Modeling and Regulatory Support Workgroup Meeting

Remote Access, February 2, 2021

Remote Access Options

Equipment Type	Access Information	Notes
Computers with microphones and speakers	Join Microsoft Teams Meeting **Please mute your microphone** unless you want to provide input.	Press control and click on this link to bring up Microsoft Teams through the internet. You can view the screen share and communicate through your computer's speakers and microphone
Computers without audio capabilities, or audio that is not working	Join Microsoft Teams Meeting (888) 404-2493 Passcode: 371 817 961# **Please mute your phone** unless you want to provide input.	Follow instructions above **Turn down your computer speakers, mute your computer microphone,** and dial the toll-free number through your phone and enter the passcode
Phone only	(888) 404-2493 Passcode: 371 817 961# **Please mute your phone** unless you want to provide input.	Dial the toll-free number and enter the passcode

Remote Access Guidelines

- This meeting will open 30 minutes prior to the official meeting start time to allow users to test equipment and ensure communication methods are working
- If you dial in through your phone, mute your microphone and turn down your speakers to avoid feedback
- Unless you are speaking, please mute your computer or device microphone and phone microphone to minimize background noise

Agenda

- Opening Comments, Agenda Review/Revisions
- MRSW Meeting Plans for Remainder of Fiscal Year
- Modeling and Regulatory Support Status
- Plan for Statistical Model Development and Regulatory Options for the Chlorophyll-a Water Quality Standard
- Model Scenario Output Workgroup
- Review of Modeling Work Relative to Re-Examination Process

MRSW Meeting Plans for Remainder of Fiscal Year

MRSW Meeting Plans for Remainder of Year

- Two additional meetings are scoped (May and June 2021)
- Potential topics include
    - Model Scenario Output Workgroup and Scenario Screening Workgroup will discuss their recommendations with the MRSW
    - MRSW to provide input on preliminary draft scope of work and budget for MRS and Communications contract in May
    - Additional calibration results for the watershed model
    - Loading summaries for the watershed model
    - Updates on EFDC hydrodynamic calibration

Modeling and Regulatory Support Status

WARMF Watershed and EFDC Lake Modeling Status

Reporting

- Interim draft report for the hydrologic model development and calibration for the Watershed Analysis Risk Management Framework (WARMF) watershed model
  - Addressing Executive Director's comments on draft
  - Including the model calibration output formats requested by the MRSW
- Deliverables associated with FY2020 are being reviewed by the Executive Director and Subject Matter Experts
  - 319 report to DWR regarding model code revisions for simulating onsite wastewater systems in WARMF
  - Transition Monitoring technical memorandum

EFDC Hydrodynamic Lake Modeling

- Modeling team met virtually with DWR Modeling Group to discuss outstanding questions and present revised calibration on November 30, 2020
  - Reviewed additional performance criteria
  - Discussed water balance assumptions applied and additional methods to consider
- Modeling team provided supplemental information and recommendations to finalize the hydrodynamic calibration following the meeting for final decision by the MRSW (distributed and voted on by email correspondence)
  - Apportion balance flows at 17 tributaries locations based on drainage areas
  - Implement smoothing of additions and withdrawals using locally weighted scatterplot smoothing (LOESS)
- MRSW has voted to accept these recommendations and the 3rd party reviewers at the UNC Collaboratory provided input and confirmation of this approach

WARMF Watershed Modeling

- Continue work on the WARMF watershed model for water quality simulations
  - Onsite wastewater treatment systems
    - Final information to format counts and types in the model was received in December 2020
    - Effluent concentrations by system type developed with input from UNC Collaboratory Researchers
  - All other data sets have been input the model
  - Preliminary calibration of temperature and total suspended sediment across the watershed
  - Total organic carbon and nutrient calibration is underway

Water Quality Calibration and Validation
2015 – 2018 WARMF Model

PRELIMINARY RESULTS / IN PROGRESS

Water Quality Model Performance Criteria

The UNRBA Modeling Quality Assurance Project Plan includes the following guidance for water quality calibration:

"For water quality variables, a similar 3-tiered system of categorizing statistical performance developed by Donigian (2002) will be used for calibration guidance at the locations where statistical water quality calibration will be performed. The system is based on the percent difference measure with the categorized values shown in Table A.7-2…These statistical measures will be used to supplement graphical evaluation of the model results and aid in determining the endpoints of model calibration."

Table A.7-2 General Watershed Model Calibration Guidance

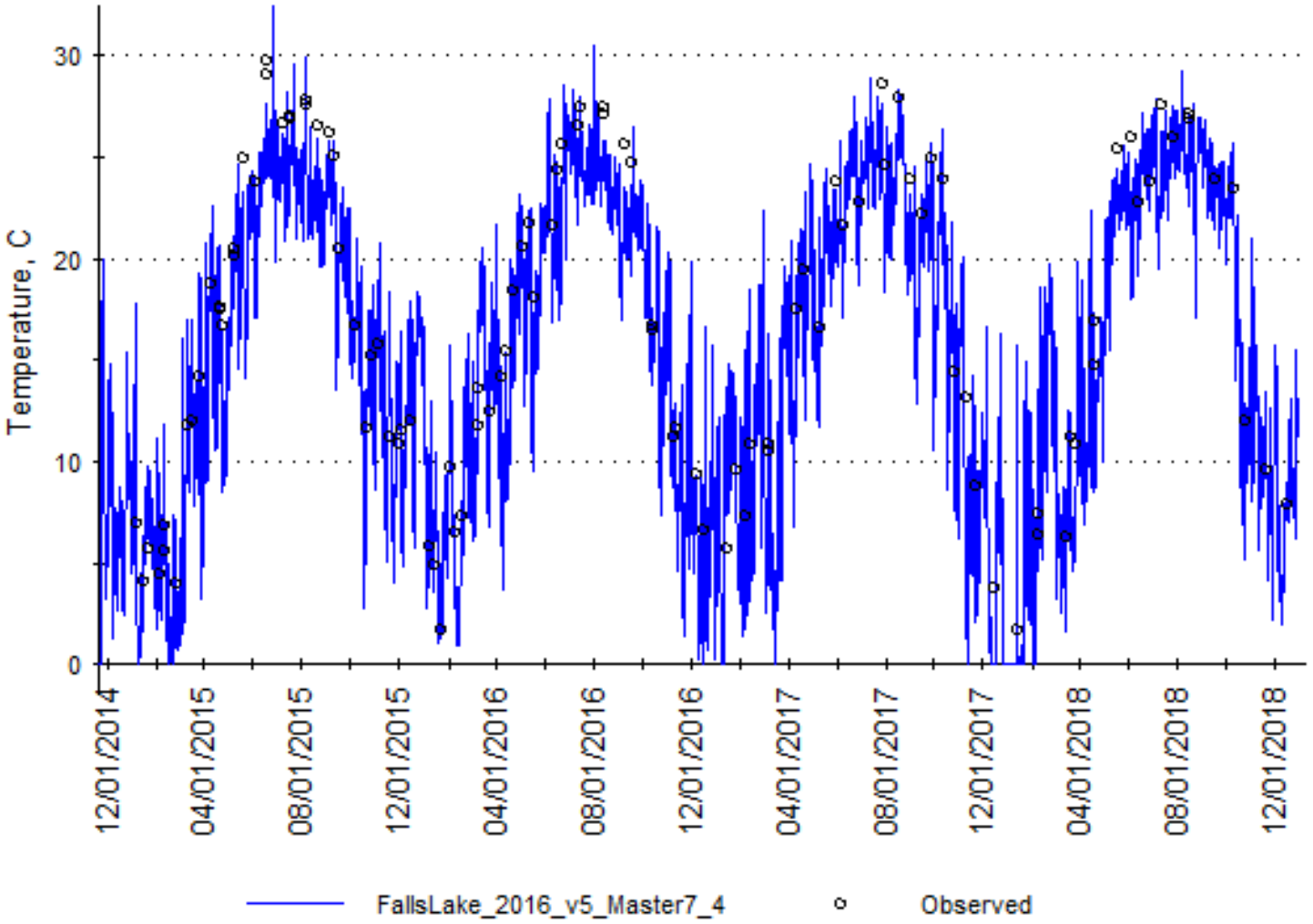
Parameter	% Difference Criteria		
	Very Good	Good	Fair
Sediment	< ± 20	± 20-30	± 30-45
Water Temperature	< ± 7	± 8-12	± 13-18
Water Quality/Nutrients	< ± 15	± 15-25	± 25-35

