

Edisto River Basin Council

Meeting #8 (Virtual)

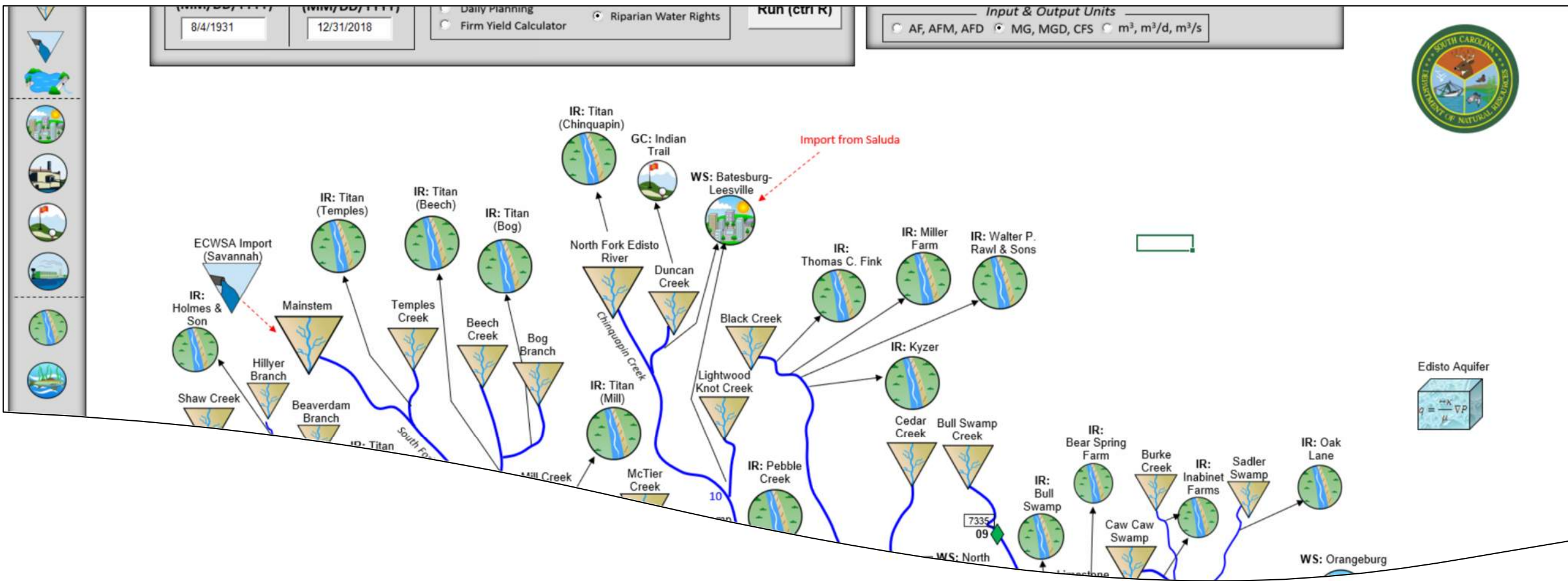
December 9th, 2020

Agenda

Meeting Objectives:

- 1) Surface Water Model Overview
- 2) Groundwater Model Overview
- 3) Environmental Flows Study Introduction
- 4) RBC Discussion

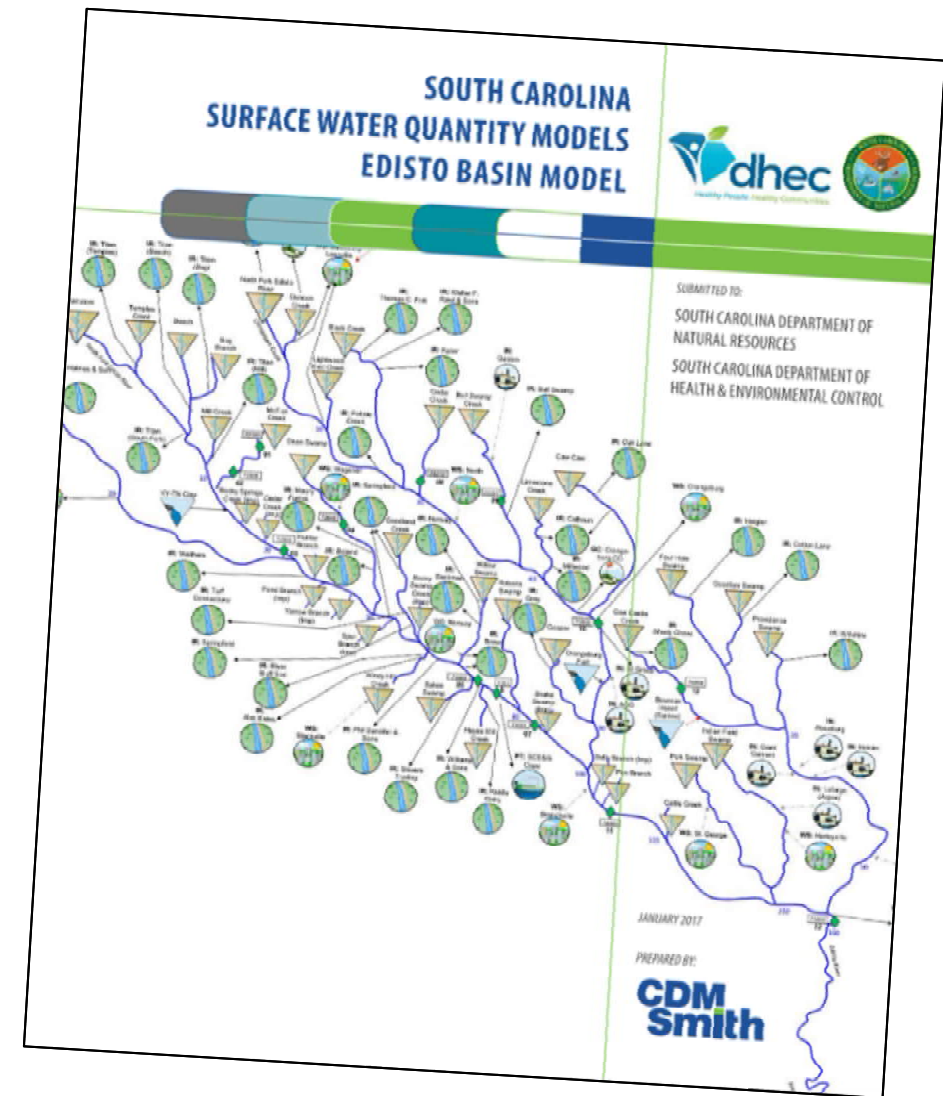
1. Call the Meeting to Order (John Boyer, Facilitator) 9:00–9:05
 - a. Review of Meeting Objectives
 - b. Approval of Agenda
 - c. Approval of November 18th Minutes and Summary
2. Public Comment (John Boyer) 9:05-9:10
 - a. Public Comment Period¹
3. Surface Water Model Overview and Q & A (John Boyer, CDM Smith) 9:10-9:50
4. Groundwater Model Overview and Q & A (Bruce Campbell, USGS (Retired)) 9:50-10:30
5. Environmental Flows Study Introduction and Q & A (Eric Krueger, The Nature Conservancy) 10:30-10:50
- *Break* 10:50-11:05
6. Edisto RBC Member Vision Statement and Goals for the Edisto Basin (John Boyer & Planning Team) 11:05-11:55
7. Meeting Conclusion (John Boyer) 11:55-12:00



