

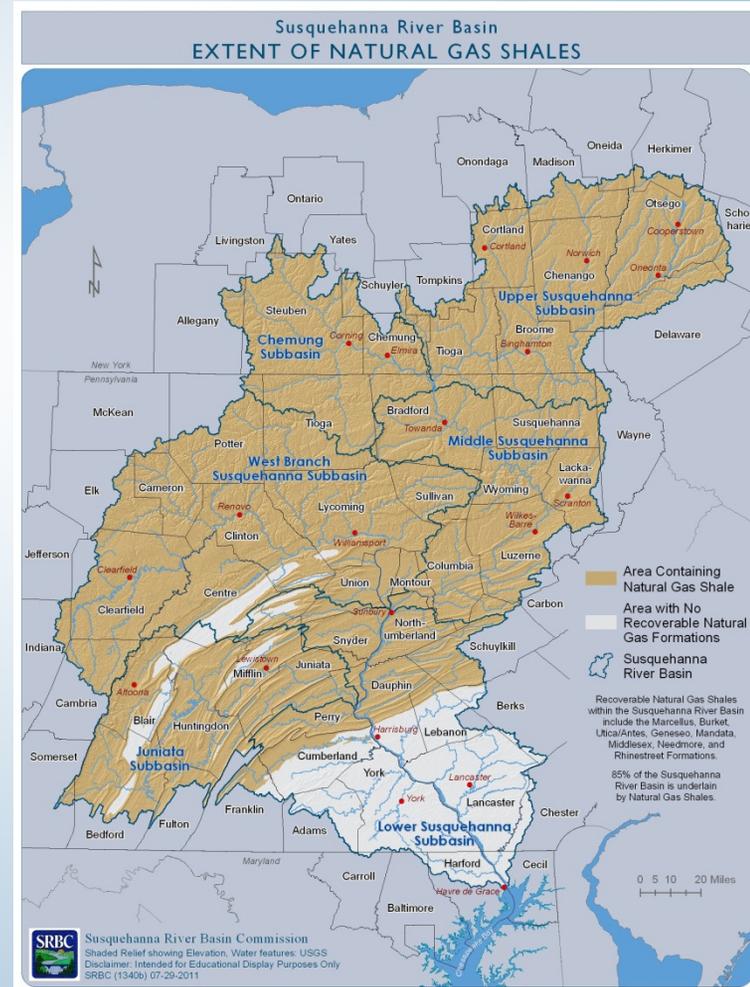
# SRBC Shale Gas Region Water Quality Monitoring Activities Overview



Water Quality Advisory Committee Meeting  
May 22, 2012

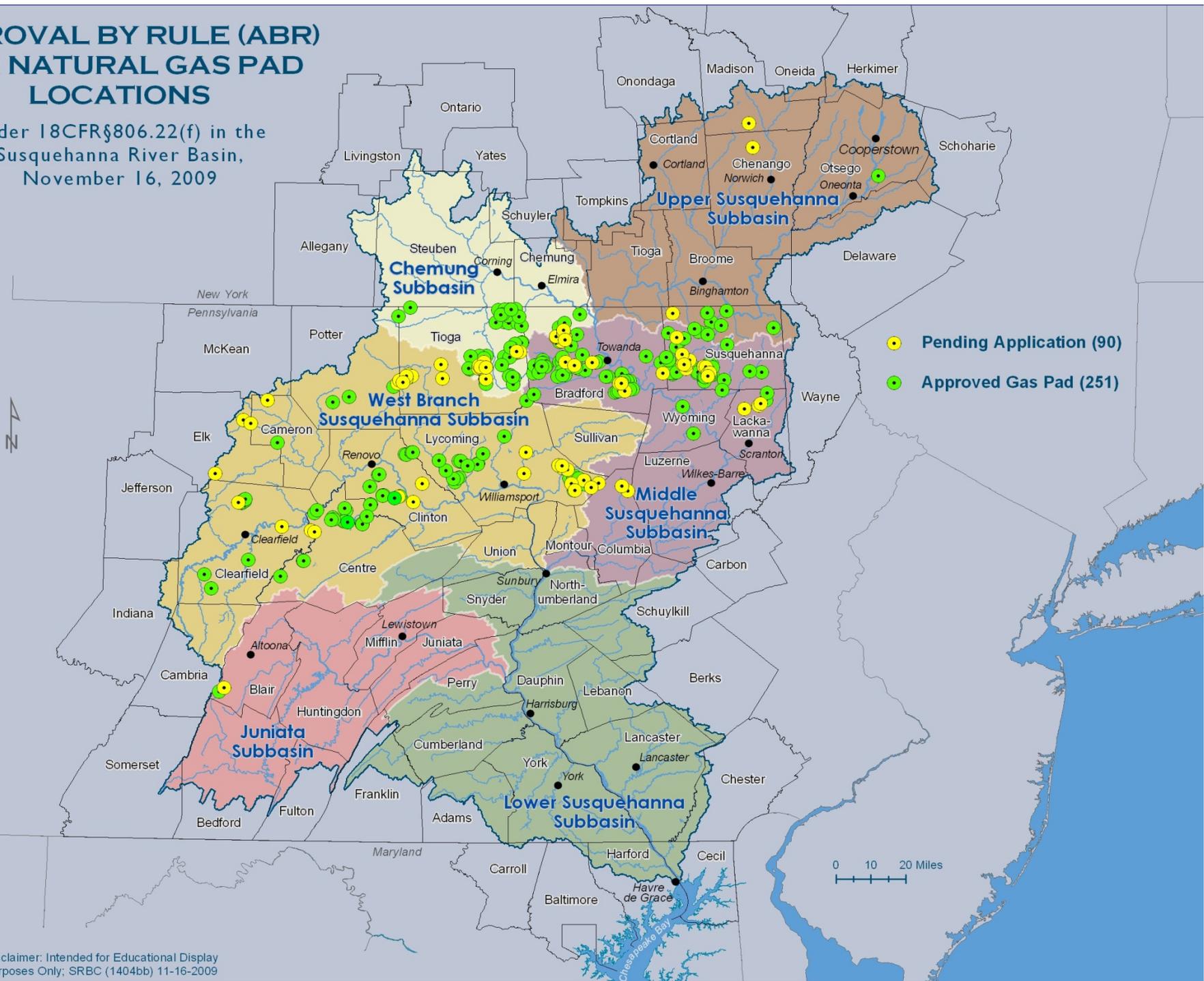
# Current Monitoring Activities

- Remote Water Quality Network\*
- Aquatic Resource Surveys and Research Project\*
- Subbasin Surveys
- Low Flow Monitoring Project
- Interstate Streams Monitoring Program
- Early Warning System
- Large River Assessment Program
- Sediment and Nutrient Monitoring Program



