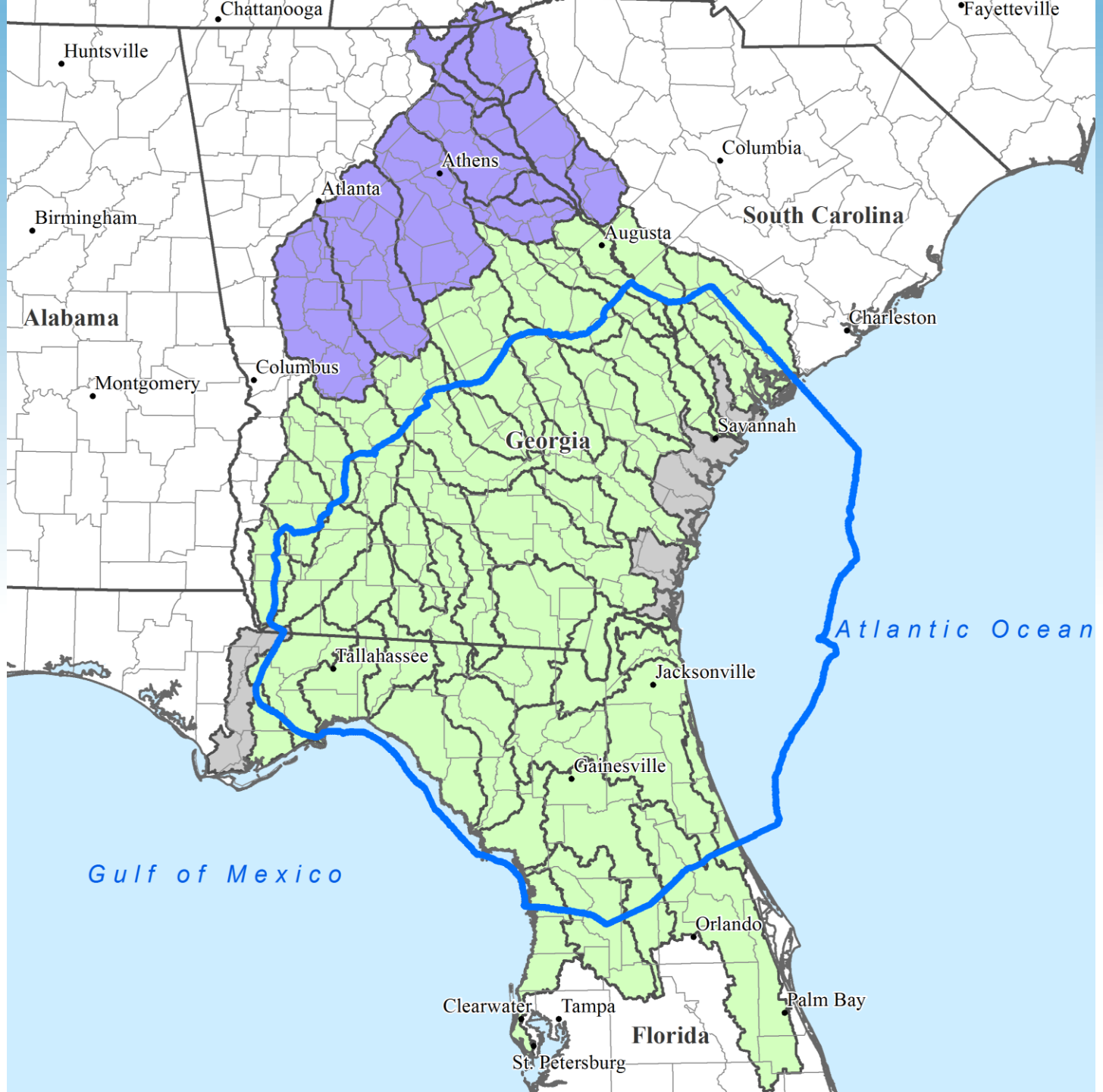
HSPF for Water Balance Inputs to MODFLOW for NFSEG 1.0

Tim Cera, P.E.
Senior Professional Engineer
St. Johns River Water Management District


