

Falls Lake and the Upper Neuse River Basin Association: Many Stakeholders, Many Challenges

Forrest Westall – UNRBA
Kenny Waldroup – City of Raleigh
Michelle Woolfolk – City of Durham
Alix Matos – Cardno
Steve Wall - UNC





Agenda

- > Brief project overviews by UNRBA and UNC
 - UNRBA background—Forrest Westall, UNRBA
 - Perspective on Water Supply Issues in the Lake—Kenny Waldroup, City of Raleigh
 - Technical feasibility and Challenges Addressing Chlorophyll a Levels in the Upper Lake Areas—Michelle Woolfolk, City of Durham
 - Current Status of UNRBA Reexamination Work—Alix Matos, Cardno
 - Status and objectives of the UNC-Lead Strategy Evaluations for Jordan and Falls—Steve Wall, UNC Institute for the Environment and NC Policy Collaboratory
- > Small group discussions and debrief

Background of the UNRBA

Forrest Westall, UNRBA



A Brief History of the UNRBA

- > Formed in 1996 due to concerns about the future water quality of Falls Lake
- > Following the adoption of Falls Lake Nutrient Management Strategy and the Falls Lake Rules in 2010, the organization shifted focus
- > **Updated goals and objectives**
 - > **Assist member jurisdictions with Strategy implementation**
 - > **Reexamine the Stage II Rules**



Municipalities

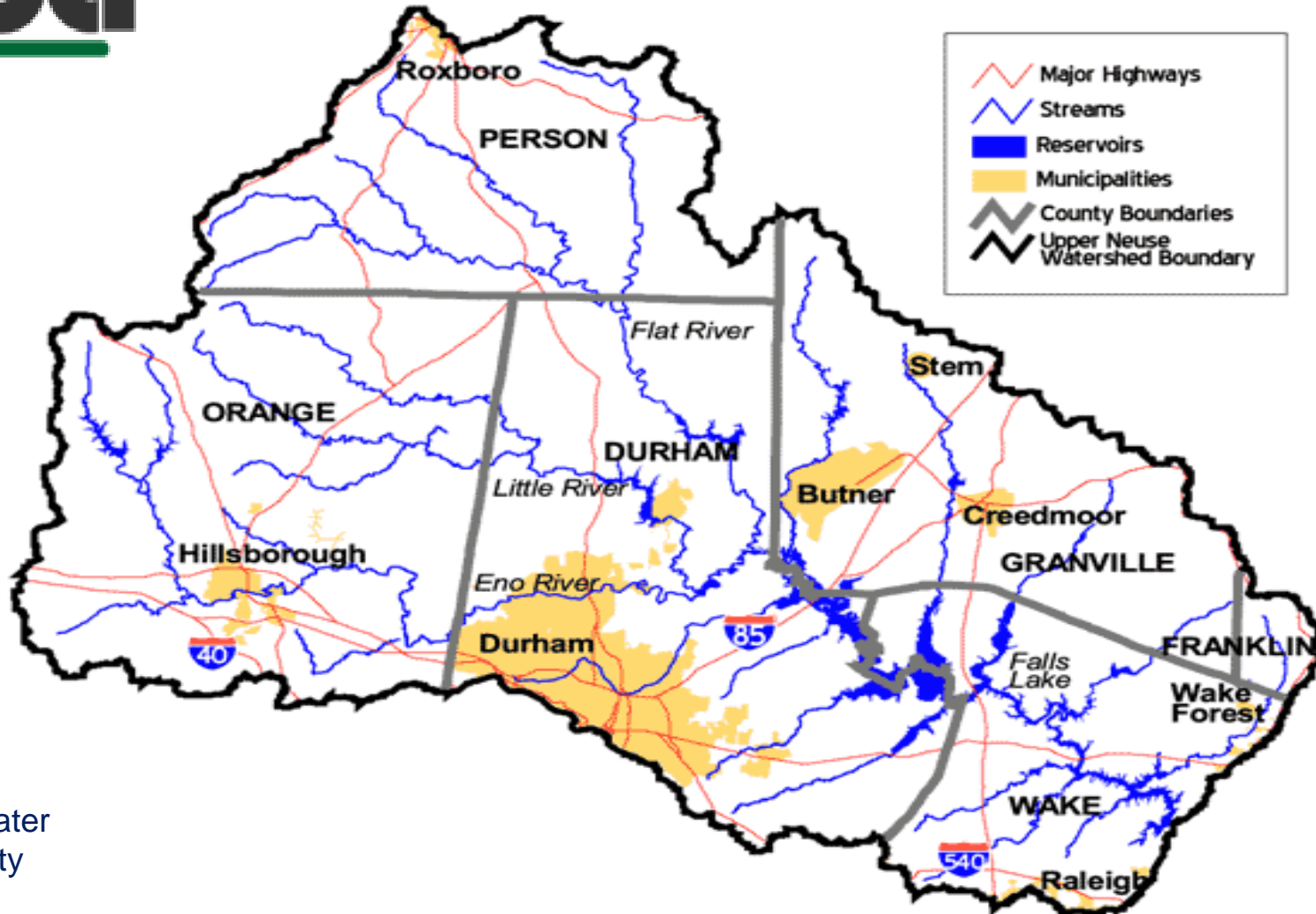
- Butner
- Creedmoor
- Durham
- Hillsborough
- Raleigh
- Stem
- Wake Forest

