

2023 Updates to the Harpeth River Water Quality Model

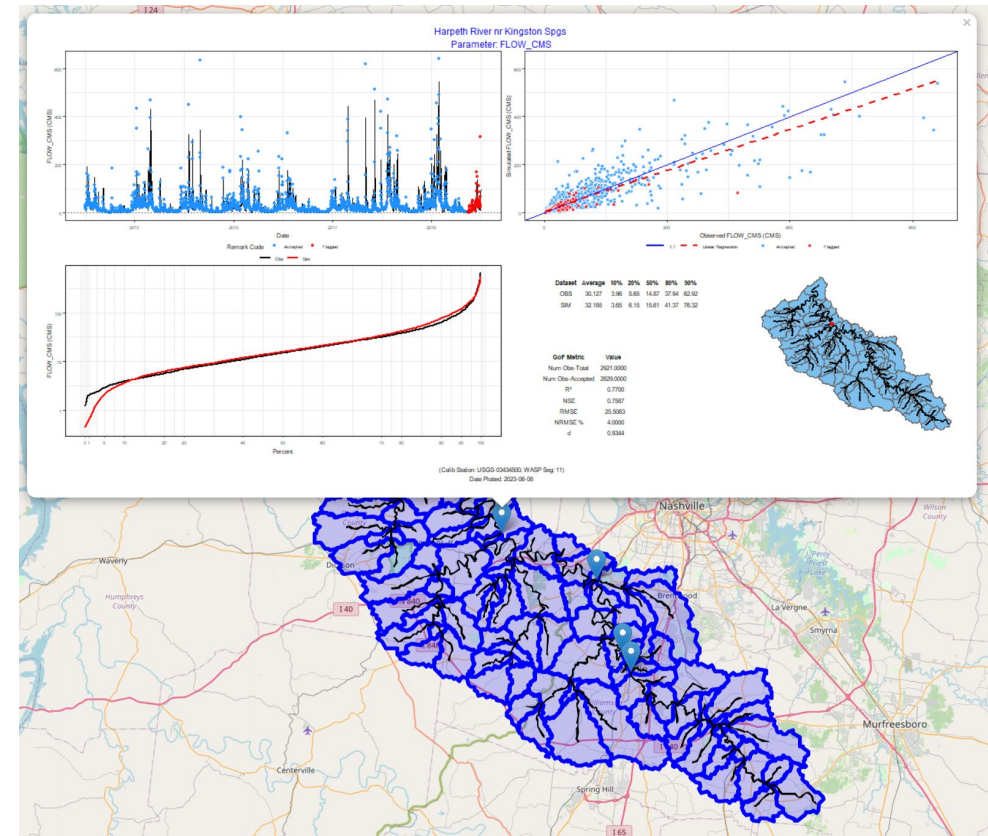
Catherine York

EPA Region 4 Modeling Team

11/29/2023

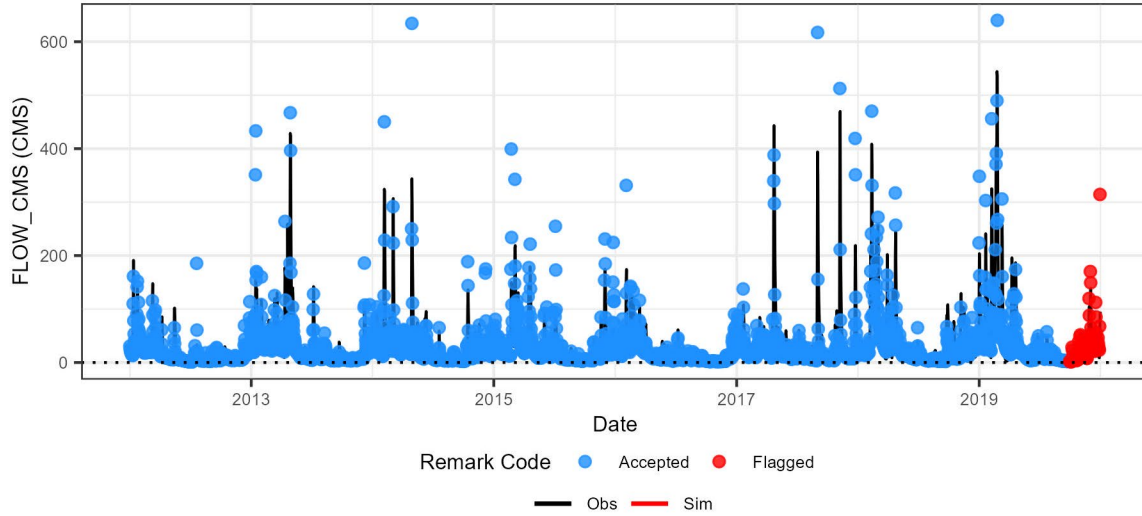
Updates/Revisions

- Current version updated by EPA Region 4 Modeling Team on 6/21/2023
- Updated to WASP model version 8.4.0
- Adds periphyton as a state variable
