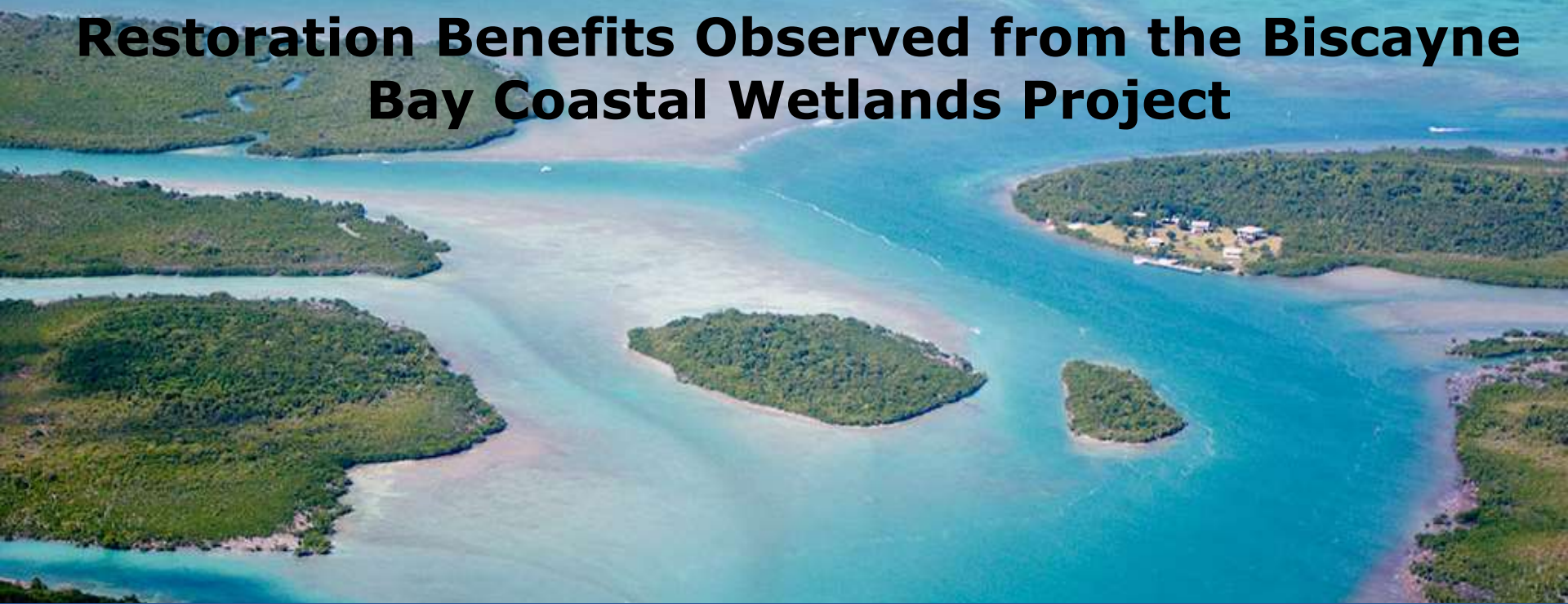


# Restoration Benefits Observed from the Biscayne Bay Coastal Wetlands Project



## Biscayne Bay Coastal Wetlands Phase I

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2017 GEER (Greater Everglades Ecosystem Restoration)

Coral Springs, Florida

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# PROJECT OBJECTIVES

## □ Biscayne Bay Coastal Wetlands (BBCW) Alternative O-Phase 1 Project Objectives

- ✓ Improve freshwater and estuarine habitat
- ✓ Improve salinity distribution and reestablish productive nursery habitat along the shoreline
- ✓ Restore the quantity, quality, timing and distribution of fresh water to Biscayne Bay and Biscayne National Park
- ✓ Preserve and restore the spatial extent of natural coastal glades habitat within the BBCW Project's study area





# DEERING ESTATE COMPONENT

## Located in southeastern Miami-Dade County

- ❑ Construction completed in April 2012

## Goals:

- ❑ Redirect up to 100 cfs freshwater to the Deering Estate Historical Sloughs and tidal wetlands
- ❑ Re-hydrate the historic wetland and restore natural freshwater flow regime



# Restoration Benefits Observed from the Biscayne Bay Coastal Wetlands Project

- ❑ **Determined extent of inundation under various pumping rates**

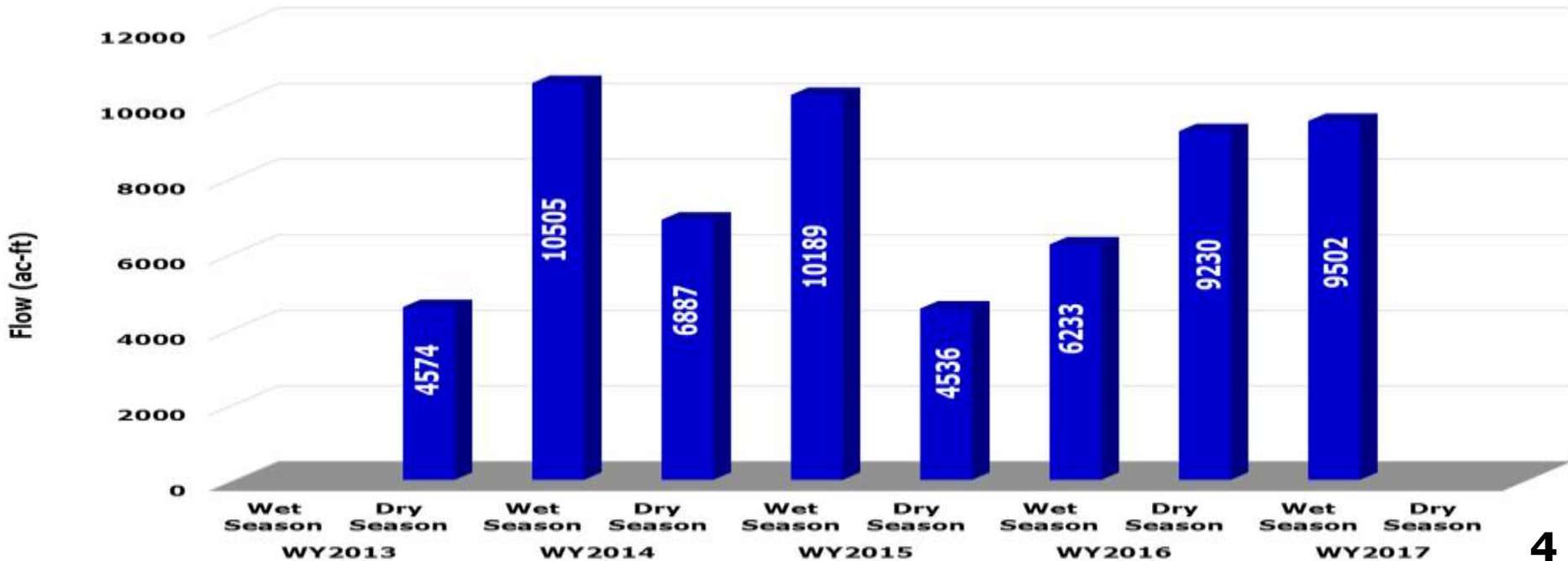
Pumping Rate(cfs)	Duration of Testing (hours)	Estimated Acres of Impounded Surface Water	Percentage of Inundate Historic Remnant Wetlands within Cutler Creek
0	5	0	0%
25	5	19	58%
50	5	25	76%
75	5	27	82%
100	5	31	94%





