Hazen

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

OOA BEAM Model Demonstration

Surface Water Availability Resource Assessment:
Pilot Development for Oconee-Ocmulgee-Altamaha Basin

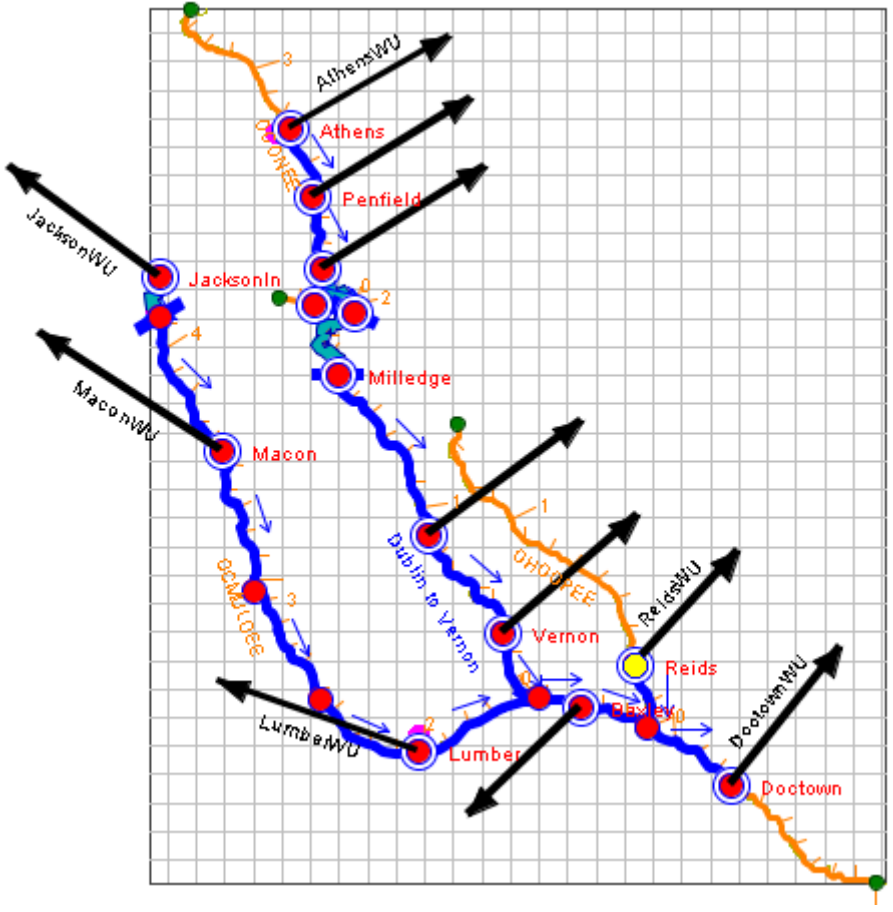
Image credit: Milledgevillegeorgia.blogspot.com

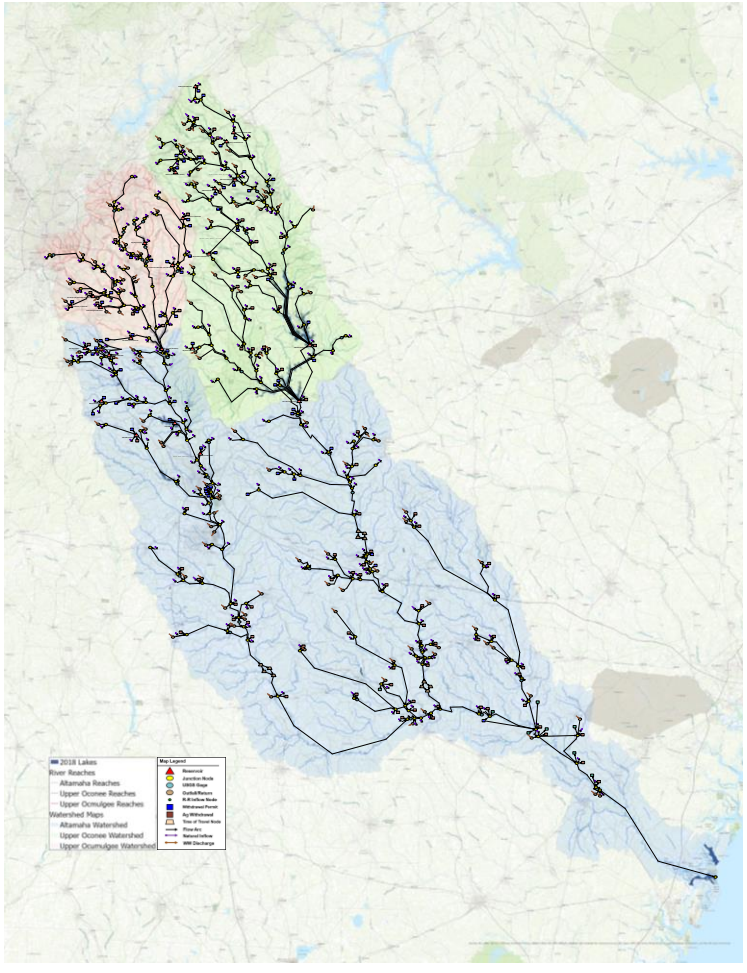
Topics:

- Introduction to Basin Environmental Assessment Model (BEAM)
- BEAM input data
- BEAM Model Performance Metrics
  - Output variables from model
  - Summary of output variables
  - Comparison among scenarios
- What additional output would the Council want to have?

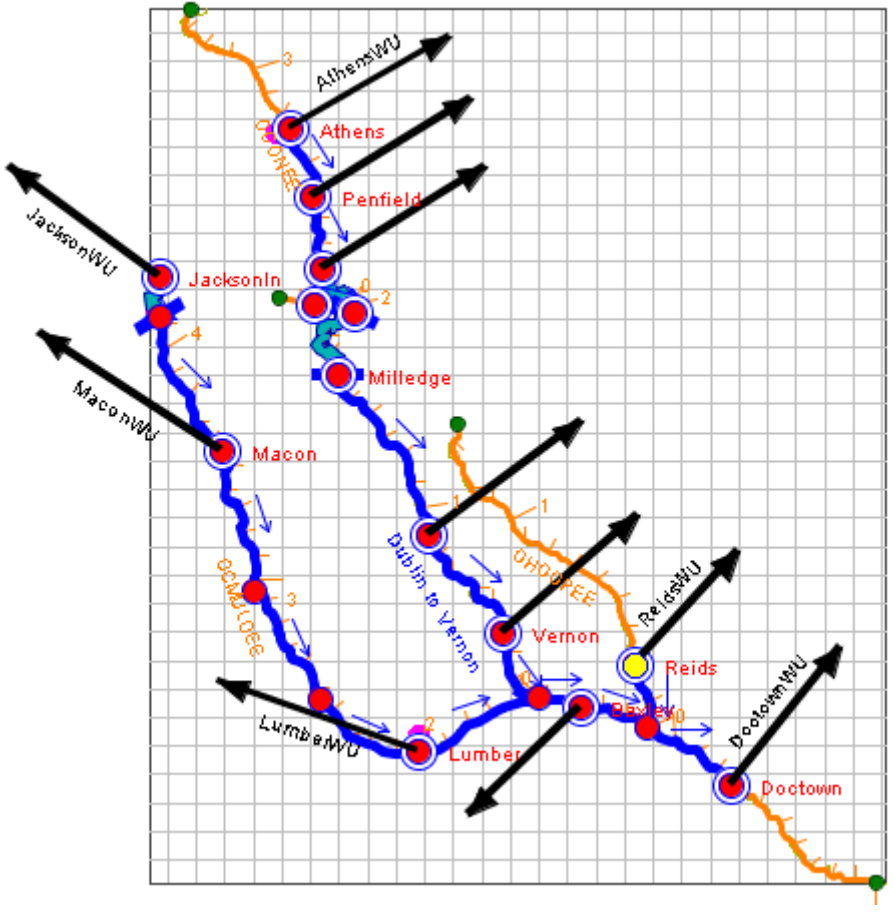
Introducing OOA BEAM Model

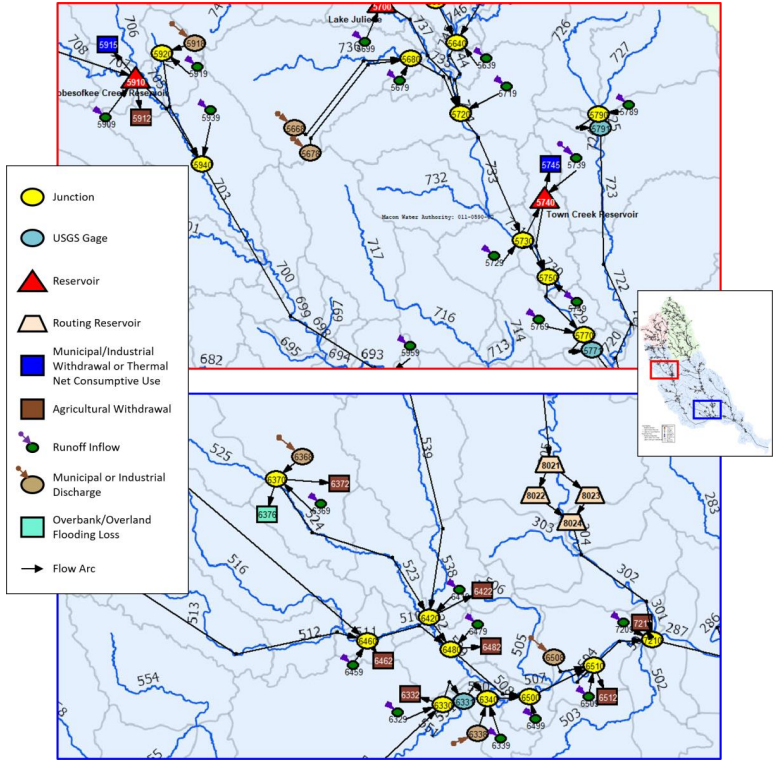
ResSim (Prior Model) and BEAM Schematics



