



Paying for Nutrient Management in Falls Lake

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SCHOOL OF GOVERNMENT

Environmental Finance Center

Acknowledgments

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About the EFC

The EFC is part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The EFC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics. The EFC is dedicated to enhancing the ability of governments to provide environmental programs and services in fair, effective, and financially sustainable ways.

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Executive Summary

Over the past four years, the Environmental Finance Center (EFC) at the UNC School of Government has conducted comprehensive research into financial and governmental approaches for ensuring compliance with the Falls Lake Rules. Building upon the foundation laid by the three-year Jordan Lake Nutrient Management Study, the EFC conducted further research, expanded its scope, and recontextualized its recommendations within the Falls Lake Watershed, resulting in a series of financial and governmental recommendations to implement affordable and stable funding strategies.

In year one, the EFC developed a strong understanding of the current financial requirements of the Falls Lake Rules and recontextualized existing knowledge from the Jordan Lake Watershed to the Falls Lake Watershed. A comprehensive summary of the Falls Lake Rules was compiled, focusing on the financial responsibilities of stakeholders in the watershed. Through interviews with stakeholders, the EFC identified the existing streams of revenue used to finance rule compliance, and summarized the Upper Neuse River Basin's (UNRBA) background, roles, and committees to understand the potential for multi-jurisdiction compliance. Finally, the EFC repurposed and restructured Jordan Lake's Revenueshed tool for a Revenueshed analysis of Falls Lake.

In year two, the EFC researched current and future financial models to fund rule compliance and completed the Revenueshed tool. A case study comparing water protection fundraising mechanisms in Raleigh and Durham was analyzed finding the financial environments where each method was most successful. The EFC studied successful water protection strategies around the nation and determined the most beneficial strategies for Falls Lake. Lastly, after completing the Revenueshed tool, the EFC provided a Revenueshed analysis of Falls Lake finding existing affordability concerns in the watershed.

In year three, the EFC analyzed the affordability of current financing mechanisms in Falls Lake, provided tools to mitigate affordability concerns, and outlined the Interim Alternative Implementation Approach's (IAIA) compliance structure. The EFC recommended using two affordability metrics to justly increase utility rates. To further mitigate affordability concerns, the EFC identified federal funding sources for disadvantaged communities- the NCDEQ and Justice40- which could be leveraged to manage nutrients and support communities in need in Falls Lake. The EFC found that the IAIA's compliance structure was successful and significantly decreases the cost of compliance.

In the final year of research, the EFC focused on filling gaps in research. The obligations of Falls Lake under the Clean Water Act (CWA) were summarized, and the impacts of a site-specific standard on current legislation were studied. The recommendations from the Jordan Lake and the Falls Lake nutrient studies were compared to understand the impact of Jordan Lake, finding that many recommendations were transferable between the two watersheds. Lastly, the financial implications of the longevity and number of funders for nutrient management in Falls Lake were discussed alongside legislative recommendations which support long-term and stable funding solutions.

The Falls Lake Nutrient Study effectively summarized the progress made in nutrient management in the Falls Lake watershed and highlights the future financial mechanisms for compliance. The tools and research compiled here may help guide policy and fundraising mechanisms in Stage II re-evaluation and compliance.

Key Findings

1. Overview of Falls Lake and Watershed Rules

Regulatory Overview

Water quality management begins at the federal level but is largely carried out by the states. The CWA¹ acts as the overarching legislation by establishing a basic regulatory structure for managing surface water quality standards and discharges of pollutants. The CWA requires states to create surface water classifications with use standards and corresponding nutrient limits. Since 1992, the Division of Water Resources (DWR) in the North Carolina Department of Environmental Quality (NCDEQ) has classified Falls Lake as a Water Source-IV (WS-IV) surface water with Nutrient Sensitive Water (NSW) and a Critical Area (CA).² The corresponding use standards for WS-IV waters are to maintain safe water for human consumption. WS-IV also must fulfill the Class C requirements to be fishable and swimmable. There are many corresponding nutrient limits for each use requirement, so it was impractical to list all limits in this document. However, an example of one nutrient limit at Falls Lake would be its Class C use to maintain good aquatic health, measured by chlorophyll-a, and set at 40 micrograms/ liter. The remaining corresponding nutrient limits for WS-IV and Class C waters are listed on the DEQ's website.^{3,4}

In addition to creating water standards, the CWA requires states to task agencies with monitoring and enforcing the use of and nutrient standards. North Carolina's main water monitoring agencies include the Department of Water Quality (DEQ), the Environmental Management Commission (EMC)⁵, and the General Assembly (GA). The General Assembly delegates monitoring and regulatory authority to organizations as they see fit.^{6,7} Currently, the GA has tasked the DEQ's Division of Water Resources (DWR) with classifying surface water, monitoring⁶ water quality and granting site permits. Located in the DEQ, the EMC⁵ oversees rule adoption for DEQ's divisions of Air Quality, Land Resources, and Water Resources. Other monitoring agencies have been created to aid in Falls Lake, including the DEQ's Technical Advisory Committee (TAC)⁸, tasked with creating a nutrient management strategy, and the Watershed Oversight Committee (WOC)⁹, tasked with overseeing the implementation of agriculture-related rules. The evolving roles of these organizations in Falls Lake are evident throughout the history of the watershed.

¹ <https://www.epa.gov/enforcement/clean-water-act-cwa-and-federal-facilities>

² <https://www.deq.nc.gov/water-quality/planning/csu/surface-water/river-basin-water-quality-classifications-dec-9-2013/neuse-hydro-order/download>

³ <http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2002%20-%20environmental%20management/subchapter%20b/subchapter%20b%20rules.pdf>

⁴ <https://www.deq.nc.gov/ncstdstable07262021>

⁵ <https://www.deq.nc.gov/about/divisions/water-resources/water-resources-commissions/environmental-management-commission>

⁶ <https://www.deq.nc.gov/about/divisions/water-resources/water-resources-regulations-guidance>

⁷ <https://www.deq.nc.gov/about/divisions/water-resources/water-resources-rules/nc-administrative-code-statutes>

⁸ <https://www.deq.nc.gov/water-quality/planning/npu/falls-lake/falls-lake-draft-report-8-full/download>

⁹ <http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2002%20-%20environmental%20management/subchapter%20b/15a%20ncac%2002b%20.0280.pdf>

In 1965, Congress authorized the US Army Corps of Engineers to create Falls Lake to address Raleigh's flooding and water supply issues.¹⁰ The North Carolina Department of Environment and Natural Resources (NCDNR)— now the NCDEQ—advised against the lake's creation citing likely complications with future nutrient pollution. Despite these recommendations, the project was completed in 1981. Two years after completion, Falls Lake was classified as NSW, and ten years after completion, the NCDENR classified the lake as eutrophic. In response, The General Assembly passed the 2005 Drinking Water Supply Reservoir Act requiring that the NCEMC create the Falls Lake nutrient management strategy. In 2008, Falls Lake was placed on the NC 303(d) list for impaired waters as it violated its Class C use requirements by exceeding allowed chlorophyll-a levels of 40 micrograms/ L.^{4,11} It should be noted that while Falls Lake violated its nutrient limit for one use standard, multiple studies by the UNRBA have shown good aquatic health has been maintained in Falls Lake despite high chlorophyll-a levels.^{12,13}

In 2011, The EMC officially adopted the Falls Lake Nutrient Management Strategy, also known as The Falls Lake Rules. The Rules established two stages for nutrient reduction goals: Stage I, which limits nutrients in the Lower Falls Reservoir, and Stage II, which expands nutrient limits to the entire Falls Lake Reservoir. Achieving Stage I compliance and transitioning to Stage II was set to occur on January 15, 2021. In 2016, S.L. 2016-94¹⁴ allowed for a re-examination of Jordan and Falls Lake Rules following a 2013 study which indicated that the Rules would have a high anticipated cost and unachievable nutrient reduction requirements.^{15,16} S.L. 2018-5 granted further study of the rules after discovering that jurisdictions faced barriers to interpretation and compliance with Existing Development (ED) Rules. S.L. 2018-5 also altered the deadline for Stage I ED requirements under the Model Program, extended the completion date of the final Falls Lake study to December 2023, and revised the deadline for the formal readoption of the Falls Lake rules to December 31, 2024. These changes were made in reaction to findings of barriers to action in jurisdictions; previously, jurisdictions had been tasked with identifying nutrient reduction goals to report to the DWR for approval; however, due to a lack of reliable quantitative nutrient history and barriers to seeing quick changes in nutrient loads, jurisdictions were not able to accurately create them.¹⁷

S.L. 2018-5 made the formal readoption of the Rules contingent on the completion of both the UNC Collaboratory's Falls Lake Study and the UNRBA's re-examination of the lake. To monitor the interim research process, the funded organizations were required to submit annual reports for the Commission to review. G.S. 150B-21.3A, S.L. 2018-5 allowed continued rule adaptation. This required the EMC to recommend regulatory alterations to the General Assembly if deemed necessary after comparing strategies 15A NCAC 2B .0275 through .0282 and .0315 against recent research on the lake.¹⁷

¹⁰ https://www.saw.usace.army.mil/Portals/59/siteimages/FY23%20Congressional%20Fact%20Sheets/FallsLakeNC_OM.pdf?ver=2NYtPH5Iz7M4DJVOFpx8RQ%3D%3D

¹¹ <https://www.durhamnc.gov/DocumentCenter/View/2266/Timeline-of-Falls-Lake-Nutrient-Management-Strategy-Events-PDF?bidId=>

¹² <https://www.deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/nc-fish-kill-activity/fish-kill-events>

¹³ https://unrba.org/sites/default/files/UNRBA%20PFC_2022%2009%2006%20v4.pdf

¹⁴ <https://www.ncleg.net/enactedlegislation/sessionlaws/html/2015-2016/sl2016-94.html>

¹⁵ <https://www.deq.nc.gov/coastal-management/gis/data/esmp-data/2008/january/info-items/attachmenta-infoitem21-if-10-falls-lake-2021-status-report/download>

¹⁶ https://unrba.org/sites/default/files/Cardno_Task_1_TM_06_21_2013_FINAL.pdf

¹⁷ <https://www.ncleg.gov/EnactedLegislation/SessionLaws/HTML/2017-2018/SL2018-5.html>

Through the Stage I ED Model Program, the UNRBA and DWR proposed the IAIA and a joint compliance model to mitigate the recently uncovered barriers to compliance due to the state's regulatory flexibility; the EMC¹⁸ could approve the IAIA through the revised Model Program.¹⁹ The IAIA altered the ED Rules' compliance mechanism, replacing the nutrient loading-based compliance with joint IAIA financial-based compliance.

As of March 2022, all reduction requirements of Stage I had been met, and the UNBRA had verified that all steps necessary to start Stage II reduction requirement re-examination were complete.²⁰ Subsequently, IAIA Group Compliance for Stage I ED was officially approved by the EMC in September 2022.¹⁹

Rules

The Falls Lake Rules and estimated cost of compliance are as follows. All cost estimations in the following rules are from the Fiscal Analysis for Proposed Nutrient Strategy for Falls of Neuse Reservoir, prepared by the North Carolina Division of Water Quality Planning Section and are in 2010 dollars.²¹

Stage I: At minimum, achieve and maintain nutrient-related water quality standards in the Lower Falls Reservoir by January 15, 2021 and improve water quality in the Upper Falls Reservoir.

Stage II: Reduce an estimated 40 and 77 percent average annual mass loads of nitrogen and phosphorus to achieve and maintain nutrient-related water quality standards throughout Falls Reservoir. No later than January 15, 2021, additional controls in the Upper Falls Watershed should be carried out to the maximum extent technically and economically feasible to achieve nutrient-related water quality standards in the Falls Reservoir by 2041.

I. Rule .0277 Stormwater Management for New Development

Gives new development in local governments nutrient rate loading targets for nitrogen and phosphorus, with a special case for greenfield developers.²¹ Requires new development to comply with riparian buffer regulations and sets net peak flow limits to minimize erosive flow.

Most of this rule's associated costs fall on new developers, with the estimated cost of compliance between \$5 million and \$10 million per year for developers and about \$90,000 per year for local governments.²¹

II. Rule .0278 Stormwater management for existing development

Requires all local governments to create an implementation program to reduce nutrient loads on existing developed lands to 2006 baselines by 2020. Additionally, it sets questions the program must answer regarding development and pollutants, outlines how the program can gain this information, and informs protocol if the 2006 reductions are not met.

¹⁸ <https://files.nc.gov/ncdeq/Falls-Existing-Development-Model-Program-EMC-Approved-1-14-2021.pdf>

¹⁹ <https://unrba.org/sites/default/files/Final%20Submitted%20For%20Approval%20of%20IAIA%202022.pdf>

²⁰ https://unrba.org/sites/default/files/Draft_IAIA_ProgramDescription_20200108_BODreview_v9.pdf

²¹ North Carolina Division of Water Quality. Fiscal Analysis for Proposed Nutrient Strategy for Falls of Neuse Reservoir. 14 June 2010.

DEQ estimated that the total costs of implementing Stage I ED over ten years would be \$225 million in 2010 dollars, about \$22 million per year. The total cost of implementing Stage II would be \$776 million watershed-wide or \$51 million annually.

III. Rule .0279 Wastewater discharge requirements

To decrease wastewater pollution, three of the larger wastewater discharges in the upper Falls area were given point source loading goals (Figure 1), and two private plants in the lower watershed were given concentration limits, and nutrient load reductions were set for stage I and II. The projected cost for wastewater discharge compliance was \$249 million for Stage I and \$229 million for Stage II in 2010 dollars.

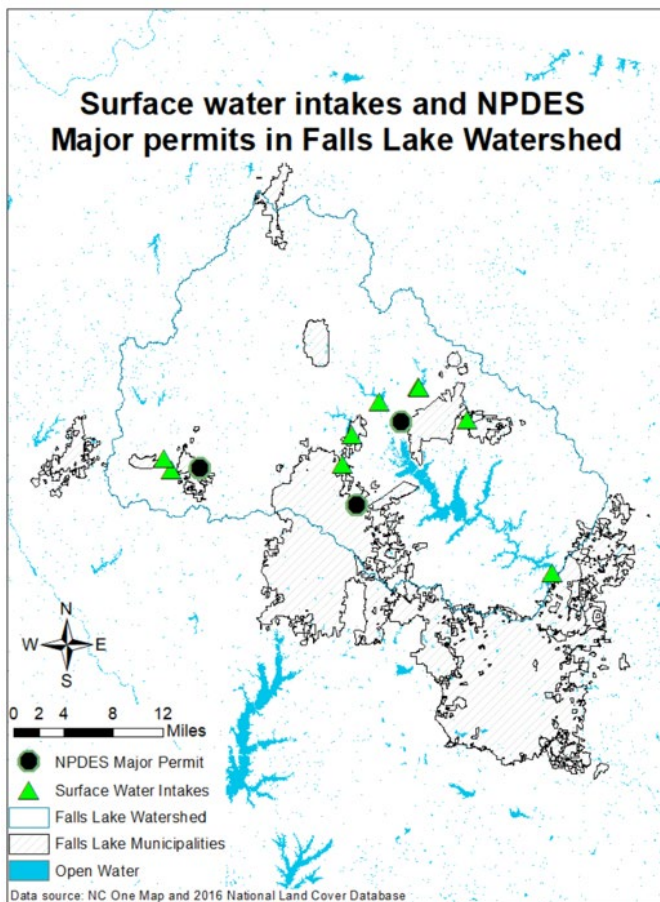


Figure 1. Surface water intakes and National Pollution Discharge Elimination System (NPDES) major permits. The major permits are for WWTPs in Hillsborough, Durham, and Granville County.

