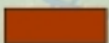


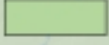




# WHERE WE WORK



-  Archbold Station and Buck Island Ranch
-  Archbold Research Sites
-  Conservation Lands
-  Avon Park Air Force Range
-  Lake Wales Ridge
-  Headwaters of the Everglades



Lake  
Okeechobee



# Archbold manages 20,000 acres of natural laboratories

ARCHBOLD  
RESERVE

ESTABLISHED 2002

3,600 acres  
Grazing and  
restoration site

ARCHBOLD  
BIOLOGICAL  
STATION

ESTABLISHED 1941

5,200-acres  
pristine scrub preserve

ARCHBOLD'S  
BUCK ISLAND  
RANCH

ESTABLISHED 1988

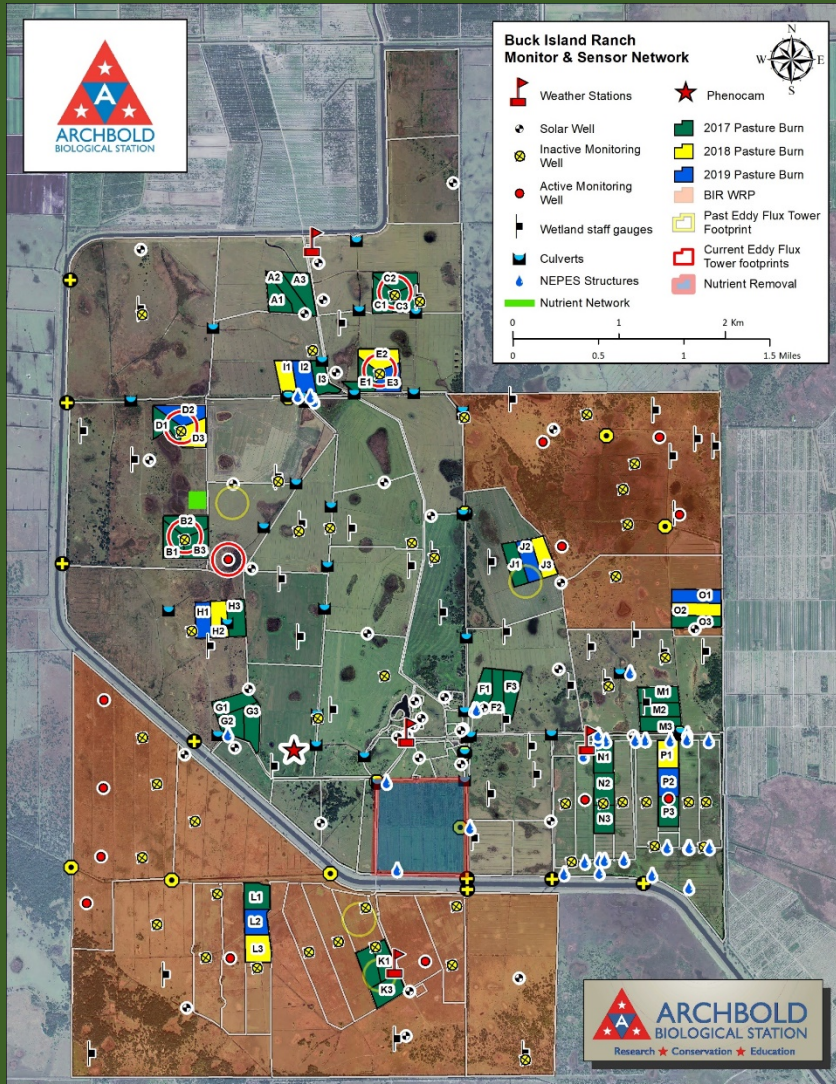
10,500-acres  
Working cattle ranch





# Field infrastructure and sensor networks

streams of environmental data, many long-term



- Buck Island Ranch is a platform for research
- Improved versus semi native pastures.
- Real-world cow-calf
  - Biodiversity
  - Water Quality/Nutrient cycles
  - Carbon
  - Fire Ecology
  - Life Cycle Analysis





