

NH EPSCoR

Research Currents



2014

Do You Trust Scientists About the Environment?

Submersible Sensors Will Help Town Reduce Pollution

Mobilizing Volunteers: The Power of 70 Partners

Getting Smarter by Using Smartphones

Can Scientific Research and Parenting Mix?

Beyond the Bunsen Burner: When Teachers Become Researchers

Experimental
Program to
Stimulate
Competitive
Research



Linking Education, Research and Economic Development

NH EPSCoR
Research Currents
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NH EPSCoR, supported by the National Science Foundation, advances competitiveness and builds research capacity in science and engineering by strategically investing in research infrastructure; promoting education; and partnering with businesses that enhance job creation and economic development.

Partnerships are fundamental and critical to NH EPSCoR's success. All partners are listed by project on page 23.

Director's Message

Building research capacity requires investment in the partnerships that lead to scientific discovery and technological innovation. The National Science Foundation established EPSCoR, the Experimental Program to Stimulate Competitive Research, to strengthen science and engineering infrastructure in states that historically have received less in federal research grants than a handful of large states such as California and New York. In the last 10 years, since New Hampshire became an EPSCoR state, nearly \$118 million in competitive federal grants has been awarded to the University of New Hampshire, Dartmouth College, and several academic and industry partners to support basic research in environmental and space science, biomedicine and health sciences, and energy.

We have built advanced laboratories and testing facilities and installed a statewide network of environmental sensors. We have established educational programs to train new scientists and teachers and provide hands-on research experiences to youths who aspire to a career in science, technology, engineering, or mathematics. We are sharing data from our research projects with municipal, state, and federal officials who make decisions that affect our towns and cities, our forests and water resources.

In November, 2015, NH EPSCoR and Maine EPSCoR will host the national EPSCoR conference in Portsmouth entitled "Collaboration: Advancing the Role of Science in the Service of Society," which will bring together some 350 scientists and state officials. They will work on developing teams to address some of the nation's most challenging scientific questions while enjoying all that New Hampshire's historic seaport has to offer. We are proud to showcase New Hampshire's natural beauty, quality of life, and innovations in scientific discovery to this national organization.



JAN NISBET: NH EPSCoR State Director; Senior Vice Provost for Research, the University of New Hampshire

In November, 2015, NH EPSCoR and Maine EPSCoR will host the national EPSCoR conference in Portsmouth entitled "Collaboration: Advancing the Role of Science in the Service of Society," which will bring together some 350 scientists and state officials.



New Hampshire's Innovation Challenge

Innovation and technological advances are the keys to economic prosperity in today's knowledge-based world. In fact, high-tech companies and their highly paid employees have served as the engines of New Hampshire's economy, improving the state's per capita income and overall standard of living. Over the last decade, however, there has been a 25 percent decline in high-tech jobs, and between 2002 and 2010 New Hampshire fell below the national average in the percentage of jobs at high-growth companies.

No longer able to rely on in-migration from other states, New Hampshire must strengthen the educational "pipeline," from kindergarten through college, to produce its own highly skilled workers. The underdevelopment of the state's science and technology workforce should be a major concern for policy makers since it will limit the state's ability to generate technology-based economic development.

Models of economic development show a close relationship between university-based innovation, government policies, and industry partnerships. Entrepreneurs need support from all three sectors to explore new technologies and test new products. NH EPSCoR and its partners across the state and region are promoting collaboration, cooperation, and innovation among institutions of higher education plus inquiry-based learning for students at all levels.

The goal is to improve the state's economy and better our understanding, and management, of natural resources. Federal investments in NH EPSCoR, further leveraged by state and private funds, have already built high-speed Internet networks, expanded the R&D capacity at our research institutions, and launched new educational programs for students in technical fields of study.

The Multiplier Effect



Adapted from NH's 2012 Science and Technology Plan: Shaping New Hampshire's Economic Future

NH EPSCoR Partners with Business and Industry

The Power of Partnerships

A new product from 2KR Systems demonstrates how companies can develop breakthrough technologies through collaboration with universities

Thirty roofs collapsed in one night in the Buffalo area after the massive snowstorm there in November—just the latest reminder of the hazards posed by heavy snow. But a new product designed to help building managers and public works departments determine when rooftop snow loads are becoming dangerously heavy could be available this winter, thanks to a collaboration between UNH Manchester and a local business in Barrington. Six undergraduate students, led by two faculty members, computer scientist Mihaela Sabin and electrical engineer Christopher LeBlanc, have worked with 2KR Systems entrepreneur Chris Dundorf to adapt his company's SnowScale—a system originally designed for water resource managers and researchers to measure water content in snow packs—for commercial use and emergency planning. The lightweight and portable product uses sensors to provide real-time rooftop snow load information, accessible online.



WEIGHT WATCHERS: Chris Dundorf, president of 2KR Systems, shows off the SSC300 SnowScale, an instrument which measures the water weight in snow loads, along with UNH Manchester student collaborators. From left, the electrical engineering team: Rick Hilton, Chris Bye, Dundorf, and Casey Hoefler. Not shown: software developers Stephen Griffin, Colby Johnson, David Meehan; mechanical engineer Patrick Melvin

2014 Social Venture Challenge

The 2014 New Hampshire Social Venture Innovation Challenge engages New Hampshire college students and community members who are inspired to design entrepreneurial concepts to tackle major local and global challenges such as climate change, access to clean water, food access and food waste, and community economic development.

In only its second year, the challenge attracted entries from 158 individuals representing 71 teams of college student and community entrepreneurs, which included students at UNH, Antioch, Colby-Sawyer, and Plymouth State University. Contestants in the student track represent at least 25 different majors and areas of study.

The winning 2014 community team, Andrew Jaccoma's Sensible Spreader

Technologies, aims to increase road safety, reduce wasteful dissemination of deicers and lessen impact on the environment by integrating the latest technology into road maintenance equipment. The winning 2014 student team, Amano's Mobile Grocery Stores, proposed creating vehicle-based stores to operate in close proximity to homes, offices, and community centers for people who do not have easy access to traditional grocery stores. The UNH team members were Bradley and Shannon Calabro, master's students in business and social work respectively.

The challenge is organized and hosted at UNH by the Peter T. Paul College of Business and Economics, the Carsey School of Public Policy, the Sustainability Institute, NH EPSCoR, and Net Impact UNH.

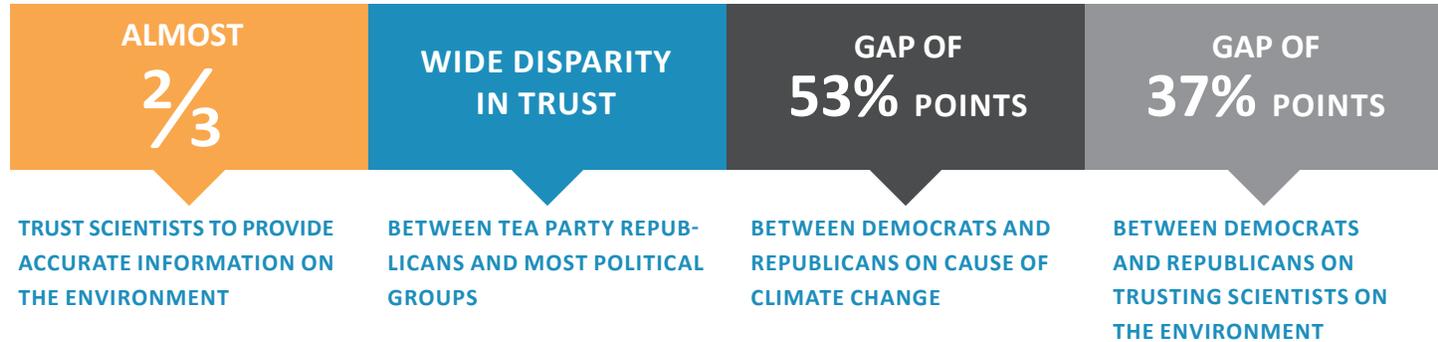


SEED MONEY: Andrew Jaccoma of Sensible Spreader Technologies accepts award from Fiona Wilson, UNH assistant professor of strategy, social entrepreneurship, and sustainability. Photo: Perry Smith Photography

What is your idea that could change the world? #NHInnovates

Do You Trust Scientists About the Environment?