IV. Rule .0280 Agriculture

Nitrogen and phosphorus reduction goals for agriculture are outlined in this rule for both Stage I and Stage II. The estimated cost of compliance for this rule in 2010 dollars is \$6.6 million for Stage I and \$6.1 million for Stage II.²¹

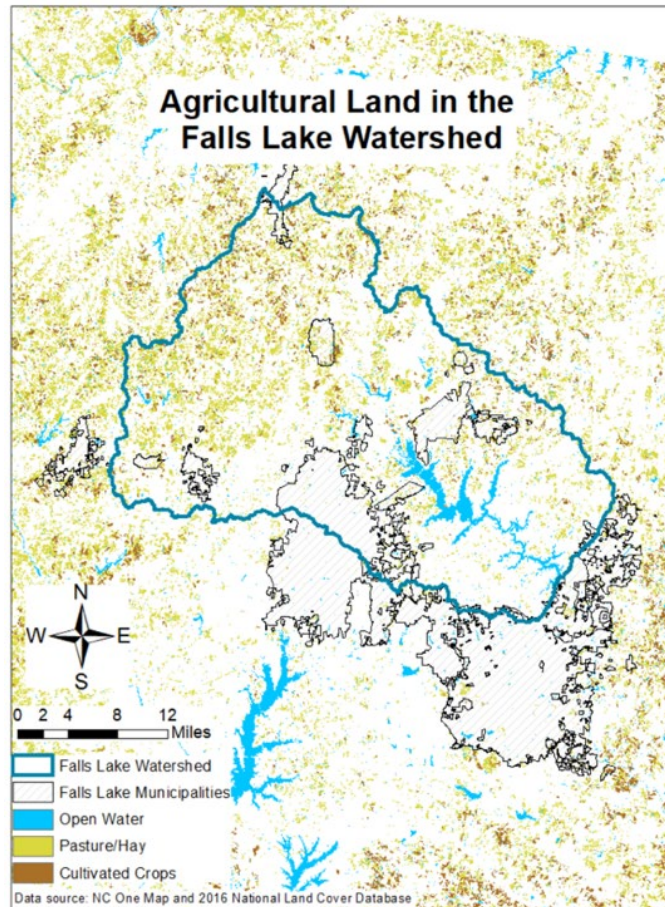


Figure 2. Agricultural land in the Falls Lake watershed is concentrated in the upper watershed.

V. Rule .0281 Stormwater requirements for state and federal entities

Federal and state entities are subject to similar requirements with new and existing development as those set in Rules .0277 and .0278. Under this rule, NDOT has fewer rules for compliance; however, they still are expected to fulfill buffer rules. Rule .0278 specifically requires NDOT to finish six retrofit retrofits annually.

VI. Rule .0282 Options for offsetting nutrient loads

Parties have the option to purchase reduction credits from other reduction sources or private sellers, similar to nutrient trading used in the Neuse and Tar-Pamlico strategies, provided minimum on-site reductions are met before seeking credits elsewhere.

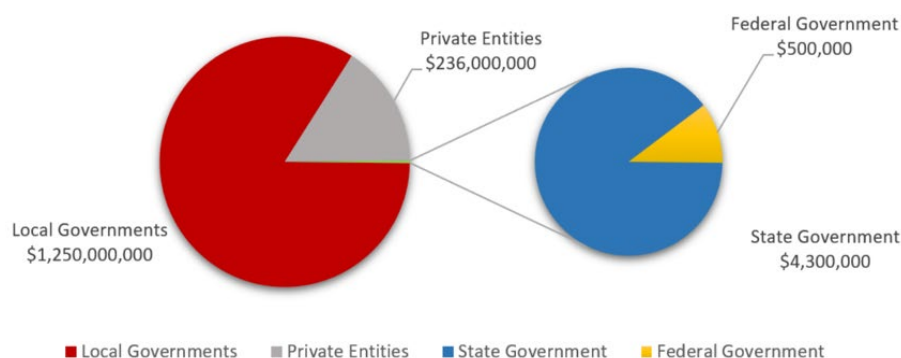
VII. Rule .0283 Fertilizer management

All nonresidential fertilizer applicators must have completed the nutrient management training or follow an approved nutrient management plan by at least three years after the effective date.

Rate Burdens

In a 2010 study²¹, the total estimated cost for compliance among all parties under the original Falls Lake Rules was estimated to be \$605 million for Stage I and \$946 million for Stage II. Financial compliance was shown to fall largely on local governments. The total cost breakdown, based on a 30-year estimate with a high degree of uncertainty, was calculated as follows; \$1.25 billion for local governments, \$236 million for private entities, \$4.3 million for the State government, and \$500,000 for the federal government (Figure 3).

Figure 3: Projected Costs to Comply with the Falls Lake Rules²¹



With the addition of the IAIA's financial compliance mechanism for Existing Development, total costs for Stage I have decreased.²²

2. Navigation of Rule Compliance Under the IAIA

UNBRA and IAIA

Established in 1996 by local governments, the UNRBA is a highly collaborative organization comprised of seven of the eight municipalities in the Upper Neuse River Basin and private and public agricultural and environmental advocacy organizations. The UNRBA includes 13 of the 15 jurisdictions governed by the Falls Lake Rules. Since adopting the Rules, the UNRBA has worked to help jurisdictions influence and comply with nutrient standards. Most recently, it aided local governments with Stage I compliance through the IAIA implementation, advocated for a re-examination of costly Stage II Rules, and studied the IAIA as a pilot program for Stage II as a cost reduction method. Upon findings that ED Rules faced obstacles to interpretation and implementation, the UNRBA Path Forward committee approved the IAIA on July 1, 2021.^{23,19} The IAIA's central goal is to aid and mitigate the high community cost burden through an investment-based approach to the Falls Lake Rules as opposed to the original nutrient standard approach. To maximize granted credits, the IAIA grants them to projects implemented any time after the introduction of the Falls Lake Rules. As a result, all reduction requirements of Stage I were met or exceeded. Due to the IAIA's success, the EMC officially approved the program in September

²² https://unrba.org/sites/default/files/UNRBA%20Bylaws%20revised%20Mar2022-Final_IAIA%20Provisions%20Highlighted.pdf

²³ Falls Lake 2022 Interim Update 12-8 version

2022.¹⁹ Approval of the IAIA demonstrated that all parties understand and are willing to make reductions sooner than mandated. Additionally, it put the concept of financial compliance vs. pounds of reduced nutrients compliance before the EMC as an alternative to the existing rules.

IAIA Stakeholder Experience

The EFC gathered the opinions of jurisdictions operating under the IAIA. First impressions of the IAIA and UNRBA were positive or neutral from all stakeholders, and jurisdictions shared feedback for their future compliance needs. Overall, participants noted that the cost of compliance under the IAIA was cheaper. Additionally, they noted the membership provides access to previously unattainable resources such as the type and amount of monitoring, modeling, and advocacy.^{24,25,26,27} Even representatives from the North Carolina Farm Bureau Federation praised the IAIA, mentioning that this environment created a positive collaborative atmosphere rather than an “us vs. them” mindset.²⁸

Wake Forest

Wake Forest viewed the UNRBA and costs positively and believed public officials agreed. Additionally, they noted the decreased cost of compliance, even with the required monthly membership fee, and the increased access to resources through the UNRBA.

Durham

Like Wake Forest, Durham appreciated the decreased price, access to better resources, and decreased project allocation time. They especially appreciated direct communication with the board of commissioners. Their support extended to the IAIA, as Durham noted appreciation of IAIA’s on-the-ground results and indicated an eagerness to participate more in the future. Durham hoped that the UNRBA would implement more capital projects, in addition to the modeling and monitoring work it supports.

Hillsborough

Hillsborough supported the UNRBA. Building upon Durham’s discussion of connections, Hillsborough noted that the organization can communicate with large stakeholders in a way that small municipalities cannot. Additionally, they appreciated the IAIA’s ability to foster impactful inter-jurisdictional partnerships through watershed projects.

While experiences with the UNRBA and IAIA were positive, year two of EFC research uncovered that stakeholders requested more clarity on obtaining and tracking credits. Additionally, they have concerns regarding decreased new development, high cost, and lack of quick nutrient reductions under New Development rules (ND). Members worried that projects completed by other communities would decrease credit potential within their jurisdiction. Due to the misalignment of jurisdiction and watershed boundaries, multiple communities can benefit from the same project, even if it’s not in their jurisdiction. For example, projects in Orange County could also benefit the water quality of jurisdictions downstream; consequently, Orange County and downstream jurisdictions would compete for credits

²⁴ Interview with Barry Baker, Mike Felts, Jim Wrenn, Granville County; Jennifer Tavantzis, Raftelis, June 2021

²⁵ Interview with Ryan Eaves and McKenzie Myers, Durham County, July 2020

²⁶ Interview with Neena Nowell and Michael Frangos, City of Creedmoor, September 2020

²⁷ Interview with Carrie Mitchell and Allison Snyder, Town of Wake Forest, May 2020

²⁸ Interview with Anne Coan and Keith Larick, North Carolina Farm Bureau Federation, April 2021

from projects in Orange County. That being said, many jurisdictions noted that they wanted to complete projects within their boundaries. Durham County wanted to display the positive effects of their Stormwater fund and fees through projects “on the ground,” easily visible to their paying constituents.

Furthermore, many jurisdictions have circumvented the issue of competing for credits through collaboration with organizations or outside jurisdictions on land conservation projects. Lastly, members expressed issues with a streamlined and organized credit tracking process. Previously under the nutrient-compliance-based rules, a UNRBA-created Excel sheet allowed jurisdictions to track and estimate specific nutrient reductions; however, no such tracking sheet had been made for the credit-based rules.

IAIA Financial Structure

The UNRBA addressed the above requests and updated rule requirements accordingly¹⁹ in their final approved IAIA. UNRBA successfully advocated for an expanded list of creditable nutrient reduction projects and creditable cross-jurisdictional nutrient management projects and created a personalized financial credit tracker.²⁹ The current financial structure of the IAIA is as described below.

Under the approved joint membership program, members financed ED nutrient management through an annual fee calculation modeled after the UNRBA’s due formula. This formula calculates each member’s fee based on three factors: a flat membership fee, a jurisdiction’s water allocation from Falls Lake, and their land area within the watershed. It was estimated that if all jurisdictions in Falls Lake chose to join the IAIA, the annual financial commitment would be \$1.5 million.¹⁹ As of January 2022, all towns have joined the UNRBA and IAIA. The Town of Stem was the last jurisdiction to receive an approved membership.³⁰ The annual funding levels for year one of the IAIA are reflected in Table 1.

*Table 1: Financial Commitment Levels for Local Governments under Stage I ED IAIA*²²

Member	Annual Funding Level	Member	Annual Funding Level
Town of Butner	\$23,393	Town of Hillsborough	\$34,221
City of Creedmoor	\$16,926	Orange County	\$161,943
City of Durham	\$337,587	Person County	\$114,394
Durham County	\$133,300	City of Raleigh	\$466,081
Franklin County	\$19,058	Wake County	\$88,968
Granville County	\$100,453	Town of Wake Forest	\$13,692
Town of Stem	\$11,605		

Jurisdictions fund their annual membership fees with specific investment mechanisms and projects granted under the IAIA Bylaws. Jurisdictions were given four investment mechanisms 1) self-funded, 2) interlocal agreements, 3) funding existing organizations, or 4) development of a special project. Special projects can be wide-ranging; however, they must be approved through the process outlined in the Bylaws. Under these four investment mechanisms, nine project types were granted (Table 2). Most funds were raised through conservation projects, with a total investment of \$3,951,898.

²⁹ https://unrba.org/sites/default/files/IAIA%20Annual%20Report_JurisdictionName_FY_v6.1.xlsx

³⁰ https://unrba.org/sites/default/files/BOD%20Meeting%20Agenda%20for%202022%2003%2016_v5.pdf

Best Management Practices (BMPs) and stormwater control projects were the most populous project type, with eight projects each.²²

As requested by jurisdictions, the IAIA showed flexibility with rule compliance and credit allocation. For example, in year two of research, the EFC discovered that many IAIA members used previously earned credits from implementing best management practices or stormwater control for their next year’s membership eligibility. As a result, some jurisdictions overshot credits for Stage I, and there was only one new project after the approval of the IAIA. In 2022 the DWR granted credit for Orange County’s pesticide use on the invasive Hydrilla plant in the Eno River.³¹ Further details on jurisdictions’ current creditable projects are described in section 3 on the finance and governance approaches to falls lake rules.

Table 2: 2021-2022 Approved IAIA Projects and Funds³²

Project Type	Total Funds Allocated	Number of Projects
Land conservation	\$3,951,898	3
Green infrastructure and other best management practices (BMPs)	\$964,729	8
Stormwater control measures (State-approved SCMs)	\$237,179	8
Project planning and administrative costs associated with the participation in the IAIA	\$162,086	2
Illicit discharge detection and elimination	\$152,377	4
Programmatic measures	\$21,338	4
Stream and riparian buffer restoration and enhancement	\$14,074	2
Projects and activities that focus on flooding that have an associated water quality benefit	\$4,846	1
Projects in greenways and parks with water quality and quantity benefits	\$3,383	1
Grand Total	\$5,511,909	33

As requested by jurisdictions, the UNRBA created a more comprehensive credit tracker to monitor annual financial compliance. The Excel tracker²⁹ includes each jurisdictions’ fiscal year financing requirements, Bylaw-allowed investment strategies, Bylaw-allowed projects, percent of the cost covered, and tools to help estimate nutrient offsets from a listed project. While reducing nutrients is not required for compliance under the IAIA, tracking eliminated nutrients is helpful for future analysis. First, a jurisdiction name must be chosen from the drop-down menu to use the credit tracker. This action automatically populates the Excel table with that area’s annual financial requirement. As projects are completed, the total cost can be entered, and its investment strategy and project type are chosen from the drop-down menu. The table then automatically calculates the difference in remaining financial commitment as total costs are entered. This report streamlined the credit reporting and tracking process.

Concerns regarding decreased new development, high cost, and lack of quick reductions under ND rules are still being addressed. Staff from rural jurisdictions reported that compliance with nutrient control measures has decreased new city development, weakening the jurisdiction’s urban cores. While development has decreased in all jurisdictions, the negative effects impact rural areas more than urban areas like Durham and Raleigh. This creates an unequal impact of the rules on smaller rural areas. Staff members also mentioned the difficulty of bearing the financial burden of compliance without financial support from the state. While the IAIA reduced the cost of compliance, the cost is still high. Lastly,

³¹ <https://www.orangecountync.gov/CivicAlerts.aspx?AID=903>

³² https://unrba.org/sites/default/files/FinalUNRBA_FY2021-2022_IAIA%20Joint%20Report,11-16-2022_0.pdf

studies at Falls Lake have shown that nutrient loads do not react quickly to nutrient-reducing projects.³³ Sometimes, changes in nutrient loads are only noticeable after thousands of years.³⁴

3. Finance and Governance Approaches to Falls Lake Rules

Pre-IAIA

Many nutrient reduction projects and management organizations credited under the IAIA were created before the IAIA, and some even before the Falls Lake Rules. Agricultural communities have observed nutrient controls since the early 1990s.²⁸ Orange County has regulated stormwater and zoning density since 1994. Durham implemented an NPDES (National Pollution Discharge Elimination System) in 1995.³⁵ The City of Durham, Orange County, and Wake County were subject to nutrient management of the Jordan Lake Rules in 2009.³⁶ Roxborough implemented stormwater control measures due to their 1974 NPDES MS4 permit^{36,37}. Lastly, stormwater utilities like the five-jurisdiction collaboration Granville-Person Stormwater Services were implemented pre-Falls Lake Rules. The Neuse River Basin and surrounding areas are no strangers to water quality improvement organizations. Aside from the UNRBA, the other major water organization is Jordan Lake One Water (JLOW).