- Includes updated output from the LSPC watershed model
- Uses revised WRDB input datafiles
- Incorporates additional calibration compared to the previous Harpeth modeling package that was delivered in September 2020
- Includes HTML mapped Calibration figures
 - \WASP\Model_Current\Hrpth_w_Perl\Calib_Sumry_2023-06-08

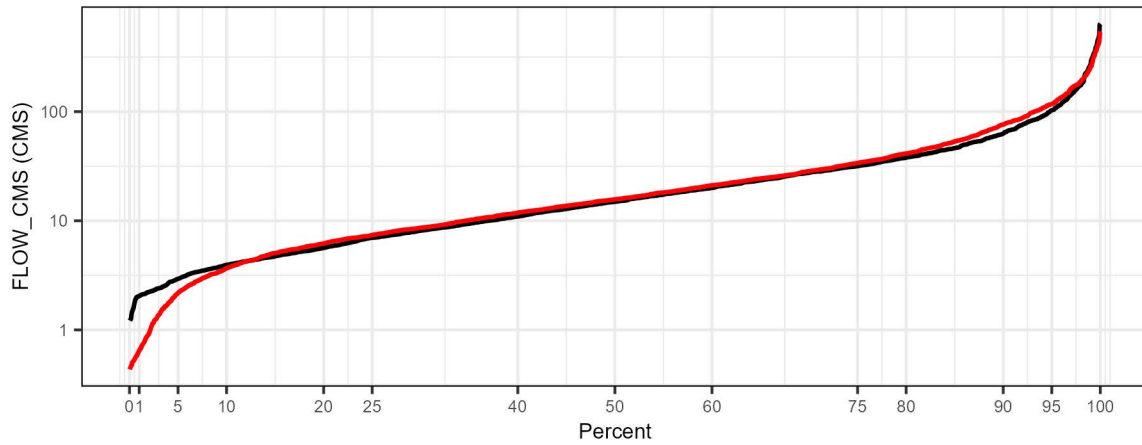
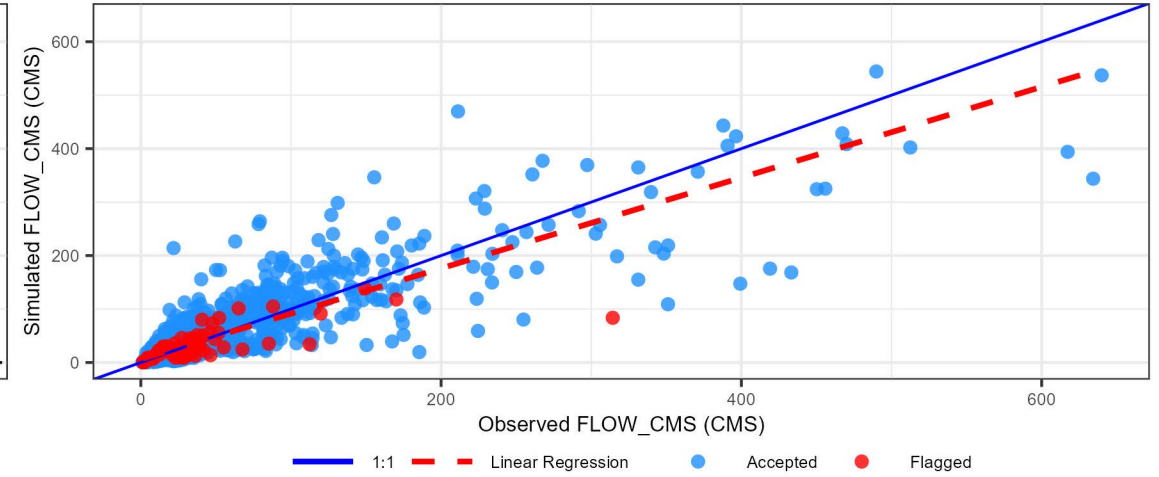