Overview of the Edisto Basin Surface Water Quantity Model

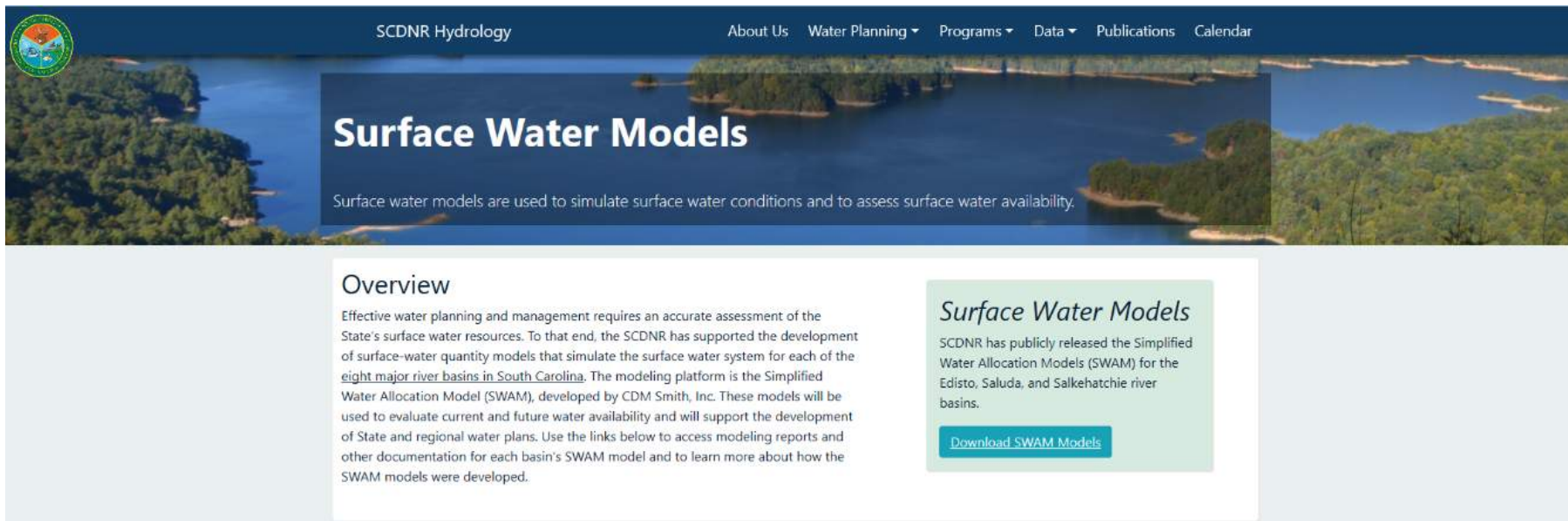
Simplified Water Allocation Model (SWAM)

- Developed as a desktop tool to facilitate regional and statewide water planning and allocation
- SWAM calculates physically and legally available water, diversions, storage, consumption and return flows at user-defined nodes
- From 2014 to 2017, all eight South Carolina surface water quantity models were built in the SWAM platform



Surface Water Model Access

- Available for download at: <http://hydrology.dnr.sc.gov/surface-water-models.html>
- Also available for download:
 - SWAM User's Manual
 - Model reports for each basin
 - Supplementary technical memoranda



SCDNR Hydrology

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Surface Water Models

Surface water models are used to simulate surface water conditions and to assess surface water availability.

Overview

Effective water planning and management requires an accurate assessment of the State's surface water resources. To that end, the SCDNR has supported the development of surface-water quantity models that simulate the surface water system for each of the [eight major river basins in South Carolina](#). The modeling platform is the Simplified Water Allocation Model (SWAM), developed by CDM Smith, Inc. These models will be used to evaluate current and future water availability and will support the development of State and regional water plans. Use the links below to access modeling reports and other documentation for each basin's SWAM model and to learn more about how the SWAM models were developed.

Surface Water Models

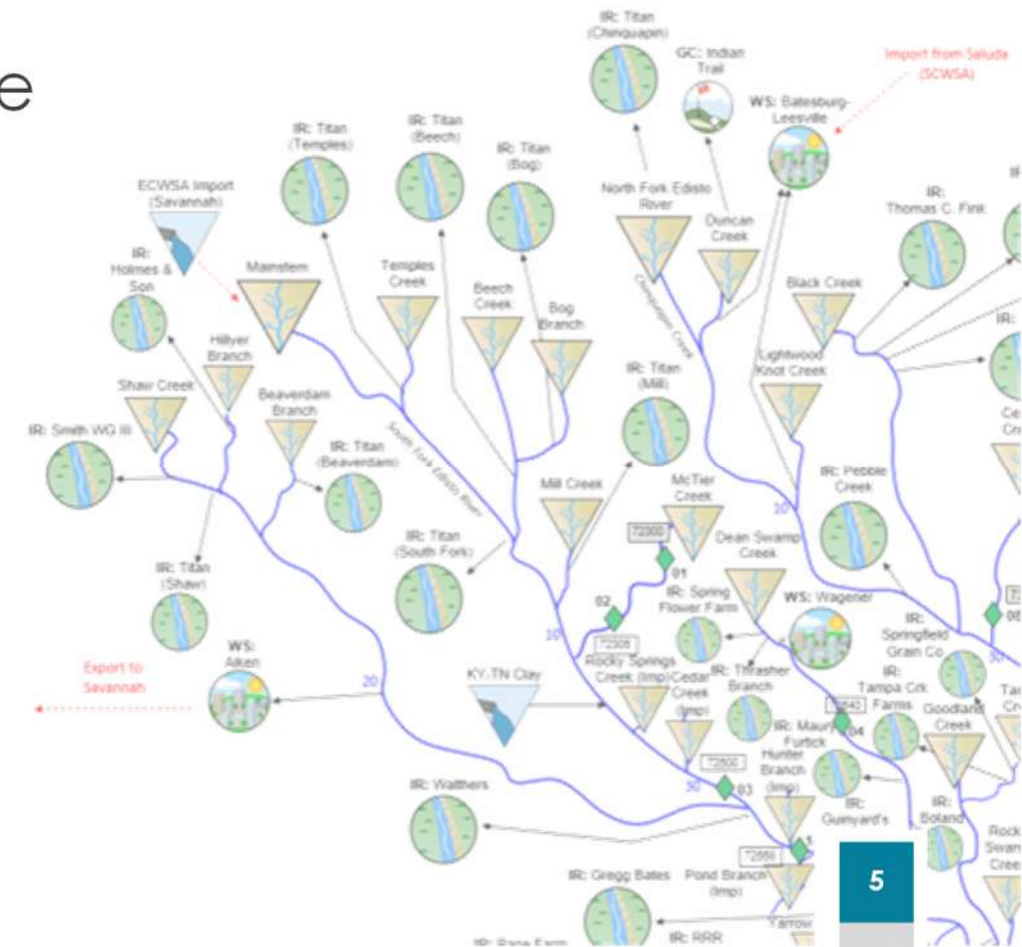
SCDNR has publicly released the Simplified Water Allocation Models (SWAM) for the Edisto, Saluda, and Salkehatchie river basins.