Current Nutrient Reduction Credited Under the IAIA

Stormwater

Funding structures for stormwater fees include a fee on customers' water bills, a volumetric charge for water use, or an annual stormwater charge similar to a tax. Several jurisdictions instituted or raised stormwater fees in response to Falls Lake Rules, including Hillsborough, Durham, Person County, Granville Counties, and the City of Creedmoor, Butner, and Stem.³⁸

Durham County approved moving the stormwater funding out of its general fund and into the stormwater enterprise fund for the fiscal year 2020.³⁹ The originally proposed operating budget of the enterprise fund of \$2.5 million was decreased to \$800,000 due to the anticipated financial burdens on residents from Covid-19.⁴⁰ The stormwater enterprise fund is expected to expand Durham County's nutrient management by increasing staffing capacity in the stormwater department and supporting Durham's capital projects. Previously, stormwater department staffing was funded by stormwater permitting fees. The approval took years and was only successful with the proper education of elected town officials through outreach from the stormwater department. Hillsborough's 2016 stormwater utility and enterprise fund pays for UNRBA dues and other nutrient control measures. As of the 2019

³³ <https://nutrients.web.unc.edu/wp-content/uploads/sites/19393/2023/04/2023-12-Borah.pdf>

³⁴ Carleton JN, Lee SS. Modeling lake recovery lag times following influent phosphorus loading reduction. *Environ Model Softw* [Internet]. 2023 Feb [cited 2023 Feb 6];105642. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1364815223000282>

³⁵ City of Durham, Stormwater Quality webpage, <https://durhamnc.gov/909/Stormwater-Quality>

³⁶ NC DEQ, Jordan Lake Nutrient Rules, <https://deq.nc.gov/about/divisions/water-resources/water-planning/nonpoint-source-planning/jordan-lake-nutrient#rule-re-adoption-process-/jordan-lake-one-water>

³⁷ Based on a GIS analysis of tax parcels. Data source: 2020 NC OneMap.

³⁸ Year 1 and 2 Interviews with IAIA jurisdictions By Evan Kirk

³⁹ <https://www.dconc.gov/county-departments/departments-a-e/budget-management-services/quarterly-budget-reports/fy-2020-21-1st-quarter>

⁴⁰ <https://lgrreports.nctreasurer.com/Reports/2021/County/Durham.pdf>

fiscal year, their stormwater enterprise fund had \$659,000 in revenues. Despite Durham's and Hillsborough's efforts, their current annual funds are not expected to not raise enough money to cover the projected costs for Stage II. Consequently, they planned to raise their fees or charges for Stage II and use any saved revenue to fund larger projects.³⁸

In addition to individual stormwater utilities, the counties of Person and Granville, the City of Creedmoor, and the towns of Butner and Stem created Granville-Person Stormwater Services in 2012. In this partnership, they share one stormwater services manager, expertise related to stormwater, and collaborate on projects. While Pearson has their own stormwater fee and fund, Granville County bills for Stem, Butner, and Creedmoor and their constituents. Granville, Stem, Butner, and Creedmoor moved several stormwater costs outside the stormwater fund to completely fund their IAIA membership while keeping stormwater rates the same. Alternatively, Pearson chose to raise stormwater rates to comply.^{24,26}

Jurisdictions used stormwater funds for nutrient management in their other watersheds, such as Jordan Lake, Rogers Lake, and Tar-Pamlico River. Often, funds for nutrient management are not tracked by watershed as they can be difficult to differentiate, specifically with plan review and administrative costs. Staff from all interview jurisdictions estimated that 30-100% of stormwater funds are allocated to UNRBA membership and administrative costs annually. The remaining capital can be spent on a myriad of projects, including land conservation, membership fees beyond the UNRBA, such as the Clean Water Education Partnership (CWEP) and North Carolina Water Quality Association (NCWQA), and nutrient management projects.

Watershed Protection Fees

Raleigh introduced a watershed protection fee in 2011, charging each water user \$0.15 per 1,000 gallons to generate \$2.25 million annually. With these funds, and a collaboration with the Conservation Trust of North Carolina (CTNC) through the UNRBA, Raleigh identifies and protects land with the highest water quality and ecological benefit to the Falls Lake Watershed. The protection fee's success can be attributed to support from Raleigh's political leaders and reduced administrative and maintenance costs from CTNC and UNRBA collaboration. The well-structured fee and predictable revenues continued benefiting Raleigh's water protection efforts. In 2019, the UNCWI utilized \$19.75 million from Raleigh's watershed protection funds to secure \$90 million in grant funding and landowner donations.⁴¹ Beyond financial gains, the constant watershed protection fee educates consumers; its presence communicates the city's dedication and the overall importance of watershed protection.⁴²

Durham also created their watershed protection structure in 2011 and named its fund "penny per tier" after its one-penny rate.³⁵ **Error! Bookmark not defined.** The \$0.01 per CCF rate raises \$100,000 annually. Efforts to raise charges have been unsuccessful, most likely due to Covid-19's financial burdens on Durham residents. Like Raleigh, Durham purchases land adjacent to their drinking water watersheds. To maintain healthy water quality, all structures on these lands are removed, and only light recreation is allowed. Durham funds their efforts by setting aside \$500,000 annually from their Capital Improvement Plan funds. The City of Durham worked with the Triangle J Council of Governments to facilitate the collaboration with UNCWI. With this partnership, they participated in cost-share programs to purchase lands around Lake Michie and Little River Reservoir Watersheds.⁴²

⁴¹ <https://www.newsobserver.com/news/local/counties/wake-county/article219425600.html>

⁴² <https://nutrients.web.unc.edu/wp-content/uploads/sites/19393/2019/12/Paying-for-Nutrient-Reduction-and-Management.pdf>

The comparison of Raleigh and Durham’s watershed protection structures gave insight into barriers, benefits, and best management practices when funding watershed protection. First, it demonstrated that altering existing watershed protection charges can be impacted by factors beyond a water utility’s control, such as economic conditions and political support, as seen through Durham’s inability to raise charges. Second, successful funding structures for watershed protection are not limited to an extra line on a water bill, as seen with Durham’s watershed protection fund. Third, both fee and fund models can benefit from outside collaboration, as seen with CTNC partnerships. Fourth, the amount of capital allocated for watershed protection should be proportional to the size of the watershed. For example, Falls Lake is smaller than the watersheds of Lake Michie and Little River Reservoir. If Raleigh allocated the same funding for all three areas, Falls Lake would experience a greater impact. These four findings should be considered when implementing or managing a watershed protection fee.⁴²

Interlocal-Cooperation and Multidisciplinary Approaches

Raising capital for nutrient management requires a multidisciplinary approach for jurisdictions without extraneous fees and funds. Governments typically contributed through general funds and or partnerships. Partners included but are not limited to, the Soil and Water Conservation Districts (SWCD), the US Department of Agriculture (USDA), North Carolina Farm Bureau Federation (NCFBF), Tar River Conservancy, utilities like Orange County Water and Sewer Authority (OWASA), the Clean Water State Revolving Fund (CWRSF), the Triangle Land Conservancy (TLC) and other land conservation groups, County Health Departments, School Districts, watershed improvement associations, and private landowners. Partnerships are not limited to jurisdictions lacking extraneous fees; however, governments with limited resources for funding rely heavily on these partnerships to achieve rule compliance.³⁸

Farmers have relied on organizations like the NCFBF and USDA for partnerships and the SWCD for assistance with natural resource management, natural disaster cleanup and restoration, and individual project requests. The NCFBF also mentioned partnerships for support, including groups such as the National Fish and Wildlife Federal and the EPA-319 program. Farmers who participated in an SWCD program have been provided with a cost share of at least 25% for any projects.³⁸

Wake Forest, Creedmoor, and Orange County have participated in interlocal-cooperation. They contributed \$9,715.29 to the UNRBA for dues in the fiscal year 2020 through Raleigh’s watershed protection fees. Under the IAIA, Wake Forest contributed an additional \$13,692 annually to the UNRBA through their general fund as they do not have a stormwater enterprise fund or stormwater fee.³⁸

In addition to aiding Wake Forest, Raleigh succeeded with inter-local conservation projects. Through partnerships, the City of Raleigh leveraged \$80 million (including \$14.7 million of their funds) for UNCWI land conservation measures to support clean water investments in the Raleigh watershed. Partners included the City and County of Durham, Granville County, the Towns of Creedmoor and Butner, the State of North Carolina’s Clean Water Management Trust Fund, and contributions from private trusts and property owners.⁴³

Policy

All watershed jurisdictions adopted new development ordinances to comply with Falls Lake-specific nutrient management strategies. To limit development density and protect critical areas in the

⁴³ Email with Wayne Miles, City of Raleigh, September 2020

Falls Lake Watershed, jurisdictions such as Raleigh increased or altered their zoning restrictions.^{43,44} Raleigh also updated its Public Utilities Handbook and Comprehensive plan to offer limited water service in the Falls Lake Reservoir to limit development within the watershed boundaries.⁴³

Facility and Best Practice for Nutrient Management

Beyond rates and policy, jurisdictions also pursued technical and managerial solutions. Three wastewater treatment plants (WWTP) — Hillsborough, Durham, and South Granville Water and Sewer Authority (SGWASA) — upgraded to comply with the Falls Lake Rules. To comply with Stage I requirements for wastewater discharge, Hillsborough spent \$16 million to upgrade its WWTP. Its nutrient reduction strategies were so successful that it received credit for future reduction requirements and gained national recognition for upgrades. The town revealed that these upgrades had been planned for the near future but were hastened due to the Falls Lake Rules. Hillsborough also reduced overflows by moving a facility for fleet maintenance from a floodplain and replacing sanitary sewers.⁴⁵ The City of Creedmoor instituted successful best management practices by reducing the city's nutrient loading through mandatory street sweeping and fleet vehicle washing vehicles at the carwashes.²⁶²⁶ Farmers have individually contributed to Rule compliance by creating stream buffers and livestock exclusion areas, planting cover crops, and reducing fertilizer amounts. **Error! Bookmark not defined.** Many of these efforts were made possible by partnerships and interlocal cooperation.

Potential For Future Nutrient Reduction Credits Under the IAIA

While the financing for Stage I Rules is sufficient, Stage II is expected to be more expensive. With this expectation, the EFC researched examples of additional watershed financing methods used around the Nation. A largely unexplored financing form is a usage fee. This fee is typically charged to people who utilize a state, local, or federal protected area's benefits. These fees can be raised as boating fees, hunting or fishing licenses, or park entry fees. Federal lands must comply with the Federal Lands Recreation Enhancement Act (FLREA) and use fees only for projects to enhance the visitor experience. The requirements go so far as to limit habitat restoration projects to wild-life specific recreation hunting, fishing, and wildlife observation. State lands are not subject to FLREA and instead operate under state and local official control; therefore, they lack the limitations on fee allocation listed above. Park users are open to paying user fees when fees contribute to facility and park maintenance.⁴⁶ The EFC researched several versatile programs that raise watershed protection and restoration funds.

Chesapeake Bay Trust Fund

In 1985, the Maryland General Assembly created The Chesapeake Trust Fund, a grant-making committee that provides funding to projects that improve the watershed. These grant-funded projects include but are not limited to agriculture crop cover support, stormwater management, environmental organizations, watershed research, education, and technologies to accelerate bay restoration. On average, 400 grants, each valued at \$20,000, are awarded annually, for a total annual cost of \$10 to \$14

⁴⁴ Interview with Chris Sandt, Craig Benedict, Wesley Poole, David Stancil, Orange County, August 2020
https://www.unrba.org/sites/default/files/Prospective%20UNRBA%20Membership%20Fees%20Schedule%20fir%20Fy%202021-22_0.pdf

⁴⁵ Interview with Terry Hackett, Town of Hillsborough, May 2020

⁴⁶ <https://www.fws.gov/law/federal-lands-recreation-enhancement-act>

million.⁴⁷ The first 90% of these funds are allocated to Chesapeake Bay restoration and education programs.⁴⁸ License plates, tax donations, and partnerships financially support the grant fund.

License Plates

Maryland's Chesapeake Bay license plate program has proven an effective cost-raising technique. License plates are sold at \$20, with 50% of the revenues going to the Maryland Vehicle Association (MVA) and 50% to the Trust Fund. License plate owners reap several benefits from this program; the ability to "accessorize" their vehicle, validation for personally supporting a restoration project, and an ability to join the "Plate Perks" program to receive discounts and prime parking at local stores. A Trust Fund survey analyzed the selling rate of the plate, finding that customers were willing to pay up to \$50 per plate.⁴⁷ Therefore, determining that the plate's rate was set effectively.

Tax Check-Off

Income Tax Check-off programs also raised considerable funds for the Chesapeake Bay Trust. In Maryland, the collected revenues are split evenly between The Chesapeake Bay Trust and the Maryland Department of Natural Resources. The fund is appropriately named the Chesapeake Bay and Endangered Species Fund.⁴⁹ In 2019, the Trust raised \$400,000 through individual donations from this program.⁵⁰ These tax revenue methods have become increasingly popular; From 2002-2016, the number of US tax check-off programs almost doubled.⁵¹

The benefits of tax checkoff methods are threefold. First, funds are raised through the voluntary donations of taxpayers through indications on their income tax refund forms. Because this is not a new tax and simply a donation, legislators do not have to announce a new tax or raise in tax. Second, awareness is raised for the program and its cause as a short description of the organization is included on the tax form. So, the awareness reaches even individuals who do not donate. Third, if there are limited organizations on the tax form, this method can be an opportunistic way to raise money.

This fundraising method is not without faults. First, in opposition to the opportunistic advantage, if there are many organizations on the tax form, it increases competition and ultimately decreases donations to an organization. Second, additional information on already confusing tax forms can make attempts to simplify the forms less attainable. Lastly, it might take some time for a new program to be featured on the tax form as these spots are limited. A new program can only be added when an existing program is removed.

North Carolina has several tax check-off programs, including the Nongame and Endangered Wildlife Fund. This fund, organized by NC Wildlife Commission, uses garnered taxes monies to complete nongame conservation projects for non-game animals. Approximately \$11 million have been donated this way since 1984.⁵²

⁴⁷ Staff from Chesapeake Bay Trust

⁴⁸ Chesapeake Bay Trust mission statement webpage, <https://cbtrust.org/mission/>

⁴⁹ https://dnr.maryland.gov/wildlife/pages/tax_checkoff.aspx

⁵⁰ Chesapeake Bay Trust, Contribute at Tax time <https://cbtrust.org/taxdonation/>

⁵¹ National Conference of State Legislatures, Income Tax Checkoff Programs, <https://www.ncsl.org/research/fiscal-policy/income-tax-checkoff-programs.aspx#:~:text=Income%20tax%20%E2%80%9Ccheckoff%E2%80%9D%20programs%20allow,introduced%20in%20Colorado%20in%201977>

⁵² Jacksonville Daily News, Wildlife can be helped on state income tax form, April 4, 2018, <https://www.jdnews.com/sports/20180404/wildlife-can-be-helped-on-state-income-tax-form>

Hunting, Boating, and Fishing Funds

The Healing, Hunting, and Fishing Fund is a partnership between three organizations—The Chesapeake Bay Trust Fund, The Chesapeake and Atlantic Coastal Bays Trust Fund, and the Maryland Department of Natural Resources (MDNR). Funds are split between the two former partners. Individuals purchasing a hunting, fishing, or boating license through the MDNR’s online portal can choose to donate to this fund.⁵³ As established by the Maryland General Assembly in 2020, the Chesapeake Bay Trust is allowed to use these funds for grants which result in promoting or enhancing water health, reforestation around waterbodies, waterbody research, and groups that support aquatic or wildlife habitat, healthy water, wetlands, and educational experiences.

