Yaoyang Xu, post doctoral associate, VT EPSCoR collects samples from a cyanobacteria (blue-green algae) bloom in late August in the Missisqoui Bay.

Photo by Joel Banner Baird, Burlington Free Press

Vermont Experimental Program to Stimulate Competitve Research

VERMONT EPSCoR

Winter 2016

INNOVATE HER VT
Presented by Hotel Vermont & Vermont Center for Emerging Technologies

Celebrates and promotes women entrepreneurs and ventures that impact and empower the lives of women and families.

LAUNCHVT

Vermont's statewide business pitch competition.

Lake Champlain Basin Program

Works in partnership with government agencies from New York, Vermont, and Québec, private organizations, local communities, and individuals to coordinate and fund efforts that benefit the Lake Champlain Basin's water quality, fisheries, wetlands, wildlife, recreation, and cultural resources.

VERMONT AGENCY OF NATURAL RESOURCES

Promoting the sustainable use of Vermont's natural resources, protecting and improving the health of Vermont's peoples and ecosystems, and promoting sustainable outdoor recreation.

The University of Vermont

Home of Vermont EPSCoR and center of RACC interdisciplinary research aligning with its mission to be among the nation's premier small research universities for faculty, post-doctoral associates, graduate students, undergraduates.

JOHNSON STATE COLLEGE VERMONT

Facilitating the VT EPSCoR Water Quality Research laboratory and undergraduate and high school research opportunities.

SAINT MICHAEL'S COLLEGE FOUNDED 1904

Home to the VT EPSCoR Center for Workforce Development and Diversity (CWDD), water quality analysis laboratory for total suspended solids and summer internship opportunities for undergraduates and high school students.

Middlebury College

Offering researchers valuable insights into Lake Champlain processes enhanced by data from the research vessel, David Folger.

COMMUNITY CCV COLLEGE OF VERMONT

Providing motivated adults the opportunity to participate in authentic research opportunities leading to continued STEM education or career opportunities.

LANDMARK COLLEGE

A leader in creating successful learning strategies for students who learn differently and strengthening the STEM workforce.

Alan Alda Center for Communicating Science
AT STONY BROOK UNIVERSITY

Working to enhance understanding of science by helping train the next generation of scientists and health professionals to communicate more effectively with the public, public officials, the media, and others outside their own discipline. University of Vermont became an Alda Center Affiliate in 2015.

RACC
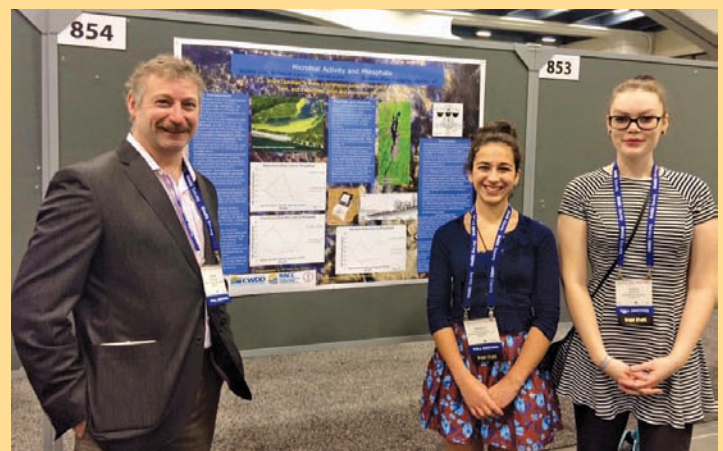**Research on Adaptation to Climate Change**
in the Lake Champlain Basin

Research On Adaptation to Climate Change (RACC) is an NSF funded project for research on water quality in the Lake Champlain Basin.

UMET | UNIVERSIDAD METROPOLITANA
SISTEMA UNIVERSITARIO ANA G. MÉNDEZ

The Ana G. Méndez University System (AGMUS) and Universidad Metropolitana
Providing undergraduate summer research internships and an opportunity to present VT EPSCoR research at the annual "Research Symposium for Minority Students" in San Juan, Puerto Rico.

AGU
VT EPSCoR attends 2015 American Geophysical Union (AGU) Meeting in San Francisco, CA with multiple partners!

Back row: Tom Lane (BFA-Fairfax High School), Sophie Lee (BFA-Fairfax High School), Catherine Winters (Research Assistant and M.S. candidate in the Water Science and Policy program, UDel), DongJoo "DJ" Joung, VT EPSCoR Postdoctoral Associate, (UVM), Doug Rowland (M.S. Candidate in the Water Science and Policy interdisciplinary program, UDel), Del Levia (NEWRnet, UDel), Shreeram Inamdar (NEWRnet, UDel), Matt Vaughan (VT EPSCoR, Graduate Research Associate, UVM) Front: Rebekah LaRose(BFA-Fairfax), Kathryn Wheeler(UDelaware undergraduate student and NEWRnet intern summer 2015), Janice Hudson (Geospatial Analyst UDel), Donna Rizzo (Professor, College of Engineering, UVM)

University of Puerto Rico at Rio Piedras and the Luquillo Long Term Ecological Research (LTER)
Integrating high school teams into Vermont EPSCoR RACC research to learn about climate change and water quality.

VSSMF (Vermont State Science and Math Fair) and Norwich University
Vermont 5th-12th grade students' state-wide science fair competition inspires students and provides opportunities to further their interests in STEM.

Vermont Technology Council

Vermont Technology Council
A catalyst for the creation of science-and-technology-based business in Vermont.

