



Memorandum

*To: South Carolina Department of Natural Resources (DNR)
South Carolina Department of Health and Environmental Control (DHEC)*

From: CDM Smith

Date: June 2015

Subject: Edisto River Basin SWAM Model Framework

This memorandum presents the Simplified Water Allocation Model (SWAM) framework for the Edisto River Basin. Several Tables and maps are provided to help understand how the tributaries, water users, and discharges are being represented in the SWAM modeling environment. The tables and figures include:

Table 1 Permitted and registered water users included in the Edisto Basin model framework.

Table 2 NPDES discharges included in the Edisto Basin model framework.

Table 3 Interbasin transfers included in the Edisto Basin model framework.

Figure 1 Overview Map

This map consolidates and presents all active permitted and registered water users; significant discharge locations, including those outside of the Edisto basin which represent the export of water withdrawn from the Edisto basin; USGS stream gage locations; and tributaries (the “higher order tributaries” are not represented explicitly in the model, but their contributions to flow are included in the flows of larger, modeled tributaries). Significant discharge locations generally include NPDES discharges that average over 3 million gallons per month (Mg/m).

Figure 2 Model Tributaries and USGS Gages

This map presents the Edisto River Basin hydrography including the North and South Forks of the Edisto River, the Edisto River at their confluence, and the North and South Edisto Rivers located at the terminus of the basin. Also represented are major branches, primary tributaries and several secondary tributaries. The contributions of many of the secondary and higher order tributaries are accounted for in the

aggregate flow in the larger tributaries that are modeled explicitly. Both active and inactive USGS streamflow gages are displayed.

Figure 3 Surface Water Users

This map presents the location of permitted surface water users.

Figure 4 Agricultural Users

This map presents the location of registered agriculture surface water users.

Figure 5 All Discharge Points

This map presents the location of all significant NPDES discharge locations, including those outside of the Edisto basin which represent the export of water withdrawn from the Edisto basin. Significant discharge locations generally include NPDES discharges that average over 3 Mg/m; however, discharges that average less than 3 Mg/m, but with some months greater than 3 Mg/m are also included.

Figure 6 Edisto Basin SWAM Model Framework

Note that water and wastewater discharges can be simulated two ways in SWAM. First, they can be associated with a water user object, each of which may specify five points of discharge anywhere in the river network. These discharges are not represented with visual model objects, but are identified within the dialogue box for the associated water user object. An example in the Edisto basin is the City of Orangeburg, which is represented by a water user object but not a separate discharge object. The discharge is represented within the water user object. Alternatively, discharges can be specified as a discharge object. In the Edisto, some dischargers that do not have associated surface water withdrawals are represented in this manner. Other dischargers have a groundwater withdrawal, and have been represented using a water user object, even though they do not withdraw from surface water. Examples include the Town of Wagener, Town of North and Giant Cement Company. Representing them as water user objects provides more flexibility in conducting future management and planning because their discharge can be directly related to changing water demand.

Similar to the Saluda Basin, the guiding principles in determining what elements of the Edisto River Basin to simulate explicitly were:

1. Begin with a simple representation, with the understanding that it is easier to add additional details in the future than to remove unnecessary detail to make the model more efficient.
2. Any tributary with current uses (permitted or registered withdrawals or significant discharge) will be represented explicitly. This includes most primary tributaries to the Edisto and its major branches, and some secondary tributaries.

3. Generally, tributaries that are unused are not included explicitly, but the hydrologic contributions from these tributaries is embedded in the unimpaired flows (or reach gains) in downstream locations. As unimpaired flows (UIFs) are developed throughout the Edisto, some additional tributaries may be added explicitly if warranted as candidates to support future use (or these can be easily added at any time in the future as permit applications are received).

The proposed framework is submitted with the understanding that it is malleable – that is, we may find that additional tributaries are warranted as explicit model objects (to support simulation of future withdrawals or discharges) rather than implicit flow additions, or that further simplifications are possible without compromising model utility.

The proposed model framework is a starting point based on discussions with DNR and DHEC, and on CDM Smith’s initial estimate of an appropriate framework for planning and permitting in South Carolina. Feedback from water users, environmental organizations, and other stakeholders within the Edisto Basin will be important in refining the representation of the river system. The framework will be presented at the first planned stakeholder meeting for the Edisto Basin, and feedback will be used to refine the framework as appropriate.

Table 1. Permitted and registered surface water users included in the Edisto Basin model framework.