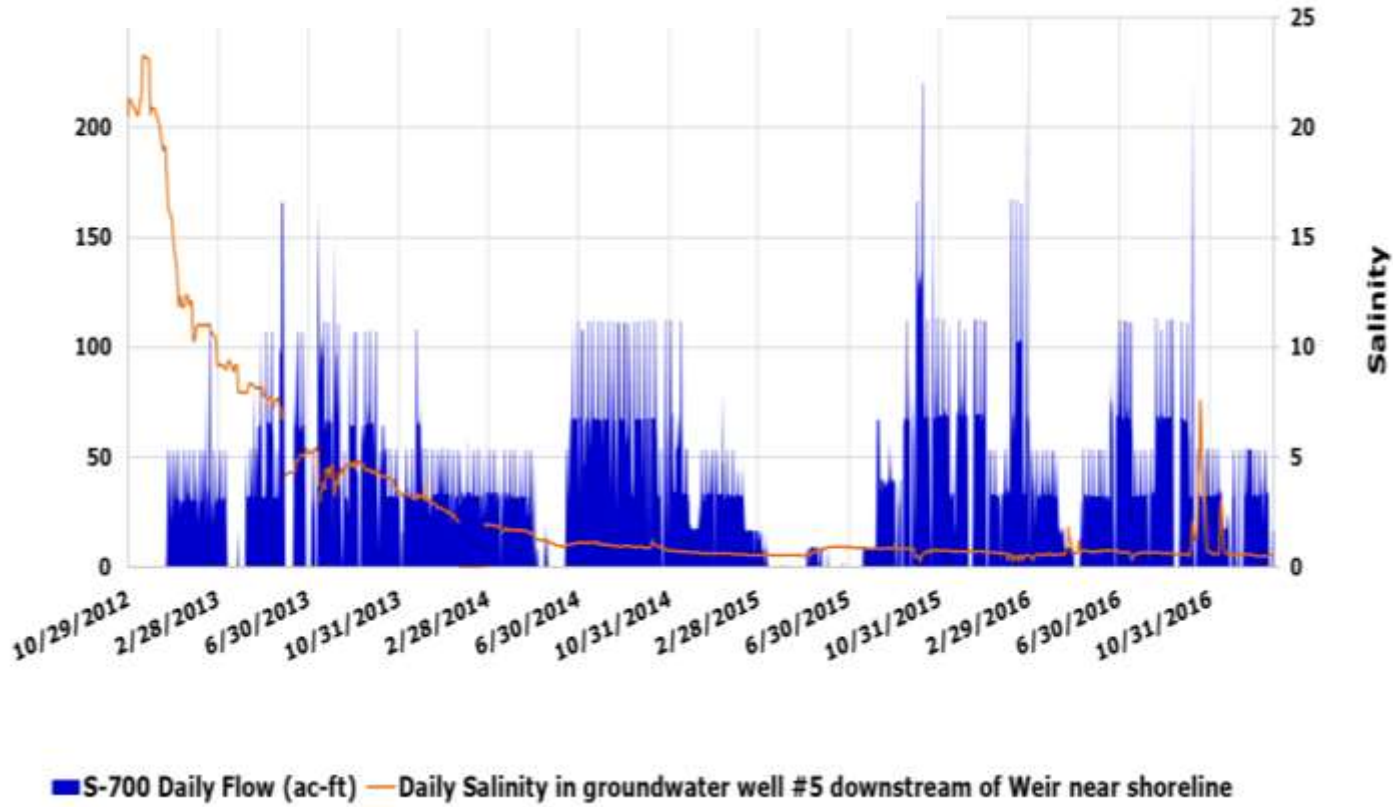
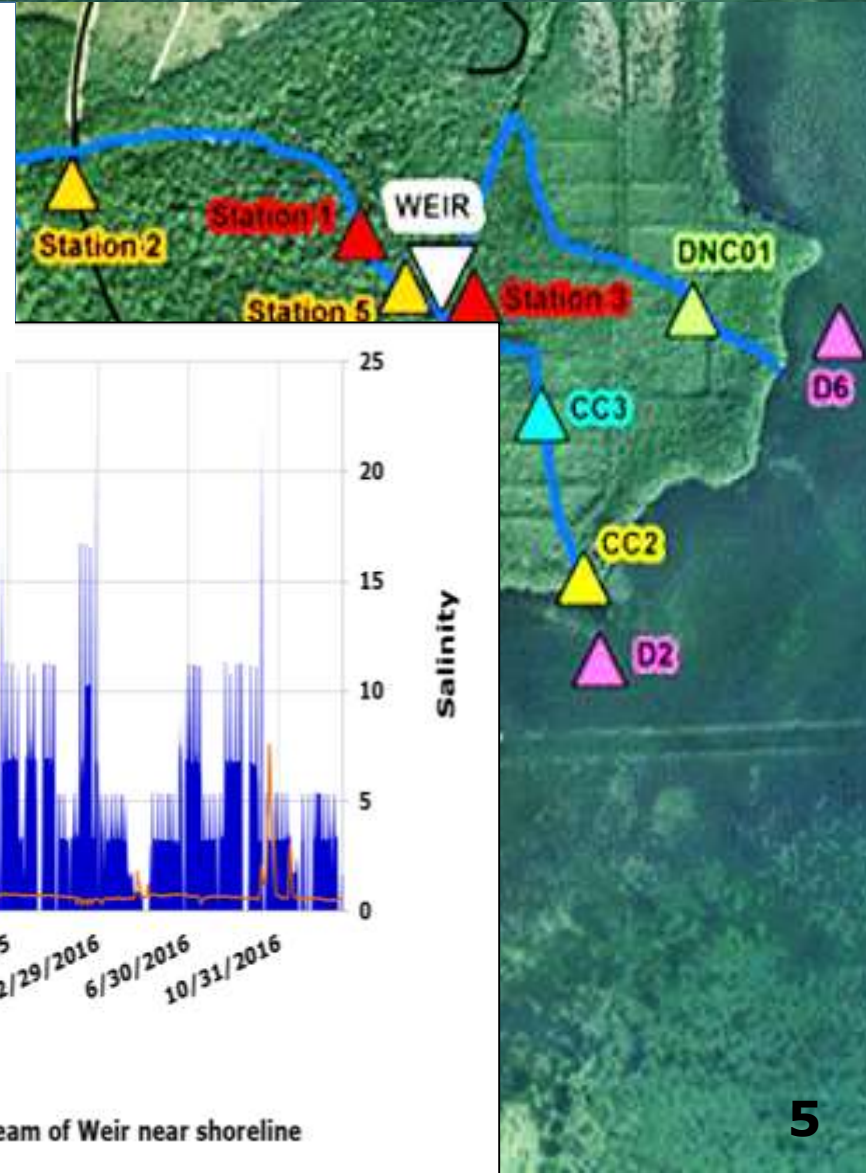
# DEERING ESTATE WETLAND REHYDRATION

