The Ocean State
Tracking change in our marine life and ecosystems
Our Mission is to provide a platform to promote collaboration and cooperation among Rhode Island’s institutions of higher education (IHE) and to enable alignment of our efforts with the needs of the state to increase research competitiveness, especially in marine life science and affiliated sciences.

We believe this will improve the employment rate, provide more attractive employment opportunities, create new businesses, and preserve and strengthen our connection to Narragansett Bay, its watersheds, Rhode Island Sound, and the Atlantic Ocean.

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They work together under the auspices of Rhode Island NSF EPSCoR, funded by a $20 million grant that began in 2010, driven by a common mission to understand how climate change will impact marine life — information that will help our leaders and citizens better prepare for an uncertain future and best manage precious resources.

Supported by shared RI EPSCoR core facilities and bolstered by a community of expertise, researchers at the state’s nine institutions of higher education collaborate in myriad ways on three central questions:

• What are the stress responses and evolutionary potentials of marine organisms in response to climate change?

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

• How will global climate change affect the ecology of marine pathogens and parasites?

EPSCoR funding also has trained and educated the next generation of scientists through undergraduate, graduate and postdoctoral research opportunities, and sought to broaden and diversify the Rhode Island workforce through novel outreach experiences for K-12 students. None of the work would be possible, researchers say, without the support of RI EPSCoR or the state’s match through RI Science and Technology Advisory Council (STAC) collaborative research awards.

I invite you to take a read through this issue of The Current and learn more about the research and people of Rhode Island EPSCoR.

Best wishes,

Carol Thornber
Principal Investigator
RI NSF EPSCoR

Explore these stories more in depth on our website:
http://web.uri.edu/rinsfepscor/we-are-rhode-island-nsf-epscor/
 Collaborative research grants pool scientific talent in the Ocean State

R.I. Gov. Gina M. Raimondo congratulates STAC award recipients Jason Grear, US EPA, and Tatiana Rynearson, URI. Standing with the governor are STAC co-chairs, David A. Savitz, Brown University, and Gerald Sonnenfeld, University of Rhode Island.

RI Science and Technology Advisory Council (STAC)

Recognizing the value of the federal Experimental Program to Stimulate Competitive Research (EPSCoR), the state of Rhode Island chips in a 20 percent cash match through an annual round of research grants.

“The way we support EPSCoR is unique and special in that we support it in the spirit of the program,” says Christine Smith, STAC executive director. “We help build collaborations that have a high potential for follow-on funding.”

Rhode Island launched STAC in 2005 and embedded the council in a legislative statute the following year to secure a key place for innovation in the state’s agenda. The central tenets of the STAC mission — increasing research and development capacity, and encouraging entrepreneurship and creation of new companies — directly sync up with EPSCoR objectives to do the same.

“EPSCoR is all about building capacity, both with people and the infrastructure,” Smith says. “Rhode Island has wonderful assets, but in order to play to these assets in an increasingly competitive world, the state needs to nurture and support innovation so we can perform on a global level.”

The state awards roughly $800,000 in STAC grants each year to about six to eight research teams with projects that reflect the EPSCoR theme — the impact of climate change on marine life and ecosystems — and showcase collaborators from at least two different institutions in the state.

Another unique factor about the STAC grants lies in their support of projects with high potential for follow-on funding, according to Smith. Typically, the successful proposal comes in at the catalytic stage, taps into the STAC grant as seed funding, and emerges with data needed to secure larger grants at the national level.

“It’s a small chunk of extra dollars to get them to that final step,” Smith explains.

Through the 2016 round of grant awards, Smith says, Rhode Island has invested $11.4 million in 80 research teams. She notes that more than 200 students have trained in research labs during the EPSCoR grant period through STAC supported projects.

The return on the money for Rhode Island, while certainly measurable, far exceeds the price tag. The state economy depends heavily on the fishery and tourism industries, both of which stand to feel the brunt of climate change. Smith says the research funded brings understanding and informs policy.

What’s more, she adds, the work being done in the Ocean State holds international relevance.

“We have a wonderful lab in Narragansett Bay, and it’s unique in so many ways,” Smith says. “It’s a fairly small footprint with a coastal watershed and open ocean. Geographically, we are in the North Atlantic, at the cusp of where true north meets the mid-Atlantic.

