

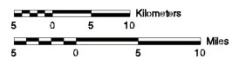
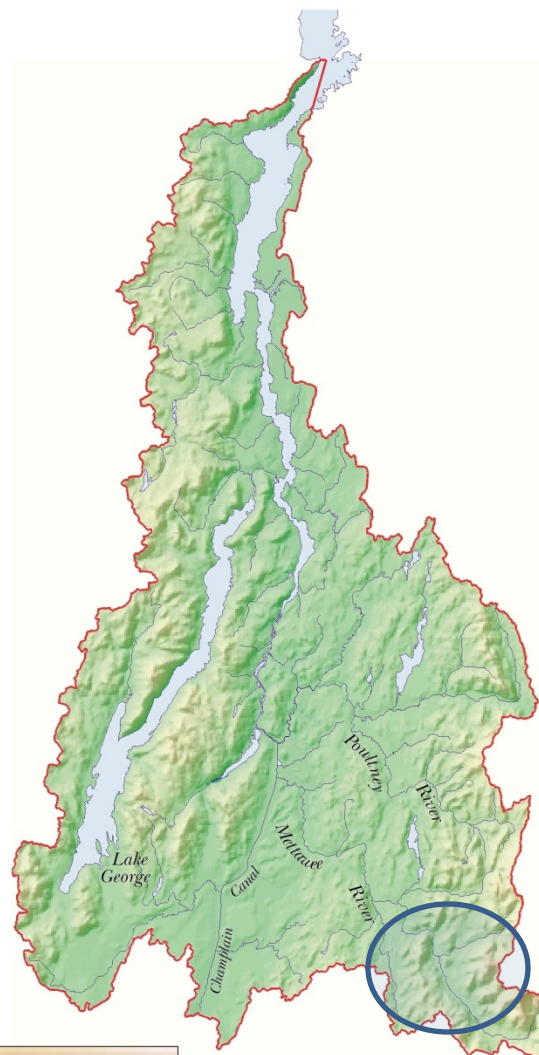
# A Comparison of Chemical and Biological Indicators of Water Quality between a Forested and Agricultural Site along the Mettawee River

**Long Trail School in Dorset,  
Vermont**

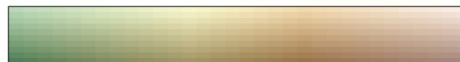
**Noah Lowenthal, Erika Davis,  
and David Spero, Ph.D.**



# Poultney-Mettawee/South Lake Basin

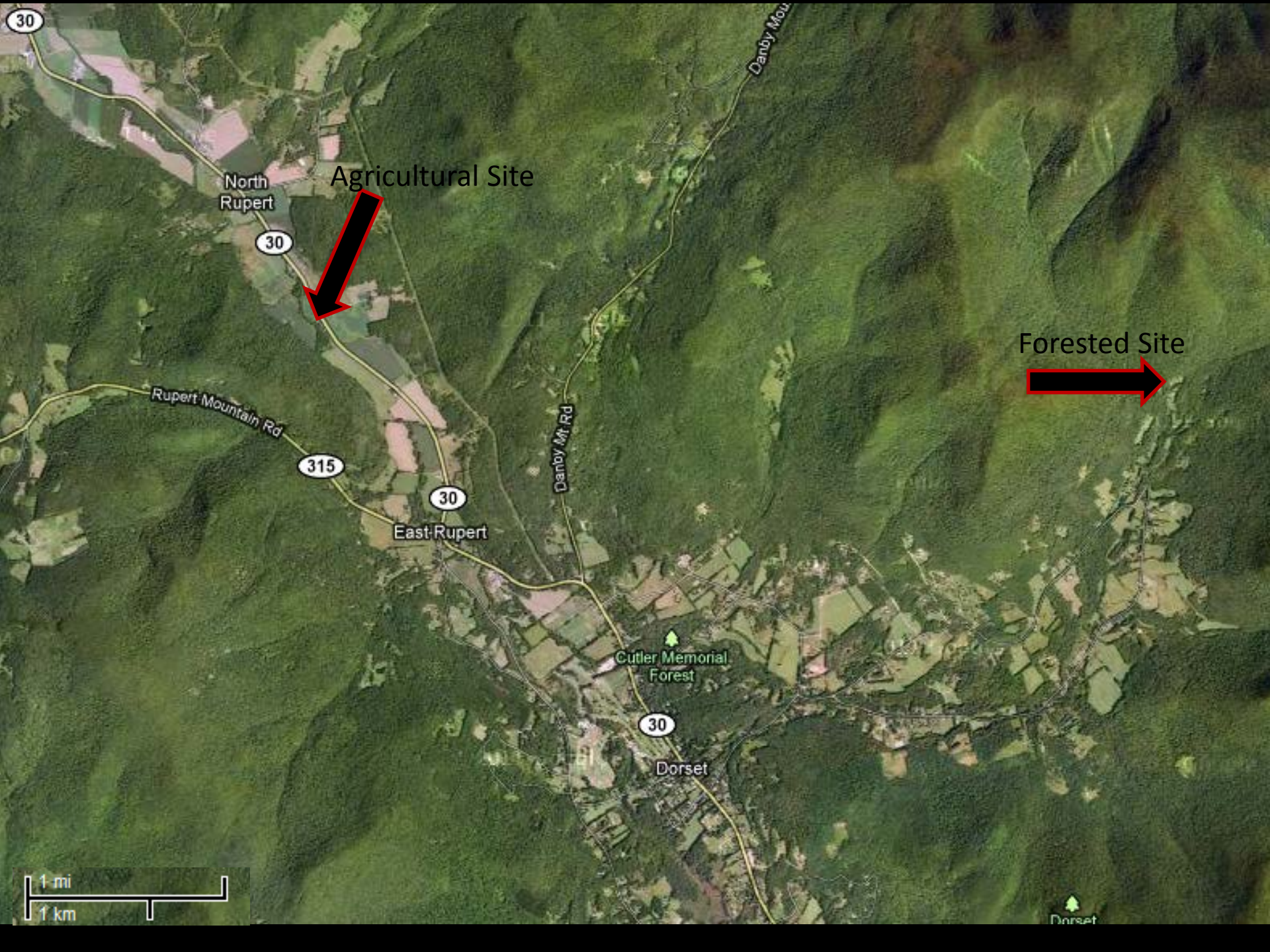


Elevation Above Mean Sea Level



Feet 0 500 1000 1500 2000 2500 3000 3500 4000 4500  
Meters 150 300 450 600 750 900 1050 1200 1350