Vermont Earth Sciences teacher, Tom Lane, BFA-Fairfax, with Vermont High School Juniors, Rebekah Larose and Sophie Lee (BFA-Fairfax High School)

Soupy Bacteria Clogs Missisquoi Bay

Joel Banner Baird,
Burlington
Free Press

HIGHGATE SPRINGS "When it rots, it stinks bad," Jim Tinker proclaimed Wednesday. Tinker, an avid angler, wasn't talking about a fish carcass. The Highgate Springs resident was referring to the blue-green, soupy slime that lapped at the Rock River boat launch en route to the Missisquoi Bay. Cyanobacteria, also known as blue-green algae, is a frequent, though sporadic visitor to these parts, as almost any advocate for Lake Champlain will tell you. Has it hurt the fishing? None that Tinker can tell. Slime or no slime, for the past 20 years, he has plied these warm, shallow waters of Lake Champlain. He follows the Department of Health safety guidelines posted at the boat launch: Avoid contact with paint-like scums. Keep children and pets out of water that looks suspect. Tinker knows that some types of cyanobacteria, some of the time, will release toxins that can irritate the skin, cause stomach upsets and in very rare cases, result in severe illness or death. Tinker said he takes common-sense precautions.

But he has noticed a disconcerting trend: "The algae has definitely gotten worse in the past five, six, seven years." How much worse? The prospects of an answer increased with the arrival of another boat at the launch, 10 minutes after Tinker had disappeared downstream. The two young researchers from University of Vermont who unloaded the bright orange inflatable craft toted no fishing tackle. They heaped their vessel with waterproof cases and clipboards and set off into the middle of the bay, close to hailing distance of the Canadian border. The bay is about 3 meters deep here — compared to broad-lake

*Photo by
Joel Banner Baird,
Burlington Free Press*

depths of more than 100 meters. That difference affects how quickly the water bodies warm, and how they transfer nutrients to organisms that float or swim through them. Tending an instrument-laden buoy is part of a weekly, summer routine, explained Peter Isles, a PhD candidate at the Rubenstein School of Environment and Natural Resources. Together with Yaoyang Xu, a post-doctoral fellow at the Rubenstein School, Isles is piecing together some of the many variables that shape the life of cyanobacteria cells. What, for instance, prompts colonies to flourish and fade? Why and when do some cells create cyanotoxins? How do cyanobacteria relate to other aquatic species? The work of Isles and Xu — and that of dozens of scientists worldwide — is more than academic: A warming climate provides cyanobacteria with longer growing seasons and greater opportunities for toxin production. Indeed, the UVM team's project is part of the Adaptation to Climate Change in the Lake Champlain Basin initiative, funded through the Vermont Experimental Program to Stimulate Competitive Research (EPSCoR).

BUOY-BOUND

En route to the anchored buoy, the orange boat chugged through acres-wide blooms of cyanobacteria. The water appeared variously as an olive-green cloud, an avalanche of forest-green streaks, a lightly dusted expanse of pebbles and large nuggets. At times it was difficult to distinguish the aquatic bloom from the reflections of clouds. Some of the stuff felt faintly greasy. A different sort of bloom, a broad, oily, pale blue-green sheen, prompted the human travelers to squint. They reached the buoy, which minutes before had been a roost for gulls. Isles and Xu got to work. They replaced a battery. They fished out a tethered sensor that for the past week had been lowered by half-meter increments, sampling the living conditions for cyanobacteria.

While Isles fetched a week's worth of water samples from a carousel-like device, Xu gathered piped today's water into jars and set them on ice. They wielded channel locks and laptops. Isles swept a spider's web from the anemometer. The wind had been tame in these parts — ideal conditions for the formation of surface blooms. The researchers packed their gear and cast off. Their "ground-truthed" data would ultimately join forces with decades of earlier studies; with fresh insights collected by scientists around the world; with new perspectives offered by satellites and even drones, Isles said. Further west, the water cleared appreciably as the team approached the Missisquoi River delta. Wetland habitat, Isles explained, is the "poster-child" for filtering out excess nutrients.

"The algae has definitely gotten worse in the past five, six, seven years."

ATTRACTIVE NUISANCE

Close to noon, the UVM team steered back toward the Rock River. The boat's wake stirred up a wave of pea-soup green. In the distance, a pleasure craft whirled youngsters on a towed-tube ride — an act of imprudence, most experts agree, because of the potential for exposure to toxins. Suddenly there appeared on the orange boat's starboard a streak in the water of white and green, hundreds of meters long and several meters wide. For a few minutes, no one spoke. Xu leaned over with a bucket and gathered samples of the creamy, foamy scum. Later, in the lab, Isles explained that wind and water currents had likely concentrated the cyanobacteria bloom. The colony had become over-crowded; access to food and light had diminished. As the organisms died, they left their remnants, Isles said, including bleached mucilage, blue-green pigment — and possibly, an elixir that could poison us. What are the chances? Isles said he'd know more, even just a little more, when he finishes looking through last week's water.

Photo by Joel Banner Baird, Burlington Free Press

Photo by Joel Banner Baird, Burlington Free Press

Mind the Climate Gap

New study gives hot and wet forecast for Lake Champlain Basin

Josh Brown,
University of Vermont Communications

Photo by Josh Brown, University of Vermont Communications

Here's your northern Vermont forecast for the rest of this century: annual precipitation will increase by between a third and half an inch per decade, while average temperatures will rise some five degrees Fahrenheit by midcentury. By late in the century, average temperatures will have spiked more than eight degrees. In July, by 2100, the City of Burlington will have at least ten additional days above ninety degrees. The growing season picks up 43 more days. Looking at ski conditions, expect annual snowfall at six major ski resorts to decline about fifty percent by century's end.

