Path Forward Committee Meeting
9:00 AM on June 2, 2020
Remote Access Only (see next slides)

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 10 minutes prior to the first meeting start time (e.g., MRSW) 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
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Agenda

- Opening comments
- Summary of UNC Collaboratory Jordan Lake Modeling, guest speaker, Jim Bowen, UNC Collaboratory
- Action Item
  - Review of FY2021 Modeling and Regulatory Support Contract and Scope of Work
- Status Updates
  - Status of IAIA
  - Modeling and Regulatory Support Status
- Other status items
- Closing comments

Summary of UNC Collaboratory Jordan Lake Modeling, Guest Speaker: Jim Bowen

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Summary of Results: Three-Dimensional Mechanistic Modeling of Jordan Lake, NC

James Bowen
Associate Professor, Associate Chair
Civil and Environmental Engineering Department
UNC Charlotte

Upper Neuse River Basin Association PFC Committee Meeting,
June 2, 2020

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Dec. 2019 NC Collaboratory Report Available

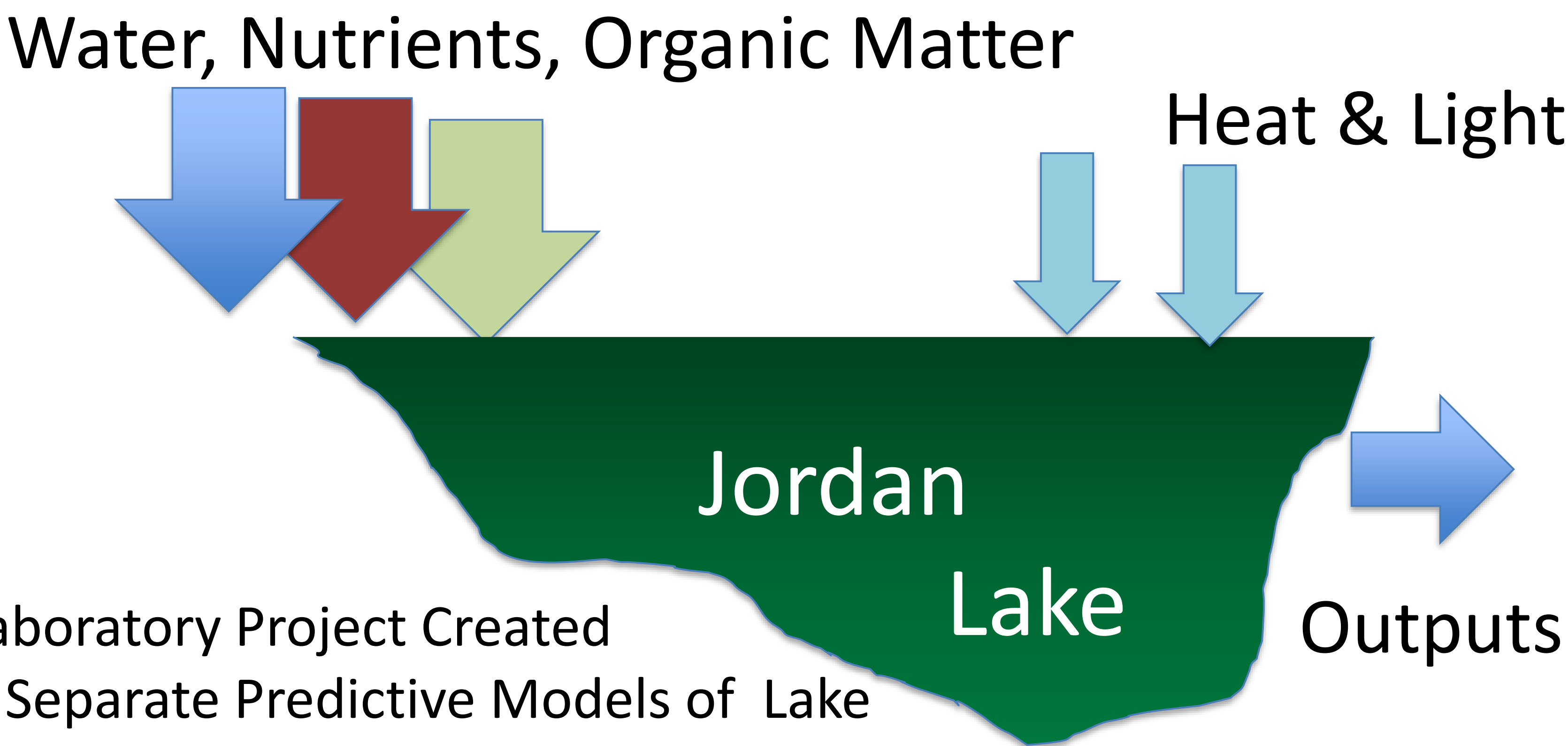
Jordan Lake Responses to Reduced Nutrient Loading: Results from a New Three-Dimensional Mechanistic Water Quality Model

James D. Bowen, William Langley, and Babatunde Adeyeye
Department of Civil and Environmental Engineering, UNC Charlotte

December 2019

https://nutrients.web.unc.edu/files/2019/12/Reservoir-Model-UNC-Charlotte.pdf

Using a mechanistic lake nutrient response model



Collaboratory Project Created
Two Separate Predictive Models of Lake Response to Reduced Nutrient Loading

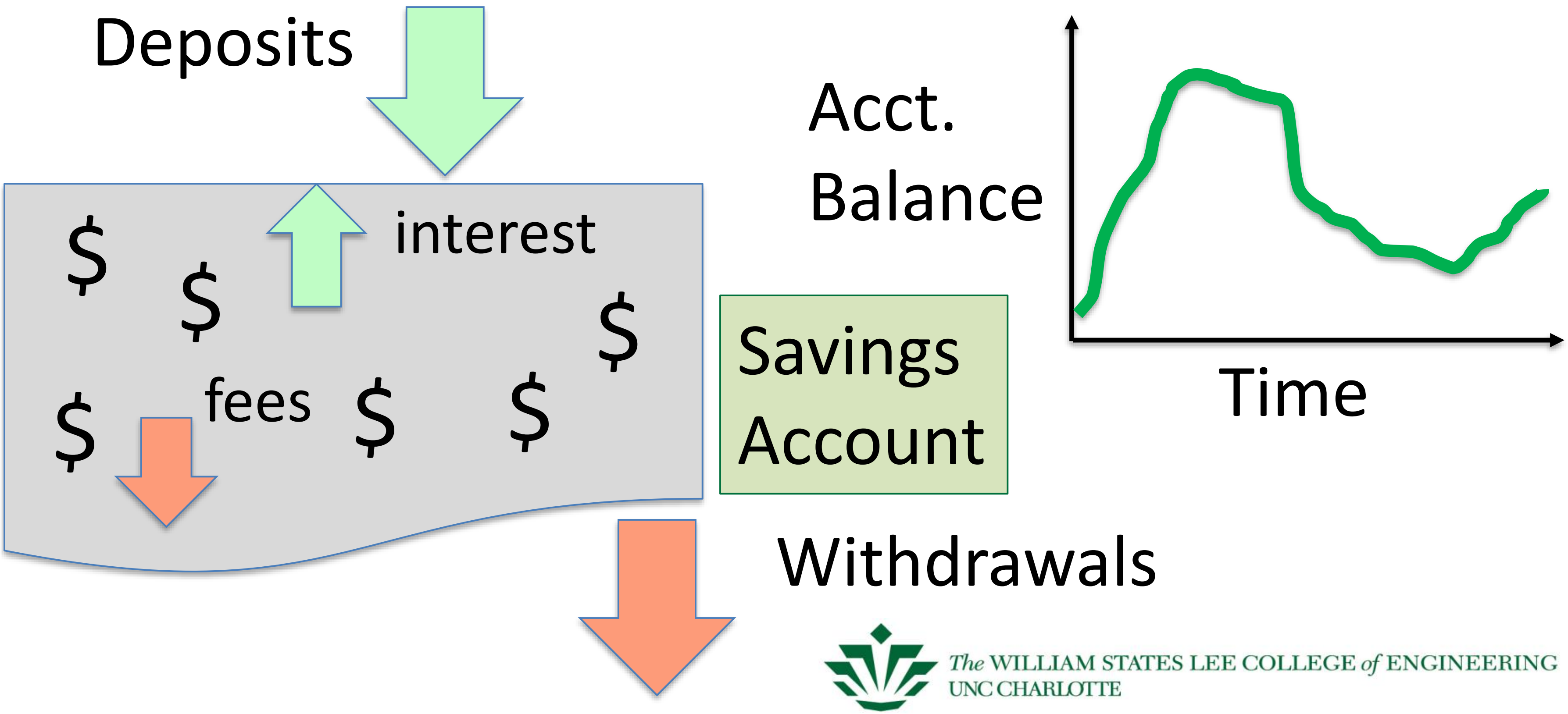
1. Three-dimensional mechanistic model
2. Bayesian-Mechanistic

Project Objectives: Examining System Functioning and Management Implications

a) Quantify and compare nutrient sources w/r to location and composition
b) Investigate how lake circulation affects delivery of nutrients to various regions of the lake
c) Compare the efficacy of various nitrogen and phosphorus watershed loading reductions for reducing algal levels in the reservoir.
d) Estimate how long it will take for the benefits of nutrient loading reductions to be fully realized.

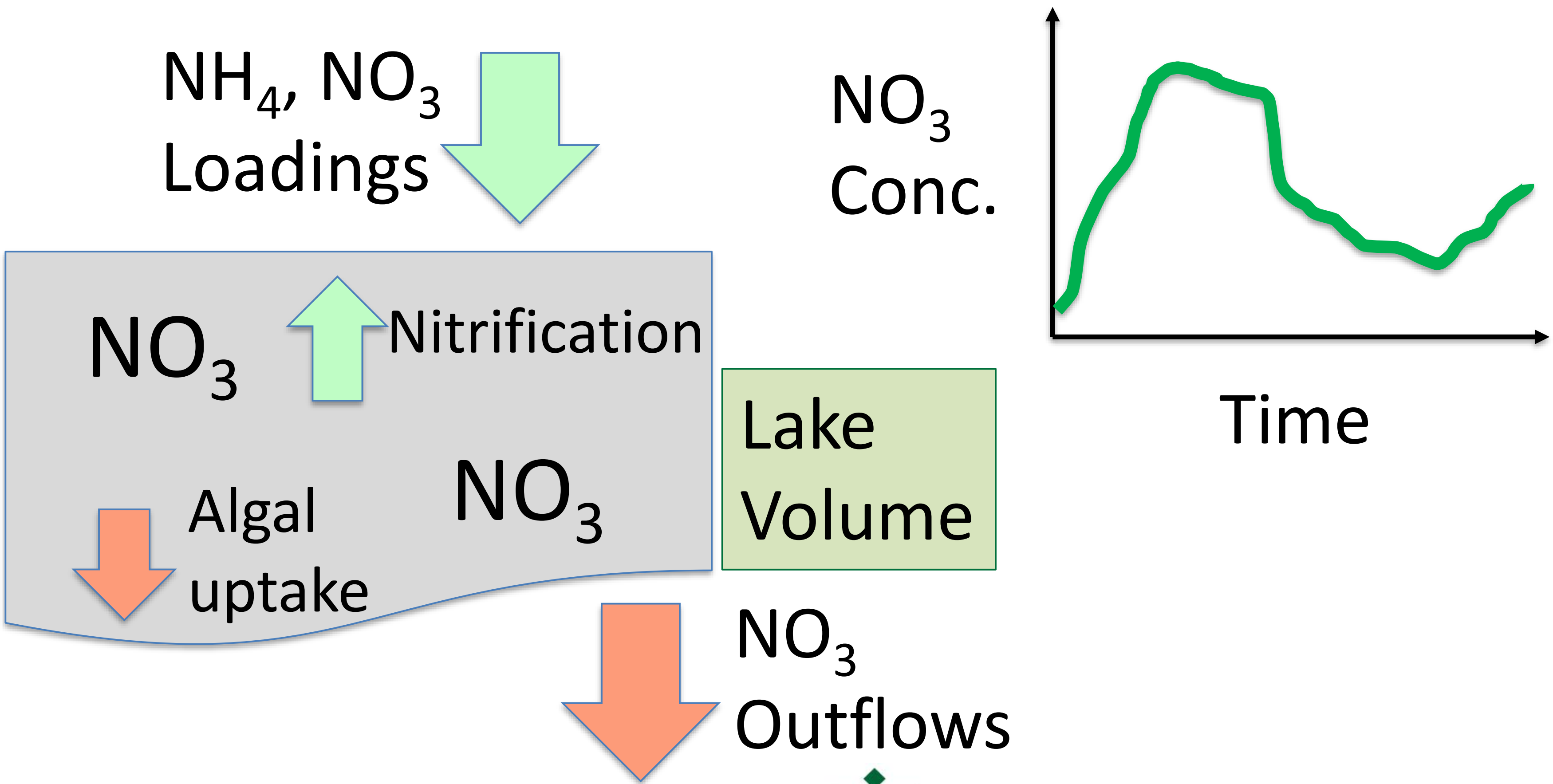
Approach: Create a Mechanistic Model Using Material Balances for Water, Heat, Momentum, Mass