Locations for Water Quality Model Evaluation

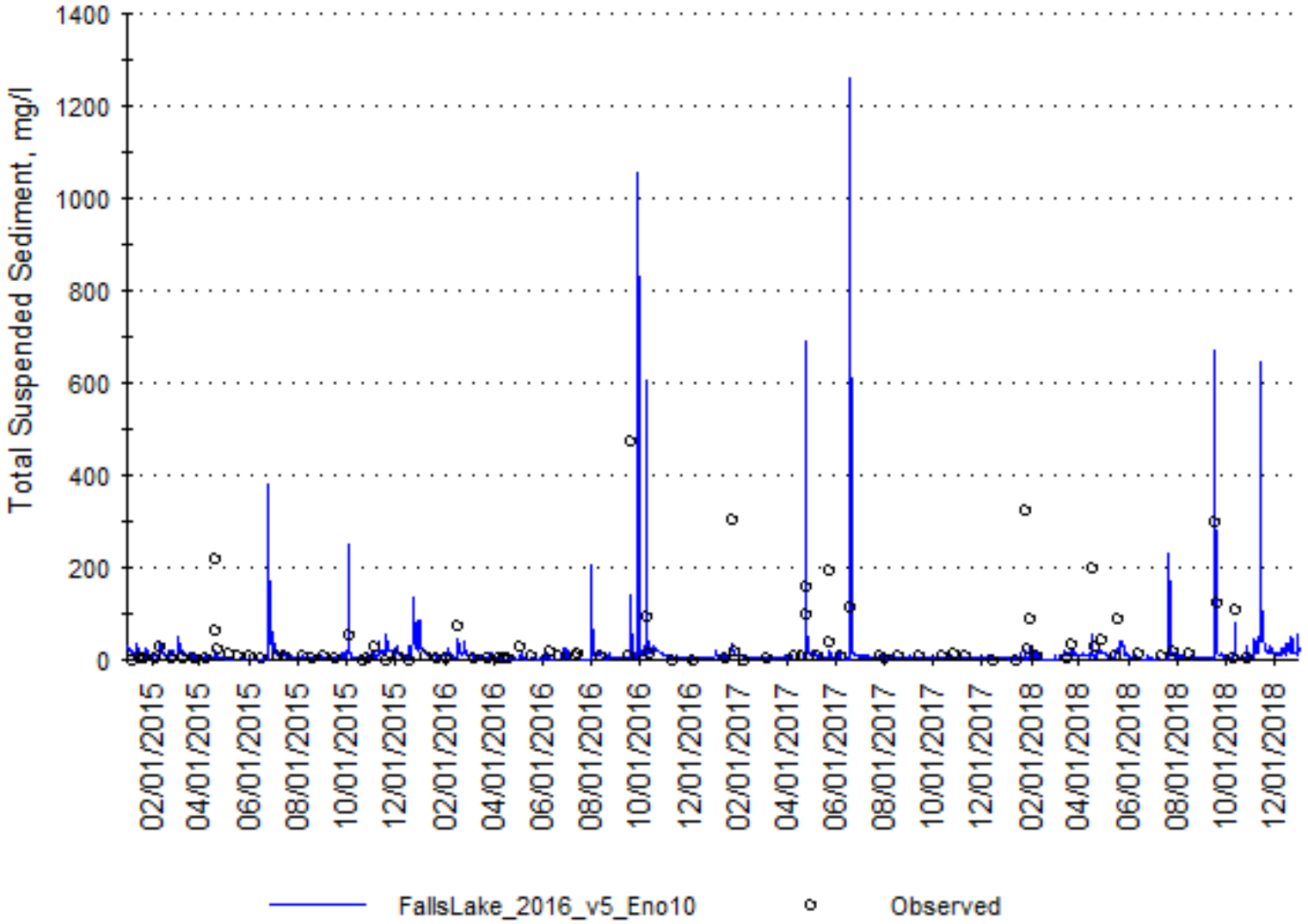
The UNRBA Modeling Quality Assurance Project Plan includes the following guidance:

"A complete water quality calibration (for each parameter) including evaluation of performance criteria and generation of documentation will be performed for a minimum of 7 locations. These locations include the lake loading stations of the five largest tributaries (ELC-3.1, ENR-8.3, LTR-1.9, FLR-5.0, and KRC-4.5)…Data collected at all watershed stations will be used to support calibration. Specific stations and parameters will be utilized to improve model calibration at locations where full calibration will be conducted."

