Freshwater Inflows Biscayne Bay Coastal Wetlands

Are All Flows Equal?

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GEER 2018

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BISCAYNE BAY COASTAL WETLANDS

Improve quantity, quality, timing and distribution of freshwater inflow to Biscayne Bay.

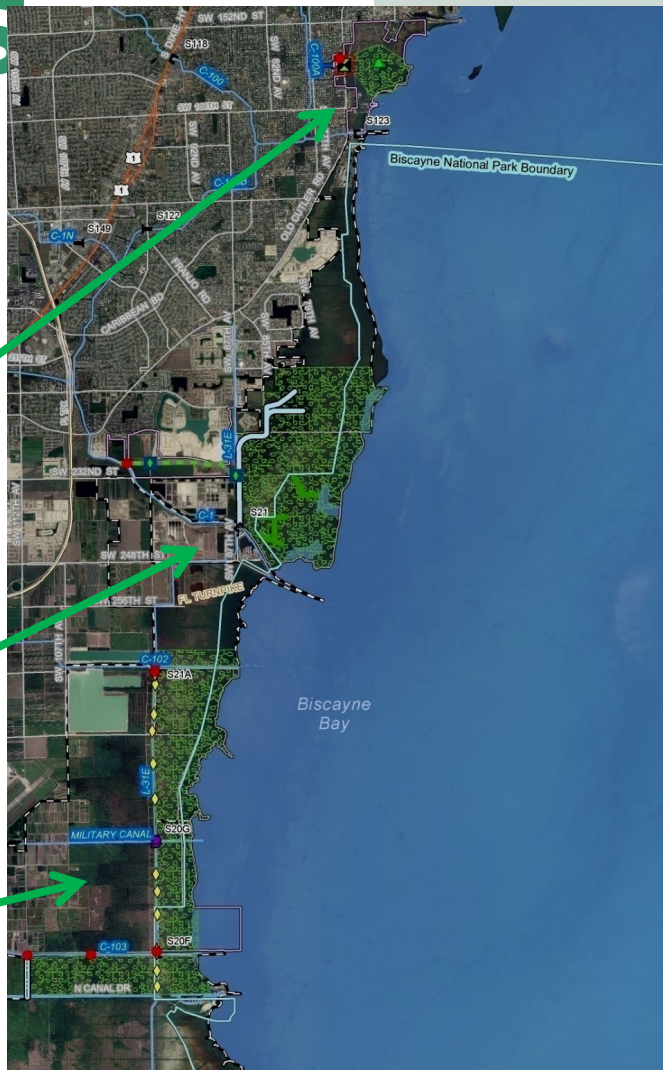
Improve nearshore salinity conditions

Phase 1

Deering

Cutler Flow-Way

L31E Flow-Way



OBJECTIVE HYDROLOGIC BASED

- Data Evaluations
- Assessment Relative to Salinity Targets / Expectations

When are targets currently met?

How to manage inflows to achieve targets in future?

APPROACH

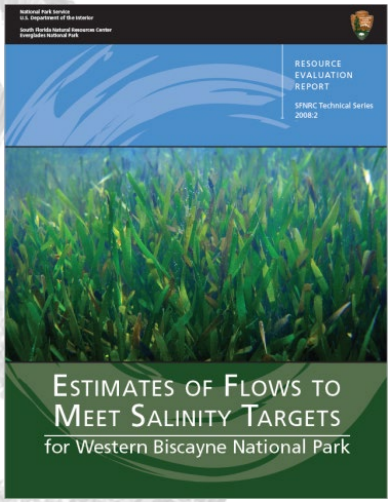
- SE Coastal Rainfall
- *Managed* flows by structure
  - S20F, S21A, S21
- Nearshore Salinity

Scales

1) Long (POR)
& Short-term (2015-2018)

