

Unassessed Trout Streams in Pennsylvania



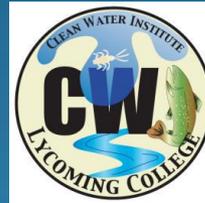
Dr Mel Zimmerman , Lycoming College Biology
Department and Clean Water Institute



Lycoming College Clean Water Insti



Through internships and independent studies, students can assist in data collection and analysis of the watershed projects.



Education programs and workshops are offered to watershed groups, schools, and other public forums on stream restoration and habitat and water quality improvement.



The Clean Water Institute (CWI) provides service, analysis, and education for the natural resource heritage of North Central Pennsylvania, the West Branch of the Susquehanna River, and its major tributaries.



Muncy Creek

CWI



Pine Creek



Buffalo Creek

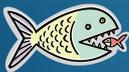


Lycoming Creek

- Projects Include:**
- Big Bear Creek Stream Restoration
 - Black Hole Creek Survey
 - Lycoming Creek Erosion Survey
 - Muncy Creek Monitoring
 - Pine Creek River Conservation Plan



Loysalsock Creek



Director: Mel Zimmerman and Research Associate: Peter Petokas



<http://www.lycoming.edu/biology/cwi/>

CWI INTERNS –2010-2011 :

Funding from PFBC, Susquehanna Chapter Trout Unlimited, Pine Creek Preservation, Pine Creek Headwaters Protection, Deginstein Foundation and:

- Zach Bassett
- Zeb Buck
- Gwen Forestal
- Mike Henao
- Nick Lansberry
- Josh Moore
- Max Olsen
- Lori Smith
- Ouentin Reinford
- Alyssa Tomaskovic
- Laura Walter
- Steve Wanner
- Brittany Buckley



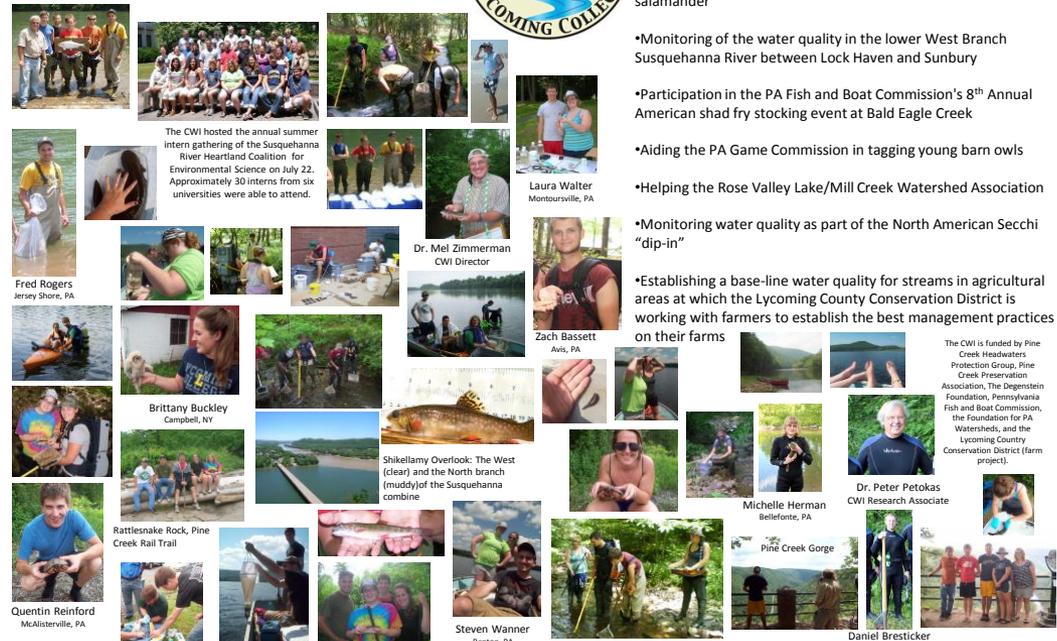
Foundation for Pennsylvania Watersheds

Lycoming College
Summer 2011
Clean Water Institute



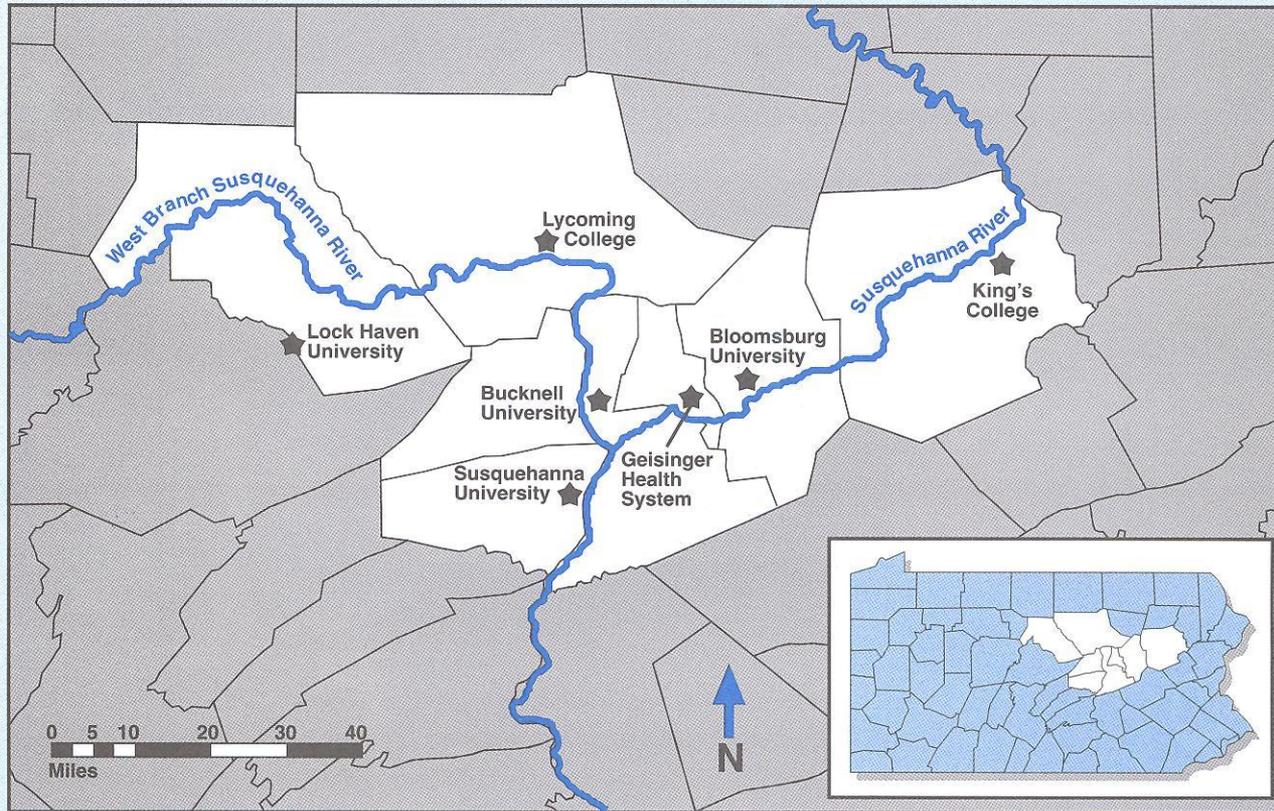
CWI 2011 Projects

- Unassessed water analysis for fish population of head water streams in the Pine Creek, Loyalsock Creek, Lycoming Creek and Muncy Creek water sheds
- Monitoring populations of the North American Hellbender salamander
- Monitoring of the water quality in the lower West Branch Susquehanna River between Lock Haven and Sunbury
- Participation in the PA Fish and Boat Commission's 8th Annual American shad fry stocking event at Bald Eagle Creek
- Aiding the PA Game Commission in tagging young barn owls
- Helping the Rose Valley Lake/Mill Creek Watershed Association
- Monitoring water quality as part of the North American Secchi "dip-in"
- Establishing a base-line water quality for streams in agricultural areas at which the Lycoming County Conservation District is working with farmers to establish the best management practices on their farms



The CWI is funded by Pine Creek Headwaters Protection Group, Pine Creek Preservation Association, The Degenstein Foundation, Pennsylvania Fish and Boat Commission, the Foundation for PA Watersheds, and the Lycoming County Conservation District (farm project).

The interns will present a poster session on their summer research at a River Symposium in October at Bucknell University.



For more information about SRHCES, please visit www.SRHCES.org.