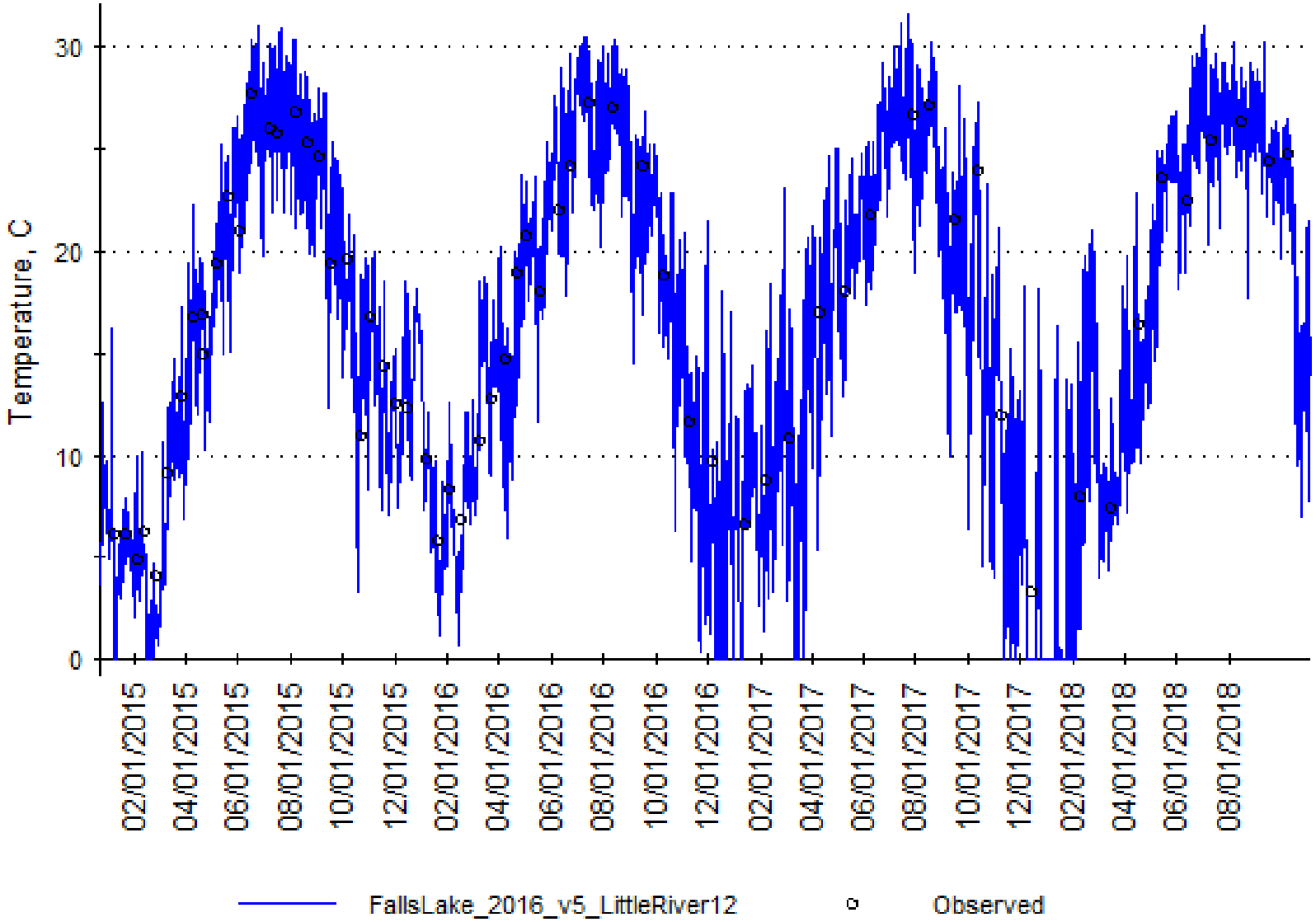
Temperature:
Eno River at Old Oxford Road (ENR8_3)



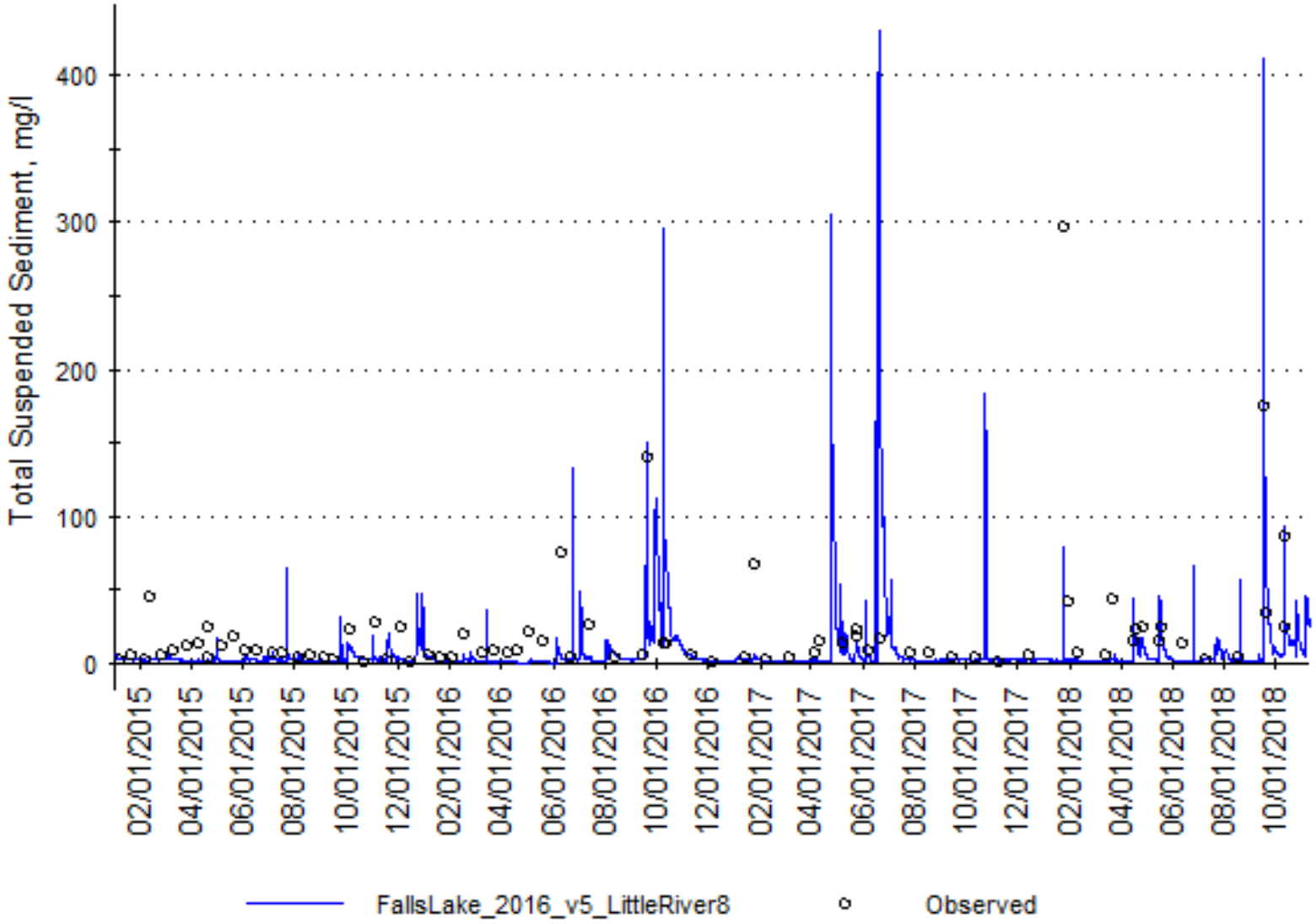
Total Suspended Sediment: Eno River at Old Oxford Road (ENR8_3)