Counties

- Durham
- Franklin
- Granville
- Orange
- Person
- Wake

South Granville Water and Sewer Authority (SGWASA)

Soil and Water Conservation Districts (Ex Officio)





Challenges and Realities: Resource and Burden

- > Primary source of water for one jurisdiction
- > Water quality concerns – chlorophyll *a* impairment
- > Legislative action required nutrient management
- > Falls Lake adopted rules
 - > Very restrictive nutrient requirements
 - > Existing development nutrient reductions
 - > Stage I requirements expensive
 - > Extremely costly Stage II requirements
- > Consensus Principles



The Importance of the Consensus Principals

- > Established the Goal of Meeting the Chlorophyll a standard in the Lower Lake
- > Broke Rules into Two Stages
- > Provided the Opportunity for Adaptive Management Modifications to Stage II Rules
- > Strengthened the Cooperative/Collaborative Process within the UNRBA
- > Positioned the UNRBA to Take On the Reexamination of the Falls Lake Nutrient Management Strategy





Primary Driving Forces of the UNRBA

- > Protect lake water quality for the purpose of water supply
- > Stage II feasibility
 - > Costs greater than \$1 billion
 - > Requirements are not technically feasible
- > Reexamination
 - > Enhanced monitoring program - \$800,000 per year
 - > Remodeling/updated data analysis – evaluate the impacts of nutrient management strategies on lake water quality
- > Nutrient credits development project
 - > Expansion of BMP Toolbox
- > Development of alternative regulatory options

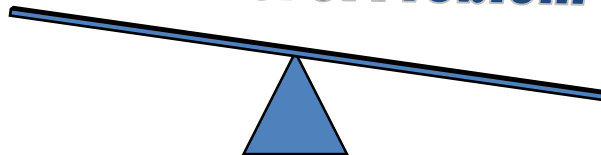


Summary of Falls Reexamination

- a measured, stepwise, reexamination process

- > Local governments want to improve water quality
- > Current Monitoring Shows Compliance in the Lower Lake
- > Local governments' burden is over \$1,000,000,000
- > Local governments want the best science
- > Achieve improved water quality by applying economic, scientifically supportable and reasonable actions

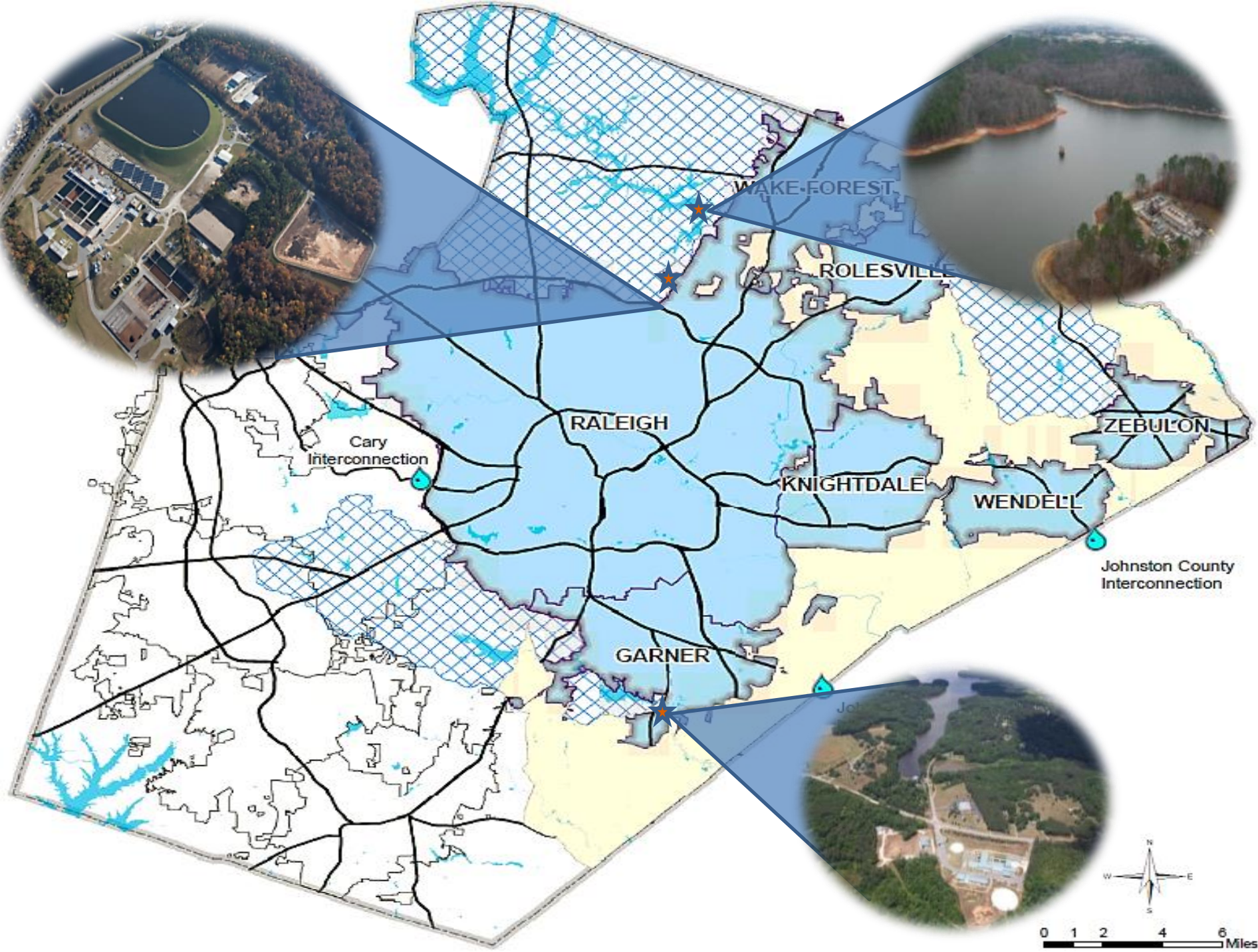
***Working to Balance Action
With Level Of Problem***