Chattanooga
Fayetteville
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Augusta
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Charleston
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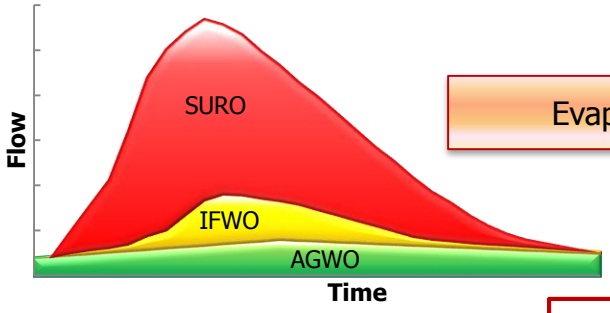
Savannah
Georgia
Atlantic Ocean
Tallahassee
Jacksonville
Gainesville
Gulf of Mexico
Orlando
Clearwater
Tampa
Palm Bay
Florida
St. Petersburg

NFSEG

- HSPF
  - Recharge
  - Maximum saturated ET for Evapotranspiration Package



Precipitation

Evaporation

Evaporation

Transpiration

Precipitation Yield, SUPY

SURET

Interception Storage (CEPS)

Interception Evaporation, CEPE

SURI

SURO SURface Outflow

Surface Detention Storage (SURS)

Upper Zone ET, UZET

Interflow Inflow, IFWI

Infiltration, INFIL

IFWO InterFloW Outflow

Interflow Storage (IFWS)

Upper Zone Storage (UZS)

Percolation, PERC

Lower Zone Inflow, LZI

Lower Zone ET, LZET

Lower Zone Storage (LZS)

Vadose Zone

Active Groundwater Inflow, AGWI

Saturated Zone

AGWO Active GroundWater Outflow

Active Ground Water Storage (AGWS)

Inactive Groundwater Inflow, IGWI

Active Groundwater ET, AGWET

Baseflow ET, BASET

Inactive Groundwater (Does not contribute to baseflow)

MODFLOW Inputs

- Recharge is the sum of Active Groundwater Inflow (AGWI) and Inactive Groundwater Inflow (IGWI)

Recharge = AGWI+IGWI

- PET is input as demand
- Maximum Saturated ET is PET minus all unsaturated ET values

