

**Vermont EPSCoR**  
 Experimental Program to Stimulate Competitive Research

## Adaptation to Climate Change in the Lake Champlain Basin: New Insights through Complex Systems Modeling



Beginning Year 2 of the \$20M Award from NSF EPSCoR



Science and Engineering Research



Diversity and Workforce Development




Private Sector Innovation Awards


Communication Plan (Emmy Award winning television show on Vermont Public Television)

Cyberinfrastructure for Research and Education

VT EPSCoR Alignments and Partnerships:







**State of Vermont:**  
 Governor Peter Shumlin



**Partners and Stakeholders:**  
 Agency of Natural Resources  
 Governor's Climate Cabinet  
 Lake Champlain Basin Program  
 Nature Conservancy of New York and Vermont  
 Lamoille River Project  
 Lake Champlain International  
 Vermont State Colleges  
 Saint Michael's College  
 Middlebury College

**Congruent with the State Science and Technology Plan**

**Driving Our Research and Outreach:**  
 From the beautiful watershed comes storm water run off, sediment and nutrients that fuel algal blooms in the Lake. Managers must make decisions about development, land and lake use, agriculture practices in light of the predictions of more precipitation, less snow and more rain and more severe storm events.

## The Overarching RACC Question

How will the interactions of climate change and land use alter hydrological processes and nutrient transport from the landscape, internal processing and eutrophic state within the lake, and what are the implications for adaptive management strategies?

- Instrumentation of the Lake and watershed**
- Modeling of the in Lake and to Lake processes**
- Development of adaptive management strategies**
- Scenario testing through integration of the hydrological and agent based models**

## Center for Workforce Development and Diversity Saint Michael's College

**Integrate participants into RACC research:**

- Internships for undergraduates - Veterans, Disabled
- High school teachers and their students
- Middle school teachers
- New partner, Community College of Vermont

**Scholarships** for first generation and Native American students

**Governor's Institutes of Vermont** – funds for girls and economically disadvantaged to attend

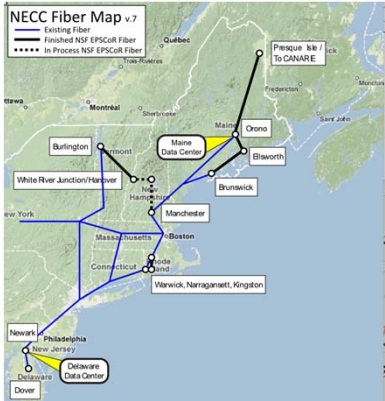
**Water Analysis Labs** for RACC research at Saint Michael's College and Johnson State College



Undergraduate and graduate students have been directly involved in installation, maintenance, sampling, analysis, and data management.

## Cyberinfrastructure

We are the lead in a consortium of 5 (ME, NH, DE, RI, VT) states that built the first fiber network in the NE enabling the transfer of large datasets that were previously mailed on hard drives. Now we have 120Gb connections to Albany and NY and 120 Gb to NH (soon to be to Boston and the world).



## Do we cross units at UVM and beyond???

Since 2003, we have supported **91 faculty members from 10** baccalaureate institutions and universities in Vermont.

- Within UVM our faculty come from CALS, CAS, RSENR, Gund, CEMS. (**social, natural, and physical scientists and engineers**)
- **Partner Institutions:**
  - Bennington College
  - Middlebury College
  - Castleton College
  - Norwich University
  - Green Mountain College
  - Saint Michael's College
  - Johnson State College
  - Sterling College
  - Lyndon State College
- We work with many **high schools** (>25 per year), and **middle schools**. Soon we will reach **elementary pre-service** teachers.
- Our **stakeholders** work with us on our research: including the State DEC ANR, LCBP, Nature Conservancy, etc.
- We include investigators from the **private sector** in our research.

## Quantitative Indicators:

**Faculty:** since 2003, we have supported **91 faculty** from 10 colleges or universities across the state. (Currently support 27.)

**Grad Students:** **57 graduate students** (35 PhD, 22 MS) have graduated since 2003. (Currently we have 5 PhD students.)

**Postdocs:** Over the last 5 years, we have had 5 (currently we have 4).

**Undergraduates:** Over the past 10 years, we have trained 137 undergraduate interns. So far 134 have graduated.

### Our Recent Past and Current Funding (\$38.7M):

iRWE:	\$8,513,079	(2003-2007)
Water Dynamics Workshop:	\$99,966	(2008)
CSYS:	\$7,854,444	(2007-2012)
Track 2:	\$1,199,921	(2009-2012)
C2:	\$1M	(2011-2013)
RACC:	\$20M	(2011-2016)

## Internal and external barriers that limit effectiveness & sustainable outcomes:

- RPT Guidelines that value transdisciplinary research and collaboration by faculty
- UVM policies and procedures that slow down research and infrastructure building, especially purchasing for fiber network projects – need innovative and real-time “fast-track” options for large programs such as VT EPSCoR
- We need more investments by UVM to build critical mass and infrastructure
- We bring value to the spires in **Complex Systems, Food Systems** and **Human Health and Behavior**, but there should be a recognition of excellence in research specifically on the **Environment**.

## To Increase our effectiveness:

- We recommend UVM invest dollars in programs like VT EPSCoR for a more effective set of programs and improved chances of future funding because of demonstrable institutional commitment.
- We would like more Deans and Chairs to partner with VT EPSCoR to recruit and retain talented faculty in areas of environmental excellence and our RACC research. We still need to build **critical mass** in many areas of environmental research.