ID	Type	Facility Name	Withdrawal Tributary	Model Object ID
32GC011S01	GC	INDIAN TRAIL GOLF CLUB	Duncan Creek	GC: Indian Trail
38GC004S01	GC	ORANGEBURG COUNTRY CLUB	North Fork Edisto River	GC: Orangeburg CC
38IN002S01	IN	ALBEMARLE CORP	North Fork Edisto River	IN: Albemarle
38PT001S01	PT	SCE&G - COPE STATION	South Fork Edisto River	PT: SCE&G
02WS002S01	WS	CITY OF AIKEN	Shaw Creek	WS: Aiken
10WS004S03	WS	CHARLESTON CPW - HANAHAH WTP	Edisto River	WS: Charleston
38WS002S03	WS	CITY OF ORANGEBURG WTP	North Fork Edisto River	WS: Orangeburg
38WS002S01	WS	CITY OF ORANGEBURG WTP	North Fork Edisto River	WS: Orangeburg
38WS002S02	WS	CITY OF ORANGEBURG WTP	North Fork Edisto River	WS: Orangeburg
32WS003S01	WS	BATESBURG WATER PLANT	Lightwood Knots Creek	WS: Batesburg-Leesville
32WS003S02	WS	BATESBURG WATER PLANT	Duncan Creek	WS: Batesburg-Leesville
09IR003S01	IR	COTTON LANE FARMS	Goodby's Swamp	IR: Cotton Lane
09IR003S02	IR	COTTON LANE FARMS	Goodby's Swamp	IR: Cotton Lane
09IR003S03	IR	COTTON LANE FARMS	Goodby's Swamp	IR: Cotton Lane
38IR020S01	IR	BACKMAN FARMS	Willow Swamp	IR: Backman
38IR081S01	IR	BOLAND FARM	Dean Swamp Creek	IR: Boland
38IR081S02	IR	BOLAND FARM	Dean Swamp Creek	IR: Boland
38IR015S01	IR	BROWN FARMS	Willow Swamp	IR: Brown
38IR015S02	IR	BROWN FARMS	South Fork Edisto River	IR: Brown
38IR014S03	IR	BULL SWAMP PLANTATION	Bull Swamp Creek	IR: Bull Swamp
38IR014S01	IR	BULL SWAMP PLANTATION	Bull Swamp Creek	IR: Bull Swamp
38IR014S02	IR	BULL SWAMP PLANTATION	Bull Swamp Creek	IR: Bull Swamp
09IR004S02	IR	CALHOUN TRADING CO	Limestone Creek	IR: Calhoun
09IR004S01	IR	CALHOUN TRADING CO	Caw Caw Swamp	IR: Calhoun
38IR042S01	IR	GRAY FARM	Cooper Swamp	IR: Gray
09IR009S01	IR	HAIGLER FARMS INC	Four Hole Swamp	IR: Haigler
09IR009S02	IR	HAIGLER FARMS INC	Four Hole Swamp	IR: Haigler
09IR009S03	IR	HAIGLER FARMS INC	Four Hole Swamp	IR: Haigler
09IR009S04	IR	HAIGLER FARMS INC	Four Hole Swamp	IR: Haigler
19IR002S01	IR	HOLMES & SON LEWIS FARM	Shaw Creek	IR: Holmes & Son
19IR002S02	IR	HOLMES & SON LEWIS FARM	Shaw Creek	IR: Holmes & Son
32IR004S01	IR	KYZER FARMS	Black Creek	IR: Kyzer
02IR028S01	IR	MAURY FURTICK FARM	Dean Swamp Creek	IR: Maury Furtick
38IR004S01	IR	MILLWOOD FARM	Limestone Creek	IR: Millwood
38IR004S02	IR	MILLWOOD FARM	Limestone Creek	IR: Millwood
38IR004S03	IR	MILLWOOD FARM	Limestone Creek	IR: Millwood
38IR067S01	IR	NORWAY FARM	Willow Swamp	IR: Norway
09IR011S01	IR	OAK LANE FARM HALFWAY SWAMP	Caw Caw Swamp	IR: Oak Lane
02IR027S01	IR	PEBBLE CREEK ENTERPRISES	North Fork Edisto River	IR: Pebble Creek
05IR012S01	IR	PHIL SANDIFER & SONS, LLC	South Fork Edisto River	IR: Phil Sandifer & Sons
05IR054S01	IR	RIDDLE DAIRY FARM	Hayes Mill Creek	IR: Riddle Dairy
38IR077S01	IR	RIVER BLUFF SOD FARM	South Fork Edisto River	IR: River Bluff Sod
06IR020S01	IR	ROB BATES FARM	Windy Hill Creek	IR: Rob Bates
38IR040S01	IR	SHADY GROVE PLANTATION & NURSERY INC	Cow Castle Creek	IR: Shady Grove
05IR005S01	IR	SHIVERS TRADING AND OPERATING COMPANY	Sykes Swamp	IR: Shivers Trading
19IR012S02	IR	SMITH W G III	Shaw Creek	IR: Smith WG III
19IR012S03	IR	SMITH W G III	Shaw Creek	IR: Smith WG III
19IR012S04	IR	SMITH W G III	Shaw Creek	IR: Smith WG III
38IR066S01	IR	SPRINGFIELD FARM	Goodland Creek	IR: Springfield

Blue and gray shading identifies water users with multiple permitted withdrawal locations. These are represented by one model object.

Table 1. Permitted and registered surface water users included in the Edisto Basin model framework (continued...)