# Biodiversity e.g. 454 plant species, 371 (85%) native plants found in wetlands



Photos by Shirley Denton





# Ranchland Biodiversity

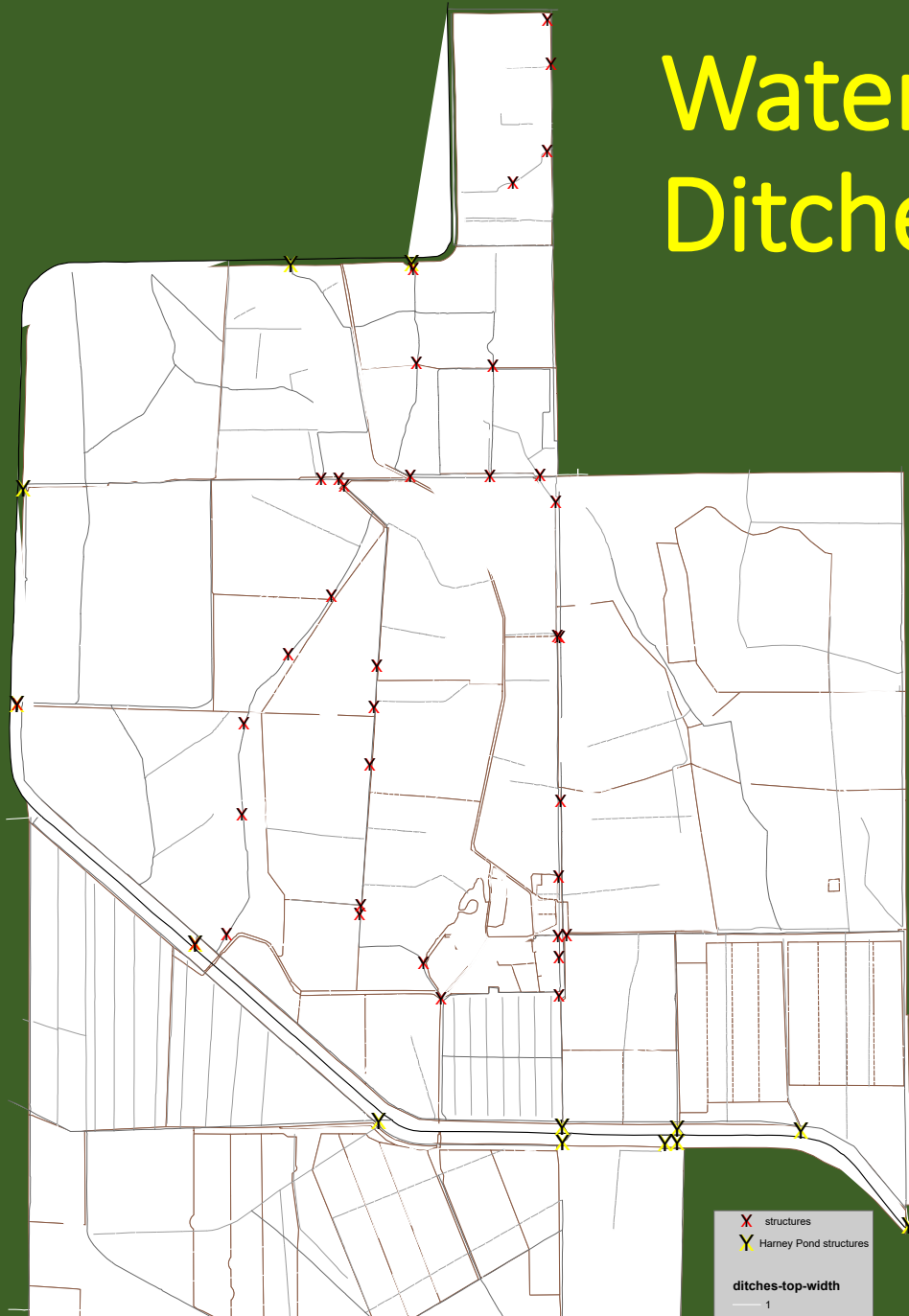