Recreational Boating Fees: Vehicle Excise Tax

The Maryland Waterway Improvement Fund (WIF), managed by the Maryland DNR, uses Vessel Excise Tax (VET) to fund projects that aid the development and the use of surrounding waters to benefit registered boaters. The VET taxes all vessels that are mostly used in Maryland waters and therefore can include registered boaters from out of state. The VET is separate from boating registration fees as VET dollars go to WIF for water quality projects. In contrast, boat registration dollars are allocated to the State Boat Act Fund for boating safety projects. The VET is a one-time charge, paid at registration, set at 5% of the boat’s net purchase price, also known as the fair market value. The VET has a floor tax of \$5 and a ceiling tax of \$15,100, impacting boats less than \$100 or more than \$302,000. Studies indicate that the ceiling tax increased sales of higher-valued boats.

Annual revenues from the VET range from \$15 million to \$31 million, largely fluctuating with economic health.⁵⁴ These dollars help support WIF grants ranging from \$2,900 to \$2.8 million, averaging \$150,000. The grants support water quality by funding projects like monitoring submerged aquatic vegetation, supporting living shorelines, and financing green energy. A \$263,100 project funded the dredging of a channel in Kent Narrows’ and Ferry Point Park’s shorelines to stabilize the shore and allow space for the seeding of native marsh plants. Falls Lake could use a similar grant and funding structure as WIF to improve nutrient management as the topics which qualify for WIF grants support projects which could have a direct positive impact at Falls Lake.

Program Open Spaces

The ad valorem tax funding structure for Maryland’s Program Open Spaces (POS) directly links development to dollars raised for public open lands and healthy water quality. This fund was achieved through the General Assembly’s approval of a real estate transfer tax. This tax charges 5% on every real estate transaction in Maryland. 75% of the ad valorem real estate tax is fully allocated to fund the POS. POS dollars fund their protected land acquisition and Greenway and Green Infrastructure projects. As a result of POS’s success, 394,000 acres of land are protected, and most Maryland citizens live within 15 minutes from POS land.⁵⁵

⁵³ Chesapeake Bay Trust, Healing, Hunting, and Fishing Fund, <https://cbtrust.org/veterans/>

⁵⁴ University of Maryland Environmental Finance Center, Vessel Excise Tax and Impacts Through the Waterways Improvement Fund, <https://arch.umd.edu/sites/default/files/docs/publications/VET%20and%20WIF%20Final%20with%20Case%20Stories%201.5.17.pdf>

⁵⁵ Maryland Department of Natural Resources, Land Acquisition and Planning, <https://dnr.maryland.gov/land/Pages/ProgramOpenSpace/Program-Open-Space-101.aspx>

Protecting lands can be one potential method to protect the quality of water and local sewer systems. It has been well established in academia that increased water quality is linked to land cover, especially forest cover.⁵⁶ The benefits of open spaces on water quality are twofold. First, runoff decreases due to the lack of impervious surfaces or buildings and the presence of plants to regulate stream flow and water levels. Second, open lands- specifically forests- act as natural filters for pollutants. When planning open lands, upstream land use should be considered. For example, if upstream land includes high-intensity agriculture, impervious surfaces, and/or high development, a larger open space should be protected to slow and filter anticipated runoff effectively. If Falls Lake were to implement a similar program, a vote would be required. North Carolina state statute requires a vote for publicly funded conservation.⁵⁷

Voluntary Habitat/ Conservation Permit

The Pennsylvania Fish and Boat Commission has succeeded tremendously with its voluntary permit-funded program. The commission raises funds through permit sales for trout, bass, muskies, and habitat/ waterway conservation.⁵⁸ Permits range from \$10 to \$25 and can last one, three, five, or ten years. In 2020, the commission raised \$129,850 through sales of 7,000 permits.⁵⁹ By February 2021, they had already raised \$13,000, outpacing their 2020 rate.⁶⁰ Dollars are only used to finance fish-specific projects like fish habitat work, research, or stream improvement. The Falls Lake Watershed could benefit from implementing all permits, but most notably from the Voluntary Habitat Waterways Concertation. This permit's projects specifically strengthen aquatic habitats by creating riparian buffers, decreasing erosion, and improving water quality. This permit costs \$11.90 annually in Pennsylvania, contributing to 16% of total permit revenue.⁶¹

Incentives to purchase permits include the gratification of contributing towards the fund's cause and a paper certificate. Some purchasers noted that a more substantial certificate, such as a badge, button, or bumper sticker, could further increase program interest and sales. While sales exceeded expectations, a willingness to pay study should still be done to maximize financial gains.

Site Specific Standard

The UNRBA addressed the anticipated cost burdens and an inability to reach the 40 micrograms/L chlorophyll-a limit with its proposal to the DWR for a site-specific standard at Falls Lake.⁶² A future site-specific standard would either select a new nutrient to monitor or alter the quantitative limit of chlorophyll-a from the existing 40 micrograms/L. A site-specific standard must meet two criteria:

⁵⁶ Morse, J., Welch, J. N., Weinberg, A., & Szabo, P. (2018). Literature review: forest cover & water quality—implications for land conservation. Open Space Institute: June, 24, 2018.

⁵⁷ The University of North Carolina Environmental Finance Center, <https://efc.web.unc.edu/2021/06/01/land-ing-the-vote-ballot-measures-for-land-conservation/>

⁵⁸ Pennsylvania Fish and Boat Commission, Voluntary Permits, <https://www.fishandboat.com/Transact/AnglerBoater/AnglerBoater2019/Documents/2019-0910so04-voluntarypermits.pdf>

⁵⁹ Pittsburgh Tribune Review, Voluntary fishing permits sell better than hoped, February 5, 2020, <https://triblive.com/sports/voluntary-fishing-permits-sell-better-than-hoped-plans-for-funds-revealed/>

⁶⁰ Daily American, Voluntary fishing permits sell even better than expected, February 7, 2020, <https://www.dailyamerican.com/story/sports/2020/02/07/voluntary-fishing-permits-sell-even-better-than-expected/43638011/>

⁶¹ Interview with official at Pennsylvania Fishing and Boating Commission

⁶² <https://unrba.org/sites/default/files/UNRBA%20BOD%20Meeting%202022%2006%2015%20v2.pdf>

First it cannot alter a water body's designated use, and second, it must be an environmental indicator.⁶³ The future site-specific standard would most likely use chlorophyll-a, as it satisfies the criteria mentioned above, according to the UNRBA. Site-specific standards have been implemented in North Carolina before, for example, High Rock Lake's chlorophyll-a standard in 2019.⁶⁴

Regulatory Impact Analysis

Before adoption, all proposed rules must undergo a Regulatory Impact Analysis to ensure compliance with North Carolina state law. Therefore, a site-specific standard at Falls Lake would also have to undergo this process. The process includes analysis of unnecessary and unduly burdensome policies to ensure fair treatment to state citizens. Adhering to North Carolina General Statute 150B-19.1, DWR should quantify the costs and benefits of a proposed rule on citizens to the "greatest extent possible."⁶⁵ Due to the similar regulatory structures at High Rock and Falls Lakes, the EFC used the financial impacts and Regulatory Analysis outcomes at High Rock under a site-specific standard to anticipate outcomes at Falls Lake. These similarities include existing structures for the total maximum daily load (TMDL) and the specific use standard to maintain good aquatic health measured with chlorophyll-a.

The DRW compared the proposed site-specific standard's financial impact to the current High Rock Lake rules, arguing that there would be no financial impact. Since the anticipated cost for the first 12 months was under \$1 million, as there was no estimated financial impact, the Administrative Procedure Act did not require a fiscal note examining all costs and potential burdens.⁶⁶ While no financial impact was estimated for the rule proposal, the DRW predicted a financial impact for rule implementation. They noted, "While adopting the standard will establish a more specific water quality improvement goal, any costs associated with meeting that goal will occur well into the future and be more directly associated with implementation. Benefits and costs associated with implementation will be accounted for during future nutrient management strategy rulemaking; as such, we have not attempted to quantify or monetize impacts in this analysis." Therefore, the DWR noted that the financial impact of the rules would be analyzed in future nutrient management strategy rulemaking. Even with the site-specific standard, it is unknown if High Rock would be taken off the 303(d) impaired waters list. The DWR noted that they are working with the EPA to incorporate site-specific standard considerations when compiling the future list.⁶⁷

Based on the results from High Rock Lake, the EFC anticipated the Regulatory Impact Analysis for the proposal of a site-specific standard at Falls Lake will report no financial impact but that rule implementation would have an anticipated impact. As the cost for the proposed rule would be under the \$1 million limit at \$0, it was anticipated that no fiscal note would be required. Additionally, Falls Lake might still be added to the 303(d) list.

⁶³ <https://www.epa.gov/wqs-tech/key-concepts-module-5-flexibilities#:~:text=Site%2Dspecific%20criteria%20are%20criteria,that%20reflect%20local%20environmental%20conditions>

⁶⁴ https://files.nc.gov/ncdeq/Environmental%20Management%20Commission/Water_Quality_Committee_Meetings/2021/may/attachments/Attachment_D_HRL-RIA-OSBM-approved.pdf

⁶⁵ https://www.ncleg.net/enactedlegislation/statutes/html/bysection/chapter_150b/gs_150b-19.1.html

⁶⁶ https://www.ncleg.net/enactedlegislation/statutes/html/bysection/chapter_150b/gs_150b-21.4.html

⁶⁷ <https://files.nc.gov/ncdeq/Water%20Quality/Planning/TMDL/303d/2020/2020-Listing-Methodology-approved.pdf>

While implementation costs are unknown, the UNRBA continues to create a petition for the standard. The UNRBA seeks flexibility in the proposed site-specific standard not seen at High Rock Lake.⁶⁸ The financial impact of implementation costs with additional flexibilities is uncertain. Even with flexibility, the implementation costs of Stage II are expected to be high. The 2010 Fiscal Analysis for the Proposed Nutrient Strategy for Falls of Neuse Reservoir estimated that Stage II implementation costs would be more than double the costs for pre-IAIA Stage I. With inflation and the decreased costs of Stage I due to the IAIA, Stage II costs could be greater than the current doubled Stage I costs.⁶⁹

4. Affordability of Financial and Governance Approaches

Many of the Falls Lake jurisdictions have cited raising utility rates and fees as a mechanism to comply with the Falls Lake Rules. While increased rates help to maintain watershed health, these changes could disproportionately affect lower-income houses. With this understanding, the EFC studied the financial burden of consumer utility bills in Falls Lake.

To study a utility bill's impact accurately, bills should be measured with the most representative metric. States⁷⁰ and the AWWA⁷¹ have recommended substituting the traditional metric of median household income for the percent of 20th percentile household income and the affordability ratio at the 20th percentile household income (AR20). The latter two metrics specifically highlight burdens on low-income customers. This shift in emphasis can help policymakers in Falls Lake Watershed structure financing mechanisms to have the lowest impact on low-income customers.

Affordability Metrics

Percent of 20th percentile household income

The percent of 20th percentile household income accesses the financial burden one utility bill would have on a home in the lower 20th percentile for household income. Burden is determined by calculating the ratio of a home's utility bill to its median income to quantify the proportion of income spent on a water bill. The price of a utility bill is calculated by adding the cost of all water-related utilities such as wastewater, water, and stormwater. Affordable water-related utility bills should take up 4 percent or less of household income for the percent of 20th percentile household income.

Affordability ratio at the 20th percentile household income (AR20)

The AR20 expands on the previous metric by calculating the affordability of water-related utility bills while incorporating all household expenses (housing, food, healthcare, energy, taxes, Wi-Fi, and phone bills). The metric determines the percentage of discretionary income spent on water, sewer, and wastewater utility bills. Discretionary income is all income after essential household or living expenses

⁶⁸ https://unrba.org/sites/default/files/UNRBA%20PFC_2023%2004%2004%20v3.pdf

⁶⁹ https://files.nc.gov/ncosbm/documents/files/DENR06082010_v2.pdf

⁷⁰ <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/affordability/affordability-ratio>

⁷¹ <https://awwa.onlinelibrary.wiley.com/doi/full/10.1002/aws2.1260>

are paid. Affordable water-related utility bills should take up 10 percent or less of discretionary income for the AR20.⁷²

Figure 4: AR20 Calculation⁷³



It is important to calculate both the percent 20th percentile household income and the AR20. Consider Durham; their percent 20th percentile household income at 2.8 percent indicated an affordable bill for low-income customers; however, the AR20 at 20 percent indicated an unaffordable water bill for the same low-income households. The stark difference in affordability can be attributed to the addition of all living or household costs in the AR20. The AR20 also showed existing financial hardships. Roxborough’s negative AR20 value indicated that living costs exceed a household’s total income, likely forcing these low-income residents to make tradeoff decisions on basic services. In the case of Roxboro, any rate will indicate an unaffordable bill using the AR20.

Table 3: Affordability metric calculations for municipalities in the Falls Lake Watershed

Local Government	Percent 20th Percentile Household Income	AR20
Butner	4.9%	14.1%
Creedmoor	4.3%	11.9%
Durham	2.8%	20.0%
Hillsborough	3.9%	15.4%
Raleigh	2.6%	11.9%
Roxboro	5.1%	Negative
Stem	3.7%	9.0%
Wake Forest	1.6%*	3.9%*

*Wake Forest does not have a stormwater bill; therefore, the water sector bill only includes water and wastewater.

The EFC’s affordability analysis indicated that Falls Lake residents suffer existing burdens with their utility bills. About half of the analyzed jurisdiction’s percent of 20th percentile household income metric is above or close to 4%. This indicated that half of the jurisdictions in Falls Lake have citizens in lower twentieth percentile households who experience unaffordable water bills. Affordability concerns

⁷² <https://mannyteodoro.com/wp-content/uploads/2014/03/Teodoro-JAWWA-2018-affordability-methology.pdf>

⁷³ <https://efc.sog.unc.edu/outside-rates-why-are-they-higher/>

became greater with the AR20. Seventy-five percent of the analyzed jurisdiction's AR20s are above 10%. This indicated that seventy-five percent of jurisdictions in Falls Lake have citizens in lower twentieth percentile households who experience unaffordable water bills.

While the two metrics are more encompassing than affordability for median-income households, they are not perfect models. First, the calculations did not incorporate an estimation of supplemental income for the 20th-percentile households. The omission could have yielded an artificially high estimated burden. Second, the two metrics did not separate the utility burden for residents inside and outside city limits. Outside rates can vary drastically from inside rates. Residents outside city limits can be subjected to higher rates than those inside.⁷³ Alternatively, some outside residents do not pay water bills as they are on well and septic. A deeper analysis accounting for these errors could be highly beneficial to understand a community's specific needs fully.

Mechanisms for Addressing Affordability Concerns

Increasing Block Rates for Utility Services

Increasing block rate structures could mitigate affordability concerns as they charge proportionally for water usage, thus shifting the financial burden to the higher-end users. This is achieved by structuring the marginal rate for water's and wastewater's volumetric use to increase as consumption increases. Therefore, households consuming more water pay a higher unit rate for their use on average. Increasing block rates are not a blanket solution for affordability. Service areas with lower-income families living in larger homes, for example, multi-generation housing, might not see a positive affordability outcome with this rate structure.