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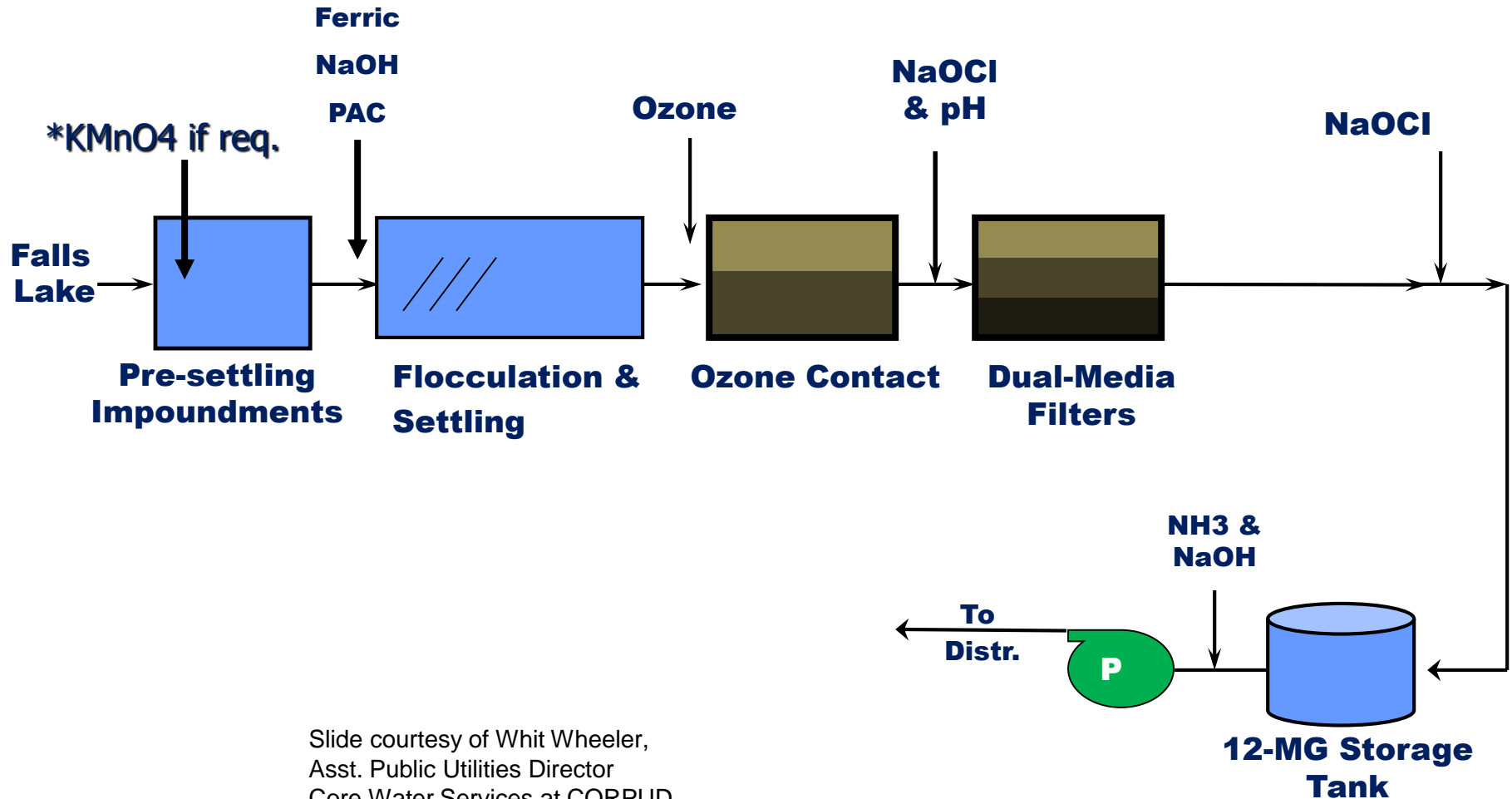
Overview of Water Supply Issues

Kenny Waldroup, City of Raleigh





TREATMENT PROCESS: E.M. JOHNSON WATER PLANT



Slide courtesy of Whit Wheeler,
Asst. Public Utilities Director
Core Water Services at CORPUD



