REQUEST FOR PROPOSALS (RFP)

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

Date Posted
Monday, September 11, 2023

Due Date
Proposals must be received by 3:00 pm Mountain Time on Tuesday, November 14, 2023.

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
- 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
Guided by the Clean Water Act (CWA), water quality management has been focused on individual pollutant management under state-delegated authorities for National Pollutant Discharge Elimination System (NPDES)-regulated sources. This has proven to be an effective remedy for xenobiotic pollutants with clearly defined threshold criteria adopted into state Water Quality Standards (WQS) that could be permitted, monitored, effectively treated, and enforced. However, with growing concerns over ecosystem degradation and diminishing human health and welfare benefits once provided by healthy ecosystems, a more holistic remedy is required that is consistent with the CWA's overarching goal to "…restore and maintain [collective] chemical, physical, and biological integrity of the Nation's waters."
Traditionally, sewershed and watershed management have been siloed with different monitoring emphases, analysis and modeling approaches, and management objectives. In accordance with the CWA and delegated state authorities, managers have focused on two

siloed implementation classes: 1) regulated sources associated with piped discharges comprising the “sewershed” area as a subset of the watershed; and 2) diffuse, non-regulated watershed management, typically nonpoint sources (NPS). Each class is governed by separate policies and regulations that define monitoring, assessment, modeling, planning and management approaches (USEPA 2002 and 2003). Sewershed management has focused on challenging issues such as combined sewer overflows, odor generation potential, infiltration, and inflow (I/I), leak mitigation from property service lines and in the utility conveyance systems, etc. Watershed management, on the other hand, focuses on water supply and allocation, source water protection (including identification and management of point and non-point sources of pollution from nutrients), microbial contamination, etc. However, there are feedbacks that are ignored or poorly considered leading to sub-optimal solutions. For example, it is important to understand what the long-term impact of combined sewer overflow discharges are on the diversity of useful microbial populations and other ecosystems in receiving water bodies. Conventional stormwater, wastewater, and the broader water resources management community need to be fully empowered to develop, implement, and advance real-time monitoring and surveillance tools as well as physics-based and AI/machine learning (ML) modeling and optimization approaches. Such approaches fuse information from disparate infrastructure at the watershed and sewershed scale for water quantity (i.e., flow) and quality monitoring. This will help confirm linkages between receiving water quality, wastewater discharges, and other sources and provide guidance on optimal management/decision-making approaches that are not myopically developed from the perspective of a single domain or pressure.

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, 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.

There are three main topics to review as part of the case studies:

- Of interest are 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 feedbacks and impacts of wastewater discharges on watersheds and that connect the sewershed and watershed monitoring, modelling, and management into one integrated package.
- Also of interest is identifying approaches and cases where information gleaned from these analyses have 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 to mitigate adverse impacts.
- A final question relates to 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. 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.

Pervasive nonpoint sources from agriculture and suburban development are not subject to enforceable mechanisms unless considered a Confined Animal Feeding Operation (CAFO) or exceed a population density threshold under Municipal Separate Storm Sewer System (MS4) regulations and require individual or general permits. Even in those cases, management practice effectiveness is subjective, often design-based rather than performance-based, limited in spatial application, expensive, and monitoring uncertainty is high and often masked by natural variability and weak connection to specific sources.

In recent decades, concerns over aquatic ecosystem capacity to meet basic human uses and demand for water resources and the decline of essential ecosystem goods and services have escalated (IPBES 2018a, 2018b, 2019). The primary causes are the major drivers of landscape degradation and climate change that have impacted watershed structure and functionality layered on top of pollutant loading (Allan and Castillo 2007, Pörtner et al. 2021, USEPA 2011 and 2012). In response, management emphasis is shifting towards ecosystem-based management (EBM) frameworks (O'Higgins et al. 2020a). Holistic, Integrated Watershed Resource Management (IWRM) frameworks (Cesanek and Wordlaw 2015, UN-Water and Global Water Partnership 2007, Rugland 2021 and 2022), including One Water conceptual models (Paulson et al. 2017), complement traditional end-of-pipe "treatment" remedies for individual pollutants, but emphasize more sustainable and resilient structural and functional watershed conservation and recovery solutions that healthy watershed ecosystems provide (Pelletier et al. 2020). The White House Office of Science and Technology has recently initiated efforts to assess natural conditions and employ natural and nature-based recovery practices as an effective remedy for ecosystem decline and a looming biodiversity crisis (NRC 1988) and to mitigate impacts of a changing climate (White House Council on Environmental Quality, Office of Science and Technology Policy, and Domestic Climate Policy Office 2022a and 2022b).