“We have an incredibly rich resource to study and to provide us with a natural laboratory that exists nowhere else in the world. We can be a leading source of information and a leader of excellence.”
Baylor Fox-Kemper, Brown University
Assistant professor; earth, environmental and planetary sciences

Baylor Fox-Kemper arrived at Brown University three years ago with his research focus on ocean turbulence, or, more simply, how things get mixed and transported in the upper part of the ocean.

Winds, waves and currents — turbulence as small as the wake behind a buoy to a massive eddy the size of 10 Rhode Islands — Fox-Kemper seeks to understand how they work and the impact of climate change on these natural systems.

Rhode Island NSF EPSCoR offered the chance to jump aboard and collaborate with colleagues at partner institutions and learn from their local expertise. Today, Fox-Kemper is the lead principal investigator on a Rhode Island Science and Technology Advisory Council (STAC) grant that brings together scientists at Brown, University of Rhode Island and Rogers Williams University, and relies on the research capacity of RI EPSCoR-supported facilities throughout the state.

Fox-Kemper brings his high resolution ocean modeling to the project; URI researchers Lewis Rothstein, Christopher Kincaid, and David Ullman add their expertise on modeling the region. RWU’s Dale Leavitt and David Taylor contribute their fisheries expertise.

“It spans the whole spectrum, from the fundamental physics through the local physical experience, and up to the biological expertise,” Fox-Kemper says. “The goal here is to predict what will happen in the future so we can be ready for what comes.”

What the EPSCoR grant has allowed, he adds, is for the Rhode Island scientists to build a fully functioning model that will have application in other regions (Chesapeake Bay, Puget Sound, Gulf of Mexico), attract additional funding, and give rise to the pursuit of bigger and more complex questions.

Lewis Rothstein, URI Graduate School of Oceanography
Professor; physical oceanography

The ocean, with the ebb and flow of tides, currents swirling at and beneath the surface, and winds blowing overhead, never stills, even at its calmest moments.

This constant state of circulation, says Lewis Rothstein, determines the health of our coastal system, which, in turn, supports the food web, drives the economy, and sustains quality of life.

The balance that is the earth’s heat budget — whether purely natural or influenced by human actions — determines how and where the water moves, and affects such characteristics as the light penetration and food availability organisms depend on for survival.

“The overall focus of my research is trying to understand the flow of energy through the world’s oceans,” Rothstein explains. “How is the coastal regime responding to natural climate variability and the trend that is climate change?”

Awarded a series of three, interrelated RI Science and Technology Advisory Council (STAC) grants, Rothstein and his peers in the Rhode Island NSF EPSCoR community are creating numerical models guided by observed scientific data to forecast the impact of climate change on water movement and the implications for marine life and ecosystems.

Says Rothstein: “We have to understand how the ocean circulates. The foundation of our coastal ecosystem — from the tiniest of organisms to fish — lies in how the water responds within a world that is experiencing profound climate change.”

What the EPSCoR grant has allowed is for the Rhode Island scientists to build a fully functioning model that will have application in other regions.

Models calculate the ocean’s motion
On Narragansett Bay: Exploring environmental impacts

Roxanna Smolowitz, Roger Williams University
Assistant professor; biology, marine biology
Director, Aquatic Diagnostic Laboratory
SURF program mentor

If there is an EPSCoR research project in Rhode Island investigating the health or disease of marine animals, there is a good chance Roxanna Smolowitz is involved.

With deep expertise in aquatic veterinary science, Smolowitz regularly teams up with her colleagues at EPSCoR partner institutions, from developing tools to combat aquaculture disease to seeking answers to a mysterious and prolonged sea star die off. Throughout all of the projects, Smolowitz says, RI EPSCoR core facilities and equipment provide support, without which the work would not be possible. For example, the RI Genomics and Sequencing Center at URI, makes procedures — identifying a parasite in blue mussels — accessible and affordable.

She also says the breadth and depth of the EPSCoR community of scientists offers a knowledge base that builds on what is available on individual campuses: “Without collaboration, it wouldn’t be anywhere near possible to do what we do. That accessibility and interactions with other professors is critical.”

Dale Leavitt, Roger Williams University
Associate professor; marine biology
SURF program mentor

Dale Leavitt sums up his research focus — he is, he says, “mostly a shellfish guy.”