Source Water Organic Impacts

- > Dissolved Organic Carbon (component of Total Organic Carbon or TOC) reactions with disinfectants
 - form TTHMs and HAAs (carcinogenic compounds)
- > Taste and Odor (MIB /Geosmin)
- > Cyanotoxins (EPA UCMR 4, 9 toxins)
- > Filter Blinding – Diatoms



Slide courtesy of Whit Wheeler,
Asst. Public Utilities Director
Core Water Services at CORPUD



Recent Falls Lake Water Quality Summary

	Ave	Max	Min
Turbidity (NTU)	4.3	16.5	1.9
Alkalinity (mg/L as CaCO ₃)	32.5	37.7	14.9
TOC (mg/L)	6.9	12.1	3.1
Iron (mg/L)	0.38	1.07	0.03
Manganese (mg/L)	0.08	0.61	0.01
Apparent Color	65.2	224	17

Slide courtesy of Whit Wheeler,
Asst. Public Utilities Director
Core Water Services at CORPUD



Treatment Goals

- > Finished water turbidity less than 0.10 NTU.
- > Finished water Fe and Mn less than EPA secondary standards (0.3 and 0.05 mg/L, respectively).
- > Required TOC removal 45%.
- > Finished Water TOC <2.3 mg/L
- > Disinfection by-product formation potential minimized.
- > No Taste and Odor Calls!



Complex and Dynamic System for Source Water

Weather Influenced

Terrestrial Sources of Total Organic Carbon (TOC)

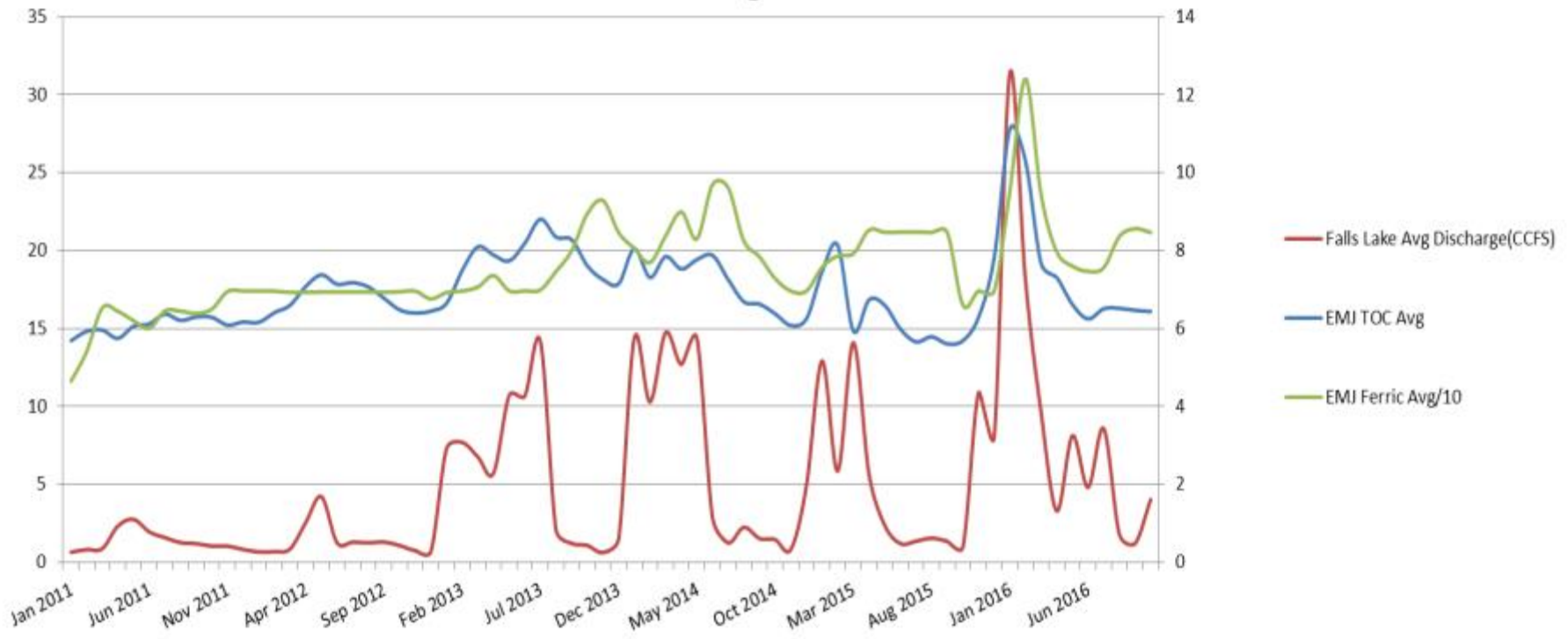
In Lake Sources of TOC such as Biota, Benthic Flux and Legacy Loading

Lake Geographic Topology!