North Rupert

Agricultural Site

Forested Site

Rupert Mountain Rd

Danby Mt Rd

East Rupert

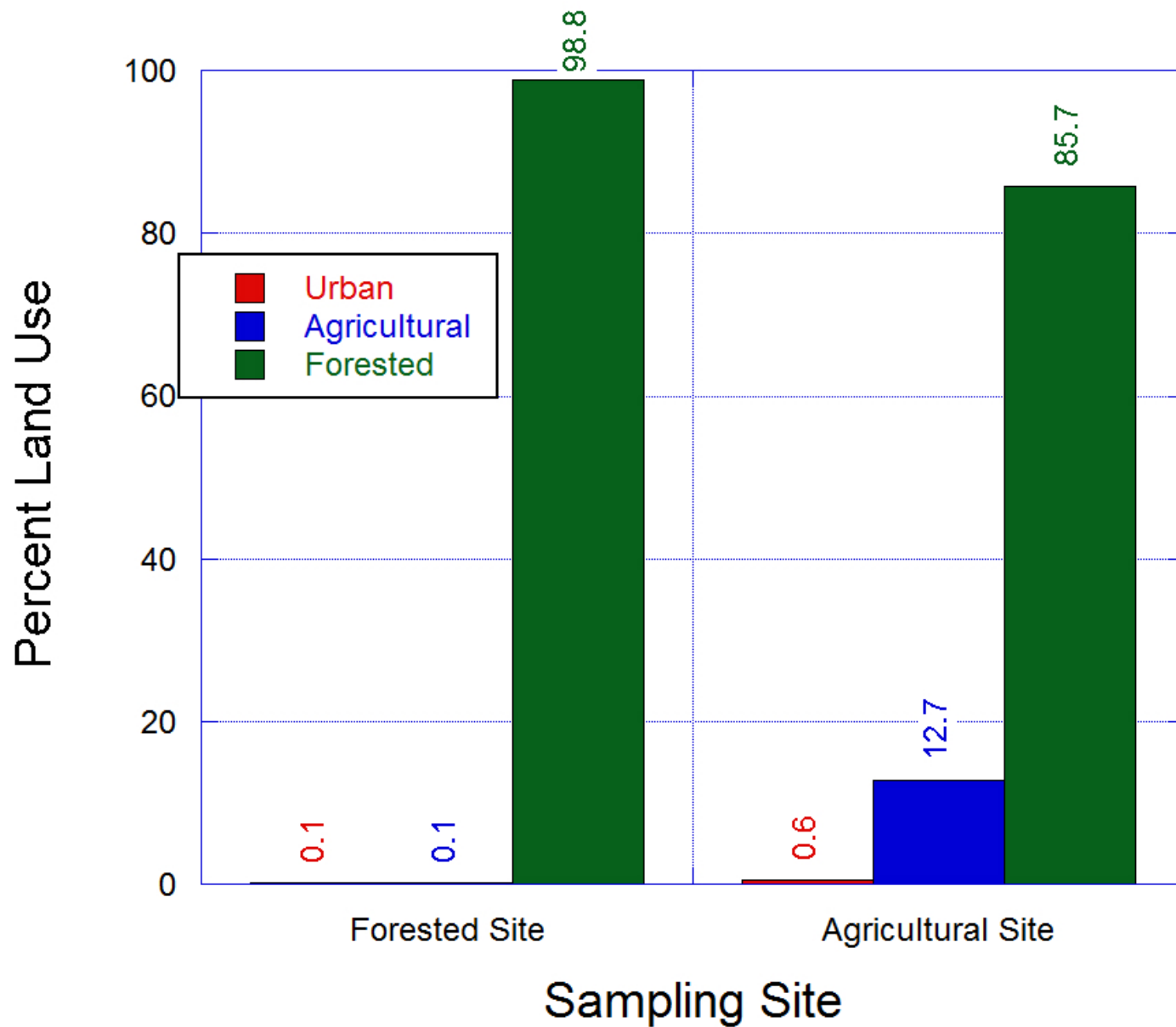
Cutler Memorial Forest

Dorset



Dorset

# Land Use Within Watershed of Sampling Site

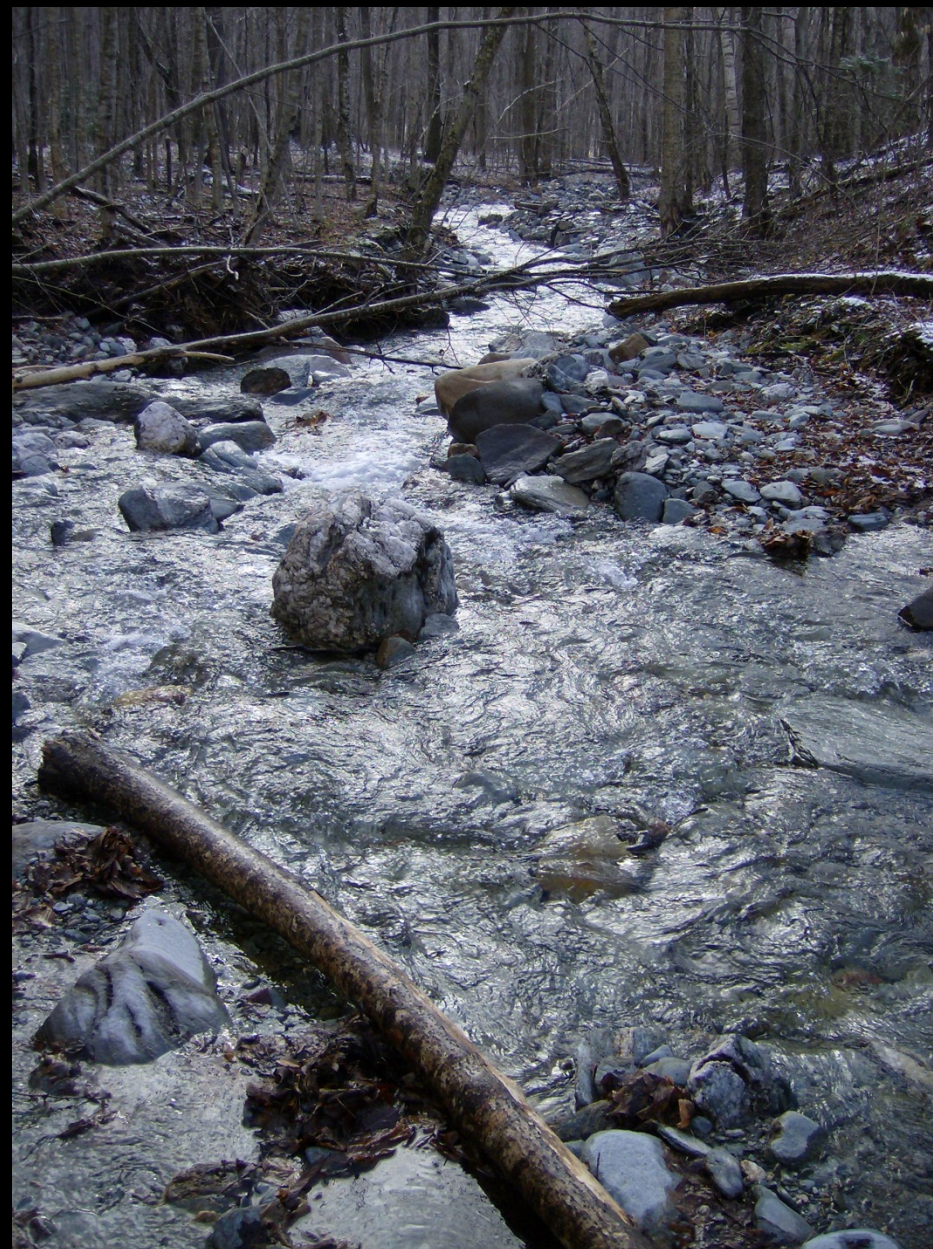




# Forested Site

2010

2011





