Caloosahatchee River and Estuary Basin Management Action Plan (BMAP)

Hydrological Simulation Program – FORTRAN (HSPF) Model Technical Meeting

Via Webinar

Meeting Link

Meeting ID: 244 973 018 435 3

Passcode: 3vD6ir7v

August 26, 2025

10 AM EDT

Agenda

- Caloosahatchee River and Estuary BMAP Model Background.
- Overview of Caloosahatchee River and Estuary HSPF Model Updates.
- Questions/Comments.

Please note the site for information relating to the Caloosahatchee River and Estuary BMAP:
Basin Management Action Plans (BMAPs) | Florida Department of Environmental Protection
For more information on the Caloosahatchee River and Estuary BMAP, contact: Tony Tomalewski, 850-245-8683.
Anthony.Tomalewski@FloridaDEP.gov

TETRA TECH

Caloosahatchee River and Estuary HSPF Model Update

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August 26, 2025

Model History and Scope Overview

- In 2017, the Hydrological Simulation Program-FORTRAN (HSPF) model for the Caloosahatchee River and Estuary Watershed was updated for use in:
  - Developing total maximum daily loads (TMDLs) for the impaired tributaries.
  - Updating the allocations and project credits in the 2020 BMAP Update.
- Current project extends the model period of record by adding data from 2015 through 2023 for:
  - Land use cover.
  - Agricultural irrigation.
  - National Pollutant Discharge Elimination System (NPDES) and reuse facilities.
  - Septic systems.
  - Weather.
  - Wet and dry atmospheric deposition loading.
  - Water quality and flow.
- Follow same approach as 2017 model for executing hydrology and water quality.

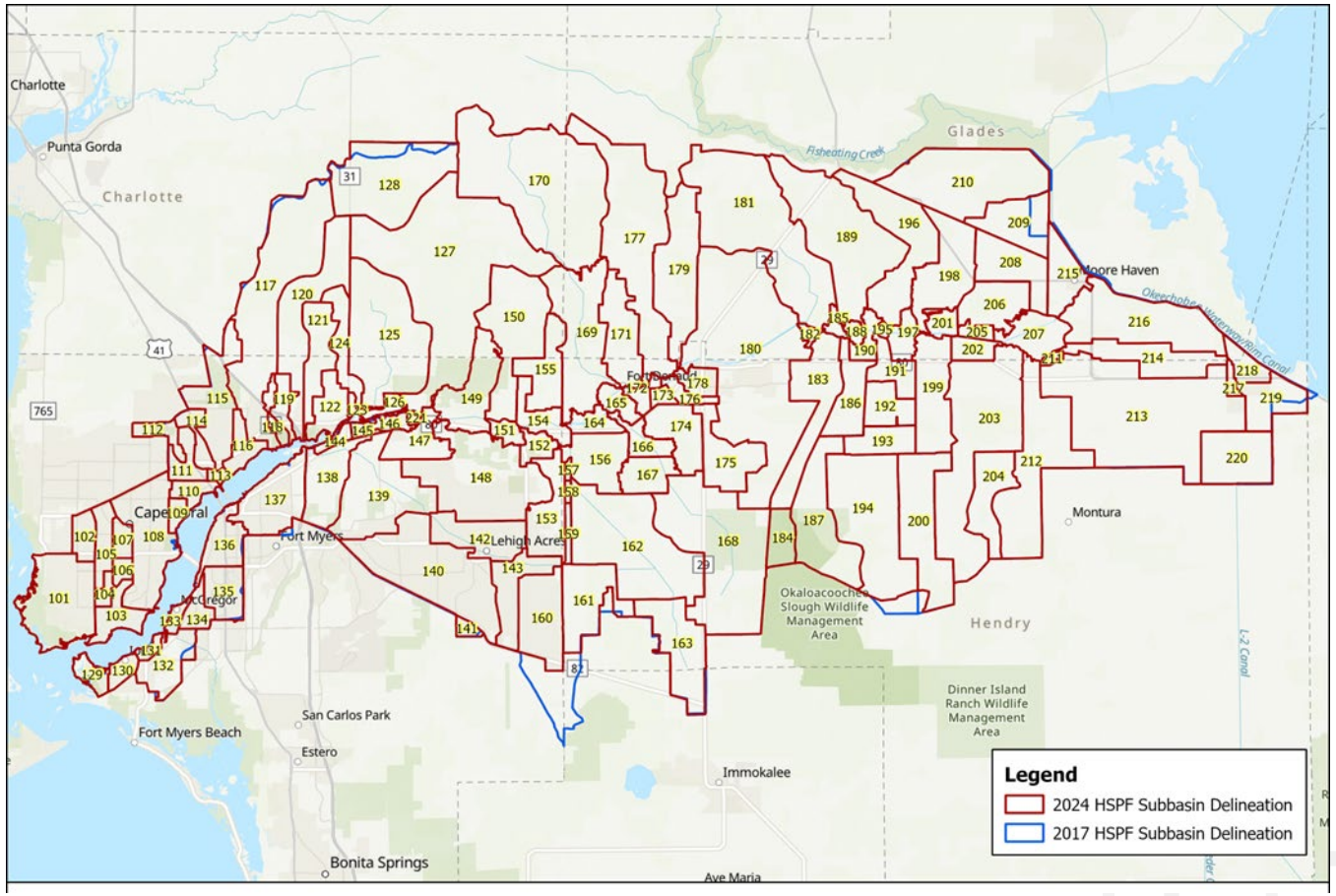
Tasks

- Gather latest data.
- Update the hydrology calibration.
- Update the water quality calibration.
- Develop an ArcGIS Nitrogen Load Estimation Tool (ArcNLET) model to represent septic systems.
- Prepare a load estimation tool (LET) for future basin management action plan (BMAP) update.

