

## CALL FOR PREPROPOSALS

July 28, 2009

**TO:** Prospective Investigators in Water Resources  
**FROM:** Michael Voiland, Acting Director, Water Resources Research Institute  
**SUBJECT:** **Preproposals for FY 2010-2011 WRRI Research Program**

The Water Resources Research Institute (WRRI) of The University of North Carolina invites preproposals from faculty members of senior colleges and universities in North Carolina for FY 2010-11 research funding. Project preproposals will primarily be reviewed for need and relevance. Full proposals will thereafter be requested only from investigators who have submitted preproposals that are found to be of HIGH importance and relevance. To be considered, completed preproposals and CVs must be submitted by **4:00 pm, Monday, August 31, 2009**, to WRRI at [water\\_resources@ncsu.edu](mailto:water_resources@ncsu.edu).

Total available funds are approximately \$250,000. This includes \$92,000 in federal funds (if appropriated by Congress) from the U.S. Geological Survey. The maximum award is \$50,000. WRRI does not pay indirect costs. The starting date for projects accepted for U.S. Geological Survey funding is March 1, 2010. Other projects may start later. All projects must be completed within a 12-month period.

WRRI identifies and supports research needed to help solve water quality and water resources problems in North Carolina and the region. A list of priority research topics identified this year by the WRRI Advisory Committee is attached (Attachment 1) and also viewable at <http://www.ncsu.edu/wrri/cfp/2010-11Priorities.pdf>. While it is highly recommended that preproposals specifically address a WRRI research priority topic, preproposals on any water resources topic that fall within the Institute's mission and on emerging issues will be considered. WRRI strongly encourages collaboration among researchers from different institutions, and with state, federal and local agencies. Additional consideration will be given to qualified preproposals where the principal investigator is in early-career status.

Principal investigators may be asked to revise scopes of work and budgets so that their work can be included in WRRI's 2010-11 research portfolio. Not all highly rated projects may be included for funding, due to program priorities and funding considerations. Results of peer reviews and the selection process will be completed in December 2009. The proposals selected for U.S. Geological Survey funding will be submitted to U.S. Geological Survey in January 2010 (Attachment 5).

Proposals not eligible include research on health effects involving human subjects, and research involving oceanography (estuarine research-oriented proposals are acceptable).

Timeliness of researcher performance on past projects funded through WRRI will be a factor in proposal selection. As a consequence, any researcher who is late in reporting on or completing

an ongoing study funded through WRRI without an approved no-cost extension may not be eligible to be a named participant in any proposal for the 2010-2011 funding cycle. If you have any questions about your eligibility for the 2010-2011 funding cycle, please contact Lynne Bridger at 919-513-1216 or via email ([lynne\\_bridger@ncsu.edu](mailto:lynne_bridger@ncsu.edu)).

Prospective applicants having specific questions regarding either the appropriateness of their subject matter for WRRI support or the Institute's competitive research funding process are welcome to contact me at 919-515-2455 or via email ([michael\\_voiland@ncsu.edu](mailto:michael_voiland@ncsu.edu)).

Detailed instructions are included with the application materials at <http://www.ncsu.edu/wrri/cfp/>.

Thank you and good luck!

cc: Dr. Terri Lomax  
Dr. Steve Leath  
Dr. Courtney Thornton

**INSTRUCTIONS**  
**WRRI Request for Preproposals**  
**for FY 2010-2011 Funding**

**APPLICATION PROCESS**

1. Go to <http://www.ncsu.edu/wrri/cfp/>.
2. Download and review all the materials as described in the Request for Preproposals announcement. In particular, downloading Attachments 2 and 4 to your computer will give you offline access to the forms that you need to complete.
3. Complete the interactive PDF preproposal form (Attachment 2). Rename the file using your name in the following format: Firstname\_Lastname\_Attachment2.pdf. ***In the form, your input is limited to the text boxes provided.***
4. Complete the required CV form (Attachment 4). Rename the file using your name in the following format: Firstname\_Lastname\_Attachment4.doc or .pdf. Include a separate CV form for each co-PI. CVs are not required for collaborators. ***Each completed CV form may not exceed 2 pages total when submitted.***
5. Preproposals are not required to have approval through a campus administrative process.
6. **Completed preproposals and CV documents** must be submitted via email to [water\\_resources@ncsu.edu](mailto:water_resources@ncsu.edu) by **Monday, 4:00 pm, August 31, 2009**. Do not submit letters of support in the preproposal stage.

