Stream Monitoring to Identify Impacts of Oil & Gas Well Drilling in Allegany State Park Watersheds

Quaker Run

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Allegany State Park Location









ASP Stream Monitoring Program GOALS

- To obtain baseline data on streams entering the park from P.A. before oil and gas well development causes impacts
- To identify changes in water quality *when they occur* as a result of oil and gas well activities
- To take actions to protect the quality of all of our park's water resources

Stream Monitoring Stations



Murray Brook







Yeager Brook





Yeager Brook 2





Map

Coon Run







Willis Creek





Quaker Run







English Creek







Wolf Run



Original station



Wolf Run 2 - upstream



Approach to Monitoring

- 4 teams
- Each team monitors 1x per month
- Teams formally trained on equipment
- Follow a specific monitoring protocol
- Equipment calibration 1x per month
- Data entered into Access database
- Back up field work with lab samples

Adaptive Management

- Changes to program as needed
- Winter monitoring stations and schedules
- Addition of Yeager 2 station
- Changes to protocol to work more closely with DEC
- Moving Wolf Run due to Beaver Dam
- Reduction in frequency of monitoring 2013 during period of low development activity

Water Quality Teams









Water Quality Teams - additions







YSI - 30

- Temperature
- Raw Conductivity
- Specific Conductance
- Salinity



Turbidity

Hach 2100 P portable turbidimeter





• Fluorescence







• pH - kits







- Flow tape measure, stop watch, tongue depressors
- Other Camera
- Rainfall
- GPS Units



Back up Laboratory samples

- When to collect a sample:
- Specific Conductance > 100 test for TDS
- Salinity >1ppt test for TDS
- Turbidity > 20 test for TSS
- Fluorescence under a blacklight test for Oil and Grease

Allegany State Park Stream Monitoring Field Sheet

Water Quality Monitoring Staff: _____

Date of Sampling: _____

Current Weather Conditions: SKY: Sunny Partly Cloudy Cloudy Hazy

RAIN: Heavy / Moderate / Light / No Rain / Snow WIND: Calm / Breezy / Windy

(Please circle)

					YSI			Hach		LaMotte	Visual		
Sampling Stations	Start Time	End Time	Water Temp. (⁰ C)	Specific Conductance (µS/cm)*	Raw Conductivity (µS/cm)	Lab Samp? (TDS)	Salinity (ppt)	Turbidity (NTU)	Lab Samp? (TSS)	рН	Velocity (sec/2m)	Sample Fluroescence?	Lab Samp? (O&G)
Wolf Run						Y / N			Y / N		•	Y / N	Y / N
Quaker Run						Y / N			Y / N		•	Y / N	Y / N
Willis Creek						Y / N			Y / N			Y / N	Y / N
Coon Run						Y / N			Y / N			Y / N	Y / N
Yeager Brook						Y / N			Y / N			Y / N	Y / N
Yeager 2						Y / N			Y / N		•	Y / N	Y / N
Murray Brook						Y / N			Y / N		•	Y / N	Y / N
English Creek						Y / N			Y / N			Y / N	Y / N

*Make sure °C symbol is flashing

Equipment issues that could affect data quality? (e.g., batteries died, broken equipment) ______ Signature of Responsible Staff: _____

Photo #	Sampling Station	Description					
When to take lab samples: f Specific Conductance is 100 μs/cm or higher take TDS sample f Salinity is 1.0 or higher take TDS sample f Turbidity is 15 NTU or higher take TSS sample							

If stream sample shows fluorescence under black light take an Oil & Grease sample

Sampling Stations:	Wolf Run	Quaker Run	Willis Creek	Coon Run	Yeager Brook	Yeager 2 (optional)	Murray Brook	English Creek
General Notes & Observations: Water color?								
Water odor? Water level: low, normal, high?								
Changes? Anything unusual?								
Listen. Truck or equipment sounds? Notes.								
Travel into P.A.? Observations. Photos: (include photo # and brief description)								
	N/A	N/A						N/A

Data Management and Quality Control

- Access Database
- All photographs stored on a computer
- Written Protocol updated as necessary
- Calibration of instruments 1/month
- Calibration checks weekly
- Equipment checklist
- Training of new staff conducting monitoring

Equipment checklist

Allegany State Park Stream Sampling Project

Equipment Check Sheet

Directions: Please complete in full before going out in field. Enter data as required, or a Y / N (for Yes or No), and sign after properly checking equipment.