Hydrology

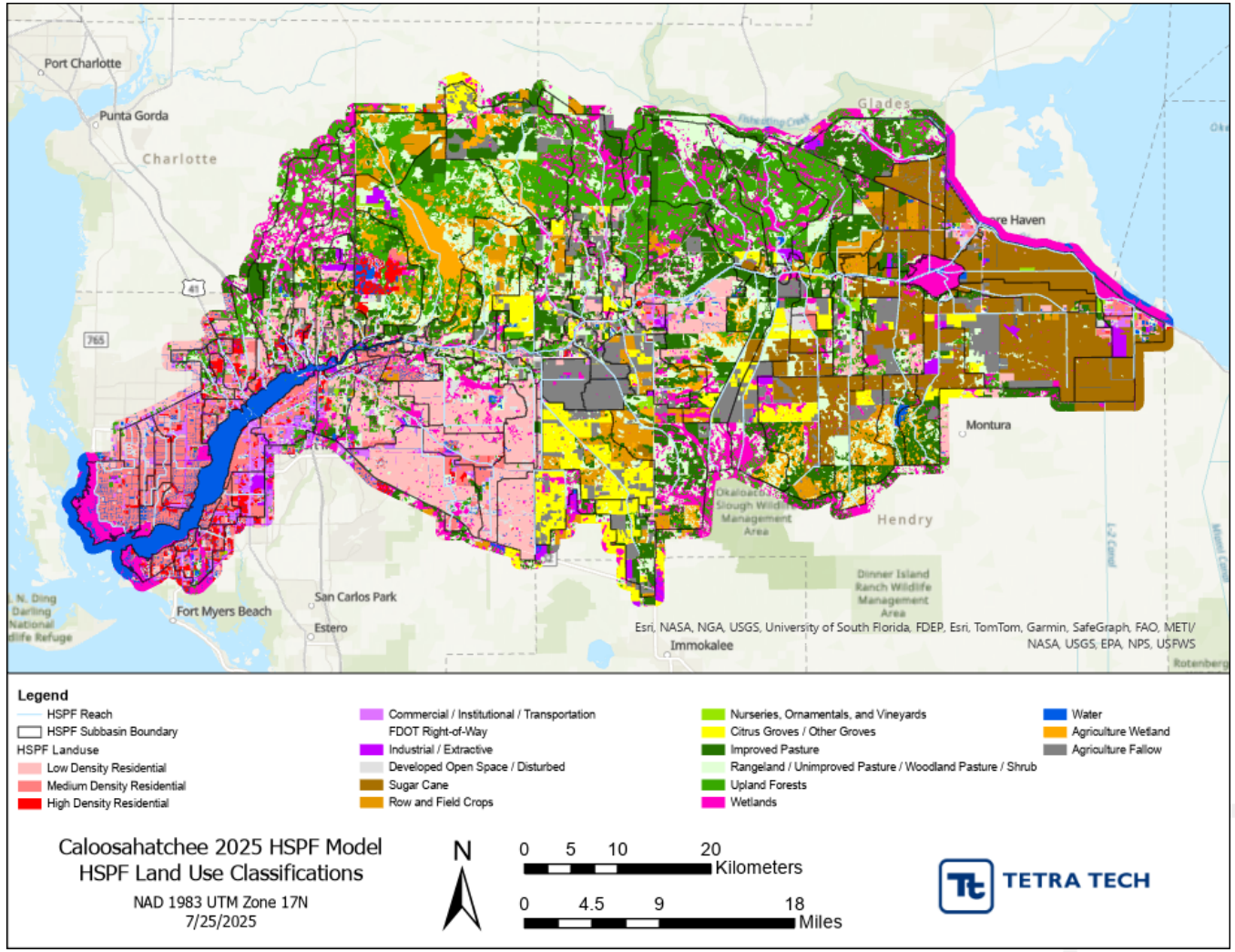
Subbasin Delineations

- Same 121 subbasin delineations as the 2017 HSPF Model.
- Overall watershed boundary was slightly modified to reflect changes made by South Florida Water Management District (SFWMD) in collaboration with the Coordinating Agencies (Florida Department of Environmental Protection [DEP] and Florida Department of Agriculture and Consumer Services [FDACS]).



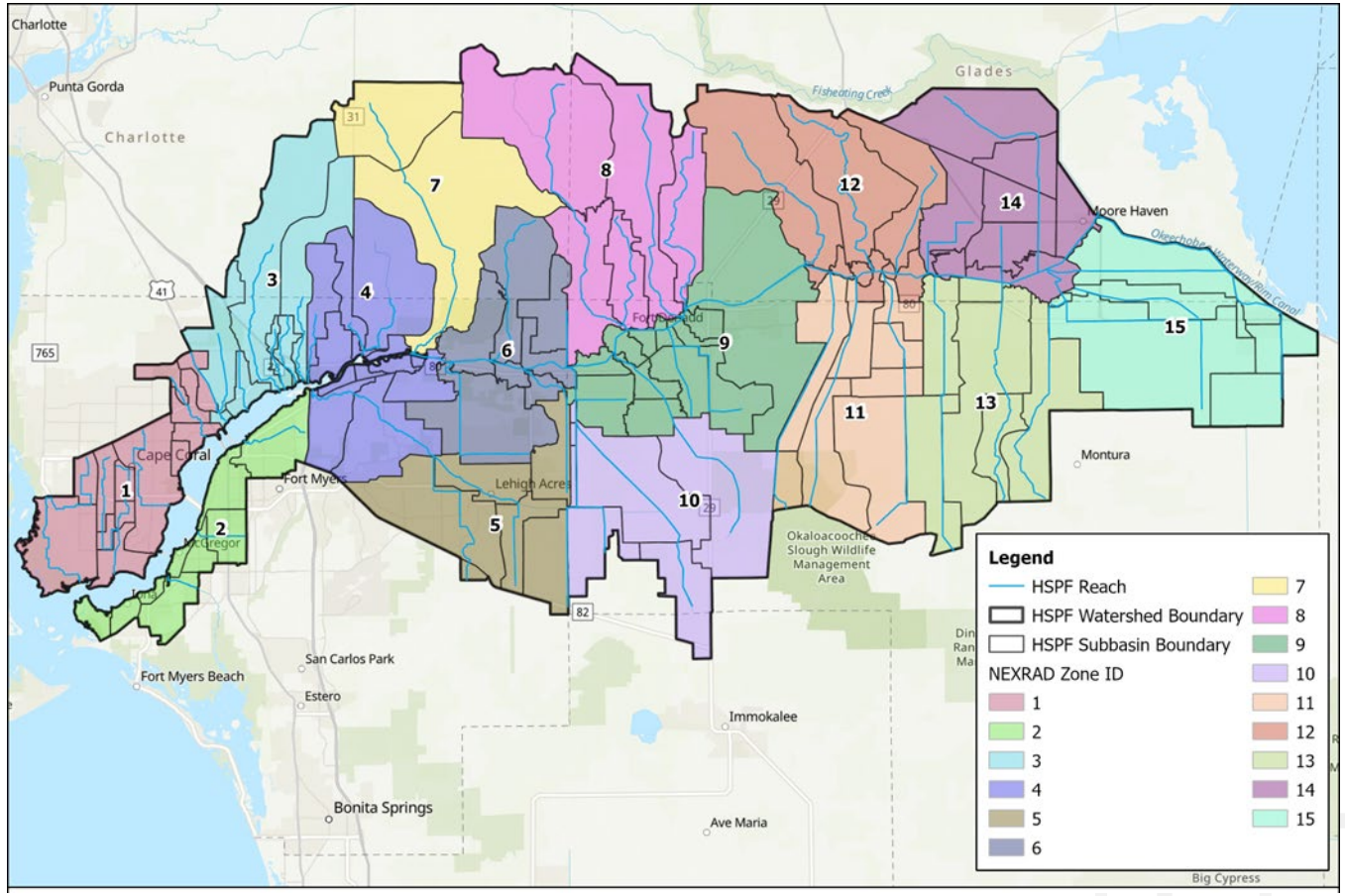
Land Use

- Combination of:
  - 2020–2023 DEP Statewide Land Use Land Cover.
  - 2023 National Land Cover Dataset (NLCD).
  - FDACS Florida Statewide Agricultural Irrigation Demand (FSAID) 12.
  - Florida Department of Transportation (FDOT) roads and rights-of-way.
- Added two new land use categories:
  - Agricultural Wetland.
  - Agriculture Fallow.