Map provided courtesy of Jeff Brunskill, Department of Geography & Geosciences, Bloomsburg University

Defining the Issue

- Roughly 45,000 waters in Pennsylvania have not been surveyed
- Many are small first and second order stream and have the potential to support wild trout populations
- Using GIS and existing data, sub-watersheds have been prioritized based on where wild trout are likely to occur and are at most risk from human degradation.
- Human Development and Marcellus Shale drilling activities are primary threats.
- Proper Classification through biological survey is key to protect these resources.
- Presence of Wild Trout elevates the WQ protection classification.

PAFBC stream classification based on trout biomass :

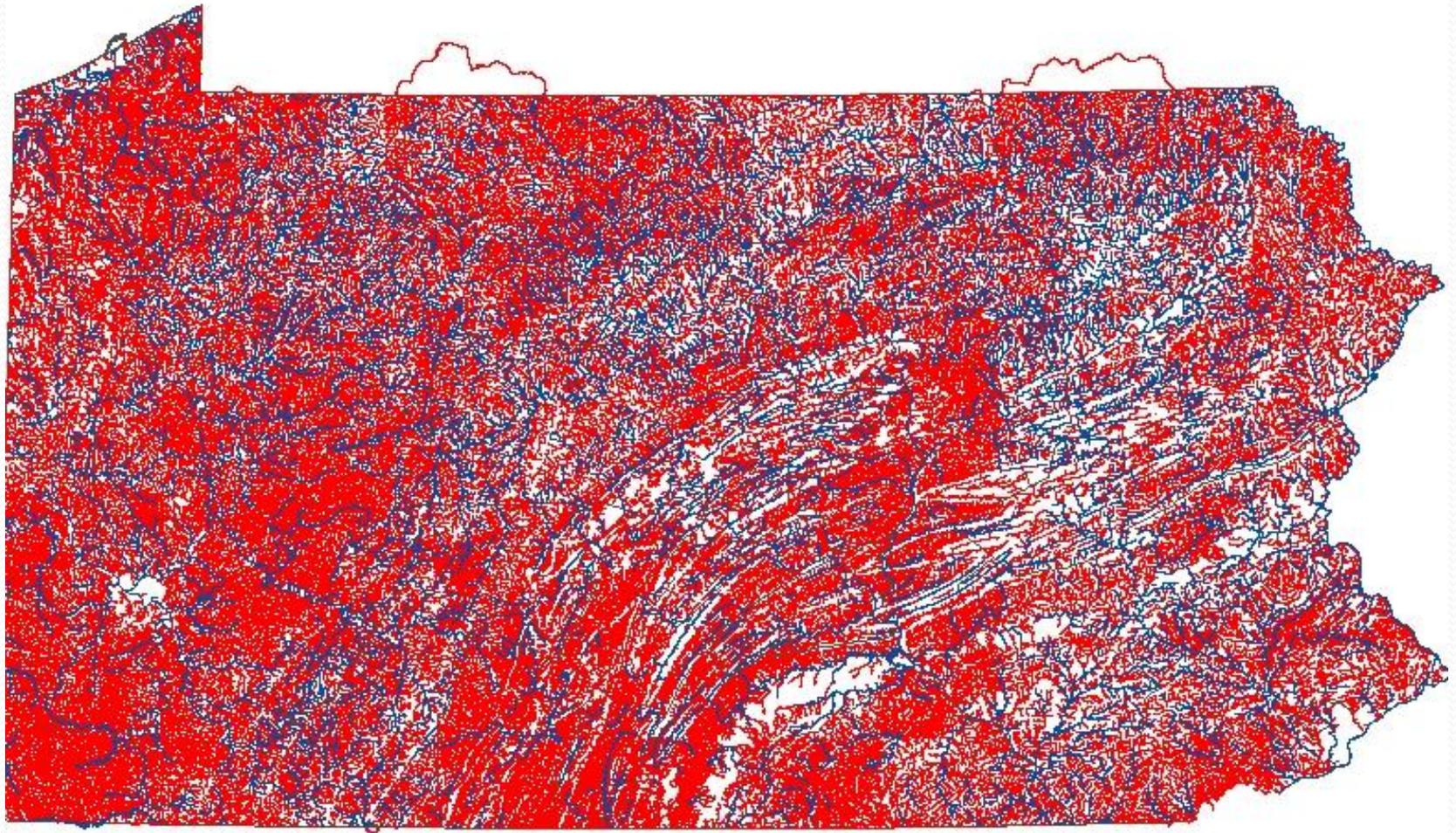
Class A, B, C, D, and E.

- **A (Brook Trout)**
 - Total wild brook trout biomass of at least 30 kg/ha (26.7 lbs/acre)
 - Total biomass of wild brook trout less than 15 centimeters (cm) or 5.9 inches in total length of at least 0.1 kg/ha (0.089 lbs/acre)
 - Wild brook trout biomass must comprise at least 75% of the total wild trout biomass
- **A (Brown Trout)**
 - Total wild brown trout biomass of at least 40 kg/ha (35.6 lbs. acre)
 - Total biomass of wild brown trout less than 15 centimeters (cm) or 5.9 inches in total length of at least 0.1 kg/ha (0.089 lbs/acre).
 - Wild brown trout biomass must comprise at least 75% of the total wild trout biomass
- **A (Mixed Brown and Brook)**
 - Combined wild brook and wild brown trout biomass of at least 40 kg/ha (35.6 lbs. acre)
 - Total biomass of wild brook trout less than 15 centimeters (cm) or 5.9 inches in total length of at least 0.1 kg/ha (0.089 lbs/acre).
 - Total biomass of wild brown trout less than 15 centimeters (cm) or 5.9 inches in total length of at least 0.1 kg/ha (0.089 lbs/acre).
 - Wild brook trout biomass comprises less than 75% of total trout biomass
 - Wild brown trout biomass comprises less than 75% of total trout biomass
- **A (Rainbow Trout)**
 - Total biomass of wild rainbow trout less than 15 cm (5.9 inches) in total length of at least 2.0 kg/ha (1.78 lbs/acre).
- **B**
 - a. Total wild brook trout biomass of at least 20 kg/ha (17.8 lbs/acre) and less than 30 kg/ha (26.7 lbs/ acre).
 - b. Total wild brown trout or wild brown and wild brook trout combined biomass of at least 20 kg/ha (17.8 lbs/ acre) and less than 40 kg/ha (35.6 lbs/acre).
- **C**
 - Total wild trout biomass of at least 10 kg/ha (8.9 lbs/ acre) and less than 20 kg/ha (17.8 lbs/acre).
- **D**
- **Total** wild trout biomass greater than 0 kg/ha and less than 10 kg/ha (8.9 lbs/ acre).
- **E**
- **Total** wild trout biomass of 0 kg/ha.

Protecting Exceptional Value Streams (PA DEP)

- Exceptional Value (EV) streams are the state's best and most pristine streams, and represent about 3% of the state's stream miles. High Quality (HQ) streams are another 15% of our streams, and are the next best streams in our
- Designation based on water quality, macroinvertebrates and fish

