

# VT EPSCoR's Workforce Development Initiatives

VT EPSCoR Annual Meeting

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June 2, 2011

# Center for Workforce Development and Diversity

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Objective: Cultivate and prepare a diverse science, technology, engineering and math (STEM) and social science workforce in Vermont

- Provide research opportunities
  - Gain skills
  - Research experience to inform future plans

# The Streams Project

Collaborative effort by high schools, colleges and community partners to collect water quality data on small streams

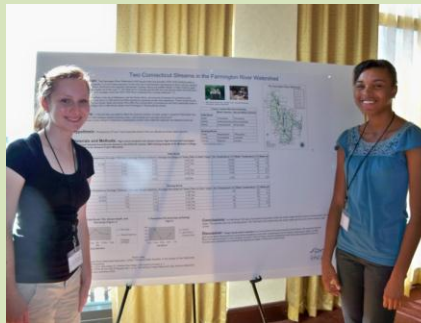


*Vermont*  
*EPSCoR*  
**Streams**  
*PROJECT*

[www.uvm.edu/~streams](http://www.uvm.edu/~streams)

# Streams Project Goals

- Workforce Development
  - Interaction of faculty, undergraduates, high school teachers and students
  - Practical experience in scientific research
  - Promote diversity in STEM fields
- Service to the state of Vermont
  - Collect water quality data on streams of importance in Vermont



# Central Research Questions

1. How do land use patterns affect the physical condition and water quality of small streams?
2. How does water quality change in response to precipitation events? How might this response vary based on land-use patterns?



# Participants

## High School Teams

- Collect biological, physical and chemical data in streams near their schools
- Carry out independent research project



## Undergraduates

- Carry out independent research project
  - Internship experience in a lab:
    - macroinvertebrate
    - water chemistry
    - bacteria ribotyping
- or work on complementary projects with community partners

# Undergraduate Program

## 2010-11:

- 30 interns

St. Michael's College  
Johnson State College  
University of Vermont  
Universidad Metropolitana

University of Puerto Rico  
University of Delaware  
Wesley College  
University of Rhode Island