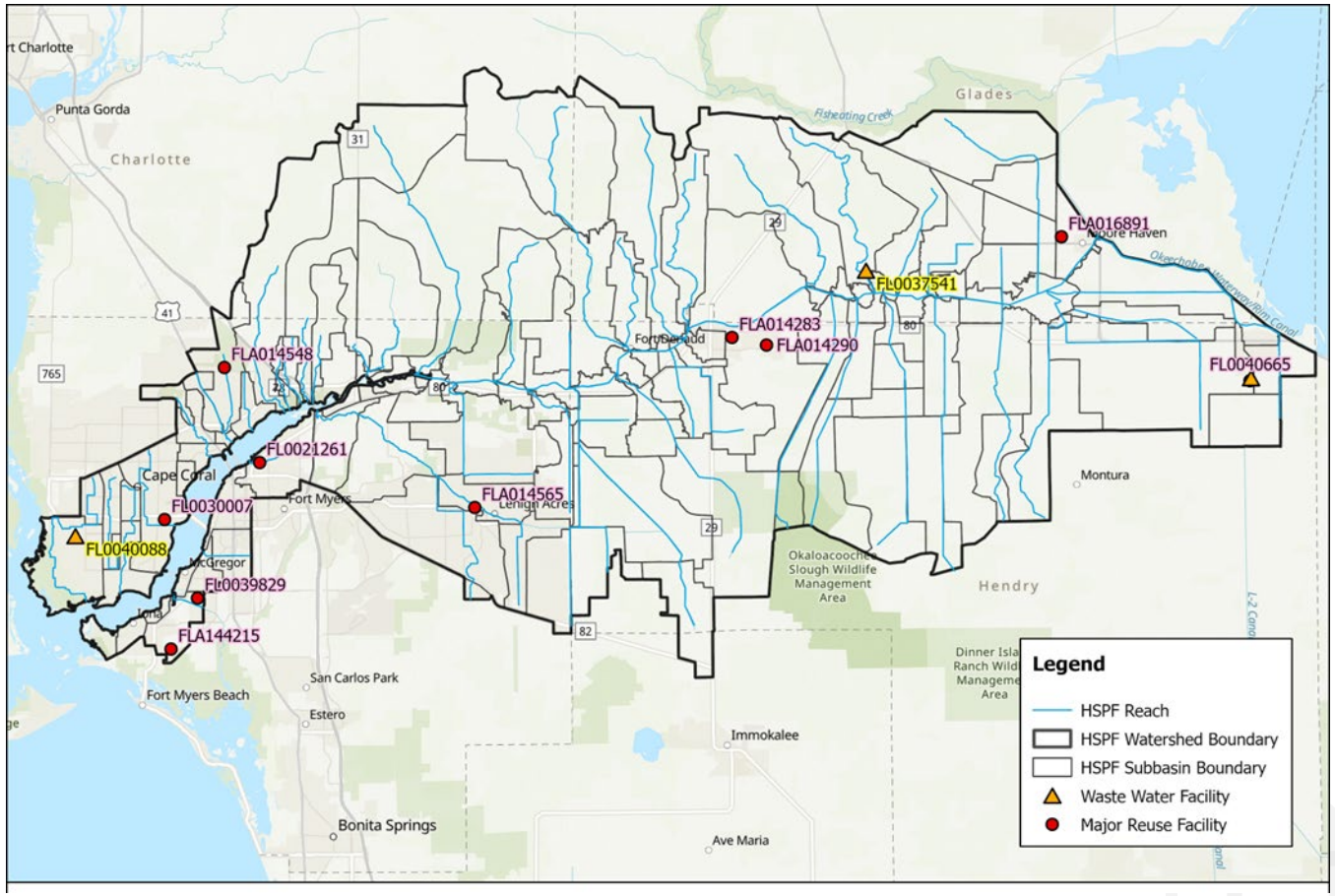
Weather Data

- Precipitation data were extended using Next Generation Weather Radar (NEXRAD) data.
  - Averaged into same 15 NEXRAD zones as the previous HSPF model.
- Changed from the reference evapotranspiration (ETo) in the Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS) model to SFWMD data.
- Continued to use Surface Airways (SA) station WBAN 12835 (Page Field Airport), located in Fort Myers for air temperature, dew point temperature, wind speed, cloud cover, and solar radiation.



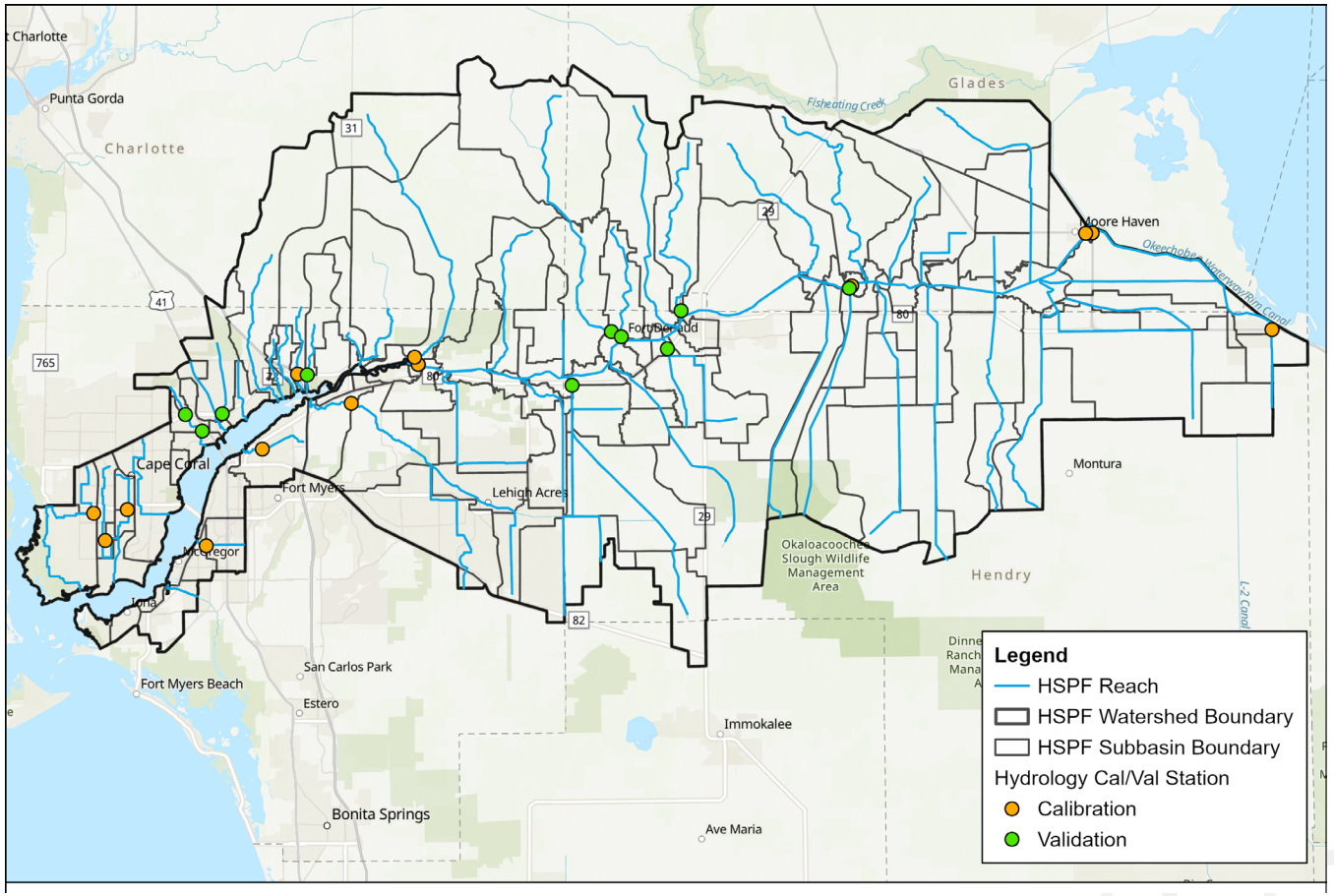
Point Sources and Reuse Facilities

- Same facilities as the previous model:
  - 3 NPDES domestic and industrial wastewater treatment facilities.
  - 11 reuse facilities.
- Missing values filled using the same assumptions applied in the 2017 HSPF Model.