Funding and capacity have been a challenge for most jurisdictions responsible for monitoring. 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.

Desired Outcome/s of the Work: Case studies offer a powerful tool in providing lessons learned to inform decision making. Web-based applications such as The Healthy River Ecosystem Assessment System (THREATS) assist in developing policies and management frameworks (GreelandGroup 2017). A 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 needed to make collaborative management decisions at the 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) and other non-engineered best management practices.
(5) clearly identified approaches, lessons learned, observations and a matrix of success.
(6) 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, which can be found at https://www.waterrf.org/project-report-guidelines#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)
- Web tool (must follow the criteria outlined for web tools presented in the *Web Tool Criteria and Feasibility Study for The Water Research Foundation Project Deliverables* at https://www.waterrf.org/project-report-guidelines#webtool-criteria)

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#project-deliverable-guidelines. 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.

Gerritsen, J., B. Jessup, and E. Leppo. 2004. *Effects of Multiple Stressors Aquatic Ecosystems.* Project 1244. Alexandria, VA: Water Environment 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
Allan, J. D., and M. M. Castillo. 2007. *Stream Ecology: Structure and Function of Running Waters*. Second edition. The Netherlands: Springer.

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.

GreenlandGroup. 2017. THREATS – The Healthy River Ecosystem AssessmenT System. Accessed August 24, 2023. https://www.youtube.com/watch?v=dT2J1Vmi0rc.

IPBES. 2018a. *The Assessment Report on Land Degradation and Restoration: Summary for Policymakers*. R. Scholes, L. Montanarella, A. Brainich, N. Barger, B. ten Brink, M. Cantele, B. Erasmus, J. Fisher, T. Gardner, T. G. Holland, F. Kohler, J. S. Kotiaho, G. Von Maltitz, G. Nangendo, R. Pandit, J. Parrotta, M. D. Potts, S. Prince, M. Sankaran and L. Willemen (eds.). Bonn, Germany: Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. http://www.ipbes.dk/wp-content/uploads/2018/09/LandDegradation_SPM_2018.pdf.

IPBES. 2018b. *The Regional Assessment Report on Biodiversity and Ecosystem Services for the Americas: Summary for Policymakers*. Rice, J., C. S. Seixas, M. E. Zaccagnini, M. BedoyaGaitán, N. Valderrama, C. B. Anderson, M. T. K. Arroyo, M. Bustamante, J. Cavender-Bares, A. Diaz-de-Leon, S. Fennessy, J. R. García Márquez, K. Garcia, E. H. Helmer, B. Herrera, B. Klatt, J. P. Ometo, V. Rodríguez Osuna, F. R. Scarano, S. Schill, and J. S. Farinaci (eds.). Bonn, Germany: IPBES Secretariat. https://www.ipbes.net/sites/default/files/spm_americas_2018_digital.pdf.

IPBES. 2019. *The Global Assessment Report on Biodiversity and Ecosystem Services: Summary for Policymakers*. S. Díaz, J. Settele, E. S. Brondízio, H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). Bonn, Germany: IPBES Secretariat. https://zenodo.org/record/3553579#.Yqy9AaLMK8U.

Norton, J. D., J. D. Wickham, T. G. Wade, K. Kunert, J. V. Thomas and P. Zeph. 2009. "A Method for Comparative Analysis of Recovery Potential in Impaired Waters Restoration Planning." *Environ. Management,* 44 :356–368. https://doi.org/10.1007/s00267-009-9304-x.

NRC (National Research Council). 1988. *Biodiversity*. Washington, DC: The National Academies Press.

O'Higgins, T. G., M. Lago, and T. H. DeWitt (eds.). 2020a. *Ecosystem-Based Management, Ecosystem Services and Aquatic Biodiversity: Theory, Tools and Applications*. Cham, Switzerland: SpringerOpen.

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

Pelletier, M. C., J. Ebersole, K. Mulvaney, B. Rashleigh, M. N. Gutierrez, M. Chintala, A. Kuhn, M. Molina, M. Bagley and C. Lane. 2020. "Resilience of Aquatic Systems: Review and Management Implications." *Aquatic Sciences* 82(44). https://doi.org/10.1007/s00027-020-00717-z.