News media sources and politics affect New Hampshire residents' views:



Project Update: Moving Science Forward

NH EPSCoR manages three projects funded with a total of \$23.7 million in highly competitive National Science Foundation awards designed to improve research infrastructure in the state



Ecosystems & Society

This five-year project has reached the halfway mark. The interdisciplinary team of more than 150 researchers, students, teachers, and volunteers across the state has made significant progress, gathering massive amounts of data on forests, water, soil, and snow with state-of-the-art technology. The data is being used to design mathematical models to predict the environmental and economic impacts of different land-use policies as well as climate change.

In addition, new public opinion surveys have revealed residents' attitudes toward the reliability of scientific information and the value of clean water for drinking, recreation, and economic health. Some of this information is already available to resource managers, planners, and the general public. NH EPSCoR's largest project, Ecosystems & Society provides information to help decision makers manage our state's diverse natural resources in order to protect our economy, our way of life, and the ecosystems we all rely on. (See related stories throughout this publication.)



New England Sustainability Consortium

This three-year collaboration with Maine EPSCoR aims to strengthen the connection between science and decision making in the management of beaches and shellfish harvesting. With fecal bacterial contamination and naturally occurring *Vibrio* pathogens on the rise, there's a lot working against the economic viability of Maine and New Hampshire's beaches and shellfish flats. And the growing problem raises the specter of serious public health consequences. A key component is collaboration with state and local government, beach managers, shellfish harvesters and citizen science volunteers. (See page 8 for related story.)



Ecosystem Computing Challenge

Ecosystem Computing Challenge

This five-year project provides professional development for New Hampshire teachers and engages high school students in computational thinking as they develop their own smartphone apps for gathering environmental data. (See page 16 for a related story.)

NH PUBLIC RADIO LISTENERS

GET NEWS FROM TV AND NEWSPAPERS

TRUST SCIENTISTS ON THE ENVIRONMENT MORE THAN OTHER RESIDENTS

RESPOND DIFFERENTLY FROM OTHERS ONLY ON GUNS AND CRIME

Almost two-thirds of the New Hampshire residents surveyed say that they trust scientists as a source of information about environmental issues, according to a new survey from UNH's Carsey School of Public Policy. Somewhat higher than in national polls, this proportion holds across political groups with one striking exception. While large majorities of Democrats, Independents, and non-Tea Party Republicans say they trust scientists, only 28 percent of Tea Party Republicans trust them.

The party-line gaps on some other science questions, however, equal or surpass those of historically divisive social issues including gun control and abortion. Although 87 percent of all respondents agree that climate change is happening now, for example, the 53 percent gap between Democrats and Republicans on the cause of climate change is one of the largest for any issue. The new research, supported by NH EPSCoR's Ecosystems & Society project, was conducted by Lawrence Hamilton, professor of sociology and a senior fellow at the Carsey School.

Adapted from the Carsey School policy brief "Do You Trust Scientists About the Environment?"

New Scientists, New Expertise



Georgia Mavrommati, Ph.D., Ecological Economist
Postdoctoral researcher with a joint appointment at Dartmouth College and University of New Hampshire
Previous experience: Michigan State University

Mavrommati studies how people value the benefits derived from the environment, such as water supply, biodiversity, carbon storage, and timber. Decision theory can be combined with deliberation, she believes, to enhance transparency and increase community involvement in decision making. "This method enables us to take into account ecosystem characteristics such as nonlinearity and irreversibility," she says, "along with ethical concerns, and the needs of future generations."



Muge Komurcu, Ph.D., Meteorologist
Research scientist at the University of New Hampshire
Previous experience: Yale University

Komurcu uses global climate model simulations of the next century and downscales these projections to the New England region. Future regional climate variables obtained using this method—such as temperature, precipitation and photosynthetically active radiation—are then used in other models to simulate the responses of the regional ecosystems and economy to climate change.

New Hampshire has abundant water resources, but are they in jeopardy?

40"
of rainfall annually

18
miles of seacoast

1,000
lakes

300
ponds

17,000 miles
of rivers and streams

235 miles
of estuarine shoreline

245,000
private water wells

THE PERCENTAGE OF RESPONDENTS WHO ARE CONCERNED ABOUT...

90% pollution in local streams, rivers, lakes, and bays

92% cleanliness of water for fish and wildlife

91% availability of clean drinking water in the future

82% contaminants, such as mercury, in locally caught seafood

64% protection from flooding

AND MANY ARE WILLING TO PAY MORE OR TAKE ACTION TO PROTECT IT ...

58% believe actions on their property can impact overall water quality in the community

70% would be willing to pay higher water and sewer fees to improve cleanliness of lakes, rivers, streams, and bays in their community

83% would be willing to take action to reduce storm water pollution, especially if it would help keep water and sewer bills down

80% see a connection between clean water resources and economic stability of their community

Survey of 600 N.H. residents, Spring 2014.

How Much Do N.H. Citizens Value Clean Water?

Many Western states have used rebates and coupons to encourage homeowners to buy water-saving devices or replace thirsty lawns with drought-resistant plants. Would Granite Staters support an incentive program designed to protect water resources? The results of a spring 2014 survey of 600 state residents not only reveal how much we value clean water, but also indicate some ways to protect it.

The study was led by Shannon Rogers, an ecological economist at Plymouth State University and member of the Ecosystems & Society project team in partnership with the Piscataqua Region Estuary Partnership. She was surprised by the number—80 percent—of respondents who saw a connection between clean water and the economic health of their communities. Perhaps even more surprising, a majority expressed a willingness to pay higher water and sewer fees—or take action on their own property—to protect water quality.

The survey also produced useful data on homeowners' practices. "If you're trying to figure out how much nitrogen is going into Great Bay, for example," says Rogers, "it's so much better if you have the actual number of people spreading fertilizer on their lawns, instead of estimating it." With access to both social and physical indicators, she believes, resource managers and decision makers will be better equipped to protect the water Granite Staters prize so much for swimming, fishing, boating, and drinking.

The partnership and baseline survey data from this effort will continue on in a NOAA Coastal Management Fellow project connecting social indicators with coastal water quality indicators in New Hampshire.

Photo: Evelyn Jones

High-Tech Submersible Sensors Will Help Town Reduce Water Pollution

When it comes to nitrogen—the most abundant element in the air we breathe and a major component of fertilizers—it’s definitely possible to have too much of a good thing. Nitrogen becomes a water pollutant in excess amounts, feeding algae blooms that can severely lower or eliminate oxygen. In New Hampshire’s Great Bay, dissolved inorganic nitrogen has risen 42 percent in just the past five years, and the populations of water-filtering eel grass and oysters have plummeted.

The Environmental Protection Agency, after declaring the bay “impaired” in 2009, tightened regulations on the amount of nitrogen released by wastewater treatment plants throughout the Great Bay watershed. Even the recently upgraded treatment plant in the town of Durham—the cleanest in the watershed—wouldn’t be able to meet the new EPA limits without further modification.

The data will provide the town with a baseline for gauging reduction in nonpoint-source pollution in the future.

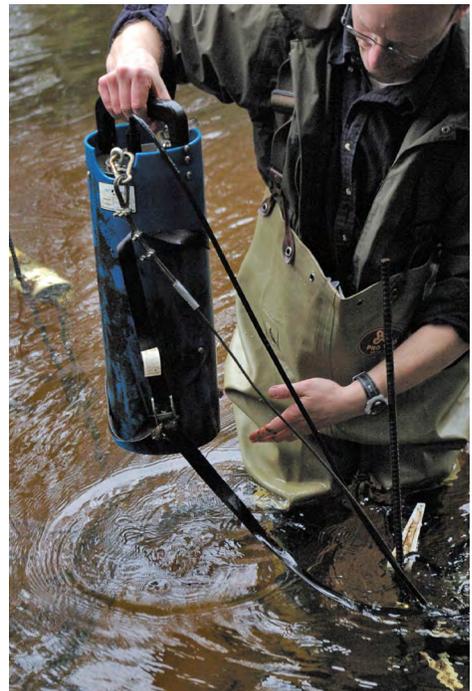
“That would be a very expensive proposition for the town—to go even further than the level they already had achieved,” notes Wil Wollheim, an assistant professor in the UNH Department of Natural Resources and the Environment and the Earth Systems Research Center. That’s why the town of Durham jumped at the opportunity two years ago when NH EPSCoR researchers, including Wollheim, expressed interest in deploying state-of-the-art underwater sensors in the

Lamprey River watershed, the largest tributary to Great Bay, as part of the Ecosystems & Society project.