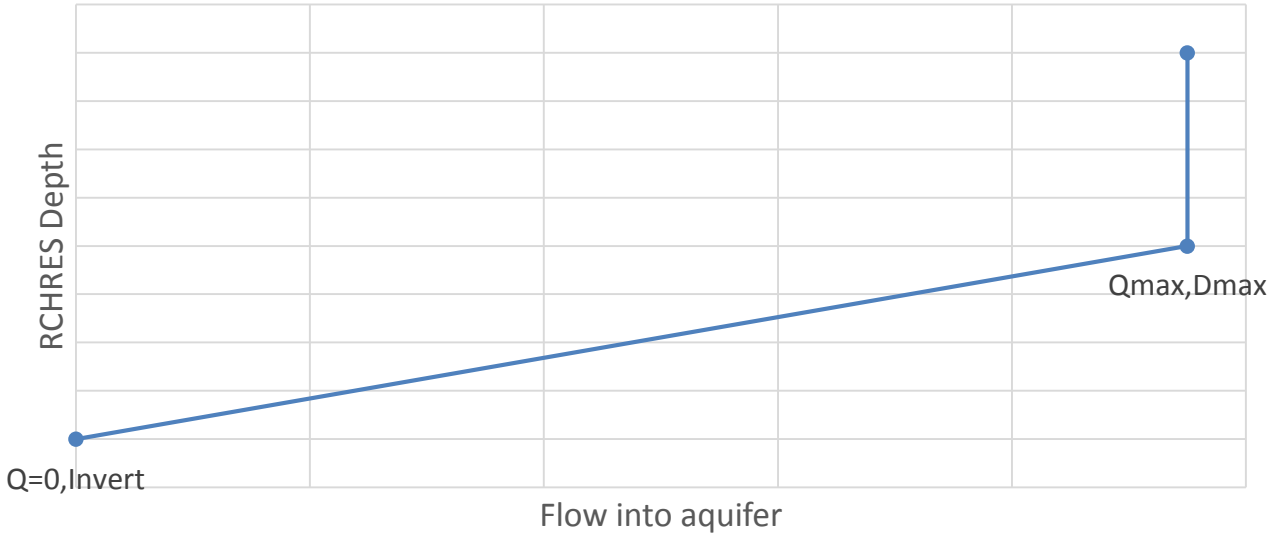
MSATET = PET–CEPE–UZET–LZET

Closed Basins

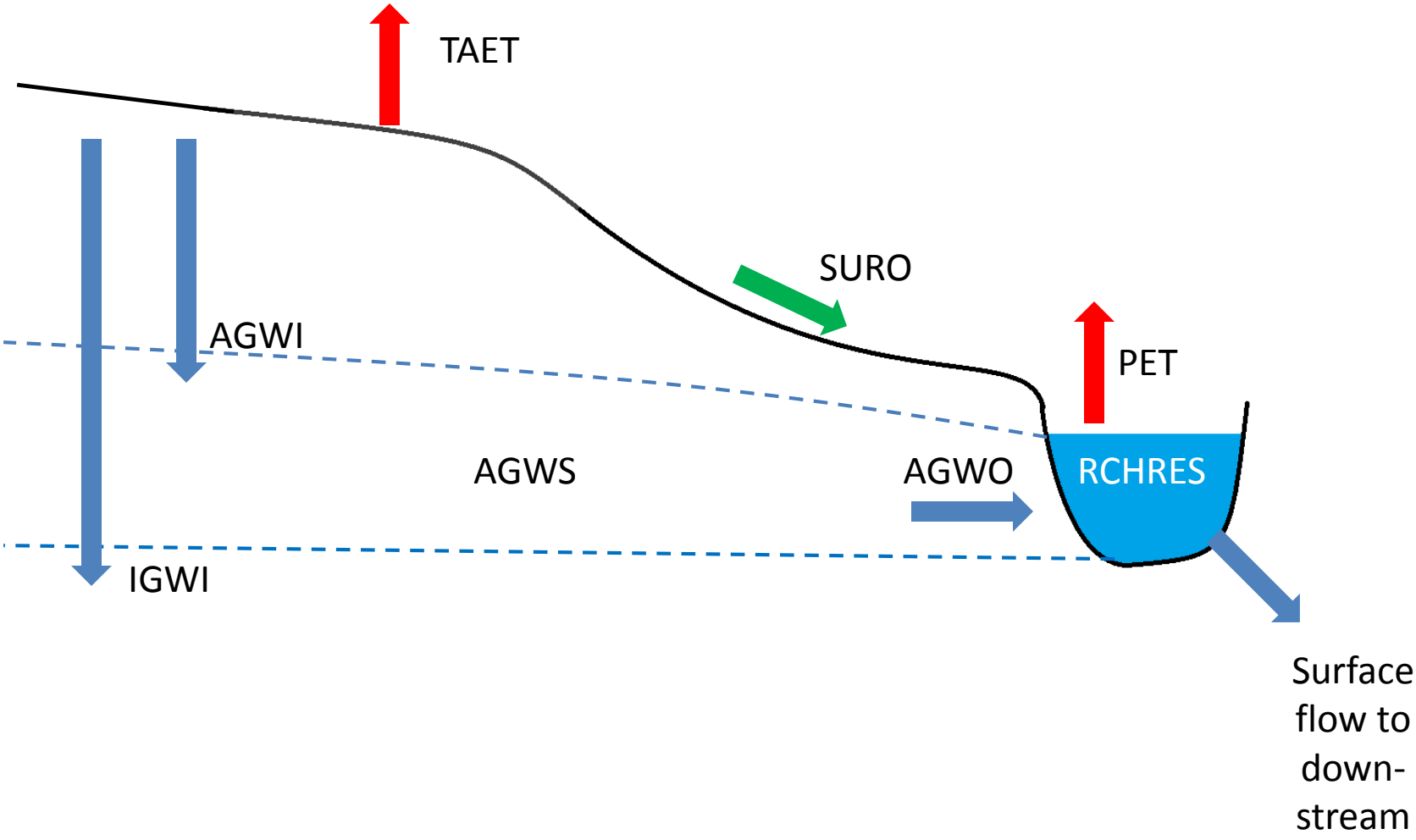
- Traditionally are not modeled since they do not contribute to surface flows
- Naive approach would be to increase IGWI until surface flow is 0
  - Distorts the infiltration and evaporation parameters
- NFSEG Methodology
  - Use calibrated parameters from nearby subwatersheds for infiltration and evaporation
  - Increase IGWI to high, but reasonable values
  - All closed basins had NHDPlus identified swallets
  - Apply the drainage well concept, but configure as a sink