# APPROVAL BY RULE (ABR) FOR NATURAL GAS PAD LOCATIONS

under 18CFR§806.22(f) in the  
Susquehanna River Basin,  
November 16, 2009



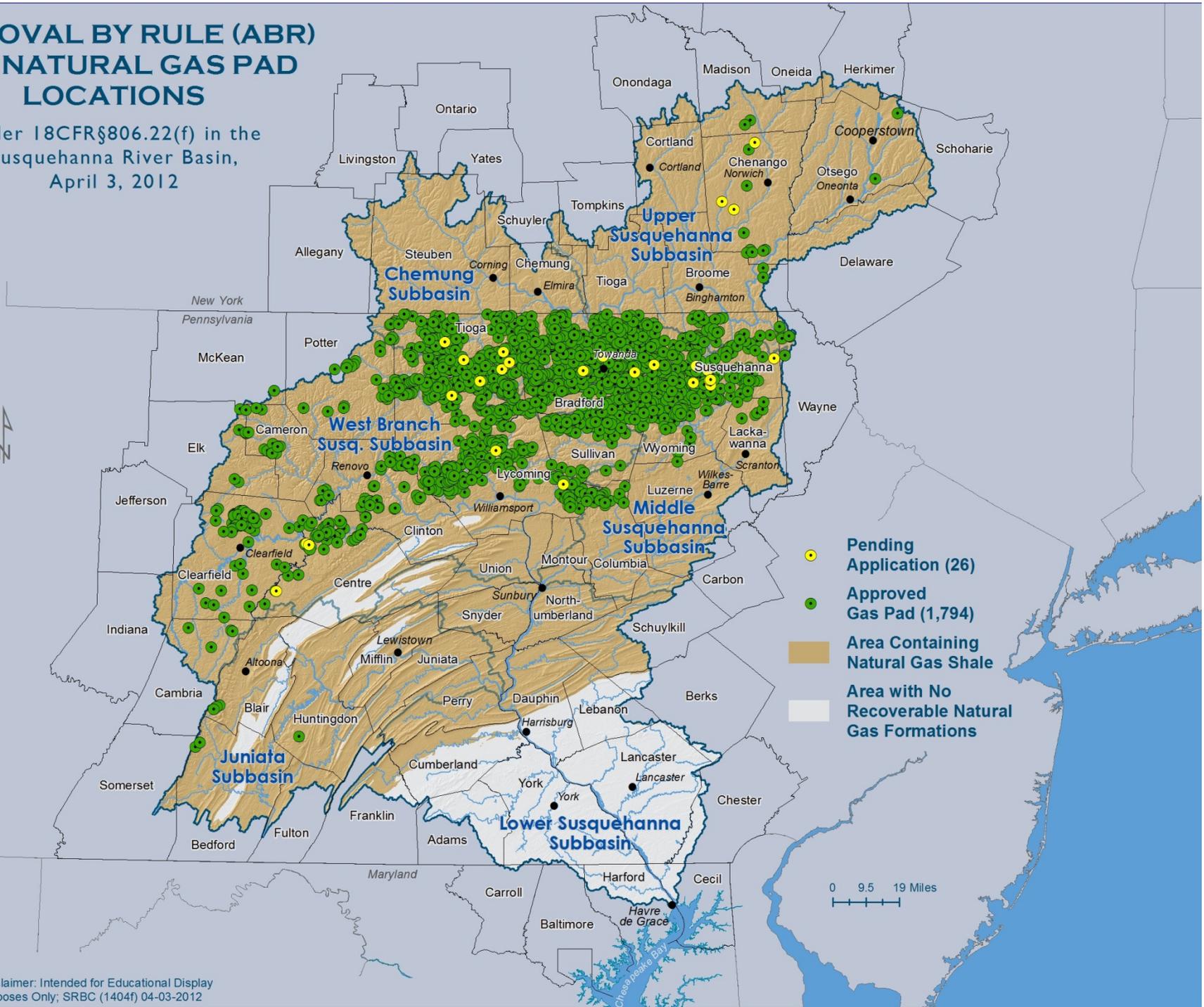
- Pending Application (90)
- Approved Gas Pad (251)



Disclaimer: Intended for Educational Display  
Purposes Only; SRBC (1404bb) 11-16-2009