The apt description, concise and straightforward, tells not only where Leavitt’s expertise lies, but also explains his presence in three distinctly different collaborative research grants. One RI Science and Technology Advisory Council (STAC) grant sought to develop new tools and mechanisms to combat aquaculture disease. Another created sculptural forms for an urban coastal restoration site. The most recent award employs numerical modeling to better understand coastal turbulence and its impact on the marine ecosystem.

And, as a mentor in RI EPSCoR’s Summer Undergraduate Research Fellowship (SURF) program, Leavitt trains undergraduate students to work on shellfish stock assessment and management. Together, the research grants and the SURF projects all fall within Leavitt’s wheelhouse, he says: “This is where my interests lie. I would be doing similar work anyway with my own research. EPSCoR, SURF, STAC — they all fall along the same lines.”

And yet, Leavitt notes, the EPSCoR grant has opened up important opportunities through the collaborative research of the STAC grants and work with SURF students, while yielding valuable data to better manage the state’s fisheries.

To read more about the researchers here and others in the RI EPSCoR community, please see the continuing series featured on our website: http://web.uri.edu/rinsfepsco/
Rebeka Rand Merson, Rhode Island College
Associate professor; biology
SURF program mentor
Past RI EPSCoR research team leader

Rebeka Rand Merson investigates the molecular impact of environmental chemicals on apex predators, those marine animals at the top level of the food chain, as part of the Rhode Island NSF EPSCoR effort to understand the resilience and adaptation of marine organisms to environmental change.

Using skates as a model, Merson studies what happens when an organism, say a shark, is exposed to environmental chemicals and tracks the changes wrought at the molecular level.

When skates are exposed to polychlorinated biphenyls (PCBs), environmental contaminants often found in industrial waste, the chemical travels into the fatty tissue, where it stays and doesn’t break down. Merson’s research looks at the response of one protein, AHR (aryl hydrocarbon receptor), which the chemical binds to and then moves into the cell nucleus, where it alters the protein’s function and disrupts development.

The resulting impact, according to preliminary results from Merson’s work, spells developmental trouble for the apex predators, upsetting the delicate process of gene expression and initiating a devastating ripple effect.

“If these apex predators are sick, their disease being caused by chemicals, they will be less able to assert that top down regulation on the food web,” Merson says. “If we lose the apex predator, we’re going to see the impact at the lower levels. And then, we will have a whole myriad of outcomes, from the fisheries to the health of the ecosystem.”

Merson sees a direct connection between climate change and the results turning up in her research. More rain falls in shorter periods of time, increasing the flow of water washing over roads and land, and overwhelming water treatment plants.

The resulting runoff and untreated wastewater load into Narragansett Bay chemicals from industry, agriculture and development that alter the cellular function in marine organisms, which puts at risk the ecosystem that fuels the economy and quality of life in the Ocean State.

Jack Costello, Providence College
Professor; biology
SURF program mentor

When we last checked in with Jack Costello two years ago, he had just published a paper on propulsion as part of a collaborative research team.

Investigating how to incorporate the benefit of flexibility to enhance propulsion, the scientists studied a cross-section of animals moving at their steady state, or regular motion. They found that once moving regularly in fluid, whether through water or air, animal propulsors bended to the same degree.

The puzzling issue that arose was that while there was a similarity in the position of bending, the materials making up the propulsors of the group studied was mixed.

“It makes sense that for something to bend, it has to be flexible,” explains Costello. “What we argue is that material flexibility is necessary, but it is completely insufficient to explain bending.”

Think about it, prompts Costello, noting that he is not saying materials are unimportant to the process. He points out that materials do vary between different groups. Some have backbones, some don’t; some have fins, others feathers. As it turns out, bending is not only a result of material composition (although flexibility is needed), but rather more about how animals move through water or air.

Jack Costello (second from the left) : Flexibility and bending in propulsion / Photo by Joel Page for Providence College

Today, Costello and his collaborators continue to build on their research together, having published several more important papers in 2015 and securing more grant funds to pursue answers and understanding.

The intriguing question, he adds, is why do animal propulsors bend, yet manmade ones do not? The implications of climate change unpack more questions about propulsion and what warming temperatures may mean for movement.
RI EPSCoR brings Bay science to a broader audience

Sunshine Menezes, Executive director
Metcalf Institute for Marine & Environmental Reporting

Tracking the impact of climate change on marine life and ecosystems demands the attention of researchers throughout the Rhode Island NSF EPSCoR community. Yet, the work doesn’t end with the data gathered, conclusions drawn and findings published. These scientists also have to communicate about their research and the meaning of their work, not only so we understand what is taking place, but also to inform development of policies that will better prepare the Ocean State and its people for an uncertain future.