Analogous to a Bank Account

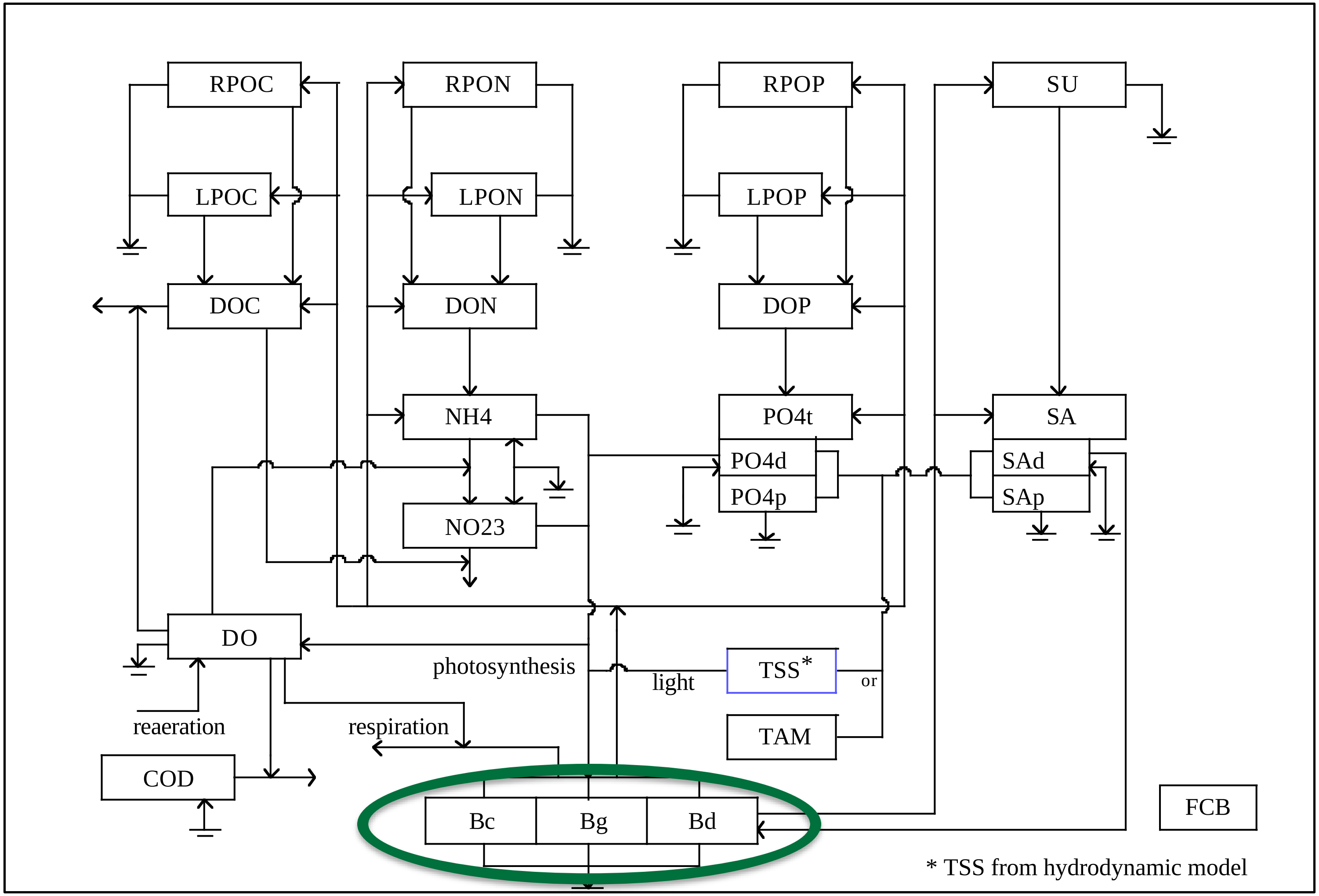


Qu: What are Material Balances?