# APPROVAL BY RULE (ABR) FOR NATURAL GAS PAD LOCATIONS

under 18CFR§806.22(f) in the  
Susquehanna River Basin,  
April 3, 2012

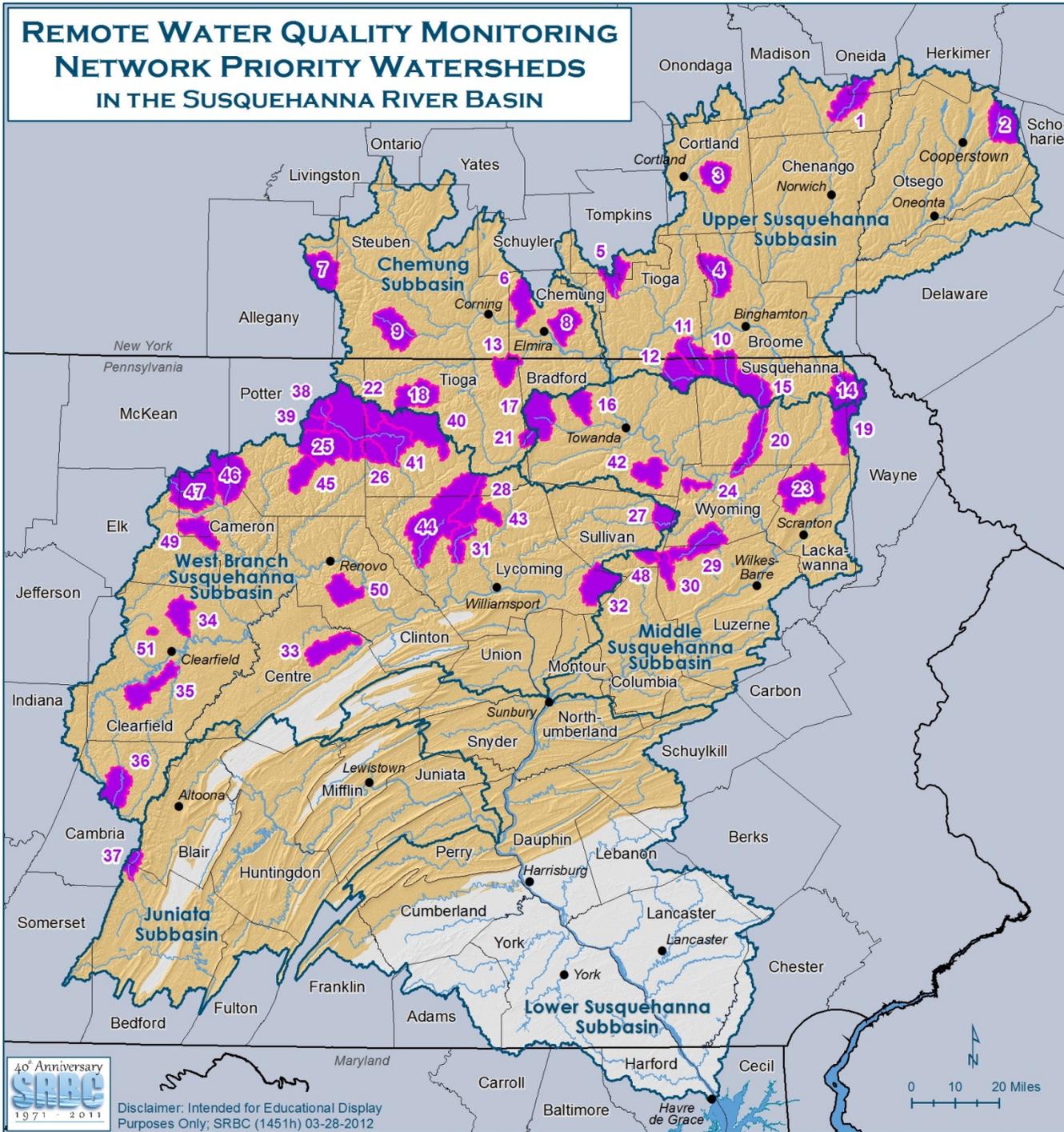


- Pending Application (26)
- Approved Gas Pad (1,794)
- Area Containing Natural Gas Shale
- Area with No Recoverable Natural Gas Formations



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Purposes Only; SRBC (1404f) 04-03-2012

# REMOTE WATER QUALITY MONITORING NETWORK PRIORITY WATERSHEDS IN THE SUSQUEHANNA RIVER BASIN



**Area Containing Natural Gas Shales**

**Area with No Recoverable Natural Gas Formations**

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

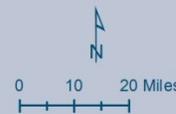
## PRIORITY WATERSHEDS

**Station Installed**

- |                                       |   |
|---------------------------------------|---|
| 1. Sangerfield River                  | 26. Elk Run                                     |
| 2. Cherry Valley Creek                | 27. Loyalsock Creek                             |
| 3. Trout Brook                        | 28. Blockhouse Creek                            |
| 4. Nanticoke Creek                    | 29. Bowman Creek                                |
| 5. Catatunk Creek                     | 30. Kitchen Creek                               |
| 6. Sing Sing Creek                    | 31. Larrys Creek                                |
| 7. Canacadea Creek                    | 32. Little Muncy Creek                          |
| 8. Baldwin Creek                      | 33. Marsh Creek                                 |
| 9. Tuscarora Creek                    | 34. Trout Run                                   |
| 10. Choconut Creek                    | 35. Little Clearfield Creek                     |
| 11. Apalachin Creek                   | 36. Chest Creek                                 |
| 12. Wappasening Creek                 | 37. Bobs Creek                                  |
| 13. Hammond Creek                     | 38. Upper Pine Creek                            |
| 14. Starrucca Creek                   | 39. Ninemile Run                                |
| 15. Snake Creek                       | 40. Marsh Creek                                 |
| 16. Tomjack Creek                     | 41. Pine Creek                                  |
| 17. Sugar Creek                       | 42. Sugar Run                                   |
| 18. Crooked Creek                     | 43. Grays Run                                   |
| 19. Lackawanna River                  | 44. Little Pine Creek                           |
| 20. Meshoppen Creek                   | 45. East Fork First Fork<br>Sinnemahoning Creek |
| 21. Tioga River                       | 46. Portage Creek                               |
| 22. Long Run                          | 47. Driftwood Branch                            |
| 23. South Branch<br>Tunkhannock Creek | 48. East Branch<br>Fishing Creek                |
| 24. Little Mehoopany<br>Creek         | 49. Hicks Run                                   |
| 25. West Branch<br>Pine Creek         | 50. Baker Run                                   |
|                                       | 51. Moose Creek                                 |



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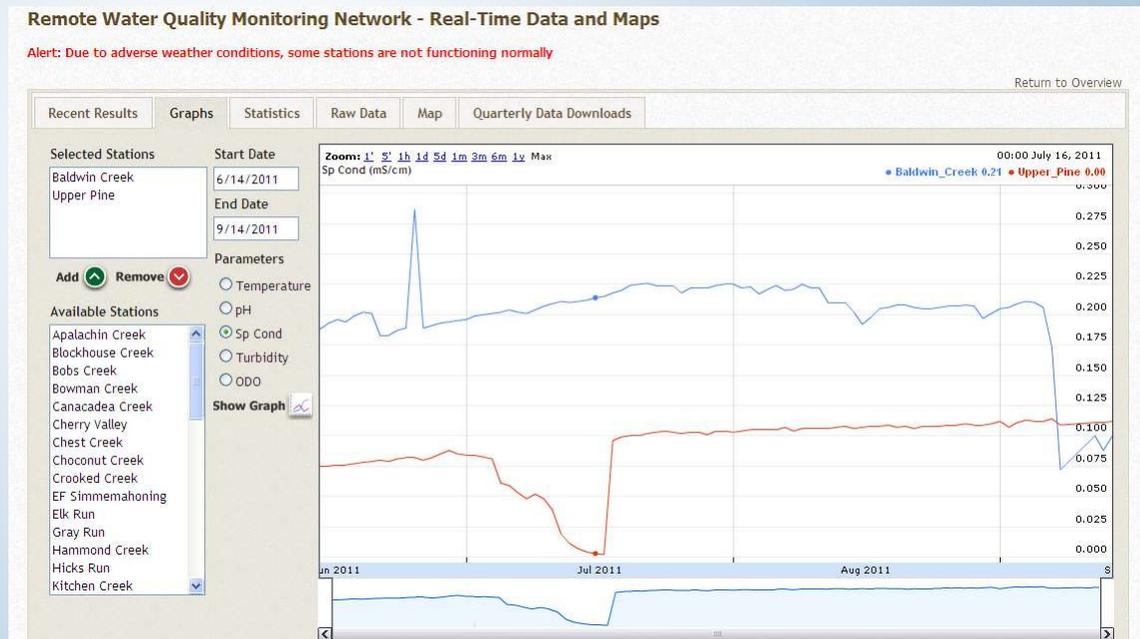
# Remote Water Quality Network