Swallets and Drainage Wells

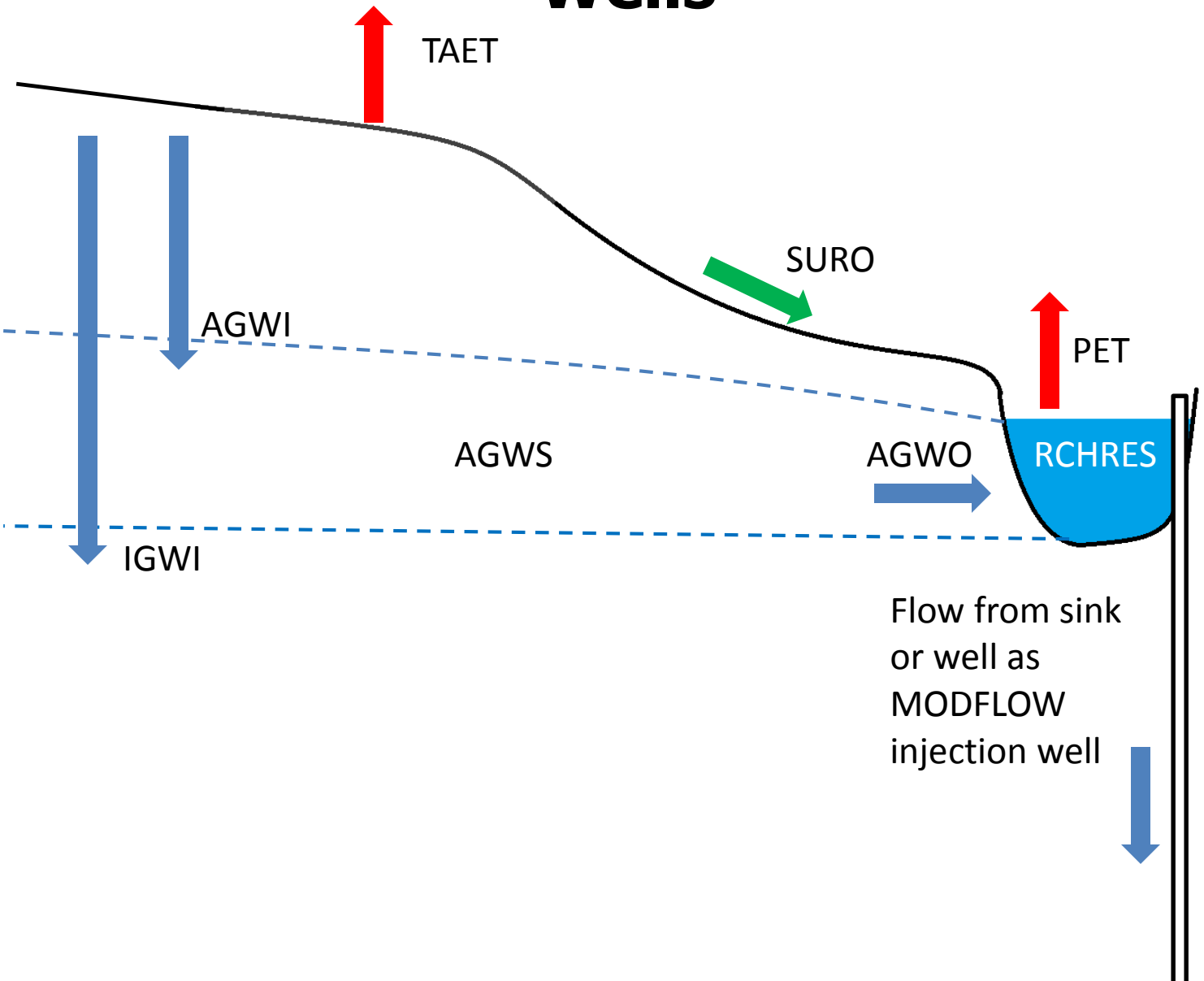
- Composite of all swallets and drainage wells in subwatershed
- Simple linear flow relationship
  - Linear representing flow controlled by opening
  - Maximum representing flow controlled by aquifer
- Well invert, Qmax, Dmax parameterized by PEST