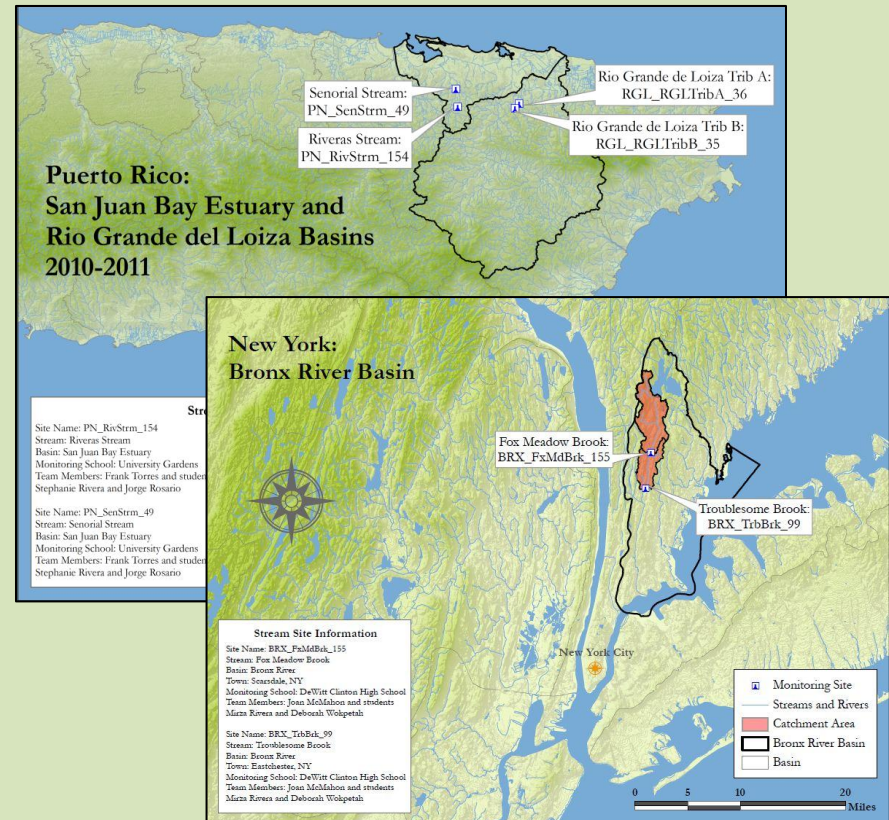
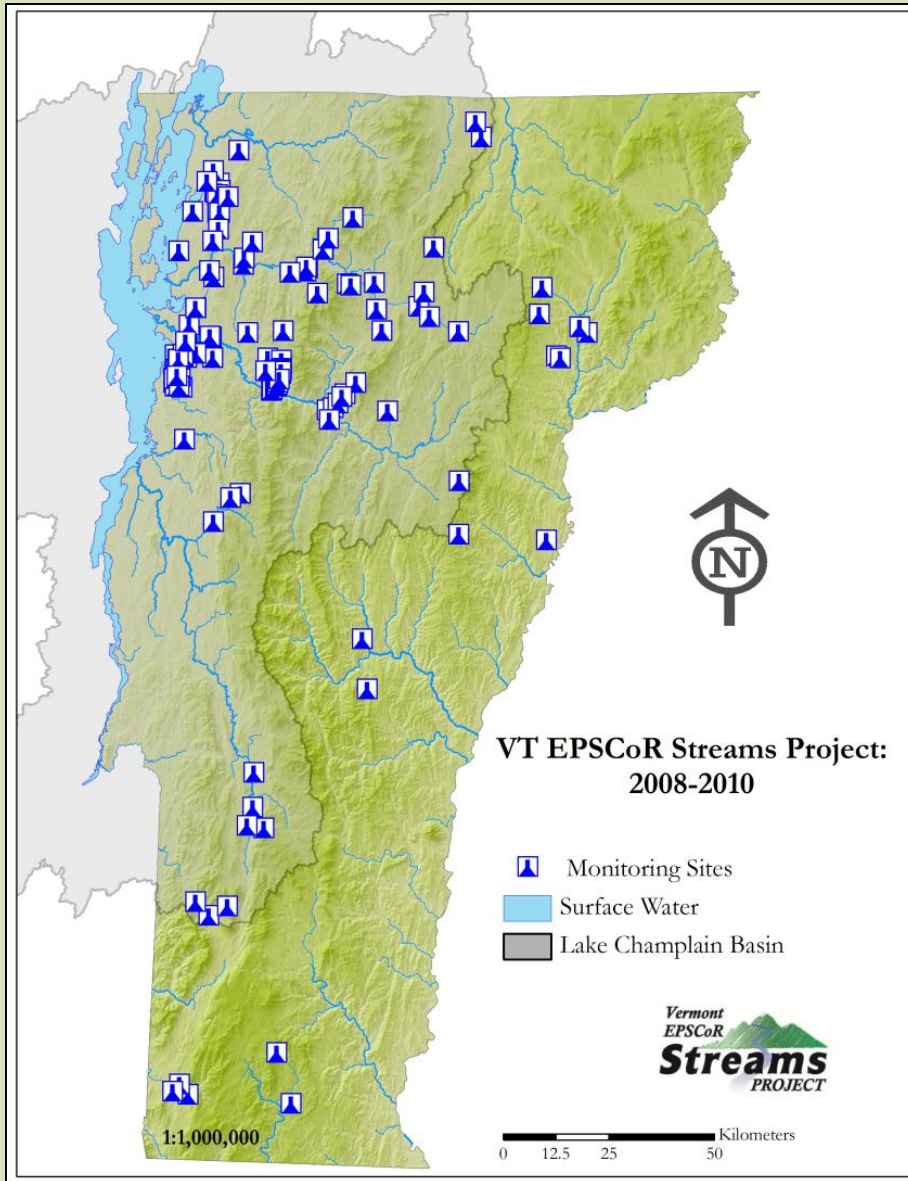
## Over the 3 years of the program:

- 80 internships
- Students from 12 colleges and universities



# Monitoring Sites

- Total sites: 165  
(157 VT, 2 NY, 2 CT, and 4 PR)
- Total streams: 66  
(59 VT, 1 NY, 2 CT and 4 PR)





# Database

The Streams Project Data Download Website:

[www.uvm.edu/~streams/redirects](http://www.uvm.edu/~streams/redirects)


The screenshot shows the website's header with the Vermont EPSCoR Streams Project logo on the left, the title "The Streams Project" in the center, and the NSF logo on the right. Below the title is the text "Experimental Program to Stimulate Competitive Research". A navigation menu on the left lists: HOME, ABOUT, RESEARCH, RESOURCES, MAPPING RESOURCES, DATA, RESULTS & SYMPOSIUM, SHOTS FROM THE FIELD, LINKS, PEOPLE, GET INVOLVED, and CONTACT US. The main content area is titled "Reports" and contains three columns: "Stream/Site Code \*", "Available Reports", and "Date Range".

Stream/Site Code *	Available Reports	Date Range
BRX_FxMdBrk_155	<input type="radio"/> Site Assessments	<b>Start Date:</b> Jun 1 2008
BRX_TrbBrk_99	<input type="radio"/> Habitat Assessments	
Cold Brook	<input type="radio"/> Macroinvertebrate	
CTJW_HllsBrk_713	<input type="radio"/> Macroinvertebrate ID	
CTWW_EOBrnch_1567	<input type="radio"/> Water Quality	<b>End Date:</b> Jan 31 2011
DR_BeavBrk_1524	<input type="radio"/> E. coli	
DR_NBDrfld_2067	<input type="radio"/> Total Suspended Solids	
FMR_FallBrk_323	<input type="radio"/> Phosphorus	
FMR_RoaBrk_238	<input type="radio"/> Lab Data (Ecoli, Phosphorus, TSS)	
HRD_FuBrk_1013	<input type="radio"/> GIS Assessment Data	
HRD_RBWalBrk_939		<b>Report Help</b>
HRD_WaRv_767		<ul style="list-style-type: none"><li>• Data Variable Definitions</li><li>• Bedrock Subcategories</li><li>• Stream Site Information</li></ul>
LCC_MetRv_1506		
LCD_BrtltBrk_124		
LCD_BrtltBrk_138	<input type="button" value="Generate Report"/>	

# Resources

## Stream-specific macroinvertebrate identification keys:

[http://academics.smcvt.edu/Vermont\\_rivers](http://academics.smcvt.edu/Vermont_rivers)



**The Streams Project**

**Macroinvertebrate Pages**

This site is designed to facilitate macroinvertebrates identification in stream sites being studied by our partner high schools in Vermont, New York, Connecticut, and Puerto Rico. We are open to suggestion to improve the site and welcome your comments: [Contact Declan McCabe](#)

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**Tailored River Sites:**


The most commonly seen bugs in the rivers thus far can be found here: [Usual Suspects](#)

<a href="#">Allen Brook</a>	<a href="#">French Hill Brook</a>	<a href="#">Riveras</a>
<a href="#">Baldwin Creek</a>	<a href="#">Furnace Brook</a>	<a href="#">Roaring Brook</a>
<a href="#">Bartlett Brook</a>	<a href="#">Indian Brook</a>	<a href="#">Ruge Brook</a>
<a href="#">Beaver Brook</a>	<a href="#">Halls Brook</a>	<a href="#">Ryder Brook</a>
<a href="#">Branch Brook</a>	<a href="#">Lamoille River</a>	<a href="#">Seymour Brook</a>
<a href="#">Brewster River</a>	<a href="#">Lake Sunrise Outlet</a>	<a href="#">Shady Rill</a>
<a href="#">Bully Brook</a>	<a href="#">LR_TribA_374</a>	<a href="#">Sheldon Brook</a>
<a href="#">Cascades Brook</a>	<a href="#">Metawee River</a>	<a href="#">Señorial</a>
<a href="#">Centennial Brook</a>	<a href="#">Mill Brook</a>	<a href="#">Sleeper's River</a>
<a href="#">Cold Brook</a>	<a href="#">Miller's Run Tributary</a>	<a href="#">Snipe Island Brook</a>
<a href="#">Cold River</a>	<a href="#">Mud Creek</a>	<a href="#">Steven's Brook (1)</a>
<a href="#">Deerfield River North Branch</a>	<a href="#">Munroe Brook</a>	<a href="#">Steven's Brook (2)</a>
<a href="#">East Orange Branch</a>	<a href="#">Otter Creek</a>	<a href="#">Stone Bridge Brook</a>
<a href="#">Elmore Branch</a>	<a href="#">Pine Brook</a>	<a href="#">Sunderland Brook</a>
<a href="#">Englesby Brook</a>	<a href="#">Pond Brook</a>	<a href="#">Troublesome Brook</a>
<a href="#">Fall Brook</a>	<a href="#">Potash Brook</a>	<a href="#">Walloomsac River</a>
<a href="#">Fox Meadow Brook</a>		