[Download SWAM Models](#)

Edisto Surface Water Model Overview

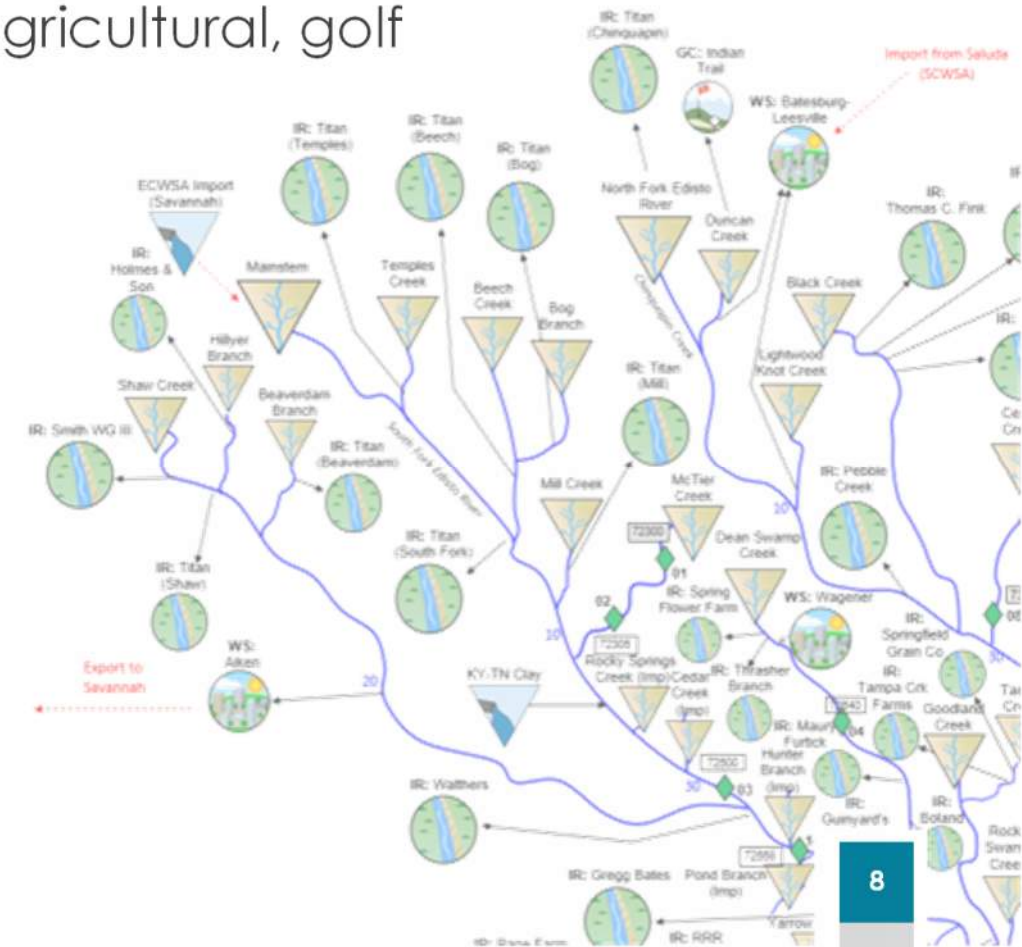
Water Allocation Modeling *is*:

- Water balance calculations of physical flow
- Water rights calculations of legally available flow
- Demands, withdrawals, and return flows
- Reservoir storage
- Stream networks, multiple “nodes”
- Data intensive