NO_3 Material Balance

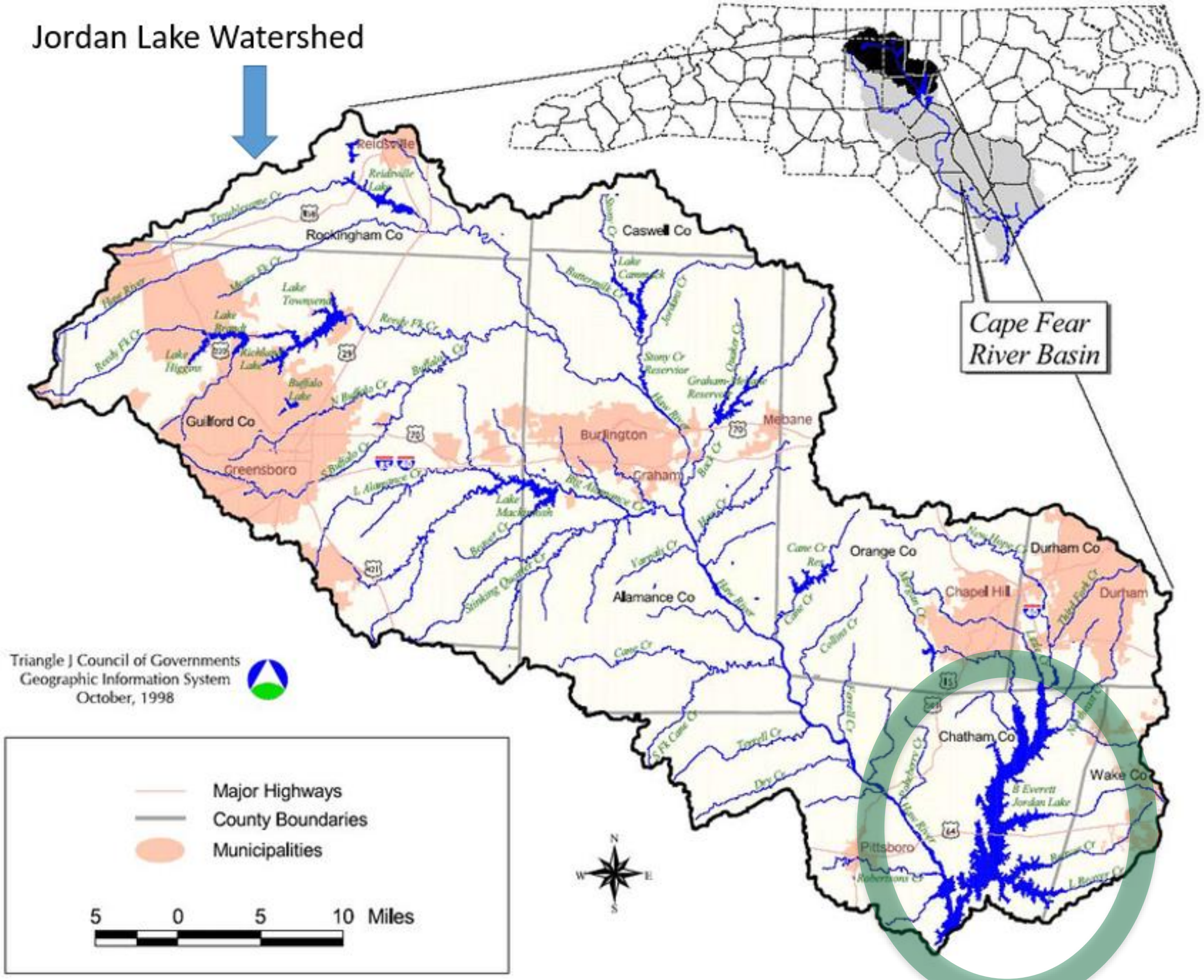


Three Separate Algal Functional Groups

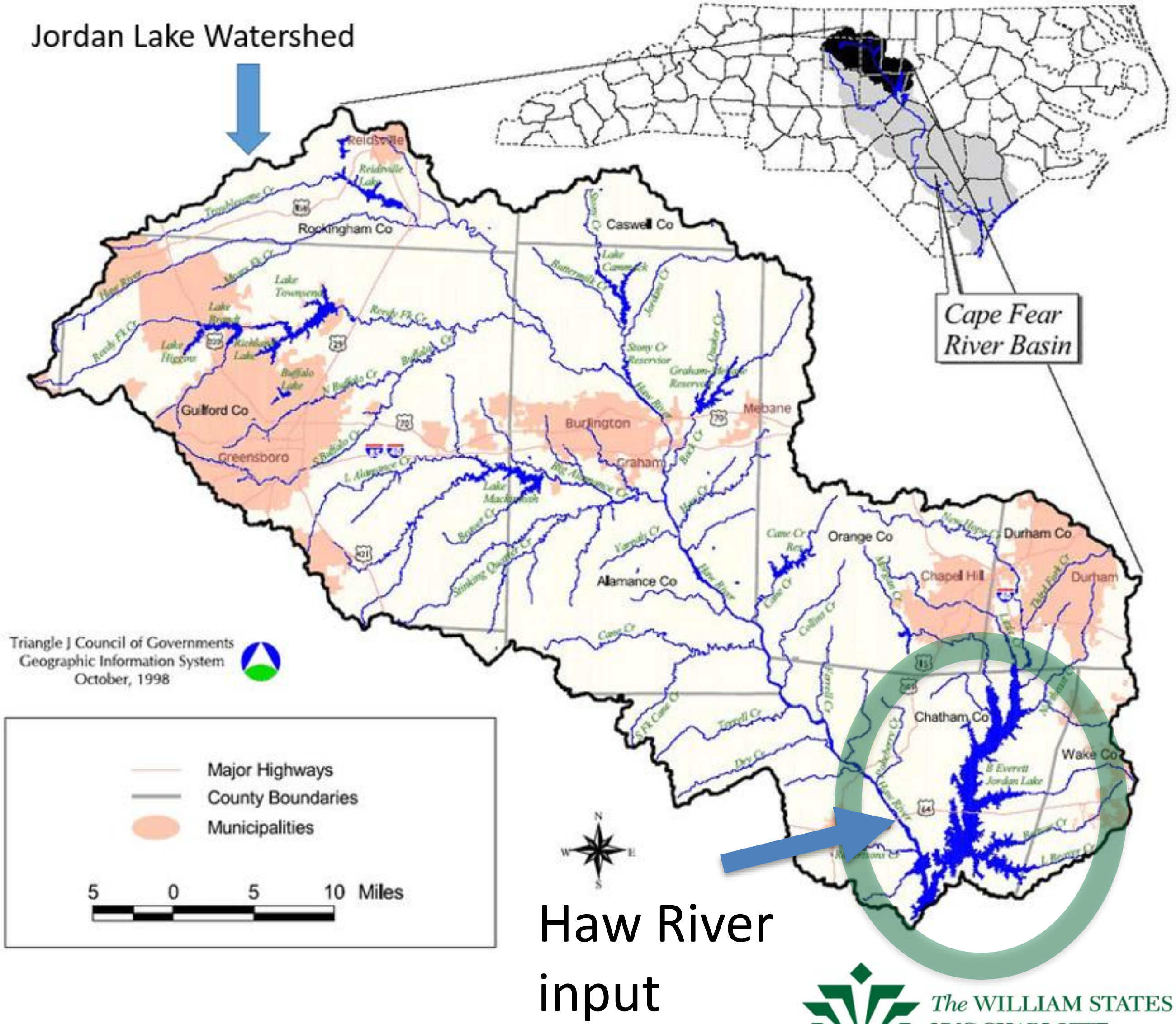


Jordan Lake and its Watershed

Jordan Lake Watershed

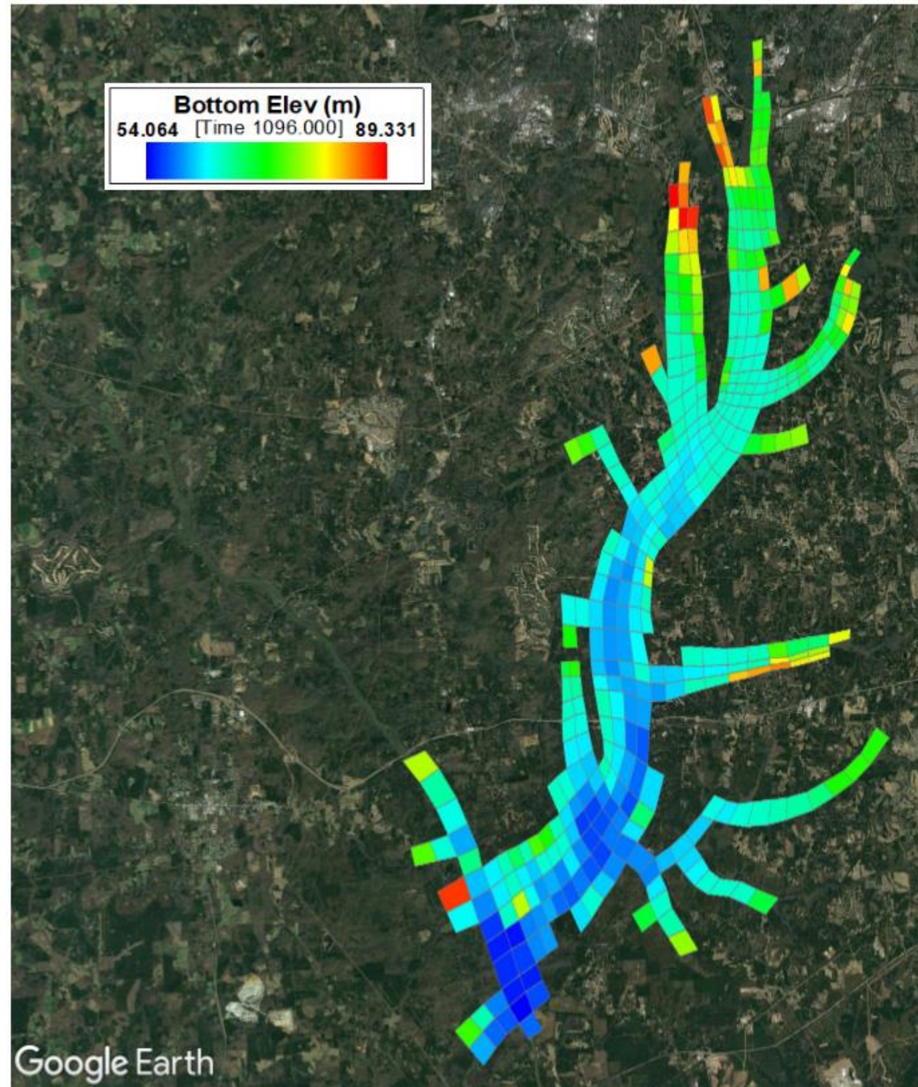


Jordan Lake and its Watershed

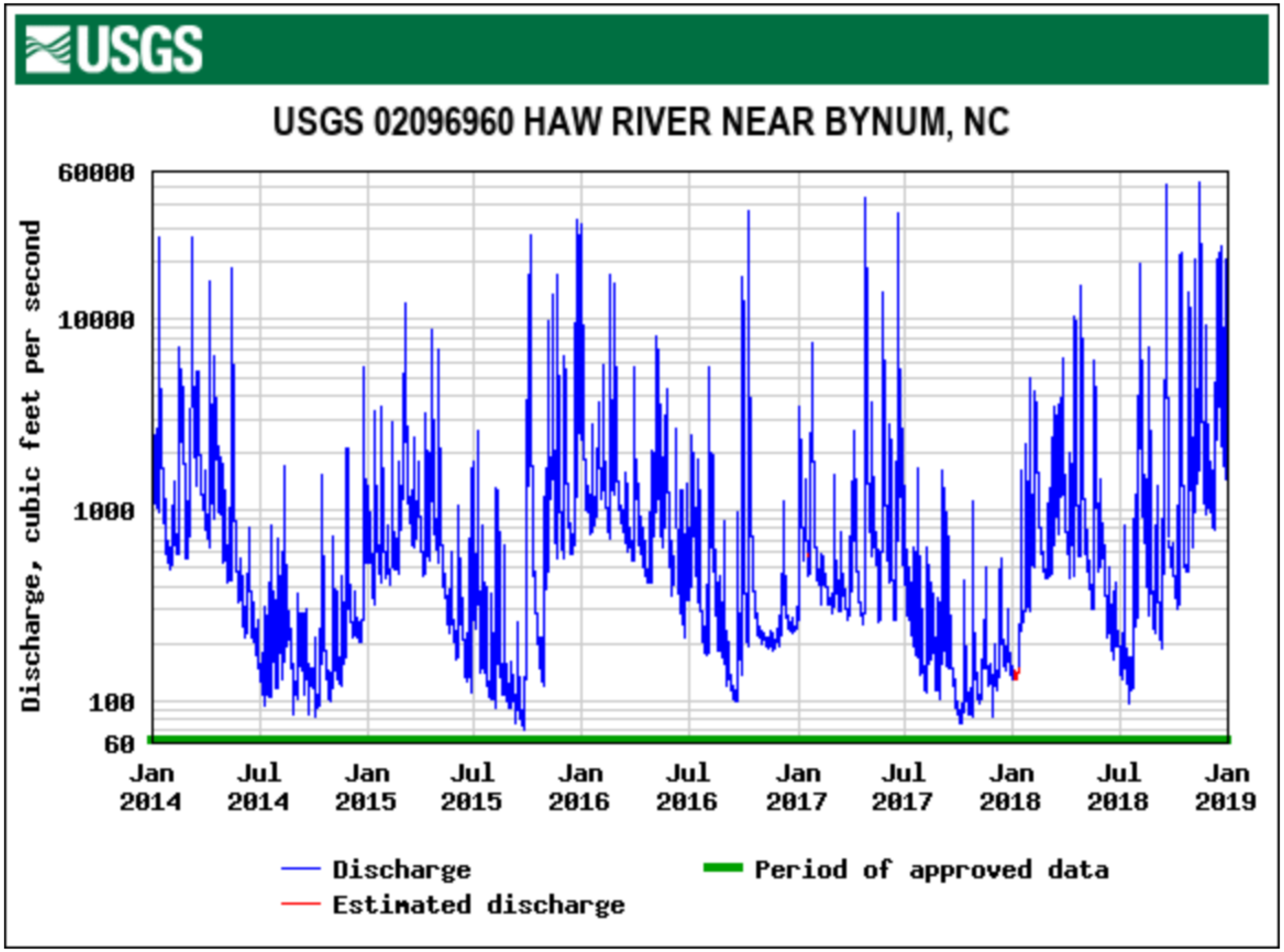


Model Setup, 3-d Mechanistic, a New Grid

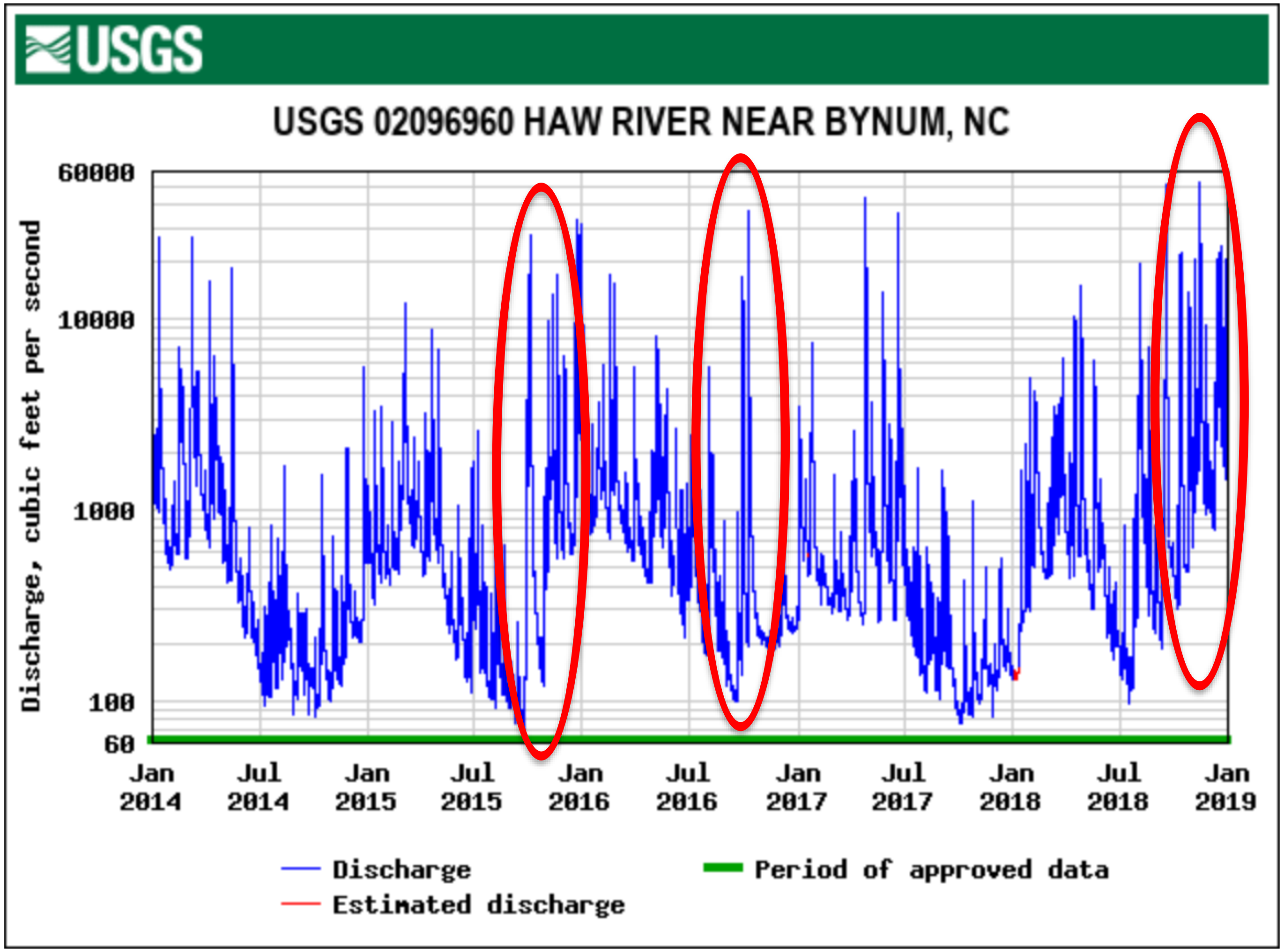
- Lake divided into 407 cells horizontally
- Each cell divided vertically into up to 25 layers (~.4 m), using a z-grid layering method
- Bottom elevations use new bathymetry plus LIDAR data
- Lake is modeled for five years (2014-2018) at a 100 second time step (sed flux specified) or 5-sec time step (w/ predictive sediment flux)