- ❑ Approximately 62,000 ac-ft. of freshwater redirected to historic remnant wetlands
- ❑ Timing of flows to the wetlands at Deering Estate has been improved



# DEERING SALINITY RESPONSE

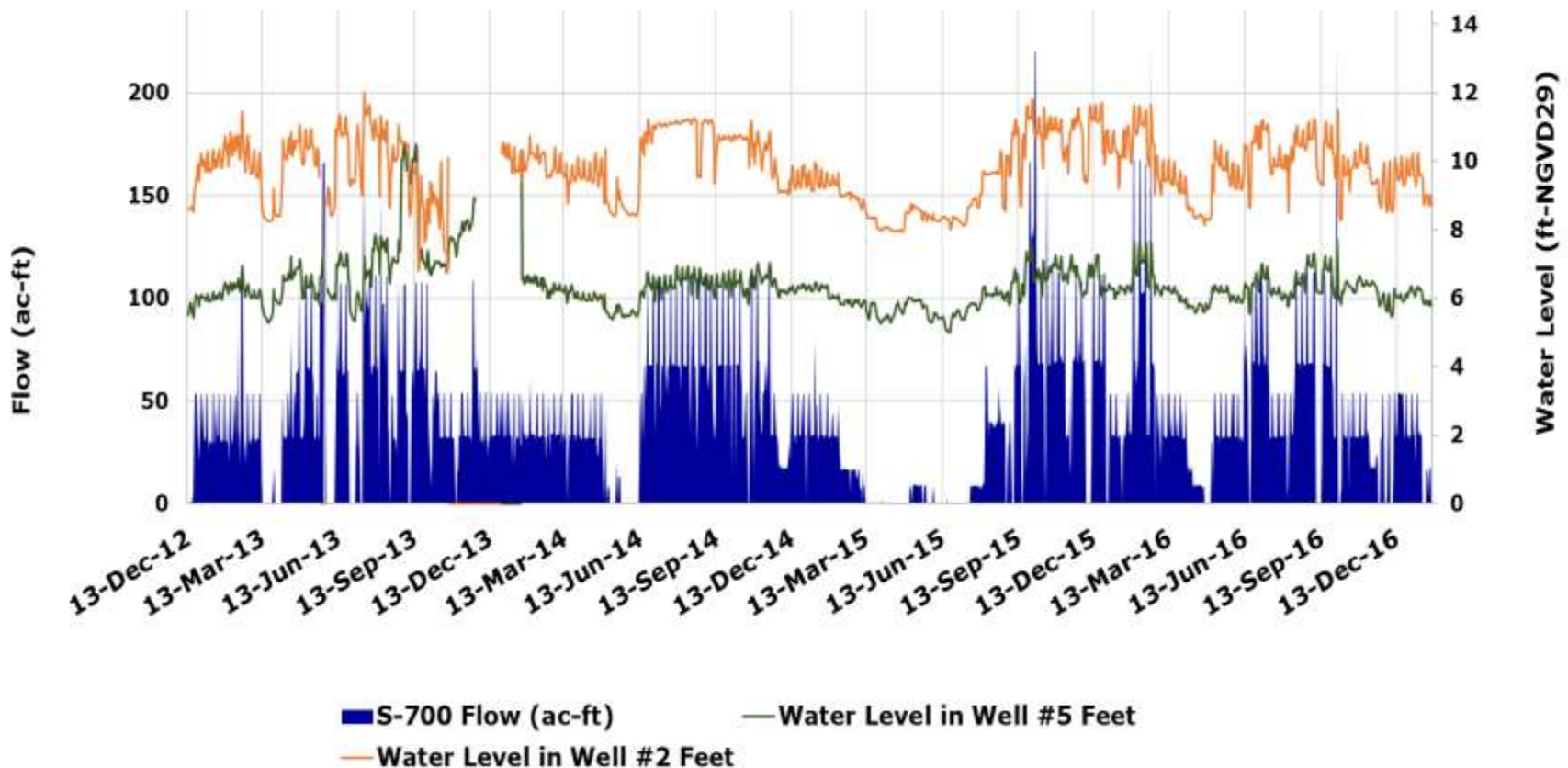
- Groundwater salinity responded to the input of fresh water from Deering Estate Pump Station (S-700) into historic remnant Wetlands