The sensors would detect, among other things, nitrogen from “non-point sources.” Unlike pollution from wastewater treatment plants, non-point source pollution comes from many tough-to-measure sources such as stormwater runoff from roadways and parking lots, drainage from agricultural fields and fertilized lawns, and groundwater that picks up the outflow from seeping septic systems.

“The town of Durham and the scientists began partnering,” says Wollheim, “to identify and reduce nonpoint sources of nitrogen in both the Lamprey and Oyster River watersheds and to get an ‘integrated permit’ from EPA that would consolidate both wastewater and non-point sources to meet the overall nitrogen threshold.” And that’s where the high-tech submersible sensors came in.

During storms, rapid physical and chemical changes occur in the water over a very short window of time. Typically, measurements are done by infrequent “grab sampling” techniques, in which a person has to physically collect the sample from the water. In contrast, the underwater sensors can be placed in strategic locations within a watershed and provide high-resolution, around-the-clock, continuous measurements. In addition to its uses for the NH EPSCoR project, the data will provide the town with a baseline that can be used to gauge actual improvement when non-point-source mitigation efforts occur down the road.



SUBMERGED: UNH researcher Wil Wollheim preps a sensor in the Lamprey River. Over 100 underwater sensors have been deployed in watersheds of all sizes throughout the state.

In October, the town of Durham in partnership with the university won a grant from EPA, one of only five in the nation, to help address pollution from both wastewater and stormwater in an integrated effort to meet Clean Water Act regulations. “Through this scientific work we can now see the relationship between nitrogen levels and storm flows and are developing a much better understanding of how this affects Great Bay and its watershed,” notes Paul Chamberlin, UNH’s associate vice president for facilities and a partner with town officials on the sensor project. “This will ultimately help us undertake effective control measures to meet the new EPA standards.”

—David Sims
Science Writer, Institute for the Study of
Earth, Oceans, and Space



Keeping Illness Off the Half Shell

CONSIDER THE GIFTS OF THE OYSTER. The humble mollusk gives us dining pleasure and cleaner water, thanks to each oyster's ability to filter up to 40 gallons of water daily. Recently, it's launched a growing aquaculture industry in Great Bay.

But the oyster—when eaten raw—can also give a gift we wish we'd never received: vibriosis, an illness that causes gastrointestinal distress, and in rare instances, may cause a more serious infection in patients with weakened immune systems. We get sick when we eat raw oysters contaminated with a pathogenic strain of a ubiquitous and usually harmless group of bacteria called *Vibrio*.

As our appetite for oysters—particularly in the warm summer months—has increased and as water temperatures have risen due to climate change, incidences of vibriosis have also gone up. In 2013, there was an unprecedented number of shellfish bed closures in Massachusetts and Connecticut.

"This whole procedure of closing is very troublesome," says Steve Jones, research associate professor of natural resources and the environment at UNH. Particularly problematic, he says, is the often weeks-long lag between an outbreak of human illness and the closure of the offending bed.

Jones is working with Vaughn Cooper and Cheryl Whistler, associate professors of microbiology at UNH, and Tom Safford, a UNH sociologist. With Great Bay and its 10 commercial oyster farms as their laboratory, they're attacking illness-producing *Vibrio* bacteria on many fronts.

Working out of UNH's Jackson Estuarine Laboratory on Great Bay, Jones is drawing on a large set of data on conditions such as water temperature, salinity, pH, dissolved oxygen, and turbidity in the bay and the Oyster River, which UNH scientists have been monitoring for nearly a decade. "What we're really interested in is being able to tell shell fishermen, 'Don't harvest now,'" says Jones. "We want to look at conditions and be able to predict when harmful microorganisms are present."

Back in the lab, microbiologists Cooper and Whistler use population genetics and the latest genomic techniques to determine which strains are being associated with disease during a given season. "There are lots of strains out there," says Cooper, "and only some of them will make you sick."

But how to convey the information from this cutting-edge science to shellfish growers and eaters? That's where sociologist Tom Safford comes in. Through a survey of New Hampshire residents, he's studying public perceptions of the reliability of scientific information and the safety and risks of eating seafood.

"Ultimately, if you want people to be safe, it's not just about saying, 'Hey, the science said it's not safe,'" Safford says. "You need to understand that maybe just talking about scientific information may not resonate with many people."

"We want to be able to tell shell fishermen, 'Don't harvest now,' when harmful microorganisms are present."

—Steve Jones, UNH water quality specialist

These four UNH researchers are part of a larger team under the umbrella of the New England Sustainability Consortium, which includes university scientists from the New Hampshire and Maine EPSCoR programs. They are examining beach and shellfish bed closures for a better understanding of how various conditions affect potential pathogens—essential information for those who manage these public resources.

And while each partner brings a unique skill to the raw bar, they're all aligned in the ultimate goal: to keep oyster lovers healthy by keeping *Vibrio* off the menu.

—Beth Potier

Adapted from an article in the August 27, 2014, issue of UNH Today, an online newsletter

BAY WATCH: UNH water quality specialist Steve Jones and Ph.D. student Meg Hartwick are monitoring water conditions in Great Bay.

The Power of 70 Partners

Mobilizing volunteers to care for and study our lands and waters

The Stewardship Network: New England connects volunteers with science and stewardship opportunities. Thanks to so many enthusiastic partners and volunteers, the network, supported in part by NH EPSCoR, is transforming the landscape of volunteerism across the state:

- More than 1,300 volunteers have joined the network
- More than 70 New Hampshire organizations, agencies, and towns use the website
- Partners and volunteers have contributed more than 4,600 hours of their time



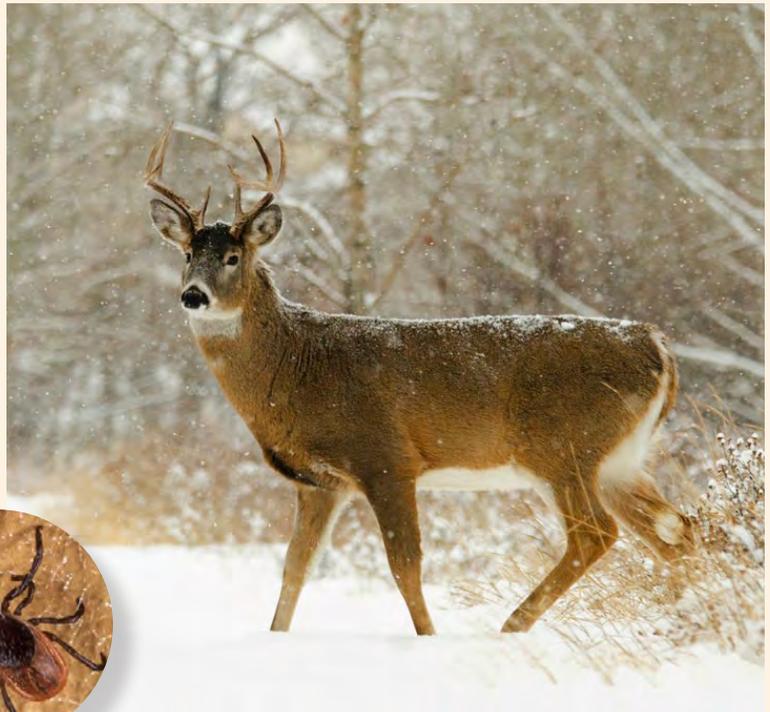
70	1300+	4600
ORGANIZATIONS	VOLUNTEERS	HOURS



Lyme disease & tick research

Daring volunteers help count ticks on deer carcasses

“Do you think volunteers would be willing to help?” asked Alan Eaton, an entomologist with UNH Cooperative Extension who is studying the spread of black-legged ticks into northern parts of the state. The work involved surveying dead deer for engorged ticks at deer hunting check stations in the far reaches of northern New Hampshire. Despite the challenge, Stewardship Network: New England staff bet that the right volunteers, curious and not squeamish, were out there and that the new network could help identify them. As this publication goes to press, Eaton has expanded his research capacity ninefold—by training eight new volunteers to collect data this fall.





Measuring How Our Landscapes “Breathe and Sweat”

Scientists examine how different environments influence local and regional climate

A forest, a grassy field, a cornfield, and a parking lot—four different landscapes with the potential to have very different impacts on the climate—are being monitored by scientists with sophisticated meteorological instruments mounted on towers. Data from the towers, which are all located in the vicinity of UNH, will help the scientists understand how different types of land cover interact with climate and better predict how land-use changes could influence future climate conditions in the state, a central goal of the Ecosystems & Society project.

