Wakulla and Sally Ward Spring MFL Development

August 28, 2020

Minimum Flows and Levels Program

Water Resource Evaluation

Wakulla and Sally Ward Spring Minimum Flows and Levels (MFL) Project Outline

- Overview of Wakulla/Sally Ward Spring MFLs
- Composite Flow and Baseline Time Series
- MFL Metrics and Metric Evaluation Methodology
- Tentative Timeline for Completion

Statutory Requirements s.373.042, F.S.

What is an MFL? Limit at which further withdrawals will cause significant harm to the water resources or ecology of the area.

Purpose: To protect water resources and associated ecology. Provides information to support water supply planning and water use permitting evaluations.

MFLs Shall Be Established for:

- **1st** magnitude and Outstanding Florida Springs
- **2nd** magnitude springs on state or federal conservation lands
- Other waterbodies: Based on importance of waterbody and potential for significant harm to regional water resources or ecology.

Florida Administrative Code (FAC) Requirements

Chapter 62-40.473(1), FAC

1. Natural seasonal fluctuations in water flows or levels,
2. Non-consumptive uses, and
3. Environmental values associated with coastal, estuarine, riverine, spring, aquatic, and wetland ecology, including:

(a) Recreation in and on the water
(b) Fish and wildlife habitats and the passage of fish
(c) Estuarine resources
(d) Transfer of detrital material
(e) Maintenance of freshwater storage and supply
(f) Aesthetic and scenic attributes
(g) Filtration and absorption of nutrients and other pollutants;
(h) Sediment loads
(i) Water quality
(j) Navigation

} "Water Resource Values" (WRVs)

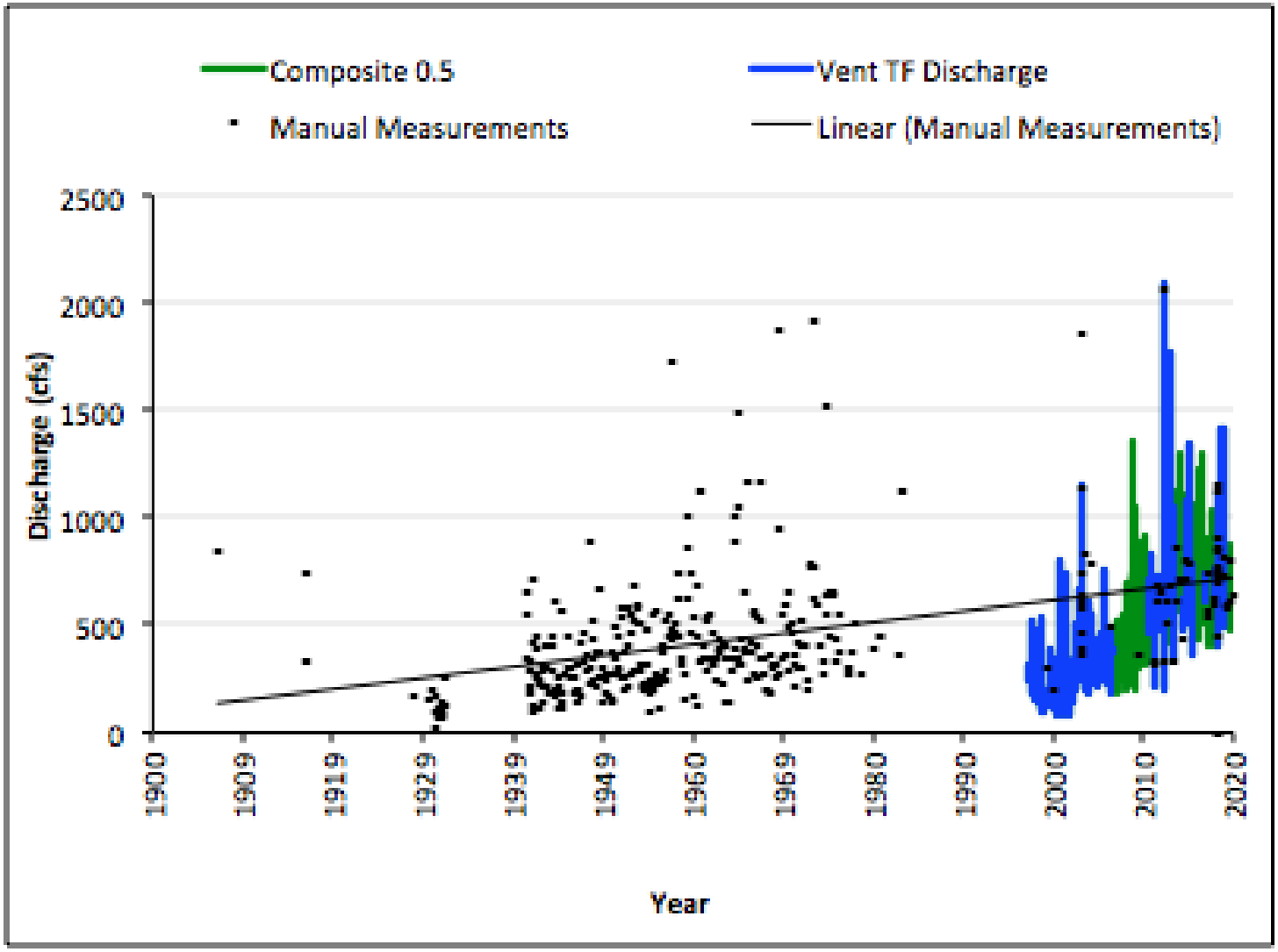
Wakulla and Sally Ward Spring Minimum Flows and Levels (MFL) Project

- Study area extends from spring vents to the confluence of the St. Marks and Wakulla Rivers
- Wakulla Spring
  - First magnitude spring
  - Discharge is increasing
- Sally Ward Spring discharge
  - Second magnitude spring
  - Discharge is increasing