TOC, Ferric Dose, Lake Releases

TOC Vs. Discharge



Slide courtesy of Whit Wheeler,
Asst. Public Utilities Director
Core Water Services at CORPUD

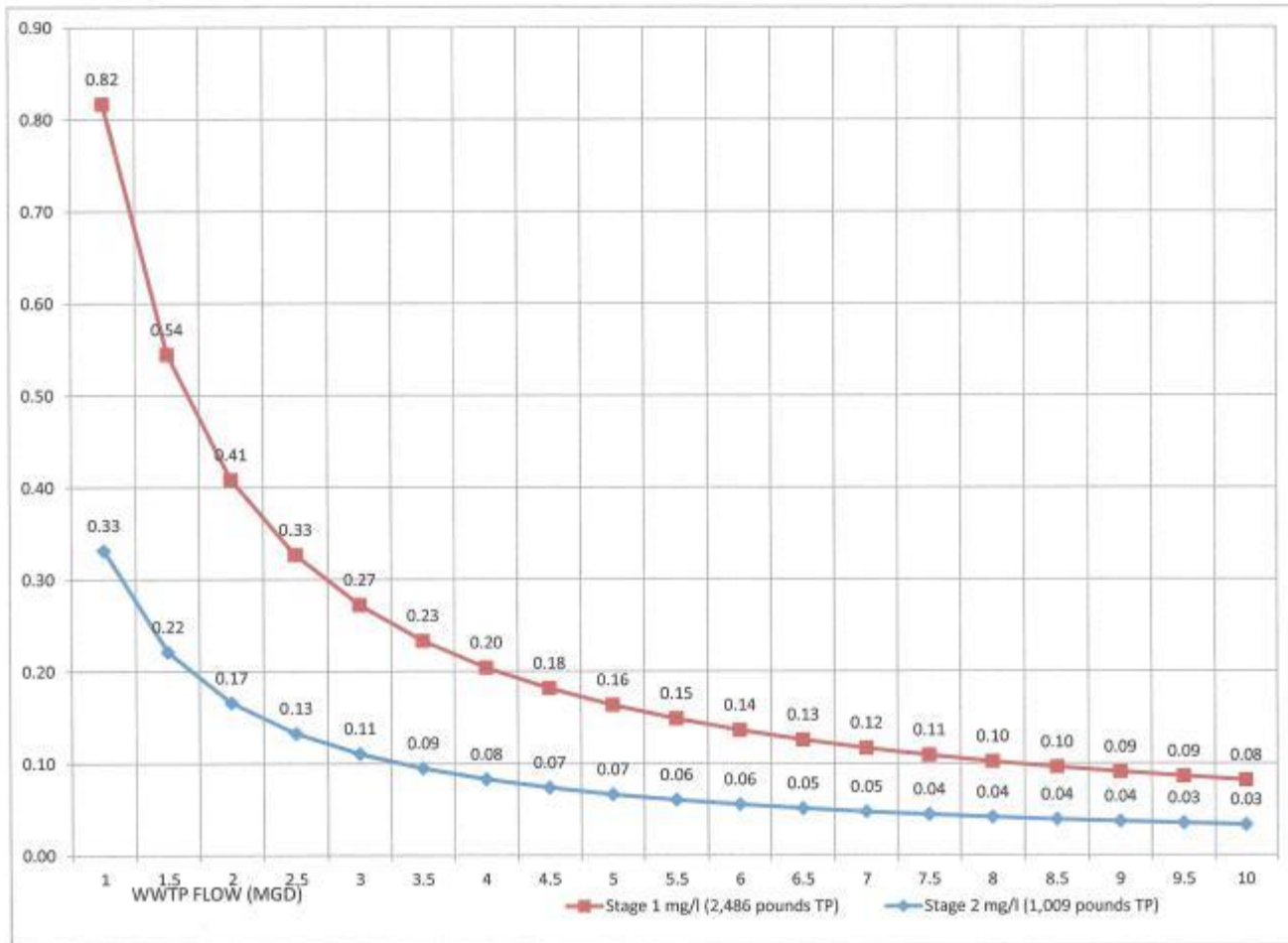
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Feasibility and Challenges of Nutrient Reductions

Michelle Woolfolk, City of Durham



SGWASA AVERAGE WASTEWATER DISCHARGE TOTAL PHOSPHORUS CONCENTRATION VERSUS FLOW
 BASED ON PROPOSED PHASE I AND II FALL LAKE RULES