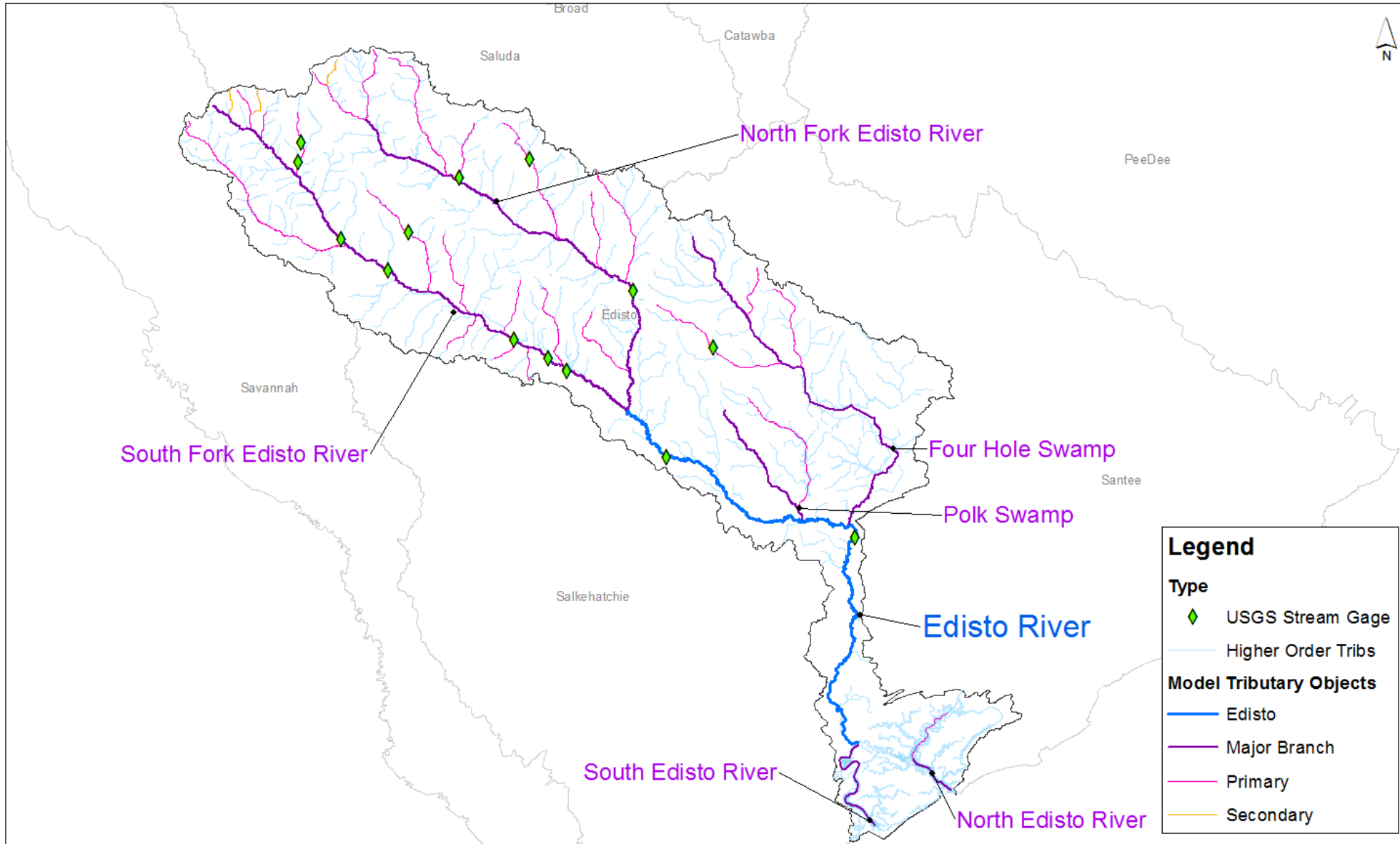


Edisto Model Inputs

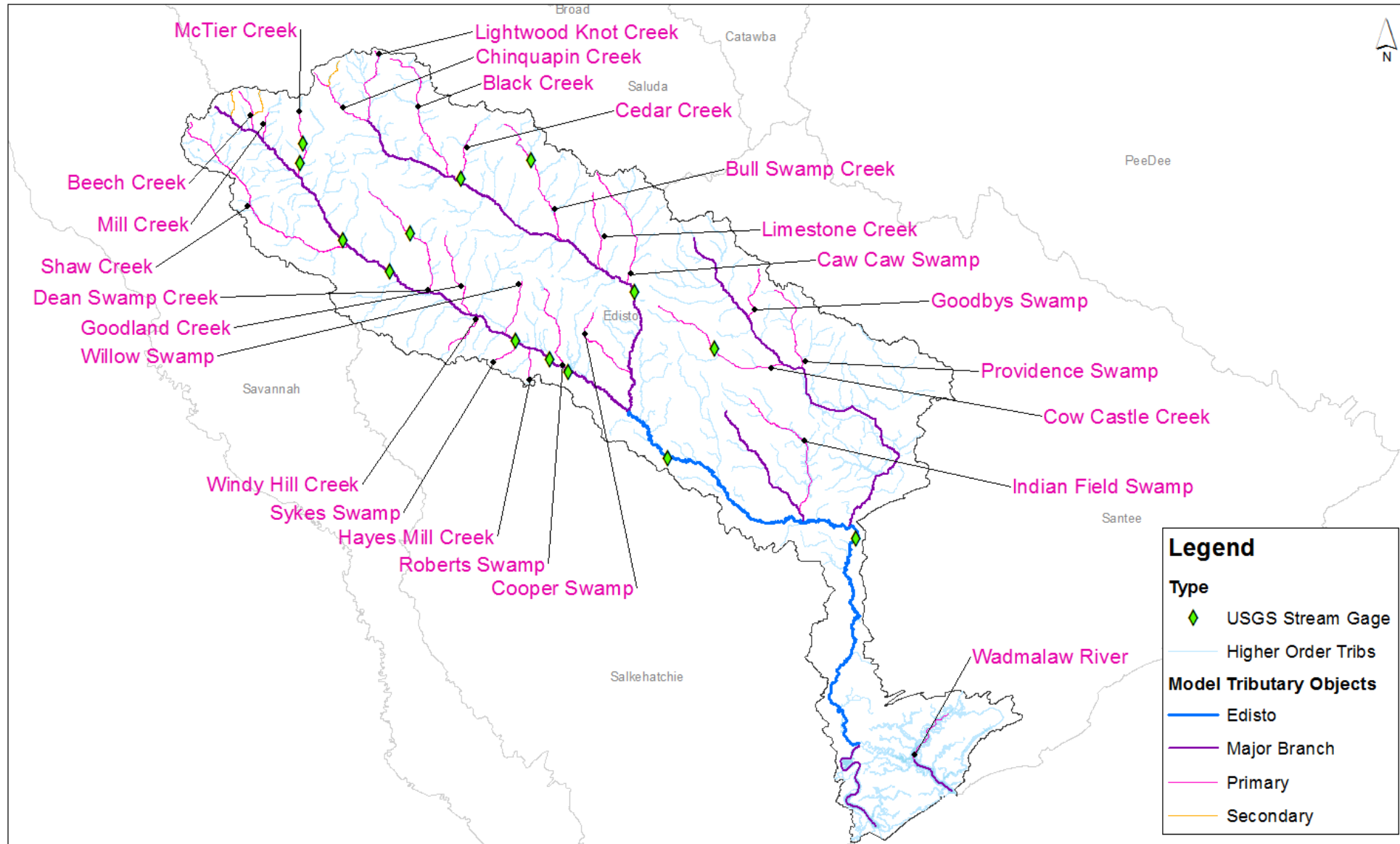
- USGS daily flow records
- Historical Operational Data
 - Withdrawals (municipal, industrial, thermoelectric, agricultural, golf courses, hatcheries)
 - Wastewater discharges and return flows
 - Includes transfers in and out of the basin
- Subbasin characteristics (from GIS)
 - Drainage area
 - Land use
 - Basin slope