## *Real-time Data Collection*

### Data Collection

### Continuous monitoring

- Conductance\*
- Turbidity\*
- Temperature
- pH
- Dissolved Oxygen
  
- Depth



# Remote Water Quality Network *Supplemental Data Collection*

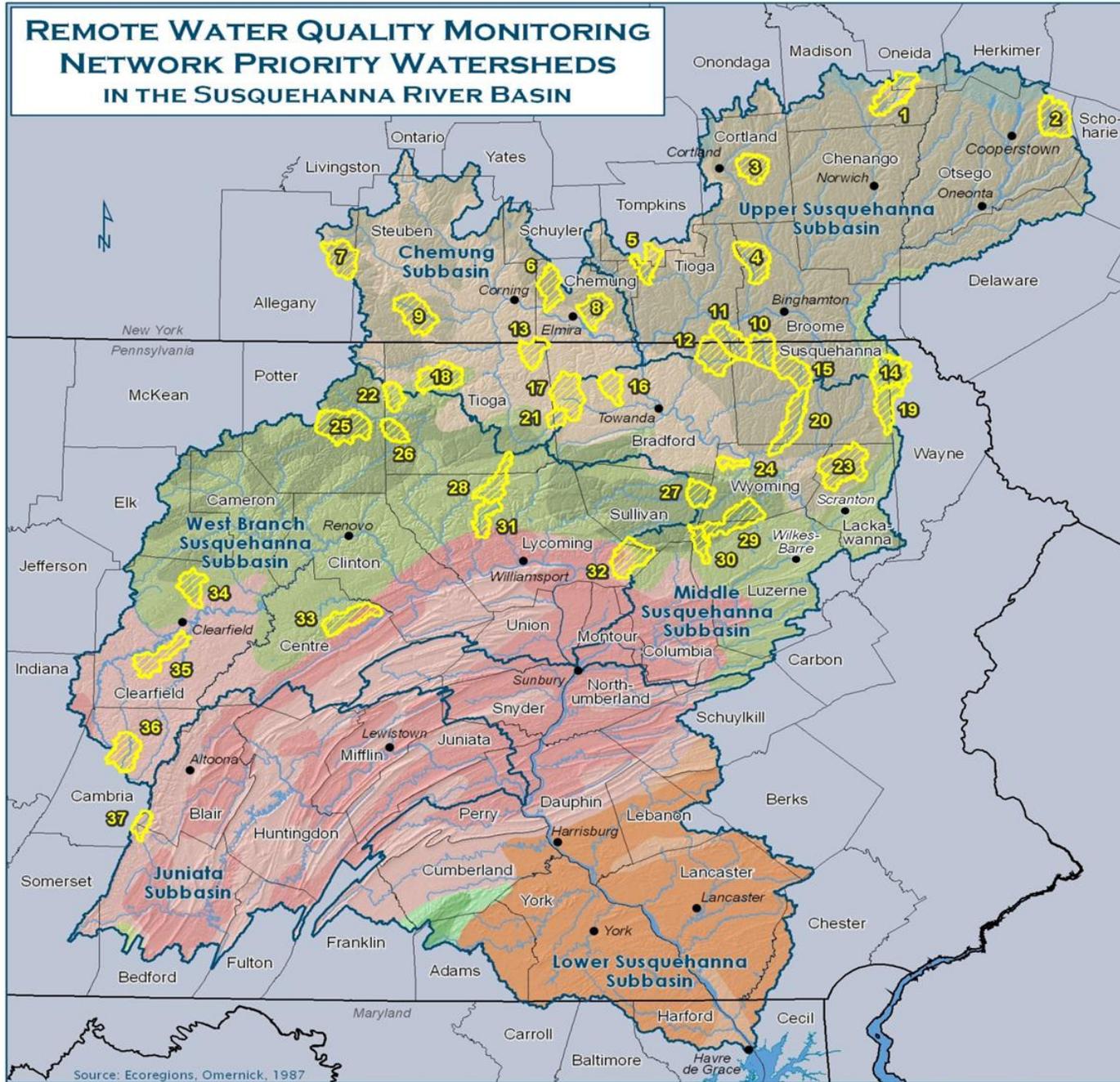
Information collected during station visits by staff include:

- Stream flow measurements
- Aquatic biological community and habitat data
- About six times a year - Acidity/Alkalinity, Chloride, Barium, Aluminum, Total Dissolved Solids, Sulfate, Total Organic Carbon
- About four times a year - Calcium, Magnesium, Sodium, Potassium, Nitrate, Phosphorus, Carbonate Alkalinity, Bicarbonate Alkalinity, Carbon Dioxide, Bromide, Lithium, Strontium, Gross Alpha and Gross Beta.

# Data Report - Baseline Conditions

- Characterizes baseline water quality conditions for the first 37 stations, drawing no conclusions on any potential impacts
  - Provides basic statistical results
  - Groups data results by similar setting
  - Analyzes variability of select parameters at select stations
- Informs the public about the future direction of data collection and analysis efforts
  - Data analyses covering the full 51 station network
  - Targeted data collection/analyses for select watersheds requiring further study
  - Data collection/analyses to assess aquatic biology
  - Data reporting interval - to occur every 6 months

# REMOTE WATER QUALITY MONITORING NETWORK PRIORITY WATERSHEDS IN THE SUSQUEHANNA RIVER BASIN



## ECOREGIONS

-  Northern Appalachian Plateau and Uplands
-  Erie/Ontario Lake Plain
-  North Central Appalachians
-  Northern Piedmont
-  Blue Ridge Mountains
-  Central Appalachian Ridges and Valleys
-  Central Appalachians

## PRIORITY WATERSHEDS

- |                        |                                    |
|------------------------|------------------------------------|
| 1. Sangerfield River   | 21. Tioga River                    |
| 2. Cherry Valley Creek | 22. Long Run                       |
| 3. Trout Brook         | 23. South Branch Tunkhannock Creek |
| 4. Nanticoke Creek     | 24. Little Mehoopany Creek         |
| 5. Catatunk Creek      | 25. West Branch Pine Creek         |
| 6. Sing Sing Creek     | 26. Elk Run                        |
| 7. Canacadea Creek     | 27. Loyalsock Creek                |
| 8. Baldwin Creek       | 28. Blockhouse Creek               |
| 9. Tuscarora Creek     | 29. Bowman Creek                   |
| 10. Choconut Creek     | 30. Kitchen Creek                  |
| 11. Apalachin Creek    | 31. Larrys Creek                   |
| 12. Wappasening Creek  | 32. Little Muncy Creek             |
| 13. Hammond Creek      | 33. Marsh Creek                    |
| 14. Starrucca Creek    | 34. Trout Run                      |
| 15. Snake Creek        | 35. Little Clearfield Creek        |
| 16. Tomjack Creek      | 36. Chest Creek                    |
| 17. Sugar Creek        | 37. Bobs Creek                     |
| 18. Crooked Creek      |                                    |
| 19. Lackawanna River   |                                    |
| 20. Meshoppen Creek    |                                    |



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Source: Ecoregions, Omernick, 1987

# RWQMN Program Expansion

## *Next Steps*

### Additional stations

- Increased watershed coverage (PA/NY)