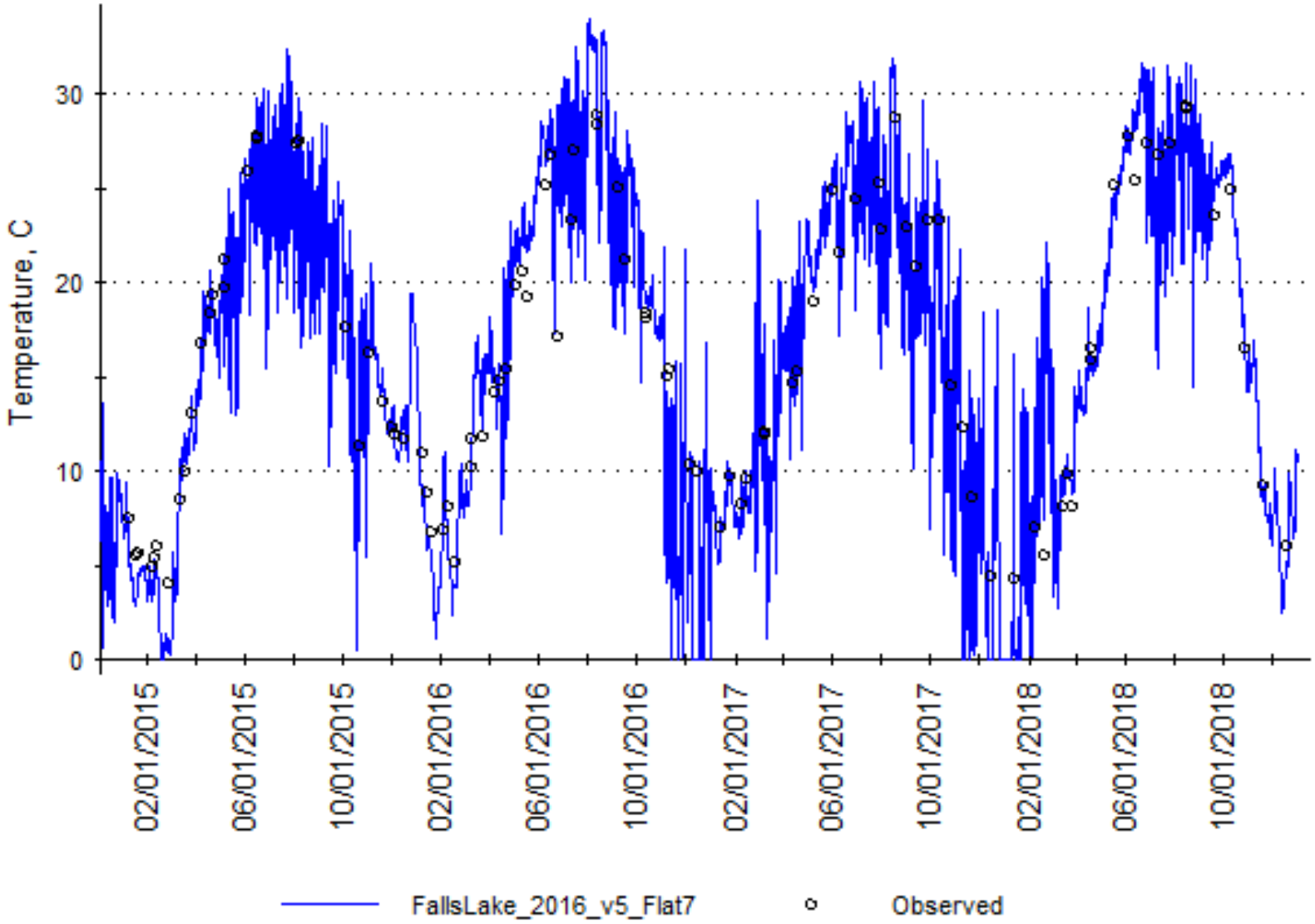
Temperature:
Little River at Old Oxford Highway (LTR1_9)



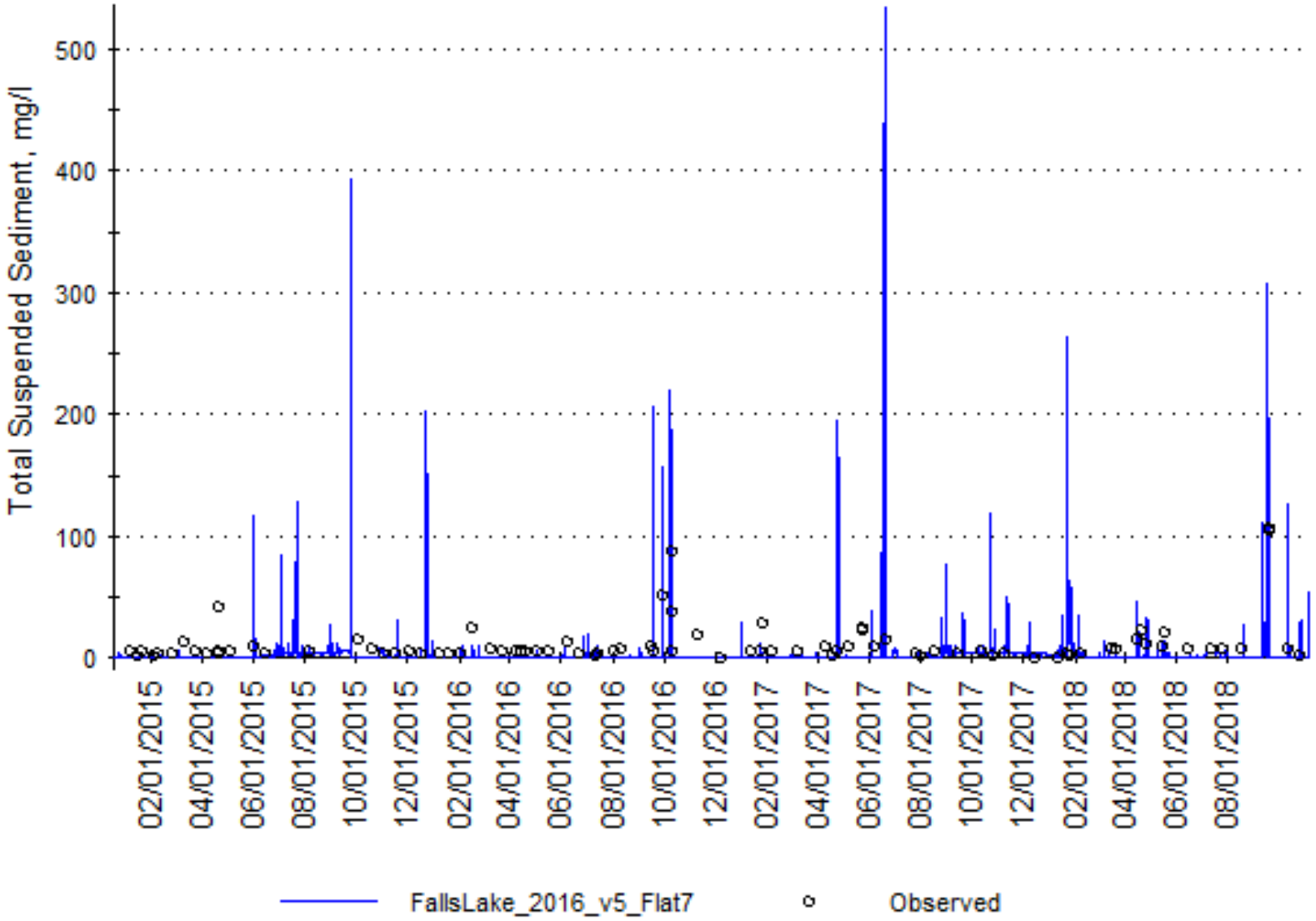
Total Suspended Sediment: Little River at Old Oxford Highway (LTR1_9)



