Remote Water Quality Monitoring Network (RWQMN)

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Susquehanna River Basin Commission
National Monitoring Conference May 2, 2012
The Basin
- 27,510-square-mile watershed
- Comprises 43% of the Chesapeake Bay Watershed
- 4.2 million population
- 60% forested
- 32,000+ miles of waterways

The Susquehanna River
- 444 miles, largest tributary to the Chesapeake Bay
- Supplies 18 million gallons a minute to the bay
Remote Water Quality Monitoring Network

Objectives

Establishing a real-time water quality monitoring network within areas of concern in the Susquehanna River Basin

- Establish baseline water quality conditions;
- Determine if the natural gas well industry and/or other activities are causing adverse impacts on local water quality;
- Form collaborative partnerships to improve monitoring technology and provide educational opportunities;
- Enhance protection for water supplies; and
- Be responsive to public concerns.
APPROVAL BY RULE (ABR) FOR NATURAL GAS PAD LOCATIONS
under 18CFR§806.22(f) in the Susquehanna River Basin,
November 16, 2009

Disclaimer: Intended for Educational Display Purposes Only; SRBC (1404bb) 11-16-2009
Remote Water Quality Monitoring Network – Timeframe

• Project Scope – late 2009

• First Stations Deployed – January 2010

• Expanded into New York State – May 2010

• Expanded to State Forest lands in PA – December 2010

• April 2012 – 51 real-time stations
Remote Water Quality Monitoring Network Priority Watersheds in the Susquehanna River Basin

Recoverable Natural Gas Shales within the Susquehanna River Basin include the Marcellus, Burket, Utica/Anes, Genesee, Mandata, Middlesex, Needmore, and Rhinesheet Formations.

PRIORITY WATERSHEDS

1. Sangerfield River
2. Cherry Valley Creek
3. Trout Brook
4. Nanticoke Creek
5. Catonick Creek
6. Sing Sing Creek
7. Canacaca Creek
8. Baldwin Creek
9. Tuscarora Creek
10. Chocornt Creek
11. Apalachin Creek
12. Wappinger Creek
13. Hammond Creek
14. Starrucca Creek
15. Snake Creek
16. Tomack Creek
17. Sugar Creek
18. Cruised Creek
19. Lackawanna River
20. Meshoppen Creek
21. Tioga River
22. Long Run
23. Upper Pine Creek
24. Ninemile Creek
25. Marsh Creek
26. West Pine Creek
27. Pine Creek
28. Sugar Run
29. South Branch
30. Little Mamonday
31. Elk Run
32. Loyalsock Creek
33. Blockhouse Creek
34. Grays Run
35. Little Pine Creek
36. East Fork First Fork
37. Sinehamonning Creek
38. Driftwood Branch
39. Bowman Creek
40. Kitchen Creek
41. East Branch
42. Lurby Creek
43. Hicks Run
44. Little Munsey Creek
45. Baker Run
46. Marsh Creek
47. Trout Run
48. Moose Creek
49. Little Clearfield
50. Chest Creek
51. Bob’s Creek

Susquehanna River Basin Commission www.srbc.net
Equipment

- Data sonde
  - YSI 6600 V2-4 data sonde
- Data platform
  - NexSens 3100 or 6100 iSIC unit
- Power source
  - Solar panel – most common
  - Direct power connection
Network Design - Watershed Selection

• Watershed size - 30-60 square miles

• Activities associated with natural gas development
  (Drilling activity, wastewater/chemical storage and transport,
  water withdrawals, etc.)

• Areas of potential natural gas development
  (Leasing activity, existing pipeline infrastructure, transportation
  corridors, etc.)

• Sensitive and high quality headwater areas
  (Aquatic life, recreation, public water supply)

• Site conditions
  (channel morphology, seasonal conditions, etc.)

• Land use

• Property access/agreements – private and public
Operation & Maintenance

- Data Sonde
  - Site visit every 6-8 weeks
  - Sonde is calibrated before deployment and post calibrated after deployment
  - Annual tune-up
- Data Platform – software updates
- Data
  - Corrected for fouling and probe drift
    - Aquarius 3.0 software
  - Corrected data are posted on SRBC’s web site
  - Data reports
Continuous Parameters

• Dissolved Oxygen
• Temperature
• pH
• Conductance
• Turbidity

❖ Turbidity, conductance and pH are the parameters of focus.
Continuous Data

- Collected at 5-minute intervals
- Transmitted to a public website at 2-4 hour intervals
- Posted as provisional data
- “Alarms” sent via email to alert staff of potential problems or sonde malfunctions

<table>
<thead>
<tr>
<th>Monitoring Station</th>
<th>Temperature (°C)</th>
<th>Specific Conductivity (mS/cm)</th>
<th>pH</th>
<th>Turbidity (NTU+)</th>
<th>ODO (mg/L)</th>
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<tbody>
<tr>
<td>Apalachin Creek</td>
<td>13.11</td>
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Supplemental Sampling

• Discharge measurements
• Macroinvertebrates
• Habitat
• Fish
• Lab water chemistry
## Supplemental Sampling Parameters

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<th>Quarterly Sampling</th>
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<td>Barium</td>
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<td>Total Dissolved Solids</td>
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<td>Carbonate Alkalinity</td>
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<td>Total Organic Carbon</td>
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<td>pH</td>
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Data Report

• Released April 2, 2012

• Focus – determine existing conditions in the initial 37 stations installed (minimum of 6 months of data)

• Inform the public of the future direction of data collection and analysis

• Available on SRBC’s web site and in hard copy
Level 3 Ecoregions

- Northern Appalachian Plateau and Uplands
  - 22 stations
- Northern Central Appalachian
  - 10 stations
- Central Appalachian Ridges and Valleys
  - 5 stations
10 stations
Showed smallest variability of conductance, turbidity, and pH
Lowest values of conductance, turbidity, and pH
Data Report
Northern Appalachian Plateau and Uplands

• 22 stations
• More variability seen in conductance, turbidity, and pH
• Stations with glacial till geology showed higher conductance and turbidity values
Data Report
Central Appalachian Ridges and Valleys

- 5 stations
- Largest variability in conductance, turbidity, and pH
- Small sample size
- Two stations impacted by mine drainage
Conductance and Turbidity

- Main two parameters of concern
- Conductance – frack flowback/wastewater have very high conductance
- Turbidity – related activities
  - New roads
  - Pad construction
  - Pipelines
Conductance

Specific Conductance

μhos/cm

N. Central Appal
N. Appal, Plateau & Uplands
Central Appalachian (No AMD)
Central Appalachian (AMD)
Turbidity
### Biological Data

- Collected at each station in 2011

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<tr>
<th>PERCENT FORESTED</th>
<th>Upper Pine</th>
<th>Ninemile</th>
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### PA IBI METRICS

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<th>Percent Sensitive (PTV 0-3)</th>
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<th>IBI SCORE (large)</th>
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<th>Pine</th>
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<td>95.39</td>
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</tbody>
</table>

- Pine Creek Watershed – scenic, recreational river
- Baker Run – drilling is the only activity in the watershed
Future Direction of the Project

• Continuous real-time monitoring at the 51 stations
  • Plan to increase the network to 60 stations
• Continue supplemental water chemistry sampling
• Macro sampling
• Select sites
  • Fish sampling
  • Pressure transducers
  • Rain gauges
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http://mdw.srbc.net/remotewaterquality/