Pennsylvania's Flowing Water Resources

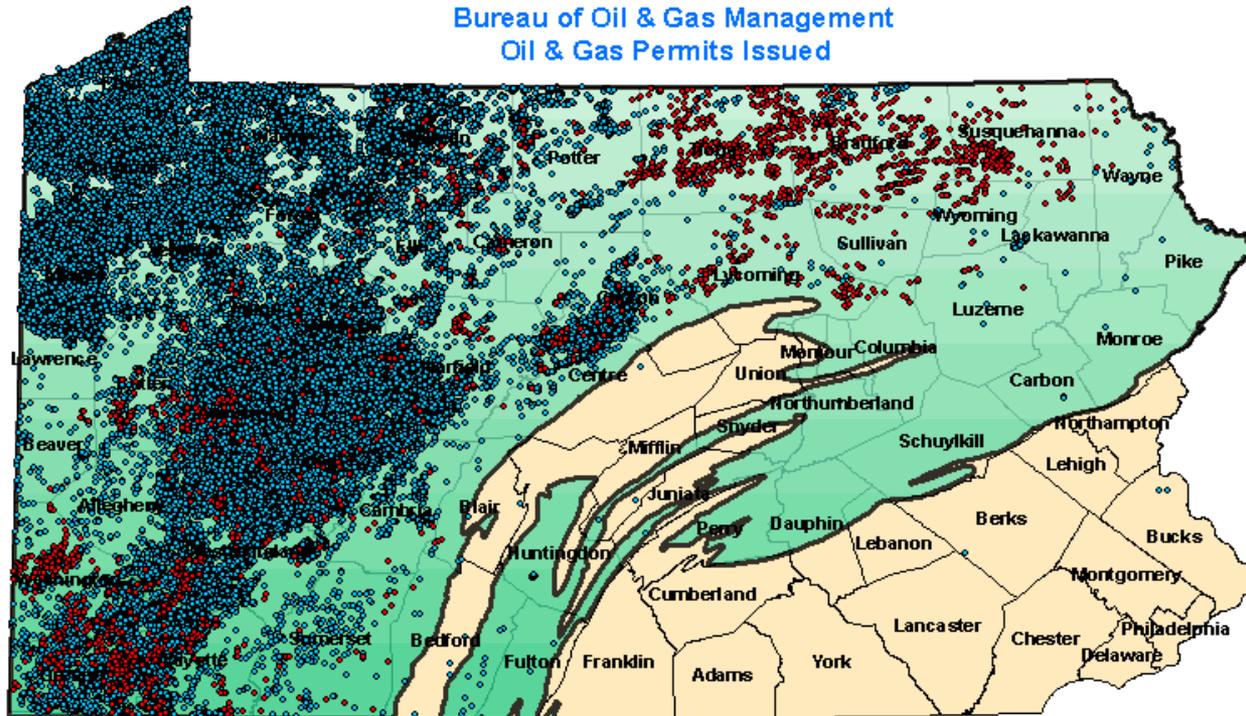


 Surveyed Sections

 Unassessed Sections

Gas Permits

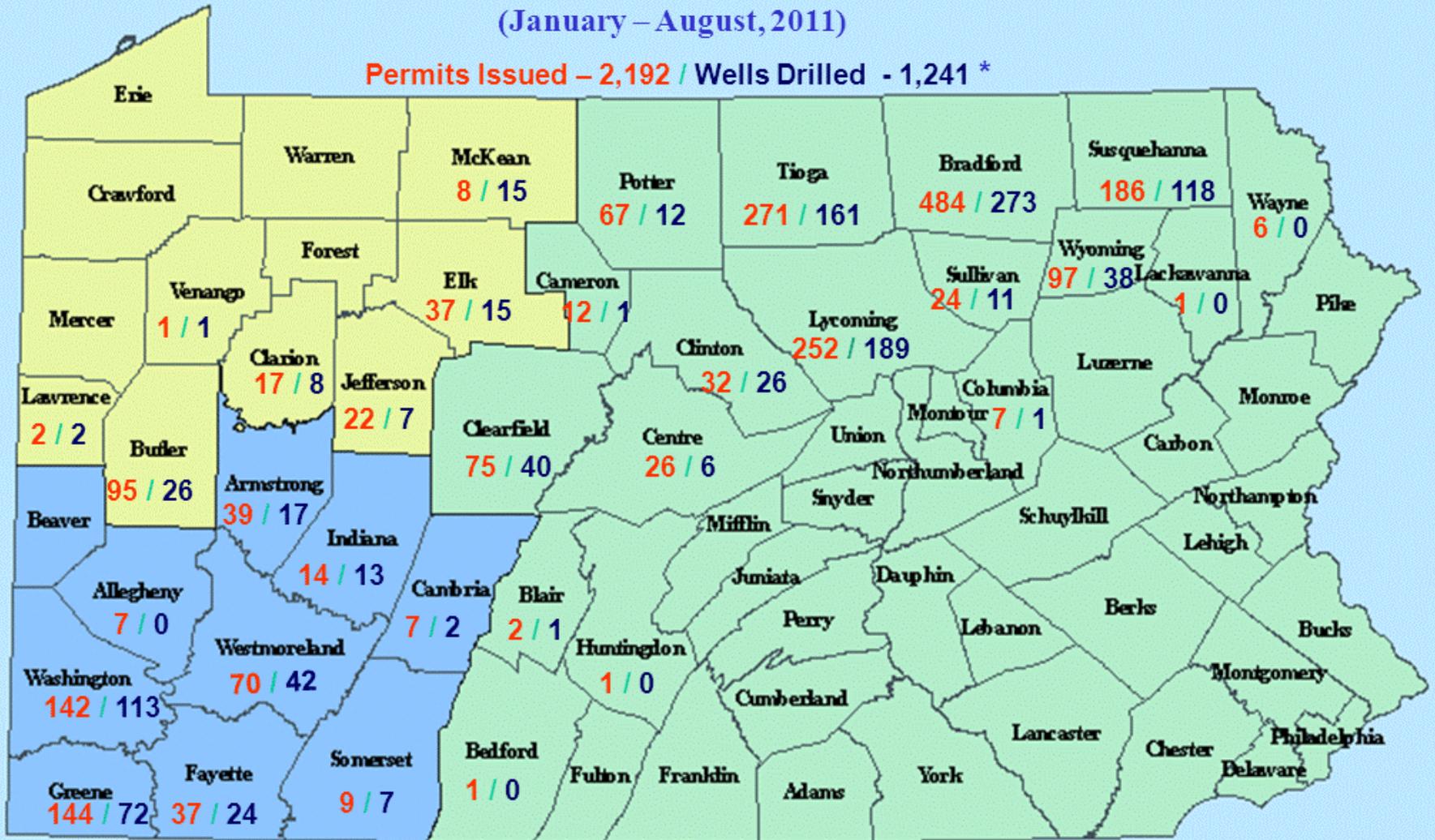
Pennsylvania Department of Environmental Protection
Bureau of Oil & Gas Management
Oil & Gas Permits Issued



 = Marcellus Shale Formation  = Non-Marcellus Shale Well  = Marcellus Shale Well

Department of Environmental Protection
 Bureau of Oil and Gas Management
 Marcellus Shale Permits Issued & Wells Drilled
 (January – August, 2011)

Permits Issued – 2,192 / Wells Drilled - 1,241 *



Fishery Sampling - continued

- All trout should be collected, held and measure to the nearest 25mm length group or to the nearest mm. No weights need to be taken.
- Other fish species should be properly identified and roughly counted for a relative abundance rating.
- Population Estimates can be completed at discretion of the survey leader. See protocols
- Biosecurity protocols (Appendix D) will be followed.



Fishery Sampling

- Electrofishing is an inherent dangerous operation and everyone involved should be constantly aware of safety issues.
- Electrofishing Safety Guidelines (Appendix B) should be reviewed by everyone participating and strictly followed.
- Battery backpacks using pulsed or straight DC are preferred
- Electrofishing proceeds in an upstream manner and attempts to cover all available habitat.
- Fish can be held until sampling is complete or processed as sampling occurs.