Haw River Flows Just Above Jordan Lake, 2014-2018

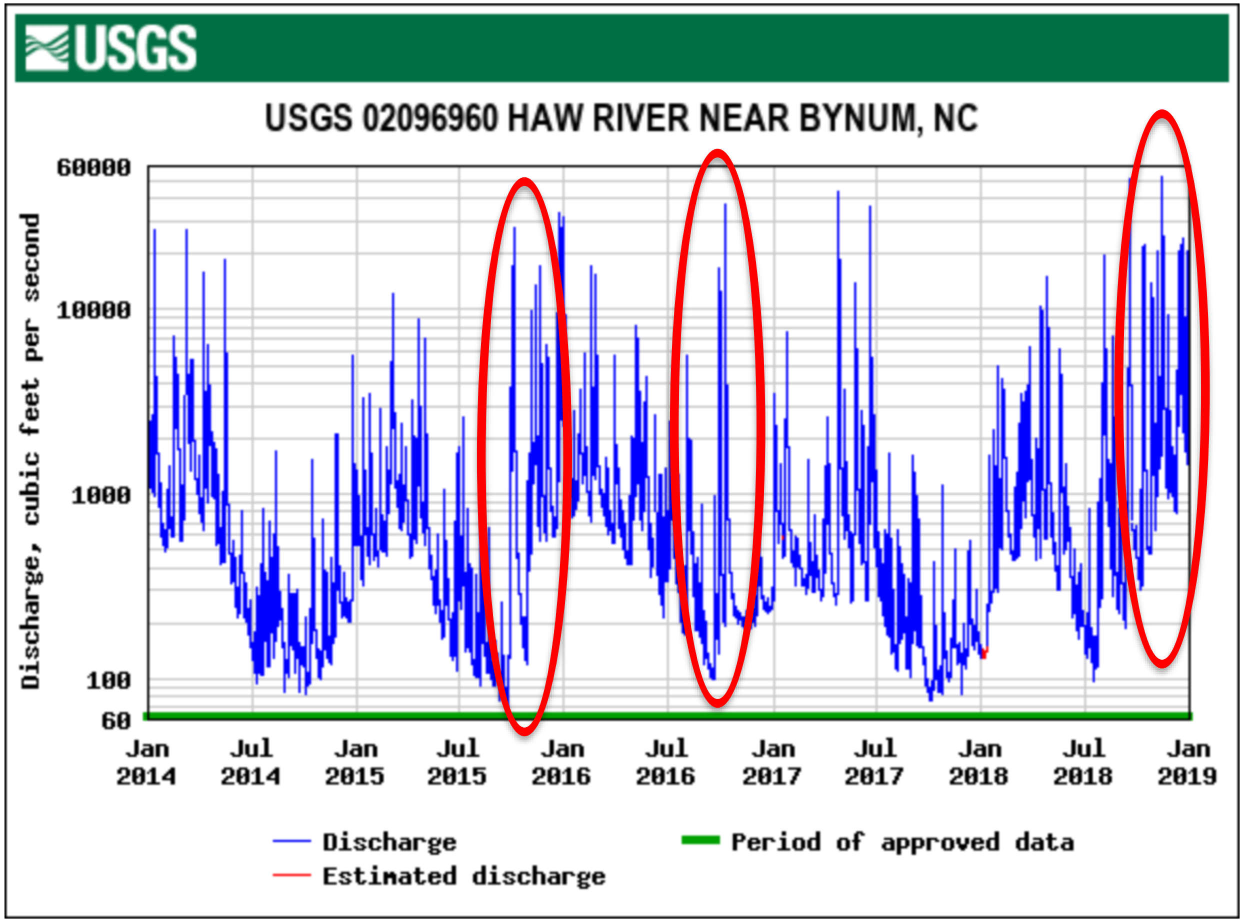


Haw River Flows Just Above Jordan Lake, 2014-2018



High Flow Events in 2015, 2016, 2018

Haw River Flows Just Above Jordan Lake, 2014-2018



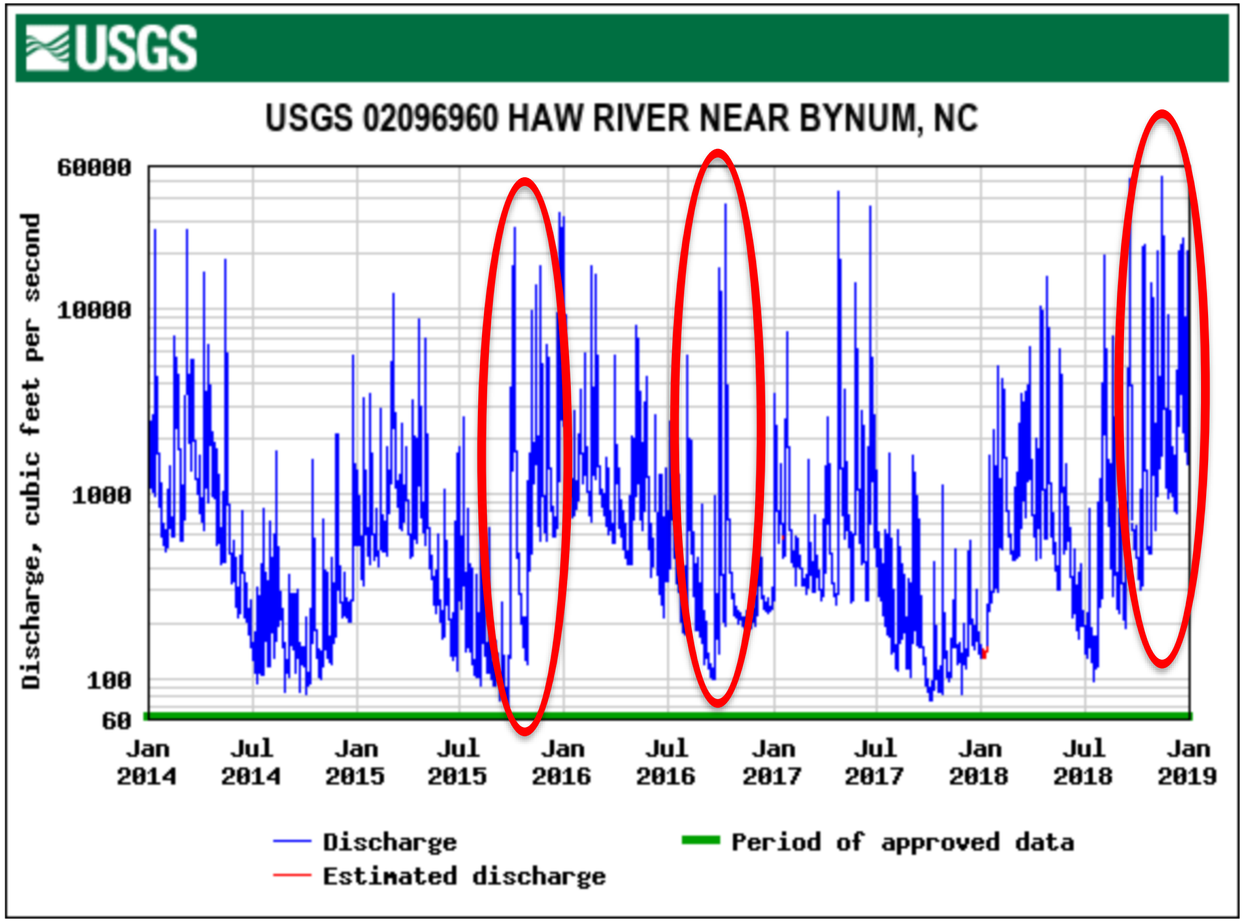
2014 - 2015

2016

2017 - 2018

Modeled Time Periods

Haw River Flows Just Above Jordan Lake, 2014-2018



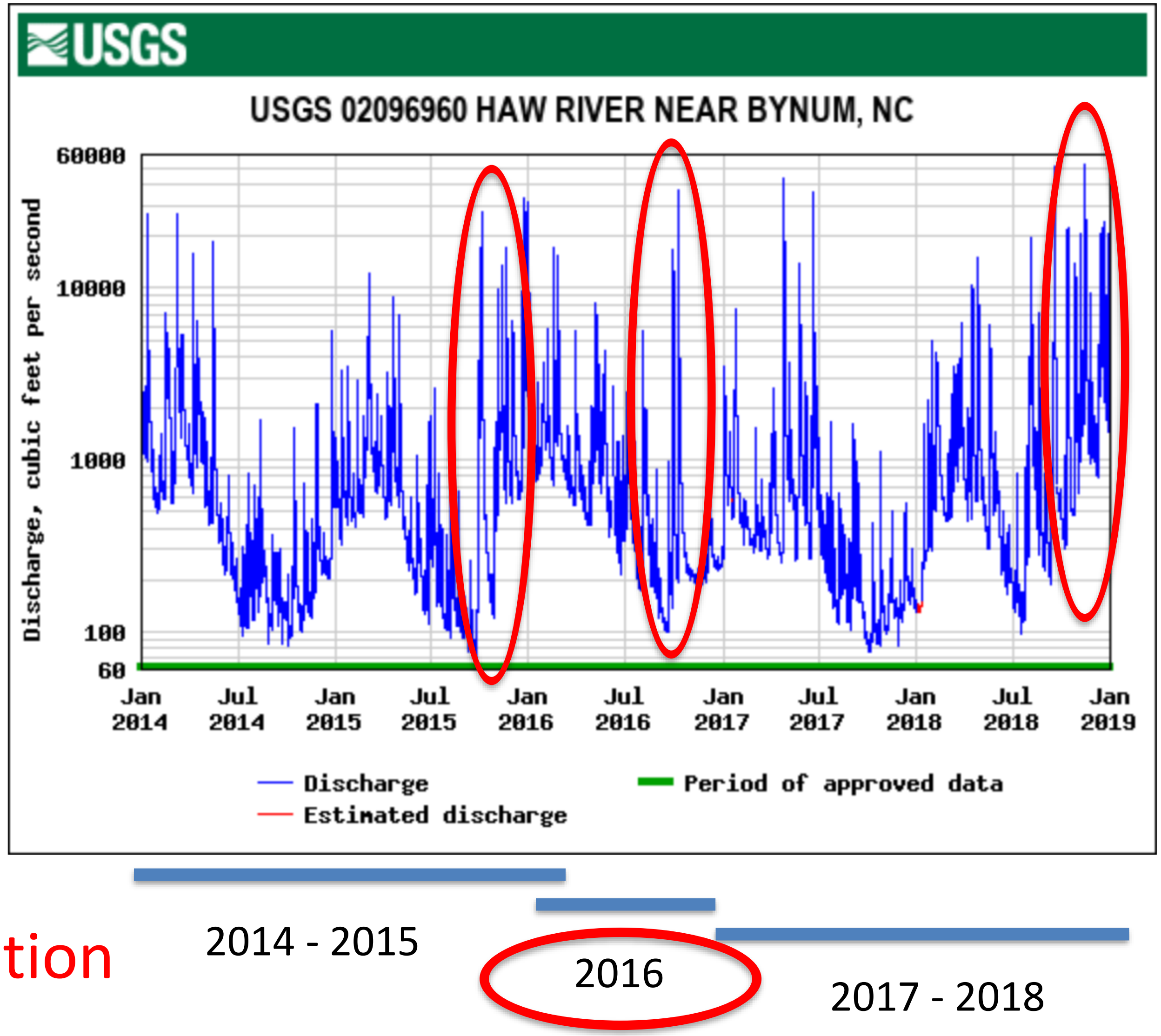
2014 - 2015

2016

2017 - 2018

Calibration &
Nutrient Reduction Tests

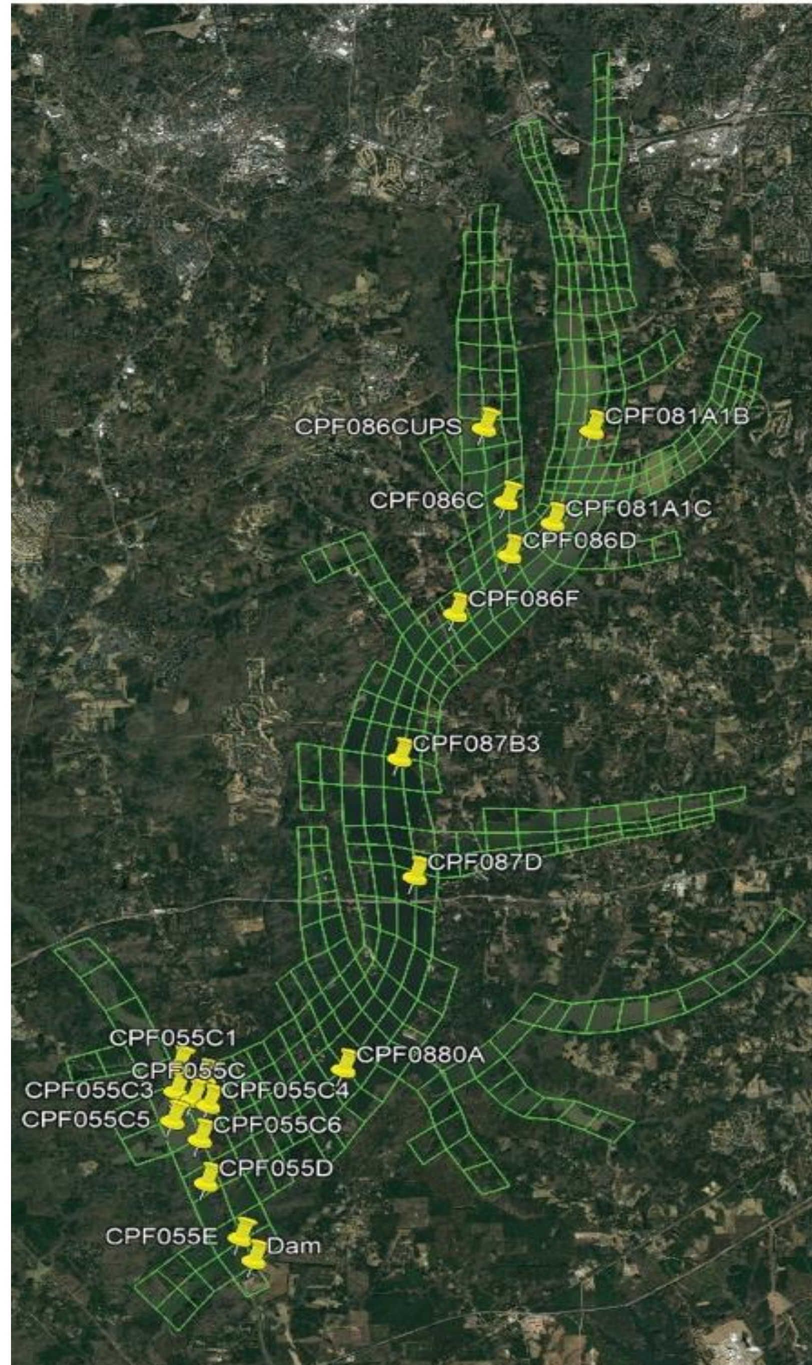
Haw River Flows Just Above Jordan Lake, 2014-2018



Model Validation

Model Predictions Compared to DWR Temp, Nutrients, DO, Chl a Data

- Long-term monitoring data available for Jordan Lake
- 18 stations in both Haw River and New Hope Creek arms of lake
- Data available since the 1980's