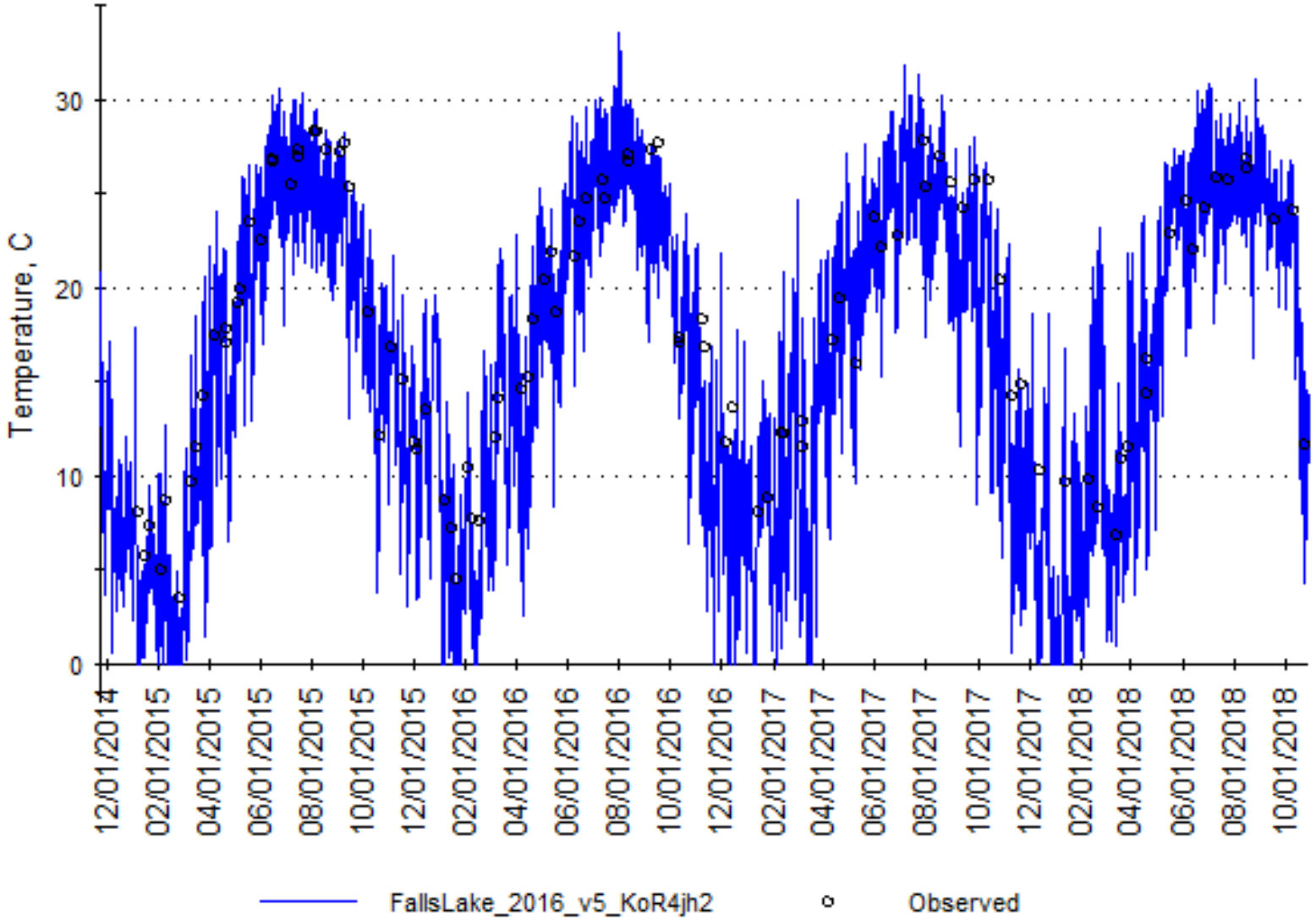
Temperature:
Flat River at Old Oxford Highway (FLR5_0)



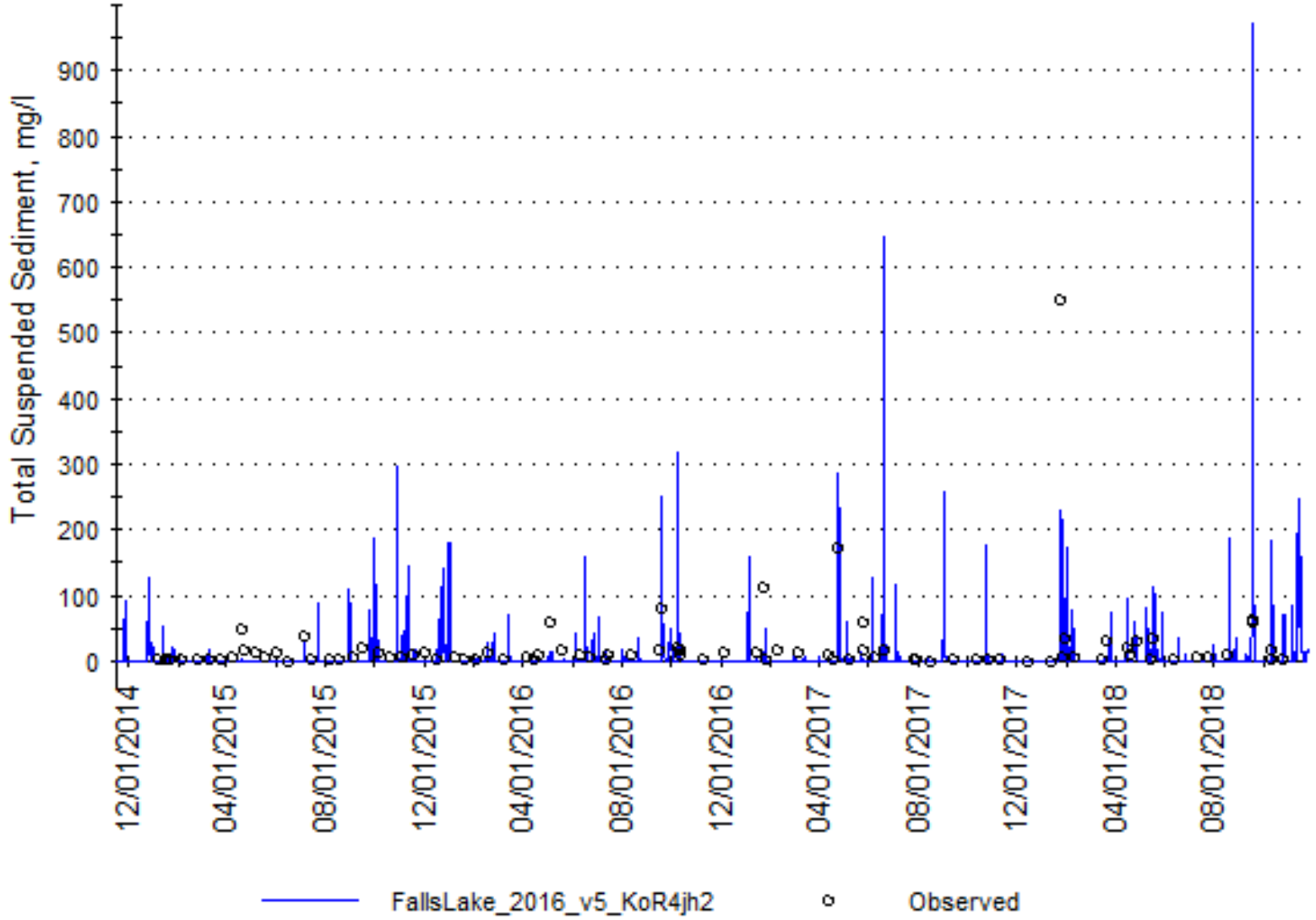
Total Suspended Sediment: Flat River at Old Oxford Highway (FLR5_0)