Time series

Harpeth River nr Kingston Spgs
Parameter: FLOW_CMS



1:1 Simulated vs. measured



Dataset	Average	10%	20%	50%	80%	90%
OBS	30.127	3.96	5.65	14.87	37.94	62.92
SIM	32.185	3.65	6.15	15.61	41.37	76.32

GoF Metric	Value
Num Obs-Total	2921.0000
Num Obs-Accepted	2829.0000
R ²	0.7700
NSE	0.7587
RMSE	25.5063
NRMSE %	4.0000
d	0.9344



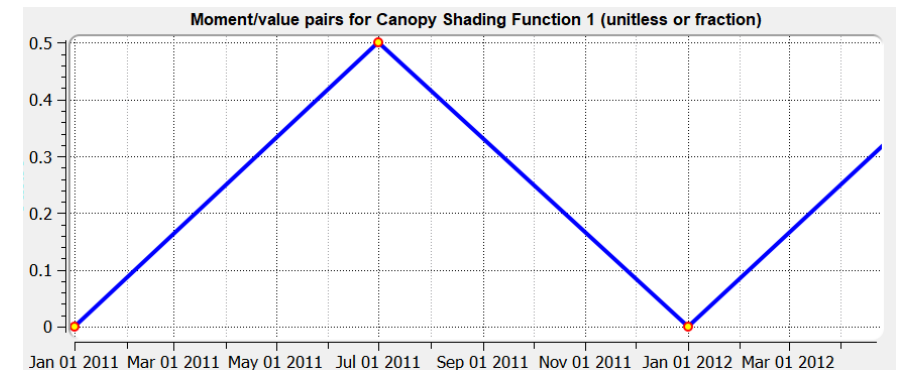
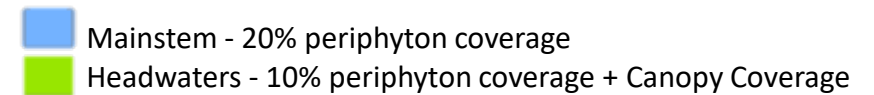
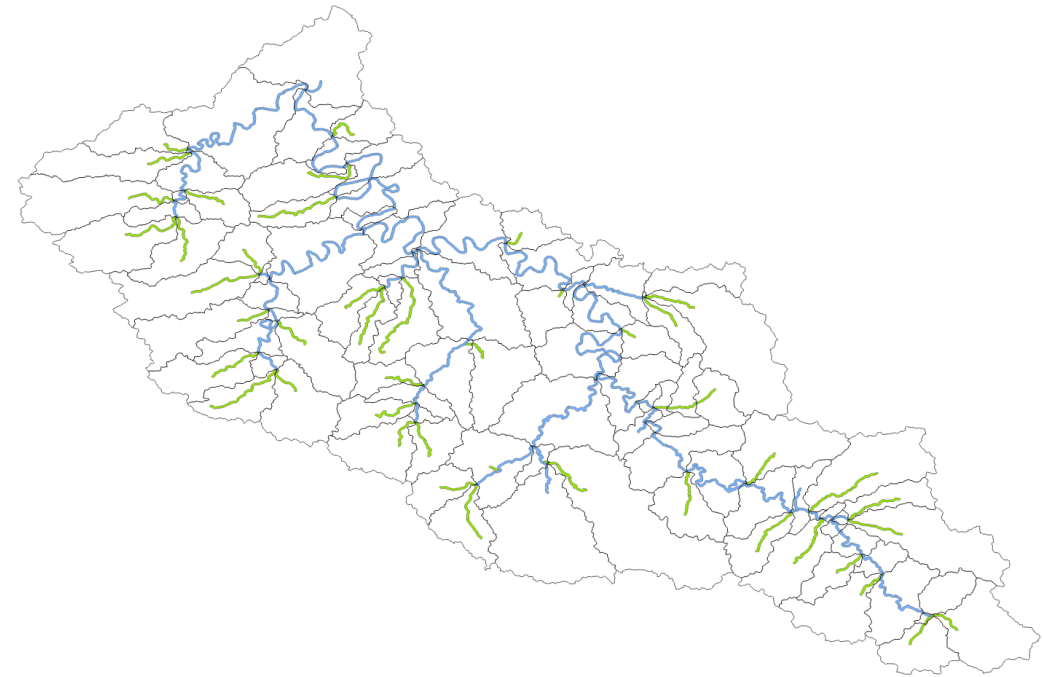
(Calib Station: USGS-03434500; WASP Seg: 11)
Date Plotted: 2023-06-08