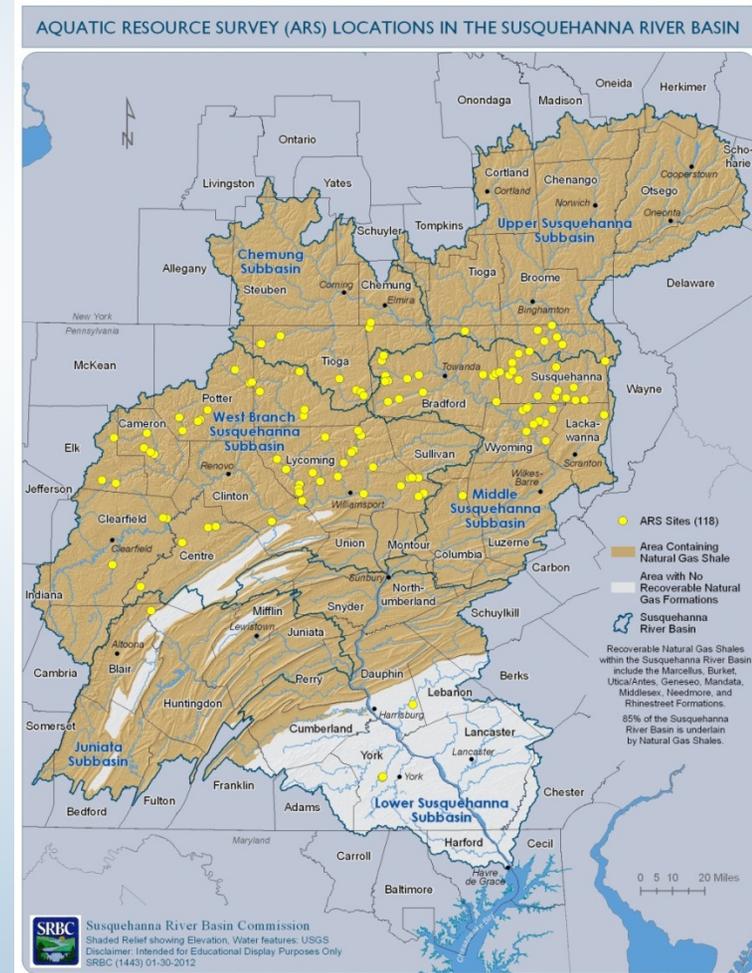
### Additional monitoring capability

- Water quality auto-samplers to better characterize fluctuating conditions at select stations
- Stream flow gaging for select stations, in addition to existing water depth monitoring
- Additional water quality and precipitation sensors

# Aquatic Resource Surveys (ARS)

Comprehensive field investigation conducted at proposed water withdrawal locations to inform the technical review process

- Assessment of physical, chemical, and biological conditions
- Select criteria determine when surveys are conducted
- To date, over 100 surveys have been conducted for both surface and ground water withdrawals
- Coordinated closely with member jurisdictions



# Aquatic Resource Surveys (ARS) *Review Process Guidance*

- Seasonal restrictions on intake installations
- Protective passby flow requirements
  - Percent of ADF
  - In high quality settings
  - Presence of RTE species, wild trout
- Require monitoring
- Reduction in requested quantity
- Denial/relocation
- Incentivize use of lesser quality waters



Eastern hellbender -  
*Cryptobranchus alleganiensis*  
*alleganiensis*

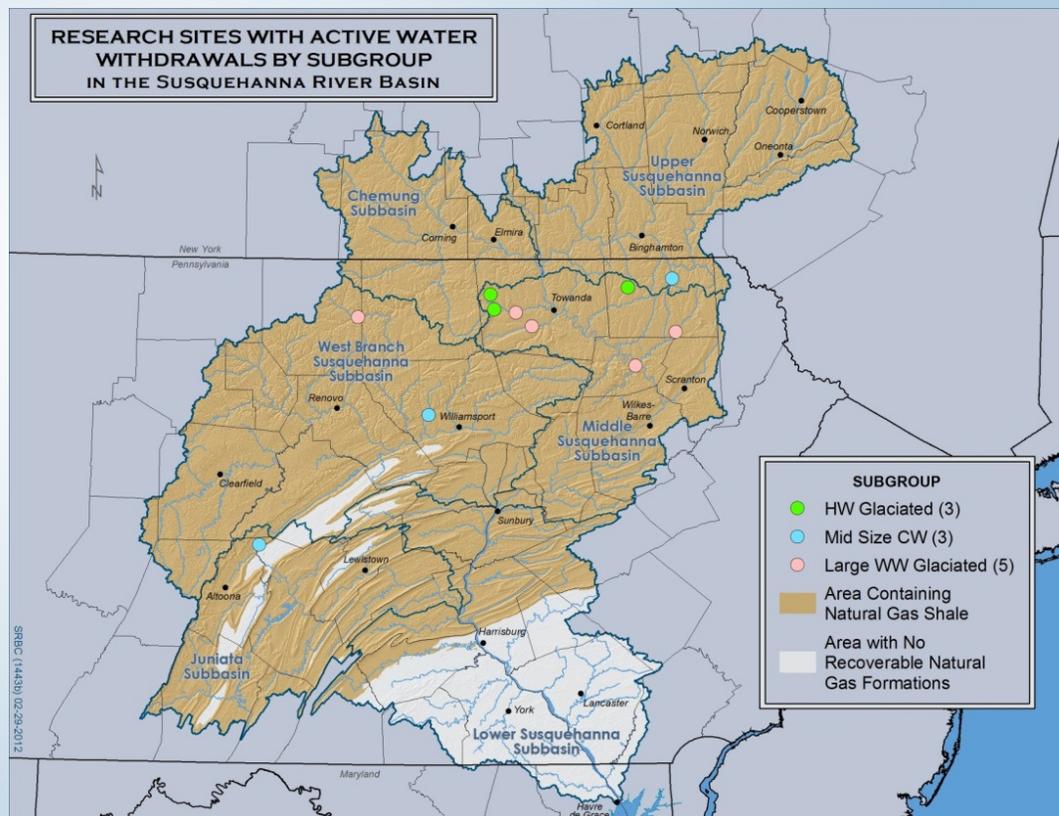


Intake structure - Bradford County,  
PA

# Aquatic Resource Survey Research

Are surface water withdrawals impacting fish and/or macroinvertebrate communities?