ID	Type	Facility Name	Withdrawal Tributary	Model Object ID
38IR026S02	IR	SPRINGFIELD GRAIN CO BROWN KIRBY & SONS	South Fork Edisto River	IR: Springfield Grain Co
38IR026S01	IR	SPRINGFIELD GRAIN CO BROWN KIRBY & SONS	Goodland Creek	IR: Springfield Grain Co
38IR026S03	IR	SPRINGFIELD GRAIN CO BROWN KIRBY & SONS	Goodland Creek	IR: Springfield Grain Co
32IR050S01	IR	THOMAS C. FINK FARM	Black Creek	IR: Thomas C. Fink
41IR014S07	IR	TITAN FARMS	Beech Creek	IR: Titan (Beech)
41IR014S09	IR	TITAN FARMS	Beech Creek	IR: Titan (Beech)
19IR004S03	IR	TITAN FARMS	Beech Creek	IR: Titan (Beech)
19IR004S08	IR	TITAN FARMS	Beech Creek	IR: Titan (Beech)
41IR014S02	IR	TITAN FARMS	Bog Branch	IR: Titan (Bog)
41IR014S06	IR	TITAN FARMS	Bog Branch	IR: Titan (Bog)
19IR004S01	IR	TITAN FARMS	Bog Branch	IR: Titan (Bog)
19IR004S05	IR	TITAN FARMS	Bog Branch	IR: Titan (Bog)
19IR004S06	IR	TITAN FARMS	Bog Branch	IR: Titan (Bog)
19IR004S07	IR	TITAN FARMS	Bog Branch	IR: Titan (Bog)
19IR004S15	IR	TITAN FARMS	Bog Branch	IR: Titan (Bog)
41IR010S01	IR	TITAN FARMS	Chinquapin Creek	IR: Titan (Chinquapin)
41IR014S05	IR	TITAN FARMS	Mill Creek	IR: Titan (Mill)
41IR014S10	IR	TITAN FARMS	Shaw Creek	IR: Titan (Shaw)
19IR004S12	IR	TITAN FARMS	Shaw Creek	IR: Titan (Shaw)
19IR004S09	IR	TITAN FARMS	South Fork Edisto River	IR: Titan (South Fork)
19IR004S13	IR	TITAN FARMS	South Fork Edisto River	IR: Titan (South Fork)
19IR004S14	IR	TITAN FARMS	South Fork Edisto River	IR: Titan (South Fork)
02IR024S02	IR	TITAN FARMS	South Fork Edisto River	IR: Titan (South Fork)
19IR004S02	IR	TITAN FARMS	Temples Creek	IR: Titan (Temples)
19IR004S04	IR	TITAN FARMS	Temples Creek	IR: Titan (Temples)
19IR004S10	IR	TITAN FARMS	Temples Creek	IR: Titan (Temples)
19IR004S11	IR	TITAN FARMS	Temples Creek	IR: Titan (Temples)
19IR004S16	IR	TITAN FARMS	Temples Creek	IR: Titan (Temples)
38IR078S01	IR	TURF CONNECTIONS	Goodland Creek	IR: Turf Connections
32IR013S08	IR	WALTER P. RAWL & SONS/WP FARL FARM	Black Creek	IR: Walter P. Rawl & Sons
02IR025S01	IR	WALTHERS FARMS	South Fork Edisto River	IR: Walthers
38IR021S01	IR	WILLIAMS & SONS FARMS	South Fork Edisto River	IR: Williams & Sons
38IR021S02	IR	WILLIAMS & SONS FARMS	South Fork Edisto River	IR: Williams & Sons
38IR043S01	IR	WILLSHIRE FARMS INC	Providence Swamp	IR: Willshire
38IR043S02	IR	WILLSHIRE FARMS INC	Providence Swamp	IR: Willshire
10IR014S01	IR	YELLOW HOUSE FARMS	Wadmalaw River	IR: Yellow House

Blue and gray shading identifies water users with multiple permitted withdrawal locations. These are represented by one model object.

Table 2. NPDES discharges included in the Edisto Basin model framework.