# Agricultural Site

2010

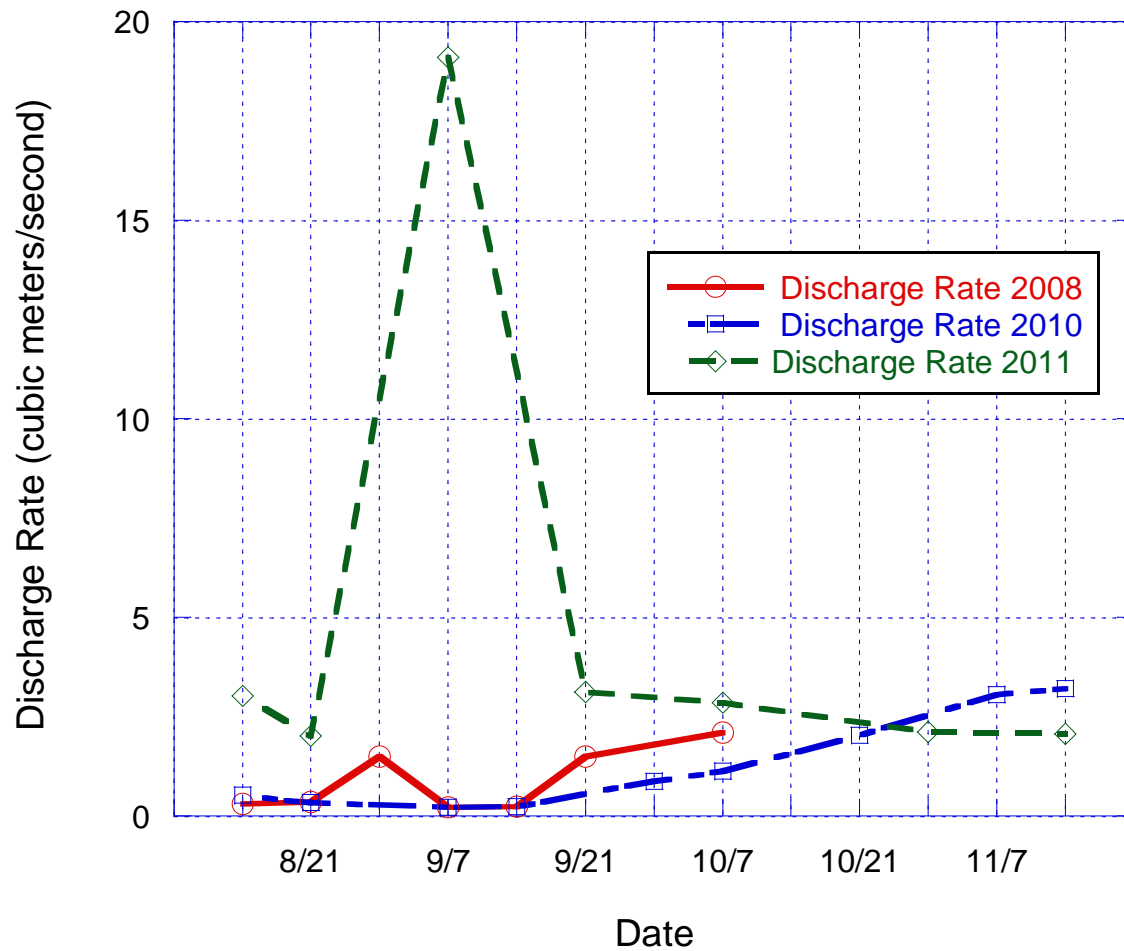


2011

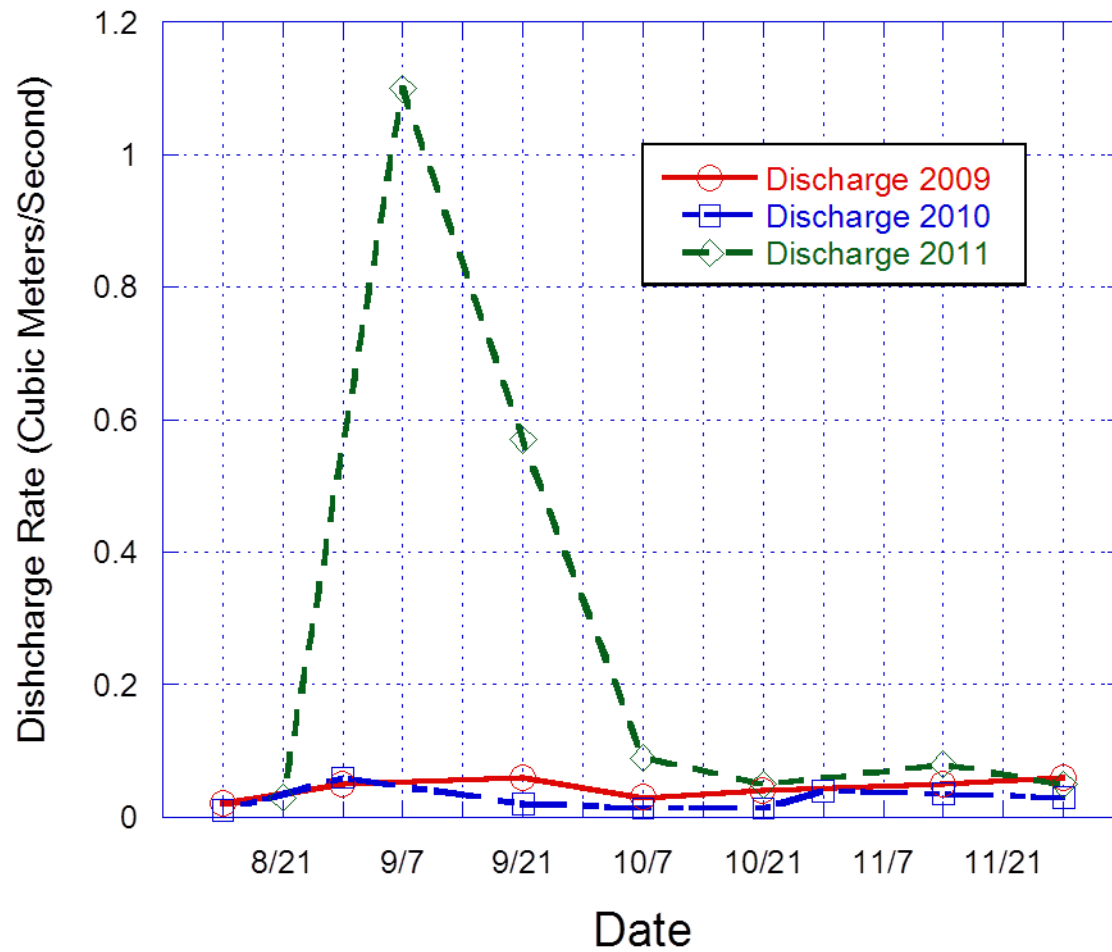




# Stream Discharge Rate at Agricultural Site

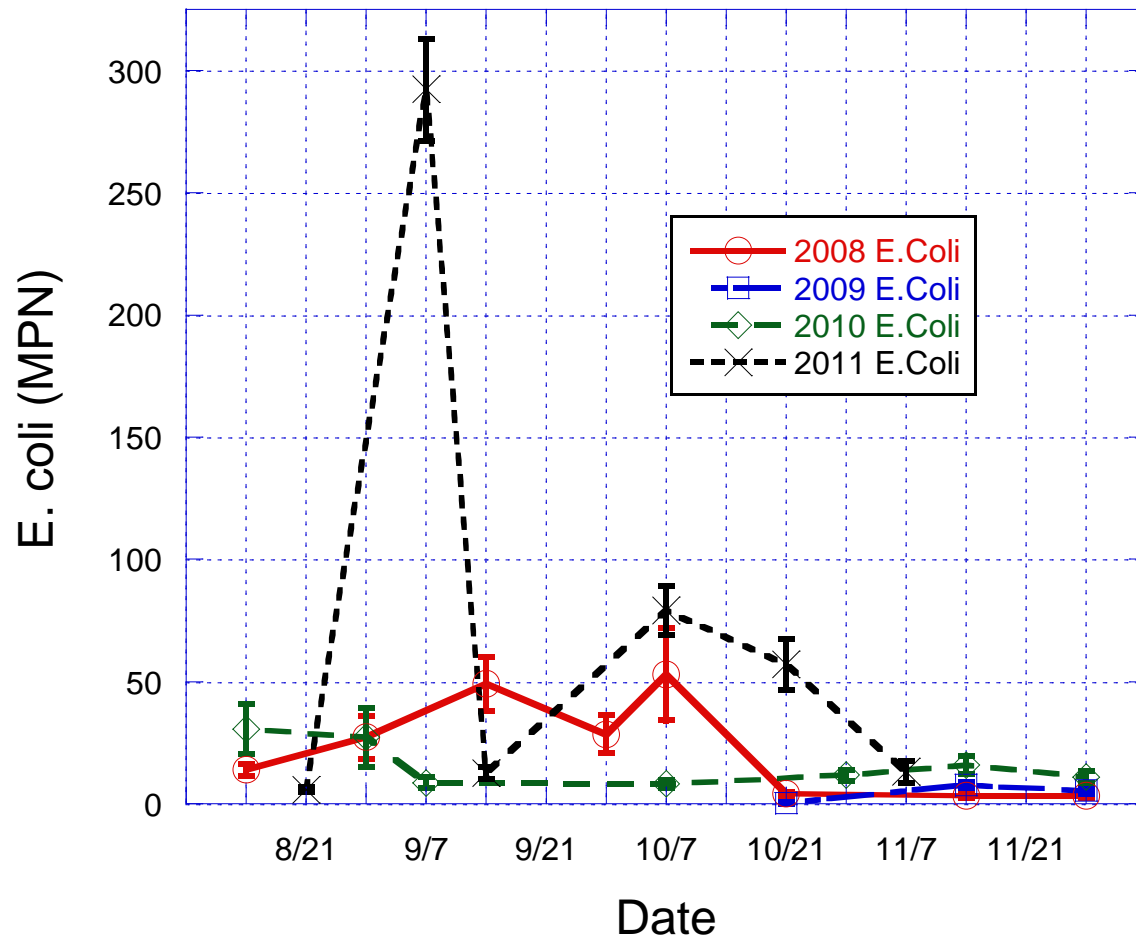


## Stream Discharge Rate at Forested Site

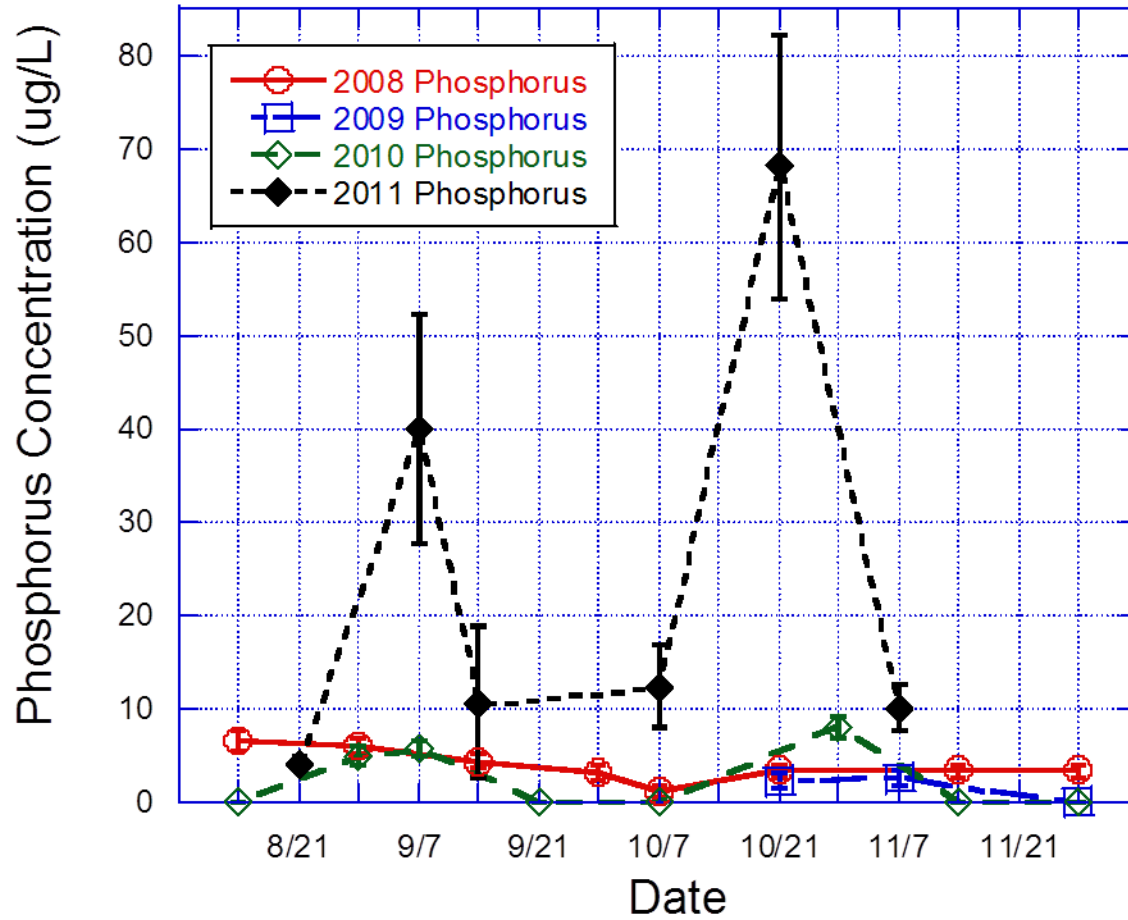