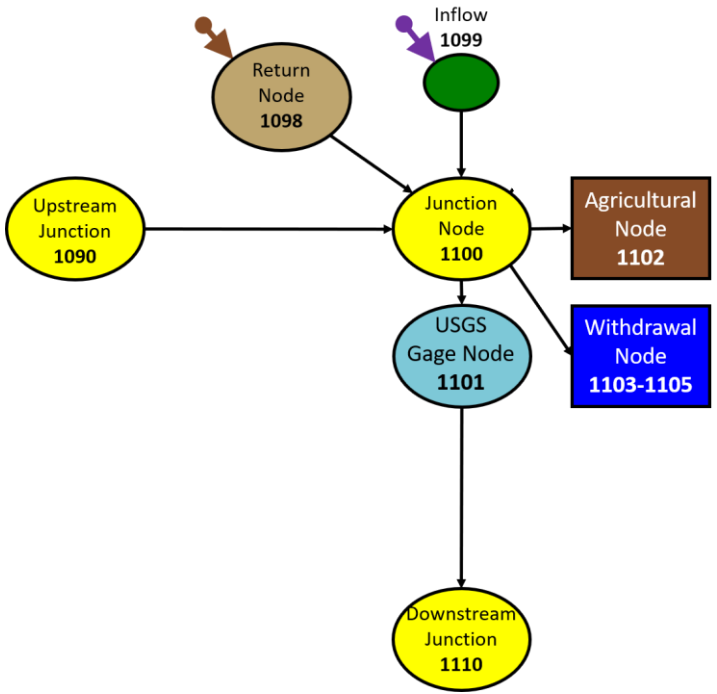


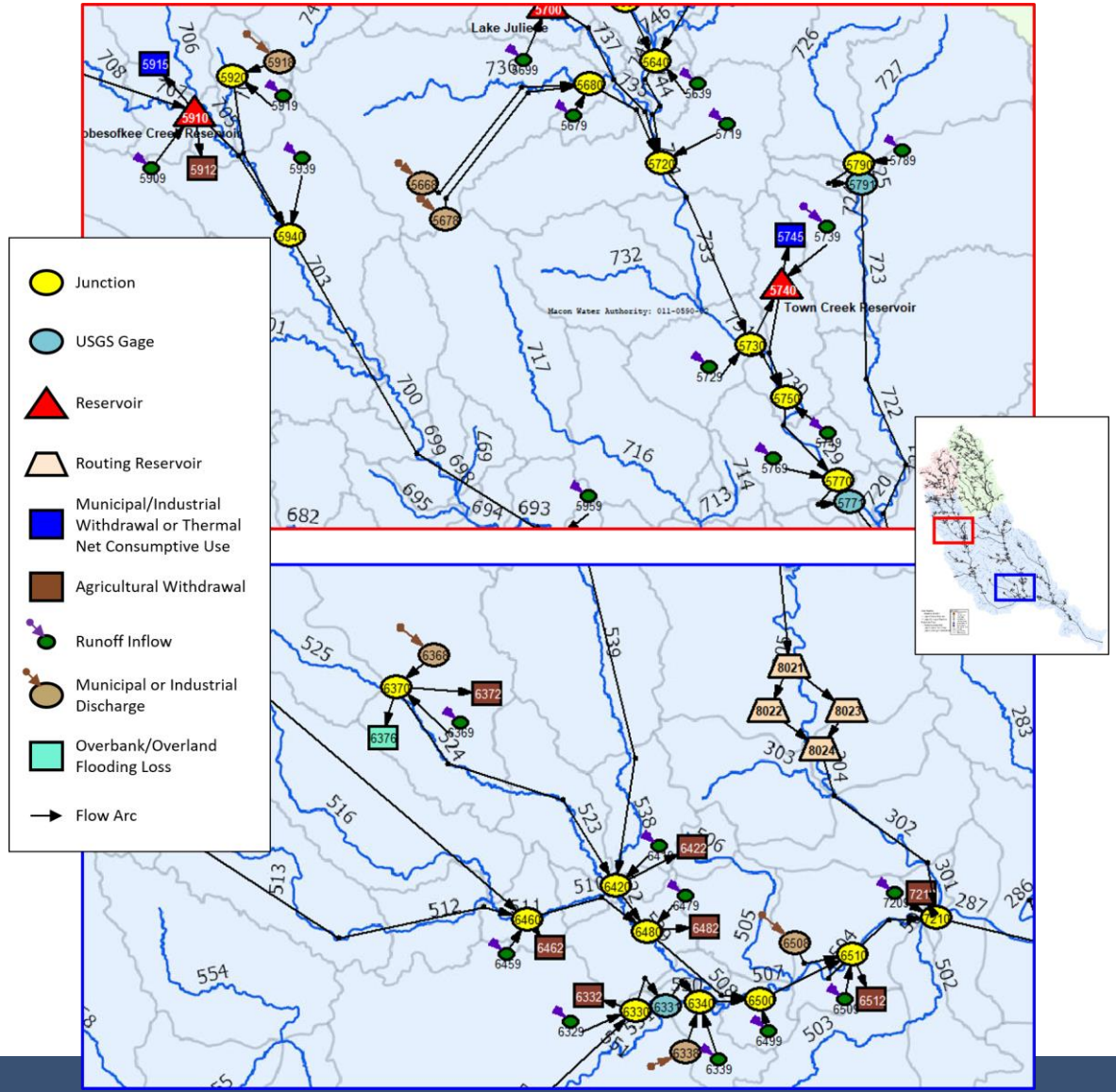
ResSim (Prior Model) and BEAM (Zoomed In) Schematics



