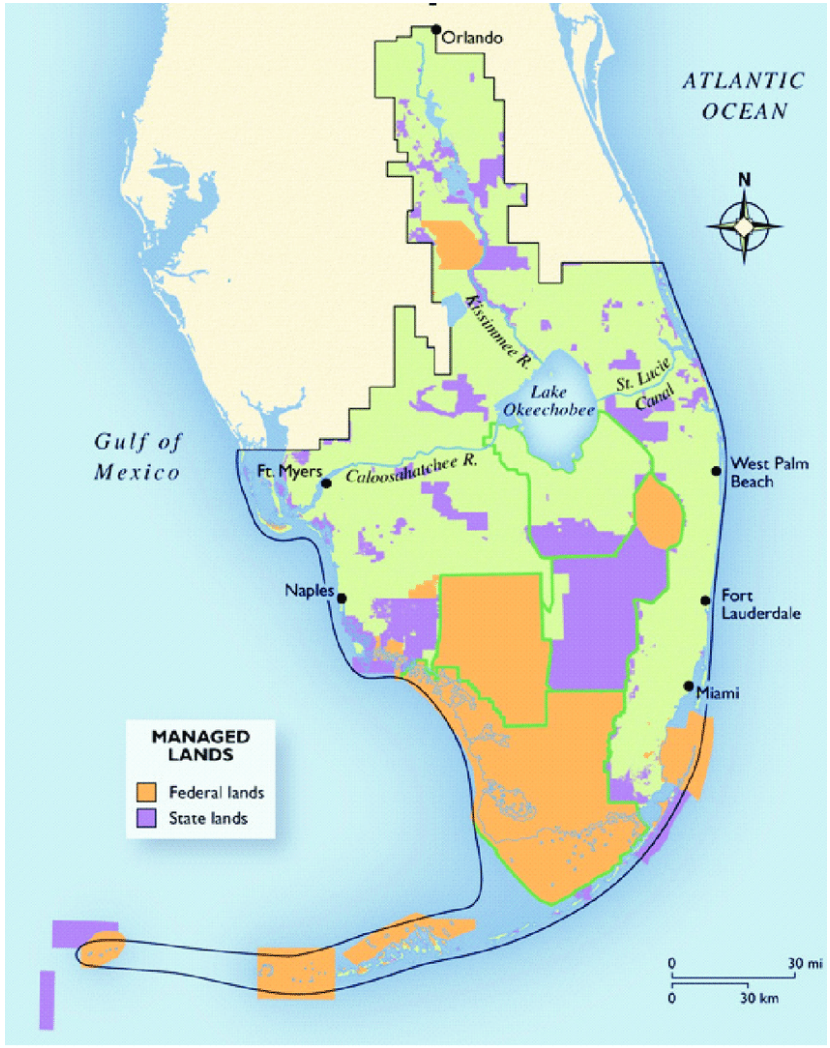





Data: Ross Hinkle (UCF) and Barclay Shoemaker (USGS)

# Prescribed Fire is a Powerful Management Tool

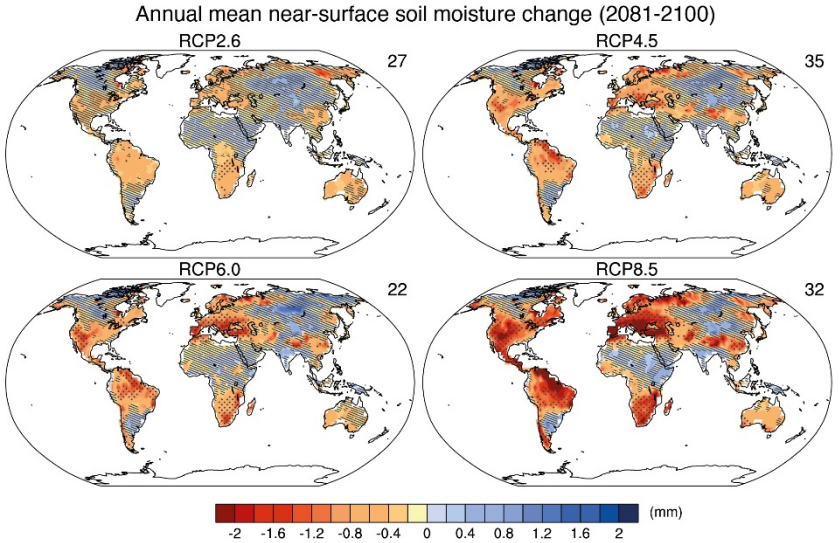
- Extensive managed lands
- Rx fire common tool
- Federal lands ~130,000 acres burned annually




