# Quantifying the Effects of Upland Prescribed Fire on the Hydrology of Geographically Isolated Wetlands in Florida Pine Flatwoods

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### 1. MOTIVATION

- Pine flatwoods are fire-dependent ecosystems that were once dominant in the southeastern US
- □ Habitat matrix: ~30% geographically isolated wetlands (GIWs) and 70% upland pine forest.
- $\Box$  GIWs are ephemeral  $\rightarrow$  unique habitat for endemic species



#### 2. METHODS

- "Paired-Wetland Design": Monitored water level in 3 treatment/1 control wetlands for 1 yr before and after prescribed burn (3 wells per wetland)
- □ Measured groundcover, leaf area index (LAI), duff depth, and basal area before, immediately after, and 1 yr after burn
- Estimated ET in wetland wells based on diurnal water level; compared to Eddy covariance
- Wilcoxon rank sum to compare water levels and ET in treatment wetlands before and after fire







Historical longleaf pine range



Bald cypress dome embedded in pine flatwoods

**Research Question**: How do fire and biomass removal via thinning affect hydrology of embedded wetlands?

•  $H_1$  – Prescribed fire will reduce ET across the uplandwetland mosaic relative to control sites

•  $H_2$  – Prescribed burns will increase wetland water level in embedded GIWs relative to control wetlands



Prescribed burns took place over two days in August 2017; trash can is protecting groundwater well.

**Example forest structural changes from pre**burn to post-burn: herbaceous, palmetto, and shrub percent cover and leaf area index



**Control (C) and treatment wetlands** (W1-W3) in ACMF; inset shows fire history

## **3. RESULTS – MAJOR FINDINGS**



**LEFT**: Hydrographs from upland and wetland wells for control and treatment plots; orange line marks the burn.

> **RIGHT:** Corrected water levels (treatment–control) before/after burn; all postburn increases significant; mean water level increase of 0.20 ± 0.10 m for upland wells and 0.16 ± 0.03 m for wetland wells.



### 4. CONCLUSIONS & IMPLICATIONS

- One of the first experimentally measured links between upland management and wetland hydrology.
- □ Prescribed burn caused 81% reduction in herbaceous cover, 69% reduction in shrub cover, and 48% reduction in palmetto cover
- Burn increased wetland water levels by 20 cm, decreased yearly ET by 141 mm, and increased water yield by more than 50%
- Prescribed fire can have both important ecological and hydrological benefits













B. Monthly corrected ET (Treatment ET – Control ET) for all wells; average ET reduction of 141 mm (50% increase in water yield)



#### **5. ACKNOWLEDGEMTS**

The authors thank Scott Sager, Gary Johns, and Rosvel Bracho-Garrillo at the UF School of Forest Resources and Conservation for providing conceptual ideas and support, coordinating a prescribed burn, and providing weather data from Austin Cary Forest. We also thank Steven Miller and Jeremy Olsen from St. Johns River Water Management District for allowing access, providing support, and coordinating forestry services at Longleaf Flatwoods Reserve as well as assisting in the Austin Cary Forest prescribed burn.