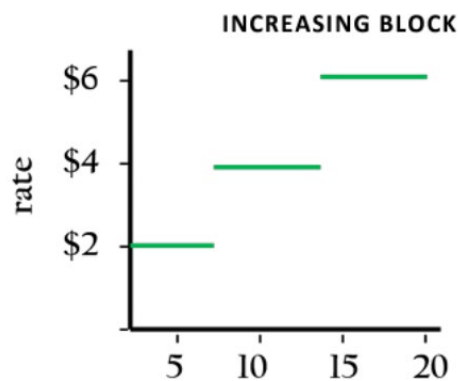


Figure 5: The marginal volumetric cost of water and/or wastewater in an increasing block structure

Cape Fear Public Utility Authority (CFPUA) found that on average, high-volume users lived in census block groups with high MHI and below-average household sizes. Therefore, they concluded that an increasing block rate structure would likely help to achieve a positive affordability outcome as high-volume users with high MHI would shoulder a burden relative to their use. CFRUA estimated that 80% of their consumer's utility bills decreased after studying usage patterns and implementing this cost-effective structure.⁷⁴

⁷⁴ <https://www.cfpu.org/CivicAlerts.aspx?AID=1288&ARC=2633>

Table 4 displays the existing rate structures for jurisdictions in the Falls Lake Watershed, highlighting that four of the six utilities have uniform rates. Utilities could benefit from usage pattern research to determine the most suitable rate structure for their community.

Table 4: Existing residential water and wastewater rate structure designs for UNRBA members with utilities

Utility	Water and Wastewater Rate Structure
Durham	Increasing Block
Franklin County	Uniform
Hillsborough	Uniform
Raleigh	Increasing Block
Roxboro	Uniform
South Granville Water and Sewer Authority (SGWASA)	Uniform

Budget Billing Programs

Seasonal fluctuations in utility costs can be burdensome and almost impossible to budget for. An increase in discretionary water and wastewater use in the summer months for irrigation, water activities, and gardening can all contribute to a high-water bill. Budget billing programs mitigate this burden of unpredictability by providing customers with a stable annual rate based on their last 12 months of billing. Budget billing allows customers of low-income households and those of fixed incomes to budget more accurately for their water and wastewater bills.

Shelby, North Carolina’s Budget Billing Program, implemented a successful budget billing program.⁷⁵ In their opt-in program, credit is built up during the spring and fall months to pay higher bills in the winter and summer. If customers incur a missed or late payment, their utility rate reverts to the default monthly charged rates.

Customer Assistance and Incentive Programs

Customer assistance programs (CAPs) use pooled funds to subsidize low-income customers’ utility bills. These programs can be rate funded through utility bill revenues or voluntarily funded through charitable donations. North Carolina case law implies that rate-funded CAPs are disallowed, limiting utilities to only charge use-based rates.⁷⁶ Beyond limitations to use-based rates, North Carolina case law is broad. Therefore, CAPs in North Carolina are frequently voluntarily funded. These programs already exist in NC like The City of Raleigh and Wake County Human Services Department’s Utility Customer Assistance Program (UCAP).⁷⁷ Individuals and corporations can donate to Project Share which contributes up to \$240 per eligible customer per year in utility assistance. Eligibility is determined by

⁷⁵ <https://www.cityofshelby.com/departments/customer-services/levelized-billing>

⁷⁶ <https://efc.sog.unc.edu/wp-content/uploads/sites/1172/2021/06/Navigating-Pathways-to-Rate-Funded-CAPs.pdf>

⁷⁷ <https://raleighnc.gov/water-and-sewer/assistance-program-water-and-sewer-utility-customers>

participation in or eligibility for other low-income assistance programs such as SNAP, LIHEAP, and Medicaid.⁷⁸

Utilities can also partner with governments, organizations, or companies to subsidize customers' high-efficiency technologies through Incentive Programs. These programs offer customers the chance to purchase high-efficiency appliances, thus decreasing their energy usage and lowering their utility bills. Appliances are typically funded through grants or partnerships with corporations. Durham and Fayetteville both offer toilet rebate programs.⁷⁹ Fayetteville Public Works Commission's Water Sense High-Efficiency Toilet Incentive Program offers a \$75 rebate per toilet to replace up to three toilets. Old toilets are replaced by the new Water Sense High-Efficiency Toilets valued at \$300. While the up-front cost is high, the rebate combined with an estimated annual savings of 10,300 gallons per toilet offers a competitive selling point.⁸⁰

Affordability Tool Benefits and Demos

A Note on the Proposed CWA: calculating burden of utility based on EPA metrics

The CWA requires states to maintain healthy water bodies; however, it offers flexibility under certain circumstances. The EPA can offer a variance if it is determined that compliance would cause a significant social or financial burden on the customer. Responding to community feedback regarding barriers to compliance or finances has been a longstanding practice of the EPA. They continue developing their community support, recently releasing the Proposed 2022 Clean Water Act Financial Capability Assessment (Proposed FCA).⁸¹ This Proposed FCA standardizes the process of analyzing the feasibility of new rules by offering a comprehensive procedure and affordability metrics to assess a rule's impact.

The 2022 Proposed FCA expands on previous FCAs by adding two new affordability metrics: the Residential Indicator (RI) and Financial Capabilities Indicator (FCI). The EFC determined that the RI was sufficient to analyze affordability in Falls Lake. The RI ranks degrees of burden from "low" to "high" (Table 5). The FCA recommended that calculated RI's of "mid-range" and "high" submit a Financial Alternatives Analysis (FAA). This analysis incorporates data on technical, managerial, and financial capacity to determine alternative financing mechanisms, intending to decrease the burden on customers.

Table 5: Benchmarks for determining financial impact using the EPA residential indicator

Benchmark	Financial Impact
< 2% of MHI	Low
2% to 4% of MHI	Mid-Range
> 4% of MHI	High

⁷⁸ <https://raleighnc.gov/project-share>

⁷⁹ <https://www.durhamnc.gov/1102/Toilet-Rebate-Program>

⁸⁰ <https://www.faypwc.com/high-efficiency-toilet-incentive-program/>

⁸¹ https://www.epa.gov/system/files/documents/2022-02/2022-proposed-fca_feb-2022.pdf

The EFC simplified the FCA’s two-step RI calculation process in Table 6 below using financial statements from Durham (2020) and SGWASA (2021).

Table 6: Calculating the residential indicator for Durham and SGWASA using the methodology in the 2022 EPA proposed FCA^{82,83}

	Equation	Durham (2020)	SGWASA (2021)
1. Annual Operating Expenses (Excluding Depreciation) for W, WWT, and CWA		\$117,403,386 ²⁰	\$8,952,561
2. Annual Debt Service for W, WWT, and CWA		\$12,307,923	\$3,368,585
A. Subtotal of Current Costs	1 + 2	\$129,711,309	\$12,321,146
3. Estimated Additional Operating Expenses (Excluding Depreciation) for W, WWT, and CWA Future Conditions		Unknown	Unknown
4. Estimated Additional Debt Service for W, WWT, and CWA Future Conditions		Unknown	Unknown
B. Subtotal of Future Costs	3 + 4	Unknown	Unknown
C. Total of Future and Current Costs	A + B	\$129,711,309+	\$12,321,146+
5. Residential Share of WWT plus CWA Costs		\$73,665,214 ²¹	\$4,128,453.93
6. Total Households in Service Area		94,081	5,389
D. Annual Cost per Household	5 ÷ 6	\$783+	\$766.09+
7. MHI		\$58,905	\$55,856
E. Residential Indicator	(D ÷ 7) x 100	1.33%+	1.37%+
Financial Impact		Low	Low

The EPA’s RI analysis indicated that both Durham and SGWASA experienced a low financial impact from current operations, maintenance, and capital debt services costs. However, it should be noted that the EPA’s IR calculation model is not error-free, and communities using this model should check estimates against actual data. The EPA RI estimation of SGWASA residents’ annual utility cost per household at \$766.09+ was much lower than actual community averages. For example, Stem’s reported annual utility cost per household was \$1,597+. The artificially low value of utility cost per household in the RI calculation resulted in an artificially low measure of impact in SGWASA.

This vast gap in estimated utility cost per household (CPH) vs. actual CPH could be attributed to disproportionate residential flow. The EPA RI model estimated that SGWASA customers paid for 34 percent of total utility water flow. However, in SGWASA, residents accounted for 91 percent of the total connections. When calculating its rates, SGWASA understood that residents accounted for a larger connection base and redistributed its rate structure to charge customers for their proportionate usage accurately. The change increased residential bills.

To determine a more accurate RI, the EFC used the actual cost of water, wastewater, and stormwater bills for customers. In Table 7, the EFC amended the incorrectly low utility cost in Table 6. As

⁸² Includes operating expenses minus depreciation for water and sewer operating fund, operating expenses for stormwater management fund, plus transfers into the stormwater construction fund.

⁸³ Based on a proportion of meter use attributed to residential usage of 0.57 multiplied by WWT and CWA subtotal of current costs. Local water supply information available here: <https://www.ncwater.org/WUDC/app/LWSP/report.php?pwdid=03-32-010&year=2021>

seen in Table 7, the resulting impact for customers in SGWASA (Stem) was calculated to be “mid-range.” The calculated RI in Stem would require the completion of an FCC to determine affordable alternatives.

Table 7: Calculating the residential indicator for Durham and SGWASA using actual bill amounts for fiscal year 2022

	Equation	Durham	SGWASA (Stem)
A. Current W, WW, and SW Bill		\$758	\$1,597
B. Subtotal of Future Costs		Unknown	Unknown
C. Total of Future and Current Costs	A + B	\$758+	\$1,597+
1. MHI		\$58,905	\$55,856
F. Residential Indicator	$(C \div 1) \times 100$	1.29%+	2.86%+
Financial Impact		Low	Mid-range

Environmental Justice (EJ) Communities

In recent years, increasing awareness of environmental justice has been reflected in policy. The 2021 Justice40 Initiative⁸⁴, the American Rescue Plan Act (ARPA), and the 2022 FCA provided extensive funding to environmental justice projects. The EPA defines environmental justice as the “fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income.”⁸⁵ Managing watersheds through a lens of environmental justice ensures that all people benefit from improved water quality and reduced environmental hazards. It also involves them meaningfully in the decision-making process as stakeholders.

Local governments in Falls Lake could benefit financially and politically from engagement with environmental justice concerns. First, federal and state funding reserved for EJ communities could be leveraged for community improvement projects. Tools such as the Justice40 mapping tool and NCDEQ community mapping tool could help to identify these communities easily. Second, the instituted projects could begin to remediate the effects of long-term pollutant exposure on historically underrepresented communities. Lastly, engaging with the EJ communities could help Falls Lake comply with the 2022 FCA. The 2022 FCA requires that all implementation schedules give precedent to projects targeted to EJ areas which address the public health effects from environmental impacts.

Justice40 Initiative

The Justice40 Initiative is a multi-government level effort that sets a minimum standard of 40% of federal expenditures on climate and energy initiatives to be spent in areas defined as disadvantaged.⁸⁶ This is an expansive executive order, as government funding, including funds from the Bipartisan Infrastructure Legislation (BIL), must designate a portion of their funds specifically to disadvantaged communities (DAC). While at first straightforward, the state’s individual definitions of a DAC complicate the funding and identification process. In response, the government created the Interim Guidance⁸⁷ to guide the state’s definitions. The government also provided a mapping tool that defines Justice40-designated communities at the census tract level.⁸⁸

⁸⁴ <https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/27/fact-sheet-president-biden-takes-executive-actions-to-tackle-the-climate-crisis-at-home-and-abroad-create-jobs-and-restore-scientific-integrity-across-federal-government/>

⁸⁵ <https://www.epa.gov/environmentaljustice>

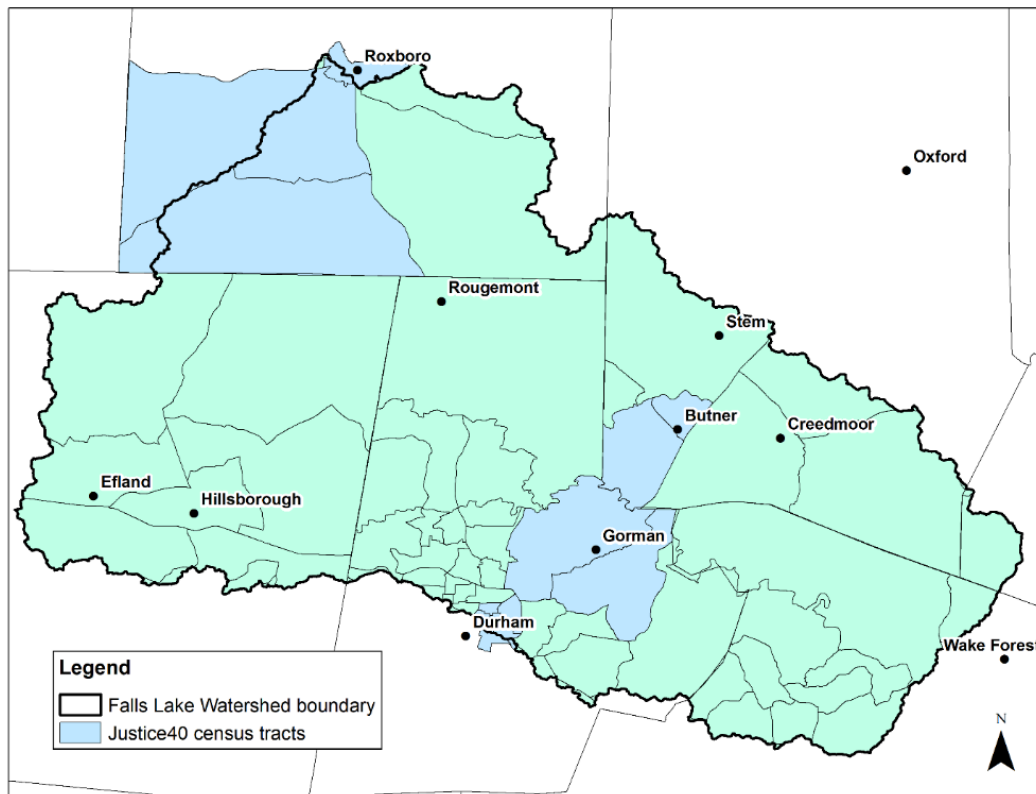
⁸⁶ <https://www.whitehouse.gov/omb/briefing-room/2021/07/20/the-path-to-achieving-justice40/>

⁸⁷ <https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf>

⁸⁸ <https://www.arcgis.com/apps/mapviewer/index.html?webmap=bdac3e391cd04d2396983fc67c23bf1c>

The Justice40 initiative identifies both urban and rural communities. It should be noted that most communities in Falls Lake's watershed are rural. Rural communities experience large environmental challenges, such as soil erosion and agricultural runoff, that can negatively impact water quality. Emphasis on rural communities would help governments and politicians focus their funding, management, and projects on the areas in the most need.