*FNAI data; Tom Dreschel*

# Shifting Baselines Create New Pressures

- Increased Temperatures
- Net drying & 'megadroughts' *(Cook et al. 2015)*
- US NPS lands already at climate extremes *(Monahan and Fisichelli 2014)*
- Land use-land cover change
  - Greater impact than climate *(Parmesan et al. 2005)*




(IPCC AR5 Fig 12.23)

# The Path Forward…

## Challenges

- Physical Drivers
- Exotics
- Novel Fuels

## Opportunities

- Harnessed Severity
- Mixed-management
- Shifting targets

# …Within the Context of Reality

- Distinct wildland-urban interface
- Dense, extra-urban populations
- Tourism & Commerce

Grant Gifford, USFWS

Watts & Kobziar 2013

www.nytimes.com

# Challenges of Changing Physical Drivers

- Hotter and Drier

- Longer fire seasons
- More intense fire behavior
- More severe fire impacts

NPS, via WildfireToday.com

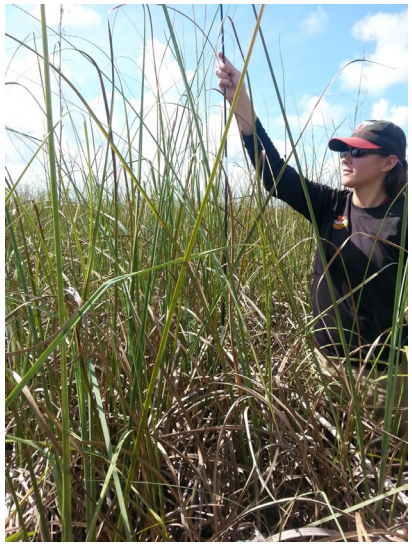
# Challenges of Exotic Plants

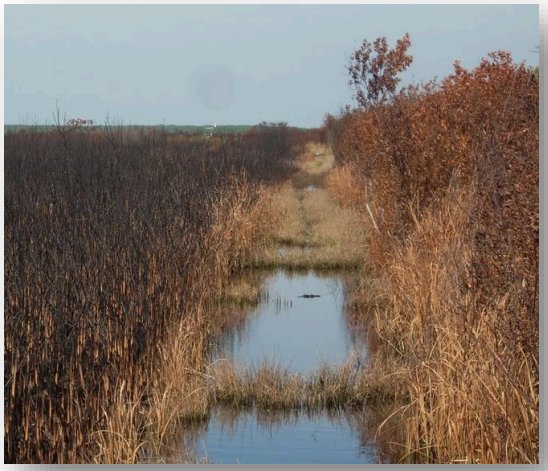
- *Lygodium* & *Melaleuca* (Australian pine, Brazilian pepper, …)
- Change fuel structure
- Flammability
- Compromise recovery
  - New or Re-invasion

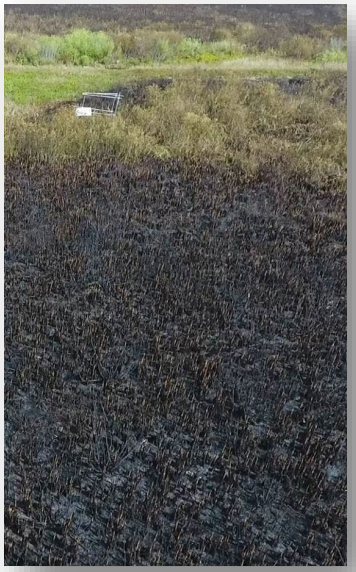
Nature.org

# Challenges of Changing Fuels

- Loss of habitat heterogeneity
- Spread of native invaders
  - Cattails
  - Willow
- Change fire behavior