And yet, explains Sunshine Menezes, executive director of the Metcalf Institute for Marine & Environmental Reporting, scientists traditionally do not receive the training needed to engage an audience without a scientific background: “We go through rigorous training in graduate school about how to conduct our research. But, in terms of communicating research goals and findings, graduate students’ training only prepares them to interact with other scientists.”

As part of the University of Rhode Island Graduate School of Oceanography (GSO), the Metcalf Institute serves as an international leader in science training for journalists. The EPSCoR grant brought Metcalf on board to flip the paradigm and deliver communication expertise to scientists.

“This grant allowed us to focus our efforts on the other side of the coin,” says Menezes, who also holds a Ph.D. in biological oceanography from the URI GSO. “The RI EPSCoR funding is intended to give the grantees whatever they need to boost themselves to the next level, and that is exactly what has happened with Metcalf Institute.”

Jennifer Bissonnette, Rhode Island School of Design Biological programs designer, The Nature Lab SURF program mentor

With an undergraduate degree in biology, a Ph.D. in marine science, and a passion for art, Jennifer Bissonnette embodies what Rhode Island School of Design brings to the Rhode Island NSF EPSCoR table — the marriage of scientific investigation and artistic inquiry.

The Rhode Island EPSCoR jurisdiction is the only one in the country to include an art and design school, and the partnership has exceeded expectations, enriching the institution and its students as well as the RI EPSCoR community in both intended and previously unimagined ways.

“If you only hear the science, it doesn’t always resonate,” says Bissonnette, who holds oversight responsibility for the microscopy, imaging, and aquatic systems developed through EPSCoR funding at the RISD Nature Lab. “It doesn’t evoke a connection, an urge, a willingness to protect Narragansett Bay in the face of climate change.

“Once you see these organisms, these fish, and get told the story that the science is analyzing, it’s not us versus them anymore. We are all a part of it and we are connected. That is what engages people.”

Together, the EPSCoR equipment and the RISD pedagogy set the stage for students to take in the science and be rigorous about the discipline while exploring from an emotional perspective, Bissonnette explains: “People have multiple sides to themselves. Science fills our need for knowledge, and the arts evoke meaning.

“In a way, combining the two gives us the freedom to look at the whole picture, reinvigorating the science without losing the factual basis and with the kind of expressiveness that will engage the public.”
Tiny organisms yield big clues

Tatiana Rynearson, URI Graduate School of Oceanography
Associate professor, oceanography

To the non-scientist, the idea sounds farfetched — microscopic organisms drift freely in the currents and tides of the world’s oceans, generating half of the oxygen we breathe. These tiny, one-celled plants — phytoplankton — undergo photosynthesis in the sunlit waters of the ocean’s surface, drawing down enormous amounts of carbon dioxide and pumping oxygen into the atmosphere. Unseen by the naked eye, they also form the base of the marine food web, eaten by tiny floating animals, zooplankton, which in turn serve as a food source for the next level of predators.

Consequently, climate change or not, these organisms hold considerable interest for scientists and are the subject of much study. “We want to know what they do and how they work,” says Tatiana Rynearson, whose research focuses on plankton ecology and evolution. “Then, you add in climate change, and there is the concern of how they are going to respond. What drives their productivity, what regulates their success over time?”

Stepping back and contemplating the impact of her research, Rynearson says no single project or outcome is likely to change minds or spur leaders to act. However, she figures, her findings will add to a continually growing body of work and help fill in the unknowns. The information produced by the RI EPSCoR community as a whole can help leadership adapt policy to projected change; for example, less phytoplankton in Narragansett Bay could lead to less fish, which means adjusting to the new normal.

“Capstone conclusions are always supported by many, many research projects,” she explains. “One paper may not change the trajectory of policy, but if we have a list of 20 publications that all reach the same set of conclusions, then we can say, globally, here are the changes we expect.”

Rebecca Robinson, URI Graduate School of Oceanography
Associate professor, oceanography

The research work of the Rhode Island NSF EPSCoR community spans the depth and breadth of the Ocean State’s coastal and offshore waters, from surface to sediment, and all manner of life and movement found in between.