If you have questions, contact Kelly Porter, WRRI Environmental Education & Communications Coordinator, at 919-513-1152 or [kelly\\_porter@ncsu.edu](mailto:kelly_porter@ncsu.edu).

## WRRI Priority Research Areas for FY 2010-2011

*The Water Resources Research Institute (WRRI) has established the following priorities for Institute supported research for the fiscal year 2010-2011 based on input from the WRRI Advisory Committee. In evaluating proposals, priority will be given to proposals that address these topics. However, all proposals that address water issues and problems in North Carolina will be considered.*

### A. Water Availability, Use and Climate Interaction

#### 1. **Water supply and demand:**

- Investigate potential effects of climate change on both supply and demand for water.
- Study barriers to increasing onsite water storage capacity.
- Determine feasibility of small scale aquifer storage and recovery systems.
- Determine the feasibility for regionalized water treatment and distribution for small water treatment systems and optimal scales at each level.

#### 2. **Conservation measures:** Determine effectiveness of conservation measures, including measures that improve the long-term efficiency of water use and measures that reduce demand during droughts.

#### 3. **Climate forecasts:** Determine climate forecasts to improve water management during droughts, including environmental instream flow determination and modeling.

#### 4. **Water collection and reuse:**

- Determine water quality benefits of cisterns and the public health concerns associated with using cistern water on vegetation for direct human consumption.
- Evaluate quality of gray water and harvested rainwater that has potential for reuse.
- Evaluate the cost and other factors affecting alternative approaches to reuse.
- Evaluate feasibility of dual potable water systems: one larger pipe for industry/fire water and a second smaller pipe treated to the highest level of drinking water quality.

### B. Drinking Water Quality

#### 1. **Contaminant screening:** Evaluate current and new techniques to screen drinking water regulated contaminants and other contaminants of special concern upstream of water intakes and downstream of wastewater discharges.

#### 2. **Compliance with drinking water standards:** Evaluate how water suppliers can most effectively comply with regulations for disinfection by-products (including nitrogenous DBPs) and other difficult-to-comply parameters.

#### 3. **Heavy metals:** Evaluate factors affecting lead, copper and other metals in household plumbing.

#### 4. **Groundwater quality and safety:** Evaluate criteria for groundwater standards, groundwater aquifer storage and recovery systems; groundwater safety for individual homes and small public systems with special attention to arsenic and radon.