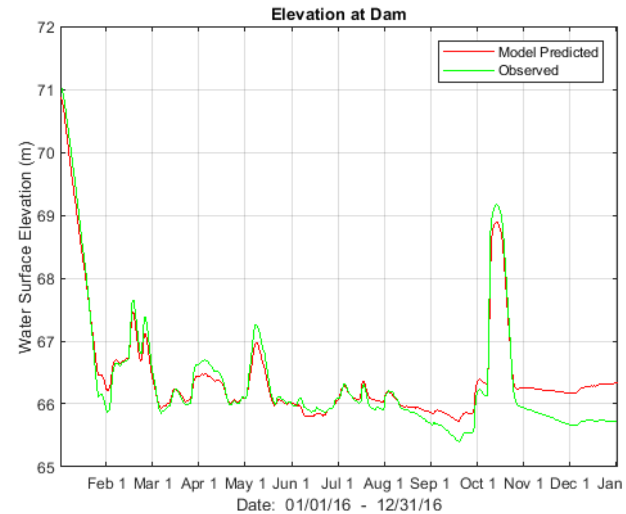


Mechanistic Model, Elevation @ Dam, Time Series

Model Time Period: 2014-2018

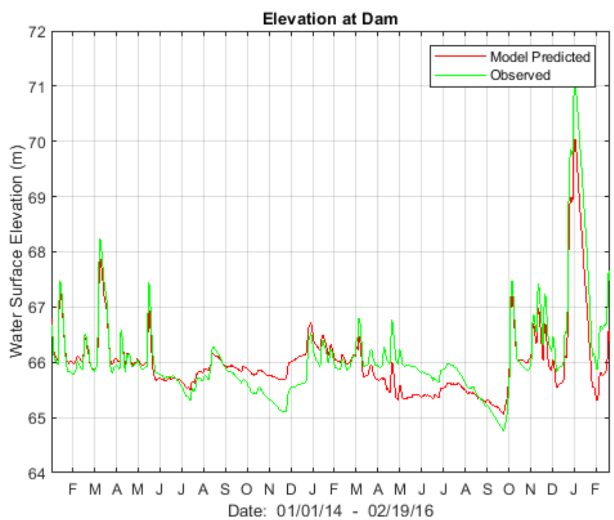
1. 2014 – 2015
2. 2016
3. 2017 – 2018

2016 Used for Model Validation

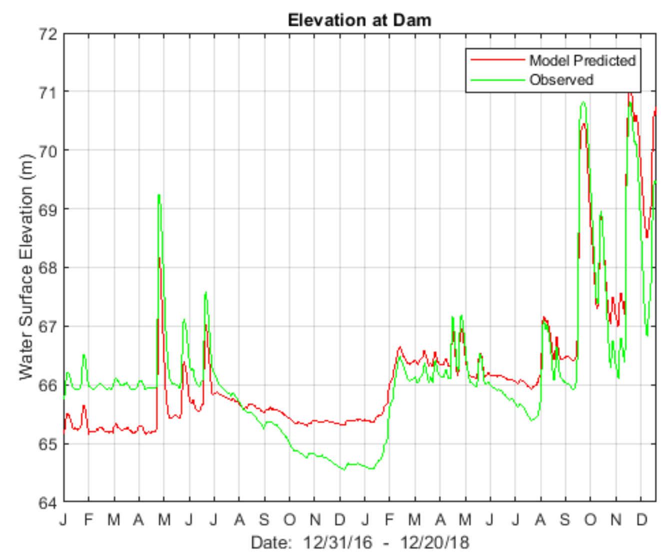


NB: No adjustment of dam outflows

Two Separate Two-Year Runs Used for Scenario Tests



2014 - 2015



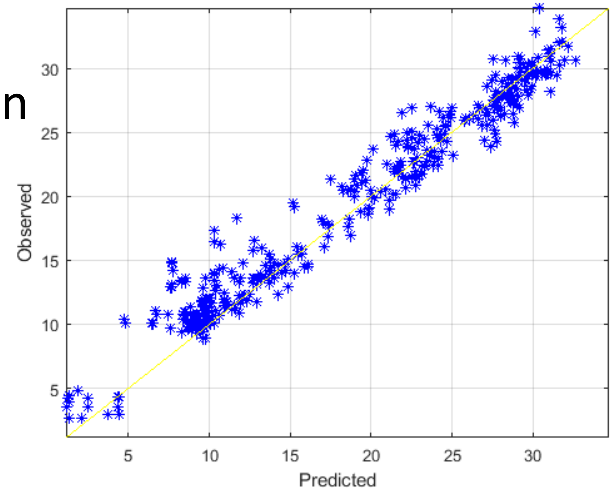
2017 - 2018

Mechanistic Model, Temperature scatter plots

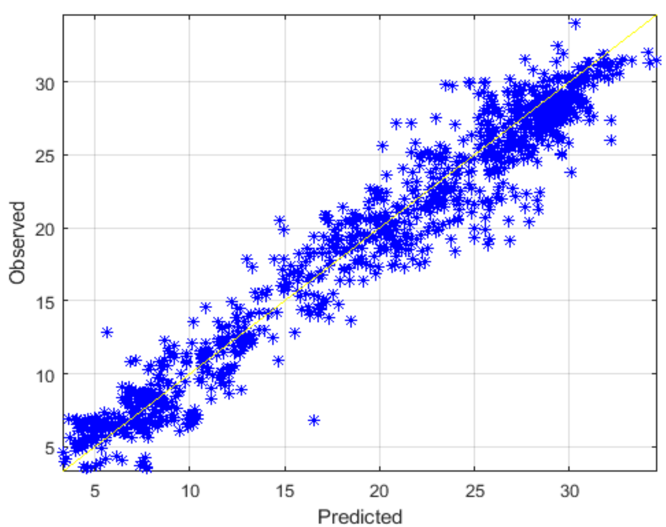
Model Time Period: 2014-2018

1. 2014 – 2015
2. 2016
3. 2017 - 2018

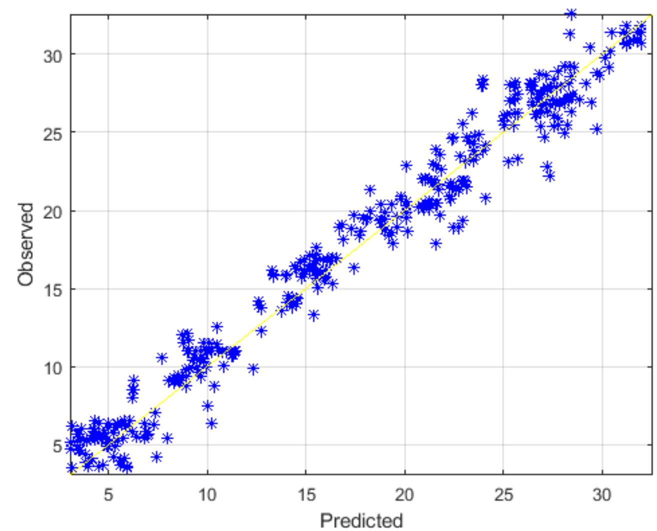
2016 Used for Model Validation



Two Separate Two-Year Runs Used for Scenario Tests



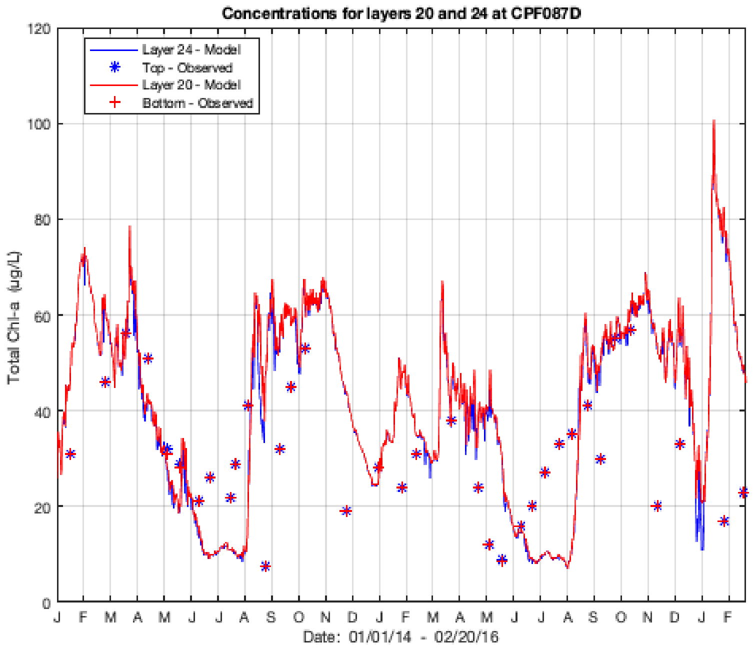
2014 - 2015

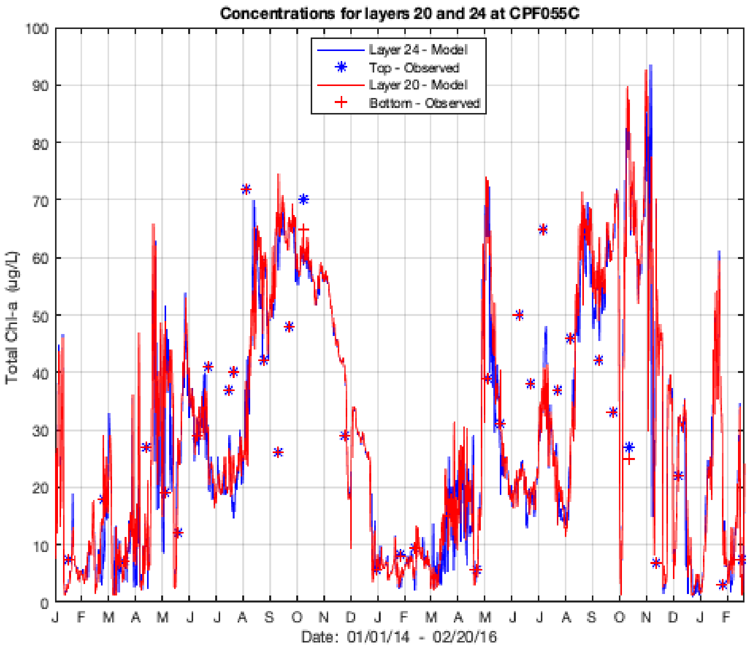


2017 - 2018

Mechanistic Model, Chl a time histories

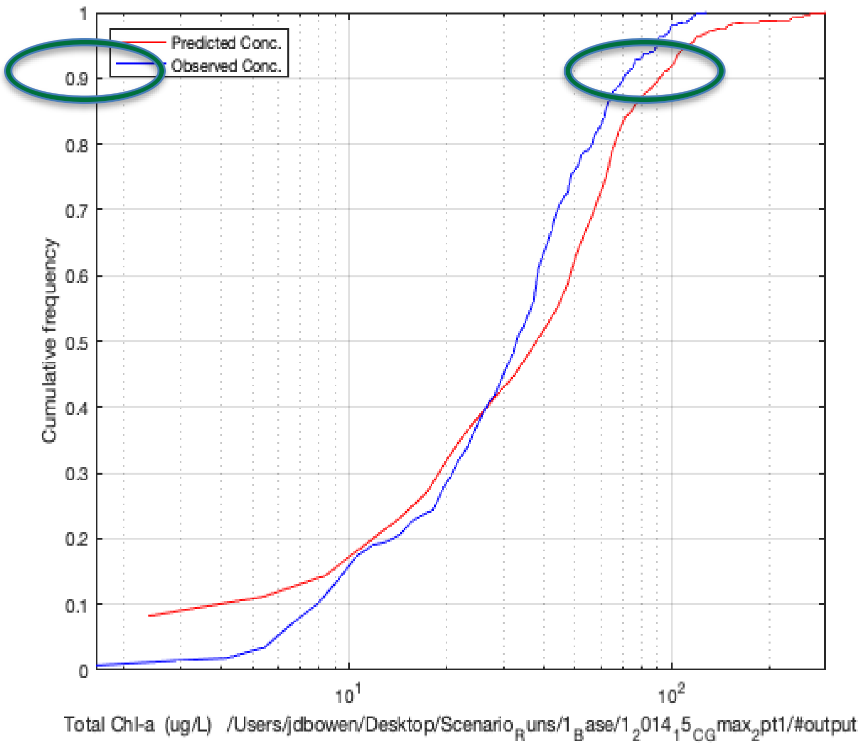
Predicted & Observed at two Stations, 2014-2016

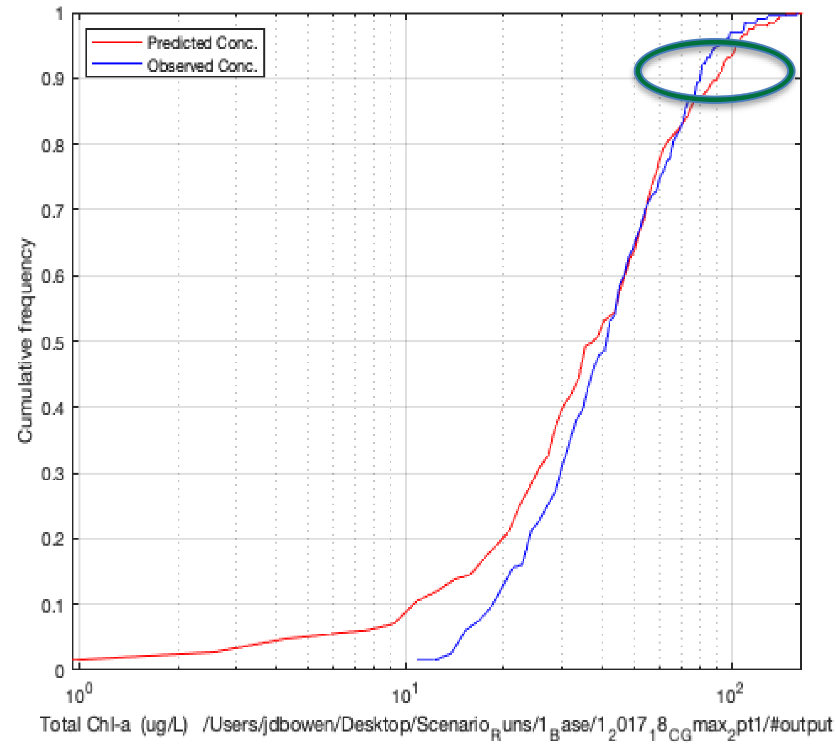




Mechanistic Model, Chl a CDFs

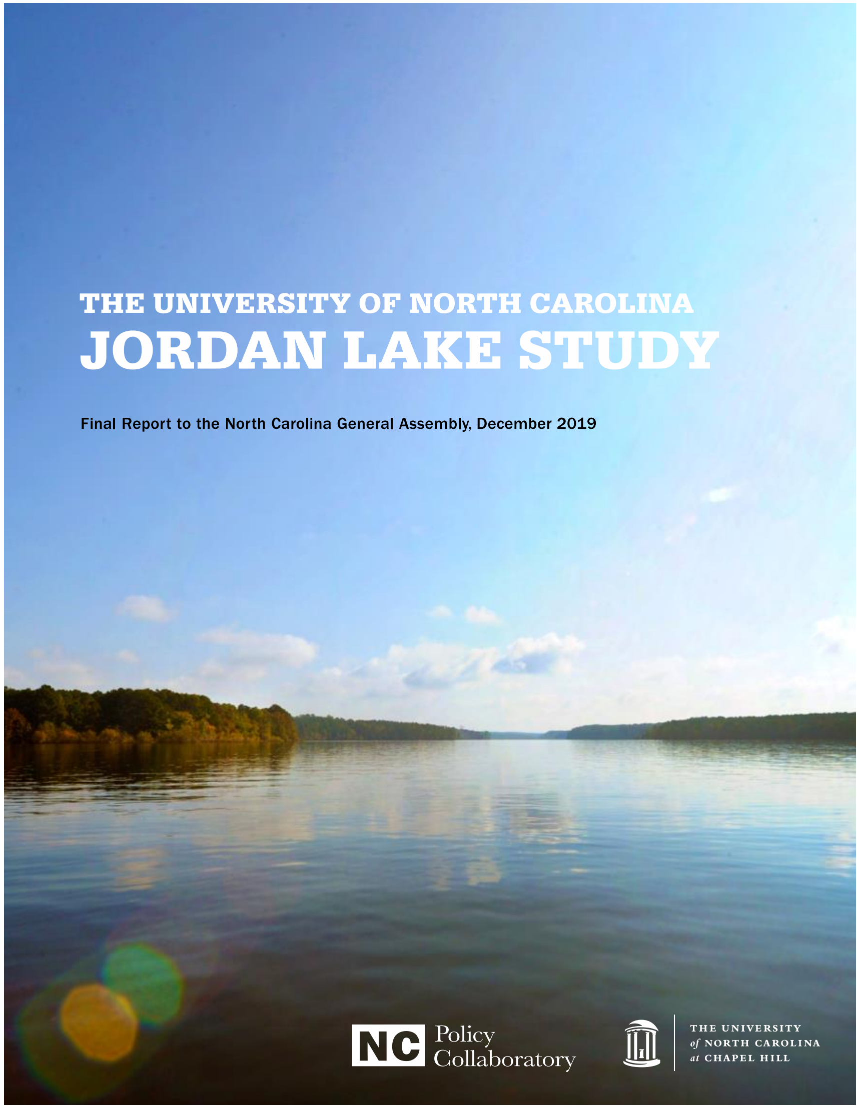
Predicted & Observed at all 18 stations, 2014-2015 and 2017-2018