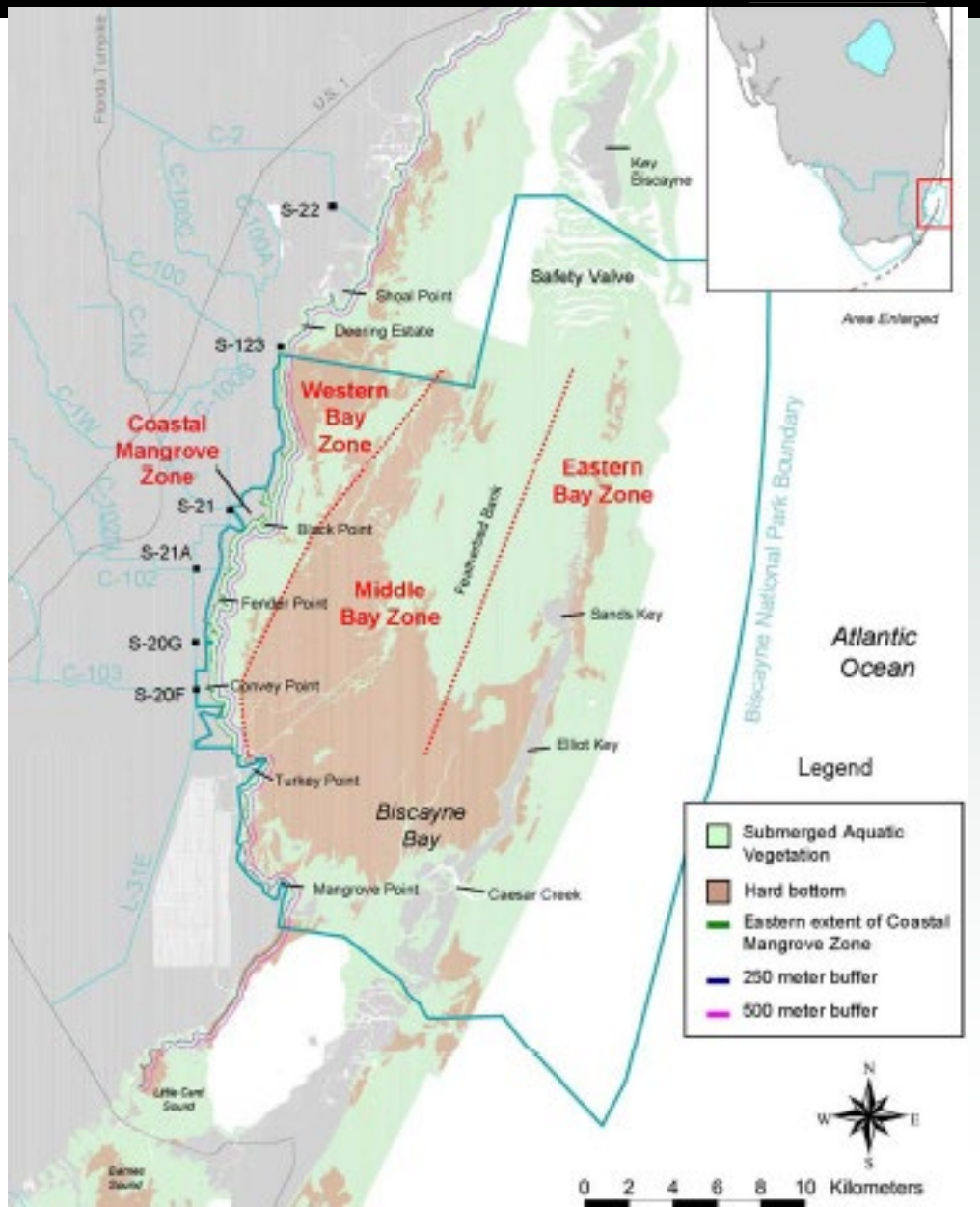
2) Annual, Season & Month

SALINITY TARGETS



Daily Average Salinities
WBZ

- < 30 (Throughout year)
- 15 - 25 (March – Aug.)



RAIN DATA

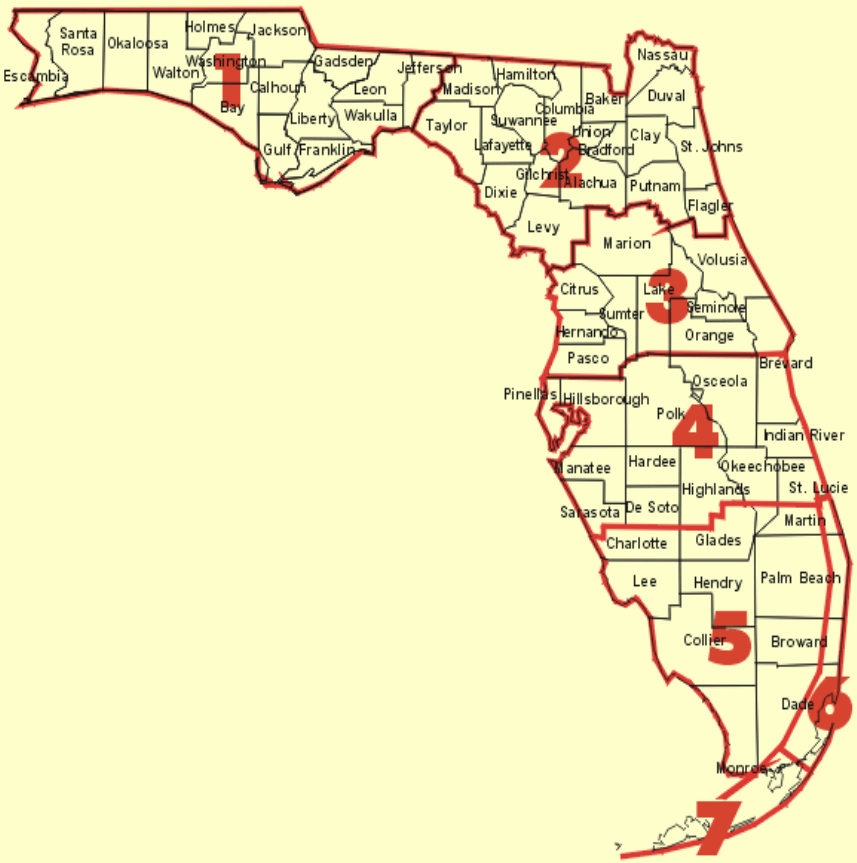
NOAA / NCDC maintains long-term climate set

- 1895 - 2018 (>120 Yrs)

Network of established stations

- computational approach & climatologic interpolation

Division 6 (SE Coastal)