Photo credit: Carlton Ward



# Water Management – Ditches and Wetlands

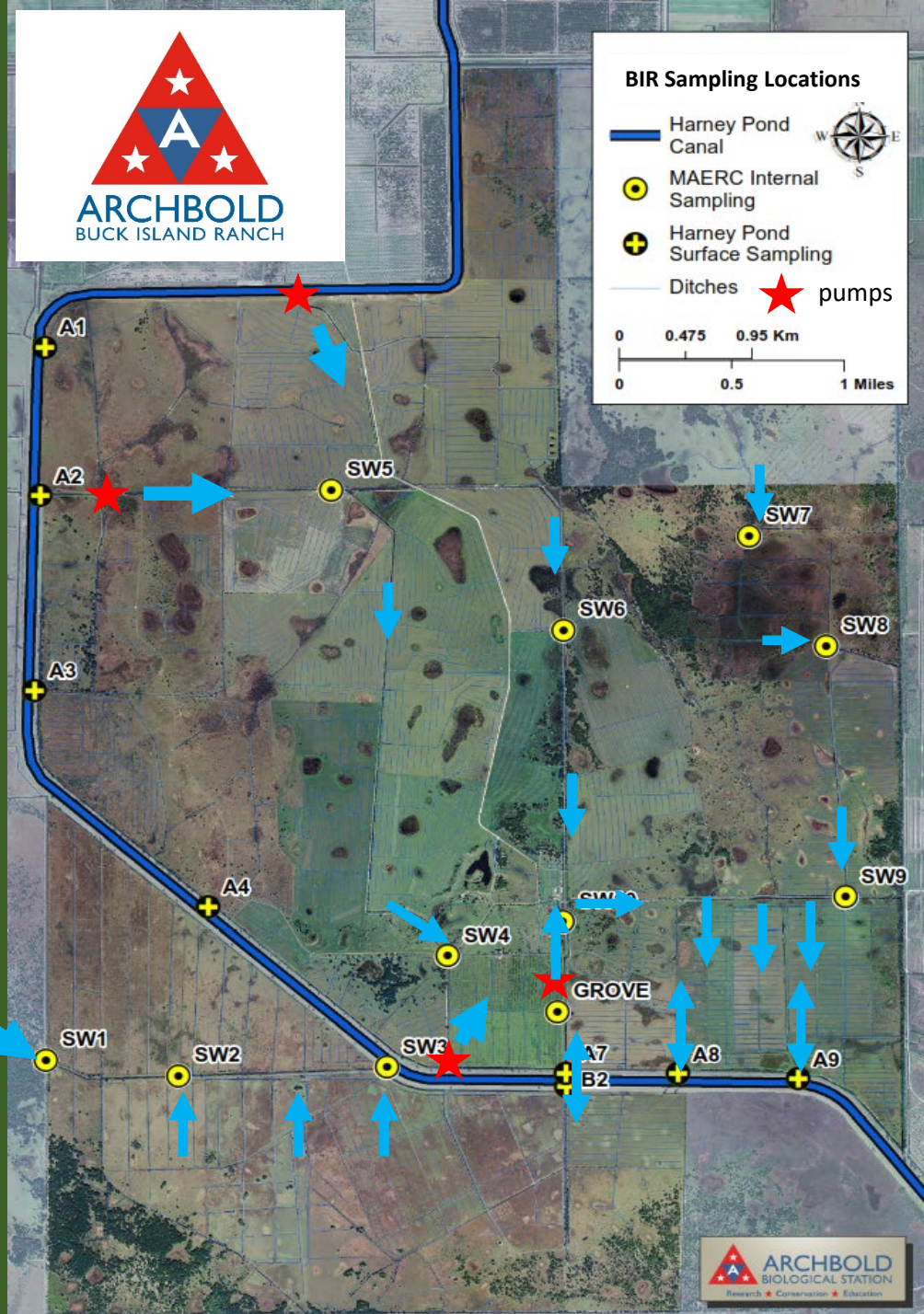
629 wetlands  
~500 miles of  
ditches  
Harney Pond canal