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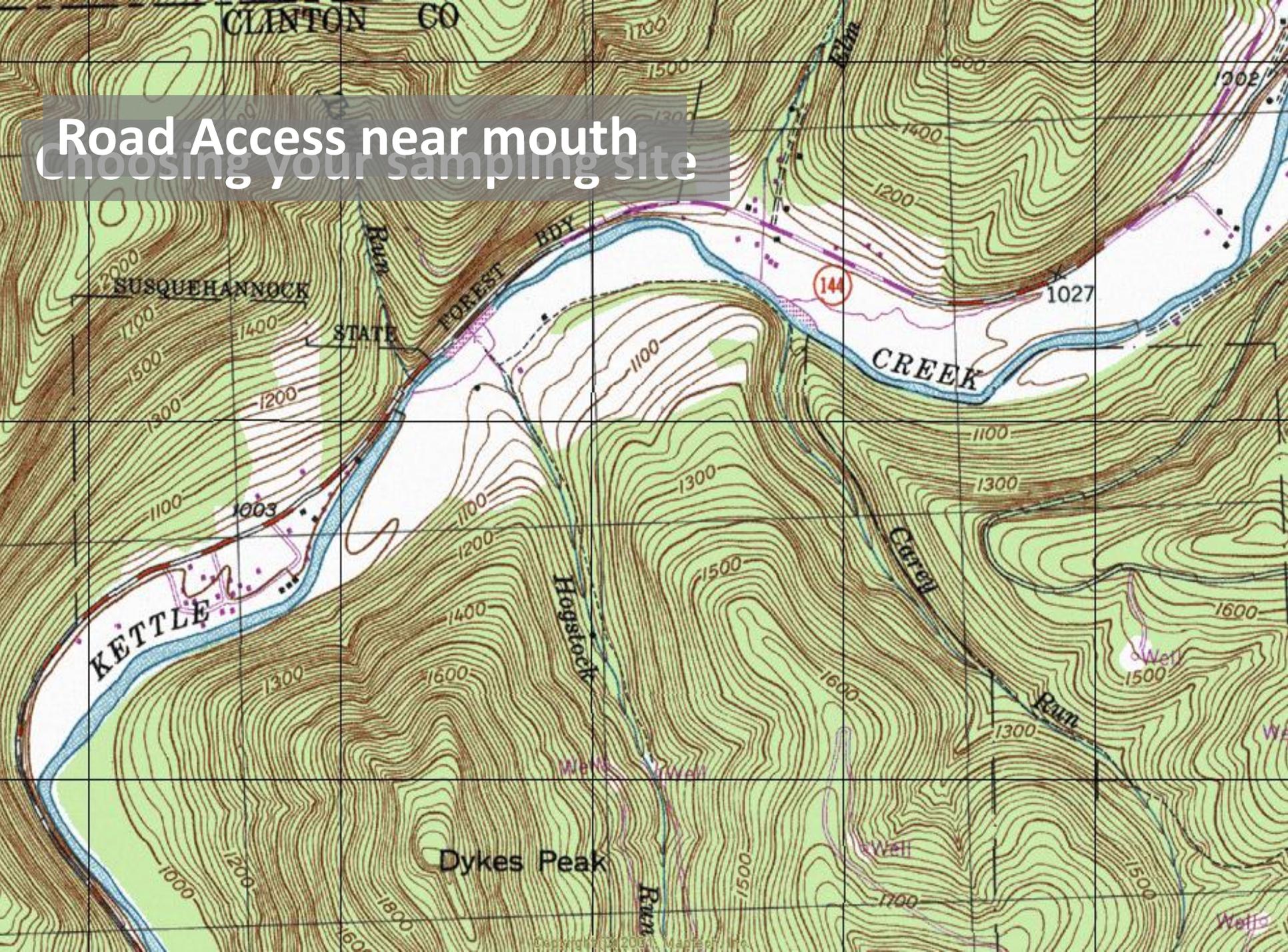
DATA COLLECTION

Unassessed Waters Surveys - 2010									
Survey Leader:		Sci Collector Permit #		Sample Date					
Water Name:		Mouth Latitude:							
Tributary to:		Mouth Longitude:							
Site Latitude:		Site Longitude:							
Site Length: (meters)		Widths: (meters)				Avg			
Site Location:									
Gear Used:		Pulsed DC: _____ volts		Sampling Effort (min): _____					
		Straight DC: _____ volts							
		Other (specify): _____							
Species:		Number Caught:		Species:		Number Caught:		Species Occurrence:	
Size Group	Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3			
25 - 49 mm									
50 - 74 mm									
75 - 99 mm									
100 - 124 mm									
125 - 149 mm									
150 - 174 mm									
175 - 199 mm									
200 - 224 mm									
225 - 249 mm									
250 - 274 mm									
275 - 299 mm									
300 - 324 mm									
Time of Day: _____		Water Temp: _____ °C		pH: _____					
								Electrometric Colorimetric	

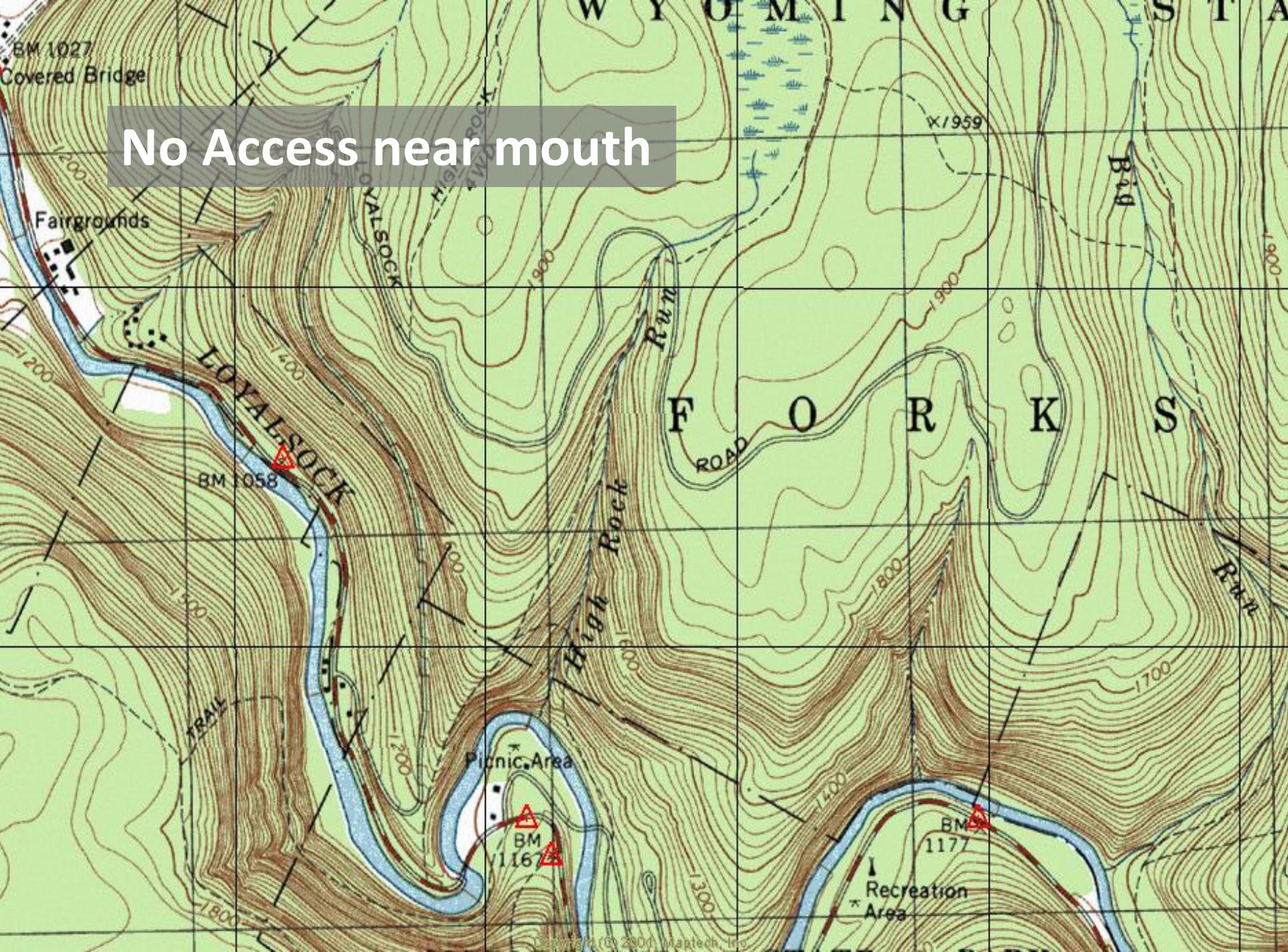
- Additional data collected- DO, Temp., Conductivity, Hardness, Alkalinity, pH, and TDS
- Other fish species (relative abundance)
- Macroinvertebrate kick samples in all trout waters