Wakulla Spring Baseline Time Series Period of Record Selection

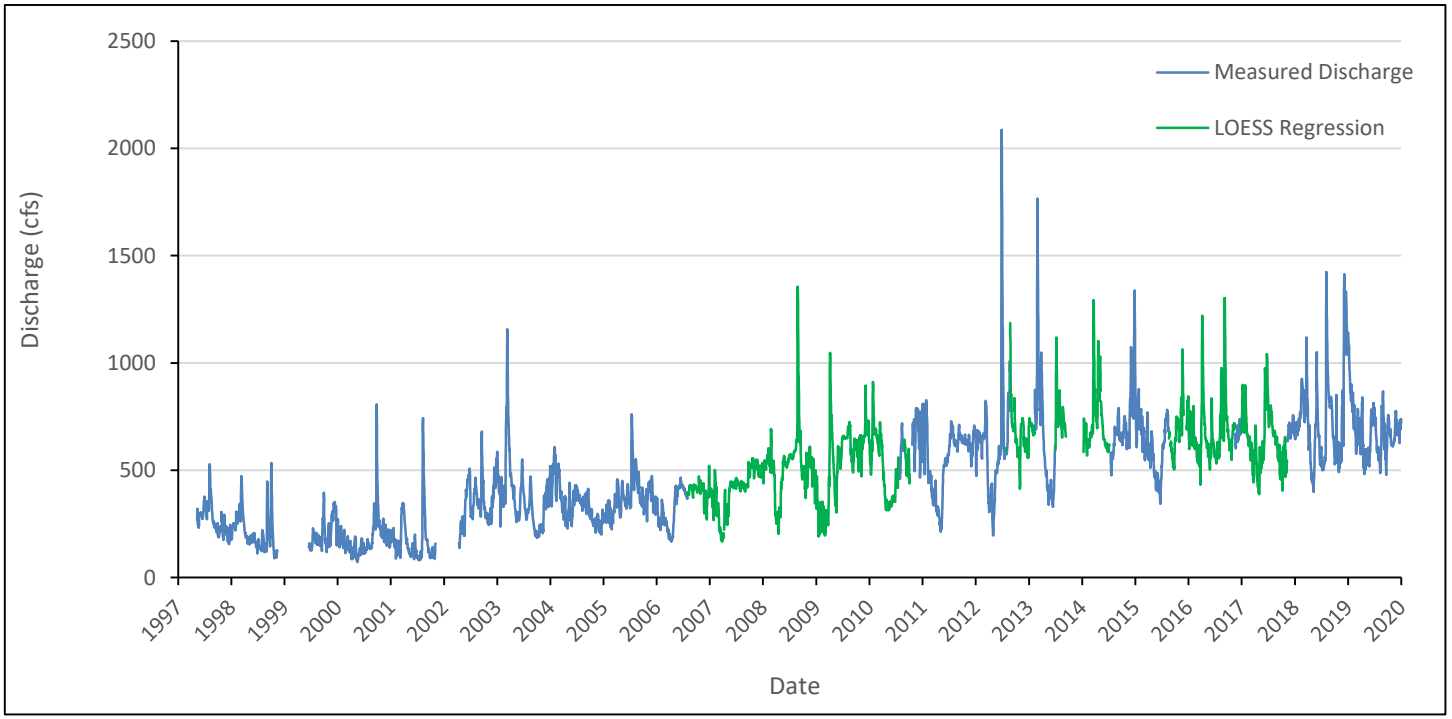
- Daily Discharge Estimates
- Created a composite spring discharge time series
  - Measured spring vent discharge (S4 and Argonaut) with LOESS regression using 0.5 Smoothing Factor for Gap Filling
  - When direct measurements were not available
    - LOESS regression using USGS Station 023237022 (Wakulla River near Crawfordville, Fl.) discharge
- Tidally Filtered Data