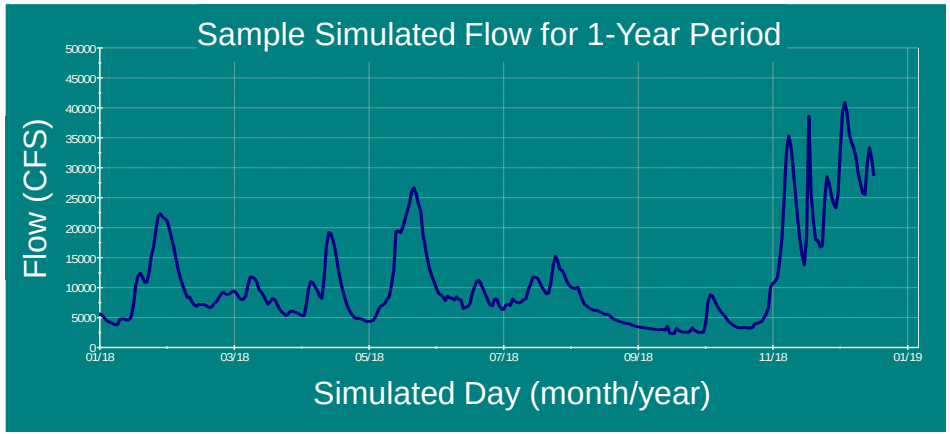


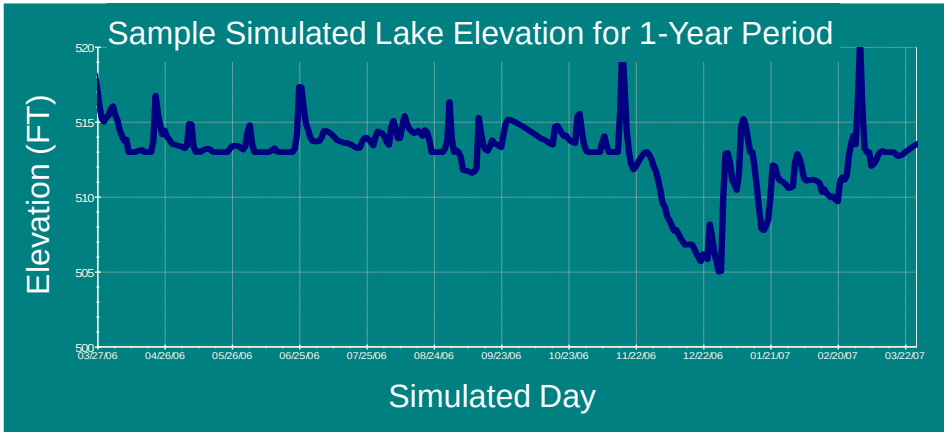
BEAM Node Types

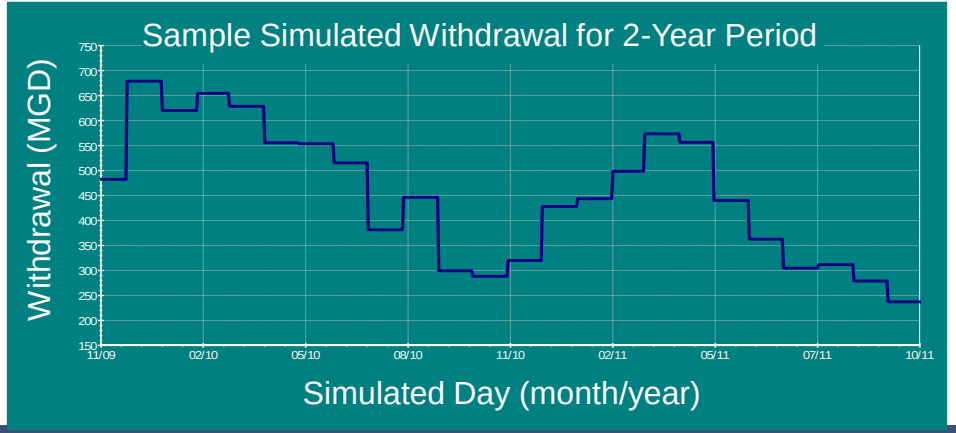




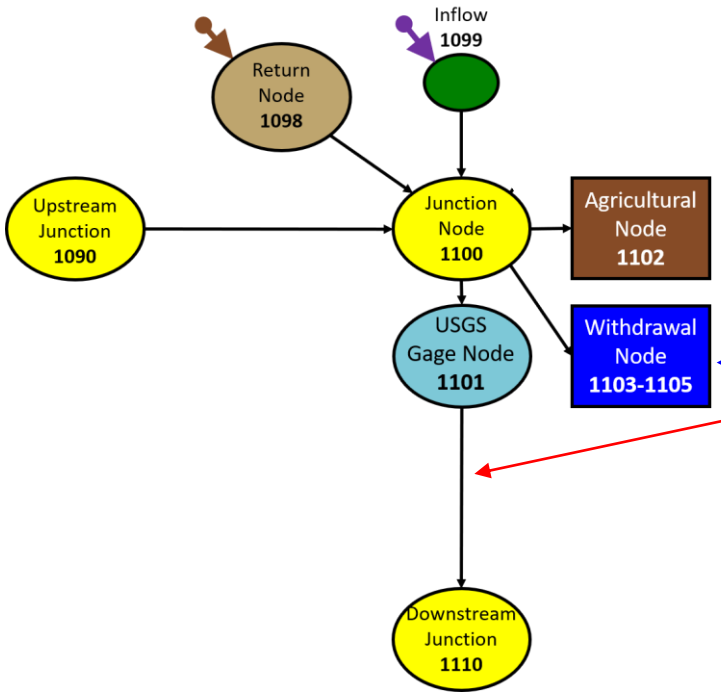
Sample Model Output







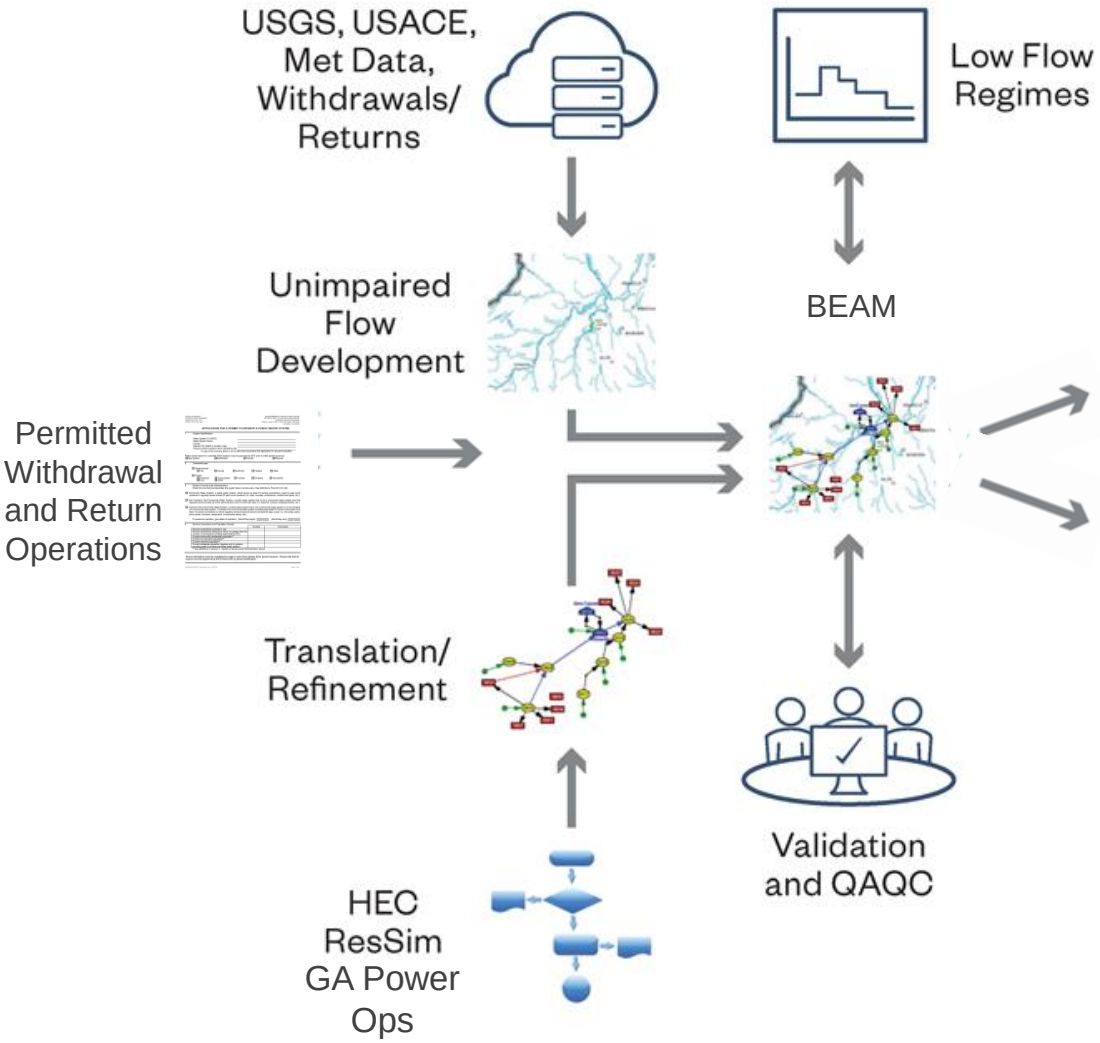
Instream Flow Protection Thresholds are Met *Before* Withdrawals are Made



Withdrawal made only if there is sufficient water above the instream flow protection threshold at the withdrawal location

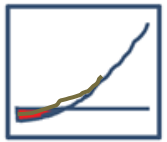
If there is insufficient water to meet the desired withdrawal, the model shows a water “shortage”, and the location is flagged as an area of potential concern

