

Freshwater Inflow modeling under the ABSI project

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Introduction

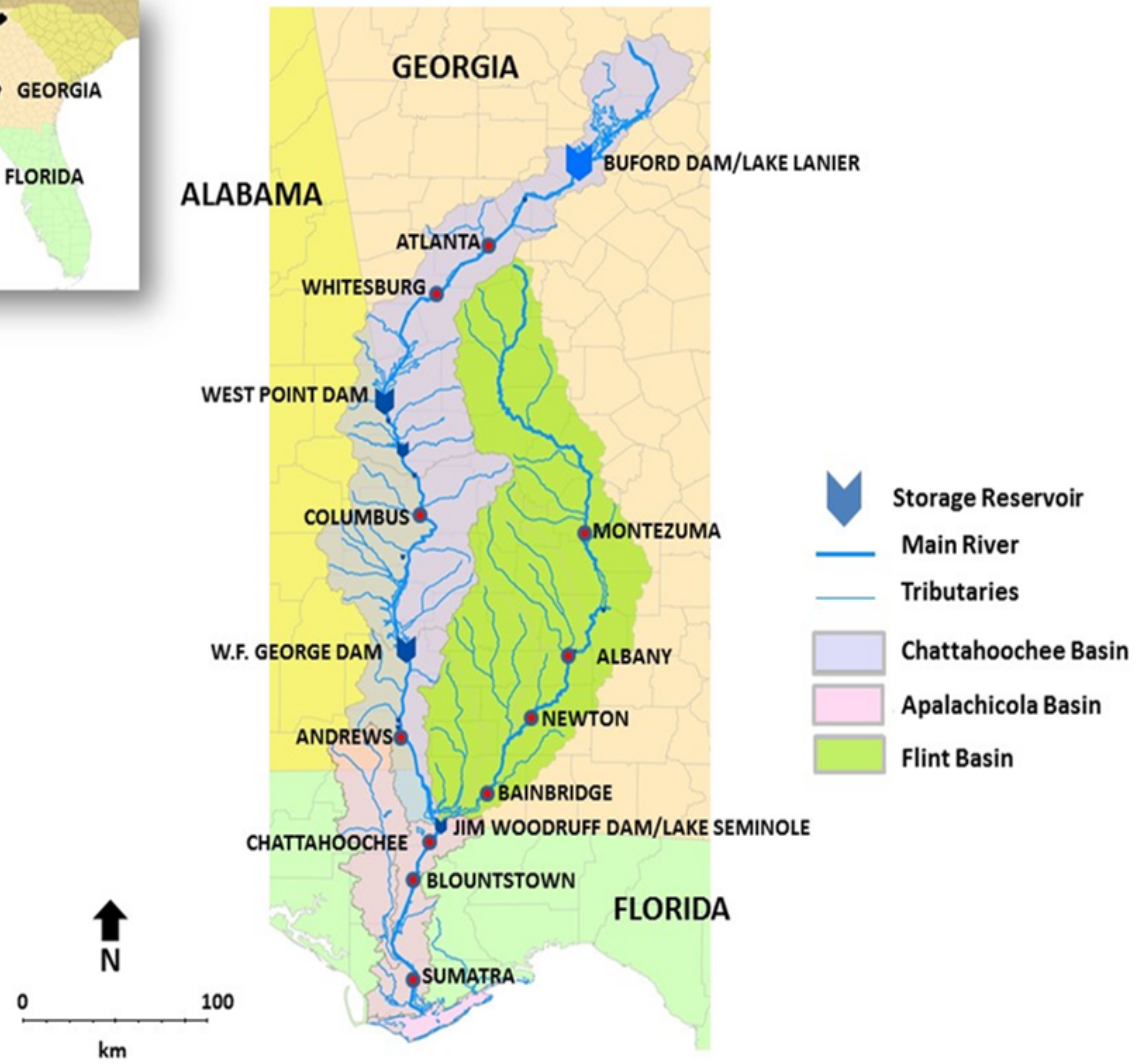
- On September 29, 2020 a zoom call was held with some members of the CAB to explain the freshwater inflow modeling work being done under ABSI.
- This call focused on:
 - Why freshwater inflow modeling is being done as part of the ABSI project.
 - The capacity of the reservoir system in the ACF basin to manage flow entering the Apalachicola River at Jim Woodruff Dam.
 - The freshwater inflow model being used, why this model was selected and what questions can be addressed through this model.
 - How will better and worse water supply and demand management approaches be defined through the freshwater inflow modeling.
 - Soliciting questions CAB members would like to see addressed regarding freshwater inflow.