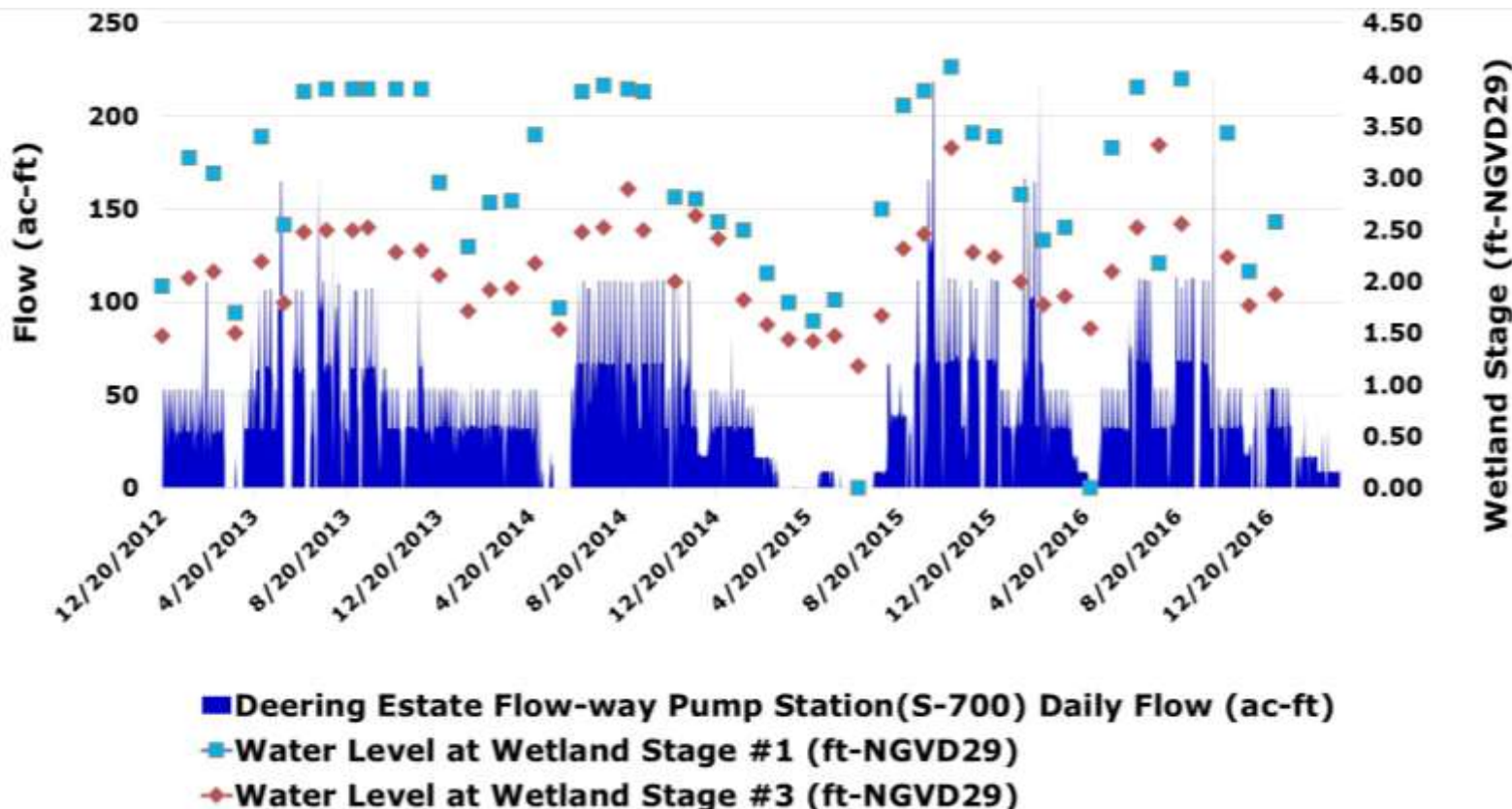
# DEERING GROUNDWATER

- Groundwater stage rose noticeably at groundwater monitoring stations 2 and 5, and water levels varied according to Deering Estate Pump Station operations



# DEERING HISTORIC SLOUGHS

- ❑ Water level in Deering Estate Historical sloughs responded to Deering Estate Pump Stations (S-700) operation
- ❑ Surface water salinity decreased in Deering Estate Historical sloughs in response to Deering Estate Pump Stations (S-700) operation





# Comparison of pulse versus continuous pumping under different pumping rates (25 - 100 cfs)

## ❑ Objective of study:

- ✓ Evaluation of pump operation under fix stage rate pumping rates
- ✓ Comparison of pulse versus continuous pumping under different rates
- ✓ Statistical comparisons of data

## ❑ Duration of study: January 2016 - November 2016

## ❑ Outcome:

- ✓ Recommendation to modify operation of at a rate of 25 cfs

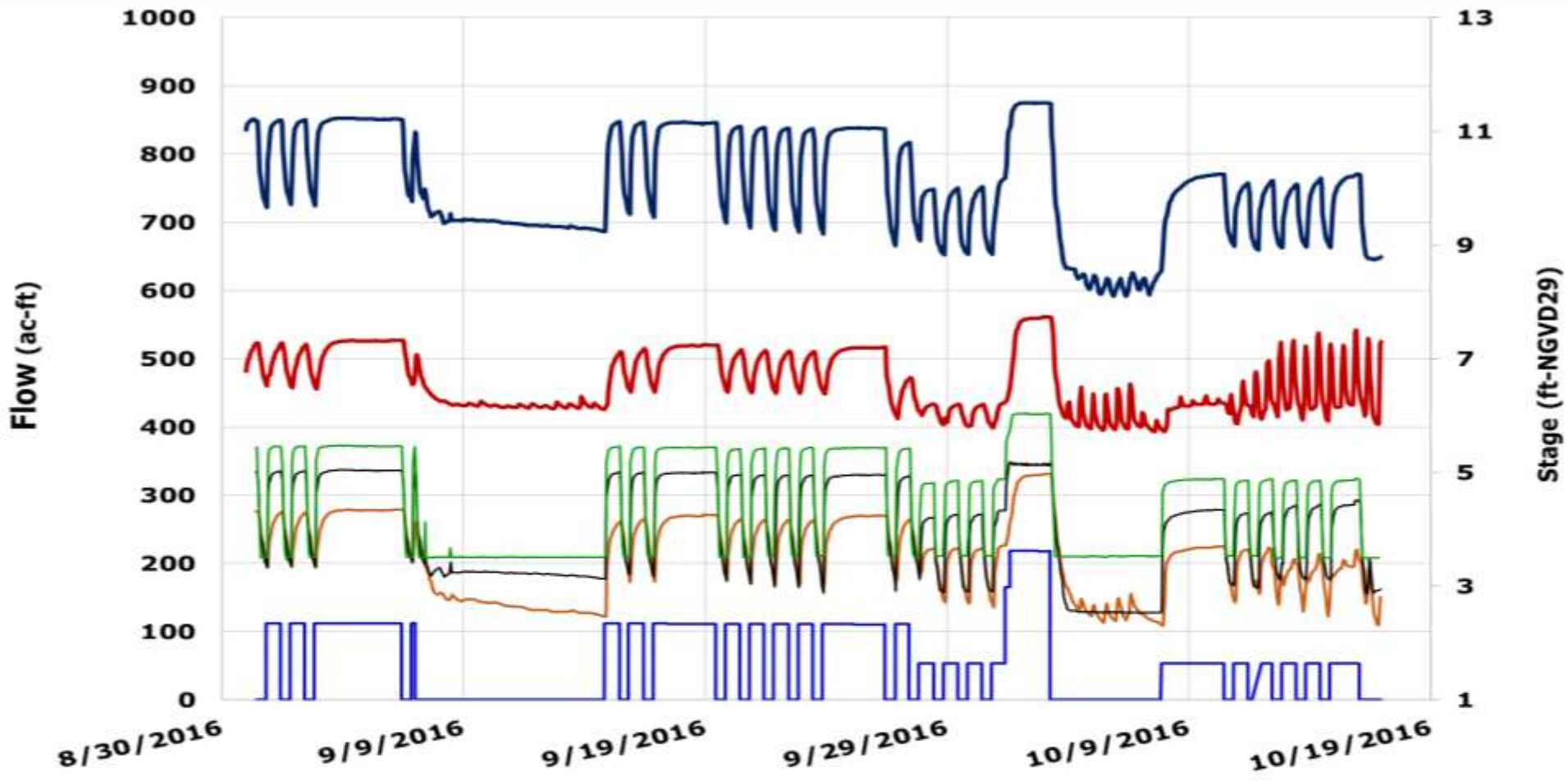
## ❑ Benefits:

- ✓ Maintaining wetlands within historical sloughs of Deering Estate at an optimal level and eliminating unnatural water level fluctuations
- ✓ Recharging ground water and reduce salinity within wetlands and groundwater
- ✓ Improving timing and distribution of freshwater to the historical sloughs and nearshore of Biscayne Bay and Reducing operating costs of pump station
- ✓ Improving salinity in Creeks and nearshore of BBCW, and enhance productive nursery habitat along shoreline



Data logger

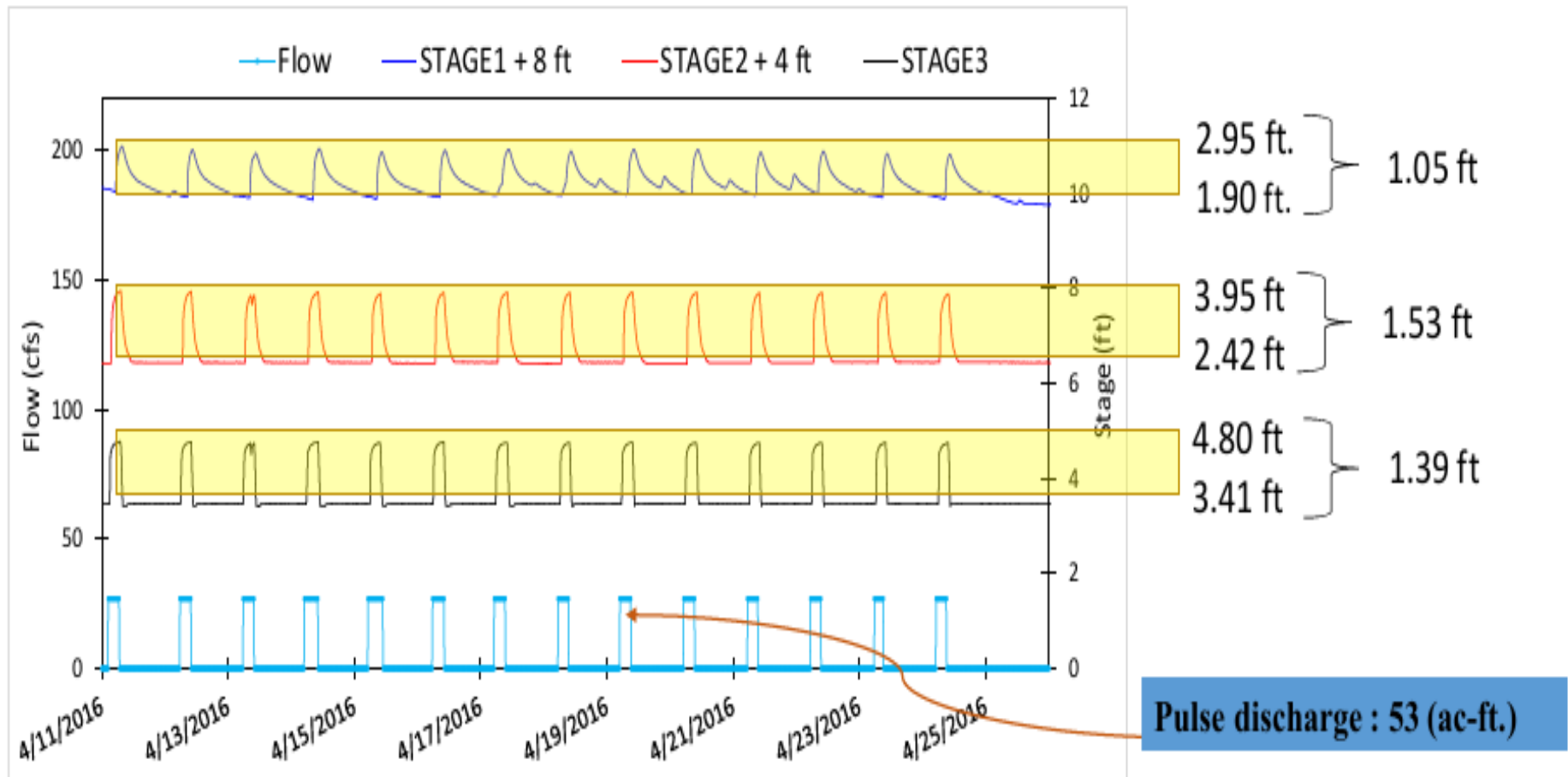
# SOUTH FLORIDA WATER MANAGEMENT DISTRICT