BEAM Development



Regional Planning with Collaborative Testing of Management Alternatives

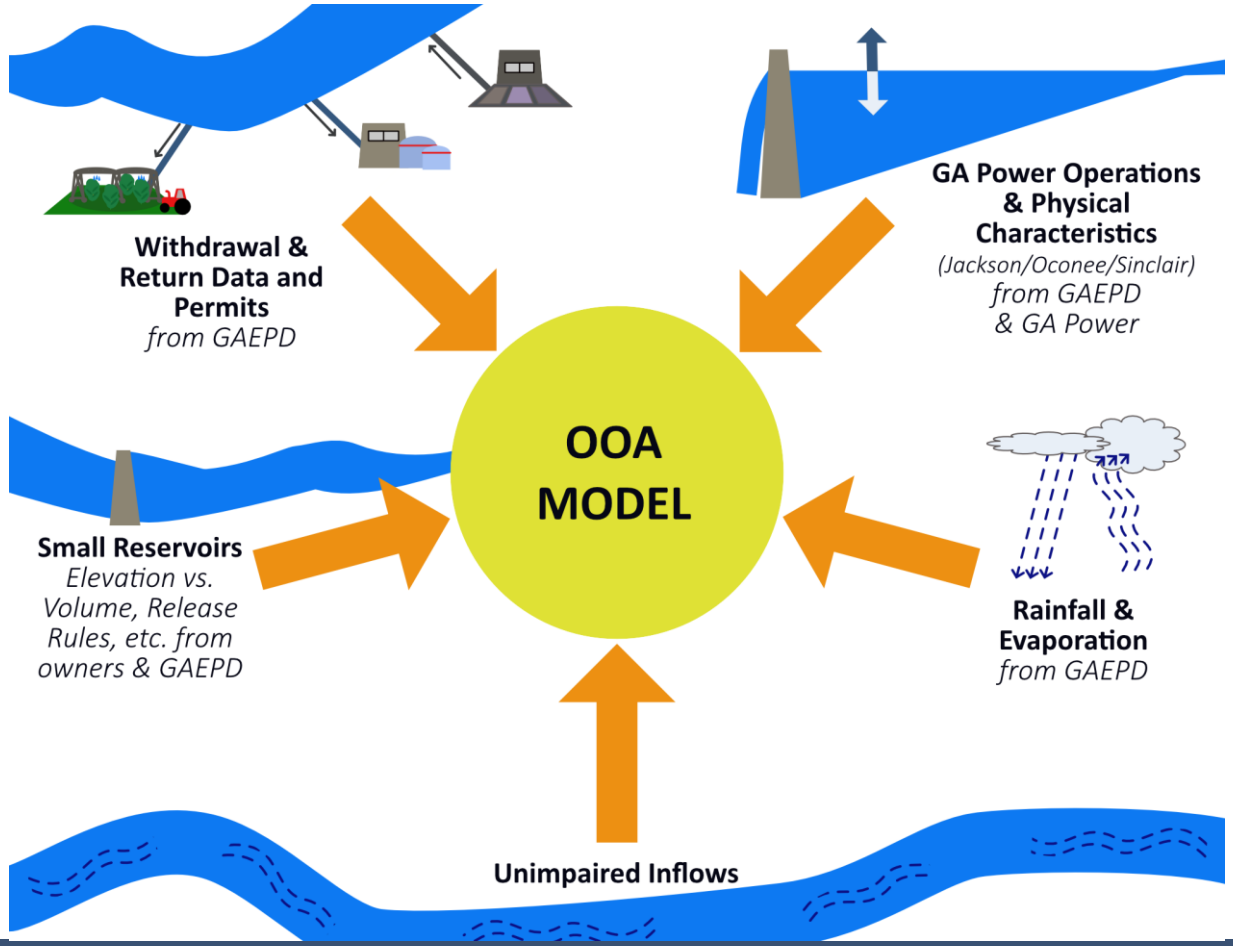
Permit Analyses



OOA BEAM Inputs

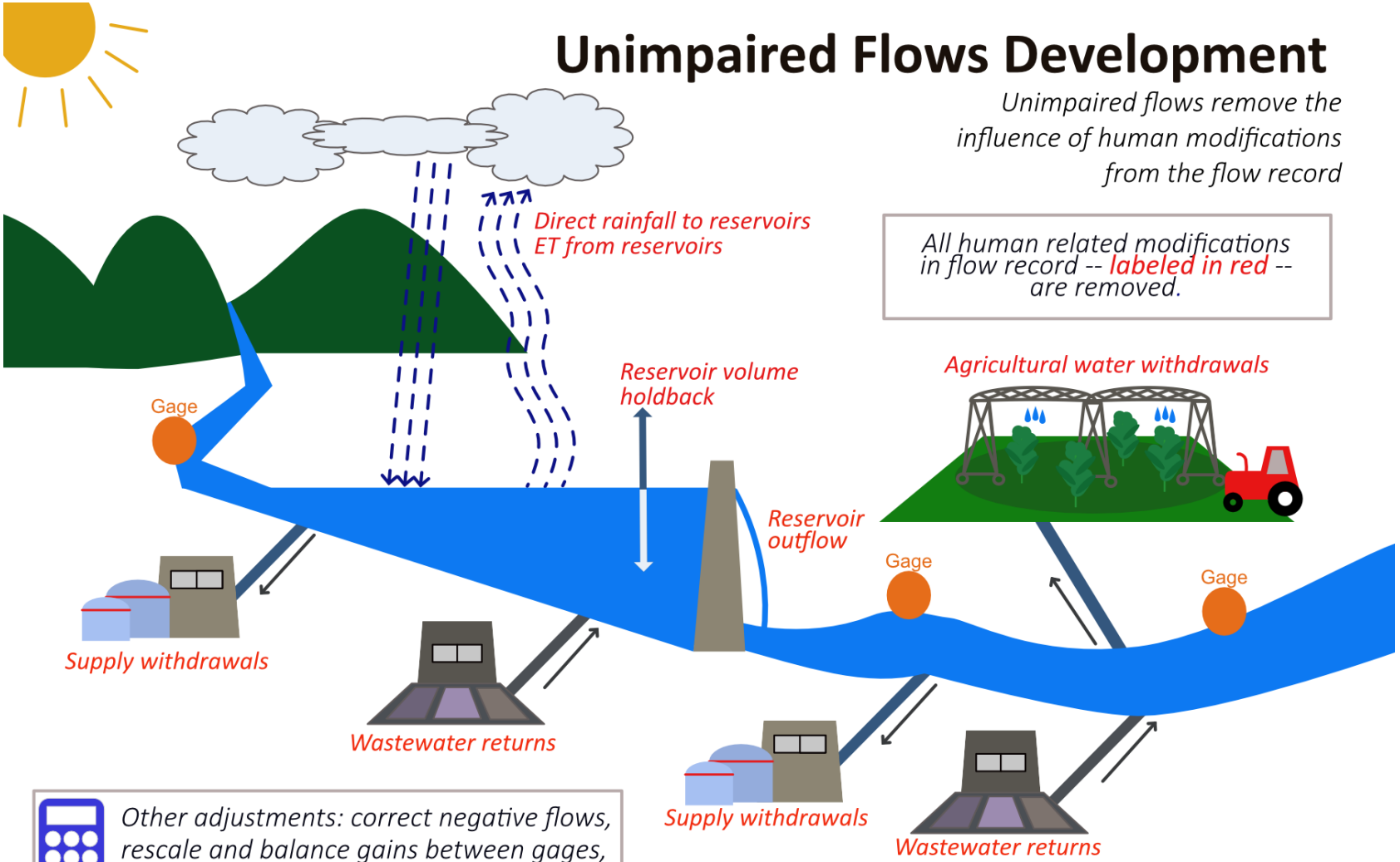
Time series, static data, and operations

Input Data Sources



Unimpaired Flows Development

Unimpaired flows remove the influence of human modifications from the flow record

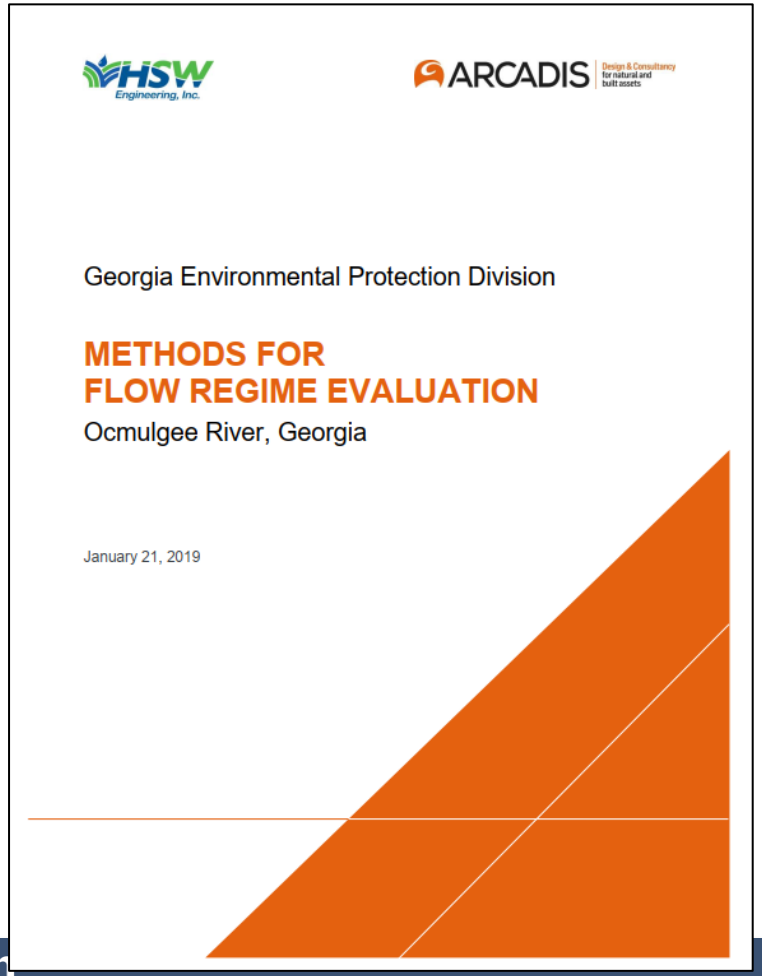


Performance Measures and Example Model Output

Performance Metrics for Today's Demonstration

- Water Supply
  - **Number of days per year that flow falls below the regulatory flow requirement at a wastewater discharge location**
  - **Daily volume of desired withdrawal that cannot be taken from the river because of low flows**
  - **Daily reservoir elevation (reservoir drawdown)**
  - **Percent of months with minimum elevation below a threshold**
- Ecological
  - **Average monthly area of available habitat suitable for specific species of fish**
  - **Percent of years with sufficient floodplain inundation during spawning season**
- Recreation
  - **Number of days per year with sufficient river water level for boating**
  - **Percent of days with elevation below a recreational threshold**
- Hydropower
  - **Average annual peak generation (energy generated during "peak" hours)**

Pilot Study on Ocmulgee River Identified Potential Metrics



River service	Service metric
Recreation (Paddling)	Paddling during low water conditions (Stage < 6 feet)
Recreation (Boating)	Paddling during low water conditions (Stage < 7.5 feet)
Instream aquatic habitat	AWS index (Shallow Fast, Shallow Slow, Deep Fast)
	Macon site habitat area (Bhattacharjee, 2017)
Instream bottom and channel-side habitat	Frequency of exceeding wetted perimeter threshold Wetted perimeter (feet)
Floodplain wetland habitat	Wetland inundation area (square miles) Frequency of exceeding floodplain inundation threshold

Ocmulgee Scenario: New Industrial Demand

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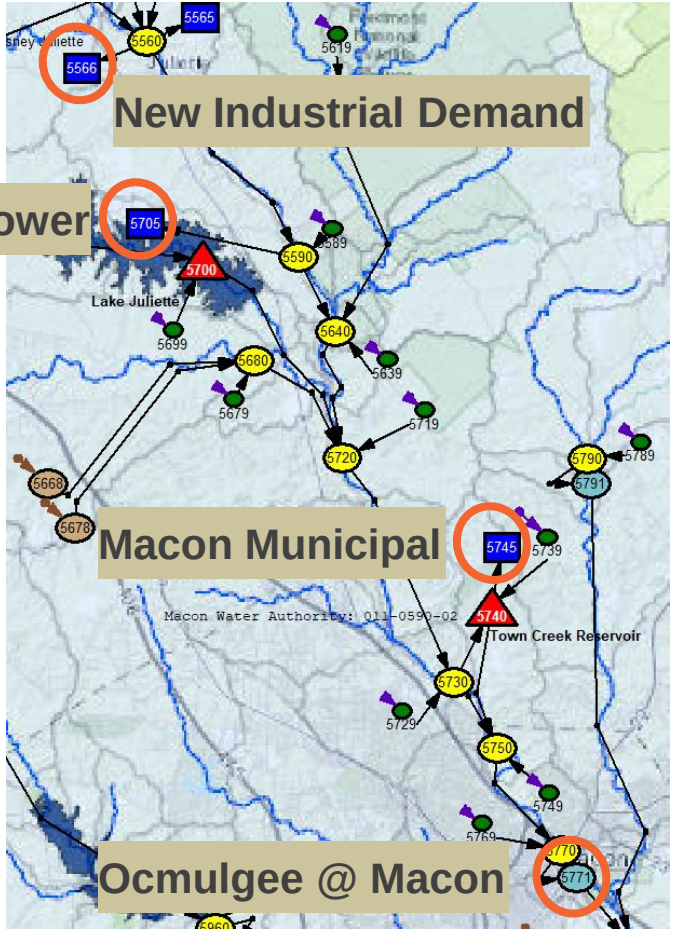
- What would happen if a large (50 mgd) new industrial demand was added at Juliette, GA?
- Performance Metrics for downstream impacts
  - **Impacts to downstream withdrawals**
    - *Volume of desired pumping that cannot be pumped from the river because of low flows*
    - *Daily reservoir levels at Town Creek Reservoir*
  - **Ocmulgee River at Macon PMs**
    - *Number of days per year with sufficient river level for boating*
    - *Instream Aquatic Habitat*
    - *Boating/Paddling*