Rebecca Robinson’s focus lies at the deepest point, in the particles that comprise the ocean floor. There, in the sediment, Robinson looks at diatoms, a single-celled organism distinctively known for its glass cell wall.

“In the last 50 years or so, the type of diatoms that were typically in Narragansett Bay are starting to decline,” Robinson says. “Some have surmised that this is in response to climate change. So, as the system warms up, it is possible the chemistry of the water is changing.” In turn, that means change for the Bay’s marine life and ecosystem. Diatoms are phytoplankton, a plant or algae, and exist at the base of the food web, the initial source of energy on which the whole ecosystem depends. The status of these microscopic organisms provides important insight to the Bay’s health and yields clues — indicators of sea ice to salinity — about the environment.

Using equipment at the Marine Science Research Facility (MSRF), a RI EPSCoR facility at the URI Bay Campus, Robinson examines cores of Narragansett Bay sediment. She compares diatom communities in the sediment from the deep past (decades to centuries ago) to those from more modern to recent times, using phytoplankton surveys by URI Graduate School of Oceanography scientists.

“We want to understand how to use this environmental data,” Robinson says. “If the diatom community is changing and is really different than what Narragansett Bay has seen, if the organisms are being pushed outside of their normal limits, then maybe it’s an alarm bell. But, if they’re within the natural limits, we can consider that as plans are made to adjust our management of the ecosystem.”
Before Rhode Island NSF EPSCoR, there was a group of individuals who envisioned what might be possible in the Ocean State with collaboration among scientists and shared research facilities.

The actual process took several iterations before meeting with complete success and a five-year, $20 million grant that brought together the state’s two research institutions (University of Rhode Island and Brown University) and six primarily undergraduate institutions (PUIs) (Bryant University, Community College of Rhode Island, Providence College, Rhode Island College, Roger Williams University, and Salve Regina University), and later, Rhode Island School of Design.

The overarching theme of marine sciences constituted a natural fit for the small state with more than 400 miles of coastline, according to David Rand, who was among the early planners of RI EPSCoR. Researchers also needed genomics and proteomics capabilities — lab services that would enable and enhance investigation as well as keep and draw talent in the state.

Sitting back in his office chair, Rand contemplates RI EPSCoR today as the grant wraps up a sixth year.

“I would say it has been a huge success and surpassed all expectations,” says Rand, whose own research focuses on the ecological genetics of barnacles. “It’s certainly met what we hoped for and what we realistically believed might happen.

“This is due to lots of people working together, and doing what was proposed. Also, the principal investigators at URI and Brown and other institutions have made sure that the rest of us did what we promised to NSF.”

In addition to the research and collaborative efforts that extend beyond campus boundaries, the grant built research capacity with core genomics (URI and Brown) and proteomics (Brown) facilities used by Rhode Island scientists. Rand credits EPSCoR Steering Committee member Edward Hawrot of Brown University with taking the lead on computational resources with Brown’s Center for Computation and Visualization (CCV), which is available to the statewide EPSCoR community.

The technology and equipment accessible through the shared centers and the Marine Science Research Facility (MSRF) provide the framework that allows EPSCoR researchers to address Rhode Island’s climate change issues, many of which are relevant to other states.

“We’ve been able to leverage existing grants and train people with new skills,” Rand notes. “And, EPSCoR has enabled people to get to know one another across the state. That’s a good thing.”

David Rand, Brown University
Professor; biology
Stephen T. Olney Professor of Natural History
Chair, Department of Ecology and Evolutionary Biology
RI NSF EPSCoR partner liaison, graduate student coordinator

Paul White, CCRI Warwick campus
Associate professor; oceanography, geology

Duwayne Rieger, CCRI Newport campus
Assistant professor; oceanography, geology, physics

CCRI sets stage for learning on the Bay

Paul White teaches an introductory oceanography course and lab at Community College of Rhode Island, the largest public, two-year, degree-granting college in New England.

The lab focuses on water quality in Narragansett Bay, collecting data and samples from Warwick’s Conimicut Point and Goddard Park and investigating common Atlantic and invasive species. Out in the field, the students wear waders and use seine nets for collection; back in the lab, microscopes allow study of plankton samples.

CCRI purchased this and other related equipment with Rhode Island EPSCoR funding, making the lab and learning possible.
White collaborated with Duayne Rieger, CCRI Newport campus, and Emily Burns, Providence and Lincoln campuses, to create the curriculum.