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**Lake and Pond sites**

<a href="#">Lake Champlain at Oakledge Park</a>		
<a href="#">Ponds at the Schoolhouse</a>		



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ACADEMICS
ADMISSION
STUDENT LIFE
ATHLETICS
ABOUT SAINT MICHAEL'S
NEWS & EVENTS





Site codes [explained](#) and [mapped](#) (under mapping resources tab)

**MACROINVERTEBRATES HOME**                      **STREAMS PROJECT**

### Allen Brook (WR\_AllnBrk\_361)

These are the most common macroinvertebrates identified from samples from Allen Brook by Allen Brook Lane in Williston.

Click on images to zoom in.

			
<p>ORDER: <i>Diptera</i> FAMILY: <i>Chironomidae</i></p> <p>Midge larvae tend to be the most common macroinvertebrate at our sites. As with other <i>Diptera</i>, there are no true jointed legs. <i>Chironomidae</i> do have a pair of prolegs at each end and preserved individuals tend to curl into a 'C'. Identification past family requires slide-mounted heads. We have seen philopotamid caddisflies misidentified with the chironomids and we suspect</p>	<p>ORDER: <i>Trichoptera</i> FAMILY: <i>Philopotamidae</i> GENUS: <i>Chamaera</i></p> <p><i>Chamaera</i> are distinguished from the other <i>Philopotamidae</i> by a prominent <b>asymmetrical notch</b> in the frontoclypeus as well as a <b>prominent process on the femora</b> which bears a single hair (seta). <small>SNIC</small></p>	<p>ORDER: <i>Trichoptera</i> FAMILY: <i>Hydropsychidae</i></p> <p>This family of net-spinning caddisflies is very abundant at several sites. They are important filtering collectors and are quite common at urban and agricultural sites where particles of organic material can be important food resources. Genus-level identification is possible for mature specimens and we will include the genera we found at your site if possible.</p>	<p>ORDER: <i>Trichoptera</i> FAMILY: <i>Hydropsychidae</i> GENUS: <i>Ceratopsyche</i></p> <p><i>Ceratopsyche</i> has a <b>forked foretrochantin</b>. The foretrochantin is the projection at the uppermost portion of the foreleg. The leg may need to be pulled away from the body to expose this feature.</p> <p><i>Ceratopsyche</i> have a <b>large pair of sclerites</b> underneath the prosternum. Note: the large single sclerite is the prosternal plate. <small>SNIC</small></p>

# 2010-11 Accomplishments

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- Database includes 157 sites on 59 streams in VT. Some sites have three years of data.
- 6 undergraduates attended national and international research meetings:
  - 1 St. Michael's College, 1 UVM, and 2 UMet to ASLO Aquatic Sciences Meeting, San Juan, PR
  - 2 UMet to SACNAS Annual Conference, Anaheim, CA
  - 3 UMet to AGMUS Research Symposium, San Juan, PR
- 2 high school students chosen as semi-finalists in Am. Museum of Natural History Young Naturalist Competition for their Streams Project research
- 2 high school students participated in Puerto Rico regional science fair; 2<sup>nd</sup> place overall and 1<sup>st</sup> place in Env. Sciences category
- 2 high school students participated in VT State Science Fair; winning 2<sup>nd</sup> place

