Freshwater Inflow modeling for ABSI

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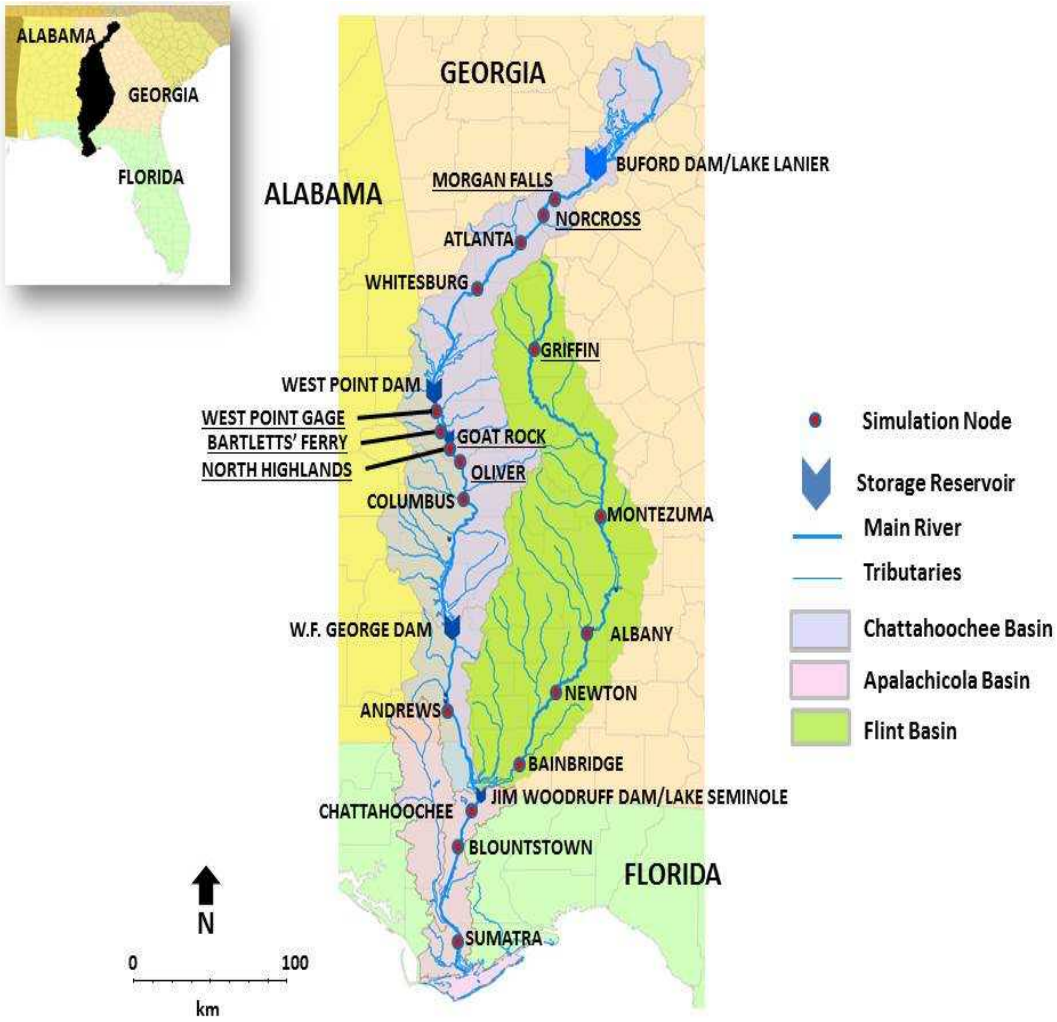
MODEL BASICS

- My role in the ABSI project is with the modeling of freshwater inflow into the Apalachicola River/estuary.
- The intent is for the freshwater inflow modeling to serve as input to the distributatry, estuarine and ecological modeling.

MODEL BASICS

- Freshwater inflow, hence climate, is factored into the model via an unimpaired flow set developed by the states of Alabama, Florida and Georgia and the U.S. Army Corps of Engineers and extends from 1939 to 2012.
- The base reservoir operating system in the model is the Water Control Manual.
- The current volume of consumptive demands is also included in the model.
- We have the capacity within the model to modify reservoir operations, consumptive withdrawals and basin inflow on a reach-by-reach basis.


ALABAMA
GEORGIA
FLORIDA
GEORGIA
ALABAMA
FLORIDA
BUFORD DAM/LAKE LANIER
MORGAN FALLS
NORCROSS
ATLANTA
WHITESBURG
GRIFFIN
WEST POINT DAM
WEST POINT GAGE
BARTLETTS' FERRY
NORTH HIGHLANDS
GOAT ROCK
OLIVER
COLUMBUS
MONTEZUMA
W.F. GEORGE DAM
ALBANY
NEWTON
ANDREWS
BAINBRIDGE
JIM WOODRUFF DAM/LAKE SEMINOLE
CHATTAHOOCHEE
BLOUNTSTOWN
SUMATRA
N
0
100
km
Simulation Node
Storage Reservoir
Main River
Tributaries
Chattahoochee Basin
Apalachicola Basin
Flint Basin

MODEL BASICS

- To utilize the model one needs to provide a detailed approach to managing the ACF reservoirs, a specific set of basin water inflow data on a reach-by-reach basis and a specified volume of consumptive demands on a reach-by-reach basis.
- The model runs for a 74-year time period extending from 1939 – 2012 and the output tells you what the resultant Jim Woodruff outflow will be for 74 different annual hydrographs as well as at all of the other nodes in the previous diagram.

MODEL BASICS

- Within the model there is an ability to insert alternative climates which can include events which are more extreme than those developed in the historic record (e.g. more extreme droughts and more extreme floods).
- With this feature I am able to extend what the outflow from the model would be for over 800 different annual flow regimes.

Performance metrics

- The output from the model provides river flow at many locations in the watershed and reservoir elevations at the principal federal reservoirs.
- A major question with regard to model output is what does more or less flow mean for the ecosystems of the Apalachicola River and estuary. Simply saying that you will get more water or less does not tell us enough.
- We need to understand the relationship between flow and the ecosystem components we are trying to sustain and support.

Performance metrics

- For example, if it is determined that there is a need is to provide a freshet to the estuary in a period of extreme low flows, we need to know how much water, for how long and when it needs to be provided to make a difference with oyster survival and enhancement. When all of the parameters needed to define a freshet are provided, then the model can then define what is possible under the management capacity and restraints in the ACF basin in multiple climate conditions.

Performance metrics

- The catch is that for some of the metrics, we simply do not know enough to do good job defining the metric.
- In this case we need to do the best we can in the present and then to set up a research programs to better define the metric.

Performance metrics

- We are presently in the midst of developing an initial set of metrics for both the river and estuary.
- An example of a riverine metric would be timing, duration and extent of inundation of the Apalachicola River floodplain. This metric would relate to tupelo swamps, fish spawning, mussels and other factors and the specifics of the metric could be different for each.
- An example of an estuarine metric would be frequency, duration and timing of lower flows entering the Apalachicola estuary. As the work being done under ABSI and FWC progresses, additional metrics to define better management will be developed.