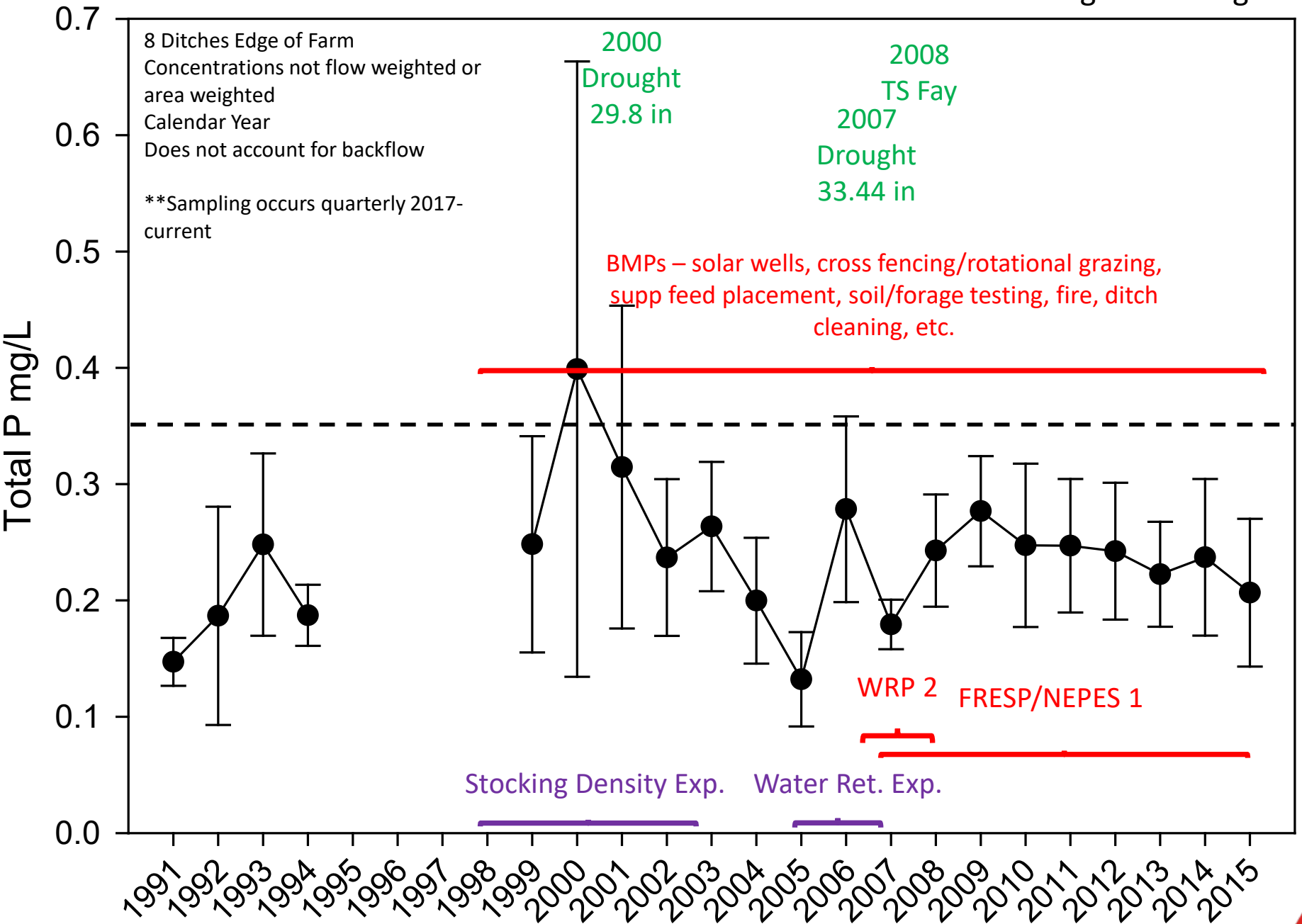
# Archbold's BIR Long-term Water Quality Sampling

- Data collected by BIR/  
analyzed in our chem lab
- Many sites have monthly  
data '90's – 2015
- Quarterly 2017-current
- Need funding to assess  
hydro-, meteo- and land  
management drivers of  
nutrient concentrations