NPDES Pipe ID	Facility Name	Discharge Tributary	Associated Surface Water Permit	Associated Groundwater Withdrawal ID	Model Object ID
SCG641003-001	AIKEN/SHAW CREEK WTP	Shaw Creek	02WS002	02WS002G	WS: Aiken
SC0024465-001	BATESBURG-LEESVILLE WWTF	Duncan Creek	32WS003	32WS002G	WS: Batesburg-Leesville
SC0001180-001	ALBEMARLE CORP/ORANGEBURG	North Fork Edisto River	38IN002	<i>none</i>	IN: Albemarle
SC0045772-001	SCE&G/COPE POWER PLANT	Roberts Swamp	38PT001	38PT001G	PT: SCE&G
SC0045772-002	SCE&G/COPE POWER PLANT	Roberts Swamp	38PT001	38PT001G	PT: SCE&G
SC0045772-003	SCE&G/COPE POWER PLANT	Roberts Swamp	38PT001	38PT001G	PT: SCE&G
SC0045772-005	SCE&G/COPE POWER PLANT	Roberts Swamp	38PT001	38PT001G	PT: SCE&G
SC0045772-006	SCE&G/COPE POWER PLANT	Roberts Swamp	38PT001	38PT001G	PT: SCE&G
SC0024481-001	ORANGEBURG WWTF	North Fork Edisto River	38WS002	<i>none</i>	WS: Orangeburg
SC0001147-001	ROSEBURG FOREST PRODUCTS S/HOLLY HILL MDF	Four Hole Swamp	<i>none</i>	38IN005G	IN: Roseburg
SC0001147-002	ROSEBURG FOREST PRODUCTS S/HOLLY HILL MDF	Four Hole Swamp	<i>none</i>	38IN005G	IN: Roseburg
SC0001147-003	ROSEBURG FOREST PRODUCTS S/HOLLY HILL MDF	Four Hole Swamp	<i>none</i>	38IN005G	IN: Roseburg
SC0002992-001	HOLCIM (US) INC/HOLLY HILL PLT	Four Hole Swamp	<i>none</i>	38IN001G	IN: Holcim
SC0002992-002	HOLCIM (US) INC/HOLLY HILL PLT	Four Hole Swamp	<i>none</i>	38IN001G	IN: Holcim
SC0002992-003	HOLCIM (US) INC/HOLLY HILL PLT	Four Hole Swamp	<i>none</i>	38IN001G	IN: Holcim
SC0002992-02A	HOLCIM (US) INC/HOLLY HILL PLT	Four Hole Swamp	<i>none</i>	38IN001G	IN: Holcim
SC0022667-001	GIANT CEMENT COMPANY INC	Four Hole Swamp	<i>none</i>	18WS014G/18IN001G	IN: Giant Cement
SC0022667-002	GIANT CEMENT COMPANY INC	Four Hole Swamp	<i>none</i>	18WS014G/18IN001G	IN: Giant Cement
SC0022667-003	GIANT CEMENT COMPANY INC	Four Hole Swamp	<i>none</i>	18WS014G/18IN001G	IN: Giant Cement
SC0022667-004	GIANT CEMENT COMPANY INC	Four Hole Swamp	<i>none</i>	18WS014G/18IN001G	IN: Giant Cement
SC0022667-004	GIANT CEMENT COMPANY INC	Four Hole Swamp	<i>none</i>	18WS014G/18IN001G	IN: Giant Cement
SC0022667-005	GIANT CEMENT COMPANY INC	Four Hole Swamp	<i>none</i>	18WS014G/18IN001G	IN: Giant Cement
SC0022586-001	LAFARGE BUILDING MATERIALS INC	Indian Field Swamp	<i>none</i>	18IN0040G	IN: Lafarge (Argos)
SC0022586-002	LAFARGE BUILDING MATERIALS INC	Indian Field Swamp	<i>none</i>	18IN0040G	IN: Lafarge (Argos)
SC0038504-001	TOWN OF HARLEYVILLE	Indian Field Swamp	<i>none</i>	18WS003G	WS: Harleyville
SC0043419-001	ACO DISTRIBUTION & WAREHOUSE INC	North Fork Edisto River	<i>none</i>	38IN004G	IN: ACO
SC0026417-001	BLACKVILLE WWTF	Windy Hill Creek	<i>none</i>	06WS002G	WS: Blackville
SC0047333-001	TOWN OF BRANCHVILLE	Edisto River	<i>none</i>	38WS007G	WS: Branchville
SC0047333-001	TOWN OF BRANCHVILLE	Edisto River	<i>none</i>	38WS007G	WS: Branchville
SC0034541-001	GASTON COPPER RECYCLING CORP	Bull Swamp Creek	<i>none</i>	32IN002G	IN: Gaston
SC0047821-001	TOWN OF NORTH	North Fork Edisto River	<i>none</i>	38WS003G	WS: North
SC0047821-002	TOWN OF NORTH	North Fork Edisto River	<i>none</i>	38WS003G	WS: North
SC0038555-001	SHOWA DENKO CARBON	Four Hole Swamp	<i>none</i>	18IN002G	Showa Denko
SC0038555-01A	SHOWA DENKO CARBON	Four Hole Swamp	<i>none</i>	18IN002G	Showa Denko
SC0023272-001	SPRINGFIELD/PLANT #1	South Fork Edisto River	<i>none</i>	38WS009G	WS: Springfield
SC0023281-001	SPRINGFIELD/PLANT #2	Goodland Creek	<i>none</i>	38WS009G	WS: Springfield
SC0025844-001	TOWN OF ST. GEORGE, TOWN	Polk Swamp	<i>none</i>	18WS002G	WS: St. George
SC0026204-001	TOWN OF WAGENER	Dean Swamp Creek	<i>none</i>	02WS001G	WS: Wagener
SC0045993-001	TOWN OF NORWAY	Willow Swamp	<i>none</i>	38WS006G	WS: Norway
SC0046388-001	KENTUCKY-TENN CLAY/GENTRY PIT	South Fork Edisto River	<i>none</i>	<i>none</i>	KY-TN Clay
SC0046388-002	KENTUCKY-TENN CLAY/GENTRY PIT	South Fork Edisto River	<i>none</i>	<i>none</i>	KY-TN Clay
SC0047023-001	ORANGEBURG NTL FISH HATCHERY	North Fork Edisto River	<i>none</i>	<i>none</i>	Orangeburg Fish
SC0047023-002	ORANGEBURG NTL FISH HATCHERY	North Fork Edisto River	<i>none</i>	<i>none</i>	Orangeburg Fish
SC0047848-001	BEARS BLUFF NATL FISH HATCHERY	Wadmalaw River	<i>none</i>	<i>none</i>	Bears Bluff Hatchery
SC0047848-002	BEARS BLUFF NATL FISH HATCHERY	Wadmalaw River	<i>none</i>	<i>none</i>	Bears Bluff Hatchery
SC0047848-003	BEARS BLUFF NATL FISH HATCHERY	Wadmalaw River	<i>none</i>	<i>none</i>	Bears Bluff Hatchery

No shading identifies dischargers that have a surface water withdrawal permit and are represented by a Water User object.

Blue shading identifies dischargers that have a public water supply permit or registration to withdrawal groundwater, but no surface water permit, and are represented by a Water User object.

Gray shading identifies dischargers that do not have a public water supply permit or registration to withdrawal groundwater, and are represented by a Discharge model object.

Table 3. Interbasin transfers included in the Edisto Basin model framework.