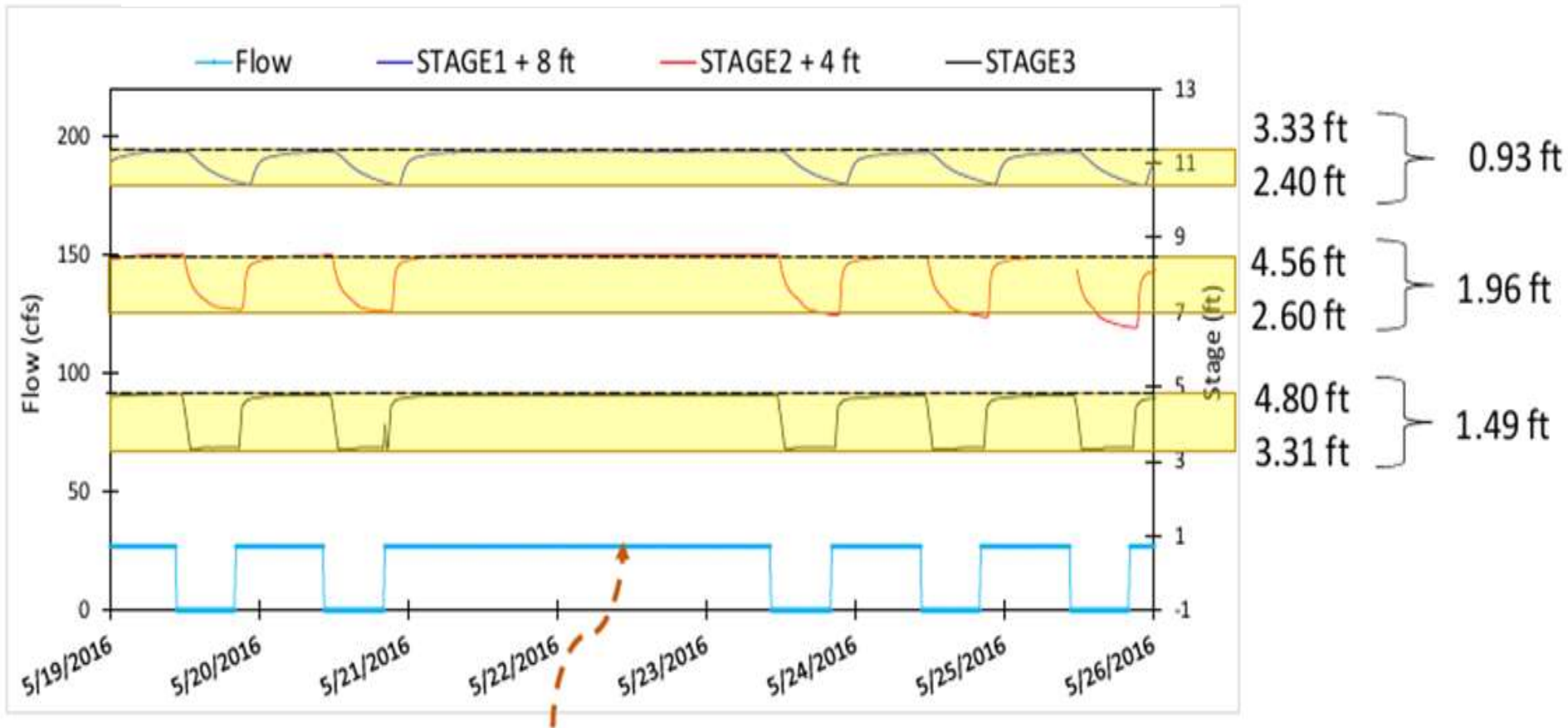
- S-700 Flow (ac-ft)
- Water Level Monitoring Well #2 (ft-NGVD29)
- Water Level Monitoring Well #5 (ft-NGVD29)
- #3- Deering Estate Wetland Stage Weir (ft. NGVD29)
- #2-Deering Estate Wetland Stage Pipeline Monitoring Station (ft. NGVD29)
- #1-Deering Estate Wetland Stage Old Culter Monitoring Station