CLINTON CO

Road Access near mouth Choosing your sampling site



No Access near mouth



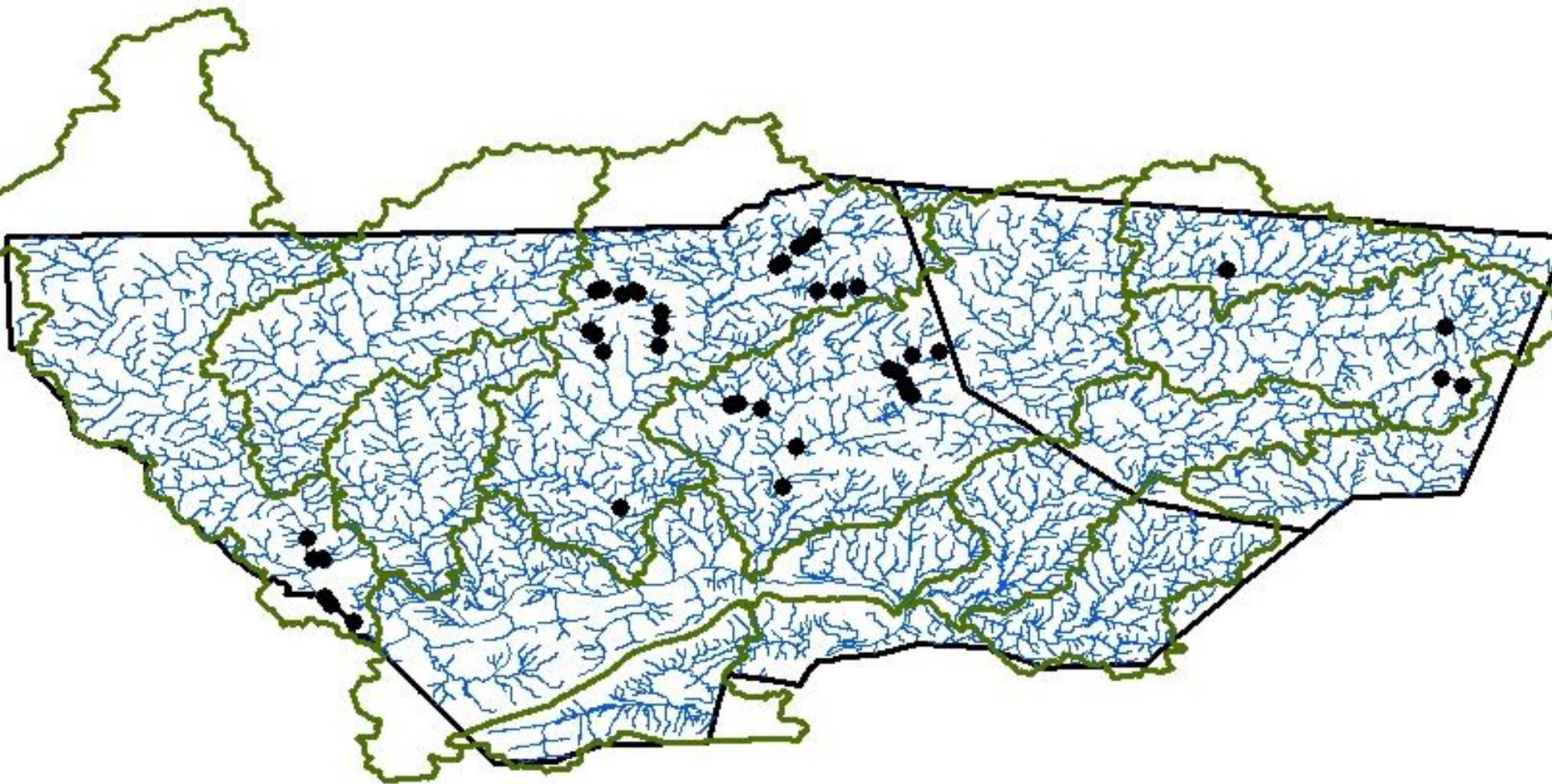
2010 Unassessed Waters (over 300 total by all partners)

- Lycoming College
- Presented with a list of unassessed streams in Pine Creek, Lycoming Creek, Loyalsock Creek and Muncy Creek watersheds
- Total over 150
- Completed 44
- Kings College
- Presented with a list of unassessed streams in Tuscarora Creek, Wallenpaupack Creek, Towanda Creek and Seeley Creek watersheds
- Total over 100
- Completed 36

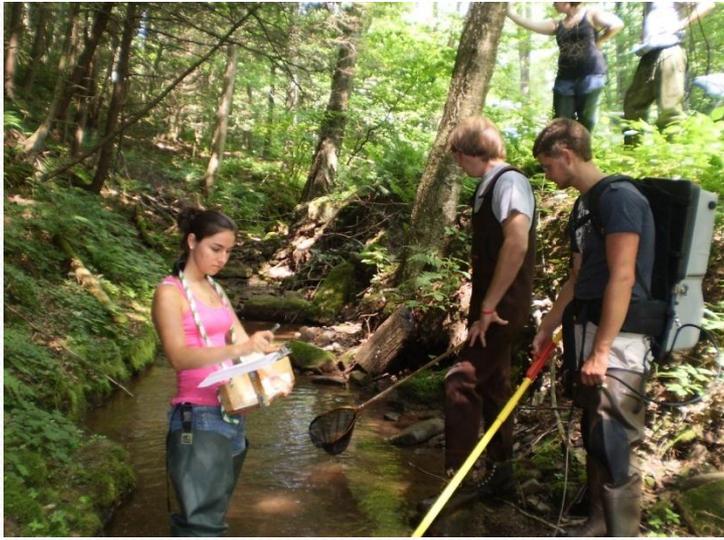
Example of Biomass to stream class designation (of the 43 streams sampled -and had fish, A=3; B=5, C=5; D= 10 and E=11)

- **A (Brook Trout)**
- Total wild brook trout biomass of at least 30 kg/ha (26.7 lbs/acre)
- Total biomass of wild brook trout less than 15 centimeters (cm) or 5.9 inches in total length of at least 0.1 kg/ha (0.089 lbs/acre)
- Wild brook trout biomass must comprise at least 75% of the total wild trout biomass
- **C**
- Total wild trout biomass of at least 10 kg/ha (8.9 lbs/ acre) and less than 20 kg/ha (17.8 lbs/acre).

<u>Watername</u>	<u>Trib To</u>	<u>Brook Trout Biomass (Kg/Ha)</u>	<u>Brown Trout Biomass (Kg/Ha)</u>	<u>Biomass Class</u>
Bonnell Run	Pine Creek	10.5	2.9	C
Tombs Run	Pine Creek	32.5	1.15	A
North Tombs Run	Tombs Run	14.21	1.97	C