“The towers allow us to very accurately measure how these different landscapes ‘breathe and sweat’ and reflect light and heat throughout the day and night as environmental conditions change,” says Andy Ouimette, who is heading up the project along with Lucie Lepine. Both are research scientists at UNH’s Earth Systems Research Center. The “breathing” is the respiration of carbon dioxide by plants, and the “sweating” is evapotranspiration—a combination of water that is evaporated and water transpired by plants.

“The effect of land cover on both local and larger scale climate processes is a result of all three of these processes,” says Ouimette, “not just emissions of CO₂.” Although forested landscapes have been thought to

have a cooling effect on global climate due to their ability to take up and store carbon dioxide, they are dark compared to other types of land cover and thus cause the Earth’s surface to absorb a much higher proportion of incoming solar radiation. Still, forests tend to have a cooling effect overall on local climate because they “sweat” a lot.

“A parking lot may be the other extreme,” Ouimette says. “Urban surfaces tend to reflect a much higher proportion of incoming radiation, but due to their inability to sweat or absorb CO₂, they have a warming effect on local and global climate.” Data from the tower in the parking lot, notes Lepine, will help researchers predict the amount of “urban heat island effect” that could be expected in developed areas like Nashua or Manchester in the future.

Data from these different environments will enable the researchers to create realistic scenarios of what the Granite State could look like depending on land-use decisions. If, for example, there’s a future scenario in which half the state gets developed or changes from agricultural to residential, the researchers could predict with some certainty how that might affect local and regional climate.

—David Sims
Adapted from an article in the Spring 2014 issue of EOS Spheres online newsletter.

TOWER OF POWER: Andy Ouimette, a UNH earth scientist, makes adjustments to micrometeorological instruments that can measure how fast the wind is moving in all directions and measure the amount of carbon and water vapor in that wind—20 times per second. (Photo: Lucie Lepine)

A Dartmouth Grad Student Has the Skinny on Snowflakes

FROZEN

When Alden Adolph moved from Louisiana to Hanover, N.H., seven years ago, her new friends at Dartmouth College advised her to “dive into winter” by skiing and ice skating. Little did they know how deep a dive she would take—literally and figuratively—into the cold white stuff.

Adolph was a junior in high school in a New Orleans suburb when Hur-

ricane Katrina hit in 2005. Her family’s home was flooded and uninhabitable for two years. “That got me into all sorts of environmental questions about energy use and climate,” she recalls, “and I started wondering why these strong storms were happening more frequently.”

Keeping cool

At Dartmouth, where she studied mechanical engineering, Adolph went to the Arctic to study how gases travel through “firn,” or old snow, on the Greenland ice sheet, helping to set up a mini lab in a deep snow pit. That experience clinched her interest in the science of snow and ice as they relate to climate, and led her into the doctoral program in engineering sciences at Dartmouth.

For the past two years, Adolph has been studying the albedo, or reflectivity, of snow as it evolves over time. She and her Dartmouth advisor, Mary Albert, professor of engineering, are performing the research as part of the NH EPSCoR Ecosystems & Society project. Although the term “albedo” may not be a household word, it is a concept we all use whenever we keep cool in the sun by wearing light colors. Freshly fallen snow can reflect

up to 90 percent of the sun’s energy, whereas old, dirty snow, may reflect as little as 20 percent.

Shape shifters

This decrease in albedo is caused in large part by a change in the shape of snowflakes as they age. While there are many types of fresh snowflakes, falling snow in New Hampshire often consists of “fresh six-pointed snowflakes that have all those little details in them,” Adolph explains. Over time, however, the points take on a more rounded shape, and “there are fewer interfaces for the sun to scatter off of, and they absorb more of the light.” As less energy is reflected, melting and warming may be hastened in a feedback loop. The albedo of snow—and other land surfaces—is an important factor in the cooling or warming of land, which in turn can have a significant impact on climate and weather.

During the winter, Adolph digs a pit in the snow near Dartmouth every day. She measures density and temperature, gathers samples for chemical analysis in the lab, and documents the changing shapes of the flakes. “We’re hoping what we learn about these snow dynamics in New Hampshire will apply to many temperate climates across world,” she says, “and might help us better understand how long our snow-cover season might be in the future, and what sorts of feedback mechanisms we might expect to see.”

—Virginia Stuart

AWARD WINNERS: Alden Adolph, left, and Danielle Grogan (not shown), doctoral candidates at Dartmouth and UNH respectively, each won a prestigious 2014 NSF Graduate Research Fellowship for their demonstrated potential for making significant achievements in science and engineering. (Photo: Liza Chrust Photography)





Weathering Climate Changes

Extrême weather events and flooding in New England have increased dramatically since the 1960s. Now new numbers indicate that the Northeast will continue to get warmer and wetter, and extreme precipitation events and summertime drought will become more frequent.



Woodford, VT 28 Aug 2011

TROPICAL STORM IRENE brought torrential rain and historic flooding to Vermont on August 28, 2011. The storm stranded thousands behind washed-out roads, destroyed dozens of homes, and changed the landscape of Vermont.



PATRIOT'S DAY FLOOD: In April 2007, the Macallen Dam abutments were overtopped and 800 people were evacuated in the town of Newmarket.

Two reports on "Climate Change in New Hampshire: Past, Present, and Future" cover northern and southern New Hampshire, and were partially supported by the NH EPSCoR's Ecosystems & Society project. Commissioned by the Granite State Future project, the reports were compiled to assist municipalities in making decisions on future investments.

More flooding

"More frequent extreme precipitation events combined with development in our watersheds will likely lead to more frequent and larger flooding events," says UNH climatologist Cameron Wake, lead author of the study and director of Climate Solutions New England. "If we decide to deal with this issue, the good news is that we have the time, the tools, and the civic structures to help our communities become more resilient to future flooding events."

Communities prepare

Kerrie Diers, executive director of the Nashua Regional Planning Commission, agrees. "The reports are a resource for local communities to understand the range of potential impacts that they may face in the near future," she says. "As many communities strive to become more resilient, they need to be able to identify and implement cost-effective actions to both mitigate and adapt to changing climate patterns."

Justin Kates, director of emergency management for Nashua, has already been putting the reports to good use. "Nashua has taken the initiative to involve long-term climate data into our emergency planning," he explains, "and these reports help us better gauge potential increases in demand for emergency services and the need for infrastructure adaptation due to extreme temperatures, flood events, and major storms."