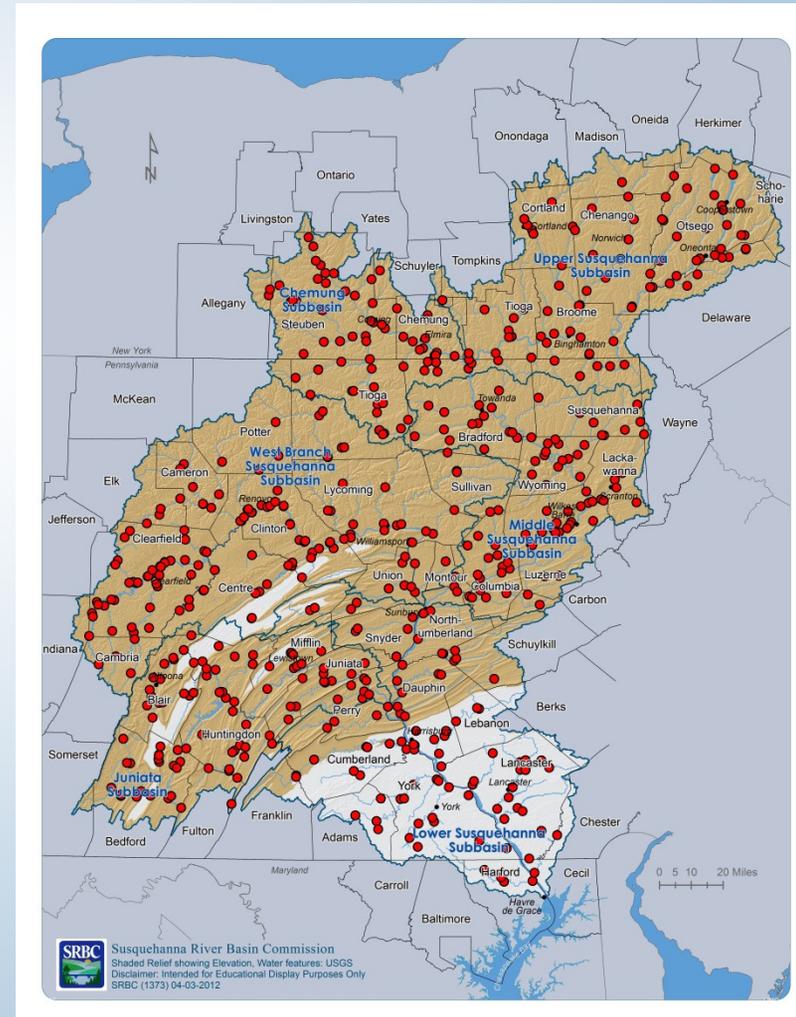
- Sampling scheduled
  - Late spring 2012
  - Alternate site locations chosen
- Analysis
  - After 2012 field season
  - Withdrawal Index predictor of abundance of fish/macroinvertebrate guilds?
  - Withdrawal causing shifts in communities?



# Subbasin Surveys

Focus on tracking ambient conditions over time within each of the major subbasins, with a second-year subwatershed focus

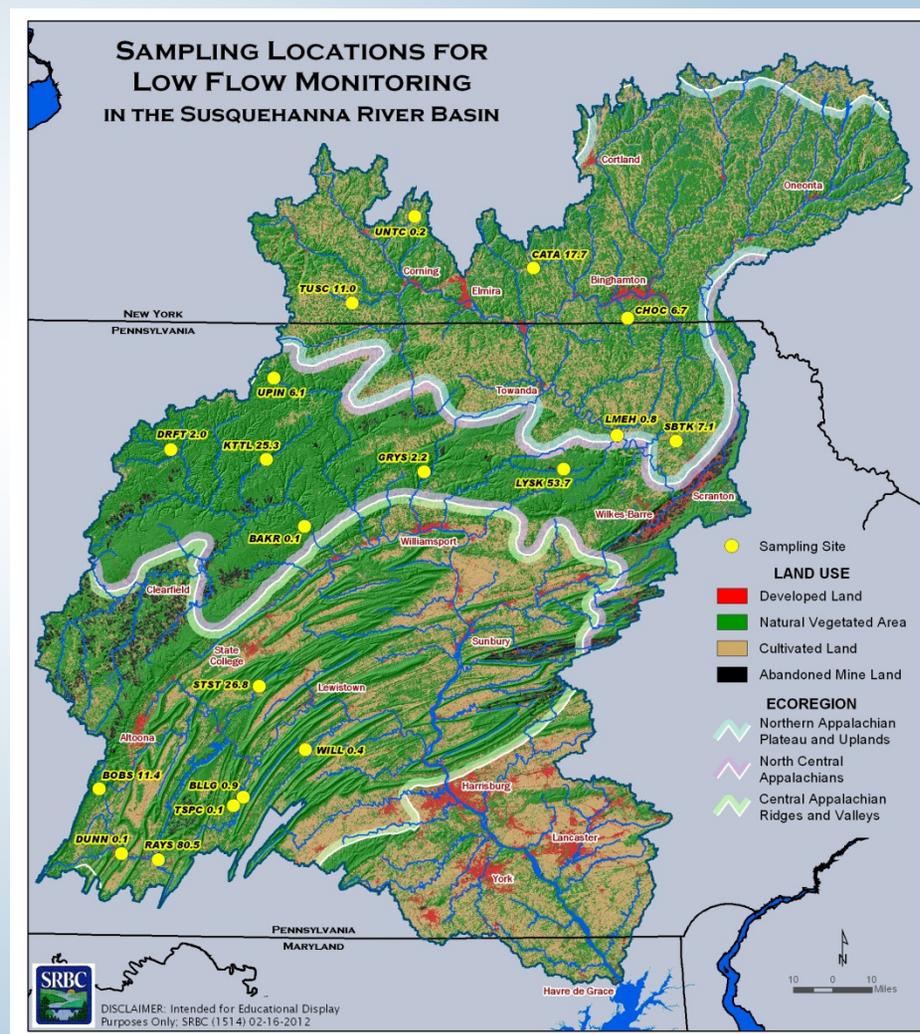
- Data collection initiated in the late 1990s
- Snapshot surveys at ~100 stations for Year 1 surveys
  - WQ, macros, habitat, and streamflow
- Year 2 surveys - Subwatershed focus
  - Nutrient/sediment loading
  - CSOs/stormwater
  - Lower reservoir water quality and biological conditions
- New focus on basinwide analyses (i.e. stressor analyses)



# Low Flow Monitoring Project

Focus on characterizing the influence of low stream flows on aquatic ecosystems in the basin