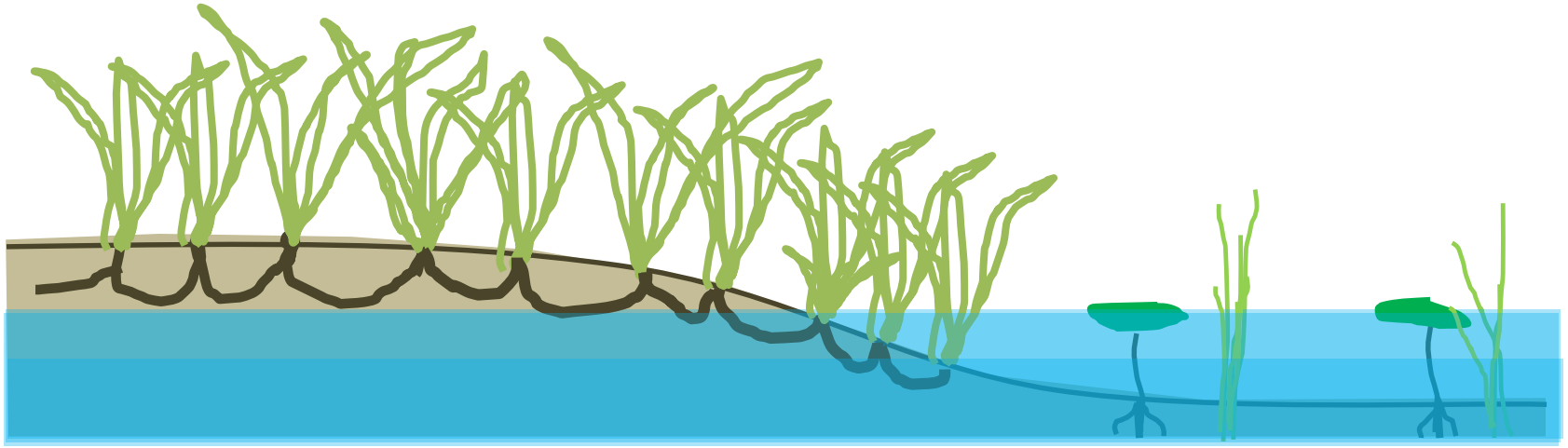




# Opportunity: *Breaking Legacies*

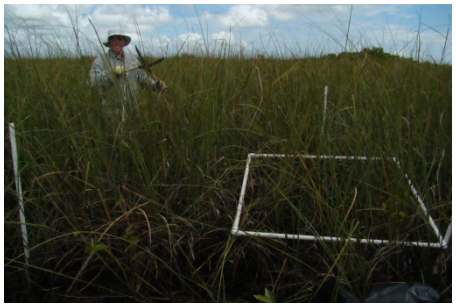
- Changing water management
  - Wetter or drier
  - Timing
- Burning "outside the envelope"
  - Promote varied fire behavior & effects