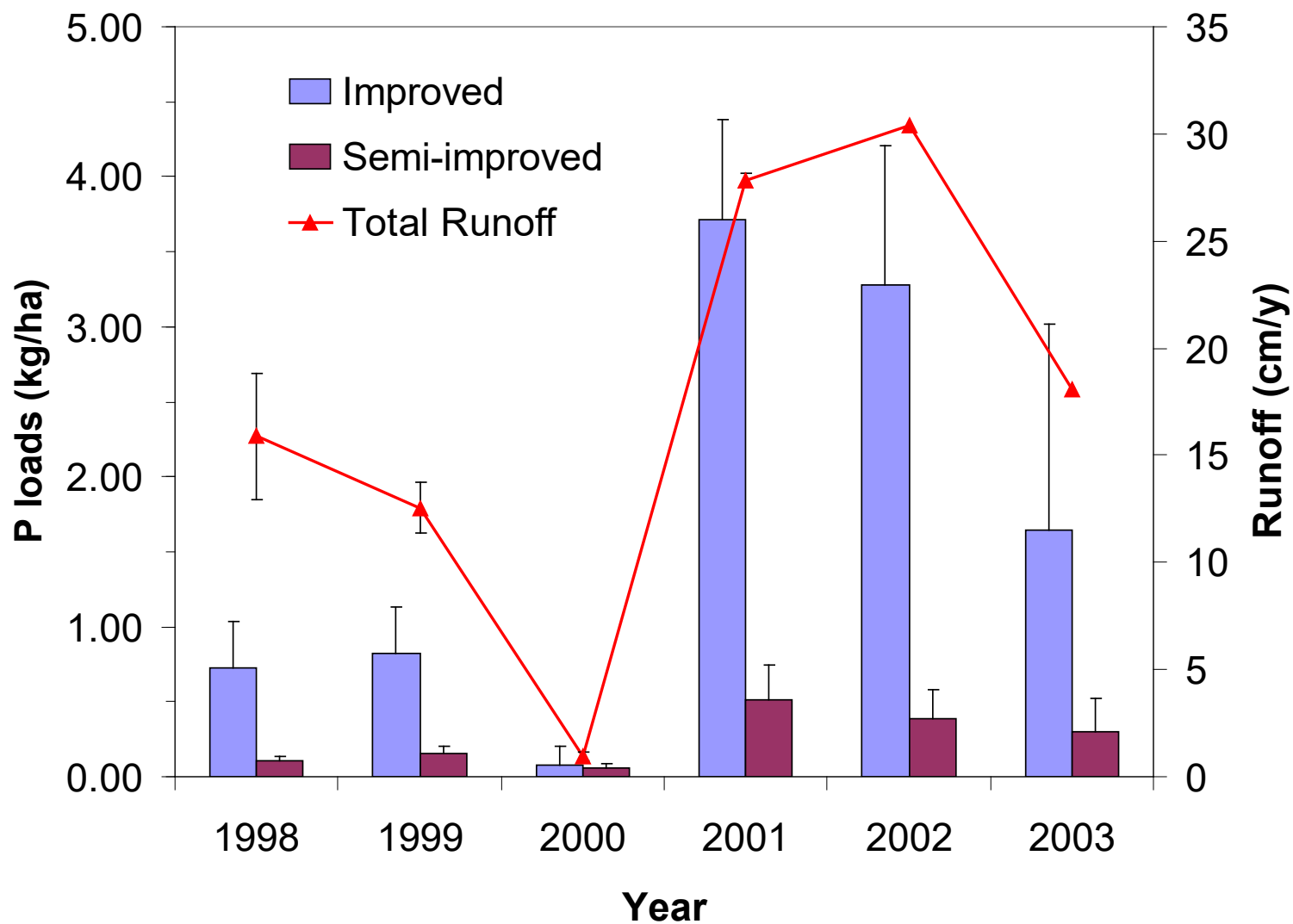
\*data in preparation

1991-2015 Total P Average = 0.24 mg L-1





# No P fertilizer for 14 years at the time of this study – Importance of Legacy P





# Quality, Quantity, Timing, Distribution



2005 03 17



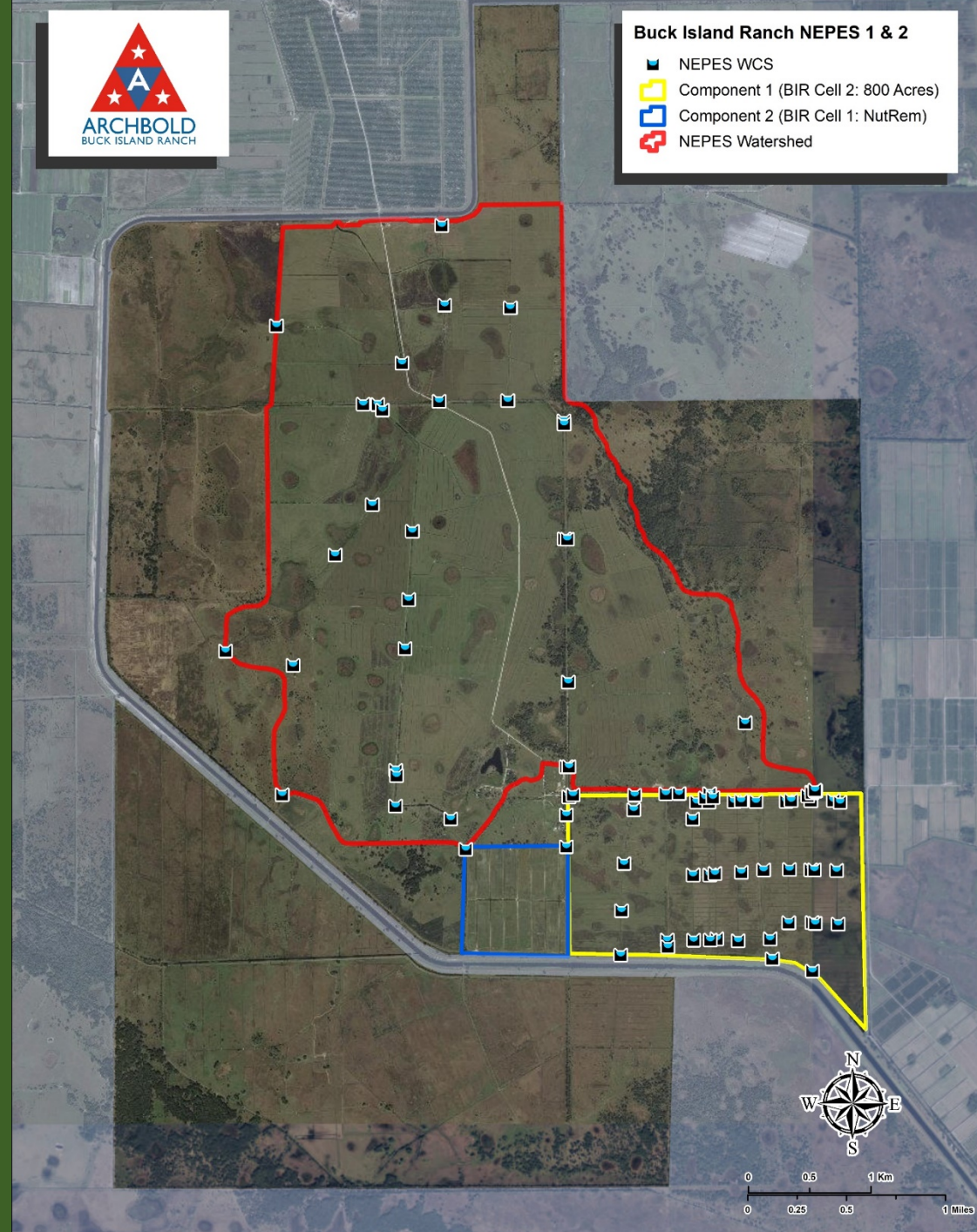


# Over 100 Water Control Structures on BIR



## Buck Island Ranch NEPES 1 & 2

- NEPES WCS