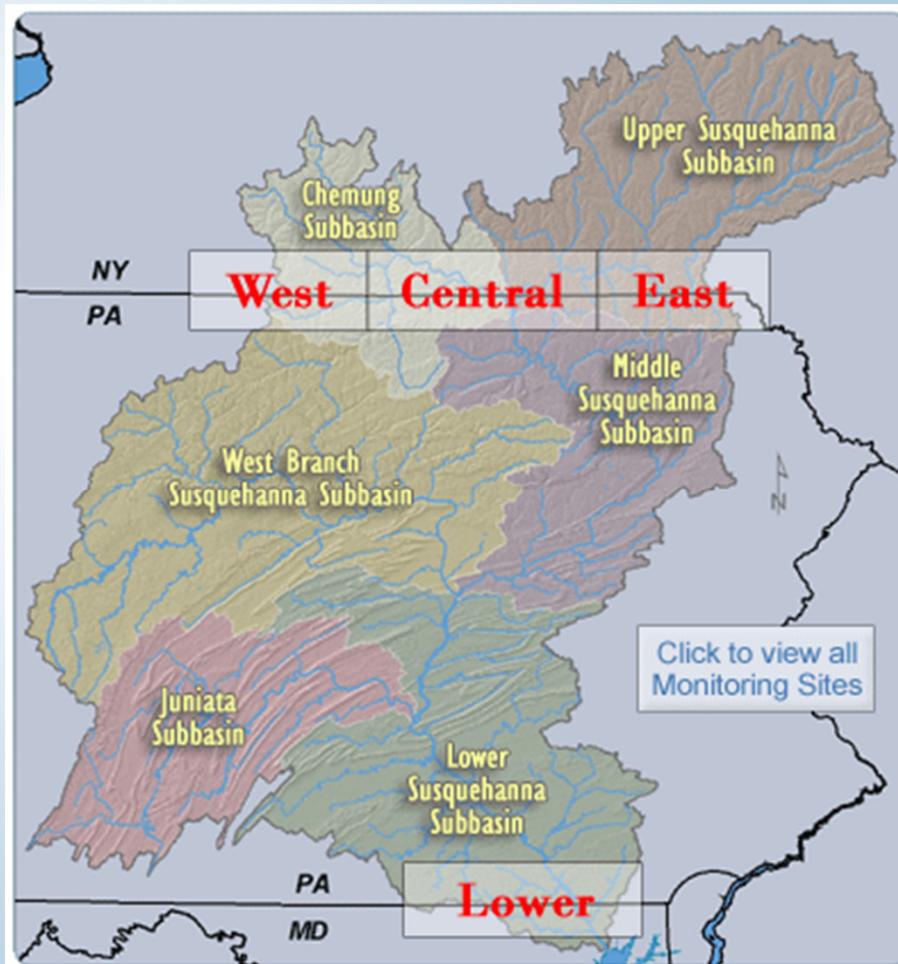
- Data collection basinwide to start summer 2012
- Annual surveys to be conducted at 19 stations in 3 of the 4 major ecoregions
- Data collection - WQ, macros, fish, habitat, and streamflow
- Continuous flow monitoring stations to be established at 17 sites



# Interstate Monitoring Program

## Monitoring interstate watersheds along the PA/NY border

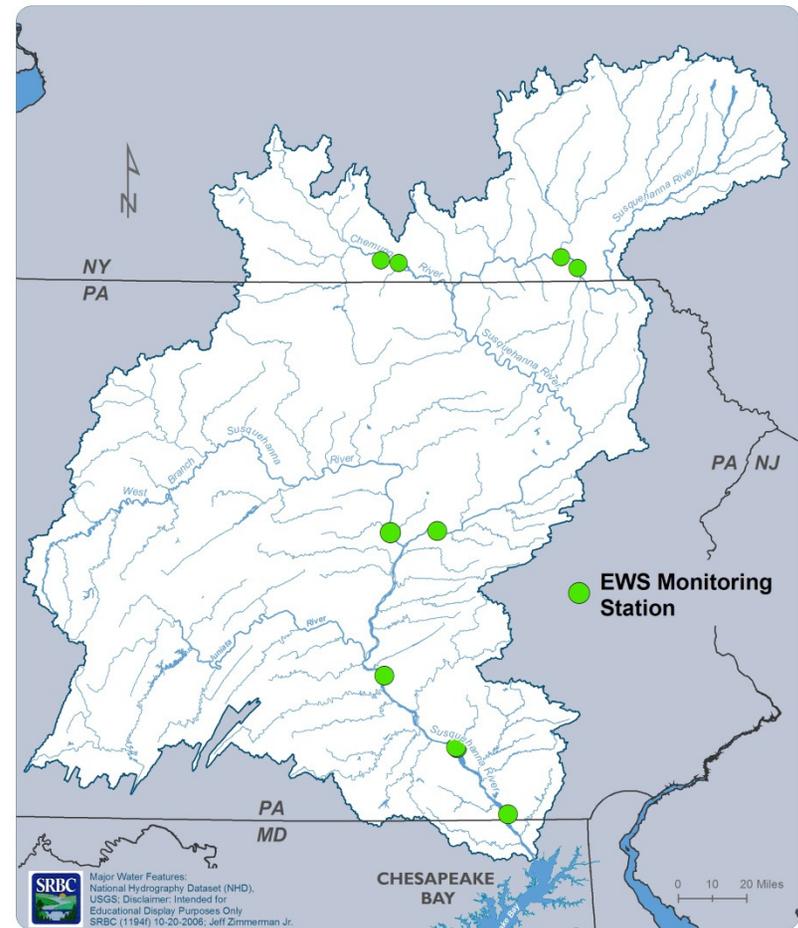
- Data collection initiated in 1986
- 40 stations along the PA/NY border
- Stations grouped by watershed size
- Data collection - WQ, macros, fish (recent), habitat, and streamflow
- Increasing data collection efforts within 4 watersheds where overlap occurs with RWQMN stations



# The Susquehanna River Basin Early Warning System (EWS)

Focus of protection of Pennsylvania and New York public water supplies through source water monitoring of the Susquehanna main stem and major tributaries

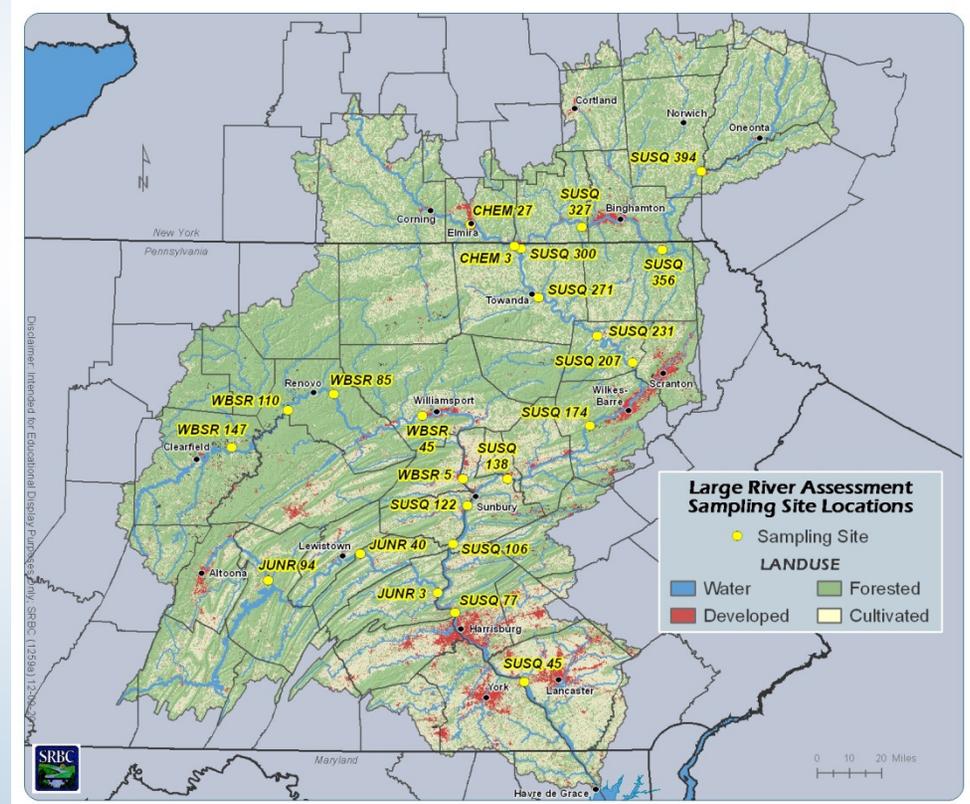
- Helps minimize impact from spills and major fluctuations in WQ through early detection
- Basic WQ parameters continuously monitored, along with organics detection at select stations
- Provides framework for data sharing and communication among water suppliers, state/local agency personnel, etc.