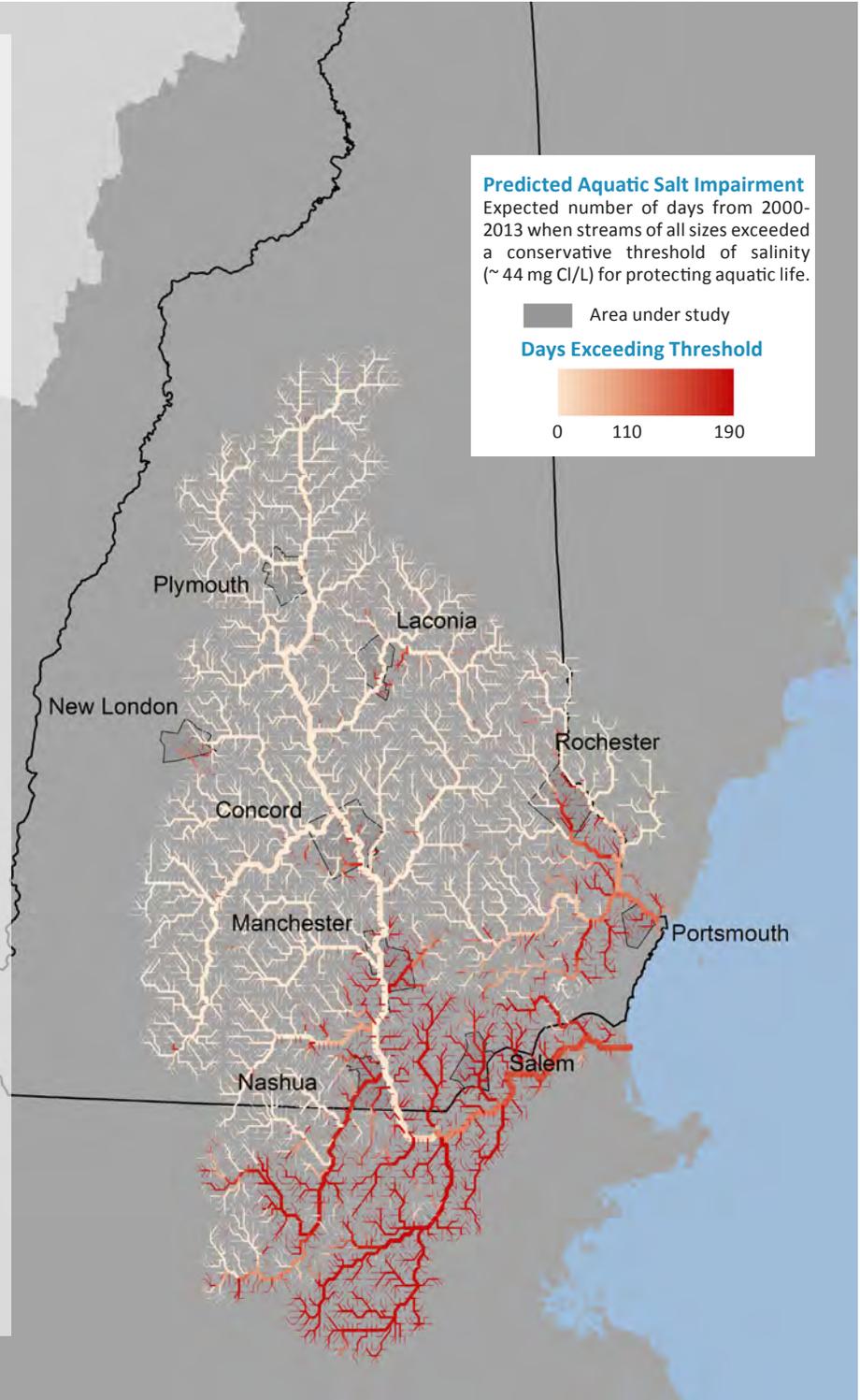
The Southern NH Report and Northern NH Report can be downloaded in PDF format at: <http://climatesolutionsne.org>

Developed Areas Contribute Excessive Salt to New Hampshire Streams

UNH and Plymouth State University researchers are finding that human activities in developed areas add at least 1000 times more salt to freshwater streams than the amount that occurs naturally from soil weathering. This “secondary salinization” comes from sources such as waste water and road salt applications. The researchers, who are part of NH EPSCoR’s Ecosystems & Society project, are using data from high tech sensors to create a model for studying this type of salinization.

An extensive network of sensors in streams collects data on temperature, electrical conductivity, and water height every 3-5 minutes during warmer months and every 15 minutes during the winter. The network includes all watershed sizes, shapes and attributes and is geographically dispersed statewide in New Hampshire and in parts of Massachusetts and Maine.

Preliminary results suggest that under current conditions many streams, including major rivers such as the Merrimack, may be affected by salinity above conservative thresholds for protecting aquatic life, not to mention our own resources for recreation and drinking water. Ongoing work will investigate whether projected climate and development patterns will exacerbate potential habitat degradation.



New Hampshire's Future

Blending natural resources and economic development

By Cameron Wake, Curt Grimm, and Alexandra Thorn

New Hampshire faces a significant challenge in the future. Can we maintain robust economic development and associated population growth while retaining the state's natural beauty—from our coastline to the forests to the thousands of rivers and lakes that connect it all together?

As researchers with NH EPSCoR's Ecosystems & Society project, we have talked with dozens of residents from different sectors, ranging from developers to environmental activists to state officials, in a series of round-table discussions. We asked two questions: What do you expect New Hampshire to look like in the next 20 to 40 years? What do you want New Hampshire to look like in the next 20 to 40 years?

We also consulted population projections from the N.H. Office of Energy and Planning and the Environmental Protection Agency as well as existing plans, including the state's 2009 Climate Action Plan, the N.H. Science and Technology plan, and the recently developed New England Food Vision.

Among several visions of the future that emerged from this process is one in which New Hampshire maintains a vibrant economy connected to a thriving innovation economy and growing population, but also preserves most of its existing natural resources. Despite the enthusiasm for this vision in our discussions, however, the sprawl that has overtaken much of Rockingham and Hillsborough counties raises an important question. Is a balanced growth model possible?

Thinking ahead

Here's one land-use scenario we've developed for achieving balanced growth: New Hampshire's economy and population continue to grow not by expanding into undeveloped land, but instead by renovating and redeveloping existing developed areas. Population densities in cities and villages would increase, but so would the economic, social, and cultural vitality of town centers. More people would be able to walk to buy a gallon of milk and a cup of coffee and visit with friends and neighbors. Enhanced transportation systems, supported by increased population density, would improve access for all and reduce traffic.

This type of redevelopment would require significant planning, upfront investments, and hard choices. Zoning would need to shift to smaller house lots in clustered developments surrounded by public open space. Towns would need to invest in municipal water and sewer and wastewater treatment plants. On the other hand, studies in other states



A view of Manchester along the banks of the Merrimack River

suggest that compact development can help communities balance their budgets, because increased revenue from new houses on big lots is often more than offset by the costs of maintaining the infrastructure to support those living far from town centers.

A new perspective

Increasing density would also attract both seniors and young professionals who want it all—a great job, a great place to live, a walkable community, and recreational opportunities. While there are many ways development can play out, one compelling model is the Nubanusit Neighborhood and Farm cohousing community in Peterborough, where residents balance the benefits of home ownership with the efficiencies and stronger neighborhoods created by shared common spaces.

If New Hampshire does the hard work over the next few decades of refocusing development within its existing urban and village centers, then the state should be able to absorb the population growth that will serve as a significant boost to our economy while preserving the natural beauty that is the foundation of our quality of life and the true New Hampshire Advantage.

Adapted from an article that appeared in New Hampshire Business Review in December 2014. Anthropologist Curt Grimm is the deputy director of UNH's Carsey School of Public Policy. Cameron Wake, a climatologist, and Alexandra Thorn, an earth scientist, are researchers at UNH's Institute for the Study of Earth, Oceans, and Space.



Photo: Courtesy of Sarah Grosvenor

A Rising Tide of Learning Lifts All Boats

Stream Safari gets kids—and their teachers—into Granite State rivers

School had only been in session for a couple of weeks last fall, but Sara Cantrell already recognized that something new had crept into her teaching.

“I’ve never said the word ‘macro-invertebrates’ so much before in my entire life,” says Cantrell, who teaches at the Maple Street Magnet School in Rochester, with a laugh.

In the spring of 2014, she and her third-grade students visited the Cochecho and Isinglass rivers and learned all about crayfish, worms, and other macroinvertebrates as part of the Stream Safari program through NH EPSCoR. For the fall semester, her class is once again putting on boots and going down to the river.

Stream Safari helps Cantrell teach aspects of her school’s curriculum. “We’re definitely able to align the Stream Safari program to the Common Core, especially those standards that ask the students to comprehend nonfiction, use research skills, and in

writing opinion pieces. During Stream Safari they learn about pollution and my kids became very opinionated in regards to preserving the water and taking care of it,” says Cantrell.

“Stream Safari teaches students that the river you are about to study doesn’t just appear, but that it comes from a different place, and that place could be a really healthy place or a really polluted place,” explains Sarah Grosvenor, a UNH Cooperative Extension field specialist who focuses on science, technology, engineering, and mathematics, or STEM, education. “Then from our field work we start to really explore that.”

But much like the ebbs and flows of a river, Stream Safari isn’t rigid and can be adaptable to different grades, skill levels, and settings. For instance, Charles Collinson works each day at the Boys & Girls Club of Greater Nashua, where many of his “club kids” live in households that receive some sort of financial assistance.

“Especially in Nashua, these kids have never gone into a river before. So for these kids to see a pair of rubber boots and being told they’ll be putting those on to keep their feet dry, that’s a whole new experience for them,” says Grosvenor.

Collinson worked closely with Grosvenor so that he and his staff can now run the program independently during their after-school programs and tailor it to the needs of his participants.

“Let’s face it, my club kids face an increasingly complex future,” says Collinson. “So when I show my kids a dragonfly nymph that we discovered during our Stream Safari program and then show them an adult dragonfly that we found during our gardening program, that connection is priceless. We can apply those experiences to help my kids develop a sustainable view of their community and hopefully give them a chance upon which to optimize—to build upon—their future choices.”