**C. Surface Water Quality Management**

1. **Chlorophyll  $\alpha$  standard:** Evaluate alternatives to the use of chlorophyll  $\alpha$  standard as a water quality indicator.
2. **Nutrient balance in watersheds:**
  - Determine nitrogen sources, fate and transport, assess changes over time in loading, and assess time-scale of response to changes.
  - Determine the hydrological influences on nutrient cycling, including influence of hydromodification.
  - Determine and quantify relative-source contribution of atmospheric deposition of nitrogen on loading (urban, suburban, and rural).
  - Evaluate identification techniques of surface water impairment sources or stressors on 303(d) list.
3. **Improved effectiveness of water quality monitoring across North Carolina:** More effective monitoring is needed for permitting, modeling use support, and assessment of trends. Determine frequency of sampling in relation to environmental indicators, and fate and transport of important pollutants.
4. **Economic value and assessment:**
  - Determine economic and feasibility assessment of water quality and remote environmental monitoring programs.
  - Determine the economic value of water quality to the state of North Carolina and its communities including next steps in establishing tools that allow full estimation of the monetized economic benefits of restoring a given nutrient-impaired water.
5. **Agricultural impacts:**
  - Determine water quality impacts (nutrients, fecal coliform, pharmaceuticals, etc.) of concentrated animal feeding operations (CAFOs), land application of animal waste, pasture operations, municipal biosolids, organic farming, and livestock mortality disposal options.
  - Determine effect of spray operations on runoff of nutrients. Improved management strategies to decrease nutrient transport from sprayfields.
  - Quantify unit-area mass loading rates to surface waters of nitrogen and phosphorus from different management scenarios of grazed livestock land use. Address the relative deliveries of: open-access minimal management; exclusion fencing; excluded buffers; and managed/rotational grazing.
  - Agricultural best management practices (BMPs):
    - Determine water quality benefits associated with controlled drainage technologies for tile drain systems in nutrient sensitive watersheds.
    - Quantify the water quality benefits of pasture BMPs in nutrient sensitive watersheds.
6. **Local government nutrient management:** Evaluate nitrogen and phosphorus mass loading reduction effectiveness and cost-effectiveness of programmatic local government management measures applied to existing developed lands—(improved) street sweeping; pet waste ordinances; fertilizer application ordinances.
7. **Nitrogen loading comparisons:** Use quantitative statistical comparison of nitrogen loading to streams in developed residential settings to compare development that uses conventional onsite wastewater and development that uses central sewer in the Piedmont and Coastal Plain physiographic settings.

#### **D. Urbanization Impacts on Water Quality**

1. **Stormwater management:** Evaluate how well stormwater best management practices (BMPs) and management strategies protect downstream water quantity and quality at the watershed scale. Evaluate performance of practices for addressing coastal stormwater discharges. Evaluate the barriers to stormwater retrofits and off-stream management for water quality.
2. **Low impact development (LID):**
  - Determine which LID techniques work best in North Carolina coastal, piedmont and mountain regions to minimize development impacts to watersheds.
  - Evaluate how the use of LID could affect the hydrology of a watershed as compared to our present "detention-based" program would be more desirable. Develop recommendations on the most appropriate design storm(s) or other hydrologic standard(s) for use in applying the LID framework in the physiographic regions of NC.
3. **BMPs in the mountain physiographic region:** Since Western North Carolina has 80 percent of the state's high quality waters and trout streams it is important to measure the effectiveness and performance of BMPs for both erosion and sediment control and stormwater.
  - Evaluate effectiveness and performance of erosion and sediment control BMPs and buffer widths as associated with slope.
  - Identify adaptations needed for post-construction stormwater BMPs to effectively protect water quality, and recommendations on best mountain stormwater BMPs. Evaluate minimum widths of riparian buffers and determine vegetative types needed to protect water quality, maintain stable banks, trap sediment, and process nutrients.

#### **E. Aquatic Ecosystem Functions and Instream Flow Needs**

1. Review and test methods for evaluating environmental instream flow needs to determine a simple, effective approach for North Carolina waters. How can results from site-specific Instream Flow Incremental Methodology (IFIM) studies be extrapolated for river basin water allocation purposes?
2. Evaluate methods to incorporate the surface water/groundwater interaction into river basin water allocation models.
3. Evaluate environmental instream flow and wetland functional assessment approaches.
4. Develop effective approaches to aquatic ecosystem restoration.
5. Evaluate needs for protection of rare and endangered aquatic species in North Carolina streams.
6. What are the key measures for the aquatic ecology of a reservoir?

## F. Waste Management

### 1. **Biosolids disposal:**

- Determine alternative uses and markets for biosolids generated from wastewater.
- How should municipal biosolids and septage be considered in nutrient sensitive water (NSW) strategies?
- Quantify the water quality impacts of biosolids and septage application at municipal and agricultural sites for NSW strategies.
- Evaluate if "emerging contaminants" may be leaching into water table aquifer at biosolids application fields. Assess the utilization rates of biosolids by various crops to help develop comprehensive land application rates that will not result in groundwater contamination under land application fields.

### 2. **Fogs, oils and greases (FOGs):** Investigate factors leading to sanitary sewer overflows, including disposal of FOGs.