Cumulative probability distribution

Statistical GOF summary & map

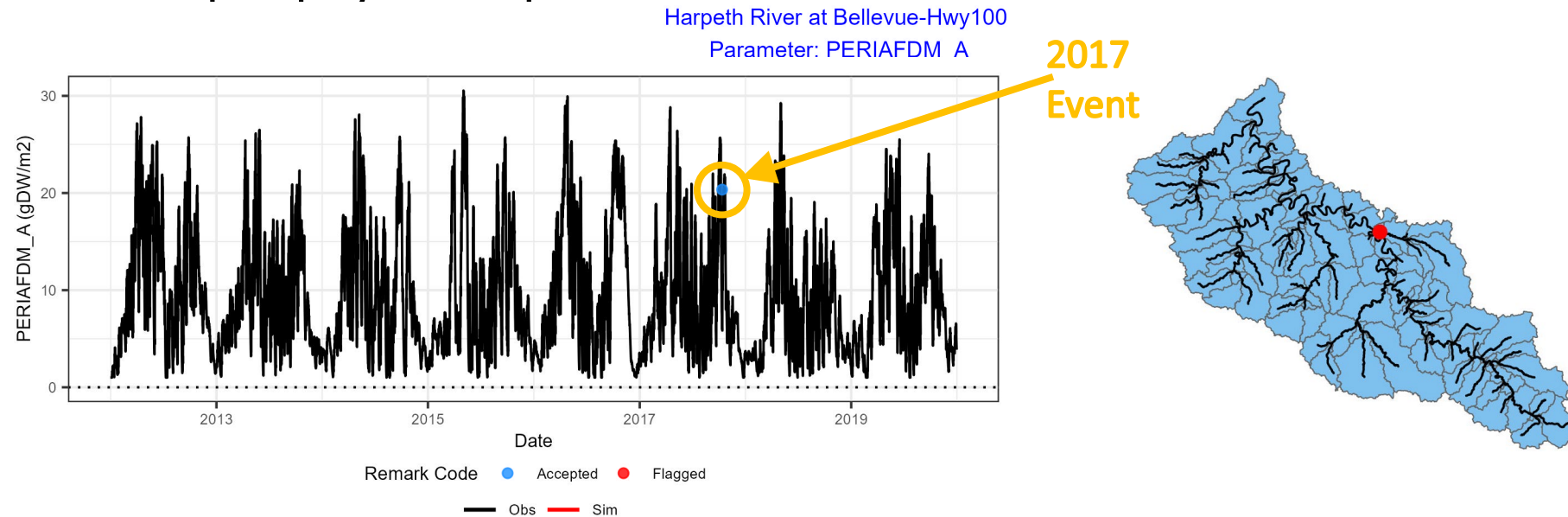
Periphyton Updates

- Sets proportion of WASP stream segment available for periphyton growth
 - 20% of mainstem segments
 - 10% of the upper segments draining headwater tributary subbasins
- Included a canopy cover time function for headwater tributary segments
 - varied seasonally between the winter and summer
 - 0% cover on January 1st of each year, then linearly interpolated to increased up to 50% cover on July 1st of each year.