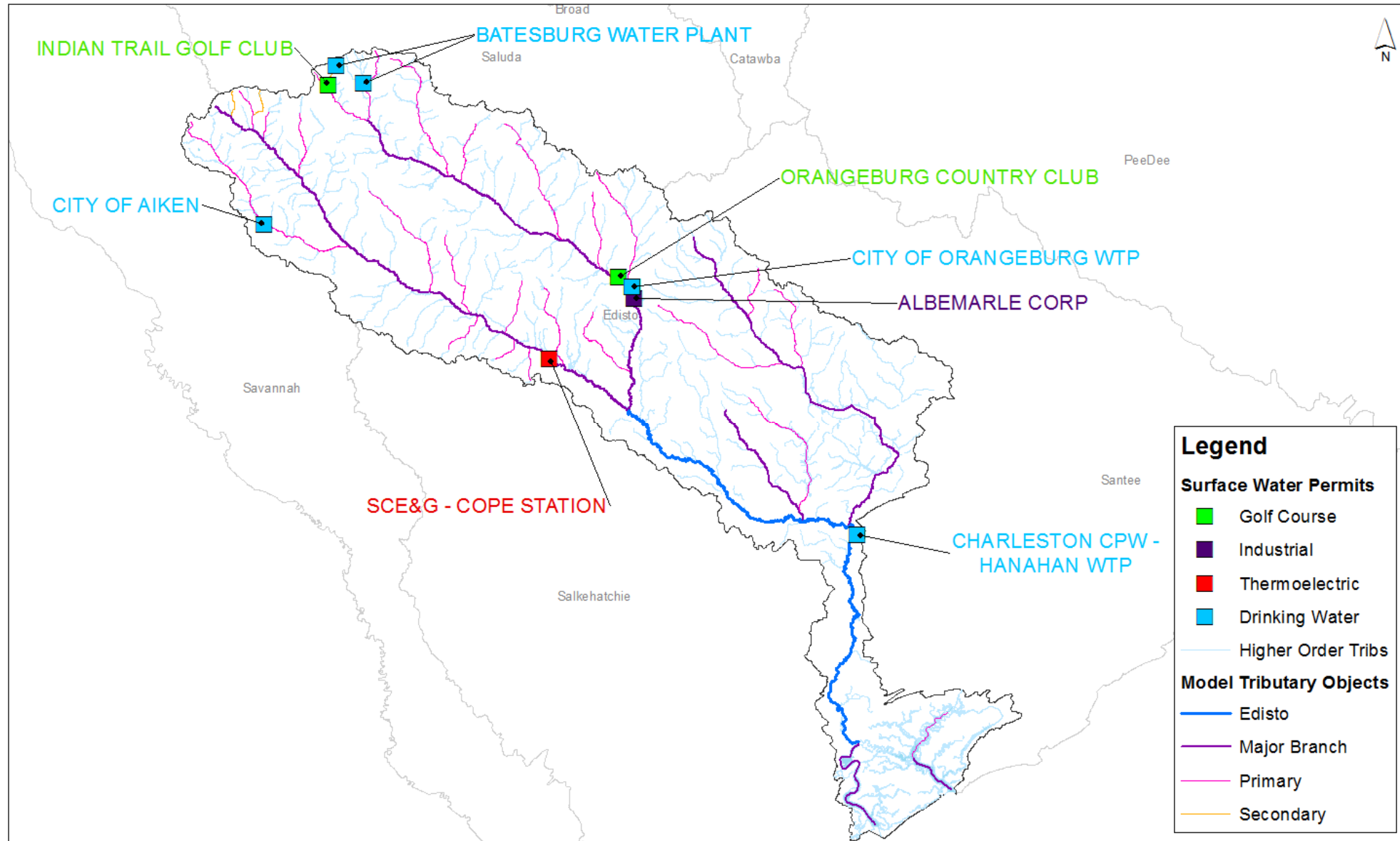
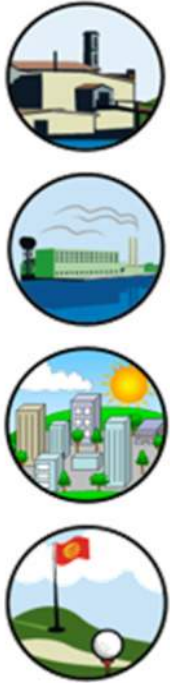
Main Stem and Major Branches