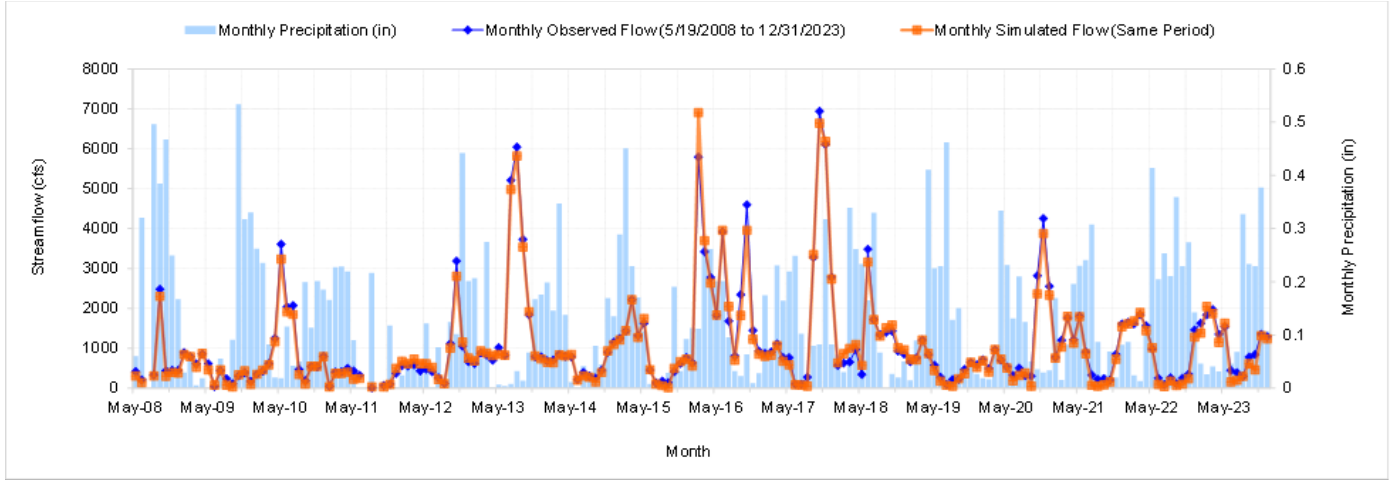


Updated Hydrology Calibration

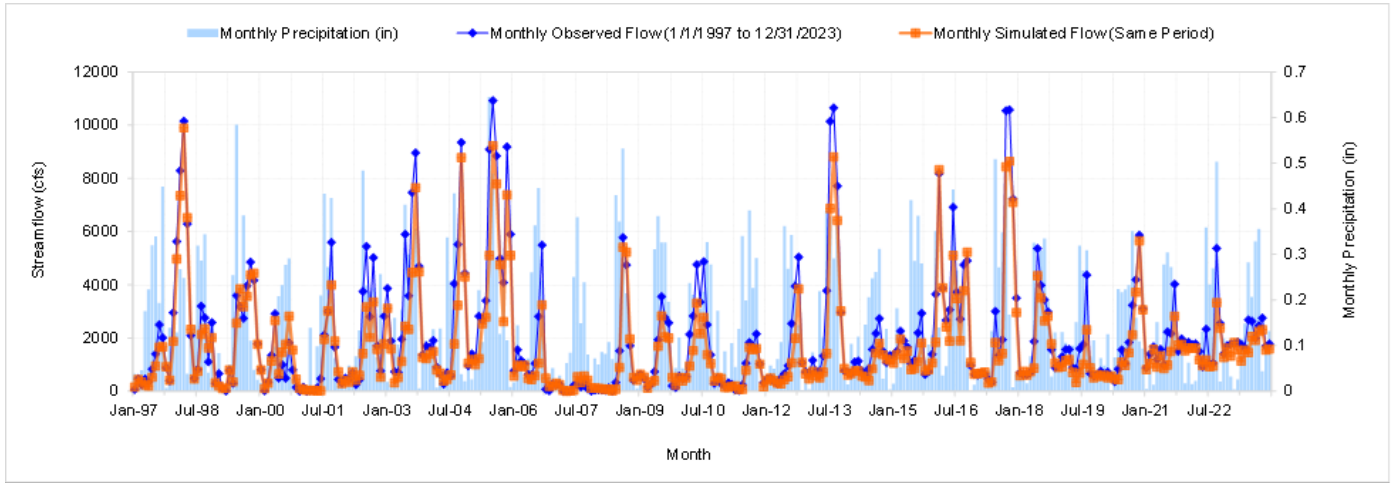
- Hydrology parameterization and boundary conditions remained the same.
- Calibration and validation to observed flow data at 23 stations:
  - 17 U.S. Geological Survey (USGS) stations, 3 new stations.
  - 6 DEP stations.
- Calibration results in 2025 model similar to calibration from 2017 model.