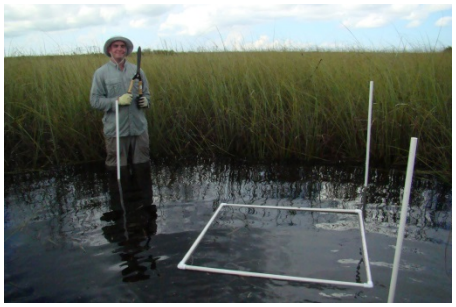
usace.army.mil



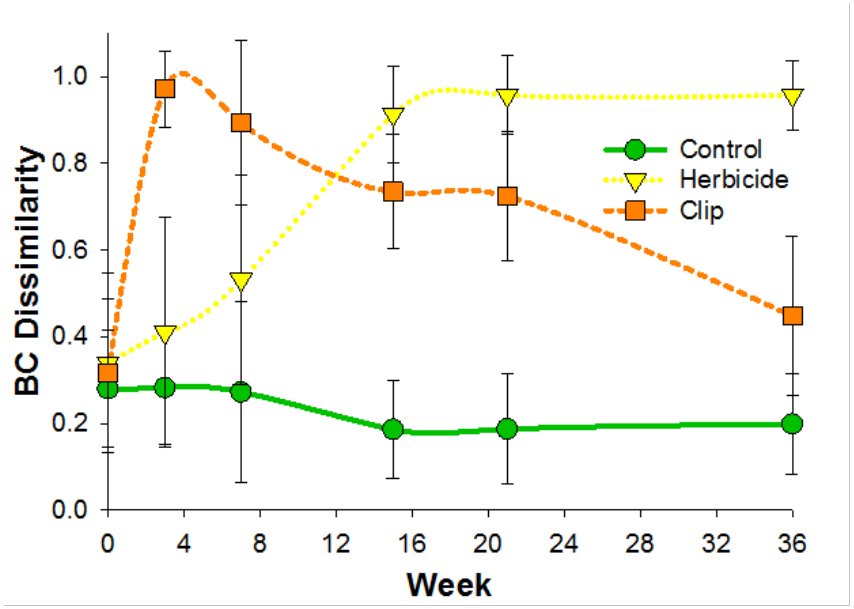
# Opportunity: *Tag-Team Tactics*

- One tool might not be enough





- Mixed management
  - E.g., herbicide & fire

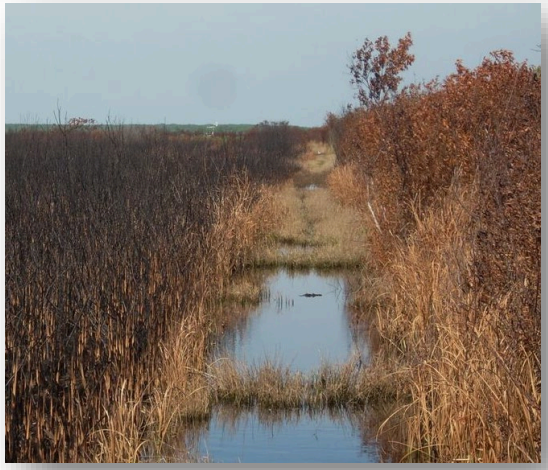



- Remove legacy ***and*** prevent return

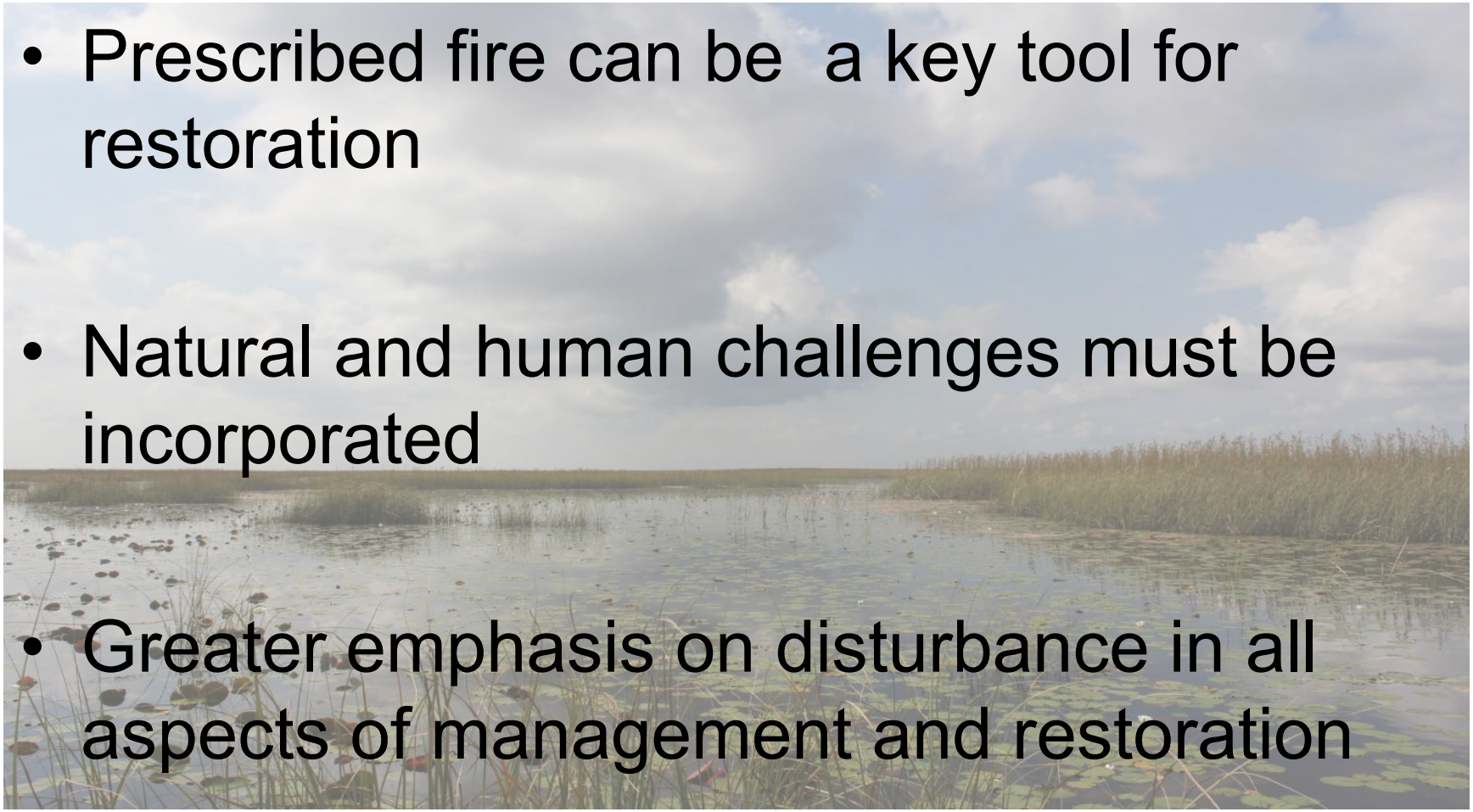
(J Lange, FAU Env Sci MS 2013)