And these are just a few of the estimates by a team of University of Vermont and other scientists in a new research study, "Impacts of Projected Climate Change over the Lake Champlain Basin in Vermont," published in the current issue of the Journal of Applied Meteorology and Climatology.

SCALED-DOWN
A tidal wave of historical data, current observations, and computer models makes it clear that the earth's climate is getting hotter, and dangerously so. But one of the fundamental challenges of climate change forecasting is how to bridge the gap between global-scale models and local impacts.

"Our new study helps close this gap," says Justin Guilbert, the lead author on the new study and a doctoral student in UVM's College of Engineering and Mathematical Sciences. In one of the first such studies of its kind, he and his colleagues took four climate projections — that had been downscaled from global-scale "general circulation models," or GCMs — to look at likely climate change in northern Vermont and southern Quebec in greater detail.

Graduate Research Associate, Jody Stryker

This new study "gives us regionally downscaled climate change information that was not previous available," notes Gillian Galford, a University of Vermont climate scientist not involved in the new study and who leads the Vermont Climate Assessment project. "It is an advancement in climate modeling that has been needed by the state to build resilience economically, socially and environmentally in the face of climate change."

Using two scenarios of possible greenhouse-gas concentrations in the future — a "high" and a "moderate" trajectory of C02 levels (called "RCP 4.5" and "RCP 8.5" to climate change wonks) — the team of scientists calculated a range of probable outcomes for the Lake Champlain Basin over the next 85 years. They then combined these projections with historical data on temperature and precipitation from weather stations over the period from 1961 to 2000 to assess Vermont's future climate.

"The strength of our study is that we used a much finer resolution grid — approximately 13 kilometers on side — instead of hundreds of kilometers, as you see in the GCMs, where all of Vermont fits in one or two boxes," notes UVM professor Brian Beckage who helped lead the new study. "This finer scale will capture more of the heterogeneity in the climate and landscape — and yields a more accurate local forecast," he says.

For example, the new study suggests that the number of days suitable for making maple syrup will decrease, and coarser global models might lead one to think that this would be a uniform problem across the state — or even that sugar maples themselves may be pushed out. "But if you look with this much finer resolution, you will see that there will be areas where the temperature will remain well within the range for sugar maple, at higher elevations and in these coves. It's more likely that its distribution will change. With a finer-scale model, we'll have a less dramatic headline, and a more accurate forecast," Beckage says.

"We wanted planners, the general public, and others to get a feeling for changes that they are likely to care about," Guilbert says. These include a rising heat index — "values in July for late in the century will make the average day feel approximately 13° Fahrenheit warmer," the scientists write. They also forecast more extreme temperature and precipitation events, increased chances for flooding, but also rising aridity during the growing season and increased number of short droughts.

VERMONT CLIMATE ASSESSMENT
The new study follows in the wake of the release of the National Climate Assessment at the White House in May, and the Vermont Climate Assessment, released by UVM's Gund Institute, in June.

The new study is the "type of work that is useful and meaningful to planners, policy makers and citizens," UVM's Gillian Galford notes, "These findings are consistent with the trends outlined by the Vermont Climate Assessment and go further — the authors provide quantitative details, such as a precipitation increase" of a third to a half an inch per decade. "These specifics were not previously available from existing tools and represent significant progress in understanding the local outcomes from global climate change."

Northern Vermont and the Lake Champlain Basin experience very different climates than Vermont's southern and northeastern region, Galford said, and "the state could use comprehensive analysis of climate change patterns across the state as these researchers continue to refine and expand their models."

KNOWN UNKNOWNS
The conditions in the Lake Champlain region are forecast to — probably — get wetter and "this increased flow could overwhelm current infrastructure including bridges and culverts as well as increase nutrient loading to Lake Champlain through overland flow and stream bank erosion," the team writes. But there is enough uncertainty in the precipitation modeling, that, in fact, conditions could be drier by the end of the century, or patterns of rain and drought could be different than today.
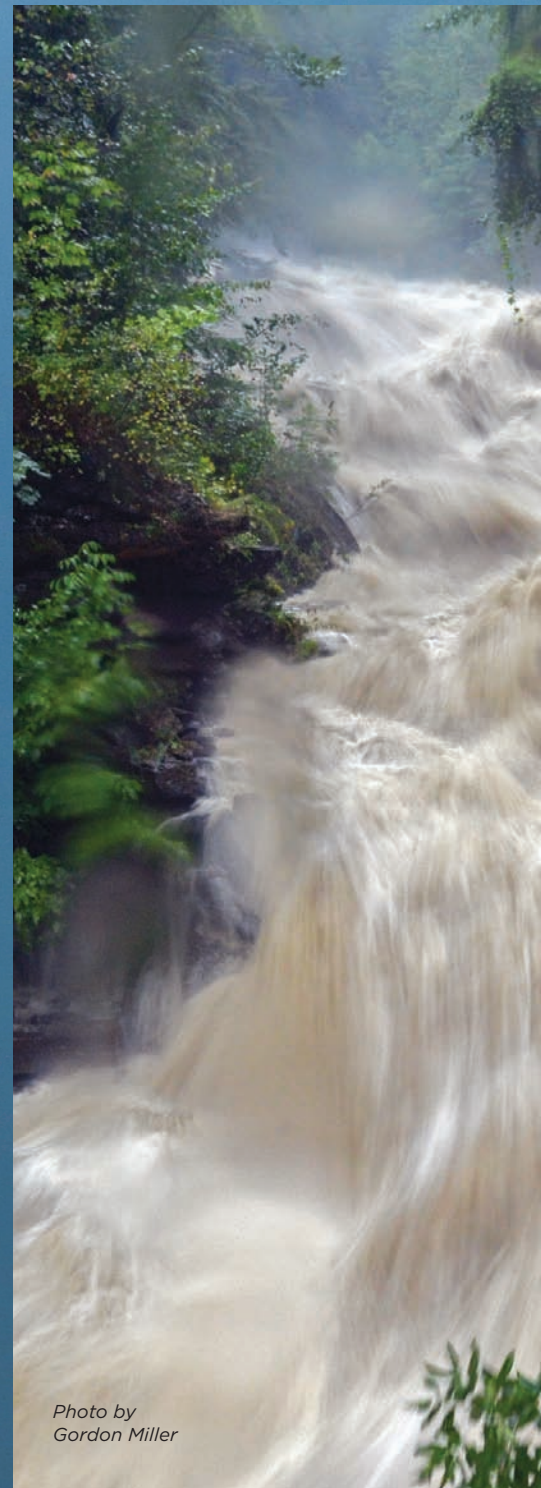
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Photo by
Gordon Miller