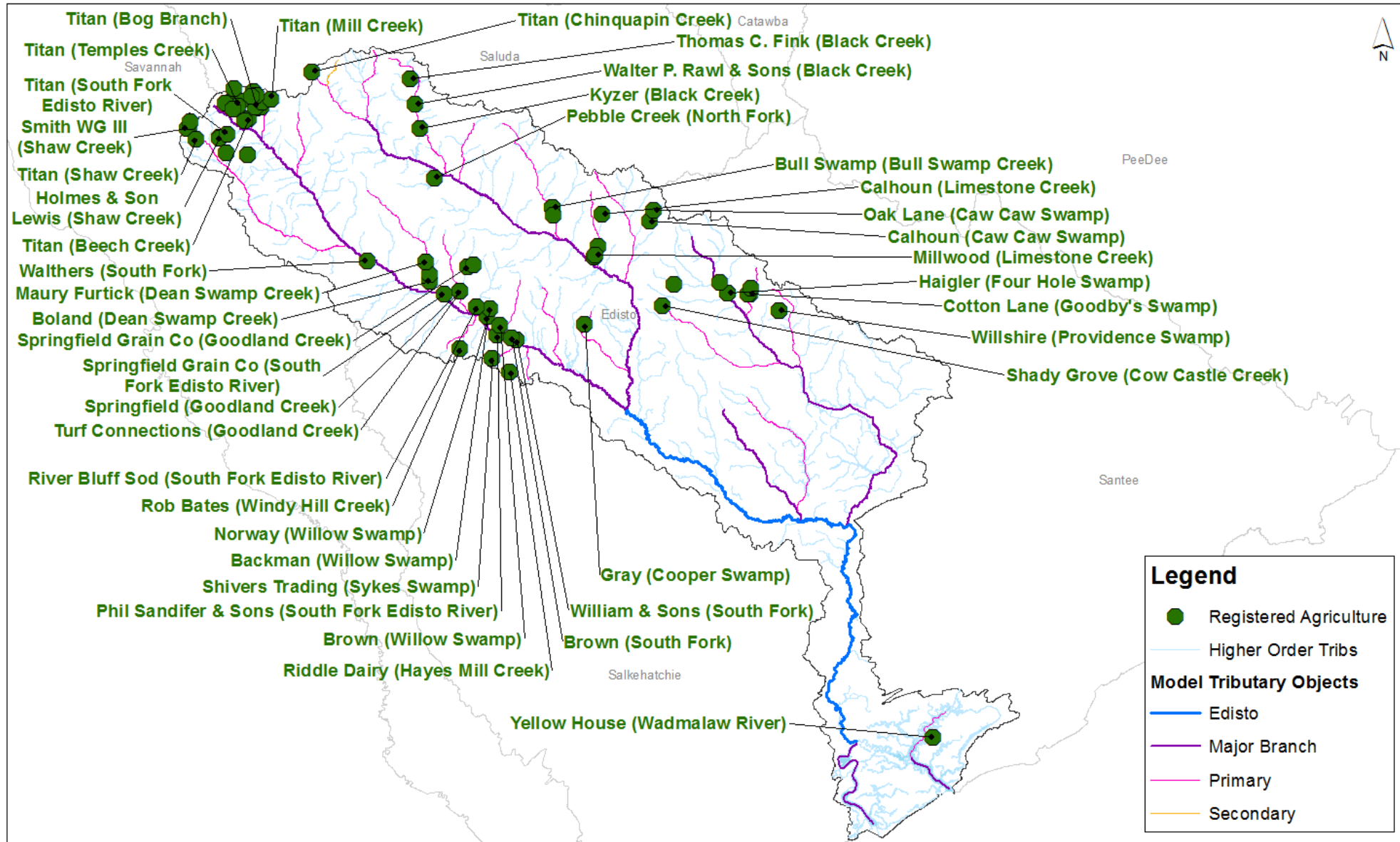
Primary Tributaries



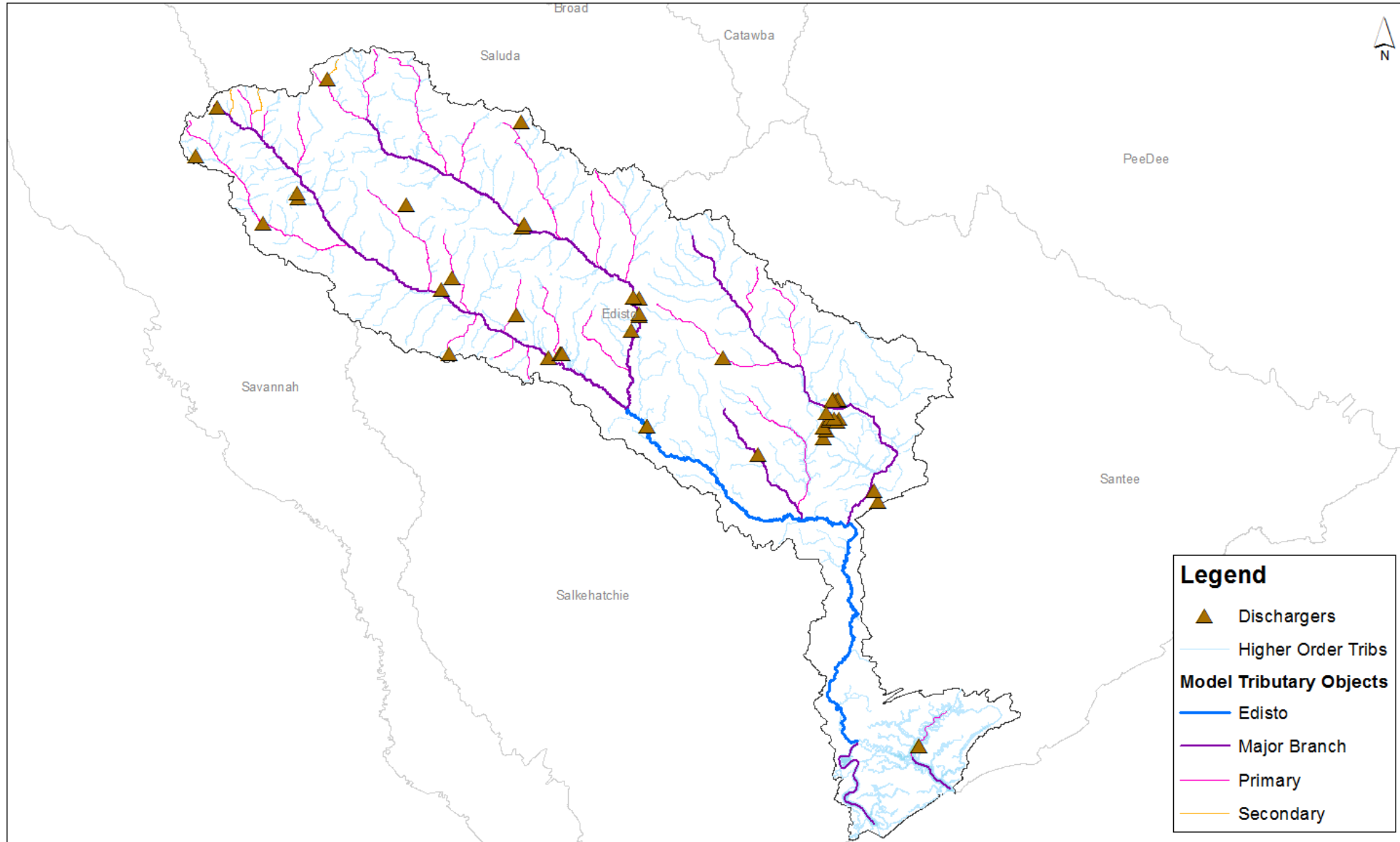
Municipal Water Supply, Industrial, Thermoelectric and Golf Course Withdrawals



Agriculture Withdrawals



Wastewater Discharges and Returns



SWAM Calculations: Supply

- **Physically available** flow is a function of:
 - upstream tributary inflows,
 - reach gains and losses,
 - upstream diversions, withdrawals, returns, and storage

Tributary ×

Tributary Name:
Cow Castle Creek Delete Tributary

Confluence Stream: Four Hole Swamp Confluence Location: 22.2 (mi)

Spatial Flow Changes

Subbasin Flow Factors (unitless)

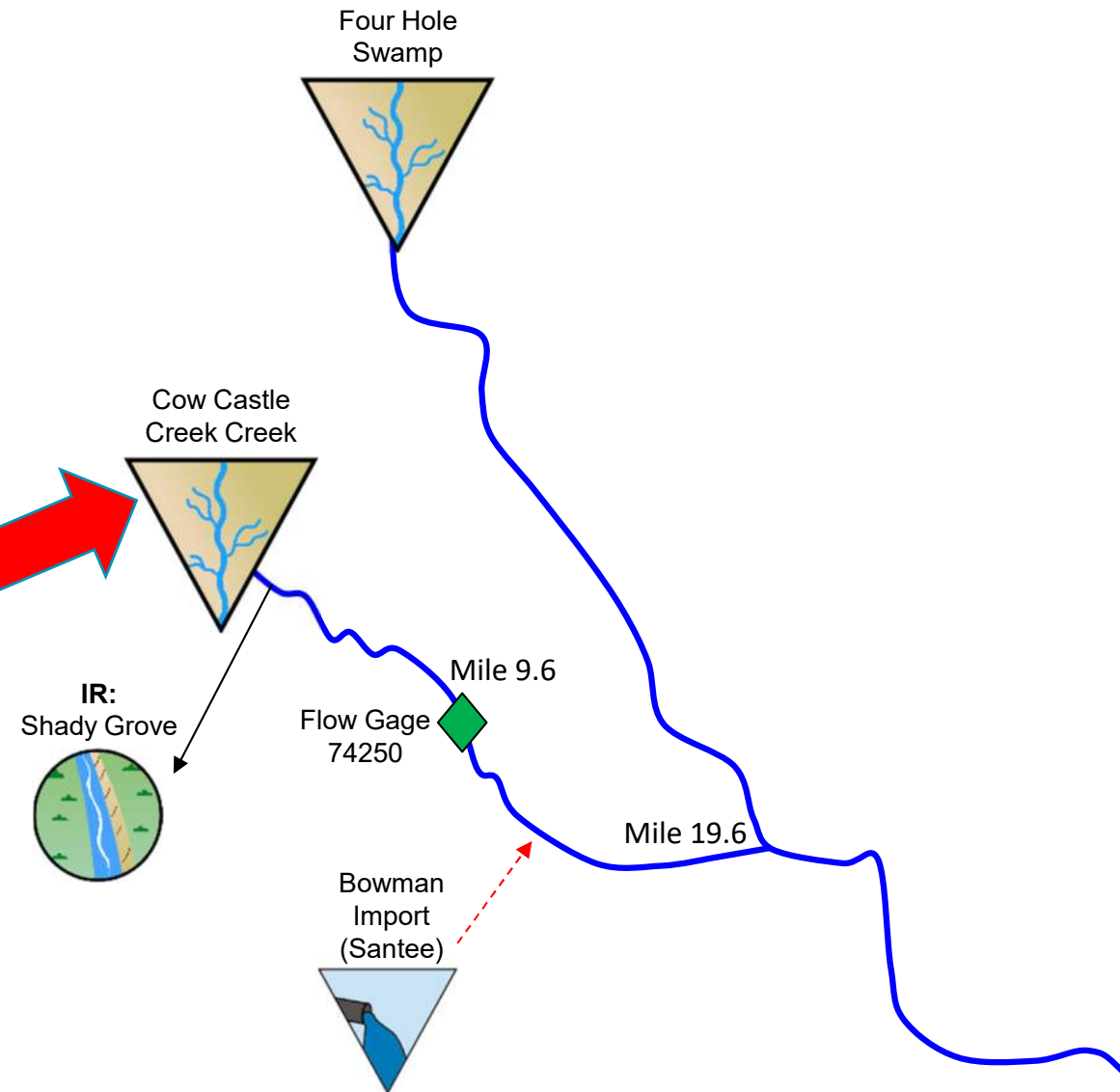
end mile:	9.6	19.6							
factor:	17.4	49.1							