## Levels of E. coli at Agricultural Site

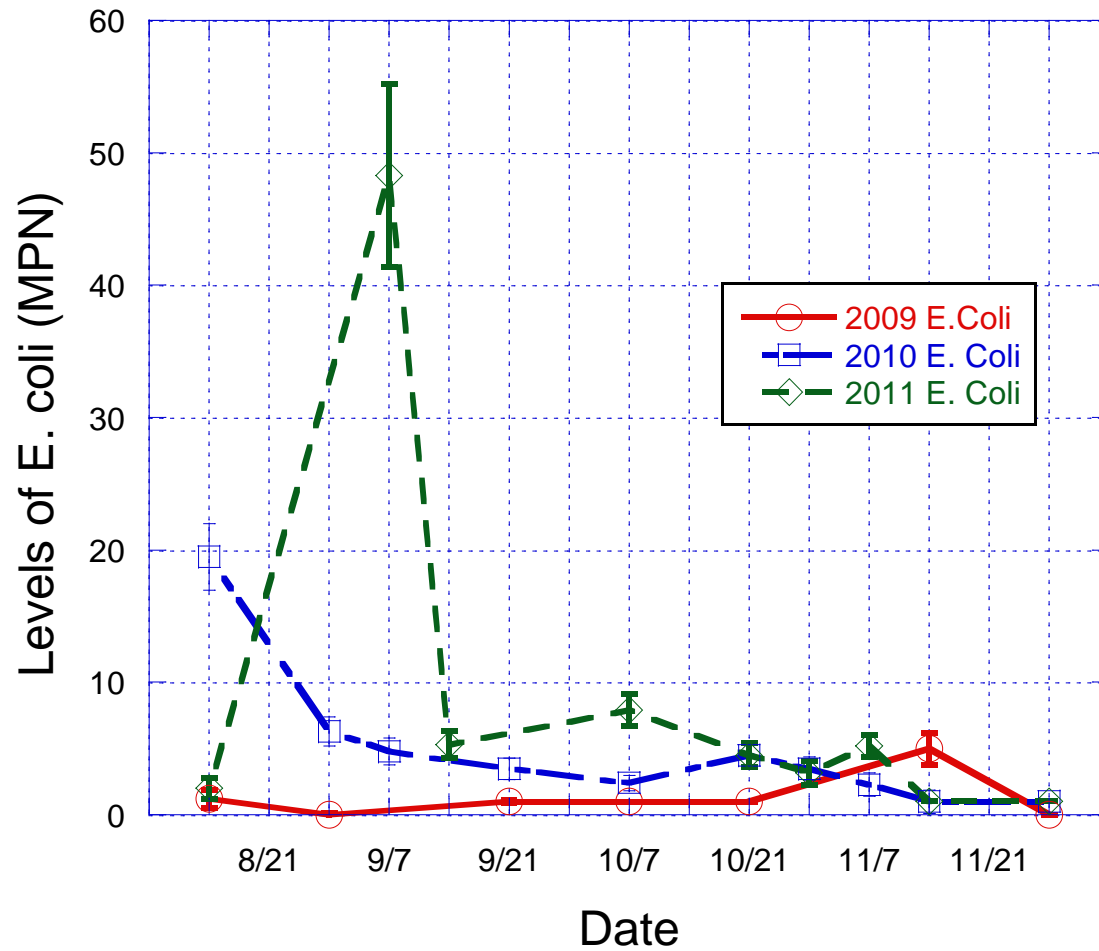


## Phosphorus Concentration at the Agricultural Site

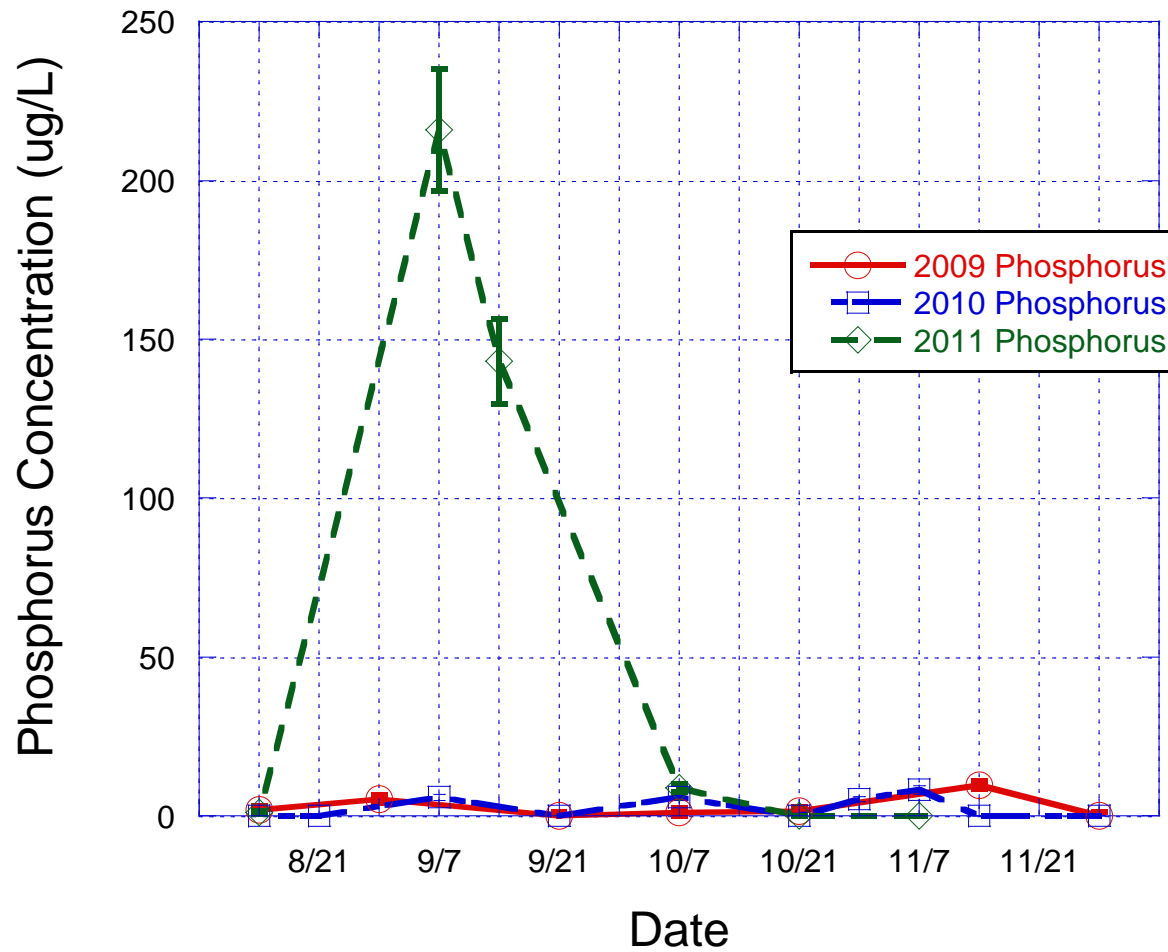




## Levels of E. coli at Forested Site



## Phosphorus Concentration at Forested Site





# Insect Identification



# Macro-invertebrate Data Collected From The Agricultural Site

Metric	2009	2010	2011
Mean Density of Animals per Sample	202.6( $\pm 16.1$ )	181.3 ( $\pm 12.0$ )	<b>54.8</b> ( $\pm 7.7$ )
Number of Taxa* per Sample	18.5( $\pm 1.3$ )	18.0( $\pm 0.8$ )	<b>13.0</b> ( $\pm 1.1$ )
EPT** Index	9.0( $\pm 0.8$ )	9.5( $\pm 0.5$ )	7.5( $\pm 1.1$ )
EPT/EPT + Chironomidae Index	0.82( $\pm 0.05$ )	0.85( $\pm 0.07$ )	0.95( $\pm 0.07$ )
% of EPT per Sample	75.2( $\pm 8.2$ )	69.7( $\pm 7.8$ )	68.5( $\pm 6.5$ )
Hilsenhoff Biotic Index***	3.01( $\pm 0.3$ )	3.30( $\pm 0.3$ )	3.25( $\pm 0.4$ )