Introduction

- A recording of this call and power point presented is available in the ABSI web page under the following URL:
<https://marinelab.fsu.edu/absi/research/biophysical-models/leitman/>
- Instead of repeating this talk, I would like to focus this presentation on the role I would like the CAB to play in the freshwater inflow modeling and encourage people to listen to the recording of the previous talk. If anyone has any questions on this presentation you may call me at 850-363-5823 or email me at sfleitman20@gmail.com to address any questions.

QUESTIONS RELATED TO FRESHWATER INFLOW TO APALACHICOLA BAY

- An important part of my role in the ABSI project is to allow for researchers and the CAB to have a good understanding of the relationship between the Apalachicola-Chattahoochee-Flint watershed and freshwater inflow to the Apalachicola estuary.
- It has been my observation that many people have mistaken assumptions about this relationship.



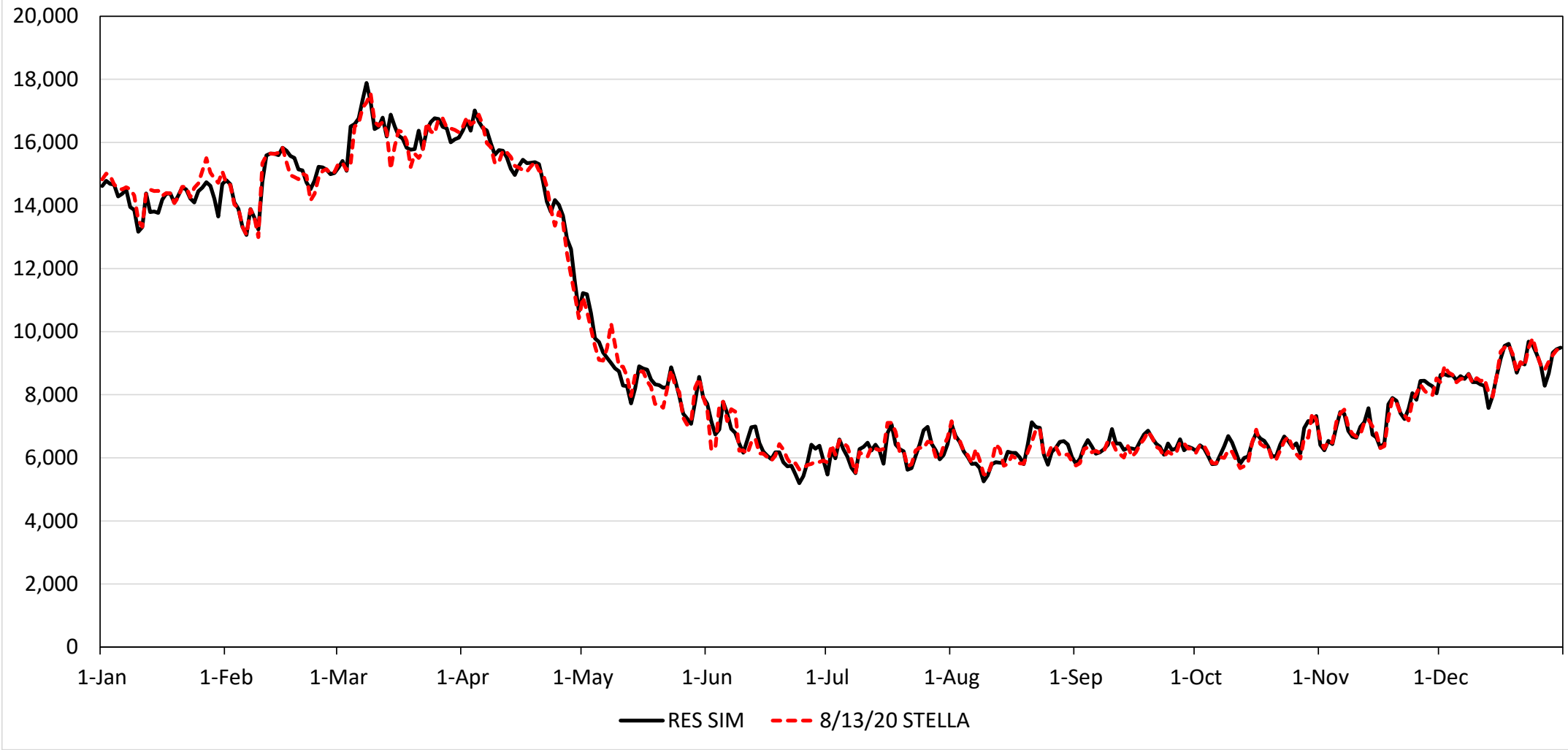
QUESTIONS RELATED TO FRESHWATER INFLOW TO APALACHICOLA BAY

- Through use of the ACF STELLA model I have the capacity to change consumptive demands, reservoir management and climate and then determine how any changes to any of them will affect flow entering the Apalachicola River from Alabama and Georgia. As the following slides show, the ACF STELLA model has been shown to produce similar results to the Corps of Engineers' HEC ResSim model when the same approach to managing the federal reservoirs and the same level of consumptive demands are used in both models with historical climate.

JW OUTFLOW MEDIUM



JW OUTFLOW 90% exceeded



QUESTIONS RELATED TO FRESHWATER INFLOW TO APALACHICOLA BAY

- Some examples of questions which can be addressed through the STELLA model include:
 - What would happen if agricultural demands in the Flint basin doubled? If they were cut in half?
 - What would happen if Metro Atlanta's demands doubled or were cut in half?
 - What would happen to freshwater inflow to the estuary if there were a three-year drought? A four-year drought?

QUESTIONS RELATED TO FRESHWATER INFLOW TO APALACHICOLA BAY

- What would happen to the storage reservoirs if the minimum flow entering Florida was increased from 5,000 cfs to 6,000 cfs? From 5,000 cfs to 7,000 cfs?
- What are the limits of the reservoir system to provide summer freshets during a drought?
- Again, I encourage all members of the CAB to submit to me any questions they would like to see addressed regarding freshwater inflow to the Apalachicola estuary.

HOW DO WE DEFINE WHAT IS ACCEPTABLE?

- Once I have done a model run and defined the volume of water which will be entering the Apalachicola river and estuary, an important question is: So what?
- How should ABSI define better in terms of the sustainability and productivity of the Apalachicola estuary in general and oysters in specific with regards to freshwater inflow?
- Within the model I have the capacity to modify climate, water consumption and water management, but what changes make things better and what changes make things worse?

HOW DO WE DEFINE WHAT IS ACCEPTABLE?

- One example we can draw on with regard to defining acceptable is the “metrics” used by the U.S. Fish and Wildlife Service (USFWS) in preparing the Biological Opinion for the Water Control Manual for managing the Federal reservoirs in the ACF basin.
- Because of the authority invested in the USFWS, their focus was on protecting Federally listed species, specifically the gulf sturgeon and several species of mussels.