Figure 6: Justice40 census tracts in the Falls Lake Watershed



NC DEQ Community Mapping Tool

The NC DEQ aims to comply with and adhere to federal environmental justice initiatives. In efforts to adhere to the Justice40 Initiative, the Division of Water Infrastructure has released its iteration of the Justice40 mapping tool. This tool identifies pollution hazards as well as potentially underserved communities. Underserved communities in NC are based on two characteristics: low-income and percentage of minority population.⁸⁹

Communities identified as disadvantaged have the potential to receive designated funds from the state government. These underserved communities must also have their water utilities identified by the Viable Utilities Program (VUP) as distressed, at risk of becoming distressed, or non-distressed serving a >75% underserved community.^{90,91}

Communities in Justice40 and the NC DEQ overlap, as seen in Figure 7. The EFC recommended that local governments pay close attention to the overlapping NC DEQ and Justice40 communities as

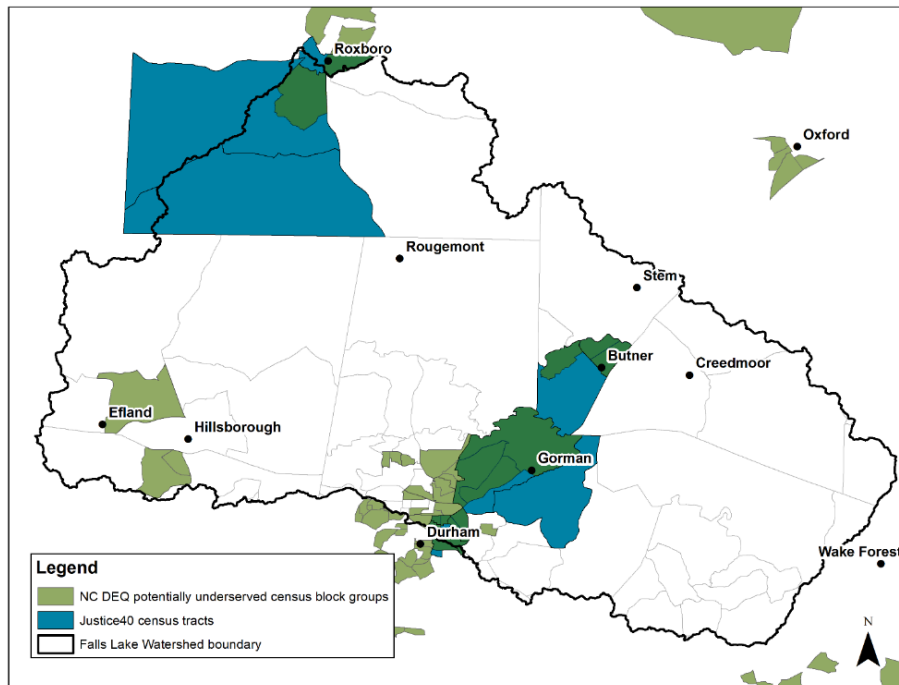
⁸⁹ <https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=1eb0fbe2bcfb4cccb3cc212af8a0b8c8>

⁹⁰ <https://deq.nc.gov/about/divisions/water-infrastructure/viable-utilities#what-are-the-assessment-and-identification-criteria>

⁹¹ <https://deq.nc.gov/media/27186/download?attachment>

two funding sources are available. However, with ample funding through both avenues, governments should not limit themselves to selecting projects in only overlapping areas.

Figure 7: NC DEQ potentially underserved census block groups and Justice40 census tracts



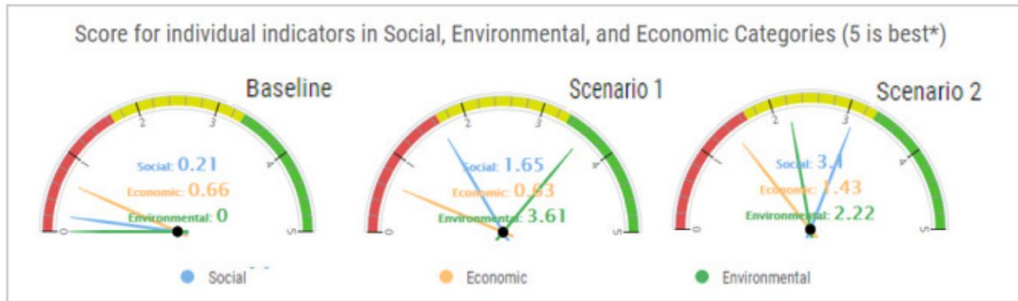
CLASIC Tool

With the understanding that communities have limited financial resources and that Stage II compliance will be more costly than Stage I, the EFC recommended that communities invest wisely in nutrient management projects. To choose the most advantageous project, a multitude of factors should be compared, encompassing financial details, social aspects, public health considerations, and nutrient reductions. The Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC) Tool allows communities to do just that with stormwater projects. The interface ranks and compares stormwater projects' benefits across a variety of factors. The higher a factor's score, the greater its benefits. The factors compared include social, economic, and environmental. To determine the most effective stormwater project, the interface scores each project based on the aggregate scores of its factors. Figure 8 shows the co-benefits analysis from a case study conducted in Oxford, MS using the tool.⁹²

The CLASIC tool also estimates a stormwater infrastructure project's total life cycle cost. Lifecycle costs consider the price of construction, maintenance, and rehabilitation. This comparison allows both long-term and short-term economic considerations while crafting policy. Understanding a project's total cost is the only way to estimate its long-term impact on utility rates.

⁹²https://clasic.erams.com/static/er2_clasic/pdf/case_studies/Combination%20Gray%20and%20Green%20Infrastructure%20Scenarios%20-%20Oxford,%20MS.pdf

Figure 8: Co-benefit analysis scoring from Oxford, MS case study



5. Revenueshed

The Falls Lake Watershed includes six counties and all or part of eight municipalities with a total taxable value of \$35 billion.³⁷ To guide jurisdictions to the most financially beneficial policies to harness this taxable value for nutrient management, the EFC completed a Revenueshed analysis and Revenueshed Tool. The model combines existing utility rates, property tax, consumption, and analysis of affordability to develop a comprehensive model to aid in analyzing revenue-generating mechanisms in the Falls Lake Watershed.

Revenueshed Defined

The EFC defines a Revenueshed as the area within which revenue is generated for a specific purpose.⁹³ The UNRBA already utilizes a Revenueshed model for their membership dues.⁹⁴ Each member pays dues based on three factors; a flat fee, their impact (land in the watershed), and their benefits (water demands). The Revenueshed expands past the polluter (impactor) pays model to include the beneficiaries as payees. In Falls Lake, this model could be used to raise funds for water quality protection. The impactors, those in the 'water quality Revenueshed,' and beneficiaries in the 'water supply Revenueshed' could financially contribute to this water protection.

Benefits of a Revenueshed Framework

In addition to expanding the payment model, the Revenueshed model also aims to mitigate issues caused by the misaligned water and jurisdiction boundaries. Jurisdictional boundaries frequently do not align with watershed boundaries, as jurisdictional boundaries were created with political, economic, or social incentives. This results in a myriad of complexities 1) Free-riding and reactive water quality protection, 2) Financing multiple watersheds, and 3) lack of a polluter pays model.

The issue of free-riding and reactive water quality protection arises when multiple jurisdictions are part of, and therefore responsible, for maintaining water quality. All jurisdictions want clean water

⁹³ https://efc.web.unc.edu/2020/11/16/using-the-revenueshed-model-to-investigate-watershed-funding/#_ftn1

⁹⁴ https://www.unrba.org/sites/default/files/Prospective%20UNRBA%20Membership%20Fees%20Schedule%20fir%20Fy%202021-22_0.pdf

but don't want to finance the initiative. Even if jurisdictions were eager to participate, organizing a pooled revenue for water quality is difficult. This results in a reactionary water quality policy that sees regulatory action occur only when the need is acute and immediate. To further complicate the issue, one jurisdiction can rely on and be a part of multiple watersheds (Figure 9). Financing multiple watersheds as one county is expensive and complicated. Many watersheds are subject to unique legislative requirements; Durham and Orange County are subject to two state nutrient regulations, Jordan Lake Rules and the Falls Lake Rules. Lastly, with the lack of an encompassing polluter pays model, not all upstream users are charged for their pollution, and downstream users suffer the environmental and financial consequences of poor water quality. For example, only counties in the Falls Lake watershed contribute to the IAIA; however, counties outside Falls Lake pollute the watershed through runoff. Counties must determine if downstream, upstream, or both parties must pay for nutrient maintenance and how payments are structured.

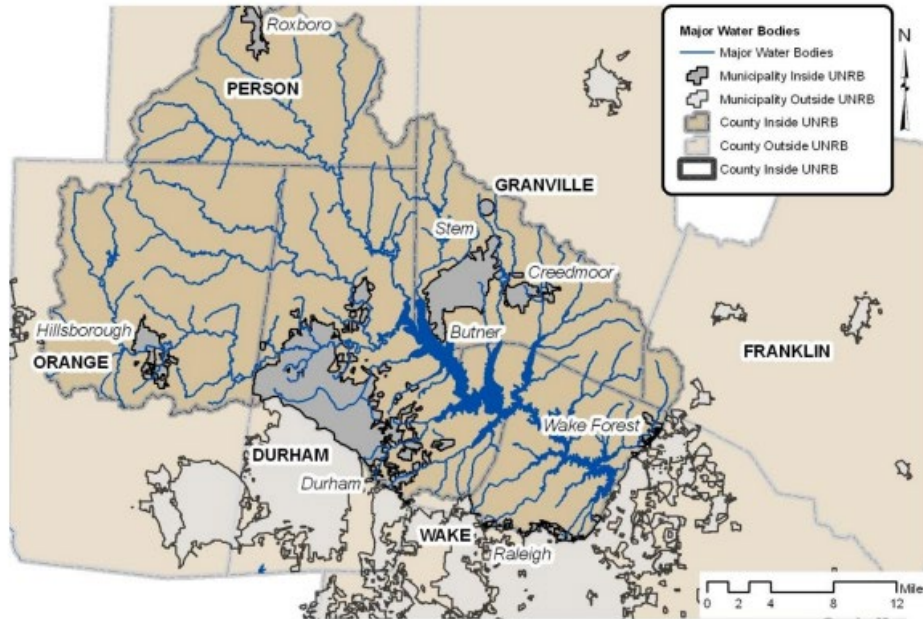


Figure 9: Map of Upper Neuse River Basin showing county and municipal boundaries do not align with watershed boundaries.

Revenueshed Framework used as a tool for Watershed Protection

The Falls Lake Revenueshed Tool presents data meant to guide political decisions in and between jurisdictions intending to create a sizeable revenue from existing rate structures for watershed protection. Revenuesheds can achieve success by following three broad steps. First, understanding the baseline revenue generation through the impact of raising existing fees and taxes. Second, generating discussion and scenario building. Lastly, raising taxes and or fees in small increments throughout a Revenueshed to generate large funds for water protection. The EFC followed these steps while demonstrating the Falls Lake Revenueshed Tool. The EFC also incorporated an affordability analysis.

Revenueshed Analysis for Falls Lake: **Baseline Revenue from Drinking Water**

The four utilities which rely on the Falls Lake Reservoir include the City of Durham, Hillsborough, Orange-Alamance, Raleigh, and SGWASA.

Table 8: Average metered drinking water demand for Falls Lake reservoir utilities

Drinking Water Utility	Average Metered Water Demand (MGD) ⁹⁵	Reservoirs in the Watershed
City of Durham	23.98	Lake Michie, Little River Reservoir
Hillsborough	1.34	Lake Ben Johnson, West Fork, Lake Orange
Orange-Alamance	0.25	Corporation Lake
Raleigh	40.97	Falls Lake
SGWASA	1.76	R.D. Holt

The price of monthly water bills at 5,000 gallons from the utilities above ranged from \$26.69 to \$47.65. The bill as a percentage of 20th percentile household income had a large variance in the burden on low-income households between jurisdictions ranging from 2.02% to 5.02%. As discussed above, values near or over 4% indicate a high burden. Therefore, customers with existing utility burdens will have less ability to pay for future rate increases, even if those rates are for a noble cause, such as watershed management.

Table 9: Average drinking water bill and affordability considerations for Falls Lake utilities

Drinking Water Utility	Monthly Water Bill at 5,000 gallons	20 th Percentile Household Income	% 20 th Percentile Household Income
City of Durham	\$26.69	\$13,808	2.32%
Hillsborough	\$46.30	\$14,011	3.97%
Orange-Alamance	\$45.50	\$10,867	5.02%
Raleigh	\$29.72 ⁹⁶	\$17,657	2.02%
SGWASA	\$47.65	\$20,427	2.80%

Revenuedshed Analysis for Falls Lake: **Baseline Revenue from Wastewater**

Falls Lake has three utilities with NPDES wastewater discharge permits: the City of Durham, Hillsborough, and SGWASA. The City of Durham has two wastewater plants; The North Durham Reclamation Facility discharges into Ellerbe Creek in the Falls Lake Watershed, while the South Durham Reclamation Facility discharges into New Hope Creek in the Jordan Lake Watershed. The North Facility discharges 10.7 MGD on average, while the South Facility discharges 9.04 MGD; therefore, this analysis

⁹⁵ 2020 NC DEQ Local Water Supply Plans. <https://www.ncwater.org/WUDC/app/LWSP/search.php>

⁹⁶ Bill for Raleigh, Garner, Rolesville, Wake Forest, and Knightdale

assumed 54 percent of Durham’s wastewater flows into the Falls Lake watershed. Hillsborough discharges into the Eno River and SGWASA into Knapp of Reeds Creek, both in the Falls Lake Reservoir.

Existing monthly wastewater bills among these three utilities ranged from \$37.99 to \$83.32 per month for 5,000 gallons. The bill as a percentage of 20th percentile household income ranged from 3.3% to 5.86%, indicating both a large variance and for some counties, a high burden.

Table 10: Average wastewater bill and affordability considerations for Falls Lake utilities

Wastewater Utility	Monthly Water Bill at 5,000 gallons	20th Percentile Household Income	% 20th Percentile Household Income
City of Durham	\$37.99	\$13,808	3.30%
Hillsborough	\$68.46	\$14,011	5.86%
SGWASA	\$83.32	\$20,427	4.89%

*Revenued Analysis for Falls Lake: **Baseline Revenue from Stormwater***

Ten stormwater utilities with stormwater systems are either completely or partially within the Falls Lake Watershed (Table 11). The utilities are comprised of seven city utilities and three county utilities. Person and Granville counties have separate stormwater fee structures for properties inside and outside the Falls Lake Watershed.

Table 11: Average stormwater bill for Falls Lake utilities

Stormwater Utility	Monthly Residential Bill (3,000 sq ft impervious)
Butner	\$5.58
Creedmoor	\$8.92
Durham	\$7.25
Durham County	\$2.00
Granville County	\$1.50
Hillsborough	\$6.25
Person County	\$1.33
Raleigh	\$5.00
Roxboro	\$1.50
Stem	\$7.33

*Revenued Analysis for Falls Lake: **Scenario Building and Revenued Funds***

The EFC incorporated the data above into the Revenued Tool, allowing multiple fund-raising scenarios to be compared side by side and in conjunction. The EFC demoed each portion of the Revenued tool to model a replicable step-by-step process. In the demo, only one rate-raising technique and funding method were modeled at a time; however, more than one technique and funding method can be modeled when using the tool.

The tool is publicly accessible here:

<https://public.tableau.com/app/profile/efcatunc/viz/FallsLake/Introduction?publish=yes>

Introduction

Introduction	Participants	Water	Wastewater	Stormwater	Property Tax
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Falls Lake Revenued

What is a Revenued?
A revenued describes the area within which revenue is generated for protection of the Falls Lake Watershed.

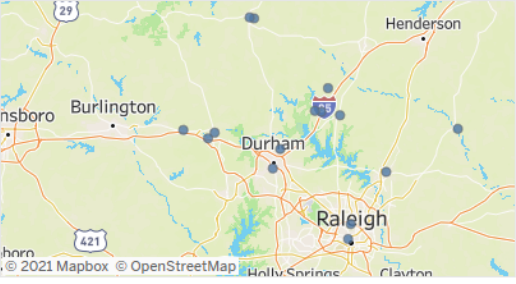
Enter Project Goals:

How would you like to pay for the project?

Enter Cash Amount(\$):	\$1,000,000.00
Enter Loan Amount (\$):	\$0.00
Enter Interest Rate (%):	0.00%
Enter Loan Term (yrs.):	0

Explore Rate and Tax Changes:

1. Choose a project goal by selecting a loan amount, loan term, and interest rate.
2. Investigate the tabs dedicated to different revenue sources.
3. Use sliders to increase revenue supply and achieve target goal.
4. Discover how new revenue for watershed protection may affect customer bill affordability.



The *Water Quality Revenued* represents all parcels and environmental service rate payers within the Falls Lake Watershed. Potential revenue from the water quality revenued includes wastewater fees for customers whose wastewater is discharged into the watershed, stormwater fees for parcels inside the watershed, and property tax.