Graph courtesy
 of L. Mize,
 SGWASA



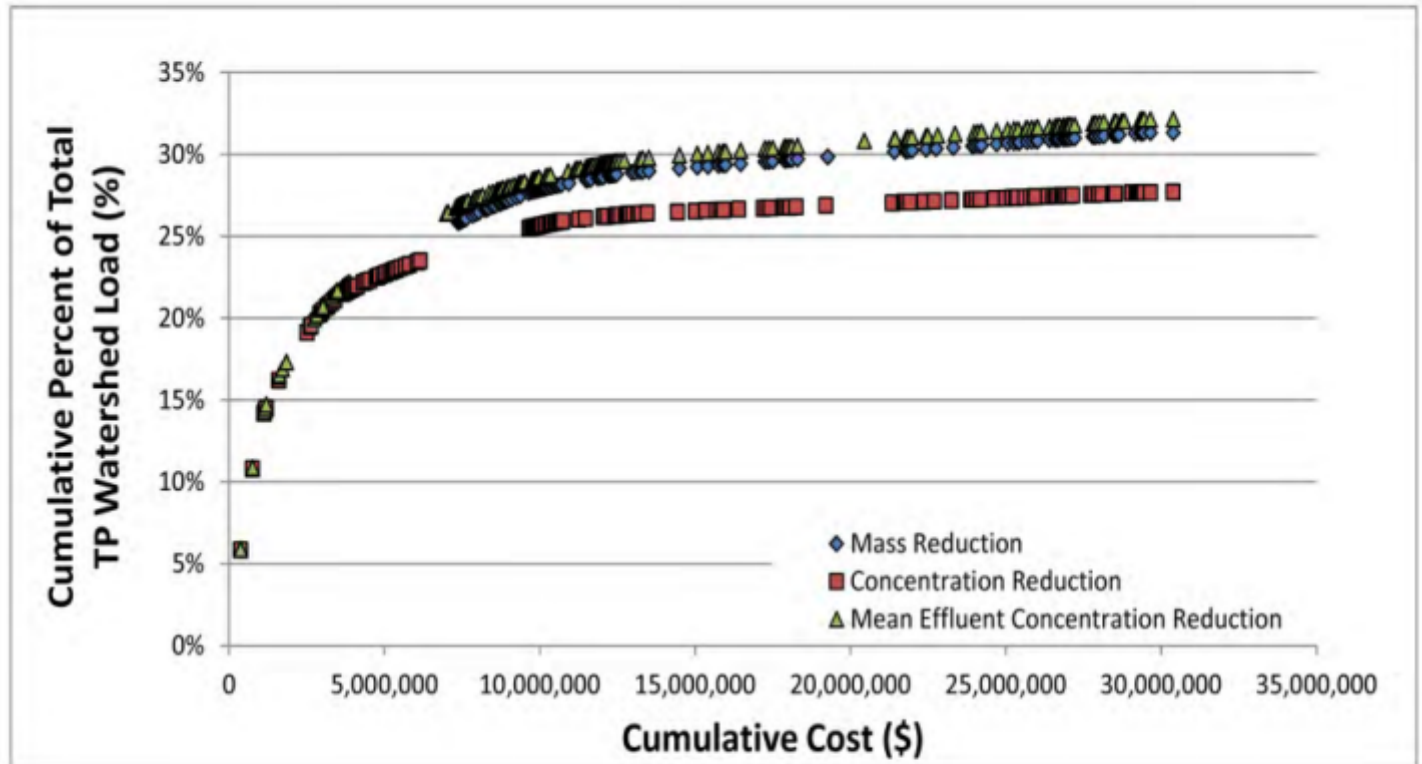
North Durham WRF Implementation Costs Falls Lake Stage 2 Reduction Goals

Initial estimated **capital costs** for technology leap:

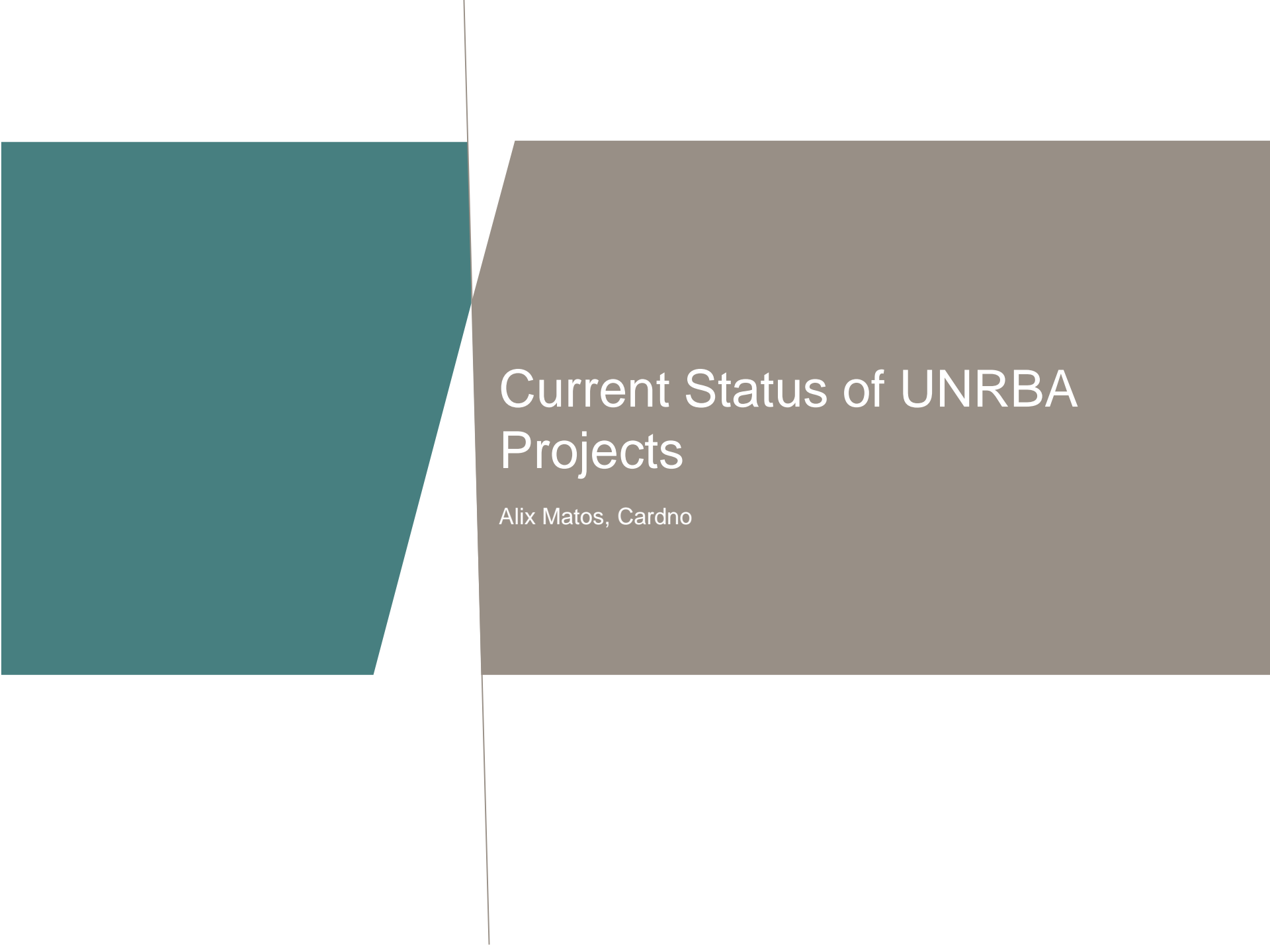
- > \$80 M (in 2009 \$) to construct/install microfiltration or membrane BioReactor
- > \$240 M (in 2009 \$) for the construction and installation of or **nanofiltration or reverse osmosis**
- > If both treatment options are required to achieve the reductions currently proposed in Stage 2, the cost escalates to \$320 Million.