# Pulse pumping under pumping rate of 25 CFS

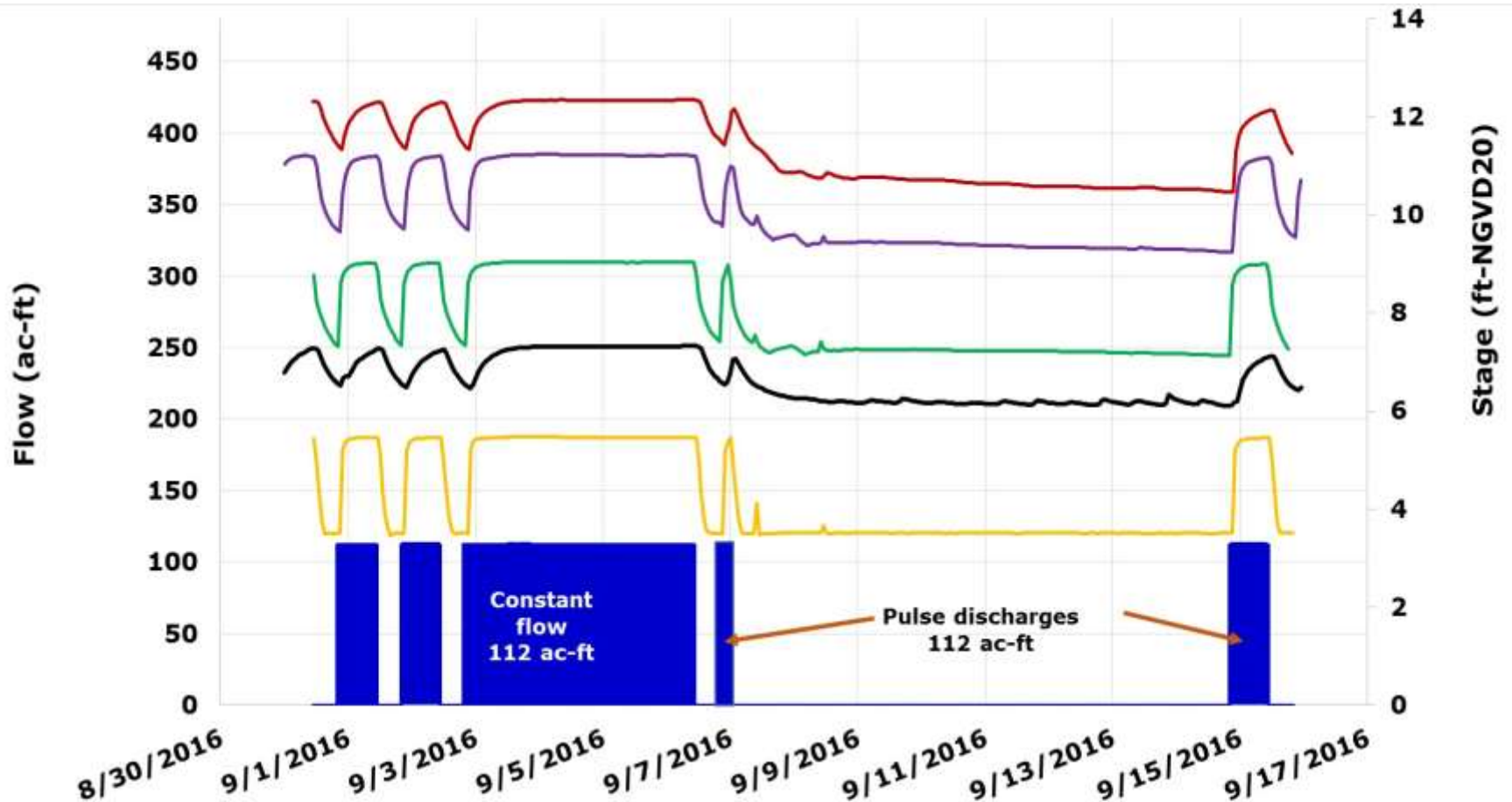


# Continuous pumping under pumping rate of 25 cfs



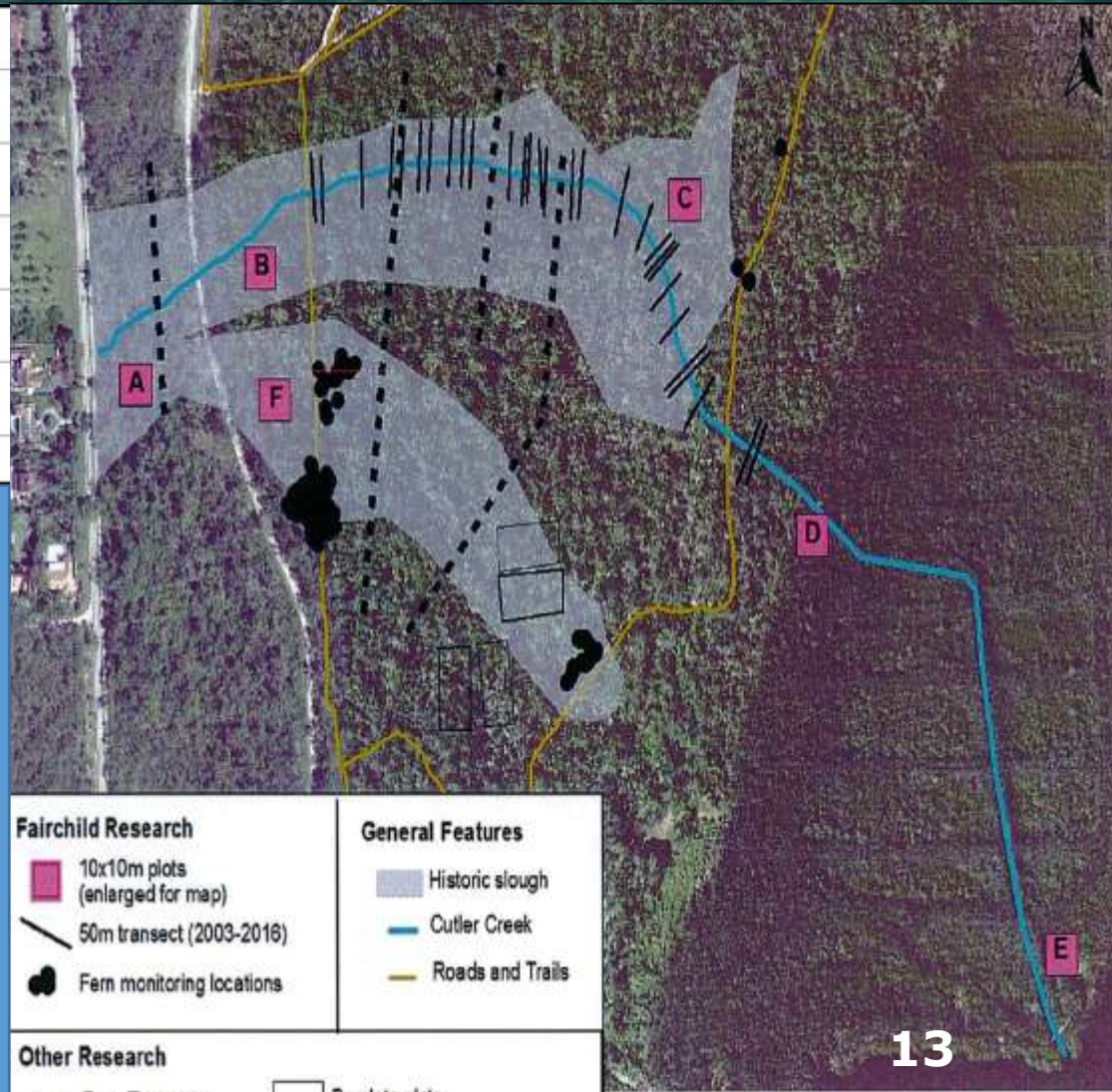
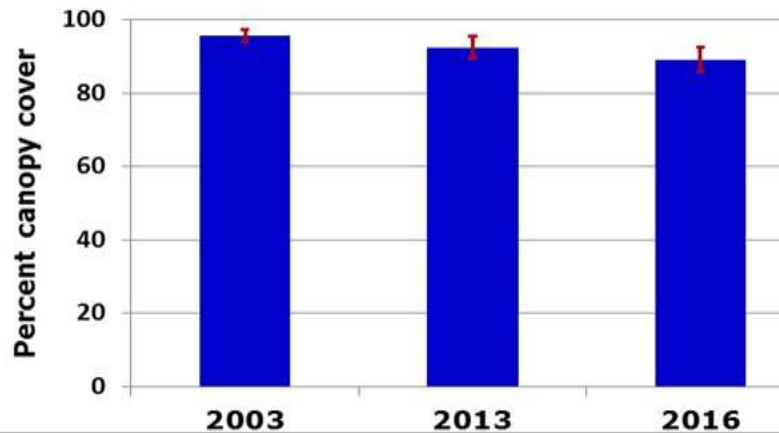
Between Friday, 5/20/2016 8:15 PM and  
Monday, 5/23/2016 10:15 AM  
Constant flow = 53 ac-ft





- S-700 Flow (ac-ft)
- Wetland Stage -Old Culter Monitoring Station #1(ft-NGVD29)
- Wetland Stage Pipeline Monitoring Station#2 (ft-NGVD29)
- Wetland Stage Weir Monitoring Station#3 (ft- NGVD29)
- Stage in Groundwater Monitoring Well #5 (ft-NGVD29)
- Stage in Groundwater Monitoring Well #2 (ft-NGVD29)