Tributary Reach



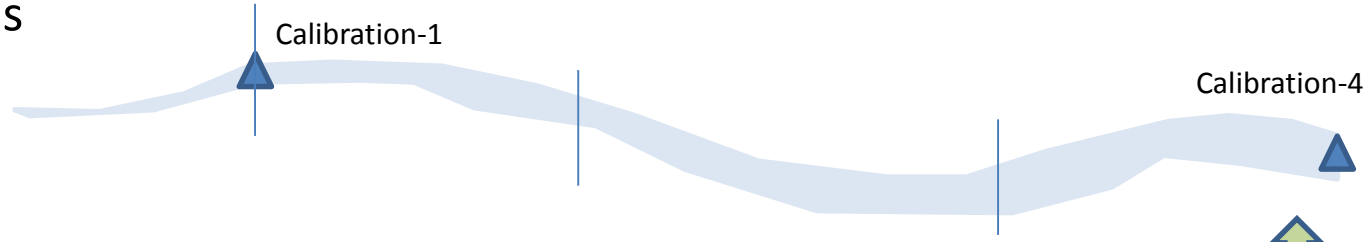
Closed Basins: Swallets and Drainage Wells



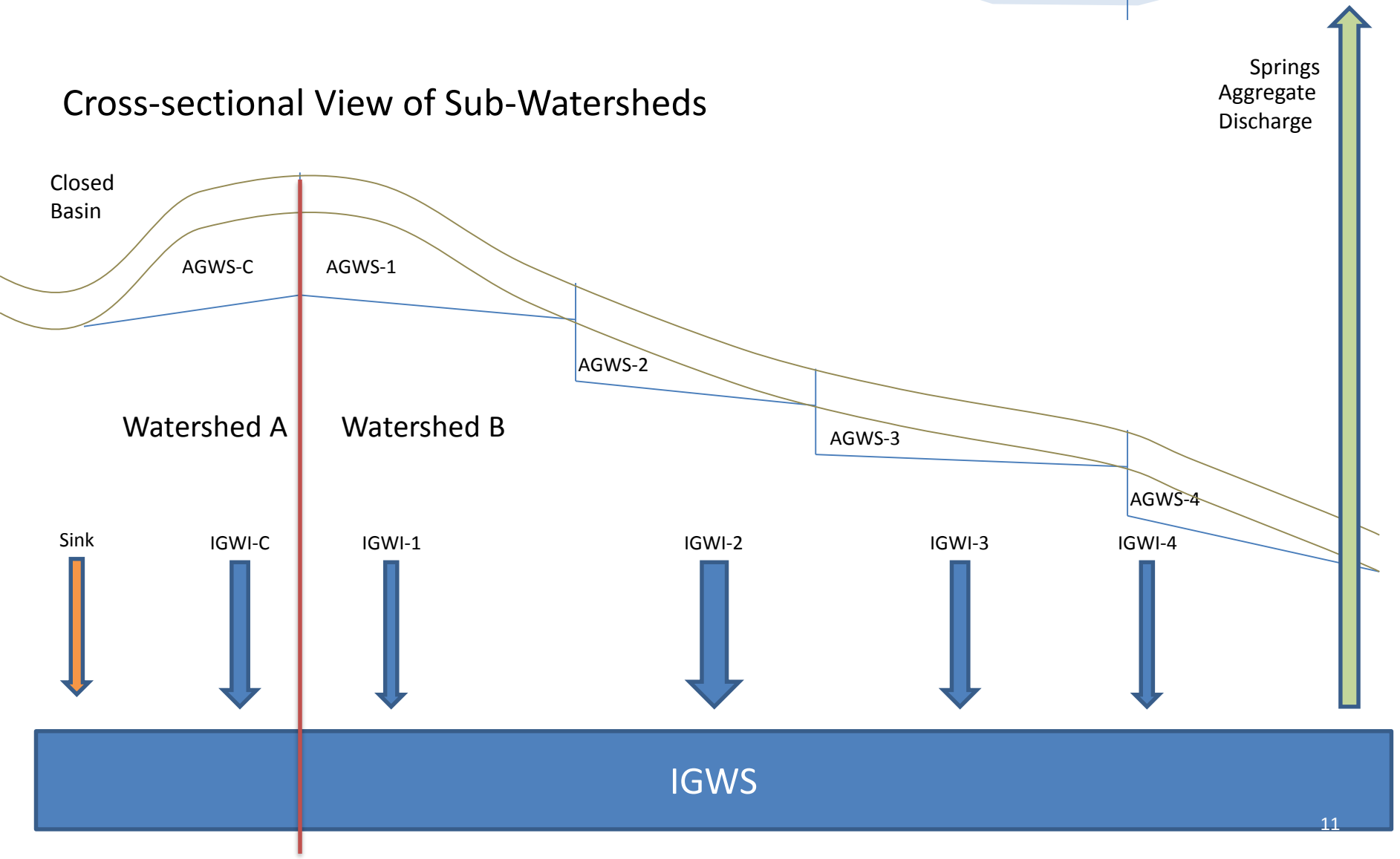
Springs Plus Diffuse Groundwater Discharge to a Reach (Aggregate Discharge)