NPDES Pipe ID	NPDES Facility Name	Associated Water Permit	Associated Water Permit Facility	Intake Basin	Discharge Basin	Location of Discharge in Edisto Basin	Model Object ID
SC0024465-001	BATESBURG-LEESVILLE WWTF	41WS003	SALUDA COUNTY WATER & SEWER AUTHORITY	Saluda	Edisto	Duncan Creek	SCWSA Import
SC0040037-001	TOWN OF BOWMAN	38WS052	SANTEE COOPER REGIONAL WATER SYSTEM	Santee	Edisto	Cow Castle Creek	SCRWS Import
SC0025682-001	ECW&SA/TRENTON WWTF	19WS001	EDGEFIELD COUNTY WATER & SEWER AUTHORITY	Savannah	Edisto	Shaw Creek	ECWSA Import
SC0025691-001	ECW&SA/JOHNSTON #1 PLANT	19WS001	EDGEFIELD COUNTY WATER & SEWER AUTHORITY	Savannah	Edisto	South Fork Edisto River	ECWSA Import
SC0024457-001	AIKEN PSA/HORSE CREEK WWTF	02WS002	CITY OF AIKEN	Edisto	Savannah		WS: Aiken
SC0021229-001	CHARLESTON CPW/PLUM ISLAND	10WS004	CHARLESTON CPW	Edisto	Santee		WS: Charleston
SC0024783-001	NCSA/FELIX C DAVIS WWTP	10WS004	CHARLESTON CPW	Edisto	Santee		WS: Charleston
SC0040771-001	MT PLEASANT/CENTER ST & RR RD.	10WS004	CHARLESTON CPW	Edisto	Santee		WS: Charleston
SC0040771-002	MT PLEASANT/CENTER ST & RR RD.	10WS004	CHARLESTON CPW	Edisto	Santee		WS: Charleston
SC0040771-003	MT PLEASANT/CENTER ST & RR RD.	10WS004	CHARLESTON CPW	Edisto	Santee		WS: Charleston
SC0040771-004	MT PLEASANT/CENTER ST & RR RD.	10WS004	CHARLESTON CPW	Edisto	Santee		WS: Charleston
SC0040771-005	MT PLEASANT/CENTER ST & RR RD.	10WS004	CHARLESTON CPW	Edisto	Santee		WS: Charleston
SC0046060-001	BCW&SA/LOWER BERKELEY WWTF	10WS007	CHARLESTON CPW	Edisto	Santee		WS: Charleston
SC0038822-001	DORCHESTER CO/LOWER DORCHESTER	10WS008	CHARLESTON CPW	Edisto	Santee		WS: Charleston

Gray shading identifies Edisto Basin discharges that are imports from either the Saluda, Santee or Savannah basins. All others are exports from the Edisto Basin.