Results Summary

Key Takeaways in NC Policy Collaboratory Report



https://collaboratory.unc.edu/files/2020/01/2019-jordan-lake-final-report.pdf

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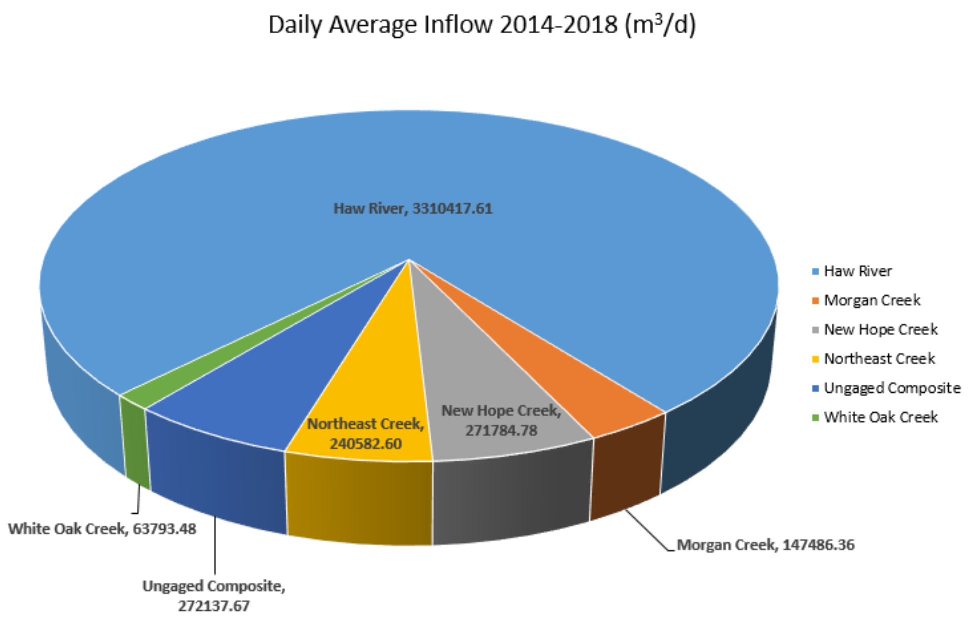
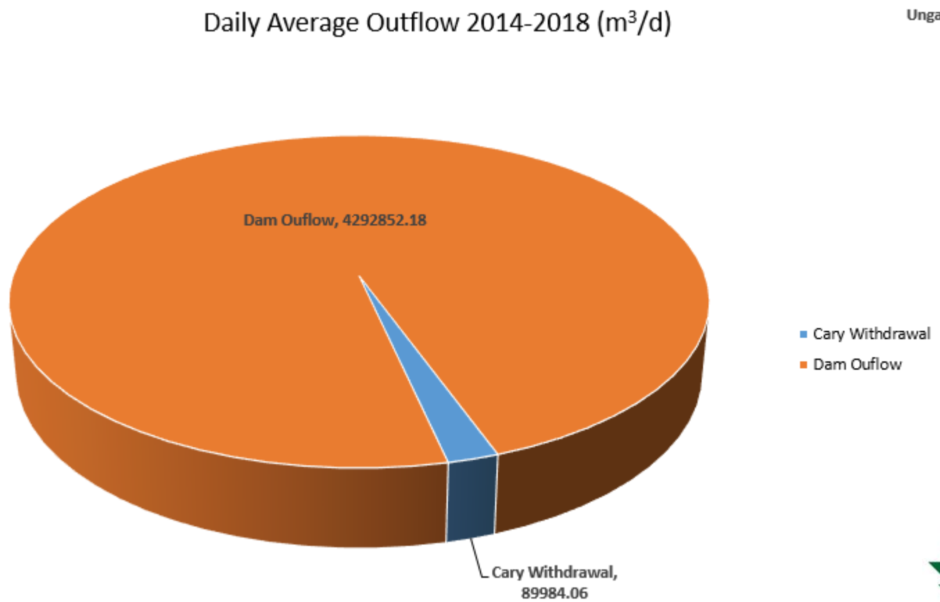
3-d Mechanistic Model – Key Takeaways

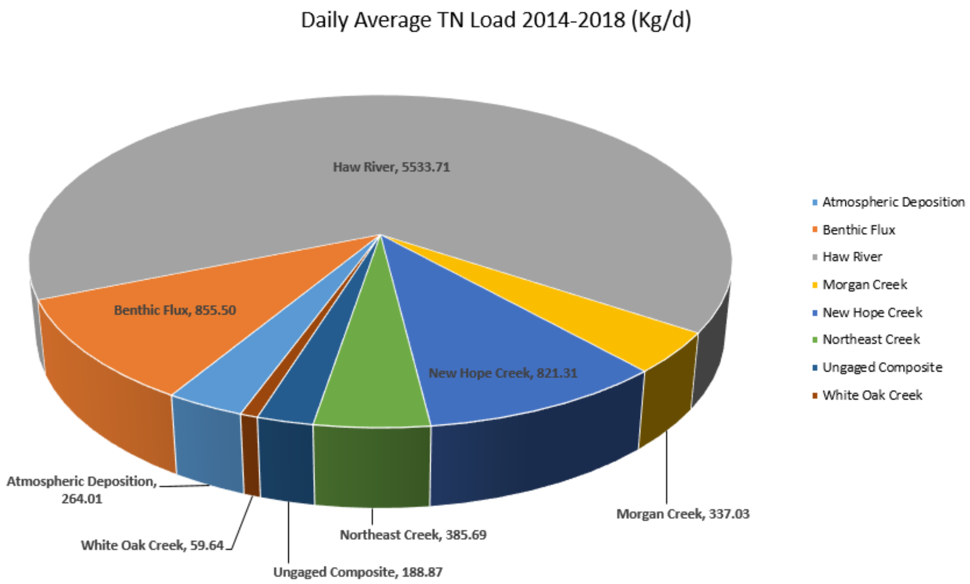
- The majority of nutrients (N and P) entering the lake are from watershed sources, primarily from the Haw River. These nutrients are mostly in particulate and organic forms that are not immediately available to phytoplankton.
- Only a very small fraction of inflowing Haw River water makes its way to the region above the two causeways in the New Hope Creek arm of the lake. In this region, local inflows (Morgan Creek, New Hope Creek, Northeast Creek) supply the majority of nutrient inputs.
- The benthic sediments of Jordan Lake act as a sink for the particulate fraction of organic nutrients, nitrate, and dissolved oxygen. Benthic sediments are also the major source of bioavailable nutrients, providing more than 75% of phosphate and 90% of ammonia to the lake.

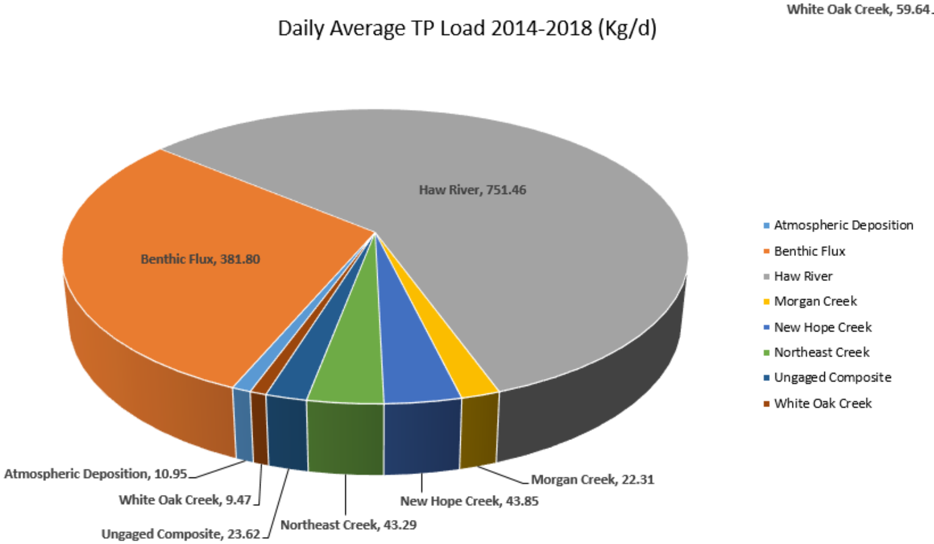
Average Inflows & Outflows (2014-2018)





Average TP and TN Loading (2014-2018)





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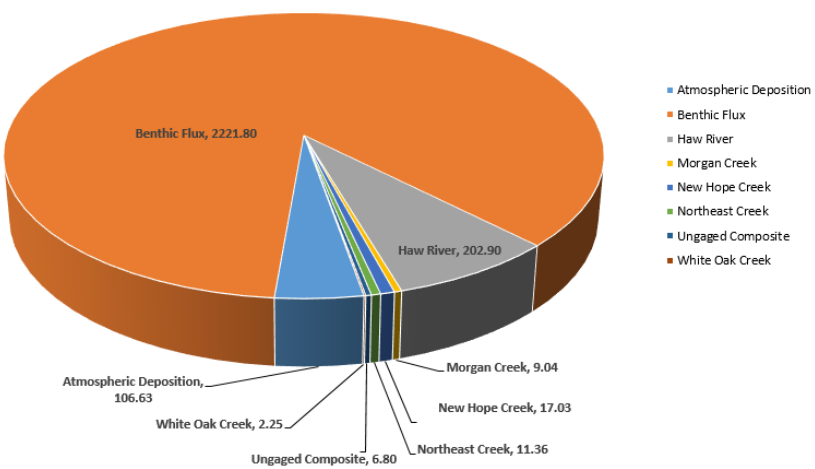
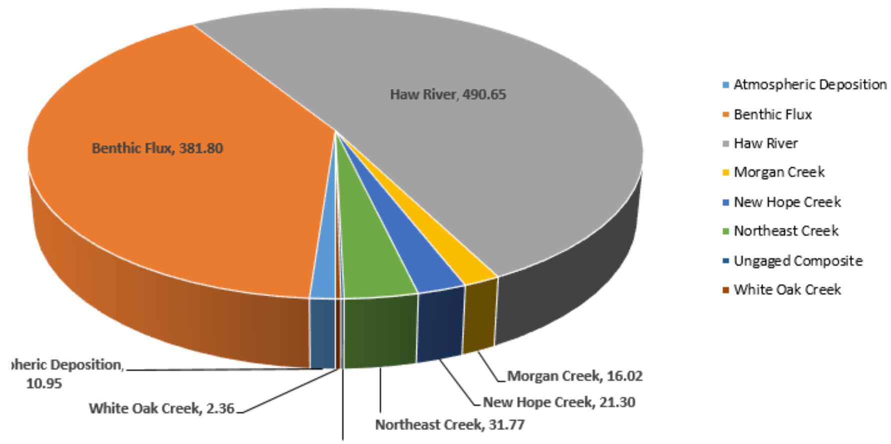
Bioavailable N & P Loading (2014-2018)

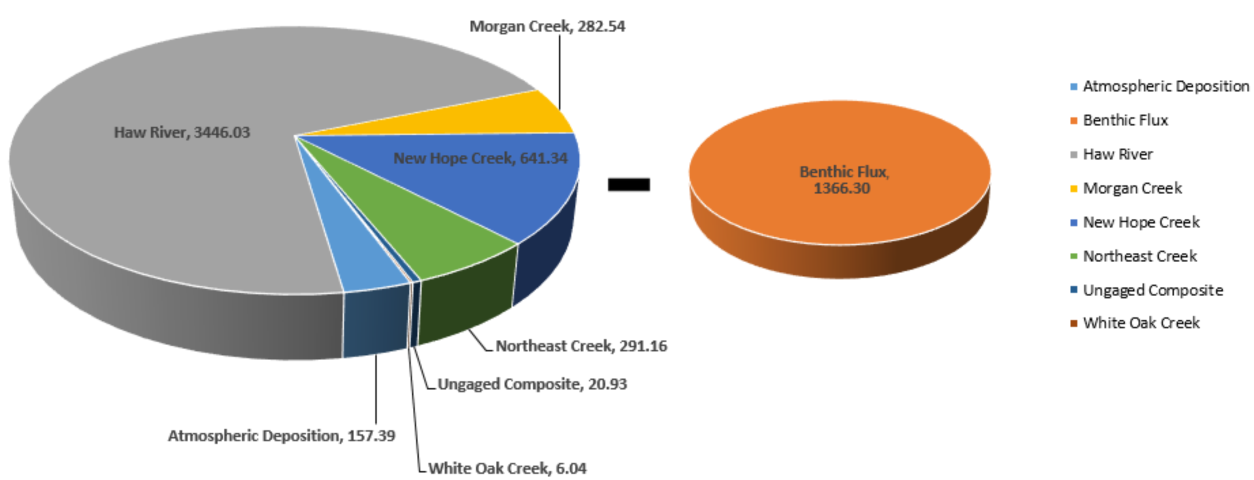
Daily Average Ammonia Load 2014-2018 (Kg/d)



Daily Average Phosphate Load 2014-2018 (Kg/d)



Daily Average Nitrate Load 2014-2018 (Kg/d)



3-d Mechanistic Model – Key Takeaways, cont'd

- For the five-year time period studied (2014-2018), the observed 90th percentile photic-zone chlorophyll a concentration at eighteen monitoring stations across Jordan Lake was 72 µg/l, which is 44% above the North Carolina water quality criteria value of 40 µg/l.