Pumping to Lake Juliette May Be Impacted By New Demand

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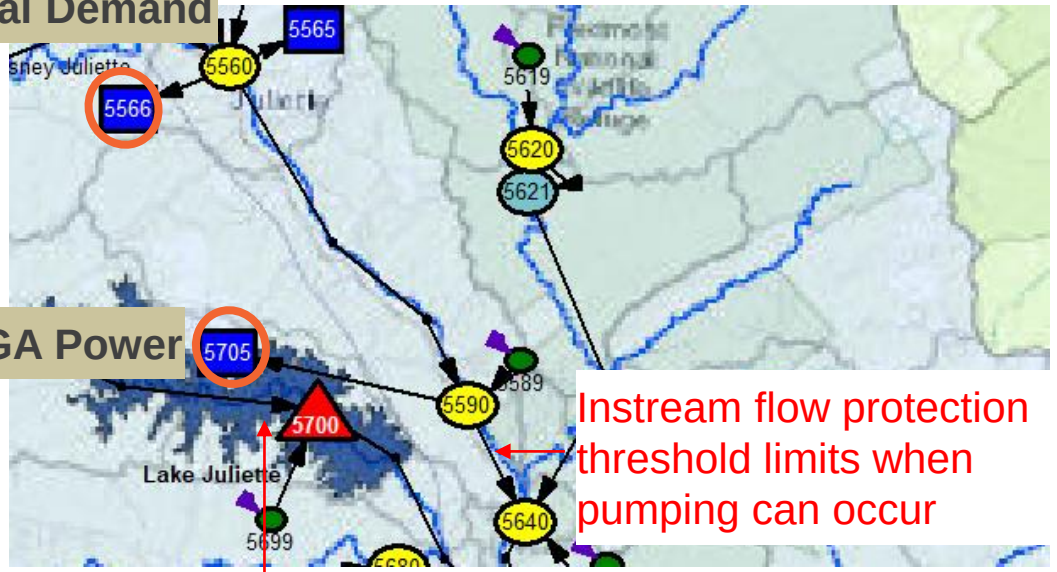
New Industrial Demand

GA Power



Instream flow protection threshold limits when pumping can occur

When the elevation at Lake Juliette falls below 428’, the instream flow protection threshold is reduced (from 931 cfs to 410 cfs)

Ocmulgee River Flow Downstream of Pumps to Lake Juliette

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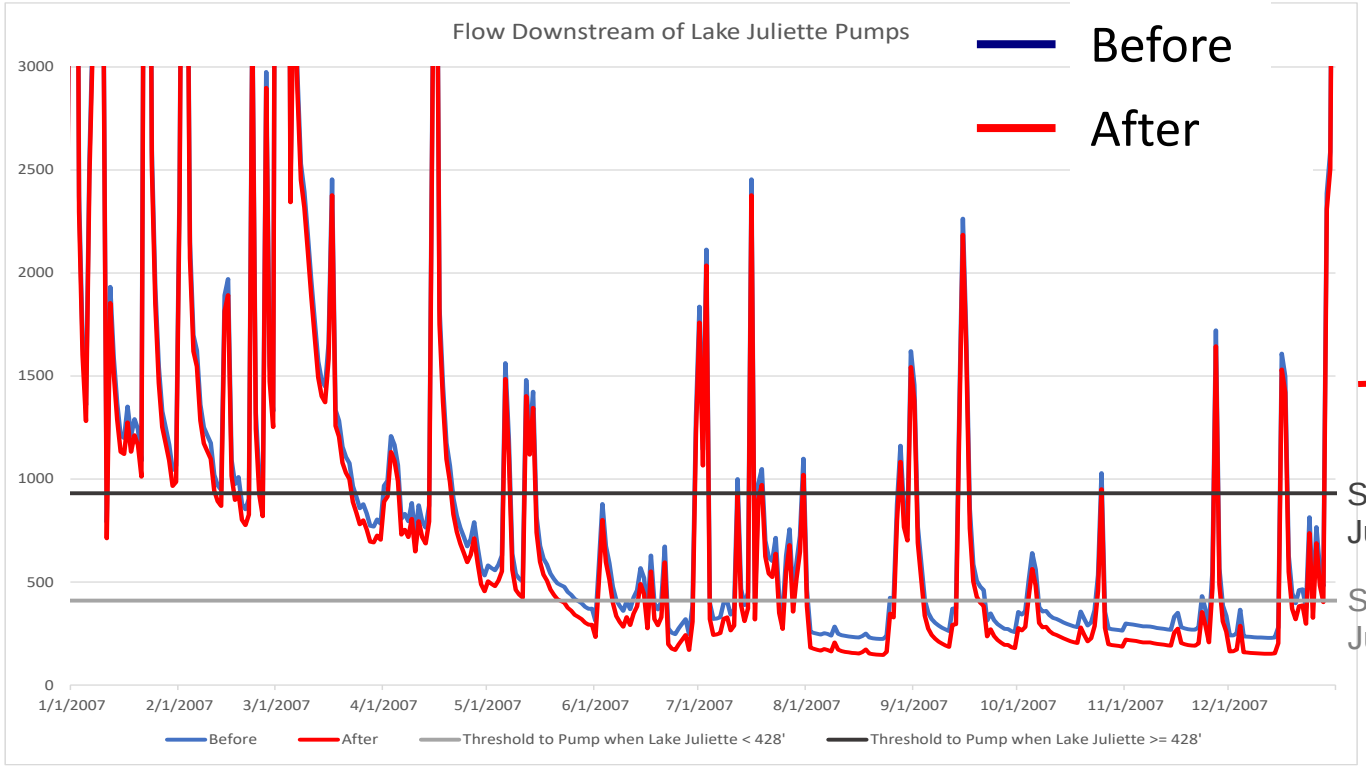

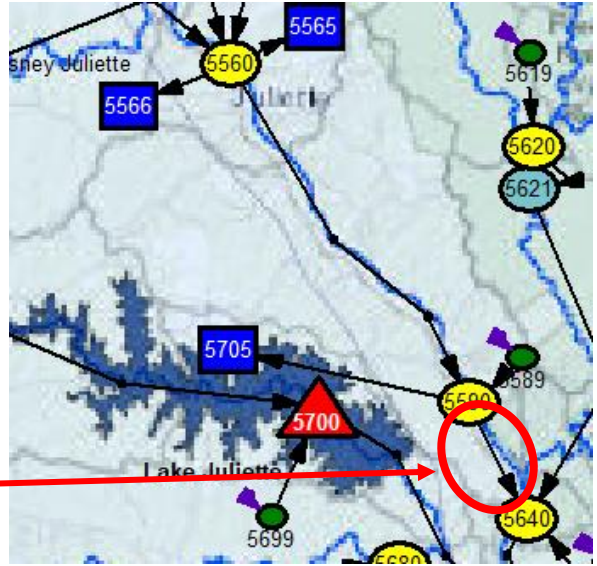

Streamflow threshold to pump when Lake Juliette >= 428’

Streamflow threshold to pump when Lake Juliette < 428’

Number of Days Each Year Ocmulgee River Flow Downstream of Pumps is Less than 931 CFS

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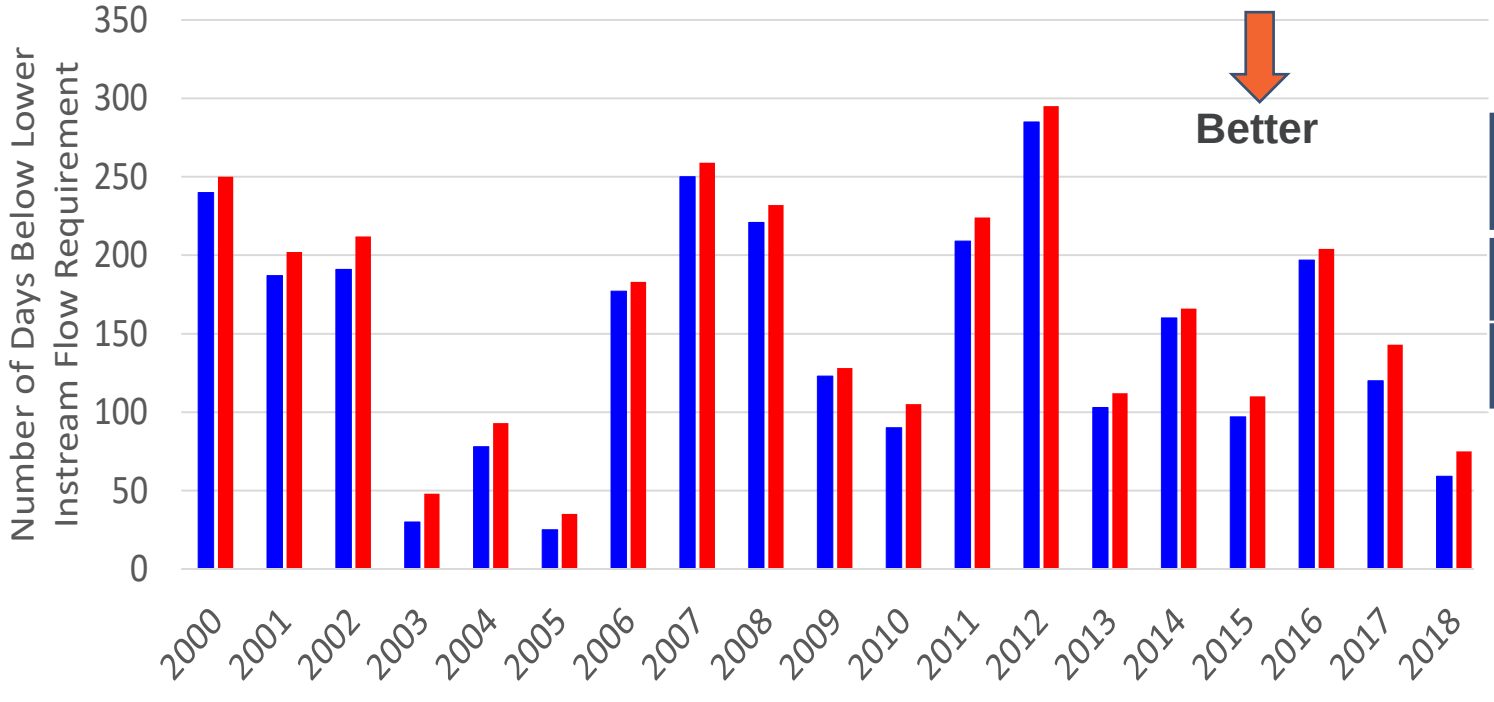