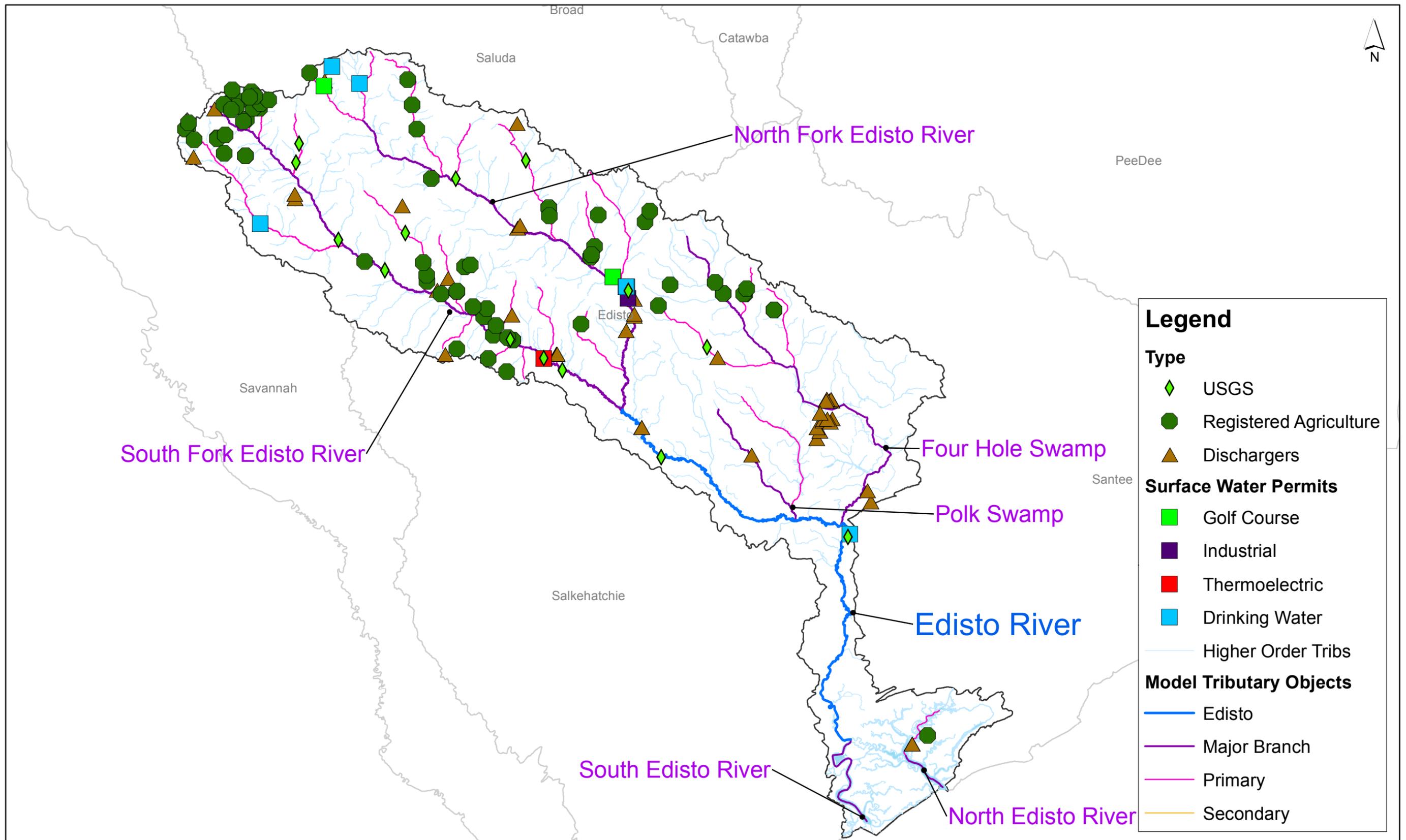
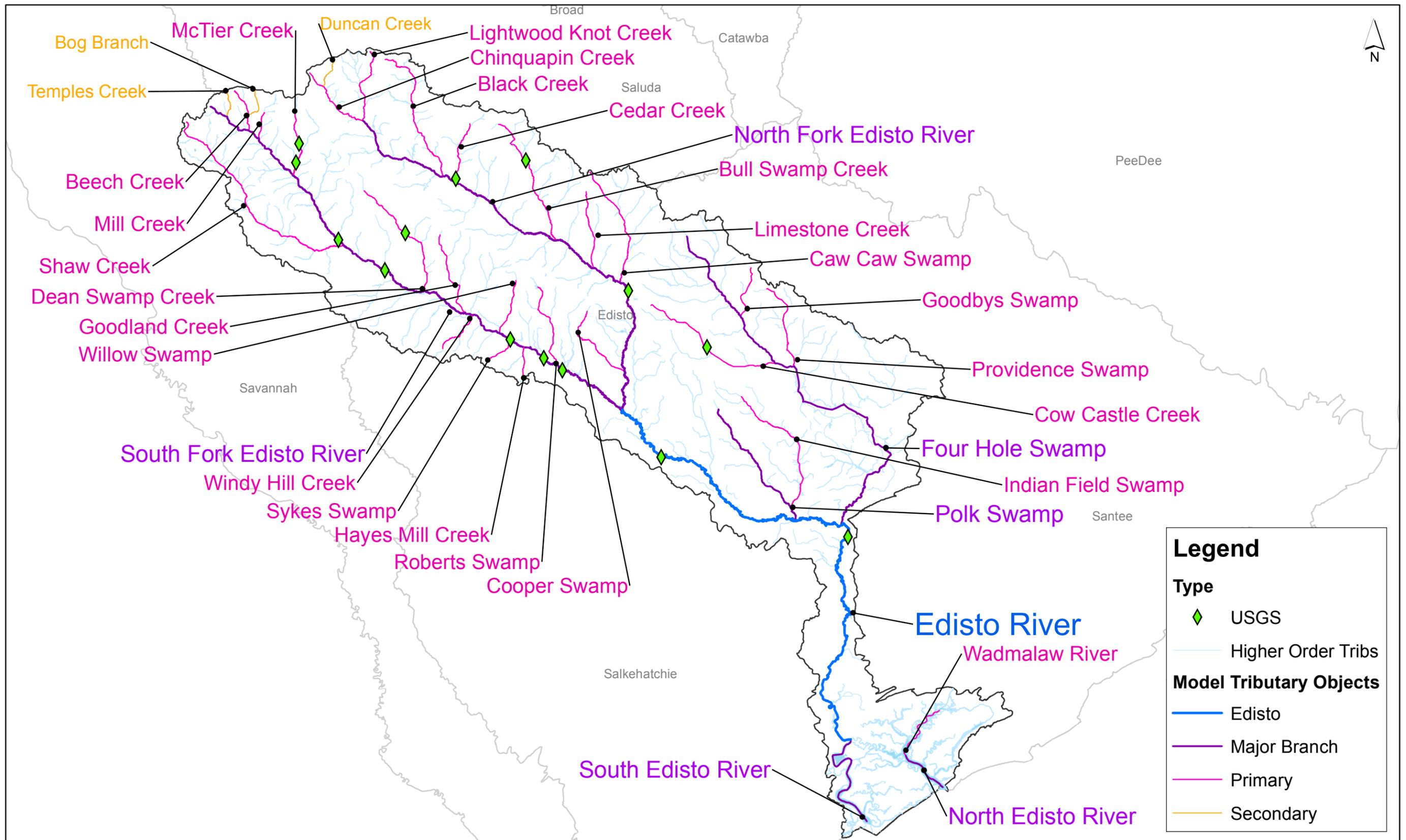