“The waders have really opened up how much sampling we can do,” says White. “The students can go out in the water, seine, collect fish, do plankton hauls. Then, back in the lab, they can look at samples and assess the data. It really connects the fieldwork to the lab.”

The experience, grounded in an inquiry-based learning format, also sets the stage for discussion about ocean acidification and the impact on both the ecosystem and the Ocean State economy, White adds.

Rieger says he notices the impact on his Newport class of hands-on, experiential lab work.

“The students get excited when learning about where we live,” he says. “They’re looking at their world in a way they’ve never looked at it before. They’re paying attention to what’s on the beach and what the water quality is. They are seeing the world that is familiar, but through a new perspective.”

Associate Professor Dan McNally, Bryant University, wasn’t looking for any examples of the impact of Rhode Island NSF EPSCoR on his campus.

The alternative is clear, says McNally: “We wouldn’t have an undergraduate research program if we didn’t have EPSCoR.”

Still, last year, when Megi Feraizi returned to campus from her visits to pharmacy doctoral programs she delivered a stunning endorsement. After being granted interviews at every school where she applied, she received across-the-board acceptances — in some instances, within an hour after her interview.

“She about busted down my door, she was so excited,” McNally recalls. “And, the reason why she got accepted was because of her undergraduate research experience — she flat out contributes it to undergrad research.”

From McNally’s perspective, Feraizi’s story showcases the collaborative effort by Bryant and RI NSF EPSCoR to get undergraduates conducting research in the lab, above and beyond the classroom experience.

At Bryant, undergraduate research in the biological and environmental science curriculum is a graduation requirement. And, all business majors have to fulfill science requirements to graduate, including an upper level class with a lab.

With EPSCoR funding, McNally’s department has been able to hire students to conduct research in faculty labs during the academic year and purchase materials and equipment to support the research.

Students also are encouraged to apply for the Summer Undergraduate Research Fellowship (SURF) program, which provides a 10-week, intensive research experience in the labs of faculty mentors through a Rhode Island NSF EPSCoR and Rhode Island IDeA Network for Excellence in Biomedical Research (INBRE) collaborative program.

McNally says Feraizi’s story represents what happens when undergraduates gain opportunities and guidance in undergraduate research. They discover their passion and make contributions; they deliver the best kind of outcomes.

To read more: http://web.uri.edu/rinsfepscor/

“She about busted down my door, she was so excited. The reason why she got accepted was because of her undergraduate research experience — she flat out contributes it to undergrad research.” – Dan McNally, Bryant University
respond to increases in water temperature), chemical defenses (does Ulva chemically inhibit growth of other species), and herbivore control (the impact of snails on blooms).

Anyone who goes for a walk along the Rhode Island coast or swims or fishes understands the importance and impact, the effects of the blooms disrupting leisure activities and clogging and tearing fishing nets. And, once the seaweed dies, the large decaying masses drive down oxygen levels and cause fish kills.

“Algal blooms are a natural part of marine communities and they play a vital role in the marine ecosystem,” Thornber explains. “We expect to see them. But, where we run into problems is when there is above average abundance.”

Jameson Chace, Salve Regina University
Associate professor, faculty fellow
Biology and biomedical sciences, environmental studies
SURF program mentor

A self-described bird guy, Jameson Chace investigates how organisms respond to changes in the environment: “It’s the fundamental thing I do. My whole career has focused on examining how human impacts on the environment affect biological populations and communities, especially aspects of avian ecology.”

At the same time, as an educator, Chace devotes himself to training the next generation of scientists, selecting his projects through the lens of providing research experience for undergraduates at a small, liberal arts institution.
With these two guiding missions, Chace found RI NSF EPSCoR a natural fit when the grant program first began in the Ocean State six years ago. He already had been collecting data with his students since 2006 on winter sea duck distribution along the Newport Cliff Walk.

“Since the inception of this project, the question always was, why do we find some birds in some places and not others,” he says. “It was a classic habitat analysis. I’m convinced their abundance and distribution is mostly tied to food availability — that’s what the birds are in Newport for during the nonbreeding season.”

Teaching in the departments of Biology and Biomedical Sciences, and Environmental Studies, Chace tracks available food to document the link between birds and foraging locations. His surveys count the subtidal abundance of crabs, lobsters and small fish along the portion of Newport Neck that follows the Cliff Walk from Easton’s Beach to Goose Neck Cove.