- Traditional Approach
  - Inactive Groundwater Inflow (IGWI) goes out of the model
  - Springs are observed flow time-series imposed into a RCHRES
- Inactive Groundwater Storage Approach
  - IGWI and sink flow is collected within the springshed into an "underground RCHRES reservoir"
  - Flow from the underground RCHRES reservoir is used to represent the aggregate discharge within the springshed

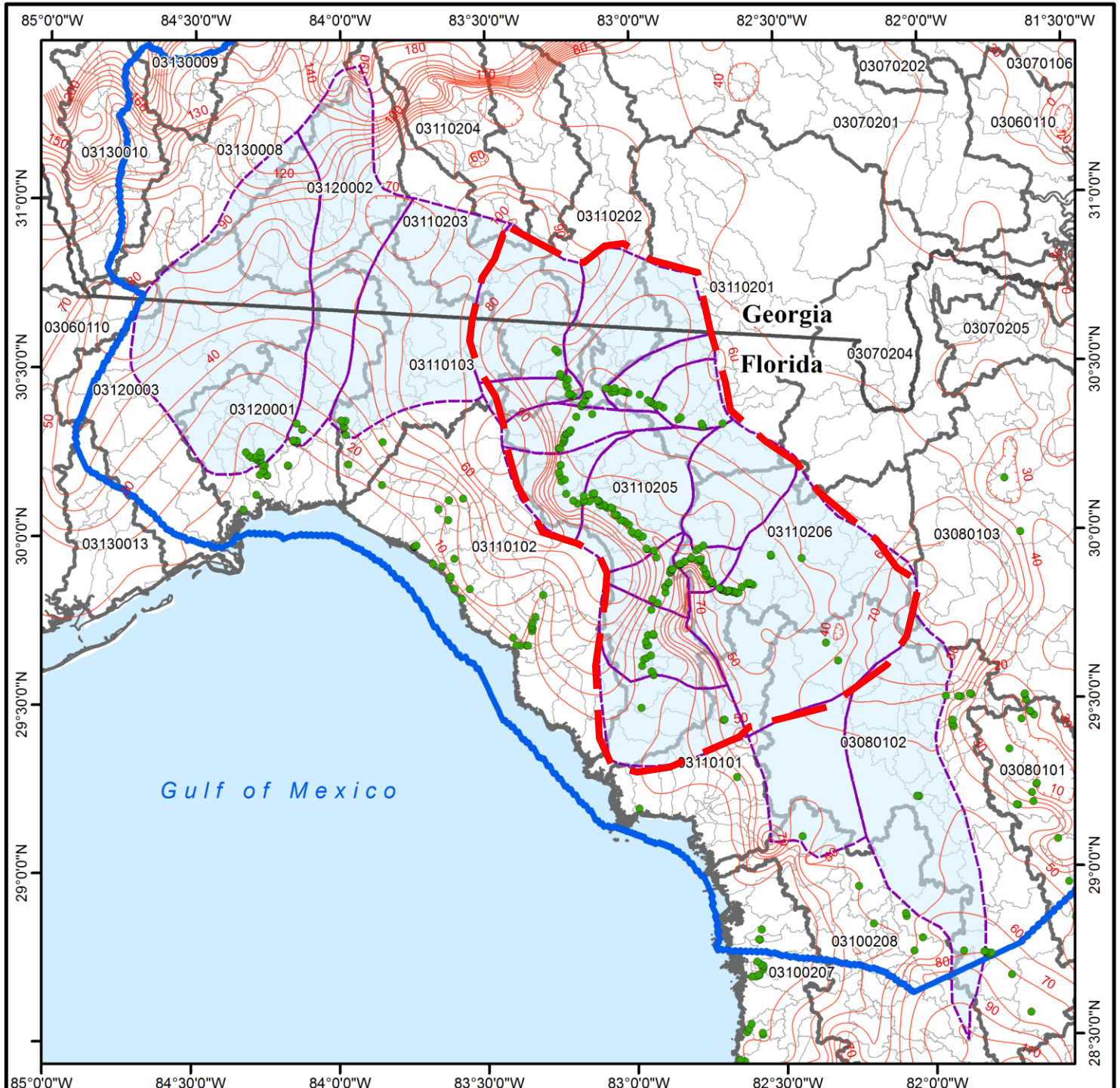
Plan View of Reaches



