



# Rhode Island NSF EPSCoR

Experimental Program to Stimulate Competitive Research

## Collaboration: We are better together

**Partnerships with state agencies and organizations:** Outreach programs broaden diversity in STEM fields, engage K-12 students, and enhance research experience for teachers.

**Undergraduate development:** The competitive Summer Undergraduate Research Fellowship (SURF) program offers paid, intensive, 10-week research experiences in the labs of faculty mentors.

**Graduate student support:** Fellowships allow students the opportunity to pursue stimulating, collaborative, nationally competitive research.

**5 shared facilities:** Genomics & Sequencing Center (URI); Marine Life Science Facility (URI); Proteomics Center (Brown); Center for Computation & Visualization (Brown); Edna Lawrence Nature Lab (RISD)

**A growing, searchable database:** CoresRI.org provides scientists detailed information on more than 620 lab instruments in 26 categories and services available in more than 48 facilities and laboratories at 13 institutions and 15 centers in RI

**Communication skills:** URI's Metcalf Institute launched SciComm Exchange workshop series for RI natural and social science faculty, researchers and graduate students to share best practices in science communication.



## Track I: Climate change research

"What is the response of marine life to climate variability?" This is the guiding force behind three questions central to RI NSF EPSCoR research:

**# 1 What are the stress responses and evolutionary potentials of marine organisms in response to increased climate variability?**

**# 2 How are the structure and function of coastal marine food webs and biogeochemical cycling being directed in response to climate change?**

**# 3 How will global climate change affect the ecology of marine pathogens and parasites?**

## Initiatives: Our nine partner campuses

**Brown University:** Completed hardware purchases for the EPSCoR computational condo hosted in the Brown Center for Computation and Visualization (CCV). The EPSCoR condo now has 1012 cores devoted to support of primary users with EPSCoR-approved research projects.

**Bryant University:** Purchased equipment to increase research capacity and enrich research experience of students; created team of researchers to tackle the multidisciplinary, environmental problem of non-point pollution affecting Narragansett Bay.

**Community College of Rhode Island:** Continued work with Rhode Island Educational Talent Search (ETS) to deliver STEM education to est. 1,000 students in grades 6-12 at 11 urban schools; purchased equipment & supplies to fill gaps in STEM curriculum and prepare CCRI students for STEM degrees and industry employment.

**Providence College:** Increased focus on providing undergraduates with research experience through SURF and campus opportunities; developed collaborative research projects with researchers at URI and the EPA; purchased capital equipment for installation in laboratories.

**Rhode Island College:** Expanded opportunities for faculty to research, integrate research into teaching, and incorporate undergraduate research into institutional goals; equipment/supply purchases and core facility use increased research competitiveness.

**Rhode Island School of Design:** Advanced data visualization research through investments of \$125,000+ for capital improvements and new technology since grant's inception, and funding of additional \$56,000 for new compound microscopes for student use, additional camera systems, a lab-grade refrigerator and freezer, and wet lab equipment.

**Roger Williams University:** EPSCoR's support of faculty and students enhanced climate of engagement in undergraduate research during the academic and summer months; purchase of major equipment improved and expanded research capacity.

**Salve Regina University:** EPSCoR funds added needed technician positions during the summer session and equipment purchases to expand the institution's research portfolio.

**University of Rhode Island:** Research utilized genomics, proteomics, metabolomics, and computational biology to understand and predict responses of marine systems to unusual fluctuations in climate; supported training and professional development of graduate and undergraduate research fellows.





## Looking ahead: RII Track-I proposal

RI NSF EPSCoR's pending 5-year, \$20m plan with the NSF seeks to assess the impacts of global climate change and associated environmental stressors on Rhode Island's watershed, coastal, and marine environments, through a hypothesis-driven approach.

## Year 4: Track I goals & outputs

**Broader impacts:** Programming served 300+ students (grades 6-12), 100 undergraduates, 30 graduate students

**Intellectual merit:** 69 presentations at national meetings, 48 publications and 19 proposals

**Enhance core infrastructure:** \$850,000+ in equipment purchases and cyber infrastructure upgrades

**Project work:** 194 participants (including 66 faculty); 26 collaborations

**Outreach activities:** 895 people (faculty, students, teachers, & K-12 students) reached directly or by teacher training

**Research & development:** Development of new techniques for use in marine life science disseminated in 10 publications



## Track 2: Watershed health

Researchers from the University of Rhode Island and Salve Regina University continue their collaborations with their counterparts in Delaware and Vermont to develop, test and employ innovative real-time sensors that advance understanding of water quality responses to extreme climatic events and advance adaptation strategies at the community, state and regional scales.

In Rhode Island, results are actively being acquired and analyzed from three public drinking water networks. Economics laboratory experiments are ongoing to assess the impact of high frequency monitoring on decision making. The sensor network served as a basis for a successful URI NSF grant project that sponsored a research development workshop in China (October, 2015) focused on urbanizing watersheds.

On the innovation front, URI researchers have developed a new metal plating process for silicon and silicon nitride chips that shows promise for identifying organic chemicals such as pesticides. Autonomous sampling vessels are undergoing novel modifications by URI scientists to permit their deployment in river networks.

RI NSF EPSCoR Track II Collaborative Research: North East Water Resources Network; AWD 1330406 (8/1/13-7/31/16)  
PI: Arthur Gold

## Major research activities in Year 5

### Diatom Community Composition as an Indicator of Coastal Ecosystem Change

This project will bring together four scientists from different fields to explore coastal biogeochemical responses to climate change and develop new assessment tools for monitoring ecological change.

### Canaries in Narragansett Bay? Untangling the Ecological Response of a Key Diatom Genus to Environmental Change

This project links an academic scientist with expertise in genetics and a federal agency scientist with expertise in predictive modeling to examine how the base of the food web in Narragansett Bay is changing in response to changes in environmental conditions.

### Marine Disturbance Disease and Climate Change in Rhode Island's Coastal Waters: Merging Higher Trophic Level Population Dynamics Models/Datasets with Lower Trophic Level Climate Forecast Models

This team will use physical oceanography and aquatic pathology to integrate historic datasets to understand the relationship between physical and chemical changes in the ocean and various health issues affecting coastal fish and shellfish of commercial interest.

### A Proteomics Approach to Analyzing Phenotypic Plasticity versus Adaptation in the Response of Marine Invertebrates to Climate Change

This team will study the proteins in a common invasive marine species to determine if it is adapting to local stress factors within one generation or going through genetic changes over multiple generations. The findings will be used to predict the impact on economically important fisheries and aquaculture.

### Pushing to New Limits for Models of RI Bays and Sounds

This trans-disciplinary project combines expertise in coastal waterway modeling and supercomputing model development to create a new 3D modeling tool that extends our existing ability to understand coastal turbulence for such things as risk assessment, infrastructure planning, tracking of toxic spills and fisheries/aquaculture management.

### Narragansett Bay Apex Predators' Response to Toxic Chemicals and Climate Change

Working in partnership with the federal Environmental Protection Agency, a research scientist with expertise in shark biology and molecular toxicology will study the sensitivity of predators to persistent chemicals in Narragansett Bay.