Wakulla Spring Flow



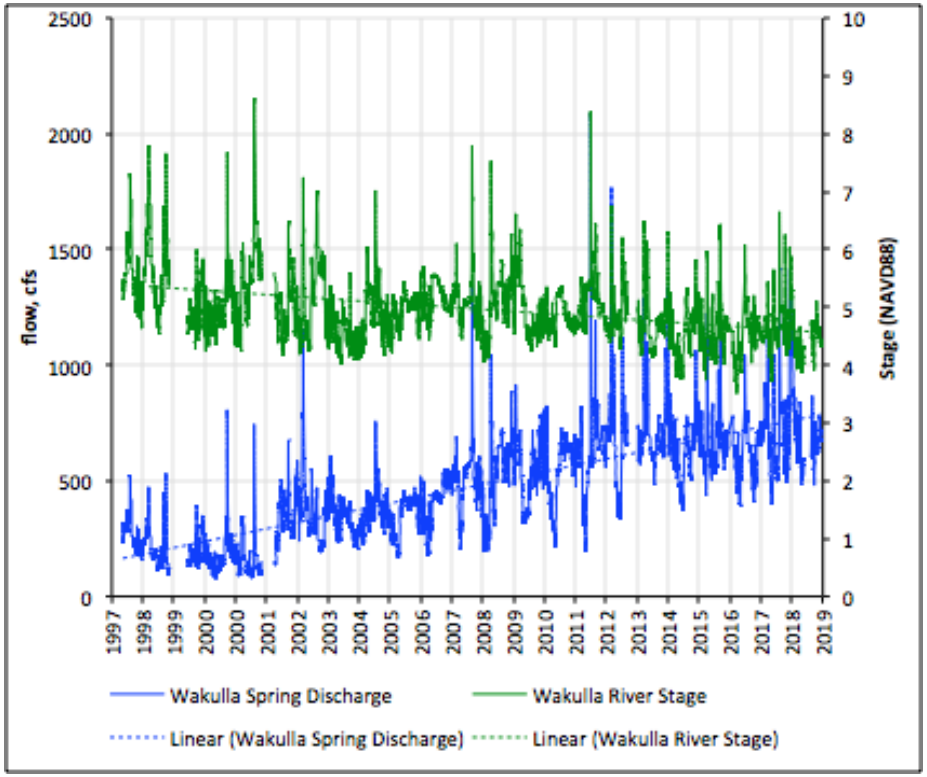
Composite Time-series

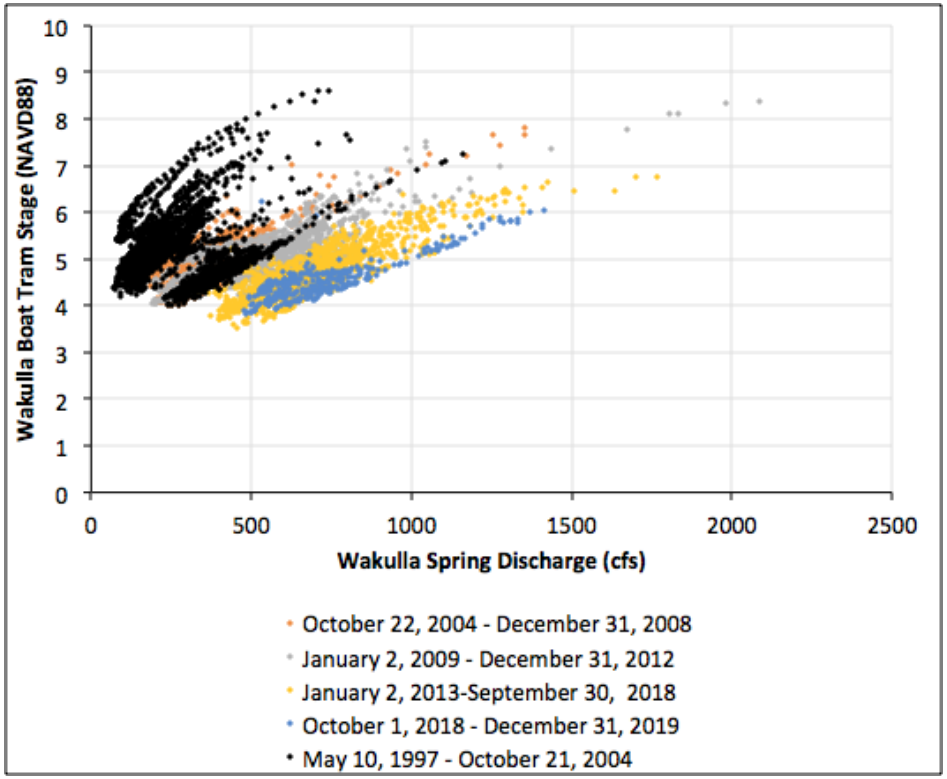
- Period of Record, May 10, 1997, to December 31, 2019 (Present)
- Filled in most data gaps



Wakulla Spring Stage/Discharge Relationship

- The relationship between discharge and stage has changed over time
- Stages are lower now, but discharge is higher