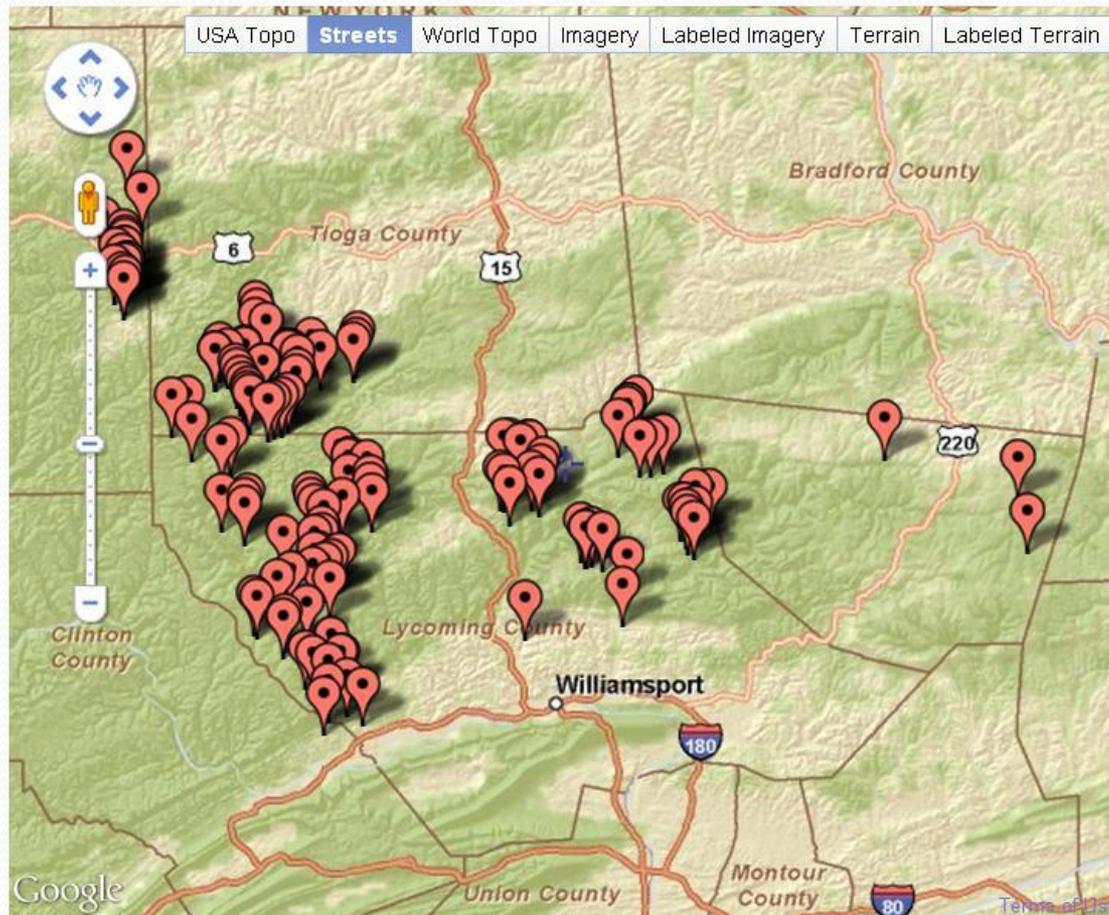




2011 focused on the Pine Creek Watershed (list of over 300 streams unassessed

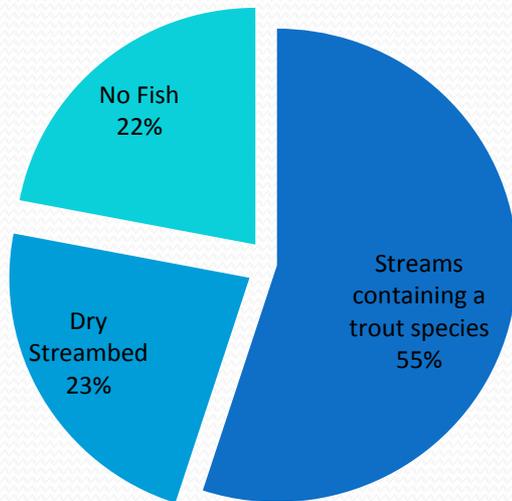


TOTAL OF 139 STREAMS ASSESSED BY Lycoming in 2010-2011 (Pine, Lycoming, Loyalsock Creek Watersheds)

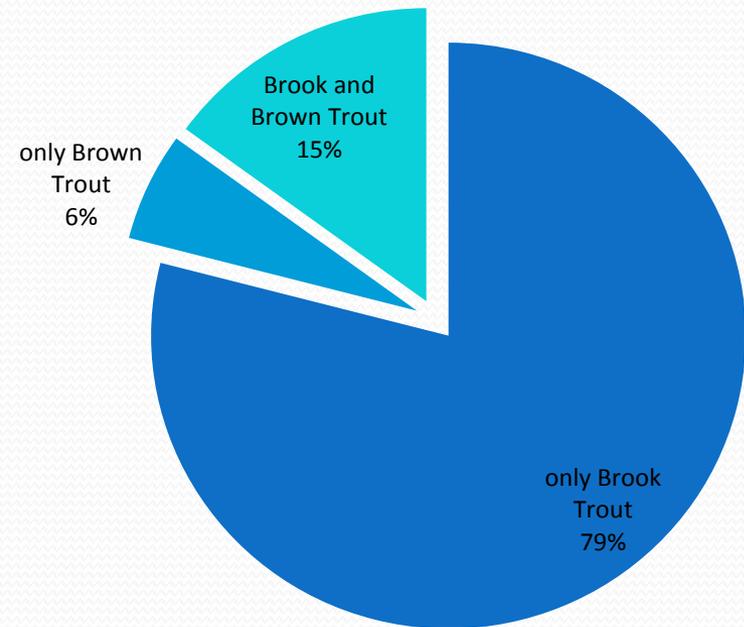


Pine Creek Unassessed Waters (102 streams assessed)

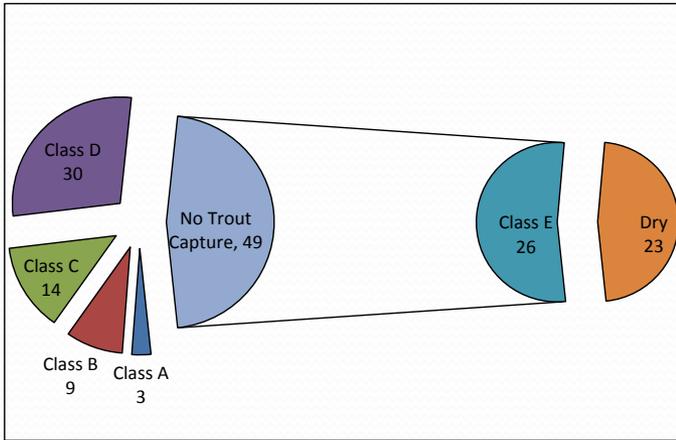
**Unassessed Pine Creek
Watershed Completed by
Lycoming College CWI as of
August 16, 2011**



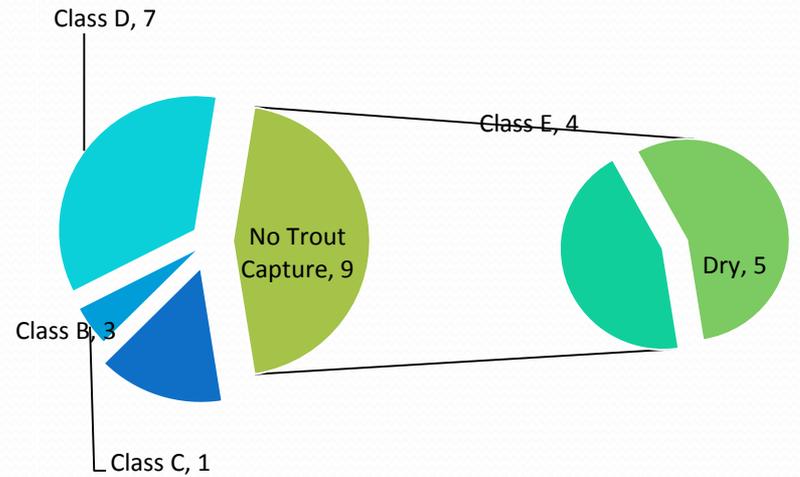
**Of the streams containing a
Trout species:**



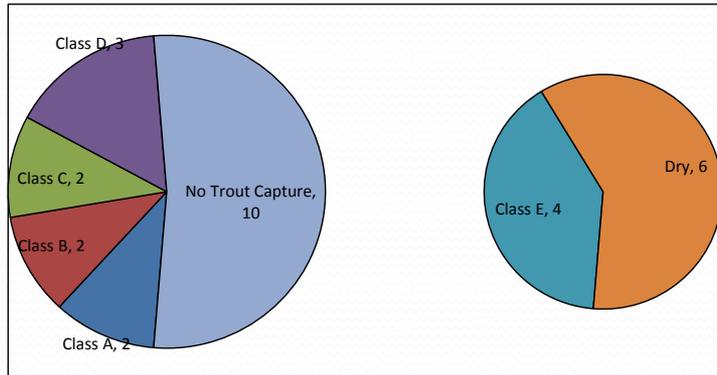
Summary Pine Creek Trout Streams by Biomass Class (Total 2010-2011)



Summary Loyalsock Creek Trout by Biomass Class (2010 samples)



Summary Lycoming Creek Trout by Biomass (2010 samples)





Lycoming College CWI Contribution to PFBC Unassessed Waters Project: 2010-2011



Introduction

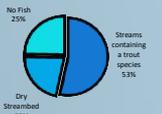
Over the past decades, there has been an interest in protecting Pennsylvania's trout populations from environmental impacts, including human impacts. However, increase urgency for protection has recently come about due to the rise of Marcellus Shale drilling activities throughout the state. Pennsylvania contains 86,000 miles of flowing water. To date, the PFBC has surveyed 21,654 miles of which 12,677 miles have been designated as wild trout waters.

Background

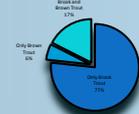
As part of the PFBC's continued interest in securing and protecting wild trout populations of Pennsylvania, Lycoming College and Kings College assisted the PFBC in the summer/fall 2010 in completing fish population surveys on unassessed waters of PA. After the 2010 pilot project 10 additional Colleges or Non-profits were trained and assigned a list of unassessed waters in 2011. Through population estimates the biomass class can be assigned to a stream, according to PFBC's criteria. Classes range from Class A, Biomass of at least 30 kg/ha, Class B at least 20 kg/ha, etc. The Department of Environmental Protection uses this classification information to independently confirm whether a stream is wild trout water. The major threat to unassessed wild trout waters is inadequate water quality protection due to the unknown condition of the trout population. This deficient knowledge may result in permitting actions that are not properly conditioned to protect the stream and its trout population.