Through RI NSF EPSCoR, the study focuses on projecting where the sea ducks might be, based on projected changes in resource abundance with climate change-influenced sea level rise, compared to where they are now. At the same time, the research has provided an unparalleled platform for learning beyond the classroom.

“The importance of EPSCoR funding is the development of students and student training,” Chace says. “The amount of equipment this funding has brought to this small university has allowed us to do more research and get more students out in the field.

“It has brought equipment into classes, general biology labs, and allowed us to do extensive surveys in the intertidal and subtidal zones. It’s equipment I never dreamed of having six years ago.”

Gordon Ober, University of Rhode Island
Ph.D. candidate; ecology and ecosystem science
RI EPSCoR graduate fellow

Ask Gordon Ober about the impact of his Rhode Island NSF EPSCoR graduate fellowship and the University of Rhode Island Ph.D. candidate gives an unequivocal response.

“It’s meant everything,” says the Kittery, Maine, native as he eyes the summer 2016 conclusion of his doctoral work. “I honestly don’t know where I would be without the funding.”

Without the support, Ober says, he would not have been able to set up his research project investigating the impact of climate change on the marine ecosystems and food webs of Narragansett Bay.

Equally important, he adds, “EPSCoR had faith in me to produce this project. EPSCoR made me more competitive for everything I’ve done, from getting the grant and starting my project to all of these other avenues. It’s given me a leg up, for sure.”

Now supported by a substantial national fellowship, Ober is in the final stages of writing his dissertation while he continues to work in the lab of URI Associate Professor Carol Thornber, principal investigator of the RI EPSCoR grant. The project he designed investigates the impact of ocean acidification on macroalgae, which holds implications for the overall health of the marine ecosystem.

Working in the Thornber lab and being a part of the EPSCoR community also provided Ober the opportunity to work on other research projects, including a RI Science and Technology Advisory Council (STAC) grant, which investigated the ability of marine organisms to adapt to climate change.

“What I think is important about EPSCoR and, particularly, my fellowship, is that it wasn’t just a matter of ‘here’s a lump sum of money, go do your work,’” Ober says. “There is a connection the whole way through.”

The Thornber lab gave him the chance to pursue his interests, Ober says, and the EPSCoR fellowship allowed him to get his project up and running. He participated in conferences and the larger discussions about where the field of climate change research is heading.

As a young, emerging scientist, Ober says he felt his work was appreciated and carried weight: “I was invited to meetings with other professors; EPSCoR brought me to the table. It helped me see my contributions as valuable and was huge for my professional development.”

Gordon Ober: Climate change impact on marine ecosystems and food webs
Sitting at the interface of land and sea, salt marshes serve as the mediator of the marine realm. From one side, the ocean tides flood and drain the coastal wetlands; from the other, land runoff leeches through on its way out to the sea.

Here among the tall reeds of grass, roots anchored in the mud of the salt marsh floor, Serena Moseman-Valtierra studies the cycles in which plants take in and emit greenhouse gases.

“Salt marshes have long been valued for their ability to filter pollutants and nutrients,” says Moseman-Valtierra. “They could help us with climate change by minimizing the extent of the impact — another tool in our toolkit to try to solve or reduce human impacts.”

In an early RI Science and Technology Advisory Council (STAC) collaborative research grant, Moseman-Valtierra worked with Associate Professor Breea Govenar, Rhode Island College (RIC), to investigate whether climate change was switching the role of salt marshes from carbon sinks to sources. The research paired Govenar’s expertise in invertebrates, particularly the mussels and snails that live in the marsh, with Moseman-Valtierra’s in plants and the biogeochemical cycling of nutrients.

“In natural habitats, pollution and nitrogen enrichment can increase the extent to which plants, soils, and animals emit gases,” Moseman-Valtierra explains. “I’m trying to understand the extent to which the input of nitrogen into Narragansett Bay potentially is fueling the release of climate-driving gases from coastal marshes.”

Determining whether and how human activities — rising temperatures, burning of fossil fuels, raising livestock, for example — accelerate the emission of greenhouse gases from the ecosystem is particularly important given how salt marshes filter pollutants and take up carbon, qualities that could be enhanced through coastal restoration efforts.