Overall Summary

- WASP conservatively underpredicts periphyton AFDM compared to the 2017 sampling event, but predicted range is within the bounds of measured values.
- Addition of seasonal canopy cover in headwaters improved temperature calibration
- Addition of periphyton improves the diurnal DO calibration



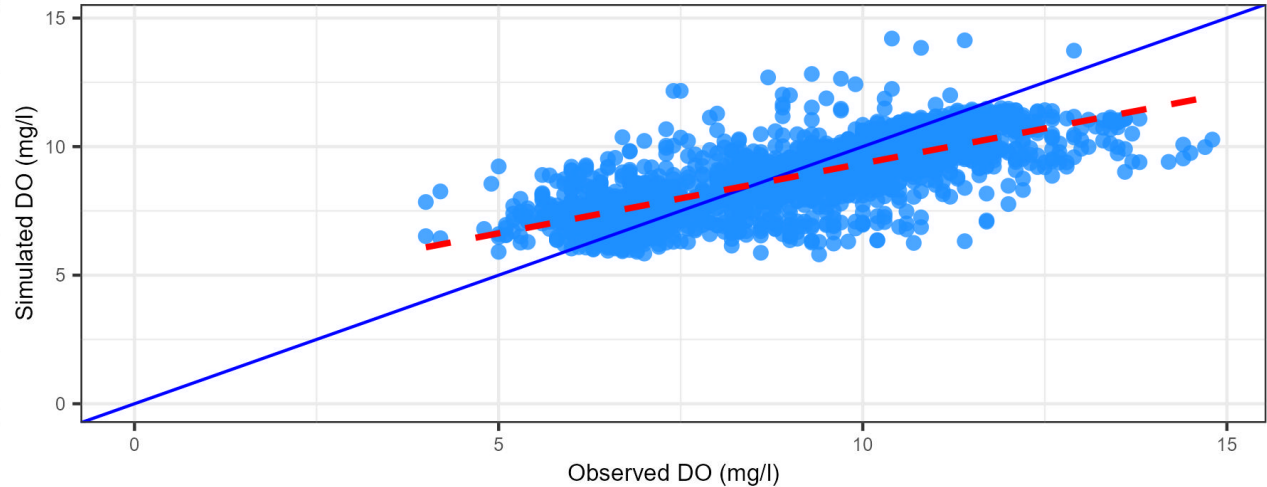
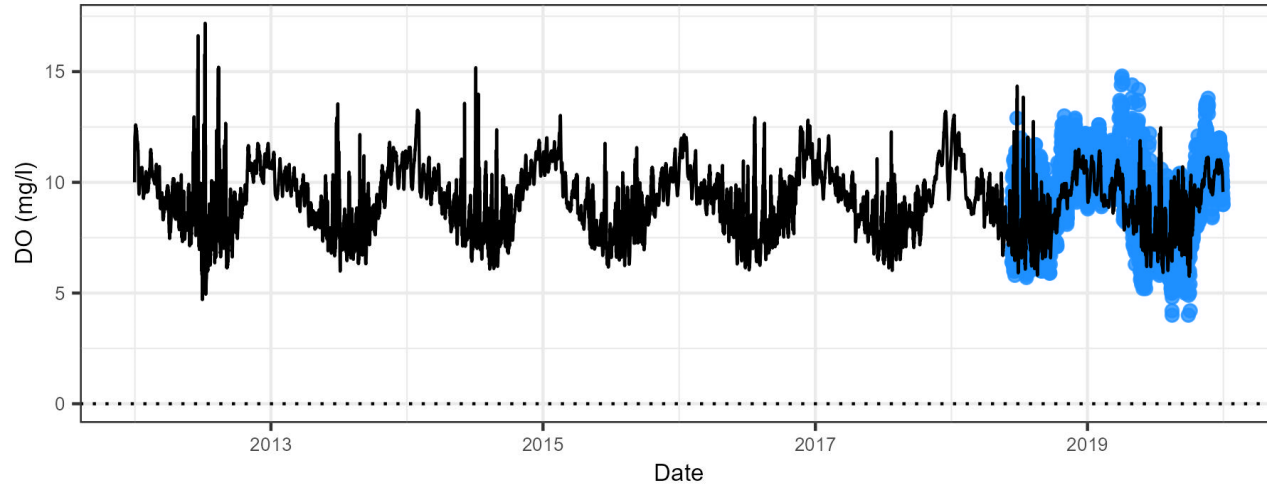
(Calib Station: HARPETH-1 / HARPETH-4A / HRC-4A / TNW000002797 / USGS-03433500; WASP Seg: 21)