SE COASTAL RAIN: ANNUAL

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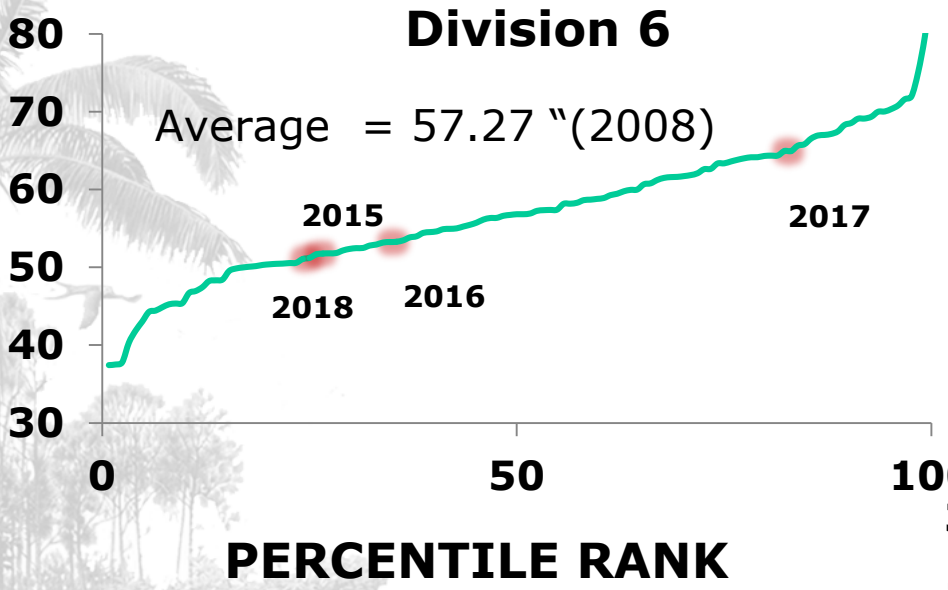
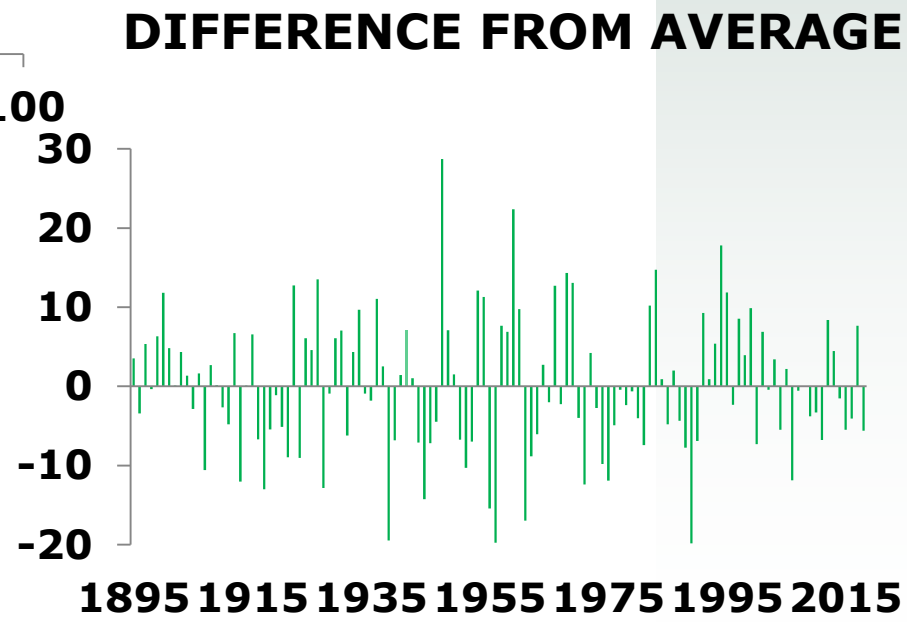
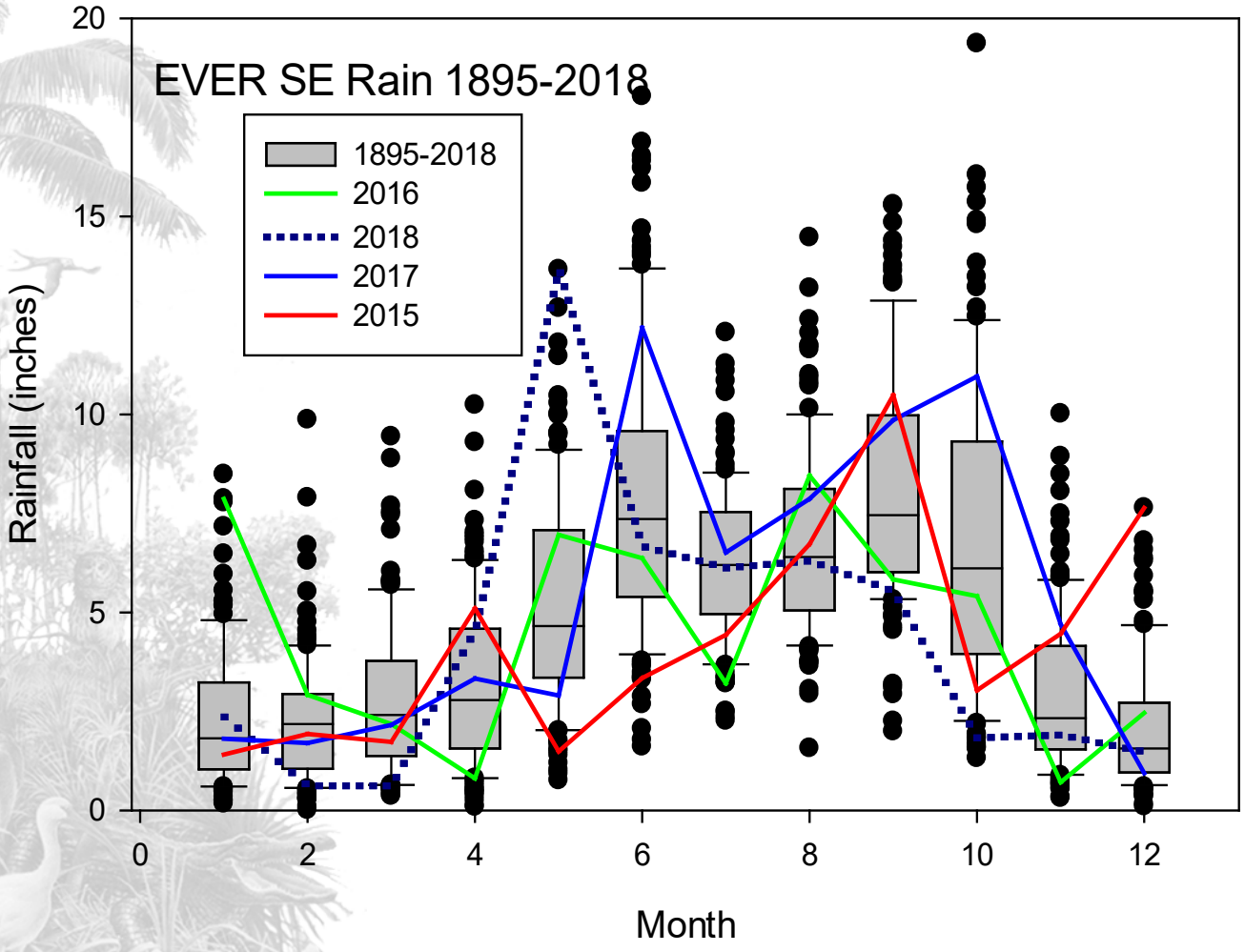
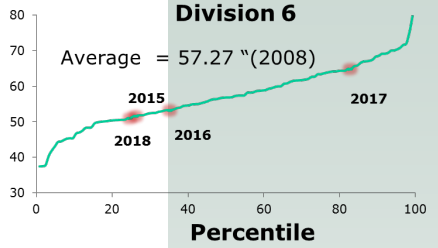




