REQUEST FOR PROPOSALS (RFP)

Case Studies for Successful Watershed and Sewershed Monitoring and Decision Making (5247)

Date Posted
Monday, July 2, 2024

Due Date
Proposals must be received by 3:00 pm Mountain Time on Thursday, August 29, 2024.

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

Project Objectives

- Provide a comprehensive/robust compendium of case studies on management, economic, policy, and regulatory approaches showcasing an understanding of methods (including artificial intelligence [AI]), parameters, and drivers that impact ecosystem health at the watershed and sewershed scale.

Budget
Applicants may request up to $150,000 in WRF funds for this project.

Background and Project Rationale
Traditionally, sewershed and watershed management have been siloed with different monitoring emphasis, analysis and modeling approaches, and management objectives. Sewershed management has focused on challenging issues relative to National Pollutant Discharge Elimination System (NPDES) permitted sources such as municipal wastewater, combined sewer overflows (CSO), and stormwater under the Municipal Separate Storm Sewer System (MS4) permits, as well as associated conveyance problems of odor generation potential, infiltration and inflow (I/I), and leak mitigation.

In 2019, the Water Infrastructure and Improvement Act (WIIA) added a new Section 402(s) to the Clean Water Act (CWA) to include the 2012 Integrated Municipal Stormwater and Wastewater Planning Approach Framework. While this level of Integrated Planning (IP) provides a more efficient and cost-effective process for municipalities to prioritize capital investments

and achieve water quality management objectives within the NPDES program, more inclusive Integrated Watershed Resource Management (IWRM) frameworks (Cesanek and Wordlaw 2015; Global Water Partnership 2007) extend management to the entire watershed. This is necessary to meet CWA Section 303(d) Water-Quality Based (WQB) targets consistent with Water Quality Standards (WQS) and implement Total Maximum Daily Load (TMDL) analyses, particularly the Load Allocation (LA), which complements the Wasteload Allocation (WLA) "point" sources that the sewershed defines under the NPDES program.

The LA comprises diffuse natural, nonpoint, and surface runoff and groundwater loads throughout the watershed not captured in the WLA, often creating an inconsistency and management gap that IWRM—including One Water conceptual models developed by The Water Research Foundation (Paulson, Broley and Stephens 2017)—strive to fill. According to the U.S. Government Accountability Office (USGAO), although tens of thousands of TMDLs have been completed, and "…pollutants had been reduced in many waters, few impaired water bodies have fully attained water quality standards" (USGAO 2013). They attributed this to the difficulty of managing and integrating diffuse nonpoint and stormwater sources (although now regulated as a point source) into holistic IWRM frameworks that meet CWA and state water quality management objectives. USGAO recommended changes in the CWA that parallel IWRM and One Water frameworks to integrate and strengthen regulatory authorities that would allow this to happen.

IWRM and One Water concepts focus on water supply and allocation, source water protection including identification and management of point and non-point sources of pollution from nutrients, microbial contamination, and more. The context of the prevailing social-ecological system (SES) should not be neglected, nor should the balance of human stressors and natural ecosystem service benefits, as keys to One Water outcomes. Multiple feedbacks are ignored or poorly considered that can lead to sub-optimal solutions even if permit limits are met. For examples, it is important to understand how the landscape development and disturbance driver contributes to watershed health and how healthier landscapes help mitigate impacts of development and climate change on water quality and environmental and human health/well-being. How does hydrologic isolation in sewer pipes limit the filtration and biogeochemical cleansing functions the ecosystem could provide? What are the long-term impacts of physical pressures and pollutant loadings on the diversity of aquatic life, including CSO effects on ecosystem services and those that microbial populations in receiving water bodies might provide?

The broader stormwater, wastewater, and water resources management community needs to be fully empowered to develop, implement, and advance real-time monitoring and surveillance tools. Physics-based and artificial intelligence/machine learning (AI/ML) modeling and optimization approaches can fuse information from these disparate monitoring infrastructures at the integrated watershed and sewershed scales for water quantity (e.g., flow) and quality that yield benefits to both ecosystem and human health. These tools should not be limited to water quality monitoring and management; they should extend to landscape analyses using today's fine-scale resolution Geographic Information Systems (GIS) that link landscape

condition to collective chemical, physical, and biological water quality pressures, which are not easily monitored beyond the sewershed but provide necessary insight into aquatic and human health outcomes. This One Water IWRM framework will help confirm linkages between receiving water quality, wastewater discharges, and other non-regulated sources. It will provide guidance on optimal management/decision making approaches that are not myopically developed from the perspective of a single pollutant or domain but effectively combine sewershed and watershed pressures, water quality consequences, and management targets and opportunities.