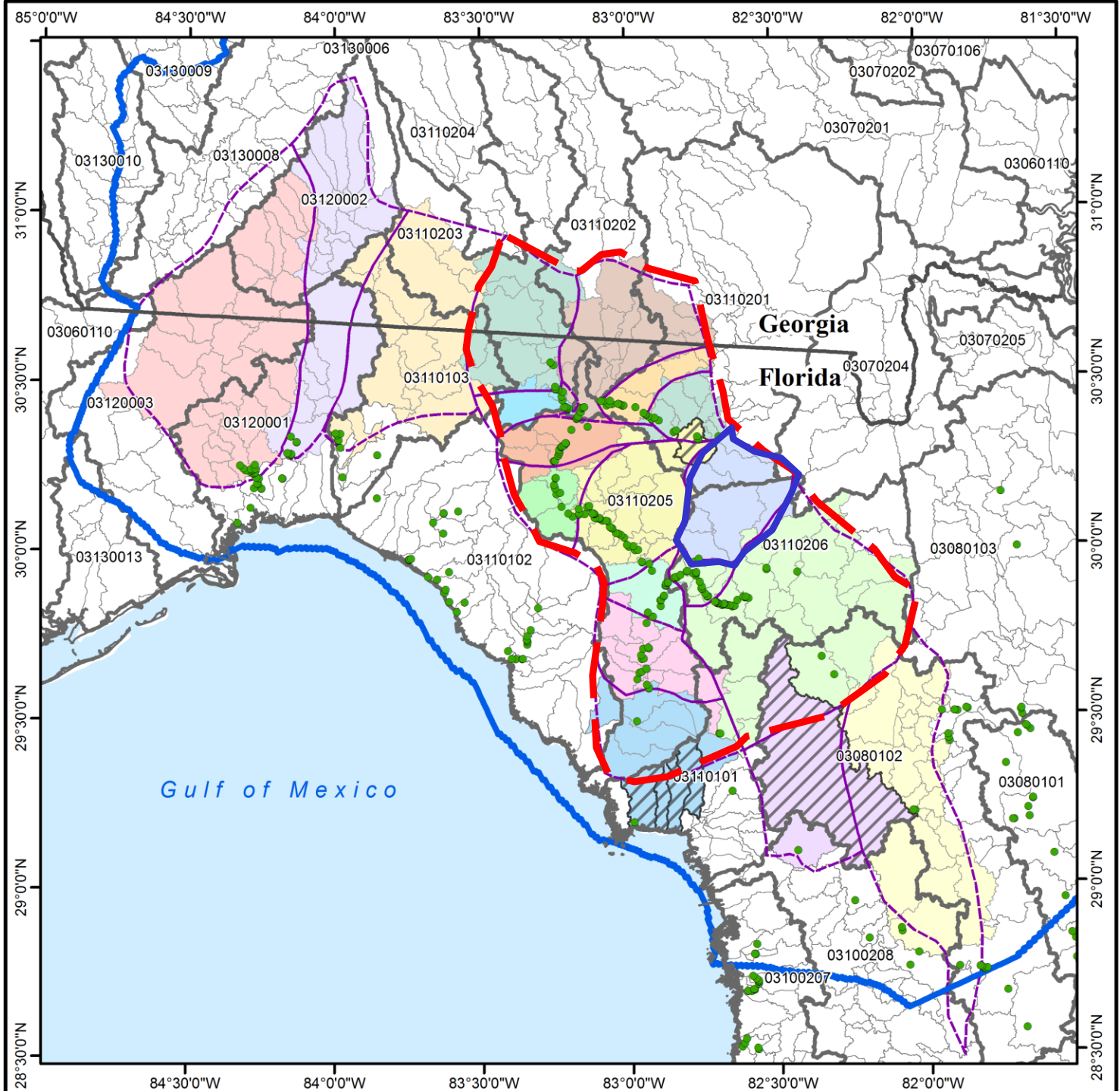
Cross-sectional View of Sub-Watersheds



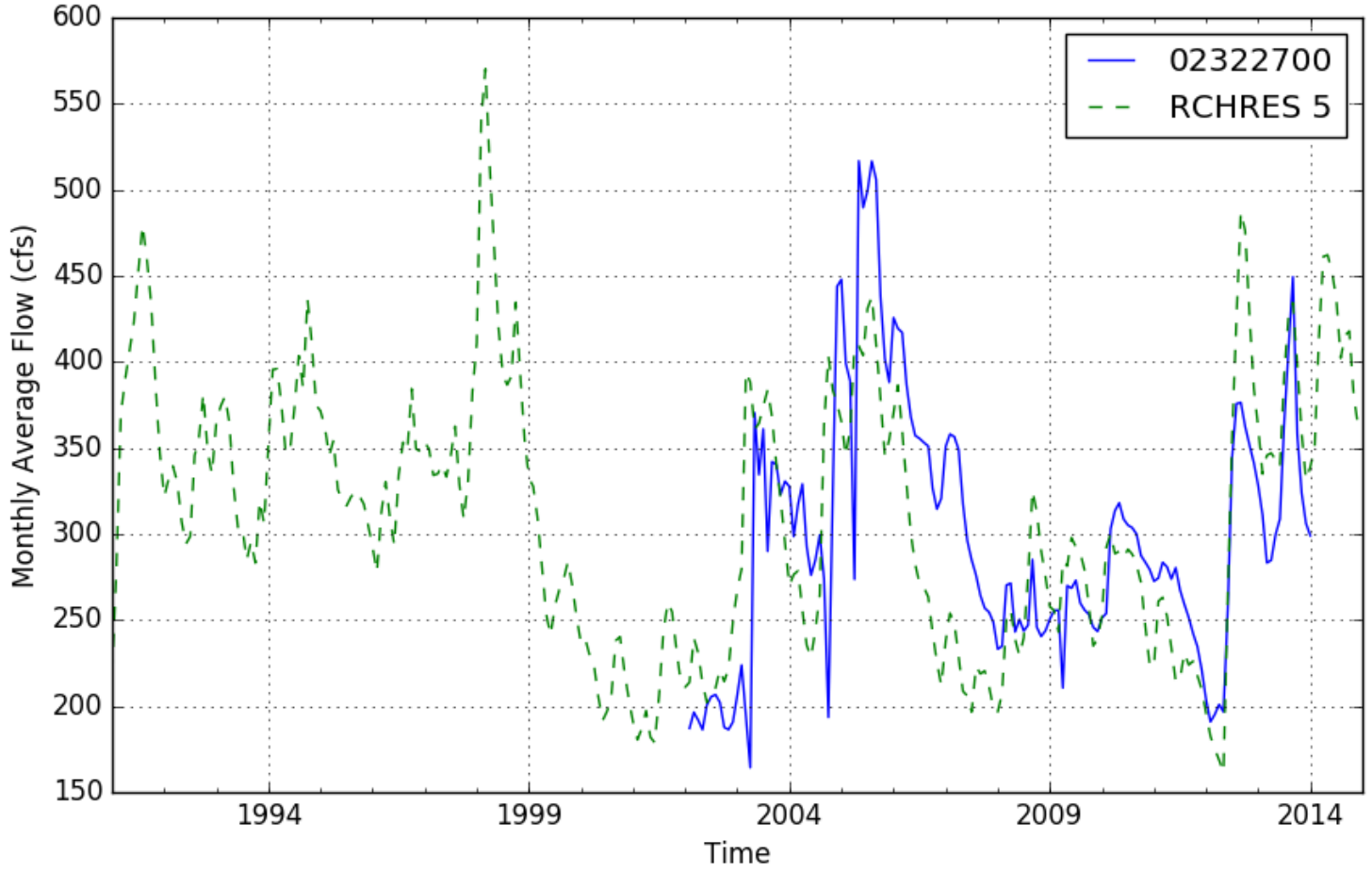
2010 Potentiometric Surface and Springsheds



Contributing Springsheds and Surface Subwatersheds



Ichetucknee Springs



HSPF Water Use: NFSEG

- NFSEG HSPF models
  - Agricultural irrigation
  - Domestic Self Supply
  - Public Water Supply
  - Septic fields
  - Golf courses
  - Reuse spray fields

Post-Processing

- Develop PERLND ID raster
  - National Land Cover Database (NLCD) 30x30 meter
  - Subwatershed raster
- Develop Look Up Table (LUT)
  - hspfbintoolbox to develop PERLND ID to model output (LUT)
- ViRTual (VRT) spatial dataset
  - http://www.gdal.org/drv_vrt.html
  - Allows for efficient transformation of PERLND ID raster to model output raster using LUT
- QGIS is used for visualization of VRTs (http://qgis.org)
- Zonal statistics to get average across MODFLOW cell