The *Water Supply Revenued* is made up of 3 municipalities and 1 water authority that currently use Falls Lake water. The revenue source for the water supply revenued is drinking water rates.

The *Total Revenued* is the combination of the Water Supply and Water Quality Revenueds.

The introduction tab presents a preview of the tool and provides the first steps required for its use. To begin, one must enter a project's funding cost and method. In this example, an annual \$1 million cash project was chosen. Remember that the tool is not limited to one funding method. For example, one could input both a cash and a loan amount.

Participants

Introduction **Participants** Water Wastewater Stormwater Property Tax

Participants

Choose Participating Entities:

Place

- Butner
- Creedmoor
- Durham
- Durham County
- Franklin County
- Hillsborough
- Orange County
- Orange-Alamance
- Person County
- Raleigh
- Roxboro
- South Granville Water and Sewer Authority
- Stem
- Wake County
- Wake Forest

Next, participants should be chosen for project participation. As a default, all counties are selected for participation. In the example above, all entities were selected to participate.

Water

Introduction Participants **Water** Wastewater Stormwater Property Tax

Water Rates

Change Retail Rates:

Volumetric Increase: (Increase in \$ amount per 1,000 G)

Base Charge Increase (\$):

How will changing water rates affect your bill?

Bill Increase as Percentage of 20th Percentile Annual Household Income (for 4,000 G consumption)

0.02%

Annual Revenue Raised

\$0.00

Legend: Wastewater, Water, Stormwater, Property Tax

Project Goal(\$): \$1,000,000.00

Annual Revenue Raised

Water Quality Revenueshed

Water Supply Revenueshed

Total Revenueshed

0K 500K 1000K Revenue Raised (\$)

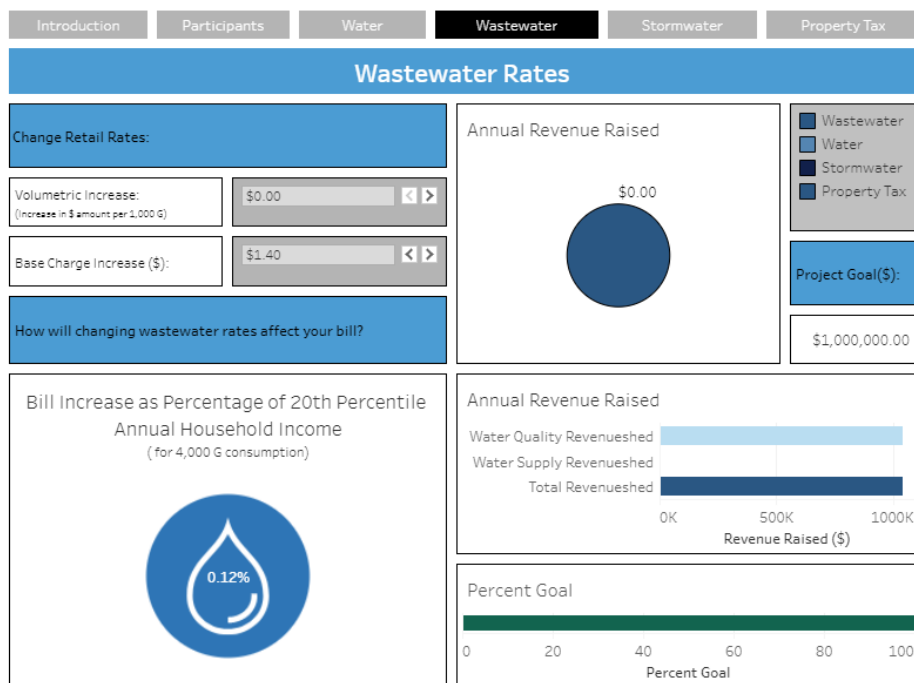
Percent Goal

0 20 40 60 80 100 Percent Goal

Water fees can be raised via two methods, 1) increasing the volumetric cost of water or 2) increasing the base charge. This tool's revenue generated through method one is calculated using the daily metered water demand from the 2020 North Carolina Local Water Supply Plans. Revenue generated through method two is calculated by raising the base rate for an estimated total number of connections.

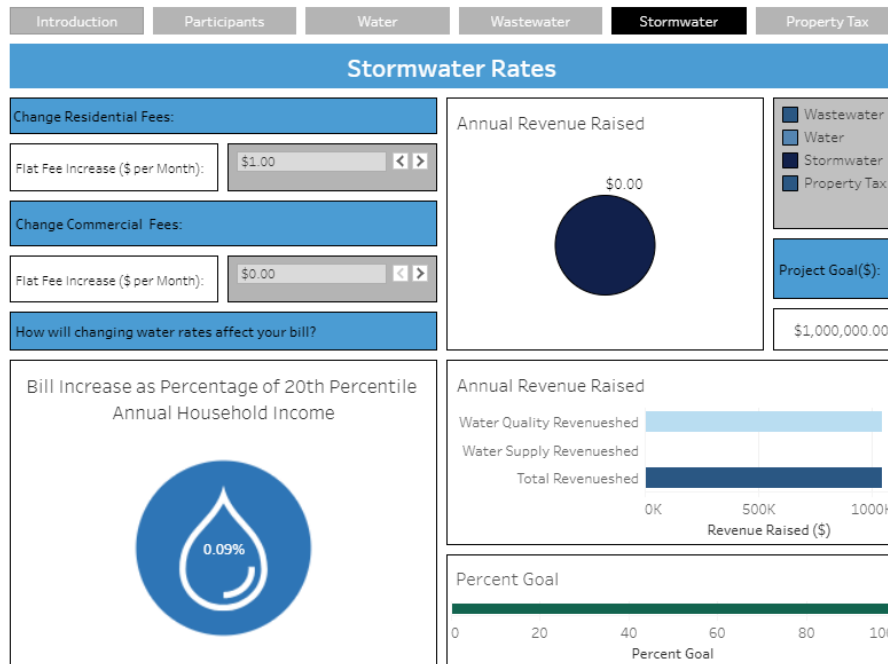
The example illustrated that to pass the annual funding goal of \$1 million, all water utilities participating needed to raise the volumetric price of water by \$0.05 every year or \$0.2 per month for every 4,000 gallons. The bill alteration was considered affordable as the resulting percent of 20th percentile annual household income metric was below 4% at 0.02%. If Raleigh does not participate in this bill alteration, which is likely as they already charge \$0.15 per thousand gallons for a watershed protection fee, the remaining water utilities would need to raise their volumetric price of water by \$0.10 per thousand gallons.

Wastewater



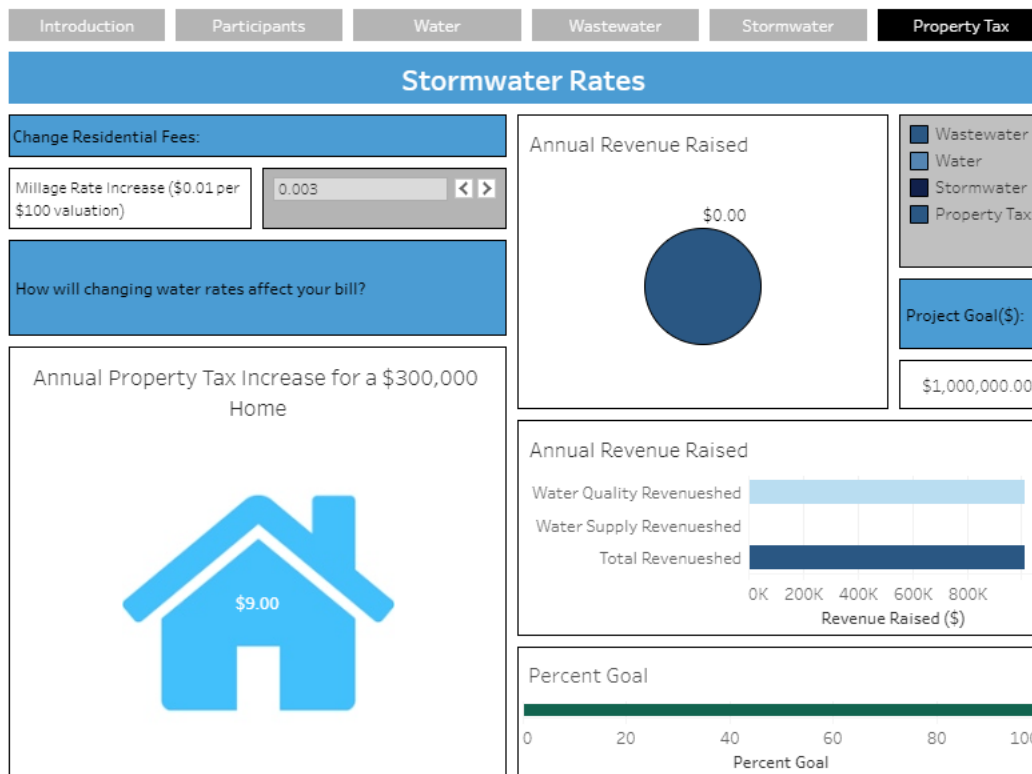
The two methods of raising wastewater are the same as for water. Revenue generated through method one for wastewater is calculated using 80% of the daily metered water demand from the 2020 North Carolina Local Water Supply Plans. This value is then multiplied by the proportion of wastewater discharged into the Upper Neuse Basin. Revenue generated through method two is calculated by raising the base rate for an estimated total number of connections.

This example illustrated that wastewater utilities would need to increase their base charge by \$1.40 per month to pass their funding goal of \$1 million. The bill alteration was considered affordable as the resulting percent of 20th percentile annual household income metric was below 4% at 0.12% among the participating wastewater utilities.



Stormwater fees can be raised through two avenues, 1) increasing residential fees or 2) increasing commercial fees. Revenue generated through both methods is based on the estimated number of residential and non-residential (non-vacant) parcels using 2020 tax parcel data from NC OneMap. Existing stormwater utilities are not limited to charging flat fees, so this is an oversimplified model. Despite the oversimplification, stormwater rates still need analysis; therefore, this model is still useful for scenario building.

This example illustrated that participating jurisdictions would need to raise residential stormwater charges by \$1.00 per month to reach the annual funding goal of \$1 million. The bill alteration was considered affordable as the resulting percent of 20th percentile annual household income metric was below 4% at 0.09%.



On the property tax tab, the millage rate can be altered on all the properties in the watershed. To calculate total revenue generation from raising property taxes, the estimated taxable value for all taxable properties in the watershed was included. These properties were generated through a GIS analysis of 2020 taxable properties from NC OneMap.

This example illustrated that all participating jurisdictions would need to raise property taxes by \$0.03 per \$100 valuation to reach their annual funding goal of \$1 million. This property tax alteration would increase \$9 per year for a \$300,000 home. It should be noted that per NC § 139-39 watershed improvement tax levies have a limit of \$0.25 per \$100.

6. Jordan Lake Management Study Impacts on Falls Lake

The Falls Lake Nutrient Management studied the policy and financial recommendations in the Jordan Lake Management Study and built upon its existing research for Falls Lake.⁹⁷

Currently Used Finance and Governance Structures in Falls Lake- Recommended by Jordan Lake

Approaches to financing nutrient management used in Jordan Lake were transferred to studies in Falls Lake. These included the creation of a voluntary watershed organization, levying aid from local

⁹⁷ <https://nutrients.web.unc.edu/wp-content/uploads/sites/19393/2019/12/Paying-for-Nutrient-Reduction-and-Management.pdf>

organizations such as the Soil and Water Conservation Districts (SWCD), levying non-designated utility charges, and creating lake models.

Jordan Lake created its Jordan Lake One Water Approach (JLOW) to allow cross-jurisdictional collaboration. It focuses on a triple-bottom-line approach to water resource management, which incorporates economic, social, and environmental considerations within water resource management and planning. JLOW is administered by the Triangle J Council of Governments (TJCOG), with collaboration from the Piedmont Triad Regional Council, and is comprised of local governments, conservation groups, university groups, water utilities, agricultural entities, and private industry stakeholders. Like JLOW's regional water structure, Falls Lake and the UNRBA also created a regional water structure by establishing the IAIA. Both JLOW and the UNRBA have partnered with outside organizations, including SWCD. SWCD has provided financial and organizational aid to jurisdictions and farmers under the Jordan Lake and Falls Lake Rules. In Falls Lake, jurisdictions have expanded on this finding by partnering with SWCD to help comply with the agriculture-specific Falls Lake Rules requirements.

Jordan Lake has also raised funds outside of partnerships through non-designated utility funds. Projects funded through utility funds mainly include stormwater projects and wastewater plant upgrades. Falls Lake also used non-designated utility funds in stormwater projects in Hillsborough, Durham, and South Granville Water and Sewer Authority (SGWASA).

Researchers expanded on Jordan Lake's models by creating the Falls Lake-specific lake model and the Revenueshed Tool. Scientists at UNC used a similar modeling method to Jordan Lake to study nutrient flows at Falls Lake. Scientists created extensive lake models incorporating water, nutrients, precipitation, and waste flow through the reservoir. The EFC created a Revenueshed Tool using the area, base utility and property fees, and jurisdictions in the Falls Lake watershed. The tool analyzes base revenue generation using the same mechanisms created in the Jordan tool.

Currently Unused Finance and Governance Approaches in Falls Lake - Recommended by Jordan Lake

Several recommendations for financing Jordan Lake remain to be used in Falls Lake. These include the institution of a property tax, stormwater district tax, sales tax, business improvement district tax, property assessments, CLASIC analysis, a structure like the Maryland Bay Restoration Fee, and introducing a different financing structure for multi-jurisdictional water management organizations.

The most complex and least studied of the recommendations is the latter point. The EFC expanded its analysis of this topic in year four. The Jordan Lake Study uncovered that the watershed had fragmented financing mechanisms and existing funding structures that did not guarantee long-term funding. In response to these findings, the Jordan Lake Study offered four overarching mechanisms to alter existing finance methods which required varying degrees of policy changes to implement. The methods included 1) using the existing financing framework, 2) expanding the existing financing framework, 3) implementing watershed fees or taxes, and 4) implementing a regional watershed utility. These mechanisms were supplemented with additional considerations when implementing any financing method. The considerations included combing the four financing methods, altering the TMDL and receiving designation as a 4b waterbody, considering voluntary, voluntary plus, or mandatory participation structure in a nutrient management program, and being aware of equity concerns.

The UNRBA and EFC applied these recommendations to Falls Lake. Stage I ED of the Falls Lake Rules is funded through an existing and expanded financing framework. Jurisdictions have used existing

structures such as water, sewer, and stormwater fees. Jurisdictions have also expanded existing frameworks by creating and investing in joint management agencies or joining interlocal agreements. The Falls Lake Nutrient Management Study also operates under a 4b demonstration plan.⁹⁸ The EFC has analyzed affordability and equity concerns in financing nutrient management and provided methods to mitigate identified concerns as shown in this study. Lastly, the IAIA operates under a voluntary plus-participation structure. They use both an incentive and a disincentive to join the program. Research at Jordan Lake concluded that using a voluntary plus or mandatory framework over strictly voluntary is more financially and environmentally effective. Mandatory and voluntary plus approaches are as follows.

Mandatory: All jurisdictions within a watershed district are required to comply with regulations once the district is formed.

Voluntary-Plus Disincentive: A fully voluntary program which offers a disincentive to not joining. For example, Catawba Wateree regional watershed authority. The authority requires membership fees to join and helps to raise funds for watershed management. Nonmembers must pay a water withdrawal fee. The UNRBA's IAIA is another example. While membership is voluntary, non-member jurisdictions in Falls Lake must submit nutrient-loading compliance plans to the EPA. The IAIA membership provides an alternative financial-based compliance mechanism.