Despite the differences in monitoring infrastructure, locations, and testing endpoints in watershed systems and even between combined sewer systems (CSS) and separate sewer systems (SSS), this project aims to identify sensing technologies—including GIS technology as appropriate—analysis and modeling solutions/tools, and successful case studies that incorporate both watershed and sewershed systems into the One Water context for monitoring and decision making. Such "One Water" or "Three Waters" integrated water cycle management plans and strategies are undertaken in some jurisdictions as part of their strategic business planning. Case studies related to TMDL, IP, IWRM, and Watershed-Based Plans (e.g., Sec. 319 9-key element plans) that have been implemented with outcomes fully or partially achieved may be most insightful, especially if sewershed and watershed comparisons can be made; the integration of management contributions from each can be identified as meeting the combined and complementary management goals and objectives of the watershed.
There are three main topics to review as part of the case studies:

- Approaches and successful case studies that have demonstrated the fusing of sensing infrastructure data and analytics with modeling approaches (including AI/ML methods) that provide the scientific basis for quantifying the feedback and impacts of wastewater discharges on watersheds and that connect the sewershed and watershed monitoring, modelling, and management into one integrated package.
- Approaches and cases where information gleaned from these analyses has been used to inform policy or long-term control planning efforts. Of special interest is the use of real-time sensing data to develop real-time decision support tools that guide utility operators and watershed managers on how best to operate their respective systems in a balanced and complementary manner to mitigate adverse impacts and meet collective and/or common water quality goals and objectives.
- Optimal allocation of resources, where integration of sewershed and watershed monitoring and management planning programs has provided evidence to develop least-community-cost solutions to pollution control challenges and outcomes. This may include informing decisions on the best and most efficient relative allocation of resources between options to mitigate sewershed contamination, discharges and overflows from sewerage systems, sewage treatment, water resources management, and water treatment with results-based accountability as measured in the field (Friedman, 2009).

Funding and capacity have been a challenge for most jurisdictions responsible for monitoring and assessment, the foundation of IWRM, and One Water planning and management. Some

cities, states, and utilities have added monitoring onto water rates to address this ongoing challenge. This project may be applicable to drinking water, wastewater, and stormwater within One Water and all-sized utilities. It is also nationally and regionally relevant.

Case studies offer a powerful tool for providing lessons learned to inform decision making. Web-based applications such as EPA's Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS) for water quality impairments (USEPA 2024a); EPA's Causal Analysis/Diagnosis Decision Information System (CADDIS) for biological impairments (USEPA 2024b); and EPA's Recovery Potential Screening (RPS) – Comparing Watershed Condition and Restorability (USEPA 2024c) may assist in developing policies and management frameworks.

One desired outcome is a deliverable that leverages and builds on the existing body of work (including roadmaps and guidance tools/resources), experiences, lessons learned, and observations to advance the technical water quality knowledge base and reduce the uncertainties around making collaborative management decisions at the integrated watershed and sewershed scale.

Research Approach

This RFP is intentionally flexible in the research approach to encourage creativity and originality from proposers. Proposers should describe how they will conduct the research to meet the objectives listed above.

An approach that articulates the following key elements should be outlined:

(1) Clearly defined critical elements versus "nice-to-haves" and agreed selection of case studies.
(2) Clearly defined data that is consistently used versus data that is rarely used.
(3) Clearly defined case studies criteria with well-defined sampling set.
(4) Clearly identified locations with various monitored examples of green/gray infrastructure (e.g., engineered wetlands); other non-engineered best management practices; and the landscape conservation, restoration, recovery, and mitigation practices for natural and nature-based structural and functional integrity outcomes in the watersheds.
(5) Clearly compared sewershed and watershed practices, outcomes, and options for trade-offs and balances as well as the regulatory/non-regulatory constraints and opportunities.
(6) Clearly identified approaches, lessons learned, observations, and a categorical matrix of success for sewersheds, watersheds, and their integration.
(7) Clearly focused outreach/engagement with utilities to present the findings.

Expected Deliverables

Proposers are encouraged to recommend deliverables in alignment with the project objectives and desired outcomes. Proposers should outline the basis for selecting case studies.

Typical types of WRF deliverables for consideration include:

- Research report (must use WRF's *Research Report Template*)
- Guidance manual
- Webcast, conference presentation, etc.
- Peer-reviewed journal article
- Field demonstration/pilot project
- Fact sheet, case study, white paper, etc.
- Workshop (consider plan to document workshop)
- Technology Deliverable (must follow the criteria outlined for technology deliverables presented in the *Technology Deliverables Guidance*)

Communication Plan

Please review WRF's *Project Deliverable Guidelines* for information on preparing a communication plan. Conference presentations, webcasts, peer-reviewed publication submissions, and other forms of project information dissemination are typically encouraged.