# Large River Assessment Program

Focus on characterizing conditions on the main stem of the Susquehanna River and its three major tributaries, for both aquatic ecosystem health and drinking source WQ

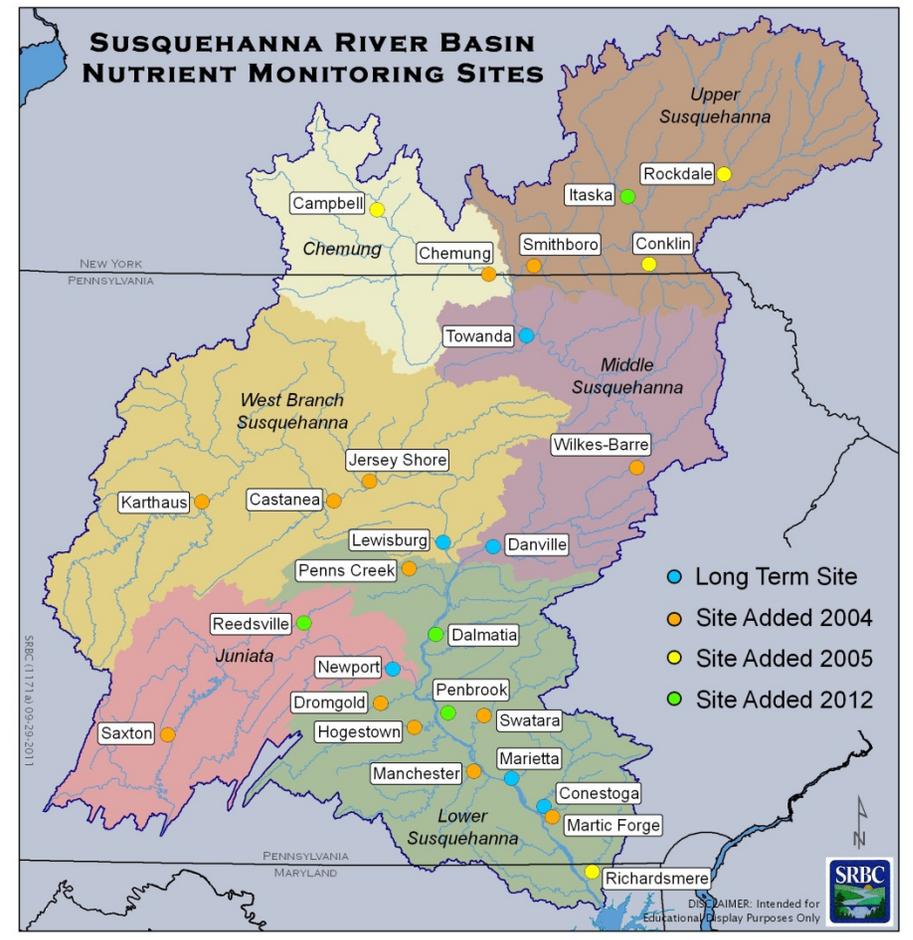
- Data collection initiated 2005
- Annual surveys at 23 stations, with 6 stations in the vicinity of SRBC EWS stations
- Data collection - WQ, macros, fish, habitat



# Sediment and Nutrient Assessment Program

Focus on monitoring in support of the non-tidal Chesapeake Bay efforts

- 27 stations (4 recently added in 2012)
- Sediment and nutrient WQ data
- Adding select parameters related to shale gas activity and drinking water source WQ (tied to Large River Program and the Susquehanna EWS)



# Susquehanna River Basin

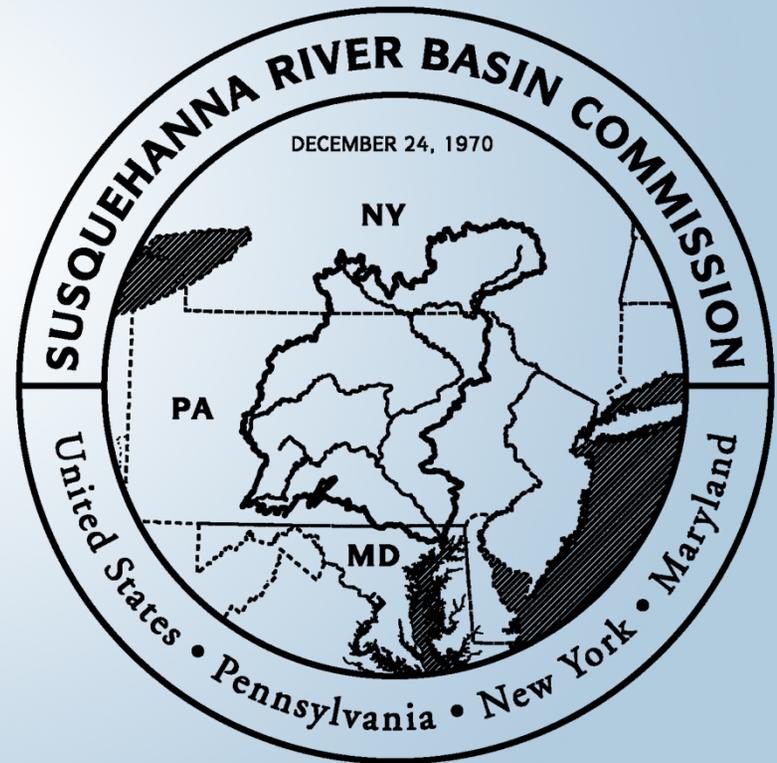
## Remote Water Quality Monitoring Network

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Protection

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May 22, 2012