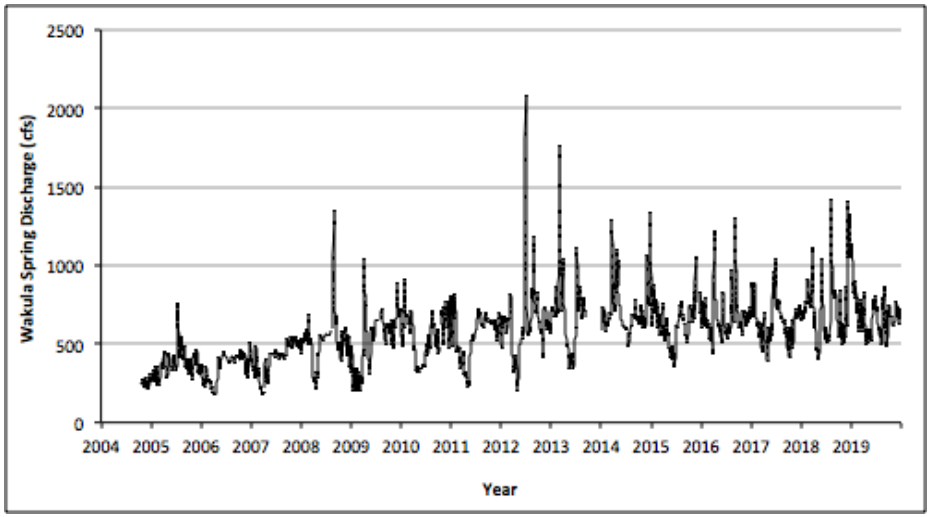


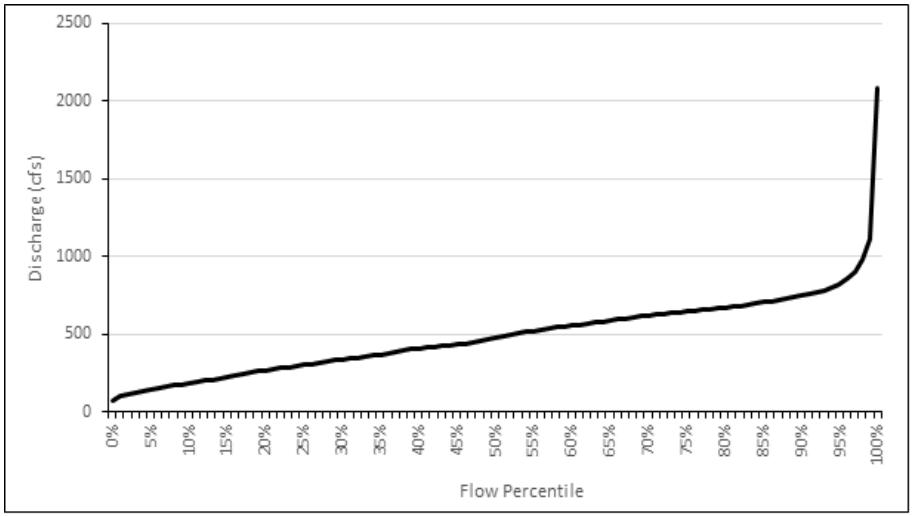


Wakulla Spring Baseline Time Series Determination

Selected October 22, 2004, to December 31, 2019

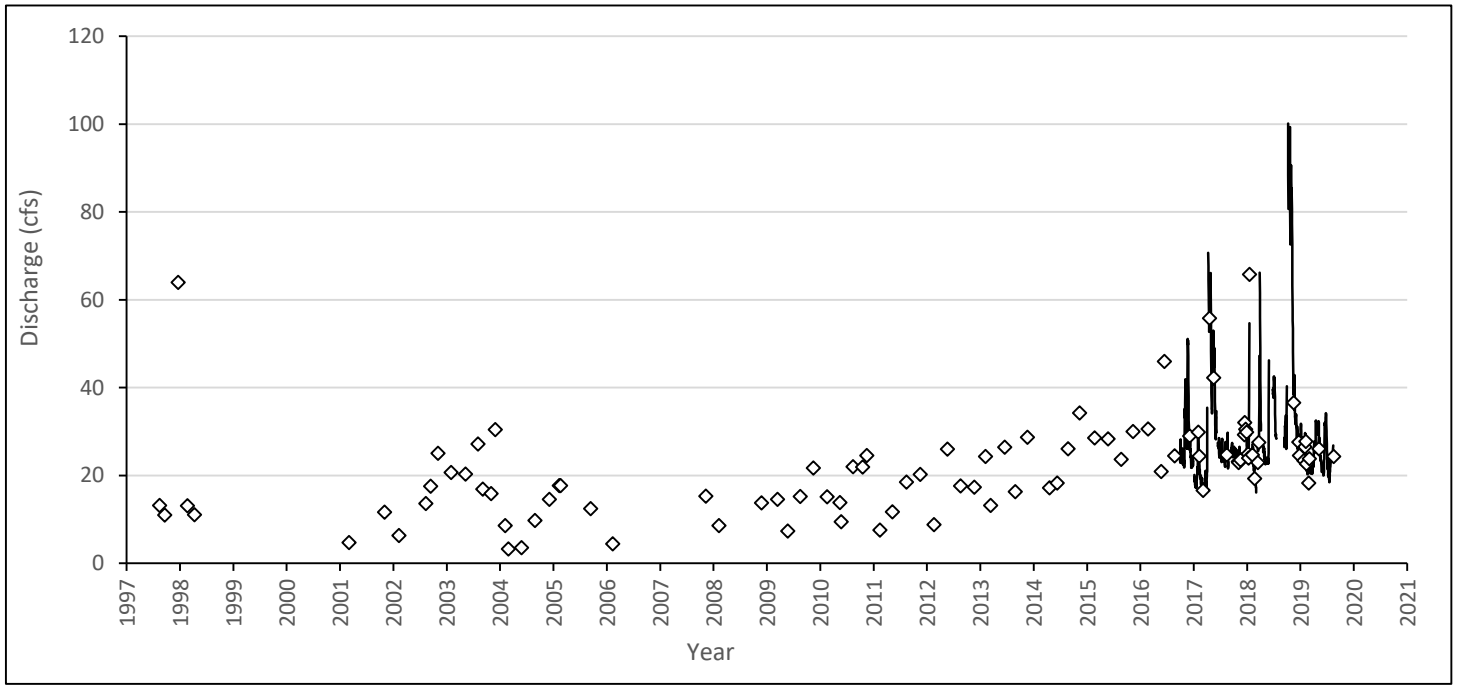
- Needed River Flows at Shadeville Rd. (USGS Station 02327022) for model inputs
- 1997 through 2002 not representative (hydrilla)
- Changing stage discharge relationship
- Average Flow of 575 cfs (372 MGD)





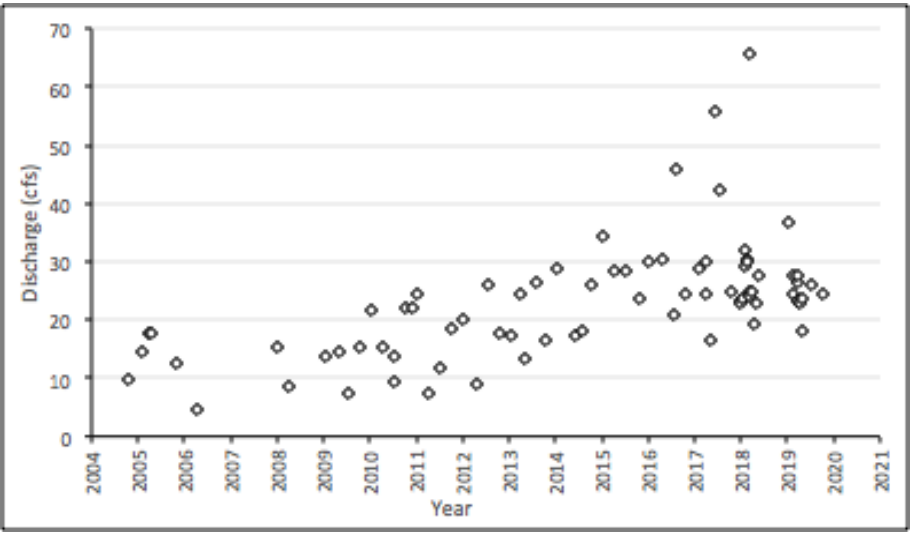
Sally Ward Spring Baseline Time Series Determination

