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REQUEST FOR PROPOSALS (RFP)

Linking Nutrient Reductions to Receiving Water Responses (RFP 5078)

Due Date: Proposals must be received by 2:00 pm Mountain Time on
Thursday, October 15, 2020

WRF Project Contact: Lola Olabode, lolabode@waterrf.org

Project Sponsors

This project is funded by The Water Research Foundation (WRF) as part of WRF's Research Priority Program.

Project Objectives

The objective of this project is to evaluate and quantify the effects of nutrient loading reduction strategies on observed changes in key water quality and biological response variables that meet desired water quality goals.

Budget

Applicants may request up to \$150,000 in WRF funds for this project. WRF funds requested and total project value are evaluation criteria considered in the proposal selection process.

Background and Project Rationale

Excessive nutrient loading to receiving waters is one of the most widespread, costly, and challenging water quality management issues in the United States. The U.S. Environmental Protection Agency (EPA) identifies over 15,000 waterbodies within the U.S. that are impaired for nutrients, with up to 78% of coastal waters exhibiting cultural eutrophication symptoms. Nutrient over-enrichment can manifest itself in many ways that endanger human health and ecosystems, including excessive algal growth, cyanobacterial harmful algal blooms (cHABs), hypoxia, loss of biological diversity, and invasive species. Setting scientifically sound nutrient management goals (e.g., through Total Maximum Daily Loads [TMDLs], site-specific numeric criteria, or watershed management plans and targets) or biological condition (e.g., biodiversity) benchmarks that produce ecologically relevant outcomes remain among the highest-profile challenges facing states and the regulated community.

Increased nutrient loading comes from multiple anthropogenic sources such as direct point source discharges from wastewater treatment and industrial activities, nonpoint source runoff from urban and agricultural land uses, and atmospheric deposition. Disruption of structural features in the watershed, such as conversion of natural forest and wetland cover to other uses, especially in sensitive buffer areas, can alter functions that reduce mitigative capacity and, thus, increase nutrient loading to receiving waters and contribute to losses of aquatic ecosystem integrity and beneficial uses. High levels of

nutrients in sediment or in groundwater from past loadings may continue to leach into, or cycle within, waterbodies, impacting them many years after the sources have been removed.

Local governments are challenged to reduce nutrient contributions to achieve desired receiving water quality goals. Often, nutrient reduction needs push the limits of current nutrient removal technologies but continue to exceed watershed and receiving water assimilative capacity and potential for recovery. These situations can require substantial financial resources that stretch or exceed limits of the affected communities' capital and long-term operational investments and expenditures. The water quality and/or biological improvements associated with nutrient reductions vary considerably, with some waterbodies showing direct and measurable improvement and others exhibiting limited to no changes and failing to attain standards or management goals.

With the uncertainty of receiving water responses to reductions in nutrient loading, and the varying waterbody targets, the regulated community would significantly benefit from additional assessment and an expanded database of knowledge on nutrient reductions and responses based on both successes and failures (lessons learned) from actual case studies. Thus, the overall objective/goal of WRF's Linkages in Receiving Water Quality (LINK) Research Area is to enable the water quality community to fully participate in the development and implementation (including permitting) of water-quality-based discharge standards (principally nutrients) by developing independent methods for confirming linkages between receiving water quality, wastewater discharges, and other sources, including landscape contributions, in the next 3 - 5 years.

Through previous and ongoing WRF research projects, substantial progress has been made in understanding nutrient response relationships in receiving waters using tools such as water quality models. For example, WRF and its researchers, alongside state agencies, permit holders, and decision makers, have utilized the WRF Nutrient Modeling Toolbox (NMT) as an option to link nutrient management strategies to ecological response indicators for aquatic systems. Applicants are encouraged to review the reports included in the References and Resources section below for details on the genesis and direction of the LINK research area. The reports provide findings and progress on the foundational understanding, direction, and evolution of management tools that a successful proposal should build upon for this project, including identification of potential candidate case studies and recommendations for knowledgebase improvements that emphasize site-specific applications.

While these projects and tools are helpful in determining what data are required to predict receiving water responses to nutrient reductions, there is a continuing and expanding need to evaluate post-nutrient-reduction conditions using defined and measured receiving water response variables and indicators that demonstrate improvement from pre-nutrient-reduction conditions and target attainment. This information can then be used to inform and refine model developments, provide a sound technical basis for nutrient reduction targeting, and provide a more robust data-driven guideline for defining costs and benefits when planning capital water quality improvement projects or comprehensive watershed management plans. Benchmarking responses for various scenarios that might include a natural or historical benchmark, a current condition, and a target benchmark condition that meets standards or goals, is a potential alternative to typical stressor-response relationships, especially for site-specific applications and bio-conditional outcomes that integrate many stressors and provide context for nutrient management.