Temporally Variable Factors

UIF ID EDO284.

Save **Close**

Year (YYYY)	Month (MMM)	Monthly Flow (CFS)
1931	Aug	0.38
1931	Sep	0.16
1931	Oct	0.16
1931	Nov	0.25
1931	Dec	0.69
1932	Jan	1.84
1932	Feb	2.29
1932	Mar	1.98
1932	Apr	0.77
1932	May	0.31
1932	Jun	0.58
1932	Jul	0.18
1932	Aug	2.90
1932	Sep	0.38
1932	Oct	1.94
1932	Nov	2.85
1932	Dec	2.60
1933	Jan	2.49
1933	Feb	3.58
1933	Mar	1.93
1933	Apr	0.77



SWAM Calculations: Supply

- **Legally available** flow is a function of:
 - Water rights / permit limits
 - Storage rights
 - Minimum Instream flow requirements
 - Downstream priority water uses

Agricultural Water User

Main Source Water Return Flows

Source Stream:
Cow Castle Creek

Source Water Type
 Direct River
 Reservoir
 Groundwater

Diversion Location
0.1 (mi)

Priority Date
3/27/1900

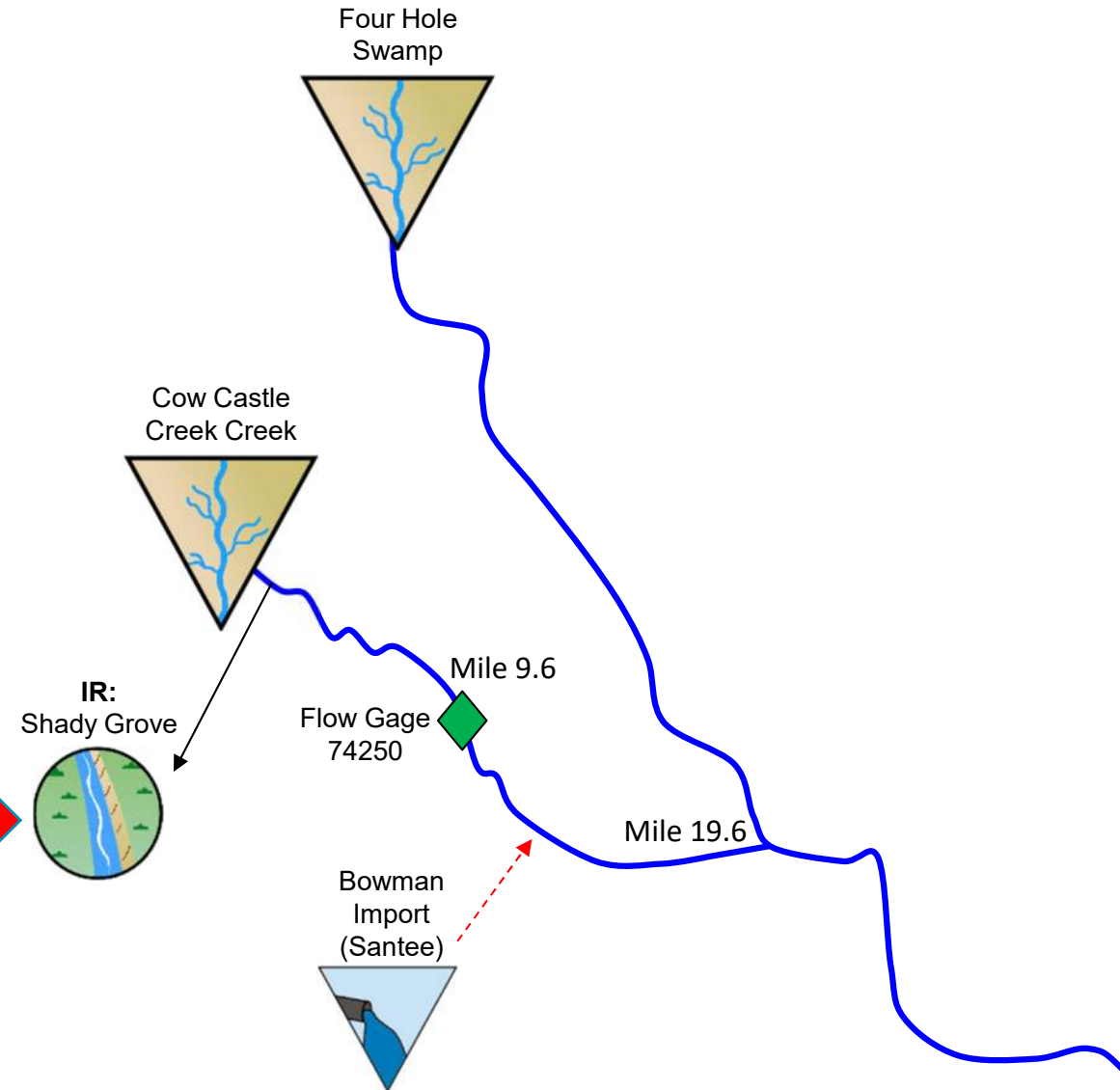
Diversion Capacity
10000 (CFS)

Permit Limit
100.6 (MGM)

Seasonal Permit
 Minimum Flow Requirements

Save

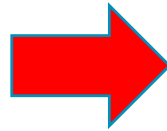
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SWAM Calculations: Demand

- Water User Object:
 - Node-based demand, use and returns

WS: Aiken



Water User

Main | Water Usage | Source Water 1 | Source Water 2 | Source Water 3 | Source Water 4 | Source Water 5 | Return Flows

Water User Name:
WS: Aiken

Delete Node

Multiple Sources of Water?