Pörtner, H. O., R. J. Scholes, J. Agard, E. Archer, A. Arneth, X. Bai, D. Barnes, M. Burrows, L. Chan, W. L. Cheung, S. Diamond, C. Donatti, C. Duarte, N. Eisenhauer, W. Foden, M. A. Gasalla, C. Handa, T. Hickler, O. Hoegh-Guldberg, K. Ichii, U. Jacob, G. Insarov, W. Kiessling, P. Leadley, R. Leemans, L. Levin, M. Lim, S. Maharaj, S. Managi, P. A. Marquet, P. McElwee, G. Midgley, T. Oberdorff, D. Obura, E. Osman, R. Pandit, U. Pascual, A. P. F. Pires, A. Popp, V. Reyes-García, M. Sankaran, J. Settele, Y. J. Shin, D. W. Sintayehu, P. Smith, N. Steiner, B. Strassburg, R. Sukumar, C. Trisos, A. L. Val, J. Wu, E. Aldrian, C. Parmesan, R. Pichs-Madruga, D. C. Roberts, A. D. Rogers, S. Díaz, M. Fischer, S. Hashimoto, S. Lavorel, N. Wu, H. T. Ngo. 2021. *IPBES-IPCC Co-Sponsored Workshop Report on Biodiversity and Climate Change*. Bonn, Germany: IPBES Secretariat. https://www.ipbes.net/sites/default/files/2021-06/20210609_workshop_report_embargo_3pm_CEST_10_june_0.pdf.

Rugland, E. 2021. *Integrating Land and Water: Tools, Practices, Processes, and Evaluation Criteria*. Working Paper WP21ER1. Cambridge, MA: Lincoln Institute of Land Policy. https://www.lincolninst.edu/publications/working-papers/integrating-land-water.

Rugland, E. 2022. *Integrating Land Use and Water Management: Planning and Practice*. Policy Focus Report. Cambridge, MA: Lincoln Institute of Land Policy. https://go.lincolninst.edu/IntegratingLandUseWaterManagementPlanningPracticePFR.

UN-Water and Global Water Partnership. 2007. *Roadmapping for Advancing Integrated Water Resources Management (IWRM) Processes*. https://www.unwater.org/app/uploads/2017/05/UNW_ROADMAPPING_IWRM.pdf.

———. 2002. *Consolidated Assessment and Listing Methodology: Toward a Compendium of Best Practices*. First Edition. Washington, DC: U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds. https://www.epa.gov/sites/default/files/2015-09/documents/consolidated_assessment_and_listing_methodology_calm.pdf.

———. 2003. *Elements of a State Water Monitoring and Assessment Program*. EPA 841-B-03-003. Washington, DC: U.S. Environmental Protection Agency, Assessment and Watershed Protection Division, Office of Wetlands, Oceans and Watersheds. https://www.epa.gov/sites/default/files/2019-03/documents/elements-state-water-monitoring-assessment-program.pdf.

———. 2011. *Healthy watersheds initiative: National framework and action plan*. EPA 841-R-11-005. Washington, DC: United States Environmental Protection Agency, Office of Water. www.epa.gov/healthywatersheds.

———. 2012. *Identifying and protecting healthy watersheds. Concepts, assessments, and management approaches*. EPA 841-B-11-002. Washington, DC: U.S. Environmental Protection Agency, Office of Water. https://www.epa.gov/sites/default/files/2015-10/documents/hwi-watersheds-complete.pdf.

White House Council on Environmental Quality, White House Office of Science and Technology Policy, and White House Office of Domestic Climate Policy. 2022a. *Opportunities to Accelerate Nature-Based Solutions: A Roadmap for Climate Progress, Thriving Nature, Equity, and Prosperity: A Report to the National Climate Task Force*. Washington, DC. https://www.whitehouse.gov/wp-content/uploads/2022/11/Nature-Based-Solutions-Roadmap.pdf.

White House Council on Environmental Quality, White House Office of Science and Technology Policy, and White House Office of Domestic Climate Policy. 2022b. *Nature-Based Solutions Resource Guide: Compendium of Federal Examples, Guidance, Resource Documents, Tools, and Technical Assistance*. Washington, D.C. https://www.whitehouse.gov/wp-content/uploads/2022/11/Nature-Based-Solutions-Resource-Guide-2022.pdf.

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*. The current version of these guidelines and the *Instructions for Budget Preparation* are available at https://www.waterrf.org/proposal-guidelines. 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 web tools presented in the *Web Tool Criteria and Feasibility Study for The Water Research Foundation Project Deliverables* at https://www.waterrf.org/project-report-guidelines#webtool-criteria.

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. 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% 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 *Instructions for Budget Preparation* available at https://www.waterrf.org/proposal-guidelines#RPP-instr-budget-prep 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 3:00 pm Mountain Time on Tuesday, November 14, 2023.

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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