Comprehensive evaluation of receiving water responses to nutrient reduction efforts in a step-wise or adaptive process can be a more cost-effective and economically and environmentally sustainable

method to achieve receiving water quality goals. For example, in 2012, the State of Colorado Water Quality Control Commission adopted Regulation #85 – Nutrient Management Control Regulation (CCR 2012) for the adoption of technology-based nitrogen and phosphorus effluent limitations for municipal and industrial discharges. One intent of the regulation was to take the first step in nutrient reductions and evaluate the receiving water responses prior to requiring more advanced nutrient removal treatment. Additionally, local governments that undertake substantial capital improvements to achieve advanced nutrient removal can modify how they operate their water resource recovery facilities (e.g., modify chemical addition, aeration, etc.), which can result in long-term operation and maintenance savings. While this relatively straightforward relationship between sewage and industrial discharge provides a good conceptual example of project interests specific to nutrients, the much more complex interaction of stormwater and nonpoint source stressors and effects on an integrated watershed basis, aimed at bio-conditional or bio-integrity outcomes, is of prime importance as well.

Importantly, the context of the watershed and aquatic ecosystem is essential to effective management and will require consideration of biological indicators and endpoints to successfully achieve healthy water outcomes and meet Clean Water Act goals for collective physical, chemical, and biological integrity.

The target audiences for this project include utilities (especially small and medium sized); water ratepayers; state, regional, and municipal water quality managers; water quality regulators; watershed managers; and members of the public; all of whom would greatly benefit from a current state of collective knowledge and the decision support it will provide.

Research Approach

The primary task of this project is to assemble multiple case studies on work completed by local and state entities that have invested in capital improvements and demonstrably reduced nutrient discharges. Concurrently, the project should assess receiving water quality and ecological responses that may include integrated chemical, physical, and biological attributes (e.g., by measuring multiple response variables) linked to the nutrient reductions and effectiveness of the practices.

The focus should be on cases with TMDLs (or similar targets) or watershed management plan implementation, and approaches that have reliably demonstrated target attainment, including statistical significance testing if appropriate. Important lessons may also be learned from projects that failed to demonstrate significant progress towards water quality targets; applicants may also choose to highlight these case studies when they are informative and contribute to the project objectives.

This project is intended to leverage and build on WRF and other bodies of work (see References and Resources), experiences, lessons learned, and observations to advance the technical water quality knowledge base and reduce the uncertainties needed to make collaborative management decisions. Proposers are encouraged to review the report, [*Linking Receiving Water Impacts to Sources and to Water Quality Management Decisions: Using Nutrients as an Initial Case Study*](#) (WERF3C10), for a detailed example of a case study assessment positioned in Florida, and a thorough assessment of nutrient sources, impacts, management options, and benefits of controls that captures the intent and objectives of this RFP. The report also identifies many knowledge gaps that WRF hopes to fill with this project.

Criteria to be considered when selecting the case studies include:

- Well-defined sampling set. Clear and measurable reductions in nutrient loads to the receiving water that provide a sound basis for linking nutrient response to reduction. Specify how much data was collected over how many years and how long it took to establish with confidence the relationship between nutrient reductions and water quality or ecological responses.
- Robust receiving water baseline water quality data that include key nutrient and biological stressor and response variables, prior to and after implementing technology-based or enhanced nutrient removal technologies or watershed management actions.
- Target values and indicators that are well-described and subject to robust statistical analyses. Where possible, improvements must be documented to show significant reductions and the meeting of water quality target(s).
- Locations representative of a variety of geographies, biogeophysical conditions, and degrees of impairment, or reference conditions and ancillary data to support these attributes, if feasible.
- Clearly identified range of monitored examples of green/gray infrastructure (e.g., engineered wetlands) and non-engineered management practices, including landscape restoration and management actions that provide structural and functional integrity to the watershed as part of the nutrient mitigation efforts.
- Projects that employ a generalized stressor gradient based on nutrient loadings and both nutrient and biological responses as indicators of the effect of nutrient enrichment, including tiered aquatic life use support in the mix of case studies. Applicants should consult the EPA *Practitioner's Guide* (EPA 2016) and its application to nutrient control.
- Recovery potential in the watershed assessed with respect to case study nutrient and bio-condition targets for use attainability and best attainable condition limitations.
- Costs and justifications included in the assessment (i.e., estimated or actual costs to achieve nutrient removal and operation and maintenance costs).