Hillsborough pictures courtesy of T. Hackett, Town of Hillsborough



K. DeBusk and W. Hunt, 2012

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Current Status of UNRBA Projects

Alix Matos, Cardno



Overview of the UNRBA Credits Project

- > Collaborative effort with DWR to increase the number of approved nutrient reducing measures
- > UNRBA prioritized several measures for credit development
 - Available research
 - Stakeholder feedback
- > Project is nearly complete



Credit Development (Expanding the “Toolbox”)

**Existing measures
with approved credits**
(e.g., wet ponds)

**New measures being
developed by DWR**
(e.g., street sweeping)

**New measures
developed by UNRBA:**

- Design variants
 - Bioretention
 - Infiltration
 - Level spreader filter strips
- Soil improvement with pervious area nutrient management
- Removal of illicit discharges
- Buffer restoration in developed areas
- Land conservation
- Cattle exclusion (contingent approval)





UNRBA Monitoring Program – Routine Monitoring

- > 4-5 year program
- > Began in August 2014
- > Stations
 - 18 lake loading
 - 20 jurisdictional
 - 12 inlake
- > Sampled monthly
 - Nutrients
 - Carbon
 - Chlorophyll *a*
 - Field parameters





UNRBA Monitoring Program – Special Studies

- > Special studies address specific questions
 - Storm event sampling (automated samplers)
 - High flow event sampling (grab samples)
 - Lake bathymetry study
 - Lake constriction point monitoring (velocities and water quality)
 - Lake sediment evaluations (cores, mapping depths of sediment)





UNRBA Modeling and Reexamination Project

> Approach

- Use multiple models to corroborate results
- Link changes in the watershed to lake water quality and designated uses
- Test and optimize management strategies
- Make future predictions