RAIN: SEASONAL/MONTHLY





High Extremes

2015 Dec.*
2016 Jan.
2018 May *

Low Extremes

2016 April
2016 May
2016 Oct

IRMA-Sept. 2017

FLOW/SALINITY

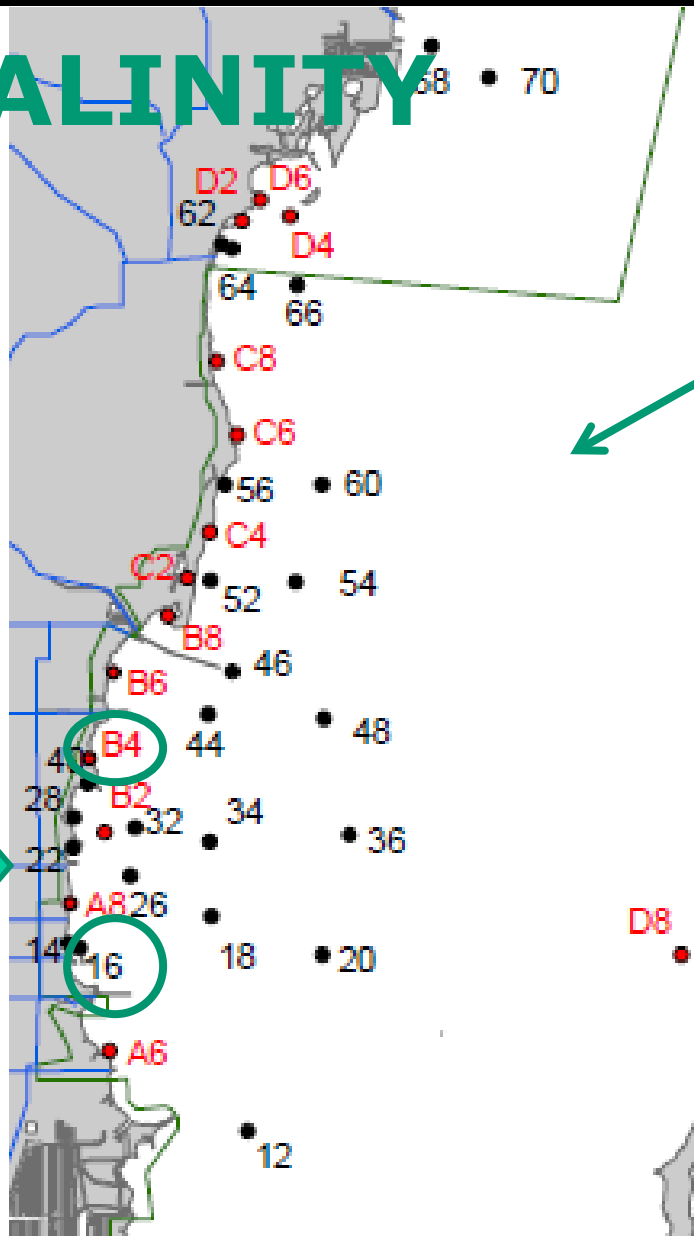
(1980)

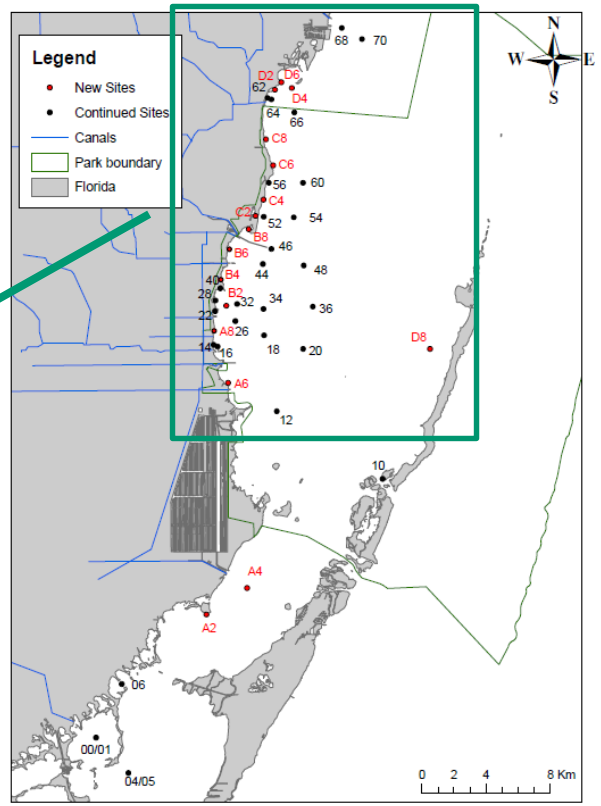
S21

S21A

S20G

S20F





D8

Nearshore Salinity Stations (2000)

UPPER L31 E Flow-Way (S21A)

Project Components in Place Along L31 E

2010-2012: 4 Culverts

2018: 6 Culverts

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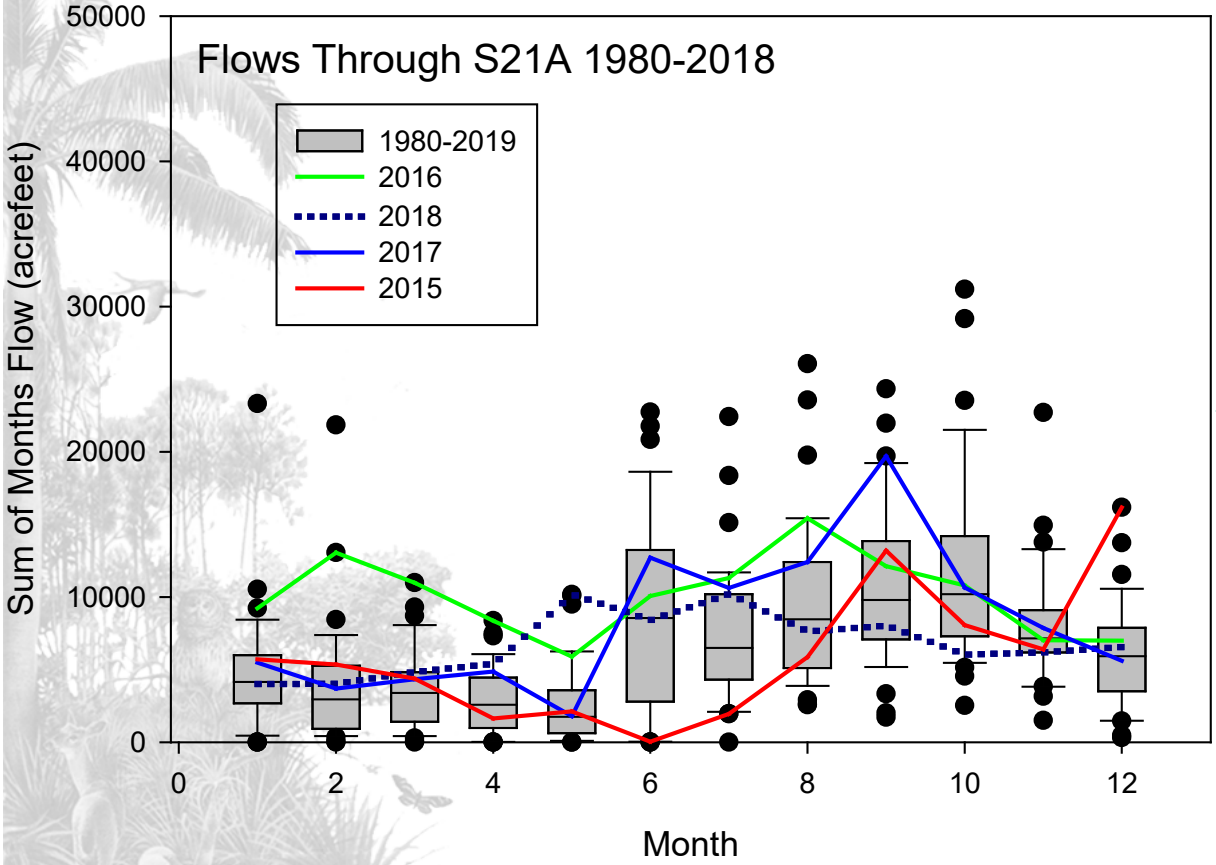
MONTHLY FLOW: S21A