# Opportunity: *Dynamic Objectives*

- Adaptive management…in reverse
- Lean into change trajectories
- Use changes as advantages



# Parting thoughts…



- Prescribed fire can be  a key tool for restoration
- Natural and human challenges must be incorporated
- Greater emphasis on disturbance in all aspects of management and restoration

## Collaborators

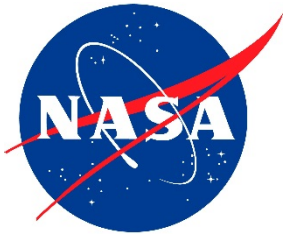
- Xavier Comas (FAU)
- Ross Hinkle (UCF)
- Rebekah Gibble (USFWS)
- Evan Kane (MTU)
- Mike Falkowski (CSU)
- Jim Reardon (USFS)
- Martha Nungesser (SFWMD)
- Kim Ponzio (SJRWMD)
- David Sumner (USGS)
- Don DeAngelis (USGS)
- Barclay Shoemaker (USGS)
- Diane Harshbarger (FAU)

## Students

- Siham Abou El Haoul, Nadia Abouhana, Amira Bashir, Liz Becker, Victor Benavides, Alex Chapman, Jessica Dell, Jacob Dombrowski, Tristan Froud, Daniel Hagood, James Johnson, Jimmy Lange, Marina Lauck, Joanne Pauyo, Emily Persico, Juan Polanco, Lisa Reger, Jaci Roberto, Manon Transleau, Nestor Yeyati

## Partner Agencies & Facilities

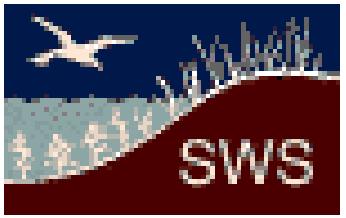
- Florida Atlantic University
- US Geological Survey
- USFWS- A.R.M. Loxahatchee NWR
- US State Department
- SFWMD
- SJRWMD
- The Nature Conservancy-DWP