# Outcomes – Research Projects

## Annual Spring Symposium

- 11 oral presentations
- 30 poster presentations



Welcome to the

3<sup>rd</sup> Annual

Vermont EPSCoR  
Watershed Project  
Spring Symposium

April 26<sup>th</sup>, 2011

Burlington, Vermont



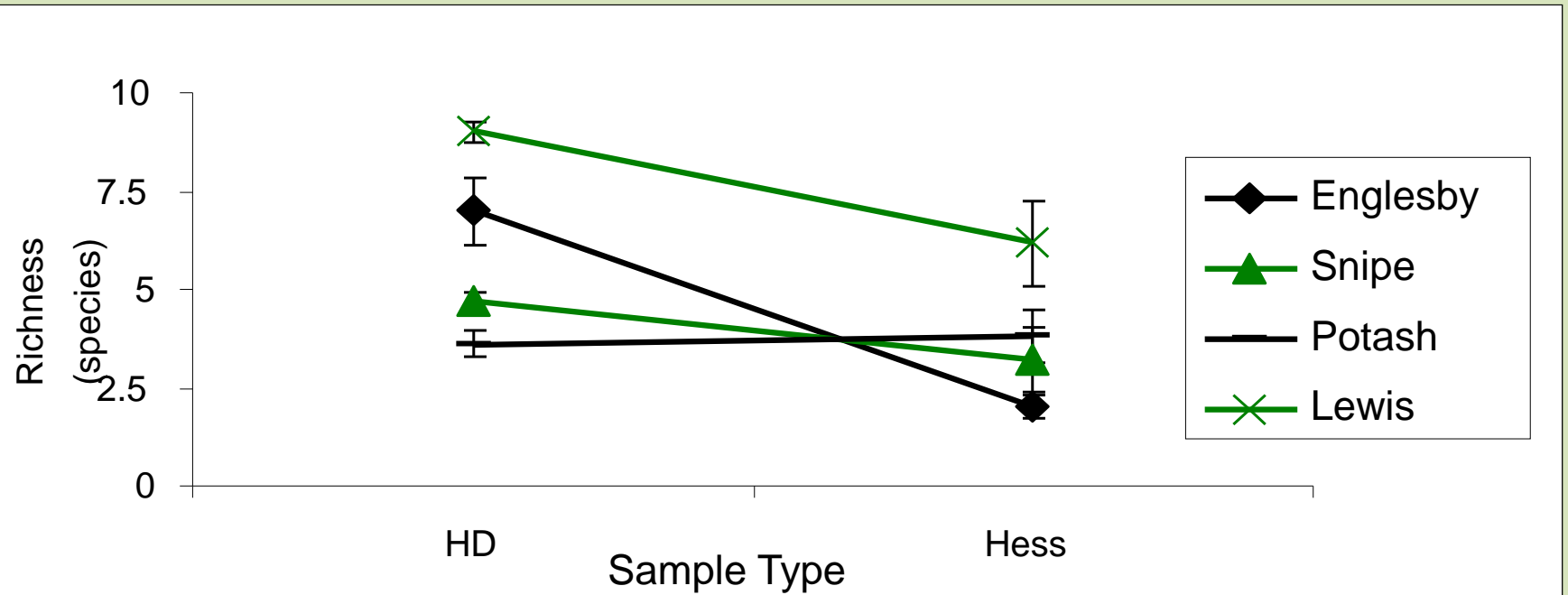
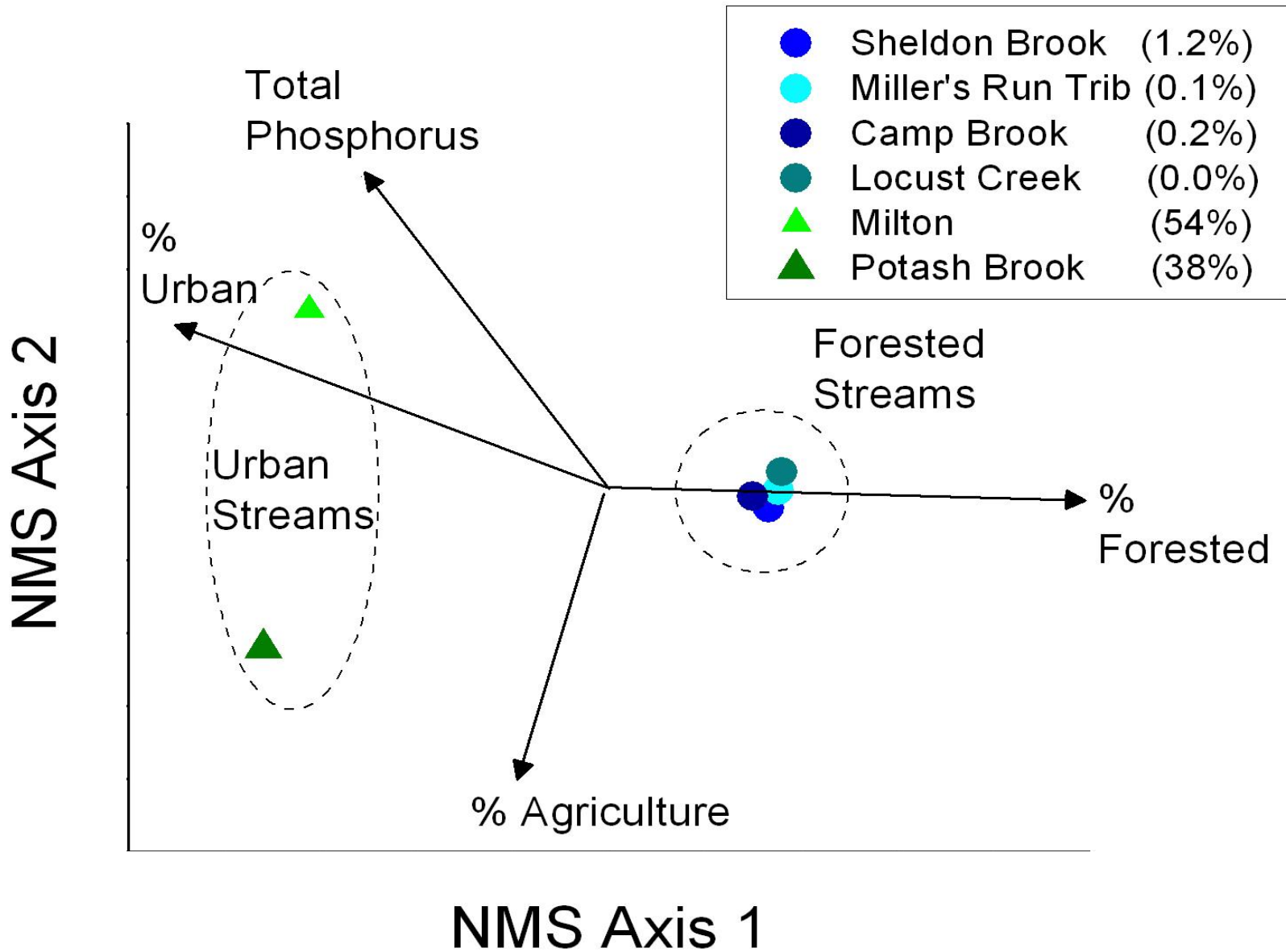