Extremes : Highs and Lows
Highs: Dec 2015; Feb-April 2016
June 2015

2015
Late Dry Season: Low
Early Wet Season: Low

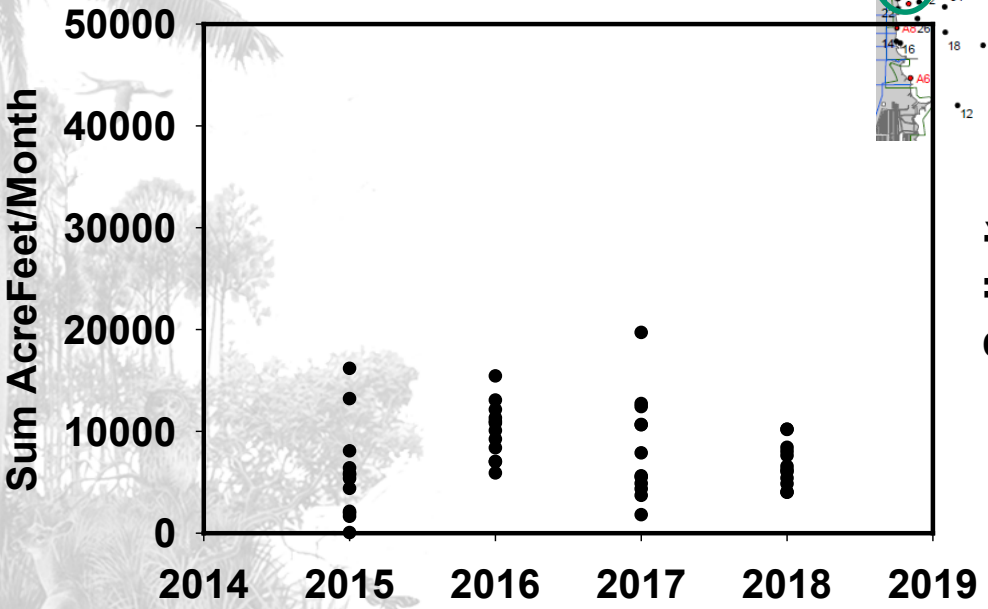
2016
Dry Season: High
Wet Season: Mod.

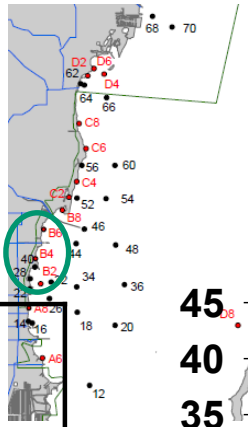
2017 (IRMA)
Late Dry: Low
Early Wet: Mod-High