—Linda Kirk

Adapted from an article that appeared in the Nashua Telegraph in November 2014.

Planting Seeds, Building Capacity for Future Research

Students conduct research on natural dams and beaver ponds

“This is a great educational opportunity,” says Josh Dallesander, an environmental studies major. “I’m doing real work in the field, learning how to collect data.” Denise Burchsted, an assistant professor of environmental studies at Keene State College and her students are studying beaver dams and other natural obstructions in rivers and streams in New Hampshire, especially in the Monadnock Region, collecting information on such things as water quality and flooding for NH EPSCoR’s Ecosystems & Society project. “I have a team of undergrads who are on the ground, collecting data, which is good for me and the science, but it’s also giving them good training and helping them build their professional networks,” says Burchsted.



KEENE TEAM: Research scientist Denise Burchsted and student researchers are studying the effects of “natural dams,” such as fallen trees and beaver dams, on rivers. From left, Charles Stoll, Mike McGuinness, Josh Dallesander, Olivia Thorndike, Birchsted, and Lindsay St. Pierre (Photo: William Wrobel)

Students find common ground, language through science

Samora speaks French and Creole. Marleny speaks Spanish. Khoi Vu, Vietnamese. But last summer, these very different young people from very different parts of the world were all able to communicate through the common languages of English and science.

“I was kind of fixed-minded in a way, because I always kind of thought I won’t be able to do [science] because my English isn’t that great and fluent as the others,” says Marleny Almonte, who is in 10th grade at Nashua North High School. “But then I saw the great diversity [of English language skills] in the program this summer. I’m definitely going to be more prepared and confident talking in front of people and reaching out to my teachers because of this program.”

These students all participated in the Educational Excellence for English Language Learners, or EXCELL, program at UNH Manchester. As part of the program, 42 middle and high school students from Derry, Hooksett, Manchester, and Nashua devoted five weeks of their summer to developing and expanding their English skills while learning science, technology, engineering, and math—known as the STEM disciplines.

EXCELL 2014 has been a cooperative effort between UNH Manchester, NH EPSCoR, the Nashua School District, the Manchester School District, and the Gate City Project, and has also had the support of the Thomas W. Haas Fund of the New Hampshire Charitable Foundation.



SCIENCE SPOKEN HERE: Immigrant students practice their scientific English and learn about marine science at Odiorne State Park in Rye (Photo: Courtesy of Kim Wall)



Ecosystem Computing Challenge

Getting smarter by using smartphones

Seeing a group of teenagers hunched over their phones is nothing out of the ordinary. Last summer, however, 14 high school students were doing something extraordinary with smartphones in the STEM Discovery Lab at UNH Manchester—using computer science to design their own mobile apps.

To be competitive in the 21st-century workplace, high school students today need to acquire strong computational skills and be able to apply academic content to real-world challenges. These students were doing just that at the Ecosystem Computing Challenge (ECC) Summer Camp, led by Mihaela Sabin, associate professor of computer science at UNH Manchester.

The ECC is a five-year NH EPSCoR program designed to improve access to technical education for high school students from groups that are underrepresented in computer-related fields. The camp also provided professional development for teachers from four public high schools, who observed and coached the students. The teachers then took what they had learned about teaching computer science back to their own classrooms this fall.

High tech professionals visited with campers to talk about careers and to “dispel stereotypical beliefs that women and minorities still have about not belonging in the computing field,” says Sabin.

The campers developed their own mobile apps for gathering environmental data to address local sustainability concerns, such as storm water, stream dynamics, shoreland habitat and invasive species. Shane Bradt, a geospatial technologist at UNH Cooperative Extension, spoke to students about how an app could be used to help collect data. He was impressed with their work, noting, “I have little doubt that some of the apps students were considering could and would be used tomorrow by professionals in the field.”

A day in the life of an undergrad

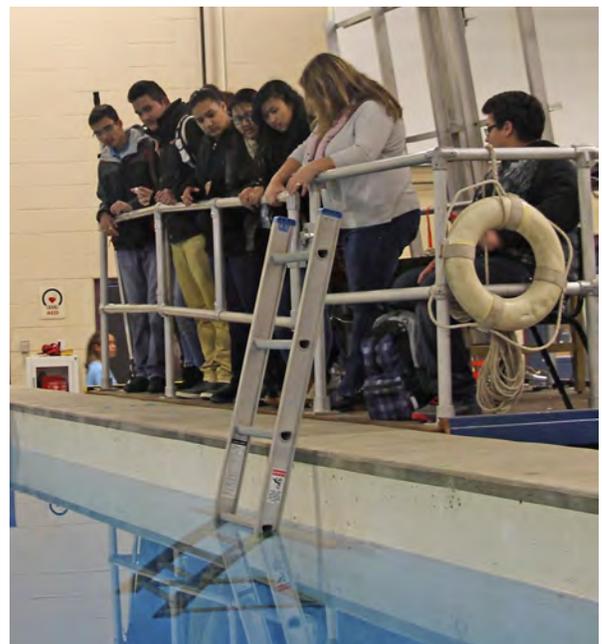
In November, 28 Manchester high school students from Saint Anselm College’s Access Academy program visited UNH to experience a day as an undergraduate student. The students took an engineering tour of the campus and labs, as well as a dining hall and the student union building. They also met with a variety of people around campus including current students, faculty, admissions and financial aid officers. The Access Academy program is run through the Meelia Center for Community Engagement at Saint Anselm College. Refugee and immigrant high school students in the Manchester area attend these programs every week, and work directly with service learners and student volunteers. The visit was coordinated by Saint Anselm College, the Litzel Center at UNH, and NH EPSCoR.



GETTING WITH THE PROGRAM: Students at the ECC Summer Camp present their own environmental-data smartphone apps to parents, teachers, and community partners. (Photo: Allison Wasiewski)



ECOSYSTEMS + SOCIETY



IMMERSED IN SCIENCE: High school students from Saint Anselm College’s Access Academy peer into the 20-foot-deep engineering tank on a tour of UNH’s Chase Ocean Engineering Lab, led by Tara Hicks Johnson, outreach specialist with the Center for Coastal and Ocean Mapping. (Photo: Allison Wasiewski)



“STREAMS NERD”—Madeleine Mineau’s Twitter handle reflects her profession, and passion, as an aquatic ecosystem ecologist. At left, she makes adjustments to a fluid metering pump in a mountain stream. Now she has also another identity: mom to baby Camille, below.

Can Scientific Research and Parenting Mix?

Madeleine Mineau was calculating the uptake of dissolved organic nitrogen and carbon in water samples from mountain streams when her cell phone rang. It was the day care center. In a heartbeat, the image of an ambulance flashed before her mind’s eye. “This is not an emergency,” said the voice on the other end. “But we think Camille has pink eye.” Mineau, back at work on only the second day after maternity leave, exhaled. “And you need to come pick her up right away.” The voice might as well have said, “Welcome to the joys of working full time while parenting a young child.”

The challenges faced by women, and especially mothers, in demanding careers have been receiving a lot of attention in the last year or two. Women have been urged to be bold and “lean in,” in Sheryl Sandberg’s book by that name. “Why Women Still Can’t Have It All,” an article by Anne-Marie Slaughter in *The Atlantic*, drew a huge response online. And last year, new research revealed further evidence that the workplace tends to reward men and penalize women for becoming parents. These challenges can be intensified in male-dominated scientific fields where there may be few if any female mentors to emulate or even female peers to lean on while leaning in.

Mineau, an aquatic ecosystem ecologist, works almost exclusively with male colleagues in her job as an assistant research professor at UNH. But she is also part of a team of scientists from eight colleges and universities across the state working

on NH EPSCoR’s Ecosystems & Society project. In keeping with the National Science Foundation’s goal of broadening participation in scientific research, the project is staffed by roughly as many women as men. A number of these women—as well as young men who are increasingly involved in parenting—are finding their own ways to succeed as both parents and researchers, with solutions as traditional as enlisting Grandma as caregiver and as modern as meeting with other scientist moms in Google Hangouts.