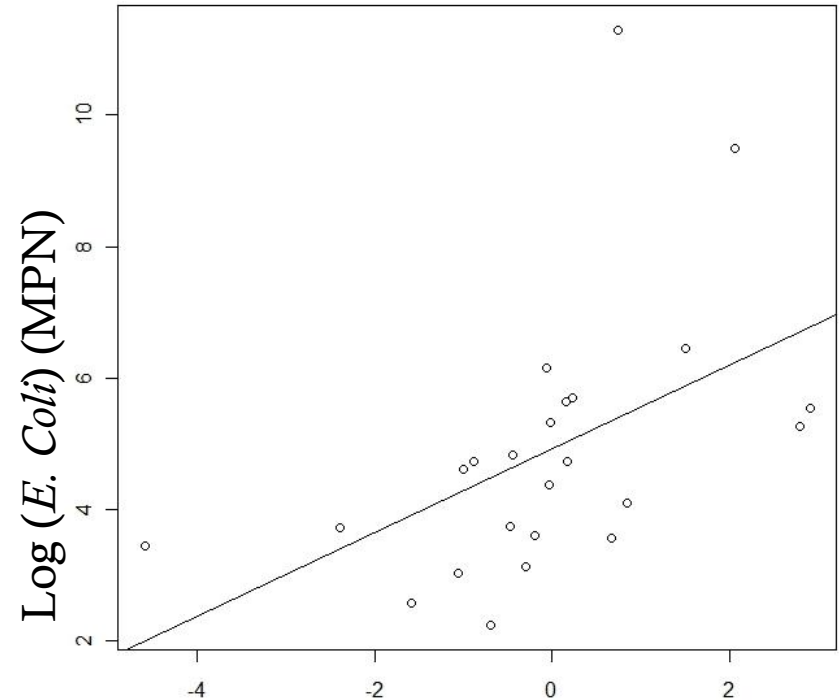
Figure 6. Average richness of Hester Dendy samples versus Hess samples in pools of four streams. Error bars represent standard error. Green lines represent forested streams and black lines represent urban streams.