Days Below Threshold 2000-2018

	Number	Percent
Before	2842	41.0%
After	3076	44.3%

Before

After

Number of Days Each Year Ocmulgee River Flow Downstream of Pumps is Less than 410 CFS

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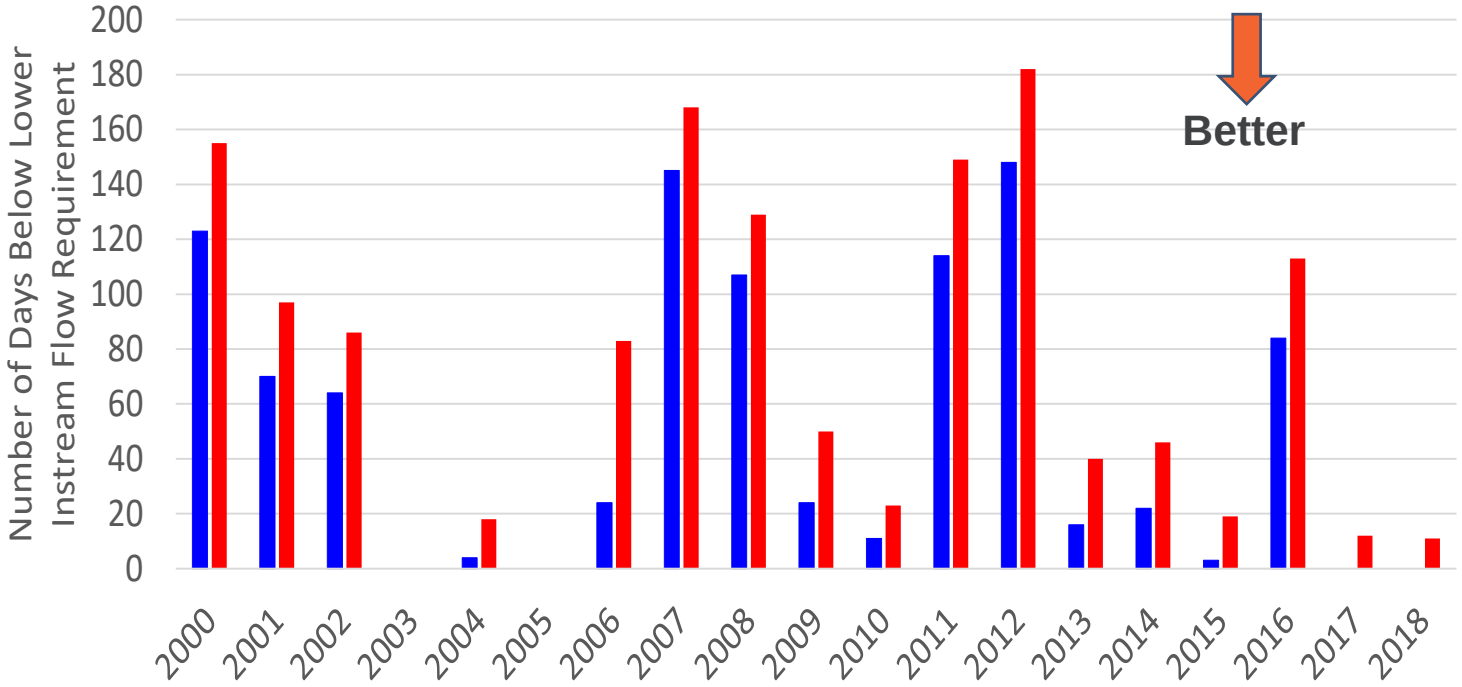

Days Below Threshold 2000-2018

	Number	Percent
Before	959	13.8%
After	1381	19.9%

Before

After

Pumping to Town Creek Reservoir May Be Impacted By New Demand

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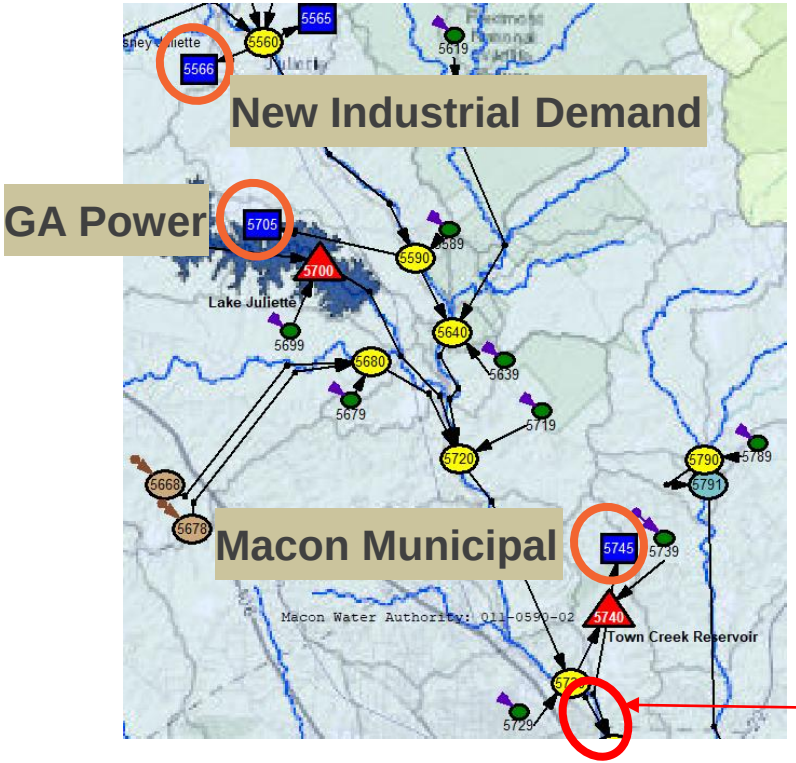

Instream flow protection permit allows up to 35 MGD to be pumped any day (regardless of flows)

Ocmulgee Scenario: No Impacts to Town Creek Reservoir

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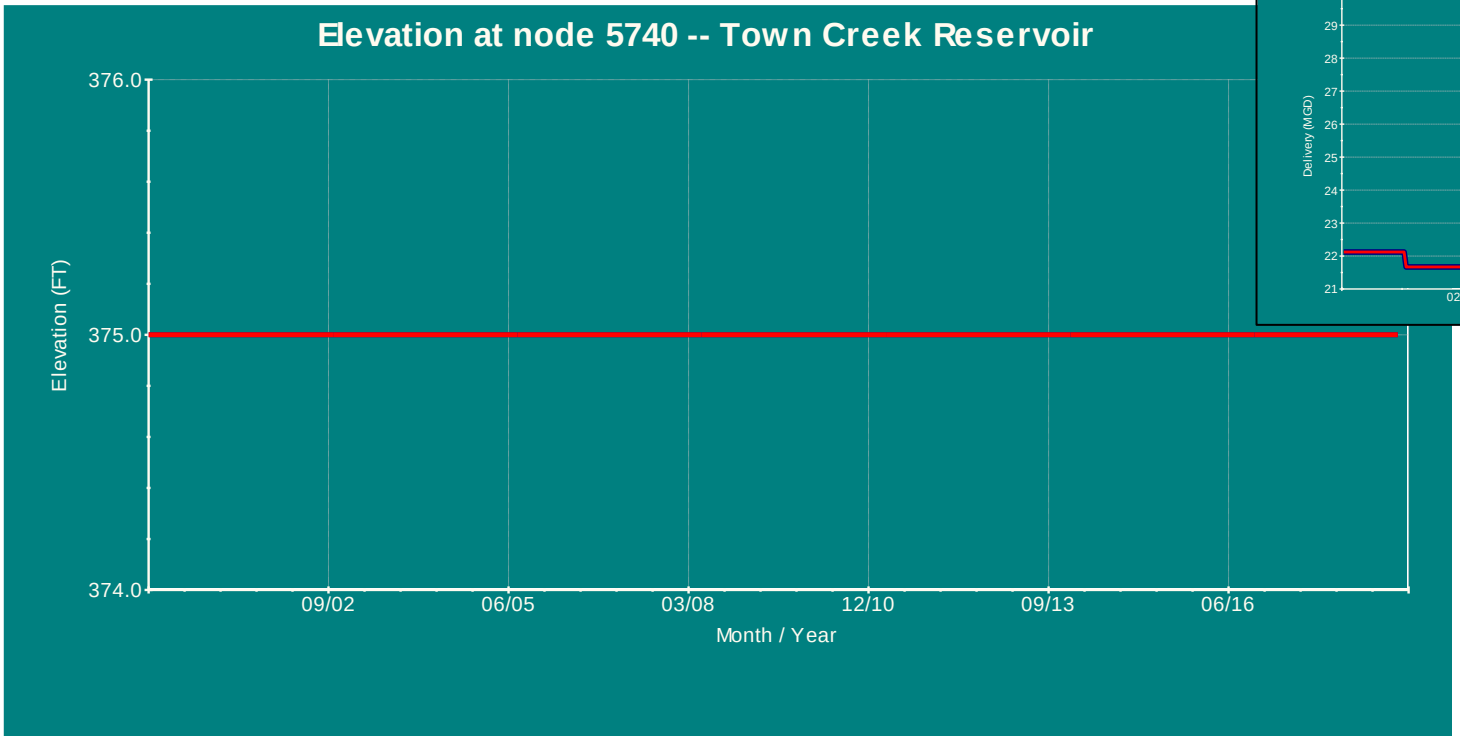