Choosing not to choose

Mineau’s Twitter handle, Streams Nerd, expresses both her identity as a geek, which she is proud to reclaim after having been “not cool” in high school, and her love of aquatic worlds. A specialist in ecosystems, she tends to see a river and its watershed, as “a giant organism” and has been known to say things like “rivers naturally want to move and migrate.” As she worked her way up through graduate school and toward a tenure-track academic job, she was told more than once by senior scientists that she had better choose between having a family and having a career—or else make sure that she had a stay-at-home husband. It was only after she got married, in her early 30s, that she felt a strong desire to have a child, and she had no intention of sacrificing her career to do so.

So Mineau returned to work full time 12 weeks after Camille was born. Her husband, Neil Olson, a hydrogeologist who works just five minutes from the day care center, is the one who makes the spur-of-the-moment pickups for something like pink eye. Surprisingly, Mineau discovered that carving out time for her child has improved her sense of work-life balance. “There’s a lot of pressure in academia to work all the time,” she explains. “I just stopped doing it—from the time I get home till Camille goes to bed—and I don’t think my productivity has suffered at all.”

“If you’re disciplined, academia is a good place for motherhood because of the flexibility,” says Jan Nisbet, UNH’s senior vice



provost for research and state director of NH EPSCoR. Nisbet should know. Shortly after getting her first faculty position, at Syracuse University, she had two children, both colicky, 18 months apart. She quickly learned to do her scholarly writing at home in the wee hours of the morning. But her field was education, and she acknowledges that the sciences have been slower to welcome women and make room for family obligations.

A long and winding road

Increasing attention has been focused on the “leakage” of women from the “pipeline” that flows from kindergarten to university positions in the sciences. More women have been earning doctorates in these fields, yet the rate of attrition before getting a position, and earning tenure, remains much higher for women than for men. Unconscious bias can play a role: in more than one study identical resumes received more positive ratings and higher salary offers when labeled with a male as opposed to a female name. Still, one of the biggest predictors of attrition for women is whether or not they marry and have children.

Part of the difficulty, says Mineau, is that it can take many moves to get from graduate school through one or more temporary post-doctoral research appointments to that first tenure-track job. Finding a job for a spouse at each stop along the way adds to the pressure and stress. When both spouses are scientists, the task can be even more difficult. Gopal Mulukutla, another member of the Ecosystems & Society team, and his wife, Emese Hadnagy, are two environmental researchers who consider themselves fairly lucky to have found faculty positions “only” three and a half hours apart at, ironically, the two UNH’s—in New Hampshire and New Haven. Last September, Hadnagy and their 1-year-old son began living in New Haven during the workweek.

The couple, both immigrants, don’t have any role models at work or in their extended families to help guide them in raising a family while living apart, says Mulukutla, “so we just go by our own in-

stincts.” He adds, however, that reading online about other couples in similar circumstances makes him and his wife feel “not alone.” Hadnagy’s mother, who lives in Hungary, has come to help out with the transition.

Patching the leaks

The Internet has helped Mineau find support in a different way. She uses email and Facebook to stay in touch with a network of young women colleagues from graduate school who are scattered across the country. They stay in touch by email and Facebook. She also meets every other week with a group of peers from other institutions—by video chat through Google Hangouts. This peer-mentoring group came out of a symposium sponsored by the NSF program called Advance, which is designed to increase the representation of women in the fields of science, technology, engineering, and math. (At UNH, Advance funding has been used for scholarships and leadership development grants.)

Leaning in

Last spring, more than 50 researchers from institutions across the state met to talk about proposals for EPSCoR funding. Mineau, who embraces her new identity as a mother as openly as her identity as a science nerd, walked into the room before the meeting began with her breast pump and cooler in a sizable, and noticeable, case. And, she is happy to report, it was noticed immediately. Another researcher, also the mother of a new baby, approached her and was pleased to learn that NH EPSCoR had arranged for a private room that could be used for pumping or childcare during the day long meeting.

Jan Nisbet knows how hard it can be to keep up with professional conferences with a new child. Back when her son was an infant, she was asked to speak at a national conference. She managed to pull it off, but had to go home early because she was still breastfeeding her son and couldn’t bring him along. Today childcare is available at some conferences, and a few even offer childcare travel grants.

At the NH EPSCoR planning meeting last spring, another mom who took advantage of the private room was Shannon Rogers, an ecological economist at Plymouth State University. Rogers had given



TALE OF TWO UNHS: Gopal Mulukutla, center, and his wife, Emese Hadnagy, are environmental researchers who work at the University of New Hampshire and the University of New Haven, respectively. The couple and son Hunor live together on weekends.

birth to her second child only two weeks earlier, and she needed a quiet space to change and care for the baby, whom she had brought along. Still on maternity leave, she was under no obligation to attend, but her desire to do so was strong. Teaching and research are more than just a job to her. “For many of us, it’s a way of life,” she says, “and when you have a baby, you don’t want to be left behind.”

—Virginia Stuart



Beyond the Bunsen Burner

When teachers become researchers, they bring a new understanding of science back to the classroom



“Scientific knowledge doesn’t come from a book,” says Stephen Hale. “Someone has to get it into the book first.” It comes, he explains, “from collaboration, critical thinking, trial and error, frustration—all of the things that go into research.” Hale, a UNH research associate, directs a summer program that turns public school teachers into full-time scientific researchers for eight weeks, so they can take a better understanding of science back to their own classrooms.

Rebecca Steeves was one of five teachers who participated in the Research Experiences for Teachers program, which is sponsored by NH EPSCoR, last summer. She had already performed research as one of a number of “citizen scientists” in the LoVoTECS volunteer network who oversee 108 sensors in rivers and streams in a statewide study of water quality that is also funded by NH EPSCoR. Steeves had set up three sensors in the Pemigewasset River in 2013, including one within walking distance of Lin-Wood Public

School in Lincoln, where she teaches middle-school science. “Students could walk to the site with me and see me get into the river and actually do a reading,” says Steeves. “It was cool for them to see their teacher participating in science and how things are happening in their own backyard.”

Getting her feet wet

But the readings Steeves was gathering didn’t come from one of those water-test kits that most science teachers used when they got their teaching degrees. Today’s high-tech sensors automatically measure water temperature, conductivity, and water height—every five minutes. In the Research Experiences for Teachers program, she continued to work on the same water-quality project, mentored by Mark Green, a hydrologist at Plymouth State University. The experience enabled her to go far beyond getting her boots wet in the name of science.

“Science has changed a lot in a short time,” says Green, “especially with such sensors and how they create huge data sets. Programs such as Excel are no longer sufficient in handling that much data. You need to write [computer] code and know how to work with it. A lot of teachers don’t have that background in computer science because that wasn’t the nature of the field [when they were in school].”

Cracking the code

Steeves worked with Green to understand the technology, investigate the data, and start making hypotheses and drawing conclusions. Back in her own classroom, she was able to show students how technology could be used to view those water measurements from their “backyard” in the larger context of changes in water quality in the state.

Running computer code, operating a Scanning Electron Microscope, and calibrating sensitive instruments were just a few of the many new technological skills that she and the other teachers learned. “You can have a student who wants to work in finance or another industry, but whether a student in her class wants to work with water or not, Rebecca’s experience can expose her students to coding and show them that the coding knowledge is transferable [to other careers],” explains Green.



TEACHER RESEARCHERS: Linwood Middle School teacher Rebecca Steeves (right) and Ashley Hyde from PSU check a sensor in the Pemigewasset River for debris. (Photo: Courtesy of Mark Green)

Science from the inside

Just as important as their new technical skills, the teachers acquired a new understanding of science itself. “Most teachers have bachelor’s degrees in science disciplines,” says Hale, “and they might have done three hours of lab work a week during a college semester, but that isn’t doing research. The teachers in the program learn how science is done. They get to experience the look and feel of research culture and bring that back to their students.”

Part of that culture is understanding the checks and balances that are essential to the scientific community and then realizing that answers do not come easily. “Being in the lab and looking at that data shows you that it’s OK to look into a question, thinking you can answer it, but seeing you have too many holes [in your data] to make it reliable,” says Steeves.

Poster child

The program also challenges teachers to hone their communication skills. Much like a middle school student at a science fair, participants create posters at the end of the summer and present them to their colleagues. But these posters

aren’t made out of cardboard, glitter, and glue. These are professional, highly detailed posters that summarize a hypothesis, list research methods, include graphs and charts, draw conclusions, suggest future study, and acknowledge the scientists who assisted the teachers in their research.