### 3. **Waste and energy:** Determine generation of power during wastewater treatment process.

## G. Groundwater

### 1. **Shallow groundwater:** Determine the relationship between the Coastal Plain's surficial aquifers, surface water, and the first confined aquifer. Determine the relationship between the transfer of contaminants and waste discharges from land and surface waters to surficial aquifers and vice versa.

### 2. **Naturally occurring chemicals:** Compile latitude and longitude coordinates and well and water depth of areas that have naturally occurring chemicals in soil that affect groundwater. Working with US Geological Survey datasets would be useful.

### 3. **Residual agricultural chemicals:** Examine the occurrence of nutrients and pesticides in wells where former agricultural fields have been converted to housing developments. Determine/Predict areas of North Carolina and conditions under which such contamination may occur.

### 4. **Geochemical conditions:** Examine the geochemical conditions under which adverse reactions will occur due to aquifer storage and recovery, or the range of combinations of injected water quality, native water quality, aquifer geochemistry, and storage/recovery times that should have minimal adverse reactions. Mobilization of arsenic is of primary concern.

### 5. **Concentrated animal feeding operations (CAFOs):** Assess impacts of CAFOs on groundwater quality.

Attachment 2  
**Water Resources Research Institute Preproposal Form  
2010-2011 Research Program**

Number assigned by WRI: \_\_\_\_\_

Project Title:

WRI Priority Research Area addressed (See Attachment 1 and select up to 2 priority areas using letter and number, e.g. B4 for Groundwater quality and safety.):

Proposed Initiation Date (Enter as MM-DD-YYYY):

Proposed Completion Date (Enter as MM-DD-YYYY):

*Duration between Initiation and Completion Dates is limited to one year in length.*

WRI Fund Requested (\$50,000 maximum):

Principal Investigator (name, academic rank, university, address, phone, email):

Co-Investigators (name, academic rank, university):

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**STATEMENT OF PURPOSE AND RELEVANCY:**

Please provide a coherent statement of purpose and relevancy for your proposed work.

**IMPORTANT GUIDANCE:** This statement will be provided to reviewers, stakeholders and communicators so they might grasp the essence of the proposed work and make a value judgment on its relevance and importance as a WRI research project. Therefore, it is to your distinct advantage that the statement effectively addresses the following questions:

- What water resources issue/problem does the proposed work seek to address? (**See Attachment 1**) Why is this research important?
- How is this proposed work relevant to water resources in North Carolina? How would the findings/results be especially significant to water resources issues/problems existing in the state?
- Does the proposed work have the potential to expand the fundamental knowledge in its specific area?
- What are the intended outcomes and potential realistic impacts of this proposed work? Please include information on undergraduate/graduate student education and other training opportunities.

Please remember that your statement must stand alone as a separate description and justification of your proposed effort. While your responses to several other sections of the preproposal might be helpful in developing this statement of purpose and relevancy, it should be a cohesive composition (simply “pasting it together” from other sections is NOT advised). Do not use acronyms, technical jargon, or scientific terminology that might not be familiar to lay audiences and scientists outside your discipline or specialization.

A sample statement of purpose and relevancy is appended as Attachment 4 for your guidance. Begin entering the statement on the following page (page 2), and contain it to that page.

**NOTE: The completed Preproposal Form may not exceed 5 pages total when submitted.**

## Attachment 2

(Begin entering Statement of Purpose and Relevancy here; Contain your "Statement of Purpose and Relevancy" to this page)

## Attachment 2

**RATIONALE:** Describe the problem or opportunity to be addressed. Document the magnitude of the situation and relevance of the issue/problem to state and/or regional issues. Why is this project/topic innovative and important? (Contain your "Rationale" to this page)

**GOAL:** Describe how the proposed work would address needs listed on the WRRR Research Priority List. (Contain your "Goal" to this page)

## Attachment 2

**OBJECTIVES:** Number and list the objectives of the project. State objectives in a way that enables measurable comparison to expected project results. (Contain your "Objectives" to this page)

**RESEARCH APPROACH:** Describe the project design and explain how the work will accomplish the stated objectives. (Contain your "Research Approach" to this page)