Date Plotted: 2023-06-08

Sonde DO @ Kingston Spring (WASP Seg 11)

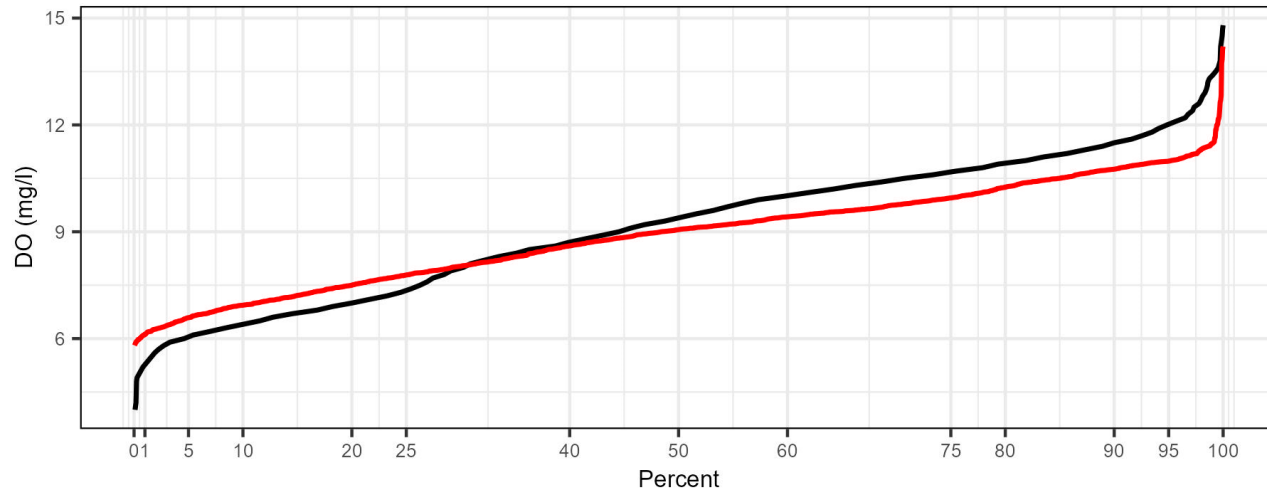
Harpeth River nr Kingston Spgs

Parameter: DO



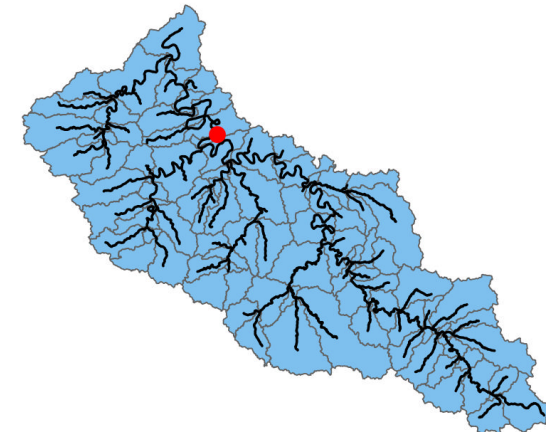
Remark Code ● Accepted ● Flagged
— Obs — Sim

— 1:1 - - Linear Regression ● Accepted ● Flagged



Dataset	Average	10%	20%	50%	80%	90%
OBS	9.203	6.50	7.02	9.40	11.00	11.50
SIM	8.913	6.94	7.51	9.06	10.25	10.76

GoF Metric	Value
Num Obs-Total	2212.0000
Num Obs-Accepted	2212.0000
R ²	0.5696
NSE	0.5465
RMSE	1.3198
NRMSE %	12.2000
d	0.8345