This RFP also encourages flexibility in the research approach to encourage creativity and originality from proposers to leverage existing bodies of work for the most cost-effective deliverable to the end-users (ratepayers, utilities, water quality managers, and water quality regulators). Proposers should describe how they would conduct the research to meet the objectives listed above outlining the rationale behind the waterbody/sites selected and the criteria used, if not highlighted above. Proposers should also state (in a table) the percent time each key team member would spend on each task they will be involved in. The case studies selected could be sample sets of non-structural efforts, structural practices, or a mix. Proposed frameworks should include the right assortment of chemical/physical and biological response variables that can be linked back to TMDL, water quality criteria, and/or National Pollutant Discharge Elimination System (NPDES) requirements. The proposed approach mentioned above is intended as a starting point.

Expected Deliverables

A minimal set of deliverables from this project may include:

- Case Studies: A compilation of case studies including clearly identified approaches; lessons learned; observations; and a matrix of attributes, actions, and outcomes essential to project objectives)
- Final Report. The proposal should include an outline of the final report, consistent with the scope of the research project that includes:
 - Methods used to link and demonstrate efficacy of the nutrient reduction technology (or approach) to water quality metrics to the extent practicable.

- Identified factors contributing to success or failure of methods, such as data gaps or deficiencies in the case studies and with respect to specific engineered/non-engineered technologies or approaches.
- Analysis of the cost/benefit/effectiveness of the types of nutrient reduction efforts presented in the case studies.
- Measured or estimated co-benefits associated with various technologies.
- Time period required to demonstrate whether the nutrient mitigation and management efforts met the water quality goals, or if the TMDL specified met the desired goals. How long it took to demonstrate confidence in the management decisions.
- Fact Sheet, Infographics, and Peer Reviewed Journal Article
- Webcast, Conference Presentation, Field Demonstration

Communication Plan

Please review WRF's *Project Deliverable Guidelines* for information on preparing a communication plan. The guidelines are available at <https://www.waterrf.org/project-report-guidelines>. Conference presentations, webcasts, peer review publication submissions, and other forms of project information dissemination are typically encouraged.

Project Duration

The anticipated period of performance for this project is 24 months from the contract start date.

References and Resources

The following list includes examples of research reports, tools, and other resources that may be helpful to proposers. It is not intended to be comprehensive, nor is it a required list for consideration.

Project List

Ongoing project:

- Roadmap Workshop on Prioritizing Permitting and Linkages Research in Water Quality (5038) (contact lolabode@waterrf.org to request Roadmap summary)

Completed projects:

- [Screening-Level Modeling of Site-Specific Nutrient Responses: Demonstrations](#)
- [Establishing Methods for Numeric Nutrient Target-Setting](#)
- [Developing Site-Specific Nutrient Goals – Demonstration: Boulder Creek, Colorado](#)
- [Modeling Guidance for Developing Site-Specific Nutrient Goals](#)
- [Nutrient Modeling Toolbox \(NMT\) and Guidance Bundle](#)
- [Linking Receiving Water Impacts to Sources and to Water Quality Management Decisions: Using Nutrients as an Initial Case Study](#)

References

CCR (Colorado Code of Regulations. 2012. "5 CCR 1002-85. Regulation #85: Nutrients Management Control Regulation." <https://drive.google.com/file/d/1Vu85mWGbYJg-6iTV22HI6QId0f-EGBBL/view>.

EPA (U.S. Environmental Protection Agency. 2016. [A Practitioner's Guide to the Biological Condition Gradient: A Framework to Describe Incremental Change in Aquatic Ecosystems](#). EPA-842-R-16-001. U.S. Environmental Protection Agency, Washington, DC.

Proposal Evaluation Criteria

The following criteria will be used to evaluate proposals:

- Understanding the Problem and Responsiveness to RFP (maximum 20 points)
- Technical and Scientific Merit (maximum 30 points)
- Qualifications, Capabilities, and Management (maximum 20 points)
- Communication Plan, Deliverables, and Applicability (maximum 15 points)
- Budget and Schedule (maximum 15 points)

Proposal Preparation Instructions

Proposals submitted in response to this RFP must be prepared in accordance with the WRF document *Guidelines for Research Priority Program Proposals*. The current version of these guidelines is available at <https://www.waterrf.org/proposal-guidelines>, along with *Instructions for Budget Preparation*. The guidelines contain instructions for the technical aspects, financial statements, indirect costs, and administrative requirements that the applicant must follow when preparing a proposal.