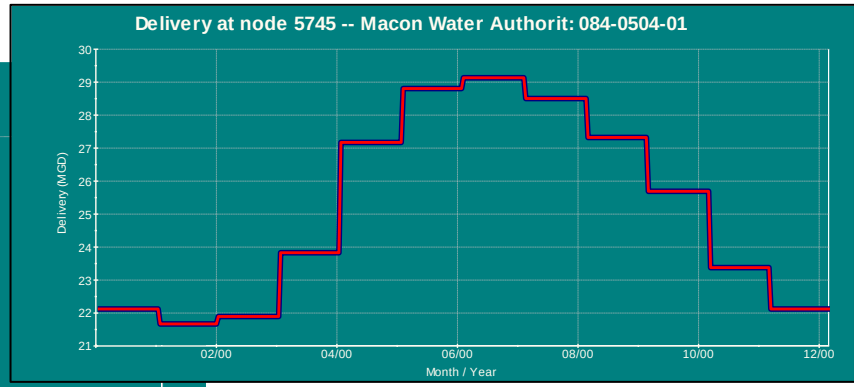

Before

After

- Pumping to reservoir is exempt from instream flow protection threshold if pumping is below 35 mgd

Using Flow to Create Boating/Paddling Performance Metric

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- Convert stream flow to stage

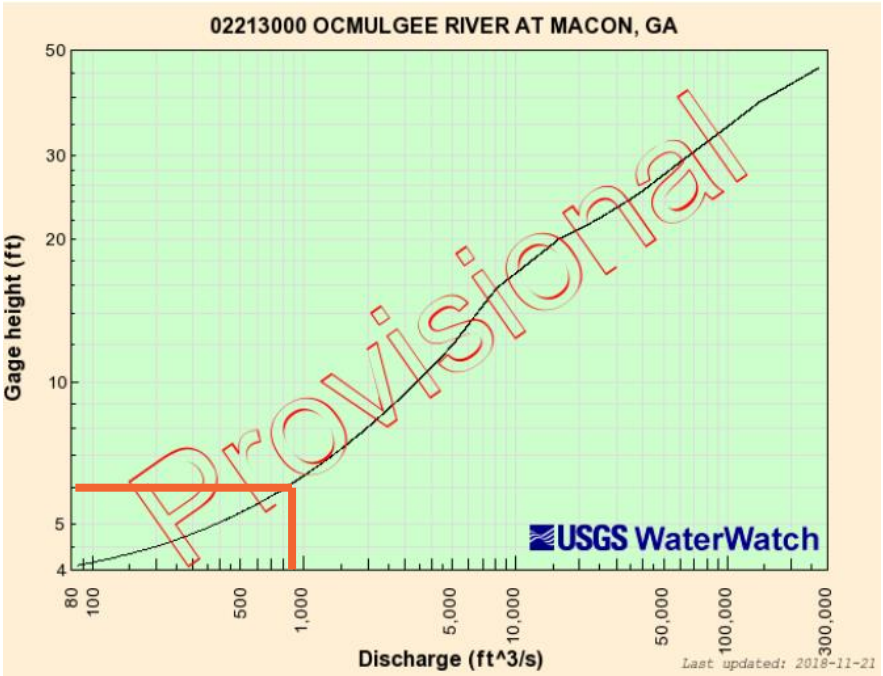

Table 11. Low-flow metrics for Ocmulgee River recreational boating

River Service	Metric	Source
Kayaking/canoeing	Amount of time that kayaking or canoeing is not ideal (i.e., gage height ≤ 6.0 feet) due to low water conditions	Personal communication with Kathleen O' Neal (Ocmulgee Outdoor Expeditions)
Boating	Amount of time that boating is not ideal (i.e., gage height ≤ 7.5 feet) due to low water conditions	Viable stage for kayaking/canoeing + 1.5 feet (average shaft length of short- and long-shaft small engines); (Iboats, 2009)

Performance Metric at Macon, GA for Boating

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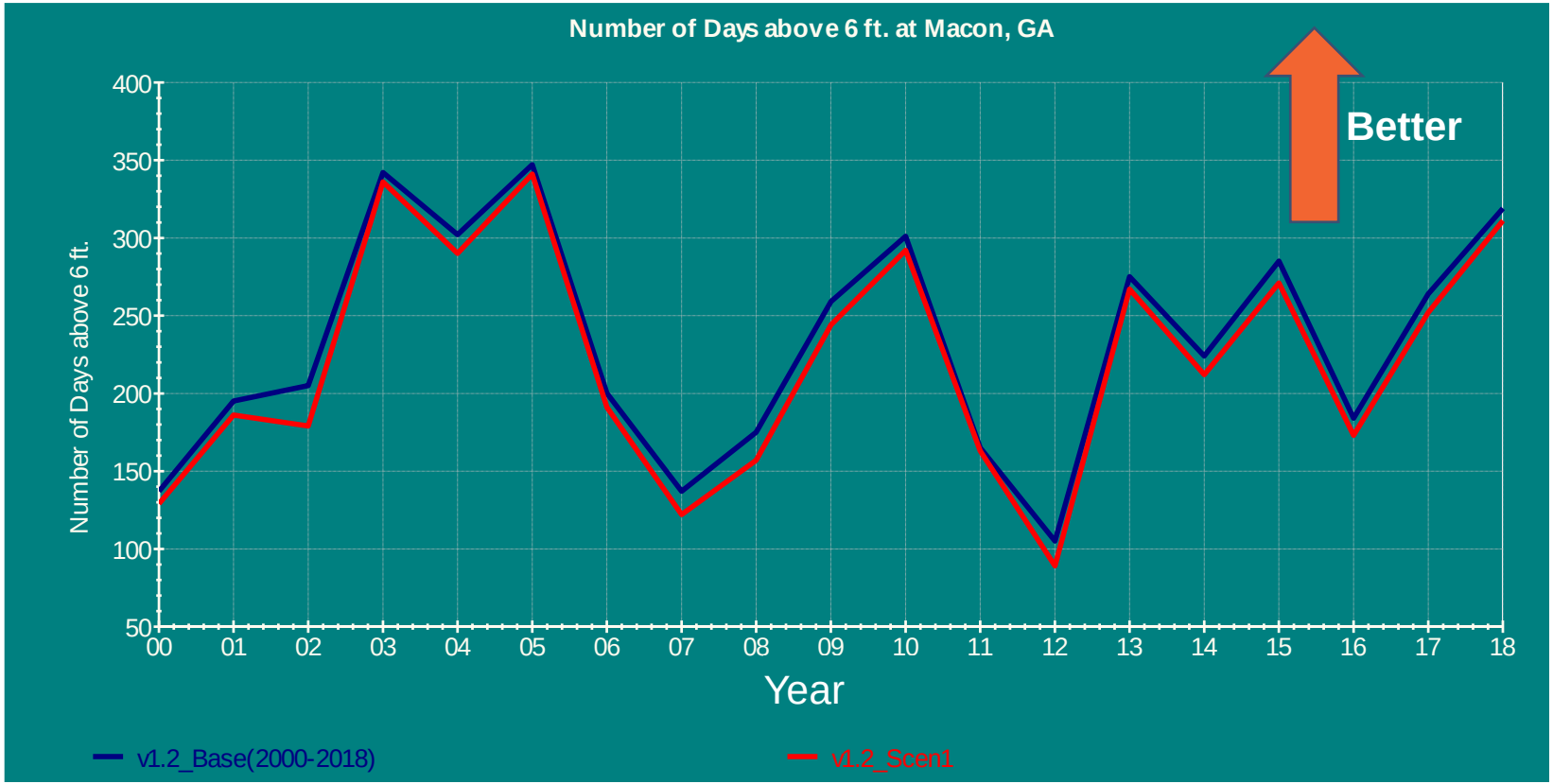


Before

After

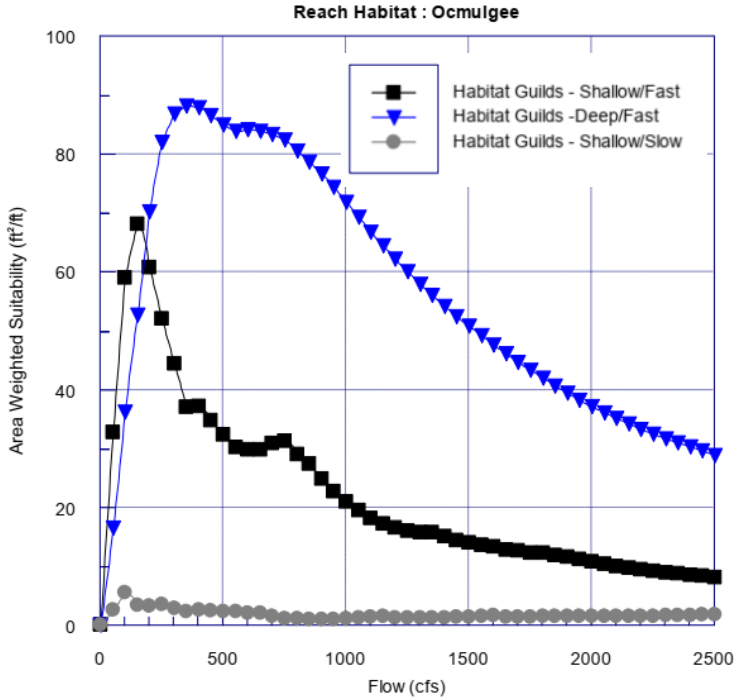
Reach Habitat

- Shallow/Fast
  - **Species: Spottail Shiner and Bluehead Chub**

https://www.inaturalist.org/guide_taxa/490641
https://en.wikipedia.org/wiki/Spottail_shiner