- Component 1 (BIR Cell 2: 800 Acres)
- Component 2 (BIR Cell 1: NutRem)
- NEPES Watershed

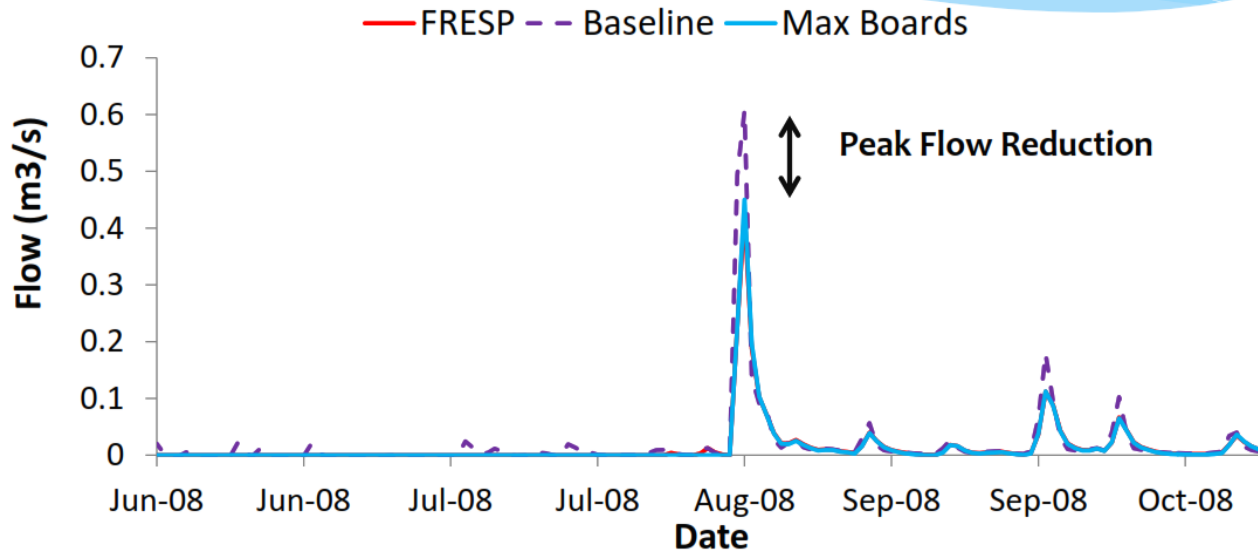


# MIKE-SHE/MIKE II model, S. Shukla UF Results from Buck Island Ranch



Wetland area  
**inundated**  
**increased by**  
**28%**

Baseline= Ditch bottom , FRESP = 1 m above bottom , Max Board = 1.1 m above bottom