# VEGETATION MONITORING



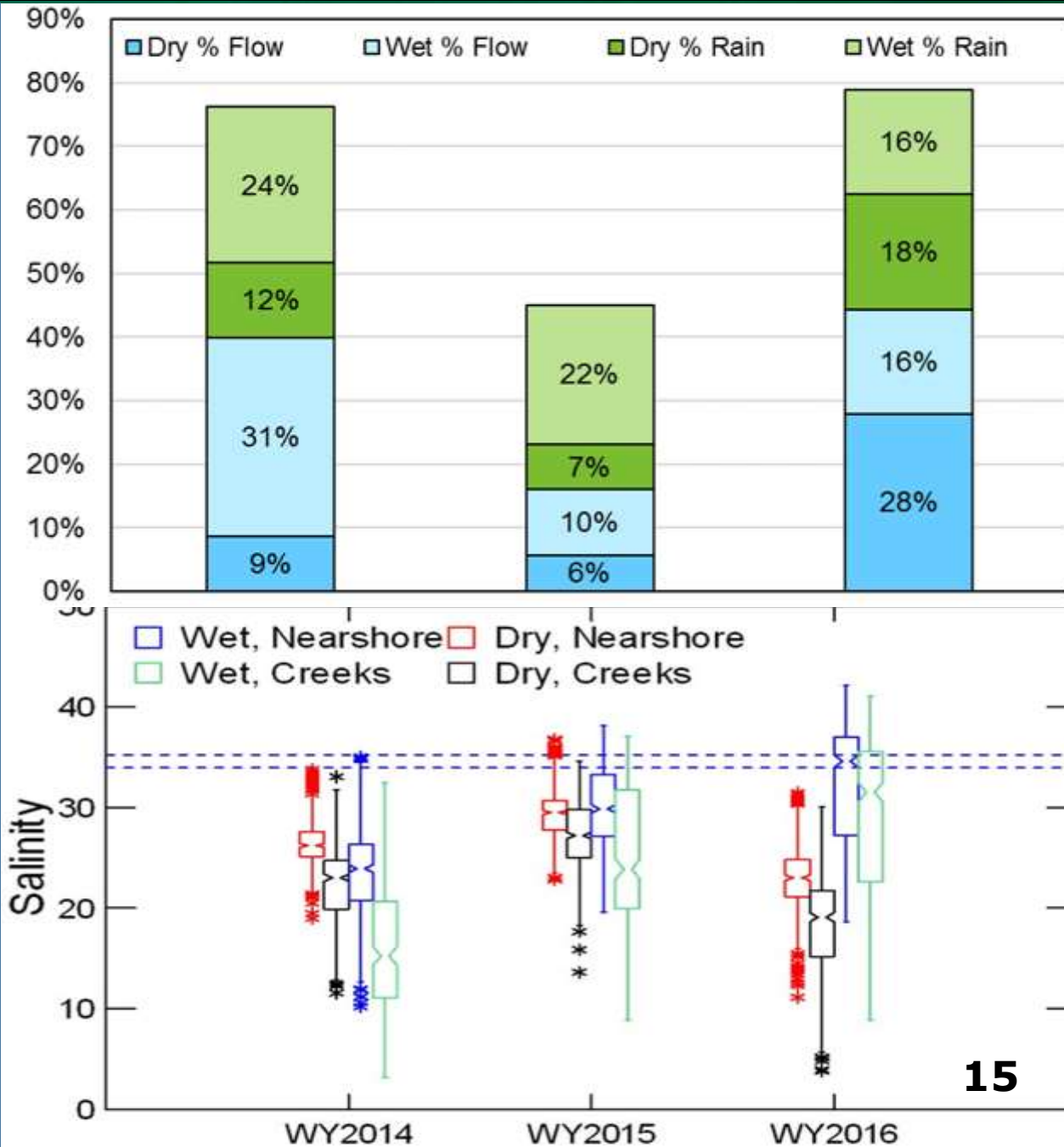
- ❑ Preliminary mean percent canopy cover from fixed points vegetation monitoring transects within Cutler Creek, in 2003, 2013, and 2016.
- ❑ Canopy cover decreased slightly in the study area after completion and operation of Deering Estate Pump Station, though this change was not statistically significant (ANOVA,  $P=0.251$ ), and overall canopy cover remains high





Top: Total percent seasonal flow (at S-123 and S-700) and percent rain (at S123) in the Deering Estate nearshore and creeks areas, normalized by total flow and total rain by water year for WY2014–WY2016

Bottom: Notched box plots of daily mean salinity at nearshore stations (BICS62, BISCD2, and BISCD6) and creek stations (CC2, CC3, and DNC01) by season and water year (bottom)





# L-31E COMPONENT

- ❑ **Construction completed June 2010**
- ❑ **Environmental benefits from the L-31E Culverts are being realized**
  - ✓ Point source discharges from C-103 Canal were reduced or eliminated
  - ✓ Monitoring results demonstrate improvement of hydrologic conditions in response to pump test
  - ✓ Pilot Pump Test resulted in improved saltwater wetlands salinity regimes, enhanced sheet flow, rehydration of freshwater and saltwater wetlands
  - ✓ Percent cover of category I and II invasive exotic plants within the vicinity of Culverts has been reduced to <5%
  - ✓ No exceedances of Class III marine water criteria in Biscayne Bay nearshore L31E area, during WY2016



# CUTLER WETLAND COMPONENT

❑ **Design Completed in 2009**

❑ **Project features:**

- ✓ S-701 pump station
- ✓ Concrete flow-way
- ✓ Spreader canal

❑ **Next Steps:**

SFWMD to update design of Cutler Component and complete permit acquisition





# CONCLUSIONS

- ❑ Based on BBCW project data collected during the last five years of ecological monitoring and a comparison of this to baseline data, the project is trending towards success
- ❑ The quality of all water redirected from canals to wetlands in the Deering Estate Component improved prior to entering Biscayne Bay
- ❑ Point source discharges from the C-100 have been significantly reduced, possibly improving salinity conditions in Deering Estate creeks, and the nearshore area of Biscayne Bay
- ❑ Monitoring results demonstrate a clear improvement of hydrologic conditions in response to Deering Estate (S-700) Pump Station operation
- ❑ Overall, these results demonstrate that the BBCW project is achieving success and short-term hydrologic improvements are being realized

# CONCLUSIONS

- ❑ Percent cover of category I and II invasive exotic plants within the vicinity of the Deering Estate Flow-way has been reduced to less than five percent
- ❑ Rehydration of historic coastal wetlands Wetland plant species are proliferating including expansion of sawgrass, upland plants have died off and new wetland vegetation species are emerging
- ❑ During the reporting period, salinity in Cutler Creek, North Creek, and nearshore at the mouth of Cutler Creek was reduced in both groundwater and surface water
- ❑ Groundwater stage rose noticeable at groundwater monitoring stations, and water levels varied according to pump operations



**Thank you!**