2018
Late Dry Season: High
Wet Season: Mod- Low

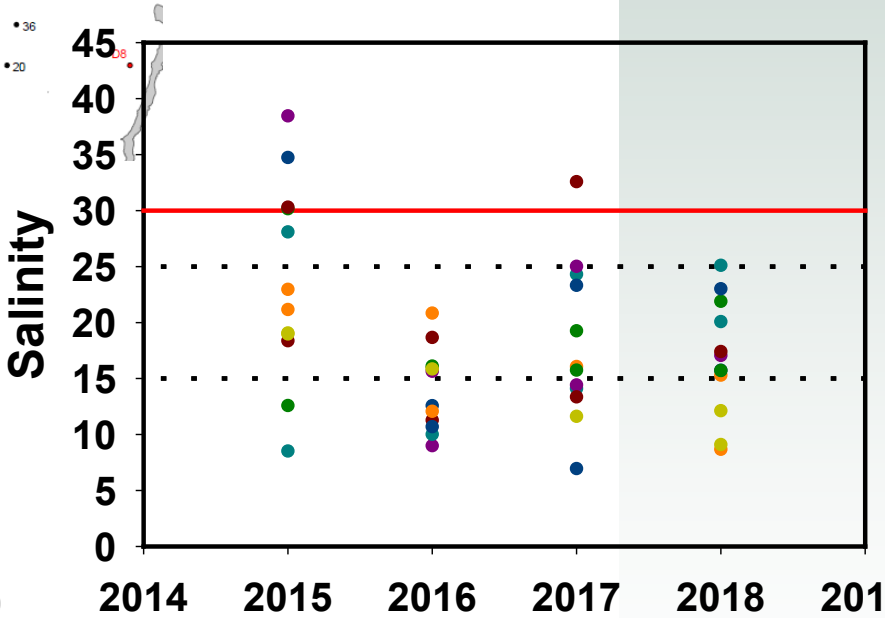
FLOW & SALINITY 2015-2018

Flow S21A





Bisc B4

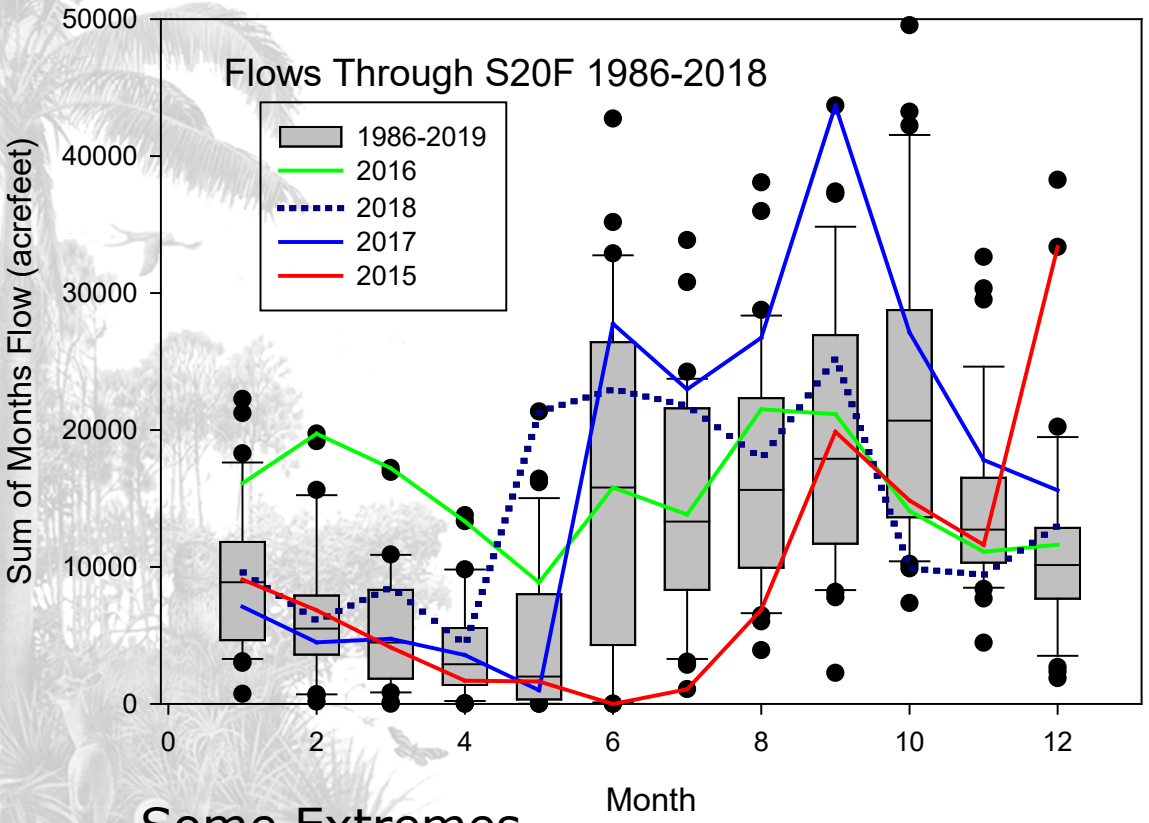


LOWER L31 E Flow-Way (S20F)

Some capacity to move water into Lower L31 E Flow-way to raise stage, provide water to wetlands

- Late 2014-2015: Testing with Temporary Pumps
- April 2017: Interim pump installed

MONTHLY FLOW: S20F



Some Extremes
High: Feb-April 2016; Sept 2017
Lows: May-June 2015

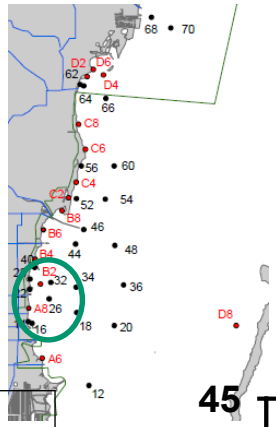
2015
Late Dry Season: Low
Early Wet Season: Low

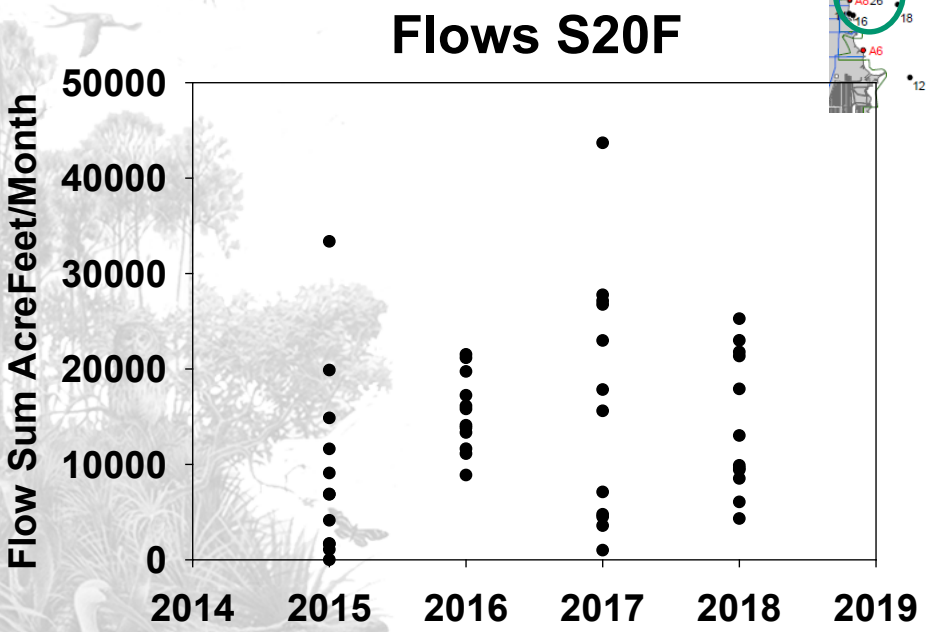
2016
Dry Season: High
Wet Season: Mod.

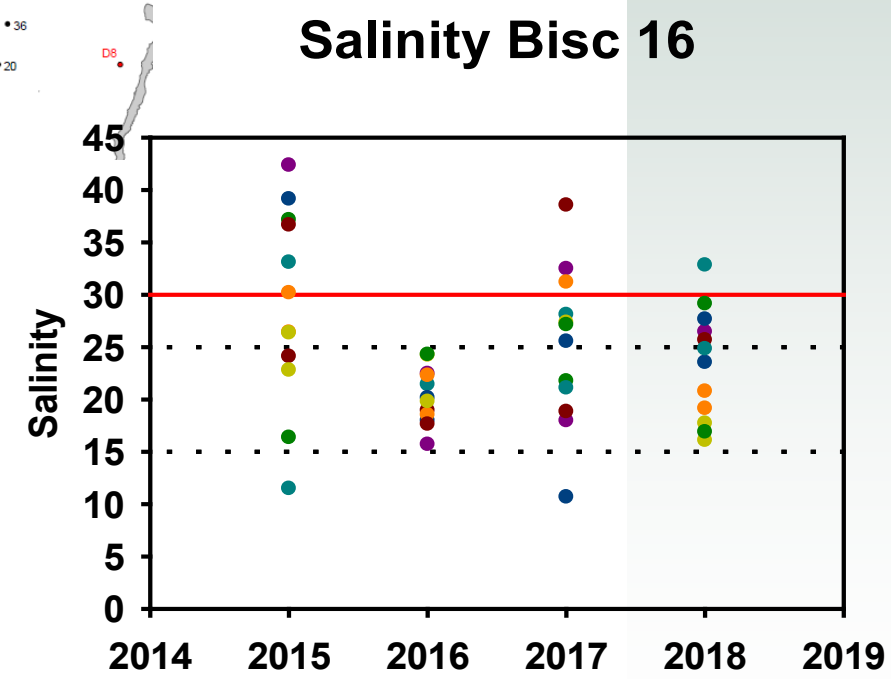
2017 (IRMA)*
Late Dry: Low
Early Wet: Mod-High