Figure 1: Overview Map



0 5 10 20 Miles

Figure 2: Model Tributaries and USGS Streamflow Gages

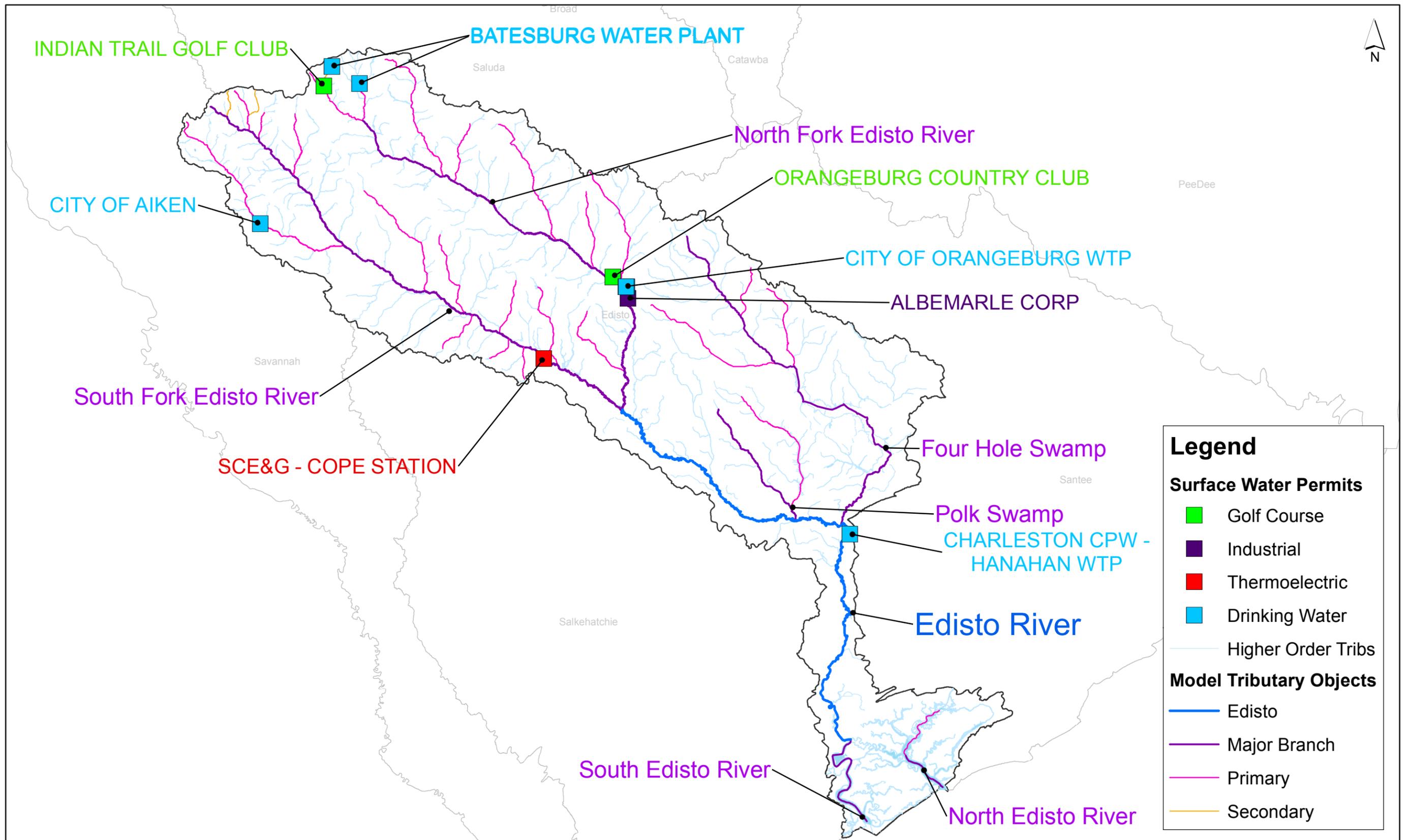


Figure 3: Permitted Surface Water Users