With expertise in deep-sea research, Breea Govenar arrived on the RIC campus in 2010 — the same year Rhode Island NSF EPSCoR began. The timing turned out to be fortuitous for both.

“The grant was instrumental in my career trajectory and in helping me establish a research program,” says Govenar. “It’s been that big and that important.”

Likewise, Govenar has played an instrumental role in RI EPSCoR, serving as RIC’s partner liaison for the grant, collaborating with scientists in the RI EPSCoR community, teaching and training RIC students in her lab, and mentoring students in the RI EPSCoR Summer Undergraduate Research Fellowship (SURF) program.

RI EPSCoR funding and the state’s match through the RI Science and Technology Advisory Council (STAC) grants allowed Govenar to develop a strong footing in coastal and regional work, establishing an urban research program with opportunities that otherwise would not exist for RIC students.

Meanwhile, she adds to the collective body of RI EPSCoR research with her investigation of marine community ecology. Tapping into her deep-sea expertise, Govenar looks at how changes in the temperature and chemistry of Narragansett Bay, brought on by climate change, alter the distribution and interaction of organisms such as ribbed mussels, oysters, and snails, and, in turn, impact the ecosystem.

“When I think about the purpose of EPSCoR within the National Science Foundation and the support for states that don’t get the same proportion of federal dollars for research, this is the impact,” says Govenar. “For states like Rhode Island, the EPSCoR funding helps to level the playing field. Our research productivity and student success stories are indications that we’re doing the right things.”
Five years of EPSCoR outreach

Rhode Island NSF EPSCoR's outreach programming enhances engagement with the classroom curriculum, cultivates awareness and appreciation of natural resources, broadens the science, technology, engineering, arts, and mathematics (STEAM) pipeline, and develops a more skilled and capable workforce. Hands-on Science Experiences delivered by RI EPSCoR and partner campuses throughout five years of the grant have reached 1,949 students in K-12 from 23 schools. Here is a look at some of the experiences provided.

RISD Nature Lab
The Nature Lab experience at Rhode Island School of Design aligns with curriculum from both science and art classes. Planned discussion and activities in the bone, taxidermy, fish, and microscope rooms provide opportunities to study populations and ecosystems, and draw to scale and using grids to draw.

CCRI biotech crash course
Led by CCRI Assistant Professor Scott Warila, high school students follow the same upstream and downstream processes used in the biotech industry, conducting each step and visually tracking the green fluorescent protein (GFP).

Life in the Bay
A trip to the Jamestown coast lands students in the waters of Narragansett Bay, giving them a rare opportunity to explore up close the marine life and ecosystems of the rocky intertidal zone and salt marsh areas. They learn to use the seine net and work to identify many of the creatures they find.

Sheep heart dissection
Often the first time in a dissection lab, a Hands-on Science Experience at Roger Williams University literally puts science in these students’ hands. The daylong event also gives high schoolers a firsthand look at a college campus, including lunch and a visit with admissions representatives.

Narragansett Bay ecosystem
Middle and high school students conduct an experiment that provides insight into the role filter feeders play in the Bay ecosystem. They add algae to two tanks — one empty and one with mussels — and observe and track the changes in water quality, considering concepts of experiment design and ecosystem health management.

Campus visits
Hands-on Science Experiences showcase what RI EPSCoR has to offer, leveraging relationships, providing project-based learning, sharing research and resources, and opening young minds to the possibilities that exist in STEM education and careers.
Launched in 2005 and sustained by legislative statute in 2006 to make innovation central to the state’s leadership agenda, the Rhode Island Science and Technology Advisory Council (STAC) is the official oversight body of Rhode Island NSF EPSCoR.

In 2007, STAC created the RI Research Alliance to establish a statewide platform for collaboration across the state’s research organizations, increase competitiveness for federal funding, and support efforts such as the EPSCoR, Centers of Biomedical Research Excellence (COBRE) and IDeA Networks of Biomedical Research Excellence (INBRE) networks.

STAC Council members represent the academic, business and policy leadership of Rhode Island. They meet on a regular basis to review progress and develop new recommendations for enhancing research and development, supporting entrepreneurial activity, and increasing innovation in Rhode Island.

Christine Smith is Director of Innovation Programs at the RI Commerce Corporation and serves as STAC executive director.

Council members are:

David A. Savitz  
Vice President for Research,  
Brown University (Co-Chair)

Gerald Sonnenfeld  
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Janet Coit  
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