THE Water Research FOUNDATION

Date Posted: Friday, August 14, 2020

REQUEST FOR PROPOSALS (RFP)

Assessment of Vulnerability of Source Waters to Toxic Cyanobacterial Outbreaks (RFP 5080)

Due Date: Proposals must be received by 2:00 pm Mountain Time on
Thursday, October 15, 2020
WRF Project Contact: Dr. Djanette Khiari, dkhiari@waterrf.org

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

Project Objectives
Develop a risk assessment model for the prediction of the occurrence of cyanobacteria and the potential for problematic biomass development. The model will track the progress of bloom development, a feature useful for making timely mitigation decisions. It would use the conventional understanding of the major factors triggering and supporting the growth of cyanobacteria, which could be tailored by utilities for site-specific use for their lake or reservoir.

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
Cyanobacteria are notorious indicators of degraded nutrient-rich aquatic systems and are extremely well adapted to dominate lakes and reservoirs during warm weather and stratified conditions. It is broadly recognized that the growth of cyanobacteria in lakes and reservoirs is favored by high nutrient concentrations, particularly phosphorus, in combination with the right physical conditions of elevated temperature, usually accompanied by thermal stratification and high light. However, the dynamic seasonal and temporal combinations of these factors is less well understood in individual circumstances.

Information on the importance and interrelationship of environmental variables may be used in a range of ways to determine the likelihood of the growth of cyanobacteria and the development of blooms in lakes. A range of approaches has been used for this risk assessment and these have been variously termed 'susceptibility' assessments. An underlying assumption of these simple models is that for most freshwaters, there is a clear relationship between phosphorus loading to a waterbody, temperature, algal productivity, and biomass.

In addition to these simple models, there are far more complex deterministic 2D and 3D hydrodynamic models linked to water quality models, which can be used to model the occurrence of different algal groups including cyanobacteria. These models are generally complex to run and calibrate, require a large amount of data for a wide range of physical and chemical variables for successful validation, and they are not user-friendly for the day-to-day management of source waters or small utilities.

An example of a simple alternative risk assessment approach was developed in Australia to assess waterbodies for their susceptibility to cyanobacterial blooms. This approach assesses a range of major driving variables for cyanobacterial growth in a semi-quantitative way to determine the potential for excessive cyanobacterial production. The four variables used in the assessment are considered the predominant drivers or indicators of the potential for cyanobacterial blooms. These variables are: prior history of cyanobacterial occurrence, water temperature, total phosphorus concentration, and a measure of thermal stratification. The combinations and the values of these parameters are assigned to categories and assessed in a matrix that defines the risk of the 'Potential for Cyanobacterial Growth' into five categories, ranging from 'Very Low' to 'Very High.' (Table 1). This matrix is a linear continuum of the major variables from low to high that line up across the columns and is therefore very simplistic. This is because it is possible to have a range of other combinations of variables that lead to intermediate risk. Nevertheless, the approach is suitable for semi-quantitative application to reservoir data.

This risk assessment approach is, to some extent, also biased to determine the likelihood of conditions that favor occurrence of types such as *Microcystis* spp. (potentially toxic), and a range of *Dolichospermum* species – these are often the 'buoyant bloom-formers.' It may not apply as well to other important problem types such as *Cylindrospermopsis raciborskii* or *Aphanizomenon* spp.

Table 1: Assessment of the Potential for Cyanobacterial Growth Based on Environmental Parameters.

	Environmental Factor			
Potential for Cyanobacterial Growth	**History of Cyanobacteria**	**Water Temperature (°C)**	**Nutrients Total Phosphorus (mg L^{-1})**	**Thermal Stratification**
Very Low	No	<15	<10	Rare or Never
Low	Yes	<15-20	<10	Infrequent
Moderate	Yes	20-25	10-30	Occasional
High	Yes	>25	30-100	Frequent and Persistent
Very High	Yes	>25	>100	Frequent and Persistent/Strong

Source: Newcombe, G., J. House, L. Ho, P. Baker, and M. Burch. 2010. *Management Strategies for Cyanobacteria (Blue-Green Algae): A Guide for Water Utilities*. Research Report No. 74. Adelaide, SA: Water Quality Research Australia. Reprinted with permission from Water Research Australia.

Research Approach

- Collect historical physico-chemical and biological data from a minimum of five utilities representing different geographical areas, limnological characteristics, and meteorological patterns.
- Develop a target list of appropriate physicochemical and biological indicators.

- Establish a series of simple relationships so that potential users can adapt this series of indicators and measures within the framework of an empirical model to describe the conditions which lead to cyanobacterial blooms in their lakes. It will identify the major driving variable(s) which may change as the growing season progresses. Mitigation strategies may depend on the dominant driving variable.
- The final deliverable will be a web-based tool that would have inputs on a dashboard and could be regularly updated over short monitoring intervals. The output would be predictions of cyanobacteria cell numbers and growth rates with boundaries and reliability estimates of the predictions.
- Consideration will be given for testing the tool on several lakes not otherwise associated with the project.

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 18 months from the contract start date.

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, Dr. Djanette Khiari at (303) 734-3478 or dkhiari@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**.**

5080 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 upon your settings, you may need to click refresh on your browser to load the latest file.)**

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