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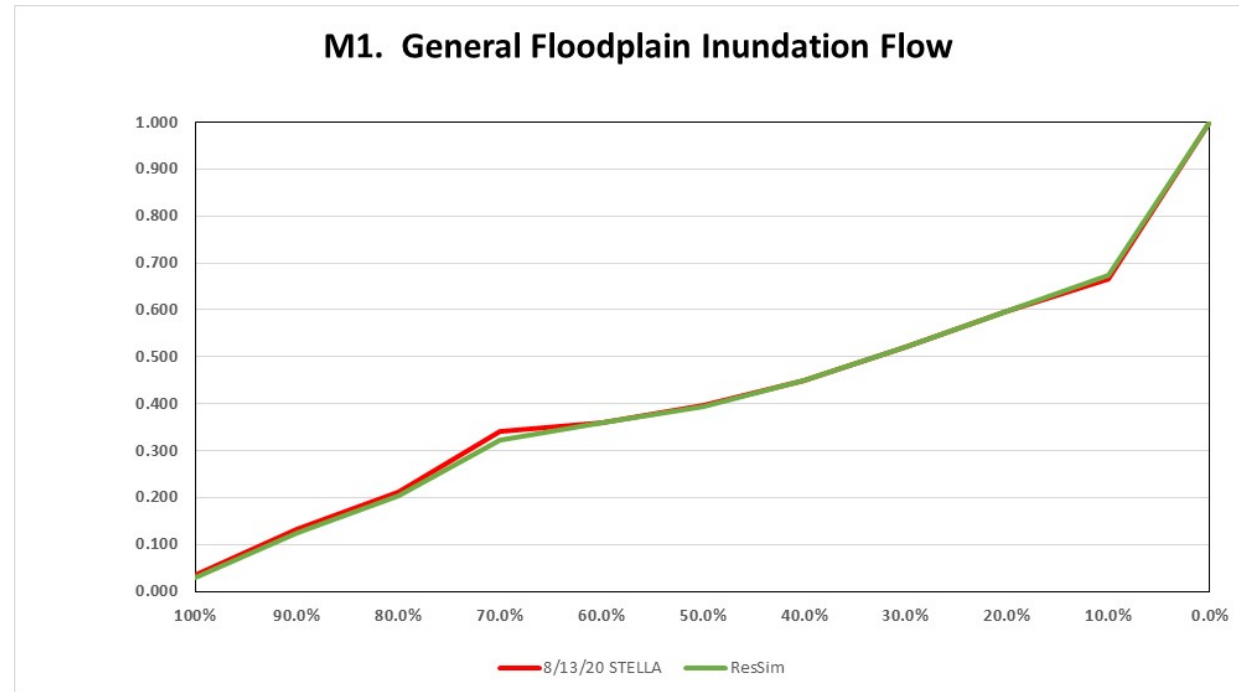
An example of metrics from US Fish and Wildlife Biological Opinion for the Water Control Manual.

Freshwater Mussel Hydro-ecological Metric 1 - Access to Floodplain for Spawning and Rearing of Host Fish

Metric Description: To evaluate the potential effects of the proposed action on the ability of adult host fish to access the floodplain for spawning and juvenile host fish to hatch and mature in the floodplain, this metric calculates the number of days between March 1 and November 24 exhibiting flows >16,200 cfs.

This metric was used by Dutterer et al. (2012) in a study of fish recruitment and floodplain inundation in the Apalachicola River. March represents the onset of spawning for stream fish in the Apalachicola River (Pine et al. 2006, Walsh et al. 2009, Burgess et al. 2013). At 16,200 cfs, approximately 10% of the available floodplain is inundated (Light et al. 1998).