Example Hydrology Calibration Results

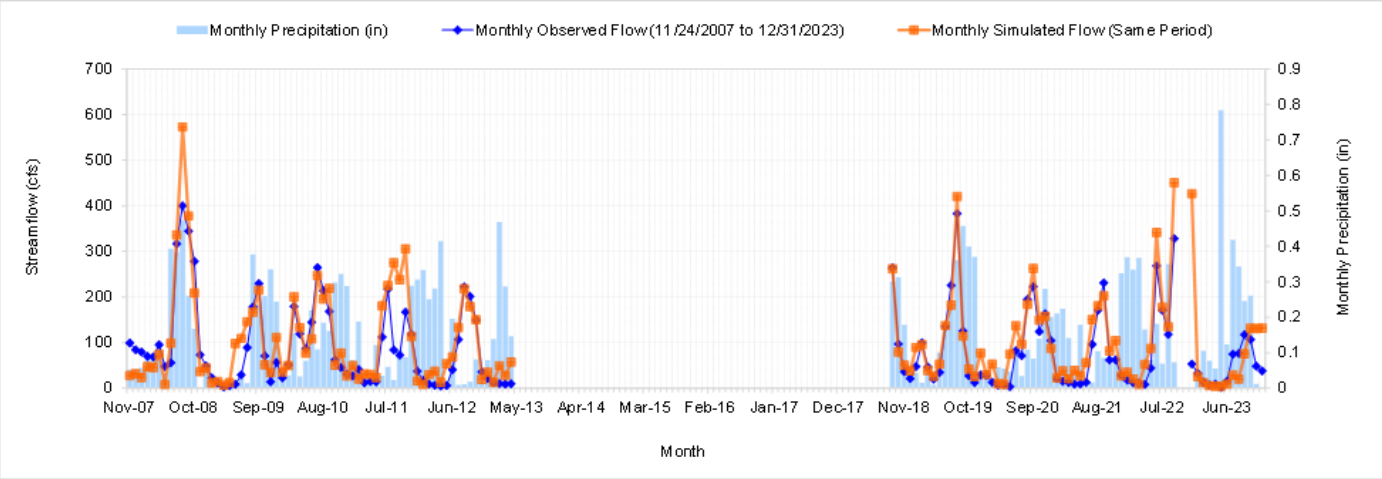


USGS 02292010 Caloosahatchee Canal Downstream of S-77 at Moore Haven

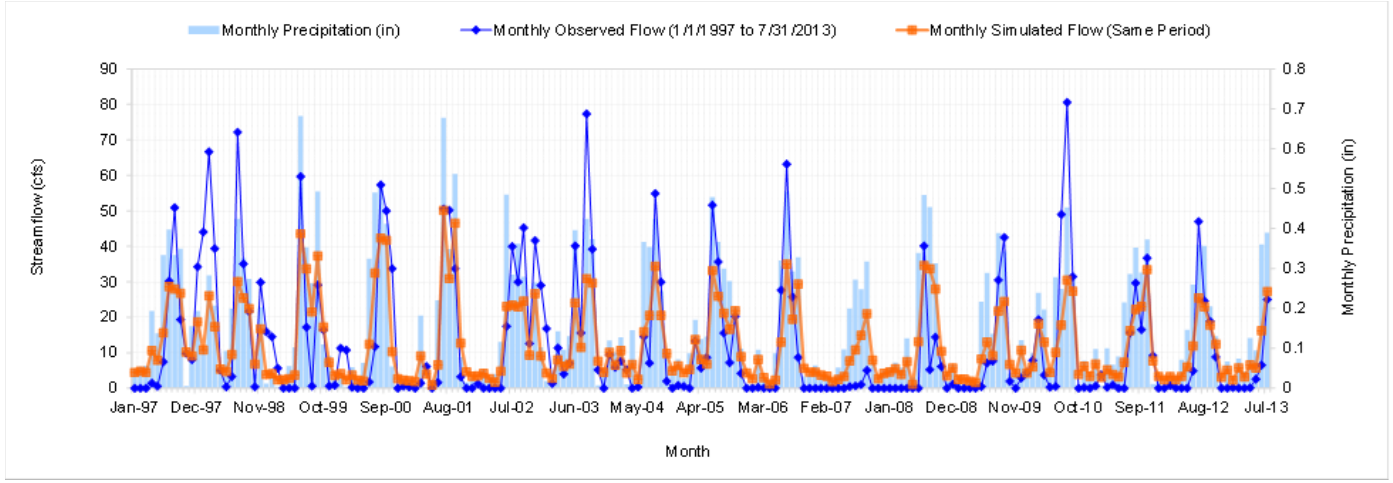


USGS 02292900 Caloosahatchee River at S-79 near Olga, FL

Example Hydrology Calibration Results, continued



USGS 02293055 Orange River near Buckingham



USGS 02293243 Courtney Canal at Cape Coral

Questions?

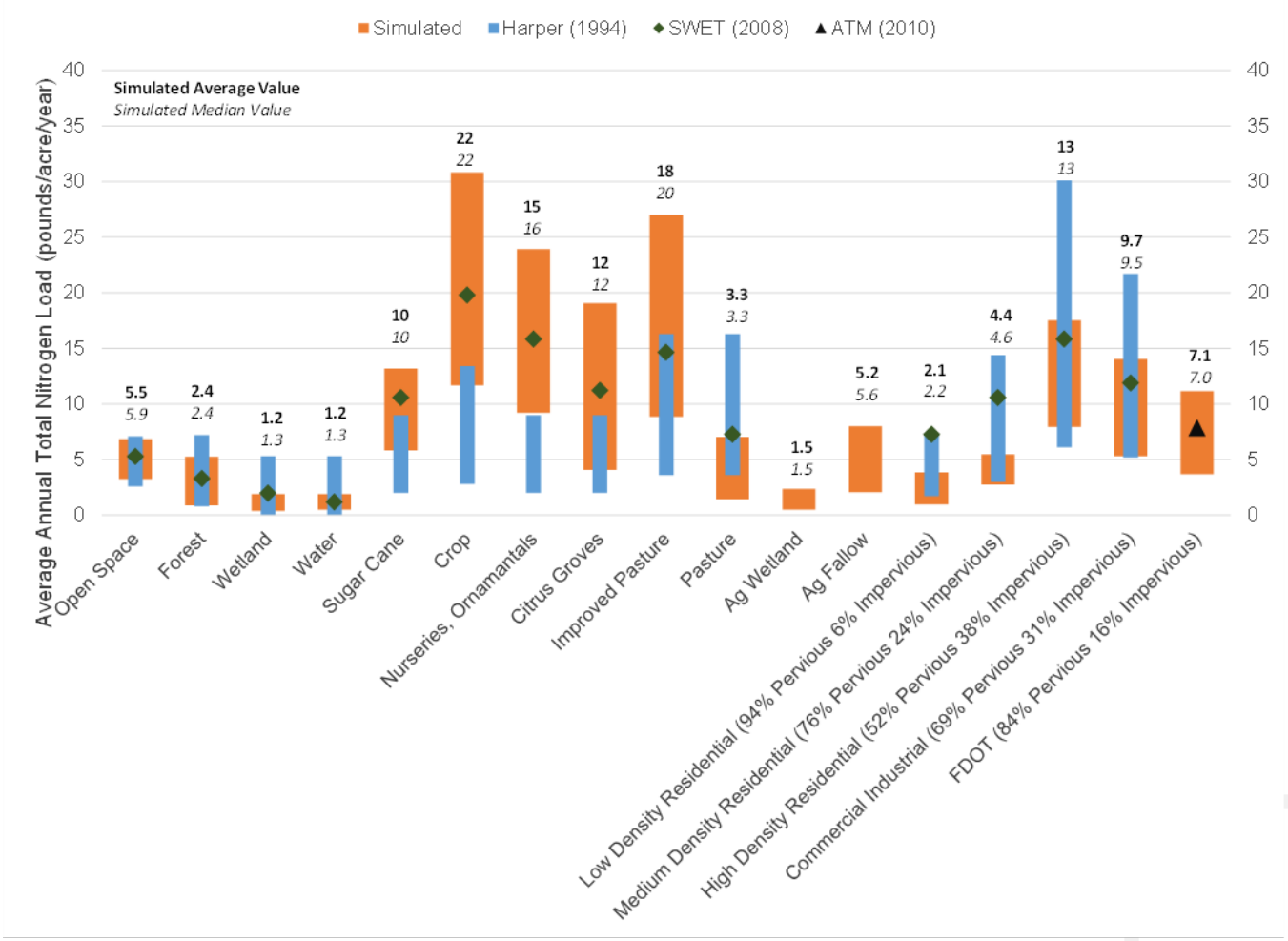
Water Quality

Water Quality Data and Parameterization

- Used data processed in previous task for:
  - Land uses.
  - NPDES and reuse facilities.
  - Atmospheric deposition.
  - Upstream boundary conditions.
  - Septic systems (from ArcNLET).
- Overall, 2017 HSPF Model water quality parameters remained unchanged in the 2025 HSPF Model:
  - Minor modifications to some agricultural land uses to represent information from FSAID and add new land use categories (Agricultural Wetland and Agricultural Fallow).