Unassessed Pine Creek Watershed Completed by Lycoming College CWI as of August 2011



Percent Trout Unassessed Waters Pine Creek

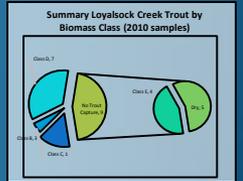
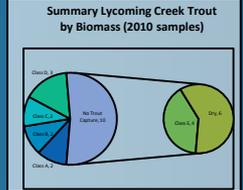
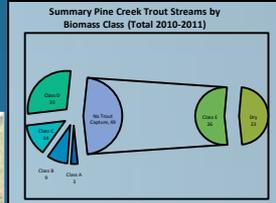
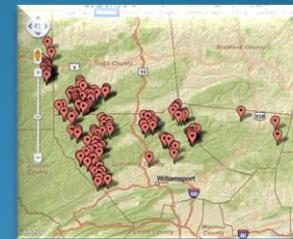


In order to provide more base line data and additional protection for a stream Physical, chemical, and fisheries data were collected at each site. Electrofishing steps included the use of battery powered backpacks using DC (direct current). Prior to sampling, a 100m reach of stream was selected. A minimum of five wetted width measurements were recorded at each site. Other measurements included pH, water temperature, total hardness (mg/L), specific conductance (µS/cm), and total alkalinity (mg/L).

Results

Lycoming College's participation in the project focused on streams in the Pine Creek, Loyalsock Creek and Lycoming Creek basins.

Unassessed Waters Completed by Lycoming College CWI: 2010-2011 (Total= 139 Watersheds: Pine Creek=102 Lycoming Creek= 19 Loyalsock Creek= 18)



Award to CWI in recognition of Pine Creek Project

Conclusion

The unassessed waters initiative will continue for the next several years with Lycoming College focusing on Pine Creek and Lycoming Creek, and Susquehanna University focusing on Loyalsock and Muncy water sheds in North Central Pennsylvania.

Acknowledgements: Pennsylvania Fish and Boat Commission, Foundation of Pennsylvania Watersheds, Dr. Mel Zimmerman, Dr. Peter Petokas, Interns- Zack Bassett, Zeb Buck, Mike Henao, Josh Moore, Max Olsen, Quentin Reinford, Lori Smith, Alyssa Tomaskovic, Laura Walter, Steven Wanner, Brittany Buckley, Fred Rogers.

Additional Funding: Susquehanna Chapter Trout Unlimited, Pine Creek Headwaters Protection Group, Pine Creek Preservation Group

Photo: Pine creek Gorge from Colton Point lookout (rail trail on left of creek)

PA WILDS



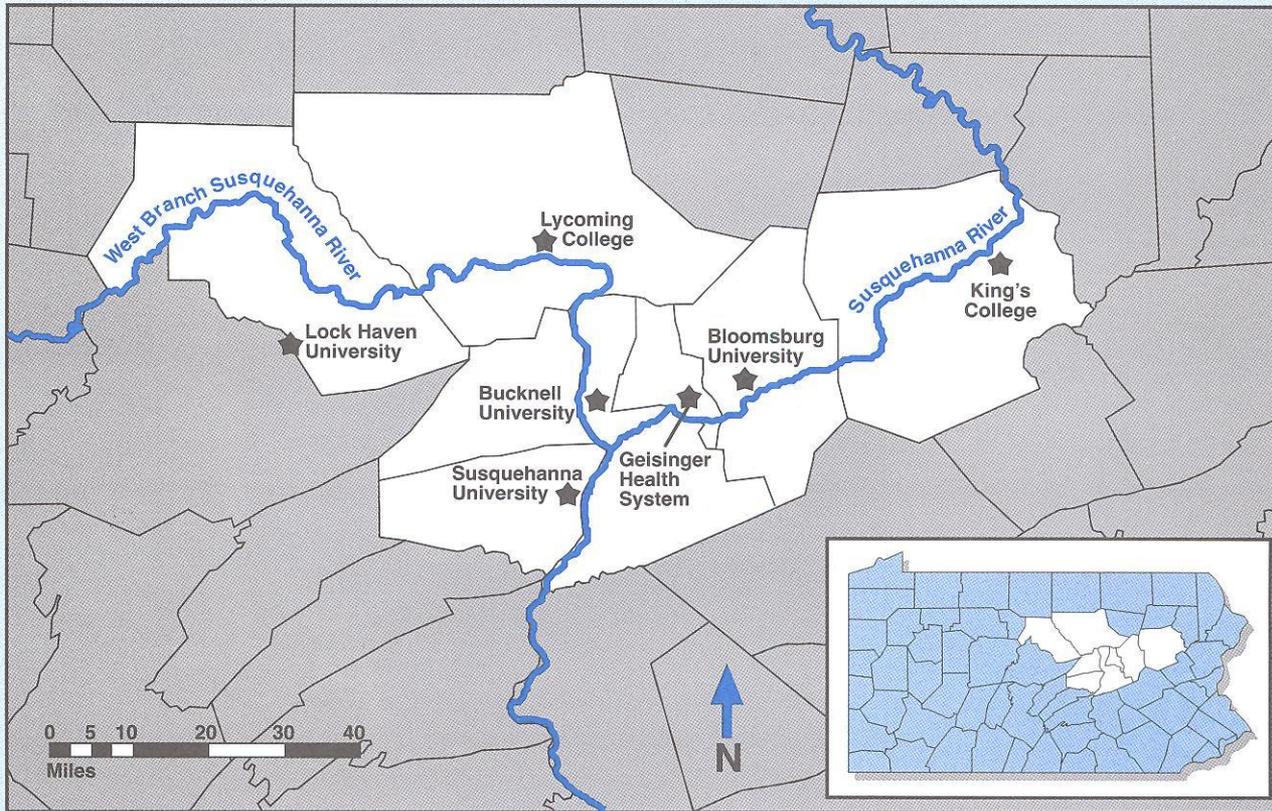
What next ?

- All partners completed over 300 in 2010 and on target to complete over 900 in 2011.
- List of over 200 more streams to assess in Pine Creek Watershed
- More to finish on Loyalsock , Lycoming and Muncy Creek watersheds
- Additional help from SRHCES members -Kings College and addition of Susquehanna University- will focus on Muncy and Loyalsock sites) -- other groups certified by PAFBC
- Continue to compile water chemistry and macroinvertebrate data on class A,B,C streams



QUESTIONS?

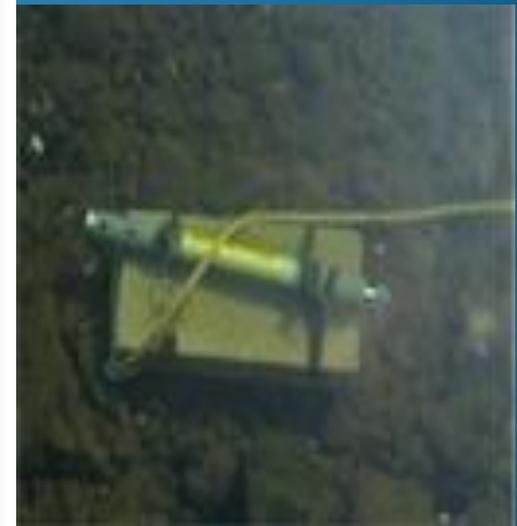
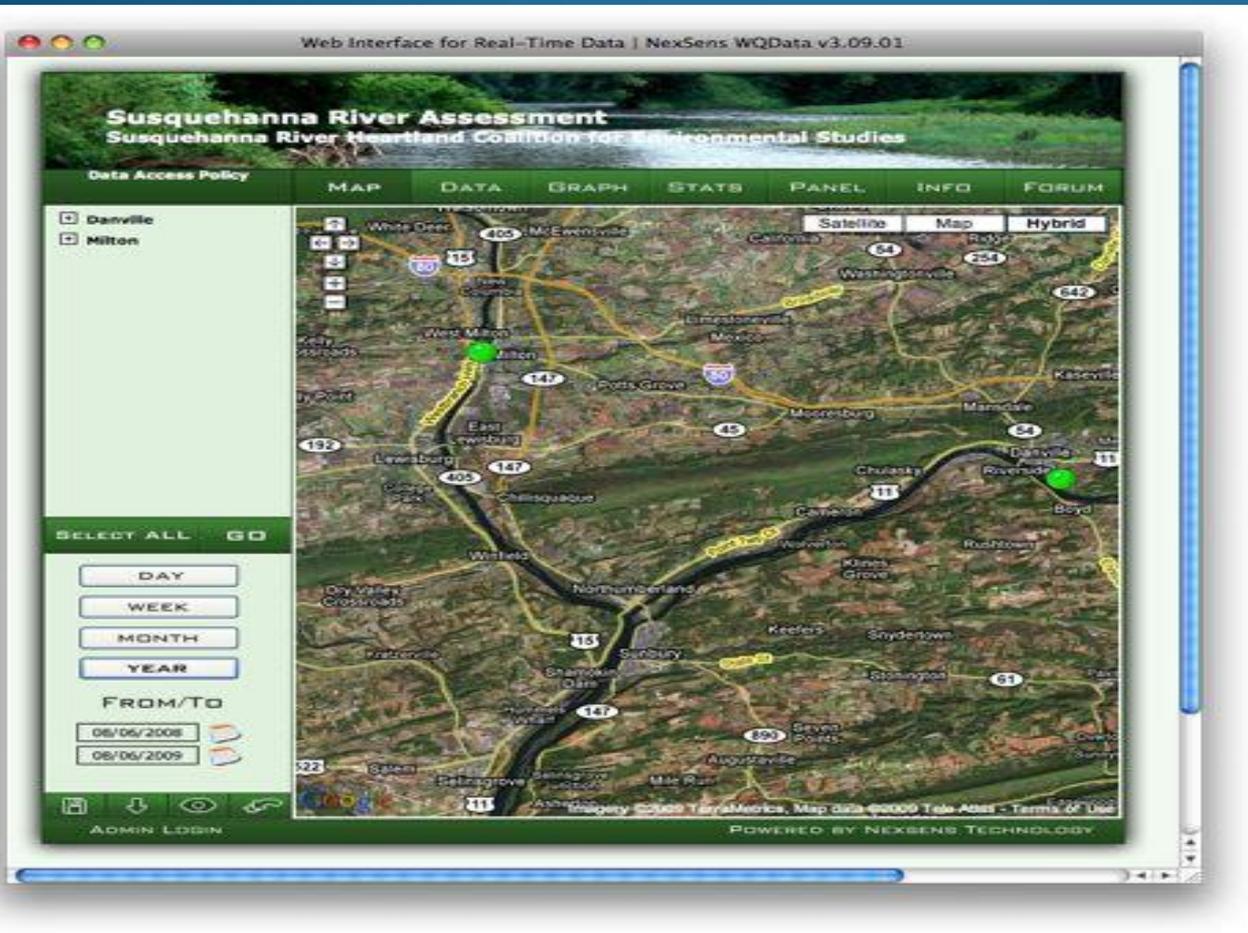