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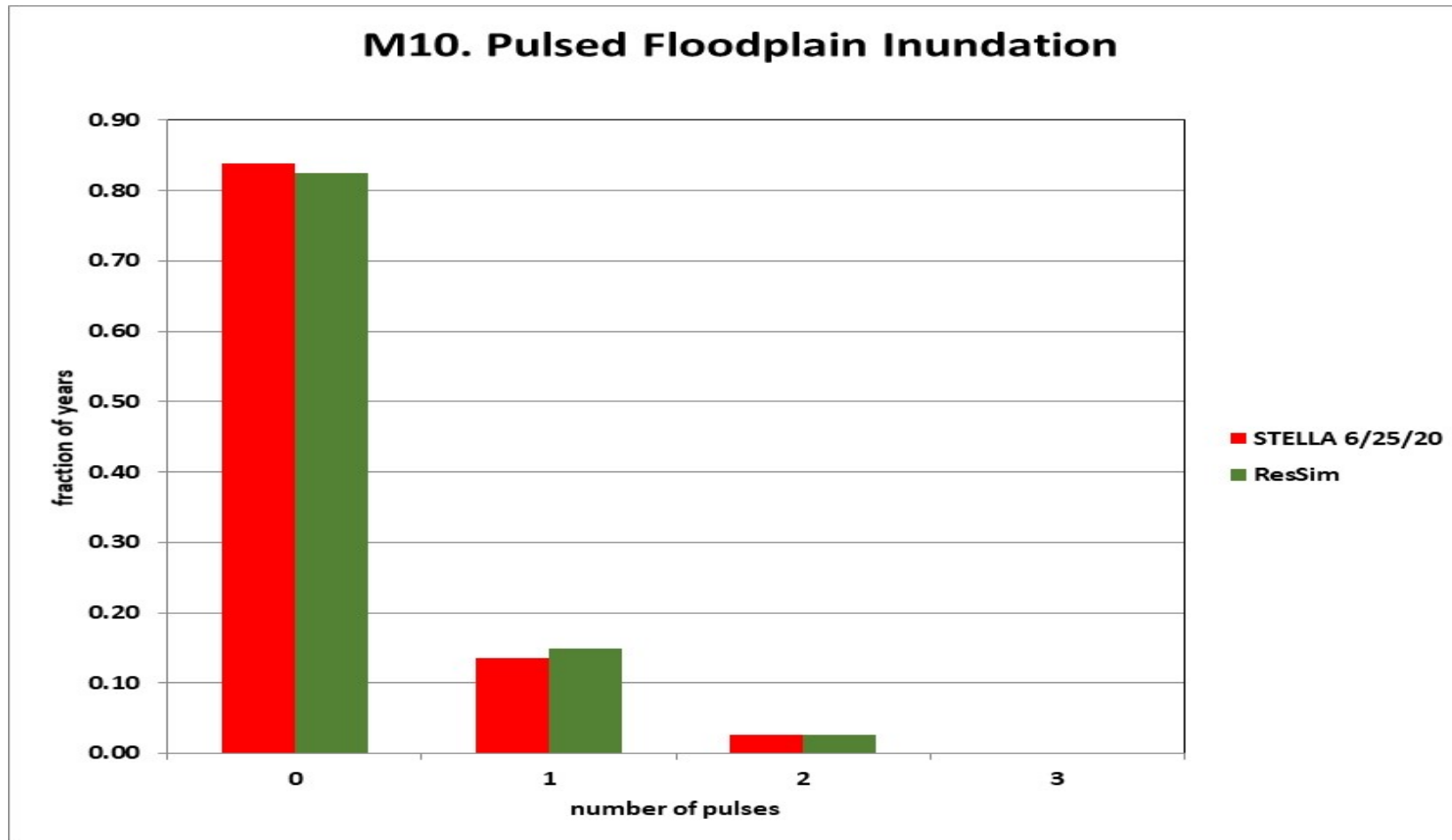
HOW DO WE DEFINE WHAT IS ACCEPTABLE?

Freshwater Mussel Hydro-ecological Metric 10- Pulsed Floodplain Inundation during Summer-Fall

Metric Description: To evaluate the potential effects of the proposed action on the contribution of the floodplain to nutrients for food production for mussel growth and fecundity, the metric calculates the total number of floodplain pulse episodes between July 15 and November 24.

This metric emphasizes the role of floodplain inundation pulses during the mid- to late- growing season after mussel drop, rather than focus singularly on the amount of time the floodplain is inundated. A flood pulse is a discrete discharge episode with flows continuously $\geq 16,200$ cfs for a period of at least 15 or 30 of days, followed by a period of flows

HOW DO WE DEFINE WHAT IS ACCEPTABLE?



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- The development of metrics for the Apalachicola estuary will depend upon the work being done by both Dr. Morey on the estuarine circulation and Dr. Camp's ecological modeling. Estuarine metrics should be based on their work as well as previous work.
- As specific metrics are developed I would suggest a similar outline to that used by the USFWS in their Biologic Opinion which both explains what the metric is, the source of logic behind the metric including research citations and a graphical display of how different management, consumptive demands and climate scenarios effect the metric.
- The selection of metrics will be coordinated with the CAB.