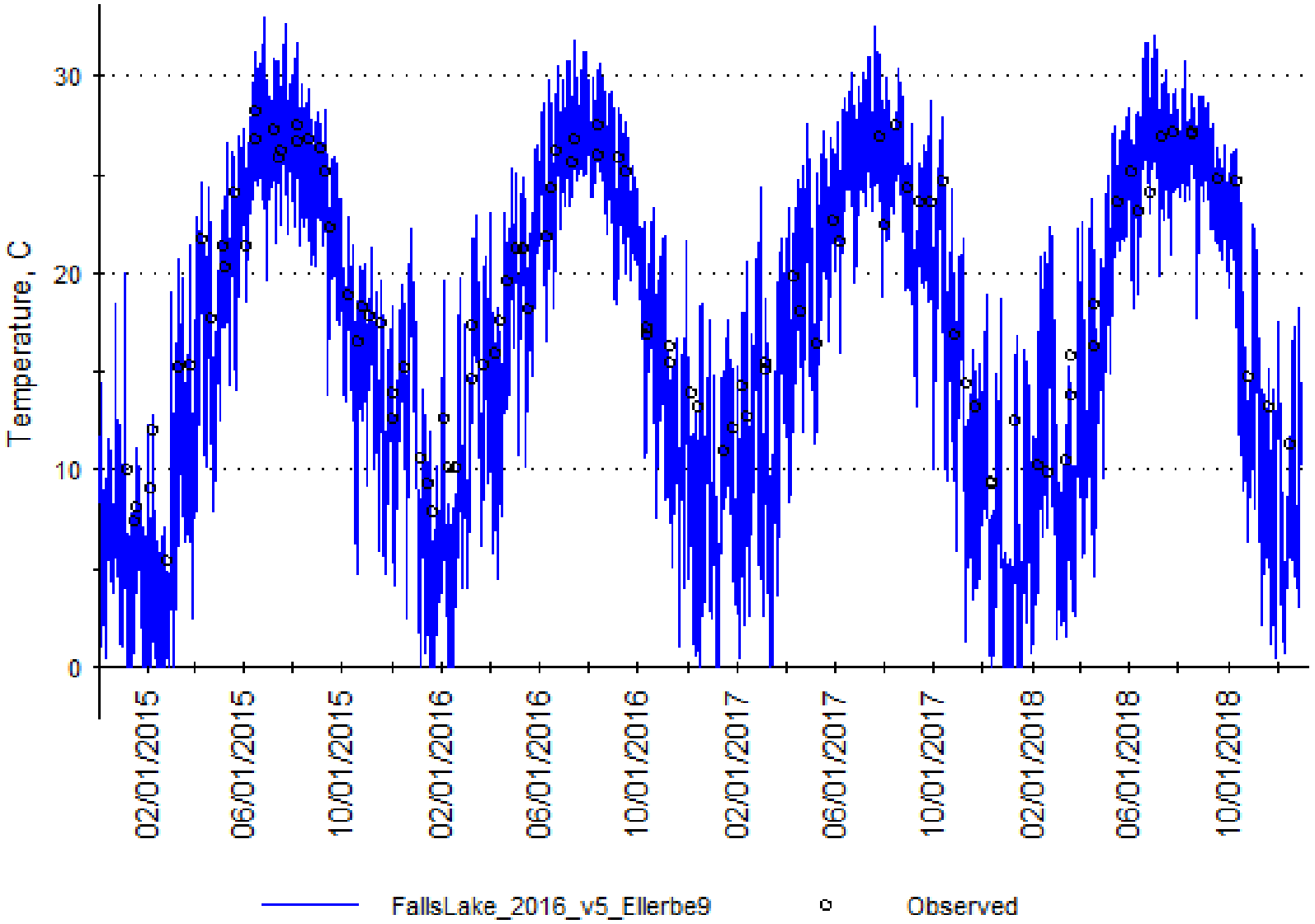
Temperature:
Knap of Reeds Creek at SGWASA WWTP (KRC-4.5)



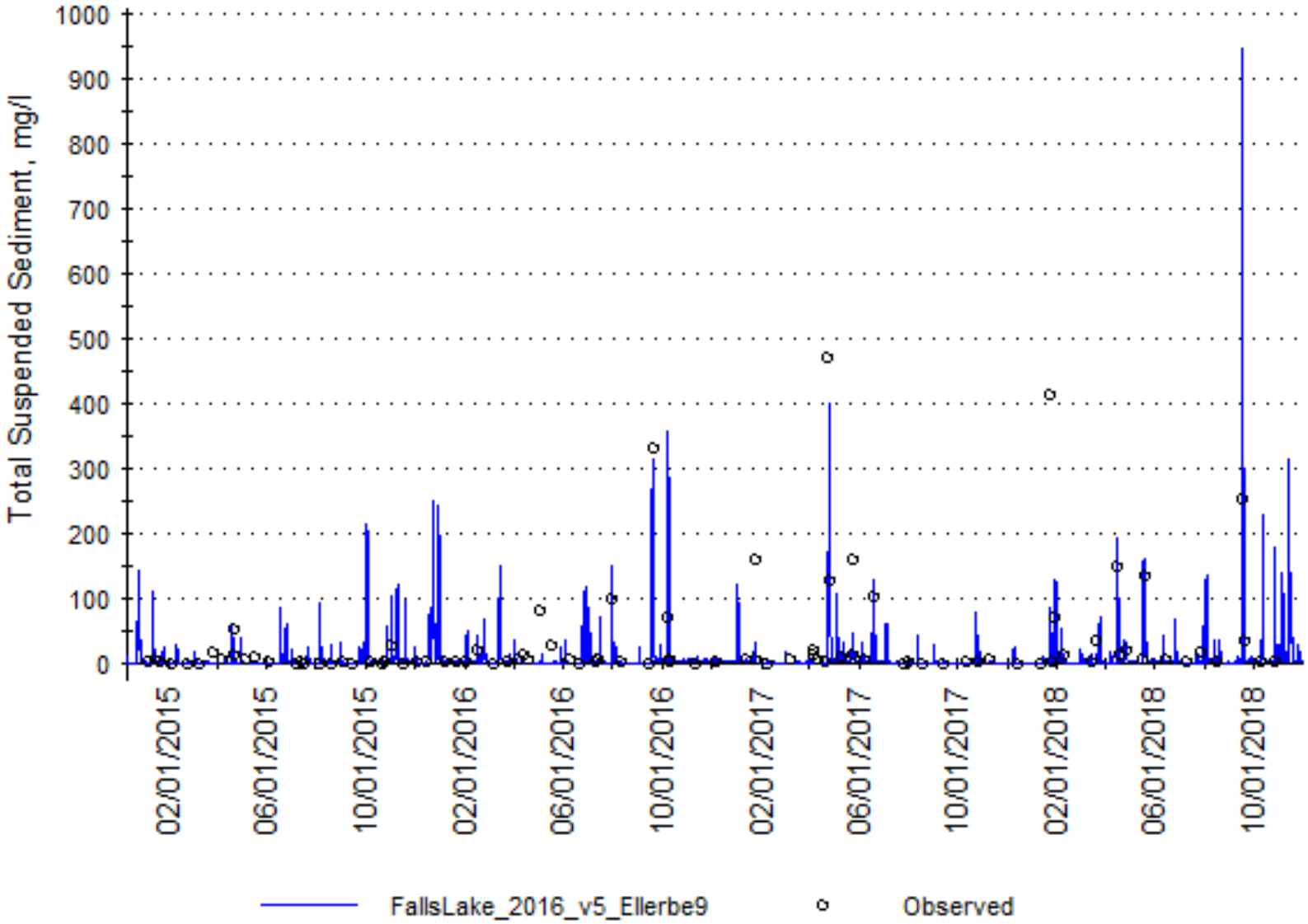
Total Suspended Sediment: Knap of Reeds Creek at SGWASA WWTP (KRC-4.5)