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"Things are obviously changing, but the climate system is complex. We'll never know exactly how it's going to respond," notes Beckage, an expert on ecological modeling and statistics. But getting closer, reducing error bars, clarifying what is and isn't "well-bounded," as the scientists say, is one of the great and urgent science challenges of the age.

"We're more confident about temperature," Beckage says, "precipitation is much harder to get right." And for policymakers, as well as scientists, knowing what is unknown — and levels of uncertainty — may prove as important as what is known.

Even the specifics of temperature are fuzzy. "It's going to get warmer, but it might get a lot warmer or it might just get a little bit warmer," Beckage says. He points at a graph in the new study labeled "temperature delta" where monthly temperature changes range from about a two-degree Fahrenheit rise to an alarming eleven-degree rise that might be in store over the next century. "That's huge uncertainty," he says.

But what makes the "known unknowns," in the inimitable words of Donald Rumsfeld, even more complicated is that scientific knowledge always, inescapably, lives in a social context. And no social context around science is more complex and fraught than the one around climate change.

Uncertainty, unfortunately, often leads to public confusion and feeds the fires of the climate-change skeptic community. A growing body of social science research makes clear that among people who are already skeptical about climate change, greater scientific information and literacy makes them more skeptical of the reality of climate change.

"The climate change skeptics like to focus on uncertainty and say, 'we should do nothing because it's so uncertain.' The other side is really worried, and wants to save the world, so they discount the uncertainty," Beckage says. "The most interesting and complex part of climate change science has become the social dynamic."

"Whether climate is changing and how much it will change is not like an electoral process that is determined by people's beliefs. Nature is going to behave the way nature is going to behave." Beckage says. "But the climate is a coupled human and natural system and we have a hand in what will happen next."
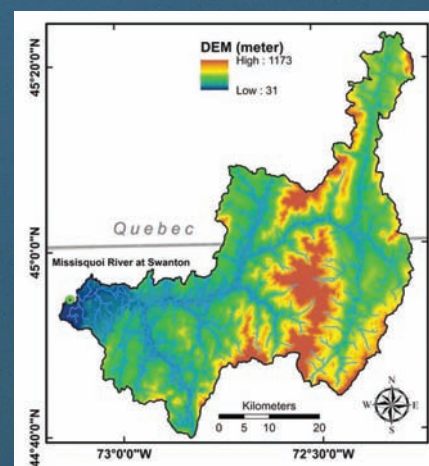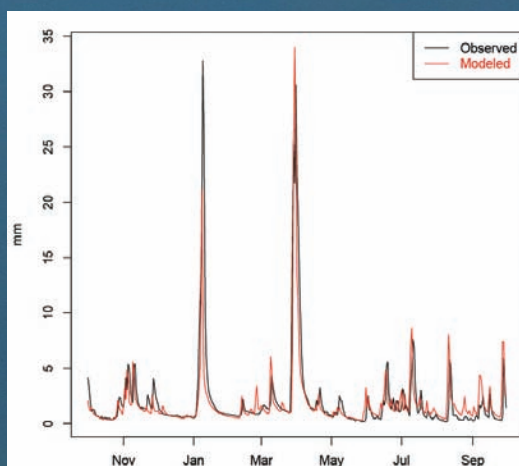
Representations courtesy of Arne Bomblies, Science Leader, Watershed Processes

Crowdsourcing Solutions
to Climate Change
for the Lake Champlain Basin

New Report:
Vermonters Willing to Pay for Lake Champlain Clean-up

Jeff Wakefield, University of Vermont Communications

VERMONTERS RANK WATER QUALITY AS A TOP PUBLIC POLICY PRIORITY and are willing to pay to improve the health of Vermont's waterways, according to survey data published in a new report by the Vermont EPSCoR Adaptation to Climate Change in the Lake Champlain Basin (RACC) project. The findings are based on two surveys of Vermont residents conducted in 2013 and 2014.

More than 95 percent of respondents to the 2013 survey ranked water quality as either "moderately important" or "very important," a higher percentage than for all other public issues in the survey, including preserving the working landscape and economic development.

The 2014 survey found that 65 percent of Vermonters were willing to pay at least $40 a year to improve the health of Lake Champlain. Respondents were willing to finance the clean-up either as part of a water utility tax or as an added fee to their motor vehicle registration.

Researchers estimated that the added taxes or fees could raise more than $15 million per year toward the state's efforts to improve the water quality of Lake Champlain. With public education, researchers write in the report, the total could be higher.