From Evelyn Boardman, *Influence of Urbanization on the Physical, Chemical and Biological Characteristics of Streams*

# *E. Coli*

	Component 2
<b>Road Length</b>	0.779
<b>Gravel Road Length</b>	- 0.374
<b>Road/Stream Crossings</b>	0.504

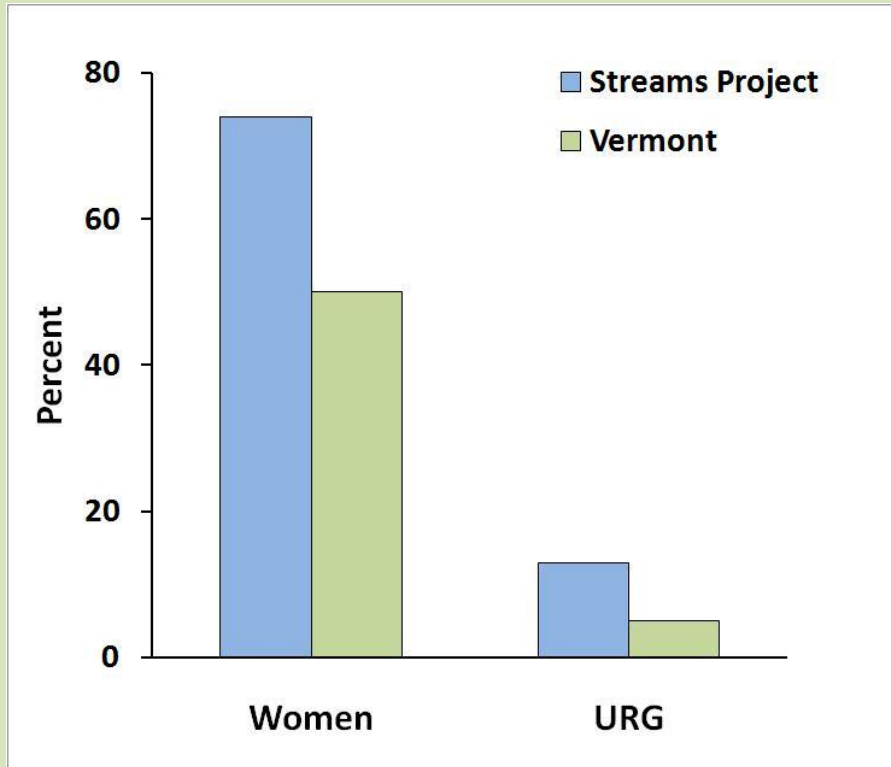


PC 2

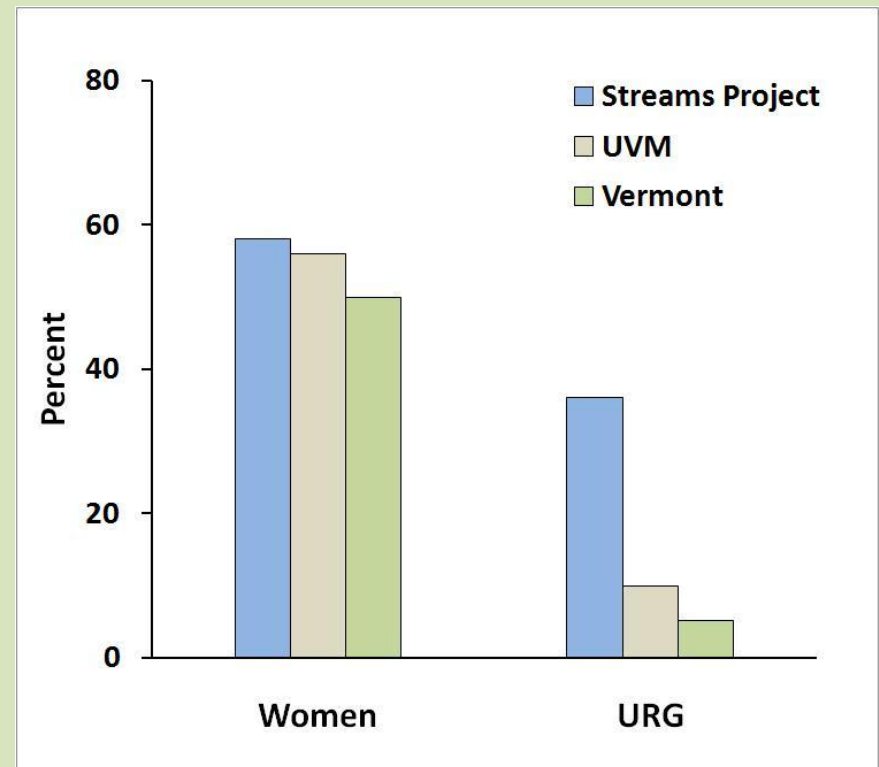
Multiple  $R^2 = 0.243$

# Outcomes – Workforce Development

## High School Students



## Undergraduate Students

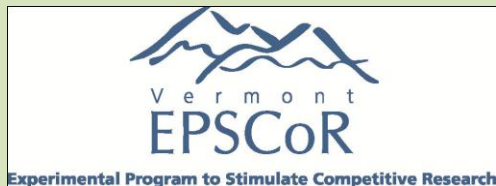


- 100% of HS participants matriculate to college
  - \* 74% are women
  - \* 71% enter STEM majors



# Streams Project 2011-12

- 16 high school teams
- 24 undergraduate interns
  - 8 from Baccalaureate colleges
  - 6 from UVM
  - 10 from Puerto Rico
  - 2 from UVM to El Verde field station, Puerto Rico



The  
**GOVERNOR'S INSTITUTES**  
of VERMONT



*Are you a female high school student interested in science, engineering, technology and math?*

**Did you know** that the Vermont Experimental Program to Stimulate Competitive Research (VT EPSCoR) is pleased to offer Vermont high school students **financial assistance** to participate in Engineering, Information Technology and Math Institutes offered through the Governor's Institutes of Vermont (GIV)?

Incentive Awards for girls in the amount of 50% of the tuition (regardless of financial status) for the following residential programs:

**ENGINEERING • INFORMATION TECHNOLOGY • MATHEMATICAL SCIENCES**

All students are eligible for need-based scholarships for the following institutes:

**ENGINEERING • INFORMATION TECHNOLOGY • MATHEMATICAL SCIENCES • ENVIRONMENTAL SCIENCE AND TECHNOLOGY**

Simply contact your school's guidance counselor for more information or visit [www.giv.org](http://www.giv.org).

**Apply now- spaces are limited!**



# New Initiatives

- Watershed Project



- Carbon Partitioning High School Research Project

## Leaves of Green:



**A workshop for high school teachers** exploring how carbon partitioning by plants affects agriculture, global climate change, and biofuel production.

- Vermont Technology Council Internship Program