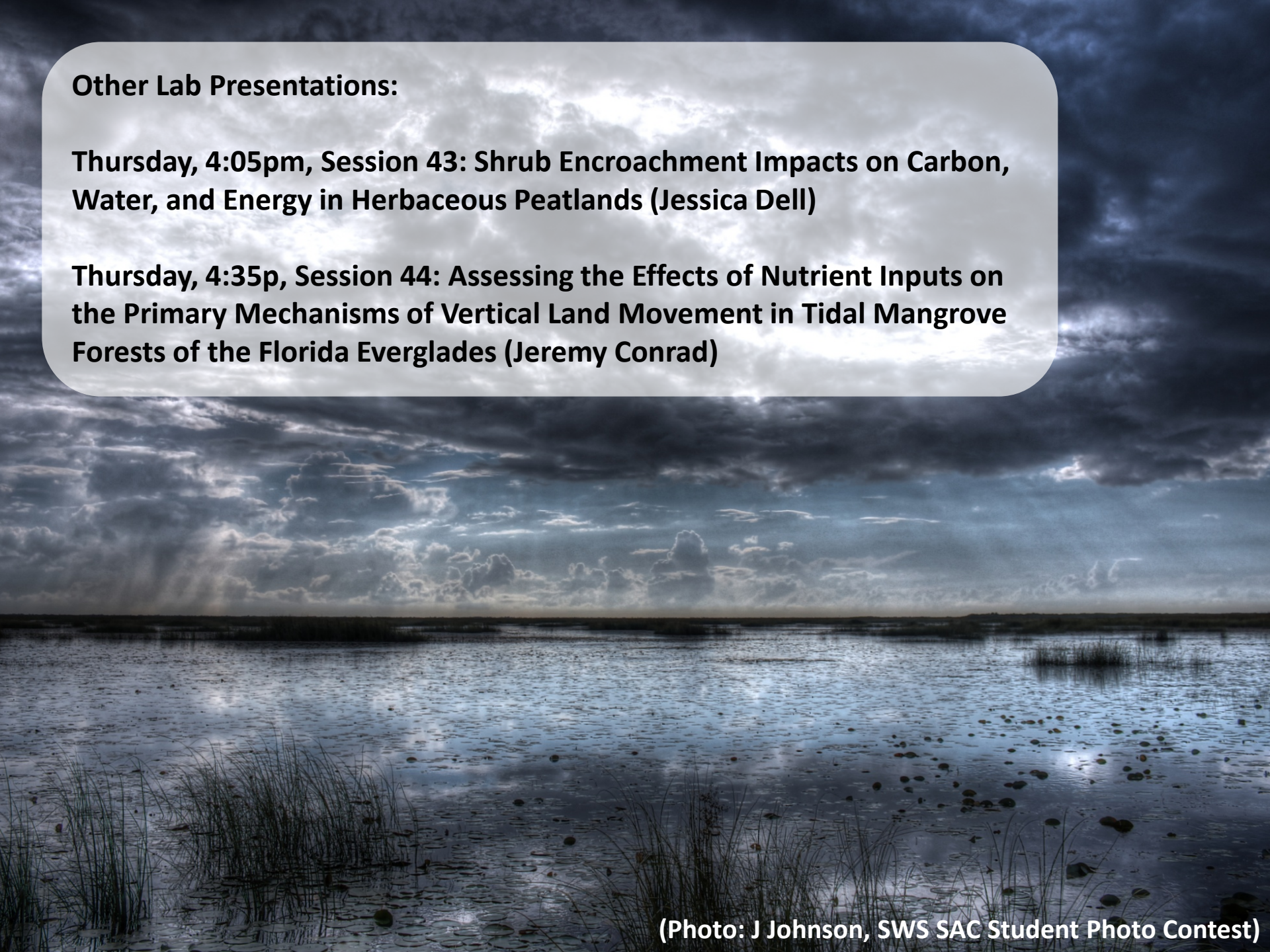










**Other Lab Presentations:**

**Thursday, 4:05pm, Session 43: Shrub Encroachment Impacts on Carbon, Water, and Energy in Herbaceous Peatlands (Jessica Dell)**

**Thursday, 4:35p, Session 44: Assessing the Effects of Nutrient Inputs on the Primary Mechanisms of Vertical Land Movement in Tidal Mangrove Forests of the Florida Everglades (Jeremy Conrad)**

**(Photo: J Johnson, SWS SAC Student Photo Contest)**