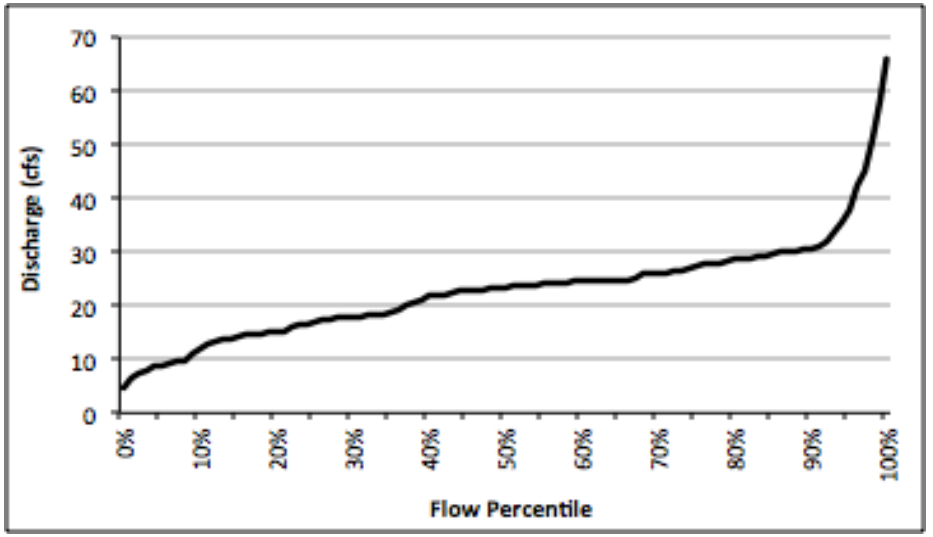
- Manual measurements show an increasing trend
- Manual measurements (1997 - present)
- Continuous data limited



Sally Ward Baseline Time Series

- Same POR as Wakulla Spring – October 22, 2004, through December 31, 2019
- Using Discrete (Manual) Measurements
- Continuous data for model calibration
- Average Flow = 23 cfs (15 MGD)



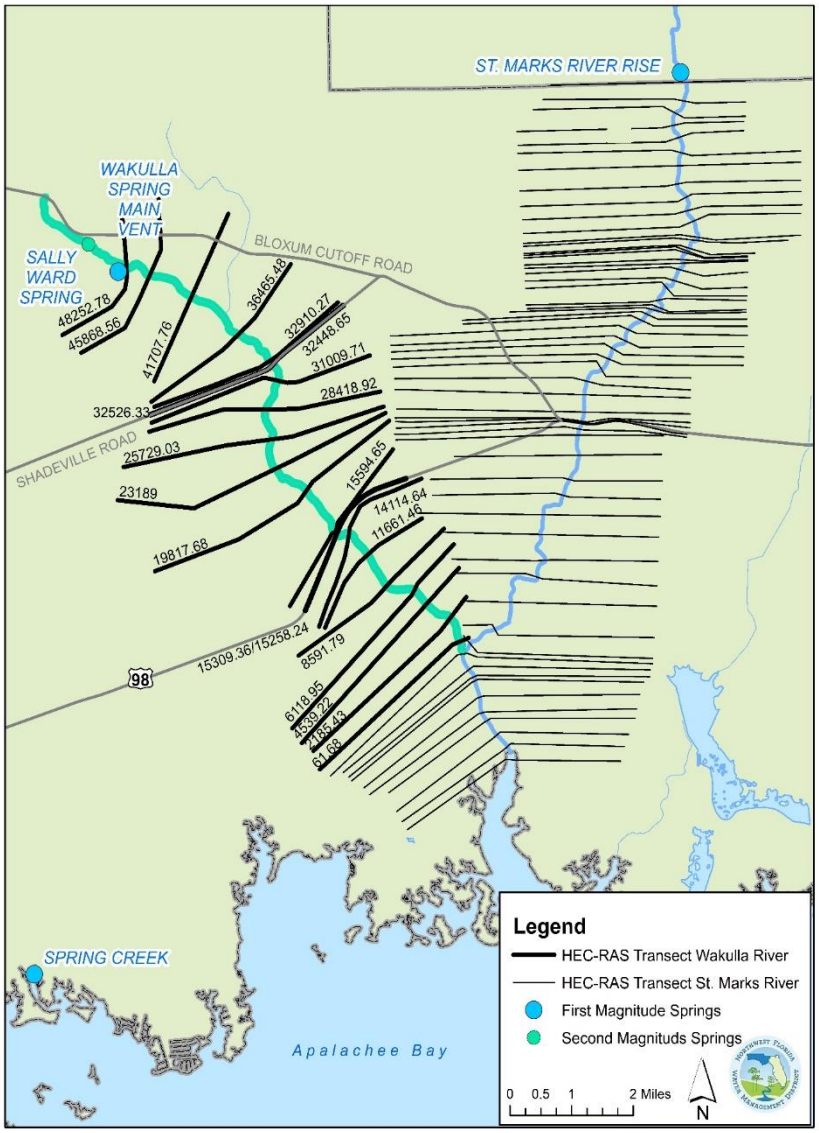


Wakulla MFL Modeling Efforts

- Developed multiple models used for metric evaluation
  - Models useful in predicting different hydrologic parameters
  - Models relate changes in flow to changes in metrics
- Two model types:
  - Hydraulic – predicts spring/river stage and velocity
  - Hydrodynamic – simulate water levels, temperature, and salinity (thermal model and estuarine model)
- All models evaluated for accuracy to post-Michael conditions
  - Hydraulic and thermal models recalibrated to post-Michael conditions
  - Estuarine model was representative of both conditions