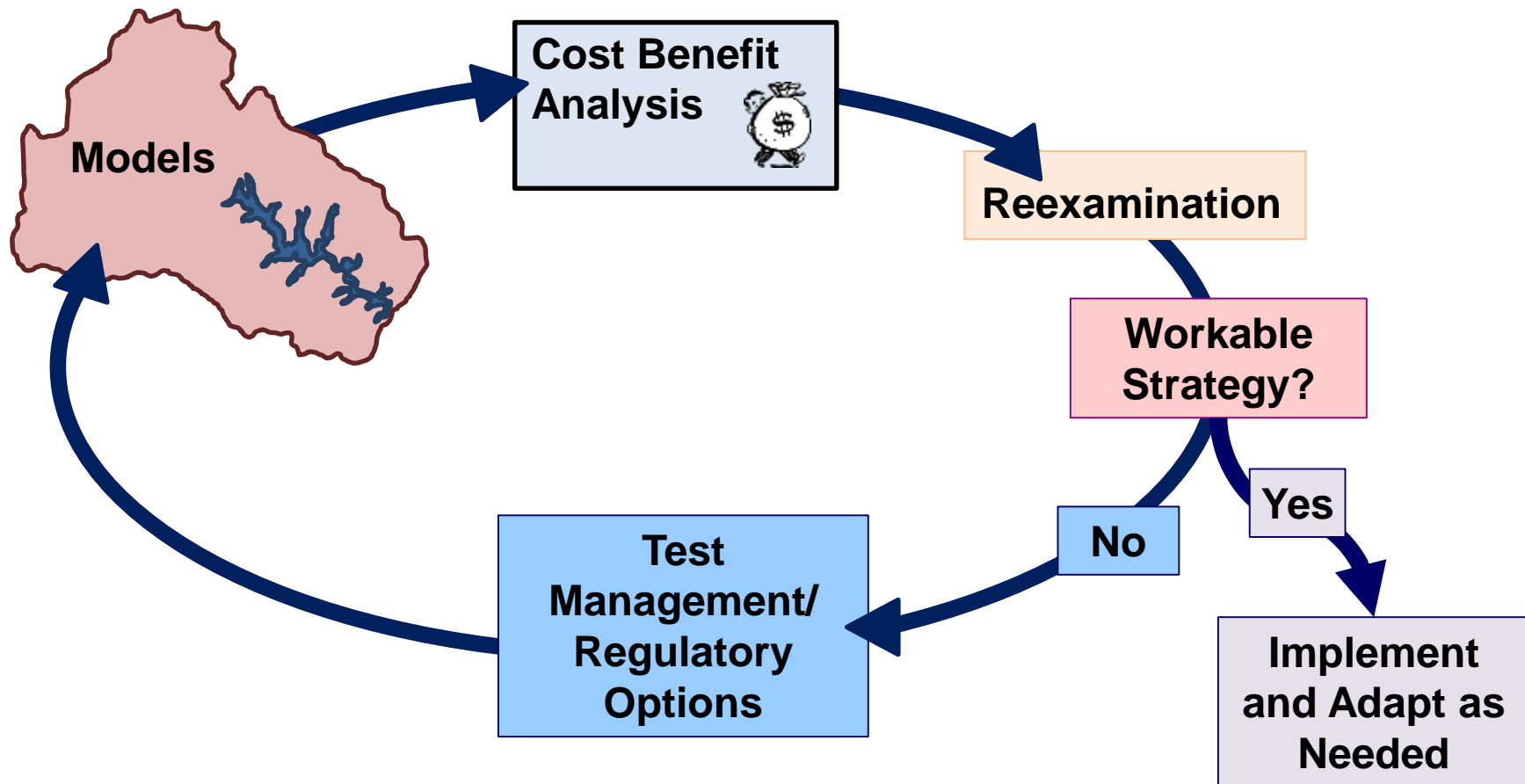
> Status

- Model selection is complete
- Developing QAPPs





Framework for the Reexamination of Stage II



Status and Objectives of the UNC Evaluation

Steve Wall,
UNC Institute for the Environment and NC Policy Collaboratory



UNC Nutrient Study

- > In 2016 NC General Assembly passed legislation in budget bill for “Development of New Comprehensive Nutrient Management Regulatory Framework”
- > UNC-Chapel Hill directed to conduct study of nutrient management strategies for Jordan and Falls Lakes.
- > Study is to be funded annually at \$500,000 over a six year period. First three years of study are to focus on Jordan lake and final three years are to focus on Falls Lake.



UNC Nutrient Study

- > UNC-Chapel Hill leadership decided to put the Nutrient Study under the newly formed NC Policy Collaboratory.
- > NC Policy Collaboratory established by the legislature in 2016 to utilize and disseminate environmental research expertise of UNC for practical use by state and local governments.
- > UNC Nutrient Study team is comprised of faculty from UNC and NC State University.



UNC Nutrient Study

- > Legislative language outlines specific components to be included in study:
 - Review data collected by Department of Environmental Quality and compare trends in water quality to implementation of the elements of each of the nutrient strategies.
 - Examine costs and benefits of basinwide nutrient strategies in other states and the impact (or lack of impact) those strategies have had on water quality.



UNC Nutrient Study

- > UNC submitted an interim report in December 2016 to General Assembly as required by legislation.
- > Interim Report outlines the types of projects and research that will be conducted in 2017 as part of the study.
- > Copy of Interim Report can be found at:
<http://collaboratory.web.unc.edu/>



UNC Nutrient Study

- > Researchers are trying to take holistic approach to management of the Jordan Lake watershed and address two fundamental questions:
 - What are the sources of nutrients in the watershed and how significant is the problem of nutrient eutrophication?
 - What are the current nutrient mitigation measures and how cost-effective are these options?



UNC Nutrient Study

- > Project components include:
 - Reviewing water quality data and conducting new sampling
 - Evaluating reservoir vulnerability to harmful algal blooms
 - Identifying major sources of nutrients and sediments
 - Analyzing nutrient mitigation and regulatory measures
 - Evaluating innovative financing mechanisms
 - Reviewing nutrient management strategies from other states
 - Engaging with stakeholders throughout the watershed



UNC Nutrient Study

- > Next steps:
 - Research is underway
 - Coordination with Department of Environmental Quality stakeholder group
 - Identify projects needed for next funding cycle
 - Second Interim Report to the legislature due in December 2017

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Small Group Discussions



Small Group Instructions

- > Break out into groups of approximately 6 people
- > Table facilitators will guide discussion and take notes
- > See the handout for background information and discussion items
- > Ground rules
 - End on time (3:00) to allow for debrief
 - One speaker at a time
 - Share the time available for speaking
 - Stick to the tasks and topics that are on the agenda
 - Listen attentively to each other
 - It is OK to disagree with each other...please do so respectfully



Discussion Items for Small Groups (See Handout)

1. What concerns do you have about the Reexamination? What could we do to address them?
2. Should the UNRBA and UNC processes be coordinated? If so, in what ways?
3. What are the pros and cons of developing surface water sub-classification(s) with associated designated uses to represent the conditions in manmade Piedmont Reservoirs or in certain defined areas of these type waters?
4. What information/studies would the UNRBA need to develop and evaluate to support sub-classifications with associated designated uses for Falls Lake or portions of the lake?
5. What are the pros and cons of developing site specific chlorophyll *a* criteria for Falls Lake?
6. Are you interested in receiving additional information about proposed revisions to the Falls Lake regulatory framework?