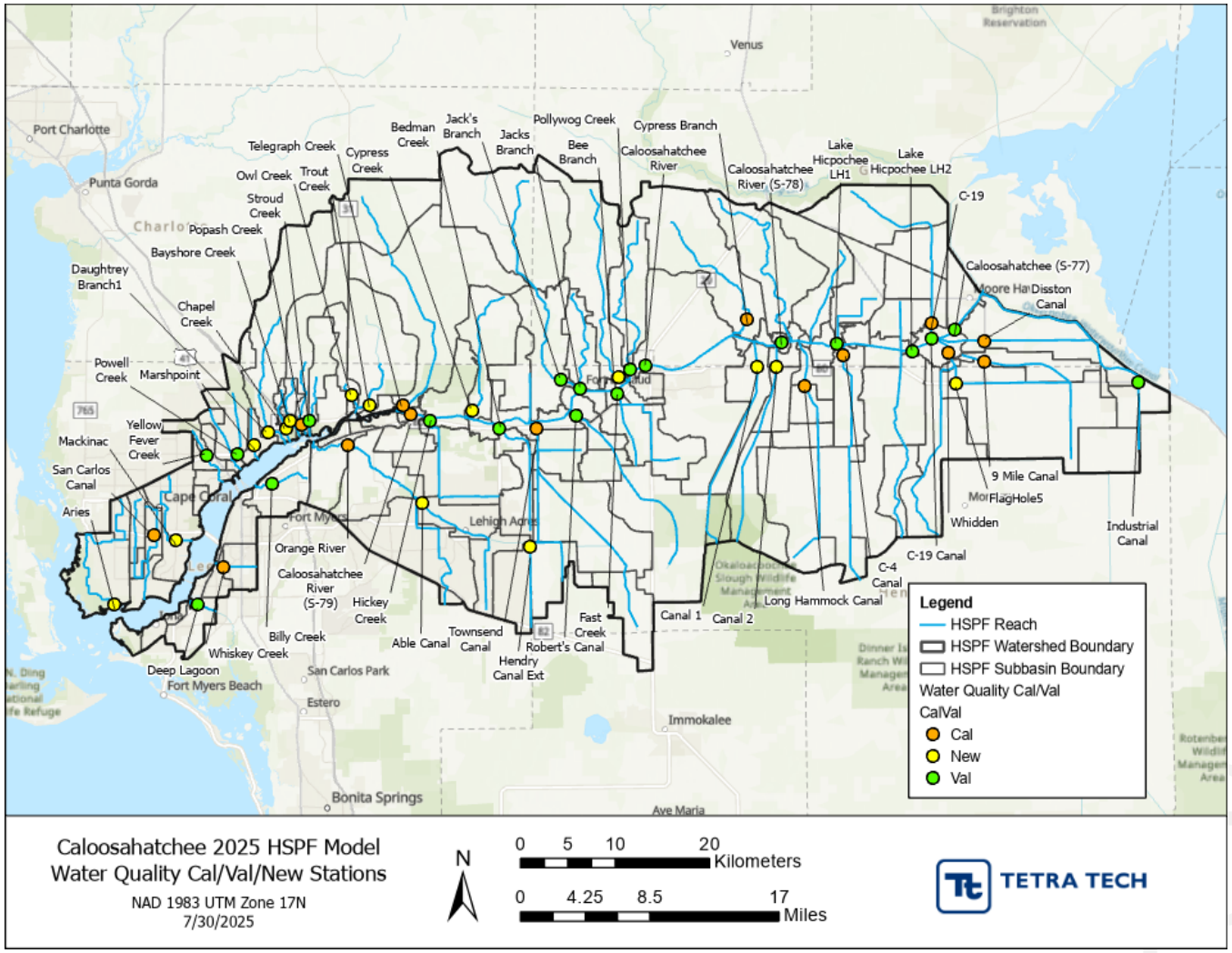
Water Quality Calibration

- Calibrated total nitrogen (TN) and total phosphorus (TP) to same targets as 2017 HSPF Model:
  - Harper (1994) values for urban areas.
  - SWET (2008) values for agricultural areas.
- Generally, the target values in Harper (1994) and SWET (2008) were near the median and average of the model simulated range.
  - Some values slightly higher or lower to balance the upland load and instream calibration.

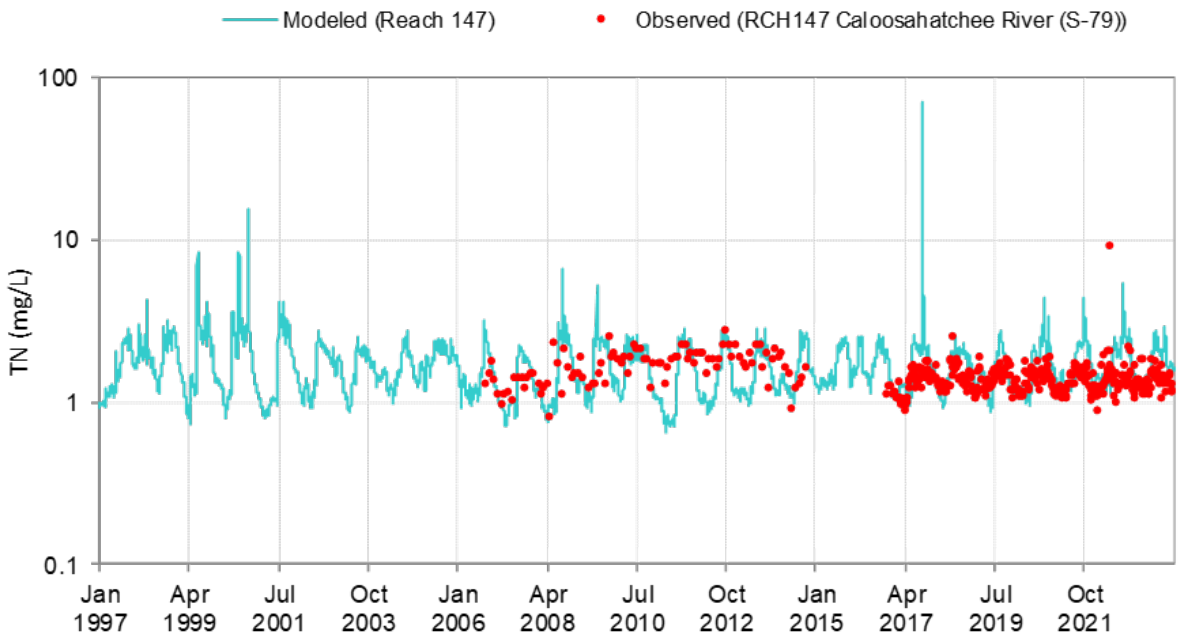


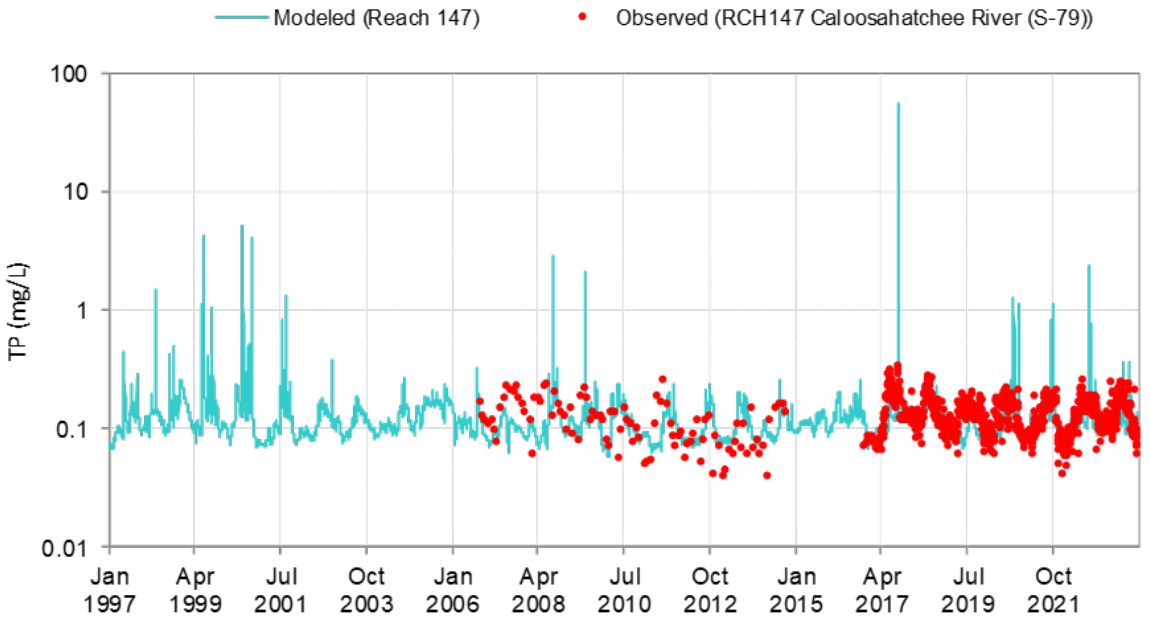
Water Quality Calibration and Validation Locations