Wetland plants  
and animals  
increased  
(Boughton et al.  
2019)

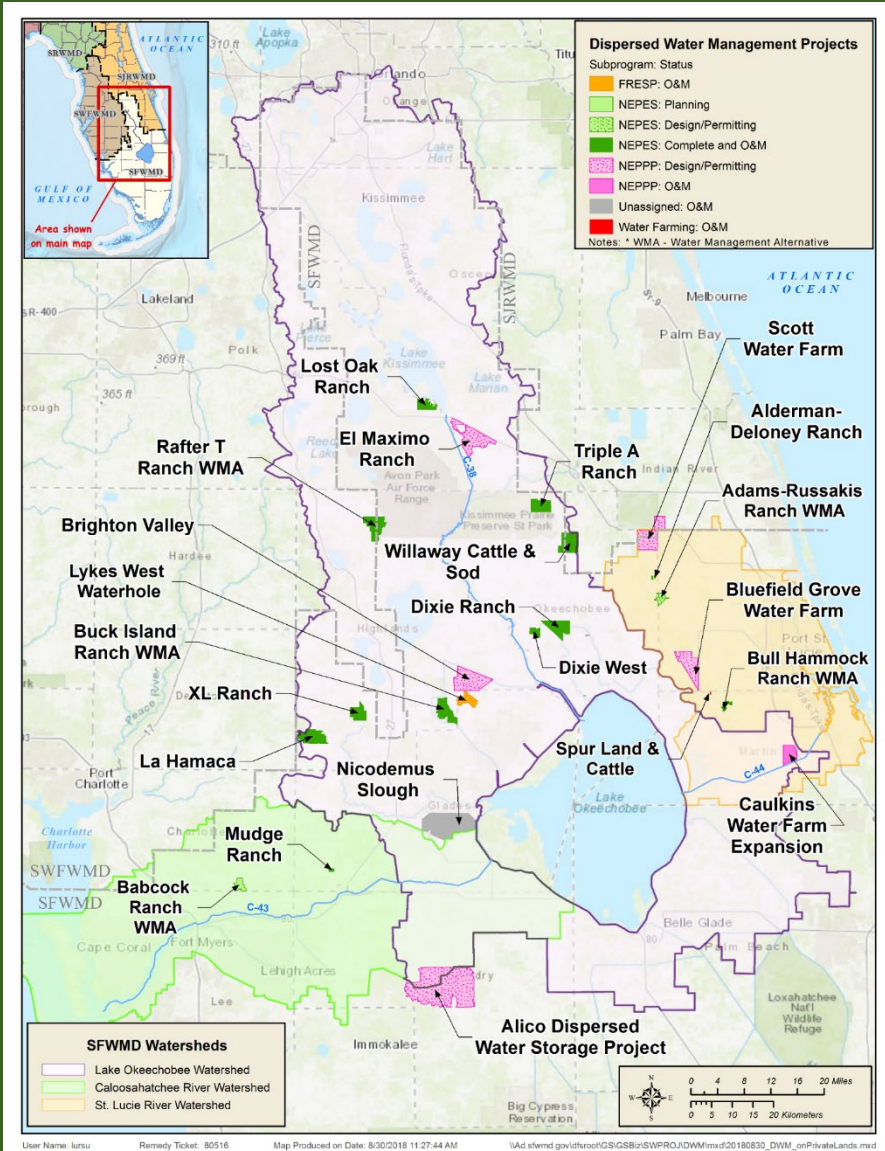
When riser boards were installed under FRESP,  
resulted in **22% reduction in flow.**

Water retention increases subsurface storage.