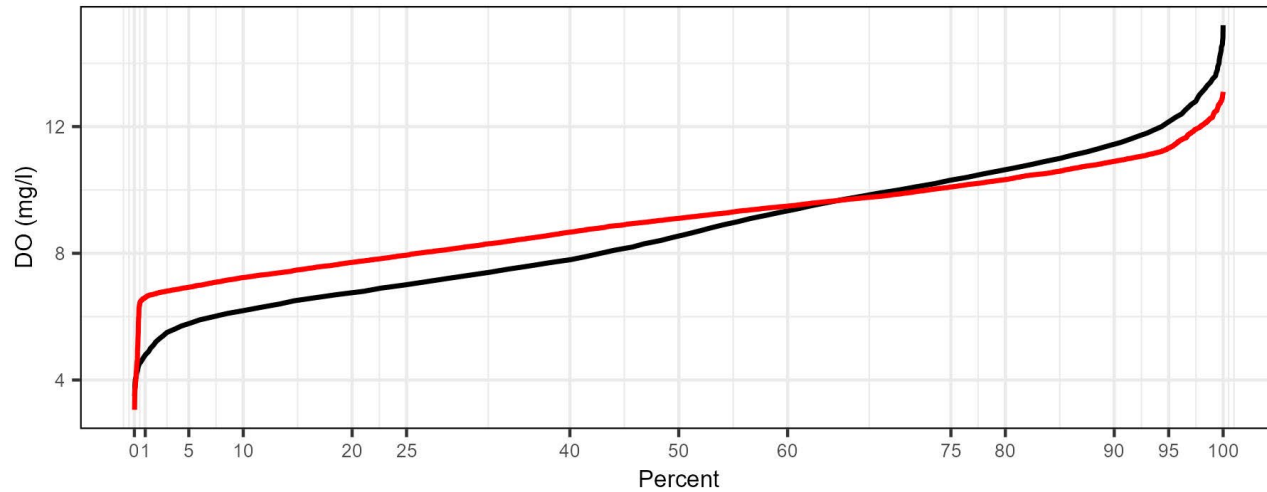
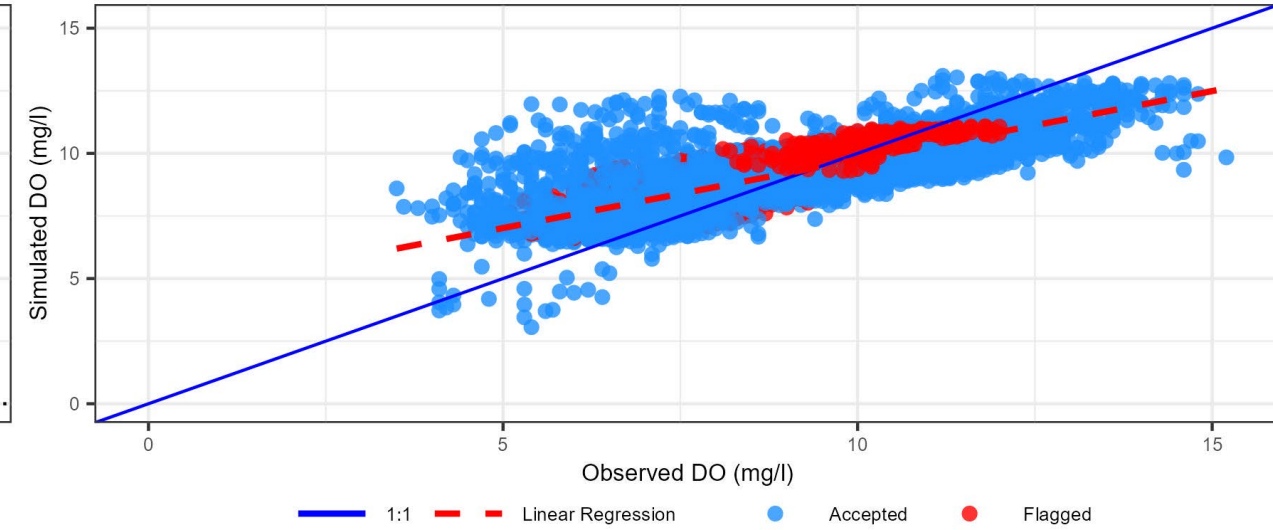
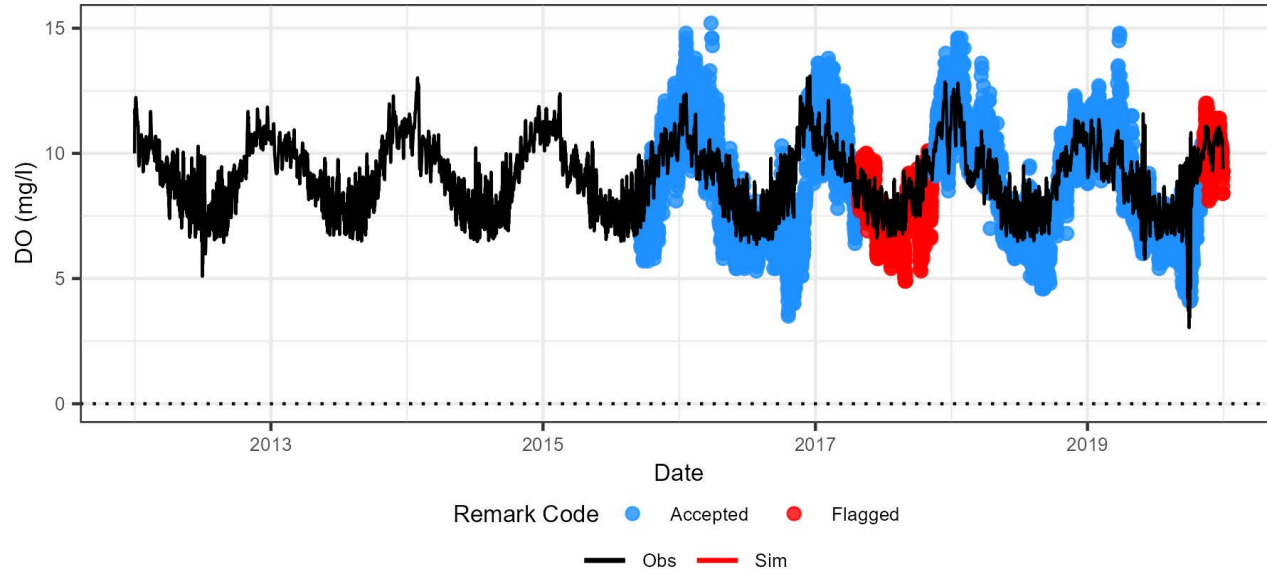
(Calib Station: USGS-03434500; WASP Seg: 11)