Project Duration

The anticipated period of performance for this project is 12–18 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.

Selected WRF Publications

Arabi, M., G. Macpherson, D. Dezfooli, S. Millonig, J. Bolson, M. Sukop, I. Wiersema, J. Reed, and K. Wamstad. 2021. *One Water Cities: Development of Guidance Documents and Assessment Metrics Literature Review*. Project 4969. Denver, CO: The Water Research Foundation.

Bell, C. F., and M. J. DeBoer. *Screening-Level Modeling of Site-Specific Nutrient Response Demonstrations*. Project 4815. Denver, CO: The Water Research Foundation.

Bledsoe B. P., H. Yaryan Hall, and R. Lammers. 2019. *Evaluation of and Recommendations for Functional Assessment of Stream Restoration for Water Quality Benefits in Urban Watersheds*. Project 4838. Denver, CO: The Water Research Foundation.

Clark, D. L., T. Stober, M. Falk, H. Holmberg, and P. Vanrolleghem. 2023. *Holistic Approach to Improved Nutrient Management*. Project 4974. Denver, CO: The Water Research Foundation.

Liggett, J., C. Macintosh, and K. Thompson. 2018. *Designing Sensor Networks and Locations on an Urban Sewershed Scale.* Project 4835. Denver, CO: The Water Research Foundation.

Nemura, A., J. Rexhausen, E. Toot-Levy, P. McGovern, F. P. Andes, and E. K. Powers. 2020. *Toolbox for Completing an Alternatives Analysis as Part of an Integrated Planning Approach to Water Quality Compliance*. Project 4854. Denver, CO: The Water Research Foundation.

Paulson, C., W. Broley, and L. Stephens. 2017. *Blueprint for One Water*. Project 4660. Denver, CO: Water Research Foundation.

Thompson. K., and S. Sinha. Forthcoming. *Designing Sensor Networks and Locations on an Urban Sewershed Scale with Big Data Management and Analytics.* Project 4797. Denver, CO: The Water Research Foundation.

Literature Cited

Cesanek, B., and L. Wordlaw. 2015. *Recommendations and Report of APA's Water Task Force*. Chicago: American Planning Association. https://planning-org-uploaded-media.s3.amazonaws.com/legacy_resources/leadership/agendas/2015/spr/pdf/WaterTaskForceFinal.pdf.

Friedman, M. 2009. *Trying hard is not good enough*. ISBN: 1-4392-3786-7. Charleston, SC: Booksurge.

Global Water Partnership. 2007. *Roadmapping for advancing integrated water resources management (IWRM) processes*. UN Water; Global Water Partnership. https://www.unwater.org/app/uploads/2017/05/UNW_ROADMAPPING_IWRM.pdf

Paulson, C., W. Broley, and L. Stephens. 2017. *Blueprint for One Water*. Project 4660. Denver, CO: Water Research Foundation.

United States Environmental Protection Agency (USEPA). 2024a. ATTAINS. Accessed June 25, 2024. https://www.epa.gov/waterdata/attains

USEPA. 2024b. Causal Analysis/Diagnosis Decision Information System (CADDIS). Accessed June 25, 2024. https://www.epa.gov/caddis

USEPA. 2024c. Recovery Potential Screening (RPS) - Comparing Watershed Condition and Restorability. Accessed June 25, 2024. https://www.epa.gov/rps

U.S. Government Accountability Office (USGAO). 2013. "Clean Water Act: Changes needed if key EPA program is to help fulfill the nation's water quality goals." GAO-14-80. Washington, DC: USGAO. https://www.gao.gov/products/gao-14-80

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 15 points)
- Communication Plan, Deliverables, and Applicability (maximum 20 points)
- Budget and Schedule (maximum 15 points)

PROPOSAL PREPARATION INSTRUCTIONS

Proposals submitted in response to this RFP must be prepared in accordance with WRF's *Guidelines for Research Priority Program Proposals* and *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.

Proposals that include the production of web- or software-based tools, such as websites, Excel spreadsheets, Access databases, etc., must follow the criteria outlined for technology deliverables presented in the *Technology Deliverables Guidance*.

Eligibility to Submit Proposals
Proposals will be accepted from both U.S.-based and non-U.S.-based 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. 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*.

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% 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% to the project, but the maximum WRF funding available remains fixed at $150, 000. Proposals that do not meet the minimum 33% of the

project award will not be accepted. Consult the *Preparation 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.

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 3:00 pm Mountain Time on Thursday, August 29, 2024.

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. Submit your proposal at https://forms.waterrf.org/cbruck/rfp-5247 .

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.

Utility and Organization Participants

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 on your settings, you may need to click refresh on your browser to load the latest file.)**

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