\*Taxa are defined as larvae identified to the level of Family

\*\*EPT – Ephemeroptera, Plecoptera & Trichoptera

\*\*\*Hilsenhoff, W. L., 1987, An improved biotic index of organic stream pollution. *The Great Lakes Entomologist*, v. 20, p. 31-39



# Macro-invertebrate Data Collected From The Forested Site

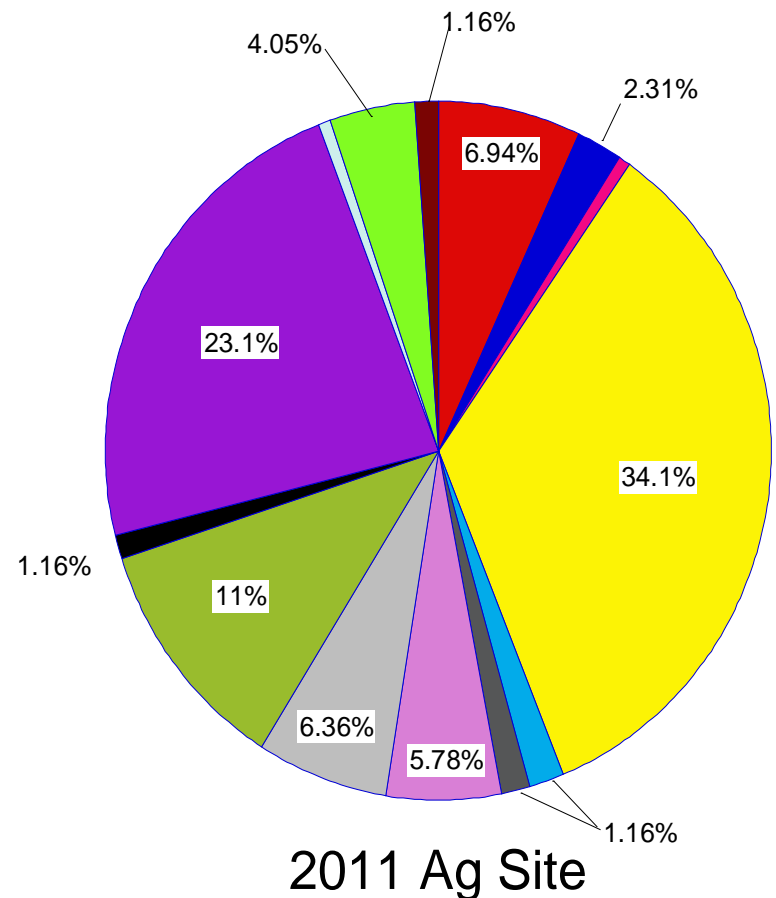
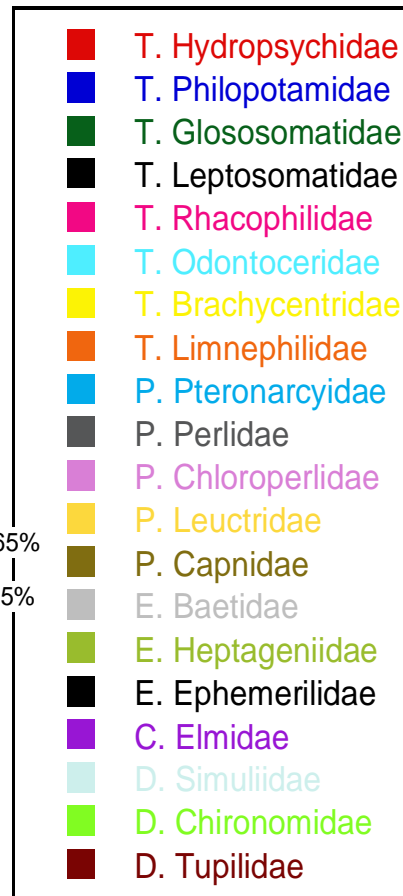
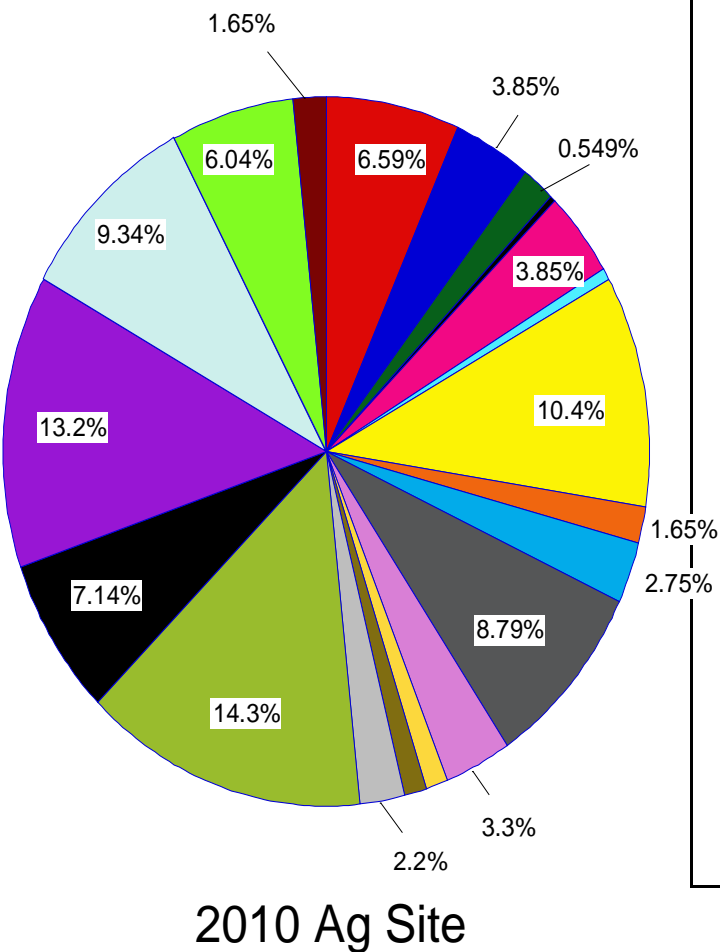
Metric	2009	2010	2011
Mean Density of Animals per Sample	72.2( $\pm$ 5.3)	63.8 ( $\pm$ 4.0)	<b>31.0</b> ( $\pm$ 7.1)
Number of Taxa* per Sample	14.0( $\pm$ 0.8)	15.0( $\pm$ 0.8)	<b>10.3</b> ( $\pm$ 1.2)
EPT** Index	8.2( $\pm$ 0.7)	7.0( $\pm$ 0.5)	7.3( $\pm$ 0.6)
EPT/EPT + Chironomidae Index	0.93( $\pm$ 0.01)	0.87( $\pm$ 0.07)	0.89( $\pm$ 0.05)
% of EPT per Sample	76.5( $\pm$ 8.2)	66.7( $\pm$ 7.8)	78.4( $\pm$ 6.2)
Hilsenhoff Biotic Index***	2.97( $\pm$ 0.3)	3.47( $\pm$ 0.4)	2.90( $\pm$ 0.3)