Date Plotted: 2023-06-08

Sonde DO near Franklin (WASP Seg 66)

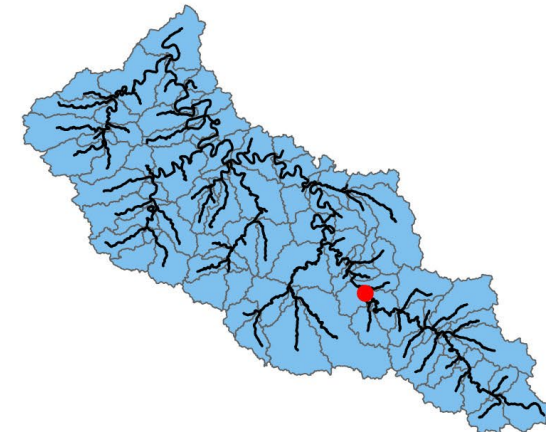
Harpeth River nr Franklin

Parameter: DO



Dataset	Average	10%	20%	50%	80%	90%
OBS	8.864	6.20	6.80	8.80	10.9	11.7
SIM	9.149	7.23	7.75	9.21	10.4	11.0

GoF Metric	Value
Num Obs-Total	6162.0000
Num Obs-Accepted	5159.0000
R ²	0.6299
NSE	0.5973
RMSE	1.3575
NRMSE %	11.6000
d	0.8493



(Calib Station: USGS-0343233905; WASP Seg: 66)

Date Plotted: 2023-06-08

Questions