Voluntary-Plus Incentive: A fully voluntary program which offers incentives to join. For example, the UNRBA. Members receive connections to state organizations and policymakers they might not have had before. Additionally, jurisdictions have the chance to participate in consensus agreements. This is very successful, as 19 of the 20 possible members have joined and pay dues.

Voluntary: Fully voluntary with no incentives or disincentives to join. For example, in Iowa, WMAs must gain full consensus from members before levying a tax or instituting membership dues for self-funding, limiting potential revenue generation.

In year one of research at Falls Lake, the EFC analyzed the existence of similar fragmentation and long-term funding in the watershed. It was determined that the UNRBA and IAIA significantly reduced the fragmentation of financial planning and spending on nutrient management; however, the UNRBA uncovered issues in guaranteeing long-term funding for nutrient management. The UNRBA and IAIA are both voluntary programs with incentives and disincentives. While they have been successful in overshooting credits required for Stage I ED, they are still voluntary programs. If a large supporter like Raleigh left, financing nutrient management would be a large burden to existing members. Therefore, work is underway to consider the transition from voluntary to mandatory participation in nutrient management programs. Dan McLawhorn is currently researching policy methods to ensure future financing of Falls Lake Nutrient Management. In year four, the EFC explored the financial implications of Dan's policy recommendations.

⁹⁸ <https://www.deq.nc.gov/about/divisions/water-resources/water-planning/modeling-assessment/tmdl-alternative/approved-tmdl-alternatives>

7. Structures for Secure and Long-term Funding for Nutrient Management

As the areas surrounding water bodies urbanize, the expansion adds to the adverse impacts of nutrients that pollute water bodies and the ability to mitigate water quality impairment. Currently, rules are placed on a polluter-pays approach which creates disparities in funding for different local governments as it regulates discharges of areas surrounding upstream waterbodies. With this approach, use is not on par with the funding allocated to pay, inflicting a huge financial burden.⁹⁹ In downstream communities, like Raleigh, near the dam for reservoirs, the footprint in the Falls basin is small, resulting in less financial responsibility for nutrient remediation than the benefit obtained from the water body.⁹⁹ Oppositely, upstream governments have limited access, which results in higher costs for remedial implementation.⁹⁹ When creating a budget for nutrient reduction, an economic burden arises as regulation for improved water supply that falls on regulated upstream governments would be exclusively for downstream populations. Along with these funding deficiencies, the time and effort in the evaluation and modeling needed to satisfy water quality standards are deficient to the staffing available for this project, leaving a need for better distribution of prioritization measures.⁹⁹ Overall, there are two issues with the future funding of Falls Lake. These issues include regulatory approaches to how nutrient control can be managed and how funding should be allocated based on production.

Local-Government Coalition Formation

Upholding nutrient standards is a long and time-intensive implementation process which can be overburdening if designated to just one agency.⁹⁹ The process includes years of modeling and evaluation for each water body and requires processes to adopt the rules. To better alleviate these demands, site-specific standards may be helpful to diminish any impacts on the environment or the economy that could arise from general applications of nutrient budgeting that would be performed. To manage site-specific standards, a collaboration between local governments and the state in the form of a coalition can be created. These coalitions could ease any burdens by taking localized approaches to the long-term implementation of nutrient strategies and avoiding litigation threats by having the availability to enforce multiple regulatory requirements at one time. With the creation of a coalition of local governments and the state agency, the coalition could be formed into a non-profit organization that creates a long-term strategy for a watershed plan. This plan will allow local leaders to prioritize specific projects for their area that can then be evaluated, monitored, and presented to the agency for enforcement. It will ultimately be a long-term strategy for enhancing and restoring the water bodies in their designated area, including methods for nutrient reduction. The water quality plan will focus on a specific site area, usually a watershed. It will be comprehensive to address the long-range need of measures to protect and enhance the designated area.⁹⁹

The plan would uphold legislative findings as well as the goals and policies in General Assembly statute NC 143-214.14. A framework is established to encourage state-local pollutant reduction strategies under the supervision and coordination of the commission with the goal of the state adopting water quality protection plans developed from the state-local cooperation. The framework can be expanded to ensure compliance with the plans and legislation set forth by the statute of NC 143-214.14 with each local government being subject to removal, and other penalties per Article 21 of Chapter 143,

⁹⁹ The Sisyphean Dilemma: Can Amending the Falls Lake Rules Result in Achieving the Nutrient Water Quality Standards? Daniel F. McLawhorn Daniel F. McLawhorn Law Office, PLLC

if they fail to implement the plan set by the coalition. Amendments can also include other consequences if there is a failure to abide by the coalition agreement. These consequences would include barring the local government from accessing state grants or loans except for projects designed to bring political subdivision or local water authority into compliance with basin requirements.⁹⁹ This would remedy problems that arise with membership fees that are used to ensure compliance with the Falls Lake Rules. Implementing strategies such as local government coalitions is supported by the EPA. It is an opportunity to create a plan for long-term strategies for water quality issues and empowerment of local governments and their flexibility regarding other water quality issues. Several successful coalitions are detailed below.

Choctawhatchee, Pea, and Yellow Rivers Watershed Management Plan

The Choctawhatchee, Pea, and Yellow Rivers watersheds cover southeast Alabama. The mission of the watershed management authority, CPYRWMA, is to develop and execute plans and programs related to water resource management within the watersheds. The watershed management authority was established through Alabama legislature Public Law 91-602 for entities to “protect and manage the watersheds of this state.” The Watershed Management Plan provides a framework to assist federal, state, and local officials and agencies.¹⁰⁰ The CPYRWMA is governed by a Board of Directors composed of sixteen volunteer directors representing local governments within watershed boundaries. Directors serve four-year terms and receive no salaries but are reimbursed for actual and necessary expenditures incurred in performing their duties. The Watershed Management Authority concept is closely tied with SWCD. Public Law 91-602 Section 9-10A-6 states that petitions to create Watershed Management Authorities must be filed with the Board of Supervisors of the SWCD for counties containing watersheds included in the petition. The law (Section 9-10A-9, 10) also states that the SWCD Board of Supervisors shall determine the number of Directors and shall elect or appoint Directors to the Watershed Management Authority¹⁰⁰.¹⁰⁰ Soil and water conservation districts receive funding from various sources such as state and federal funding. On local levels, county governments may also fund specific projects and overhead costs. Additional funding is available through low-interest loans or tax credits, such as an irrigation tax.¹⁰⁰ To address and improve water quality, the CPYRWMA commissions water quality monitoring projects to track conditions related to nutrient concentrations and sedimentation rates and disclose findings. The CPYRWMA sponsors and funds local projects designed to control erosion and sedimentation and work with partners to promote stream and habitat restoration projects.¹⁰⁰

Minnesota Watershed Management Organizations

The Minnesota legislature approved the Metropolitan Area Surface Water Management Act in 1982.¹⁰¹ This act requires local governments in the Metro area to prepare and implement comprehensive surface water management plans through membership in a Watershed Management Organization (WMO). The WMO can be organized by joint powers' agreements between cities and townships within the watershed. It also can be organized as a watershed district under Minnesota statutes 103B-D.¹⁰¹ The statutes highlight that a Metropolitan Water Management Program has the

¹⁰⁰ https://cpyrwma.alabama.gov/wp-content/uploads/2017/07/00-CPYR-WMP_webready.compressed.pdf

¹⁰¹ [https://bwsr.state.mn.us/watershed-management-organizations#:~:text=In%201982%2C%20the%20Minnesota%20Legislature,Watershed%20Management%20Organization%20\(WMO\).](https://bwsr.state.mn.us/watershed-management-organizations#:~:text=In%201982%2C%20the%20Minnesota%20Legislature,Watershed%20Management%20Organization%20(WMO).)

purpose of protecting and preserving water while also minimizing public capital expenditures to correct quality and establish more control and policy for management.¹⁰¹

The WMO can:

- Prepare, adopt, and implement a plan for the watershed.
- Review and approve local water management plans.
- Regulate the use and development of land in the watershed.
- Accept the transfer of drainage systems in the watershed to repair, improve, and maintain the transferred drainage systems, and to construct all new drainage systems and improvements of existing drainage systems in the watershed.
- Adopt a budget and decide on the total amount necessary to be raised from ad valorem tax levies to meet the budget.
- Certify its budget with the auditor of each county having territory within the joint powers' watershed management organization
- Approved assessment statements with each affected county; and
- Other powers necessary to exercise authority include entering contracts to perform functions with governmental units or persons.

Tax Implementation

The current system of allocation of fees based on use has created inequities. Governments with protected water supplies do not necessarily support the cost of the water supply even when they are receiving benefits. If a general state tax were implemented to raise revenue to address nutrient management, then both polluters and non-polluters would have to pay.¹⁰² To create a more equitable system of constant funding, the state or municipalities can consider imposing a tax on water users who rely on the supply and those who contribute to nutrient runoff.

Solid Waste Tax

In implementing water quality plans, a solid waste tax on local governments that benefit from the water supply for remediation costs should be imposed to ensure that current inequities are addressed, and the long-term process for water quality improvement is expedited.¹⁰² According to Article V, this tax can be imposed statewide by the General Assembly as there is no incentive for local governments, and it would avoid any risks that could be barred by the constitution.¹⁰³ This tax would resemble contamination issues addressed in Solid Waste Amendments in 2009. The General Assembly adopted a tax on new shipments of solid waste to landfills (N.C. Gen. Stat. 105187.61.), an amendment to a polluter pays principal situation of cleanup costs falling on entities who created and used landfills for waste disposal.¹⁰⁴ In the nutrient reduction case, stormwater fees are currently used to derive funds for nutrient loading reduction.¹⁰² The improvements in solid waste placed a focus on liability for remediation costs. For water quality improvements, legislation directing local governments to cover environmental remediation costs for impaired drinking water would be useful to incorporate. The tax

¹⁰² Addressing Inequity from Polluter Pays Principle, Daniel F. McLawhorn Daniel F. McLawhorn Law Office, PLLC [Manuscript in preparation]

¹⁰³ <https://www.ncleg.gov/Laws/Constitution/Article2>

¹⁰⁴ N.C. Gen. Stat. 105187.61

rate of 3% would be billed monthly for water service, including the monthly bill by Raleigh to other local governments contracting for water supply from the reservoir.¹⁰² Funding from the tax will be able to be distributed to various local governments in the basin to help with their compliance costs should burdens or disparities arise. New watershed management fees can help reduce equity burdens and help the burdens of utilities by providing a collaborative effort, such as stormwater utilities being used as a channel for watershed improvement fees. This also allows more of a localized effort on projects to address issues not driven by regulation. For districts and boundaries that contain parts of watersheds, there can be flexibility in pooling funds that limit one watershed to do.¹⁰²

Sales Tax

As mentioned in the *Paying for Nutrient Reduction and Management in Jordan Lake report*, jurisdictions can utilize a portion of sales tax revenues for nutrient management.⁴²**Error! Bookmark not defined.** They cannot, however, increase sales tax to generate additional revenue for nutrient management. Various mechanisms specifically target certain watershed management projects, but problems arise with sales tax allocated to non-related spending. In Iowa, a Natural Resources and Outdoor Trust Fund was implemented in 2011 as part of the Invest in Iowa Act to aid water quality, trails, and other projects. This fund would be a permanent and constant protected funding source as money is exclusively appropriated by law to protect and enhance the state's water quality and natural areas. While this fund is for the general application of natural resources, all funding vehicles support water protection measures and can still be a satisfactory way of paying for remediation.¹⁰⁵ A rate of 3/8 of one percent of sales tax revenue the next time Iowa approves a sales tax increase would be implemented. For any other funding recommendations requested, the new funding would supplement current allocations not replace them.¹⁰⁵ In North Carolina, the courts have established a set of tests for tax legislation to assure its compliance with the limits in the Constitution. The tax must be used for a "public purpose," meaning it should be uniformly applied within the classification of taxpayers; and be based on a classification based on reasonable, and not arbitrary distinctions.¹⁰²

Specific water protection measures that are held as funding vehicles in the Iowa Natural Resources and Outdoor Trust Fund and can possibly be used as a model for the North Carolina sales tax include:

Lake Restoration- 7%- Restoring water quality to promote safe and healthy lakes by implementing lake and watershed restoration efforts through projects that utilize local collaborative long-term improvement projects.¹⁰⁵

Trails- 10%- Recreational trails enhance the area's quality of life by promoting active lifestyles. The design and maintenance of trails help fix erosion problems that result in increased suspended sediment in water bodies.¹⁰⁵

REAP (Resource Enhancement and Protection program) - 13%- Investment in the enhancement and protection of the state's natural and cultural resources. Establishes conservation practices and buffer strips, wetlands, and roadside prairies for water quality improvement.¹⁰⁵

Local Conservation Partnership program- 13%- Sustainable funding support for infrastructure, habitat conservation techniques, and nature outreach. It is done by education and cooperation of the local community with state or federal governments to carry out the initiative. Such initiatives include enhancing the ability of non-governmental organizations to partner with the

¹⁰⁵ <https://www.iowadnr.gov/Portals/idnr/uploads/sf/SF%20NRAOR%20TF%20Rpt%202020%20Due%2011521.pdf>

state, county conservation boards, and cities to develop projects that will improve the public spaces of the state and better overall awareness to the public.¹⁰⁵¹⁰⁵

Watershed Protection-14%- A specifically dedicated account to watershed protection that funds water resource projects that protect, restore, or enhance water quality by giving financial assistance to communities for impairment-based, locally directed watershed projects. Initiatives include cleaner point and non-point source protection and improving water supplies for lower cleanup and treatment costs. Also, local partnerships for more active watershed protections.¹⁰⁵

20% Soil Conservation and Water Protection (IDALS) - 20%- Proper land management that is consistent with the land's capability to sustain agriculture, preserve the state's natural resources, and protect infrastructure. Failure to comply results in water degradation as programs dedicated to conservation help with funding a watershed protection program that reduces sediment and nutrient delivery to water bodies by accelerating watershed assessment, planning, implementation, and other measures for waterways and wetlands.¹⁰⁵

Natural Resources (DNR)- 23% - Management of natural resources so that they are sustained for future generations. Includes aquatic and terrestrial invasive species management and improvement of wildlife habitats in lakes and streams by addressing urbanization impacts. Also, improvements to critical infrastructure needs of water and sewer for regulation, safety, and accessibility.¹⁰⁵

Conclusions

During the first two years of this study, the EFC focused on evaluating the efforts made by local governments, nonprofit organizations, and the State of North Carolina to finance nutrient management in the Falls Lake watershed. It was observed that high costs and interpretation of rules posed significant challenges to rule compliance. Therefore, it is unsurprising that the EFC found that much of their attention was given to addressing these obstacles. As a result of the complications faced by rule compliance, the current financing mechanisms were found to be highly collaborative and innovative. In years three and four, the EFC conducted further research to identify financial strategies that could mitigate and overcome the existing barriers to compliance. The study found that, like Jordan Lake, there was no single solution for financing nutrient management. Instead, several strategies must be implemented in conjunction to achieve the desired outcomes.

This report aims to highlight these valuable resources, enabling decision-makers to customize their approach based on the unique circumstances in North Carolina. There are various options for implementing new fundraising methods at both the local and legislative levels; however, it should be noted that aspects of affordability must be considered for each method. The successful fundraising methods identified by the study include widening revenue creating jurisdictional areas, implementing fees or taxes for water quality protection, building partnerships and inter-jurisdictional organizations, prioritizing projects with the most benefits, and developing regional approaches to watershed management. To manage affordability, the study suggests utilizing metrics highlighting the impact on the lower percentile, state and federal DAC identifying tools, state and federal DAC grants, the EFC's Revenueshed Tool, and utility programs.

Implementing these strategies has the potential to significantly increase the funding of nutrient management in the Falls Lake watershed, providing a long-term and effective solution for the future.



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