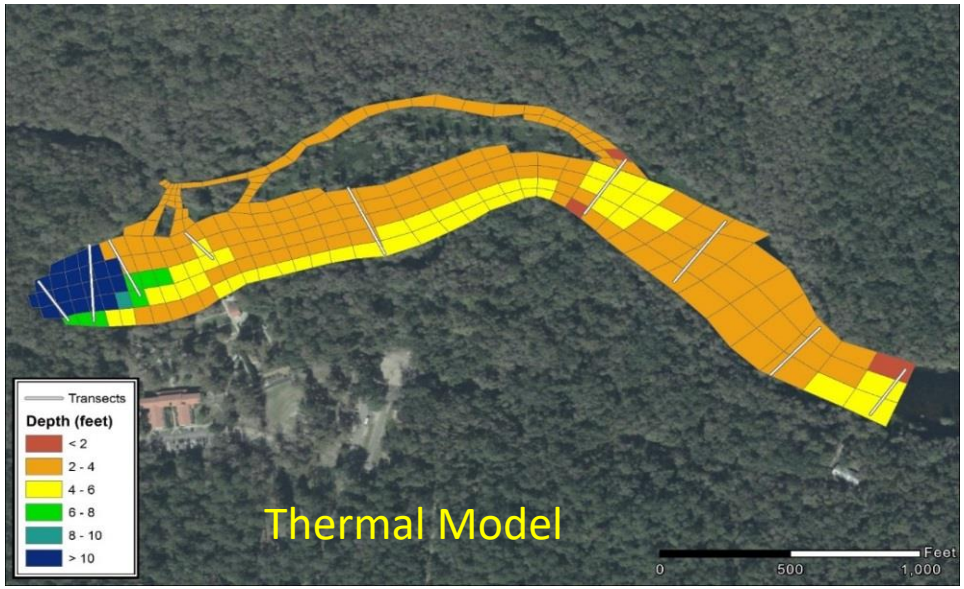
Hydraulic Model

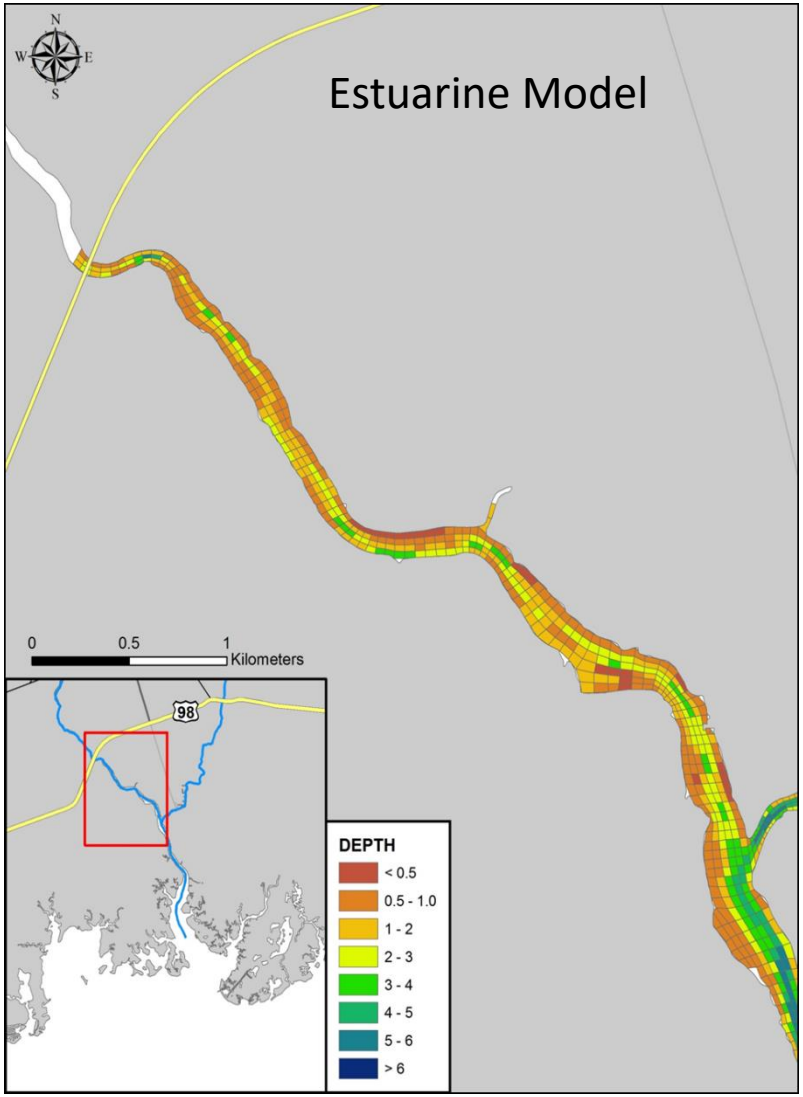
- Entire Wakulla and Sally Ward river/spring run system
- Relates spring/river flow and river stage
- Useful for stage-based metrics
- Model code is HEC-RAS



Hydrodynamic Models

- Simulates changes in salinity and temperature, as a result of changes in spring flow
- Three-dimensional models
- Two separate models – thermal and estuarine