Date		Calibration Check - YSI Meter			Calibration Check - Turbidimeter			Full	Full	Do you have		
	Time	Standard used?	Sp. Cond. Reading (°C flashing)	Batteries Replaced?	Standard used?	NTU Reading	Batteries Replaced ?	Calib of YSI?	Calib of Turb?	listed below?	NOTES	SIGNATURE
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		Distilled Water	г									
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		Distilled Water	r									

_Clipboard Field Sheet _Pen & Sharpie Glass Jars for Each Site _Small Plastic "Scooper" Bottle

_TDS Sample Bottles

_YSI Meter _Cooler

_Oil & Grease Sample Bottles

_pH Kit (s) _Turbidimeter _Measuring Tape

_Bobbers and/or Tongue Depressors _Camera

_Ice Packs _Black Light

_Stop Watch



Development in P.A. Black Snake Mountain Trail



Development in P.A. Yeager Snowmobile Trail



Development in P.A. Coon Run Road



Yeager Brook Watershed Development





Specific conductance is consistently higher in Yeager Brook than in the control site, English Creek.

Stream	Active	Well Density	Mean Specific	Percent of	Mean	рН
Name	Wells	wells/km ²	Conductance	Salinity > 0	Turbidity	
Yeager Brook	122	25.5	109.90	47.0	7.46	6.9
Coon Run	63	8.9	76.21	20.2	7.81	6.7
Murray Brook	9	4.4	50.14	3.6	4.03	6.8
Willis Run	3	1.3	50.92	0.0	3.06	6.6
Wolf Run	0	0.0	61.60	1.1	4.35	6.7
English Creek	0	0.0	58.85	0.0	6.13	6.7

- 122 wells have been drilled in the Yeager Brook watershed in recent years, with a well density of 25.5 wells/km². Each well has a well pad of ~¹/₂ acre and several associated roads.
- The mean pH in Yeager Brook has been increasing and is now significantly higher than any other stream (p<0.05).
- Coon Run has 63 wells (8.9 wells/km²) in its watershed, a medium density compared to other streams. The mean turbidity was the highest in this watershed.



- Specific conductance, a measure of total dissolved solids, was significantly higher in sites with higher well density (>20 wells/km², Yeager Brook) than those with no or low well density (p<0.05).
- Specific conductance in Coon Run was slightly higher than in streams with lower well density.



- The number of occurrences of salinity in Yeager Brook is significantly higher than any other site (p<0.05).
- Salinity in Yeager Brook was >0, 47% of the time.
- Salinity in Coon Run was >0, 20% of the time.

Pollution Incidents







Yeager Brook Pollution Incident August 10, 2010







November 22, 2010



Yeager Brook



Muddy oil and gas road



Failing erosion controls



Erosion Control Measures in ANF







September 28, 2011- Yeager and Yeager 2



Yeager Brook



Yeager 2











November 21, 2011—Yeager and Yeager 2



11/20/11 Yeager Brook



11/21/11 Yeager Brook



11/22/11 Yeager Brook



11/20/11 Yeager 2



11/21/11 Yeager 2



11/22/11 Yeager 2

January 17, 2012



Coon Run

Yeager Brook



Pollution Events Summary

- 5 single-day pollution events involving storm water runoff from well sites and roads reaching Yeager Brook have been documented.
- These events resulted in Yeager Brook having 2-3 times the normal levels of turbidity or suspended solids which violated NYS narrative water quality standard (6NYCCRR§ 703.2).
- NYS DEC has commenced enforcement actions against the energy company responsible for the wells. Enforcement actions and fines are currently pending the outcome of legal actions.
- Since the large fine and media attention during January, 2012 there has been no new development in the watersheds affecting the park.

Questions and Discussion

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