- Deep/Fast
  - **Species: Largemouth Bass**

https://www.fws.gov/fisheries/freshwater-fish-of-america/largemouth_bass.html



Ocmulgee Scenario: Performance Metrics at Macon, GA

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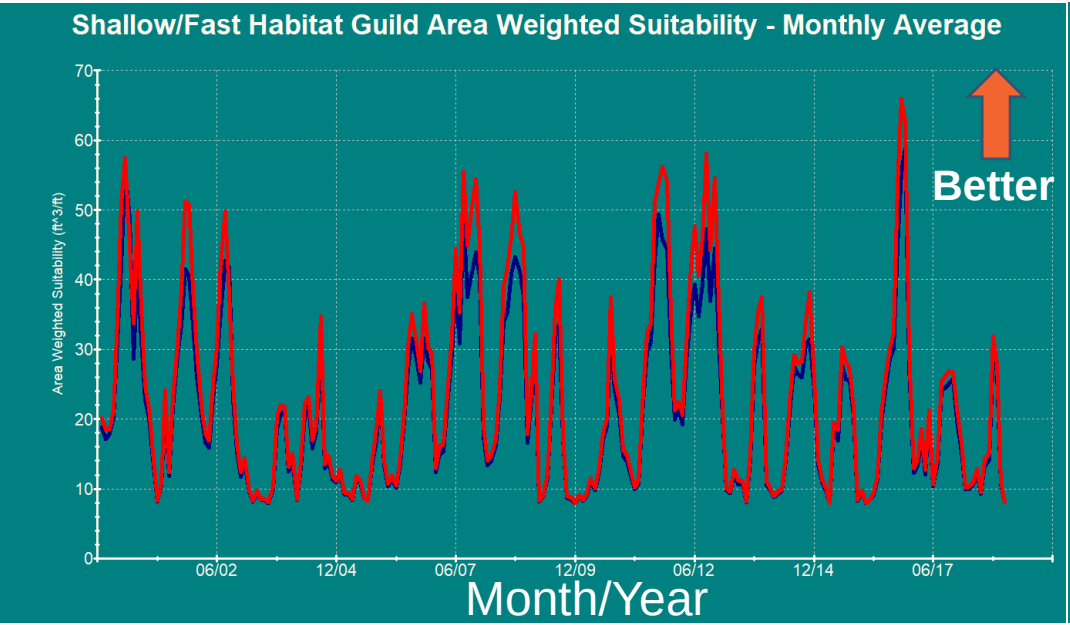

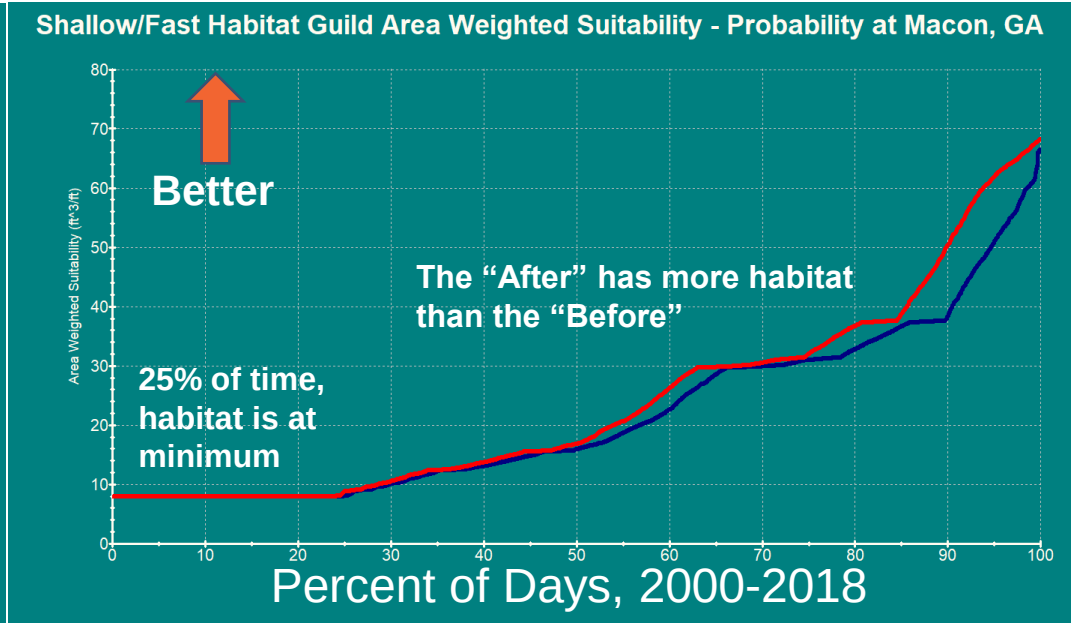

Before

After

https://en.wikipedia.org/wiki/Spottail_shiner#/media/File:Notropis_hudsonius.jpg
https://www.inaturalist.org/guide_taxa/490641

Ocmulgee Scenario: Performance Metrics at Macon, GA

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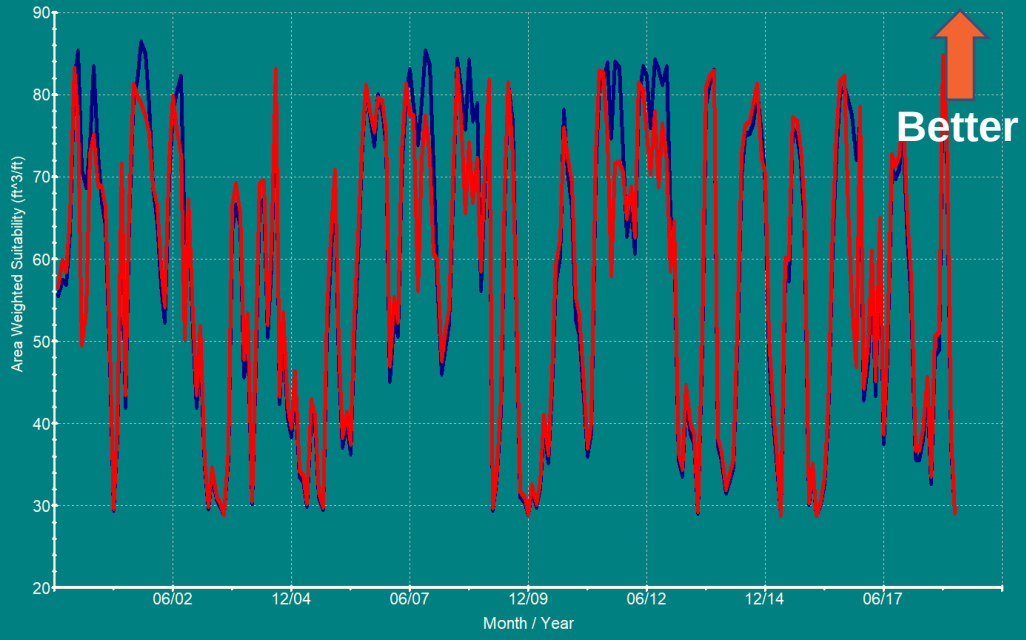
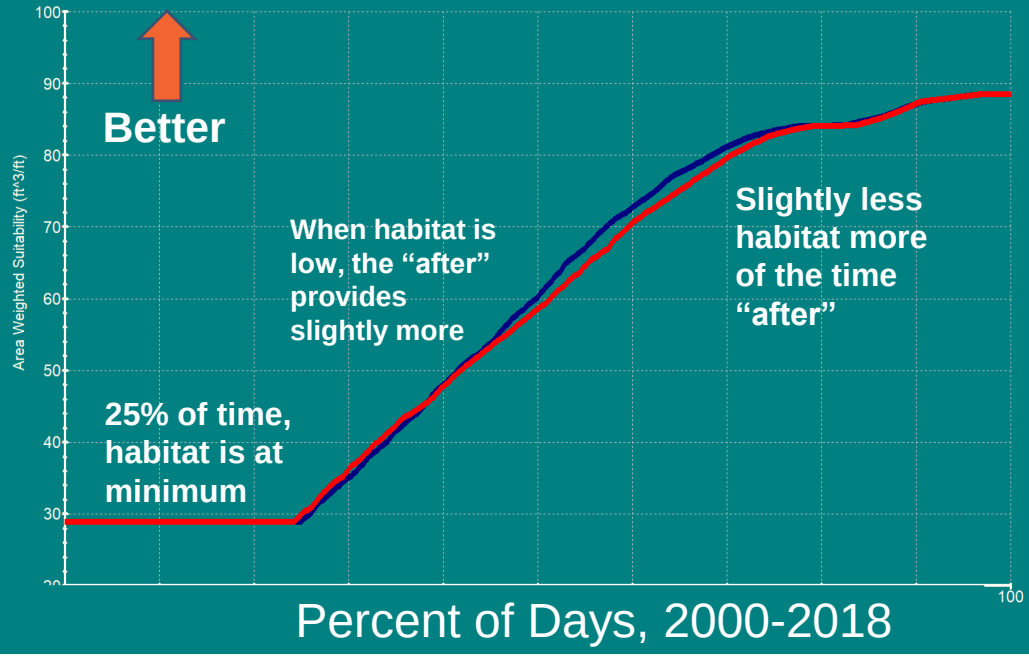
Deep/Fast Habitat Guild Area Weighted Suitability - Monthly Average



Deep/Fast Habitat Guild Area Weighted Suitability - Probability at Macon, GA



Before

After

Questions for the Council and for EPD

- What additional performance measures does the Council want to see/use in planning?
- What other environmental/ecological information would the Council want to consider?
- Questions for EPD?

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