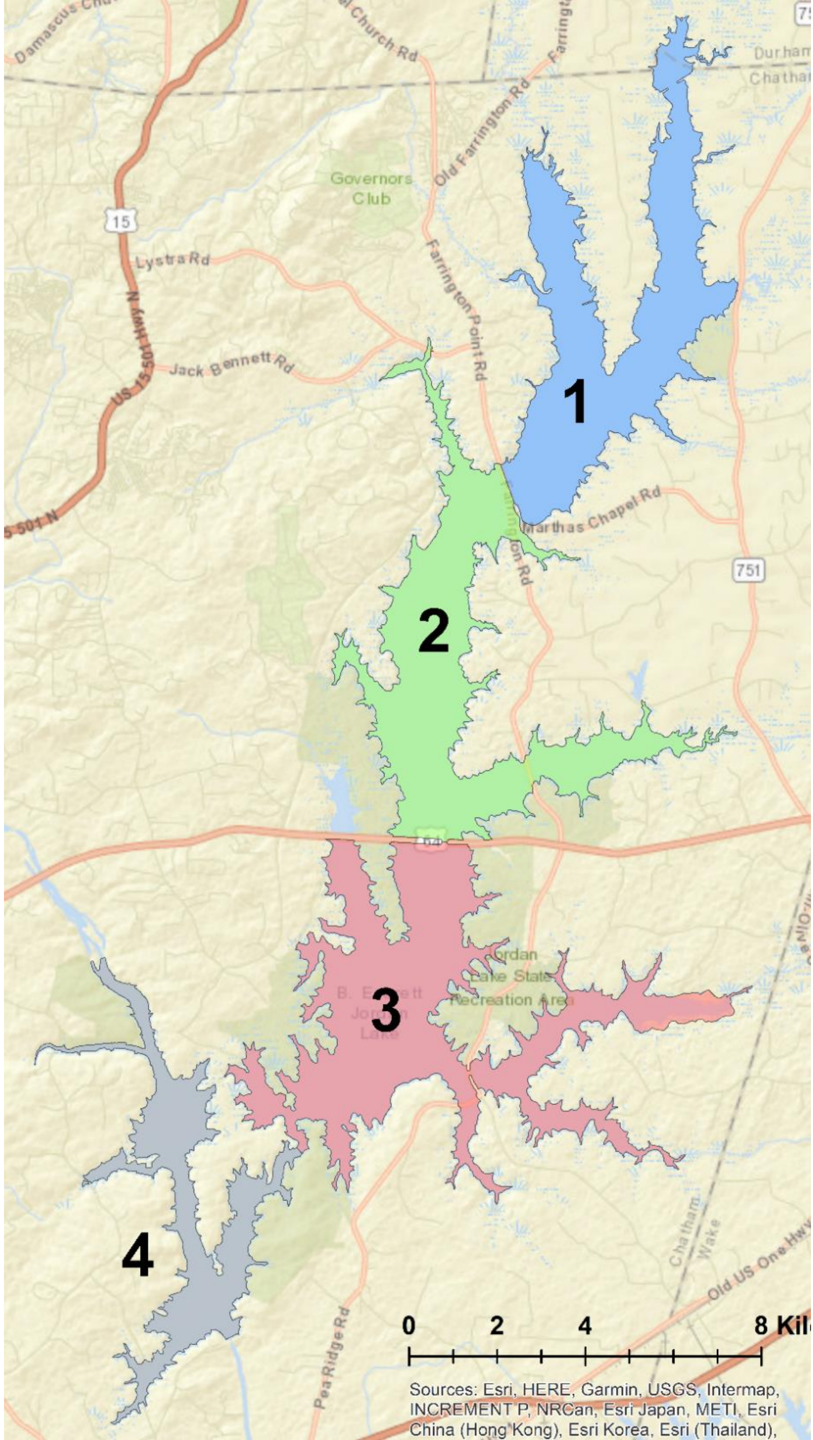
Analysis of 2014-2018 Chl a Data

Lake Region	Station	Number of Chl a samples	Chl a median concentration (µg/L)	90th percentile Chla a concentration (µg/L)	Reduction needed for 90th percentile Chl a concentration at 40 µg/L
Haw River	CPF055C	74	29.0	63.7	37%
	CPF055D	72	25.0	44.9	11%
	CPF055E	73	28.0	44.0	9%
Above Causeways	CPF081A1C	74	57.5	90.4	56%
	CPF086C	74	58.5	89.0	55%
	CPF086F	74	52.5	81.7	51%
Between Causeways	CPF087B3	74	34.0	52.4	24%
	CPF087D	74	29.5	53.0	25%
Below Causeways	CPF0880A	74	28.0	42.0	5%
Jordan Lake	All 18 Stations	1004	36.0	72.0	44%

Both Models Examine Lake Regions:

Bayesian-Mechanistic

- Lake is longitudinally segmented based on major constrictions.
- Lake is modeled over three decades at a monthly time step.



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Jordan Lake	All 18 Stations	1004	36.0	72.0	44%

Region 4

Region 1

Region 2

Region 3

3-d Mechanistic Model – Key Takeaways, cont'd

- Two-year simulations of all regions of Jordan Lake predicted that nitrogen and phosphorus watershed load reductions of 10%, 30% and 40% would reduce algal biomass by 3%, 13% and 17% respectively.

Lake Responds to Reduced N and/or P Loading

Table 11. Average reduction in model predicted chlorophyll a concentration at 18 locations from the 2014-2015 and 2017-2018 base case runs for various nutrient load reduction scenarios (upper table) and the fraction of model predicted values exceeding the chlorophyll a water quality criteria value of 40 µg/L (lower table).

Chl a Reduction (µg/L)	Change in N loading				
Change in P Loading	-40%	-30%	-20%	-10%	0%
0%	-12%	-9%	-6%	-3%	0%
-10%	-13%	-10%	-7%	-3%	-1%
-20%	-15%	-12%	-9%	-5%	-3%
-30%	-16%	-13%	-10%	-7%	-5%
-40%	-17%	-14%	-12%	-10%	-7%

% Chl a Above 40 µg/L	Change in N loading				
Change in P Loading	-40%	-30%	-20%	-10%	0%
0%	39%	41%	43%	44%	45%
-10%	38%	40%	42%	43%	44%
-20%	37%	39%	41%	43%	44%
-30%	36%	38%	40%	42%	43%
-40%	35%	37%	39%	41%	42%

Lake Responds to Reduced N and/or P Loading

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Change in N loading					Chl a Reduction (µg/L)	
-40%	**-30%**	**-20%**	**-10%**	**0%**		
-12%	-9%	-6%	-3%	0%	**0%**	**Change**
-13%	-10%	-7%	-3%	-1%	**-10%**	**in**
-15%	-12%	-9%	-5%	-3%	**-20%**	**P**
-16%	-13%	-10%	-7%	-5%	**-30%**	**Loading**
-17%	-14%	-12%	-10%	-7%	**-40%**	

Chl a reduction % less than the corresponding nutrient load reductions

Lake Responds to Reduced N and/or P Loading

Table 11. Average reduction in model predicted chlorophyll a concentration at 18 locations from the 2014-2015 and 2017-2018 base case runs for various nutrient load reduction scenarios (upper table) and the fraction of model predicted values exceeding the chlorophyll a water quality criteria value of 40 µg/L (lower table).

Change in N loading					Chl a Reduction (µg/L)	
-40%	**-30%**	**-20%**	**-10%**	**0%**		
-12%	-9%	-6%	-3%	0%	**0%**	**Change**
-13%	-10%	-7%	-3%	-1%	**-10%**	**in**
-15%	-12%	-9%	-5%	-3%	**-20%**	**P**
-16%	-13%	-10%	-7%	-5%	**-30%**	**Loading**
-17%	-14%	-12%	-10%	-7%	**-40%**	

System more sensitive to % changes in N loading compared to P

3-d Mechanistic Model – Key Takeaways, cont'd

- A simulation that considered changing sediment conditions predicted that a sustained nutrient load reduction of 50% would after a decade reduce algal biomass by 43%.

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Lake Responds Slowly to Reduced Nutrient Loading

Table 14. Average reduction in model predicted chlorophyll a concentration at 18 locations for the 2014-2015 model time period for a 50% load reduction in N & P for various time periods using time-varying sediment organic matter compositions.

Effect of 50% N & P load reductions for the following time periods									Chl a Reduction (% from base case)
0-2 years	2-4 years	4-8 years	6-8 years	8-10 years	10-12 years	12-14 years	14-16 years	16-18 years	
-23%	-27%	-33%	-41%	-43%	-44%	-45%	-45%	-45%	

Effect of nutrient reduction takes ~20 years to be fully expressed

Summary and Conclusions

- Two separate models (this EFDC model + NCSU Bayesian model) w/ different formulations and approaches were used to predict Jordan Lake's response to reduced nutrient loading
- The two models produced qualitatively similar results
- Nutrients stored in the lake's bottom sediments damp and delay the response of nutrient load reduction
- The lake is less sensitive to Haw River reductions than those from the New Hope Creek arm

Mechanistic Model, Chl a Fit to Data

Parameter	Time Period			Units
	2014-2015	2016	2017-2018	
Mean Error (predicted – observed)	0.06	0.10	-0.03	log μg/L
Normalized Mean Error	4.1%	6.8%	-1.9%	%
Root Mean Square Error	0.41	0.40	0.27	log μg/L
Normalized Root Mean Square Error	29%	28%	17%	%
Correlation R^2	27%	26%	28%	%
Number of Model/Data Comparisons	898	366	334	-

N,P Load Reductions: Chl a response based on CDFs as Compared to Base Case

Case	Year	Clorophyll a Concentrations at Percentile Values				Percentage	Reductions from Base Case				Average
		25th	50th	75th	90th	Above 40 ug/L	25th	50th	75th	90th	Reduction
Observed Values	2014-2015	19	33	49	71	39%					
All DWR Stations	2017-2018	28	42	62	81	53%					
1. Base Case	**2014-2015**	**14.4**	**35.1**	**62.3**	**93.6**	45%	0.00%	0.00%	0.00%	0.00%	0.00%
	2017-2018	**22.1**	**35.4**	**57.1**	**92.2**	45%	0.00%	0.00%	0.00%	0.00%	
2. N minus 10%	**2014-2015**	14.2	34.2	58.8	90.8	44%	-1.39%	-2.56%	-5.62%	-2.99%	-2.91%
P unchanged	**2017-2018**	21.5	35.3	56.2	86.5	44%	-2.71%	-0.28%	-1.58%	-6.18%	
3. N minuse 20%	**2014-2015**	14	32.3	55.8	87.1	42%	-2.78%	-7.98%	-10.43%	-6.94%	-5.94%
P Unchanged	**2017-2018**	20.8	34.8	55	84.7	44%	-5.88%	-1.69%	-3.68%	-8.13%	
4. N Minus 40%	**2014-2015**	13.4	29.7	49.9	79.1	37%	-6.94%	-15.38%	-19.90%	-15.49%	-12.31%
P unchanged	**2017-2018**	19	32.6	52.8	81.8	41%	-14.03%	-7.91%	-7.53%	-11.28%	
5. N unchanged	**2014-2015**	14	34.5	61	92.3	45%	-2.78%	-1.71%	-2.09%	-1.39%	-1.34%
P minus 10%	**2017-2018**	21.7	35.1	55.8	94.2	44%	-1.81%	-0.85%	-2.28%	2.17%	
6. N Minus 10%	**2014-2015**	13.9	33.1	58.4	89.6	43%	-3.47%	-5.70%	2.28%	-4.27%	-3.34%
P minus 10%	**2017-2018**	21.3	34.3	55.6	86.5	43%	-3.62%	-3.11%	-2.63%	-6.18%	
7. N minus 20%	**2014-2015**	13.8	32.1	54.9	86.2	41%	-4.17%	-8.55%	-11.88%	-7.91%	-7.13%
P minus 10%	**2017-2018**	20.5	34	54	84.9	43%	-7.24%	-3.95%	-5.43%	-7.92%	
8. N minus 40%	**2014-2015**	13.3	29.1	49.2	78.3	36%	-7.64%	-17.09%	-21.03%	-16.35%	-13.17%
P minus 10%	**2017-2018**	19	32	52.2	82	40%	-14.03%	-9.60%	-8.58%	-11.06%	