Data is timely as state prepares response plan to EPA targets. The survey results come as the state prepares its response plan to the Environmental Protection Agency's new targets for the total maximum daily load, or TMDL, of phosphorous in Lake Champlain and its tributaries, which were issued over the summer. EPA sets TMDL targets for a range of pollutants and nutrients in impaired waterways across the U.S.

The survey data in the report was initially scheduled to be collected this year and next as part of the multi-tiered information collection and computer modeling RACC project, whose goal is to create an integrated predictive modeling tool state and local policy-makers can use to weigh the effects on Lake Champlain of land-use and other decisions they make.

But agency staff and legislators asked that the consumer survey component of the project be accelerated by a year to coincide with the TMDL cycle.

"They had a deep interest in knowing this fall about public perception of the importance of water quality and willingness to pay issues," said Christopher Koliba, a professor in

the University of Vermont's Community Development and Applied Economics Department and one the leaders of the RACC project. "So, with their encouragement, we moved the schedule up by a year."

Policy-makers who have seen the report feel the information it contains will be important as the response plan is being developed.

"This report confirms that Vermonters feel strongly about protecting Vermont's waters, especially Lake Champlain," said Vermont Department of Environmental Conservation Commissioner David Mears.

Proximity to Lake Champlain not a factor
Survey results also indicated that proximity to Lake Champlain did not play a role in the public's willingness to pay the tax or fee, a key finding.

"Water issues are not just a concern for those living near Lake Champlain or the Lake Champlain basin," Koliba said. "They have salience across the state."

Vermont EPSCoR director Judith Van Houten, University Distinguished Professor of Biology at UVM, is glad to see that the RACC project is providing assistance to policy-makers even before the final integrated modeling tool -- due to be completed in 2016 -- is finished.

"I am extremely pleased with this new information now available for policy makers and state leaders to consider as they seek options to help address the health of the Lake," she said. "Vermont benefits greatly from the economy generated from lake activities and we are aligned with these efforts to help study the best way to help ensure its health well into the future."

The 2013 survey was distributed to more than 5,000 households in Vermont. The 2014 survey was conducted as part of the "Vermonter Poll," which the University of Vermont's Center for Rural Studies performs annually, contacting over 2,000 households in the state.

"Water issues are not just a concern for those living near Lake Champlain or the Lake Champlain basin, they have salience across the state."
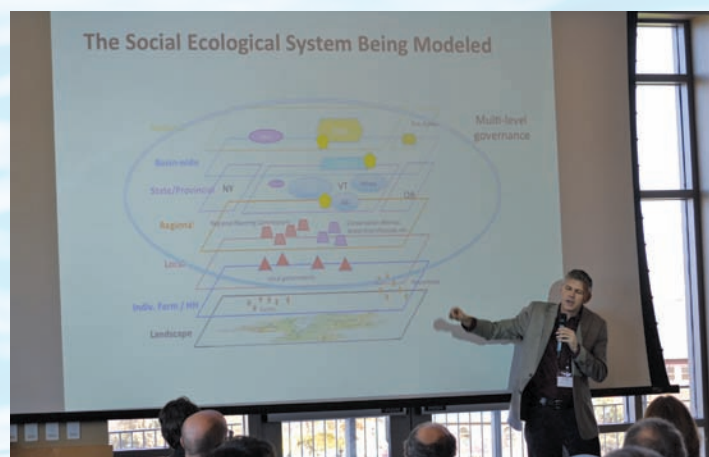
NOAA Local Climate Analysis Tool (LCAT) awarded NOAA Department of Commerce Silver Medal

Dr. Lesley-Ann Dupigny-Giroux, Department of Geography, University of Vermont, co-authored inaugural journal article just published in the American Meteorological Society Journal awarded the NOAA Department of Commerce Silver Medal.

A group honored for conceiving, designing, developing, and implementing the revolutionary Local Climate Analysis Tool (LCAT) that uses trusted data and scientifically-sound analysis techniques, as determined by Science Advisory Teams made up of NOAA and external scientists, to provide stakeholders rapid responses to questions on the impacts of local climate variability and change was awarded the Department of Commerce Silver Medal. The medal was awarded for Scientific/Engineering Achievement. LCAT enables users to provide decision support to customers in seconds what otherwise would take hours and provides all relevant statistical output as well as metadata and graphics.

# VT EPSCoR CWDD represented at the 2015 SACNAS National Conference

The Vermont EPSCoR Center for Workforce Development and Diversity (CWDD) recently joined five EPSCoR representatives from jurisdictions around the country to represent NSF-EPSCoR at the SACNAS conference. SACNAS, the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science, hosts a national conference each year. The 2015 National SACNAS Conference, held in Washington D.C from October 29-31, hosted speakers, workshops, conference sessions, poster presentations, and more, for undergraduate and graduate scientists. It offers an opportunity for a diverse group of researchers to disseminate their research while networking and engaging in career development opportunities.

The NSF EPSCoR booth was set up in the exhibitor hall which offers attendees the opportunity to explore graduate schools, fellowships, internships, and job opportunities. The NSF-EPSCoR table represented opportunities in fifteen different states/jurisdictions, and five states sent representatives to talk to students and faculty about the research programs available. The conference was also a chance for EPSCoR jurisdictions to network with each other about NSF EPSCoR education, outreach, and diversity (EOD) programs.

In addition, VT EPSCoR Intern Jake Carrasquillo-Rodriguez was awarded a SACNAS Travel Scholarship which enabled him to present his research poster at the SACNAS National Conference. Jake presented the research he conducted with Dr. Yaoyang Xu, Peter Isles, Dr. Jason Stockwell, and Dr. Andrew Schroth on algal blooms in Lake Champlain and Shelburne Pond during the 2015 Summer Internship.