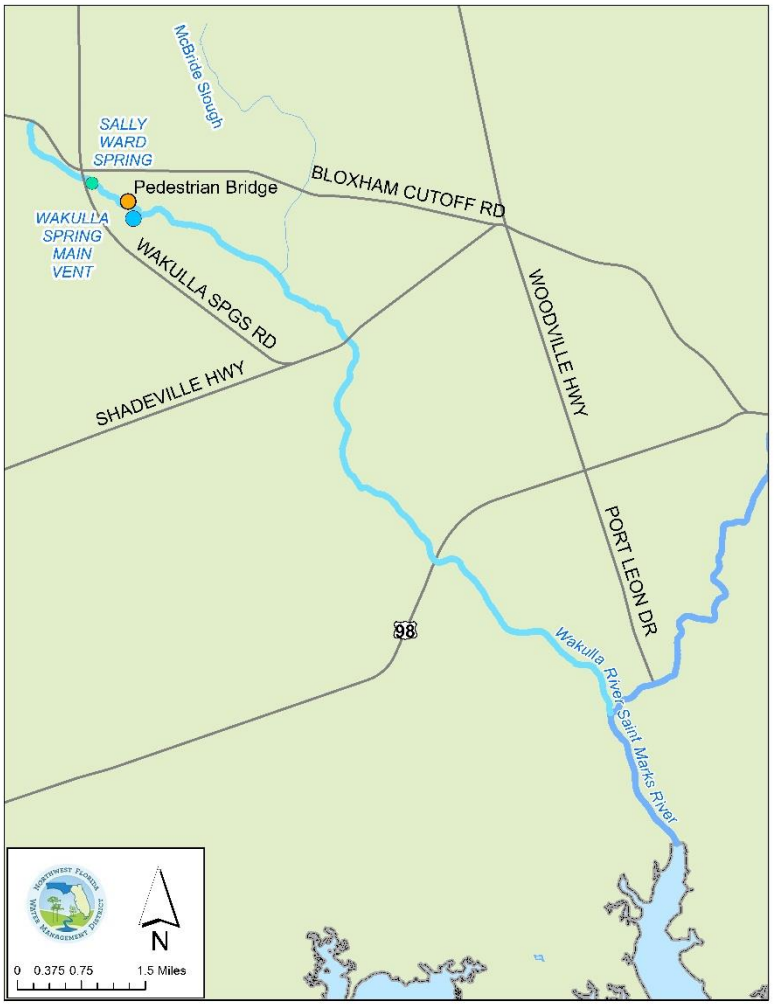
Water Resource Values

10 Environmental Values assessed for their potential to be adversely affected by withdrawals, availability of data, and their applicability to the Wakulla and Sally Ward spring system.

- **Recreation in and on the water**
- **Fish and wildlife habitat and the passage of fish**
- **Estuarine resources**
- **Water quality**
- Aesthetic and scenic attributes
- Transfer of detrital material
- Sediment loads
- Filtration and adsorption of nutrients and other pollutants
- Maintenance of freshwater storage and supply
- Navigation

Recreation in and on the Water Metrics

- Wakulla River only
  - No recreational use of Sally Ward Spring run allowed
- Recreational boats downstream of Shadeville Road bridge
  - Power Boating
    - Downstream of Shadeville Hwy.
    - 2 ft depth across a continuous 30 ft width
  - Canoe/Kayak
    - 1.5 ft Depth at thalweg
- River Tour boats in State Park
  - 3 ft depth across two 20-ft widths along tour boat route

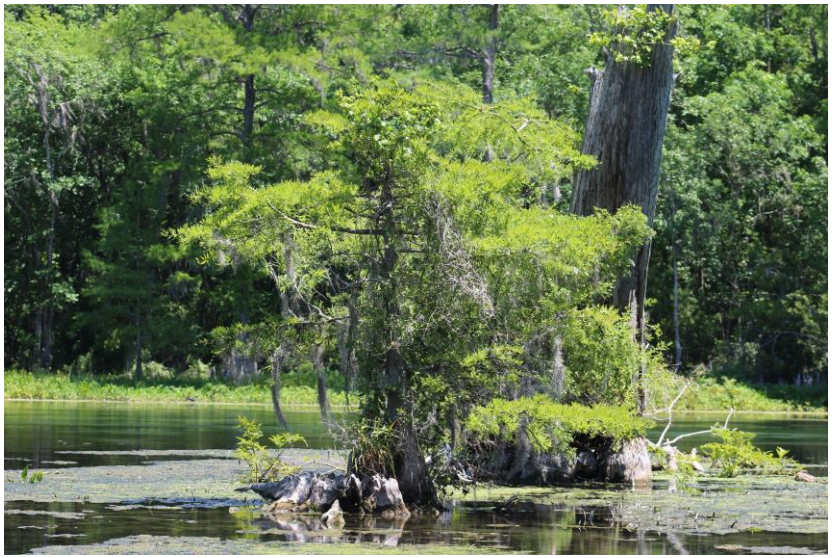


Fish and Wildlife Habitat Metrics

- A stage/flow relationship metric
  - HEC-RAS model
- Multiple metrics across a range of flows
  - Fish passage depth
  - Manatee passage depth
  - Manatee thermal refuge habitat
  - Estuarine habitat
- Additional metrics considered
  - Woody habitat inundation
  - Floodplain wetland inundation
- Reduction in number of days or area conditions are met by up to 15%

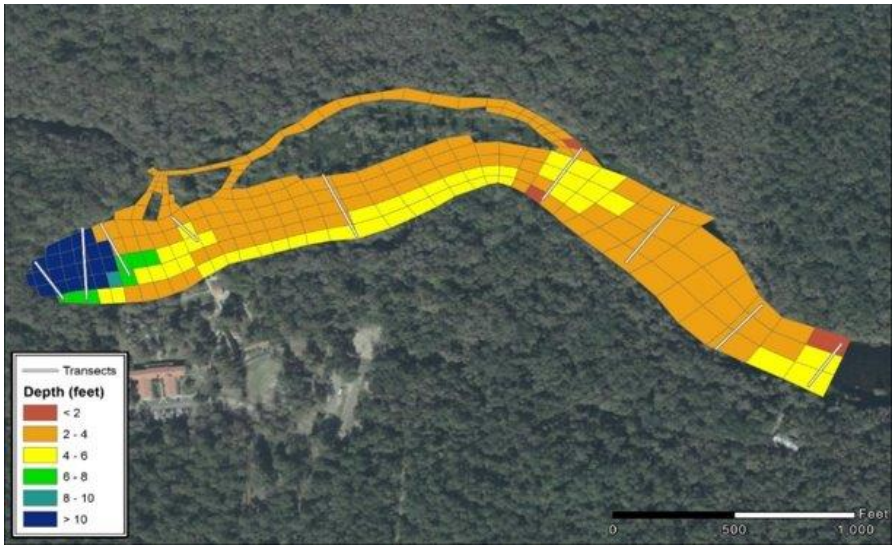
Fish and Wildlife Habitat Stage-Based Metrics