2018
Late Dry Season: High
Wet Season: Mod- Low

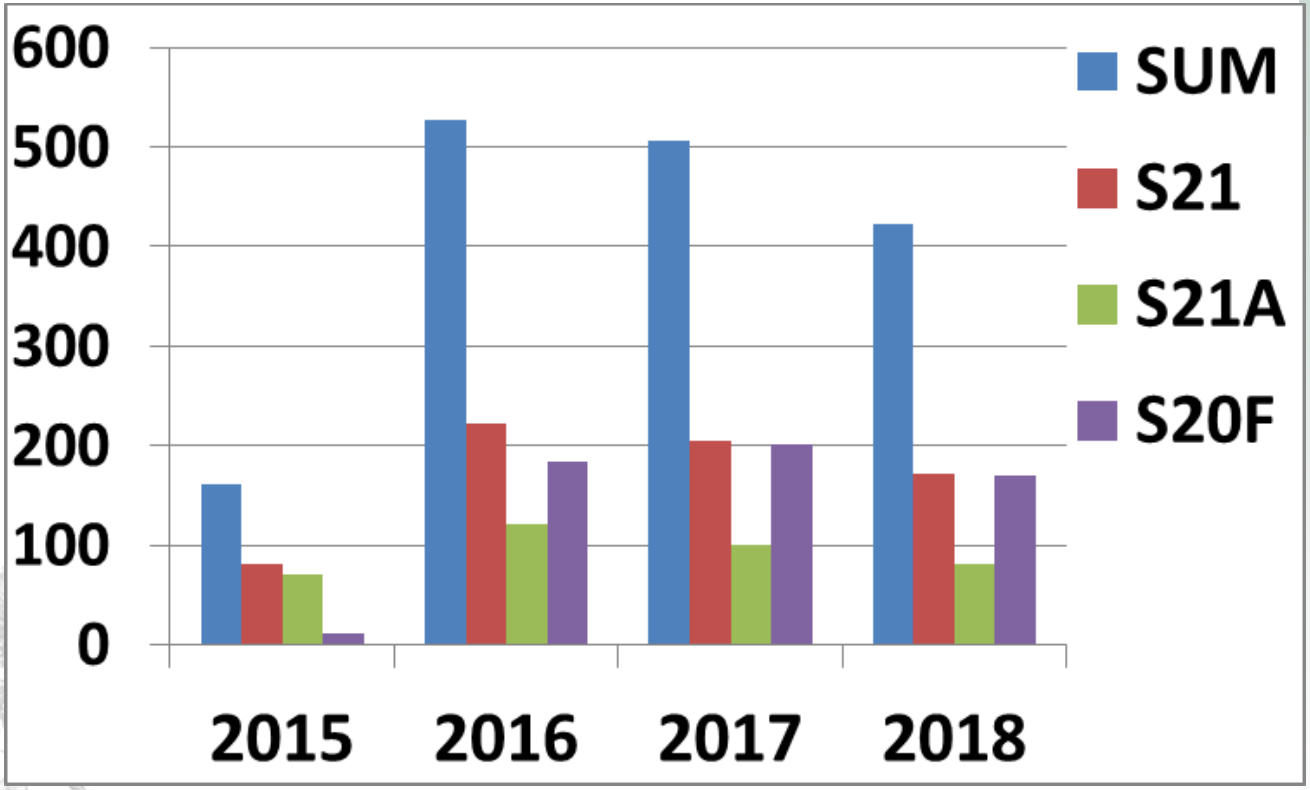
Flow & Salinity 2015-2018





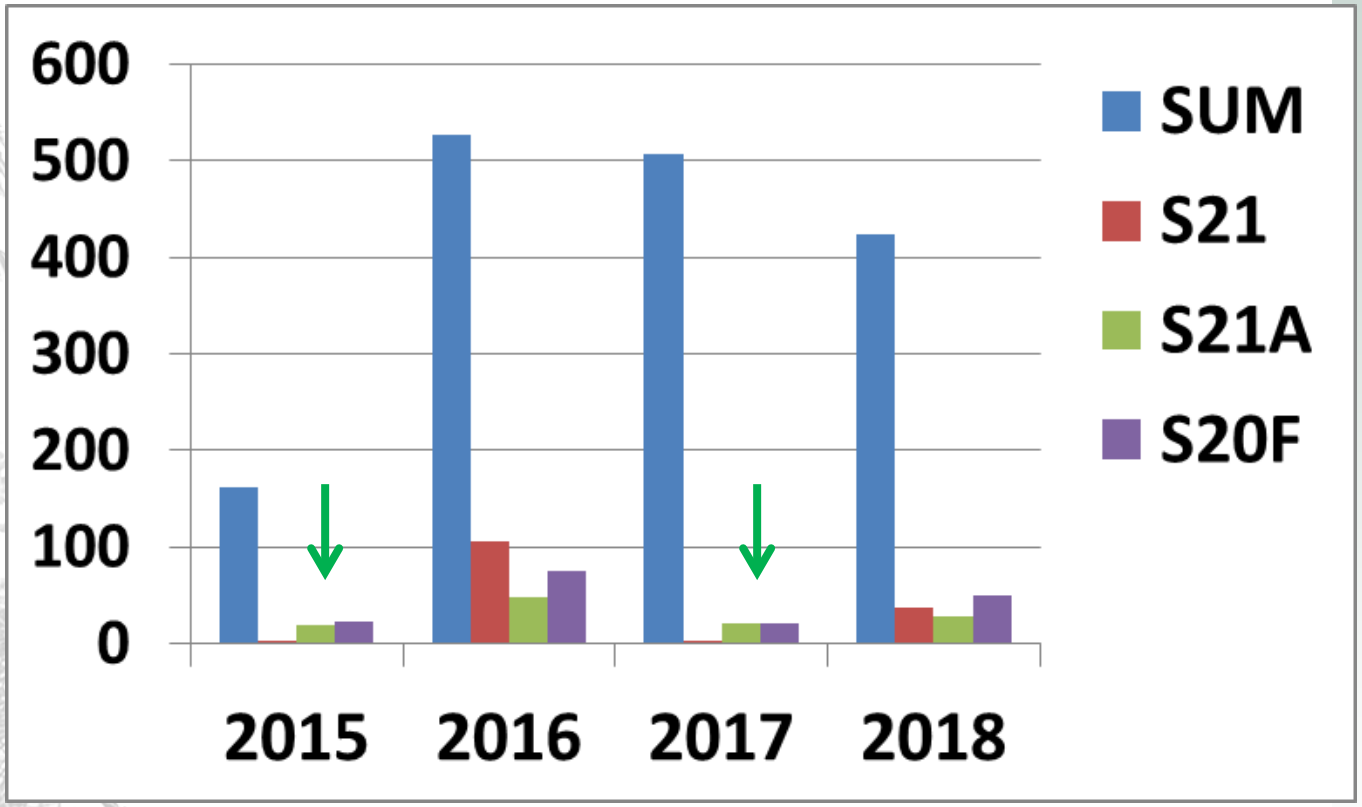


INFLOWS: ANNUAL 2015-2018



2016 and 2017 Comparable Annual Canal Inflows
Different Annual Rainfall

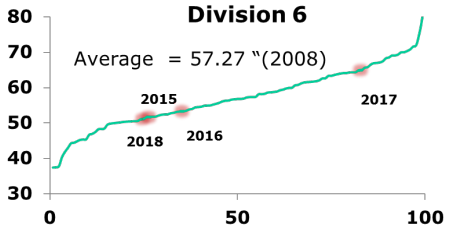
INFLOWS: JANUARY- MAY



Flows through dry season each structure :
2015 and 2017 comparable
2018 and 2016 higher