N,P Load Reductions: Chl a response based on CDFs as Compared to Base Case

Case	Year	Clorophyll a Concentrations at Percentile Values				Percentage	Reductions from Base Case				Average
		25th	50th	75th	90th	Above 40 ug/L	25th	50th	75th	90th	Reduction
Observed Values	2014-2015	19	33	49	71	39%					
All DWR Stations	2017-2018	28	42	62	81	53%					
1. Base Case	**2014-2015**	**14.4**	**35.1**	**62.3**	**93.6**	45%	0.00%	0.00%	0.00%	0.00%	0.00%
	2017-2018	**22.1**	**35.4**	**57.1**	**92.2**	45%	0.00%	0.00%	0.00%	0.00%	
2. N minus 10%	2014-2015	14.2	34.2	58.8	90.8	44%	-1.39%	-2.56%	-5.62%	-2.99%	-2.91%
P unchanged	2017-2018	21.5	35.3	56.2	86.5	44%	-2.71%	-0.28%	-1.58%	-6.18%	
3. N minuse 20%	2014-2015	14	32.3	55.8	87.1	42%	-2.78%	-7.98%	-10.43%	-6.94%	-5.94%
P Unchanged	2017-2018	20.8	34.8	55	84.7	44%	-5.88%	-1.69%	-3.68%	-8.13%	
4. N Minus 40%	2014-2015	13.4	29.7	49.9	79.1	37%	-6.94%	-15.38%	-19.90%	-15.49%	-12.31%
P unchanged	2017-2018	19	32.6	52.8	81.8	41%	-14.03%	-7.91%	-7.53%	-11.28%	
5. N unchanged	2014-2015	14	34.5	61	92.3	45%	-2.78%	-1.71%	-2.09%	-1.39%	-1.34%
P minus 10%	2017-2018	21.7	35.1	55.8	94.2	44%	-1.81%	-0.85%	-2.28%	2.17%	
6. N Minus 10%	2014-2015	13.9	33.1	58.4	89.6	43%	-3.47%	-5.70%	2.28%	-4.27%	-3.34%
P minus 10%	2017-2018	21.3	34.3	55.6	86.5	43%	-3.62%	-3.11%	-2.63%	-6.18%	
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	2017-2018	**22.1**	**35.4**	**57.1**	**92.2**	45%	0.00%	0.00%	0.00%	0.00%	
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P Unchanged	**2017-2018**	20.8	34.8	55	84.7	44%	-5.88%	-1.69%	-3.68%	-8.13%	
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P unchanged	**2017-2018**	19	32.6	52.8	81.8	41%	-14.03%	-7.91%	-7.53%	-11.28%	
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P minus 10%	**2017-2018**	19	32	52.2	82	40%	-14.03%	-9.60%	-8.58%	-11.06%	

Modeling and Regulatory Support FY2021 Contract and Scope of Work – Action Item

Task 330 – WARMF Lake

- **Setup and hydrologic calibration and validation of WARMF Lake**
  - Develop WARMF lake segments with input from UNRBA subject matter experts and MRSW
  - Process Falls Lake bathymetry data collected by the UNRBA to develop stage-area curves for each segment
  - Link WARMF watershed model output to WARMF lake segments
  - Calibrate and validate the water levels in Falls Lake to USGS measurements at two locations
  - Run baseline period as a comparison

Task 331 – Water Quality Model Inputs

- **Compile and format water quality data inputs and observations**
  - WARMF watershed model
    - Soil chemistry and atmospheric deposition
    - Nutrient application rates
    - Wastewater treatment plant effluent data
    - Sanitary sewer overflow data
    - Onsite wastewater treatment systems
    - Regional best management practices
  - EFDC lake model
    - Monitoring data in Falls Lake to support calibration
    - Atmospheric deposition
    - In lake sediment chemistry

Task 332 – Water Quality Calibration

- **Water quality calibration and validation of WARMF watershed model based on Modeling QAPP**
  - Report performance statistics and visual comparisons for 7 locations
  - Provide visual comparisons for other 31 locations
- **Preliminary water quality calibration of EFDC lake model**
  - Setup and initialization
  - Progressive calibration of water quality parameters at 12 DWR monitoring locations
  - Final calibration for the full set of parameters listed in the QAPP will occur in the first quarter of FY2022
    - This will not impact the schedule for the re-examination package

Task 333 – Modeling Support and Cost Benefit Analysis

- **Modeling support**
  - Integration of data and special studies into water quality calibration
  - Evaluation of model performance and development of scripts to calculate performance criteria
  - Formatting model output tables and graphics
- **Cost benefit analysis**
  - Engage subject matter expert economist
  - Continued compilation of references
  - Participation in select UNRBA workshops to hear input

Task 333 – Statistical Modeling

- Develop lake segments with input from UNRBA subject matter experts and the MRSW
- Develop draft model framework (inputs, linkages, outcomes) for discussion with MRSW
- Identify goals and desired outcomes for the model with the MRSW
- Define outcomes in terms of metrics, units, and categories of information
- Exploration of input data sets including local, regional, and national
- Develop preliminary model structure in R programming language

Task 334 – Interim Reporting

- Continued drafting of technical report(s)
- Generation of status updates and modeling summaries for 7 MRSW, 6 Board, and 12 PFC meetings
- Generation of materials for other meetings
  - Technical stakeholder workshop summarizing model inputs and hydrologic/hydrodynamic calibration
  - Water Resources Research Institute annual conference

Task 335 – Update the Work Plan

- Update the multi-year work plan
- Develop scope and contracts for FY2022

Task 336 – Regulatory Support

- **General regulatory support**
  - Planning and preparation for meetings with agency staff, watershed stakeholders, and interested parties
  - Review of materials generated by external parties related to the re-examination
- **Support implementation of the IAIA**
  - Continue with Program development
  - Develop presentation materials for presentation to DEQ and EMC Water Quality Committee
  - Support discussions with local governments
  - $15,000 allocated to this task from unallocated UNRBA funds

Task 337 - Communications

- Management and coordination of the UNRBA's Communication Team (Executive Director, Subject Matter Experts, Brown and Caldwell and HDR support staff)
- Development of a communication strategy for internal stakeholder input, external stakeholder input, and public interactions (meetings and materials: goals, schedule, distribution approach)
- General communications support (internal and external)
- Maintenance of communication materials
- Generation of meeting materials to support communication efforts
- $35,000 allocated to this task from UNRBA communications budget

Task 338 – Meetings and Project Mgt.

Table 1. Anticipated Meetings and Workshops for FY2021				
Month Year	PFC	BOD	MRSW	Other Anticipated Meetings
Jul 2020	●		●	
Aug 2020	●		●	
Sept 2020	●	●	●	
Oct 2020	?			Technical Workshop
Nov 2020	●	●	●	IAIA Presentation to EMC WQC
Dec 2020	●		●	
Jan 2021	●	●		
Feb 2021	●			Regulatory Forum
Mar 2021	●	●		WWRI
Apr 2021	●			
May 2021	●	●	●	
Jun 2021	●	●	●	

Schedule for Finalizing FY2021 Contracts

- April 22nd – submittal of preliminary draft scope to Executive Director
- April 29th – submittal of preliminary draft scope to the MRSW
- May 5th – presentation of scope to MRSW; status update to PFC
- May 12th – comments back from MRSW on draft scope
- May 20th – status update to Board
- May 26th – revised draft scope to PFC
- June 2nd – presentation of scope and contract to PFC
- June 5th – comments back from PFC on revised draft scope
- June 10th – distribution of contract to the Board for review
- June 17th – approval of contract by the Board
- July 1st – start date for FY2021 contract

Status of the UNRBA Stage I Existing Development (ED) Interim Alternative Implementation Approach (IAIA)

UNRBA Efforts to Develop an Alternate Approach for Stage I Existing Development

- The UNRBA has been considering this approach since early 2018
- In 2019, efforts increased to work through details
  - 5 meetings of the IAIA Workgroup
  - 9 meetings of the PFC
  - 5 status updates to the Board
  - Several reviews and revisions to the conceptual document, framework, and Program Description
- In 2020, efforts have continued
  - The Board approved the Program Description in January
  - Multiple discussions with DWR to build IAIA into Model Program
  - Legal Workgroup began drafting Interlocal Agreement
  - Began development of the Program Document for inclusion in the Model Program

Status of the UNRBA Stage I ED IAIA

- The UNRBA Board endorsed a Program Description document on January 15, 2020
  - Provides basis for additional discussions on how such a program could be established and implemented
  - Preliminary evaluation that did not represent commitments from members to participate
  - Did not represent a final IAIA Program document.
- Schedule considerations - a preliminary prospective schedule was developed previously and was provided to the PFC and the Board aimed at IAIA Program implementation date of July 1, 2021

Language to Allow the IAIA in the Model Program (Being Developed by DWR)

- Draft language for insertion into the Model Program
  - Developed by DWR with input from UNRBA and NGOs
  - Distributed to the legal group and PFC in April
  - Revised following input
    - Clarifications/editorial changes
    - Reference to Upper Neuse Compliance Association rather than the UNRBA as administrator (discussed on subsequent slides; name and need for a separate association are under consideration)
  - DWR has finalized their draft language consistent with the UNRBA comments

UNRBA IAIA Program Document

- Based on the Board-endorsed Program Description, the UNRBA IAIA Program Document
  - Provides guidance for the IAIA
  - Will include specific provisions for
    - Financial commitment levels
    - Eligible practices and actions
    - Self-management of compliance with reporting
    - Establishment of reporting components
      - Under development
    - Interlocal Agreement(s)
      - Under development by the Legal Workgroup
    - General guidelines
- A preliminary draft Program Document was provided to the PFC and legal workgroup for review in April
- An updated draft was provided to the PFC on May 21, 2020

Preliminary Input from the Legal Group on the UNRBA IAIA Program Document

- The UNRBA Bylaws do not allow for administration of the IAIA
    - A separate compliance association may be needed (e.g., Upper Neuse Compliance Association, UNCA)
    - The name and need for this association are still under consideration
- The participating members of the IAIA may be different than the members of the UNRBA
    - May require development of a separate organization with its own bylaws, voting, etc.
    - Meetings could be held jointly with only members of respective group voting
- The Legal Workgroup is working on a draft Interlocal Agreement for review by the PFC
- Input is preliminary and additional discussion is needed

Prospective Development Schedule for UNRBA IAIA Program Implemented under the Falls Lake existing rules. Potential start date of July 1, 2021.

Feb 2020: DWR provides draft language in the Falls Lake Existing Development Model Program to allow an IAIA

UNRBA and members review and provide comments.

Mar and Apr 2020:

UNRBA develops draft IAIA Program including investment levels, reporting requirements, etc.

Apr 2020: Meeting with DEQ leadership to discuss IAIA and impacts on other practices like land conservation

May 2020: Internal review of UNRBA IAIA

Develop revised draft for external review; provide status presentation to UNRBA Board

June 2020: DWR reviews UNRBA IAIA Program document

July 2020: DWR provides a revised draft Model Program for UNRBA review

August 2020: UNRBA PFC reviews DWR Model Program and finalizes IAIA Program for Board review

Sep 2020: DWR finalizes draft Model Program

Presentation of IAIA Program to UNRBA Board; DWR/UNRBA information update to EMC WQC

Oct 2020: Local governments brief local councils and decision makers; UNRBA prepare for UNRBA/DWR/NGO presentation to EMC WQ Committee

Nov 2020: UNRBA Board action to submit, or not, to the EMC for approval in January

Present Model Program with IAIA to EMC WQ Committee; DWR information update to full EMC

Jan 2021: Model Program submittal to full EMC for approval

July 2021: Submit and begin implementation of either the IAIA (with signatures of participants) or individual jurisdictions submit their own Local Programs

Modeling and Regulatory Support (MRS) Status

Modeling and Regulatory Support Status

- The Modeling Team is drafting an interim technical memorandum to describe the watershed modeling and hydrologic performance
  - Interim draft will be provided to the MRSW in June following review by the Executive Director
  - Hydrologic modeling results will be included in the interim draft using a compilation of slides presented at MRSW and/or PFC meetings.
  - MRSW input on reporting formats will guide development of subsequent drafts

Schedule Challenges in FY 2020

- USGS released reharmonized land use data 4 months after plan
- NEXRAD precipitation data took longer than anticipated to get from the State Climate Office
- NEXRAD precipitation data required extensive data filling for 2006 that was not anticipated
- FY2020 budget did not accommodate
  - WARMF lake model setup and hydrologic calibration
- FY2021 budget will not accommodate
  - WARMF lake water quality set up and calibration
  - EFDC final water quality calibration
- Interim modeling tasks are affected by up to one quarter but overall milestones for the project are not

Milestones for Current and Upcoming Modeling and Regulatory Support Tasks

Task	Original Plan	Revised Plan
Model Setup Hydrologic/hydrodynamic calibration		
• WARMF watershed	December 2019	**January 2020**
• WARMF lake	June 2020	**October 2020**
• EFDC lake	June 2020	**October 2020**
Water quality calibration		
• WARMF watershed	December 2020	**April 2021**
• WARMF lake	June 2021	**October 2021**
• EFDC lake	June 2021	**October 2021**
Sensitivity Analyses Load Reduction Scenarios Cost benefit analyses	March 2022	March 2022
Final Report	September 2022	September 2022
Agency Review Final Report	December 2022	December 2022
UNRBA Re-examination Package	June 2023	June 2023

Modified dates are in bold faced font.

Other Status Items

Communications Support

- Utilize an integrated, multi-perspective support team
- Brown and Caldwell ($35,000)
  - Scope of work described in Task 337 (above)
- HDR ($15,000)
  - Advisor for review of work products
  - Meeting facilitation by Amy Shahar

Ongoing Items

- Coordination with the UNC Collaboratory
  - Virtual meeting held May 27, 2020
- Legal support
  - Scope of work for FY2021 is under development
- 2019 UNRBA Data Report meeting
  - Schedule for face to face when possible
- IAIA Program meeting with DEQ/DWR
  - Depending on availability and ongoing COVID-19 response
- 303(d), chlorophyll-a listing, and lake segmentation
- MOA for re-examination

Future Meetings as Currently Scheduled:

Next BOD Meeting
June 17, 2020, 9:30 AM to Noon
Remote Meeting

Next MRSW Meeting
July 7, 2020, 9:00 AM to 10:30 AM
Remote Meeting

Next PFC Meeting
July 7, 2020, 10:40 AM to 1:10 PM
Remote Meeting

Closing Comments
Additional Discussion