Temperature:
Ellerbe Creek near Gorman (ELC-3.1)



Total Suspended Sediment: Ellerbe Creek near Gorman (ELC-3.1)



Water Quality Calibration/Validation Statistics (Preliminary)

Location	Average Temperature Difference (Degrees C)[1]	Total Suspended Sediment (% Diff)
Eno River at Old Oxford Road (ENR8_3)	1.3	1%
Little River at Old Oxford Highway (LTR1_9)	0.8	-2%
Flat River at Old Oxford Highway (FLR5_0)	0.0	-2%
Knap of Reeds Creek at SGWASA WWTP (KRC-4.5)	0.2	8%
Ellerbe Creek near Gorman (ELC-3.1)	-0.2	-3%

[1] Difference in degrees C is a better measure of model fit than percent difference for temperature

[2] Large wetland complexes in Knap of Reeds watershed will require additional effort to calibrate organic carbon

Model Scenario Output Workgroup – Status Update

Simplified Scenario Evaluation Workflow

Process for Developing Documentation Topics/ Example Questions

WHO?	Who, as in which jurisdiction or sector, the scenario affects the most?
WHAT?	What modeling tool was used to evaluate the scenario?
WHEN?	When does the sediment source get reduced?
WHERE?	Which subwatersheds are affected most?
WHY?	Why did the model respond as it did to the scenario?
HOW?	How confident are the modelers with the evaluation of the scenario?

Sample Scenario Documentation

- Identification
  - ID, Description
  - High level
- Costs
  - Scenario Implementation
  - Evaluation
- Results
  - Graphical (Maps, Charts)
  - Tabular (Tables)
- Technical Documentation
  - Details

Plan for Statistical Model Development and Regulatory Options for the Chlorophyll-a Water Quality Standard

Planning for Development of a Statistical Model Development and Regulatory Options for the Chlorophyll-a Water Quality Standard

- The primary task for the legal team in FY2021 is to begin consideration of a petition for site specific criteria for Falls Lake
- This work will rely partially on the UNRBA Statistical Model of Falls Lake
- Evaluation of other State's site-specific standards for chlorophyll-a and nutrient-related standards is ongoing.
- The legal team and the statistical modeling team are coordinating on this effort
- The Technical Advisors Workgroup was formed at the January 2021 PFC meeting
- This workgroup will report back to the MRSW and PFC

Purpose of the Modeling Effort

- Re-examine Stage II of the Falls Lake Nutrient Management Strategy
- Better understand sources of nutrient loading to Falls Lake
- Evaluate nutrient management options to improve water quality and continue to protect designated uses
- Consider cost and technical feasibility in the revised strategy
- Work with stakeholders throughout the process
  - Hear concerns and address issues
  - Build a workable strategy with buy-in across organizations

Three Types of Output Associated with Different UNRBA Models

Watershed Loading to Falls Lake

- Flow
- Nutrients
- Carbon
- Chlorophyll-a

Water Quality in Falls Lake

- Temperature
- Nutrients
- Carbon
- Chlorophyll-a

Attainment of Designated Uses in Falls Lake

- Drinking water supply
- Flood protection
- Aquatic life
- Recreation
  - Fishing
  - Swimming

Three Types of Output Associated with Different UNRBA Models

Watershed Loading to Falls Lake

- Flow
- Nutrients
- Carbon
- Chlorophyll-a

WARMF (2015-18)

Water Quality in Falls Lake

- Temperature
- Nutrients
- Carbon
- Chlorophyll-a

Attainment of Designated Uses in Falls Lake

- Drinking water
- Flood protection
- Aquatic life
- Recreation
  - Fishing
  - Swimming

Statistical
(long-term estimates)

Three Types of Output Associated with Different UNRBA Models

Watershed Loading to Falls Lake

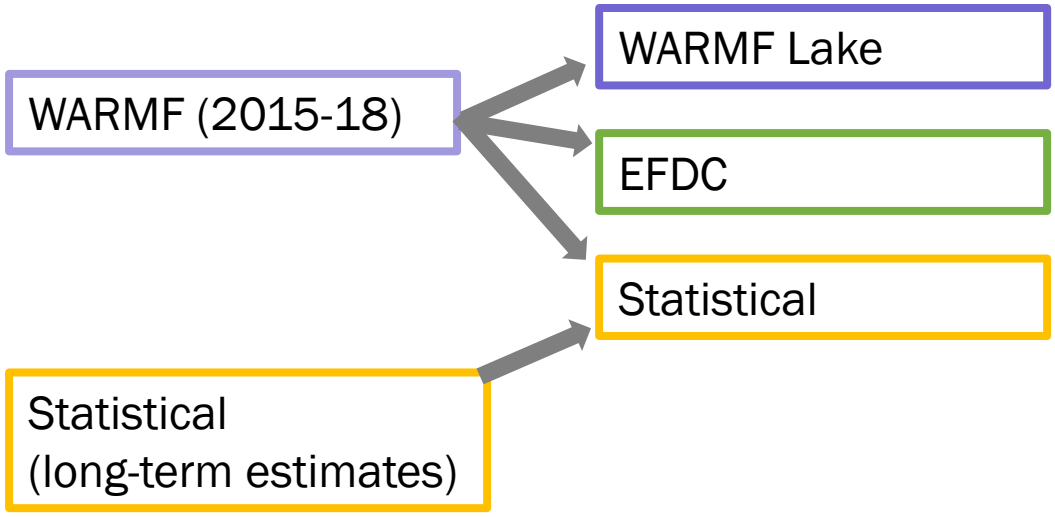
- Flow
- Nutrients
- Carbon
- Chlorophyll-a