VT EPSCoR Interns Present Research at the 2015 AGMUS Research Symposium for Minority Students in San Juan, Puerto Rico

On August 29, 2015, three VT EPSCoR interns presented their research at the 2015 AGMUS Research Symposium for Minority Students in San Juan, Puerto Rico. The conference was hosted by Dr. Juan F. Arratia, Executive Director of the Student Research Development Center. Two VT EPSCoR Intern presented research posters created from their experiences with the VT EPSCoR internship in the summer of 2015.
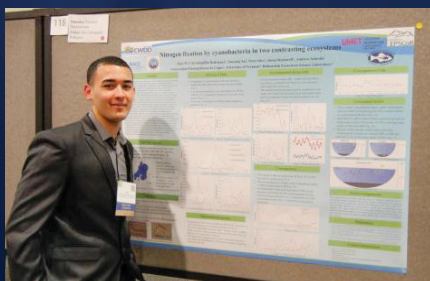
Universidad Metopolitana sophomore, Jake Carrasquillo, presented the research he conducted with Dr. Yaoyang Xu, Peter Isles, Dr. Jason Stockwell, and Dr. Andrew Schroth on algal blooms in Lake Champlain and Shelburne Pond. His poster was titled: Nitrogen Fixation by Cyanobacteria in Two Contrasting Ecosystems. Jake's research looked at two very different sites to learn how factors interact before, during, and after an algal bloom, and specifically how nitrogen fixation plays a role in the system. Jake was awarded a SACNAS Travel Scholarship, which will enable him to present his poster at the 2015 SACNAS National Conference in Washington, D. C. on October 29-31.
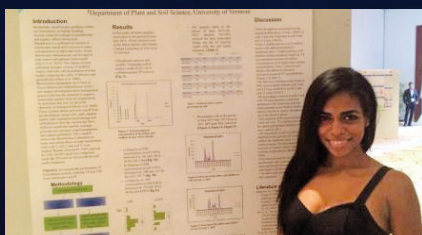
Jelissa Reynoso, a student at the University of Puerto Rico, presented her project titled: Total Phosphorus and Total Suspended Solids Removal by Bioretention Systems. The bioretention cells are located at the University of Vermont, a project led by her mentor, Dr. Stephanie Hurley. Jelissa was particularly interested in the TP and TSS in-flow and out-flow from these bioretention cells after storm events.

2014 RACC intern, Illiansherry Santiago, continues to study water quality in her coursework at the University of Puerto Rico. During the summer 2015, she completed a research project looking at the nutrients and metal contamination in the Rio Piedras River in San Juan, Puerto Rico.

Lindsay Wieland, Director of the VT EPSCoR Center for Workforce Development and Diversity, sat on the invited panel to discuss summer internship opportunities and the value of undergraduate research.

Patricia Moulton, Secretary of the Vermont Agency of Commerce & Community Development, Encourages Students to Consider Seeking a Career in Vermont.

Seven Vermont college students were awarded a total of $35,000 in VT EPSCoR Native American and First Generation College Student Scholarships for Science, Technology, Engineering and Math (STEM) at the Vermont State House on August 5, 2015.

The location was selected to remind students of the many career opportunities available to them in Vermont. Secretary Patricia Moulton encouraged the students to seek employment in Vermont after graduation saying "There is a real need in Vermont for a well-trained STEM workforce," and further, that she was "impressed with the quality of students receiving the scholarships."

The scholarships are offered annually by the VT EPSCoR Center for Workforce Development and Diversity at Saint Michael's College (CWDD) to encourage students from diverse backgrounds to enter STEM (Science, Technology, Engineering and Math) careers. These competitive scholarships are designed to help defray college expenses and encourage young Vermonters to pursue STEM (Science, Technology, Engineering and Math) majors and careers. Awards this year were made to students from Bennington, Caledonia, Chittenden, Franklin and Washington Counties.

The scholarship program provides financial support to students interested in pursuing a career in STEM (Science, Technology, Engineering and Math) areas who are of Native American ancestry or first in their family to attend a four-year college. The $5,000 awards are made to Vermont students who plan to attend a Vermont College or University during the next academic year, or who are currently an Undergraduate enrolled in a STEM (Science, Technology, Engineering and Math) degree program at a Vermont College or University. The scholarships are awarded based on academic standing, letters of recommendation and an essay. For more information and to learn how to apply, please visit:
http://uvm.edu/epscor/scholarships

L to R: Logan Tracy (SMC), Hunter Denault-Reynolds (UVM), Brittany Ryan (JSC), Foram Patel (UVM), Jessica Colby (UVM), Tiffany Martin (CCV Winooski), and Bradley Roy (UVM).

Front: Secretary Patricia Moulton (Agency of Commerce and Community Development) and Lindsay Wieland (VT EPSCoR CWDD Director)

2015 SCHOLARSHIP AWARDEES

Brittany Ryan, recipient of a Native American Scholarship, is currently a student at Johnson State College double-majoring in Sociology and Anthropology.

Hilary (Hunter) Denault-Reynolds, recipient of a Native American Scholarship, graduated from Bellows Free Academy, St. Albans, in 2015 and will begin a Computer Engineering degree at the University of Vermont (UVM) in the fall.

Bradley Roy, a recipient of a First-Generation Scholarship, is attending UVM where he is pursuing a Fisheries Biology major, and Geospatial Technologies minor.

Jessica Colby, a recipient of a First-Generation Scholarship, is currently a student at UVM, majoring in Wildlife and Fisheries Biology.

Logan Tracy, a recipient of a First-Generation Scholarship, is currently a student at Saint Michael's College double-majoring in Mathematics and Elementary Education.