Eligibility to Submit Proposals

Proposals will be accepted from domestic or international entities, including educational institutions, research organizations, governmental agencies, and consultants or other for-profit entities.

WRF's Board of Directors has established a Timeliness Policy that addresses researcher adherence to the project schedule. The policy can be reviewed at <https://www.waterrf.org/policies>. Researchers who are late on any ongoing WRF-sponsored studies without approved no-cost extensions are not eligible to be named participants in any proposals. Direct any questions about eligibility to the WRF project contact listed at the top of this RFP.

Administrative, Cost, and Audit Standards

WRF's research program standards for administrative, cost, and audit compliance are based upon, and comply with, Office of Management and Budget (OMB) Uniform Grants Guidance (UGG), 2 CFR Part 200 Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, and 48 CFR 31.2 Contracts with Commercial Organizations. These standards are referenced in WRF's *Guidelines for Research Priority Program Proposals*, and include specific guidelines outlining the requirements for indirect cost negotiation agreements, financial statements, and the Statement of Direct Labor, Fringe Benefits, and General Overhead. Inclusion of indirect costs must be substantiated by a negotiated agreement or appropriate Statement of Direct Labor, Fringe Benefits, and General Overhead. Well in advance of preparing the proposal, your research and financial staff should review the detailed instructions included in WRF's *Guidelines for Research Priority Program Proposals* and consult the *Instructions for Budget Preparation*, both available at <https://www.waterrf.org/proposal-guidelines>.

Budget and Funding Information

The maximum funding available from WRF for this project is \$150,000. The applicant must contribute additional resources equivalent to at least 33 percent of the project award. For example, if an applicant requests \$100,000 from WRF, an additional \$33,000 or more must be contributed by the applicant. Acceptable forms of applicant contribution include cost-share, applicant in-kind, or third-party in-kind that comply with 2 CFR Part 200.306 cost sharing or matching. The applicant may elect to contribute more than 33 percent to the project, but the maximum WRF funding available remains fixed at \$150,000. **Proposals that do not meet the minimum 33 percent of the project award will not be accepted.** Consult the *Instructions for Budget Preparation* available at <https://www.waterrf.org/proposal-guidelines> for more information and definitions of terms.

Period of Performance

It is WRF's policy to negotiate a reasonable schedule for each research project. Once this schedule is established, WRF and its sub-recipients have a contractual obligation to adhere to the agreed-upon schedule. Under WRF's No-Cost Extension Policy, a project schedule cannot be extended more than nine months beyond the original contracted schedule, regardless of the number of extensions granted. The policy can be reviewed at <https://www.waterrf.org/policies>.

Utility and Organization Participation

WRF encourages participation from water utilities and other organizations in WRF research. Participation can occur in a variety of ways, including direct participation, in-kind contributions, or in-kind services. To facilitate their participation, WRF has provided contact information, on the last page of this RFP, of utilities and other organizations that have indicated an interest in this research. Proposers are responsible for negotiating utility and organization participation in their particular proposals. The listed utilities and organizations are under no obligation to participate, and the proposer is not obligated to include them in their particular proposal.

Application Procedure and Deadline

Proposals are accepted exclusively online in PDF format, and they must be fully submitted before 2:00 pm Mountain Time on Thursday, October 15, 2020. All proposal documents must be compiled into two PDF files consisting of your technical review documents and your financial review documents. All forms and components of the proposal are available in the *Proposal Component Packet* zip file on the proposal website at <https://proposals.waterrf.org/Pages/RFPs.aspx>. An FAQ and a tutorial are also available. A login is required to access the proposal website and download the packet. Proposers are encouraged to create logins and verify the validity and compatibility of the system well in advance in order to avoid last-minute errors or delays.

The online proposal system allows submission of your documents until the date and time stated in this RFP. To avoid the risk of the system closing before you press the submit button, do not wait until the last minute to complete your submission.

Questions to clarify the intent of this RFP and WRF's administrative, cost, and financial requirements may be addressed to the WRF project contact, Lola Olabode at (571) 384-2109 or lolabode@waterrf.org. Questions related to proposal submittal through the online system may be addressed to Caroline Bruck at (303) 347-6118 or cbruck@waterrf.org.

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The following utilities have indicated interest in possible participation in this research. This information is updated within 24 business hours after a utility or an interested organization submits a volunteer form, and this RFP will be re-posted with the new information. **(Depending upon your settings, you may need to click refresh on your browser to load the latest file.)**

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