\*Taxa are defined as larvae identified to the level of Family

\*\*EPT – Ephemeroptera, Plecoptera & Trichoptera

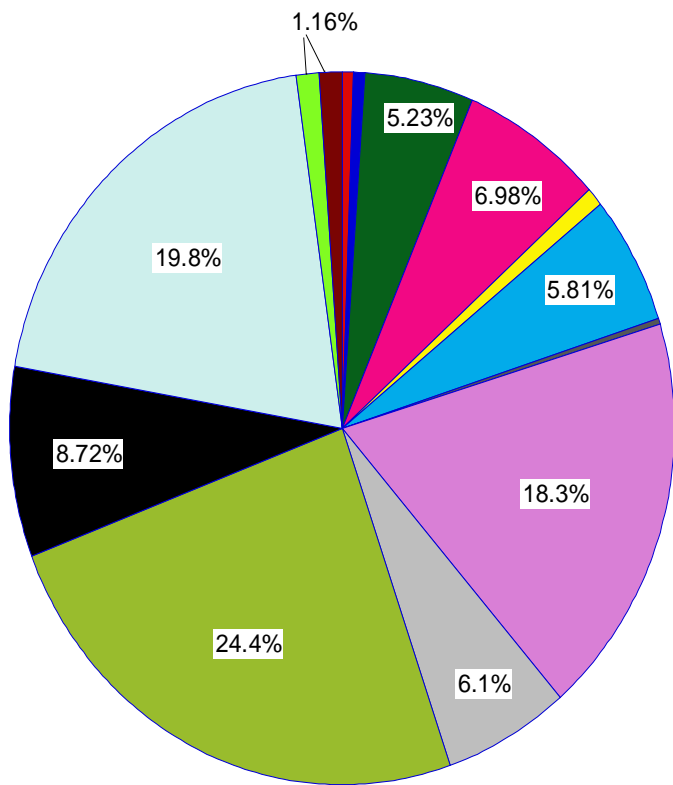
\*\*\*Hilsenhoff, W. L., 1987, An improved biotic index of organic stream pollution. *The Great Lakes Entomologist*, v. 20, p. 31-39

# Comparison of Ag site Macroinvertebrates 2010/2011

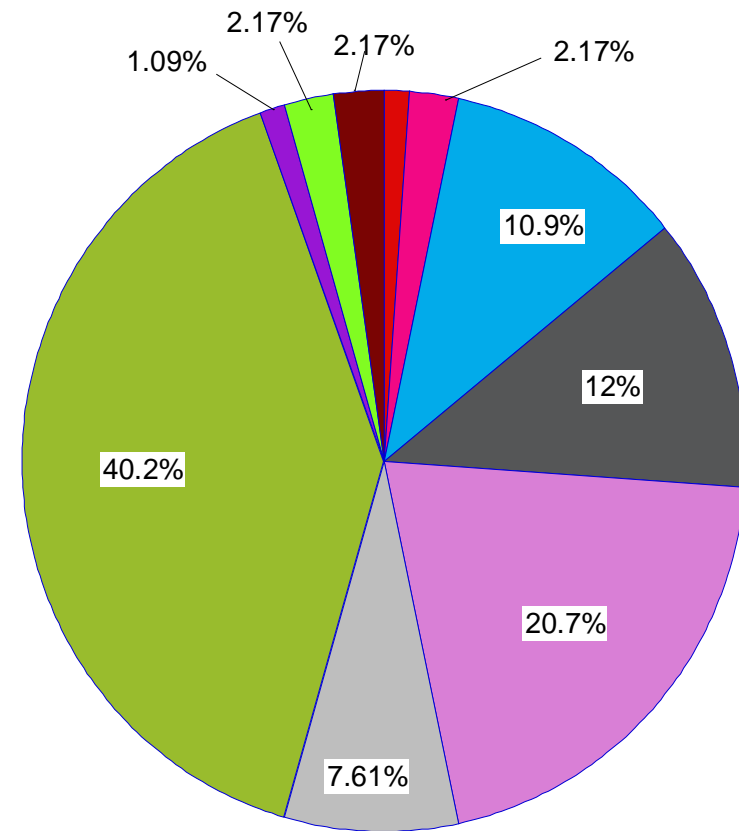




# Comparison of Forested Site Macroinvertebrates 2010/2011



2010 Forested Site



2011 Forested Site

# Conclusions

- The major storm event (tropical storm Irene) was associated with significant increases in the concentration of E. coli, Phosphorus, and Total Suspended Solids in water samples from both forested and agricultural sites.
- There was a significant decrease in the density of macroinvertebrates and the number of taxa from both sites in 2011. However, the impact was greater in the Agricultural site.
- These results support the idea that major storm events such as tropical storm Irene are capable of causing major changes in stream chemistry and macroinvertebrate communities.
- Future studies will be directed toward investigating the recovery of macroinvertebrate communities following major storm events such as tropical storm Irene.



# Many Thanks To The People at EPSCoR, UVM, and St. Michael's College!

- We appreciate the opportunity to participate in this collaborative research initiative and look forward to further partnerships.