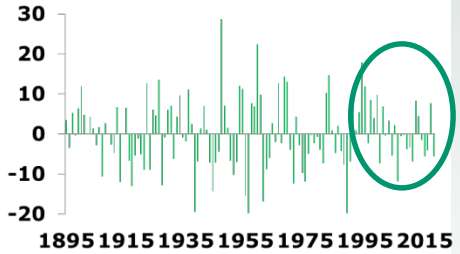
RAIN SUMMARY

Rainfall 120 Year Record

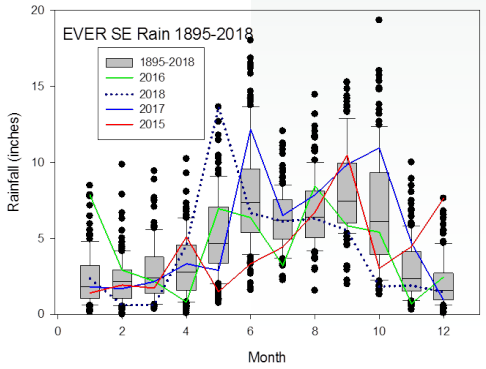


2017 (>80%)
2015,2016, 2018 (<40%)

Last 20 Yrs: No Annual Extremes



Last 4 Yrs: Several Monthly Extremes
Dec 2015, (Jan2016) May 2018

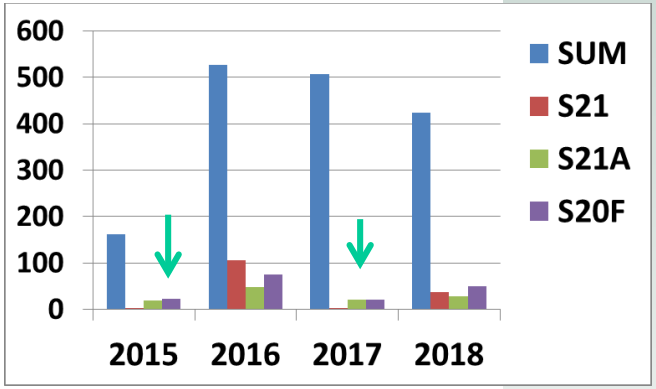


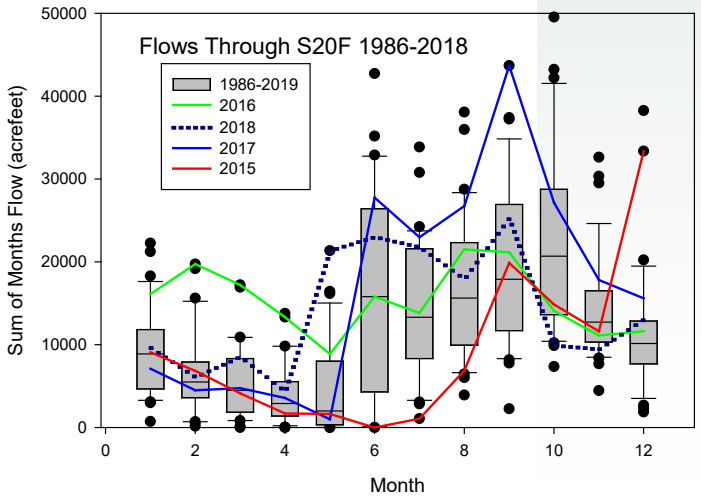
STRUCTURE FLOW SUMMARY

Flows ~40 Years Record

Flows Through Dry Season at Structures:
2015 and 2017 comparable different annual flow
2018 and 2016 higher dry season flows

Some Monthly Extremes s20F
High: Feb-April 2016; Sept 2017
Lows: May-June 2015

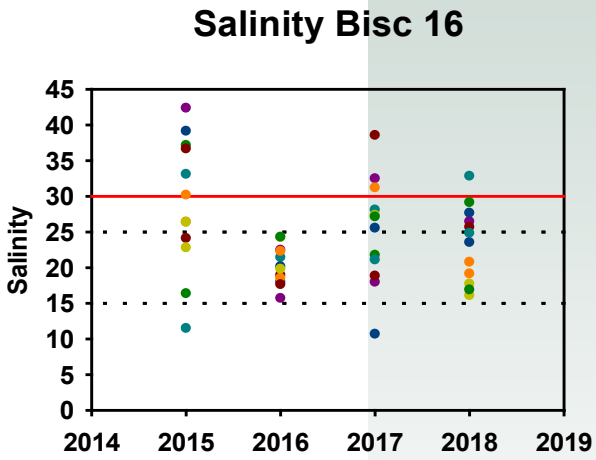




SALINITY SUMMARY

Nearshore Salinity 20 Year Project record

- 2016 & 2018 Within/Near Target Ranges (Monthly) despite below average annual rain (<40%)
- 2017 – Not within target ranges despite large annual flows and rainfall



CONCLUSIONS

Annual Expressions – (e.g. Targets/ Performance Measures) not adequate to quantify rainfall, water delivery, or assess project expectations

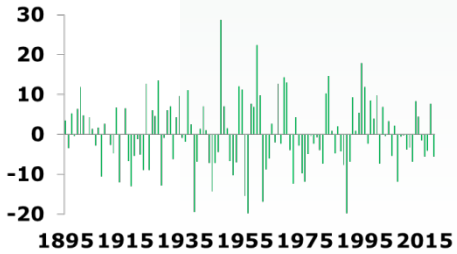
Rain - seasonal or monthly analyses needed for predicting or measuring performance (e.g. last 4 years as example)

Inflow- Closer look at individual structures and delivery to project features on component basis. Move away from annual delivery estimates.

Salinity - Comparable Flow-Salinity Targets (e.g. Month- Month)

Resiliency- meeting targets future conditions

- Start Adaptive Management
- Climate Variability and Change – monthly extremes
- Sea- Level Rise – Project location



MORE TO DO.....

- L31E Stages
- Assess Monthly Conditions Over Longer Periods
- Comparable Flow-Salinity targets

National Park Service

South Florida Natural Resources Center

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