- Fish passage depth
  - All transects
  - 0.6 ft depth at thalweg
- Manatee passage depth
  - 3.8 ft depth across 3.8 ft width
- Additional metrics considered
  - Woody habitat inundation frequency
  - Floodplain wetland inundation frequency



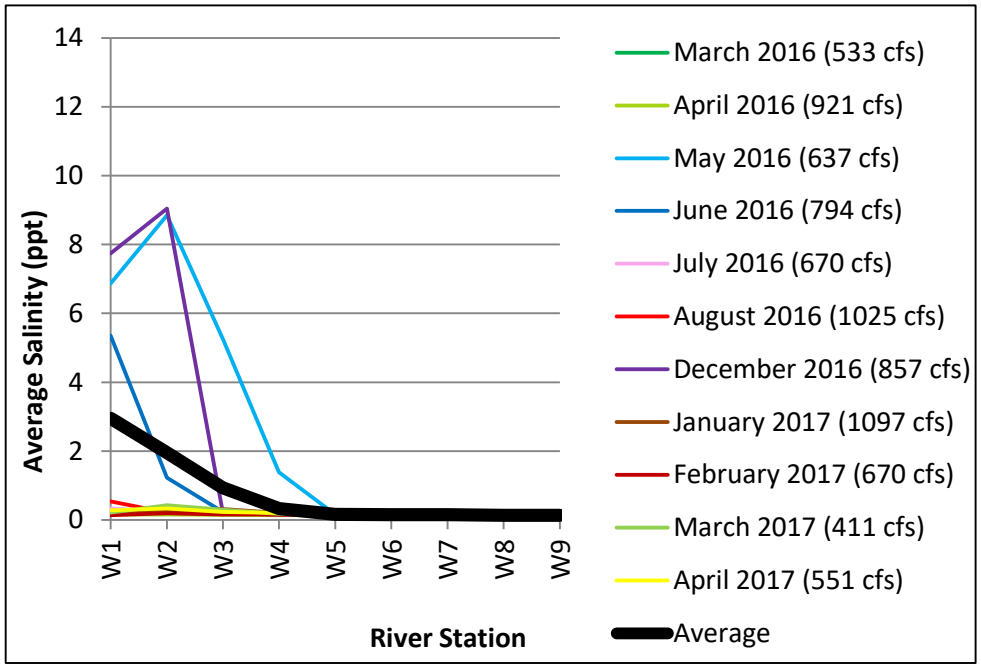
Manatee Thermal Refuge

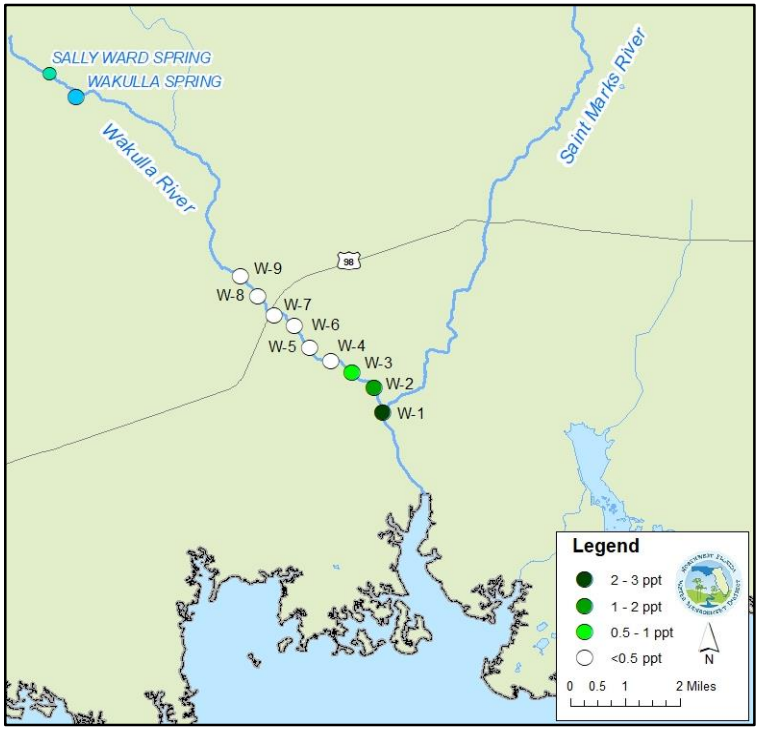
- Requires a hydrodynamic model
- Spring vent to boat tram
- Surface area or volume of water which is >3.8 ft in depth and:
  - Chronic = >20 C° for less than three days
  - Acute = >15 C° for less than four hours
- Calculated reduction in available habitat for a specified flow reduction



Estuarine Resources Metrics

- Lower Wakulla River downstream of US Hwy 98 Bridge
- Low salinity habitats required for fish, plant, and invertebrate species
  - Volume, surface area, and shoreline length
  - ≤ 3 ppt, ≤ 2 ppt, ≤ 1 ppt, ≤ 0.5 ppt salinity zones





Water Quality

- Salinity/specific conductance to be addressed with Estuarine Resources (WRV 3)
- Temperature to be addressed with Manatee Thermal Refuge (WRV 2)
- Additional water quality analysis is ongoing

Schedule

- Draft MFL Technical Assessment Report – September 2020
- Peer Review – October 2020 through early December 2020
- Address Comments – December 2020 - January 2021
- Final Draft Report – by end of February 2021
- Rule Development Workshop – February 2021
- Rule Language Approval - March 2021 Governing Board Meeting

Thank you

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