Tiffany Martin, a recipient of a First-Generation Scholarship, is currently a student at the Community College of Vermont in Winooski. She is majoring in Network Administration.

Foram Patel, a recipient of a First-Generation Scholarship, is currently a student at UVM majoring in neuroscience.

The deadline for applications is April 1, 2016. For more information please contact: ***epscor@uvm.edu***

Tiffany Martin, a recipient of a First Generation Scholarship at the Community College of Vermont said of her award:

"I am grateful to receive an award like this," Martin said. "STEM in Vermont is really important, and it is a huge component of the future of the state's economy."

Let's Bug Out!

On October 15, 2015, the Vermont EPSCoR Center for Workforce Development and Diversity (CWDD) had a table at the "Women Can Do!" Action Expo hosted by Vermont Works for Women at the Vermont Technical College in Randolph, VT. The event is a one-day career immersion experience for 9-12 grade girls. Students have the opportunity to test out various STEM (Science, Technology, Engineering and Math) and trades careers while networking with other girls around the state interested in STEM (Science, Technology, Engineering and Math). The CWDD table, called "Let's BUG Out!" was a success. Students were asked to identify three benthic macroinvertebrates using dissecting microscopes, a dichotomous key, and the Macroinvertebrate App (free download on the iTunes store!). If they correctly identified two out of three correctly, they won a prize!

The CWDD was thrilled to be a part of this event and to meet so many motivated girls!

Harwood Union Middle School students learn about water quality with Matt Vaughan!

On Wednesday, October 21, NEWRnet graduate student, Matt Vaughan, along with CWDD Staff met Harwood Union Middle School eighth graders at Lozelle Brook - right on the school campus! The eighth grade science teacher, Brian Wagner, has been involving the students in an ongoing project to learn about the school's storm water runoff infrastructure.

At the stream, students divided into groups to learn more about the research that NEWRnet does, and to measure parameters that enable scientists understand the health of the watershed. Matt introduced students to the NEWRnet sensor, and together they measured characteristics including the pH, conductivity, dissolved oxygen, and temperature. The students salted a demonstration "road" and washed the road salt into the "lake" to see how runoff impacts water quality.

# North East Water Resources Network (NEWRnet)

On the Shores of Lake Champlain with J.J. Flynn Elementary School!

On Friday, October 2, NEWRnet graduate student Ryan Sleeper along with CWDD Staff met J.J. Flynn Elementary School fifth graders just a short walk from their school - on the shores of Lake Champlain! A few days earlier, the CWDD presented background information to each class about the work of VT EPSCoR. The fifth grade, led by teachers Joni Pecor, Keith Brown, and Michelle D'Agostino, has been involved in an extensive water quality unit this fall. Activities include a workshop with the Floating Classroom program, creating aquaria/terraria in the classroom, and visiting Lake Champlain with the VT EPSCoR CWDD.

On this windy fall day, students and their teachers walked down to the beach, where they could see the impacts of the recent heavy rain on the lake, with portions of the lake brown from sediment draining from the Winooski River, and other portions of the lake the more typical blue. At the beach, students divided into two groups to learn more about the research that NEWRnet does, and to measure parameters that enable scientists understand the health of the watershed and lake. With Ryan, the students were introduced to the NEWRnet sensor, and took note of characteristics including the pH, conductivity, dissolved oxygen, and temperature. Then, they salted a demonstration "road" and washed the road salt into the "lake" to see how runoff impacts water quality.

Working with Laura Yayac and Janel Roberge, the students made observations about the beach site, including dominant vegetation, woody debris in the lake shallows, and sampled water and sediment from the lake to note any odors, colors, and other characteristics. To combat the chill of the wind, jumping jacks and group huddles were employed. It was a great day to be out by the lake and learn about keeping the lake healthy.
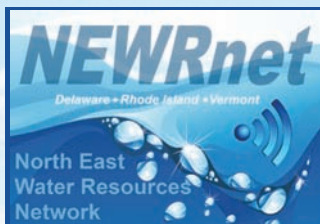
NEWRnet is an NSF funded project for collaboration among Vermont, Rhode Island and Delaware on research on water quality.

NEWRnet Undergraduate Research Symposium

On August 11th, eighteen NEWRnet interns returned to Vermont for the NEWRnet Undergraduate Research Symposium. NEWRnet interns spent the past 10 weeks studying topics related to water quality and agent based modeling in three EPSCoR states: Delaware, Vermont, and Rhode Island. Interns presented their summer research in two formats: the 2-minute talk served as an introduction to their research, and the research poster allowed for more time to learn about individual projects, methods, and findings.