Water Quality in Falls Lake

- Temperature
- Nutrients
- Carbon
- Chlorophyll-a

Attainment of Designated Uses in Falls Lake

- Drinking water
- Flood protection
- Aquatic life
- Recreation
  - Fishing
  - Swimming



Three Types of Output Associated with Different UNRBA Models

Watershed Loading to Falls Lake

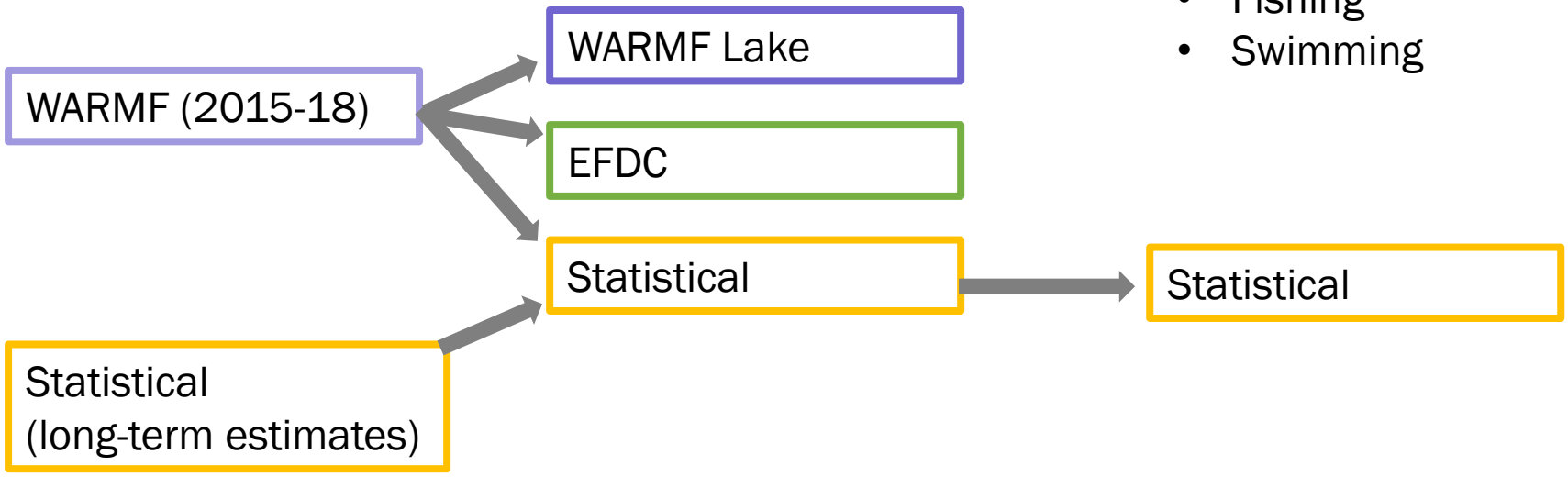
- Flow
- Nutrients
- Carbon
- Chlorophyll-a

Water Quality in Falls Lake

- Temperature
- Nutrients
- Carbon
- Chlorophyll-a

Attainment of Designated Uses in Falls Lake

- Drinking water
- Flood protection
- Aquatic life
- Recreation
  - Fishing
  - Swimming



Statistical Modeling Overview and Guiding Principals

Objectives of the Statistical Model

- Understand how eutrophication affects designated uses of Falls Lake
  - Drinking water
  - Recreation
  - Aquatic life
  - Flood protection
- Understand how management actions affect water quality and therefore designated uses
- Explore relationships between chlorophyll-a and designated uses
  - No direct linkage, but eutrophication affects both
  - Provide insight into potential site-specific chlorophyll-a criteria for Falls Lake that represent protection of designated uses

Guiding Principals for Development

- Start simple and build complexity as needed
- Use existing, local data when available
- Use regional data, literature, and experts to fill in gaps
- Rely on previously compiled water quality databases (and estimates of flow) to provide a
  - Long-term record of inputs to Falls Lake
  - Water quality observations within Falls Lake
- Use the WARMF watershed model to understand how current loading and potential management actions impact designated uses
  - Flow, nutrients, sediment, and carbon are predicted
  - Scenarios will estimate changes in each of these inputs

Potential Endpoints for Statistical Model

Designated Uses

- Safe drinking water
  - Taste, Odor
  - Disinfection byproducts
  - TOC removal
- Aquatic Life
  - Dissolved Oxygen
  - Fish Kills
- Recreation
  - Fishing
  - Swimming
- Flood control

Water Quality Standards

- Dissolved oxygen
- pH
- Chlorophyll-a

Next Steps for Statistical Model Development

- Define the output metrics for the model in terms of parameters and units
  - What information is most useful to the legal team?
  - What information is most useful to the local governments for their decision making?
- Identify sources of data and information and subject matter experts to support model development
- Select a designated use or water quality parameter to focus on and begin model building

Technical Advisors Workgroup for the Legal Group and Statistical Modeling Team

- Comprised of PFC and MRSW members
  - Includes specific technical staff to provide data, information, and coordinate on desired outputs
  - UNC Collaboratory 3rd party reviewers to be involved in statistical modeling discussions
- Preliminary recommendations from the group to be discussed at PFC and MRSW meetings and then Technical Stakeholder Workshops for review and input from broader audiences
- Topics to address
  - Statistical model development and local government needs
  - Evaluation of regulatory options including, but not limited, to a petition for site-specific chlorophyll-a standard
  - Memorandum of Agreement with DWR

Members of the Technical Advisors Workgroup for the Legal Group and Statistical Modeling Team

- UNRBA PFC and MRSW Members
  - Michelle Woolfolk
  - Reggie Hicks
  - Kenny Waldroup
  - Terry Hackett
  - Nancy Daly
  - Barry Baker
  - Scott Schoyer
  - Ryan Eaves
  - Mike Cirello
- Additional local government staff with expertise
- Statistical modeling team, economic, water quality consultants
- Input from 3rd party reviewers and DWR at key points in the process

This Workgroup will likely meet in late February / early March.

Review of Modeling Work Relative to Re-Examination Process

Review of Modeling Work Relative to Re-Examination Process

- The UNRBA's Re-examination process is entering into the last two and a half years of the effort to develop specific recommendations for revision to the Falls Lake Nutrient Management Strategy.
- The amount of work remaining is significant and as the effort moves from finalization of the modeling tools into the evaluation of scenarios it is critical that we keep this overall goal in mind.
- The MRS work is essential to the development of these recommendations, but there are significant policy issues and communication goals that will need to be effectively addressed before the UNRBA can complete its Re-examination recommendations package for submittal to DWR and the EMC.
- It will be essential to effectively plan and carryout our MRS work to support the overall UNRBA objectives.

Closing Comments
Additional Discussion