## Attachment 2

**EXPECTED RESULTS AND BENEFITS:** Describe the expected outcomes of the project. What new solutions and/or opportunities will be available to industry and/or management agencies? What impact will successful completion of this project have on North Carolina and/or the region? (Contain your "Expected Results and Benefits" to this page)

**RELEVANCE TO NORTH CAROLINA:** Explain how this project relates to water resource problems and issues in North Carolina. (Contain "Relevance to North Carolina" to this page)

**RELEVANCE TO OTHER WORK:** Explain how this project might coordinate and integrate with other research in the state and/or region. (Contain "Relevance to Other Work" to this page)

**TRAINING POTENTIAL:** Estimate the number of graduate and undergraduate students, fields of specialty, and degrees expected to result from participation in the project. (Contain "Training Potential" to this page)

## **Sample Statement of Purpose and Relevancy**

### **Rain-Impact Controls on Erosion and Chemical Transport in Watersheds and Agricultural Land**

The ultimate goal of this project is to improve our understanding about how pollutants are transported between the landscape and the nation's lakes, rivers, and water supply reservoirs. Despite more than 70 years of research aimed at understanding the processes involved, sediment, phosphorus, nitrogen, and agro-chemicals continue to negatively impact our water quality. Improved understanding of the mechanisms moving these pollutants provides a basis upon which scientists, managers, and producers can develop better land-management practices for maintaining good water quality.

Current pollution risk tools do not consider the roles that raindrop impacts have on detaching soil and entraining chemicals into runoff even though the importance of this process was hypothesized 40 years ago. Only within the past few years has research meaningfully elucidated exactly how raindrops influence soil detachment and how we can mathematically describe the process.

We propose to extend this research to include chemicals in soil-water and bound-to-soil particles. We plan to extend the theoretical basis of the new rain-impact equations to account for chemicals dissolved in soil water and bound-to-soil particles. We will then test our theory using controlled laboratory experiments in which we will simulate rainfall over small containers of contaminated soil and collect and analyze the runoff. We will revise the theory and retest as needed. Once we are satisfied with our laboratory results, we will test our model in the field. Ultimately, we anticipate that our results will be incorporated into regionally and nationally recognized pollution assessment tools and will be used as a new basis for the next generation of related research.

Because polluted agricultural runoff is identified as a primary contributor to the impairment of rivers, lakes, and reservoirs, our work will help achieve improved harmony between agriculture and the environment and be useful in the development/enactment of erosion control measures by resource agencies and local and state legislative bodies. This could translate into diminished socio-political stress in regions where substantial dairy production coexists within primary municipal water supply watersheds.

**WRRI Curriculum Vitae**  
(must not exceed 2 pages)

**NAME:**

**Position:**

**Professional Address:**

**Telephone:** \_\_\_\_\_ **Fax:** \_\_\_\_\_

**E-mail:** \_\_\_\_\_ **Web Site:** \_\_\_\_\_

**EDUCATION (most recent first):**

**PROFESSIONAL EXPERIENCE (include positions, pertinent research, teaching activities and recent grants):**

**SELECTED PUBLICATIONS:**

## WRI Timeline for FY 2010-2011 Funding

This timeline depends upon the timing of the Congressional budget approval process for federal fiscal year 2010.

<b>YEAR</b>	<b>DATE</b>	<b>ACTION</b>
2009	July 28	Request for preproposals distributed.
	August 31	Preproposals due electronically to WRI by 4:00 pm.
	September	Preproposals are reviewed.
	September 28	PIs notified of preproposal results. Full proposals solicited.
	October 28	Full proposals due.
	Early November	Full proposals sent for peer review.
	December 15	Technical Committee meets to consider full proposals.
	Late December to Early January 2010	PIs notified of Technical Committee results and status of full proposals.
2010	January 15	Research projects to receive USGS funding due to USGS.
	March 1	USGS-funded research projects start.
	March - August	WRI-funded research projects start.
2011	February 28	USGS-funded research projects conclude.
	March - August	WRI-funded research projects conclude.