The 2015 symposium included presentations by NEWRnet faculty, Dr. Shreeram Inamdar, and graduate students Catherine Winters and Douglas Rowland from the University of Delaware. We were honored to welcome Dr. Sidney A. McNairy, Jr. from the NEWRnet External Advisory Committee and former member of the Senior Executive Service of the National Institutes of Health, Bethesda, MD. Dr. McNairy gave the Keynote Address, inspiring students to excel during the remainder of college and into their professional careers.
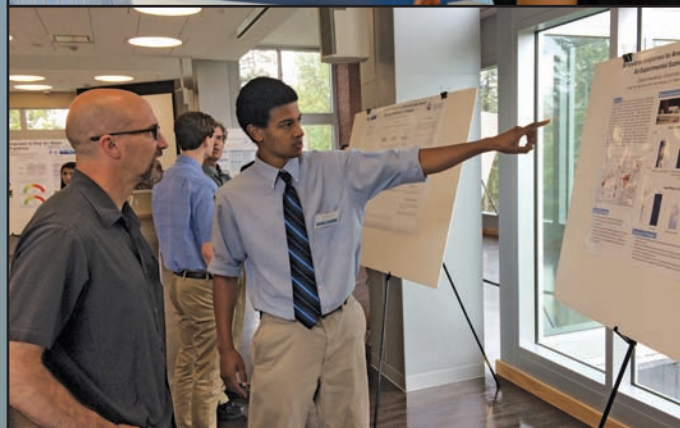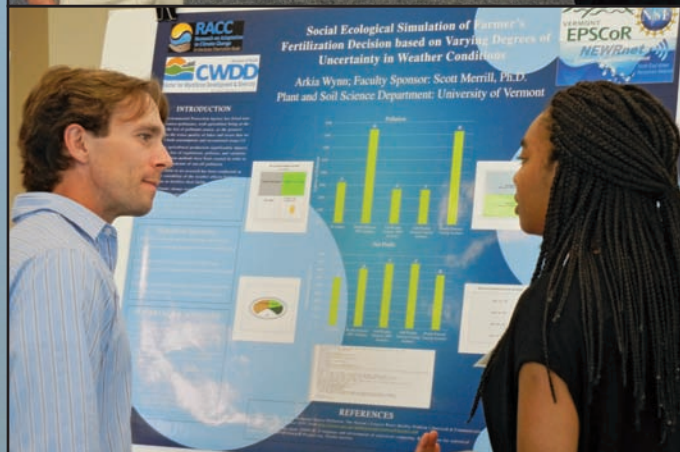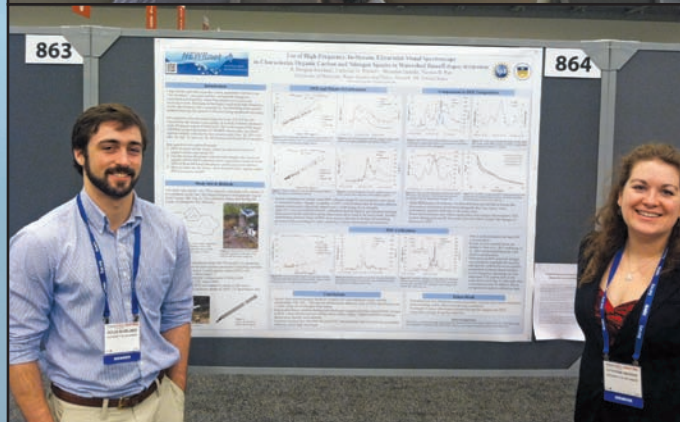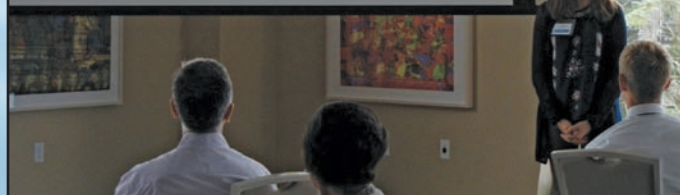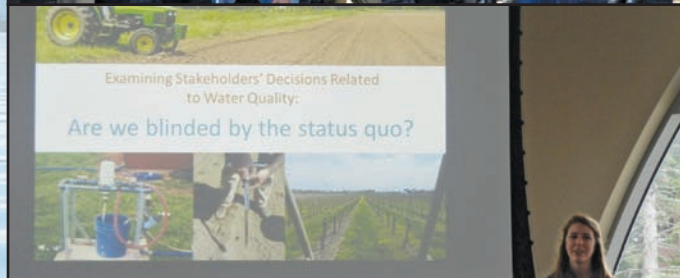
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From
the Director

We hope this report provides you with a glimpse of the important initiatives that many individuals are moving forward in Vermont through collaboration, team science, education and transdisciplinary research methods.

Highlights of our year include our "All Hands Meeting" with RACC and NEWRnet that this year was held at Saint Michael's College in Colchester, Vermont. We were delighted that our Program Director from the National Science Foundation, Dr. C. Susan Weiler, was present to hear our exciting progress. Our talented graduate students and postdocs presented their work in Slam talks of 6 minutes duration. Our faculty leaders gave context to the short talks, and put everything into the perspective of what we have accomplished in 4 ½ years. We took the opportunity with everyone present to begin a synthesis paper describing our transdisciplinary collaborative approach to research. Dr. Donna Rizzo led this effort with a writing session. Dr. Asim Zia, Science Leader for the Integrated Assessment Model (IAM), shared the great news that the IAM accommodates feed forward and feed back. This IAM integrates the models includes data from all three question areas (Lake Processes, Watershed Processes and Policy & Governance). This is a major advancement for Vermont to share with other EPSCoR programs that are striving to integrate their models.

Another exciting milestone for our Year was the Alan Alda Workshop on Communicating Science on February 1st and 2nd, our second workshop with the Alan Alda Center for Communicating Science. Our Vermont EPSCoR members along with folks from higher education, state agencies and the private sector in Vermont enjoyed trying their hands at improvisational methods and story-telling exercises developed by the Alda Center. Many had the opportunity to create their own videos to distill their message.

Our stakeholders are participants in our research and our outcomes are important to them as they manage the health of the Lake Champlain Basin and live and work in its watersheds. Our final stake-holders meeting is planned for summer when we will work with them to test the future outcomes of policy scenarios of lake and watershed management.

For more information, and to learn more, please visit us on the web at **www.uvm.edu/EPSCoR**

Please check in with us often and follow us on twitter, Facebook and our awesome web page.

Cheers!

Judith Van Houten, Ph.D.
Vermont State EPSCoR Director