- 2017 HSPF Model used 33 locations:
  - 14 for calibration and 19 for validation.
- Same locations used in 2025 HSPF Model.
- 15 new locations were also added.
  - All verification stations.
- Calibration results in 2025 model similar to calibration from 2017 model.



Example Water Quality Calibration Results - Caloosahatchee River (S-79)





Questions?

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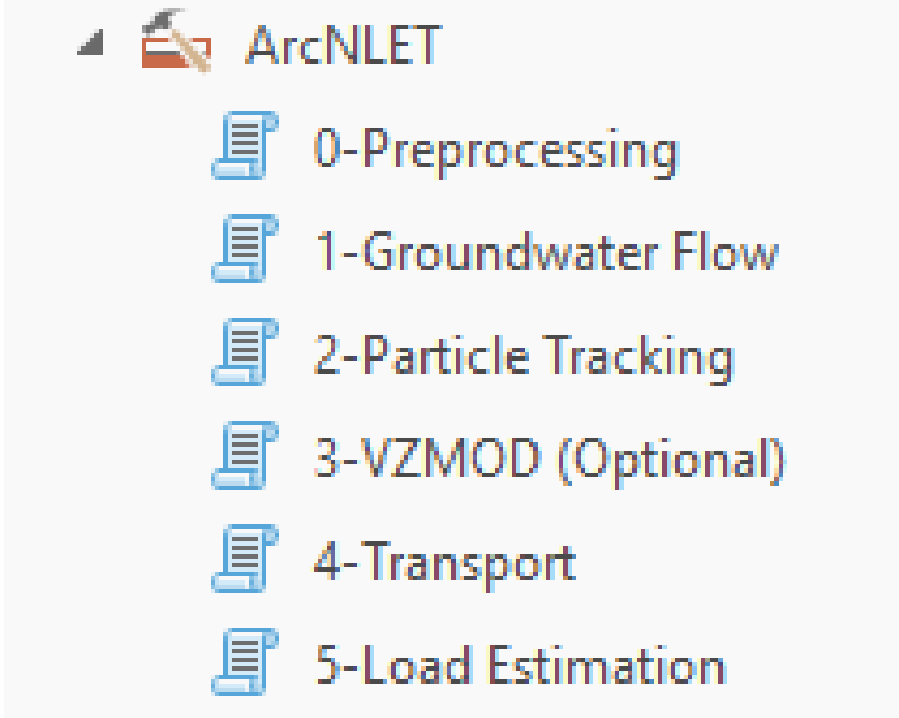
ArcNLET

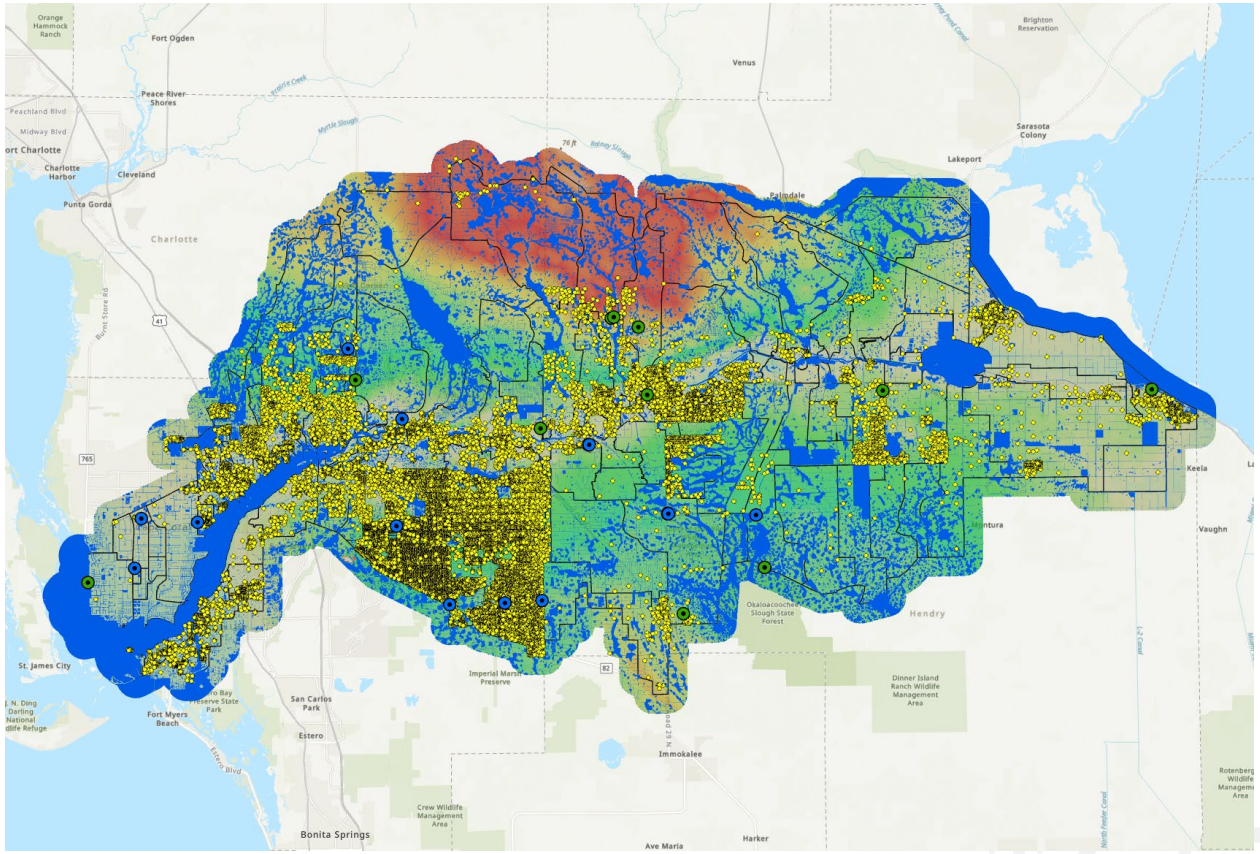
Septic Systems Representation

- 2017 HSPF Model included representation of septic systems in model.
  - Added as point source input to each reach.
  - Used Florida Department of Health (FDOH) data on decay rates.
- 2025 HSPF Model uses ArcNLET model to add septic system loads.
  - Added as point source input to each reach.
  - Consistent with BMAP crediting approach and provides tool for stakeholders.
- Used latest ArcNLET-Py model.
  - Simplified model of nitrogen and phosphorus transformation and transport.