For more information about SRHCES, please visit www.SRHCES.org.

Map provided courtesy of Jeff Brunskill, Department of Geography & Geosciences, Bloomsburg University

Data collecting Sondes



Marina Project - Sunbury



Variability in Water Quality and Benthic Communities at the Confluence of the North and West Branches of the Susquehanna River

Cynthia Venn, Chris Hallen, Steve Rier - Bloomsburg
University of PA

Jack Holt, Ahmed Lachab - Susquehanna University

Mel Zimmerman - Lycoming College

Mike Bilger - EcoAnalysts, Inc.





Macroinvertebrate Monitoring of the Lower West and North Branches of the Susquehanna River- Rock Baskets and Hester-Dendy Sampling



Zach Bassett, Zebidiah Buck, Josh Moore, Lori Smith, Laura Walter, Max Olsen and Dr. Mel Zimmerman

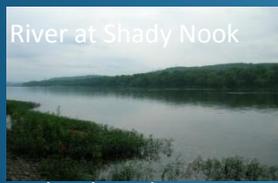


Introduction

During the summer of 2009 the Susquehanna River Heartland Coalition for Environmental Studies (SRHCES.org) began in stream monitoring for chemistry and aquatic macro invertebrates at Danville on the North Branch, Milton and Watsonstown on the West Branch, and Shady Nook below the confluence of the two branches at Selinsgrove. Permanent *Sondes* were placed at water intake points at Danville and Milton to monitor chemistry. Continuous Sonde data from the Danville and Milton sites can be accessed at

<http://www.facstaff.bucknell.edu/mmctamma/research/susquehanna/>.

Along with the Sondes, Rock Baskets and Hester-Dendy artificial samplers were deployed to collect macroinvertebrate life in the river. These artificial samplers were placed in the river at the Shady Nook/Selinsgrove, Watsonstown, and Danville sites for a six week incubation period so that population density and diversity of macroinvertebrate populations could be attained. Three sets of each sample were placed along a transect at each site at the right and left banks and middle river. Each set contained 3 Rock Baskets and 3 Hester-Dendy samplers. Rock Baskets encompass 0.3m² surface area while Hester Dendy samplers are 0.1m². During the summer of 2010 these samplers were again deployed at the same sites along with an additional location at Milton State Park. Interns from Susquehanna University and Lycoming College are processing these samples. At each of the locations diatoms were sampled with diatometers incubated in the river for two 3 week periods each summer. These samples are being processed by Susquehanna University.



River at Shady Nook

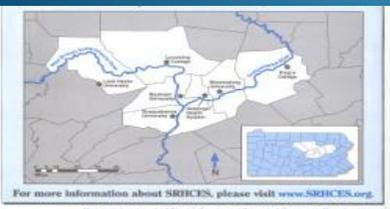


River at Danville

Heartland Coalition Partners



Deployment at Watsonstown



For more information about SRHCES, please visit www.SRHCES.org. Map provided courtesy of Jeff Brunard, Department of Geography & Environmental Planning, Bucknell University.

Methods

Rock Baskets were filled with washed limestone (grade 3-4) and attached to cinder blocks with wire and plastic zip-ties. Hester-Dendy and diatometers were attached to the rock baskets with zip-ties. Deployment and recovery of samplers involves use of snorkeling and scuba diving equipment.



Benthic Macroinvertebrates Collected for SRHCES Project 2009

Order Amphipoda:

- Family Gammaridae
 - Gammarus

Order Coleoptera:

- Elmidae
 - Stenelmis
- Psephenidae
 - Psephenus

Order Decapoda:

- Cambaridae
 - Orconectes

Order Ephemeroptera:

- Caenidae
 - Caenis
- Isonychiidae
 - Isonychia
- Heptageniidae
 - Stenonema
 - Maccraffertium
 - Heptagenia
 - Stenacron
- Batidae
 - Baetis
- Tricorythidae
 - Tricorythodes
- Potamanthidae
- Ephemerellidae
- Leptophlebiidae
- Ephemeridae

Order Gastropoda:

- Pleuroceridae
 - Lymnaeidae

Order Isopoda:

- Asellidae

Order Diptera:

- Chironomidae
- Simuliidae
- Tipulidae

Order Megaloptera:

- Sailiidae
 - Sialis
- Corydalidae
 - Croydulus

Order Odonata:

- Coenagrionidae
 - Argia

Order Plecoptera:

- Leuctridae
 - Leuctra
- Perlodiidae
- Taeniopterygidae

Order Trichoptera:

- Hydropsychidae
 - Cheumatopsyche
 - Hydropsyche
- Lepidostomatidae
- Philopotamidae
 - Chimarra
- Polycentropodidae
- Rhyacophilidae

Preliminary Results

Over 35 taxa of macroinvertebrates have been identified to date. Eventually all taxa will be identified to genus and species and processed according to the EPA Rapid Bioassessment protocols for water quality assessment. Distinct density values were observed along transects at each site and between each location. Eventually, macroinvertebrate data will be correlated with water chemistry and diatom diversity and provide an overall water quality evaluation at each location.

Macroinvertebrate Density (org/m ²) Data from River Study Summer 2009			
Site:	Watsonstown	Danville	Shady Nook
Rock Basket Density (org/m²):			
Left Bank (org/m²)	342.3 ± 203.7	N/A	2456.7 ± 1016.5
Center (org/m²)	4104.7 ± 1069.8	7243 ± 6335.68	5690.7 ± 3254.2
Right Bank (org/m²)	1306.7 ± 1024.42	5818.7 ± 2660.6	1779.0 ± 478.8
Hester-Dendy Density (org/m²):			
Left Bank (org/m²)	380 ± 103.92	N/A	*
Center (org/m²)	686.7 ± 222.79	2943.3 ± 1857.7	*
Right Bank (org/m²)	416.7 ± 203.06	2133.3 ± 1413.0	*
Grand Mean (org/m²) ± SD, Deviation			
Rock Basket Density (org/m²):	1917.9 ± 1850.2	6388.4 ± 3765.9	2660.7 ± 2427.5
Hester-Dendy Density (org/m²):	494.4 ± 215.5	2538.3 ± 1541.4	*

* Susquehanna University is processing Hester-Dendy samples



2009 CWI interns included Tracie Curtis, Megan Schultz, K.C. Failor, Trisha Lindenmuth, Gwen Forestal, and Greg Sledzik. Coordination of Susquehanna University interns was by Dr. Jack Holt. Special thanks to the Degenstein Foundation for their continued support of this project.