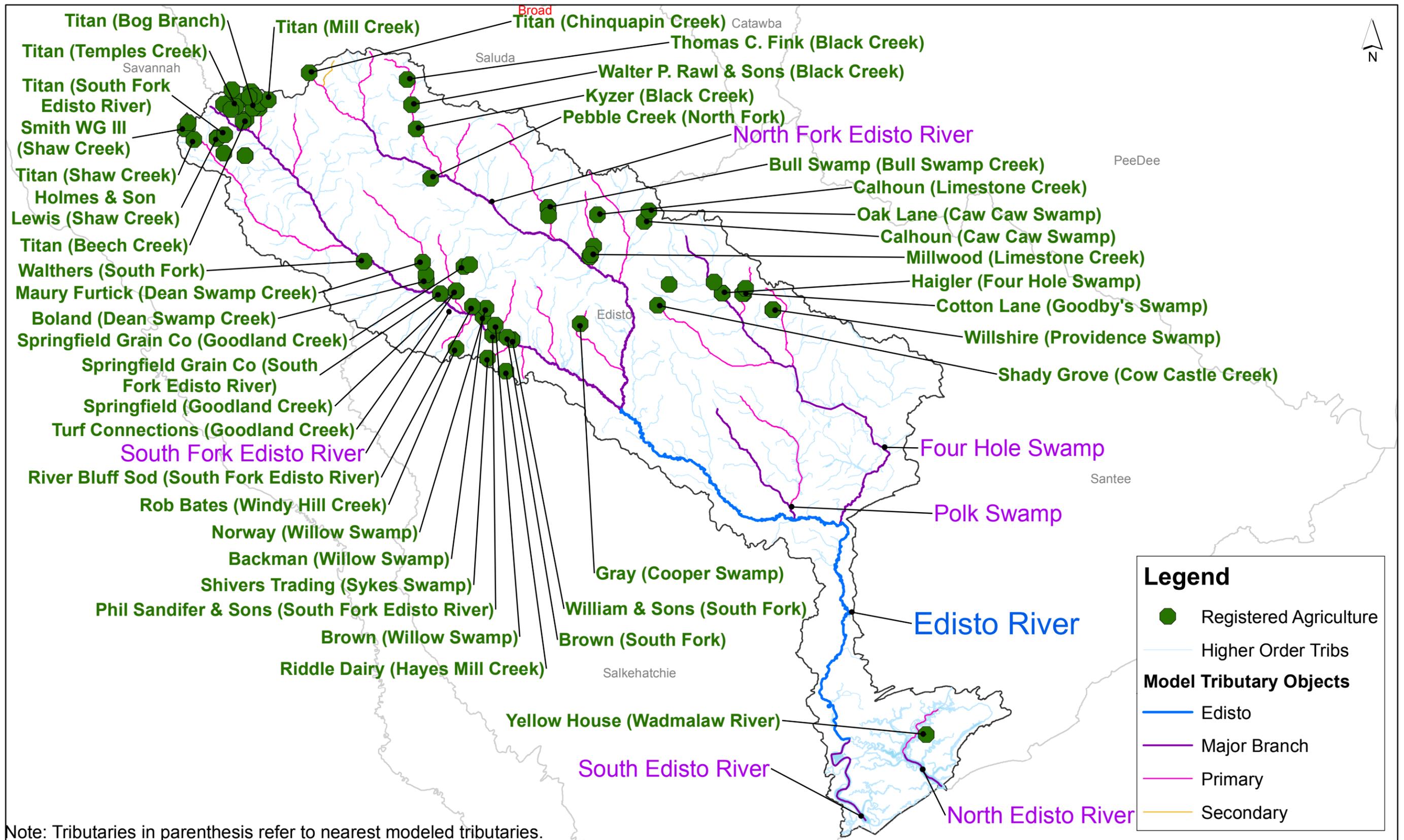


Figure 4: Registered Agricultural Users

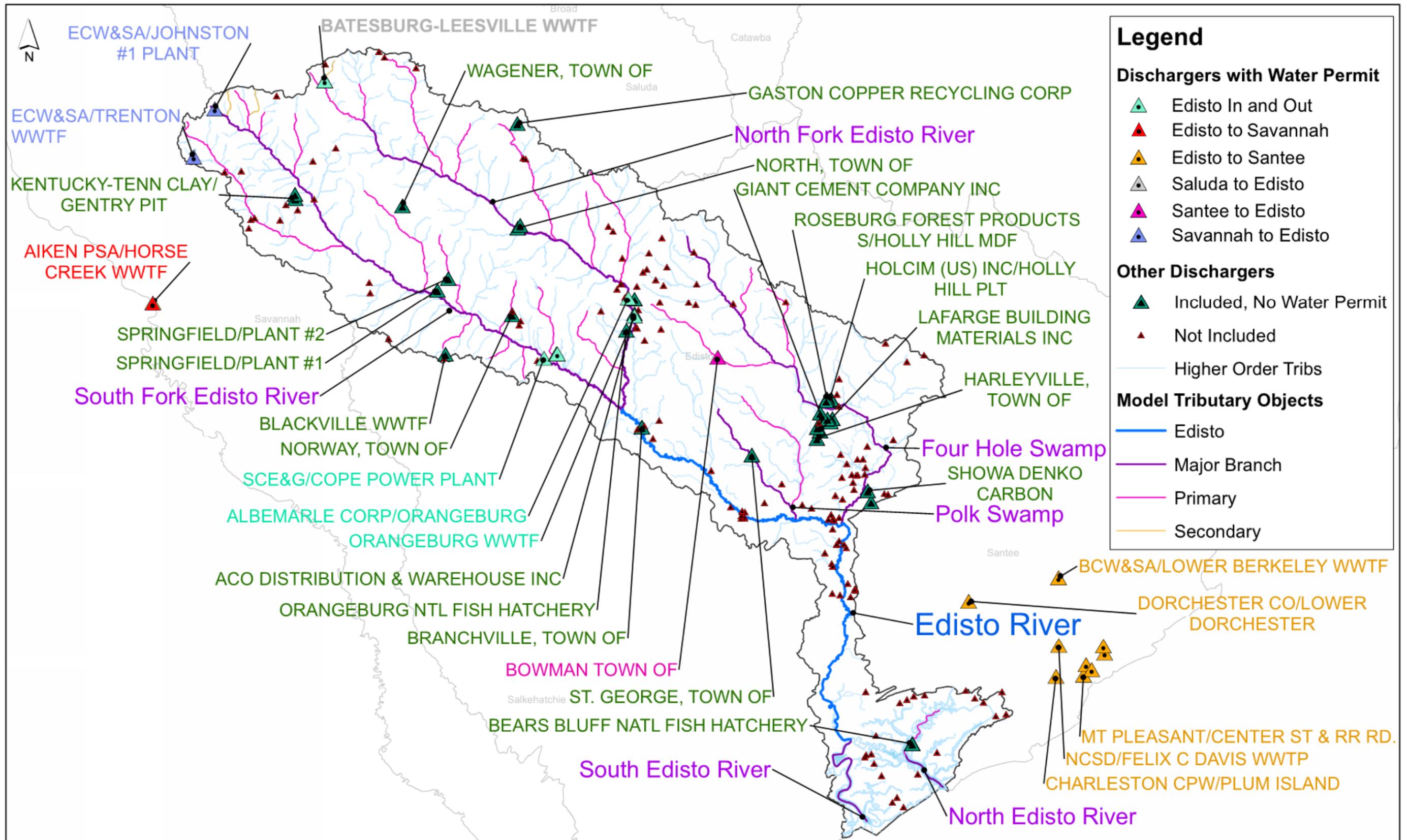


Figure 5: Dischargers