Under the guidance of Green, Steeves will be presenting her poster in the spring at the New Hampshire Water Conference, where it will be seen by water professionals, including staff from the Environmental Protection Agency. “I’ve done presentations in college, but I’ve never had to do one at this level,” says Steeves with a laugh. “I grade my science students on their presentation skills and now it’s my turn.”

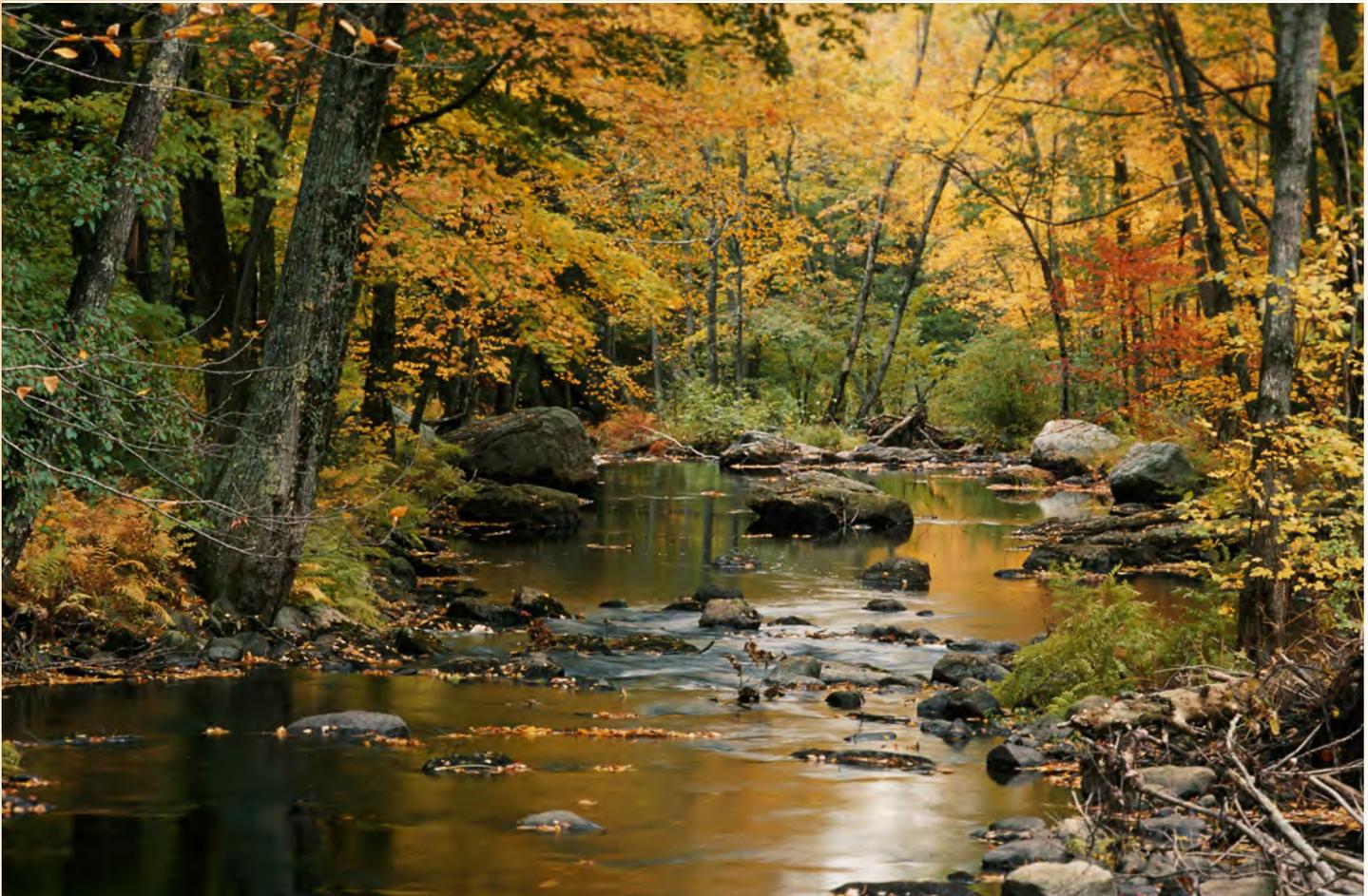
—Linda Kirk
Adapted from a PSU
online news article,
October 2014

The Research Experiences for Teachers program is open to middle-school, high-school, and community-college educators.

A stipend is provided and other financial support is available.

To learn more, visit:

<http://www.nhepscor.org/outreach>





Science Cafés Offer a Sip of Learning

NH EPSCoR hosts the
Portsmouth Science Café

**Free two-hour gatherings held at
the Portsmouth Brewery in
the Jimmy LaPanza Lounge
from 6 to 8 p.m.**

Website:

<http://nhepscor.org/sciencecafe>

Facebook:

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**Podcasts from the 2012, 2013 and Spring 2014 series
are available for download.**

Other cafés in New Hampshire:

Nashua: Nashua Science Café New Hampshire

Manchester: SEE Science Center's Science on Tap

Lebanon: Science Pubs at Salt Hill from Dartmouth College

Upcoming discussions

JANUARY 21

"Encroaching Tides: How Sea Level Rise and Tidal Flooding Threaten U.S. East and Gulf Coast Communities over the Next 30 Years"

Panelists:

Erika Spanger Siegfried is a senior analyst in the Climate and Energy Program at the Union of Concerned Scientists and one of the lead authors of the 2014 "Encroaching Tides" report, which includes a profile of Portsmouth.

Julie LaBranche is a Senior Planner with the Rockingham Planning Commission in southeast New Hampshire.

FEBRUARY 18

"What's the Government's Role in Building the Economy?"

What are the tensions between public and private sector investment? When is government the best tool for economic progress? How do funders, private or public, measure the impact of their investments?

Panelists:

Michael Ettlinger is the founding director of the Carsey School of Public Policy and is leading the transformation of the Carsey Institute into a school of public policy.

Michael Swack is an economist at UNH, where he has appointments at the Carsey School of Public Policy and the Paul College of Business and Economics. He is the faculty director of the Center for Social Innovation and Finance.

MARCH 25

"From Concept to Commercialization"

How can companies develop breakthrough technologies by collaborating with universities?

Panelists:

Marc Sedam is the associate vice provost for innovation and new ventures at UNH and executive director of the N.H. Innovation Research Center.

Christopher Dundorf is a local entrepreneur and the president of 2KR Systems in Barrington.



NH EPSCoR Partners

NH EPSCoR and its partners across the state and region are moving science and engineering forward by promoting collaboration, cooperation, and innovation among institutions of higher education and by promoting inquiry-based learning

as a means of inspiring students to pursue careers in science, technology, engineering, and mathematics. The goal is to improve the state's economy and better our understanding, and management, of our natural resources.



NH EPSCoR

Projects funded by the National Science Foundation are managed by the NH EPSCoR central office at UNH. EPSCoR projects funded by NASA are managed by the Institute for the Study of Earth, Oceans, and Space at UNH. EPSCoR-like projects funded by the National Institutes of Health's IDeA program are managed by the Geisel School of Medicine at Dartmouth College.

NEST

Managed by the EPSCoR programs at UMaine and UNH in partnership with: College of the Atlantic, the University of New England, the University of Southern Maine, Great Bay Community College, Plymouth State University, Keene State College, and the Stewardship Network: New England.



Ecosystems & Society

Project partners include: Dartmouth College, Great Bay Community College, Keene State College, Mount Washington Observatory, Plymouth State University, the Seacoast Science Center, St. Anselm College, UNH, and White Mountains Community College, and StayWorkPlay.

Ecosystem Computing Challenge

Project partners include: UNH Manchester, UNH Cooperative Extension, the Joan and James Litzel Center, and the New Hampshire Department of Education.



NH EPSCoR Statewide Committee

The NH EPSCoR Statewide Committee is composed of members representing industry, the executive and legislative branches, and higher education. Its purpose is to improve the capacity of New Hampshire's universities and two- and four-year colleges to compete successfully for R&D funds, and to stimulate complementary efforts in education and human resource development to ensure growth and support of research and training in the STEM disciplines: science, technology, engineering, and mathematics.

The committee led the development of the N.H. Science and Technology Plan and 2014 Data Toolkit for Key Indicators (including New Hampshire STEM Education Outcomes) and provides oversight to the NH EPSCoR leadership team. It supports linkages with business and industry, state policy makers, private and not-for-profit entities, and community members.

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