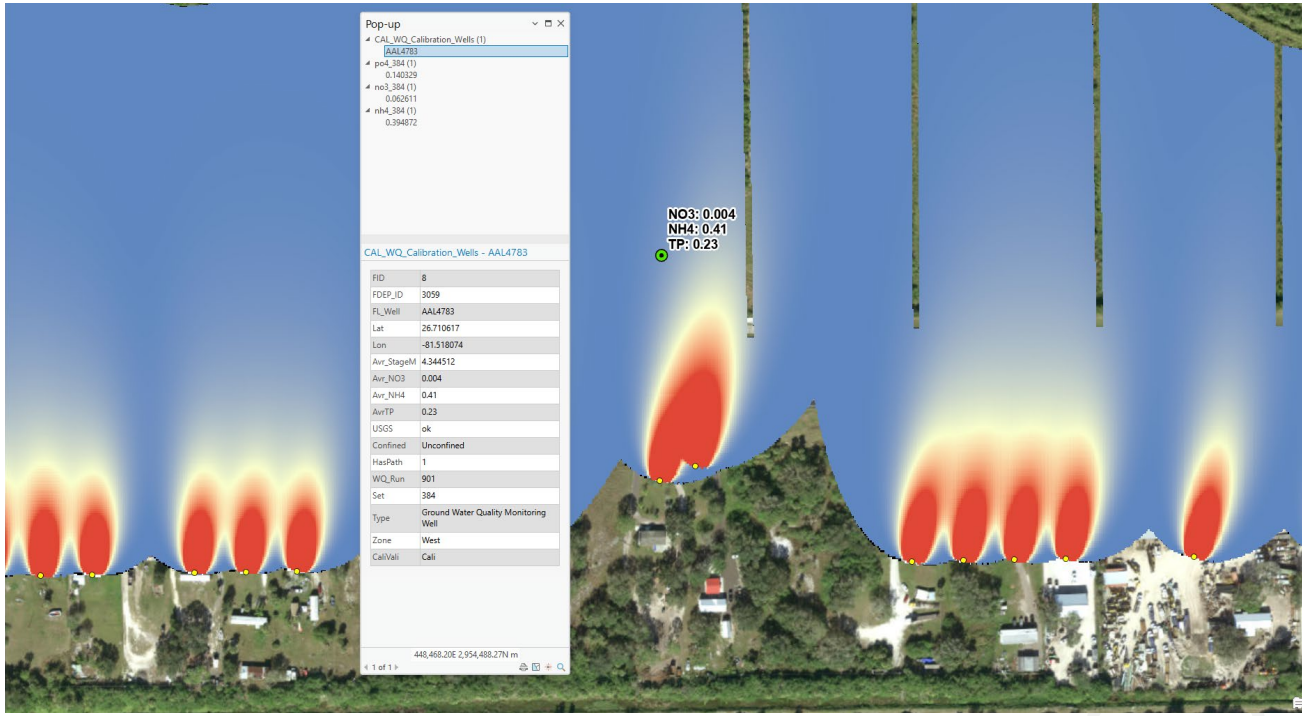
ArcNLET Data

- Used latest FDOH Florida Water Management Inventory septic system coverage.
  - Posted in late 2024.
  - 51,840 septic systems in the watershed.
- Elevation.
- Soil properties for hydraulic conductivity, porosity, texture, and spatial distribution.
- Waterbodies.
- Groundwater well data for water level, nitrogen and phosphorus concentrations.



ArcNLET Components

- Groundwater flow: simplified flow model using smoothed topography to approximate water table.
- Particle Tracking: calculate flow paths based on velocity direction and magnitude.
- Transport: simulate the movement of ammonia, nitrate, and phosphate plumes.
- Load Estimation and HSPF integration:
  - Calculate mass load input, output, and removal.
  - Assign each septic system to a HSPF model reach and summarize the loads.
- Create a summary spreadsheet with individual parcel information.



Next Steps

Final Deliverables

- Distribute water quality memorandum for stakeholder review.
  - Will be sent after this meeting.
- Prepare the 2025 HSPF Model report and share for stakeholder review.
- Prepare ArcNLET report and share for stakeholder review.
- Update LET using latest model results.

Questions?

Caloosahatchee River and Estuary Basin Management Action Plan BMAPs
Technical Meeting on the Model Update
Webinar Summary
Tuesday, August 26, 2025
10:00 am – 10:52 am

Participants

Santiago Acevedo del Rio, SFWMD
Chuck Adams, WHH Associates
Regan Armstrong, Tetra Tech
David Ferguson, Hendry County
Marcy Frick, Tetra Tech
Aubrey Frye, SFWMD
Joel Garcia, Hendry County
Greg Giarratana, Craig A. Smith
Jorge Hernandez, Hendry County
Mollie Holland, Charlotte County
Moira Homann, DEP
Chandler Keenan, DEP
Steven Kelly, FDOT
Lisa Kreiger, Lee County
Garrett Kusienski, Lee County
Laura Layman, SFWMD
Amanda McDonald, SFWMD
Jessica McPherson, Johnson Engineering
Brandon Moody, Charlotte County
Valentin Nechita, SFWMD
Stacey Ollis, SFWMD
Steffany Olson, SFWMD
Jose Otero, SFWMD
Roland Ottolini, Lee County
Harry Phillips, Cape Coral
Misha Plis, Tetra Tech
Maya Robert, Cape Coral
Jennifer Thera, FDACS
Richard Thompson, Fort Myers
Tony Tomalewski, DEP
Chad Ward, Collier County
Jeremy Wyss, Tetra Tech

Questions and Answers

Question: Regarding reuse data, did you use monitoring data in the modeling or just permit limits? Are there any regulations on monitoring reclaimed water? How much data did you pull, and how were the data used?
Answer: Available monitoring data were used based on actual flow and nutrient data from the discharge monitoring reports (DMRs) provided by the Florida Department of Environmental Protection (DEP). In the memos, there is a table identifying the facilities and data that were included. The reuse facilities were put into the model as an external input with additional loading where that water is being applied.

Question: Did you cross-reference the reclaimed water with other facilities that you had? For facilities that did not report their reclaimed water levels for nutrients, did they not get an additional load on their waterbodies?
Answer: We had data on all the facilities that were included in the model. The memo we sent last year on hydrology has some more detail and so will the water quality memo that DEP will send out today. We picked reuse facilities greater than a certain size. In terms of reclaimed water distribution, it was applied the same way as the 2017 model.

Question: Is there going to be another presentation on wet and dry atmospheric loading data?
Answer: The next section of the presentation is on water quality and the memos have a lot more information. Once we have the final report with the final information, we will have another meeting. There will be an opportunity to review and provide comments before we finalize everything.

Question: In terms of the update of the septic coverage, does that include new permit data added to the old base, or how do you discount those that have been hooked up to central systems since that time?
Answer: In the new FDOH coverage, we did see some septic systems removed and then some new ones come on. When you look at the data, if there is information that is missing, we can refine it. A lot of the septic systems that were phased out occurred closer to the estuary, and then we saw some areas where new septic systems were added.

Question: Several years ago, Lee County conducted several microbial source tracking studies and we talked with Florida Department of Health (FDOH) about their inventory. FDOH noted that the information is self-reporting so they are dependent upon utilities across the state to provide information. If people do not report changes, then the information is not updated in the FDOH coverage.
Answer: Thank you.