# Opportunities for Dispersed Water on Private Land: Quality, Quantity, Timing, & Distribution (and Other Benefits)



- Florida Ranchlands Environmental Services Project pilot program. Measured loadings from 4 projects (in prep). Biodiversity impacts (Boughton et al 2019)
- Archbold provides compliance monitoring/reporting for SFWMD Dispersed Water Program
- Northern Everglades Payment for Environmental Services project –
  - 14 projects (NE-PES/FRESP); 25,463 acres;
  - 15,477 acre-feet retention/year (modeled)
  - Lykes WWH removed 58.3 metric tons of P (86% of the P pumped in) (2007-2015)
- Water Farming – 1,500 ac-ft on 210 acres
- Northern Everglades Public Private Partnerships



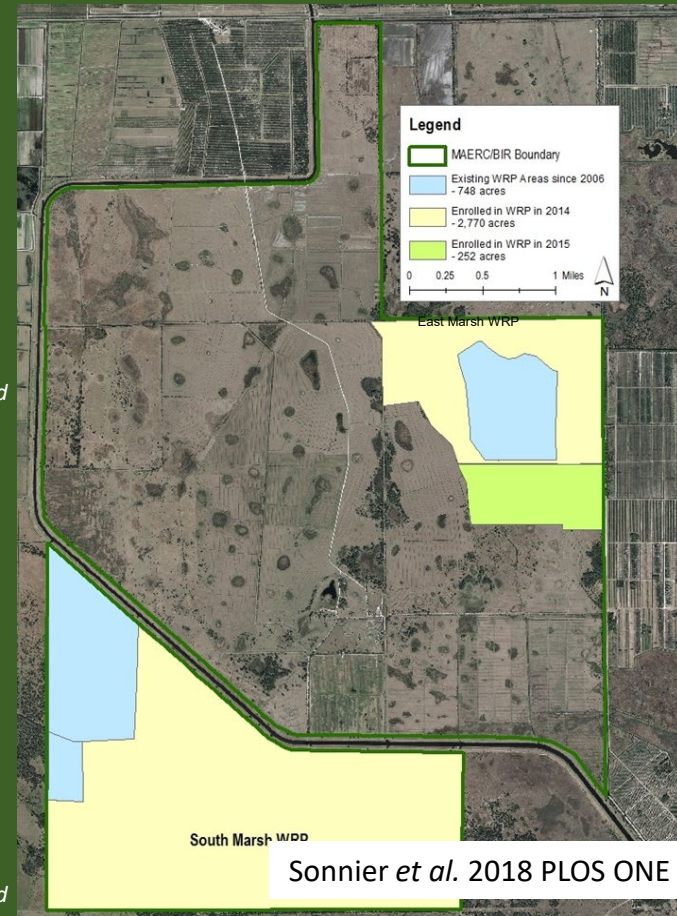
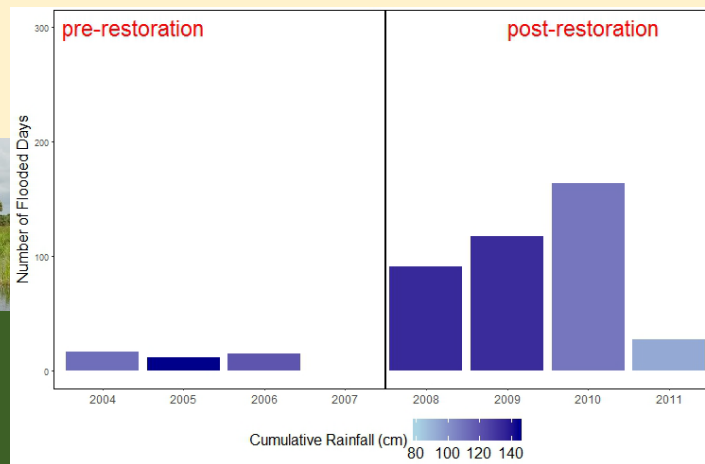
# Wetland Restoration/Easements; 3,770 acres

- **2 WRP easements (800 acres)**

- South marsh easement
- East marsh easement

- **Results :**

- Water levels and hydroperiod increased following restoration.
- Floristic quality and cover of wetland adapted species increased following the restoration.
- Cattle grazing had a neutral effect on success of restoration.



Sonnier *et al.* 2018 PLOS ONE





# BIR: What else can we do to reduce loading?

- Proposals

1. Harvesting and reducing imports/inputs
2. Intensive soil sampling to identify hotspots and understand variability, targeted BMPs for high areas
3. Intensification – solution or risk? E.g. sugar conversion. Scale up scenario modeling needed
4. Implement conservation easements and make sure low contributing landscapes are not being converted (~50% of BIR landscape)
5. Phosphorus budgets (ranch and regional scale)