Supplemental Supply/Demand Alternatives

Conservation Transbasin Import
 Recapture Reuse Water Exchange
 Ag Transfer

Comments: Surface water withdrawal - 02WS002S01; groundwater - 02WS002G01-10. Discharge - general permit in-basin SCG646003, out-of-basin SC0024457

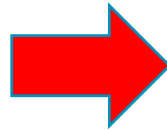
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SWAM Calculations: Demand

- M&I User Object:

- Municipal and industrial water demands (prescribed monthly mean)

WS: Aiken



Water User

Main | **Water Usage** | Source Water 1 | Source Water 2 | Source Water 3 | Source Water 4 | Source Water 5 | Return Flows

Monthly User Distribution

Manual

M&I

Agriculture

Annual Baseline Usage

Total Use (MGY)

Input Format

monthly means

timeseries

Monthly Baseline Usage

Month	Monthly Usage	% Indoor Use	% CU Indoor	% CU Outdoor
Jan	5.52	100	45.5	100
Feb	5.55	100	45.5	100
Mar	6.08	100	45.5	100
Apr	7.53	100	45.5	100
May	8.82	100	45.5	100
Jun	9.66	100	45.5	100
Jul	9.68	100	45.5	100
Aug	9.42	100	45.5	100
Sep	9.06	100	45.5	100
Oct	7.8	100	45.5	100
Nov	6.34	100	45.5	100
Dec	5.35	100	45.5	100

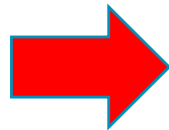
(MGD)

SWAM Calculations: Demand

- Ag User Object:

- Agricultural water demands (prescribed monthly mean – repeated time series)

IR:
Shady Grove



Agricultural Water User

Main | Source Water | Return Flows

User Name:
IR: Shady Grove

Delete Node

Multiple Sources of Water ?

Supplemental Supply/Demand Alternatives

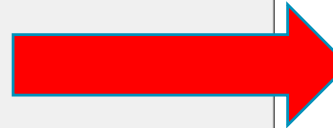
Transbasin Import
 Groundwater

Demands

user-defined
 ag calculations

Edit Demands

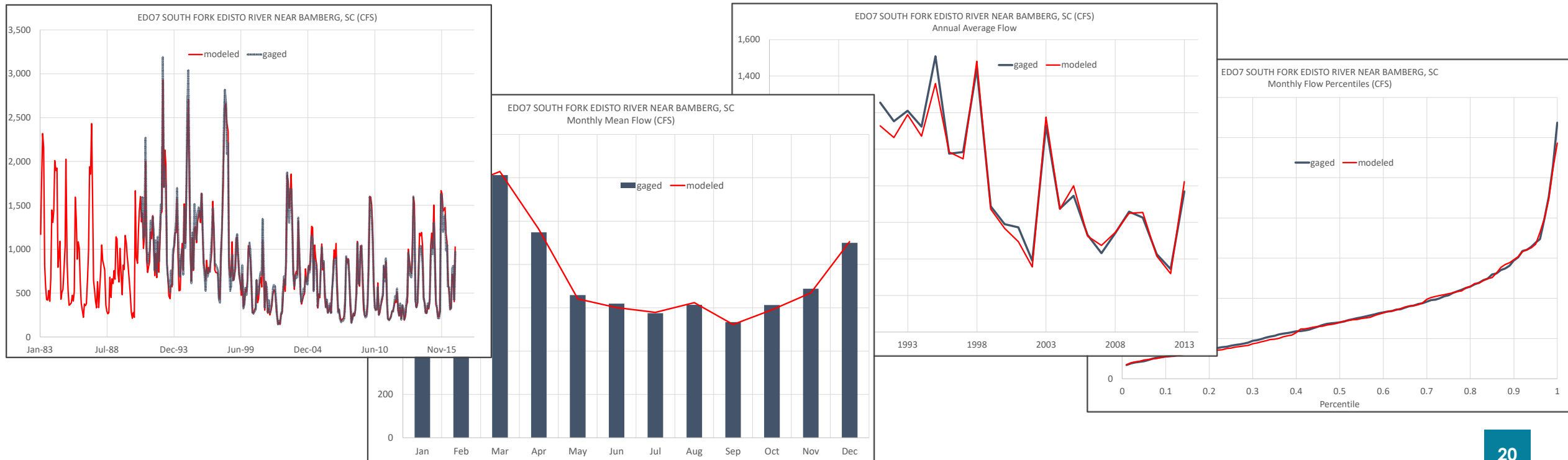
Comments: 38IR040S01



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Model Calibration

- Calibration performed for multiple sites across wide range of hydrologic conditions
- Key calibration parameters = reach gain/loss factors (hydrology)



Model Limitations

- Greater uncertainty in predictions for ungaged reaches compared to gaged
- Model not designed for reach routing of flow changes at a daily or sub-daily timestep
- Greater uncertainty in supply availability (and “shortage”) predictions associated with small stream withdrawals compared to larger river and reservoir withdrawals
 - e.g. offline irrigation ponds
- Baseline model assumes past hydrologic variability is representative of future hydrologic variability (stationary climate)

Surface Water Scenarios

Base Scenarios

- Current Surface Water Use Scenario
 - *Uses most recent 10-yr average withdrawals (as reported by month)*
- Permitted and Registered Surface Water Use Scenario
 - *Uses current fully permitted and registered amounts*
- Business-as-Usual Water Demand Projection Scenario
 - *Future water demand projection based on moderate growth and normal climate*
- High Water-Demand Projection Scenario
 - *Future water demand projection based on high growth and hot/dry climate*

Additional scenarios may be identified and requested by the RBC

Performance Measures

Assessment of simulation results will focus on quantifying key performance measures for multiple reaches of interest across the basin.

Examples:

- Percent change in a monthly minimum flow or 5th percentile flow
- Percent change in surface water supply
- Percent change in magnitude of a surface water shortages
- Percent of time recreational facilities were unavailable on a stream reach
- Change in the number and magnitude of excursions below 20, 30 and 40 percent mean annual daily flows